dpr

Department of Pesticide Regulation

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Secretary for Environmental Protection

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Pete Wilson
Governor

MEMORANDUM

TO: Gary M. Carlton, Executive Officer
California Regional Water Quality Control Board
Central Valley Region
3443 Routier Road
Sacramento, California 95827-3098

FROM: James W. Wells
Director
(916) 445-4000

DATE: December 29, 1998

SUBJECT: RICE PESTICIDES PROGRAM 1998 UPDATE

On January 23, 1998, the Central Valley Regional Water Quality Control Board (CVRWQCB) adopted Resolution No. 98-024 in which they approved management practices for the 1998 through 2000 rice seasons. The attached report provides an update on the 1998 rice production season and addresses issues presented in this resolution.

The Rice Pesticides Program protects water quality and prevents aquatic toxicity by prescribing a program designed to meet performance goals for rice pesticides established in the Basin Plan of the CVRWQCB. The most significant features of the 1998 season were:

- Rice acreage decreased 4.3 percent from 510,000 acres harvested in 1997 to 478,000 acres harvested (projected as of October 7) in 1998.
- El Nino rains and winds prevented adequate preparation of rice fields and extended the planting and pesticide application season.
- One hundred fifty-six early and emergency releases of field water were reported to county agricultural commissioners; almost all were weather-related.

- County agricultural commissioners' offices made nearly 3,300 inspections to check compliance with water holding requirements and issued six agricultural civil penalties. Three hundred ninety-two pesticide application inspections were made.

- Sacramento Valley waterways were monitored for the rice pesticides molinate, thiobencarb, carbofuran, methyl parathion, and malathion from May 5 through July 9. Propanil, triclopyr, 2,4-D, and MCPA were monitored (starting on appropriate dates) from June 2 through July 23. The Colusa Basin Drain was monitored for toxicity from May 5 through June 30.

- Water holding requirements used to facilitate field dissipation of rice pesticides were generally adequate for meeting performance goals.

- Performance goals were exceeded when the most significant pesticide contributions were made by aerial drift, seepage, and weather-related early releases of field water.

- No toxicity related to rice pesticides was noted in Sacramento Valley waterways.

- Water quality objectives, including those for pesticides and toxicity, were complied with, despite excursions above performance goals.

- Sales and use of carbofuran as a rice insecticide may be prohibited next year.

- Carbofuran alternatives including fipronil, lambda cyhalothrin, and diflubenzuron are currently under evaluation at the Department of Pesticide Regulation (DPR).

The resolution also expressed the Board's concerns regarding seepage, spray drift, emergency release provisions for saline field conditions, and trends in thiobencarb use. These issues are being addressed in the following ways:

- **Seepage** - Grower efforts to control seepage will be guided by a new brochure published by DPR staff and staff from the University of

California. A copy of this brochure is attached with the report as Appendix F.

- **Spray drift** - DPR staff are in the process of drafting a series of regulations covering the generic management of spray drift for ground and aerial applications. When these regulations are in a draft stage ready for review by associated agencies prior to public review, I will have a copy sent to the State Water Resources Control Board (SWRCB) and to the CVRWQCB for review.

- **Emergency release provisions based on saline field conditions** - The Board asked that these new emergency release provisions be tracked and evaluated for impacts on water quality with subsequent reconsideration if appropriate. Although there were many emergency releases in 1998, only two listed salinity as the cause. No adverse impacts resulted from these releases.

- **Trends in thiobencarb use** - The Board asked that DPR evaluate steps to reduce trends in thiobencarb use. My staff are conducting a study utilizing Geographic Information Systems technology to evaluate changes in thiobencarb use. A copy of the study plan can be found in Appendix E of the report. If maximum contaminant levels or water quality objectives are exceeded, as described in the Management Agency Agreement, DPR will notify the Board and propose appropriate mitigation measures.

My staff and I look forward to another successful year maintaining the quality of our surface water while allowing production of this important food source. If you have any questions, please contact Dr. Nan Gorder, of my staff, at (916) 324-4265.

Attachment

cc: Walt Pettit, SWRCB (w/Attachment)
Nan Gorder (w/Attachment)

Information on Rice Pesticides Submitted to the California Regional Water Quality Control Board Central Valley Region

December 31, 1998

by

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Department of Pesticide Regulation
Information on Rice Pesticides
Submitted to the Central Valley Regional Water Quality Control Board
December 31, 1998

Programs have been implemented by the Department of Pesticide Regulation (DPR) since 1983 to reduce discharges of the rice herbicides molinate (Ordram®) and thiobencarb (Bolero®and Abolish®) into surface waterways. In 1990, the objectives of these control efforts were clarified and expanded, following the adoption of amendments to the Central Valley Regional Water Quality Control Board's (Regional Board) Water Quality Control Plan (Basin Plan). This plan established performance goals for molinate and thiobencarb beginning in 1990, and for the insecticides carbofuran (Furadan®), methyl parathion, and malathion beginning in 1991. Regional Board staff will amend the pesticide section of the Basin Plan in the future to include numeric water quality objectives for the rice pesticides addressed in this program.

The following review describes the factors affecting quantities of molinate, thiobencarb, carbofuran, methyl parathion, and malathion discharged to agricultural drains and the Sacramento River and efforts to meet the performance goals in 1998. Programs implemented in 1998 helped control discharges of molinate, thiobencarb, carbofuran, methyl parathion, and malathion from rice fields to comply with the performance goals and the water quality objective for toxicity in the Basin Plan. A summary of pertinent water quality monitoring efforts is provided.

REVIEW OF 1998 RICE PESTICIDES PROGRAM

Discussion

A summary of the 1998 Rice Pesticides Program can be found in the following sections. Program requirements for molinate, thiobencarb, carbofuran, and methyl parathion were implemented by county agricultural commissioners (CACs) using restricted material permits. A description of the 1998 rice pesticide program requirements can be found in the guidelines provided to the CACs by the Director of DPR in a memorandum dated March 8, 1995 (see Appendix A). Permit conditions used since 1995 were determined appropriate for use in 1998; additional emergency release provisions were added to address saline conditions in rice fields treated with molinate or thiobencarb. The CACs also provided information to growers on the voluntary malathion program. Additional efforts were taken by DPR staff to continue improved communication about seepage and to address drift issues through the regulatory process.

Molinate

The standard molinate holding period remained 28 days in the Sacramento Valley. Shorter holding periods were available for molinate users in specific areas (closed water management systems, water-short areas, hydrologically isolated fields throughout the rice-growing region, and the San Joaquin Valley).

Thiobencarb

The standard Bolero holding period remained 30 days in the Sacramento Valley, while the standard Abolish hold was 19 days. Shorter holding periods were available for thiobencarb users in specific areas (closed water management systems, water-short areas, in hydrologically isolated fields throughout the rice-growing region, and in the San Joaquin Valley).

Carbofuran, Methyl parathion, and Malathion

The programs for the insecticides retained the basic strategies of the programs used in 1995, with standard required holds of 28 days for carbofuran-treated fields and 24-day holds for methyl parathion-treated fields. Shorter holding periods were available for carbofuran users within closed water management systems. Malathion is not a restricted material; there are no requirements that treated field water be held on site. Malathion users are encouraged to voluntarily hold malathion-treated water for 4 days.

Seepage Control

Users of rice pesticides were required to prevent seepage of field water through the field's weir box, generally by securing the box with plastic and with soil to a depth higher than the water level.

Additionally since 1995, the CACs offices were supplied with several handouts providing guidance to growers on voluntary seepage prevention measures (see Appendix B). The single-page handout was prepared by DPR and numerous interested parties representing the industry, the University of California, and the United States Department of Agriculture. The handout entitled *Closed Rice Water Management Systems* was prepared by the United States Department of Agriculture with the University of California Cooperative Extension. This information was distributed to growers at the time of permit issuance.

Use of Selected Pesticides in 1998

Pesticide use is impacted by weather and the total acres of rice in production. El Nino rains and wind throughout the spring delayed the rice planting season by up to one

month. Many growers were unable to properly prepare their fields prior to planting due to the wet conditions, setting up a difficult weed control regime for the season. The planting season was extended and the excess water proved difficult to control. Estimated harvested rice acreages for 1998 are 478,000 acres, down 6.3 per cent from 510,000 acres in 1997.

In rice-growing counties of the Sacramento Valley, CACs record the acreage treated with rice pesticides. Notices-of-Application (NOAs) for rice pesticides are submitted by the grower to each CAC office. Based on these records, and on pesticide use reports where available, it was estimated that 259,278 acres were treated with molinate, 140,624 with thiobencarb, 77,658 with carbofuran, and 10,500 with methyl parathion (Table 1); propanil was applied to 84,500 acres treated in the Sacramento Valley, triclopyr (Grandstand®) was applied to 104,016 acres in the Sacramento Valley and the phenoxy herbicides (2,4-D and MCPA) were applied to 53,006 acres (Table 2). Pesticide use report data for two other important rice pesticides, malathion and bensulfuron methyl (Londax®), are not available yet.

Regulations have severely restricted propanil use in the Sacramento Valley since 1986 to prevent potential damage to nearby susceptible crops (especially prunes). Use was allowed only in limited areas of Glenn and Colusa counties, with a cap on total daily applications (500 acres) and a limit to total seasonal use (25,000 acres). With the rapid development of widespread resistance to Londax in the broadleaf and sedge weed populations, alternative chemical tools were desperately needed since 1997. A new formulation of propanil was available and was believed to have a low propensity to move off the site of application. Emergency regulations were promulgated to allow expanded use of the new formulation of propanil by ground application (valley-wide use allowed with buffer zones from susceptible crops) and aerial applications in a special study area in Butte County.

Azoxystrobin (Quadris®) has a Section 18 emergency registration to control rice blast, a potentially devastating fungal disease of rice. This multi-cyclic disease was first discovered in California in 1996 with 13,000 acres infected. Incidence of rice blast increased to 50,000 acres infected by 1997. Incidences of rice blast were low to nonexistent in 1998, presumably due to unfavorable weather conditions affecting the disease cycle. Use for azoxystrobin data are not yet available.

Enforcement Activities

The CACs are responsible for enforcement of the rice pesticide programs. The role of the CACs staff includes explaining the program to growers, pest control advisers and operators; issuing restricted material permits; conducting use monitoring inspections; evaluating emergency release variances; and providing DPR with information on the use of pesticides.

Before any pesticide on the list of California restricted materials may be applied, growers must obtain a permit from their CAC. The permits may specify conditions for use of the pesticide, including post-application water-holding requirements. A Notice-of-Intent must be filed with the CAC 24 hours prior to the application, providing the CACs with the option to observe the mixing, loading, and application of the material, thus enforcing regulations that pertain to pest control operations. Molinate, thiobencarb, carbofuran, and methyl parathion are currently California restricted materials; malathion is not. Permits which specify post-application water-holding requirements like those for the use of molinate, thiobencarb, carbofuran, and methyl parathion also require that the NOA be filed with the CAC within 24 hours after the application. NOAs are used to determine when water holding periods begin.

In 1998 DPR and the CACs implemented a Prioritization Plan and a Negotiated Workplan. Part of the plan included a negotiated number of water hold inspections. These plans allow the counties to set priorities within standard guidelines. Rice pesticide applications and water-hold inspections are ranked as "High Priority" inspections as the rice pesticides are restricted materials, and several rice pesticides are under special study by DPR. The county offices then receive partial reimbursement from DPR based on numbers of inspections completed.

CACs staff inspected 3,291 rice fields for compliance with water-holding requirements. Six growers were cited for early release violations with no intentional releases of water. Additionally there were 262 inspections of the pesticide mixing and loading process with two non-compliances and 392 inspections of pesticide applications. A total of eight violations were serious enough to warrant agricultural civil penalty actions. One of the violators was cited in previous years.

Emergency releases are generally limited to fields where an 11-day molinate hold has elapsed and circumstances beyond a conscientious grower's control lead to the need to release water. Growers granted such variances are instructed to drain water only to the extent necessary to restore a healthy growing environment for the rice seedlings. In 1998 many fields did not meet the requirements of emergency release provisions yet were overwhelmed with excess water. Controlled early releases were deemed preferable to uncontrolled water flowing through damaged levees. With DPR approval, CACs authorized 103 documented emergency or early releases affecting 9,892 molinate-treated acres (Appendix C); CACs denied three. In addition, undocumented inadvertent releases occurred. Table 3 presents information on emergency releases from molinate-treated fields from 1987 through 1998.

Beginning in 1994, repeat and multiple violators were required, as part of permit conditions, to make improvements in their water management capabilities. Such improvements may include installation of pumps for tailwater recirculation or containing spillage on fallow land. Growers who violate water holding requirements are subject to

maximum penalties within DPR's Enforcement Guidelines. However, environmental conditions preceding violations (e.g., unfavorable field conditions that could not be moderated by the growers' best efforts) may be considered when assessing penalties.

DESCRIPTION OF 1998 COOPERATIVE WATER QUALITY MONITORING

The California Rice Industry Association retained the consulting firm Kleinfelder, Inc., to collect water monitoring samples from the Colusa Basin Drain at Highway 20 (CBD5) in Colusa County, Butte Slough at Lower Pass Road in Sutter County, and the Sacramento River at the Village Marina (see Figure 1). The monitoring protocol is in Appendix D.

Summaries of the monitoring activities in Sacramento Valley waterways in 1998 are presented below.

Sampling and Analytical Regimen

Routine samples were collected from all three sample sites for ten weeks from early May through early July. Samples were collected from CBD5 twice weekly. Samples were collected from Butte Slough and the Sacramento River near the Village Marina weekly during the first and last two weeks of this period, and twice weekly during the middle six weeks.

Samples were delivered to Zeneca Ag Products, manufacturer of Ordram, for molinate analyses. Samples were delivered to Valent, the primary distributor of thiobencarb, for analyses. Samples were delivered to FMC Corporation, manufacturer of Furadan, for carbofuran analyses and to the California Department of Food and Agriculture (CDFA) laboratory for methyl parathion and malathion analyses. Additional samples representing approximately half of the total samples collected at CBD5 and analyzed by the primary laboratories were analyzed as quality control samples. Molinate, thiobencarb, and carbofuran concentrations in the quality control samples were determined by the CDFA laboratory. Additional samples were collected and stored for analyses in cases where confirmations of analytical results might have been required. Blind spikes were periodically submitted for analyses with field samples.

Additionally in 1998, due to changes in use patterns of rice pesticides since the advent of weed resistance to Londax, the presence of several other herbicides in the agricultural drains was evaluated. Water samples were collected twice weekly in the Colusa Basin Drain. Samples were collected from early June through late July and analyzed for propanil and from late June through late July and analyzed for triclopyr, 2,4-D and MCPA. These analyses were conducted at the California Department of Food and Agriculture laboratories.

The City of Sacramento analyzed molinate and thiobencarb concentrations in water samples collected from the Sacramento River at the intake to its water treatment plant. Samples were collected during the peak of the use season.

Toxicity Testing

Water samples were collected from the Colusa Basin Drain at CBD5 weekly from May 5 through June 30 (except the week of May 19). Department of Fish and Game staff exposed neonate (<24 hours old) cladocerans (*Ceriodaphnia dubia*) to sample water for 96 hours and to control and blind spiked water samples. Percent survival was recorded.

MONITORING AND TOXICITY TEST RESULTS

The peak thiobencarb concentration (11.0 parts per billion or ppb) in the agricultural drains in 1998 (Table 4) was not higher than that observed in recent years. The period during which concentrations were elevated (associated with drift at application and possible contributions from uncontrolled and early releases of water) has increased compared to recent years (Figures 2 and 3 and Tables 5, 6, and 7). Additionally, thiobencarb was detected at the City of Sacramento's intake for drinking water, but at a very low level (0.14 ppb) and only on one date (Table 8).

The peak molinate concentration in the Colusa Basin Drain in 1998 (44 ppb) was similar to that of recent years (Table 9). The period during which concentrations were elevated was shorter in 1998 by several weeks compared to recent years (Tables 5 and 6 and Figures 4 and 5). This period of elevated concentrations is associated with drift at application, possible seepage after application, and possible contributions from uncontrolled and early releases of water. Molinate was detected at the City of Sacramento's intake for drinking water at a peak concentration of 0.69 ppb (Table 8).

The peak carbofuran concentration in the Colusa Basin Drain in 1998 was 1.35 ppb, which is not unusually high compared to recent years (Table 5). Typically concentrations are thought to be associated with drift at application and possible contributions from uncontrolled and early releases of field water. No toxicity tests were conducted on the date this peak concentration occurred.

