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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

**MEMORANDUM**

PC Code:123000
DP: 271576

**SUBJECT:** Isoxaflutole State Monitoring Program: Iowa, 1999-2000

**FROM:** William P. Eckel 5/10/01
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Environmental Fate and Effects Division (7507C)

**TO:** Dan Kenny
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**THRU:** Tom Bailey, Branch Chief Tom Steeger for Tom Bailey 5/10/01
Environmental Risk Branch II / EFED (7507C)

This memorandum presents EFED's analysis and interpretation of monitoring results for isoxaflutole collected by the state of Iowa. Iowa has been conducting both state-wide and watershed-specific studies of isoxaflutole and its degradates since the first year of its use, 1999. A description of Iowa's monitoring program for isoxaflutole may be found at: http://wqm/igsb/uiowa.edu. The Registrant, Aventis CropScience, was required to provide sample analysis services to states where isoxaflutole was registered as a condition of its registration in 1998. The graphic presentations of the data in this memorandum were prepared by the Iowa Geological Survey Bureau.

The monitoring conducted by Iowa in 1999-2000 clearly demonstrates that isoxaflutole residues have caused widespread contamination of state water resources, at concentrations often well above the Effective Concentration for 25% of species ( EC25, from a vegetative vigor study) for phytotoxicity (22 parts per trillion). Use of such water for irrigation has the potential to damage sensitive crops such as vegetables. This conclusion reinforces EFED's findings from the Missouri state monitoring data, and from tile drain studies in Iowa and Ohio.

1999 Growing Season

In 1999, the Iowa Geological Survey Bureau conducted a state-wide survey of isoxaflutole residues in its established network of 60 fixed surface water monitoring sites, plus randomly selected stream sites and long-term monitoring wells. The stream sites represent the discharge

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from watersheds of 100 to over 2000 square miles, and so are representative of water that could be used for irrigation.404 samples were analyzed from May to July, 1999. The first degradate (RPA202248 or DKN) was detected in **62%** of the samples, with a maximum value of 186 parts-per-trillion (over 8 times the EC25 of 22 ppt) and a mean of 12.9 ppt. Table I summarizes Iowa's results for 1999.

Parent isoxaflutole was detected in 4% of the 404 samples, and the terminal degradate (RPA203328) in 26% of samples with a maximum of 213 ppt and a mean of 4.6 ppt.

Figure 1 ("Isoxaflutole Degradate RPA202248 Concentrations (ppt) 1999") shows that detections of this phytotoxic chemical, above the 22-ppt EC25 (pink and red dots), occurred in widespread areas of Iowa.

2000 Growing Season

In 2000, Iowa continued its ambient stream monitoring, and also did intensive daily monitoring in three watersheds of different sizes. Figure 2 ("Daily Monitoring 2000") shows these watersheds and their basin sizes: Iowa River (2794 sq mi), English River (627 sq mi) and Old Mans Creek (201 sq mi). Each of these watersheds was sampled daily during May through July of 2000, at the points indicated in Figure 2.

*Intensive Monitoring*. Figures 3, 4, and 5 show the concentrations of RPA202248 (the phytotoxic degradate) in the three watersheds, and also the discharge measured in cfs (cubic feet per second) as a function of time.

In the Iowa River, a watershed of 2794 square miles, RPA202248 exceeded the 22-ppt level almost continuously through late June, with a peak over 100 ppt. The English River, draining 627 square miles, exceeded 22 ppt six times through late June, also with a peak over 100 ppt. Finally, in Old Man's Creek, draining 201 square miles, exceeded 22 ppt eight times through the third week in June. Application times are generally in early to mid-May.

Figures 3-5 also illustrate the correlation between stream discharge and RPA202248 concentrations. The concentrations increase with increasing flow, indicating that the chemical is likely running-off treated fields in response to rainfall. This behavior confirms EFED's previously stated concerns about contamination of water resources.

