U. 4401

10/19 Oct/82

[Naled]

ECOLOGICAL EFFECTS

TOPICAL SUMMARIES

Effects on Birds

Sixteen studies (contained in three references) were received and evaluated under this topic. Three studies are acceptable for use in a hazard assessment, and 10 studies are not acceptable.

AUTHOR	FICHE I.D. NO.
Hill	00028757
Tucker	BAONALO1
DeWitt	GS092010

In order to establish the toxicity of naled to birds, the following tests are required using the technical grade: two subacute dietary studies on one species of waterfowl (preferably mallard duck) and one species of upland game bird (preferably bobwhite quail or ring-necked pheasant); and one avian single-dose oral study on one species (preferably mallard duck or bobwhite quail).

The acceptable acute oral toxicity study is listed below:

Species	% A.I.	LD_{50} (mg/kg)	Author	Date	ID#	Fulfills Guidelines Requirements?
Mallard	93%	52.2 (37.8-72.3)	Tucker	1970	BAONALO1	Yes
Canada Goose	93%	36.9 (27.2-50.0)	Tucker	1970	BAONALO1	Partial
Sharp-tailed Grouse	93%	64.9 (37.3-111)	Tucker	1970	BAONALO1	Partial

There is sufficient information to characterize naled as moderately to highly toxic to birds on an acute basis. The avian acute guideline requirement has been satisfied by the evaluated document.

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The acceptable subacute dietary toxicity studies are listed below:

Species	% A.I.	LC_{50} (ppm)	Author	Date	I.D.#	Fulfills Guidelines Requirements
Mallard	Tech.	2724 (1068-15089)	Hill	1975	00028757	Yes
Bobwhite Quail	Tech.	2117 (1502-2890)	Hill	1975	00028757	Yes
Ring-necked Pheasant	Tech.	2538 (2221-2896)	Hill	1975	00028757	Yes

There is sufficient information to characterize naled as slightly toxic to upland game birds and slightly toxic to waterfowl on a dietary basis. The avian subacute dietary guideline requirements have been satisfied by the evaluated document.

Precautionary Labeling: The toxicity demonstrated in the acute oral studies requires that naled labels bear the statement, "This product is toxic to wildlife".

Effects On Freshwater Invertebrates

Six studies (contained in six references) were received and evaluated under this topic. Two were acceptable for use in a hazard assessment.

AUTHOR	I.D. #
Frear	00002875
Wheeler	BAONALO2
Wheeler	BAONAL03
Ruber	00001327
Sanders	05009242
Sanders	05007538

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

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The acceptable acute toxicity data on the technical grade are listed below:

Species	% A.I.	LC_{50} (ppb)	Author	Date	I.D.#	Fulfill Guidelines Requirements
Daphnia magna	91.6	0.3 (0.2-0.4)	Wheeler	1978	BAONAL02	Yes
Gammarus lacustris (mature scud)	Tech.	160. (110-230)	Sanders	1969	05009242	Partial

There is sufficient information to characterize naled as very highly toxic to Daphnia. The guideline requirement for LC_{50} values for freshwater invertebrates has been satisfied.

Formulated Products: Testing of an end-use product is required when it will be introduced directly into an aquatic environment when used as directed. While naled labels for fogging swamps and marshes read, "Direct application to water is prohibited", the Agency considers that applying a pesticide above the water surface constitutes a direct application, regardless of how much material may eventually settle to the surface.

One test on formulated naled was received (BAONAL03). The 48-hour LC_{50} for Daphnia magna nymphs for Dibrom 14C was 0.0005 ppm naled (0.0003-0.0007). The formulated product does not appear to differ significantly from the technical product in its toxicity to Daphnia.

This test satisfies the requirement for determining the LC_{50} values on aquatic invertebrates for formulated products intended for aquatic uses.

Precautionary Labeling: The results of toxicity testing with Daphnia require that naled labels bear the statement, "This product is toxic to aquatic invertebrates."

Effects on Freshwater Fish

Thirteen studies (contained in thirteen reference) were received and evaluated under this topic. Four studies were considered acceptable for use in a hazard assessment and nine studies were not acceptable.