Methyl parathion was detected only once in the Colusa Basin Drain in 1998 at the level of the performance goal (0.13 ppb) (Table 5).

Malathion was not detected in the surface waters monitored in 1998.

Propanil was detected at a peak of 5.87 ppb in the Colusa Basin Drain, triclopyr (Grandstand®) at a peak of 8.86 ppb, 2,4-D at 0.25 ppb, and MCPA at 1.63 ppb (Table 9).

Aquatic toxicity was observed on one date (June 16) in the 96-hour aquatic toxicity tests conducted on *Ceriodaphnia dubia* at the California Department of Fish and Game Aquatic Toxicology Laboratory.

DISCUSSION OF THE 1998 MONITORING RESULTS AND RELATED PESTICIDE ISSUES

Rice pesticide use practices continue to change in response to the problem of weed resistance to Londax, the primary control agent for broadleaf and sedge weeds in rice in California. Various combinations of chemical controls provide weed control where resistance is a problem. These changes in herbicide use are driving many of the pesticide issues for the Rice Pesticides Program for 1998 and 1999. DPR continues to evaluate and address the potential impacts of changes in pesticide use on water quality in the following ways:

Changes in Thiobencarb Use (See Tables 1, 4, 5, 6, and 7 and Figures 2 and 3.) Thiobencarb use overall has increased as this product has a wide range of activity versus grasses, an important species of sedge, and several broadleaf species, and because it can be used in combination with other products to obtain the full spectrum of weed control needed. The data cited in this report are based on acres treated, but the full rate of thiobencarb may not be applied when this product is used in combination with other chemical controls. Acres treated with thiobencarb in 1998 declined considerably from 1997 (141,000 acres treated in 1998 versus 224,000 acres in 1997). This may have been because the weather conditions caused the weed population to germinate over a long period of time and grow at different rates than the rice; it is difficult to use thiobencarb effectively under such conditions. Additionally, propanil was available for use through emergency regulation and there is some overlap in weed susceptibility to propanil and thiobencarb. Additionally, resistance of grass weeds to thiobencarb and delayed phytotoxic syndrome in rice have been observed.

Water quality goals for thiobencarb were fully protected; the maximum contaminant level set by the Department of Health Services to protect human health is 10 ppb and the secondary action level to protect against off-taste in drinking water is 1 ppb, measured in drinking water sources. Additionally, the water quality objective for toxicity was protected from thiobencarb in all waterways.

DPR Geographic Information Systems Study on Thiobencarb Use
DPR staff are conducting an investigation utilizing Geographic Information Systems technologies to describe changes in use in thiobencarb by formulation for 1994-1996 over the geographic regions of Glenn and Colusa counties. (See Appendix E.)

Monitoring to Track Impacts of Additional Pesticides (See Tables 2 and 10.)
Concentrations of several pesticides used to control weeds resistant to Londax were monitored in 1998 to determine the scope of the impacts of use on water quality. Uses of propanil, triclopyr, and the phenoxies 2,4-D and MCPA were on the rise, yet the surface water concentrations did not approach levels of concern when compared with levels considered toxic to aquatic invertebrates.

Regulatory Activity Related to Spray Drift
DPR is drafting new regulations to govern drift from both ground and aerial pesticide applications. Additionally, product-specific regulations are being developed for the use of propanil and the phenoxies with the goal of allowing judicious use of these products while protecting the environment and susceptible crops from aerial drift. Additionally, region-specific regulations are being developed where appropriate. DPR anticipates sending the draft drift regulations to the State Water Resources Control Board (State Board) as well as to the Regional Board prior to public comment as per the Management Agency Agreement between DPR and the State Board.

Molinate Use (See Tables 1, 5, 6, 7, and 9 and Figures 4 and 5.)
Molinate use has declined somewhat since the peak of use in 1993 (approximately 389,000 acres treated). Use in 1998 was approximately 259,000 acres in the Sacramento Valley. Molinate is not always the grass weed control chemical of choice when growers are faced with control of Londax-resistant broadleaf or sedge weeds.

The maximum contaminant level set by the Department of Health Services to protect human health is 20 ppb. The maximum contaminant level is fully protected in the Sacramento River and the water quality objective for toxicity is protected from molinate in the agricultural drains and the Sacramento River.

Carbofuran Use (See Tables 1, 5, 6, and 7 and Figure 6.)
Carbofuran is the only product registered for control of the rice water weevil (*Lissorhoptrus oryzophilus*) in 1998. Use of this product on rice after 1998 will be prohibited. Use of carbofuran on rice in 1998 was 78,000 acres, down from 138,000 acres in 1997.

Alternatives to carbofuran
Three alternatives to carbofuran are currently under review for registration including fipronil, diflubenzuron, and lambda cyhalothrin. Water quality concerns are under consideration in the registration process. As these products are evaluated, DPR will determine the need for surface water monitoring as it relates to proposed use practices, toxicity levels, and field dissipation.

Methyl Parathion Use and Aquatic Toxicity Testing Results (See Tables 1, 5, 6, 7, and 11.)

Methyl parathion was detected only once in the Colusa Basin Drain in 1998 at 0.13 ppb. This coincided with the only date (June 16) on which toxicity was observed in the 96-hour aquatic toxicity tests conducted on *Ceriodaphnia dubia* at the California Department of Fish and Game Aquatic Toxicology Laboratory. The only published EC_{50} (effective concentration at which fifty percent of the test organisms are affected) for *Ceriodaphnia dubia* is 2.6 ppb in a 48-hour test (Norberg-King, T.J., E.J. Durhan, and G.T. Ankley. 1991. Environmental Toxicology and Chemistry 10:891-900.). The NOEC (no observable effect concentration) in a 7-day test was 0.99 ppb in this same study. Other cladoceran species are sensitive to methyl parathion at levels an order of magnitude lower than this study indicates for *C. dubia*. More work may be needed to fully characterize sensitivity of *C. dubia* and other cladocerans to methyl parathion. DPR concludes that given the current data, there is not evidence to suggest methyl parathion was responsible for the toxicity observed on June 16.

ONGOING ACTIVITIES RELATED TO SOURCES OF RICE PESTICIDES

Seepage (See Appendix F.)

Seepage of water from the rice fields to the surface waterways, potentially carrying rice pesticides, has long been thought to be one unquantified source of rice pesticides in the agricultural drains. Growers have been asked to voluntarily prevent, control, or contain seepage water since 1995. For the 1999 season, a brochure has been published to help growers identify seepage problems on their property and to guide voluntarily mitigation of this problem and other inadvertent discharges.

Emergency and Early Releases of Rice-field Water (See Table 11 and Appendix C.)

The wet and windy weather resulted in many documented and undocumented difficulties in containing and managing rice-field water. There were 156 documented emergency or early releases in 1998, with 16,346 rice acres (plus one closed district) releasing water prior to the end of the required water-holding periods. Many releases were uncontrolled, caused by breached levees. Most of the documented emergency and early releases occurred in late May and early June.

For the first time in 1998, emergency releases could be granted for reasons of saline conditions on the rice field. Several releases were granted for salinity in early July, yet there were no observed increases in concentrations at that time.

Drift

See discussion above under Pesticide Use Patterns Resulting from Londax Resistance: (Regulatory Activity Related to Spray Drift). Additionally, CAC offices inspected 392 rice pesticide applications.

In 1998, two emergency regulation packages were adopted. The first emergency regulation package amended section 6464. The emergency regulation imposed additional restrictions on nonorchard use of phenoxy herbicides which were necessary to mitigate off-site (drift) movement and/or phenoxy herbicide volatilization in designated regions within the Sacramento Valley. All phenoxy herbicide applications were limited to ground applications. Prior to making ground applications, growers had to complete a drift reduction techniques training course approved by the CACs. Unless expressly authorized by permit, no phenoxy application was permitted within two miles of any cultivated commercial cotton, grape, or pistachio planting. Each spray nozzle was required to produce a droplet size not less than 500 microns.

The second emergency package regulated propanil by amending section 6462. The amendment allowed the Director of DPR to designate use areas in Butte, Colusa, Glenn, Placer, and Yuba counties, the northern part of Sutter County, and northern part of Yolo County for ground applications of water-based flowable propanil. Except for the Emulsifiable Propanil Use Area and the Butte County Study Area, all applications of propanil were limited to ground equipment only in expanded use areas. Unless expressly authorized by permit, no application could be made within 1/2 mile of cultivated commercial cotton plantings, and two miles of cultivated commercial grape vineyards, pistachios, prunes, or other sensitive crops. Each nozzle had to produce a droplet size not less than 500 microns. Unless expressly authorized by the CAC, no more than 1,500 acres of water-based flowable propanil could by used in each county per day. The Emulsifiable Propanil Use Area located in Colusa and Glenn Counties was allowed to continue.

Illegal Releases

CAC offices made 3,291 water-hold compliance inspections and cited six growers for noncompliances resulting in agricultural civil penalties.

Legal Releases

The application season during 1998 was protracted due to the rainy and windy weather and as a result it was not always clear when the start of the legal release period was. For thiobencarb, this resulted in an extended period where the concentrations in the Colusa Basin Drain stayed just above the performance goal (Figure 2). The water quality objective for toxicity was protected during this period, except as noted above (Table 11).

RICE PESTICIDES PROGRAM FOR 1999

The 1999 program will remain as described for the 1998 program in this report. DPR continues to track rice production practices and problems related to pesticide use and to work to solve these issues to allow economic production of rice while protecting the quality of our surface water.

Routine Monitoring of Thiobencarb, Molinate, Carbofuran, Methyl parathion, and Malathion

- The monitoring program for these pesticides will be maintained in a similar form to the 1998 program.
- The possible need for monitoring of new rice pesticides is under consideration.

Ongoing Activities Related to Sources of Rice Pesticides:

Seepage

- The new color seepage brochure will be distributed to CAC offices for distribution to growers in the 1999 season.

Emergency and Early Releases of Rice-field Water

- Impacts of all early releases will continue to be tracked.
- Impacts of emergency releases due to saline conditions on the fields will be documented.

Drift

- See the Discussion of the 1998 Monitoring Results and Related Pesticide Issues: Regulatory Activity Related to Spray Drift

Legal and Illegal Releases

- The Enforcement Branch as well as the CAC offices continue to place a priority on compliance with rice pesticide use permit conditions.

Pesticide Use Patterns Related to Changes in Rice Production Practices:

DPR Geographic Information Systems Study on Thiobencarb Use

- DPR will complete the study on thiobencarb use utilizing Geographic Information Systems technologies as a means of evaluating the changes in use of the two formulations of this active ingredient.

Additional Monitoring

- Monitoring for propanil, triclopyr, 2,4-D, and MCPA in 1998 demonstrated there is no evidence to suggest concentrations approach levels of concern for protecting the water quality objectives. Therefore, DPR does not recommend monitoring for the presence of these pesticides in 1999.

Regulatory Activity related to Spray Drift

- DPR will continue to draft generic drift regulations which will be forwarded to the State and Regional Boards prior to public comment as per the Management Agency Agreement between DPR and the State Board.

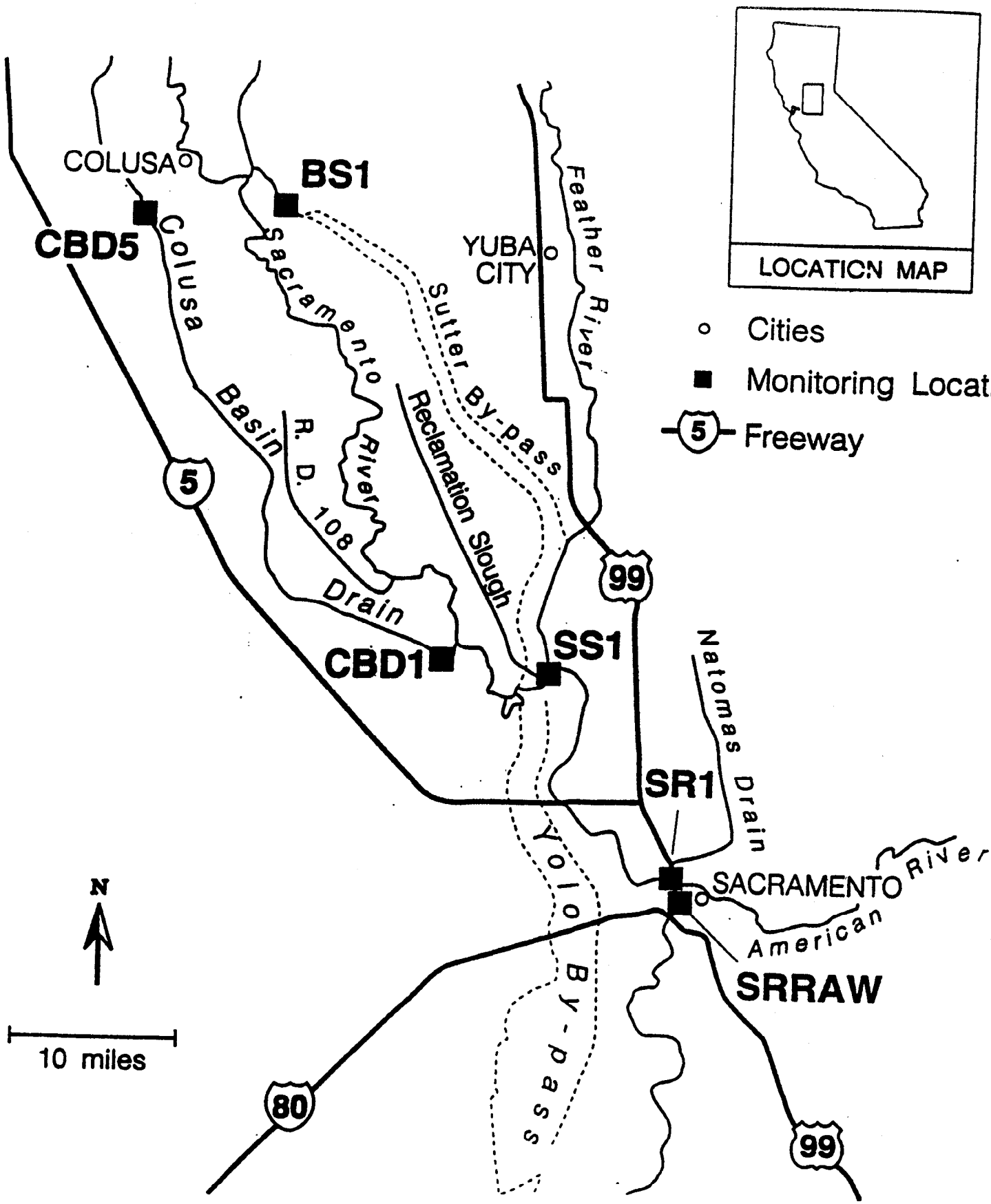


Figure 1. Pesticide monitoring sites in the Sacramento Valley

Monitoring Sites in the Sacramento Valley

CBD5 Colusa Basin Drain near Highway 20 in Colusa County.

CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County, near its outfall on the Sacramento River.

