111601
SHAUGHNESSEY NO.

REVIEW NO.

EE BRANCH REVIEW

DATE: IN 11/28/84 OUT JAN 22 1985

FILE OR REG. NO. 707-174, 707-145

PETITION OR EXP. PERMIT NO.

DATE OF SUBMISSION 11/20/84

DATE RECEIVED BY HED 11/21/84

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RD ACTION CODE/TYPE OF REVIEW 325/Amendment

TYPE PRODUCT(S): I, D, H, F, N, R, S Herbicide

DATA ACCESSION NO(S).

PRODUCT MANAGER NO. R. Mountfort (23)

PRODUCT NAME(S) Goal 1.6E (707-174)

Goal 2E (707-145)

COMPANY NAME Rohm and Haas Company

SUBMISSION PURPOSE Proposed conditional registration of noncrop uses including levee banks

SHAUGHNESSEY NO.	CHEMICAL, & FORMULATION		% A.I.
111601	Oxyfluorfen	1.6E =	19.4%
		2E =	22.6%

EEB Review

Goal 1.6E and Goal 2E

100 Submission Purpose and Label Information

100.1 Submission Purpose and Pesticide Use

The registrant, Rohm and Haas, proposes to register Goal 1.6E and Goal 2E for use on non-crop areas including fence rows, storage yards, levee banks, roadsides, and farmsteads. The label specifically states use only on the side of levee away from water channels. An accompanying letter states that use on ditchbanks or waterways is specifically prohibited.

Goal is an herbicide.

100.2 Formulation Information

Goal 1.6E is 19.4% Oxyfluorfen.
Goal 2E is 22.6% Oxyfluorfen.

100.3 Application Methods, Directions, Rates

GENERAL INFORMATION

GOAL herbicide is effective as a postemergence and/or preemergence herbicide for the control of certain annual broadleaf weeds in non-crop areas including fence rows, storage yards, levee banks (use only on the side of levee away from water channels), roadsides, farmsteads and other similar non-crop locations.

The most effective postemergence weed control is achieved when GOAL herbicide is applied to seedling weeds at the recommended growth stage. For postemergence control of certain grassy and broadleaf weeds, a tank mix of GOAL herbicide with paraquat (Gramoxone^{R} or Ortho^{R} paraquat) or Roundup^{R} can be used.

Preemergence control is most effective when spray is applied to clean weed free soil surfaces. Treated soil surfaces should not be disturbed as the herbicidal effectiveness of GOAL may be decreased. Seedling weeds are controlled as they come in contact with the soil applied herbicide during emergence. For residual grass control in non-crop areas, a tank mixture of GOAL herbicide with Karmex or simazine can be used. Contact herbicides such as paraquat or Roundup may also be added to the tank mixture.

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DOSAGE

GOAL herbicide is recommended for postemergence and preemergence control of susceptible weed species. GOAL herbicide is recommended for postemergence control at 0.5 to 2.0 lb. active per broadcast acre. The lower rate is recommended for the control of susceptible seedling weeds in the early postemergence stage, up to the 6 leaf stage. For postemergence and preemergence control of susceptible weeds, GOAL herbicide is recommended at 2.0 lb. active per broadcast acre.

100.4 Target

Weeds

100.5 Precautionary Labeling

SPECIFIC USE RESTRICTIONS

The following specific use restrictions should be observed when GOAL herbicide is used alone or in any tank mix spray combination recommended on this label.

- Do not contaminate irrigation water or water used for domestic purposes.
- Do not use any plants treated with GOAL herbicide for feed or forage.
- Do not feed or allow animals to graze on any areas treated with GOAL herbicide.
- GOAL herbicide should be applied only by ground application equipment.
- Do not apply when weather conditions favor drift. Avoid drift to all non-target areas. GOAL herbicide is phytotoxic to plant foliage.
- Thoroughly flush spray equipment (tank, pump, hoses and boom) with clean water before and after each use. Residual GOAL herbicide remaining in spray equipment may damage other crops. To assist removal of GOAL herbicide residues in spray equipment, TRITON AG-98 or TRITON CS-7 may be added at the rate of one quart per 100 gallons of water during flushing.
- Do not rotate to any crops other than cotton, onions, soybeans, or spearmint/peppermint within a 10-month period after treatment.

- Use GOAL herbicide only for recommended purposes and at recommended rates.

