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FOREST SERVICE

REGION 10

DEPARTMENT OF AGRICULTURE

REGIONAL OFFICE

ALASKA

U.S.D.A. Forest Service Environmental Analysis Report

on the Use of Antimycin to Rehabilitate Lakes and Streams

Prepared by _____ Date 10/17/73
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Recommended by _____ Date 1/30/74

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Approved by _____ Date 2/14/74
Regional Forester

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U.S.D.A. FOREST SERVICE ENVIRONMENTAL ANALYSIS

REPORT ON THE USE OF ANTIMYCIN TO REHABILITATE LAKES AND STREAMS

Summary Sheet

I. Brief Description of the Action

As part of the Alaska Department of Fish and Game recreation and commercial fish enhancement program, it is sometimes necessary for a chemical to be applied to lakes and streams within National Forest boundaries of the Alaska Region. The primary objective of chemical rehabilitation is to reduce the numbers of undesirable fish or to eliminate them entirely in order that more desirable species of game or commercial fish may become established. Rehabilitation may involve the use of substances which are harmful to humans and other animal life under certain circumstances. One toxicant that may be used is antimycin, which is not considered a serious water pollutant. Antimycin breaks down rapidly and chronic effects are not likely. It is an organic chemical registered for fish control and other aquatic use and is approved for use in waterways by the Food and Drug Administration, the Public Health Service, Department of Interior and Department of Agriculture (Threiner, 1972; Lennon and Berger, 1970).

In order to establish fish stocks, it is usually necessary from a management standpoint to prohibit fishing for a time. Thus it is obvious that timing of projects is a problem of mutual concern to the Forest Service and the State.

II. Summary of Environmental Impact and Adverse Environmental Effects

Removal of predator and/or competitor species of fish usually results in enhanced production of more desirable species. The main impact is on the target fish and other organisms in the treated waters.

III. List of Alternatives Considered

1. Do not rehabilitate.

2. Use fish toxicants other than antimycin.

3. Use biological controls - such as introduction of predator species.

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IV. Significant Environmental Impact Yes ( ) No (X)

Based upon the contents of this Environmental Analysis, an Environmental Statement will not be needed for the use of Antimycin as a fish toxicant on a Region-wide basis. For each specific project, however, an Environmental Analysis will be prepared, emphasizing the effect of lake and/or stream rehabilitation on the local economy, effects on wildlife in the area and other factors.

U.S.D.A. FOREST SERVICE ENVIRONMENTAL ANALYSIS

REPORT ON THE USE OF ANTIMYCIN TO REHABILITATE LAKES AND STREAMS

I. Description

This Environmental Analysis identifies and evaluates effects of the use of antimycin to destroy undesirable fish populations so that the lake or stream can be planted with a more desirable species. Antimycin will usually be applied in the fall by hand, from helicopter, boats or with a backpack pump, in controlled concentrations. In a short period of time, waters are nontoxic so that more desired stocks can flourish.

The reason for use is to remove predator or competitor species such as stickleback, lake chub, whitefish and suckers, so that waters will produce more salmon, trout, Dolly Varden or grayling.

General information on antimycin follows:

A. Common Name

Fintrol-5, Fintrol-15, Fintrol-30, (Dry Formulations), Fintrol Concentrate (liquid); Antimycin, Antimycin A

B. Chemical Name

Oligomycin A, $C_{45}H_{74}O_{11}$; Oligomycin B, $C_{45}H_{72}O_{12}$.

The empirical formula is $C_{28}H_{40}N_2O_9$.

Lockwood, Leven, and Keitt (1954) described antimycin as a chemical complex made up of several active fractions which they identified from paper chromatograms as A_1, A_2, A_3 and A_4 according to increasing RF values. Liu and Strong (1959) determined that one or more of these RF values were represented in Antimycin A-102, blastmycin and virosin, and they investigated them. Dickie, Loomans, Farley and Strong (1959) established that the fractions differ only in the alkyl side chain. The Antimycin A_1 and A_4 fractions are probably isomeric with R = N-hexyl, and calculations of the elemental composition indicate that the empirical formula is $C_8H_{40}N_2O_9$. The A_2 and A_3 isomers bear the n-butyl side chain, and the empirical formula is perhaps $C_{26}H_{36}N_2O_9$.

C. Registered Uses

This organic chemical is registered for fish control and other aquatic use. It is approved for use in waterways by the Food and Drug Administration, the Public Health Service, the Department of Interior and the Department of Agriculture. (Threiner, 1972; Lennon and Berger, 1970)

D. Formulation(s) Manufactured

Fintrol (trade name) occurs in both liquid and dry crystalline forms. Fintrol is also coated on 40 mesh sand with Carbo was with one percent Antimycin. 400 grams of Fintrol-5 will contain 1 gram active chemical.

E. Dilution of Formulations for Use

Extremely small quantities (five to ten parts per billion (ppb) of active ingredient) are effective for most species of fish.

F. Rate and Method of Application

Five to ten ppb depending on species and applied by hand or by mechanical spreaders and spray apparatus.

G. Tolerances in Food or Feed and Other Safety Limitations

Lennon et al (1970) recommended that treated waters must not be used for drinking by man or animals, or for crop irrigation, until fingerling rainbow trout or bluegill survive 48 hours exposure in livecars. Pending further study, fish killed with Antimycin should not be consumed by man or animals. Safeguards will be taken to prevent consumption by man.

H. Manufacturer or Producer

Ayerst Laboratories, New York, New York

I. Physical-Chemical Properties

Biodegradation occurs rapidly in the water. Complete biodegradation usually occurs in 48 to 168 hours, depending on variable factors such as pH, light, and temperature. Generally, fish are more susceptible to Antimycin at warmer temperatures, ~~higher~~ LOWER pH values, and softer waters.

Lower Ph values

Lennon et al (1970) reports that the shelf life of liquid acetone-antimycin in stock solutions is stable in cool dark storage, whereas the same formulations of dry pellets are good if kept in a cool, dry place. Exposure to high heat (200°C for 60 minutes) was found to be nontoxic.

Antimycin can be detoxified by using potassium permanganate ($KMnO_4$).

Physical-chemical properties of antimycin crystals:

1. Melting point 149°-150°C

2. Insoluble in water

3. Freely soluble in acetone, alcohol, chloroform, and ether

4. Very slightly soluble in benezene, petroleum ether, and carbon tetrachloride.

J. Effectiveness for Intended Purpose When Used as Directed

Antimycin A is relatively non-toxic to invertebrates or higher forms of life (such as bears and eagles) at the low concentrations used (Derse and Strong, 1963; Walker et al 1964; Herr, Greselin and Chappel, 1967; Vezina, 1967; Berger et al 1969; Finucan, 1969; Gilderhus et al 1969). Various formulations of Antimycin A, under the trade name Fintrol, have been used to selectively control various fish species (Walker et al 1964; Powers and Schneberger, 1967; Radonski, 1967; Vezina, 1967; Berger, 1969; Burress and Luhning, 1969a and 1969b). Antimycin is an effective fish toxicant because:

1. It is irreversibly toxic to most species of fish after short exposure to extremely low concentrations.

2. It is toxic to all fish life stages from egg to adult over a broad range of temperature and water hardness.

3. It degrades rapidly, especially in water with high pH or may be instantly detoxified by using potassium permanganate at concentrations of 1.0 ppb or less.

4. It does not repel fish as rotenone does and can be formulated for distribution in a manner that is selectively toxic to many species of fish.

5. Its pattern of selectivity provides great potential for selective control or eradication of many species of fishes in both fresh and salt water.

6. It can be applied easily to flowing or static waters and requires extremely small quantities of material to effect partial control or complete eradication.

7. Antimycin may be used in combination with rotenone to complete a fish eradication program.

Antimycin A has some general disadvantages:

1. It degrades very rapidly at high pH's, which requires knowledge of the water chemistry and careful calculations for effective use. Concentrations greater than 10 ppb are required in water above pH 8.5.

2. Present labeled restrictions do not allow human consumption of affected fish.

3. Concentrations required for a lethal dose affect some aquatic invertebrates such as rotifers, cladocerans and copepods for a period of time.