BS1 Butte Slough near Highway 20 in Sutter County

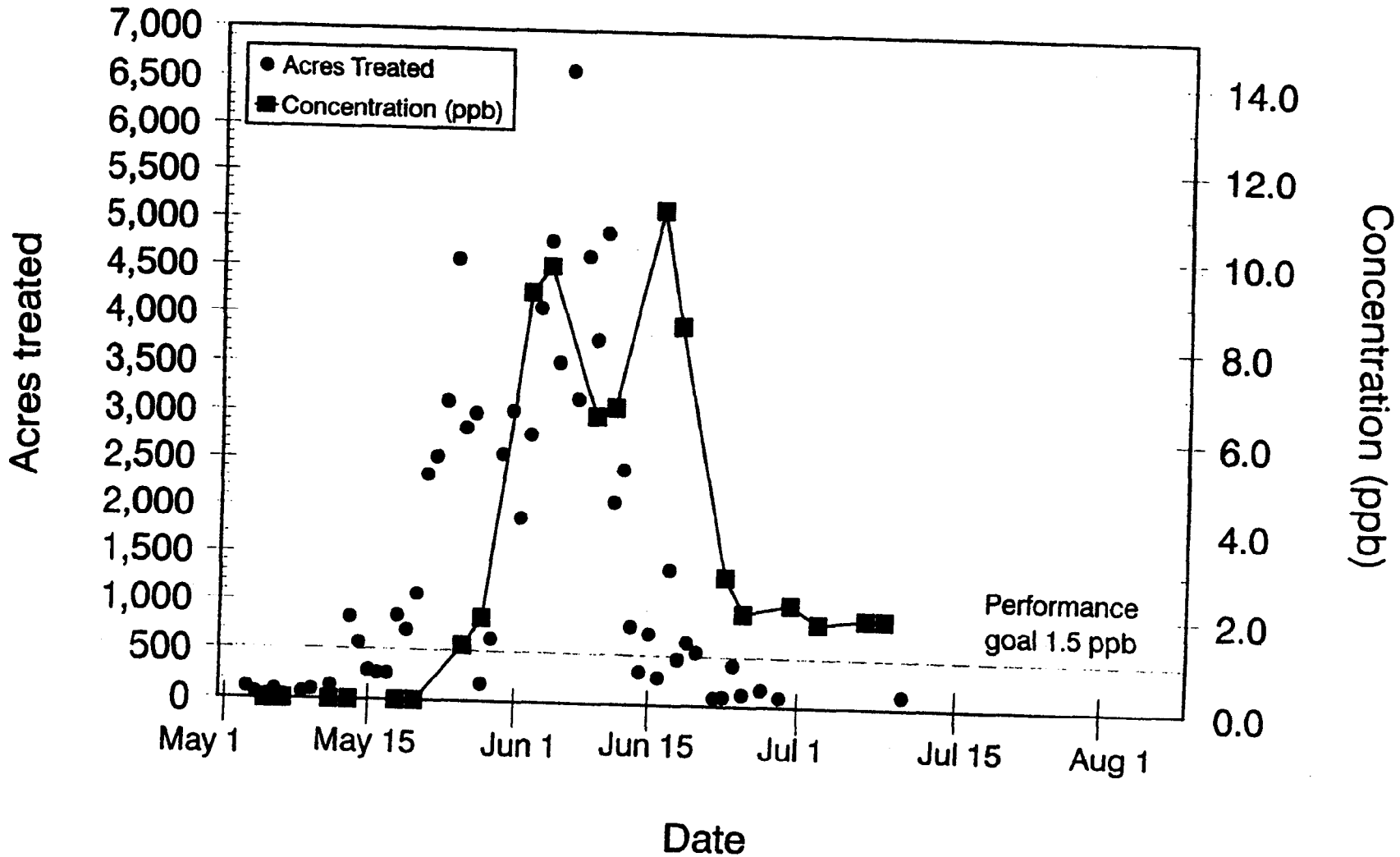
SS1 Sacramento Slough at the Department of Water Resources gauge station in Sutter County, near its outfall on the Sacramento River.

SR1 Sacramento River approximately 1.5 km upstream from the confluence with the American River, at the Village Marina in Sacramento County.

SRRAW Sacramento River at the intake to the water treatment facility in Sacramento, approximately 0.3 km downstream from the confluence with the American River, in Sacramento County.

Preliminary Data
Subject to Change

Figure 2. Acres treated with thiobencarb in Colusa and Glenn Counties and concentrations of thiobencarb in the Colusa Basin Drain near SR20 in 1998.



Preliminary Data
Subject to Change

Figure 3. Acres treated with thiobencarb in Butte County and concentrations of thiobencarb in Butte Slough near SR20 in 1998.

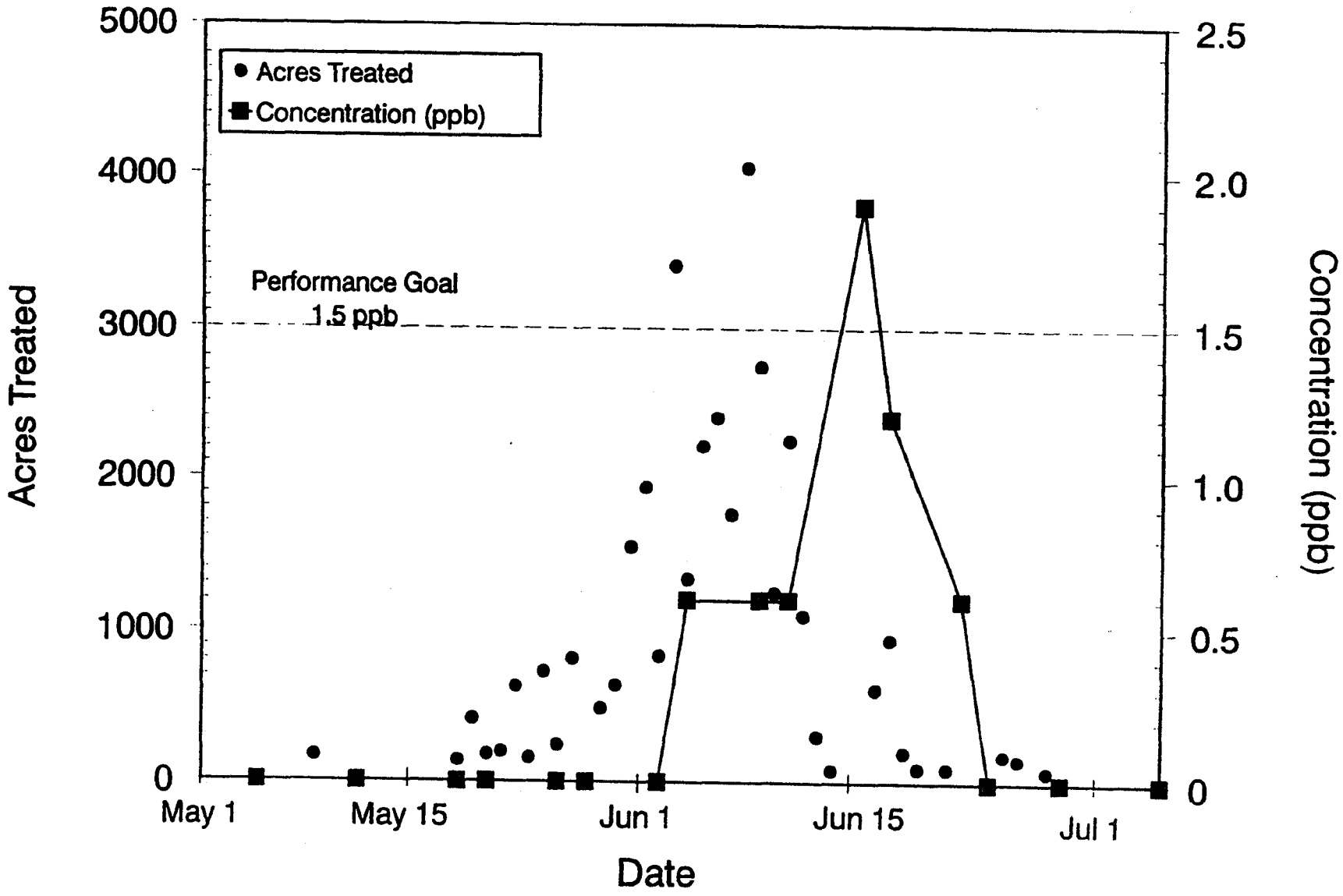


Figure 4. Acres treated with molinate in Colusa and Glenn Counties and concentrations of molinate in the Colusa Basin Drain near SR20 in 1998.

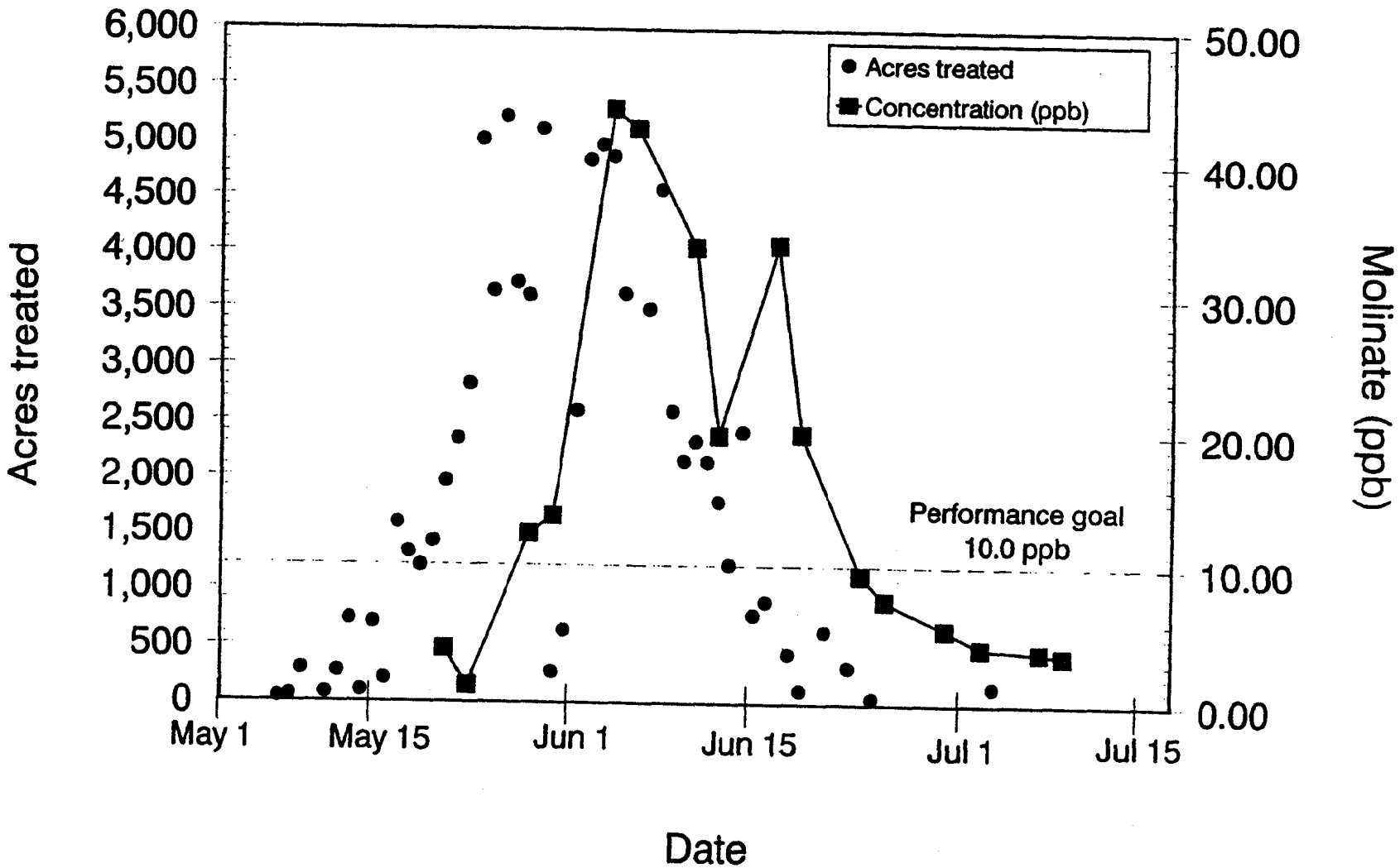


Figure 5. Acres treated with molinate in Butte County and concentrations of molinate in Butte Slough near SR20 in 1998.

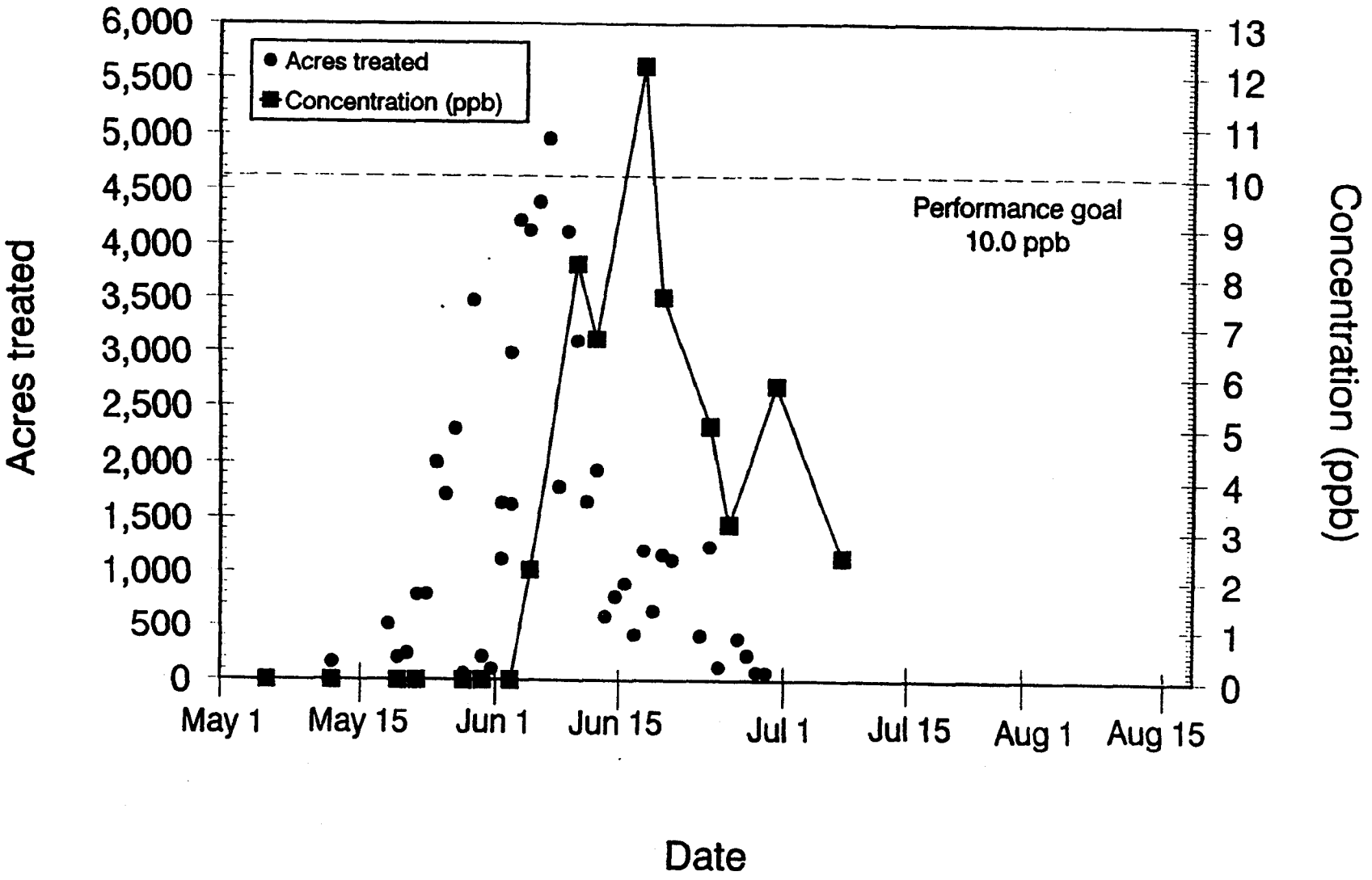
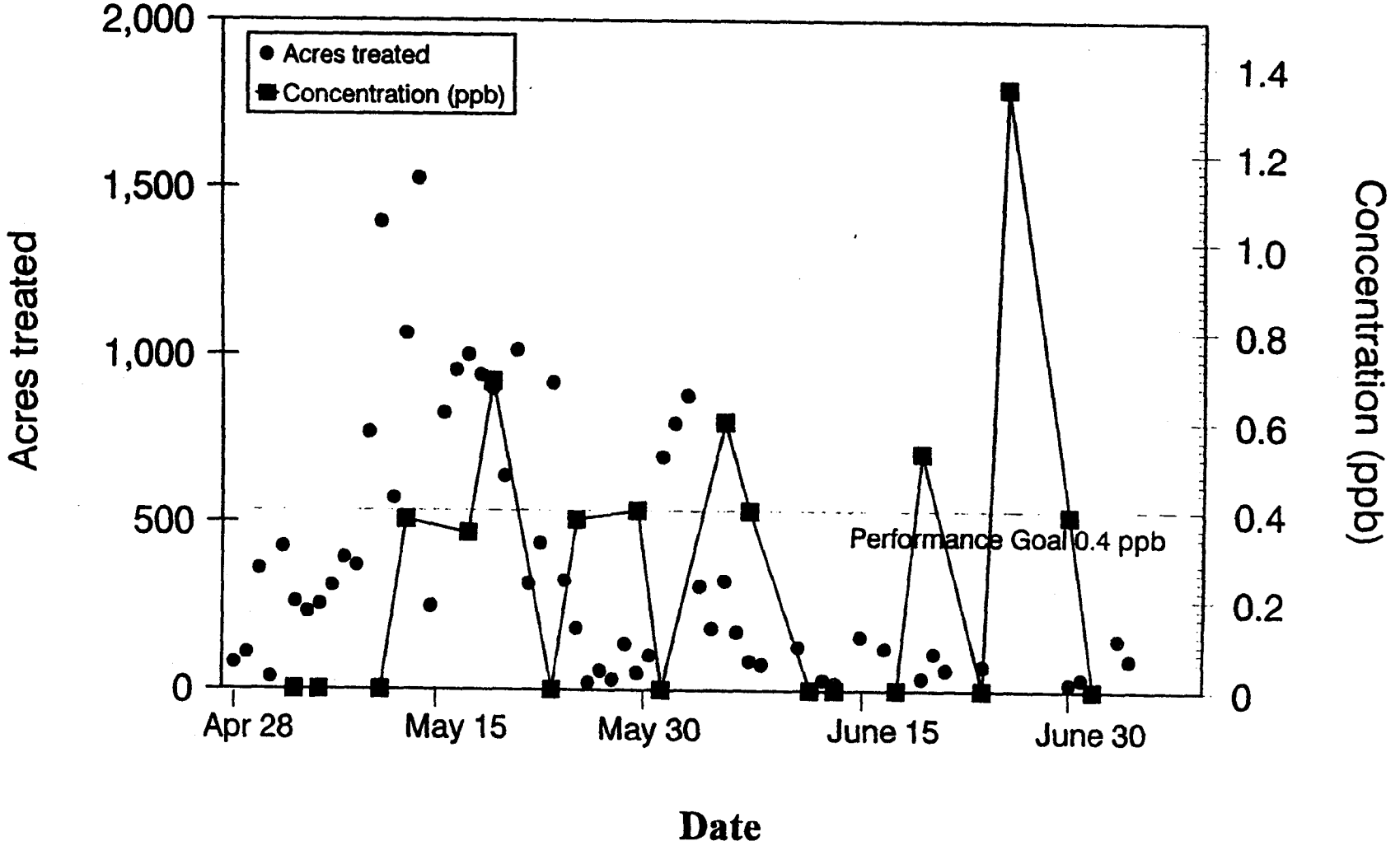


Figure 6. Acres treated with carbofuran in Colusa and Glenn Counties and concentrations of carbofuran in the Colusa Basin Drain near SR20 in 1998.



