6-1-93

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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

June 1, 1993

MEMORANDUM

SUBJECT: Transmittal of EFED Science Chapter for Boric Acid/Sodium Metaborate RED (Chemicals #011001, 011103; Case #0024)

FROM: Fred Betz, Acting Chief
Science Analysis and Coordination Staff
Environmental Fate and Effects Division (H7507C)

TO: Larry Schnaubelt, Acting Chief
Reregistration Branch
Special Review and Reregistration Division (H7508C)

Attached please find the completed EFED RED Chapter for Boric Acid/Sodium Metaborate.

Please note that although initial worst case calculations indicated that the level of concern **could** be met for birds and aquatic invertebrates from the rights-of-way use, EFED's refined assessment is that no unreasonable adverse effects will result from this unique use.

Please note also that phytotoxicity studies are required to assess the risk to endangered plant species.

If you have any questions concerning this case, please contact Mary Frankenberry at 305-5694.

cc:

Anne Barton Hank Jacoby Tony Maciorowski
List A File
List A Cover Memo File

ENVIRONMENTAL ASSESSMENT

ENVIRONMENTAL FATE

A. CHEMISTRY AND ENVIRONMENTAL FATE PROFILE

Boric acid exists in three crystalline forms, with melting points varying from 170 to 200 C.; its solubility in water is 13,000 parts per million. Dilute aqueous solutions contain predominantly undissociated H_3BO_3 molecules, the pK_a being 9.14 (1). The apparent acid strength of boric acid is increased by strong electrolytes that modify the structure and activity of the solvent water; in the presence of excess $CaCl_2$ the strength of boric acid becomes equivalent to that of carboxylic acids.

Boric acid, borax, and boron-containing salts are ubiquitous in the natural environment. Available boron occurs in nature in the form of a number of closely related compounds which differ chiefly in the water of hydration associated with the molecule and are not easily differentiated. Because of this, the following discussion refers to the group as "boric acid," "boron," or "the boron salts." The specie which occurs in solution is the BO_3^{3-} cation. More complex mineral forms containing boron may gradually release it in the form of borate as a result of weathering. The range of boron as a micronutrient in soil is 5-150 ppm, and representative surface soil contains 50 ppm. Boron salts occur naturally in low concentrations in most unpolluted waterways. The average concentration for boron in surface waters has been reported to range from 0.001 mg/liter (2) to 0.1 mg/liter (3). Seawater boron concentrations average 4.5 mg/liter (4). In some geographical areas such as the American Southwest, boron occurs in concentrations in surface waters that have been shown to be toxic to plants of commercial importance (5). Most of the naturally occurring boron is inorganic, but because it is an essential element for many organisms there is an organically-bound component. It is against this background of naturally occurring boron that judgments on the environmental fate of boron compounds must be made.

B. ENVIRONMENTAL FATE ASSESSMENT

Because of the relatively small amount of boric acid employed for most uses as a pesticide, and the already significant amounts of boron present in soil and water, EFED will not require any additional environmental fate data at this time.

1. Summary of environmental fate data reviewed:

The adsorption and desorption coefficients were determined to be <1 in a study (1) submitted to the OPP. Although this study was considered to be invalid because the soil texture was altered by the sieving procedures used, it provided enough information to confirm the compound as mobile.

2. Data Requirements Table:

161-1 - hydrolysis - - - NR*
161-2 - photolysis in water - - - NR
161-3 - photolysis in soil - - - NR
161-4 - photolysis in air - - - NR
162-1 - metabolism, aerobic soil - - - NR
162-2 - metabolism, anaerobic soil - - - NR
162-3 - metabolism, aerobic aquatic - - - NR
162-4 - metabolism, anaerobic aquatic - - - NR
163-1 - leaching/adsorption/desorption - - - NR
163-2 - volatility, laboratory - - - NR
163-3 - volatility, field - - - Nr
164-1 - field dissipation, terrestrial - - - NR
164-2 - field dissipation, aquatic - - - NR
164-3 - field dissipation, forest - - - NR
164-5 - field dissipation, long term - - - NR
165-1 - rotational crop accumulation, confined - - - NR
165-2 - rotational crop accumulation, field - - - NR
165-3 - rotational crop accumulation, irrigated - - - NR
165-4 - fish bioaccumulation, laboratory - - - NR
165-5 - non-target species accumulation, field - - - NR
201-1 - droplet size spectrum - - - NR
202-1 - drift field evaluation - - - Nr

* NR = not required

C. DERs for all studies that support the RED:
Attached 163-1: Ryan, Miyamoto, and Strochlein (below)

REFERENCES

(1). J. Ryan, S. Miyamoto, J. T. Strochlein, 1977. "Relation of solute and sorbed boron to the boron hazard in irrigation water", Plant and Soil, 47 (1), 253-256.