4. Cost of using is relatively high.

Walker et al (1964) exposed many species of fish to concentrations of Antimycin A, ranging from 0.01 to 120 ppb. Carp proved vulnerable to small concentrations and short exposure at cool and warm temperatures. Other fishes, which are often undesirable, were killed also. Those included white suckers, green sunfish and pumpkinseeds. Tests were conducted in the laboratory and in the field. Sensitivity to Antimycin A varied among species. Sensitivity was correlated with water temperature and duration of exposures. Laboratory tests at 12°, 17° and 22°C indicated smaller quantities of toxicant or shorter exposures produced kills of fish in warmer waters. Three general degrees of sensitivity were detected among the 24 species used in outdoor tests. Indicative of extremes in response, gizzard shad perished at 0.04 ppb under similar other conditions. There also appeared to be a tendency for sensitivities to follow family lines. Species within the nine families tested exhibited variations in susceptibility as follows:

Most Sensitive	Intermediate Sensitivity	Least Sensitive
Trout (salmonids)	Pike	Freshwater catfish
Perch	Sunfish	Gars
Herring	Suckers	Bowfins
	Minnows and Carps (except goldfish)	Goldfish

Vezina (1966) reported on Antimycin A's effectiveness in killing fish eggs. Laboratory tests with goldfish eggs resulted in 96.1 percent mortality of 48 hour old eggs exposed for four days at 17°C to 2.5 ppb Antimycin A.

Work conducted by McHenry, (1969) on three spine stickleback, Gasterosteus aculeatus, in Bear Lake, Seward, Alaska showed that concentrations of 7.0 ppb Antimycin A was required for a

total kill at water temperatures ranging from 40°-45°F. Ayerst Laboratories recommend that an additional 0.25 to 0.5 ppb be added to a minimum lethal concentration. This would indicate that a 7.25-7.50 ppb concentration level was used to eradicate all fish in Bear Lake.

Antimycin A is recognized as a precision tool in fish management. Its effect on fish is species-dependent. Its concentration in water must be precisely controlled, if advantage of selective properties is to occur. For instance, Antimycin A is lethal to carp at a concentration which does not affect large-mouth bass. Also Antimycin A can be applied to shallow waters only, where a fish population is spawning, or to an entire body of water to kill all fish.

Often Antimycin A may appear more costly than other fish toxicants in some total-lake treatments. The easy formulations of Antimycin contribute to economy and safety in application. The non-repellancy and irreversible action of Antimycin A yields better control of target fish. In many situations, Antimycin A may be applied only to that stratum of a lake, such as the upper epilimnion, which contains the target fish. Thus, the expense and time of treating an entire body of water can be avoided. Variable formulations of Antimycin A make this flexibility possible. For instance, Fintrol-5 consists of Antimycin coated on sand grains in such a way as to release the toxicant evenly in the first five feet of depth as the sand sinks. Another formulation (Fintrol-15) is available that releases the toxicant evenly in the first 15 feet of depth.

K. Translocation with Plant or Animal Treated.

Strong (1956) reported that Antimycin is a powerful and highly selective inhibitor of electron transport in oxidative phosphorylation systems. The exact mechanism by which the toxic effect is exerted on fish is not known (Vezina, 1966). Since Antimycin is extremely effective as an inhibitor of electron transport, Derse et al (1963) speculated that Antimycin is absorbed into the gills and interferes with respiration of fish.

Antimycin A-sensitive organisms are generally endowed with a respiratory system based on the activity of cytochromes. These respiratory systems are inhibited by Antimycin A. Herr et al (1967) reported that it was evident some mechanism of toxicity differing from that in mammals must be found to explain the extremely high immersion toxicity ot Antimycin for goldfish. The toxicity of Antimycin to goldfish (LD_{50}) is over 200 times less than that which would produce death if given intra-peritoneally

to a single fish. The extreme toxicity of Antimycin for fish by immersion with oral or intra-peritoneal routes suggested that some mechanism other than a direct toxic effect to organ systems mediated via high circulating drug levels was involved in the sensitivity. Loeb (1964) reported a marked difference between peroral and immersion toxicity of Antimycin to carp. Herr et al (1967) also reported Antimycin was much less toxic when given intra-peritoneally than when fish were exposed by immersion. Herr et al (1967) concluded that a mechanism involving absorption did not appear plausible, unless Antimycin administered intra-peritoneally was degraded so rapidly that effective toxic concentrations were not readily obtained via the circulatory system. It appears then that interference of oxygen transfer directly at the gill surface cells explains the high immersion toxicity.

L. Persistence in Soil, Water or Plants

Antimycin degrades rapidly in water, usually within a few days or sooner in water with high pH. When necessary, it can be detoxified in water by adding potassium permanganate (Berger et al 1969; and Gilderhus, 1969). Antimycin is susceptible to alkaline degradation as indicated previously. Hydrolytic cleavage occurs at the lactone carbonyl sites on the cyclic diester and leads to the formation of antimycic acid or blastmycin and the neutral fragment (Tener et al 1953; Liu et al 1960; Van Tamelen et al 1961; and Walker et al 1964). The degradation is rapid in water, and detoxification of 10 ppb is accomplished within 7 days according to Derse and Strong (1963). Degradation is accelerated in the presence of light, high alkalinity, and warm temperatures.

II. Environmental Impacts

Under the normal rate of application of antimycin, very little if any environmental impact would be expected.

A. Safety Data

The Sport Fishing Institute (1972) reports that in the concentrations that Antimycin is employed for carp control, it has been demonstrated that little harm will befall insects, insects' larvae and eggs, plankton, frogs, crayfish, snails, salamanders, turtles, birds, and various other aquatic and semiaquatic forms of life (one to five ppb). Antimycin is selectively toxic to fish and fish eggs, breaks down rapidly upon exposure to water and its degradation products are nontoxic. Antimycin has been approved as safe to use in waterways by the Food and Drug Administration, the Public Health Service, the Department of the Interior, and the Department of Agriculture. In certain commercial formulations, this biological extract has been registered by the Environmental Protection Agency for use as a fish toxicant.

Safety glasses and protective gloves should be worn when applying by hand or mechanical spreader.

Seaman, Norton and Devaney (1969) report that extensive feeding trials of Antimycin-killed fish to laboratory animals have failed to show any toxic effects. One of the problems associated with this is that no analytical method of detecting the small residues has been developed. In addition, there is yet to be established a feeding level of Antimycin-exposed fish which will produce pathological effects in mammals. The residue studies with tritium-tagged antimycin and the toxicological studies conducted by Ayerst Laboratories have not been able to satisfy the data requirements of the Department of Agriculture and the Food and Drug Administration.

B. Phytotoxicity

Derse and Strong (1963) related that Antimycin was toxic to yeasts and other fungi. Walker et al (1964) found that Antimycin did not significantly affect plankton in wading pools and hatchery ponds. There was no gross evidence of toxicity to filamentous algae, submergent or emergent aquatic plants.

C. Effects on Non-Target Organisms

Generally, antimycin appears to be one of the safest and most carefully researched nonpersistent, limited spectrum fish toxicants ever developed. The primary target has been carp. Tests indicate that it is selectively toxic to fish and fish eggs.

Antimycin breaks down very rapidly upon exposure to water and its degradation products are nontoxic. At the concentrations listed for carp control, it has little effect on insects, insects' larvae and eggs, plankton, frogs, crayfish, snails, salamanders, turtles, birds, and various other aquatic and semiaquatic forms of life, Walker et al (1964) reports. For example:

Damselfly nymphs were relatively tolerant to Antimycin. At 12°C all specimens survived at 100 and 50 ppb for 24 hours and 48 hours, respectively.

Tiger salamanders survived at 80 ppb at 12°C for 96 hours.

Bullfrog tadpoles survived at 20 ppb at 12°C for 24 hours.

Daphnia were killed at a concentration of 10 ppb in 24 hours at 54°F.

Methods employed in reaching the above evaluations were largely standard static and flowing bioassay techniques in environmentally controlled laboratory or outdoor pool situations. The great majority of tests were made for standard 24, 48, and 96 hour median tolerance conditions at 12° and 20°C. Some tests, particularly outdoor pool and flowing water raceway situations, were for standardized results. Highlights of the summarized range of data ranged from complete survival of damselfly numphs at 50 ppb for 48 hours and 20 ppb for bullfrog tadpoles for 24 hours in 12°C water to complete survival of tiger salamanders at less than 50 ppb for 96 hours at 12°C. Another significant invertebrate is represented by the intermediate sensitivity of Cambarus which survived 10 ppb for 96 hours at 12°C. Hatchery pond tests revealed either increases or no decreases in aquatic bottom fauna at 10 ppb for 96 hours at 12°C and 17°C. (Berger et al 1965; Walker et al 1964)

Herr et al (1967) reported Antimycin toxicology tests on terrestrial mammals. Included were data on residues of Antimycin A in tissues. Ritter and Strong (1966) studied residual levels of Antimycin A in fish tissues. Trout and carp were killed at Antimycin concentrations of 5 and 10 ppb. Whole body levels averaged 2 or 3 micrograms of Antimycin A per kilogram of fish. Carp contained two or three times more Antimycin A than did trout, probably because carp were more resistant and longer exposure was necessary. Edible portions ranged from 113 micrograms per kilogram in trout to 201 micrograms per kilogram in carp. From the tests, Ritter et al (1966) calculated that a normal 4 ounce serving of fish containing 201 micrograms of Antimycin, the highest average level for the edible portion found would provide 23 micrograms of Antimycin A or 0.33 micrograms per kilogram for a 70 kilogram man. This is an extremely small amount (Vezina, 1966).

