Ethoprop
Analysis of Risks
to
Endangered and Threatened Pacific Salmon and Steelhead

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Introduction:

Ethoprop is a restricted use, organo-phosphorus compound developed for the control of soil insects and nematodes. It includes both granular (G) and spray forms (EC). The Agency has previously addressed numerous areas of ecological concern in Environmental Fate and Effects Division's (EFED) Interim Reregistration Eligibility Decision chapter for ethoprop, referred to in this analysis as the EFED Ecological Risk Assessment (EFED ERA), dated November 18, 1998 and amended August 30, 1999. With respect to this current analysis, the acute risk LOC's were exceeded for fish and aquatic invertebrates. As a result of concerns identified in the EFED ERA, there have been numerous alterations in the labeled use. Ethoprop may be applied only by direct ground application to the soil and current usage restrictions require immediate soil incorporation by mechanical methods or by watering in at the time of application. This stipulation minimizes runoff to permanent water sites. The agent has been used on a variety of sites, including agricultural crops, field grown ornamentals, and golf course turf. However, application to golf course turf has been discontinued (voluntarily).There are no registered home and garden uses.

Problem Formulation - The purpose of this analysis is to determine whether the registration of Ethoprop as an insecticide for use on crops and ornamentals may affect threatened and endangered (T&E or listed) Pacific anadromous salmon and steelhead or may adversely modify their designated critical habitat. The agency has previously addressed numerous areas of concern (Memorandum and update to EFED preliminay risk assessment for ethoprop, Federoff and Spatx, EFED, November 8, 1998) regarding the use and fate of ethoprop. The areas of concern included risk to all terrestrial and aquatic animals. With respect to the current analysis, acute risk LOC,s were exceeded for freshwater invertebrates, marine, estuarine, and freshwater fish in several sites. These concerns resulted in numerous alterations to the original registration (late 1960's) to reduce the potential for water contamination (see text, use restrictions and current rates). The most significant alteration is the requirement for immediate soil incorporation, minimizing potential runoff and leaching.

[1] Comment: Data and this the analysis based upon these data reflect information available at the time this report was completed. Additional data, which may have been submitted or changes in status after the submission date are not included in the authors evaluation, presentations, or comments.

Scope - Although this analysis is specific to listed western salmon and steelhead and the watersheds in which they occur, it is acknowledged that Ethoprop is registered for uses that may occur outside this geographic scope and that additional analyses may be required to address other T&E species in the Pacific states as well as across the United States. It is understood that any subsequent analyses, requests for consultation and resulting Biological Opinions may necessitate that Biological Opinions relative to this request be revisited, and could be modified.

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1. Background

Under section 7 of the Endangered Species Act, the Office of Pesticide Programs (OPP) of the U. S. Environmental Protection Agency (EPA) is required to consult on actions that 'may affect' Federally listed endangered or threatened species or that may adversely modify designated critical habitat. Situations where a pesticide may affect a fish, such as any of the salmonid species listed by the National Marine Fisheries Service (NMFS), include either direct or indirect effects on the fish. Direct effects result from exposure to a pesticide at levels that may cause harm.

Acute Toxicity - Relevant acute data are derived from standardized toxicity tests with lethality as the primary endpoint. These tests are conducted with what is generally accepted as the most sensitive life stage of fish, i.e., very young fish from 0.5-5 grams in weight, and with species that are usually among the most sensitive. These tests for pesticide registration include analysis of observable sublethal effects as well. The intent of acute tests is to statistically derive a median effect level; typically the effect is lethality in fish (LC50) or immobility in aquatic invertebrates (EC50). Typically, a standard fish acute test will include concentrations that cause no mortality, and often no observable sublethal effects, as well as concentrations that would cause 100% mortality. By looking at the effects at various test concentrations, a dose-response curve can be derived, and one can statistically predict the effects likely to occur at various pesticide concentrations; a well done test can even be extrapolated, with caution, to concentrations below those tested (or above the test concentrations if the highest concentration did not produce 100% mortality).

OPP typically uses qualitative descriptors to describe different levels of acute toxicity, the most likely kind of effect of modern pesticides (Table 1). These are widely used for comparative purposes, but must be associated with exposure before any conclusions can be drawn with respect to risk. Pesticides that are considered highly toxic or very highly toxic are required to have a label statement indicating that level of toxicity. The FIFRA regulations [40CFR158.490(a)] do not require calculating a specific LC50 or EC50 for pesticides that are practically non-toxic; the LC50 or EC50 would simply be expressed as >100 ppm. When no lethal or sublethal effects are observed at 100 ppm, OPP considers the pesticide will have "no effect" on the species.

Table 1. Qualitative descriptors for categories of fish and aquatic invertebrate toxicity (from Zucker, 1985)

LC50 or EC50	Category description
< 0.1 ppm	Very highly toxic
0.1- 1 ppm	Highly toxic
>1 < 10 ppm	Moderately toxic
> 10 < 100 ppm	Slightly toxic
> 100 ppm	Practically non-toxic

Comparative toxicology has demonstrated that various species of scaled fish generally have equivalent sensitivity, within an order of magnitude, to other species of scaled fish tested under the same conditions. Exceptions are known to occur for only an occasional pesticide, as based on the several dozen fish species that have been frequently tested. Sappington et al. (2001), Beyers et al. (1994) and Dwyer et al. (1999), among others, have shown that endangered and threatened fish tested to date are similarly sensitive, on an acute basis, to a variety of pesticides and other chemicals as their non-endangered counterparts.

Chronic Toxicity - OPP evaluates the potential chronic effects of a pesticide on the basis of several types of tests. These tests are often required for registration, but not always. If a pesticide has essentially no acute toxicity at relevant concentrations, or if it degrades very rapidly in water, or if the nature of the use is such that the pesticide will not reach water, then chronic fish tests may not be required [40CFR158.490]. Chronic fish tests primarily evaluate the potential for reproductive effects and effects on the offspring. Other observed sublethal effects are also required to be reported. An abbreviated chronic test, the fish early-life stage test, is usually the first chronic test conducted and will indicate the likelihood of reproductive or chronic effects at relevant concentrations. If such effects are found, then a full fish life-cycle test will be conducted. If the nature of the chemical is such that reproductive effects are expected, the abbreviated test may be skipped in favor of the full life-cycle test. These chronic tests are designed to determine a “no observable effect level” (NOEL) and a “lowest observable effect level” (LOEL). A chronic risk requires not only chronic toxicity, but also chronic exposure, which can result from a chemical being persistent and resident in an environment (e.g., a pond) for a chronic period of time or from repeated applications that transport into any environment such that exposure would be considered “chronic”.

As with comparative toxicology efforts relative to sensitivity for acute effects, EPA, in conjunction with the U. S. Geological Survey, has a current effort to assess the comparative toxicology for chronic effects also. Preliminary information indicates, as with the acute data, that endangered and threatened fish are again of similar sensitivity to similar non-endangered species.

Metabolites and Degradates - Information must be reported to OPP regarding any pesticide metabolites or degradates that may pose a toxicological risk or that may persist in the environment [40CFR159.179]. Toxicity and/or persistence test data on such compounds may be required if, during the risk assessment, the nature of the metabolite or degradate and the amount that may occur in the environment raises a concern. If actual data or structure-activity analyses are not available, the requirement for testing is based upon best professional judgement.

Inert Ingredients - OPP does take into account the potential effects of what used to be termed “inert” ingredients, but which are beginning to be referred to as “other ingredients”. OPP has classified these ingredients into several categories. A few of these, such as nonylphenol, can no longer be used without including them on the label with a specific statement indicating the potential toxicity. Based upon our internal databases, I can find no product in which nonylphenol is now an ingredient. Many others, including such ingredients as clay, soybean oil, many polymers, and chlorophyll, have been evaluated through structure-activity analysis or data and determined to be of minimal or no toxicity. There exist also two additional lists, one for inerts with potential toxicity which are considered a testing priority, and one for inerts unlikely to be toxic, but which cannot yet be said to have negligible toxicity. Any new inert ingredients are required to undergo testing unless it can be demonstrated that testing is unnecessary.

The inerts efforts in OPP are oriented only towards toxicity at the present time, rather than risk. It should be noted, however, that very many of the inerts are in exceedingly small amounts in pesticide products. While some surfactants, solvents, and other ingredients may be present in fairly large amounts in various products, many are present only to a minor extent. These include such things as coloring agents, fragrances, and even the printers ink on water soluble bags of pesticides. Some of these could have moderate toxicity, yet still be of no consequence because of the negligible amounts present in a product. If a product contains inert ingredients in sufficient quantity to be of concern, relative to the toxicity of the active ingredient, OPP attempts to evaluate the potential effects of these inerts through data or structure-activity analysis, where necessary.

For a number of major pesticide products, testing has been conducted on the formulated end-use products that are used by the applicator. The results of fish toxicity tests with formulated products can be compared with the results of tests on the same species with the active ingredient only. A comparison of the results should indicate comparable sensitivity, relative to the percentage of active ingredient in the technical versus formulated product, if there is no extra activity due to the combination of inert ingredients. I note that the "comparable" sensitivity must take into account the natural variation in toxicity tests, which is up to 2-fold for the same species in the same laboratory under the same conditions, and which can be somewhat higher between different laboratories, especially when different stocks of test fish are used.

The comparison of formulated product and technical ingredient test results may not provide specific information on the individual inert ingredients, but rather is like a "black box" which sums up the effects of all ingredients. I consider this approach to be more appropriate than testing each individual inert and active ingredient because it incorporates any additivity, antagonism, and synergism effects that may occur and which might not be correctly evaluated from tests on the individual ingredients. I do note, however, that we do not have aquatic data on most formulated products, although we often have testing on one or perhaps two formulations of an active ingredient.

Risk - An analysis of toxicity, whether acute or chronic, lethal or sublethal, must be combined with an analysis of how much will be in the water, to determine risks to fish. Risk is a combination of exposure and toxicity. Even a very highly toxic chemical will not pose a risk if there is no exposure, or very minimal exposure relative to the toxicity. OPP uses a variety of chemical fate and transport data to develop "estimated environmental concentrations" (EECs) from a suite of established models. The development of aquatic EECs is a tiered process.

The first tier screening model for EECs is with the GENEEC program, developed within OPP, which uses a generic site (in Yazoo, MS) to stand for any site in the U. S. The site choice was intended to yield a maximum exposure, or "worst-case," scenario applicable nationwide, particularly with respect to runoff. The model is based on a 10 hectare watershed that surrounds a one hectare pond, two meters deep. It is assumed that all of the 10 hectare area is treated with the pesticide and that any runoff would drain into the pond. The model also incorporates spray drift, the amount of which is dependent primarily upon the droplet size of the spray. OPP assumes that if this model indicates no concerns when compared with the appropriate toxicity data, then further analysis is not necessary as there would be no effect on the species.

It should be noted that prior to the development of the GENEEC model in 1995, a much more crude approach was used to determining EECs. Older reviews and Reregistration Eligibility Decisions (REDs) may use this approach, but it was excessively conservative and does not provide a sound basis for modern risk assessments. For the purposes of endangered species consultations, we will attempt to revise this old approach with the GENEEC model, where the old screening level raised risk concerns.

When there is a concern with the comparison of toxicity with the EECs identified in GENEEC model, a more sophisticated PRZM-EXAMS model is run to refine the EECs if a suitable scenario has been developed and validated. The PRZM-EXAMS model was developed with widespread collaboration and review by chemical fate and transport experts, soil scientists, and agronomists throughout academia, government, and industry, where it is in common use. As with the GENEEC model, the basic model remains as a 10 hectare field surrounding and draining into a 1 hectare pond. Crop scenarios have been developed by OPP for specific sites, and the model uses site-specific data on soils, climate (especially precipitation), and the crop or site. Typically, site-scenarios are developed to provide for a worst-case analysis for a particular crop in a particular geographic region. The development of site scenarios is very time consuming; scenarios have not yet been developed for a number of crops and locations. OPP attempts to match the crop(s) under consideration with the most appropriate scenario. For some of the older OPP analyses, a very limited number of scenarios were available. As more scenarios become available and are geographically appropriate to selected T&E species, older models used in previous analyses may be updated.