*Ambient Monitoring*. Figures 6 shows RPA202248 concentrations in the 60-stream fixed monitoring in June, 2000. Concentrations were lower in May and July. Figure 6 confirms the widespread contamination of Iowa waters observed in the 1999 growing season (Figure 1). RPA202248 was detected in 12% of samples in May, 88% in June, and 80% in July. Table 2 summarizes the data for the Iowa ambient surface water network.



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Conclusions

The monitoring conducted by Iowa in 1999-2000 clearly demonstrate that isoxaflutole residues have caused contamination of state water resources, at concentrations above the EC25 for phytotoxicity (22 ppt). The contamination is geographically widespread across the state (Figures 1, 6). Water contamination above 22 ppt is also of long duration (four to six weeks, see Figures 3, 4, 5) and affects watersheds as large as 2800 square miles for such durations.

Iowa's 1999-2000 studies demonstrate that isoxaflutole has caused widespread, chronic contamination of that state's water resources at concentrations that EFED believes have the potential to damage sensitive crops such as vegetables.

EFED has reached the same conclusions regarding water resource contamination in recent memoranda concerning drinking water reservoirs in Missouri (W.P. Eckel 3/23/01 memo to D. Kenny, DP barcode 273607) and tile drain studies in Iowa and Ohio (W.P. Eckel 5/7/01 memo to D. Kenny, DP barcode 273604).

DP Barcodes

Data reviewed in this report came from the following DP barcodes: D260920, D262819, D266295, D270075, D267695, D268313, D269858, D271576.



