Inadequate Regulation of Potential Water Quality Impacts of Aquatic Pesticides

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The California State Water Resources Control Board (SWRCB) has recently adopted Water Quality Order No. 2004-0009-DWQ, Statewide General National Pollutant Discharge and Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States, General Permit No. CAG 990005, which is available electronically at http://www.swrcb.ca.gov/resdec/wqorders/2004/wqolog.html. In connection with developing this National Pollutant Discharge and Elimination System (NPDES) permit, several drafts of the permit were released for public comment. Lee (2003, 2004a,b) provided comments on the deficiencies in the SWRCB staff's draft NPDES permit in regulating aquatic herbicides to control adverse impacts on non-target organisms:

At the public hearing that took place on May 20, 2004, considerable amounts of unreliable information were presented to the Board in support of continuing to use aquatic herbicides with little or no restrictions. Some of the key points discussed at the hearing which demonstrate the unreliable information provided to the Board are summarized below.

Adequacy of US EPA OPP and CA DPR Evaluation of Pesticides as part of Registering of Pesticides for Application to Aquatic Systems

As indicated in my comments on the SWRCB staff's draft NPDES permits (Lee, 2003, 2004a,b), neither the federal nor the state of California pesticide registration process controls toxicity to non-target organisms outside the zone of application of the pesticide. Pesticide registration involves toxicity testing against a suite of standard organisms. This registration, however, does not provide information on whether a pesticide that is applied at one location can be transported from that location to other areas where it can cause toxicity to aquatic life. The State Water Resources Control Board and its staff, in developing the draft and final NPDES permit for aquatic pesticide application, chose to ignore this situation and assumed that a pesticide applied in accordance with the label obtained as part of registration would not be harmful to non-target organisms in the zone of application or in adjacent areas. This was a significant error on the part of the State Board in their evaluation of the potential for aquatic pesticides to be adverse to the beneficial uses of waterbodies.

Adequacy of Toxicity Testing in Detecting Toxicity to Aquatic Life

Advocates of continued unrestricted use of aquatic herbicides repeatedly claim that, since a limited-scope study conducted by the San Francisco Estuary Institute (SFEI) only found toxicity in the standard toxicity test associated with the application of a copper-based herbicide, all the other pesticides that were studied in the SFEI evaluation did not cause toxicity. Again, this issue is discussed in my comments on the draft permit. It is well known that standard

laboratory aquatic life toxicity testing, in which the toxicity endpoint is mortality of the test species, does not measure all of the toxicity that can occur associated with a pesticide application. The standard laboratory toxicity tests, including those that were conducted by SFEI, are short-term, acute tests that do not assess chronic toxicity, such as impairment of reproduction, altered growth rates, etc. It is well known in the aquatic toxicity literature since the 1970s that chronic toxicity to aquatic life can occur at a pesticide or other chemical concentration that is 100 times less than that which causes acute toxicity.

As an example, the pesticide diazinon is acutely toxic to *Ceriodaphnia* (a zooplankton) at about 450 ng/L. The "safe" concentration of diazinon in water that is believed to be protective against chronic toxicity is about 50 ng/L. The lowest level that acute toxicity can be assessed in laboratory tests is between 150 and 200 ng/L. This relationship is well established in the aquatic toxicity literature and is the basis for the US EPA water quality criteria for protection of aquatic life. It has been used since the mid-1980s in developing the US EPA (1987) "Gold Book" of water quality criteria and revisions of these criteria.

Further, there is increasing evidence that toxicity to aquatic life, such as altered behavior, ability to swim away from predators, ability for migratory fish to home to their home stream waters, etc., can occur at even lower concentrations than those that can alter reproduction, growth rates, etc. In addition, there is even more subtle evidence of toxicity, such as being caused by endocrine disrupters, where extremely low concentrations of chemicals, well below any toxic threshold, can adversely affect fish, such as by causing male fish to become female. Since these issues were discussed in my comments on the draft permit, in developing the revised draft NPDES permit the staff and the Board have ignored the unreliability of aquatic life toxicity testing, as it is conventionally done, to detect chronic and subchronic toxicity of chemicals to aquatic life.

Adequacy of Pesticide Concentrations below Water Quality Criteria in Preventing Adverse Effects to Aquatic Life

In the final NPDES permit, the SWRCB staff, with support of the Board, concluded that if the application of an aquatic pesticide did not cause the concentrations outside the zone of application to exceed the US EPA's water quality criterion for the chemical, there would be no adverse impacts to non-target aquatic life. However, the US EPA has indicated that the water quality criteria development approach, which was adopted in the mid-1980s, protects about 95 percent of the species. There is an estimated 5 percent of the species which are more sensitive to the chemical than those that are protected by the criterion value. This situation can become important in protecting endangered species, where the endangered species of aquatic life may be in the 5 percent of organisms that are more sensitive to the chemical.

