

RRWPC

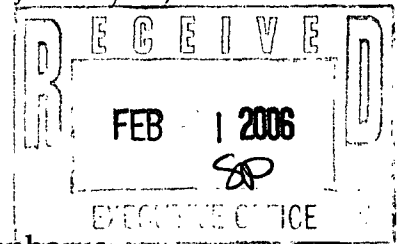
Russian River Watershed Protection Committee

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Tam Doduc, Chair
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812

**Subject: 2006 303(d) List Recommendations: Region I:
De-listing of the Laguna de Santa Rosa for Nitrogen and Phosphorus**

January 30, 2006



Dear Ms. Doduc:

First, I would like to express my appreciation for the opportunity to speak before you on this issue at the State Water Board Workshop on Dec. 6, 2005. I admired the fair and respectful way you treated all parties. I was also appreciative of your attentiveness to the issues raised regarding the Laguna de-listing issue, for which I had traveled great distance to take part. Furthermore, I am grateful for the extension of the comment deadline to Jan. 31st.

The purpose of this letter is to briefly reiterate my verbal comments on behalf of Russian River Watershed Protection Committee (RRWPC), to expand a bit on those comments, and address a few issues that I did not comment on at the time.

As I mentioned at the Workshop, RRWPC generated the form letter that raised two critical issues that continue to be of concern to us. (We heard Craig Wilson of your staff state that as of Dec. 6th, you had received 213 signed copies of this letter. I submit five more copies with this correspondence, and note that in the meantime, more may have been mailed in directly to your office.)

303 (d) Process should not have bypassed local Regional Board...

The State's bypass of Regional Board hearings on this issue was very disturbing to us. Not only were we concerned about short-changing the public of opportunities to give public input in their own area, but we are also unhappy that State Board staff has made the record for this item virtually inaccessible to us. The record is not available on the web; it is not available at the Regional Board offices, and it is not available in CD format for us to view in the comfort of our homes and offices.

Regional Board staff responsible for this issue made an effort to obtain a copy of the record and was unable to do so. He was told he had to come to Sacramento to see the record, and even then, there was no guarantee that he would be able to obtain copies. How can this lack of easy access be justified in an era of electronic instant messaging?

Furthermore, I understand that there is a formal transcript of the meeting prepared for the Board. Yet staff has insisted that those interested in obtaining a

copy must apply directly to the court reporter. It would be expected that the court reporter would charge a large fee for this service, and since your staff would already have the transcript, which could easily be put on disk, it makes no sense to force the public to have to pursue this route for access to the record.

Apparent lack of widespread support for the de-listing....

RRWPC has signed on to Nancy Kay Webb's very fine letter of Dec. 2, 2005, and we completely agree with its contents. We are grateful for her efforts and will try to not duplicate any of her comments in our letter. In addition, we are proud to sign on with a broad based coalition of groups concerned about water issues in Sonoma County and we fully support the comments of EPA and the Regional Board, all of whom oppose this action. We also support the comments of Assemblywoman Noreen Evans, the City of Sebastopol, the Russian River Chamber of Commerce, the Laguna Foundation, the Community Clean Water Institute, Robert Rawson, and probably others of whom we are unaware.

The record amply demonstrates that de-listing the Laguna for nutrients brings forth a visceral reaction from the public. Anyone who knows the Laguna from their heart, knows that this waterway is suffering dreadfully, and this proposed de-listing action is a big step in the wrong direction!

The Laguna 303(d) listing history has been a convoluted one, which we mention here since it lends credence to our allegation that this process has been energized historically more by politics, than science. In truth, we believe the underlying motivation for this and previous de-listings derives from the long time use of the Laguna for wastewater discharges by the City of Santa Rosa. The City has spent considerable sums on State and Federal lobbyists attempting to downgrade regulations that affect their discharge. Furthermore, opposition to this de-listing is so strong for good and demonstrated cause, that Dr. Smith's interpretation of the new 303(d) policy, if correct, is inappropriate and must be overruled.

I know the City attempted to get the Russian River Watershed Association to support the de-listing, but the Association's letter of Dec. 9, 2005, makes no mention of it. That group is comprised of dischargers, including the City of Santa Rosa, the Sonoma County Water Agency (SCWA) (on behalf of several County wastewater districts, which they manage), Windsor, Healdsburg, Cloverdale, Ukiah, etc., and was established by Santa Rosa and SCWA. (It's possible that the SCWA lent their support and possibly Rohnert Park, but not having seen the complete record, we are not sure.)

Historical perspective of the 303 (d) listing process...

RRWPC has tracked this issue since the early 1990's when the Laguna was the first Sonoma County stream to be put on the newly developed 303(d) list. We hereby provide a brief history of the Laguna nutrient issue from the public's perspective.

A Regional Board staff report from Aug. 28, 1997, sets the stage:

The Laguna de Santa Rosa was placed on the Clean Water Act, Section 303(d) list of impaired waterbodies in 1992 and 1994 because of occurrences of high unionized

ammonia and low dissolved oxygen. High unionized ammonia levels are the result of inputs of nitrogen in various forms. Low dissolved oxygen levels arise from inputs of organic matter, and algal growth using more oxygen than is produced in the system. Pursuant to the provisions of the Clean Water Act, the Regional Water Board prepared a Waste Reduction Strategy for the Laguna de Santa Rosa, dated March 1, 1995, which set forth estimates for the pollutant sources of concern, as well as pollutant reduction goals. The 1995 Waste Reduction Strategy (WRS) identified and provided estimates of the nitrogen sources to the Laguna de Santa Rosa, and recognizing that it may not be feasible to immediately attain the desired levels of water quality in the Laguna de Santa Rosa, established numeric interim and final goals for nitrogen compounds as well as for unionized ammonia concentrations. For dissolved oxygen, the WRS set forth a final but not an interim goal. The U.S. Environmental Protection Agency approved the WRS as consistent with Section 303(d) of the Clean Water Act on May 4, 1995.

The TMDL process for nitrogen was based primarily on estimates and lacked a true assessment of the problem (ie, no mass loading analyses) as well as lacking a nitrogen budget that addressed all sources. The goal was simply to develop a Waste Reduction Strategy that addressed the level of attainment to the USEPA criterion for unionized ammonia and Basin Plan objective for dissolved oxygen (D.O.) at four attainment sites, identification for areas in the watershed needing further reductions in nitrogen and organic matter, and to investigate the extent to which sediments and aquatic vegetation contribute to nutrient and D.O. flux. (Staff Report for Item #1 on Aug. 28, 1997, where this is described, is included with this letter.)

The report came to some interesting conclusions. It states (p. 5): *The estimates set forth in the WRS strategy are lower than the estimates calculated from the Self-Monitoring Reports. Staff tends to place more reliance in the results provided by the Self-Monitoring Reports, and proposes to use those values as a basis for comparison in the future.* What they don't specify here, although the data points to it, is that there was a significant disparity between the Self-Monitoring Reports and the WRS with the former being about 60% higher than the WRS in 1995-96. The Report went on to **assume** that improvements to the Treatment Plant would result in achievement of WRS goals, but since the goal had been modified, they weren't at all hard to meet.

"Progress toward achievement of interim and long-range goals will continue to be made as pollutants from treated wastewater, dairy, agriculture, and urban runoff are reduced." From this, according to Attachment I of the packet, Total nitrogen goal at Trenton-Healdsburg from wastewater is somehow anticipated to get down to "0", based simply on the anticipated treatment capacity addition at the Laguna Treatment Plant. Yet we do not believe that there is data to indicate this ever occurred and we certainly do not believe that this process can be construed to mean that any TMDL was completed. Given current conditions in the Laguna, it was probably an egregious "mistake" to adjust the original numeric goal to accommodate much higher existing nutrient contributions while sustaining the illusion that nutrient goals would consequently be attained.

It is significant that the Strategy at least attempted to focus on limiting nitrogen however, which was seen as causing the dissolved oxygen and ammonia problems. This appears contrary to Water Board staff's current recommendation that nutrients NOT be limited until specific numeric standards are established. **In fact, the current de-listing recommendation would assure that obtaining information on numeric standards could not be accomplished, leaving the problem to fester for many more years.**

In 1998, the North Coast Regional WQCB appeared to remove the Laguna de Santa Rosa from the 303 (d) list based on assertions that a TMDL had been completed, that a TMDL waste load reduction strategy was being implemented, that the Laguna was targeted for an Integrated Watershed Process, that the Laguna waste load reduction strategy was a high priority of the Regional Board, ensuring implementation, etc. As a result, the Laguna de Santa Rosa was omitted from the staff reports for the 1998 Update. No information in support of this action was placed in the record by Regional Water Board staff, and the de-listing was never approved by the Regional Board.

When I questioned staff of this omission at the October, 1998, Regional Board Meeting, I was assured verbally that the Laguna was not de-listed and that the fact that it did not appear on the list didn't really mean that it wasn't actually on the list. I should have been wary of this explanation, but I believed what I was told at the time and never challenged the situation. It was only much later that I learned of the rationale described above.

In a letter I wrote to the Regional Board in Spring of 2001, I asked the question: *"What is the status of the Laguna de Santa Rosa listing?"* David Leland responded in a letter to me dated April 6, 2001. I quote, *"The Laguna de Santa Rosa was listed for nutrients in 1990. A nutrients TMDL was completed and approved by U.S.EPA for the Laguna de Santa Rosa in 1995. At the December 11, 1997 Regional Water Board meeting, Resolution No. 97-132 as modified by the Board was adopted, authorizing the update of the 303(d) list and 305(b) Water Quality Assessment, which included the de-listing of the Laguna de Santa Rosa for nitrogen and ammonia. In addition, a January 14, 1998 letter to "Interested Parties" transmitted the amended Resolution No. 97-132. In November 1998 U.S.EPA approved the de-listing of the Laguna de Santa Rosa for nitrogen and ammonia."* While I do recall hearing that EPA approved the de-listing, I have to say there was never any hearing, nor any open process on this action nor any public testimony taken. The de-listing simply consisted of not putting the Laguna on the list of impaired water bodies.

To the casual observer, it may appear as though the nutrient problem was solved in 1998. We do not know the reason for any of these actions, except to say that none of them followed a legitimate, open, transparent process, where the public was given opportunity for comments and full review of the basis for this decision. Since that time, the Laguna has suffered dreadfully, and we must not allow a similar situation to continue to prevail.

Phosphorus becomes an issue....

Throughout most of the 1990's the issue of phosphorus was never raised. In 1998, Russian River Watershed Protection Committee (RRWPC) was involved in settlement talks with the City of Santa Rosa over litigation of Clean Water Act violations by their discharge system. We were working with Dan Wickham, Ph.D. and Bob Rawson, both of whom recommended a phosphorus study of Santa Rosa's wastewater. The City agreed and the study was published in 2000. (This report entitled, *"Phosphate Loading and Eutrophication in the Laguna de Santa Rosa"*, Jan. 28, 2000, was entered into the record for the 2002 listing process and has been recently resubmitted by Ms. Webb during this current process.) The report concludes that Santa Rosa's contribution of phosphorus to the Laguna is significant and most likely is contributing to its continued degradation.