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**Figure 2**

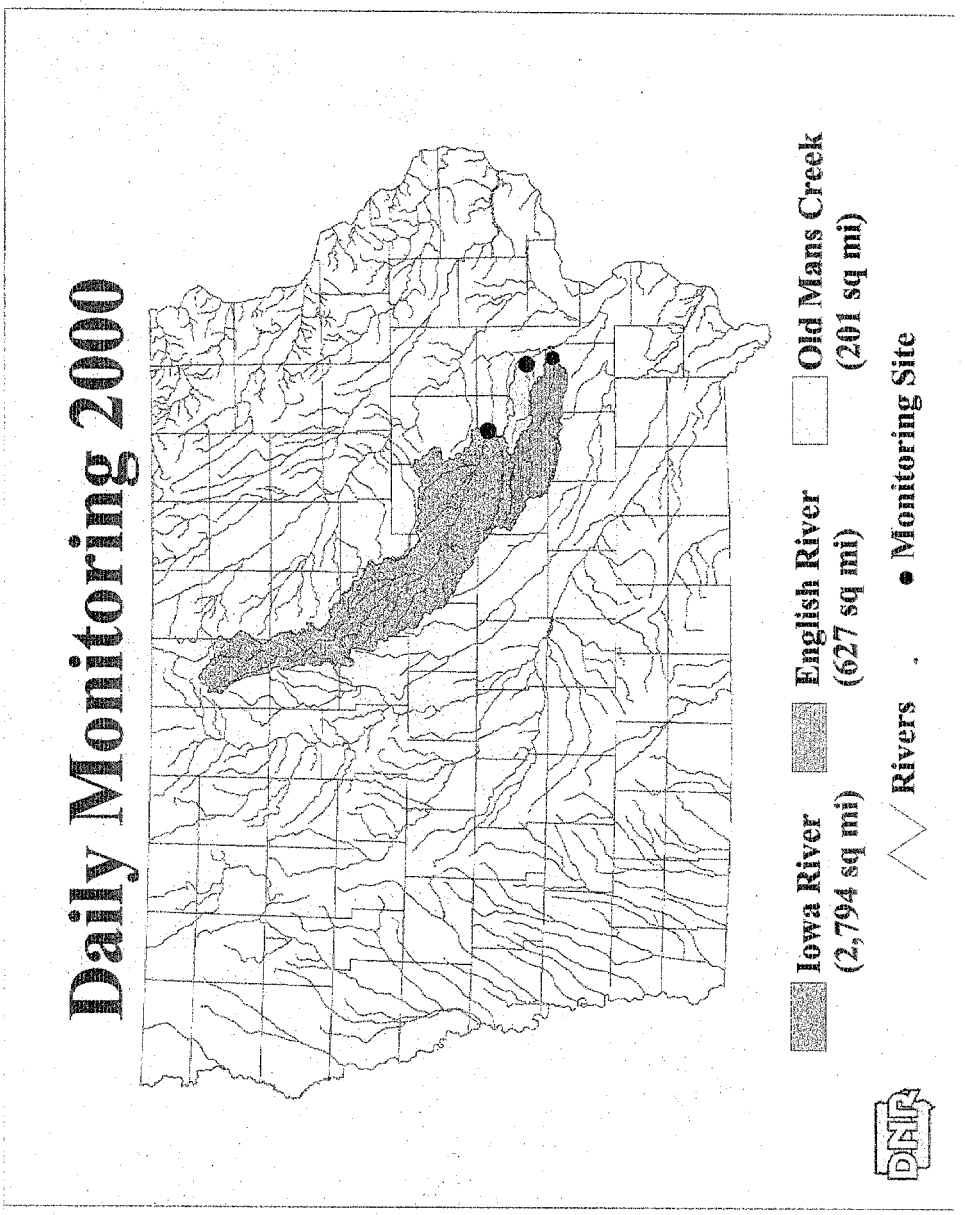