One area of significant weakness in modeling EECs relates to residential uses, especially by homeowners, but also to an extent by commercial applicators. There are no usage data in OPP that relate to pesticide use by homeowners on a geographic scale that would be appropriate for an assessment of risks to listed species. For example, we may know the maximum application rate for a lawn pesticide, but we do not know the size of the lawns, the proportion of the area in lawns, or the percentage of lawns that may be treated in a given geographic area. There is limited information on soil types, slopes, watering practices, and other aspects that relate to transport and fate of pesticides. We do know that some homeowners will attempt to control pests with chemicals and that others will not control pests at all or will use non-chemical methods. We would expect that in some areas, few homeowners will use pesticides, but in other areas, a high percentage could. As a result, OPP has insufficient information to develop a scenario or address the extent of pesticide use in a residential area.

It is, however, quite necessary to address the potential that home and garden pesticides may have to affect T&E species, even in the absence of reliable data. Therefore, I have developed a hypothetical scenario, by adapting an existing scenario, to address pesticide use on home lawns where it is most likely that residential pesticides will be used outdoors. It is exceedingly important to note that there is no quantitative, scientifically valid support for this modified scenario; rather it is based on my best professional judgement. I do note that the original scenario, based on golf course use, does have a sound technical basis, and the home lawn scenario is effectively the same as the golf course scenario. Three approaches will be used. First, the treatment of fairways, greens, and tees will represent situations where a high proportion of homeowners may use a pesticide. Second, I will use a 10% treatment to represent situations where only some homeowners may use a pesticide. Even if OPP cannot reliably determine the percentage of homeowners using a pesticide in a given area, this will provide two estimates. Third, where the risks from lawn use could exceed our criteria by only a modest amount, I can back-calculate the percentage of land that would need to be treated to exceed our criteria. If a smaller percentage is treated, this would then be below our criteria of concern. The percentage here would be not just of lawns, but of all of the treatable area under consideration; but in urban and highly populated suburban areas, it would be similar to a percentage of lawns. Should reliable data or other information become available, the approach will be altered appropriately.

It is also important to note that pesticides used in urban areas can be expected to transport considerable distances if they should run off on to concrete or asphalt, such as with streets (e.g., TDK Environmental, 2001). This makes any quantitative analysis very difficult to address aquatic exposure from home use. It also indicates that a no-use or no-spray buffer approach for protection, which we consider quite viable for agricultural areas, may not be particularly useful for urban areas.

Finally, the applicability of the overall EEC scenario, i.e., the 10 hectare watershed draining into a one hectare farm pond, may not be appropriate for a number of T&E species living in rivers or lakes. This scenario is intended to provide a "worst-case" assessment of EECs, but very many T&E fish do not live in ponds, and very many T&E fish do not have all of the habitat surrounding their environment treated with a pesticide. OPP does believe that the EECs from the farm pond model do represent first order streams, such as those in headwaters areas (Effland, et al. 1999). In many agricultural areas, those first order streams may be upstream from pesticide use, but in other areas, or for some non-agricultural uses such as forestry, the first order streams may receive pesticide runoff and drift. However, larger streams and lakes will very likely have lower, often considerably lower, concentrations of pesticides due to more dilution by the receiving waters. In addition, where persistence is a factor, streams will tend to carry pesticides away from where they enter into the streams, and the models do not allow for this. The variables in size of streams, rivers, and lakes, along with flow rates in the lotic waters and seasonal variation, are large enough to preclude the development of applicable models to represent the diversity of T&E species' habitats. We can simply qualitatively note that the farm pond model is expected to overestimate EECs in larger bodies of water.

Indirect Effects - We also attempt to protect listed species from indirect effects of pesticides. We note that there is often not a clear distinction between indirect effects on a listed species and adverse modification of critical habitat (discussed below). By considering indirect effects first, we can provide appropriate protection to listed species even where critical habitat has not been designated. In the case of fish, the indirect concerns are routinely assessed for food and cover.

The primary indirect effect of concern would be for the food source for listed fish. These are best represented by potential effects on aquatic invertebrates, although aquatic plants or plankton may be relevant food sources for some fish species. However, it is not necessary to protect individual organisms that serve as food for listed fish. Thus, our goal is to ensure that pesticides will not impair populations of these aquatic arthropods. In some cases, listed fish may feed on other fish. Because our criteria for protecting the listed fish species is based upon the most sensitive species of fish tested, then by protecting the listed fish species, we are also protecting the species used as prey.

In general, but with some exceptions, pesticides applied in terrestrial environments will not affect the plant material in the water that provides aquatic cover for listed fish. Application rates for herbicides are intended to be efficacious, but are not intended to be excessive. Because only a portion of the effective application rate of an herbicide applied to land will reach water through runoff or drift, the amount is very likely to be below effect levels for aquatic plants. Some of the applied herbicides will degrade through photolysis, hydrolysis, or other processes. In addition, terrestrial herbicide applications are efficacious in part, due to the fact that the product will tend to stay in contact with the foliage or the roots and/or germinating plant parts, when soil applied. With aquatic exposures resulting from terrestrial applications, the pesticide is not placed in immediate contact with the aquatic plant, but rather reaches the plant indirectly after entering the water and being diluted. Aquatic exposure is likely to be transient in flowing waters. However, because of the exceptions where terrestrially applied herbicides could have effects on aquatic plants, OPP does evaluate the sensitivity of aquatic macrophytes to these herbicides to determine if populations of aquatic macrophytes that would serve as cover for T&E fish would be affected.

For most pesticides applied to terrestrial environment, the effects in water, even lentic water, will be relatively transient. Therefore, it is only with very persistent pesticides that any effects would be expected to last into the year following their application. As a result, and excepting those very persistent pesticides, we would not expect that pesticidal modification of the food and cover aspects of critical habitat would be adverse beyond the year of application. Therefore, if a listed salmon or steelhead is not present during the year of application, there would be no concern. If the listed fish is present during the year of application, the effects on food and cover are considered as indirect effects on the fish, rather than as adverse modification of critical habitat.

Designated Critical Habitat - OPP is also required to consult if a pesticide may adversely modify designated critical habitat. In addition to the indirect effects on the fish, we consider that the use of pesticides on land could have such an effect on the critical habitat of aquatic species in a few circumstances. For example, use of herbicides in riparian areas could affect riparian vegetation, especially woody riparian vegetation, which possibly could be an indirect effect on a listed fish. However, there are very few pesticides that are registered for use on riparian vegetation, and the specific uses that may be of concern have to be analyzed on a pesticide by pesticide basis. In considering the general effects that could occur and that could be a problem for listed salmonids, the primary concern would be for the destruction of vegetation near the stream, particularly vegetation that provides cover or temperature control, or that contributes woody debris to the aquatic environment. Destruction of low growing herbaceous material would be a concern if that destruction resulted in excessive sediment loads getting into the stream, but such increased sediment loads are insignificant from cultivated fields relative to those resulting from the initial cultivation itself. Increased sediment loads from destruction of vegetation could be a concern in uncultivated areas. Any increased pesticide load as a result of destruction of terrestrial herbaceous vegetation would be considered a direct effect and would be addressed through the modeling of estimated environmental concentrations. Such modeling can and does take into account the presence and nature of riparian vegetation on pesticide transport to a body of water.

Risk Assessment Processes - All of our risk assessment procedures, toxicity test methods, and EEC models have been peer-reviewed by OPP's Science Advisory Panel. The data from toxicity tests and environmental fate and transport studies undergo a stringent review and validation process in accordance with "Standard Evaluation Procedures" published for each type of test. In addition, all test data on toxicity or environmental fate and transport are conducted in accordance with Good Laboratory Practice (GLP) regulations (40 CFR Part 160) at least since the GLPs were promulgated in 1989.

The risk assessment process is described in "Hazard Evaluation Division - Standard Evaluation Procedure - Ecological Risk Assessment" by Urban and Cook (1986) (termed Ecological Risk Assessment SEP below), which has been separately provided to National Marine Fisheries Service staff. Although certain aspects and procedures have been updated throughout the years, the basic process and criteria still apply. In a very brief summary: the toxicity information for various taxonomic groups of species is quantitatively compared with the potential exposure information from the different uses and application rates and methods. A risk quotient of toxicity divided by exposure is developed and compared with criteria of concern. The criteria of concern presented by Urban and Cook (1986) are presented in Table 2.

Table 2. Risk quotient criteria for direct and indirect effects on T&E fish

Test data	Risk quotient	Presumption
Acute LC50	>0.5	Potentially high acute risk
Acute LC50	>0.1	Risk that may be mitigated through restricted use classification
Acute LC50	>0.05	Endangered species may be affected acutely, including sublethal effects
Chronic NOEC	>1	Chronic risk; endangered species may be affected chronically, including reproduction and effects on progeny
Acute invertebrate LC50[a]	>0.5	May be indirect effects on T&E fish through food supply reduction
Aquatic plant acute EC50[a]	>1[b]	May be indirect effects on aquatic vegetative cover for T&E fish

a. Indirect effects criteria for T&E species are not in Urban and Cook (1986); they were developed subsequently.
b. This criterion has been changed from our earlier requests. The basis is to bring the endangered species criterion for indirect effects on aquatic plant populations in line with EFED's concern levels for these populations.

The Ecological Risk Assessment SEP (pages 2-6) discusses the quantitative estimates of how the acute toxicity data, in combination with the slope of the dose-response curve, can be used to predict the percentage mortality that would occur at the various risk quotients. The discussion indicates that using a "safety factor" of 10, as applies for restricted use classification, one individual in 30,000,000 exposed to the concentration would be likely to die. Using a "safety factor" of 20, as applies to aquatic T&E species, would exponentially increase the margin of safety. It has been calculated by one pesticide registrant (without sufficient information for

OPP to validate that number), that the probability of mortality occurring when the LC50 is 1/20th of the EEC is 2.39×10^{-9}, or less than one individual in ten billion. It should be noted that the discussion (originally part of the 1975 regulations for FIFRA) is based upon slopes of primarily organochlorine pesticides, stated to be 4.5 probits per log cycle at that time. As organochlorine pesticides were phased out, OPP undertook an analysis of more current pesticides based on data reported by Johnson and Finley (1980), and determined that the "typical" slope for aquatic toxicity tests for the "more current" pesticides was 9.95. Because the slopes are based upon logarithmically transformed data, the probability of mortality for a pesticide with a 9.95 slope is again exponentially less than for the originally analyzed slope of 4.5.

The above discussion focuses on mortality from acute toxicity. OPP is concerned about other direct effects as well. For chronic and reproductive effects, our criteria ensures that the EEC is below the no-observed-effect-level, where the "effects" include any observable sublethal effects. Because our EEC values are based upon "worst-case" chemical fate and transport data and a small farm pond scenario, it is rare that a non-target organism would be exposed to such concentrations over a period of time, especially for fish that live in lakes or in streams (best professional judgement). Thus, there is no additional safety factor used for the no-observed-effect-concentration, in contrast to the acute data where a safety factor is warranted because the endpoints are a median probability rather than no effect.

Sublethal Effects - With respect to sublethal effects, Tucker and Leitzke (1979) did an extensive review of existing ecotoxicological data on pesticides. Among their findings was that sublethal effects as reported in the literature did not occur at concentrations below one-fourth to one-sixth of the lethal concentrations, when taking into account the same percentages or numbers affected, test system, duration, species, and other factors. This was termed the "6x hypothesis". Their review included cholinesterase inhibition, but was largely oriented towards externally observable parameters such as growth, food consumption, behavioral signs of intoxication, avoidance and repellency, and similar parameters. Even reproductive parameters fit into the hypothesis when the duration of the test was considered. This hypothesis supported the use of lethality tests for use in assessing acute ecotoxicological risk, and the lethality tests are well enough established and understood to provide strong statistical confidence, which can not always be achieved with sublethal effects. By providing an appropriate safety factor, the concentrations found in lethality tests can therefore generally be used to protect from sublethal effects. As discussed earlier, the entire focus of the early-life-stage and life-cycle chronic tests is on sublethal effects.