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AUTHOR	I.D.#
Westman	00074686
Westman	00074685
Schoenig	00074682
Cope	00074876
Perivoznikov	05003926
Marking	00064847
U.S.E.P.A.	BAONALO5
U.S.E.P.A.	BAONALO4
Mulla	00074874
Dean	GS092017
Chevron	00074882
Sacca	05003376
Macek	05003107

The minimum data required for establishing the acute toxicity of naled to fish are the results from two 96-hour studies with the technical grade. These studies should be performed on one coldwater species (preferably rainbow trout) and one warmwater species (preferably bluegill). One acceptable study has been received.

The 96-hr. LC_{50} for rainbow trout using technical naled at 12.7°C was 160 (150-170) ppb (Macek, ID#05003107).

Three tests on formulated naled were acceptable. The 96-hour LC_{50} value for rainbow trout exposed to Dibrom 8 (58% AI) was 0.215 (0.185-0.250) ppm (U.S.E.P.A. ID# BAONALO4). For bluegills, the LC_{50} for this formulation was 1.20 (1.0-1.4) ppm (U.S.E.P.A., ID# BAONALO5). For both feeding fry and fingerlings of the landlocked salmon, the 24-hour LC_{50} for Dibrom 14 (85% AI) was 0.165 ppm naled (Dean, ID# GS092017).

The results of these tests indicate that some formulated products of naled are moderately to highly toxic to fish.

While we have no acceptable test for technical naled on bluegills, this value can be approximated reasonably by comparing the data on technical and fomulated naled (58%) for rainbow trout with the data on 58% naled for bluegills. By simple proportionality, the approximate LC_{50} for technical naled on bluegills is 900 ppb naled. Thus, we can conclude that technical naled is highly toxic to both trout and bluegills.

There is sufficient information to characterize the toxicity of technical naled for freshwater fish. The guidelines requirements for LC_{50} values for freshwater fish have been satisfied for naled.

In a set of field studies (Chevron 1960 ID #00074882), either Gambusia affinis or various tropical fish were placed in cartons exposed to spray from an application of 0.1 lb ai/A Dibrom. About 40% of the spray material was estimated to reach the tops of the cartons. Mortality of exposed fish was comparable to that of controls.

Precautionary Labeling: Based on current information technical naled and on end-use products of 58 and 85% a.i., all labels should bear the statement, "This product is toxic to fish."

Effects on Estuarine and Marine Organisms

Eighteen studies (in fourteen references) were received and evaluated under this topic. None of the studies were accepatble for use in hazard assessment.

AUTHOR	I.D. #
Tripp	05000735
Chevron	00074684
Chevron	00074875
Haskin	BAONAL06
Zimmerman	00001321
Tyler	00074678
Frederick	00011488
Korn	05000819
Lesser	00073823
Kelley	00062358
Kelley	00074823
Favorite	00074877
Goode	00074679
Sasaki	05000833

§72-3 Acute toxicity test for estuarine and marine organisms.

(a) When required. Data on the acute toxicity of a pesticide to estuarine and marine organisms shall be submitted for registration of an end-use product intended for direct application to the estuarine or marine environment or expected to enter this environment in significant concentrations because of its expected use or mobility pattern. Since naled is used for mosquito control in coastal areas, drift is likely to contaminate marshlands and shallow estuaries; hence, tests on estuarine and marine organisms are necessary.

(1) Test substance. (i) Data should be derived from testing conducted with the technical grade of each active ingredient in the product.

(2) Test organisms and test duration. The 96-hour LC_{50} shall be determined for shrimp and an estuarine or marine fish. Also, the 48-hour EC_{50} for oyster embryo-larvae or 96-hour EC_{50} shell deposition data shall be determined on a representative mollusc, such as the American oyster.

Two studies (Haskin 1960 ID #BAONAL06 and Chevron 1966 ID #00074684 provide supplemental information on the toxicity of Naled to larval oysters. While neither of these studies was sufficiently consistent with standard methods to be acceptable, both suggest that the 48 hr LC_{50} value is about 3 ppm.

The available studies do not satisfy any of the guidline requirements and do not provide an adequate basis for assessing naled. Since naled is very highly toxic to Daphnia, it is essential to conduct the appropriate tests on estuarine organisms.