DRAFT DATA- SUBJECT TO CHANGE

Table 1. Acres treated with molinate (Ordram®)[1], thiobencarb (Bolero® and Abolish®), carbofuran (Furadan®), and methyl parathion in the counties of the Sacramento Valley in 1998[2].

	Acres treated			
County	molinate	thiobencarb	carbofuran	methyl parathion
Butte	60,550	34,585	34,117	500
Colusa	38,396	54,224	7,577	1,456
Glenn	56,136	25,666	14,163	170
Placer	10,928	1,882	3,888	0
Sacramento	5,829	3,325	949	113
Sutter	57,741	13,234	7,366	1,576
Tehama	127	0	45	0
Yolo	8,034	4,964	0	20
Yuba	21,537	2,744	9,553	6,665
Total	259,278	140,624	77,658	10,500

1. Molinate may be applied more than once at each site.
2. Most values are based on Notices-of-Application and pesticide use reports, when available, submitted to county agricultural commissioners.

Table 2. Acres treated with propanil (Propanil-4®, Wham E-Z®, Super Wham®.)[1], triclopyr (Grandstand®), 2,4-D and MCPA in counties of the Sacramento Valley in 1998[2].

	Acres treated			
County	propanil	triclopyr	2,4-D	MCPA
Butte	5,626	2,621		10,350(combined)
Colusa	33,519	45,874	730	1,701
Glenn	13,456	24,470	2,643	649
Placer	4,208	906	569	4,276
Sacramento	7,827	4,962	1,010	1,010
Sutter	9,304	15,742	5,541	6,631
Tehama	0	127	0	0
Yolo	5,467	5,704	508	1,340
Yuba	4,880	3,610	7,226	8,822
Totals	84,287	104,016		53,006(combined)

1. All applications of propanil are governed by a Section 18 Emergency Registration in 1998. Propanil-4 may be used only within a limited zone in western Glenn and Colusa counties. The other formulations of propanil may be used throughout the Sacramento Valley counties by ground application only.

Continued from Table 2.

2. Most values are based on Notices-of-Application and pesticide use reports, when available, submitted to county agricultural commissioners. Additionally, the concentrations of these pesticides were monitored in the Colusa Basin Drain in 1998.

Table 3. Acres of molinate-treated rice fields where water was discharged under emergency release variances in the Sacramento Valley in 1987-1998.

Year	Acres	Percent of Total acres treated
1987	5,712	1.94
1988	4,897	1.41
1989	3,235	0.86
1990	23,394	6.32
1991	2,224	0.70
1992	1,029	0.29
1993	10,350	2.50
1994	172	0.04
1995	772	0.23
1996	5,193	1.46
1997	535	0.17
1998	9,892	3.82

Table 4. Peak thiobencarb concentrations in selected Sacramento Valley waterways[1] in 1981-1998.

	Concentration (ppb)[2]				
Year	CBD1	CBD5	SS1	BS1	SR1
1981	21	23	[3]		
1982	57	170		10	6
1983	11	9	5		1
1984	8	14	8		1
1985	19	18	11		4
1986	7	7	4		1
1987	4	2	1	ND[4]	ND
1988	4	1	ND	1	ND
1989	1	1	ND	1	ND
1990	ND	ND	ND	2	ND
1991	ND	ND	ND	ND	ND
1992	6	7	2	10	ND
1993	5	4	ND	ND	ND
1994	16	37[5]	ND	1	
1995		4		1	ND
1996		16		2	ND
1997		12		2	ND
1998		11		2	ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   CBD5 Colusa Basin Drain at Highway 20 in Colusa County.
   SS1 Sacramento Slough at DWR gauge station in Sutter County.
   BS1 Butte Slough at Highway 20 in Sutter County.
   SR1 Sacramento River at Village Marina in Sacramento County.

2. Concentration values are rounded to the nearest whole number.

3. Blanks indicate no data are available.

4. ND Not detected. Different detection limits (lowest quantifiable concentration) were reported during this period, all of which were less than or equal to 1.0 ppb.

5. A second extraction and analysis was conducted with a rounded result of 40 ppb.

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 5. 1998 Pesticide Concentrations at the Colusa Basin Drain near Highway 20 in Colusa County (CBD5) in parts per billion (ppb).

	Molinate		Thiobencarb		Carbofuran		Methyl parathion	Malathion
Laboratory type	Primary	QC	Primary	QC	Primary	QC	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.5	0.5	0.35	0.05	0.05	0.05
Date								
3/31	ND	ND	ND	ND	ND	0.87	ND	ND
5/05	ND	NS	ND	NS	ND	NS	ND	ND
5/07	ND	ND	ND	ND	ND	0.18	ND	ND
5/12	ND	NS	ND	NS	ND	NS	ND	ND
5/14	ND	0.93	ND	ND	0.38	0.36	ND	ND
5/19	3.91	NS	ND	NS	0.35	NS	ND	ND
5/21	1.23	2.19	ND	ND	0.69	0.68	ND	ND
5/26	12.39	NS	1.20	NS	ND	NS	ND	ND
5/28	13.76	9.86	1.80	1.53	0.38	0.38	ND	ND
6/02	44.09	NS	9.10	NS	0.40	NS	ND	ND
6/04	42.64	34.85	9.70	9.38	ND	0.22	ND	ND

Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

Key to designations on rice water monitoring tables:

PERFORMANCE GOALS (ppb):

Blank cells	Results not yet reported				
ND	Not detected	molinate	10.0	methyl parathion	0.13
NS	Not sampled	thiobencarb	1.5	malathion	0.10
		carbofuran	0.4		

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 5. 1998 Pesticide Concentrations at the Colusa Basin Drain near Highway 20 in Colusa County (CBD5) in parts per billion (ppb), con't.

	Molinate		Thiobencarb		Carbofuran		Methyl parathion	Malathion
Laboratory type	Primary	QC	Primary	QC	Primary	QC	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.5	0.5	0.35	0.05	0.05	0.05
Date								
6/09	33.68	NS	6.40	NS	0.60	NS	ND	ND
6/11	19.83	18.95	6.60	5.70	0.40	0.36	ND	ND
6/16	33.87	NS	11.00	NS	ND	NS	0.13	ND
6/18	19.98	19.56	8.40	7.61	ND	0.17	ND	ND
6/23	9.41	NS	2.80	NS	ND	NS	ND	ND
6/25	7.58	8.20	2.00	1.80	0.53	0.50	ND	ND
6/30	5.53	NS	2.20	NS	ND	NS	ND	ND
7/02	4.16	3.10	1.80	1.55	1.35	1.35	ND	ND
7/07	3.86	NS	1.90	NS	0.39	NS	ND	ND
7/09	3.61	2.41	1.90	1.55	ND	0.29	ND	ND

Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

Key to designations on rice water monitoring tables:

PERFORMANCE GOALS (ppb):

Blank cells	Results not yet reported				
ND	Not detected	molinate	10.0	methyl parathion	0.13
NS	Not sampled	thiobencarb	1.5	malathion	0.10
		carbofuran	0.4		

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 6. 1998 Pesticide Concentrations at Butte Slough at Lower Pass Road in Sutter County in parts per billion (ppb).

	Molinate	Thiobencarb	Carbofuran	Methyl parathion	Malathion
Laboratory type	Primary	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.35	0.05	0.05
Date					
3/31	ND	ND	ND	ND	ND
5/05	ND	ND	ND	ND	ND
5/12	ND	ND	ND	ND	ND
5/19	ND	ND	ND	ND	ND
5/21	ND	ND	ND	ND	ND
5/26	ND	ND	ND	ND	ND
5/28	ND	ND	ND	ND	ND
6/02	ND	ND	ND	ND	ND
6/04	2.21	0.60	ND	ND	ND
6/09	8.27	0.60	ND	ND	ND
6/11	6.75	0.60	ND	ND	ND
6/16	12.17	1.9	ND	ND	ND

Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

Key to designations on rice water monitoring tables:

PERFORMANCE GOALS (ppb):

Blank cells	Results not yet reported				
ND	Not detected	molinate	10.0	methyl parathion	0.13
NS	Not sampled	thiobencarb	1.5	malathion	0.10
		carbofuran	0.4		

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 6. 1998 Pesticide Concentrations at Butte Slough at Lower Pass Road in Sutter County in parts per billion (ppb), continued.

	Molinate	Thiobencarb	Carbofuran	Methyl parathion	Malathion
Laboratory type	Primary	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.35	0.05	0.05
Date					
6/18	7.60	1.20	ND	ND	ND
6/23	5.04	0.60	ND	ND	ND
6/25	3.14	ND	ND	ND	ND
6/30	5.82	ND	ND	ND	ND
7/07	2.46	ND	ND	ND	ND

Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

Key to designations on rice water monitoring tables:

PERFORMANCE GOALS (ppb):

Blank cells	Results not yet reported				
ND	Not detected	molinate	10.0	methyl parathion	0.13
NS	Not sampled	thiobencarb	1.5	malathion	0.10
		carbofuran	0.4		

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 7. 1998 Pesticide Concentrations in the Sacramento River at the Village Marina in Sacramento County in parts per billion (ppb).

	Molinate	Thiobencarb	Carbofuran	Methyl parathion	Malathion
Laboratory type	Primary	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.35	0.05	0.05
Date					
3/31	ND	ND	ND	ND	ND
5/05	ND	ND	ND	ND	ND
5/12	ND	ND	ND	ND	ND
5/19	ND	ND	ND	ND	ND
5/21	ND	ND	ND	ND	ND
5/26	ND	ND	ND	ND	ND
5/28	ND	ND	ND	ND	ND
6/02	1.50	ND	ND	ND	ND
6/04	1.05	ND	ND	ND	ND
6/09	1.14	ND	ND	ND	ND
6/11	ND	ND	ND	ND	ND
6/16	ND	ND	ND	ND	ND

Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

Key to designations on rice water monitoring tables:

PERFORMANCE GOALS (ppb):

Blank cells	Results not yet reported				
ND	Not detected	molinate	10.0	methyl parathion	0.13
NS	Not sampled	thiobencarb	1.5	malathion	0.10
		carbofuran	0.4		

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 7. 1998 Pesticide Concentrations in the Sacramento River at the Village Marina in Sacramento County in parts per billion (ppb), con't.

	Molinate	Thiobencarb	Carbofuran	Methyl parathion	Malathion
Laboratory type	Primary	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.35	0.05	0.05
Date					
6/18	ND	ND	ND	ND	ND
6/23	ND	ND	ND	ND	ND
6/25	ND	ND	ND	ND	ND
6/30	ND	ND	ND	ND	ND
7/07	ND	ND	ND	ND	ND

Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

Key to designations on rice water monitoring tables:

PERFORMANCE GOALS (ppb):

Blank cells	Results not yet reported				
ND	Not detected	molinate	10.0	methyl parathion	0.13
NS	Not sampled	thiobencarb	1.5	malathion	0.10
		carbofuran	0.4		

Table 8. Concentrations of molinate and thiobencarb in the Sacramento River at the intake to the City of Sacramento water treatment facility (SRRAW) in 1998[1].

	Concentration (ppb)	
Date	molinate	thiobencarb
5/20	<0.10	<0.10
5/25	<0.10	<0.10
6/01	0.69	0.14
6/04	0.23	<0.10
6/09	0.11	<0.10
6/15	0.30	<0.10
6/29	<0.10	<0.10

1. Samples collected and analyzed by the City of Sacramento.

Table 9. Peak molinate concentrations in selected Sacramento Valley waterways[1] in 1981-1998.

	Concentration (ppb)[2]				
Year	CBD1	CBD5	SS1	BS1	SR1
1981	340	357	[3]		
1982	204	697		187	27
1983	211	228	68		7
1984	110	120	44		21
1985	95	100	49		16
1986	77	88	30		11
1987	43	53	22	44	8
1988	67	89	30	52	8
1989	51	60	30	43	6
1990	51	59	40	36	9
1991	18	17	10	26	1
1992	6	24	15	26	ND[4]
1993	69[5]	96	31	39	3
1994	21	57	10	18	
1995		25		8	ND[4]
1996		44		15	1
1997		26		16	2
1998		44		12	1

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   CBD5 Colusa Basin Drain at Highway 20 in Colusa County.
   SS1 Sacramento Slough at DWR gauge station in Sutter County.
   BS1 Butte Slough at Highway 20 in Sutter County.
   SR1 Sacramento River at Village Marina in Sacramento County.

2. Concentration values are rounded to the nearest whole number.

3. Blanks indicate no data are available.

4. ND Not detected. Method detection limit=1.0 ppb.

5. Mean of duplicate analysis.

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 10. 1998 Pesticide Concentrations at the Colusa Basin Drain near Highway 20 in Colusa County (CBD5) in parts per billion (ppb).

	Propanil	Triclopyr	2,4-D	MCPA
Laboratory Type	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	0.25	0.1	0.1	0.1
Date				
3/31	ND	ND	ND	ND
6/02	ND	NS	NS	NS
6/04	ND	NS	NS	NS
6/09	0.37	NS	NS	NS
6/11	ND	NS	NS	NS
6/16	ND	NS	NS	NS
6/18	0.73	NS	NS	NS
6/23	0.96	0.40	NS	NS
6/25	2.57	0.75	NS	NS
6/30	2.36	2.10	0.25	1.63
7/02	5.30	2.56	ND	1.46
7/07	4.25	2.99	0.11	0.77

Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

Key to designations on rice water monitoring tables:

PERFORMANCE GOALS (ppb):

Blank cells	Results not yet reported				
ND	Not detected	molinate	10.0	methyl parathion	0.13
NS	Not sampled	thiobencarb	1.5	malathion	0.10
		carbofuran	0.4		

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 10. 1998 Pesticide Concentrations at the Colusa Basin Drain near Highway 20 in Colusa County (CBD5) in parts per billion (ppb), con't.

	Propanil	Triclopyr	2,4-D	MCPA
Laboratory Type	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	0.25	0.1	0.1	0.1
Date				
7/09	5.87	5.30	ND	0.57
7/14	2.40	8.86	ND	0.57
7/16	1.83	7.69	ND	0.17
7/21	0.32	7.15	ND	0.15
7/23	1.28	6.83	ND	0.19

Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

Key to designations on rice water monitoring tables:

PERFORMANCE GOALS (ppb):

Blank cells	Results not yet reported				
ND	Not detected	molinate	10.0	methyl parathion	0.13
NS	Not sampled	thiobencarb	1.5	malathion	0.10
		carbofuran	0.4		

Table 11. 1998 Monitoring and Toxicity Data at the Colusa Basin Drain near Highway 20 in Colusa County (CBD5) in parts per billion (ppb).