In recent years, Moore and Waring (1996) challenged Atlantic salmon with diazinon and observed effects on olfaction as relates to reproductive physiology and behavior. Their work indicated that diazinon could have sublethal effects of concern for salmon reproduction. However, the nature of their test system, direct exposure of olfactory rosettes, could not be quantitatively related to exposures in the natural environment. Subsequently, Scholz et al. (2000) conducted a non-reproductive behavioral study using whole Chinook salmon in a model stream system that mimicked a natural exposure that is far more relevant to ecological risk assessment than the system used by Moore and Waring (1996). The Scholz et al. (2000) data indicate potential effects of diazinon on Chinook salmon behavior at very low levels, with statistically significant effects at nominal diazinon exposures of 1 ppb, with apparent, but non-significant effects at 0.1 ppb.

It would appear that the Scholz et al (2000) work contradicts the 6x hypothesis for acute effects. The research design, especially the nature and duration of exposure, of the test system used by Scholz et al (2000), along with a lack of dose-response, precludes comparisons with lethal levels in accordance with the 6x hypothesis as used by Tucker and Leitzke (1979). Nevertheless, it is known that olfaction is an exquisitely sensitive sense. And this sense may be particularly well developed in salmon, as would be consistent with its use by salmon in homing (Hasler and Scholz, 1983). So the contradiction of the 6x hypothesis is not surprising. As a result of these findings, the 6x hypothesis needs to be re-evaluated with respect to olfaction. At the same time, because of the sensitivity of olfaction and because the 6x hypothesis has generally stood the test of time otherwise, it would be premature to abandon the hypothesis for other acute sublethal effects until there are additional data.

2. Description and use of Ethoprop

a. Chemical Identification

- Common Name: Ethoprop
- Chemical Name:
  O-ehtyl-S,S-dipropylphosphorodithioate
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- Chemical Family: Organo-phosphate
- Case Number: 0106
- CAS Registry Number: 13194-48-4
- OPP Chemical Code: 041101
- Empirical Formula: $C_8H_{19}O_2PS_2$
- Molecular Weight: 242.3 g/mole
- Trade and Other Names: MOCAP®
- Manufacturer: Bayer Corporation
  Agriculture Division

b. Application sites, methods, and rates

Methods of Application: Ethoprop is applied by ground application only. Aerial application is not permitted. At the time of application, the product must be incorporated into the soil up to recommended depths of 6". For most crops the application is pre-plant or at-planting, generally in the spring. Corn applications are pre-plant up to lay-by (the last time the crop is cultivated), however post-plant applications have been eliminated. Other methods, including drip irrigation, are for limited use on crops not of concern in the area currently being assessed (i.e., pineapple in Hawaii).

Ethoprop is currently marketed as products in which it is the only active ingredient (a.i.). Currently it is registered for use on bananas and plaintain, beans (snap and lima), cabbage, corn (sweet and field), cucumbers, peanuts, pineapple, potatoes, sugarcane, sweet potato, tobacco, citrus seedlings, and ornamentals. The product can be incorporated into the soil by rotary tiller, rotary hoe, spring-tooth harrow, or by double discing. For most sites, incorporation to a depth of 2-4 in is recommended (6-8" for potatoes in the Columbia River basis). For broadcast application, immediate watering-in with ¼ to ½ inch water is required. Table 3 details the sites of relevance to the areas being examined here. A review of active labels produced three results, in addition to ethoprop technical (95.9% a.i.). The end-use products are single agent ethoprop granular at 15%, and 20% a.i. concentrations, and an emulsifiable concentrate with a 69.6% a.i. concentration.

Application rates can vary for different sites, based largely on the pest to be controlled. The values below represent the maximum application rates for specific crops (Table 3) produced in the area of study. These data are taken from the current labels. Additional sites, not of relevance to the area of concern for this review, include bananas, plantain, peanuts, and sugarcane.

Table 3: Application Sites in California, Oregon, Washington, and Idaho

Use Site	Max.Single Rate lbs/A, a.i.	Max. No. of Appl./Year	Max. lbs a.i per Crop Year
Beans (snap and lima)	3	1	3
Cabbage	1.95	1	1.95
Corn (field and sweet)	4	1	4
Cucumbers	1.95	1	1.95
Ornamentals-nursery	3	1	3
Potatoes	3	1	3
Peanuts [1]	6	1	6
Swt. Potatoes	3.9	1	3.9

[1] Deleted by agreement under current IRED

c. Ethoprop use

The EPA Quantitative Usage Analysis (from the IRED) reports an average national usage of 691,000lbs (weighted average) for the period 1987 to 1996. The major crops are in the Northwest and California for ethoprop use appear to be potatoes, corn, and sweet potatoes.

Total annual usage of Ethoprop, as estimated by USGS and referenced in the National Center for Food and Agricultural Policy (NCFAP) National Pesticide Use Database, (Gianessi and Marcelli, 2000), was 846,807 pounds in 1997. This was applied to 292,112 acres of a total 81,264,314 acres planted with eligible crops (0.16%). Potatoes, tobacco, corn, beans and peanuts were the major sites for ethoprop use.The main usage areas are in the southeast, and the Pacific northwest.

California Department of Pesticide Regulation (CDPR) maintains detailed records of the application of ethoprop, and this data was used to generate the analytical elements of this review (Table 4). A generally steady decline in use is apparent during the time period reported.

Table 4: Pounds of Ethoprop Applied in California, 1993-2002 (CDPR)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
lbs a.i.	62,143	51,270	51,104	27,955	23,842	27,949	26,196	16,119	19,046	16,531

Oregon, Washington, and Idaho do not release detailed reports on specific use of pesticides, but do offer state summaries of use. The combination of state-wide totals with USDA crop census data does, however, allow a reasonable approximation of the most extreme usage of pesticide, within the accepted labeling restrictions (maximum rate x acres planted). Survey of selected crop application by National Center for Food and Agricultural Policy is used where possible (census year 1997). The National Quantitative Use Database (NCFAP) indicates that in the Pacific Northwest and California, use of ethoprop on the major applicable crops was 569,203 lbs a.i. in 1992 and 470,831 lbs a.i. in 1997. Summary data from the NCFAP database (Gianessi and Silvers, 2000) is presented below (Tables 5-9). For most commodities, the use of ethoprop increased during the the reported years, however use on potatoes and sweet potatoes declined significantly in some states. In California, use of ethoprop on corn, sweet potatoes, green beans, and cucumbers was not reported in 2002. This is also confirmed by the technical registrant.

Table 5: Regional Use of Ethoprop (NCFAP 2000 Survey)

Year	Crop	Location	Application Rate (lbs ai/A)	Total (lbs a.i.)
1992	Cabbage	CA/NW	1.947	1,120
1997	**Cabbage**	**CA/NW**	**2.300**	**1,893**
1992	Cucumbers	CA/NW	3.173	225
1997	**Cucumbers**	**CA/NW**	**0**	**0**
1992	Green Beans	CA/NW	2.166	22,888
1997	**Green Beans**	**CA/NW**	**2.140**	**45,909**
1992	Potatoes	CA/NW	6.201	497,767
1997	**Potatoes**	**CA/NW**	**6.863**	**354,922**
1992	Corn	CA/NW	1.551	23,149
1997	**Corn**	**CA/NW**	**2.880**	**67,158**
1992	Sweet Potatoes	CA/NW	8.099	24,054
1997	**Sweet Potatoes**	**CA/NW**	**7.932**	**949**

Table 6: California Ethoprop (NCFAP 2000 Survey)

Year	Crop	Location	Application Rate (lbs ai/A)	Total (lbs a.i.)
1992	Cabbage	CA	1.947	1,120
1997	**Cabbage**	**CA**	**2.300**	**1,893**
1992	Cucumbers	CA	3.173	225
1997	**Cucumbers**	**CA**	**0**	**0**
1992	Green Beans	CA	2.318	320
1997	**Green Beans**	**CA**	**0**	**0**
1992	Potatoes	CA	9.753	50,208
1997	**Potatoes**	**CA**	**12.330**	**21,010**
1992	Corn	CA	2.033	386
1997	**Corn**	**CA**	**0**	**0**
1992	Sweet Potatoes	CA	8.099	24,054
1997	**Sweet Potatoes**	**CA**	**7.932**	**949**

Table 7: Idaho Ethoprop Use (NCFAP Survey 2000)

Year	Crop	Location	Application Rate (lbs ai/A)	Total (lbs a.i.)
1992	Potatoes	ID	4.250	313,135
1997	**Potatoes**	**ID**	**2.140**	**161,151**
1993	Green Beans	ID	0	0
1997	**Green Beans**	**ID**	**2.140**	**3,409**

Table 8: Oregon Ethoprop Use (NCFAP Survey, 2000)

Year	Crop	Location	Application Rate (lbs ai/A)	Total (lbs a.i.)
1992	Green Beans	OR	2.090	18,430
1997	**Green Beans**	**OR**	**2.140**	**15,286**
1992	Corn	OR	1.310	9,642
1997	**Corn**	**OR**	**2.070**	**25,843**
1992	Potatoes	OR	6.130	44,136
1997	**Potatoes**	**OR**	**5.410**	**59,262**

Table 9: Washington Ethoprop Use (NCFAP Survey, 2000)

Year	Crop	Location	Application Rate (lbs ai/A)	Total (lbs a.i.)
1992	Green Beans	WA	2.090	4,228
1997	**Green Beans**	**WA**	**2.140**	**9,784**
1992	Corn	WA	1.310	13,121
1997	**Corn**	**WA**	**2.50**	**41,315**
1992	Potatoes	WA	4.560	90,288
1997	**Potatoes**	**WA**	**5.630**	**113,499**

Data provided from the Washington State Department of Agriculture (Table 10 and Attachment 6) provides more precise data on specific crops.

Table 10. Major usage of ethoprop in Washington (WSDA, 2003)

crop	acres planted[1]	acres treated (% treated)	lbs ai/A	# apps	est lbs ai applied
beans, green and lima[2]	8,092		2-3	1	
corn, grain and silage	115,000	not used on corn in Washington			
potato (western Washington)	15,000	12,000 (80%)	3	1	36,000
potato (eastern Washington)[3]	149,000				

[1] Estimated 2001 acres from Washington Agricultural Statistics Service
[2] Amount of acreage from 1997 USDA agricultural census for green and lima beans; not used on dry beans; rate and number of applications from label
[3] Information not yet available beyond acres planted

Table 11: 2002 California Ethoprop Use (California Department of Pesticide Regulation)

Crop Site	Pounds Applied	Acres
Beans	2,566	2,058
Cabbage	0	0
Corn	38	75
Cauliflower	0	0
Cucumber	0	0
Potatoes	9,497	810
Sweet Potato	3,787	687

In the state of California detailed accounting of ethoprop is available, indexed to both the major sites and the counties where the pesticide is applied to commercial sites**.** Table 9 summarized the major crop sites listed as sites on which ethoprop was used in 2002.

3. General Aquatic Risk Assessment for Endangered and Threatened Salmon and Steelhead

a. Aquatic Toxicity:

i. Freshwater Fish, Acute

The acute toxicity data for fresh water fish (Table 12) indicates that ethoprop is slightly to moderately toxic to Rainbow Trout and moderately to highly toxic to Bluegill Sunfish. There were no studies on the degradation products of ethoprop, but these were requested in the IRED. The required tests were performed on Rainbow Trout (cold water species) and Bluegill Sunfish (a warm water fish) using technical grade ethoprop. The results (Table 12) indicate an LC_{50} toxicity at 96 hours for ethoprop in the range of 0.3 to 13.8 ppm. This demonstrates ethoprop to be slightly to highly toxic to freshwater fish. The cold water species, rainbow trout, was significantly less sensitive to ethoprop than the warm water bluegill model. For purposes of this review the cold water fish is presumed to be a better model for toxicity in Pacific salmon and steelhead ESU's, due to a closer genetic relationship and similar behavioral preference for cold waters.