D. Residues Entering Food Chain and Effects on Plants

Strong (1956) reports that Antimycin is rapidly destroyed in natural water and leaves no toxic residues. Additional studies may be needed to determine the exact role of Antimycin in the food chain.

E. Effects of Use of Antimycin in Alaska

1. Undesirable predator and competitor species of fish (also called rough or trash fish) would be replaced in a lake or stream system by fish that would furnish good angling. Rough fish that are killed will add to nutrients in the lake.

2. If commercially important species of fish were involved, increased production would benefit the economy and furnish needed protein.

F. There will be no environmental impacts from the use of Antimycin to rehabilitate lakes or streams in roadless areas that will adversely affect the wilderness characteristics of such areas. Only the species of fish will be changed.

III. Favorable Environmental Effects

A. Undesirable predator and competitor species of fish (also called rough or trash fish) would be replaced in a lake or stream system by fish that would furnish good angling. Rough fish that are killed will add to nutrients in the lake.

B. If commercially important species of fish were involved, increased production would benefit the economy and furnish needed protein.

IV. Adverse Environmental Effects Which Can Not Be Avoided

A. Antimycin is toxic to yeasts and other fungi.

B. It is possible that other than target aquatic organisms (fish) will be killed by Antimycin. This occurence is usually of short duration.

C. Although more studies are needed to gain more definite information on effects of Antimycin on the food chain and effects on plant eating animals, indications are that effects would not be significant.

V. Alternatives to the Proposed Action

A. Do not rehabilitate lakes and streams. There would be no change in the existing situation. The apparent desires of the public for better angling and ability to catch and eat food fish would not be fulfilled.

B. Use of other toxicants. With the exception of rotenone, most other fish toxicants are more toxic. Antimycin has much less of an effect on plankton than any other approved toxicant.

C. Introduce predator species to control the unwanted species. This is a practical alternative. ADF&G introduced 10-inch rainbows in a stickleback infested

lake in the Matanuska Valley. The rainbow thrived. Since, however, rearing trout to a large size before planting is expensive and there are as yet no facilities in Alaska for doing so, this is an approach for the future.

VI. Relationship Between Short Term Uses of Man's Environment and the Maintenance of Long Term Productivity

There is no short term or long term impact on the environment from the use of Antimycin to rehabilitate lakes or streams. Such rehabilitation does change the species composition of fish. Since sportsmen usually consider this change beneficial, the lake or streams could receive heavier fishing pressure than before rehabilitation. This would enhance the economic benefit to be derived from the system. An additional economic benefit would result from a commercial fish rehabilitation program.

VII. Irreversible, or Irretrievable Commitment Resources

None.

VIII. Consultation With Others

Antimycin has been used for rehabilitation of lakes and streams. Rarely is there opposition because such use is a benefit to the public. Antimycin has not been used in Alaska, except in a pilot study on the Kenai Peninsula.

ADF&G is required to make public contacts (local sportsmen and civic groups) before treatment.

IX. Management Requirements and Constraints

The Federal Interagency Working Group on Pesticides has furnished guidelines for the use of pesticides. Any use that will be applied to water or might be expected to get into water (Antimycin is such a use) requires Working Group review. All pesticide use proposals for the ensuing Fiscal Year will be submitted to the Washington Office by March 1, annually. Appendix A contains instructions to federal agencies. A demonstrated public need dictates when and where a project will be carried out. Use of fish toxicants by other agencies is closely coordinated with Forest Service recreation developments, if any.

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APPENDIX A

INSTRUCTION TO FEDERAL AGENCIES ON USE OF PESTICIDES

ANNUAL REVIEW OF PEST CONTROL PROGRAMS BY THE WORKING GROUP ON PESTICIDES

Instructions to Federal Agencies

BACKGROUND

The charter of the Working Group on Pesticides provides that the Working Group may request any federal agency to submit for review a detailed description of its proposed and current pest control programs. Such programs will be reviewed from the standpoint of safety and hazard to human health, to livestock and crops, to fish and wildlife and to other elements of the environment, as well as effectiveness and economic impact. Based on such review, the Working Group shall recommend to the heads of the departments or agencies concerned such modifications in the programs as it feels will best serve the public interest. In no case, however, will this advice supersede the responsibility of each department and agency to carry out the functions assigned to it by legislative and executive mandates.

To expedite such submittal and review of plans for the calendar year 1972, the following guidelines have been prepared.

REVIEW OF PLANNED PROGRAMS

Each federal agency should prepare a detailed description of all of its anticipated pest control programs or projects that fall into one or more of the following categories:

a. Usage of a pesticide that is not registered under the Federal Insecticide, Fungicide and Rodenticide Act for that particular purpose or in that particular way

b. Usage of any of the compounds listed in Appendix A, List of Pesticide Usages of Special Interest to the Working Group, except termite control and interior use, provided registered directions on labels are followed (Appendix A is not intended to preclude the use of a compound.)

c. Any pesticide that would be applied to water or could reasonably be expected to get into water

d. Any program or project in which 100 or more contiguous acres would be treated as one application

e. Use of pesticides on a federal installation when that usage is <u>not</u> directly supervised by, nor under the on-site responsibility of, a federal employee trained in the current safe and effective use of the pesticides involved

NOTE: Pest control conducted indoors (within or to buildings) is normally housekeeping-type pest control and is to be summarized on WGP Form No. 1. For example, repetition of the details of cockroach control for a number of locations may be avoided by one summarized listing on WGP Form No. 1, noting the number of locations. Pest control in food-handling areas and storage buildings shall not be considered indoor pest control in the above sense and must be reported in detail in each case, as for all other pest control, except when supervised by or under the on-site responsibility of a federal employee trained in current safe and effective use of the pesticides involved. Building fumigation shall not be considered indoor pest control.

This report should be prepared on WGP Form No. 1 (Rev. 71) in accordance with these instructions. (See sample.)

WGP Form No. 2 is a narrative justification and is to be used (as a supplement to Form No. 1) when the programs or projects fall into categories "a," "b" and "c" listed on page 1 of these instructions. This form may be used in any case in which the supplemental information might prove helpful. Use the Form No. 2 guide provided here as an outline for preparation of the narrative justification. This Form No. 2 should be attached to the Form No. 1 page which lists the project. A notation should be made under Remarks (column 9), Form No. 1, that a Form No. 2 is attached.

Twenty copies of both WGP Form No. 1 (Rev. 71) and the narrative WGP Form No. 2 (Rev. 71) (if used) should be submitted to the Working Group on Pesticides.

EMERGENCY PROGRAMS

If an unexpected outbreak of a pest requires control measures that were not anticipated in the annual program reviewed by the Working Group, then such a control effort is reviewed by the Working Group as an emergency measure.

In those cases in which the emergency measures were essentially identical to measures that were submitted and reviewed by the Working Group's most recent review, it is not necessary to resubmit it to the Working Group unless the control activities are in a geographically different area or fall into one or more of categories "a," "b" and "c" listed on page 1. Activities that fall into one of these categories or that are not essentially identical to measures that were reviewed by the Working Group at its most recent review, should be submitted to the Working Group on WGP Form No. 1 and WGP Form No. 2 (both revised 1971), in 20 copies. However, if time is important, the necessary information may be phoned to the Executive

Secretary of the Working Group; and he or his staff will obtain prompt review by telephone poll of members so that the submitting agency may have the recommendations of the Working Group before the activity is initiated.

In addition to review by the Working Group, as described above, an emergency program, in which any populated, nonfederally owned land is to be treated with pesticides by or in cooperation with a federal agency, should be reported to the Working Group for its information and records.

