East San Joaquin Water Quality Coalition

UPDATE NEWSLETTER

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www.esjcoalition.org

Special Edition

Answering Member Questions

Who are the activist groups that filed petitions against the ESJWQC General Order?

Protectores Del Agua Subterranea v. State Board, Central Valley Water Board and East San Joaquin as real party in interest (represented by Leadership Counsel for Justice and Accountability) – Leadership Council is challenging the antidegradation findings and primarily claiming that the State Board has failed to properly apply the appellate decision in the AGUA case.

Environmental Law Foundation v. State Board and East San Joaquin as real party in interest (representing themselves) – Alleging that the State Board Order fails to comply with State Law and Policy because it allows that grower information to remain anonymous.

Monterey Coastkeeper, California Sportfishing Protection Alliance, et al., v. Central Valley Board and State Water Board (represented by Mills Legal Clinic at Stanford, Environmental Law Clinic at Golden Gate University School of Law, California Rural Legal Assistance) – Coastkeeper et al., has numerous allegations within the Petition for Writ of Mandate, including the following: failure to comply with Nonpoint Source Policy and Antidegradation Policy; failure to comply with California's Public Trust Doctrine; failure to comply with California Constitution for failing to protect against waste and unreasonable use of state waters; failure to implement human

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Winter Member Meeting Attendance Tops 1,800

Rainy weather helped prompt almost half of all ESJWQC members to attend meetings held in the first week of February in Madera, Merced and Modesto. The new speaker panel format was well received, especially the ability to text questions to speakers throughout the 90-minute event.

Audience members also contributed to the discussions with well thought out questions.

In this edition of the ESJ Update, coalition staff and consultants have combined efforts to answer the questions and also elaborate on key themes in the presentations.

Watch Member Meeting Online

Go to https://www.esjcoalition.org/meeting/

Watch Regional Water Board Presentation

New domestic well testing requirement

Go to: https://www.esjcoalition.org/meeting/ and scroll to the bottom of the page.

Calculating Nitrogen Removed at Harvest

The member packets mailed in November 2018 contained the new Irrigation and Nitrogen Management Plan (INMP) for the 2019 crop year. Growers partially fill out the INMP worksheet by March then complete after harvest results are in. The numbers under "total applied nitrogen" (A) and "yield" (Y) are then transferred to the new INMP Summary Report, which will be included in the member packets to be mailed this coming November.

Information from the 2019 crop year INMP Summary Report (due March 1, 2020) will be analyzed by ESJWQC consultants and mailed to members in Spring 2021. A key component of the Nitrogen Use Evaluation Report is the field-specific applied nitrogen minus the nitrogen removed by the crop (A-R). This value estimates the amount of nitrogen per acre that was not "removed" from the field during harvest (based on yield) and could potentially leach to groundwater. While the nitrogen applied and yield values come from grower records, the nitrogen removed value is calculated by multiplying the yield by a crop-specific

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Answering Member Questions

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right to water; violated Petitioners' right to a fair trial; constitutes an invalid underground regulation; and adoption thereof constitutes a prejudicial abuse of discretion.

What has the dairy industry done to address nitrates that manure puts into groundwater?

Every Central Valley dairy is required to follow a nutrient management plan, prepared by a certified professional, to help guide the appropriate application of manure and other nutrients used for crop production. Dairies are required to sample and analyze manure, irrigation water and harvested crops to determined how much nitrogen is applied and removed. Since 2010, dairies in the Central Valley have supported ongoing groundwater monitoring and research through the Central Valley Dairy Representative Monitoring Program (CVDRMP). On April 1, 2019, CVDRMP is submitting a summary report of monitoring to date, including recommendations for improved manure management practices to further increase groundwater protection. The monitoring network is extensive: more than 16,000 data points from 440 monitoring wells are reported annually. The data helps CVDRMP evaluate farm management practices (manure storage, croplands and animal housing) and their potential to impact groundwater.