When available toxicity data coupled with anticipated environmental concentrations suggest that there may be a substantial risk to non-target organisms, appropriate field tests may be required. Since acceptable toxicity studies are not available, and since the Agency has no data which would enable it to predict the environmental concentrations that result from various methods of mosquito control, no assessment of risk to estuarine organisms can be made at this time and the possible need for field studies cannot be determined. Several field studies have been reviewed. Kelley (1969 ID #00074823) applied 4 oz and 6 oz Dibrom 14 per acre by air (spray characteristics unspecified) to a tidal marsh. Floating cages anchored in 5 feet of water contained either subadult white shrimp, juvenile blue crabs or killifish. The test organisms were transferred to the laboratory after one hour of exposure. Survival of treated and control crabs and killifish was high. Both treated and control shrimp suffered high mortality. In a comparable test (Kelley 1970 ID #00062358), low mortality (15-25%) was observed among treated shrimp and crabs exposed to 6 oz Dibrom/acre.

Good (1967 ID #00074679) examined a salt marsh area before and after aerial application of 0.6 oz/A of Dibrom 14 (ULV). The only observed mortality of aquatic organisms was four fingernail-size blue crabs at the edge of a shallow pool.

Lesser (1977 ID #00073823) confined test organisms in cages in a salt marsh treated with one oz Dibrom 14/acre. at 24 and 48 hrs after treatment, there was negligable treatment-related mortality to oysters, mussels, salt marsh snails, periwinkles, fiddler crabs, or spot fish. Under the conditions of the tests, these have not revealed substantial adverse effects on the organisms studied. While some of these tests may be regarded as supplemental, none met the general criteria for acceptable field tests.

ECOLOGICAL EFFECTS

Disciplinary Review

1. Ecological Effects Profile

A. Manufacturing Use

Valid laboratory acute studies (Tucker 1970, ID# BAONAL01) indicate that technical naled is moderately to highly toxic to birds. The acute oral LD_{50} ranges from 36.9 mg/kg for the Canada goose to 64.9 mg/kg for Sharp-tailed grouse. Results from dietary studies (Hill 1975, ID# 00028757), however, indicate slight subacute toxicity with values from 2117 ppm for the bobwhite quail to 2724 ppm for the mallard.

The valid studies of freshwater invertebrates indicate that technical naled is very highly toxic to Daphnia (Wheeler 1978, ID# BAONAL02) with a 48 hr. LC_{50} of 0.3 ppb. While mature scud (Sanders 1969, ID# 05009242) are more resistant, naled is still categorized as highly toxic with an LC_{50} of 160 ppb.

A valid study of freshwater fish indicates that technical naled is highly toxic to rainbow trout (Macek, 1969, ID#05003107) with a 96-hr. LC_{50} of 160 ppb. By using a proportionality between this value and that for 58% naled formulations (below) one can reasonably conclude that the LC_{50} of technical naled for bluegills is about 900 ppb naled. Thus, technical naled can be characterized as highly toxic to both rainbow trout and bluegills.

B. Formulated Products

Three tests on formulated naled were acceptable. The 96-hour LC_{50} values for rainbow trout and bluegill sunfish exposed to Dibrom 8 (58% AI) were 0.215 (0.185-0.250) ppm (U.S.E.P.A., ID# BAONAL04) and 1.20 (1.0-1.4) ppm (U.S.E.P.A., ID# BAONAL05), respectively. Both feeding fry and fingerlings of the landlocked salmon had 24-hour LC_{50}'s for Dibrom 14 (85% AI) of 0.165 ppm naled (Dean, ID# GS092017).

2. Ecological Hazard Assessment

A major consideration in assessing hazards from naled is its fate in the environment. In both aquatic and terrestrial situations, naled is rapidly debrominated to DDVP with a half-life of about 24 hr or less. Since DDVP appears to be somewhat more toxic than naled, (by factors by from 2 to 6 for birds and 5 for Daphnia; values for trout and bluegills are similar) the fate of DDVP is also relevant. Available information indicates that DDVP degrades rapidly and tests

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indicate that maximum DDVP concentrations are only a small fraction (3-10%) of the initial naled concentration. Since it seems likely that these reactions take place in subacute toxicity testing, there is no need to exercise special concern over the apparent higher toxicity of DDVP. Both compounds are moderately mobile in soil but the rapid rate of degradation makes substantial contamination by leaching unlikely. Similarly, bioaccumulation for both compounds in fish appear to be negligible (not detected for naled and about x 2 for DDVP, Pack 1976, I.D.# 00074643).