Since then we have learned that algae growth is commonly attributed to phosphorus in wastewater discharges. An article in *Testing the Waters*, put out by the River Watch Network several years ago states, *"Typically, in freshwater ecosystems, phosphate is usually the nutrient that is least available for plant growth. This is called the limiting factor. If phosphate is added to a freshwater system, even in very small amounts, the plant growth usually increases significantly, having a large effect on the aquatic ecosystem."* Also, *"Some of the phosphate that had been deposited previously in the sediments was discovered to be dissolving back into the water."*

Santa Rosa has claimed in their correspondences to the State Board that phosphorus is not the limiting factor and should not be on the 303(d) list. They claim that the level of phosphorus is so high that any time nitrogen is added, algae and plants can bloom. (Had the WRS goal for nitrogen been attained, then perhaps this wouldn't be an issue.) It is fascinating that Santa Rosa now claims that phosphorus levels are so high that they shouldn't be regulated. In reality, the issue is no longer whether nitrogen OR phosphorus are triggering excessive plant growth, but that too many nutrients are causing the blooms, which then reduce dissolved oxygen and cause severe impairment in the Laguna.

In fact, a recent article in *Journal Watch*, entitled *"Phosphorus Pollution Limits Plant Diversity"* by Robin Meadows (Jan.-Mar. 2006 Vol. 7 #1) states: *"The conventional wisdom that nitrogen pollution threatens biodiversity may be wrong. Rather, the culprit might be too much phosphorus. New research shows that many more endangered plants are where nitrogen is scarce, which means these species are more likely to die out if phosphorus levels rise."* While the study is limited and was conducted in Western Europe to Siberia, nevertheless, it indicates that excessive phosphorus can be every bit as damaging as excessive nitrogen and it is likely a moot point as to which predominates in the Laguna.

We also include a letter from Dan Wickham on behalf of Friends of the Russian River date Dec. 3, 2003, where he elaborates on his findings regarding phosphorus in response to Santa Rosa comments. He makes several key points, which include: *"The Laguna de Santa Rosa has consistently exhibited phosphate concentrations that exceed all but a few fresh water bodies in the United States....The EPA clearly and strongly states that of the nutrients nitrogen and phosphate only phosphate is "controllable"In over 95% of upstream-downstream sampling at Santa Rosa Subregional System release points there is a significant and measurable increase in*

phosphate concentration.....Sediment stores of phosphate in the Laguna are the primary point of release to the water column during the summer growing period. Phosphate is bound to fine clay sediments. The City of Santa Rosa releases the largest portion of phosphate enriched wastewater in winter when fine sediments are prevalent in the water column where they act as foci for absorption." The letter is filled with pertinent comments that relate directly to this issue and we enter the entire letter as part of the record.

The 2002, 303(d) listing process was similarly complicated with the Regional Board listing the Laguna for nutrients and your State Board first supporting that listing and then removing it with no explanation. Instead, the Laguna was put on a "Watch List" for nutrients, a category that had no apparent standing in water law. The Regional Board opposed this alteration. I remember being invited to a meeting with Regional Board staff, Craig Wilson and others to discuss this very issue. At the time Mr. Wilson assured us that the impairment from nutrients would be addressed through the TMDL for dissolved oxygen, which remained on the list. Unfortunately, DO is the RESULT of nutrient pollution, not the cause. We believed that it was unlikely the problem could be effectively addressed by going at it by this direction.

The article in "Testing the Waters" states, "Human addition of phosphorus can stimulate great increases in aquatic plant growth...An algal bloom may cause an initial increase of dissolved oxygen....After the algae die, they break down with the help of decomposing bacteria. Because these bacteria use oxygen, the more organic matter present, the more the decomposing bacteria are active and the more oxygen they use. This ultimately decreases the amount of dissolved oxygen available to other organisms in the river system. Eventually, increased decaying matter affects temperature and other river characteristics, and the stream becomes choked with aquatic weeds and filled with vegetation. The result is that the types of plants and animals that live in the river changes...."

Excessive growth of Ludwigia illustrates problem.....

Nowhere is this more apparent than in the case with the Ludwigia growth in the Laguna. We want to call attention to a statement by the Sonoma County Ludwigia Task Force in their Feb. 24, 2005 letter to Catherine Kuhlman of the Regional Board, "*.....high nutrient and sediment inputs are also likely to enhance the growth rates of invasive aquatic plants, like Ludwigia. Preliminary experimental data suggests that reducing nutrient levels in the Laguns will increase our ability to manage Ludwigia infestations. For these reasons, the Task Force strongly recommends that the NCRWQCB move swiftly to develop a pollution control plan for the Laguna"*

The Laguna Foundation, in charge of a massive and expensive effort to control Ludwigia (partly funded by the City of Santa Rosa) notes the following in their Dec. 1, 2005 letter to Craig J. Wilson: "*The scale of the Ludwigia problem is immense, and has raised great public attention due to concerns over mosquito control and environmental impacts to this sensitive wildlife area, the largest tributary to the Russian River."* And, "*Biologists working on this system consider it unlikely that growth of the observed rate and magnitude would be possible without the biostimulatory effects of excessive nitrogen and phosphorus levels found in the Laguna."*

The Regional Board's Analysis of Russian River Water Quality Conditions with Respect to Water Quality Objectives for 1988 to 1999 by Peter Otis (June 12, 2000) states, "A comprehensive monitoring program was established to track the effectiveness of the Waste Reduction Strategies effect on water quality. Data from this program indicate that the Laguna generally meets the Federal EPA's ammonia criteria....but may not consistently meet the phosphate objective of 0.1 mg/L total phosphorus...." (Current data proves this to be the case.)

It is Santa Rosa's claim, frequently repeated in the last several years (A letter from Ed Brauner of 10-5-01 states, "The 303(d) listing of the Laguna for phosphorus is not justified because the Board's recent TMDL Monitoring Data continue to support the conclusion that nitrogen, and not phosphorus, limits the growth of plants in Laguna waters." A letter from Dave Smith (EPA) on 1-22-02 states, "The assumption is made, though has not been verified through empirical studies, that an increase in nutrients in the Laguna has resulted in an increase in algae which in turn has lead to a decrease in dissolved oxygen due to algal respiration." It is a matter of record that EPA reversed the State's decision on the Laguna listing and put nitrogen and phosphorus back on the list for that water body.

What else besides nutrients could have caused and/or greatly contributed to the voluminous growth of Ludwigia in the Laguna? While already part of the record, we would like to call special attention to Regional Board Executive Officer Cat Kuhlman's letter to the State: (Dec. 1, 2005, pg. 1)

"One of the most widely recognized impacts to the Laguna de Santa Rosa water quality has been the exceedence of the assimilative capacity for biostimulatory substances (nutrients), primarily phosphorus and nitrogen. The level of phosphorus entering the Laguna de Santa Rosa in sediment, agricultural runoff, and effluent discharges is so great that phosphorus is sequestered into the sediment, and cycled into the biota with any additions of available nitrogen. The nitrogen levels are additionally seen in concentrations that have direct impacts on water quality, including transient levels of unionized ammonia in exceedence of wildlife criteria. Together, the excess biostimulatory substances (phosphorus and nitrogen) contribute to additional secondary water quality impairments, including nuisance plant growth (Ludwigia is a recent example of particular concern) impairing REC1 and REC2 beneficial uses, and low dissolved oxygen levels."

The main argument made by the State for de-listing the Laguna is the lack of adequate data and the questionable standard of 0.1 mg/L for phosphorus. Again we see the City (unilaterally) put forth this very same argument in a letter mentioned above from David Smith of Merritt Smith Consulting (for Santa Rosa) on 1-22-02 where he states, "The US EPA criterion of 0.1 mg/L for total phosphorus is a toxicity criterion for elemental phosphorus and thus is not relevant to biostimulation or dissolved oxygen levels in the Laguna."

We are not scientists, and cannot argue the fine points of the causes of nutrient pollution and biostimulatory nutrient activity, but we wonder about the demand for numerical proof by your staff, as opposed to the narrative standard? It seems clear to us that the whole purpose of the narrative standard is to identify

problems that cannot be quantified numerically. Furthermore, it is our understanding that the listing is an indication of a problem and not necessarily complete "beyond a doubt" proof, and that the purpose of the TMDL process is to develop greater certitude of the scientific elements of the impairment.

Response to Santa Rosa's Correspondences....

The City of Santa Rosa submitted two letters in June, 2004, which appear to form the basis of this recommended de-listing and have been alluded to as part of the record. Nancy Kay Webb magnificently addresses the claims made by City staff and consultants, with which we totally agree.

We also want to include here anonymous comments from a friend who is a scientist and familiar with the issues raised in Dr. Dave Smith's two letters for the City of Santa Rosa dated June 2, 2004 and Jan. 5, 2006. We quote:

"1. It is disingenuous to contend that the high levels of algae are not a critical component to oxygen depletion in the Laguna. Lack of data supporting this contention has nothing to do with lack of obvious evidence of oxygen depletion. It simply reflects an active avoidance on the part of regulators to obtain the necessary data. Concentrations of algae have been part of the monitoring program for the Laguna and they clearly show high concentrations. These are presented in part in the Wickham (2000) report.

Similarly oxygen concentrations fluctuate widely with supersaturation at certain stations during daylight, indicating excessive algal photosynthesis, and almost total depletion by pre-dawn early morning. These are classic symptoms of hypertrophic conditions and cannot be ignored by claiming there is insufficient data due to absence of sampling.

2. The discussion presented regarding limiting nutrients in the Laguna are theoretically flawed and countered by the actual field data. Wickham (2000) discusses this in detail. The single study that is cited by Merritt Smith to identify nitrate as the limiting nutrient is artificial in design and does not reflect field dynamics. Aliquots of Laguna water were obtained from the field and held in the laboratory where they were exposed to light. Photosynthesis proceeded until plant growth stopped. Upon analysis it was found that nitrate had been depleted. While this indicates that nitrate is limiting in this artificial situation, to be expected given the extremely high concentration of phosphate, in the field nitrate is not the only source of nitrogen, and thus does not reflect the true situation.

In field conditions nitrogen can enter the water column from diverse sources, the most important being fixation by excessive blooms of blue-green algae that are stimulated by excessive phosphate. The EPA (1972) report "Role of Phosphorus in Eutrophication" EPA-R3-72-001 clearly states that controls on phosphate because of the alternate pathways for nitrogen to enter the system. Phosphorus, being a mineral, can be removed from water sources through source reduction. This is not a simple task, but it is the essential first step to reducing eutrophication according to EPA.

The discussion of N:P ratios in the Merritt Smith report is irrelevant since the data do not include the nitrogen in the system that is incorporated in the living biomass. Nitrate is taken up almost immediately, given the excessive plant growth, but that does not limit

plant growth. Instead N₂ is fixed from the atmosphere directly as amines incorporated in plant protein. This source of nitrogen is not accounted for in any of the data.

Given the lack of comprehensive laboratory research the only method for examining the issue is through field correlation analysis. This is, however, an extremely powerful methodology widely used in ecological studies.

The phosphate report (Wickham 2000) presents these analyses on pages 19 and 20. Table 7 shows that there is a perfect correlation (Spearman Rank Order correlation coefficient =1.00) between dissolved P and combined plant pigments. There was a slight correlation with nitrate (CC=0.43) but this was not significant.