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**Figure 1**

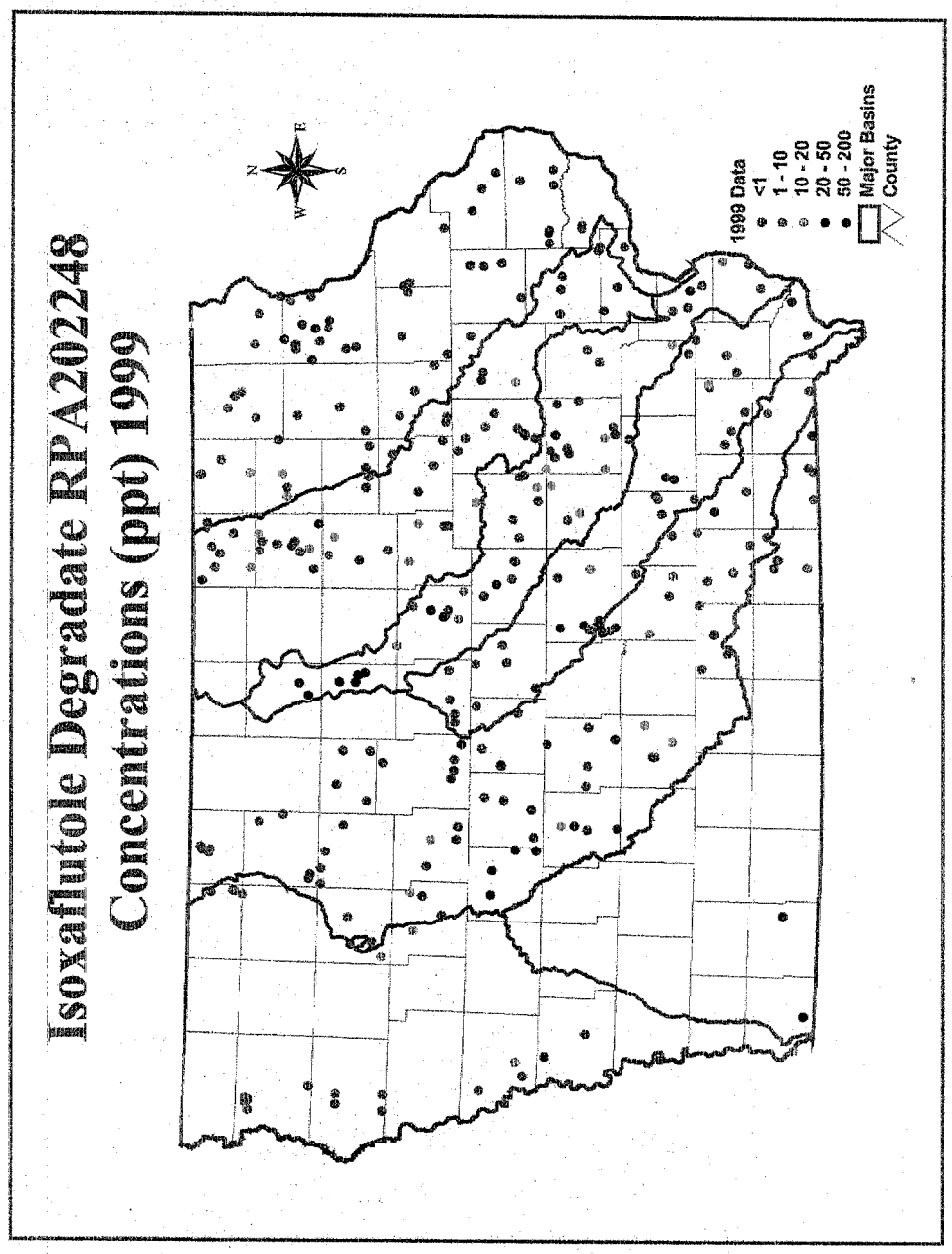

Figure 3