(2) D.A. Livingston, 1963. U.S. Geological Survey Professional Paper 440-G.

(3) J.F. Kopp and R.C. Kroner, 1970. Trace elements in water of the United States. U.S. Department of the Interior, Federal Water Pollution Control Administration, Cincinnati, Ohio.

(4) K.J. Maier and A.W. Knight, 1991. "The toxicity of waterborne boron to Daphnia magna and Chironomus decorus and the effect of water hardness and sulfate on boron toxicity", Arch. Environ. Contam. Toxicaol., 20, 282-287.

(5) M.A. Lewis and L.C. Valentine, 1981. "Acute and chronic toxicities of boric acid to Daphnia magna Straus", Bull. Env. Contam. Toxicol., 27, 309-315.

Also, Bohn, McNeal, and O'Connor, 1979, Soil Chemistry, p. 291.

N.C. Brady, 1974, The Nature and Properties of Soils, pps. 489, 496-97 et passim.

ECOLOGICAL EFFECTS

ECOLOGICAL EFFECTS TOPICAL SUMMARY

A. EFFECTS ON BIRDS

Five studies in five citations were reviewed by EFED; all were useful in a hazard evaluation.

Authors	Date	MRID No.
Fink	1982	None
Beavers	1984	None
Beavers	1987	None
Beavers	1984	254367
Beavers	1987	254367

The minimum data required to evaluate the hazard of boric acid to birds are:

- o An avian single-dose oral LD50 test with technical boric acid and salts utilizing either one avian species of waterfowl, preferably the mallard duck, or one species of upland game bird, preferably the bobwhite quail, and
- o Two avian dietary LC50 tests with technical boric acid and salts utilizing one species of waterfowl, preferably the mallard duck, and one species of upland game bird, preferably the bobwhite quail.

1. Avian Single-Dose Oral LD50

The useful avian single dose study is listed below.

Species	% ai	LD50 (mg/kg)	Authors	Date	MRID No.	Fulfills Requirement
B. Quail	100[1]	> 2510	Fink	1982	None[2]	Yes

1/Test material was technical sodium tetraborate decahydrate.

2/Study review on file does not have a MRID or EPA Accession number. It was filed before these tracking identification systems went into effect.

The data indicate that the technical sodium tetraborate decahydrate is considered "practically nontoxic" to avian species on an acute oral basis. The Guidelines requirement (71-1) for an acute oral toxicity study with avian species has been satisfied for boric acid using the results of the above referenced study.

2. Avian Dietary LC50 - Technical

The useful avian dietary studies are listed below.

Species	% ai	LC50 (ppm)	Authors	Date	MRID No.	Fulfills Requirement
Mallard	99.4[1]	> 10,000	Beavers	1984	None[3]	Yes
B. Quail	99.4[1]	> 10,000	Beavers	1987	None[3]	Yes
Mallard	99.9[2]	> 5,620	Beavers	1984	254367	Yes
B. Quail	99.9[2]	> 5,620	Beavers	1987	254367	Yes

1/Test material was technical disodium octaborate tetrahydrate.

2/Test material was technical boric acid.

3/Study review on file does not have a MRID or EPA Accession number. It was filed before these tracking identification systems went into effect.

Previous testing with disodium octaborate tetrahydrate was used as an acceptable subsitute for boric acid. The data indicate that technical disodium octaborate tetrahydrate and boric acid are considered "practically nontoxic" to avian species on a dietary basis. The Guidelines requirement for a dietary toxicity test with avian species has been satisfied (71-2) for boric acid using the results of the above referenced studies.

3. Avian Reproduction - Technical

An avian reproduction study is required when birds may be subjected to repeated or continued exposure to the pesticide or any of its major metabolite degradation products, especially preceding or during the breeding season. Because the boric acid use pattern is considered to be infrequent and the acute oral and dietary toxicity values to birds are practically nontoxic, EFED will not require the avian reproduction study (71-4) unless future use circumstances dictate otherwise.

B. EFFECTS ON FRESHWATER FISH

Two studies in two citations were reviewed by EFED. They were useful in a hazard evaluation.

Author	Date	MRID No.
LeLievre	1988	405946-01
LeLievre	1988	405946-02

The minimum data required to evaluate the hazard of boric acid to freshwater fish are two 96-hour LC50 freshwater fish toxicity tests using the technical material. One test should utilize a coldwater fish, preferably the rainbow trout, and the other should utilize a warmwater fish, preferably the bluegill sunfish (72-1).

1. Fish Acute LC50 - Technical

The useful fish acute toxicity data is listed below.

Species	% ai	LC50 (ppm)	Authors	Date	MRID No.	Fulfills Requirement
Bluegill	100[1]	>1021	LeLievre	1988	405946-01	Yes
R. trout	100[1]	>1100	LeLievre	1988	405946-02	Yes

1/Testing material was technical granular boric acid.