CAUTION

Precise information on dosage of pesticides is important. The amount of a given pesticide required to control a particular pest has been carefully determined. Variations in either direction may prove to be ineffective or may endanger plants, animals or humans. The directions on all registered labels have been prepared in the light of such factors and should be followed exactly. If for any reason any federal agency or cooperator finds it desirable to vary from instructions on the registered label, then the usage falls into category "a"; and such variation and the reasons for it should be explained in detail on the forms.

6 Enclosures:
1. Instructions for and WGP Form No. 1 (Rev. 71)
2. Illustrative Sample, WGP Form No. 1
3. WGP Form No. 2 (Rev. 71) - Guidelines
4. Illustrative Sample, WGP Form No. 2
5. Appendix A (Rev. 71), List of Pesticide Usages of Special Interest to the Working Group
6. Guide to use of WGP Forms No. 1 and 2
7. List of Examples of Commonly Used Pesticides

INSTRUCTIONS
for
WGP FORM NO. 1 (REV. 71)

USE OF FORM

WGP Form No. 1 should be used for all reports of proposed pest control programs to the Working Group. A project for which a WGP Form No. 2 is required should also be included on WGP Form No. 1.

Objective (Column 1)

(a) Project No. - Should be assigned by reporting agency in any system that may help the Working Group identify the comments to the reporting agency

(b) Target Pest - Identify the pest to be controlled by common name. Be as specific as possible. For example: Japanese beetle larvae is excellent. Root pests may be acceptable. Vegetation pest is too general to be acceptable.

(c) Purpose - State purpose of project.

Pesticide (Column 2)

(a) Common Name - Use common or coined names. In the absence of either, use the chemical name. Use trade or brand names as a last resort. Most of the pesticides used by federal agencies are found on Enclosure 7. If the label does not list the common name it will list the chemical name. In reporting the common or chemical name, report only the pesticide listed under Active Ingredient (A.I.). (See examples under Column 2 on sample form.)

(b) % A.I. or Lbs/Gal - Indicate the percent or pounds per gallon of active pesticide chemical. The active pesticide chemical is the chemical or chemicals in the formulation that performs the control required and is listed on the label as a percentage of the total formulation or as pounds per gallon. The other ingredients listed on the label may be emulsifiers, solvents or carriers of the pesticide chemical ingredient and should not be listed. Be careful that the pesticide reported is aligned with the pest to be controlled. Where a combination of pesticides is to be used to control a single pest, e.g., Borate 94% AND Monuron 4%, use the word "AND" in listing the pesticides. Where alternate materials are reported for the control of the pest, e.g., Naled 14 lbs. OR Malathion 57%, use the word "OR" in listing the pesticides. (See examples 3 and 10.)

(c) Reg. Use/Reg. No. - Advise if this is a registered use and provide the registration number as shown on the label, if available.

Application

(column 3)

(a) Form Applied (dust, granule, emulsion, bait, solution, gas, etc.)

(b) Use Strength (% or mix) - Indicate the strength of the formulation in percent active ingredient when diluted, or mixture of concentrate with diluent. (See examples 5, 6 and 7.)

(column 4)

Lbs. A.I. Per Acre or Other Rate - State pounds active ingredient per acre to be applied, unless some other unit is indicated. If reporting in acreage is not appropriate, indicate units used. Outdoor applications of pesticides are usually expressed as pounds of active ingredient per acre. (See examples 1, 2, 3, 8 and 10.) Indoor applications of residual sprays are expressed as percent of actual ingredient in the prepared spray in gallons per M (1000) sq. ft. (See example 7.) If dusts are used instead of spray, express as ounces or pounds of prepared dust per M (1000)sq. ft. Treatment of trees, if listed by number of trees or if application is by hydraulic sprayer, is expressed as pounds or quarts of concentrate per 100 gallons of diluent, oil or water--whichever is used. (See example 5.) If the pesticide for trees or brush is applied by air or mist blower, express as pounds active ingredient per acre. (See example 2.) Fumigants or inside aerosols are expressed as pounds of the fumigant or aerosol per M (1000)cu.ft. (See example 9.) Rodent baits should be listed as ounces or pounds of the prepared bait per bait station. (See example 6.) Be sure that the entry is in alignment with other columm entries for the specific pest to be controlled.

NOTE: In spot applications, the rate of application is expressed in pounds or gallons per 1,000 square feet indoors or pounds per acre of active ingredient outdoors applied to the spot area treated.

(column 5)

Method - Indicate the type of equipment as specifically as possible, e.g., helicopter, hand compression sprayer, mist-dust blower, hydraulic sprayer, power duster, paint brush,

tree injector, etc., or techniques such as hand placement of baits in burrows, measured injection into irrigation water, low volume, ultralow volume, etc. Be sure that the entry is aligned correctly with the pest to be controlled and the pesticide to be used. (See examples in Column 5 of sample form.)

(column 6)

(a) Area or Other Units to be Treated - State in terms of acres unless otherwise indicated. Indoor residual sprays or dusts will be reported as M(1000) sq. ft. (See example 7.) Fumigation or aerosol application will be reported as M(1000) cubic feet. (See example 9.) Some projects, such as mosquito control, fly control, cockroach control, etc., may require repeated applications. Report only the units to be treated for the first application, and indicate the number of repeat applications under Remarks (column 9). (See examples 7, 8 and 10.)

(b) Number and Description of Sites - Indicate the general type of area and pertinent portion of the area to be treated, e.g., ditchbank (inside berm) (outside berm), rangeland, power line right-of-way, tree nursery, etc. If the reported figures are a consolidation from several locations, separate by slashes the number of locations. (See examples 1, 3, 6, 7, 9 and 10.)

(column 7)

(a) Season of Year - Indicate month or months of year. (See examples in Column 7 of sample form.)

(b) State and/or Area - As dictated by habitat factors, may be state or county, or a national park, wildlife refuge, military base, or other designation that identifies the area geographically. If several installations are combined, an indication of geographical distribution such as "Southeast" may be acceptable.

Sensitive Areas (column 8)

(a) Areas to be Avoided - Sensitive areas that are to be avoided altogether (See example 2.) Indicate if the sensitive area is subject to inadvertent contamination as a result of treatment. Describe fully in Remarks (column 9) what protective measures are to be taken.

(b) Areas to be Treated with Caution - Sensitive areas that are to be treated with special precautions taken to avoid contamination and provide safe application of the pesticide The sensitive areas should be listed in this column and precautions taken listed in column 9. (See examples 1, 4, 6, 7, 8, 9 and 10.)

Remarks (column 9)

Use this column for information which will be helpful to the Working Group in evaluating the project.

(a) Precautions - Describe specific precautions being taken to protect sensitive areas, e.g., no application within 100 feet of streams.

(b) Number of Applications - For projects that require repeat applications to the same area, indicate the estimated number of repeat applications.

(c) Use of Trained/Certified Personnel - Provide information on the status of training and/or certification of personnel doing the actual work and of those supervising. Has project been reviewed by a field biologist, agronomist or entomologist?

(d) Monitoring - Describe any monitoring of the operation to be conducted. Indicate effectiveness of prior projects and mention undesirable side effects observed.

(e) Other - Indicate if the project is to be accomplished by contract. Indicate in this column when a Form 2 has been submitted--as "(See Form No. 2)."

NOTE: Inside (housekeeping) pest control may be summarized on the Working Group on Pesticides Form No. 1 as described on the introductory page of these instructions.

Please submit programs to: Working Group on Pesticides
Parklawn Building, Room 16B-30
5600 Fishers Lane
Rockville, Maryland 20852

Any questions regarding these instructions and forms, or any other assistance needed, should be directed to Mrs. Diana H. Baltz or Mrs. Ruth L. West, 301-443-3230, Code 153-33230.

WORKING GROUP ON PESTICIDES
PEST CONTROL PROGRAM REPORT

DEPARTMENT/AGENCY

DATE SUBMITTED

DIVISION

CONTACT TELEPHONE NO.

Refer to attached instructions before completing form. Be sure that entries are correctly aligned horizontally.