The above were based on averages so are less instructive. When samples obtained by the Regional Board were used and correlated as individual readings one could see the dynamics more clearly. Both ortho and total P was significantly correlated with algal cell density. Nitrate was not correlated to algal cell density. Neither was ammonia correlated to algal cell density. The Regional Board also measured TKN, and this measure, reflective of the nitrogen bound in the living plant cells, was highly correlated both with cell density and with phosphate. It is obvious from this that the nitrogen was available for plant growth and tracked phosphate concentration, even though conventional measures of dissolved nitrogen either as nitrate or ammonia taken in the City's samples did not show its presence.

The arguments presented in the Merritt Smith report are a simplistic restatement of earlier conclusions that were found to be unconvincing by the EPA and the Regional Board staff during the original listing arguments. They are no more convincing today. The Laguna remains a water body that is seriously impacted by excessive nutrients and with the advent of the Ludwigia problem, exacerbated by the nutrient load, is in even greater need of remediation."

RRWPC comments on Dave Smith letter of Jan. 5, 2006.....

In this letter, Dr. Smith emphasizes that there is no numeric standard for nitrogen and phosphorus and that it is extremely difficult to translate a narrative standard into a numeric one. Dr. Smith concludes that without a numeric standard, no listing can take place. We wonder if the intent of the new 303(d) listing policy is to never allow listings without extensive proof that a numeric standard is being violated?

We believe that narrative standards should carry equal weight to numeric ones in the Basin Plan and that almost every responder in this matter makes the argument that narrative standards in this case justify the listing. The listing is only the first step toward the TMDL, which perhaps will help to set a numeric standard for nutrients. It will dictate the necessity for appropriate data collection to justify TMDL allocations. Out of the process will come the information which is now being stated as necessary for the listing to occur.

It is unreasonable to expect that the numeric standard should be established before a listing could occur. As we said before, that seems backwards. City officials have been candid about not wanting to have to pay for treatment plant

alterations that would be necessary to meet numeric standards. The real truth is that they are afraid that this listing will actually lead to numeric standards, which they would like to avoid at all costs. The letter states, "Some commentators have suggested incorrectly that it is appropriate to list the Laguna for nitrogen and phosphorous, and THEN complete the studies to determine whether they are the limiting pollutants in the Laguna. Aside from being contrary to the State Board's Listing & De-Listing Policy, this approach is likely to have real-world and very expensive implications for dischargers such as the City of Santa Rosa." The letter goes on to complain that the City's discharge permit may require limits of nutrients that are difficult to meet.

Dr. Dave Smith claims that the City would be willing to help fund the appropriate study of the Laguna to determine limiting pollutants. We wonder if this will follow the path of the Mixing Zone Study, which the City helped fund, and then withdrew funds when the Regional Board stated that they needed more time to carry out the appropriate studies. It appears as though the City and the State don't always see eye to eye on the definition of "appropriate" studies.

We believe that the last paragraph of Greg Scoles Jan. 5th letter to you expresses Santa Rosa's genuine concerns. That is, what the City is really worried about is nutrient limits in their discharge permit. It is always our experience however, that when new limits are placed in a permit, such as with California Toxics Rule requirements, the dischargers always seem to be given very generous (from our view) interim requirements which allow the entity plenty of time and leeway to meet the new regulations.

We urge you to not de-list the Laguna for nitrogen and phosphorus.

Sincerely,



Brenda Adelman for RRWPC

CC. Craig J. Wilson: State Board
Cat Kuhlman and John Short: Regional Board
David Smith: EPA

List of Attachments:

1. Staff Report, "Update on the Waste Reduction Strategy for the Laguna de Santa Rosa" August 28, 1997 Item #1
2. Letter to Brenda Adelman from David Leland re: Response to Questions April 6, 2001
3. Letter to David Leland, Matt St. John, Craig J. Wilson from Marcie Commins and Dave Smith, Jan. 22, 2002
4. Daniel E. Wickham letter to Arthur G. Baggett, Jr. Dec. 3, 2003 (5 pages)
5. Article on Phosphorus from "Testing the Waters" published by River Watch Network, date unknown
6. "Phosphorus Pollution Limits Plant Diversity" by Robin Meadows *Journal Watch*: Jan.-Mar. 2006 Vol.7 #1

1260 attachment



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MEMORANDUM

TO: David Leland, NCWQCB
Matt St. John, NCWQCB
Craig J. Wilson, SWRCB

FROM: Marcie Commins, Ph.D.
Dave Smith, Ph.D.

COPIES: Miles Ferris, City of Santa Rosa
Scott Stinebaugh, City of Santa Rosa

DATE: 22 January 2002

SUBJECT: 303(d) List Update Recommendations

The purpose of this memorandum is to summarize the City of Santa Rosa's concerns with regard to the Regional Board staff's 303(d) List Update Recommendations. These concerns were discussed in an 18 January 2002 meeting between David Leland and Matt St. John, NCRWQCB, and Marcie Commins, Merritt Smith Consulting and are presented here at the request of David Leland.

The City of Santa Rosa has three points of disagreement with the Regional Board's 303(d) List Update Recommendations (Staff Recommendations) as follows:

- Placing the Laguna de Santa Rosa and Santa Rosa Creek on the watch list for copper
- Placing Santa Rosa Creek on the watch list for diazinon
- Placing the Laguna de Santa Rosa on the 303(d) List Update for dissolved oxygen and nutrients

LAGUNA AND SANTA ROSA CREEK COPPER

We disagree with the proposed addition of copper to the Watch List for the following reasons:

- The Staff Recommendations states that in surface water monitoring, copper levels did not exceed any of the applicable criteria in surface water or effluent.
- The Staff Recommendations states that one fish tissue sample and one invertebrate sample from the Laguna indicated no exceedance of copper median international standards for fish tissue or EDL-85 for shellfish tissue.

- **Potential cost.** Placement on the Watch List indicates that further study will be done. The City believes the resources could be better utilized on waterbody/pollutant combinations for which some evidence indicates a problem.
- **Misunderstanding.** Stakeholders may misinterpret inclusion on the Watch List as indicating a serious problem where none exists. Although the Regional Board considers the Watch List to be non-regulatory and only for internal use to indicate a need to obtain further information, there is no guarantee that the USEPA will use the list in this manner. USEPA may decide to include waterbodies/constituents on the Watch List on the actual 303(d) list. The USEPA has in the past added constituents to the 303(d) list that were not recommended by the SWRCB for inclusion on the list.

SANTA ROSA CREEK DIAZINON.

The Board staff indicated in the 18 January, 2002 meeting that diazinon in the Russian River, Laguna, and Santa Rosa Creek was placed on the Watch List because of the elevated concentrations of diazinon in urban areas of Region 2 and because a citizens group requested that diazinon be placed on the list for these three streams. The Board Staff Recommendations does not provide evidence of elevated diazinon concentrations in Santa Rosa Creek.

- The 1997 study found two of fifty two samples collected in the Russian River with detectable concentrations of pesticides and the concentrations were above that believed to be detrimental to freshwater organisms. Only one of the two detectable samples was for diazinon (the other was dimethoate) and this sample was obtained from the Russian River not Santa Rosa Creek.
- In November, 1999, the City of Santa Rosa monitored for diazinon in Santa Rosa Creek and other creeks in the Santa Rosa area that drain to the Russian River and found no detectable diazinon. The monitoring consisted of one sample in each of 5 creeks and the Santa Rosa Creek site was upstream of most urban influence.
- Unlike some other urban areas in Sonoma County, the City of Santa Rosa has an active pesticide management program which likely results in reduced pesticide concentrations in urban streams.

Therefore, no evidence of elevated diazinon in Santa Rosa Creek exists so Santa Rosa Creek should not be singled out for placement on the Watch List. It is recommended that the Watch List for diazinon be revised to include for all urban streams.

LAGUNA DISSOLVED OXYGEN AND NUTRIENTS

The NCRWQCB is recommending adding dissolved oxygen and nutrients to the 303(d) list update. Nutrients are generally meant to include nitrogen and phosphorus, the main nutrient requirements for photosynthetic aquatic plants. The assumption is made, though has not been verified through empirical studies, that an increase in nutrients in the Laguna has resulted in an increase in algae which in turn has led to a decrease in dissolved oxygen due to algal respiration.

The basis for recommending phosphate be put on the 303(d) list for the Laguna de Santa Rosa is stated in the Staff Recommendations as "The US EPA phosphate criterion of 0.1 mg/L for phosphorus is not consistently met (for streams or flowing waters not discharging into lakes or reservoirs)."

- The US EPA criterion of 0.1 mg/L for total phosphorus is a toxicity criterion for elemental phosphorus and thus is not relevant to biostimulation or dissolved oxygen levels in the Laguna. Although the Gold Book (US EPA, 1986) references a 1973 paper when it states that "A desired goal" for the prevention of plant nuisances in streams or other flowing waters not discharging directly to lakes or impoundments is 0.1 mg/L total P (Mackenthun, 1973), it states that a number of specific exceptions can occur to reduce the threat of phosphorus as a contributory to eutrophication including the fact that in some waters nutrients other than phosphorus is limiting to plant growth. Recognizing that the response of water bodies to nutrient enrichment differ and thus, no one number can be a suitable nutrient criterion for all locations, the US EPA had developed technical guidance to assist States and Tribes in developing regionally-based numeric criteria (US EPA, 2000). To our knowledge, no phosphate criteria have been developed for Northern California.
- We have submitted evidence to the Regional Board staff (Roth, 2002) indicating that dissolved oxygen levels is improving in the Laguna.
- The City of Santa Rosa has submitted testimony to the Regional Board staff indicating that the Basin Plan objective for dissolved oxygen in the Laguna is not a suitable standard for a waterway that is naturally warm in the summer.
- Although the Regional Board is including phosphate in its 303(d) list recommendations the Staff Recommendations points out that data show that nitrogen is the limiting nutrient in the Laguna. This indicates that phosphate does not control plant growth in the Laguna

303(d) List Update Recommendations

31 January 2002

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- As the Staff Recommendations further states “the cause of the low dissolved oxygen levels is not certain”.

Therefore, no evidence exists that reducing phosphorus in the Laguna will result in increased dissolved oxygen concentrations and phosphorus should be removed from the 303(d) list recommendations. Phosphorus should also not be included on the Watch List.

MEMORANDUM

TO: David Leland, NCWQCB
Matt St. John, NCWQCB
Craig J. Wilson, SWRCB

FROM: Marcie Commins, Ph.D.
Dave Smith, Ph.D.

COPIES: Miles Ferris, City of Santa Rosa
Scott Stinebaugh, City of Santa Rosa

DATE: 22 January 2002

SUBJECT: 303(d) List Update Recommendations

The purpose of this memorandum is to summarize the City of Santa Rosa's concerns with regard to the Regional Board staff's 303(d) List Update Recommendations. These concerns were discussed in an 18 January 2002 meeting between David Leland and Matt St. John, NCRWQCB, and Marcie Commins, Merritt Smith Consulting and are presented here at the request of David Leland.