Is the new Irrigation and Nitrogen Management Plan (INMP) required for other coalitions?

General Orders for all other Central Valley water quality coalitions were adopted on February 6, 2019, putting in place the exact same requirements as those in the ESJWQC. The new INMP goes out to growers in those other regions in 2020.

Calculating Nitrogen Removed at Harvest

continued

coefficient, which estimates how much of the yield represents nitrogen used by the crop during the growing season.

For example, studies funded by the Almond Board of California and California Department of Food and Agriculture show that an average of 68 pounds of nitrogen is removed for each 1,000 pounds of nut meats harvested. When this crop coefficient is multiplied by a yield of 2,000 pounds per acre, it shows that 136 pounds of nitrogen has been removed. If 200 pounds per acre of nitrogen was applied, that leaves 64 pounds per acre of what could be considered "excess" nitrogen.

A second metric calculated using a grower's A and R information is A divided by R (A/R). When A/R is "1", the grower has applied the same amount of nitrogen as removed at harvest. If the A/R is "2", twice as much nitrogen is applied than removed.

In the Nitrogen Use Evaluation sent to each member, a grower's nitrogen applications divided by yield (A/Y) are plotted on a graph and compared to other growers reporting on the same crop.

Outlier Identification Based on Statistics

Much time and many resources will be focused in coming years on ensuring that crop coefficients are as accurate as possible. This number has become a key measure in evaluating grower performance with nitrogen management.

In 2016-17, ESJWQC reported to members in their Nitrogen Use Evaluation Report if a field or management unit was an outlier. That designation was given to fields with A/Y values above the top 90th percentile of all A/Y values reported for a single crop. In 2019, that approach is being changed due to the recently adopted General Order for ESJWQC. The nitrogen applied and yield numbers reported for the 2018 crop year will be analyzed using the "interquartile range" calculation. This approach is a better measure when considering real-life cropping conditions and variability.

After growers report their yield and total nitrogen applied, all coalitions in the Central Valley are required to calculate the nitrogen removed using the per acre production and crop coefficient. The results will be analyzed to determine which fields or management units are considered outliers, a designation that leads to additional requirements for those members. This includes completing a Management Practice Implementation Report (MPIR), which contains specific questions regarding nitrogen management practices used on the outlier fields. In coming years, growers that have fields identified as outliers must also have their INMPs certified by a Certified Crop Advisor (CCA), or self-certified after more classes have been successfully completed, even if the grower had already completed a self-certification program.

Groundwater Quality Benefits from Recharge

Building groundwater recharge basins is a key component of plans being developed under the Sustainable Groundwater Management Act (SGMA). Diverting excess surface water flows into these percolation ponds is a proven technique for replenishing groundwater aquifers.

In groundwater basins with high concentrations of nitrate, will adding fresh water help lower contamination levels? In theory, yes. Nitrate in groundwater aquifers is very stable and, except in unique circumstances, is known to remain relatively stable over time. Adding fresh water to the aquifer, either through recharge basins or naturally via rainfall or river accretion, is likely the best way to dilute nitrate in aquifers.

The next best method to reduce nitrate in aquifers is by pumping groundwater high in nitrate and applying it to crops. The nitrate in groundwater is taken up by crop roots the same as if it was applied through fertilizer. In fact, recent modeling studies show that "pump and fertilize," as the technique is called, is the most economical way to remove nitrate from groundwater. It is important to know how much nitrate is in your groundwater so that you can account for it when applying additional sources of nitrogen. If commercial fertilizers or compost/animal manures are applied beyond the crop needs, the leaching of excess nitrate could offset any gains of pumping high nitrate groundwater onto crops.

A possible mitigation technique someday might be installing shallow wells in high nitrate aquifers to assist in cleaning up the groundwater. Currently there are no restrictions for installing wells for this purpose (other than existing restrictions on new well construction in some areas).