The data indicate that the technical boric acid is considered "practically nontoxic" to freshwater fish. Guidelines requirement for boric acid using acute toxicity testing with freshwater fish is considered fulfilled (72-2) for boric acid.

2. Fish Early Life Stage - Technical

Fish early life stage studies (72-4) are required if the pesticide is intended for use such that its presence in water is likely to be continuous or recurrent regardless of toxicity, if the LC50 is less than 1 ppm, if the estimated environmental concentration is equal to or greater than 0.1 of the LC50, and if the pesticide is persistent in water. Based upon the available acute toxicity data for fish and invertebrates, it was determined that aquatic invertebrates are more sensitive than fish. As a result, the fish early life stage will not be required.

C. EFFECTS ON FRESHWATER INVERTEBRATES

Three studies in two citations were reviewed by EFED; both were useful in a hazard evaluation.

Author	Date	MRID No.
Lewis	1981	None/public literature
Gerish	1992	None/public literature

The minimum data requirement to establish the acute toxicity of boric acid to freshwater invertebrates is a 48-hour acute study with technical material. Test organisms should be first instar Daphnia magna or early instar amphipods, stoneflies, or mayflies.

1. Aquatic Invertebrate EC50 - Technical

The useful aquatic invertebrate acute toxicity data are below:

Species	% ai	EC50 (ppm)	Authors	Date	MRID No.	Fulfills Requirement
D. magna	TGAI[1]	226	Lewis	1981	None[2a]	Yes[3]
D. magna	Unknown	133	Gerish	1984	None[2b]	Yes[3]

1/Test material was Fisher Scientific analytical grade boric acid which is usually technical grade. Actual ai% not reported.

2/Public literature submissions accompanying RED package were not assigned an MRID or EPA Accession Number. They are identified as:
a/Lewis, M.A. and L.C. Valentine. *Acute and Chronic Toxicities of Boric Acid to Daphnia magna Straus.* Bulletin of Environmental Contamination Toxicology 27, 309-315 (1981).
b/Gerish, F.M. *Evaluation of a Static Renewal Chronic Toxicity Test Method for Daphnia magna Straus Using Boric Acid.* Environmental Toxicology and Chemistry. 3:1, 89-94 (1984).

3/These unvalidated public literature studies were submitted by the registrant to support reregistration. The studies were conducted using acceptable protocols albeit the lack of submission of raw data and GLP compliance verification. EFED will presently classify these studies as supplemental data until future circumstances necessitate a formal review and reclassification, or the need for a repeated study. Because of boric acid's nontoxic profile, the toxicity values of these referenced studies will be used for hazard assessment purposes.

These data indicate that boric acid is considered "practically nontoxic" to freshwater invertebrates. The Guidelines requirement for an acute toxicity study with freshwater invertebrates has been satisfied (72-2).

2. Chronic Aquatic Invertebrate - Technical

An aquatic invertebrate life cycle study is required to assess the chronic risk of boric acid to aquatic invertebrates because of the persistence of boric acid. It does not readily hydolyze or photodegrade. The use pattern on rights-of-way also requires an unusally high application rate which may result in transport to adjacent aquatic environments.

The useful aquatic invertebrate chronic toxicity data is listed below:

Species	% ai	MATC (ppm)	Authors	Date	MRID No.	Fulfills Requirement
D. magna	TGAI[1]	>6<13	Lewis	1981	None[2]	Yes[3]

1/Testing material was analytical grade boric acid which is usually technical grade. Actual ai% not reported.

2/Public literature submission accompanying RED package was not assigned an MRID or EPA Accession Number. It is identified as: Lewis, M.A. and L.C. Valentine. *Acute and Chronic Toxicities of Boric Acid to Daphnia magna Straus*. Bulletin of Environmental Contamination Toxicology 27, 309-315 (1981).

3/These unvalidated public literature studies were submitted by the registrant to support reregistration. The studies were conducted using acceptable protocols albeit the lack of submission of raw data and GLP compliance verification. EFED will presently classify these studies as supplemental data until future circumstances necessitate a formal review and possible reclassification, or the need for a repeated study. Because of boric acid's nontoxic profile, the toxicity values of the previously referenced studies will be used for hazard assessment purposes.

D. EFFECTS ON PLANTS

Seed germination, seedling emergence, and vegetative vigor tests are required for herbicides applied to terrestrial food,

terrestrial noonfood, aquatic food, aquatic nonfood (excluding residential) and forestry sites if any of the following conditions exist:

A. The vapor pressure of the TGAI is equal to or greater than 1.0×10^{-5}mm Hg at 25^{0}C and the TEP is not thoroughly incorporated immediately after application.