Currently, naled is registered for a wide variety of outdoor uses including foliar applications to tree, vegetable, field and forage crops for control of damaging insect infestations and for controlling flying pests (e.g, flies and mosquitoes) in areas occupied or utilized by humans and livestock as well as in adjacent areas such as swamps and marshes. Thus, there is a potential for substantial direct, acute exposure to both terrestial and aquatic nontarget organisms. Methods of application include dispersion as dusts, sprays, non-thermal mist, thermal fog and ULV fog. At present, naled concentrated in baits is for indoor uses.

For foliar treatment, maximum naled concentrations on wildlife food immediately after application would approximate 120 ppm per pound per acre. Since the dietary LC_{50} for birds is on the order of 2000 ppm, unreasonable adverse effects would be unlikely below a dose of 16 pounds per acre. It is noteworthy that the tolerance of 3 ppm for naled on leafy vegetables requires a pre-harvest interval from 1 to 4 days following an application of up to two lb/acre naled and it is not necessary to remove livestock in pastures with an application rate of 0.9 lb/acre EC.

Inhalation and dermal exposure to wildlife can be anticipated from fly and mosquito control operations. While the Agency has no accurate means to quantify such exposure to wildlife, it notes that naled is used to fog poultry houses and barns at rates comparable to outdoor thermal fogging (about 0.1 lb/A) without removal of chickens or livestock. Exposure in such confined situations is likely to be much higher than that experienced from a fog designed to provide a 10-second exposure in the field and risk to wildlife from current levels of use (up to 0.25 lb/A) would not be anticipated.

Current directions for controlling flying insects with naled involve a range of equipment, generated particle sizes and rates of application (0.01 to 0.25 lb/A). Since the intent is to keep the particles airborne long enough to expose the insects, it is unlikely that most of the material will be depositied on the ground/water surface of the target area. Where two or more adjacent swaths are treated, however, there will be a cumulative effect. At this time, the Agency does not know what

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fraction of the various types of treatment remain permanently airborne and therefore it cannot determine the maximum expected concentration of a direct (and cumulative indirect) application to water 6 inches deep. Thus, no risk assessment can be made. The LC_{50} for Daphnia (0.3 ppb) would be reached by an application of 0.0004 lb naled/A to the water. This is 4% of 0.01 lb/A and 0.02% of 0.25 lb/A. In the absence of data, such rates of deposition do not seem unreasonable and a risk to aquatic invertebrates from fogging wetlands is likely.

Were the maximum fogging rate (0.25 lb/A) of naled to enter the water, it would produce a concentration of 0.18 ppm. This approximates the LC_{50} for salmonids. While it is unlikely that the full application will reach the water, the margin of safety is unknown. Application rates of 0.02 lb/A or less are unlikely to provide a substantial risk to fish.

In the absence of valid data on estuarine and marine organisms, the above values from freshwater organisms can be employed on an interim basis.

3. Precautionary Labeling

A. Non-aquatic, outdoor uses

This pesticide is toxic to fish and wildlife. Do not apply directly to water or wetlands. Drift or runoff from treated areas may be hazardous to aquatic organisms in adjacent areas. Do not contaminate water by cleaning of equipment or disposal of waste.

B. Aquatic Uses (fogging of marshes and swamps)

This pesticide is toxic to fish and wildlife. Aquatic invertebrates, shrimp and crabs may be killed at recommended application rates. Consult your State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

C. Manufacturing use

This pesticide is toxic to fish and wildlife. Do not discharge into lakes, streams, ponds or public water unless in accordance with an NPDES permit. For guidance contact your Regional Office of the EPA.

4. Data gaps

Major data gaps for technical naled include appropriate studies for estuarine organisms (fish, shrimp and oyster).