Objective	Pesticide		APPLICATION				Residue Ac.	Remarks
a) PROJECT NO. b) TARGET PEST c) PURPOSE	(a) COMMON NAME (b) % A.I. or LB/GAL (c) REG USE REG NO (if available)	(a) FORM APPLIED (liquid, granule, emulsion, bait, solution, gas, etc.) (b) USE STRENGTH (%) or MIX	LBS. A.I. PER ACRE or OTHER RATE	METHOD (aircraft, ground, aerosol, ULV, LV, other)	(a) ACRES OR OTHER UNIT to be TREATED (b) NUMBER AND DESCRIPTION of SITES	(a) SEASON of YEAR (b) STATE or REGION	(a) AREAS to be AVOIDED* (b) AREAS to be TREATED with CAUTION* *(Residence, towns, streams, human exposure, other)	(a) PRECAUTIONS to be TAKEN (b) NO. of APPLICAT (c) USE of TRAINED CERTIF PERSONN (d) MONITORING (e) OTHER
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
WGP-1 Corn rootworm Crop protection	Diazinon 14% Reg. No _____	Granular 14%	1	Power spreader	500 acres 2 croplands	May Iowa	b) Food crops	b) Applied during ing. See Form #2
WGP-2 Saltcedar, willow, cottonwood Maintenance of floodway	2,4-D oil soluble amine 4#/gal Reg. No. _____	Invert emulsion	2#/acre	Aerial, helicopter	1780 acres, floodplain, up to 600' wide	Summer New Mexico	a) No spraying over water.	a) Invert emul. to duce drift; no s ing when wind ex 8 mph. b) Annual c) Contractor conf to all State reg. licenses and perm e) No damage to cr homesites reporte effect on wildlif yr. program)
WGP-3 All vegetation Soil sterilization	Borate 94% and Monuron 4% Reg. No. 1624-29	Granular	392 & 16	Power spreader	40 acres 2 parking lots	Spring Virginia	None	e) Reviewed by ser agronomist.
WGP-4 Chub, sucker, carp, squawfish. R.B. popu-	Rotenone 2.5% 5% cube extr. 2.2% sulfoxide Reg. No. 432-171	Solution	1-3 ppm product	Boat, Venturi method	2883 gross surface acres 25 locations spot treat.	Ju&Sept, Mich, Wisc; Ju-Ark & Ore; Oct-Calif; Aug-Ida & Utah	a) downstream waters, Calif, Idaho, Utah	a) Treat at low le detoxify before release in Calif, & Utah b) application by St. Dep

WORKING GROUP ON PESTICIDES
PEST CONTROL PROGRAM REPORT

DIVISION

PERSON TO CONTACT TELEPHONE NO.

Refer to attached instructions before completing form. Be sure that entries are correctly aligned horizontally.

...jective	Pesticide	Application					Sensitive Ar.	Remarks
ROJECT NO RGET PEST URPOSE	(a) COMMON NAME (b) % A I or LB/GAL (c) REG USE REG NO (if available)	(a) FORM APPLIED (dust, granule, emulsion, bait, solution, gas, etc) (b) USE STRENGTH (%) or MIX	LBS. A.I. PER ACRE or OTHER RATE	METHOD (aircraft, ground, aerosol, ULV, LV, other)	(a) ACRES or OTHER UNIT, to be TREATED (b) NUMBER AND DESCRIPTION of SITES	(a) SEASON of YEAR (b) STATE or REGION	(a) AREAS to be AVOIDED* (b) AREAS to be TREATED with CAUTION* (croplands, forest, streams, human exposure, other)	(a) PRECAUTIONS to be TAKEN (b) NO. of APPLICATION (c) USE of TRAINED / CERTIF PERSONNEL (d) MONITORING (e) OTHER
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
P-5 ...tucket ...e tip moth ...ntation ...tection	Dimethoate 23.4% (2 lb/gal) Reg.No.___ __	Emulsion 1 lb/100 gallons	To point of run-off	Hydraulic sprayer	400 trees	Monthly Smith St. Park Va.	None	b)5 applications c)Applied by trained personnel. e)Experimental
P-6 ...way rats ...lth	Warferin 0.5% Reg.No.___ __	Cornmeal bait 0.025%	1 lb bait per sta.	Hand placement	600 bait sta. 60 warehouses	Contin. N. Central States	b)Food handling areas	a)Bait boxes locked. b)Replenished weekly. c)Supervised by trai... federal employees.
P-7 ...man ...kroaches ...ale	Diazinon 48% Reg.No._____	Emulsion 0.5%	1 gal/M sq. ft.	Hand compression sprayer	6,800 M sq.ft. 100 install., inside bldgs.	U.S.	b)Food handling areas	a)Treatment made afte... closing; food and utensils covered. b)4 applications c)Contractor supervi... by trained Federal personnel.
P-8 ...quitoes ...rval) ...lth	Abate 4E 4 lb/gal Reg.No._____	Emulsion	0.1	Helicopter	1,100 acres 5 marshes	As needed N.J.	b)Marshland	b)4 applications c)Trained operators d)Will be appraised ... effect on aquatic organisms.

WORKING GROUP ON PESTICIDES
PEST CONTROL PROGRAM REPORT

DEPARTMENT/AGENCY:

DATE SUBMITTED:

DIVISION:

REPORTING OFFICIAL TELEPHONE NO.:

Refer to attached instructions before completing form. Be sure that entries are correctly aligned horizontally.

ective	Pesticide			Application			Sensitive Ar.	Remarks
OJECT NO GET PEST RPOSE	(a) COMMON NAME (b) % A I or LB/GAL (c) REG USE REG NO (if available)	(a) FORM APPLIED (dust, granule, emulsion, bait, solution, gas, etc) (b) USE STRENGTH (%) or MIX	LBS A I PER ACRE or OTHER RATE	METHOD (aircraft, ground, aerosol, ULV, LV, other)	(a) ACRES or OTHER UNIT to be TREATED (b) NUMBER AND DESCRIPTION of SITES	(a) SEASON of YEAR (b) STATE or REGION	(a) AREAS to be AVOIDED* (b) AREAS to be TREATED with CAUTION* *(complaints, lakes, streams, human exposure, other)	(a) PRECAUTIONS to be TAKEN (b) NO. of APPLICATIO (c) USE of TRAINED / CERTIF PERSONNEL (d) MONITORING (e) OTHER
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9 flour le protec-	Methyl bromide 98% Reg.No._____	Gas	2 lb/M cu.ft.	Fumigation	500,000 M cu.ft. 10 warehouses	As needed Kansas	b)Food	c)Trained operators.
10 uitoes lt) th	Naled 14 lbs Reg.No._____ or Malathion 57% Reg.No._____	Solution 0.8% Solution 6%	0.1 0.25	Thermal aerosol Thermal aerosol	2,600 acres 4 camp sites	Summer Northern Calif.	b)Populated area	a)Fogging schedule p lished; fogging done night. b)Weekly, 13 applica tions c)Applied by trained and certified pers nel; reviewed by area entomologist.

WGP Form #2 Guideline (to be prepared across length of page)

TOPICS TO BE INCLUDED IN A NARRATIVE JUSTIFICATION

1. (a) AGENCY (b) PROJECT NO. (c) TARGET PEST

2. IMPORTANCE - (Such as economic losses or threat to health that could occur if control operations were not accomplished.)

3. AREA TO BE TREATED - (Give detailed description, including acreage, of type of site to be treated.)

4. METHOD -(Give additional details, beyond those on Form #1, on the specific pesticide, including registration number if available, and control method proposed.)

5. SPECIAL PRECAUTIONS - (Include details of effort to avoid human or environmental hazard and special training or experience of personnel.)

6. ALTERNATIVE MATERIALS OR METHODS - (List any that have been considered and give reason for rejection.)

7. COOPERATORS - (List any other organizations involved and the way in which they are involved, as governmental, private agencies, or individuals.)

8. MONITORING - (Describe type and extent of any monitoring activity planned.)

ILLUSTRATIVE SAMPLE

WGP Form #2

1. (a)AGENCY - U.S. Forest Service (b)PROJECT NO. - NA-9-71 (c)TARGET PEST - Saddled prominent, *Heterocampa guttivitta*

2. IMPORTANCE - The saddled prominent is a defoliator of beech and hard maple. The insect poses a serious threat to the sugar industry. Heavy defoliation of maple reduces tree vigor and causes a sharp reduction in sugar content of the tree sap. Repeated defoliation can cause direct tree-killing or predispose trees to attack by bark and wood-boring insects. Over one million acres were defoliated by the saddled prominent in 1969. Most of the outbreak occurred in New York. Entomologists predict heavy defoliation over this same area in 1970 with an estimated 270,000 acres being completely defoliated.