- Do not treat ditchbanks or waterways with GOAL herbicide.

Presumably the "Environmental Hazards" statement that appears on the GOAL 1.6E and GOAL 2E label will be on the label for these uses.

> Do not apply directly to water. Do not contaminate water by cleaning of equipment or disposal of wastes.
>
> This product is highly toxic to aquatic invertebrates, aquatic plants, wildlife and fish. Use with care when applying in areas frequented by wildlife or adjacent to any body of water or wetland area. Do not apply when weather conditions favor drift or erosion from target areas.

101 Hazard Assessment

101.1 Discussion

This proposed registration, for noncrop areas, involves substantial acreage and use in essentially every state. Goal would be used in or adjacent to a variety of habitats.

The proposed use rate is 2 lbs. a.i. per acre on non-crop areas including fence rows, storage yards, levee banks, roadsides, and farmsteads. According to Thomas Rogerson (letter to Mr. Mountfort, Nov. 20, 1984), "Use on ditchbanks and waterways is specifically prohibited."

For preemergent treatment the label calls for application to clean weed-free soil surfaces. The treated soil should not be disturbed as this would decrease the herbicidal effectiveness.

One of the footnotes restricts application to a maximum of 2 lbs. a.i. per acre per season. It is not clear if this is for all target weeds or just the ones the footnote refers to.

101.2 Likelihood of Adverse Effects to Non-Target Organisms
Toxicity

Oxyfluorfen is practically non-toxic to mammals and waterfowl. However, it is highly toxic to bobwhite quail (LC50=390 ppm), and fish (bluegill LC50=200 ppb; rainbow trout LC50=410 ppb). It is moderately toxic to aquatic invertebrates (Daphnia magna LC50= 1.5 ppm). Oxyfluorfen is very highly toxic to shrimp (LC50=31.7 ppb). Fish MATC >38<74 ppb; no aquatic invertebrate chronic study results are available, this study is being requested. It is practically non-toxic to mammals. Oxyfluorfen did not affect avian reproduction in bobwhite quail or mallard ducks at 100 ppm.

Chemical Properties

Oxyfluorfen adsorbs strongly to soil and leaches very little. Its' halflife in soil is from 50-70 days. Oxyfluorfen bio-accumulates in fish at up to 3900X (viscera/bluegill) and 7000X (channel catfish). If goal gets into an aquatic habitat it will concentrate in the sediment rather than remain in the water column.

Exposure:

Terrestrial

At 2 lbs ai per acre, plant and other terrestrial food material would have the following residues in ppm:

Short Grass	Long Grass	Leafy Crops	Forage	Insects	Seed Pods	Fruit
480	220	250	116	116	24	14

These values are based on an in house nomograph developed from various published articles. These levels do not exceed the waterfowl LC_{50} (4000 ppm). However, the shortgrass residues do exceed the upland gamebird LC_{50} (390 ppm). Insects, forage, leafy crop, long grass and short grass residues exceed the highest level tested in the avian reproduction studies (100 ppm). Based on these estimated residues,if a bird as sensitive as the bobwhite quail fed on short grass treated with goal exclusively for 5 days, there is more than a 50% chance it would die. In otherwords, if a population of birds fed exclusively on treated short grass, more than 50% would be expected to die. This maximum potential hazard is lessened because:

1. The estimated residues on short grass are the maximum expected and do not take into account drift, which could reduce the initial residues.

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2. The residues may not remain at this level for 5 days. Rain and other natural conditions would reduce the residues.

3. Birds do not typically feed in one site for 5 days.

4. Upland birds would not feed exclusively on short grass; in fact, grass makes up a small percent of their diet.

If the residues on bird feed was below 100 ppm, it should have no acute or chronic effect on birds. The factors listed above could reduce the avian residual intake to below the equivalent of 100 ppm. Chronic exposure to level greater than 100 ppm is also unlikely because food items with high residues (grass) would not be edible very long (i.e. they would die and dry up) and other food items such as seed pods and fruit that would be edible longer would have lower residues.

Based on the above rationale, this proposed use should have minimal acute or chronic effects on birds.

Mammalian LD_{50}'s are greater than 5000 mg/kg. A 1 kg (2 lb) mammal would have to ingest all the goal applied to 250 $ft.^2$ to receive an LD_{50}.