	Molinate		Thiobencarb		Carbofuran		Methyl Parathion	Malathion	Toxicity Data	
Laboratory Type	Primary	QC	Primary	QC	Primary	QC	Primary	Primary	Sample % Survival	Control % Survival
Reporting limit (ug/l)	1.0	0.5	0.5	0.5	0.35	0.05	0.05	0.05		
Date										
3/31	ND	ND	ND	ND	ND	0.87	ND	ND	100	95
5/05	ND	NS	ND	NS	ND	NS	ND	ND	90	95
5/07	ND	ND	ND	ND	ND	0.18	ND	ND		
5/12	ND	NS	ND	NS	ND	NS	ND	ND	100	95
5/14	ND	0.93	ND	ND	0.38	0.36	ND	ND		
5/19	3.91	NS	ND	NS	0.35	NS	ND	ND	NS*	NS*
5/21	1.23	2.19	ND	ND	0.69	0.68	ND	ND		
5/26	12.39	NS	1.20	NS	ND	NS	ND	ND	95	100
5/28	13.76	9.86	1.80	1.53	0.38	0.38	ND	ND		
6/02	44.09	NS	9.10	NS	0.40	NS	ND	ND	90	100
6/04	42.64	34.85	9.70	9.38	ND	0.22	ND	ND		
6/09	33.68	NS	6.40	NS	0.60	NS	ND	ND	100	100
6/11	19.83	18.95	6.60	5.70	0.40	0.36	ND	ND		
6/16	33.87	NS	11.00	NS	ND	NS	0.13	ND	0	100
6/18	19.98	19.56	8.40	7.61	ND	0.17	ND	ND		
6/23	9.41	NS	2.80	NS	ND	NS	ND	ND	100	100
6/25	7.58	8.20	2.00	1.80	0.53	0.50	ND	ND		
6/30	5.53	NS	2.20	NS	ND	NS	ND	ND	95	100
7/02	4.16	3.10	1.80	1.55	1.35	1.35	ND	ND		
7/07	3.86	NS	1.90	NS	0.39	NS	ND	ND		
7/09	3.61	2.41	1.90	1.55	ND	0.29	ND	ND		

Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.
Toxicity Data:
Organism: Ceriodaphnia dubia
Test type: ACUTE (96hr)

*Not sampled due to the delay in rice planting because of unseasonable weather and flooded conditions.

Appendix A

California Environmental Protection Agency
James M. Strock, *Secretary for Environmental Protection*

State of Californ
Pete Wilson, *Gov*

DEPARTMENT OF PESTICIDE REGULATION
James W Wells, *Director*

1020 N Street, Room 100
Sacramento, California 95814-5624

March 8, 1995

**TO: COUNTY AGRICULTURAL COMMISSIONERS
IN RICE-GROWING COUNTIES OF THE SACRAMENTO VALLEY**

SUBJECT: 1995 RICE PESTICIDES PROGRAM

On January 27, 1995, the Central Valley Regional Water Quality Control Board (CVRWQCB) approved management practices that limit discharges of the rice pesticides molinate (Ordram®), thiobencarb (Bolero® and Abolish®), carbofuran (Furadan®), methyl parathion, and malathion to surface waters. The CVRWQCB staff sent you a copy of the agenda item for this meeting along with a report prepared by my staff entitled: "Information on Rice Pesticides Submitted to the Central Valley Regional Water Quality Control Board" (December 28, 1995). This letter contains details on the 1995 rice pesticide program including conditions you are asked to implement for rice pesticide permits.

Most of the provisions of the rice pesticide program relating to routine water-holding times will remain the same as in 1994. However, changes will apply for regions previously considered hydrologically isolated to ensure compliance with the CVRWQCB's prohibition of acutely toxic discharges to waters that support aquatic habitat.

In addition, the CVRWQCB approved management plans to promote an educational effort with the rice-growing community that stresses the continued importance of drift prevention and introduces the potential contributions seepage water makes to the pesticide concentrations in the agricultural drains. Drift control provisions remain as they were in 1994. Continue to have your staff impress upon commercial applicators the need to better control applications of pesticides near agricultural drains and focus additional enforcement efforts, when possible, on aerial applications made to fields adjacent to agricultural drains. My

staff is working with representatives from the rice-growing community to propose voluntary measures growers might take to prevent rice field seepage water from entering surface waterways prior to the end of the required holding periods for field water. Your assistance in distributing forthcoming information to growers on seepage water containment will be appreciated.

The key features of the 1995 program are as follows:

1. The basic water management requirements for users of those pesticides that require permits (molinate, thiobencarb, methyl parathion, and carbofuran) are the same as in 1994. The water management requirements for the 1995 program as approved by the CVRWQCB are outlined in Attachments 1-4. Holding times for all applications (not just the "preflood surface" applications) of Abolish decreased to 19 days. Areas considered hydrologically isolated must hold water from fields treated with molinate and thiobencarb for longer periods (11 and 19 days, respectively) than previously required. Exceptions for some fields treated with thiobencarb are described in Attachment 2.

2. The water management practices following malathion use in rice are still voluntary. Attachment 5, which describes these practices, was designed to be distributed to growers.

3. Management practices for containing seepage water from rice fields and the pesticides this water may contain will be addressed through forthcoming educational measures and implemented through voluntary efforts by growers.

4. Water management practices within closed systems remain the same for 1995. The Department of Pesticide Regulation (DPR) will conduct a study on toxicity of water in multigrower closed systems to determine any need for longer holds in future years.

5. The emergency release provisions remain the same as in 1994 to continue to meet the CVRWQCB's prohibition of acutely toxic discharges to waters that support aquatic habitat. Growers with fields treated with Ordram may apply for an emergency release after a minimum holding period of 11 days. Fields will be prohibited from using the emergency release management option until the standard holding times for the insecticides have elapsed. Fields treated with Bolero do not qualify for the emergency release option. Attachment 6 is the form which permittees are to fill out as part of their request for an emergency release. Those that are granted an emergency release must also fill out an additional form (Attachment 7) and deliver it to your office. Failure to submit this form will be considered a permit violation. DPR staff will request the information on the completed forms later this summer.

6. Growers using the emergency release provision more than once or cited for water holding violations more than once must make improvements in water management capabilities. Such improvements will be required as conditions on future pesticide use permits and may include retention basins, ponds, or tailwater recovery systems.

7. Drift control provisions will again be an important part of the program. Methyl parathion application provisions are the same as in 1994. They include the use of an effective drift control agent, use of D8 nozzles, wind speeds $\leq$ 5 miles per hour, and a 300-foot downwind buffer zone left untreated. Attachments 8, 9, 10, and 11 outline the provisions for aerial applications of granular and liquid formulations of rice pesticides included in the program. Special attention should be directed, when possible, towards enforcement efforts during aerial applications at sites adjacent to agricultural drains.

8. Weir boxes that control discharges of water from rice fields shall be fully secured during pesticide holding times. A soil berm must be in place in front of each of these boxes

to a level above the water line, or drop boxes shall be filled with soil to a level above the water line. The need for such berms in fields where nonconventional water management systems are utilized, e.g., static/positive pressure systems, may be evaluated by County Agricultural Commissioner's office staff on a case-by-case basis.

Information transmittal of rice pesticide use data from the county offices to DPR will be handled at the end of July rather than on a weekly basis. My staff will discuss the details of this process with your deputies.

Monitoring results will not be available this year until approximately five weeks after sample collection. DPR will continue to send monitoring program results to your offices, via facsimile, when available.

Thank you for your assistance. Your cooperation continues to help make the program a real success. If you have questions, please contact Dr. Nan Gorder at (916) 324-4265 or Mr. Marshall Lee at (916) 324-4269.

Sincerely,

James W. Wells
Director
(916) 445-4000

cc: Dr. Nan Gorder
Mr. Marshall Lee

APPENDIX A

ATTACHMENT 1

MOLINATE WATER MANAGEMENT REQUIREMENTS - 1995

I. All water from fields treated with products containing molinate must be retained on the site of application for at least 28 days following application unless:

A. The water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 29 days following the last application of molinate within the system.

1. If the system is under the control of one permittee, water may be discharged from the application site in a manner consistent with product labeling.

2. If the system includes drainage from more than one permittee, water may be discharged from the application site into the system nine days following application.

B. The water is on acreage within the bounds of areas that discharge negligible amounts of rice field drainage into perennial streams until fields are drained for harvest. All water on fields treated with molinate must be retained on the treated acreage until the twelfth day following application.

C. The water is on acreage treated with a preflood application of molinate. The label restrictions apply.

II. Fields not specified in I.A., I.B., and I.C. may resume discharging field water 29 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields may then resume after seven days.

MOLINATE WATER MANAGEMENT REQUIREMENTS - 1995

III. The county agricultural commissioner may authorize the emergency release of tailwater 12 days following the last molinate application, following a review of a written request (Attachment 6) which clearly demonstrates the crop is suffering because of the water management requirements. All water management requirements must be followed that are associated with other pesticides that may have been applied to the site. Additionally, the requester must describe preventative action that would avoid the need for future emergency releases. Under an emergency release variance, tailwater may be released only to the extent necessary to mitigate the documented problem. Those issued an emergency release must submit to the county agricultural commissioner a report (Attachment 7) indicating the time and duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release. Emergency release will only be granted for reasons related to rainfall, high winds, or other extreme weather conditions that cannot be moderated with management practices.

SUPPLEMENT TO WATER MANAGEMENT REQUIREMENTS FOR MOLINATE - 1998

IV. The county agricultural commissioner may authorize the emergency release of field water on the 12th day following the last molinate application, following the review of a written application that demonstrates salinity levels are damaging to the crop.

A. Applicants for such emergency releases must provide the following information:

1. all information indicated on the emergency release request form (Attachment A), including a description of the severity and extent of salinity damage.

2. electrical conductivity (EC) measurements, expressed as deciSiemans per meter (dS/m) or microSiemans per centimeter (μS/cm), from field water in each paddy suspected of having salinity problems. To most effectively demonstrate salinity problems, measurements should be taken wherever salinity problems are evident.

3. the instrument (make and model) used to determine EC measurements. The instrument must have a sensitivity range that accommodates the full range of EC values in intake and paddy water (usually a range of 0-5.0 dS/m or 0-5,000 μS/cm should be sufficient) and should have a resolution of not less than five percent. The instrument must be calibrated according to the manufacturer's instructions. The applicant must specify the method of temperature compensation (i.e., automatic, conversion table).

4. who made the EC measurements.

5. the source of irrigation water (e.g. district supply canal, drainage canal,well, etc.).

B. An emergency release may be granted only if all of the following conditions are satisfied:

1. All required information is provided.

2. Water management requirements for rice pesticides other than molinate are satisfied.

3. EC of paddy water exceeds 2.0 dS/m or 2,000 μS/cm.

4. The County Agricultural Commissioner or his or her staff inspects the site.

C. Water may be released from paddies where EC measurements exceed 2.0 dS/m or 2,000 μS/cm and from paddies downgradient from such paddies within the same field. Water shall only be released in an amount necessary to mitigate the salinity problem.

D. Those issued an emergency release must submit to the county agricultural commissioner a report (Attachment B) indicating the time and duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release.

THIOBENCARB WATER MANAGEMENT REQUIREMENTS - 1995
Revised April 7, 1995

I. For rice fields treated with thiobencarb in the Sacramento Valley (north of the line defined by Roads E10 and 116 in Yolo County and the American River in Sacramento County), except those treated with Abolish 8EC:

A. All water on treated fields must be retained on the treated fields for at least 30 days following application unless:

1. The water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 20 days following the last application of thiobencarb within the system.

a. If the system is under the control of one permittee, water may be discharged from the application site in a manner consistent with product labeling.

b. If the system includes drainage from more than one permittee, water may be discharged from the application site into the system seven days following application.

2. The water is on fields within the bounds of areas that discharge negligible amounts of rice field drainage into perennial streams until fields are drained for harvest. Water from such fields must be held at least 19 days, unless the county agricultural commissioner evaluates such sites. If the commissioner verifies the hydrologic isolation of the fields, the water may be released seven days after application.

THIOBENCARB WATER MANAGEMENT REQUIREMENTS - 1995
Revised April 7, 1995

B. Fields not specified in I.A.1. and I.A.2. may resume discharging field water 31 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields may then resume after seven days.

II. For rice fields treated with thiobencarb in the Southern Area (south of the line defined by Roads E10 and 116 in Yolo County and the American River in Sacramento County), except those treated with Abolish 8EC:

A. All water on treated fields must be retained on the treated fields for at least 19 days following application unless:

1. The water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 20 days following the last application of thiobencarb within the system.

a. If the system is under the control of one permittee, water may be discharged from the application site in a manner consistent with product labeling.

b. If the system includes drainage from more than one permittee, water may be discharged from the application site into the system seven days following application.

THIOBENCARB WATER MANAGEMENT REQUIREMENTS - 1995
Revised April 7, 1995

2. The water is on fields within the bounds of areas that discharge negligible amounts of rice field drainage into perennial streams until fields are drained for harvest. Water from such fields may be released seven days after application if the county agricultural commissioner evaluates such sites and verifies the hydrologic isolation of the fields.

B. Fields not specified in II.A.1. and II.A.2. may resume discharging field water 20 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields may then resume after seven days.

III. For all areas, fields treated with Abolish 8EC:

A. All water on treated fields must be retained on the treated fields for at least 19 days following application unless:

1. The water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 20 days following the last application within the system.

a. If the system is under the control of one permittee, water may be discharged from the application site in a manner consistent with product labeling.

b. If the system includes drainage from more than one permittee, water may be discharged from the application site into the system seven days following application.

THIOBENCARB WATER MANAGEMENT REQUIREMENTS - 1995
Revised April 7, 1995

2. The water is on fields within the bounds of areas that discharge negligible amounts of rice field drainage into perennial streams until fields are drained for harvest. Water from such fields may be released seven days after application if the county agricultural commissioner evaluates such sites and verifies the hydrologic isolation of the fields.

B. Fields not specified in III.A. may resume discharging field water 20 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields may then resume after seven days.

SUPPLEMENT TO WATER MANAGEMENT REQUIREMENTS FOR THIOBENCARB - 1998

IV. The county agricultural commissioner may authorize the emergency release of field water on the 20th day following the last thiobencarb application, following the review of a written application that demonstrates salinity levels are damaging to the crop.

A. Applicants for such emergency releases must provide the following information:

1. all information indicated on the emergency release request form (Attachment A), including a description of the severity and extent of salinity damage.

2. electrical conductivity (EC) measurements, expressed as deciSiemans per meter (dS/m) or microSiemans per centimeter (μS/cm), from field water in each paddy suspected of having salinity problems. To most effectively demonstrate salinity problems, measurements should be taken wherever salinity problems are evident.

3. the instrument (make and model) used to determine EC measurements. The instrument must have a sensitivity range that accommodates the full range of EC values in intake and paddy water (usually a range of 0-5.0 dS/m or 0-5,000 μS/cm should be sufficient) and should have a resolution of not less than five percent. The instrument must be calibrated according to the manufacturer's instructions. The applicant must specify the method of temperature compensation (i.e., automatic, conversion table).

4. who made the EC measurements.

5. the source of irrigation water (e.g. district supply canal, drainage canal, well, etc.).

B. An emergency release may be granted only if all of the following conditions are satisfied:

1. All required information is provided.

2. Water management requirements for rice pesticides other than thiobencarb are satisfied.

3. EC of paddy water exceeds 2.0 dS/m or 2,000 μS/cm

4. The County Agricultural Commissioner or his or her staff inspects the site.

C. Water may be released from paddies where EC measurements exceed 2.0 dS/m or 2,000 μS/cm and from paddies downgradient from such paddies within the same field. Water shall only be released in an amount necessary to mitigate the salinity problem.

D. Those issued an emergency release must submit to the county agricultural commissioner a report (Attachment B) indicating the time and duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release.

APPENDIX A

ATTACHMENT 3

CARBOFURAN WATER MANAGEMENT REQUIREMENTS - 1995

I. Pre-flood applications of carbofuran to rice fields must be incorporated into the soil.

II. Water shall not be discharged from sites treated with carbofuran for at least 28 days following initial flooding (pre-flood application) or following application (post-plant application) unless the treated water is contained within tailwater recovery systems, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 29 days following the last application of carbofuran within the system.