3. AREA TO BE TREATED - The New York State Conservation Department is planning to chemically treat 60,000 acres of the infested area to prevent loss of valuable hard maples. The areas to be treated are near Waterton (Adirondack Mountain), Binghamton (Delaware County) and Albany, New York (Rensselaer County - Taconic Range). The areas are heavily populated. Spray blocks vary from 5 acres to 600 acres in size and are primarily private ownerships.

4. METHOD - The insecticide Sevin 80S (carbaryl) will be applied at the rate of one (1) pound active ingredient per acre. It will be formulated at $1\frac{1}{4}$ pounds of Sevin 80S plus 4 ounces of Pinolene 1282 plus water to make one gallon of final spray, and applied at the rate of one gallon per acre. Helicopters will be used to apply the insecticide. The State helicopter pilots are experienced in this type of spraying. The contract pilots are also experienced and are registered with the Department of Agriculture and Markets, New York State.

5. SPECIAL PRECAUTIONS - The project is under direct supervision of senior pest control technicians who have wide experience in aerial spraying. Technical supervision is provided by entomologists at the Albany office. All beehives within 2 miles of the spray area will be removed until completion of the project. Boundaries of spray blocks will be easily identifiable from both the ground and air. Special precautions will be taken to prevent spraying over water surfaces.

6. ALTERNATIVE MATERIALS OR METHODS - Sevin 80S is the only insecticide that is registered for use against the saddled prominent. The Conservation Department feels that they have a responsibility to the people in the State to suppress insect populations in these valuable hard maple forests.

7. COOPERATORS - Landowners are sharing in the cost of suppression. The State College of Forestry at Syracuse University Applied Forestry Research Institute in cooperation with State Forest Service entomologists are working together to monitor effectiveness of the project and to refine evaluation techniques.

8. MONITORING - Sevin 80S has been successfully used against the saddled prominent for the past few years. Except for its known toxicity to bees, it has created little impact on other organisms in the environment. Except for entomologists collecting efficacy data, there are no other monitoring activities.

LIST OF PESTICIDE USAGES OF SPECIAL
INTEREST TO THE WORKING GROUP
FOR WHICH WGP FORM NO. 2 IS REQUIRED[1, 2]

acrolein
aldicarb (Temik)
aldrin
amitrole
Aramite
arsenical compounds
azinphosmethyl (Guthion)
and homologs
Azodrin

Benomyl
BHC (benzene hexachloride)
Bidrin

captan
carbaryl (Sevin)
carbophenothion (Trithion)
and homologs
chlordane
chlorobenzilate
coumaphos
cyanide compounds

DDT
DDD (TDE)
demeton (Systox)
dicamba (Banvel D)
dieldrin
dinitro-cresols
dioxathion (Delnav)
diquat
disulfoton (Di-syston)
Dursban
Dyfonate

endosulfan (Thiodan)
endothall
endrin
EPN
ethion (Nialate)

fenac
fenthion (Baytex)
folpet (Phaltan)
Furadan

heptachlor

Kepone (outdoor uses)

lindane

Matacil
mercurial compounds
Meta-Systox
methyl bromide
mevinphos (Phosdrin)
Mirex

paraquat
parathion and homologs
PCNB (pentachloronitrobenzene)
phorate (Thimet)
phosmet (Imidan) (Prolate)
phosphamidon
picloram (Tordon)

sodium monofluoroacetate (1080)
Strobane

TCMTB (Busan 72)
TEPP (Tetron)
thallium sulfate
toxaphene
trichlorofon (Dylox, Dipterex)

Zectran

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[1]Listing of a pesticide on this appendix is not intended to preclude use of the compound.

[2]Certain compounds listed in Report of the Secretary's Commission on Pesticides and Their Relationship to Environmental Health, Dec. 69, have been deleted because of no record of federal use or subsequent actions.

GUIDE AS TO USE OF WGP FORMS NO. 1 AND NO. 2

	WGP No. 1	WGP No. 2
a. Usage of a pesticide that is not registered under the Federal Insecticide, Fungicide and Rodenticide Act for that particular purpose or in that particular way	yes	yes
b. Usage of any of the compounds listed in Appendix A, List of Pesticide Usages of Special Interest to the Working Group . . .	yes	yes
c. Any pesticide that would be applied to water or could reasonably be expected to get into water	yes	yes
d. Any program or project in which 100 or more contiguous acres will be treated as one application	yes	no
e. Use of any pesticide on a federal installation when that usage is <u>not</u> directly supervised by, nor under the on-site responsibility of, a federal employee trained in the current safe and effective use of the pesticides involved	yes	no

August 1971

Examples of Commonly Used Pesticides

Abate
acrolein
alachlor
aldicarb (Temik)
aldrin
alkyl dimethyl benzyl ammonium chloride
allethrin
aluminum phosphide
ametryne
amiben
amitrole
amitrole and dicamba
amitrole and simazine
AMS (ammonium sulfamate)
Antymicin A (Fintrol)
ANTU
Aramite
aromatic mineral spirits, oils and solvents
arsenic trioxide
Aspon
atrazine
Avitrole 200
azinphosmethyl (Guthion)

Bacillus thuringiensis (Thuricide)
barban (Carbyne)
Bayer 73 (Bayluscide)
benefin (Balan)
benzalkonium chloride
BHC (benzene hexachloride)
borate
borate-chlorate
borate-chlorate/monuron (Chlorea)
borate-chlorate/prometone (Pramital 5F granular)
borate-chlorate, prometone and simazine (Pramital 5PS granular)
borate/monuron (Ureabor)
borate/2,3,6 TBA (Benzbor)
Bordeaux mixture
bromacil (Hyvar X)
bromacil, chlorate/borate (Ureabor)
bromoxynil
butoxy-thiocyanodiethyl ether (Lethane 384)

cacodylic acid
calcium arsenate and calcium arsenate and metaldehyde
calcium cyanamide
calcium cyanide
captan
carbaryl (Sevin)
carbaryl and DDT micronized for aircraft disinsection (quarantine requirement)
carbon bisulfide
carbophenothion (Trithion)
CDEC (Vegadex)
chelated copper sulfate (Cutrine)
chlordane
chlorobenzilate
chloropicrin
chloropicrin and methyl bromide
chloroxuron (Tenoran)
chlorpropham
copper oleate
copper sulfate
coumafuryl (Fumarin)
coumaphos
creosote
cyclohexamide (Acti-dione)

dalapon (Dowpon) (Radapon)
DCPA (Dacthal)
DDT
DEET (diethyl toluamide)
demeton (Systox)
Diazinon
dicamba (Banvel D)
dichlobenil (Casoron)
dichlorophenyl diethyl phosphorothioate (O-2,4-dichlorophenyl O,O-diethyl-phosphorothioate)(VC-13)
dichlorvos (DDVP) (Vapona)
dicofol (Kelthane)
dieldrin
diesel oil
dimethoate (Cygon)
dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate (Dylox)
dinocap (Karathane)
dinoseb (DNBP) (dinitro butyphenol)
dioxathion (Delnav)
diphacinone (Diphacin)
diphenamid (Enide) (Dymid)
diphenylamine
dichloropropene 2-D mixture

Encl 7

diquat
diuron (Karmex)
disulfoton (Di-syston).
DNOC (dinitro-o-cresol)
dodine
DRC-1339 (Starlicide)(3-chloro-p-toluidine hydrochloride)
DRC-1347
Durstan
DSMA (disodium methanearsonate)
Dyfonate
Dyrene

endothall
endosulfan (Thiodan)
endrin (including uses in products such as Rid-a-Bird)
endrin and thiram (seed protectants)
Eptam (EPTC) (S-ethyl-dipropylthiolcarbamate)
erbon
ethion (Nialate)
ethylene dibromide
ethylene dibromide and methyl bromide
ethylene oxide
ethyl parathion

Fenac
fenitrothion (Accothion)
fenthion (Baytex)
fenuron (Dybar)
ferbam (Fermate)
ferrous sulfate

Flit MLO (petroleum oils)
Folex (Merphos)
folpet (Phaltan)
formaldehyde and formalin

Gardona
Gophacide

heptachlor
HTH (calcium hypochlorite)

Kepone

lampricide (Lamprecid) (3-trifluoromethyl-4-nitrophenol) (TFM)
lead arsenate
lime sulfur
lindane
linuron (Lorox)

magnesium chloride hexahydrate
malathion
Maleic hydrazide (MH-30)
maneb (Manzate)
MCPA
MCPP (Mecoprop)
mercurous chloride
metaldehyde
metham (Vapam) (SMDC)
methoxychlor (Marlate)
methyl bromide
methyl parathion
Mirex
miscible oils (petroleum)
monuron (Telvar)

