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Two year survey for picloram in North Dakota groundwater

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Picloram (4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid) is the main herbicide used for leafy spurge control. Leafy spurge currently infests over 900,000 acres in North Dakota in a variety of environments such as grasslands, wooded areas, wetlands and arid regions. Over 345,000 acres were treated with picloram in North Dakota in 1978 of which 82,000 acres were pasture and rangeland. The State of North Dakota began a concerted effort to control leafy spurge in 1981 when a cost share program to defray herbicide expense was begun. Picloram use has increased steadily since 1981 and it is estimated that over 230,000 acres of leafy spurge were treated in North Dakota during the summer of 1984 alone. Generally picloram plus 2,4-D at 0.25 plus 1.0 lb/A has been applied, but commonly small patches have been treated with picloram at 2.0 lb/A, the maximum labeled use rate. Most herbicide application has been by ground equipment, but helicopters and airplanes have been used in the more rugged areas of western North Dakota. The general public is becoming concerned about picloram contamination in North Dakota water as evidenced by an increased number of inquiries sent to various state agencies.

Herbicide application has been by certified personnel; however, direct accidental contamination of water or run-off from nearby application may be adversely affecting drinking water supplies, fish and wildlife. The purpose of this study was to determine if picloram was present in North Dakota groundwater especially in areas with high picloram use for leafy spurge control.

Ten North Dakota counties and at least 12 wells per county were chosen for the survey. Burleigh, Pierce, Morton, Stark, Stutsman, Ward, Wells and Williams counties had applied picloram in an active leafy spurge control program, and Cass and Dunn counties with minimal picloram application were the control sites. Stark and Ward counties were emphasized, because they included the Heart and Souris Rivers, respectively, and have conducted an active leafy spurge control program using picloram. The well locations were chosen based on the amount of picloram applied nearby, the well depth, and whether the well was in an aquifer as mapped by the United States Geological Survey (U.S.G.S.). Shallow wells located near areas that had received repeated picloram applications were emphasized as representing a site most likely to be contaminated. A total of 144 wells were sampled three times; in early June prior to the spray season, in mid-July immediately after the general spray season, and in September to detect possible changes

in herbicide content with time. Also, stream samples from the Des Lacs, Heart and Souris Rivers were collected in June and September from U.S.G.S. monitoring stations. Analyses was conducted using HPLC techniques with a detection limit of < 0.1 ppb.

An additional 44 wells were sampled in April 1986 which were located near wells where picloram was detected in 1985. These wells were chosen based on distance from contaminated wells regardless of well depth or use. Also, stream samples from the Des Lacs and Souris Rivers again were collected in June 1986.

Picloram was present in 5 wells in 5 counties in 1985 and all were within 1 mile of an area treated for leafy spurge control. Picloram was present at trace to 12.4 ppb levels. The presence of picloram was confirmed by GC-mass spectroscopy at an independent lab. The picloram concentrations detected are not a health hazard since the suggested no-adverse-response level (SNARL) is 1050 ppb. The picloram concentration of 12.4 ppb is higher than would be expected if the well had been contaminated by leaching during a weed control spraying program, and picloram was not found in nearby wells. Picloram concentrations ranging from a trace to 6 ppb were found in the Des Lacs and Souris Rivers in Ward County. No picloram was found in the Heart River or in well samples from the control counties.

Picloram concentrations had declined in the 5 contaminated wells sampled in 1986 compared to 1985. Concentrations in 1986 ranged from none detected to 6.7 ppb. Only one of the additional 44 wells sampled in 1986 contained picloram. The picloram concentration was 0.97 ppb and was within 1 mile of the contaminated well found in 1985. Picloram continued to be detected in the Des Lacs and Souris Rivers; the concentration had declined but it was detected further downstream than in 1985.