B. The TEP is applied (excluding granular formulations), by forced air, air blast, or through sprinkler irrigation.

C. Endangered or threatened plant species are associated with the site of application.

D. There are field incidents of plant phytotoxicity.

Aquatic plant testing is required for any herbicide applied to terrestrial nonfood (rights-of-way and ditchbanks), aquatic food, aquatic nonfood (excluding residental) and forestry sites. The following species should be tested: Selenastrum capricornutum, Lemna gibba, Skeletonema costatum, Anabaena flos-aquae, and freshwater diatom.

E. BENEFICIAL INSECTS

Beneficial insect testing is required to support the registration of any pesticide intended for outdoor application. Boric acid's outdoor use patterns indicate that honey bees may be exposed to the pesticide. The minimum data requirement is a honey bee acute contact LD50.

One study in one citation was evaluated by EFED and found to be useful in a hazard assessment.

Author	Date	MRID No.
Atkins	1987	402692-01

The useful beneficial insect toxicity data is listed below.

Species	% ai	LD50 (mg/kg)	Authors	Date	MRID No.	Fulfills Requirement
Apis mellifera	100[1]	>362.58	Atkins	1987	402692-01	Yes

1/Testing material was technical boric acid.

The data indicates that technical boric acid is relatively nontoxic to honey bees. The Guideline requirement for a honey bee acute contact study is fulfilled.

ECOLOGICAL EFFECTS DISCIPLINARY REVIEW

I. ECOLOGICAL EFFECTS PROFILE

A. Technical Boric Acid

1. Avian Studies

There is sufficient information to characterize technical Boric acid as "practically nontoxic" to avian species on an acute oral and dietary basis. The LD50 value for Bobwhite Quail is greater than 2510 mg/kg (Fink 1977). The dietary LC50 value for both mallard duck and bobwhite quail is greater than 5620 ppm and 10,000 ppm (Beavers 1984, 1987).

2. Aquatic Studies

There is sufficient information to characterize technical boric acid as "practically nontoxic" to fish and aquatic invertebrates. Acute LC50 values for rainbow trout and bluegill sunfish are >1100 ppm and >1021 ppm, respectively. The acute toxicity value (EC50) for the aquatic invertebrate Daphnia magna ranged from 133 to 226 ppm (Gerish, 1984; Lewis, 1981). Chronic toxicity value (MATC) for Daphnia magna is >6 <13 ppm (Lewis, 1981).

3. Beneficial Insects

There is sufficient information to characterize technical boric acid as "relatively nontoxic" to beneficial insects. The honey bee acute contact LD50 was greater than 362.58 ppm (Atkins, 1987).

II. FORMULATIONS AND USE

Boric acid is registered as an acaricide, algicide, fungicide, herbicide and insecticide. Most of the registered products are for indoor use. The multiple indoor and outdoor use products consist of dusts, wettable powders, liquids, granules, pellets, impregnated material, soluble concentrates/solids, bait solids and liquids and liquids ready-to-use. EFED files indicate that boric acid and disodium octaborate tetrahydrate products have similiar chemical properties, use rates and patterns.

Outdoor use patterns include:

terrestrial food and feed crop - unspecified agricultural crops/soils, and orchards.

terrestrial non-food - agricultural uncultivated areas, golf course turfs airports/landing fields, recreational areas, refuse solid waste sites, and rights-of-way.

outdoor residental - ornamentals lawns and turf and swimming pools.

aquatic food crop - drainage ditchbanks and lakes/ponds/reservoirs.

aquatic non-food industrial - sewage systems (manholes) and drainage systems (ditchbanks).

forestry - cut stumps and forest products (treated wood).

The outdoor use patterns are considered to be limited. The rights-of-way use pattern requires ground application equipment to apply high application rate granular products. One outdoor insecticidal use pattern involves ground and aerial applications for fire ant control. The unspecified use on golf courses, unspecified agricultural crops/soils, nonagricultural uncultivated areas, orchards and recreational areas similiarly requires the use of ground and aerial applications. The remainder of the previously referenced use sites are primarily minor uses involving ground applied broadcast or spot treatments.

The following "borax" or boric acid use sites have been addressed for assessment purposes:

Nonagricultural rights-of-way (ground applied) and agricultural uncultivated areas - 4757 lbs ai/A.

Nonagricultural uncultivated areas/soils (ground applied) - 169 lbs ai/A.

Orchards, golf courses, recreational areas, and agricultural crops/soils (ground and aerially applied) - 0.54 lbs ai/A.

Agricultural and Industrial drainage systems (ground applied disodium octoborate tetrahydrate products) - 1272 lbs ai/A.

Fire ant control (ground and aerially applied) - 1.0 lb ai/A.

