Dinoseb ($C_{10}H_{12}O_5N_2$) has a CAS name and number of 2-(1-methylpropyl)-4,6-dinitrophenol and 88-85-7, respectively. Trade names include General Weed Killer 600, Potato Top Killer 300, and Pfizer Dinoseb. Dinoseb was first registered in Canada in 1949 (Agriculture Canada 1989a). Its mode of action is inhibition of metabolism (Kaufman 1976).

Dinoseb is a selective contact herbicide used to control annual and the top-growth of perennial grassy and broadleaf weeds; it also has fungicidal and insecticidal properties (WSSA 1983). Dinoseb was used primarily (70%) as a pre-harvest aid (top killer) in potatoes (Agriculture Canada 1990).

As a result of a recommendation by Health Canada, Agriculture Canada suspended the registration of all nonessential uses of dinoseb (which amounts to an end-of-sale and use of dinoseb-containing products) on November 1, 1990 (Agriculture Canada 1990). The recommendation was based on an unacceptable risk to dinoseb applicators for teratogenic effects, cataract formation, and male reproductive effects (Agriculture Canada 1989b). Registration of dinoseb-containing products has been retained in Canada only for critical need uses. These include early cane control in raspberries in British Columbia, and weed control in beans and peas in British Columbia and the Atlantic provinces.

Concentrations of dinoseb found in Canadian freshwater sources range in from 0.8 to 18.6 $\mu g \cdot L^{-1}$ (O'Neill et al. 1989; Wan 1989). Sediment concentrations range from 19 to 108.6 $\mu g \cdot kg^{-1}$ (Wan 1989; B. Ernst 1989, Environment Canada, Dartmouth, Nova Scotia, pers. com.). A sampling program in 1980 revealed mean levels of dinoseb in fish livers ranging from 0.110 to 0.175 $mg \cdot kg^{-1}$, with a maximum level of 0.37 $mg \cdot kg^{-1}$. (B. Ernst, 1989, Environment Canada, Dartmouth, Nova Scotia, pers. com.).

Information on the accumulation of dinoseb in aquatic biota indicates rapid uptake and elimination of dinoseb by freshwater fish. In fathead minnows *(Pimephales promelas)*, 24-d exposures to high (7.22 $\mu g \cdot L^{-1}$) and low (0.62 $\mu g \cdot L^{-1}$) concentrations of dinoseb resulted in equilibrium ^{14}C BCFs of 64.1 and 61.5, respectively. Within 24 hours after transfer to uncontaminated water, the fish had eliminated 71% of the ^{14}C, and after 14 d, an average of 96% had been eliminated (Call et al. 1984).

In aqueous solutions exposed to natural sunlight, dinoseb had a half-life of 14–18 d (Dinoseb Task Force 1985). Increased stability in artificial light was indicated by a half-life of 42–58 d. Dzialo (1984) reported that hydrolysis of dinoseb was stable in solutions of pH 5, 7, and 9.

Water Quality Guideline Derivation

The Canadian water quality guideline for dinoseb for the protection of freshwater life was developed based on the CCME protocol (CCME 1991).

Freshwater Life

The acute toxicity of dinoseb to freshwater fish depends on pH levels, water hardness and temperature, species, life history stage (Woodward 1976), and the formulation of the herbicide (Skelley 1989). The chronic toxicity of dinoseb also depends on water hardness, water temperature, duration of exposure, and the species tested (Call et al. 1984).

Data on the chronic toxicity of dinoseb are available for four freshwater fish species. For salmonids, long-term chronic mortality values (6- to 81-d LC_{50}s) ranged from 12 to 125 $\mu g \cdot L^{-1}$. Similar endpoints (8- to 64-d LC_{50}s) for fathead minnows were higher, ranging from 16 to 500 $\mu g \cdot L^{-1}$ (Call et al. 1984).

Table 1. Water quality guidelines for dinoseb for the protection of aquatic life (CCME 1992).

Aquatic life	Guideline value ($\mu g \cdot L^{-1}$)
Freshwater	0.05
Marine	NRG*

*No recommended guideline.

Long-term sublethal studies on the hatchability, development, survival, and growth of fathead minnows exposed to dinoseb for 64 d yielded a LOEL of 48.5 μg·L^{-1} based on the significant effects of decrease in number of survivors and decrease in wet weight (Call et al. 1984). Significant reductions in the weight and length of lake trout fry were observed at even lower concentrations of dinoseb (Woodward 1976). Following an exposure of 81 d (21 d prehatching to 60 d posthatching), a LOEL of 0.5 μg·L^{-1} was recorded.

Available information on the toxicity of dinoseb to freshwater invertebrates indicates that these animals are generally less sensitive than fish; 24-h LC_{50}s ranged from 100 to 2800 μg·L^{-1} (Sanders 1970; Zitko et al. 1976; Paulov 1979; Hashimoto and Nishiuchi 1981).

Reported EC_{50}s for green algae ranged from 1032 to 3897 μg·L^{-1} when inhibition of growth was taken as the experimental endpoint (Hawxby et al. 1977; Hess 1980). EC_{50}s (24-h tests) for photosynthetic inhibition (based on O_2 evolution) were 432, 745, > 2400, and > 2400 μg·L^{-1} for *Chlorella*, *Lyngbya*, *Chlorococcum,* and *Anabaena* spp., respectively (Hawxby et al. 1977).

The water quality guideline for dinoseb for the protection of freshwater life is 0.05 μg·L^{-1}. It was derived by multiplying the LOEL of 0.5 μg·L^{-1} for lake trout following an exposure of 81 d (21 d prehatching to 60 d posthatching) (Woodward 1976) by a safety factor of 0.1 (CCME 1991).

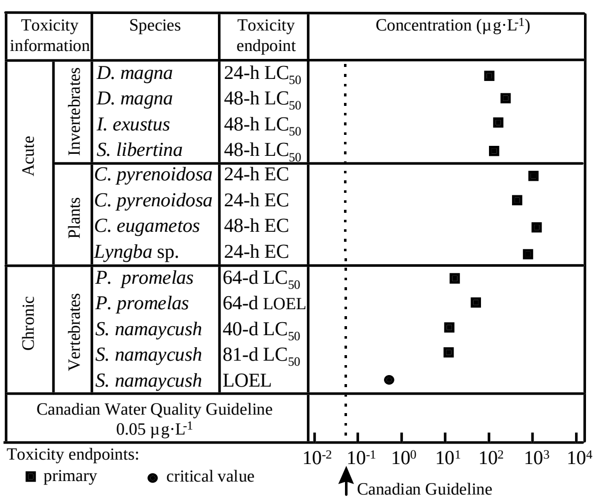

Figure 1. Select freshwater toxicity data for dinoseb.

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