Another related point: the dramatic drop of groundwater levels during the recent drought is not likely to impact the overall nitrate level in those depleted aquifers. Since nitrate is dissolved in water, it does not "float" or "sink" in an aquifer profile. So, over-pumping only decreases the volume of water in the aquifer but doesn't affect the concentration of nitrate, salts or other contaminants.

Tracking Progress Short and Long Term

High nitrate in Central Valley groundwater basins is a result of human activity taking place across these aquifers for decades. In limited areas, naturally-occurring nitrate also contribute to high concentrations in groundwater. Addressing these contaminated aquifers is a major focus of the Irrigated Lands Regulatory Program with requirements in two major areas: source control (of nitrate) and tracking groundwater nitrate concentrations over time.

Nitrate source control is accomplished in two ways: 1) reporting of fertilizer applied and removed by the crop, and 2) where needed, reducing the excess nitrogen available for leaching. When the nitrogen applied and removed are as close as possible, nitrate leaching can be minimized or eliminated. Over time, the nitrate levels in groundwater aquifers should begin to stabilize and eventually decrease through fresh water recharge, either naturally or through engineered systems.

Tracking progress over time will be accomplished by measuring nitrate in a series of wells located throughout the Central Valley. The wells chosen for the network draw water from the upper aquifer where changes in nitrate levels

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Answering Member Questions

Why are growers today responsible for existing nitrate in groundwater? How can we charge prior contributors? What about homeowners who apply fertilizers to their yards?

The Regional Water Board is basing its current program on existing groundwater conditions. They do cite data from studies that attribute those nitrates to various sources, including waste water treatment plants, dairies and agriculture, among others. But performing the studies to set an exact percentage for each source, then attempting to assign responsibility and also assess a charge for past contamination would be extremely costly and would likely have a high level of uncertainty for each subbasin. As for homeowner use of fertilizers, they are not currently regulated.

Are groundwater nitrate levels going down in our region?

The first detailed analysis of groundwater quality was performed for our region in 2014. This Groundwater Assessment Report (GAR) must be updated every five years. This next analysis could give us answers to the question of whether improvements are occurring. ESJWQC and other Central Valley coalitions performed their first trend monitoring sampling in 2018. The first "trend analysis" will be performed in three years then subsequently every five years.

Is there an excel spreadsheet template available for the INMP Worksheet?

It's on the ESJWQC website at this address: (https://esjcoalition.org/nCalc/)

Tracking Progress Short and Long Term

continued

should occur first. The water samples will be taken annually with an in-depth data evaluation occurring every five years.

The Regional Water Board will use the A-R – amount of excess nitrogen beyond the crop need – as its most closely watched metric of progress. This is because improvement in groundwater nitrate levels is expected to take decades, if not longer, before noticeable improvements are measured. How much "excess" nitrate is too much has yet to be determined. Development of Groundwater Protection Targets (GPT) was part of the General Order adopted in 2018 and is likely to be the first metric used in measuring progress. The Central Valley coalitions and technical experts are working now to develop the formula that will be used to calculate a Groundwater Protection Value (GPV) and GPT for a township-size area. The deadline for this formula is July 2020.

Nitrogen Retained in Permanent Crops

Unlike annual crops where most or all of the nitrogen is removed at harvest, permanent crops such as trees and vines store nutrients for plant structural development. Just how much nitrogen stays in the woody tissue depends on the plant age and size.

In almonds for instance, the amount of nitrogen in tissue is a small fraction of the amount removed during harvest. For permanent crops such as almonds, walnuts and pistachios, the amount of nitrogen remaining in the tissue is built in to the N removed crop coefficient for that crop. Work continues to better define whether there is significant variability due to varieties or growing conditions.

When calculating the nitrogen removed, the crop coefficient for almonds considers the hulls and shells, meaning nitrogen removed can be calculated using kernel weights (no need to report hull/shell weight). All other nut crops rely on yields reported as gross weight for nitrogen removed calculations.