The City of Santa Rosa has three points of disagreement with the Regional Board's 303(d) List Update Recommendations (Staff Recommendations) as follows:

- Placing the Laguna de Santa Rosa and Santa Rosa Creek on the watch list for copper
- Placing Santa Rosa Creek on the watch list for diazinon
- Placing the Laguna de Santa Rosa on the 303(d) List Update for dissolved oxygen and nutrients

LAGUNA AND SANTA ROSA CREEK COPPER

We disagree with the proposed addition of copper to the Watch List for the following reasons:

- The Staff Recommendations states that in surface water monitoring, copper levels did not exceed any of the applicable criteria in surface water or effluent.
- The Staff Recommendations states that one fish tissue sample and one invertebrate sample from the Laguna indicated no exceedance of copper median international standards for fish tissue or EDL-85 for shellfish tissue.

- The recommendation for adding copper to the Watch List appears to be based solely on the results from the draft report NCRWQCB, 1996. The Staff Recommendations states that the results from this report “indicate that chromium, copper, and zinc concentrations in stream sediments may be elevated downstream of the “reference” sites in both the Laguna de Santa Rosa and Santa Rosa Creek.” However, the 1996 report states for the 1985-1986 data, copper in the Laguna de Santa Rosa/Mark West Creek “none of the sites was significantly different from one another”. The 1996 report also states that for the 1985-1986 data, copper in Santa Rosa Creek “sediment concentrations were essentially the same at all sites in Santa Rosa Creek and the Delta Pond”. These data are summarized below.

	Reference Sites (median sediment concentration in mg/Kg)	Downstream Sites (median sediment concentration in mg/Kg)
Santa Rosa Creek	1.9	0.95, 1.1
Laguna de Santa Rosa	1.5	1.1, 1.2, 1.5 ^a
Mark West Creek/Laguna	1.1	0.86
^a The 1.5 value occurred at Stony Point Road which is upstream of the City of Santa Rosa		

These data show that the average concentrations of the downstream sites are never higher than the reference sites. The 1996 report also includes figures (no numbers) that show data from single samples collected the Laguna (not Santa Rosa Creek) in 1996. However, without replicate samples, no definitive conclusions can be made (For example in 1995, the concentration of copper in Stony Point Road was higher than the concentration a few miles further downstream at Occidental Road). Therefore, no evidence exists for elevated copper concentrations in the Laguna and Santa Rosa Creek and it should be taken off the Watch List.

The Regional Board staff has indicated that the Watch List will not be used for regulatory purposes and placement of Santa Rosa area streams on the Watch List should have no real impact for the City of Santa Rosa. However, the City of Santa Rosa is concerned about substances being placed on the Watch List when evidence is lacking for the need for the following reasons:

- **Potential cost.** Placement on the Watch List indicates that further study will be done. The City believes the resources could be better utilized on waterbody/pollutant combinations for which some evidence indicates a problem.
- **Misunderstanding.** Stakeholders may misinterpret inclusion on the Watch List as indicating a serious problem where none exists. Although the Regional Board considers the Watch List to be non-regulatory and only for internal use to indicate a need to obtain further information, there is no guarantee that the USEPA will use the list in this manner. USEPA may decide to include waterbodies/constituents on the Watch List on the actual 303(d) list. The USEPA has in the past added constituents to the 303(d) list that were not recommended by the SWRCB for inclusion on the list.

SANTA ROSA CREEK DIAZINON.

The Board staff indicated in the 18 January, 2002 meeting that diazinon in the Russian River, Laguna, and Santa Rosa Creek was placed on the Watch List because of the elevated concentrations of diazinon in urban areas of Region 2 and because a citizens group requested that diazinon be placed on the list for these three streams. The Board Staff Recommendations does not provide evidence of elevated diazinon concentrations in Santa Rosa Creek.

- The 1997 study found two of fifty two samples collected in the Russian River with detectable concentrations of pesticides and the concentrations were above that believed to be detrimental to freshwater organisms. Only one of the two detectable samples was for diazinon (the other was dimethoate) and this sample was obtained from the Russian River not Santa Rosa Creek.
- In November, 1999, the City of Santa Rosa monitored for diazinon in Santa Rosa Creek and other creeks in the Santa Rosa area that drain to the Russian River and found no detectable diazinon. The monitoring consisted of one sample in each of 5 creeks and the Santa Rosa Creek site was upstream of most urban influence.
- Unlike some other urban areas in Sonoma County, the City of Santa Rosa has an active pesticide management program which likely results in reduced pesticide concentrations in urban streams.

Therefore, no evidence of elevated diazinon in Santa Rosa Creek exists so Santa Rosa Creek should not be singled out for placement on the Watch List. It is recommended that the Watch List for diazinon be revised to include for all urban streams.

LAGUNA DISSOLVED OXYGEN AND NUTRIENTS

The NCRWQCB is recommending adding dissolved oxygen and nutrients to the 303(d) list update. Nutrients are generally meant to include nitrogen and phosphorus, the main nutrient requirements for photosynthetic aquatic plants. The assumption is made, though has not been verified through empirical studies, that an increase in nutrients in the Laguna has resulted in an increase in algae which in turn has led to a decrease in dissolved oxygen due to algal respiration.

The basis for recommending phosphate be put on the 303(d) list for the Laguna de Santa Rosa is stated in the Staff Recommendations as "The US EPA phosphate criterion of 0.1 mg/L for phosphorus is not consistently met (for streams or flowing waters not discharging into lakes or reservoirs)."

- The US EPA criterion of 0.1 mg/L for total phosphorus is a toxicity criterion for elemental phosphorus and thus is not relevant to biostimulation or dissolved oxygen levels in the Laguna. Although the Gold Book (US EPA, 1986) references a 1973 paper when it states that "A desired goal" for the prevention of plant nuisances in streams or other flowing waters not discharging directly to lakes or impoundments is 0.1 mg/L total P (Mackenthun, 1973), it states that a number of specific exceptions can occur to reduce the threat of phosphorus as a contributory to eutrophication including the fact that in some waters nutrients other than phosphorus is limiting to plant growth. Recognizing that the response of water bodies to nutrient enrichment differ and thus, no one number can be a suitable nutrient criterion for all locations, the US EPA had developed technical guidance to assist States and Tribes in developing regionally-based numeric criteria (US EPA, 2000). To our knowledge, no phosphate criteria have been developed for Northern California.
- We have submitted evidence to the Regional Board staff (Roth, 2002) indicating that dissolved oxygen levels is improving in the Laguna.
- The City of Santa Rosa has submitted testimony to the Regional Board staff indicating that the Basin Plan objective for dissolved oxygen in the Laguna is not a suitable standard for a waterway that is naturally warm in the summer.
- Although the Regional Board is including phosphate in its 303(d) list recommendations the Staff Recommendations points out that data show that nitrogen is the limiting nutrient in the Laguna. This indicates that phosphate does not control plant growth in the Laguna

- As the Staff Recommendations further states “the cause of the low dissolved oxygen levels is not certain”.

Therefore, no evidence exists that reducing phosphorus in the Laguna will result in increased dissolved oxygen concentrations and phosphorus should be removed from the 303(d) list recommendations. Phosphorus should also not be included on the Watch List.



California Regional Water Quality Control Board

North Coast Region

Daniel F. Crowley, Chairman

Winston H. Hickox
Secretary for
Environmental
Protection



Gray Davis
Governor

Internet Address: <http://www.swrcb.ca.gov/~rwqcb1/>
5550 Skylane Boulevard, Suite A, Santa Rosa, California 95403
Phone 1-877-721-9203 Office (707) 576-2220 Fax (707) 523-0135

156 attachment

April 6, 2001

Mrs. Brenda Adelman
Russian River Watershed Protection Committee
P.O. Box 501
Guerneville, CA 95446

158

Subject: Federal Clean Water Act Section 303(d) List of Impaired Waterbodies – Response to Questions
File Water Quality TMDL 303(d)

Dear Mrs. Adelman:

Thank you for your oral and written comments/questions presented at the North Coast Regional Water Quality Control Board meeting on March 22, 2001 and submitted on March 26, 2001, respectively. Answers to your questions are provided here. Your questions are summarized in bold.

Will the North Coast Regional Water Quality Control Board staff (Regional Water Board staff) utilize data/information collected from other agencies in developing the updated 303(d) List of Impaired Waterbodies? In particular, will Regional Water Board staff review Sonoma County Water Agency habitat assessment information.

Information that Regional Water Board staff receives will be considered in developing recommended updates to the 303(d) list. The Regional Water Board recommendations will be forwarded, along with the data/information received, to the State Board. The data/information received will be used by the State Board in updating, and ultimately adopting, the 303(d) list.

The Public Solicitation of Water Quality Information was sent to individuals on our Interested Parties mailing list pertaining to Total Maximum Daily Loads and the 303(d) List of Impaired Waterbodies. Individuals from the following agencies are included on the list: Sonoma County Water Agency, California Department of Fish and Game, California Environmental Protection Agency, USDA Forest Service, California Department of Forestry, California Department of Parks and Recreation, Natural Resources Conservation Service and Resource Conservation Districts, California Department of Health Services, California Department of Transportation, as well as cities and County Water Districts. Data/information received from these agencies prior to the Public Solicitation will also be used by the State Board for the list update. SCWA habitat assessment data will be utilized.

Does the 303(d) listing for the Russian River cover all tributaries as well as the main stem?

The tributaries within the watershed boundaries of a mainstem waterbody that is listed on the 303(d) list are generally included in the TMDL, though this does vary from waterbody to waterbody. All of the Russian River tributaries will be included in the sediment TMDL.

California Environmental Protection Agency



Recycled Paper

The Laguna has not been listed specifically for phosphorus. During the current 303(d) listing cycle staff will review available phosphorus data, and we welcome submittals of new data for this parameter. Similarly, temperature impairment will be reviewed, based on available data.

Shouldn't any salmonid-bearing stream that is water quality impaired be on the 303(d) list? How do you determine water quality impairment? How will the 303(d) listing process and Basin Plan amendment process help implement salmonid recovery?

Yes, if a salmonid-bearing stream is water quality impaired it should be on the 303(d) list. An "impaired" waterbody is one for which the water quality standards for that waterbody are not being met. Water quality standards refer to the water quality objectives and beneficial uses, as defined in the Water Quality Control Plan for the North Coast Region (Basin Plan). Therefore, water quality impairment is determined by evaluating whether the water quality objectives for the waterbody are being met and/or the beneficial uses are being supported. The objective of the 303(d) listing process, coupled with the development of a TMDL for the listed waterbody and the Basin Plan amendment process, is to attain and maintain water quality standards. This is the responsibility of the Regional Water Board. The intent is that restoring and maintaining water quality will support salmonid recovery.

Will information that has been submitted to the Regional Board in the past going to automatically be used in the current 303(d) list update process, or does this information need to be resubmitted?

If information that was submitted in the past conforms to the specifications requested in the Public Solicitation for Water Quality Information, then it need not be resubmitted. However, your assistance in identifying what the past submittals are and when they were submitted would assist us greatly.

Should you have additional questions regarding the Public Solicitation for Water Quality Information and the current 303(d) list update process, please contact Matt St. John at 570-3762. Should you have any questions pertaining to monitoring of the Russian River watershed and Laguna de Santa Rosa, please contact Peter Otis at 576-2662.