III. RESIDUES AND RISK ASSESSMENT

Terrestrial Residues and Risk

The use on agricultural crops/soils, golf courses, some nonagricultural rights-of-way, recreational areas, agricultural uncultivated areas and orchards requires the use of broadcasted granular products at 0.54 lbs ai/A, the lowest rate previously referenced. To assess the risk to avian organisms, the computation below figures the LD50 per square foot ($LD50/ft^2$). The Bobwhite quail LD50 is greater than 2510 mg/kg, the highest concentration tested. The actual LD50 is most likely to be a higher number.

$$\frac{\text{lb ai/A} \times \text{453,590 mg/lb}}{\text{43,560 ft}^2\text{/A}} =$$

$$0.54 \text{ lb ai/A} \times 10.4 = 5.6 \text{ ai(mg)/ft}^2$$

$$\frac{5.6 \text{ ai(mg)/ft2}}{1/2 \times 2510 \text{ mg/kg} \times 0.178 \text{ kg (body weight of bobwhite quail)}} =$$

$$0.025 \quad LD50/ft^2 < 1$$

The Special Review criterion for regulatory address is met when the $LD50/ft^2$ is greater than one (1). The computation above indicates that 0.025 $LD50/ft^2$ is less than one. As a result, avian risk concerns are minimal where boric acid is used on the sites referenced above.

The $LD50/ft^2$ were also computed for the following additional granular use patterns with the same formula outlined above:

Fire ant control (1.0 lb ai/A).....0.046 LD50/sq ft^2 < 1
Nonagricultural areas/soils (169 lbs ai/A).....7.8 LD50/sq ft^2 > 1
Non agricultural rights-of-way (4757 lb ai/A)..221 LD50/sq ft^2 > 1

The nonagricultural areas/soils and the rights-of-way uses exceed the special review risk ratio of 1, indicating that potential risk to avian species exists. However, the low avian acute oral and dietary toxicity of the pesticide reduces the potential for risk to avian species feeding in treatment areas. EFED's field incident files indicate there have been no reported avian mortalities attributed to boric acid. EFED does not believe that avian species will actually experience any unreasonable adverse effects from the use of boric acid.

Three additional sites requiring 1272 lb ai/A treatment with disodium octaborate tetrahydrate liquid products are airports/landing fields, agricultural drainage ditches, and

industrial drainage ditches. They do not involve large scale acreage similiar to agricultural sites. The airport/landing fields use is for spot treatment weed control. The agricultural and industrial drainage systems' uses are intended to keep ditchbanks and culverts clear of vegetation, to keep drainages clear of debris, and to promote rapid drainage. EFED believes that the risk to birds from these uses would be substantially lower than that from the rights-of-way use.

Boric acid is relatively nontoxic to honeybees; therefore, the risk to beneficial insects from granular material is considered to be of minimal concern.

Aquatic Residues and Risks

The calculations used in attachment 1 are worst case estimated environmental concentrations (EECs) expected to be found in 6-foot water bodies resulting from ground and aerial equipment application and subsequent runoff from sites treated at the rates indicated below. Aerial application drift EECs are not considered here because granular products are not expected to drift away from target sites. The rates and EECs are indicated below.

0.54 lbs ai/A - 0.016 ppm

1.0 lbs ai/A - 0.030 ppm

169 lbs ai/A - 5.1 ppm

1272 lbs ai/A - 39ppm

4757 lbs ai/A - 145 ppm

Risk to fish are expected to be low or minimal because because the EECs are far below one half the acute LC50 values (> 510 ppm) for previously referenced freshwater fish. The actual exposure to a one acre 6 foot pond from right-of-ways is most likely to be even lower than the estimate provided above because any runoff from treated sites will originate from a long, narrow strip of land (i.e, railroad tracks, power lines) treated with the pesticide.

Aquatic invertebrates are not expected to be at risk from most of the outdoor use patterns because the EECs are also far below previously referenced acute and chronic values for aquatic invertebrates. However, the rights-of-ways, airports/landing fields and drainage systems uses are an exception. Aquatic invertebrates may be subjected to acute risk if the supplemental data are considered. Two public literature studies have indicated that boric acid is practically nontoxic to aquatic invertebrates at 133 and 226 ppm, and chronic data indicate the MATC of >6 <13 ppm. The aquatic EECs of 145 ppm (rights-of-way) would be in the range

of possible acute effects and certainly would exceed the MATC. However, the same mitigating factors previously discussed for fish apply to aquatic invertebrates. As a result, EFED does not believe that the use of boric acid will result in unreasonable adverse effects to aquatic invertebrates.

At the present time, EFED does not conduct quantitative risk assessments for nontarget organisms for indoor uses without effluent. Effluent discharge uses are usually subject to the NPDES (National Pollution Discharge Elimination System) permitting process via the Office of Water. Currently, discharged biocides are receiving joint program address by the Office of Water and the Office of Pesticide Programs. The acute risks from the use of such patterns, such as boric acid's industrial or agricultural drainage discharge uses are based on the residue levels in waters receiving effluent from a facility using the pesticide. If the receiving water's residues exceed 1/2 the EC50 or LC50 for invertebrates (66.5 ppm) or fish (550 ppm), respectively, nonendangered organisms will be at risk.