Reasons for Surface Water Quality Improvements

Surface water quality in the ESJWQC region has improved over the last 10 years for a number of reasons. Grower awareness of practices to protect surface water is one factor. Another is that many fields once planted to field or row crops have been converted to permanent crops, especially almonds, walnuts and pistachios. These newer plantings are almost exclusively irrigated with micro-sprinkler and drip irrigation systems. Some of these fields formerly had irrigation runoff that transported farm inputs and sediment into waterways. The newer irrigation systems have virtually no irrigation runoff from fields to nearby surface waters that might have carried herbicides or other chemicals.

Answering Member Questions

Since the coalition is not participating in the domestic well testing, what do you do with the domestic well test results?

ESJWQC does not receive or track test results. Laboratories performing the water analysis post the results on GeoTracker, a website operated by the State Water Board (https://geotracker.waterboards.ca.gov/).

Does nitrate end up in our fruits, nuts, and produce that we consume, and does that effect the human body?

Crops convert nitrate to edible proteins which are an important part of the human diet.

Is there a minimum farm size before reporting is required?

There is no minimum acreage. Coalition participation and any reporting is based on whether a farm has commercial production. A quick test: are farm expenses itemized and deducted from farm income? If yes, you are commercial. Hobby farms are exempt.

If I volunteer my domestic well for the trend monitoring network, will the coalition pay for sampling and analysis?

Yes. But if the well exceeds the nitrate drinking water standard, the member is responsible for notifying the well users and the Regional Water Board.

My walnut orchard is irrigated with high nitrate well water. If the amount of nitrate in the water is more than recommended for

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Accuracy of Nitrogen Crop Coefficients

The level of accuracy for nitrogen crop coefficients being used today varies widely and depends on the specific crop. An analysis by ESJWQC consultants showed that nitrogen coefficients for crops grown on 75% of coalition acreage are good, 21% are reasonable and 7% poor. As part of the new General Order, ESJWQC is required to publish crop coefficients for 95% of the crops by 2021 and 99% percent of crops by 2023. In coming months, ESJWQC will be contacting commodity groups and the University of California to encourage refinement where needed or creating coefficients where they are lacking.

How accurate is the formula A-R? As with any formula using information submitted by members, it is subject to some uncertainty. Reducing that uncertainty can be accomplished by providing the best estimates of nitrogen applied (accounting for all sources) and estimating yield as accurately as possible. However, recognizing the potential uncertainty in the estimates, the coalition is proposing ranges for groundwater protection targets rather than a single number.

Water Board Pursuing Non-Participants in ESJWQC Region

The Regional Water Board (RWB) is stepping up efforts to identify growers not covered by an individual permit or enrolled in a coalition for compliance with the Irrigated lands Regulatory Program. Using GIS mapping of irrigated parcels and county records, the RWB has identified more than 280 potential non-participants in Madera, Merced and Stanislaus counties who have already or will shortly receive notices of their need to obtain regulatory coverage through either option. The combined acreage of the non-participants totals more than 50,000 acres.

The RWB uses progressive enforcement when pursuing action against what it calls “potential dischargers.” First, growers receive an outreach letter listing APNs that appear to have irrigated agriculture but are not listed on coalition membership lists. If there is not an immediate response, the RWB issues a 13260 Directive notice. If still no response, a pre-Administrative Civil Liability notice is delivered that lists a potential fine.

Should a grower seek coverage under the coalition option, the ESJQWC requires payment of back dues from 2004 (or when the property was purchased, whichever is shorter) through 2019. Recently a grower in the ESJWQC region with more than 1000 acres had to pay $70,000 in back dues and interest to become a member in good standing. To date the ESJWQC Board of Directors has not granted any exceptions to paying back dues.

Several fines have been issued against growers by the RWB in the last five years for non-participation after all the notices were ignored. The largest fine to date in the ESJWQC region exceeded $70,000.

Excess Nitrogen Fertilizer: Destined for Groundwater?