Sincerely,



David Leland, P.E.
Senior Water Resources Control Engineer

DFL:clh/adelmanresplet



Winston H. Hickox
Secretary for
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April 6, 2001

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California Environmental Protection Agency



Recycled Paper

Why is the Russian River sediment TMDL given a "Medium" priority designation on the 1998 303(d) list?

In a May 28, 1998 letter to Mr. Richard Roos-Collins with the Natural Heritage Institute, Lee Michlin provided a response to a similar question. This response is quoted here: "The schedule for developing TMDLs in the North Coast region is constrained by a consent decree for those waters listed prior to 1997. Any failure to meet the schedule would be unsatisfactory to the court. Finite staff resources, existing programmatic mandates, and this consent decree all limit the options for scheduling additional or accelerated work on TMDLs for newly listed waterbodies. However, this does not reveal the full level of commitment to protecting the resource."

Is the Russian River listed as temperature impaired?

The Russian River is not listed as temperature impaired. During the 1998 listing cycle oral testimony was provided requesting that the Russian River be listed for temperature, but no data were provided, as required, to justify listing the Russian River as temperature impaired. For the current listing cycle, should you have temperature monitoring data or are aware of such data, please forward it to us or notify us, and we shall forward it to the State Board for consideration for the 2000 303(d) listing cycle. Please keep in mind that the deadline for receiving data/information is May 15, 2001.

Under what circumstances would you consider listing the Russian River for Mercury impairment?

Lake Pillsbury was listed as mercury impaired on the 1998 303(d) list update because there was data indicative of mercury contamination in edible portions of fish tissue, which exceeded U.S. Food and Drug Administration action levels for the protection of human health. Similar data would be needed to warrant listing the Russian River for mercury impairment. The North Coast Regional Water Board is tracking fish tissue data for mercury as part of the State Mussel Watch and Toxic Substance Monitoring programs.

What is the status of the Laguna de Santa Rosa listing?

The Laguna de Santa Rosa was listed for nutrients in 1990. A nutrients TMDL was completed and approved by U.S. EPA for the Laguna de Santa Rosa in 1995. At the December 11, 1997 Regional Water Board meeting, Resolution No. 97-132 as modified by the Board was adopted, authorizing the update of the 303(d) list and 305(b) Water Quality Assessment, which included the de-listing of the Laguna de Santa Rosa for nitrogen and ammonia. In addition, a January 14, 1998 letter to "Interested Parties" transmitted the amended Resolution No. 97-132. In November 1998 U.S. EPA approved the de-listing of the Laguna de Santa Rosa for nitrogen and ammonia.

At the November 10, 1997 Public Hearing to Consider Adoption of the 1998 Water Quality Assessment and Revisions to the Clean Water Act Section 303(d) List, staff recommended investigating DO levels in the Laguna to determine if objectives are appropriate (or add low DO as a limiting factor for the Laguna). Regional Water Board staff are in the process of evaluating the DO objectives.



The Laguna has not been listed specifically for phosphorus. During the current 303(d) listing cycle staff will review available phosphorus data, and we welcome submittals of new data for this parameter. Similarly, temperature impairment will be reviewed, based on available data.

Shouldn't any salmonid-bearing stream that is water quality impaired be on the 303(d) list? How do you determine water quality impairment? How will the 303(d) listing process and Basin Plan amendment process help implement salmonid recovery?

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Sincerely,



David Leland, P.E.
Senior Water Resources Control Engineer

DFL:clh/adelmanresplet



(1200) attachment

State of California
Regional Water Quality Control Board
North Coast Region

Peter Otis
August 14, 1997

EXECUTIVE OFFICER'S SUMMARY REPORT
8:30 a.m., August 28, 1997
Regional Water Quality Control Board
Hearing Room
5550 Skylane Boulevard, Suite A
Santa Rosa, California

~~160~~

ITEM: 1

SUBJECT: Update on the Waste Reduction Strategy for the Laguna de Santa Rosa

DISCUSSION

Background

The Laguna de Santa Rosa was placed on the Clean Water Act, Section 303(d) list of impaired waterbodies in 1992 and 1994 because of occurrences of high unionized ammonia and low dissolved oxygen. High unionized ammonia levels are the result of inputs of nitrogen in various forms. Low dissolved oxygen levels arise from inputs of organic matter, and algal growth using more oxygen than is produced in the system. Pursuant to the provisions of the Clean Water Act, the Regional Water Board prepared a Waste Reduction Strategy for the Laguna de Santa Rosa, dated March 1, 1995, which set forth estimates for the pollutant sources of concern, as well as pollutant reduction goals. The 1995 Waste Reduction Strategy (WRS) identified and provided estimates of the nitrogen sources to the Laguna de Santa Rosa, and recognizing that it may not be feasible to immediately attain the desired levels of water quality in the Laguna de Santa Rosa, established numeric interim and final goals for nitrogen compounds as well as for unionized ammonia concentrations. For dissolved oxygen, the WRS set forth a final but not an interim goal. The U.S. Environmental Protection Agency approved the WRS as consistent with Section 303(d) of the Clean Water Act on May 4, 1995.

The dynamics of the hydrology of the Laguna de Santa Rosa are complex, and the WRS acknowledged the uncertainty of the estimates with respect to pollutant sources and loads. In order to gather field data to validate the assumptions, the WRS contains a monitoring program for the Laguna de Santa Rosa. The monitoring was intended to provide information regarding attainment of the goals, as well as the basis for reevaluating the goals at a future date if necessary. In October 1995, Regional Water Board staff prepared an Interim Water Quality Monitoring Report for the Laguna de Santa Rosa, which described the results of monitoring from January through June 1995. This report provides an update to the October 1995 report.

As described in the WRS, a reduction of inputs of nutrients and organic matter into the Laguna de Santa Rosa should reduce algal productivity as well as the intensity of the nighttime and early morning dissolved oxygen sags that adversely affect aquatic life. The WRS set forth a target for dissolved oxygen of a minimum of 7.0 mg/l, which is consistent with the minimum objective for dissolved oxygen set forth in the Basin Plan.

Regional Water Board WRS Monitoring Program

The monitoring plan included in the WRS set forth the following objectives:

- 1) to provide information regarding the level of attainment to the USEPA criterion for unionized ammonia and to the Basin Plan objective for dissolved oxygen at the four attainment sites on the Laguna de Santa Rosa.
- 2) to provide information to identify areas within the watershed for further reductions in nitrogen and/or organic matter.
- 3) to investigate the extent to which sediments and aquatic vegetation contribute to nutrient and dissolved oxygen flux.

The WRS established four attainment points on the Laguna de Santa Rosa: Trenton-Healdsburg Road (LTH), Guerneville Road (LGR), Occidental Road, (LOR), and Stony Point Road (LSP). An additional point, located at the Willowside Road crossing of Santa Rosa Creek (SRCWS), though not an attainment site, was later included because under some conditions, it was observed that complete mixing of Santa Rosa Creek and Laguna de Santa Rosa was not occurring at LGR. Regional Water Board staff initiated twice-monthly monitoring of these locations in January 1995. To minimize variability factors, attainment points were visited at approximately the same time of day at each sampling event (usually between 9:00 a.m. and noon). In addition, the monitoring was designed so that an equal proportion of storm and non-storm samples were obtained during both winter seasons of 1995-1996 and 1996-1997. Attachment 2 is a map of the Laguna de Santa Rosa, depicting the four attainment points and sampling locations.

Field sampling parameters included pH, specific conductance, dissolved oxygen, water temperature, and stream flow. Chemical analyses were conducted on grab samples collected at the same time that field measurements were taken. Samples collected at every field sampling were analyzed for ammonia, nitrate, and biochemical oxygen demand, while those collected at every other field sampling were analyzed for the above, plus nitrite and total Kjeldahl nitrogen. Unionized ammonia was calculated using pH, temperature, and total ammonia-nitrogen data. In addition, dissolved oxygen saturation percentage was calculated from the field and instrument calibration data.

In addition, Regional Water Board staff installed continuous recording data recorders at three attainment points in the Laguna de Santa Rosa, (LSP, LOR, and LTH), during the months of June, July and August in order to determine the diurnal fluctuations of dissolved oxygen, pH, temperature, and specific conductivity.

Attachment 3 summarizes the results of the laboratory analyses for the nitrogen compounds at the four attainment points, and field observations for dissolved oxygen, from January 19, 1995 through May 28, 1997. Utilizing the nitrogen concentrations summarized in Attachment 3 and

flow rate measurements, total load estimates of nitrogen were calculated. Attachment 4 illustrates the calculated load of total nitrogen in pounds per day at each attainment point in the Laguna de Santa Rosa, and compares these values to the goals set forth in the WRS.

Summary of Regional Water Board Monitoring Results

Unionized Ammonia: The monitoring indicates that the interim goals for unionized ammonia set forth in the WRS were attained consistently from January 19, 1995 through May 28, 1997 at three monitored attainment points on the Laguna de Santa Rosa. The fourth monitoring point, LOR, although achieving the interim goal, produced three samples in exceedance of the WRS target; of these exceedances, one occurred in the spring and two occurred in the summer. This represented 94-100 percent attainment of the final goal.

Total Nitrogen: The calculated load exceeded the WRS goal on one occasion, at LSP, and more frequently at the remaining three attainment points. The exceedances were related to high flow rates (storm events) and possible nonpoint source inputs.

Dissolved Oxygen: The goal for dissolved oxygen was not met at any of the four attainment points on the Laguna de Santa Rosa, with lowest dissolved oxygen levels occurring in the dry weather spring and summer months. Dissolved oxygen levels appear to follow a seasonal trend, as shown in Attachment 5, with non-attainment of the WRS goal most often occurring between the months of April and September. As illustrated in Attachment 6, continuous 24-hour monitoring indicated that in the summer, (July 9 to July 17, 1997), levels of dissolved oxygen ranged from approximately 0 to 6 mg/l with each attainment point having a significantly different dissolved oxygen profile. Overall there was 30-61 percent attainment, depending on the location.

Observations of Beneficial Uses in the Laguna de Santa Rosa

During the course of sampling, Regional Water Board staff observed a number of instances of fishing as well as fish and invertebrate collection on the Laguna de Santa Rosa, particularly at Occidental Road (LOR).

Evaluation of the Pollutant Source Estimates set forth in the WRS

The WRS identified the following as pollutant sources to the Laguna de Santa Rosa, and provided estimates of the nitrogen inputs provided by each source: treated wastewater, dairy agriculture, non-irrigated agriculture, septic systems, urban runoff, and open space runoff.

Treated Wastewater: Attachment 7 presents a schematic map of the Laguna de Santa Rosa, including the tributaries, major wastewater discharge points and the four water quality attainment points. It is included in this report to provide a perspective of the wastewater loading inputs into the Laguna de Santa Rosa system.

Regional Water Board staff utilized the values contained in the Self-Monitoring Reports for City of Santa Rosa's Subregional Wastewater Treatment Facility to estimate nitrogen loading to the

Laguna de Santa Rosa from wastewater. From the Self-Monitoring Reports and the measured flows at LTH, Regional Water Board staff calculated wastewater loading estimates at LTH. Following is a comparison of the WRS and Self-Monitoring nitrogen loading estimates for LTH.