* LD_{50} = 5000 mg/kg or 5 g/kg
* 2 lbs. ai = 908 g (per acre)
* 908 g/43560 ft^2 per acre = 0.02 g/ft^2
* 5 g per kg (LD_{50})/0.02 g/ft^2 (after treatment) = 250 ft^2 worth of applied chemical to equal an LD_{50} for a 1 kg (2 lb.) mammal.

Minimal acute adverse effects to mammals are expected as it is unlikely a 2 pound animal would consume the equivalent of 250 ft^2 of food material. Larger animals would have to consume proportionately more treated feed. No chronic mammalian toxicity data are available.

Aquatic

Direct application to water may occur inadvertently in spite of the label precaution. In that case, the residues could reach the following levels:

1468 ppb in 6 inches
734 ppb in 1 foot
245 ppb in 3 feet

These residues exceed the fish LC50 and the shrimp LC50. The residues in 6 inches approach the Daphnia magna LC50. Such direct application would cause acute effects to aquatic organisms. However, direct application would only occur occassionally and if it occurred in flowing water, these expected residues would be diluted and would have minimal effects. Even in standing water, the resulting residues would dissipate from the water column before chronic effects could occur.

If direct application does not occur, exposure to aquatic organisms may also occur via runoff and possibly drift. However, drift should be minimal since the label does not allow aerial application.

EEB has a runoff EEC for the application of 2 lbs a.i. per acre (see review 12, 6/30/81). According to the Exposure Assessment Branch calculation, the residues would be:

Water	Sediment
0.09 ppb	50 ppb

Further, a residue monitoring field study has been conducted to determine the fate of oxyfluorfen when applied to agricultural crops such as corn. (DER by D. Rieder, 6/13/84, Acc# 246782). The study was validated as supplemental because substantial data were lacking from the report. However, it is possible to use some of the results in this hazard assessment. Six different sites across the country were treated and samples were taken from runoff, adjacent pond water, and pond sediment. Of the samples taken none had measurable residues in pond water (minimum measurable concentration not specified). Three sites had measurable residues (>10 ppb) in pond sediment. Of those three, only one (site D-213) had consistent repeated measurements reflecting a substantial transport of goal from the field. It is not clear what the application rate was for that field site during the year of the sampling. If the rate was similar to the previous 4 years, it would have been about 1 lb. a.i. per acre. The maximum residue in the sediment was 690 ppb at the pond edge and 20 ppb in the pond middle.

Based on the above EEC's and field study discussion, it is not likely that oxyfluorfen will occur in the water column at levels high enough to have adverse acute or chronic effect on aquatic vertebrates (fish & amphibians) or aquatic invertebrates. Residue in moving water will dissipate rapidly reducing the amount of oxyfluorfen available to bind to the sediment at any one place.

Summary

In moving water, any residues of oxyfluorfen would dissipate rapidly causing no adverse effects.

Runoff is not expected to result in effects in the water column but could cause adverse acute and chronic effects to benthic organisms that are as sensitive as fish and shrimp.

The following groups of organisms would be exposed to contaminate sediments.

1. The unicellular organisms which feed on detritus, bacteria and other unicellular organisms. These in turn become food for higher animals.

2. The flatworms and roundworms. They creep over the bottom feeding on smaller organisms.

3. The rotifers, some of which are found in the sediment of shallow shore-zones and in the bottom deposits of deep water.

4. The segmented worms including the oligochaets and hirudinea. Some of these feed on detritus and others are carnivorous. These worms in turn become food for fish.

5. The Arthropods, Arachnids, Insects and Molluscs all have representatives which dwell in the sediment. Most are carnivorous, although some feed on detritus.

These benthic organisms consume detritus, alage and each other. They in turn become food for higher animals and man. They form an important part of the food web and disruption to these groups could results in disruption to the entire aquatic community.

The above discussion is based on toxicity data generated under laboratory conditions where goal was maintained in solution. There are no data available showing how toxic or non-toxic goal is when it is bound to sediment. Until such data are available it is assumed that goal could have an adverse effect on benthic organisms.

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It is also likely that bottom-feeding fish such as catfish would ingest sediment and detritus associated with goal residues. They could be exposed to levels greater than the fish LC_{50}'s mentioned earlier.