If nitrogen fertilizer is applied to a crop – be it commercial fertilizer, animal manure or compost – at levels higher than the crop can use, some assume all the excess nitrate moves straight to groundwater. But is that assumption true? Many factors influence how much of that nitrate actually migrates past the root zone. These include soil type, volume of irrigation or storm water, impervious clay or hardpan layers and microbial action in the soil. Soil chemistry can also play a role under certain conditions.

Several studies currently underway by the University of California are trying to better understand the conditions that influence movement of nitrogen through the soil profile. Central Valley coalitions are also studying this question in the Management Practices Evaluation Program (MPEP), another requirement in the General Order.

What is known in a worse-case scenario – sandy soil, shallow groundwater table, high volumes of irrigation water – is that excess nitrogen applied to a crop can move to groundwater far quicker than in heavier soils. Numerous studies have confirmed that minimizing excess nitrogen through split fertilizer applications, high efficiency irrigation practices, and proper nitrogen formulations can minimize movement of nitrate into aquifers.

While water and nitrate are known to quickly move through sandy soils, the leaching potential is less but still possible in sandy loam, clay loam and clay-based soils. The main difference: transport time is longer with these soil types. Only in extreme cases such as clay silts or other impermeable soil types is nitrate leaching extremely slow or even highly unlikely. A key task of the coalition is to identify and include the natural attenuation factors that reduce the amount of nitrogen leaching to groundwater in its reports to the Regional Water Board..

Answering Member Questions *continued*

the crop, do I have cut back on irrigation?

Nothing in the General Order requires cutting back on applied water under these circumstances. If no synthetic nitrogen fertilizer is applied, your crop is actually helping clean up nitrates in the groundwater. Any groundwater nitrate not used by your walnuts is simply returned to groundwater, but you've cleaned up the groundwater by removing some nitrate.

Realizing that nitrate moves with water, what is the average time it takes for excess nitrate to move through the soil to the groundwater?

The travel time is dependent on several factors: soil type, depth to groundwater and how much water is applied. In worse case conditions (sandy soil, over irrigation by 50%, 50-100 feet to groundwater) it can be less than a year. Using the same example in clay soils, the travel time could be measured in decades.

What depth to groundwater is considered shallow?

Regulatory compliance is based on results from the "upper aquifer" versus a shallow aquifer. The upper aquifer is known to be the first layer of an aquifer that will show effects of nitrates (or other constituents). If the water table is 400 feet, an ideal well for tracking trends has casing perforations no deeper than 450 feet. If the water table is at 50 feet, the ideal perforation level is no greater than 100 feet. In both instances, sampling would track activity in the upper aquifer.

How long before the State imposes nitrogen application restrictions by township?

The new General Order requires development of Groundwater Protection Formulas, Values and Targets by 2022. After public review and State Water Board adoption, it will likely be 2-3 years before the coalitions can perform an analysis on townships located over high vulnerability groundwater basins. This analysis could show that fields in a particular township are receiving excess nitrogen fertilizers. The discussion to remedy the situation would begin at that point with timetables set for a township to meet Groundwater Protection Targets. Best guess on when application restriction discussions will begin: about 2025.

What happens at the end of the five years if we see no improvement even though we have improved our practices? There are simply too many variables.

The State Water Board understands that improvements in groundwater aquifers can take years, even decades, before significant improvements are seen in nitrate levels. The new General Order focusses on source control, meaning minimizing excess nitrate moving to aquifers. Compliance timelines are being set in 10 year increments. Enforcement priorities will likely focus on those fields that show three-year averages of nitrogen applications that exceed what a crop should normally be removed at harvest.

How do I factor in nitrogen application efficiency when completing an INMP? Is there a way to account for smaller nitrogen applications applied more frequently (much more efficient) than fewer applications at higher amounts?

Current reporting requirements do not include efficiency adjustments for either nitrogen application methods or irrigation practices. Both are extremely important when determining if there is excess nitrogen moving past the root zone. Improving efficiency of both practices are considered fundamental steps for addressing nitrate in groundwater.

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