Estimates of Nitrogen Loading from Wastewater, in pounds per year, at Trenton-Healdsburg Road

Season	WRS	Self-Monitoring Reports	
		1995-1996	1996-1997
Winter	244,932	443,045	375,094
Spring	22,059	32,297	5,588
Summer	0	0	0
Fall	18,148	0	6,128
Total	285,139	475,342	386,810

The estimates set forth in the WRS strategy are lower than the estimates calculated from the Self-Monitoring Reports. Staff tends to place more reliance in the results provided by the Self-Monitoring Reports, and proposes to use those values as a basis for comparison in the future. A reduction in nitrogen loading from wastewater can be expected to occur in the near future as a result of the Upgrade Project at the Subregional Wastewater Treatment Plant. The Upgrade Project includes the addition of two aeration basins with anoxic zones and a fifth secondary clarifier, designed to provide an increased level of ammonia nitrogen removal. This additional level of treatment is expected to go on line prior to the next discharge season.

Dairy Agriculture: Several Clean Water Act Section 319(h) grants for nonpoint source control have been implemented by the City of Santa Rosa and the Goldridge and Sotoyome-Santa Rosa Resource Conservation Districts in efforts to reduce inputs of waste to the Laguna de Santa Rosa from confined animal operations, primarily dairies. The results of these efforts, although not specifically quantified at this time, without a question contribute to the improvement of water quality in the Laguna de Santa Rosa over the long term.

Urban Runoff: Efforts have increased to control pollutants contained in urban runoff through the recent implementation of federally-mandated storm water regulations. In compliance with those regulations, the Regional Water Board adopted Resolution No. 97-3, an NPDES Permit and Waste Discharge Requirements for the City of Santa Rosa, the Sonoma County Water Agency and the County of Sonoma (Co-Permittees), in March 1997. Resolution No. 97-3 established a municipal storm water permit for the urban area surrounding the City of Santa Rosa, based on a storm water management program, which included steps to fulfill the waste reduction goal set forth in the WRS. Resolution No. 97-3 calls for the Co-Permittees to provide, on July 1, 1998 and each year thereafter, a summary of analytical results, and an evaluation of the effectiveness of their storm water control efforts in meeting the goals.

In addition, the Regional Water Board has issued approximately 250 industrial and 100 construction storm water permits throughout the Region. Each permitted site is required to

prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) that is designed to prevent or mitigate storm water contamination.

Septic Systems: The control measures to reduce the impacts from septic systems remain essentially unchanged since 1995. The local regulatory agency for septic systems, the Sonoma County Permit and Resource Management Department, generally does not allow new construction of on-site systems in the Laguna de Santa Rosa drainage basin, due to difficulties in finding a site in the basin which will meet the setbacks from watercourses, groundwater, and the site criteria set forth in the Regional Water Board's Individual Systems Policy. As for reported system failures, the Sonoma County Permit and Resource Management Department continues its abatement efforts. In addition, the department has a policy of requiring homeowners to upgrade substandard systems as housing remodels and expansions occur. With respect to nitrogen input, none of these control measures are readily quantifiable, although they may, in the long-term, be reflected in the monitoring trends.

Summary

- The interim ammonia goal of 60 percent attainment was met.
- The dissolved oxygen target of 7.0 mg/l minimum was met 30.61 percent of the time.
- Estimates for nitrogen contributors from City of Santa Rosa Wastewater facility from their self-monitoring will be used instead of the original WRS estimates.
- No other modifications to the estimates or implementation are proposed at this time.
- Progress toward achievement of interim and long-range goals will continue to be made as pollutants from treated wastewater, dairy, agriculture, and urban runoff are reduced.

Regional Water Board staff intend to continue the twice-monthly sampling schedule, and to focus its efforts on the attainment goal for dissolved oxygen. This will involve directing attention to investigation of the extent to which sediments and aquatic vegetation contribute to nutrient and/or oxygen flux in the Laguna de Santa Rosa, as well as an evaluation of the extent to which controllable factors may contribute to the levels of dissolved oxygen in the Laguna de Santa Rosa.

STAFF RECOMMENDATION:

This is an informational item. No Board action will be requested at this time.

State of California
Regional Water Quality Control Board
North Coast Region

Peter Otis
August 14, 1997

EXECUTIVE OFFICER'S SUMMARY REPORT
8:30 a.m., August 28, 1997
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DISCUSSION

Background

The Laguna de Santa Rosa was placed on the Clean Water Act, Section 303(d) list of impaired waterbodies in 1992 and 1994 because of occurrences of high unionized ammonia and low dissolved oxygen. High unionized ammonia levels are the result of inputs of nitrogen in various forms. Low dissolved oxygen levels arise from inputs of organic matter, and algal growth using more oxygen than is produced in the system. Pursuant to the provisions of the Clean Water Act, the Regional Water Board prepared a Waste Reduction Strategy for the Laguna de Santa Rosa, dated March 1, 1995, which set forth estimates for the pollutant sources of concern, as well as pollutant reduction goals. The 1995 Waste Reduction Strategy (WRS) identified and provided estimates of the nitrogen sources to the Laguna de Santa Rosa, and recognizing that it may not be feasible to immediately attain the desired levels of water quality in the Laguna de Santa Rosa, established numeric interim and final goals for nitrogen compounds as well as for unionized ammonia concentrations. For dissolved oxygen, the WRS set forth a final but not an interim goal. The U.S. Environmental Protection Agency approved the WRS as consistent with Section 303(d) of the Clean Water Act on May 4, 1995.

The dynamics of the hydrology of the Laguna de Santa Rosa are complex, and the WRS acknowledged the uncertainty of the estimates with respect to pollutant sources and loads. In order to gather field data to validate the assumptions, the WRS contains a monitoring program for the Laguna de Santa Rosa. The monitoring was intended to provide information regarding attainment of the goals, as well as the basis for reevaluating the goals at a future date if necessary. In October 1995, Regional Water Board staff prepared an Interim Water Quality Monitoring Report for the Laguna de Santa Rosa, which described the results of monitoring from January through June 1995. This report provides an update to the October 1995 report.

The Bases for Establishing the WRS Attainment Goals

Nitrogen

Total nitrogen includes all forms of inorganic and organic nitrogen. Inorganic forms include nitrite (NO_2^-), nitrate (NO_3^-), ionized ammonia (NH_4^+), and unionized ammonia (NH_3). Organic nitrogen is composed of compounds found in living matter, such as amino acids in protein, and from the decomposition of dead organic material such as aquatic algae or plants. Total ammonia, also known as total ammonia-nitrogen, $\text{NH}_3\text{-N}$, a major component of the nitrogen cycle, is formed by the chemical and bacterial decomposition of animal wastes and other protein-bearing materials. In water, ammonia exists in two distinct chemical states: the unionized form, or NH_3 , and the ionized form, or NH_4^+ . The unionized form is most toxic to aquatic life. The unionized ammonia percentage of total ammonia increases as temperature and/or pH increase. Based on the temperature and pH ranges measured in the Laguna de Santa Rosa, the WRS established a target concentration of unionized ammonia of 0.025 mg/l N/L, a level consistent with EPA criteria for unionized ammonia as well as the toxicity objective set forth in the Basin Plan.

The WRS set forth the need to reduce the input of nitrogen into the Laguna de Santa Rosa in order to meet the target for unionized ammonia. The nitrogen sources identified and estimated in the WRS included treated wastewater, dairy agriculture, non-irrigated agriculture, septic systems, urban runoff, and open space runoff. The WRS estimated the input from each source to the Laguna de Santa Rosa by season, and then established target concentrations and mass loading rates for each source and season. These are summarized in Attachment 1.

Recognizing the long-term nature of the nitrogen removal efforts, the WRS set forth interim goals for unionized ammonia, as well as interim goals for nitrogen removal from each category of identified sources on a seasonal basis. The goals for unionized ammonia set forth in the WRS are as follows:

- 60% of the measurements below 0.025 mg/l N by July 1996
- 70% of the measurements below 0.025 mg/l N by July 1998
- 80% of the measurements below 0.025 mg/l N by July 2000

Dissolved Oxygen

One of the principal concerns surrounding high nutrient levels in surface waters is the potential for stimulating excessive algae and aquatic plant growth. While an increase in plant biomass can lead to high dissolved oxygen concentrations during daylight hours when photosynthetic productivity is high, it may also lead to a severe depletion of dissolved oxygen at night, because it is during this time that plants do not produce oxygen. The nighttime demand for oxygen by plants is augmented by the demand of aquatic animals, such as zooplankton, fish, crustaceans, and bivalves, as well as the sediment oxygen demand. The total oxygen demand from these sources may lead to a severe depletion of dissolved oxygen by daybreak. Water and air temperatures as well as stream flow rates also have their respective influences on dissolved oxygen levels.

As described in the WRS, a reduction of inputs of nutrients and organic matter into the Laguna de Santa Rosa should reduce algal productivity as well as the intensity of the nighttime and early morning dissolved oxygen sags that adversely affect aquatic life. The WRS set forth a target for dissolved oxygen of a minimum of 7.0 mg/l, which is consistent with the minimum objective for dissolved oxygen set forth in the Basin Plan.

Regional Water Board WRS Monitoring Program

The monitoring plan included in the WRS set forth the following objectives:

- 1) to provide information regarding the level of attainment to the USEPA criterion for unionized ammonia and to the Basin Plan objective for dissolved oxygen at the four attainment sites on the Laguna de Santa Rosa.
- 2) to provide information to identify areas within the watershed for further reductions in nitrogen and/or organic matter.
- 3) to investigate the extent to which sediments and aquatic vegetation contribute to nutrient and dissolved oxygen flux.

The WRS established four attainment points on the Laguna de Santa Rosa: Trenton-Healdsburg Road (LTH), Guerneville Road (LGR), Occidental Road, (LOR), and Stony Point Road (LSP). An additional point, located at the Willowside Road crossing of Santa Rosa Creek (SRCWS), though not an attainment site, was later included because under some conditions, it was observed that complete mixing of Santa Rosa Creek and Laguna de Santa Rosa was not occurring at LGR. Regional Water Board staff initiated twice-monthly monitoring of these locations in January 1995. To minimize variability factors, attainment points were visited at approximately the same time of day at each sampling event (usually between 9:00 a.m. and noon). In addition, the monitoring was designed so that an equal proportion of storm and non-storm samples were obtained during both winter seasons of 1995-1996 and 1996-1997. Attachment 2 is a map of the Laguna de Santa Rosa, depicting the four attainment points and sampling locations.

Field sampling parameters included pH, specific conductance, dissolved oxygen, water temperature, and stream flow. Chemical analyses were conducted on grab samples collected at the same time that field measurements were taken. Samples collected at every field sampling were analyzed for ammonia, nitrate, and biochemical oxygen demand, while those collected at every other field sampling were analyzed for the above, plus nitrite and total Kjeldahl nitrogen. Unionized ammonia was calculated using pH, temperature, and total ammonia-nitrogen data. In addition, dissolved oxygen saturation percentage was calculated from the field and instrument calibration data.

In addition, Regional Water Board staff installed continuous recording data recorders at three attainment points in the Laguna de Santa Rosa, (LSP, LOR, and LTH), during the months of June, July and August in order to determine the diurnal fluctuations of dissolved oxygen, pH, temperature, and specific conductivity.