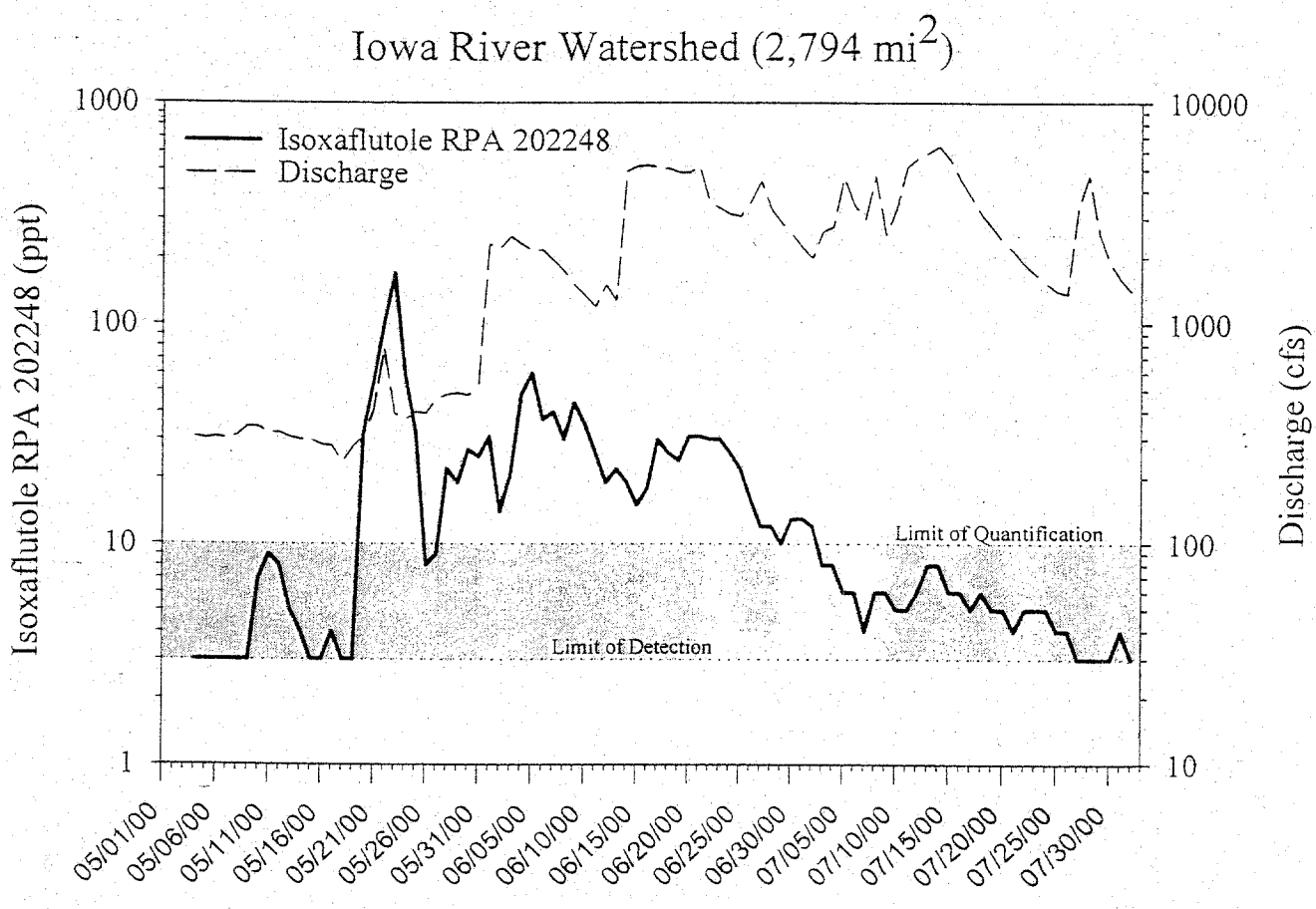


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Figure 4

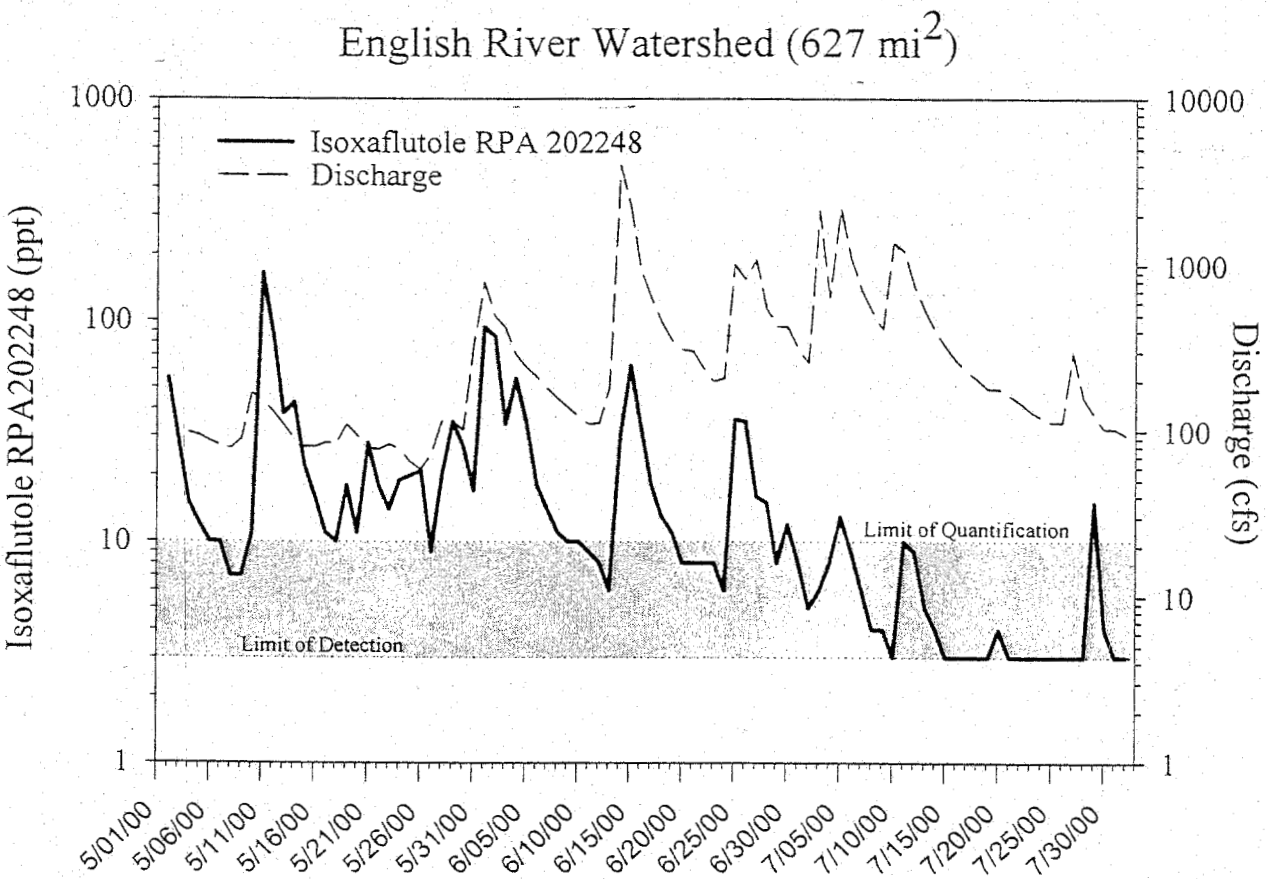