Additive and Synergistic Toxicity

There is increasing evidence that the toxicity of two pesticides, such as a herbicide and a pesticide, can be greater than the sum of the individual toxicities. An example of this is the synergistic toxicity between the OP pesticides (diazinon and chlorpyrifos) and the commonly used triazine herbicides. Therefore, the application of an aquatic herbicide, which in itself may not cause toxicity, in combination with other chemicals in the water could be toxic to non-target organisms in the region of application.

Bioassessment

Statements were made at the May 20, 2004, public hearing on the revised draft NPDES permit that there is no experience in using bioassessment in the Central Valley of California. However, there is considerable experience in using bioassessment methodology for wadeable streams in this area. Jim Harrington of the Department of Fish and Game is one of the leaders in the country in conducting work of this type in the Central Valley.

While I was a professor at Colorado State University, I became an advisor to the Department of the Interior Instream Flow Methodology group. This group was responsible for developing some of the early bioassessment techniques which relate organism numbers and types to habitat characteristics. In addition, I have published a major review paper on this issue, in which I discussed how bioassessment can readily be used in many pollution investigation situations. As I discussed in my comments on the draft NPDES permit for aquatic pesticides, bioassessment can readily be used to evaluate whether the addition of a herbicide to a waterbody alters the numbers and types of organisms present in the sediments. Measurements of selected locations before and after herbicide treatment will provide the information to determine whether the addition of the herbicide had a major effect on the benthic community.

Monitoring

The revised draft and final versions of the NPDES permit gutted the monitoring requirements that were set forth in the earlier version of the permit. Statements were made to the State Board by aquatic pesticide users that the proposed monitoring was onerous and not needed. As I discussed in my comments on the drafts, comprehensive monitoring is needed to properly evaluate whether the use of aquatic herbicides is causing significant adverse impacts on the beneficial uses of the State's waters. The conditions that have existed in the past where highly toxic chemicals can be added to waters which then enter the State's waters, without evaluating whether these chemicals are having an adverse impact on the beneficial uses of these waters, should no longer be allowed. While the SWRCB did request that the Aquatic Plant Management Program develop guidelines for monitoring, it remains to be seen whether the State Board will adopt adequate monitoring requirements to protect the beneficial uses of the waterbodies from the adverse impacts of aquatic weed control programs.

There are three components of a reliable monitoring program:

- monitoring of the concentrations of the chemical that is the primary toxicant,
- monitoring of the concentrations of the so-called "inert" and other chemicals added with it, and
- monitoring for the adverse effects to aquatic life caused by the primary chemical and the other chemicals associated with the treatment, as well as the interactions that these chemicals may have with other chemicals in the water.

The monitoring for adverse effects must be done through toxicity testing for acute and chronic toxicity, and assessment of impacts on organism assemblages in the waters that are impacted by the chemical treatment.

Control of Excess Nutrients

One of the issues not discussed in the permit review process that was raised by me in my early comments is that the problem of excessive weed growth in irrigation canals, etc., is a direct result primarily of agricultural interests discharging sufficient nutrients (nitrogen and phosphorus compounds) in their tailwater discharges and stormwater runoff to stimulate the growth of the weeds. Excessive aquatic weed growth in the irrigation water transmission canals and in the State's waters is a direct result of failing to control the adverse impacts of the tailwater discharges.

Overall

The State Board's adoption of the NPDES permit in its current form represents more of the lack of protection of the public's interests, in favor of agricultural interests being allowed to continue to conduct their affairs without evaluating the potential adverse impacts they are having on the beneficial uses of the State's waters.

References

Lee, G. F., "Comments on SWRCB November 26, 2003, Preliminary Draft Water Quality Order No. 2004-__-DWQ Statewide General National Pollutant Discharge Elimination System Permit for Discharge of Aquatic Pesticides for Aquatic Weed Control in Irrigation Systems, Drinking Water Canals, and Surface Water Impoundments that are Waters of the United States," Submitted to the State Water Resources Control Board, Sacramento, CA, December (2003).

Lee, G. F., "Comments on Draft Statewide General National Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed and Pest Control in Waters of the United States," Comments Submitted to the California State Water Resources Control Board by G. Fred Lee & Associates, El Macero, CA, March (2004a). http://www.gfredlee.com/aqweedpermit-comments.pdf

Lee, G. F., "Comments on the REVISED DRAFT STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT FOR THE DISCHARGE OF AQUATIC PESTICIDES FOR AQUATIC WEED CONTROL IN WATERS OF THE UNITED STATES, dated April 6, 2004," Comments Submitted to the California State Water Resources Control Board by G. Fred Lee & Associates, El Macero, CA, May (2004b).
http://www.members.aol.com/apple27298/Aq-weed-permit-rev-com.pdf

US EPA, "Quality Criteria for Water 1986," US Environmental Protection Agency, Office of Water Regulations and Standards, Washington, D.C. (1987).