Attachment 3 summarizes the results of the laboratory analyses for the nitrogen compounds at the four attainment points, and field observations for dissolved oxygen, from January 19, 1995 through May 28, 1997. Utilizing the nitrogen concentrations summarized in Attachment 3 and

flow rate measurements, total load estimates of nitrogen were calculated. Attachment 4 illustrates the calculated load of total nitrogen in pounds per day at each attainment point in the Laguna de Santa Rosa, and compares these values to the goals set forth in the WRS.

Summary of Regional Water Board Monitoring Results

Unionized Ammonia: The monitoring indicates that the interim goals for unionized ammonia set forth in the WRS were attained consistently from January 19, 1995 through May 28, 1997 at three monitored attainment points on the Laguna de Santa Rosa. The fourth monitoring point, LOR, although achieving the interim goal, produced three samples in exceedance of the WRS target; of these exceedances, one occurred in the spring and two occurred in the summer. This represented 94-100 percent attainment of the final goal.

Total Nitrogen: The calculated load exceeded the WRS goal on one occasion, at LSP, and more frequently at the remaining three attainment points. The exceedances were related to high flow rates (storm events) and possible nonpoint source inputs.

Dissolved Oxygen: The goal for dissolved oxygen was not met at any of the four attainment points on the Laguna de Santa Rosa, with lowest dissolved oxygen levels occurring in the dry weather spring and summer months. Dissolved oxygen levels appear to follow a seasonal trend, as shown in Attachment 5, with non-attainment of the WRS goal most often occurring between the months of April and September. As illustrated in Attachment 6, continuous 24-hour monitoring indicated that in the summer, (July 9 to July 17, 1997), levels of dissolved oxygen ranged from approximately 0 to 6 mg/l with each attainment point having a significantly different dissolved oxygen profile. Overall there was 30-61 percent attainment, depending on the location.

Observations of Beneficial Uses in the Laguna de Santa Rosa

During the course of sampling, Regional Water Board staff observed a number of instances of fishing as well as fish and invertebrate collection on the Laguna de Santa Rosa, particularly at Occidental Road (LOR).

Evaluation of the Pollutant Source Estimates set forth in the WRS

The WRS identified the following as pollutant sources to the Laguna de Santa Rosa, and provided estimates of the nitrogen inputs provided by each source: treated wastewater, dairy agriculture, non-irrigated agriculture, septic systems, urban runoff, and open space runoff.

Treated Wastewater: Attachment 7 presents a schematic map of the Laguna de Santa Rosa, including the tributaries, major wastewater discharge points and the four water quality attainment points. It is included in this report to provide a perspective of the wastewater loading inputs into the Laguna de Santa Rosa system.

Regional Water Board staff utilized the values contained in the Self-Monitoring Reports for City of Santa Rosa's Subregional Wastewater Treatment Facility to estimate nitrogen loading to the

Laguna de Santa Rosa from wastewater. From the Self-Monitoring Reports and the measured flows at LTH, Regional Water Board staff calculated wastewater loading estimates at LTH. Following is a comparison of the WRS and Self-Monitoring nitrogen loading estimates for LTH.

Estimates of Nitrogen Loading from Wastewater, in pounds per year, at Trenton-Healdsburg Road

Season	WRS	Self-Monitoring Reports	
		1995-1996	1996-1997
Winter	244,932	443,045	375,094
Spring	22,059	32,297	5,588
Summer	0	0	0
Fall	18,148	0	6,128
Total	285,139	475,342	386,810

The estimates set forth in the WRS strategy are lower than the estimates calculated from the Self-Monitoring Reports. Staff tends to place more reliance in the results provided by the Self-Monitoring Reports, and proposes to use those values as a basis for comparison in the future. A reduction in nitrogen loading from wastewater can be expected to occur in the near future as a result of the Upgrade Project at the Subregional Wastewater Treatment Plant. The Upgrade Project includes the addition of two aeration basins with anoxic zones and a fifth secondary clarifier, designed to provide an increased level of ammonia nitrogen removal. This additional level of treatment is expected to go on line prior to the next discharge season.

Dairy Agriculture: Several Clean Water Act Section 319(h) grants for nonpoint source control have been implemented by the City of Santa Rosa and the Goldridge and Sotoyome-Santa Rosa Resource Conservation Districts in efforts to reduce inputs of waste to the Laguna de Santa Rosa from confined animal operations, primarily dairies. The results of these efforts, although not specifically quantified at this time, without a question contribute to the improvement of water quality in the Laguna de Santa Rosa over the long term.

Urban Runoff: Efforts have increased to control pollutants contained in urban runoff through the recent implementation of federally-mandated storm water regulations. In compliance with those regulations, the Regional Water Board adopted Resolution No. 97-3, an NPDES Permit and Waste Discharge Requirements for the City of Santa Rosa, the Sonoma County Water Agency and the County of Sonoma (Co-Permittees), in March 1997. Resolution No. 97-3 established a municipal storm water permit for the urban area surrounding the City of Santa Rosa, based on a storm water management program, which included steps to fulfill the waste reduction goal set forth in the WRS. Resolution No. 97-3 calls for the Co-Permittees to provide, on July 1, 1998 and each year thereafter, a summary of analytical results, and an evaluation of the effectiveness of their storm water control efforts in meeting the goals.

In addition, the Regional Water Board has issued approximately 250 industrial and 100 construction storm water permits throughout the Region. Each permitted site is required to

prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) that is designed to prevent or mitigate storm water contamination.

Septic Systems: The control measures to reduce the impacts from septic systems remain essentially unchanged since 1995. The local regulatory agency for septic systems, the Sonoma County Permit and Resource Management Department, generally does not allow new construction of on-site systems in the Laguna de Santa Rosa drainage basin, due to difficulties in finding a site in the basin which will meet the setbacks from watercourses, groundwater, and the site criteria set forth in the Regional Water Board's Individual Systems Policy. As for reported system failures, the Sonoma County Permit and Resource Management Department continues its abatement efforts. In addition, the department has a policy of requiring homeowners to upgrade substandard systems as housing remodels and expansions occur. With respect to nitrogen input, none of these control measures are readily quantifiable, although they may, in the long-term, be reflected in the monitoring trends.

Summary

- The interim ammonia goal of 60 percent attainment was met.
- The dissolved oxygen target of 7.0 mg/l minimum was met 30.61 percent of the time.
- Estimates for nitrogen contributors from City of Santa Rosa Wastewater facility from their self-monitoring will be used instead of the original WRS estimates.
- No other modifications to the estimates or implementation are proposed at this time.
- Progress toward achievement of interim and long-range goals will continue to be made as pollutants from treated wastewater, dairy, agriculture, and urban runoff are reduced.

Regional Water Board staff intend to continue the twice-monthly sampling schedule, and to focus its efforts on the attainment goal for dissolved oxygen. This will involve directing attention to investigation of the extent to which sediments and aquatic vegetation contribute to nutrient and/or oxygen flux in the Laguna de Santa Rosa, as well as an evaluation of the extent to which controllable factors may contribute to the levels of dissolved oxygen in the Laguna de Santa Rosa.

STAFF RECOMMENDATION:

This is an informational item. No Board action will be requested at this time.

**Friends of the Russian River
P.O. Box 83
Duncans Mills, CA 95430**

3 December, 2003

Arthur G. Baggett, Jr., Chair and Members
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

Subject: Comments Regarding Proposed 303(D) Listings For Santa Rosa-Area Waters

Dear Chairman Baggett and Members:

I have reviewed several comments forwarded to your committee regarding recommendations by the North Coast Regional Board Staff to include phosphate on the 303(D) list update for the Laguna de Santa Rosa. I have had the opportunity to exhaustively review extant data on phosphate pollution in the Laguna and am enclosing a report that I prepared for the City of Santa Rosa under contract. I am forwarding this report to you along with another study I conducted for the City on nutrient elimination from treated wastewater discharged to an innovative subsurface irrigation system at a redwood grove on the Sonoma State University Campus.

Both of these reports relate to lobbying efforts by the City to have your board rescind the well overdue listing of the Laguna for nutrients, especially phosphate. The Laguna Phosphate study I am forwarding is comprehensive and requires a thorough review by your agency, however the following points summarize the most important findings.

1. The Laguna de Santa Rosa has consistently exhibited phosphate concentrations that exceed all but a few fresh water bodies in the United States. Typical readings range from 1000-2000 ug/L where, as acknowledged by the City's consultant, the EPA criterion is 100 ug/L. The EPA criterion is based on widely accepted classifications of trophic states defining Oligotrophic (the likely original pre-civilization state of the Laguna) at <20 ug/L phosphate; mesotrophic at 20-80 ug/L; and eutrophic at >80 ug/L phosphate. Concentrations greater than

nitrogen to the algal community through algal fixation and loading of nitrogen oxides. The excess phosphate therefore remains biologically available and algal blooms can reach phenomenal concentrations.

6. The City is proud to credit the nitrogen removed from the effluent in the treatment plant through denitrification to their account. This is misguided for the following reason. In natural systems the ratio of carbon to nitrogen to phosphorus is approximately 100:10:1. In the circumstance of Santa Rosa this means that even though a good deal of the nitrogen is removed during treatment, the release of every 1 lb. of phosphorus in the effluent stimulates fixation of 10 lbs. of nitrogen downstream due to growth of nitrogen fixing alga and bacteria. At the phosphate concentration cited for the City's effluent, approximately 2000 ug/L in 20 MGD of effluent, the city typically releases about 330 lbs of phosphate per day, as P, to the Laguna. This would stimulate a downstream load of approximately 3300 lb. of N into the Laguna. This is very close to the amount removed in the plant during denitrification. Assuming the plant receives 20 MGD of influent with approximately 30 mg/L of ammonia (as N) the plant receives 4950 lbs of N per day. Denitrification removes about 2/3 of that in the plant so approximately 3316 lbs. of N are removed by the plant each day. This is strikingly similar to the calculated amount of 3300 lbs. of N that the residual phosphate would cause to be recaptured from atmospheric sources. **In effect, the City has no nitrogen reduction program since they neglect to control phosphate. They should not receive any credit for nitrogen reduction in their TMDL until they also reduce phosphate.**

7. Sediment stores of phosphate in the Laguna are the primary point of release to the water column during the summer growing period. Phosphate is bound to fine clay sediments. The City of Santa Rosa releases the largest portion of phosphate enriched wastewater in winter when fine sediments are prevalent in the water column where they act as foci for adsorption. This occurs when flows in the Russian River are high, backing up the Laguna so the phosphate enriched sediments can settle out. Summer release of phosphate is exacerbated when oxygen tension at the bottom approaches zero and phosphorus becomes soluble. This sets in motion a positive feedback loop of ever worsening algal hypertrophy as increasing blooms lead to increased dark period O₂ depletion that then solubilizes more phosphorus. Nitrogen is never limiting because diminished dissolved nitrate favors nitrogen fixing algal species that readily capture it from the atmosphere.

Proposals to release the effluent directly into the main stem of the Russian River near Healdsburg would not address the issue. Every small bend or pool in the river would capture adsorbed phosphates in the sediments since it is virtually impossible to remove all of the suspended clays in the river during winter flows. At the same time, proposals to pump the effluents to a closed system like Lake Sonoma would have a disastrous effect on water quality, likely resulting in a water body similar to Clear Lake which has astronomical concentrations of algae.