A. If the system was under the control of one permittee, treated water may be discharged from the application site in a manner consistent with product labeling.

B. If the system includes drainage from more than one permittee, treated water may be discharged from the application site into the system nine days following application.

APPENDIX A

ATTACHMENT 4

METHYL PARATHION WATER MANAGEMENT REQUIREMENTS - 1995

Water shall not be discharged from sites treated with methyl parathion for at least 24 days following application unless the treated water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 25 days following the last application of methyl parathion within the system. Treated water may be discharged from the application site in a manner consistent with product labeling.

APPENDIX A

ATTACHMENT 5

MALATHION WATER MANAGEMENT REQUIREMENTS - 1995

The Central Valley Regional Water Quality Control Board has approved a water management practice following malathion use in rice that will help meet 1995 water quality performance goals for malathion in surface water. Malathion is currently not a restricted material and not subject to use requirements or permit conditions. However, it is important that growers comply with this practice.

Water from fields treated with malathion should be held on the site of application for at least four days following application.

Water quality monitoring will be conducted in 1995 to determine the adequacy of this practice in managing malathion discharges. If malathion levels do not adequately meet the performance goal, a more formal regulatory program may be implemented in future years.

APPENDIX A

ATTACHMENT 6

EMERGENCY RELEASE

Grower:_____ Permit No.:_____

Address:_____ Zip:_____

Field location:_____ Site No.:_____
(Attach detailed map)

Chemical applied:_____
Rate of application:_____
Date of application:_____
Average water depth_____
at time of application:_____

Chemical applied:_____
Rate of application:_____
Date of application:_____
Average water depth:_____
at time of application:_____

Chemical applied:_____
Rate of application:_____
Date of application:_____
Average water depth_____
at time of application:_____

Chemical applied:_____
Rate of application:_____
Date of application:_____
Average water depth_____
at time of application:_____

Starting date of emergency release:_____

Acres in field:_____ Laser leveled? Yes_____ No_____

Type of irrigation system: Flow through_____ Recycle_____ Static_____ Other_____

Date flooding began:_____ No. of days it takes to fill field:_____

Describe problem that led to emergency release: _____
_____
_____
_____

Steps that can be taken to prevent emergency releases from this field in future years:
_____
_____
_____

Recommendation (attached) by:_____

Applications by:_____

Grower's signature: _____ Date: _____

Approved by: _____
Agricultural Biologist

EMERGENCY RELEASE

Grower: _____ Permit No.: _____

Address: _____ Zip: _____

Field location: _____ Site No.: _____

Beginning date of release: _____ Ending date: _____

The grower must determine the amount of water discharged during the emergency release period. To do this, measure the width of each weir opened to allow the discharge. Then, on a daily basis, measure the height of water flowing over each weir. Record all information in the table below.

Weir 1		Weir 2		Weir 3	
Width:		Width:		Width:	
Date	Height of water	Date	Height of water	Date	Height of water

APPENDIX A

ATTACHMENT 8

DRIFT CONTROL REQUIREMENTS FOR GRANULAR MOLINATE, THIOBENCARB, AND CARBOFURAN APPLIED TO RICE - 1995

Granular molinate, thiobencarb, or carbofuran drifting into waterways (i.e., drainage canals) or onto levees or roadways adjacent to waterways will be considered environmental contamination. Applicators found in violation will be liable for a civil penalty.

Granular molinate, thiobencarb, or carbofuran shall not be applied by air if wind speed is greater than seven miles per hour to avoid drift into drainage canals and ditches.

APPENDIX A

ATTACHMENT 9

DRIFT CONTROL REQUIREMENTS FOR LIQUID THIOBENCARB APPLIED TO RICE - 1995

I. Aerial Applications

A. No aerial applications of liquid formulations of thiobencarb to rice shall be:

1. Discharged more than ten feet above the crop or target. Discharge shall be shut off whenever it is necessary to raise the equipment over obstacles such as trees or poles.

2. Applied when wind velocity is more than seven miles per hour.

3. Applied by aircraft except as follows:

a. The flow of liquid to aircraft nozzles shall be controlled by a positive shutoff system as follows:

i. Each individual nozzle shall be equipped with a check valve and the flow controlled by suckback device or a boom pressure release device; or

ii. Each individual nozzle shall be equipped with a positive action valve.

b. Aircraft nozzles shall not be equipped with any device or mechanism which would cause a sheet, cone, fan, or similar type dispersion of the discharged material except as otherwise provided.

c. Aircraft boom pressure shall not exceed 40 pounds per square inch.

d. Aircraft nozzles shall be equipped with orifices directed backward parallel to the horizontal axis of the aircraft in flight.

DRIFT CONTROL REQUIREMENTS FOR LIQUID THIOBENCARB APPLIED TO RICE - 1995

e. Fixed wing aircraft and helicopters operating in excess of 60 miles per hour shall be equipped with jet nozzles having an orifice of not less than 1/16 inch diameter.

f. Working boom length on fixed wing aircraft shall not exceed 3/4 of the wing span; the working boom length of helicopters shall not exceed 6/7 of the total rotor length or 3/4 of the total rotor where the rotor length exceeds 40 feet.

g. Helicopters operating at 60 miles per hour or less shall be equipped with:

i. Nozzles having an orifice not less than 1/16 inch in diameter. A number 46 (or equivalent) or larger whirlplate may be used; or

ii. Fan nozzles with a fan angle number not larger than 80 degrees and a flow rate not less than one gallon per minute at 40 pounds per square inch pressure (or equivalent).

B. Special precautions should be taken to avoid off-site deposition of liquid formulations of pesticides when applications are made adjacent to agricultural drains.

II. Ground Applications - Ground applications of liquid thiobencarb must be applied as per label instructions.

APPENDIX A

ATTACHMENT 10

DRIFT CONTROL RECOMMENDATIONS FOR MALATHION APPLIED TO RICE - 1995

I. No aerial applications of liquid formulations of malathion to rice shall be:

A. Discharged more than ten feet above the crop or target. Discharge shall be shut off whenever it is necessary to raise the equipment over obstacles such as trees or poles.

B. Applied when wind velocity is more than seven miles per hour.

C. Applied by aircraft except as follows:

1. The flow of liquid to aircraft nozzles shall be controlled by a positive shutoff system as follows:

   a. Each individual nozzle shall be equipped with a check valve and the flow controlled by suckback device or a boom pressure release device; or

   b. Each individual nozzle shall be equipped with a positive action valve.

2. Aircraft nozzles shall not be equipped with any device or mechanism which would cause a sheet, cone, fan, or similar type dispersion of the discharged material except as otherwise provided.

3. Aircraft boom pressure shall not exceed 40 pounds per square inch.

4. Aircraft nozzles shall be equipped with orifices directed backward parallel to the horizontal axis of the aircraft in flight.

DRIFT CONTROL RECOMMENDATIONS FOR MALATHION APPLIED TO RICE - 1995

5. Fixed wing aircraft and helicopters operating in excess of 60 miles per hour shall be equipped with jet nozzles having an orifice of not less than 1/16 inch diameter.

6. Working boom length on fixed wing aircraft shall not exceed 3/4 of the wing span; the working boom length of helicopters shall not exceed 6/7 of the total rotor length or 3/4 or the total rotor where the rotor length exceeds 40 feet.

7. Helicopters operating at 60 miles per hour or less shall be equipped with:

   a. Nozzles having an orifice not less than 1/16 inch in diameter. A number 46 (or equivalent) or larger whirlplate may be used; or

   b. Fan nozzles with a fan angle number not larger than 80 degrees and a flow rate not less than one gallon per minute at 40 pounds per square inch pressure (or equivalent).

II. Special precautions should be taken to avoid off-site deposition of liquid formulations of pesticides when applications are made adjacent to agricultural drains.

APPENDIX A

ATTACHMENT 11

DRIFT CONTROL REQUIREMENTS FOR METHYL PARATHION APPLIED TO RICE - 1995

I. Aerial Applications

A. No aerial applications of liquid formulations of methyl parathion to rice shall be:

1. Discharged more than ten feet above the crop or target. Discharge shall be shut off whenever it is necessary to raise the equipment over obstacles such as trees or poles.

2. Applied within a 300 foot downwind buffer zone from any agricultural drain.

3. Applied when wind velocity is more than five miles per hour.

4. Applied without an effective drift control agent.

5. Applied by aircraft except as follows:

a. The flow of liquid to aircraft nozzles shall be controlled by a positive shutoff system as follows:

i. Each individual nozzle shall be equipped with a check valve and the flow controlled by suckback device or a boom pressure release device; or

ii. Each individual nozzle shall be equipped with a positive action valve.

b. Aircraft nozzles shall not be equipped with any device or mechanism which would cause a sheet, cone, fan, or similar type dispersion of the discharged material except as otherwise provided.

DRIFT CONTROL REQUIREMENTS FOR METHYL PARATHION APPLIED TO RICE-1995

c. Aircraft boom pressure shall not exceed 40 pounds per square inch.

d. Aircraft nozzles shall be equipped with orifices directed backward parallel to the horizontal axis of the aircraft in flight.

e. Fixed wing aircraft and helicopters operating in excess of 60 miles per hour shall be equipped with jet nozzles having an orifice of not less than 1/8 inch diameter.

f. Working boom length on fixed wing aircraft shall not exceed 3/4 of the wing span; the working boom length of helicopters shall not exceed 6/7 of the total rotor length or 3/4 of the total rotor where the rotor length exceeds 40 feet.

g. Helicopters operating at 60 miles per hour or less shall be equipped with:

i. Nozzles having an orifice not less than 1/8 inch in diameter. A number 46 (or equivalent) or larger whirlplate may be used; or

ii. Fan nozzles with a fan angle number not larger than 80 degrees and a flow rate not less than one gallon per minute at 40 pounds per square inch pressure (or equivalent).

B. Special precautions should be taken to avoid off-site deposition of liquid formulations of pesticides when applications are made adjacent to agricultural drains.

APPENDIX A

ATTACHMENT 11

DRIFT CONTROL REQUIREMENTS FOR METHYL PARATHION APPLIED TO RICE-1995

II. Ground Applications - Ground equipment other than handguns shall be equipped with

A. Nozzles having an orifice not less than 1/16 inch in diameter or equivalent, and operated at a boom pressure not to exceed 30 pounds per square inch; or

B. Low pressure fan nozzles with a fan angle number not larger than 80 degrees and fan nozzle orifice not smaller than 0.2 gallon per minute flow rate or equivalent, and operated at a boom pressure not to exceed 15 pounds per square inch.

Appendix B

State of California

APPENDIX B

Memorandum

To : County Agricultural Commissioners from Rice Producing Counties

Date: March 24, 19

Place: Sacramento

Phone: (916) 324-426

From : Department of Pesticide Regulation · John Sanders, Branch Chief
Environmental Monitoring and Pest Managem

Subject : Rice Pesticides Program
Follow-up on Seepage Water Management Voluntary Guidelines

The 1995 rice pesticide permit conditions were recently mailed to office with a cover letter dated March 20 and signed by Jim Wells. That letter referred to forthcoming information regarding voluntar guidelines for seepage water management. My staff, with input fror representatives of the rice industry, county agricultural commissioners, United States Department of Agriculture (USDA), and others, developed the attached seepage water management voluntary guidelines which are meant to be reproduced and handed out when issuing permits for the use of rice pesticides. Your assistance in this matter is greatly appreciated.

Additionally, for growers interested in technical specifications on berm construction, a second handout is provided from the USDA Natura Resources Conservation Service entitled "Closed Rice Water Managemer Systems". This handout was developed for the California Rice Water Quality Demonstration Project to describe specifications for various closed systems, but it includes useful technical specifications for sound berm construction as well. We are supplying you with camera-ready copies of this handout so your office can make good reproductions for interested growers.

Should you have any questions, please contact Nan Gorder at (916) 324-4265 or Marshall Lee at (916) 324-4269.

for

John S. Sanders
Branch Chief
(916) 324-4100

SURNAME

SEEPAGE WATER MANAGEMENT: VOLUNTARY GUIDELINES

What is seepage?

Movement of water through a rice field levee to an adjacent area.

Why is seepage water a problem?

Seepage water can contain high concentrations of molinate, carbofuran, and potentially other chemicals as well, during the holding periods. If this water is allowed to reach agricultural drains, it could impact efforts to meet performance goals and result in toxicity to aquatic organisms.

What evidence is there to indicate seepage water contains pesticides?

Molinate was detected in rice seepage water from six out of six sites with concentrations ranging from 44 to 1300 parts per billion (ppb). Carbofuran was detected in rice seepage water collected from three out of three sites with concentrations ranging from 0.4 to 11 ppb. (Water samples were simultaneously collected from adjacent fields and carbofuran concentrations were as high or higher than in seepage water.) The current performance goal in the agricultural drains for molinate is 10 ppb and for carbofuran is 0.4 ppb.

Two demonstration sites were set up with tarps covering the seepage area to prevent molinate deposition from drift. Concentrations of molinate from these sites ranged from 37 to over 700 ppb (corrected for background concentrations).

Why are growers being asked to make voluntary efforts to control seepage water?

The Central Valley Regional Water Quality Control Board and the Department of Pesticide Regulation believe it is important that the rice growing community become aware of the potential impact of contaminated seepage water reaching the agricultural drains and have the opportunity to voluntarily address the problem. *If these voluntary efforts are sufficient to minimize the impact of seepage water on the agricultural drains, no future regulatory action will be needed.*

VOLUNTARY GUIDELINES

1. Prevent seepage water from leaving the rice field during the holding period through loosely constructed levees by
   - running a tractor tire or track on top of existing border levees, and
   - ensuring that newly constructed levees are built with mineral soils (not organic matter and plant residues), adequate width, and solid cores (when building levees, run tractor tire or track on top to firm up core of check). Double berming is another method of containing seepage.
   - using technical recommendations for levee construction offered by the USDA in a handout entitled "Closed Rice Water Management Systems," available from your county agricultural commissioner.

2. Prevent water in seepage areas from reaching the drains during the holding period by
   - directing or pumping seepage water to fallow land, and
   - blocking the exit of water from the seepage ditch to agricultural drains.

3. Communicate with applicators to establish the common goal of keeping drift away from seepage ditches, drains, border levees, and roads. Dry material on roads and dry ground is considered to be environmental contamination with the applicator liable for a civil penalty. This material remains viable and any runoff from these areas during wet weather should be held on your property to avoid contaminating agricultural drains.

4. Prevent leakage from levees by inspecting and repairing rodent damage during the holding periods.

basin. The minimum sump storage requirement shall be the volume of runoff generated by the normal flow off the bottom weir for 12 hours or 20 percent of the irrigation inflow for 12 hours, whichever is greater. The recirculating pump shall have a capacity equal to or greater than the mean inflow rate.

Static Water Systems - Systems that independently supply water to each basin within the field. Flap-gated inlet pipes or other devices keep pesticide treated water on the field and out of public water ways. It operates on the principle of a variable demand supply, only the amount of water needed to replace evapotranspiration and other losses is placed in each basin either from:

(i) a source ditch with flashboard weirs in the ditch and flap-gated inlet pipes into each basin, or

(ii) a pipeline or ditch with adjustable inlet float control valves into each basin.

Irrigation water in the supply ditch shall be protected from contamination by means of flap gates and other such anti-back flow devices as are appropriate. The flap gates help to keep pesticide treated field water out of the supply ditch and out of public waterways. The capacity of the static system shall be adequate to flood up the basin to the desired depth in 3 days or less.

SYSTEM OPERATION

The owner or producer is responsible for the preparation and implementation of an operation and maintenance plan. The plan will include sufficient instructions to insure that the system achieves its intended purpose.

Revised 11/94

587 - Water Control Structures
430 - Irrigation Pipelines
388 - Field Ditches
356 - Dikes
464 - Land Leveling
206 - Rice Water Management Systems

Contact your local USDA Natural Resources Conservation Service:

Auburn	(916) 823-6830
Colusa	(916) 458-2931
Willows	(916) 934-4601
Woodland	(916) 662-2037
Yuba City	(916) 674-1461

Contact your local USDA Consolidated Farm Services Agency for cost-sharing information.