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Naled

The following documents received only cursory review:

	ID #
Butler 1965	00049256
Butler ?	00048317
Chevron 1964	00074881
Haines 1960	00074878
USDA ?	00060869
Chevron 1960	00074875
Sanders 1966	05018394
Pillmore 1971	GS092015
Macek 1970	00062359
Coppage 1974	GS092013
Coppage 1975	GS092014
Lewallen 1962	GS092011
Schoettger 1974	05020767

IBT study not validated by lab audit.
Schoenig 1966 00074682

Generic Data Requirements for naled: Ecological Effects (See Chapter VIII)

(1) Guidelines Citation	(2) Name of Test	(3) Are Data Required?	(4) Compostion	(5) Does EPA have Data to Partially or Totally Satisfy This Requirement?	(6) Bibliographic Citation	(7) Most additional Data be submitted Under FIFRA 3(c)2(b)? Deficient studies must be submitted with 1 year of published Standard
71-1	Avian Single-Oral LD_{50}	Yes	Tech	Yes	Tucker (BAONAL01)	No
71-2	Avian Dietary LC_{50}	Yes	Tech	Yes	Hill (00028757)	No
71-3	Wild Mammal Toxicity	No				
71-4	Avian Reproduction	No				
71-5	Simulated and Actual Field Testing for Mammals & Birds	No				
72-1	Acute Toxicity to Freshwater Fish	a. Yes b. Yes	a. Tech b. Unique formulations[1]	a. Yes b. Partial	Macek (05003107) USEPA (BA0NA104, BA0NAL05)	a. No b. Yes

Generic Data Requirements for naled for naled: Ecological Effects (See Chapter VIII)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
72-2	Acute Toxicity to Freshwater Aquatic Invertebrates	a. Yes B. Yes	a. Tech b. Unique formulations[1]	a. Yes b. Partial	a. Wheeler (BAONAL02) b. Sanders (05009242	a. No b. Yes
72-3	Acute Toxicity to Estuarine & Marine Organisms	a. Yes b. yes	Tech b. Unique formulations[1]	No No		a. Yes[2] b. Yes
72-4	Fish Early Life-Stage or Aquatic invertebrate Life Cycle.	Reserved 3	Unique formulations[1]	No		No
72-5	Fish Life-Cycle	Reserved	Unique formulations[1]	No		No
72-6	Aquatic Organism Accumulation	No				

Generic Data Requirements for naled: Ecological Effects (See Chapter VIII)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
72-7	Simulated or Actual Field Testing for Aquatic Organisms	Reserved	Unique formulations[1]	No		No

Footnotes (1) For aquatic uses only.

(2) Testing is required for establishing the acute toxicity of the technical pesticide to estuarine/marine invertebrates when the end-use product is expected to enter the estuarine or marine environment in significant concentrations because of its use or mobility pattern. In the case of naled, it is used for mosqitoe control in estuarine marshes and swamps. Studies will include 48 hr oyster embryo-larvae or 96 hr. shell deposition, 96 hr. juvenile shrimp and 96 hr. estuarine fin fish (spot or pin fish).

(3) Testing is required for fish early life-stage and aquatic invertebrate life-cycle when an end use product is intended to be applied directly to water or expected to be transported to water from the intended use site and (among other criteria), as in the case of naled, if any LC_{50} value determined in testing required by Sec. 72-1, -2, or -3 is less than 1 mg/l. Studies may include mysid shrimp, Daphnia and brook trout. These data requirements are current as of July 1982. Refer to the guidance package for updated requirements.

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Naled Registration Standard - Nontarget Insects

Effects on Beneficial Insects

The following studies received full review under this topic:

Author	ID
Atkins et al.	00036935
Johansen	00037799
Johnansen and Eves	00060628
Johansen	05000837
Harris and Svec	05011163

Studies are outlined in Table 1.