IV. ENDANGERED SPECIES

The noncrop herbicidal use of the chemical may presumably affect listed endangered plants. Attachment 2 is a nationwide listing of all endangered plant species listed by the US Fish and Wildlife Service. At the present time EPA is working with the US Fish and Wildlife Service and other federal and state agencies to develop a program to avoid jeopardizing the continued existence of the identified species by the use of pesticides. When this program goes into effect endangered species precautionary labeling will be required.

Where boric acid's industrial or agricultural drainage discharge concerns endangered species, the acute risk for the use of this pesticide is based on the residue levels in water receiving effluent from a facility using the pesticide. If the receiving water's residue levels exceed 1/20 the EC50 or LC50 of invertebrates (6.65 ppm) or fish (55 ppm), respectively, endangered organisms will be subject to acute risk.

V. LABELING

1. Manufacturing Use

"Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or public waters unless this product is specifically identified and addressed in a NPDES permit. Do not discharge effluent containing this product to sewage systems without previously notifying the sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of

the EPA."

2. End-use

a) Terrestrial food & feed

"Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high-water mark. Do not contaminate water when disposing of equipment washwaters or rinsate."

b) Terrestrial non-crop

"Do not contaminate water when disposing of equipment washwaters or rinsate."

c) Indoor uses with effluents

Same language as for the manufacturing use.

d) Indoor uses without effluents

No precautionary labelling is prescribed at this time.

VI. DATA REQUIREMENTS

There exists a data gap for plant phytotoxicity studies. The herbicidal uses justify the necessity of requiring such studies in order to further assess the risks to endangered plant species. An additional justification for such studies is based upon the public literature information citing the phytotoxicity hazards of boron to commercially important plants. The following studies are required:

123-1(a) Seed germination\seedling emergence
123-1(b) Vegetative vigor
123-2 Aquatic plant growth with Lemna gibba, Skeletonema costatum, Anabaena flosaquae, and a freshwater diatom (Navicula).

ATTACHMENT 1 - BORIC ACID EEC CALCULATION SHEET

I. For Unincorporated ground application

A. runoff - orchards, golf courses, recreation areas, agricultural crops/soils and agricultural uncultivated areas.

0.54 lbs x 0.05 (5 % runoff) x 10 (A) (from 10 A. drainage basin) = 0.27 lb. (tot. runoff)

EEC of 1 lb a.i. direct application to 1 A. pond 6-foot deep = 61 ppb Therefore, EEC = 61 ppb x 0.27 (lb) = 16.47 ppb

B. runoff - fire ant control

1.0 lbs x 0.05 (5 % runoff) x 10 (A) (from 10 A. drainage basin) = 0.5 lb. (tot. runoff)

EEC of 1 lb a.i. direct application to 1 A. pond 6-foot deep = 61 ppb Therefore, EEC = 61 ppb x 0.5 (lb) = 30.5 ppb

C. runoff - nonagricultural areas/soils

169 lbs x 0.05 (5 % runoff) x 10 (A) (from 10 A. drainage basin) = 84.5 lb. (tot. runoff)

EEC of 1 lb a.i. direct application to 1 A. pond 6-foot deep = 61 ppb Therefore, EEC = 61 ppb x 84.5 (lb) = 5154.5 ppb or 5.1 ppm

D. runoff - nonagricultural areas/soils

4757 lbs x 0.05 (5 % runoff) x 10 (A) (from 10 A. drainage basin) = 2379 lb. (tot. runoff)

EEC of 1 lb a.i. direct application to 1 A. pond 6-foot deep = 61 ppb Therefore, EEC = 61 ppb x 2379 (lb) = 145119 ppb or 145 ppm

D. runoff - disodium octoborate tetrahydrate uses on airports/landing fields, and agricultural and industrial drainage systems.

1272 lbs x 0.05 (5 % runoff) x 10 (A) (from 10 A. drainage basin) = 636 lb. (tot. runoff)

EEC of 1 lb a.i. direct application to 1 A. pond 6-foot deep = 61 ppb Therefore, EEC = 61 ppb x 636 (lb) = 38796 ppb or 39 ppm.