Contact your local U.C. Cooperative Extension Office or ANR Publications at (510) 642-2431 for the following publications:

Rice Irrigation Systems for Irrigation Water Management. Cooperative Extension, University of California, 1994 Pub #21490

Rice Production in California. Cooperative Extension, University of California, 1992 Pub #21498

Integrated Pest Management for Rice. Second Edition, University of California, Statewide IPM project, 1993 Pub # 3280

Engineering Standards and Specifications for

Closed Rice Water Management Systems

California Rice Water Quality Demonstration Project

U.S. Natural Resources Conservation Service

in cooperation with
University of California, Cooperative Extension
and the
Consolidated Farm Services Agency

DEFINITION

A closed rice water mangement system is defined as a planned system of level basins or checks in which all neressary structures have been installed for the efficient distribution of irrigation water and containment of rice pesticides.

The standards and specifications described herein refer to the following systems;

Recirculating (tail water recovery) - A flow-through system where water is applied to the upper basin and allowed to flow over weirs through a series of lower basins to a collection point where it is pumped back to an upper level basin or supply ditch for reuse.

Static (Pearson) - A system where water is independently delivered to each basin within a field via a ditch or pipeline usually along one side of the field. Water enters each basin through flap-gated inlet pipes or other antibackflow devices which keep pesticide treated field water within the basin and out of public waterways.

Selection of a specific irrigation water management system is dependent on soil type, slope, aspect (wind direction), and water delivery. No less important is the ability to hold irrigation water for the prescribed period of time necessary for the effective dissipation of pesticides. The following standards and specifications are intended to give the producer a working knowledge of system design and function. Natural Resources Conservation Service should be consulted prior to actual design work or implementation.

All closed rice water management systems described herein are designed to contain pesticide treated water within the system for the required holding period. All drainage outlet gates and structures that can discharge water are designed such that they can be sealed during the holding period.

STANDARDS

Land Grading

- Rice only - 0.02 to 0.05 feet per 100
- Rice-row crop rotation 0.05 to 0.2 feet per 100
- Basin elevation difference not > 0.3 feet

Basin size

- Determined by maximum difference in water depth and wind.
- Where wind is a factor levees shall be closely spaced and if possible at 90 degrees to the prevailing winds. Maximum basin size is recommended at 20 acres.

Drainage

- Provisions to drain must be developed.
- Basins to be drained in a single direction no longer than 660 feet.
- Supply ditch or pipeline can serve as the drainage outlet when water control structures can be held open.
- Drainage structures shall be capable of draining basin in less than 3 days.

Dikes (Levees)

- Mineral soil only (plant residues and organic matter create seepage problems).
- Basin levees where the maximum vertical interval between checks is < 0.5 feet - minimum top width = 2 feet.
- Minimum settled height is the depth of ponding plus 0.5 feet with side slopes of 1.5 horizontal to 1 vertical.

Field perimeter dikes (levees)

- Minimum top width of 13 feet, where access is needed, 4 feet without access. Minimum height = ponding depth + 1.24 feet.
- Minimum side slope of 2 horizontal to 1 vertical constructed,
- Where dikes constitute boundaries of downslope fields, and
- Where vertical intervals between basins exceed 4 feet from top to bottom basin.

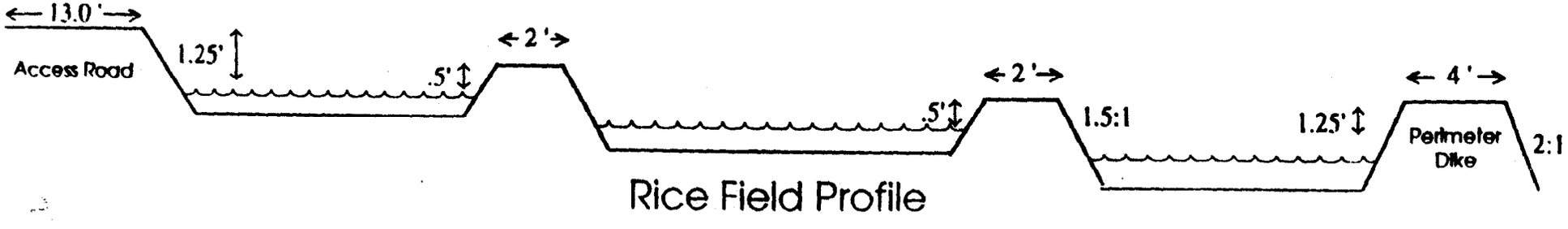
Water Control Structures

Flash board weirs, float control valves, other.
Capacity adequate to meet the following:

- Irrigation flow - providing a continuous flooding depth of 4 to 6 inches during stand establishment.
- Field Drainage - to drain the basin within 10 days.
- Storm runoff - capable of draining the runoff produced by a 10-year 24 hour storm within 2 to 3 days (1.7").

SYSTEM DESCRIPTION WATER SUPPLY

Recirculating (tail water recovery) Systems are used with flow-through basins connected in series, where the water depth is controlled by rice boxes or other weirs placed in the levees. A storage sump or ditch is used to provide a buffer for tailwater due to variations in evapotranspira-



Rice Field Profile

Appendix C

Rice Pesticides Program Emergency Releases 1998

APPENDIX C

County	Grower	Chemical	Release Date	Acres Released	Reason
Butte	John Walton/Ethan Walton	Bolero, Londax	29-May	75	Rain/Wind
Butte	S & S Family Farms	Bolero, Londaxl	29-May	117.3	Rain/Wind
Butte	Walter Robinson	Furadan	29-May	147	Rain/Wind
Butte	M & K Frams	Furadan	29-May	14	Rain/Wind
Butte	Patone Family Farms	Furadan	30-May	128	Rain/Wind
Butte	G & L Farms	Furadan	30-May	59.8	Rain/Wind
Butte	Russell Armstrong	Furadan	30-May	117.3	Rain/Wind
Butte	Robert Heryford	Furadan	30-May	254.4	Rain/Wind
Butte	Rick Heryford	Furadan	30-May	47.4	Rain/Wind
Butte	Rick Heryford	Furadan	30-May	119	Rain/Wind
Butte	Jerry Jenkins	Furadan	2-Jun	224	Rain/Wind
Butte	Tom & Sally Donati	Furadan	2-Jun	151.1	Rain/Wind
Butte	David & Marcie Chinchin	Ordram	2-Jun	13	Rain/Wind
Butte	Sue & Sam Gridley	Ordram	6-Jun	30	Rain/Wind
Butte	Mike Millar	Ordram, Bolero, Furadan	16-Jun	192	Rain/Wind
Butte	C. Ventress Farming	Ordram, Furadan	29-May	92.4	Rain/Wind
Butte	DSL Farms	Ordram, Furadan	29-May	62	Rain/Wind
Butte	Ray Robinson	Ordram, Furadan	30-May	146	Rain/Wind
Butte	Huges Farms	Ordram, Furadan	1-Jun	50	Rain/Wind
Butte	Dale Jones	Ordram, Furadan	1-Jun	100	Rain/Wind
Butte	Kurt & Debbie Boeger	Ordram, Furadan	10-Jun	94.5	Rain/Wind
Butte	CD Farms	Ordram, Furadan, Londax	31-May	115	Rain/Wind
Butte	Storm Bros.	Ordram, Furadan, Londax	31-May	70	Rain/Wind
Colusa	Jim Erdman (Ralph Dolbow)	Abolish	1-Jun	75	Rain/Wind
Colusa	James Webster	Abolish	2-Jun	225	Rain/Wind
Colusa	Griffith & Parker	Abolish	3-Jun	-	Rain/Wind
Colusa	Paul & Ron Kemp	Abolish	10-Jun	71	Rain/Wind
Colusa	Ash Brothers	Abolish, Bolero, Ordram, Furadan	10-Jun	94.5	Rain/Wind
Colusa	Keller & Keller Partners	Bolero	29-May	152.8	None given
Colusa	Brendez Farms Inc.	Bolero	1-Jun	115	Rain/Wind
Colusa	Craig & Debra Cahoon	Bolero	1-Jun	-	Rain/Wind
Colusa	Daniel Pogue	Bolero	1-Jun		Rain/Wind
Colusa	Louis Kaelin	Bolero	2-Jun	112	Rain/Wind
Colusa	Louis J. Nissen	Bolero	3-Jun	192.3	Rain/Wind
Colusa	Scott & Starr West	Bolero	3-Jun	241	Rain/Wind
Colusa	Ottenwalter Farms	Bolero	4-Jun	131	Rain/Wind
Colusa	Schard Ranch/"Vans"	Bolero	4-Jun	20	Rain/Wind
Colusa	Victoria Farms	Bolero	7-Jun	150.8	Pest Problems
Colusa	Dawson Fusaro	Bolero	16-Jun	178	Rain/Wind
Colusa	David Lacroix	Bolero	18-Jun	157	Rain/Wind
Colusa	Russell Fusaro	Bolero	1-Jul	112	Salt Intrusion

Rice Pesticides Program Emergency Releases 1998

APPENDIX C

County	Grower	Chemical	Release Date	Acres Released	Reason
Colusa	Riley Haskell	Furadan	28-May	247	Rain/Wind
Colusa	Babar & Property Opperators	Furadan	1-Jun	-	Rain/Wind
Colusa	Lydia Ferrerea	Ordram	28-May	76	Rain/Wind
Colusa	Manuel Massa	Ordram	28-May	222	Rain/Wind
Colusa	Gordon Ranch	Ordram	29-May	-	Rain/Wind
Colusa	Gene Hansen	Ordram	1-Jun	16.5	Rain/Wind
Colusa	Riverside Farming	Ordram	1-Jun	99.6	Rain/Wind
Colusa	Poundstone Brothers	Ordram	2-Jun	110	Rain/Wind
Colusa	Matt High	Ordram	3-Jun	33	Rain/Wind
Colusa	Barry Corbin	Ordram	5-Jun	139	Rain/Wind
Colusa	Nancy Pfyle	Ordram	19-Jun	68	Sick Rice
Colusa	Manuel Barrett	Ordram	24-Jun	165	Too Much H20
Colusa	Doug Weston	Ordram	2-Jul	137	Salt Intrusion
Colusa	Eugene & Gary Cain	Ordram, Bolero	29-May	318	Rain/Wind
Colusa	Mike & Tom Geyer	Ordram, Bolero	29-May	304.7	Too Much H20
Colusa	Rick Perez	Ordram, Bolero	1-Jun	134	Rain/Wind
Colusa	Jon Leonard	Ordram, Bolero	2-Jun	171	Rain/Wind
Colusa	Canal Farms	Ordram, Bolero	11-Jun	155	Rain/Wind
Colusa	Russel Pearson	Ordram, Bolero, $CuSO_4$	1-Jun	51.5	Rain/Wind
Colusa	Bray Farms	Ordram, CuSO4	22-Jun	140	Pest Problems
Colusa	Beauchamp	Ordram, Furadan	11-Jun	76.4	Rain/Wind
Colusa	Eugene Massa, Sr.	Ordram, Londax	29-May	19.1	Rain/Wind
Colusa	Richard Pence	Ordram, Londax	1-Jun	53.2	Rain/Wind
Colusa	Eugene Massa, Sr.	Ordram, Londax	12-Jun	69	Rain/Wind
Colusa	Eugene Massa, Sr.	Ordram, Londax, $CuSO_4$	2-Jun	69.4	Rain/Wind
Colusa	Durst Bros.	Ordram,Bolero, Furadan	2-Jun	152	Rain/Wind
Glenn	T.K. Enterprises Inc.	Abolish	29-May	153.4	Rain/Wind
Glenn	Maben Farms	Abolish, Furadan	30-May	157.7	Rain/Wind
Glenn	Don & Joe Furtado	Bolero	9-May	34	Rain/Wind
Glenn	Jerry & Carole Southamm	Bolero	29-May	124	Rain/Wind
Glenn	Paul Loewen	Bolero	29-May	24.5	Rain/Wind
Glenn	John Alves	Bolero	30-May	75	Rain/Wind
Glenn	David Alves	Bolero	30-May	73	Rain/Wind
Glenn	Southam Joint Venture	Bolero	30-May	535	Rain/Wind
Glenn	Bill Giesbreght	Bolero	30-May	32	Rain/Wind
Glenn	Brandon Geisbrecht	Bolero	30-May	36	Too Much H20
Glenn	Elefante & Clark	Bolero	2-Jun	80	Rain/Wind
Glenn	Pat & Blanch Nord	Bolero	9-Jun	114	Rain/Wind
Glenn	Knight Farms	Bolero, Furadan	29-May	210	Rain/Wind
Glenn	Baker Creek Farms	Furadan	26-May	103	Rain/Wind
Glenn	Baker Creek Farms	Furadan	28-May	90	Rain/Wind

Rice Pesticides Program Emergency Releases 1998

APPENDIX C

County	Grower	Chemical	Release Date	Acres Released	Reason
Glenn	Baker Creek Farms	Furadan	28-May	74	Rain/Wind
Glenn	Suhail & Masood Kahn	Furadan	29-May	55	Rain/Wind
Glenn	Chuck D. Newton	Furadan	1-Jun	150	Rain/Wind
Glenn	Heman Tompkins	Ordram	28-May	40	Rain/Wind
Glenn	Greg Hansen	Ordram	29-May	9.1	Rain/Wind
Glenn	Hansen Farms	Ordram	29-May	56	Rain/Wind
Glenn	John & Peggie Amaro	Ordram	29-May	50	Rain/Wind
Glenn	George & Lori Warlitzer	Ordram	29-May	219	Rain/Wind
Glenn	Mike Landberg	Ordram	29-May	93	Rain/Wind
Glenn	Lanabee Farms	Ordram	29-May	240	Rain/Wind
Glenn	Larry Hansen	Ordram	29-May	75	Rain/Wind
Glenn	Larry Hansen	Ordram	29-May	33	Rain/Wind
Glenn	Larry Hansen	Ordram	29-May	39	Rain/Wind
Glenn	Hansen Farms	Ordram	29-May	142	Rain/Wind
Glenn	Carriere Bros/Carriere & Sons	Ordram	29-May	122.5	Rain/Wind
Glenn	Ron & Cathy Withrow	Ordram	30-May	33	Rain/Wind
Glenn	George Corbin	Ordram	30-May	106	Rain/Wind
Glenn	Leslie Amoth	Ordram	31-May	29	Rain/Wind
Glenn	Larry Hansen	Ordram	31-May	83	Rain/Wind
Glenn	McCracken/James	Ordram	1-Jun	86	Rain/Wind
Glenn	Mike Garcia	Ordram	2-Jun	65	Rain/Wind
Glenn	Mike Garcia	Ordram	2-Jun	34	Rain/Wind
Glenn	R and D Farms	Ordram	2-Jun	124	Rain/Wind
Glenn	A & M Farms	Ordram	3-Jun	102	Rain/Wind
Glenn	A & M Farms	Ordram	3-Jun	100	Rain/Wind
Glenn	Richard Taresl	Ordram	3-Jun	45	Rain/Wind
Glenn	R and D Farms	Ordram	5-Jun	162	Rain/Wind
Glenn	R and D Farms	Ordram	5-Jun	159	Rain/Wind
Glenn	Hansen Farms	Ordram	9-Jun	10	Rain/Wind
Glenn	Couto Brothers	Ordram	9-Jun	16	Rain/Wind
Glenn	Bashiran M. Hussain Farms	Ordram	11-Jun	170.8	Rain/Wind
Glenn	Pinheiro & Deniz	Ordram	12-Jun	35	Rain/Wind
Glenn	Bill Cirigliano	Ordram	12-Jun	70	Rain/Wind
Glenn	Don Geishnecht	Ordram	15-Jun	35.5	Broken Levee
Glenn	Robert Jones	Ordram	16-Jun	40	Rain/Wind
Glenn	Leonard Kaiser	Ordram, Bolero	31-May	47	Rain/Wind
Glenn	M & D Clark	Ordram, Bolero, Furadan	30-May	170	Rain/Wind
Glenn	Knight Farms	Ordram, Furadan	28-May	120	Rain/Wind
Glenn	Renaud Ranch	Ordram, Furadan	28-May	75	Rain/Wind
Glenn	Knight Farms	Ordram, Furadan	29-May	214	Rain/Wind
Glenn	Priority Farms	Ordram, Furadan	30-May	96.8	Rain/Wind