Table 12: Acute Toxicity of Ethoprop to Freshwater Fish

Name	*Taxonomic Name*	*% a.i.*	*96 hr LC50 (ppm a.i.)*	*Toxicity Category*
Rainbow Trout	*Oncorhychus mykiss*	Tech	13.8	Slightly Toxicity
Rainbow Trout	*Oncorhynchus mykiss*	92	1.02	Moderately Toxic
Rainbow Trout	*Oncorhynchus mykiss*	92	1.15	Moderately Toxic
Bluegill Sunfish	*Lepomis macrochirus*	99.7	0.3	Highly Toxic
Bluegill Sunfish	*Lepomis macrochirus*	Tech	2.07	Moderately Toxic
Goldfish	*Carassius auratus*	Tech	13.6	Slightly Toxic

ii. Freshwater Invertebrates, Acute

Results of toxicity testing in freshwater invertebrates are presented in Table 13. Ethoprop appears very highly toxic to freshwater invertebrates. Based on the known action and intended use of ethoprop as an insecticide, it would be predicted that invertebrates would show considerable sensitivity to ethoprop when it reaches water by runoff or drift.

Table 13: Acute Toxicity of Ethoprop to Freshwater Invertebrates

Name	*Taxonomic Name*	*% a.i.*	*48 hr LC50 ppm ai*	*Toxicity Category*
Waterflea	*Daphnia magna*	99.7	0.093 (static)	Very Highly Toxic
Waterflea	*Daphnia magna*	Tech	0.044 (static)	Very Highly Toxic

iii. Freshwater Fish, Chronic Toxicity:

The preferred test species is *Oncorhynchus mykiss*. Results of an early life cycle (35 days) test for ethoprop (using Fathead Minnow) are shown in Table 14.

Table 14: Chronic Toxicity of Ethoprop to Freshwater Fish

Species	*Taxonomic Name*	*%a.i.*	*NOAEC ppm ai*	*LOAEC ppm ai*	*Endpoint Affected*
Fathead Minnow	*Pimephales promelas*	Tech **(flow-through)**	0.024	0.054 (early life cycle - 35 days)	Larval Growth

iv. Freshwater Invertebrates, Chronic Toxicity

The preferred species is *Daphnia magna*. Results of ethoprop testing are shown in Table 15.

Table 15: Chronic Toxicity of Ethoprop to Freshwater Invertebrates

Species	*Taxonomic Name*	*%a.i.*	*21 Day NOAEC ppb ai*	*LOAEC ppb ai*	*Endpoints Affested*
Waterflea	*Daphnia magna*	96.8	0.8	2.4	Growth
Waterflea	*Daphnia magna*	96.5	2.4	5.4	Reproduction

b. Estuarine and Marine Toxicity

i.. Estuarine and Marine Fish, Acute Toxicity

. The preferred test species is *Cyprinodon variegatus*. Results obtained for ethoprop are presented in Table 16

Table 16: Acute Toxicity of Ethoprop to Estuarine/Marine Fish

Species	*Taxonomic Name*	*%a.i.*	*96 hr LC50* *ppm ai*	*Toxicity Category*
Sheepshead Minnow	*Cyprinodon variegatus*	96.8 (flow through)	0.958	Highly Toxic
Sheepshead Minnow	*Cyprinodon variegatus*	95 (flow through)	0.180	Highly Toxic
Pinfish	*Logodon rhomboides*	95 (flow through)	0.0063	Very Highly Toxic
Spot	*Leiostomus xanthurus*	95 (static)	0.033	Very Highly Toxic

ii. Estuarine/Marine Invertebrates, Acute

The preferred test species are *Crassostrea virginica* and *Americamysis bahia*. Results of testing for Ethoprop are shown in Table 17.

Table 17: **Acute Toxicity of Ethoprop to Marine/Estuarine Invertebrates**

Species	*Taxonomic Name*	*%a.i.*	*96 hr LC_{50} /EC_{50} ppm ai*	*Toxicity Category*
Eastern Oyster (shell deposition)	*Crassostrea virginica*	98.7	3.7	Moderately Toxic
Eastern Oyster (larval)	*Crassostrea virginica*	95 (48 hr LC50)	14.9	Slightly Toxic
Mysid Shrimp	*Americamysis bahia*	95 (flow through	0.0075	Very Highly Toxic
Mysid Shrimp	*Americamysis bahia*	96.7	0.02	Very Highly Toxic
Grass Shrimp	*Palaemonetes vulgaris*	Tech (static)	0.0564	Very Highly Toxic
Fiddler Crab	*Uca pugilator*	Tech (static)	1.6	Moderately Toxic
White Shrimp	*Penaeus stylirostris*	95 (static)	0.0064	Very Highly Toxic
Sand Shrimp	*Crangon septemspinosa*	98.9 (62 hr LC50)	0.025	Very Highly Toxic
Pink Shrimp	*Penaeus duorarum*	95 (flow through)	0.013	Very Highly Toxic

iii. Estuarine/Marine Fish, Chronic Toxicity

. Results of early life-cycle testing for ethoprop Sheepshead Minnow are shown in Table 18

Table 18: Chronic Toxicity of Ethoprop to Estuarine/Marine Fish

Species	*Taxonomic Name*	*%a.i.*	*NOEC ppm ai*	*LOEC ppm ai*	*Parameters Affected*
Sheepshead Minnow	*Cyprinodon variegatus*	96.8 (early life-cycle)	0.0059	0.011	Growth
Sheepshead Minnow	*Cyprinodon variegatus*	95 (early life-cycle - 28 days)	0.012	0.021	Embyo and Juvinile Mortality

iv. Estuarine/Marine Invertebrates, Chronic Toxicity

Results of 28 day chronic mysid testing are shown in Table 19.

Table 19: Chronic Toxicity of Ethoprop to Esturarine/Marine Invertebrates

Species	*Taxonomic Name*	*%a.i.*	*NOEC ppb ai*	*LOEC ppb ai*	*Parameters Affected*
Mysid	*Americamysis bahia*	95	0.36 28 day	0.62	Survival
Mysid	*Americamysis bahia*	96.8	1.4 28 day	2.7	Growth

c. Environmental fate and transport:

Hydrolysis, photolysis, and metabolism studies to determine the fate and half-life of ethoprop were conducted using standardized analytical laboratory procedures, performed on ^{14}C-ethoprop. The distribution and timing of ethoprop degradation products was determined by chromatographic means and analysis of radio-labeled isolates.

Parent Ethoprop is stable to hydrolysis at pH 5, 7, and 9. It is not subject to photodegradation in water or soil. In the hydrolysis study, ethoprop comprised an average of 91.9% of the applied compound at pH 5, 92.2% at pH 7, and 73.0% at pH 9.An estimated half-life at pH 9 of 83 days (by hydrolysis) was calculated. The two main products were ethyl alcohol and S,S-dipropylphosphorodithioate; the latter is formed by cleavage of ethyl alcohol from ethoprop. In a photolysis study of 30 days, 12 hours/day exposure to a filtered xenon lamp, 83.9% of the ethoprop remained. Ethoprop is therefore considered stable to direct and indirect photolysis in water.

Aerobic soil metabolism (loam) demonstrated a half-life of 100 days. The major degradate was CO_2 (53.9% at study conclusion). The major nonvolatile degradates, after 252 days, were,

O-ethyl-S-methyl-S-propylphosphorodithioate (SME) <4 %
O-ethyl-O-methyl-S-propylphosphorodithioate (OME) <1 %
O-ethyl-S-propylphosphorodithioate (M1) <1 %

After 252 days, 23.8 % of the applied product remained as ethoprop. Each of the major degradates accounted for <4 % of the sample.The soil anaerobic study also demonstrated a half-life of 100 days. The degradates OME and M1 each accounted for <1% of the sample metabolic.

Ethoprop appears somewhat mobile in some soils. K_d's were determined in several soils; 1.08 % in sandy loam, 1.0 % organic carbon (oc); 1.2 % in sandy loam with 10 % oc, 2.10 % in silty loam with 2.3 % oc., and 3.78 % in silty clay (4.1 % oc). The M1 degradate appears highly moble by comparison. Ethoprop is moderately volatile from ground locations, accounting for 25-50 % of the volatile components after seven days (vp = 1.5×10^{-4} mm Hg). The Henrys Law constant, a value which considers both vapor pressure and water solubility, is a rather low 1.5×10^{-4} atm m^3/mole, suggesting a low vaporization from water.

In field dissipation studies, ethoprop (MOCAP 10G and MOCAP EC®) was applied at a rate of 12 lbs a.i./A. In a potato field in Washington the half life was approximately 40 days while in North Carolina, with wet soils and high temperatures, the half life was 10 days. These findings suggest that in the field, dissipation and degradation occur at a some what higher rate than what is observed in laboratory studies.

Bioaccumulation in fish (bluegill), in a 49 day study (35 days uptake, 14 days depuration) utilizing a flow-through system, maintained exposure at 2µg/l. demonstrated Bioconcentrations Factors of 140x for whole fish. Whole fish concentrations ranged from 31 to 290 µg/kg. Depuration was 38% in whole fish on day 14. The concentration of parent ethoprop decreased from 290 µg/kg on day 35 to 180 µg/kg on day 14 of depuration. These findings suggest that some bioacumulation in fish occurs,

. **d. Incidents**

Six ecological incidents were observed, all involving fish. Three where associated with tobacco and three were associated with golf course use. Of these events, one was considered as highly probable in association with ethoprop, 2 were considered probable, one possible, and two unlikely. When measurements were obtained, the concentration of product in the water, at the time of the fish kill, ranged from 3-241 ppb. In one case, laboratory tests confirmed the presence of ethoprop in the fish (Shad, golf course pond). Although not specifically confirmed, information avaiable suggests that these incidents were associated with routine application, within label limitations. No suggestion of misuse was observed. Since these reports, the golf course use has been eliminated. The application rate for tobacco has been reduced from 12 to 6 lbs/ a.i/A, a requirement for immediate soil incorporation added, and limited to one application each year. These factors will eliminate or reduce the potential for incidents. It should also be noted that the highest application rate for crops in Pacific salmon and steelhead is 4 lbs a.i./A for corn (field and sweet). A single special local needs registration was found for Puerto Rico.

e. Estimated and actual concentrations of Ethoprop in water

Details of the modeled and actual levels of ethoprop are given in the attached EFED IRED chapter. Ethoprop is soluble in water (aqueous solubility 843 ppm) and somewhat volatile (vp: 3.5×10^{-4} mmHg at 26^0C). Laboratory studies indicate ethoprop to be fairly persistent, however the field dissipation can be rapid, depending on moisture and temperature. The agent can be expected to leach, based on laboratory studies, however EPA data on 1350 wells failed to detect ethoprop. With high solubility and low K_d's, ethoprop has the potential to contaminate surface waters through runoff. Current application methods (mechanical or water incorporation), which are intended to keep the product on the field and increase exposure of sub-soil target organisms, will also reduce this effect.

PRZM 3.1 and EXAMs model scenarios generate EEC's, most applicable to ponds near the edge of treated fields. These models generate EEC's based on runoff, infiltration, erosion, plant uptake, microbial transformation, dispersion and evaporation. A summary of EEC's for relevant crops in the areas of interest is shown below. All applications are directly to the soil with soil incorporation. Only one application per year is now allowed.

Table 20: Estimated Environmental Concentration (EEC) of Ethoprop

Site	Appl. Method	Appl. Rate (lbs a.i./A)	Peak (ppb)	21-Day Avg (ppb)	60-Day Avg (ppb)
Beans (MI)	Broadcast (soil incorporated)	8	75.0	74.0	71.0
Cabbage (CA)	Broadcast (soil incorporated)	5	17.0	16.0	16.0
Corn (OH)	Broadcast (soil incorporated)	6	26.0	25.0	24.0
Cucumbers (FL)	Banded (soil incorporated)	2	15.0	14.0	14.0
Potatoes (ME)	Broadcast (soil incorporated)	1	29.0	28.0	27.0
Sweet Potatoes (LA)	Broadcast (soil incorporated)	8	18.2	18.0	17.4

Based on laboratory studies, ethoprop and its degradates appear to pose a risk because of their mobility. Field studies however, do not appear to support these findings.