ATTACHMENT 2

ENDANGERED/THREATENED INSECT SPECIES LISTED BY STATE

**ARKANSAS
PRAIRIE MOLE CRICKET

**CALIFORNIA
BAY CHECKEREDSPOT BUTTERFLY
VALLEY ELDERBERRY LONGHORN BEETLE
LANGE'S METALMARK BUTTERFLY
EL SEGUNDO BLUE BUTTERFLY
PALOS VERDES BLUE BUTTERFLY
MISSION BLUE BUTTERFLY
MYRTLE'S SILVERSPOT BUTTERFLY
LOTIS BLUE BUTTERFLY
SMITH'S BLUE BUTTERFLY
DELHI SANDS FLOWER-LOVING FLY
SAN BRUNO ELFIN BUTTERFLY
DELTA GREEN GROUND BEETLE

**COLORADO
UNCOMPAHGRE FRITILLARY BUTTERFLY
PAWNEE MONTANE SKIPPER

**CONNECTICUT
PURITAN TIGER BEETLE

**FLORIDA
SCHAUS SWALLOWTAIL BUTTERFLY

**KANSAS
PRAIRIE CRICKET MOLE

**MASSACHUSETTS
NORTHEASTERN BEACH TIGER BEETLE
PURITAN TIGER BEETLE

**MARYLAND
NORTHEASTERN BEACH TIGER BEETLE
PURITAN TIGER BEETLE

**MISSOURI
PRAIRIE MOLE CRICKET

**NEBRASKA
WESTERN PRAIRIE FRINGED ORCHID
BLOWOUT PENSTEMON

**NEVADA
ASH MEADOWS NAUCORID

**OKLAHOMA
PRAIRIE MOLE CRICKET
AMERICAN BURYING BEETLE

**OREGON
OREGON SILVERSPOT BUTTERFLY

**RHODE ISLAND
AMERICAN BURYING BEETLE

**VIRGINIA
NORTHEASTERN BEACH TIGER BEETLE

**WASHINGTON
OREGON SILVERSPOT BUTTERFLY

Date: 4/93
Case No: 0024
Chemical No: 11102 (Boric acid)

PHASE IV
DATA REQUIREMENTS FOR
ECOLOGICAL EFFECTS BRANCH

Data Requirements	Composition[1]	Use Pattern[2]	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
6 Basic Studies in Bold					
71-1(a) Acute Avian Oral, Quail/Duck	(TGAI)[3]	A,B,C,D,E,F,G,H,I,J, K,M	YES	NONE[4]	NO
71-1(b) Acute Avian Oral, Quail/Duck	(TEP)	-	-	-	-
71-2(a) Acute Avian Diet, Quail	(TGAI)	A,B,C,D,E,F,G,H,I,J, K,M	YES	254367	NO
71-2(b) Acute Avian Diet, Duck	(TGAI)	A,B,C,D,E,F,G,H,I,J, K,M	YES	254367	NO
71-3 Wild Mammal Toxicity	(TGAI)	-	-	-	-
71-4(a) Avian Reproduction Quail	(TGAI)	-	-	-	-
71-4(b) Avian Reproduction Duck	(TGAI)	-	-	-	-
71-5(a) Simulated Terrestrial Field Study	(TEP)	-	-	-	-
71-5(b) Actual Terrestrial Field Study	(TEP)	-	-	-	-
72-1(a) Acute Fish Toxicity Bluegill	(TGAI)	A,B,C,D,E,F,G,H,I,J, K,M	YES	405946-01	NO
72-1(b) Acute Fish Toxicity Bluegill	(TEP)	-	-	-	-
72-1(c) Acute Fish Toxicity Rainbow Trout	(TGAI)	A,B,C,D,E,F,G,H,I,J, K,M	YES	405946-02	NO
72-1(d) Acute Fish Toxicity Rainbow Trout	(TEP)	-	-	-	-
72-2(a) Acute Aquatic Invertebrate Toxicity	(TGAI)	A,B,C,D,E,F,G,H,I,J, K,M	YES	NONE	NO[5]

Date: 4/93
Case No: 0024
Chemical No: 11102 (Boric acid)

PHASE IV
DATA REQUIREMENTS FOR
ECOLOGICAL EFFECTS BRANCH

Data Requirements	Composition[1]	Use Pattern[2]	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
72-2(b) Acute Aquatic Invertebrate Toxicity	(TEP)	-	-	-	-
72-3(a) Acute Estu/Mari Tox Fish	(TGAI)	-	-	-	-
72-3(b) Acute Estu/Mari Tox Mollusk	(TGAI)	-	-	-	-
72-3(c) Acute Estu.Mari Tox Shrimp	(TGAI)	-	-	-	-
72-3(d) Acute Estu/Mari Tox Fish	(TEP)	-	-	-	-
72-3(e) Acute Estu/Mari Tox Mollusk	(TEP)	-	-	-	-
72-3(f) Acute Estu/Mari Tox Shrimp	(TEP)	-	-	-	-
72-4(a) Early Life-Stage Fish	(TGAI)	-	-	-	-
72-4(b) Live-Cycle Aquatic Invertebrate	(TGAI)	A,B,C,D,E,F,G,H,I,J, K,M	YES	NONE	NO[5]
72-5 Life-Cycle Fish	(TGAI)	-	-	-	-
72-6 Aquatic Org. Accumulation	(TGAI)	-	-	-	-
72-7(a) Simulated Aquatic Field Study	(TEP)	-	-	-	-
72-7(b) Actual Aquatic Field Study	(TEP)	-	-	-	-
122-1(a) Seed Germ./Seedling Emerg.	(TGAI)	-	-	-	-
122-1(b) Vegetative Vigor	(TGAI)	-	-	-	-
122-2 Aquatic Plant Growth	(TGAI)	-	-	-	-
123-1(a) Seed Germ./Seedling Emerg.	(TGAI)	A,B,C,D,E,F,G,H,I,J, K,M	NO	-	YES[6]