Morestan
MSMA (monosodium acid methanearsonate)
Mylone 50-D

naled (Dibrom)
naptalam (Alanap)
naphthalene
nicotine sulfate
nitralin (Planavin)
N-octylbicycloheptene dicarboximide (MGK 264)
norbormide (Raticate)

oxydemetonmethyl (Meta-Systox-F

paradichlorobenzene
paraquat
Paris green
PCNB (pentachlorinitrobenzene)
Pentac
pentachlorophenol (PCP)
phenylmercuric acetate (PMA)
phenyl methylcarbamate:m-(1-ethpropyl),1 part & m-(1 methyl butyl), 3 parts (Bux-ten)
phorate (Thimet)
phosmet (Imidan) (Prolate)
phosphorus paste
picloram (Tordon)
pindone (Pival)
PMP
polyram
potassium cyanide
prometone (Pramital)
propanil (STAM)
propazine
propoxur (Baygon)
pyrethrum (Pyrethrins)

red squill
ronnel (Korlan)
rotenone, cube extracts
  and sulfoxide
Ruelene

S-ethyl-diisobutylthiocar-
  bamate (Sutan)
siduron (Tupersan)
silica aerogel and ammonium
  fluorophosphate (Dri-die)
  and silica gel
silvex (Kuron) (2,4,5-TP)
simazine
sodium arsenite
sodium chlorate
sodium cyanide
sodium dimethyl-arsenate
  (dimethyl arsenic acid)
sodium fluoride
sodium fluosilicate
sodium monofluoroacetate (1080)
sodium nitrate
sodium pentachlorophenate
streptomycin
strychnine
suffocating gas cartridge
  (BCFW, USDI)
Sulfaquinoxaline and warfarin
  (Prolin)
sulfur

Tandex
TCA
TEPP
thiram (Arasan)
toxaphene
Tribromo ethanol
trifluralin (Treflan)
2,4-D
2,4-DB
2,4-DP (dichlorprop)
2,4,5-T
2,3,6-trichlorobenzoic acid

Vernam
Vitavax
Vorlex

warfarin

Xylene

Zectran
zinc ion and manganese
  ethylenebisdithiocarbamate
  (Dithane M-45)
zinc phosphide
zineb (Parzate)
Zip
ziram (Zerlate)
Zytron

U.S. DEPARTMENT OF AGRICULTURE

WORKING GROUP ON PESTICIDES
PEST CONTROL PROGRAM REPORT
(Ref: FSM 5200)

DEPARTMENT/AGENCY		DATE SUBMITTED
FOREST	REGION	PERSON TO CONTACT/TELEPHONE NO.

Be sure that entries are correctly aligned horizontally.

PROJECT NO.	PESTICIDE	APPLICATION						SENSITIVE AREAS	REMARKS
a. PROJECT NO. TARGET PEST PLANTSE	a. COMMON NAME b. LB AI OR LB/GAL c. REGISTERED USE AND REGISTRATION NO. (if available)	a) FORM APPLIED (Dust, granule, emulsion, bait, solution, gas, etc.) (b) USE STRENGTH (%) OR MIX	LBS AI PER ACRE OR OTHER RATE	METHOD (Aircraft, ground, aerosol, ULV, LV, other)	(a) ACRES OR OTHER UNIT TO BE TREATED (b) NUMBER AND DESCRIPTION OF SITES	(a) SEASON OF YEAR (b) STATE OR REGION	(a) AREAS TO BE AVOIDED (b) AREAS TO BE TREATED WITH CAUTION (Croplands, lakes, streams, human, exposure, other	(a) PRECAUTIONS TO BE TAKEN (b) NO. OF APPLICATIONS (c) USE OF TRAINED CERTIFIED PERSONNEL (d) MONITORING (e) OTHER
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

(Over)

5200-15 (12-7)

Following are the topics to be included when a narrative justification is required for specific pesticide usages:

1. (a) AGENCY (b) PROJECT NO. (c) TARGET PE

2. IMPORTANCE - (Such as economic losses or threat to health that could occur if control operations were not accomplished.)

3. AREA TO BE TREATED - (Give detailed description, including acreage, of type of site to be treated.)

4. METHOD - (Give additional details, beyond those on Form #1, on the specific pesticide, including registration number if available, and control method proposed.)

5. SPECIAL PRECAUTIONS - (Include details of effort to avoid human or environmental hazard and special training or experience of personnel.)

6. ALTERNATIVE MATERIALS OR METHODS - (List any that have been considered and give reason for rejection.)

7. COOPERATORS - (List any other organizations involved and the way in which they are involved, as governmental, private agencies, or individuals.)

8. MONITORING - (Describe type and extent of any monitoring activity planned.)

APPENDIX B

FINTROL (ACTIVE INGREDIENT ANTYMYCIN A) A BIOASSAY EXPERIMENT

by
Edward McHenry, Division of Sport Fish,
Alaska Department of Fish and Game

FINTROL (ACTIVE INGREDIENT-ANTIMYCIN A)
A BIOASSAY EXPERIMENT

By

Edward T. McHenry

FINTROL (ACTIVE INGREDIENT-ANTIMYCIN A)

A BIOASSAY EXPERIMENT

by

Edward T. McHenry, Fishery Biologist

Division of Sport Fish

Seward, Alaska 99664

1969

FINTROL (ACTIVE INGREDIENT-ANTIMYCIN A)
A BIOASSAY EXPERIMENT

by

Edward T. McHenry, Fishery Biologist
Division of Sport Fish
Seward, Alaska 99664

Introduction

A bioassay experiment kit was acquired from Ayerst Laboratories, New York, by the Alaska Department of Fish and Game to determine the feasibility of using Fintrol (Active ingredient-Antimycin A) for rehabilitating Alaskan lakes.

Antimycin is an antibiotic with a high toxicity to fish. Researchers (Berger, Lennon et al. 1969), who have conducted extensive laboratory and field tests in the development of antimycin as a piscicide, have found it has certain advantages over long-used, standard fish toxicants. The following is a brief summary of their conclusions.

Antimycin is easily and precisely formulated in liquid solution with acetone and in dry, Carbowax-coated fine sand which disperses the toxicant uniformly throughout various depths (Fintrol-5, -15). Liquid antimycin can be dispensed into the water by a metering pump or boat bailer and the sand formulation easily broadcasted by hand or by mechanical seed spreader. Antimycin is colorless and odorless and does not excite or repel fish. Its effect on fish is irreversible; once exposed sufficiently to show distress symptoms, they eventually die, even when placed in non-treated freshwater.

Antimycin's order of toxicity (i.e., different sensitivities between species) and effectiveness on various life stages (egg to adult) indicate its potential for partial or selective control of fish. Target fish-killing concentrations were not harmful to aquatic invertebrates (except rotifers, cladocerans and copepods) or vertebrates tested in quantities normally used as a piscicide.

Antimycin proved effective in a variety of water qualities. In soft, warm or low pH waters lesser toxicity may be required than in hard, cold or high pH waters. Concentrations greater than 10 ppb are required in waters of high pH (8.5 and above) and alkalinity.

Antimycin degrades rapidly, and most waters may be restocked with fish within two weeks after treatment. If faster degradation is necessary, potassium permanganate ($KMnO_4$) at 1.0 ppb or less will accelerate the breakdown process.

Procedure

Threespine stickleback (Gasterosteus aculeatus) were collected by seine and minnow traps along the Bear Lake shoreline one day prior to testing. On May 26, each of ten plastic bags was filled with 20 gallons of water from Bear Lake. The first bag was used as a control in which stickleback were placed with no Fintrol added. The desired amount of Fintrol was measured by titration burette (calibrated in 1.0 and 0.1 milliliter increments) into each bag to attain pre-determined toxicity levels ranging from 0.25 to 4.0 ppb. Approximately 0.17 lb (77.2 g) of stickleback was introduced into each bag to approximate an equal number of fish per bag. The bags were then sealed by wire and filament tape to prevent leakage or transfer of fresh water. A maximum-minimum thermometer was placed inside the control bag to record water temperature extremes during the course of the experiment. The sealed bags were tied together by a single line which was anchored at one end, and allowed to float in two to three feet of water. Setting up the experiment ran from 4:45 to 5:30 p.m. Air and surface water temperatures at 4:30 p.m., which were measured by pocket thermometer, were 47° and 42°F., respectively.