Surface water contamination from ethoprop is expected, particularly after rainfall, due to its high solubility. The effects of such movement of ethoprop into the aquatic system can be expected to be most significant in areas with high water retention times, such as lakes and ponds. Data in the Agency STORNET database on the occurrence of ethoprop between 1978 and 1997 demonstrates its minimal presence in water associated with known use sites. More than 6000 samples were collected, and >90% were below detection limits. The highest concentration, 3.1µg/l was obtained from Mill Creek in Marion County, Oregon**.** Subsequent samples from the same site demonstrated concentrations of 1.7 and 1.9µg/l. The USGS NAWQA program sampled 20 major watersheds covering a wide area of the U.S., including several ethoprop use areas. Of 5119 samples analyzed, the minimum reported concentration was 0.003µg/l (low detection limit), the highest 2.000µg/l, with a mean value of 0.004µg/l. The majority of samples above the limit of detection were in the Willamette Basin (including Marion County). These studies suggest that ethoprop, in general, does not exceed the low µg/l level, although sampling was on an annual basis in some cases, and may not have captured peak levels.

f. Recent changes in Ethoprop registrations

The following changes reflect data from the IRED for ethoprop, concluded in May 2000. Aerial application has been eliminated. Ground application is prohibited within 140 feet of inland or etuarine habitats (800 feet on the Atlantic seaboard near brackish water sites). Broadcast application of the EC formulation is eliminated for cabbage, snap beans, lima beans, sweet corn, field corn, and limited to band application. Application rate for tobacco is reduced from 12 to 6 lbs a.i./A. Household use is eliminated. Use on peanuts, golf courses, and post-plant corn is eliminated. Broadcast application for sweet potatoes is eliminated. The maximum number of applications is reduced to one for all crops in the areas of interest.California applies additional restrictions (Attachment 3) specific to T&E species. The additional requirements directly related to the current review, include prohibitions against the use of the product when T&E species are in the habitat, a universal 20 foot buffer along rivers, creeks, streams, wetlands, vernal pools, and stock ponds. The agent may not be used on the downslope side of fields where runoff could occur. At least 24 hours should elapse between pesticide application and irrigation.

f. Discussion and general risk conclusions for Ethoprop.

The Levels of Concern (LOC) for direct effects on T&E fish are when the RQ exceeds 0.05 (EEC/LC_{50}) for acute risk or 1.0 (EEC/NOEC) for chronic risk. Table 21 indicates that all uses exceed levels of concern for both acute and chronic risk when based upon the most sensitive freshwater fish species which is bluegill with an LC_{50} of 0.3 ppm and fathead minnow with NOEC of 0.024 for chronic risk. It is OPP policy to base our concern on the most sensitive fish species from which to determine "no effects" and "may affect". We do note that rainbow trout, which is congeneric with salmon and steelhead and therefore probably more representative of them, has a lowest LC_{50} of 1.02 ppm. If we were to use the rainbow trout instead of bluegill, levels of concern for acute risk would be exceeded only for beans, cucumbers, and sweet potatoes at the maximum application rates. Only the use on sweet potatoes exceeds the "high risk" level of concern where we would expect a potential for population effects. We note that many of the salmon and steelhead are in areas where runoff is considerably less than the eastern areas on which the EECs are based. Even in the wetter parts of the Pacific Northwest, annual precipitation figures may approximate those for the modeled crops, but the nature of the precipitation is typically much slower and does not lead to as much runoff as in the east.

For freshwater fish, the acute level of concern (LOC) did not exceeded 0.5 in the bluegill sunfish. Chronic level RQs exceeded 0.5 (RQ=1.5) for foliar potato application at a rate of 1.0 lb a.i/A, with three applications, 14 days apart; it is also exceeded for cotton (RQ=1), applied at rates 1.0 lb a.i./A, with three applications, 14 days apart. The acute risk RQ was <0.01 for all crop applications in the rainbow trout. The LOC for restricted use pesticides (0.1) was exceeded for all crop scenarios in the bluegill sunfish, but not with the rainbow trout. The endangered species LOC (0.05) for acute risk is exceeded in all bluegill sunfish models, but in none of the rainbow trout examples cited. A summary of acute and chronic RQ,s for frehwater fish is shown below.

Table 21: Risk Quotients for Freshwater Fish **(acute based on bluegill; chronic based on fathead minnow)**

Site	LC_{50}	NOEC ppm	EEC Peak	EEC 60-Day	Acute RQ	Chronic RQ
Beans	0.3	0.024	0.075	0.071	0.25	2.96
Cabbage	0.3	0.017	0.017	0.016	0.06	0.67
Corn	0.3	0.024	0.026	0.024	0.09	1.00
Cucumbers	0.3	0.024	0.015	0.014	0.05	0.58
Potatoes	0.3	0.024	0.029	0.027	0.10	1.13
Sweet Potatoes	0.3	0.024	0.182	0.180	0.61	7.50

Ethoprop should have no effect on aquatic plant cover for salmon and steelhead. As an example, the EC_{50} of 8.4 ppm for *Skeletonema costatum* is so low as to be insignificant. Table 22 indicates a potential concern for populations of aquatic invertebrates that may provide food for T&E salmon and steelhead. The levels of concern are somewhat exceeded for all uses based upon acute toxicity; they are markedly exceeded for chronic risk to aquatic invertebrates. Freshwater invertebrate acute risk is considered a matter of concern with RQs ranging from 0.5 to 3.8. Chronic risk in all invertebrate models produced RQ's ranging from 30.00 to 225.0. Sweet potato sites appeared to be the highest risk encountered in the states of interest (California). In the model scenarios, multiple applications appeared to be a significant factor in the assignment of risk. Foliar, multiple applications are no longer permitted under current label restriction.

In both cases, these exceedences are based upon all of a 10 hectare watershed being treated with runoff and drift into a one-hectare pond. If ethoprop is used on a smaller percentage of the crop, the risk from runoff will be proportionately lower, and if the receiving water is a stream or river instead of a pond, the potential for chronic risk is substantially reduced.

Table 22: Risk Quotients for Freshwater Invertebrates (Daphnia)

Site	LC_{50}	NOEC ppm	EEC Peak	EEC 21-Day	Acute RQ	Chronic RQ
Beans	0.044	0.0008	0.075	0.074	1.70	92.50
Cabbage	0.044	0.0008	0.017	0.017	0.39	21.25
Corn	0.044	0.0008	0.026	0.025	0.59	31.25
Cucumbers	0.044	0.0008	0.015	0.014	0.34	17.50
Potatoes	0.044	0.0008	0.029	0.028	0.66	35.00
Sweet Potatoes	0.044	0.0008	0.189	0.180	4.14	225.00

h. Existing protections

Existing recommendations for both the granular and EC formulations note that ethoprop (MOCAP®) is toxic to aquatic organisms (fish and invertebrates). The products are listed for terrestrial use only and the clear statement "do not apply directly to water" is included. Covering or incorporation of the granular product is directed. Drift and runoff precautions are included in the EC label. The EC formulation is prohibited for use within 140 feet of inland freshwater habitats. On the Atlantic seaboard , use is prohibited within 800 feet of brackish water habitats. In California the DPR Bulletins (Attachment 3) provide additional recommendations. These are currently voluntary or informational, but may become enforceable in the future.

4. Listed Salmon and Steelhead ESUs and Comparison with Ethoprop Use Areas

The sources of data available on ethoprop use are considerably different for California than for other states. California has full pesticide use reporting by all applicators except homeowners (ethoprop is not allowed for homeowner use). Oregon has initiated a process for full use reporting, but it has been delayed indefinitely. Washington and Idaho do not have such a mechanism to my knowledge.

The latest information for California pesticide use is for the year 2000 [URL: http://www.cdpr.ca.gov/docs/pur/purmain.htm]. The reported information to the County Agricultural Commissioners includes pounds used, acres treated, and the specific location treated. The pounds and acres are reported to the state, but the specific location information is retained at the county level and is not readily available to EPA.

On a statewide basis, the use of ethoprop in California during the period 1993-2001 has remained rather consistent. The highest use was in 1993 (62,143) and the lowest in 2000 (16,119). While this represents about a 60% decline, use between 1996 and 2001 was more stable. Additional information at CDPR's website (http://www.cdpr.ca.gov/docs/pur/purmain.htm).

Data for county /crop ethoprop use for California are from CDPR tables, as above. For the remaining states (ID,OR,WA), the county/crop data is an estimated value determined by multipling the number of acres planted (1997 census) with each crop and the currently registered maximum application rate from current labels. General assumptions are that there is 100% of crop treated, all at the maximum rate. Where additional information, such as the NCFAP Survey, registrant provided distribution rates, or specific data provided by states or other agencies is available, suitable corrrections are made to more accurately reflect actual ethoprop use. In all cases where calculated estimates were used, and particularly when no use corrections are possible, the stated amount of ethoprop is likely to be a significant overestimate af actual pounds applied. In Oregon, Washington, and Idaho, information on the actual amount of ethoprop used is rather limited. For ESUs in these three states, the indicated amount of acreage, by county, where ethoprop could be used, according to the labels, is multiplied by the maximum application rate for each site. These data are refined by available information on the percent of acreage actually treated, as derived from sources such as NCFAP Survey and sales/shipping data provided by the registrant, resulting in correction factors for acres actually treated. The Qualitative Usage Analysis (QUA) prepared for use with the ethoprop IRED indicates that beans, corn, and potatoes are the most likely sites in the northwest for ethoprop use.

In the following discussion of specific ESUs and ethoprop use, at the county level, information is presented on the listed salmon and steelhead ESUs and a discussion of the potential for the use of ethoprop where they occur. The information on crops harvested in the various ESUs was taken almost entirely from the 1997, USDA Census of Agricultural, critical habitat, or status reviews. As noted above, usage data were derived from the 1997 Agricultural Census and CDPR's pesticide use reporting, with compensation factors (Attachment 4) used where data was available on actual use. When corrections are made with respect to the area treated, the calculation is still based on maximum application rate to 100% of the treated area. In areas where supplemental data could not be obtained from local authorities or the registrant, use data reflects a "worst case" scenario, assuming maximum application rates to 100% of label approved sites. These specific crops are identified in **bold type** in the county tables. Crops listed as Vegetables include beans, broccoli, cauliflower, brussels sprouts, cabbage, cauliflower, and lentils. The label usage rate used is 0.63 lbs a.i./acre for all of these crops, with the same methods and application numbers/year.

A. Steelhead

Steelhead, *Oncorhyncus mykiss*, exhibit one of the most complex suite of life history traits of any salmonid species. Steelhead may exhibit anadromy or freshwater residency. Resident forms are usually referred to as ''rainbow'' or ''redband'' trout, while anadromous life forms are termed ''steelhead.'' The relationship between these two life forms is poorly understood, however, the scientific name was recently changed to represent that both forms are a single species.

Steelhead typically migrate to marine waters after spending 2 years in fresh water. They then reside in marine waters for typically 2 or 3 years prior to returning to their natal stream to spawn as 4- or 5-year-olds. Unlike Pacific salmon, they are capable of spawning more than once before they die. However, it is rare for steelhead to spawn more than twice before dying; most that do so are females. Steelhead adults typically spawn between December and June. Depending on water temperature, steelhead eggs may incubate in redds for 1.5 to 4 months before hatching as alevins. Following yolk sac absorption, alevins emerge as fry and begin actively feeding. Juveniles rear in fresh water from 1 to 4 years, then migrate to the ocean as ‘‘smolts.’’

Biologically, steelhead can be divided into two reproductive ecotypes. “Stream maturing,” or “summer steelhead” enter fresh water in a sexually immature condition and require several months to mature and spawn. “Ocean maturing,” or “winter steelhead” enter fresh water with well-developed gonads and spawn shortly after river entry. There are also two major genetic groups, applying to both anadromous and non-anadromous forms: a coastal group and an inland group, separated approximately by the Cascade crest in Oregon and Washington. California is thought to have only coastal steelhead while Idaho has only inland steelhead.

Historically, steelhead were distributed throughout the North Pacific Ocean from the Kamchatka Peninsula in Asia to the northern Baja Peninsula, but they are now known only as far south as the Santa Margarita River in San Diego County. Many populations have been extirpated.