8. The only biologically relevant DO readings in the Laguna are those taken between midnight and dawn. Algal blooms produce supersaturation with DO to as high as 20-30 mg/L during full sunshine because of excess photosynthesis. This is a transient reading with a rapid loss of this oxygen to the atmosphere as photosynthesis proceeds. Water can only hold about 7 mg/L at the temperatures typical of the Laguna. The supersaturation of oxygen reflects the excessive production of algal biomass. This same biomass respire at night, consuming very nearly the same amount of oxygen that the algae produced during the day. Unfortunately most of that oxygen escaped into the atmosphere because it is in excess of the 7 mg/L that the water can hold in dissolved form. As a consequence the algae remove virtually all of the oxygen during the night. My own readings in the Laguna have consistently shown that DO drops to near zero in most locations in the Laguna during the summer bloom period if measured just before dawn.

Presenting DO readings as averages over the course of a day has no biological validity. Ten minutes of zero oxygen in the predawn will kill aquatic animals that have lived for 23 hours and 50 minutes in saturated conditions. The only biologically valid reading for DO is the **minimum** tension experienced in a day since that reflects the bottleneck that animals must pass through to survive.

8, The City's sampling of subsurface water in their irrigation fields shows that virtually all of the phosphate applied to land through irrigation is sequestered by the soils and never reaches the Laguna .

The City should be recognized for the great strides it has made in managing their wastewater over the past 30 years. The single most important component of this is their implementation of an extensive land application system that reclaims virtually all of their wastewater during the summer months. The State Water Resources Board, as early as 1970 identified the summer releases of phosphate by the City as the single most important source of pollution to the Russian River. There can be no doubt that the cause of the improvements to the Russian River during the 70's, 80's, and 90's was due to the land application program and its dramatic uptake of the nutrients that otherwise would have reached the Laguna.

I have included in this letter a paper I presented to the Annual Symposium of the California Water Environment Association that documents the tremendous level of nutrient reduction the City achieved at the Redwood irrigation site at SSU. More important was the fact that this system showed that Santa Rosa could irrigate year around if they were to utilize subsurface forest irrigation in addition to their summer pasture irrigation program.

The State Water Quality Control Board should recognize that Santa Rosa has no justification for requesting relaxation of standards that your own regional staff has assiduously worked towards. The City has already implemented pilot scale

projects proving the viability of systems that could allow it to virtually eliminate loading of the critical nutrient phosphorus.

It is unconscionable for the City to continue to fly in the face of literally the entire scientific community in their denial of the essential need for phosphate control. The persistence of their supposedly scientifically literate consultants in supporting this absurd position suggests that the Santa Rosa ratepayers, City council and PUC, as well as the regulatory agencies receiving these consultant comments, are being defrauded by these same consultants. It is well past time for your board to support positions presented to you by staff members at the Regional Boards who have proven over and over again a level of competence and responsibility sorely lacking in the City of Santa Rosa's counterparts. The recommendation to list phosphate as a non-compliant nutrient by your board is essential to finally restoring water quality in that body.

Respectfully,

Daniel E. Wickham, Ph.D.
President, Friends of the Russian River and Russian Riverkeeper Program



Phosphorus

What is Phosphorus and Why is it Important?

Phosphorus is an essential nutrient for plant growth and for metabolic reactions in plants and animals. Together with nitrogen, this nutrient is the basis of a river's food web. Phosphorus is the nutrient in shortest supply in most fresh waters. Thus, even a small increase in phosphorus can cause a large increase in the growth of aquatic vegetation like algae and submerged plants.

Pure, elemental phosphorus (P) is rare in nature. In aquatic ecosystems, phosphorus occurs mainly in the form of phosphate (PO₄⁻³) in one of two primary forms: organic and inorganic. Organic phosphate is bound in plant and animal tissues and not available to plants. Inorganic phosphate is the form that is available to and required by plants. It is also called reactive phosphate or orthophosphate. Plants absorb it from the surrounding water and convert it into organic phosphate. Animals that feed on plants use this organic phosphate. Both organic and reactive phosphate can be either dissolved in the water or attached to suspended particles in the water.

More complex inorganic phosphate compounds are called condensed phosphates, or polyphosphates. These are mostly human-made for use in laundry detergents, commercial cleaning preparations, water supply treatment, and boiler water treatment. In time, these polyphosphates breakdown into orthophosphates (reactive phosphate).

Typically, in freshwater ecosystems, phosphate is usually the nutrient that is least available for plant growth. This is called the limiting factor. If phosphate is added to a freshwater system, even in very small amounts, the plant growth usually increases significantly, having a large effect on the aquatic ecosystem. In saltwater, nitrogen is usually the limiting factor.

The Phosphorus Cycle

Understanding phosphorus in the aquatic ecosystem is complicated by the fact that phosphorus does not stay put in one form or another—it cycles (see the diagram below). Aquatic plants take in dissolved inorganic phosphorus (reactive or orthophosphate) from the water column and convert it to organic phosphate as a part of the plant tissues. Depending on their dietary preferences, animals get the organic phosphate they need in various ways: plant eating animals get phosphorus as organic phosphate when they eat plants; predators get organic phosphate from other animals; and scavengers get phosphorus by eating decomposing plant and animal material. As plants and animals

BACKGROUND

II. The Water Quality Indicators: Phosphate

The human body releases about a pound of phosphorus per year.



What are the Sources of Phosphate?

The large number of sources and the variety of routes that phosphates can take to a stream make it difficult to pinpoint and correct specific sources of phosphate enrichment.

Natural sources of phosphate include the soil, phosphate-containing rocks, animal wastes, and decomposing plants. Phosphate comes from many human-induced sources including human wastes, animal wastes, fertilizers, detergents, and disturbed land. A description of each is below.

Animal Wastes: Phosphate from animal wastes can enter the river system in runoff from manure storage areas, feedlots, and barnyards.

Human Wastes: The main contributions of phosphate from human waste come from leaking septic systems or systems that are not properly maintained, and from waste water treatment facilities. Unless wastewater treatment plants are specifically designed to remove phosphate, they remove only a portion of the phosphate that enters them. Many wastewater treatment plants have a limit, which is set in their permit, on how much phosphate can be discharged. Outdated treatment plants often fail to meet this standard, and some industrial wastes that flow through the facility with the wastewater can interfere with the removal of phosphate. When the storm sewers are connected to the wastewater treatment plant (combined sewer overflows) storms can overload the treatment plant dumping raw sewage directly into the river.

Fertilizer: Phosphate-rich fertilizers enter our waterways through runoff from fertilized lawns and cropland. Nearly all fertilizers contain phosphates.

Detergents: Most detergents and commercial cleaning preparations contain phosphates. They enter the river with the wastewater from our plumbing through the wastewater treatment facility or a failing septic system (see above). There are an increasing number of detergents that have a reduced phosphate content. These have 0% to 10% phosphorus by weight. Some states have a phosphate ban on detergents. Read the labels to find a detergent with no phosphate.

Disturbed Land: Phosphate occurs naturally in the soil and is bound to soil particles. Soil erosion from disturbed land introduces the phosphate to the water when the soil enters the river. Wetlands that are drained for development release phosphate that has accumulated in the sediments over time.

Other: Urban and suburban runoff contains phosphate from a variety of sources that can enter waterways through the storm sewers. Road salts used in the winter contain phosphate as an anticaking agent and enter the river as runoff and through the storm sewers.

How Does Phosphate Affect Water Quality?

In most fresh water, phosphate is the nutrient in shortest supply and therefore limits the growth of aquatic plants. Human addition of phosphorus can stimulate great increases in aquatic plant growth (often seen as an algae bloom). An algal bloom may cause an initial increase of dissolved oxygen (as the plants photosynthesize). After the algae die, they break down with the help of decomposing bacteria. Because these bacteria use oxygen, the more organic matter present, the more the decomposing bacteria are active and the more oxygen they use. This ultimately decreases the amount of dissolved oxygen available to other organisms in the river system. Eventually, increased decaying matter affects temperature and other river characteristics, and the stream becomes choked with aquatic weeds and filled with vegetation. The result is that the types of plants and animals that live in the river changes. This process of human-created increase of nutrients in the river is called cultural eutrophication.

Increased nutrients in a river system eventually affect lakes and oceans. The input of nutrients in a lake can have large impacts in terms of weed growth and oxygen levels. In Lake Champlain, a very large lake between New York and Vermont, efforts are being made to reduce the amount of phosphate in the lake by reducing the amount of phosphate entering the lake's tributaries, which are the most significant source of phosphorus to the lake.

Phosphates do not pose a human or animal health risk unless they are present in very high concentrations. Even then, they probably do little more than interfere with digestion. Therefore phosphate is not regulated in our drinking water.

How is Phosphate Measured?

Phosphate is measured as mg/L. We can report results as phosphate or as phosphorus (P). Most state standards are reported "as P," therefore we suggest that results always be reported as P.

Small, naturally nutrient-poor upland streams may respond to P concentrations of 0.01 mg/L or less. Larger river systems may respond only when concentrations approach 0.1 mg/L. In general, any concentration over 0.05 mg/L will likely have an impact. Concentrations over 0.1 mg/L will certainly have an impact on the river.

From: SWHWG Newsservice <waterstrider@comcast.net>
Reply-To: riverissues@lists.sonic.net
To: SonomaWildlife <SonomaWildlife@yahoogroups.com>, River Issues <riverissues@lists.sonic.net>
Date: Tuesday, January 17, 2006 8:35 PM
Subject: [riverissues] WATER: Phosphorus Pollution Limits Plant Diversity

Newspaper clippings on habitat issues are offered to provide information and encourage conversation.

<http://www.conbio.org/cip/article71jwpho.cfm>

Journal Watch

Phosphorus Pollution Limits Plant Diversity

By Robin Meadows
Jan-Mar 2006 Vol.7 No.1

The conventional wisdom that nitrogen pollution threatens biodiversity may be wrong. Rather, the culprit might be too much phosphorus. New research shows that many more endangered plants are still surviving in areas where phosphorus is scarce than in those where nitrogen is scarce, which means these species are more likely to die out if phosphorus levels rise.

"These findings were a surprise," says Martin Wassen of Utrecht University in The Netherlands, who with three coauthors reported this work in Nature. "We expected to find many more endangered species on nitrogen-limited sites."

Nutrient pollution reduces plant biodiversity by favoring the species that grow fastest, which then block sunlight from reaching the many slower-growing species. In contrast, when nutrients are limited, slower-growing species also have a chance to thrive. Excess nitrogen has been blamed for local extinctions of plants in temperate forests, grasslands, and freshwater wetlands. However, this conclusion is based on studies that were done on a small scale and so might not apply universally.

Wassen's is the first large-scale study of how nutrient limitation affects plant diversity. The researchers surveyed plants at 274 sites from Western Europe to Siberia; the sites ranged from freshwater wetlands such as bogs and marshes to moist grasslands. Sites were classified as nitrogen- or phosphorus-limited, based on the ratios of these nutrients in the plants.

If nitrogen were the main threat to plant diversity, more endangered species should still be surviving in ecosystems that are low in this nutrient. But the researchers discovered the opposite: there were far more endangered plants in low-phosphorus ecosystems. "Thirty out of