The experiment was repeated in a like manner on May 29, using 0.26 lb (118.0 g) stickleback per bag at toxicant levels from 3.0 to 8.0 ppb plus a control. Air and surface temperatures at 4 p.m. were 53° and 45°F., respectively.

At the conclusion of both experiments, each bag was examined for fish kills. In the bags containing partial fish kills, all stickleback were enumerated and noted as either dead or alive. In the bags containing either total kill or all fish alive, no fish were enumerated. Total stickleback in these bags were estimated on the basis of average fish per partial-kill bags.

Surface water samples were collected on June 3 (water temperature 45°F.) to determine water chemistry of Bear Lake water. Chemical properties are as follows: D.O. 13 ppm, pH 6.9, CO_2 5 ppm, and Total Hardness 51 ppm. Due to failure of one indicator reagant, alkalinity could not be measured; however, from a previous determination made in March, 1965, total alkalinity in Bear Lake water is known to be low (41 ppm).

Results

On May 27, the sealed bags were cursorily examined for condition of the stickleback about 25 hours after initiation of the experiment. The control and bags of 0.5 ppb concentrate were "pulled" since all fish were alive and apparently healthy. After further inspection, it was discovered that some fish were still alive in the bag

containing the highest toxicant concentration (4.0 ppb); therefore, it was decided to allow the experiment to continue an additional 24 hours. Due to adverse weather at that time, none of the dead fish were removed from any bags. It is believed that this probably had little, if any, effect on the condition of live fish remaining in the bags. Since water temperatures were too low for any appreciable decay to add further toxicity to the already-toxic environments. Minimum (previous night) and maximum surface water temperatures were 38° and 42°F., respectively.

On May 28, the remaining bags were checked after approximately 24 hours duration since the previous day's examination. The results are presented in Table 1. Minimum and maximum surface water temperatures were identical to those recorded on May 27.

On May 30, the second series of toxicant levels were examined for fish kills approximately 25 hours after the experiment was performed on May 29. These results are shown in Table 2. The minimum (previous night) and maximum surface water temperatures were 40° and 45° F., respectively.

Table 1.--Fintrol Toxicant Levels and Resulting Fish Kills in 49 Hours, Bear Lake, May 26-28, 1969.

Fintrol (ml) per 20 gal. water	Toxicant level (ppb)	No. fish alive	No. fish dead	Total fish	Percent kill
---	Control	71 (est.)*	---	71 (est.)	---
0.1	0.25	61	---	61	---
0.2	0.50	71 (est.)*	---	71 (est.)	---
0.3	0.75	64	7	71	9.9
0.4	1.00	44	6	50	12.0
0.6	1.50	68	15	83	18.1
0.8	2.00	41	35	76	46.0
1.0	2.50	21	45	66	68.2

1.2	3.00	15	55	70	78.6
1.6	4.00	1	87	88	98.9

*These fish were released after 25 hours and were not enumerated; therefore, they were estimated by the average total fish per bag.

Table 2.--Fintrol Toxicant Levels and Resulting Fish Kills in 25 Hours, Bear Lake, May 29-30, 1969.

Fintrol (ml) per 20 gal. water	Toxicant level (ppb)	No. fish alive	No. fish dead	Total fish	Percent kill
---	Control	129 (est.)*	---	129 (est.)	---
1.2	3.00	78	56	134	41.8
1.6	4.00	49	90	139	64.7
2.0	5.00	11	103	114	90.4
2.4	6.00	4	126	130	96.9
2.8	7.00	129 (est.)*	all	129 (est.)	100.0
3.2	8.00	129 (est.)*	all	129 (est.)	100.0

*These fish were not counted, but estimated by the average total fish per bag.

Conclusions

The results in Table 2 indicate that the minimum lethal concentration of Fintrol required for a total kill of stickleback in Bear Lake is 7.0 ppb at water temperatures ranging from 40° to 45°F. Although these water temperatures are

low, it is noted that the lake's hypolimnion has a similar temperature range during early July, the optimum time to rehabilitate Bear Lake, as determined by baited minnow traps suspended in those depths.

Salmonids which inhabit Bear Lake in July, generally in juvenile stages, would be totally eliminated at a 7.0 ppb concentration. Berger, Lennon et al. (1969), found that salmonids were among the most sensitive to Antimycin of all species tested and died in concentrations of 5.0 ppb or less.

Ayerst Laboratories recommends that an additional 0.25 to 0.50 ppb Antimycin be added to the minimum lethal concentration predetermined by field bioassay when a complete fish kill is desired. This would indicate that a 7.25 to 7.50 ppb concentration level be used to eradicate all fish in Bear Lake.

NOTE: Further bioassay experiments should be prolonged to measure delay mortality factors by releasing live test fish to segregated holding boxes suspended in the lake for an additional 24-48 hours. Since antimycin toxicity is non-reversible, a delay in mortality may have been evident if test fish had remained under observation for an additional time period.

LITERATURE CITED

Berger, Bernard L., Robert E. Lennon, and James W. Hogan. 1969. Investigations in fish control: 26. Laboratory studies on Antimycin A as a fish toxicant. U.S. Bureau of Sport Fisheries and Wildlife. 19 pp.

Gilderhus, Philip A., Bernard L. Berger, and Robert E. Lennon. 1969. Investigations in fish control: 27. Field trials of Antimycin A as a fish toxicant. U.S. Bureau of Sport Fisheries and Wildlife. 21 pp.

Appendix A. Fintrol (Antimycin) Requirements for the Chemical Treatment of Waters in Elimination of Fish Populations.*

Desired Concentration	Fintrol-5		Fintrol-15		Fintrol-Concentrate	
ppb	lbs.	Units/AF	lbs.	Units/AF	ml	Units/AF
1.0	0.275	0.034	0.055	0.0079	12.63	0.0263
1.5	0.43	0.050	0.09	0.012	18.9	0.040
2.0	0.55	0.067	0.11	0.016	25.3	0.053
2.5	0.69	0.084	0.14	0.020	31.6	0.066
3.0	0.83	0.100	0.17	0.024	37.9	0.079
3.5	0.97	0.117	0.20	0.028	44.2	0.092
4.0	1.10	0.134	0.22	0.032	50.5	0.105
5.0	1.38	0.167	0.28	0.040	63.2	0.132
6.0	1.65	0.200	0.33	0.048	75.8	0.158
7.0	1.93	0.234	0.39	0.056	88.4	0.184
8.0	2.20	0.267	0.44	0.064	101.0	0.211
9.0	2.48	0.300	0.50	0.072	113.7	0.237
10.0	2.75	0.334	0.55	0.079	126.3	0.263

*Information taken and modified from Gilbert C. Radonski of Ayerst Laboratories work in the use of Fintrol.

This Appendix will assist you in determining the amount of Fintrol needed to treat any volume of water. The Appendix is based on the acre-foot. Examples for each formulation are provided.

Fintrol-5. Volume of water to be treated, 100 acre-feet. Desired concentration, 5.0 ppb, lbs./acre-ft. = 1.38; number of units required = 100 acre-ft. X 0.167 = 16.7 units of Fintrol-5.**

Fintrol-15. Volume of water to be treated, 100 acre-feet. Desired concentration, 5.0 ppb, lbs./acre-ft. = 0.28; number of units required = 100 acre-ft. X 0.0400 = 4.0 units of Fintrol.**

Fintrol-C. Volume of water to be treated, 100 acre-ft. Desired concentration, 5.0 ppb, milliliter/acre-ft. = 63.2; number of units required = 100 acre-ft. X 9.132 = 13.2 units of Fintrol Concentrate.**

** In all cases of fractional units round off at the next highest whole unit.

Appendix B. Base Formulation for Determining Dosage Amounts of Fintrol for Elimination of First Populations.

1. Fintrol-5 is a sand based formulation. Each unit contains 8.25 pounds of Fintrol-5 containing 37.42 grams of Antimycin A. Each unit will cover 30 acre-feet at a concentration of ppb.

Number of Units
1 - 49
50 - 99
100+

2. Fintrol-15 is a sand based formulation. Each unit contains 7.0 pounds of Fintrol-15 containing 158.76 grams of Antimycin A. Each unit will cover 127 acre-feet at a concentration of 1.0 ppb.

Number of Units
1 - 12
13 - 23
24 -

3. Fintrol-Concentrate is a liquid formulation. Each unit contains 480 mls. of Fintrol-Concentrate containing 48.0 grams of Antimycin A. Each unit will cover 38 acre-feet at a concentration of 1.0 ppb.

Number of Units
1 - 49
50 - 99
100+

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