1. Southern California Steelhead ESU

The Southern California steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787). This ESU ranges from the Santa Maria River in San Luis Obispo County south to San Mateo Creek in San Diego County. Steelhead from this ESU may also occur in Santa Barbara, Ventura and Los Angeles counties, but this ESU apparently is no longer considered to be extant in Orange County (65FR79328-79336, December 19, 2000). Hydrologic units in this ESU are Cuyama (upstream barrier - Vaquero Dam), Santa Maria, San Antonio, Santa Ynez (upstream barrier - Bradbury Dam), Santa Barbara Coastal, Ventura (upstream barriers - Casitas Dam, Robles Dam, Matilja Dam, Vern Freeman Diversion Dam), Santa Clara (upstream barrier - Santa Felicia Dam), Calleguas, and Santa Monica Bay (upstream barrier - Rindge Dam).

River entry ranges from early November through June, with peaks in January and February. Spawning primarily begins in January and continues through early June, with peak spawning in February and March.

Within San Diego County, the San Mateo Creek runs through Camp Pendleton Marine Base and into the Cleveland National Forest. While there are agricultural uses of pesticides in other parts of California within the range of this ESU, it would appear that there are no such uses in the vicinity of San Mateo Creek. Within Los Angeles County, this steelhead occurs in Malibu Creek and possibly, but unlikely, Topanga Creek. Neither of these creeks drain agricultural areas. In addition, there is no use of ethoprop reported by CDPR for either Los Angeles or San Diego counties for the year 2002. There is a potential for steelhead waters to drain agricultural areas in Ventura, Santa Barbara, and San Luis Obispo counties. Usage of Ethoprop in counties where this ESU occurs are presented in Table 23.

Table 23

County	Crop	Acres treated	Ethoprop usage (pounds)
Los Angeles	N-Outdoor Plants in Cont.	1,000(U)	24
San Diego	N-Greenhouse Flowers	15,000(U)	<1
Santa Barbara	Cabbage	200	299
Santa Barbara	Potato	10	127
Santa Barbara	Beans	250	1,236
Ventura	Structural Pest Cont.	NR	10
Ventura	Landscape	NR	18

Commercial use of ethoprop in the Southern California Steelhead ESU is relatively low, with the major use in Santa Barbara county for the treatment of beans and potatoes. Although large urban areas are included, there is no residential use for the compound. Even with only a small amount of usage, the potential for an effect can not be completely excluded, although it is unlikely. I conclude that ethoprop use is not likely to adversely affect steelhead in this ESU.

2. South Central California Steelhead ESU

The South Central California steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final, as threatened, a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787). This coastal steelhead ESU occupies rivers from the Pajaro River, Santa Cruz County, to (but not including) the Santa Maria River, San Luis Obispo County. Most rivers in this ESU drain the Santa Lucia Mountain Range, the southernmost unit of the California Coast Ranges (62FR43937-43954, August 18, 1997). River entry ranges from late November through March, with spawning occurring from January through April.

This ESU includes the Hydrologic units of Pajaro (upstream barriers - Chesbro Reservoir, North Fork Pachero Reservoir), Estrella, Salinas (upstream barriers - Nacimiento Reservoir, Salinas Dam, San Antonio Reservoir), Central Coastal (upstream barriers - Lopez Dam, Whale Rock Reservoir), Alisal-Elkhorn Sloughs, and Carmel. Counties of occurrence include Santa Cruz, San Benito, Monterey, and San Luis Obispo. There are agricultural areas in these counties, and these areas would be drained by waters where steelhead critical habitat occurs. Table 24 shows that Ethoprop usage is low in those counties where this ESU occurs.

Table 24.

County	Crop(s)	Acres treated	Ethoprop usage (pounds)
San Benito	Corn	407	203
San Mateo			none

San Luis Obispo	Cabbage	763	1,144
Santa Cruz			none

Commercial use of ethprop in this ESU is relatively low, with the major use in San Benito and San Luis Obispo counties for the treatment of corn and cabbage respectively. Even with only a small amount of usage, the potential for an effect can not be completely excluded, although it is unlikely. I conclude that ethoprop use is not likely to adversely affect steelhead in the South Central California Coast ESU.

3. Central California Coast Steelhead ESU

The Central California coast steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final, as threatened, a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787). This coastal steelhead ESU occupies California river basins from the Russian River, Sonoma County, to Aptos Creek, Santa Cruz County, (inclusive), and the drainage of San Francisco and San Pablo Bays eastward to the Napa River (inclusive), Napa County. The Sacramento-San Joaquin River Basin of the Central Valley of California is excluded. Steelhead in most tributary streams in San Francisco and San Pablo Bays appear to have been extirpated, whereas most coastal streams sampled in the central California coast region do contain steelhead.

Only winter steelhead are found in this ESU and those to the south. River entry ranges from October in the larger basins, late November in the smaller coastal basins, and continues through June. Steelhead spawning begins in November in the larger basins, December in the smaller coastal basins, and can continue through April with peak spawning generally in February and March. Hydrologic units in this ESU include Russian (upstream barriers - Coyote Dam, Warm Springs Dam), Bodega Bay, Suisun Bay, San Pablo Bay (upstream barriers - Phoenix Dam, San Pablo Dam), Coyote (upstream barriers - Almaden, Anderson, Calero, Guadelupe, Stevens Creek, and Vasona Reservoirs, Searsville Lake), San Francisco Bay (upstream barriers - Calveras Reservoir, Chabot Dam, Crystal Springs Reservoir, Del Valle Reservoir, San Antonio Reservoir), San Francisco Coastal South (upstream barrier - Pilarcitos Dam), and San Lorenzo-Soquel (upstream barrier - Newell Dam).

Counties of occurrence for this ESU are Santa Cruz, San Mateo, San Francisco, Marin, Sonoma, Mendocino, Napa, Alameda, Contra Costa, Solano, and Santa Clara counties. Usage of Ethoprop in the counties where the Central California coast steelhead ESU is presented in Table 25.

Table 25

County	Crop(s)	Acres treated	Ethoprop usage (pounds)
Alameda			none
Contra Costa			none
Marin			none

Mendocino	Potato	15	72
Napa			none
San Francisco			none
San Mateo			none
Santa Cruz			none
Santa Clara	Cucumber	60	92
Santa Clara	Corn	278	378
Solano			none
Sonoma			none

Use of ethoprop in this ESU is quite limited (total= 542 lbs a.i.) and dispersed over a relatively large geographic area. Although urban centers are present, there are no current residential uses for this product.I conclude it will have no effect on the Central California Coast Steelhead ESU.

4. California Central Valley Steelhead ESU

The California Central Valley steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final in 1998 (63FR 13347-13371, March 18, 1998). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

This ESU includes populations ranging from Shasta, Trinity, and Whiskeytown areas, along with other Sacramento River tributaries in the North, down the Central Valley along the San Joaquin River to and including the Merced River in the South, and then into San Pablo and San Francisco Bays. Counties at least partly within this area are Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Glenn, Marin, Merced, Nevada, Placer, Sacramento, San Francisco, San Joaquin, San Mateo, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tuloumne, Yolo, and Yuba. A large proportion of this area is heavily agricultural. Usage of Ethoprop in counties where the California Central Valley steelhead ESU occurs is presented in Table 26.

Table 26.

County	Crop(s)	Acres	Ethoprop Applied (lbs)
Alameda			none
Amador			none
Butte			none
Calaveras			none

Colusa			none
Contra Costa			none
Glenn			none
Marin			none
Merced			none
Nevada			none
Placer			none
Sacramento			none
San Joaquin	Potatoes	5,961	622
San Joaquin	Bean	2,026	639
San Mateo			none
San Francisco			none
Shasta			none
Solano			none
Sonoma			none
Stanislaus	Bean	75	238
Sutter			none
Tehama			none
Tuloumne			none
Yolo			none

There is limited use of ethoprop in the California Central Valley Steelhead ESU counties, which is geographically large. Significant use is limited to two counties. Even with only a small amount of usage, the potential for an effect can not be completely excluded, aalthough it is unlikely. I conclude that ethoprop use is not likely to adversely affect steelhead in this ESU.

5. Northern California Steelhead ESU

The Northern California steelhead ESU was proposed for listing as threatened on February 11, 2000 (65FR6960-6975) and the listing was made final on June 7, 2000 (65FR36074-36094). Critical Habitat has not yet been officially established.

This Northern California coastal steelhead ESU occupies river basins from Redwood Creek in Humboldt County, CA to the Gualala River, inclusive, in Mendocino County, CA. River entry ranges from August through June and spawning from December through April, with peak spawning in January in the larger basins and in late February and March in the smaller coastal basins. The Northern California ESU has both winter and summer steelhead, including what is presently considered to be the southernmost population of summer steelhead, in the Middle Fork Eel River. Counties included appear to be Humboldt, Mendocino, Trinity, and Lake. Table 27 shows the use of Ethoprop in the counties where the Northern California steelhead ESU occurs.

Table 27

County	Crop(s)	Acres treated	Ethoprop usage (pounds)
Humboldt			none
Lake			none
Mendocino	Potato	15	72
Trinity			none

Ethoprop usage is extremely limited in the counties associated with this ESU. I conclude there will be no effect from that amount of usage in the Northern California Steelhead ESU.

6. Upper Columbia River steelhead ESU

The Upper Columbia River steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

The Upper Columbia River steelhead ESU ranges from several northern rivers close to the Canadian border in central Washington (Okanogan and Chelan counties) to the mouth of the Columbia River. The primary area for spawning and growth through the smolt stage of this ESU is from the Yakima River in south Central Washington upstream. Hydrologic units within the spawning and rearing habitat of the Upper Columbia River steelhead ESU and their upstream barriers are Chief Joseph (upstream barrier - Chief Joseph Dam), Okanogan, Similkameen, Methow, Upper Columbia-Entiat, Wenatchee, Moses-Coulee, and Upper Columbia-Priest Rapids. Within the spawning and rearing areas, counties are Chelan, Douglas, Okanogan, Grant, Benton, Franklin, Kittitas, and Yakima, all in Washington.

Areas downstream from the Yakima River are used for migration. Additional counties through which the ESU migrates are Walla Walla, Klickitat, Skamania, Clark, Columbia, Cowlitz, Wahkiakum, and Pacific, Washington; and Gilliam, Morrow, Sherman, Umatilla, Wasco, Hood River, Multnomah, Columbia, and Clatsop, Oregon.

Tables 28 and 29 show the cropping information and maximum potential Ethoprop use for Washington counties where the Upper Columbia River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates respectively.

Table 28

St	County	Crops and acres planted	Acres	Ethoprop Applied (lbs)
WA	Benton	Corn		none
WA	Benton	**Ornamentals**	161	483
WA	Benton	Potatoes	25,914	10,106
WA	Chelan	**Ornamentals**	12	36
WA	Douglas	**Ornamentals**	7	21
WA	Franklin	Corn		none
WA	Franklin	Beans	2,470	741
WA	Franklin	Potatoes	37,770	14,731
WA	Franklin	Cucumbers	2	3.9
WA	Grant	**Cucumbers**	2	3.9
WA	Grant	Beans	4,547	1,369
WA	Grant	Potatoes	44,263	17,262
WA	Grant	**Ornamentals**	1,562	4,686
WA	Grant	Corn		none
WA	Kittitas	Potatoes	442	186
WA	Kittitas	Corn		none
WA	Okanogan	Corn		none
WA	Okanogan	**Ornamentals**	25	75
WA	Yakima	**Cabbage**	144	281
WA	Yakima	Potatoes	1,929	685
WA	Yakima	**Cucumbers**	194	378
WA	Yakima	Corn		none
WA	Yakima	**Ornamentals**	408	1224
WA	Yakima	Beans	837	251

Table 29

St	County	Crops and acres planted	Acres	Ethoprop Use (lbs)
WA	Clark	Corn	1,817	872
WA	Clark	**Ornamentals**	122	366
OR	Clatsop	Corn		none
OR	Columbia	Corn	45	22
WA	Cowlitz	**Ornamentals**	54	168
WA	Cowlitz	Corn		none
OR	Gilliam			none
OR	Hood River	Corn	4	3
WA	Klickitat			none
OR	Morrow	Potatoes	17,030	9,707
OR	Morrow	Corn	12,996	8,837
OR	Mulnomah	Potatoes	336	192
OR	Mulnomah	Beans	77	133
OR	Multnomah	**Cucumbers**	297	579
OR	Multnomah	Corn	1,405	674
WA	Pacific			none
OR	Sherman			none
WA	Skamania			none
OR	Umatilla	Beans	3,327	5,789
OR	Umatilla	Potatoes	15,003	8,552
OR	Umatilla	Corn	9,980	4,790
WA	Wahkiakum			none
WA	Walla Walla	**Cabbage**	6	12
WA	Walla Walla	Beans	708	212
WA	Walla Walla	Potatoes	9,256	3,610
WA	Walla Walla	Corn		none
OR	Wasco	Corn	1	0.7

The area included within this ESU is extensive, and includes several agricultural counties. In considering the large amount of land and potential (or calculated) amount of product that could be applied under current restrictions, it is not possible to exclude the potential for an effect. Therefore I conclude that ethoprop use may affect the Upper Columbia River Steelhead ESU.