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Figure 5

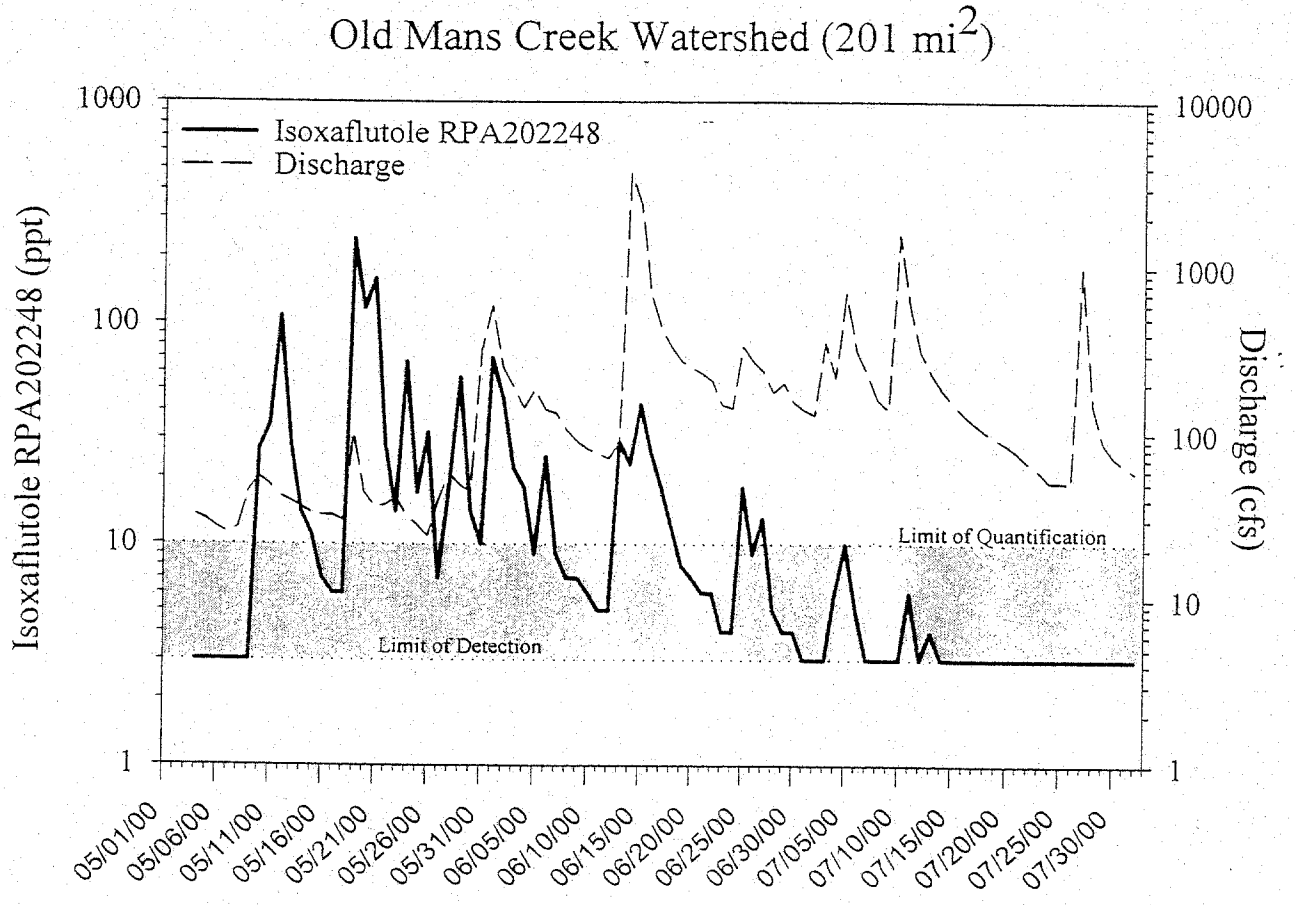