Date: 4/93
Case No: 0024
Chemical No: 11102 (Boric acid)

PHASE IV
DATA REQUIREMENTS FOR
ECOLOGICAL EFFECTS BRANCH

Data Requirements	Composition[1]	Use Pattern[2]	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
123-1(b) Vegetative Vigor	(TGAI)	A,B,C,D,E,F,G,H,I,J, K,M	NO	-	YES[6]
123-2 Aquatic Plant Growth	(TGAI)	A,B,C,D,E,F,G,H,I,J, K,M	NO	-	YES[6]
124-1 Terrestrial Field Study	(TEP)	-	-	-	-
124-2 Aquatic Field Study	(TEP)	-	-	-	-
141-1 Honey Bee Acute Contact	(TGAI)	-	-	-	-
141-2 Honey Bee Residue on Foliage	(TEP)	-	-	-	-
141-5 Field Test for Pollinators	(TEP)	-	-	-	-

1.Composition: TGAI = Technical grade of the active ingredient; PAIRA = Pure active ingredient, radiolabeled; TEP = Typical end-use product

2.Use Patterns: A = Terrestrial Food Crop; B = Terrestrial Feed Crop; C = Terrestrial Non-Food Crop; D = Aquatic Food Crop; E = Aquatic Non-Food Outdoor; F = Aquatic Non-Food Industrial; G = Aquatic Non-Food Residential; H = Greenhouse Food Crop; I = Greenhouse Non-Food Crop; J = Forestry; K = Outdoor Residential; L = Indoor Food; M = Indoor Non-Food; N = Indoor Medical; O = Indoor Residential; Z = Use Group for Site 00000

3. Study conducted with disodium octoborate tetrahydrate will satisfy reqirements for boric acid.

4. Study was submitted and reviewed before the MRID or EPA accession number tracking system went into effect.

5. Public scientific literature study results are being used as Supplemental data. Because of the reported low toxicity and the limited outdoor use patterns, no additional data will be required unless future use circumstances dictate otherwise.

6. RED package cited information concerning phytotoxicity effects to commercially important plants to boron. Also, these plant studies are needed to further assess potential for effects to listed endangered plant species.

Chemical Name: Boric acid

Chemical Code : Shaughnessy #011001

Uses: Control of roaches; flame retardant in cotton textile products; ointment and eye wash; intermediate chemical reagent.

DATA REQUIREMENTS FOR
ENVIRONMENTAL FATE

	Submitted Studies/ Addendums	DER/Addendum Review/Summary Identification	DER/Addendum Review/Summary Review Conclusions	Additional Data/Info Required?
DEGRADATION-LAB:				
161-1. Hydrolysis	pK_a = 9.1			Note (1)
Photodegradation:				
161-2. In Water	NA			"
161-3. On Soil	NA			"
161-4. In Air	NA			"
METABOLISM-LAB:				
162-1. Aerobic Soil	NA			"
162-2. Anaerobic Soil	NA			"
162-3. Anaerob. Aquat.	NA			"
MOBILITY:				
163-1. Leaching and Adsorp./Desorp.	NA			"
163-2. Volatil.(Lab)	NA			"
163-3. Volatil.(Field)	NA			"
DISSIPATION-FIELD:				
164-1. Terrestr.(Soil)	NA			"
164-2. Aquat.(Sediment)	NA			"
164-3. Forestry	NA			"
164-4. Combin./Tank Mix	NA			"
164-5. Long Term Terr.	NA			"
164-5. Long Term Aqua.	NA			"
ACCUMULATION STUDIES:				
165-1. Conf. Rot. Crops	NA			"
165-2. Field Rot. Crops	NA			"
165-3. Irrigated Crops	NA			"
165-4. Fish (Lab)	NA			"
165-5. Aqua. Non-target Organ.(Field)	NA			"

GROUNDWATER MONITORING:		
166-1. Small Prospect.	NA	"
166-2. Small Retrospect.	NA	"
166-3. Large Retrospect.	NA	"
SURFACE WATER MONITORING:		
167-1. Field Runoff	NA	"
167-2. Surface Water Monitoring	NA	"
SPRAY DRIFT:		
201-1. Droplet Spect.	NA	Note (1)
202-1. Field Spray Drift Evaluation	NA	"

Note (1). No outdoor uses are reported for this compound, therefore hydrolysis and other data requirements are not operative.