Rice Pesticides Program Emergency Releases 1998

APPENDIX C

County	Grower	Chemical	Release Date	Acres Released	Reason
Glenn	John Montz	Ordram, Furadan	30-May	109	Rain/Wind
Glenn	C.E. Newton/Chuck Newton	Ordram, Furadan	1-Jun	197	Rain/Wind
Glenn	Alice Montz Farms	Ordram, Furadan	1-Jun	62	Rain/Wind
Glenn	Taylor Brothers	Ordram, Furadan	2-Jun	30	Rain/Wind
Glenn	Snow Goose Farms	Ordram, Furadan	2-Jun	120	Rain/Wind
Glenn	Snow Goose Farms	Ordram, Furadan	2-Jun	214	Rain/Wind
Glenn	Renaud Ranch	Ordram, Furadan	3-Jun	300	Rain/Wind
Glenn	John Montz	Ordram, Furadan	3-Jun	185	Rain/Wind
Glenn	Snow Goose Farms	Ordram, Furadan	5-Jun	154	Rain/Wind
Glenn	Taylor Brothers	Ordram, Furadan	5-Jun	147	Rain/Wind
Glenn	Spurlock Ranch	Ordram, Furadan	8-Jun	231	Rain/Wind
Glenn	T.K. Enterprises Inc.	Ordram, Furadan	13-Jun	71.5	Rain/Wind
Glenn	Taylor Brothers	Ordram, Furadan, Londax	1-Jun	23	Rain/Wind
Glenn	Taylor Brothers	Ordram, Furadan, Londax	1-Jun	25	Rain/Wind
Glenn	Taylor Brothers	Ordram, Furadan, Londax	1-Jun	18	Stressed Rice
Glenn	Martinellie Farms	Ordram, Londax	29-May	30	Rain/Wind
Glenn	Shaav Bertapetle ???	Ordram, Londax	15-Jun	55	Rain/Wind
Glenn	Khan Brothers	Ordram, Londax	18-Jun	7	Rain/Wind
Sutter	C&J Capaul	Bolero, Londax	2-Jun	108	Rain/Wind
Sutter	Schbeiner Bros.	Ordram	30-May	75	Rain/Wind
Sutter	Ron Herrington	Ordram	3-Jun	122	Rain/Wind
Sutter	Scott Leathers	Ordram	10-Jun	30	Rain/Wind
Sutter	Dick Akin	Ordram	16-Jun	93	Wind
Sutter	Nicole Van Vleck	Ordram, Bolero, Furadan	30-May	72	Rain/Wind
Sutter	N & M Ranches	Ordram, Bolero, Furadan	1-Jun	157	Rain/Wind
Sutter	M.M. Vogt	Ordram, Bolero, Furadan	1-Jun	138	Rain/Wind
Sutter	Van Dyke Bros.	Ordram, Furadan	29-May	-	Rain/Wind
Sutter	Schmidt Bros.	Ordram, Londax	29-May	25	Rain/Wind
Sutter	Tom Giusti	Ordram, Londax	1-Jun	84	Rain/Wind
Yolo	J.T.K. Kalfsbeck	Abolish	29-May	160	Rain/Wind
Yolo	Garreth Schaad	Bolero	1-Jul	38.5	Growth
Yolo	Saunders Grain	Ordram, Bolero	9-Jun	75	Rain/Wind
Yolo	C. Stehle & Sons	Ordram, Londax	30-May	250	Rain/Wind
Glenn	Denied - David Spence	Bolero			Broken Levee
Glenn	Denied - Mario Rioni - Volpato	Bolero			Broken Levee
Glenn	Denied- Joe Macon	Ordram, Furadan, Londax			Rain/Wind

Appendix D

California Environmental Protection Agency
Department of Pesticide Regulation
Environmental Monitoring and Pest Management
Environmental Hazards Assessment Program
1020 N Street, Room 161
Sacramento, California 95814
February 1998

1998 RICE PESTICIDES PROGRAM MONITORING PROTOCOL - COLUSA BASIN DRAIN STUDY # 173

The 1998 Rice Pesticides Monitoring Program is a cooperative effort between the California Rice Industry Association (CRIA) and the Department of Pesticide Regulation (DPR). The standard operating procedures remain unchanged from that of the 1997 program for the sampling locations; frequency of sampling; and number of samples analyzed for molinate, thiobencarb, carbofuran, methyl parathion and malathion. For the 1998 season, additional samples will be analyzed during June and the first half of July for propanil, triclopyr, and the phenoxy herbicides 2,4-D and MCPA, if needed. These pesticides are not a part of the routine monitoring program, but will be analyzed this season. The sampling schedule, estimated number of samples, sample collection and transportation methods, and chain of custody procedures with respect to the Colusa Basin Drain monitoring site (CBD5) only, are described below.

The monitoring program will begin with background sampling two to three weeks prior to the first applications of carbofuran in the region (usually early to mid-April). These samples will be collected by CRIA consultant personnel. Surface water sampling and water quality measurements will be performed twice weekly, by a CRIA consultant, for a period of twelve weeks following initial field flooding. The anticipated sampling schedule is presented in Table 1. The number of samples for CBD5 only is estimated in Table 2 for the routine Rice Pesticides Monitoring Program, and in Table 3 for additional rice pesticides to be monitored in 1998.

Sampling Methods

All sampling for the 1998 season will be performed by a CRIA consultant. As standard operating procedure, all sampling personnel will wear rubber gloves during sampling and if contamination is suspected, the gloves will be replaced. Every attempt will be made to avoid both disturbing the bottom of the agricultural drain and sampling areas of the drain with no observable flow. All bottles and chain of custody records (COCs) will be provided by DPR, although the bottle labels will be attached and custody records will be

filled out by the consultant.

Samples will be collected using a Kemmerer water sampler (stainless steel and Teflon® model) at a depth equal to one-half the water column. The Kemmerer has a capacity of 1.5 liters, and a composite sample consisting of the appropriate number of sub-samples are to be deposited in a stainless steel container provided by DPR. The volume of water to be collected is determined by the sampling schedule number (See Laboratory Project Plan and Protocol for Study # 173, Appendix 2). The composite sample will then be homogenized and split into 1-liter amber bottles with Geotech water splitter provided by DPR. A COC will accompany each sample bottle. Samples will then be stored on wet or blue ice (4°C). All sampling equipment is to be cleaned immediately after sampling.

Samples to be analyzed for carbofuran and methyl parathion/malathion will be acidified with 3N HCl to a pH between 3.0 and 3.5 for increased sample stability during storage. All samples will be stored on wet or blue ice (4°C) until delivered to the laboratory for analyses. The toxicity samples and backups will be collected as part of the primary volume of water. Backup samples will be collected and held in storage (4°C) until the initial data analyses are complete.

Rinse blanks for each monitoring site will be prepared by pouring 4.5 liters of deionized water over the cleaned sampling equipment and collecting the resultant rinse water. The rinse water is then to be transferred to four 1-liter amber bottles and submitted for analyses with the primary samples. This process will occur in weeks six and nine for a total of two samples per target chemical.

Water temperature, pH, and dissolved oxygen will be measured at each monitoring site during all sampling periods and the data recorded on the water quality sheet provided by DPR (Attachment 1).

Sample Delivery

Samples are to be delivered to DPR's West Sacramento facility after each monitoring event. Toxicity samples will be delivered by the CRIA consultant to CDFG's Aquatic Toxicology Laboratory (ATL) in Elk Grove by the close of business (earlier if possible) on Tuesday of each week.

Table 1. Sampling schedule for the 1998 Rice Pesticides Monitoring Program

DATE	SITE (CBD5)	
	Day 1	Day 2
Background (2 to 3 weeks prior)	I[a] + II[b] + Tox[c] + QC(I)[d]	Not sampled
Week 1	I + Tox	I + QC(I)
2	I + Tox	I + QC(I)
3	I + Tox	I + QC(I)
4	I + Tox	I + QC(I)
5	I + Tox	I + QC(I)
6	I + Tox	I + QC(I)
7	I + II +Tox	I + II + QC(I)
8	I + II	I + II + QC(I)
9	I + II	I + II + QC(I)
10	I + II	I + II + QC(I)
11	II	II
12	II	II

a) Group I: molinate, thiobencarb, carbofuran, methyl parathion and malathion.
b) Group II: propanil + triclopyr + 2,4-D and MCPA (if needed)
c) Tox: Toxicity testing
d) QC(I): Quality Control samples for most Group I pesticides (excluding methyl parathion and malathion)

Table 2. Estimated number of primary and quality assurance samples from CBD5 for the routine 1998 Rice Pesticides Monitoring Program.

DATE	MOLINATE	THIOBENCARB	CARBOFURAN	METHYL PARATHION & MALATHION[a]	TOXICITY
Background	1(1)	1(1)	1(1)	1	1
Week 1	2 (1)[b]	2 (1)	2 (1)	2	1
2	2 (1)	2 (1)	2 (1)	2	1
3	2 (1)	2 (1)	2 (1)	2	1
4	2 (1)	2 (1)	2 (1)	2	1
5	2 (1)	2 (1)	2 (1)	2	1
6	2 (1)	2 (1)	2 (1)	2	1
7	2 (1)	2 (1)	2 (1)	2	1
8	2 (1)	2 (1)	2 (1)	2	0
9	2 (1)	2 (1)	2 (1)	2	0
10	2 (1)	2 (1)	2 (1)	2	0
TOTALS	**21 (11)**	**21 (11)**	**21 (11)**	**21**	**8**

a) Methyl parathion and malathion are analyzed from a single sample.
b) Numbers in parentheses indicate the number of samples taken for quality control.

Table 3. Estimated number of primary samples from CBD5 for the analyses of several additional chemicals during the 1998 season.

DATE	PROPANIL*	TRICLOPYR*	MCPA & 2.4-D*
Background	1	1	1
Week 1	0	0	0
2	0	0	0
3	2	0	0
4	2	0	0
5	2	0	0
6	2	0	0
7	2	2	2
8	2	2	2
9	2	2	2
10	2	2	2
11	0	2	2
12	0	2	2
TOTALS	**15**	**13**	**13**

*) Triclopyr, MCPA, and 2,4-D are analyzed from a single sample.
*) Propanil, Carbofuran (CNX/P) are analyzed from a single sample.

Total Chemical Analyses	(Routine Rice Pesticides Program monitoring: samples for primary analyses)	= 84 samples
	(Additional rice pesticides: samples for primary analyses)	= 27 samples
	(Samples for quality control)**	= 22 samples
Toxicity	(1 sample/wk x 8 wks)	= 8 samples
	Primary Sample Total	**= 97 samples**

**Molinate and Thiobencarb are analyzed from a single sample by the quality control laboratory.

Attachment 1

WATER QUALITY SHEET

STUDY NUMBER 173
1998 RICE PESTICIDES PROGRAM

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
DEPARTMENT OF PESTICIDE REGULATION
ENVIRONMENTAL MONITORING AND PEST MANAGEMENT
ENVIRONMENTAL HAZARDS ASSESSMENT PROGRAM
1020 N STREET, ROOM 161
SACRAMENTO, CALIFORNIA 95814-5624

DATE/TIME: _____ **CREW:** _____

LOCATION: _____

WATER TEMPERATURE (°C): _____ **AIR TEMPERATURE:** _____

DISSOLVED OXYGEN (mg/L): _____ **CALIBRATED AT:** _____

WATER pH: _____ **(NUMBER OF DROPS OF 3 N HCl** _____ **TO A pH OF** _____
IN THE WEST SACRAMENTO LABORATORY)

COMMENTS:

_____

_____

_____

_____

_____

_____

WATER DEPTH: _____ **VOLUME OF WATER COLLECTED:** _____

Appendix E

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
DEPARTMENT OF PESTICIDE REGULATION
ENVIRONMENTAL MONITORING AND PEST MANAGEMENT BRANCH
1020 N STREET, ROOM 161
SACRAMENTO, CALIFORNIA 95814-5624

A GEOGRAPHICAL INFORMATION SYSTEMS EVALUATION OF THIOBENCARB APPLICATIONS IN GLENN AND COLUSA COUNTIES ON RICE FROM 1994 THROUGH 1996, AND CONCENTRATIONS DETECTED IN THE COLUSA BASIN DRAIN

I. INTRODUCTION

Thiobencarb is the active chemical ingredient of the rice herbicides Bolero® and Abolish®. Bolero® is a granular/flake herbicide which is applied to water post-flood. Abolish® is an emulsifiable concentrate herbicide, applied pre-flood directly to the soil, or post-flood, post-emergence to drained fields. Aerial application methods are primarily used to apply thiobencarb in rice growing areas of the Sacramento Valley to control annual weeds such as watergrass and sprangletop.

The Department of Pesticide Regulation (DPR) is concerned about the off-site movement of thiobencarb, during and following application, into agricultural drains and watersheds adjacent to rice-growing areas, which eventually flow into the Sacramento River. Several circumstances exist that contribute to this off-site movement. Aerial pesticide drift can occur during herbicide applications, and has been observed to coincide with some high concentrations of herbicides in agricultural drains. Unusually high rainfall and windy weather, causing levee flooding in April and May, have resulted in early emergency releases of rice field water before water-holding requirements have been met in recent years. Much of thiobencarb's dissipation depends on water being held on the rice fields following application, to allow adsorption to soil particles where it can degrade. Even when adequate holding requirements are met, residual levels of thiobencarb can exist in rice field tailwater.

DPR implemented a program beginning in 1983 to mitigate off-site movement of

thiobencarb. A key provision of this program is a 30-day water holding requirement in all areas except where the grower's tailwater recovery system is part of a regional water recirculating system or where negligible amounts of field water are discharged into surface waterways. In addition, the Central Valley Regional Water Quality Control Board (CVRWQCB) established a water quality goal of 1.5 parts per billion (ppb) for all waters designated as freshwater habitat, including the Colusa Basin Drain (CBD5), an agricultural drain located near Highway 20 southwest of the town of Colusa, in Colusa County. While still below detectable levels in the Sacramento River, thiobencarb concentrations may be increasing at CBD5. Water samples are collected once or twice weekly during late April through June at CBD5 and analyzed for the presence of rice pesticides.

At CBD5 in 1994, thiobencarb was detected nine times, and the water quality goal, set by the CVRWQCB, was exceeded twice. The peak concentration was 37.4 ppb. In 1995 thiobencarb was detected 17 times and the water quality goal was exceeded four times. The peak concentration was 3.8 ppb. In 1996 thiobencarb was detected 16 times and the water quality goal was reached or exceeded 13 times. The peak detection of thiobencarb at CBD5 was 16.2 ppb.

Thiobencarb use increased approximately 47 percent in 1995 compared to 1994, and in 1996 use was up 29 percent over 1995. Total acreages treated in Colusa County increased from 23,097 acres in 1994 to 66,596 acres in 1996. In Glenn County total acres treated increased from 7,654 in 1994 to 12,211 in 1996. Abolish® use has increased because it works well with the "pinpoint flood" method of water management. Rice fields treated in this manner are flooded, then drained or allowed to dry soon after seeding to promote root growth in the rice seedling. Abolish® is then aerially applied and the field is reflooded. In addition to increased use, weed resistance problems began to occur with Londax®, another rice herbicide, used to control sedges and broadleaf weeds. Thiobencarb is now used in combination with other herbicides to control the same weeds that were at one time controlled by Londax® alone.

II. OBJECTIVE

To better quantify the relationship between thiobencarb detections at CBD5 and its application on rice fields, staff at DPR will use a geographic information systems (GIS) approach to spatially visualize the influences of different thiobencarb formulations, use patterns, application methods, and agricultural drain flows emanating from rice fields in Glenn and Colusa counties from 1994 through 1996. Staff believe this approach will enable a better understanding of the watershed upstream from CBD5 and can possibly reveal previously unidentified trends and relationships, which may lead to a better understanding of the movement of thiobencarb from its application point. This GIS project will also incorporate accurate mapping of the watershed and allow for further GIS analysis of this region.

III. PERSONNEL

This project will be conducted by the Implementation Group staff of the Environmental Hazards Assessment Program at DPR under the supervision of Roger Sava. KayLynn Newhart is the project leader. Nancy Gorder and Marshall Lee will collaborate on the project and John Steggall will act as consultant for the GIS efforts.

IV. METHODS

ArcView, a desktop GIS software program, will be used to create thematic mapping of rice acreages, adjacent agricultural drains, and waterways which receive rice tailwater runoff in Glenn and Colusa counties. Types of data that will be analyzed and presented in GIS format will include drainage water flow information available from Glenn-Colusa Irrigation District's Water Management Program. Total rice acreages and thiobencarb application by date, amount, formulation, and application method, will be obtained from DPR's Pesticide Use Reporting Database and the agricultural commissioners staff of Glenn and Colusa counties. Other data sources will include the Information Center for the Environment, Teale Data Center, United States Geological Survey, and the California Department of Water Resources.

A summary report will be written after completion of the project.

V. TIMETABLE

The completion of this project is estimated by December 31, 1998. For further information, please contact KayLynn Newhart at (916) 324-4190.

VI. REFERENCES

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Appendix F