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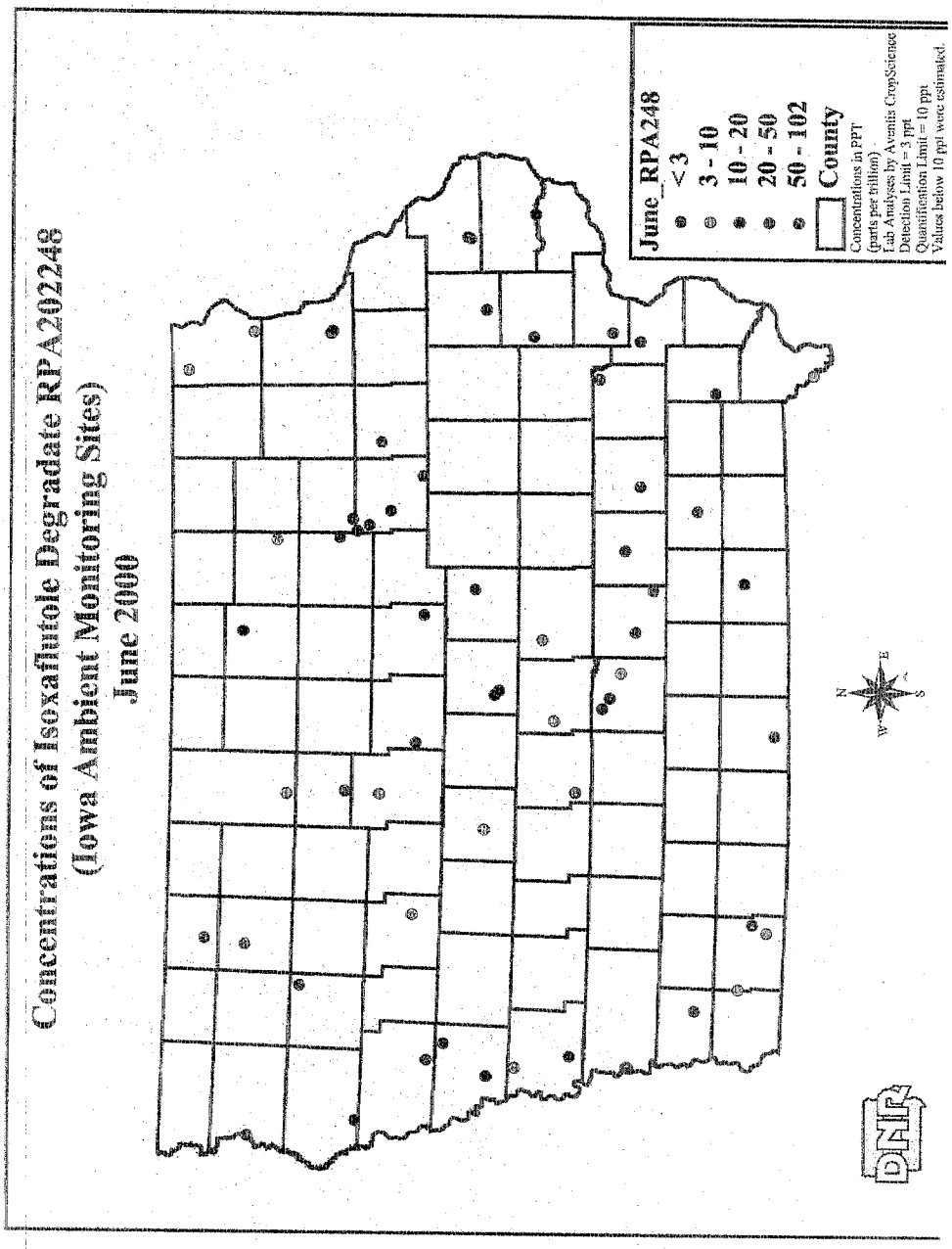
**Figure 6**