Since goal tends to bioaccumulate, the exposed organisms mentioned above could build up concentrations of oxyfluorfen. If these organisms are consumed by animals higher in the trophic system the chemical could bioconcentrate, with levels increasing at each higher trophic level.

Predators such as mosquito fish have died (within an average of 103 minutes) after eating one tubificid worm (Branchiura sowerbyi) which had been exposed to 4 ppm Endrin. In the same report, it noted that the tubificid had survived 72 hours exposure to 4 ppm endrin. (Naqvi, S. M. Z. 1973. Toxicity of Twenty-Three Insecticides to a Tubificid Worm Branchiura sowerbyi for the Mississippi Delta. In Journal of Economic Entomology., Vol 66, No. 1. February, 1973). This shows that insensitive benthic organisms may accumulate residues that are hazardous to organisms at a higher trophic level.

Further data is needed to fully assess this proposed use. Such data include:

1. A benthic organism bioassay result showing the acute toxicity of sediment bound oxyfluorfen.

2. A 21-day chronic aquatic invertebrate toxicity test, preferably with Daphnia magna.

3. Results of residue monitoring of water sediment and benthic organism following application of goal in a non-crop area.

101.3 Endangered Species Consideration

This proposed use of goal should have no adverse effects on endangered bird, mammal or reptile species either because of it's low toxicity to these groups or lack of exposure.

It is unlikely that the use of goal on non-crop areas would have an adverse effect on endangered aquatic species dwelling in flowing water (streams, rivers, estuaries). This excludes from concern all mussels, several fish and amphibians. The rationale is that moving water would:

1. dilute concentrations to below levels of concern; and

2. move "slug" of contaminated water out of endangered species habitat before any adverse effect could be realized.

The following endangered aquatic organisms dwell or breed in standing pools or small streams in which dilution may not reduce the levels enough to eliminate effects.

FISH

Species	States	Counties/distribution
Chub, Mohave tui	CA	Zzyzx Spring, San Bernadino C Pond on golf course on China Lake Naval Weap. Cntr.
Darter, Watercress	AL	Jefferson C; 3 populations -Roebuck spgs, -Thomas spgs, -Glenn spgs
Gambusia, Big Bend	TX	Big Bend N.P., Brewster C
Gambusia, Clear Creek	TX	Wilkinson Springs, Clear Creek Ranch, Menard C
Killifish, Pahrump	NV	Several populations Clark C, White Pine C
Pupfish, Owens River	CA	Owens Valley, Mono Inyo C
Pupfish, Warm Springs	NV	Devils Hole, Ash Meadows Nye C
Trout, Arizona (Apache)	AZ	Apache, Graham and Greenlee C
ISOPODS		
Socorro Isopod	NM	Socorro C 3 km west of city of Socorro
Hays Spring Amiphipod	Wash. D.C.	Rock Creek Park
AMPHIBIANS		
Houston toad	TX	Burlesun & Bastrop C.
Pine Barrens Treefrog	FL	Okaloosa C

There are numerous endangered plant species that have been included in a biological opinion from OES, FWS. This opionion was rendered in response to EEB's request for formal consultation for the use of "Oust Weed Killer™" on noncroplands including rights-of-way and ditch banks. It is dated June 30, 1983. The

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following list includes endangered plant species, state and county, and site(s) where exposure could occur.

Brady pincushion cactus - Arizona, Coconino County. Power line right-of-way; highway right-of-way.

Mesa Verde cactus - Colorado, Montezuma and Montrose Counties. New Mexico, San Juan County. Transmission line right-of-way; highway right-of-way.

Peeples Navajo cactus - Arizona County. Highway right-of-way.

Wright fishhook cactus - Utah, Emery and Wayne Counties. Powerline and Railroad right-of-way.

Kuenzler hedgehog cactus - New Mexico, Otero, Chaves, and Lincoln Counties. Highway right-of-way.

Lloyd's hedgehog cactus - Texas, Pecos County. Highway right-of-way.

Sneed pincushion cactus - New Mexico, Dona Ana County. Texas, El Paso County. In vicinity of highway.

Chapman rhododendron - Florida, Clay, Gulf, Gadsden, and Liberty Counties. Highway right-of-way and Railroad right-of-way.

Rydberg milk-vetch - Utah, Piute and Garfield Counties. Highway right-of-way.

Harper's beauty - Florida, Franklin and Liberty Counties. Highway right-of-way.