7. Snake River Basin steelhead ESU

The Snake River Basin steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

Spawning and early growth areas of this ESU consist of all areas upstream from the confluence of the Snake River and the Columbia River as far as fish passage is possible. Hells Canyon Dam on the Snake River and Dworshak Dam on the Clearwater River, along with Napias Creek Falls near Salmon, Idaho, are named as impassable barriers. These areas include the counties of Wallowa, Baker, Union, and Umatilla (northeastern part) in Oregon; Asotin, Garfield, Columbia, Whitman, Franklin, and Walla Walla in Washington; and Adams, Idaho, Nez Perce, Blaine, Custer, Lemhi, Boise, Valley, Lewis, Clearwater, and Latah in Idaho. Baker County, Oregon, which has a tiny fragment of the Imnaha River watershed was excluded from this assessment. While a small part of Rock Creek extends into Baker County, this occurs at 7200 feet in the mountains (partly in a wilderness area) and is of no significance with respect to ethoprop use in agricultural areas. Similarly excluded are the Upper Grande Ronde watershed tributaries (e.g., Looking Glass and Cabin Creeks) that are barely into higher elevation forested areas of Umatilla County. However, crop areas of Umatilla County are considered in the migratory routes. In Idaho, Blaine and Boise counties technically have waters that are part of the steelhead ESU, but again, these are tiny areas which occur in the Sawtooth National Recreation Area and/or National Forest lands. They have been excluded because they are not relevant to use of ethoprop. The agricultural areas of Valley County, Idaho, appear to be primarily associated with the Payette River watershed, but there is enough of the Salmon River watershed in this county that it was not excluded from this assessment.

Critical Habitat also includes the migratory corridors of the Columbia River from the confluence of the Snake River to the Pacific Ocean. Additional counties in the migratory corridors are Umatilla, Gilliam, Morrow, Sherman, Wasco, Hood River, Multnomah, Columbia, and Clatsop in Oregon; and Benton, Klickitat, Skamania, Clark, Cowlitz, Wahkiakum, and Pacific in Washington.

Tables 30 and 31show the cropping information for the Pacific Northwest counties where the Snake River Basin steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates, respectively.

Table 30 .

St	County	Crops and acres planted	Acres	Ethoprop Use (lbs)
ID	Adams			none
ID	Clearwater	Beans	218	386
ID	Custer	Potatoes	507	198
ID	Idaho	Corn	117	468
ID	Idaho	**Cabbage**	20	39
ID	Idaho	Beans	793	1,410
ID	Latah	Beans	1,135	2,009
ID	Lemhi			none
ID	Lewis			none
ID	Nex Perce	Beans	4,561	8,073
ID	Nez Perce	Corn	15	60
ID	Valley	Potatoes	1,317	395
OR	Union	Potatoes	660	356
OR	Union	Beans	661	535
OR	Wallowa			none
WA	Adams	Beans	102	31
WA	Adams	Corn		none
WA	Adams	Potatoes	27,914	10,886
WA	Asotin			none
WA	Columbia	Beans		none
WA	Franklin	**Cucumbers**	2	4
WA	Franklin	Beans	1,224	367
WA	Franklin	Potatoes	37,770	4,532
WA	Franklin	Corn		none
WA	Garfield			none
WA	Wala Walla	**Cucumbers**	140	273
WA	Walla Walla	**Cabbage**	6	12
WA	Walla Walla	Potatoes	9,256	1,109

WA	Walla Walla	Corn	8,062	3,870
WA	Walla Walla	Beans	708	212
WA	Whitman	Beans		none

Table 31

St	County	Crops and acres planted	Acres	Ethoprop Use (lbs)
OR	Clatsop	Corn	5	3
OR	Columbia	Corn	48	25
OR	Gilliam			none
OR	Morrow	Corn	12,996	6,758
OR	Morrow	Potatoes	17,030	934
OR	Mulnomah	Potatoes	336	131
OR	Multnomah	**Cucumbers**	297	579
OR	Multnomah	Corn	1,405	674
OR	Multnomah	Beans	77	134
OR	Multnomah	**Cabbage**	459	895
OR	Sherman			none
OR	Umailla	Poatoes	15,003	2,522
OR	Umatilla	Beans	3,327	1,298
OR	Umatilla	Corn	9,980	3,609
OR	Umatilla	Cucumbers	4	8
OR	Wasco	Corn	1	0.52
WA	Benton	**Cucumbers**	3	6
WA	Benton	**Ornamentals**	161	483
WA	Benton	Corn		none
WA	Benton	Potatoes	25,914	10,106
WA	Clark	**Ornamentals**	122	366
WA	Clark	Corn		none
WA	Cowlitz	Corn		none
WA	Cowlitz	**Ornamentals**	54	162
WA	Pacific			none

WA	Skamania			none
WA	Wahkiakum			none
WA	Walla Walla	**Cabbage**	6	12
WA	Walla Walla	**Cucumbers**	140	273
WA	Walla Walla	Corn	8,062	3,870
WA	Walla Walla	Beans	708	212
WA	Walla Walla	Potatoes	9,256	3,609

The area included within this ESU is extensive, and includes several major agricultural counties. In considering the large amount of land and potential (or calculated) amount of product that could be applied under current restrictions, it is not possible to exclude the potential for an effect. It is my opinion that ethoprop may affect the Snake River Basin Steelhead ESU.

8 Upper Willamette River steelhead ESU

The Upper Willamette River steelhead ESU was proposed for listing as threatened on March 10, 1998 (63FR11798-11809) and the listing was made final a year later (64FR14517-14528, March 25, 1999). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787). Only naturally spawned, winter steelhead trout are included as part of this ESU; where distinguishable, summer-run steelhead trout are not included.

Spawning and rearing areas are river reaches accessible to listed steelhead in the Willamette River and its tributaries above Willamette Falls up through the Calapooia River. This includes most of Benton, Linn, Polk, Clackamas, Marion, Yamhill, and Washington counties, and small parts of Lincoln and Tillamook counties. However, the latter two counties are small portions in forested areas where ethoprop would not be used, and these counties are excluded from my analysis. While the Willamette River extends upstream into Lane County, the final Critical Habitat Notice does not include the Willamette River (mainstem, Coastal and Middle forks) in Lane County or the MacKenzie River and other tributaries in this county that were in the proposed Critical Habitat.

Hydrologic units where spawning and rearing occur are Upper Willamette, North Santiam (upstream barrier - Big Cliff Dam), South Santiam (upstream barrier - Green Peter Dam), Middle Willamette, Yamhill, Molalla-Pudding, and Tualatin.

The areas below Willamette Falls and downstream in the Columbia River are considered migratiory corridors, and include Multnomah, Columbia and Clatsop counties, Oregon, and Clark, Cowlitz, Wahkiakum, and Pacific counties, Washington.

Table 32 Crops on which ethoprop can be used that are part of the spawning and rearing habitat of the Upper Willamette River steelhead ESU. Table 32 shows areas where the fish migrate.

Table 32

St	County	Crops and acres planted	Acres	Ethoprop Use (lbs)
OR	Benton	Corn	6,260	3,805
OR	Benton	Beans	3,080	5,359
OR	Benton	Potatoes	3	2
OR	Benton	**Cucumbers**	3	6
OR	Clackamas	Beans	337	597
OR	Clackamas	Potatoes	1	1
OR	Clackamas	**Cucumbers**	830	1,619
OR	Clackamas	Corn	1,807	867
OR	Clackmas	**Cabbage**	72	140
OR	Linn	Corn	7,749	3,719
OR	Linn	**Cucumbers**	4	8
OR	Linn	Beans	598	1,040
OR	Linn	**Cabbage**	3	6
OR	Marion	Corn	16,691	8,011
OR	Marion	**Cucumbers**	993	1,936
OR	Marion	Beans	12,216	21,256
OR	Polk	Beans	598	1,040
OR	Polk	Corn	3,307	1,587
OR	Washington	**Cucumbers**	188	367
OR	Washington	Corn	8,155	3,914
OR	Washington	**Cabbage**	4	8
OR	Washington	Beans	988	1,749
OR	Yamhill	Potatoes	1	0.5
OR	Yamhill	Beans	1,838	3,253

Table 33

St	County	Crops and acres planted	Acres	Ethoprop Use (lbs)
OR	Columbia	Corn	48	23
OR	Gilliam			none
OR	Multnomah	Potatoes	336	181
OR	Multnomah	Corn	1,405	731
OR	Multnomah	**Cabbage**	459	895
OR	Multnomah	**Cucumbers**	297	579
OR	Multnomah	Beans	77	136
WA	Clark	Corn		none
WA	Clark	**Ornamentals**	122	366
WA	Cowlitz	Corn		none
WA	Cowlitz	**Ornamentals**	54	162
WA	Pacific			none
WA	Wahkiakum			none

The area included within this ESU is extensive, and includes several major agricultural counties. In considering the large amount of land and potential (or calculated) amount of product that could be applied under current restrictions, it is not possible to exclude the potential for an effect. Therefore I conclude that ethoprop use may affect the Upper Willamette River Steelhead ESU.

9. Lower Columbia River steelhead ESU

The Lower Columbia River steelhead ESU was proposed for listing as endangered on August 9, 1996 (61FR41541-41561) and the listing was made final a year later (62FR43937-43954, August 18, 1997). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

This ESU includes all tributaries from the lower Willamette River (below Willamette Falls) to Hood River in Oregon, and from the Cowlitz River up to the Wind River in Washington. These tributaries would provide the spawning and presumably the growth areas for the young steelhead. It is not clear if the young and growing steelhead in the tributaries would use the nearby mainstem of the Columbia prior to downstream migration. If not, the spawning and rearing habitat would occur in the counties of Hood River, Clackamas, and Multnomah counties in Oregon, and Skamania, Clark, and Cowlitz counties in Washington. Tributaries of the extreme lower Columbia River, e.g., Grays River in Pacific and Wahkiakum counties, Washington and John Day River in Clatsop county, Oregon, are not discussed in the Critical Habitat FRNs; because they are not "between" the specified tributaries, they do not appear part of the spawning and rearing habitat for this steelhead ESU. The mainstem of the Columbia River from the mouth to Hood River constitutes the migration corridor. This would additionally include Columbia and Clatsop counties, Oregon, and Pacific and Wahkiakum counties, Washington.

Hydrologic units for this ESU are Middle Columbia-Hood, Lower Columbia-Sandy (upstream barrier - Bull Run Dam 2), Lewis (upstream barrier - Merlin Dam), Lower Columbia-Clatskanie, Lower Cowlitz, Lower Columbia, Clackamas, and Lower Willamette.

Tables 34 and 35 show the cropping information for Oregon and Washington counties where the Lower Columbia River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates, respectively.

Table 34.