# Table 1

**Isoxaflutole Sample Results: May - July, 1999**

| Analyte | | |
|---|---|---|
| **Isoxaflutole** | Number of Analyses | 404 |
| | # Detects | 15 |
| | % Detects | 4 |
| | # Above Quantification Limit | 3 |
| | % Above Quantification Limit | 1 |
| | Minimum (Quantified Value; ppt) | 10 |
| | Maximum (Quantified Value; ppt) | 14 |
| | Mean (ppt)* | 1.17 |
| | Median (ppt)* | 1 |
| **RPA202248** | Number of Analyses | 404 |
| | # Detects | 252 |
| | % Detects | 62 |
| | # Above Quantification Limit | 118 |
| | % Above Quantification Limit | 29 |
| | Minimum (Quantified Value; ppt) | 10 |
| | Maximum (Quantified Value; ppt) | 186 |
| | Mean (ppt)* | 12.9 |
| | Median (ppt)* | 3 |
| **RPA203328** | Number of Analyses | 404 |
| | # Detects | 104 |
| | % Detects | 26 |
| | # Above Quantification Limit | 38 |
| | % Above Quantification Limit | 9 |
| | Minimum (Quantified Value; ppt) | 10 |
| | Maximum (Quantified Value; ppt) | 213 |
| | Mean (ppt)* | 4.6 |
| | Median (ppt)* | 1 |

* Calculation of Mean and Median:
NonDetections Replaced with the Detection Limit Concentration, 1 ppt
Detections Below Quantification Limit Assigned Estimated Values from Lab
Detection Limit increased from 1ppt to 3 ppt from 1999 to 2000.

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# Table 2

**Isoxaflutole Sample Results: May - July, 2000**

| Analyte | | May | June | July |
|---|---|---|---|---|
| **Isoxaflutole** | Number of Analyses | 59 | 62 | 62 |
| | # Detects | 13 | 19 | 6 |
| | % Detects | 22 | 32 | 10 |
| | # Above Quantification Limit | 3 | 0 | 0 |
| | % Above Quantification Limit | 5 | 0 | 0 |
| | Minimum (Quantified Value; ppt) | 10 | -- | -- |
| | Maximum (Quantified Value; ppt) | 33 | -- | -- |
| | Mean (ppt)* | 4.1 | 3.3 | 3 |
| | Median (ppt)* | 3 | 3 | 3 |
| **RPA202248** | Number of Analyses | 59 | 62 | 62 |
| | # Detects | 7 | 52 | 47 |
| | % Detects | 12 | 88 | 80 |
| | # Above Quantification Limit | 8 | 34 | 9 |
| | % Above Quantification Limit | 14 | 58 | 15 |
| | Minimum (Quantified Value; ppt) | 14 | 11 | 10 |
| | Maximum (Quantified Value; ppt) | 83 | 102 | 18 |
| | Mean (ppt)* | 8.5 | 20.7 | 5.4 |
| | Median (ppt)* | 3 | 12 | 3 |
| **RPA203328** | Number of Analyses | 59 | 62 | 62 |
| | # Detects | 0 | 33 | 33 |
| | % Detects | 0 | 56 | 56 |
| | # Above Quantification Limit | 3 | 27 | 7 |
| | % Above Quantification Limit | 5 | 46 | 12 |
| | Minimum (Quantified Value; ppt) | 14 | 10 | 10 |
| | Maximum (Quantified Value; ppt) | 40 | 95 | 19 |
| | Mean (ppt)* | 4.3 | 14.1 | 5.0 |
| | Median (ppt)* | 3 | 6.5 | 3 |

* Calculation of Mean and Median:
NonDetections Replaced with the Detection Limit Concentration, 3 ppt
Detections Below Quantification Limit Assigned Estimated Values from Lab

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