Dwarf bear-poppy - Utah, Washington County. Highway right-of way.

MacFarlane's four-o'clock - Idaho, Idaho County. Highway right-of-way.

Northern wild monkshood - Iowa, Allamakee, Clayton, and Jackson Counties. New York, Ulster County. Highway and powerline right-of-way.

Gypsum wild buckwheat - New Mexico, Eddy County. Highway-right-of-way adjacent to critical habitat.

Texas poppy-mallow - Texas, Runnels County. Highway right-of-way.

Hairy rattlweed - Georgia, Wayne and Brantley Counties. Highway and powerline right-of-way.

Malheur wire-lettuce - Oregon, Harney County. Highway right-of-way bordering critical habitat.

Phacelia - Utah County. Railroad right-of-way. Possible expansion of powerline right-of-way into habitat.

Bunched arrowhead- North Carolina, Henderson County. South Carolina, Greenville County. Railroad right-of-way, North Carolina. Powerline right-of-way, South Carolina.

Contra Costa wallflower and Antioch Dunes evening-primrose - California, Atchinson, Topeka, and the Santa Fe Railroad in northern Contra Costa County, from State Route 160 west to the city limits of Pittsburg, and powerline right-of-way within designated critical habitat.

Solano grass - California, Sacramento Northern Railroad line north of the Rio Vista Road in Solano County to the end of the line, and Southern Pacific Railroad northeast of the city limits of Fairfield and Travis Air Force Base to the Yolo County line. Also transmission Line right-of-way, natural gas pipeline and road right-of-way.

Salt marsh bird's beak - California, Railroad rights-of-way within estuarine systems from point Conception south to the Mexican border.

San Diego mesa mint - California, San Diego County. Railroad rights-of-way.

Uinta Basin hookless cactus - Colorada, Delta County. Between Delta and Grande Junction along the Denver Rio Grande Railroad.

Formal Section 7 consultation with the Office of Endangered Species, USFWS is necessary to determine what species would be jeopardized and the methods to avoid the hazard. It is important that endangered species be considered before goal is used on noncrop areas because of the particular susceptibility of the endangered plants mentioned above.

101.4 Adequacy of Toxicity Data

No new data were submitted with this registration action. The available data were adequate to suggest likelihood of adverse effects to aquatic organisms from this proposed use. Additional data are required to either quantity the effects or show that goal would have minimal effects on aquatic organisms when used on non-crop areas. See 103. Conclusions for specific data requirements.

101.5 Adequacy of Labeling

The "Environmental Hazards" statement that appears on the Goal 1.6E and Goal 2E labels would be adequate. The specific use restrictions listed in 100.5 above are required.

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103. Conclusion

EEB has completed an incremental risk assessment (3(c)(7) finding) of the proposed conditional registration of Goal 1.6 E and Goal 2E for use on noncropland areas. Based on the available data EEB concludes that the proposed use provides for:

1. Occassional acute effects to fish and aquatic invertebrates may occur.

2. A significant increase in exposure and acute and chronic effects to benthic organisms.

3. A may effect situation of several Federally listed endangered species. Formal consultation with OES, USFWS is being initiated.

The following data are required to more fully understand the effects of this proposed use. This information could also serve to show that goal would have minimal impacts to benthic organisms when used on non-crop areas.

1. An acute bioassay measuring the toxicity of sediment-bound oxyfluorfen. This should show whether sediment-bound oxyfluorfen is as toxic as oxyfluorfen in solution.

2. A 21-day chronic aquatic invertebrate toxicity test.

3. The missing information from the previously submitted study including:

    a. A full description of the sites including topographic maps and sketches showing treated area, routes of runoff, soil types and vegetation types;
    b. A description of the meterological conditions during application and sampling (wind speed and direction, rainfall, temperature, barametric readings and humidity);
    c. A description of the ponds sampled including sediment type, depth of water and volume;
    d. Application schedule including specific dates;
    e. Application rate at D-213 in 1981;
    f. Minimum detection level of oxyfluorfen in water and sediment; and
    g. Size in acres of treated fields.

These must be addressed for all 6 sites sampled.

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4. Residue monitoring at various sites representing different types of non-cropland. The residue studies must include sampling and analysis of receiving water, receiving sediment and benthic organisms. The registrant is strongly encouraged to contact EEB before initiating any field monitoring studies.

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