Table 1. Toxicity studies on beneficial insects with naled.

pecies	Formulation	Results	Author	Date	MRID#
oney bee Apis mellifera)	Technical	LD_{50}=0.4800 micrograms per bee (highly toxic)	Atkins et al	1975	00036935
oney bee	Technical	solutions of .01% to 1.0% caused 79-100% mortality (highly toxic)	Harris and Svec	1969	0501163
oney bee lkali bee Nomia elanderi) eafcutter bee legachile otundata)	4 lb. E	At 1 lb. AI/A, 1-hr. residues highly toxic to all species. One-day residues rel. non-toxic to all species.	Johansen and Eves	1965	00060628
oney bee kali bee afcutter bee	8 lb. EC	At .5 lb AI/A, 3-hr residues low to mod. in tox. to honey bee (21% mort.) and alkali bee (30% mort.), highly toxic to leafcutter bee (100% mort.)	Johansen	1972	05000837
oney bee	20% WP, 8 lb/gal EC	Highly toxic residues, but residual toxicity is short-lived.	Johansen	1961	00037799

here is sufficient information to characterize naled as highly toxic to oney bees, when bees are exposed to direct application or to short-term less than 3 hr.) residues. Data indicate a rapid decrease in residual oxicity from 3-24 hours posttreatment.

here is sufficient information to characterize naled as highly toxic to eafcutter bees and moderately to highly toxic to alkali bees, when bees re exposed to short-term (less than 3 hr.) residues. Again, data indicate significant decrease in residual toxicity from 3-24 hours posttreatment.

here are presently no guidelines requirements for evaluating toxicity to ontarget insects.

Naled Registration Standard - Nontarget Insects

Effects on Nontarget Soil and Surface Invertebrates

The following studies received full review under this topic:.

Author	ID
Bartlett	05003978
Bartlett	05004148
Bartlett	05005640

Studies are outlined in Table 1.

Table 1. Toxicity studies on nontarget soil and surface invertebrates with naled.

Species	Formulation	Results	Author	Date	MRID#
Eleven species of parasitic wasps and predaceous beetles	8 lb/gal EC	At .50 lb AI/100 gal, toxicity ranged from non-toxic to highly toxic, depending on species tested.	Bartlett	1963	05003978
Predaceous mite (*Amblyseius hibisci*)	8 lb/gal EC	At .50 lb AI/100 gal., highly toxic	Bartlett	1964	05004148
Parasitic wasps (*Aphytis melinus*, *Metaphycus luteolus*) Predaceous beetles (*Lindorus lophanthae*, *Cryptolaemus montrouzieri*)	8 lb/gal EC	At 0.0477% Conc. in honey, zero to low tox. to all species. At 0.477% conc. in honey, zero to low tox. to beetles, high tox. to wasps	Bartlett	1966	05005640

Data indicate that toxicity of naled to parasitic wasps and predaceous beetles is highly variable, depending on species tested, concentration of toxicant, etc. In one study, naled tested highly toxic to a predaceous mite.

There are presently no guidelines requirements for evaluating toxicity to non-target insects.

Jaled Registration Standard - Nontarget Insects

The following studies received abbreviated reviews:

Author	ID
Amer. Cyanamid Co.	00001378
Rhone-Poulenc, Inc.	00006660
Chipman Chem. Co.	00006661
Atkins et al.	00037798
Univ. of Calif.	00049252
Atkins and Anderson	00049254
Anderson and Atkins	00060631
Atkins and Anderson	00060633
Univ. of Calif.	00061021
Atkins et al.	00066220
Harris and Svec	00078515
Womeldorf et al.	05000820
Bartlett	05009955
Caron	GS092016

aled Registration Standard - Nontarget Insects

tatements for Disciplinary Review

ffects of naled on beneficial insects

aled was shown to be highly toxic to honey bees (Atkins et al. 1975, arris and Svec 1969, Johansen 1961, and Johansen and Eves 1965) and lfalfa leafcutter bees (Johansen 1972, Johansen and Eves 1965) when ees were exposed to direct treatment or to short-term (less than 3 hr.) esidues. Short-term residues were moderately to highly toxic to alkali ees (Johansen 1972, Johansen and Eves 1965).

n all of the above studies which dealt with residues (Johansen 1961, 1972, ohansen and Eves 1965), data indicated a significant decrease in residual oxicity from 3 to 24 hours posttreatment.

ffects of naled on nontarget soil and surface invertebrates.

n laboratory studies, toxicity of naled to parasitic wasps and predaceous eetles was highly variable, depending on test species and concentration of oxicant. (Bartlett 1963, 1966.) No general statement can be made at this me.

n one laboratory study, naled was highly toxic to a predaceous mite, Amblyseius bisci (Bartlett 1964.)