St	County	Crops and acres planted	Acres	Ethoprop Use (lbs)
OR	Clackamas	Potatoes	1	1
OR	Clackamas	Beans	337	597
OR	Clackamas	**Cabbage**	72	140
OR	Clackamas	Corn	1,807	867
OR	Clackamas	**Cucumbers**	830	1,619
OR	Hood River	Corn	4	2
OR	Mulnomah	Potatoes	336	181
OR	Multnomah	**Cabbage**	459	895
OR	Multnomah	**Cucumbers**	297	579
OR	Multnomah	Beans	77	136
OR	Multnomah	Corn	1,405	674
WA	Clark	**Ornamentals**	122	366
WA	Clark	Corn	1,817	872
WA	Cowlitz	**Ornamentals**	54	162
WA	Cowlitz	Corn	1,604	770
WA	Skamania			none

Table 35

St	County	Crops and acres planted	Acres	Ethoprop Use (lbs)
OR	Columbia	Corn	48	23
OR	Clatsop	Corn	5	3
WA	Wahkiakum			none
WA	Pacific			none

Moderate use of ethoprop in this ESU is seen, however no large, centralized application sites are noted and the area is associated with large, downstream portions of major waterways.. The land area and total product usage calculated, however, prevent the conclusion that no potential effects will be seen, although ethoprop is not likely to adversely affect the Lower Columbia River ESU.

10. Middle Columbia River Steelhead ESU

The Middle Columbia River steelhead ESU was proposed for listing as threatened on March 10, 1998 (63FR11798-11809) and the listing was made final a year later (64FR14517-14528, March 25, 1999). Critical Habitat was proposed February 5, 1999 (64FR5740-5754) and designated on February 16, 2000 (65FR7764-7787).

This steelhead ESU occupies "the Columbia River Basin and tributaries from above the Wind River in Washington and the Hood River in Oregon (exclusive), upstream to, and including, the Yakima River, in Washington."(64FR145170, March 25, 1999). The Critical Habitat designation indicates the downstream boundary of the ESU to be Mosier Creek in Wasco County, Oregon; this is consistent with Hood River being "excluded" in the listing notice. No downstream boundary is listed for the Washington side of the Columbia River, but if Wind River is part of the Lower Columbia steelhead ESU, it appears that Collins Creek, Skamania County, Washington would be the last stream down river in the Middle Columbia River ESU. Dog Creek may also be part of the ESU, but White Salmon River certainly is, since the Condit Dam is mentioned as an upstream barrier. Although I am unsure of the status of Dog and Collins creeks, they have little relevance to the analysis of ethoprop because there are only 716 acres of potential use sites in Skamania for ethoprop, and it would be expected that these acres would be in the agricultural rather than forest areas of the county.

The only other upstream barrier, in addition to Condit Dam on the White Salmon River is the Pelton Dam on the Deschutes River. As an upstream barrier, this dam would preclude steelhead from reaching the Metolius and Crooked Rivers as well the upper Deschutes River and its tributaries.

In the John Day River watershed, I have excluded Harney County, Oregon because there is only a tiny amount of the John Day River and several tributary creeks (e.g., Utley, Bear Cougar creeks) which get into high elevation areas (approximately 1700M and higher) of northern Harney County where there are no crops grown. Similarly, the Umatilla River and Walla Walla River get barely into Union County OR, and the Walla Walla River even gets into a tiny piece of Wallowa County, Oregon. But again, these are high elevation areas where crops are not grown, and are excluded counties for this analysis.

The Oregon counties then that appear to have spawning and rearing habitat are Gilliam, Morrow, Umatilla, Sherman, Wasco, Crook, Grant, Wheeler, and Jefferson counties. Hood River, Multnomah, Columbia, and Clatsop counties in Oregon provide migratory habitat. Washington counties providing spawning and rearing habitat would be Benton, Columbia, Franklin, Kittitas, Klickitat, Skamania, Walla Walla, and Yakima, although only a small portion of Franklin County between the Snake River and the Yakima River is included in this ESU. Skamania, Clark, Cowlitz, Wahkiakum, and Pacific Counties in Washington provide migratory corridors.

Tables 36 and 37 show the cropping information for Oregon and Washington counties where the Middle Columbia River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates, respectively.

Table 36

State	County	Crop	Acres	Ethoprop Use (lbs)
OR	Gilliam			none
OR	Jefferson	Beans	220	126
OR	Jefferson	**Ornamentals**	40	120
OR	Jefferson	Potatoes	973	525
OR	Morrow	Potatoes	17,030	9,196
OR	Morrow	Corn	12,996	6,753
OR	Sherman			none
OR	Umailla	Potatoes	15,003	2,522
OR	Umatilla	Beans	3,327	1,963
OR	Umatilla	Corn	9,980	5,190
OR	Umatilla	**Cucumbers**	4	8
WA	Benton	**Ornamentals**	161	483
WA	Benton	Potatoes	25,914	4.121
WA	Benton	Corn	16,086	3,109
WA	Columbia	Beans		none
WA	Franklin	**Cucumbers**	2	4
WA	Franklin	Potatoes	37,770	4,532
WA	Franklin	Beans	1,224	367
WA	Franklin	Corn		none
WA	Grant	Beans		1,365
WA	Grant	Corn		none
WA	Grant	Potatoes	44,263	44,263
WA	Grant	Ornamentals	6,453	19,359
WA	Grant	**Cucumbers**	2	4
WA	Kittitas	Potatoes	442	172
WA	Kittitas	Corn	2,180	1,846
WA	Klickitat			none
WA	Skamania			none
WA	Walla Walla	Corn		none

WA	Walla Walla	Beans	708	212
WA	Walla Walla	**Cucumbers**	140	273
WA	Walla Walla	**Cabbage**	6	12
WA	Walla Walla	Potatoes	9,256	1,109
WA	Yakima	Potatoes	1,929	228
WA	Yakima	**Cucumbers**	194	378
WA	Yakima	**Cabbage**	144	281
WA	Yakima	**Ornamentals**	408	1,224
WA	Yakima	Corn		none
WA	Yakima	Beans	837	251

Table 37

St	County	Crops and acres planted	Acres	Ethoprop Use (lbs)
OR	Clatsop	Corn	5	3
OR	Columbia	Corn	48	25
OR	Hood River	Corn	4	2
OR	Mulnomah	Potatoes	336	181
OR	Multnomah	Beans	77	436
OR	Multnomah	**Cabbage**	459	895
OR	Multnomah	**Cucumbers**	297	579
OR	Multnomah	Corn	1,405	731
WA	Clark	Corn		none
WA	Clark	**Ornamentals**	122	366
WA	Cowlitz	Corn		none
WA	Cowlitz	**Ornamentals**	54	162
WA	Pacific			none
WA	Wahkiakum			none

This ESU is large and includes several major agriculture sites, where ethoprop is currently utilized. Many sites are also found in association with upstream, smaller waterways, where the dilution effects are less significant. Therefore I conclude that ethoprop use may affect the Middle Columbia River Steelhead ESU.

B. Chinook salmon

Chinook salmon *(Oncorhynchus tshawytscha)* is the largest salmon species; adults weighing over 120 pounds have been caught in North American waters. Like other Pacific salmon, chinook salmon are anadromous and die after spawning.

Juvenile stream- and ocean-type chinook salmon have adapted to different ecological niches. Ocean-type chinook salmon, commonly found in coastal streams, tend to utilize estuaries and coastal areas more extensively for juvenile rearing. They typically migrate to sea within the first three months of emergence and spend their ocean life in coastal waters. Summer and fall runs predominate for ocean-type chinook. Stream-type chinook are found most commonly in headwater streams and are much more dependent on freshwater stream ecosystems because of their extended residence in these areas. They often have extensive offshore migrations before returning to their natal streams in the spring or summer months. Stream-type smolts are much larger than their ocean-type counterparts and are therefore able to move offshore relatively quickly.

Coast-wide, chinook salmon typically remain at sea for 2 to 4 years, with the exception of a small proportion of yearling males (called jack salmon) which mature in freshwater or return after 2 or 3 months in salt water. Ocean-type chinook salmon tend to migrate along the coast, while stream-type chinook salmon are found far from the coast in the central North Pacific. They return to their natal streams with a high degree of fidelity. Seasonal ‘‘runs’’ (i.e., spring, summer, fall, or winter), which may be related to local temperature and water flow regimes, have been identified on the basis of when adult chinook salmon enter freshwater to begin their spawning migration. Egg deposition must occur at a time to ensure that fry emerge during the following spring when the river or estuary productivity is sufficient for juvenile survival and growth.

Adult female chinook will prepare a spawning bed, called a redds, in a stream area with suitable gravel composition, water depth and velocity. After laying eggs in a Redds, adult chinook will guard the redds from 4 to 25 days before dying. Chinook salmon eggs will hatch, depending upon water temperatures, between 90 to 150 days after deposition. Juvenile chinook may spend from 3 months to 2 years in freshwater after emergence and before migrating to estuary areas as smolts, and then into the ocean to feed and mature. Historically, chinook salmon ranged as far south as the Ventura River, California, and their northern extent reaches the Russian Far East.

1. Sacramento River Winter-run Chinook Salmon ESU

The Sacramento River Winter-run chinook was emergency listed as threatened with critical habitat designated in 1989 (54FR32085-32088, August 4, 1989). This emergency listing provided interim protection and was followed by (1) a proposed rule to list the winter-run on March 20, 1990, (2) a second emergency rule on April 20, 1990, and (3) a formal listing on November 20, 1990 (59FR440-441, January 4, 1994). A somewhat expanded critical habitat was proposed in 1992 (57FR36626-36632, August 14, 1992) and made final in 1993 (58FR33212-33219, June 16, 1993). In 1994, the winter-run was reclassified as endangered because of significant declines and continued threats (59FR440-441, January 4, 1994).

Critical Habitat has been designated to include the Sacramento River from Keswick Dam, Shasta County (river mile 302) to Chipps Island (river mile 0) at the west end of the Sacramento-San Joaquin delta, and then westward through most of the fresh or estuary waters, north of the

Oakland Bay Bridge, to the ocean. Estuary sloughs in San Pablo and San Francisco bays are excluded (58FR33212-33219, June 16, 1993).

Table 38 shows the ethoprop usage in California counties supporting the Sacramento River winter-run chinook salmon ESU.Spawning areas are primarily in Shasta and Tehama counties above the Red Bluff diversion dam.

Table 38

County	Crop(s)	Acres treated	Ethoprop usage (pounds)
Alameda			none
Butte			none
Colusa			none
Contra Costa			none
Glenn			none
Marin			none
Sacramento			none
San Mateo			none
San Francisco			none
Shasta			none
Solano			none
Sonoma			none
Sutter			none
Tehama			none
Yolo			none

Ethoprop is not applied in the Sacramento River Winter-run ESU counties, and has no effect on this species.

2. Snake River Fall-run Chinook Salmon ESU

The Snake River fall-run chinook salmon ESU was proposed as threatened in 1991 (56FR29547-29552, June 27, 1991) and listed about a year later (57FR14653-14663, April 22, 1992). Critical habitat was designated on December 28, 1993 (58FR68543-68554) to include all tributaries of the Snake and Salmon Rivers accessible to Snake River fall-run chinook salmon, except reaches above impassable natural falls and Dworshak and Hells Canyon Dams. The Clearwater River and Palouse River watersheds are included for the fall-run ESU, but not for the spring/summer run. This chinook ESU was proposed for reclassification on December 28, 1994 (59FR66784-57403) as endangered because of critically low levels, based on very sparse runs. However, because of increased runs in subsequent year, this proposed reclassification was withdrawn (63FR1807-1811, January 12, 1998).

In 1998, NMFS proposed to revise the Snake River fall-run chinook to include those stocks using the Deschutes River (63FR11482-11520, March 9, 1998). The John Day, Umatilla, and Walla Walla Rivers would be included; however, fall-run chinook in these rivers are believed to have been extirpated. It appears that this proposal has yet to be finalized. I have not included these counties here; however, I would note that the Middle Columbia River steelhead ESU encompasses these basins, and crop information is presented in that section of this analysis.

Hydrologic units with spawning and rearing habitat for this fall-run chinook are the Clearwater, Hells Canyon, Imnaha, Lower Grande Ronde, Lower North Fork Clearwater, Lower Salmon, Lower Snake-Asotin, Lower Snake-Tucannon, and Palouse. These units are in Baker, Umatilla, Wallowa, and Union counties in Oregon; Adams, Asotin, Columbia, Franklin, Garfield, Lincoln, Spokane, Walla Walla, and Whitman counties in Washington; and Adams, Benewah, Clearwater, Idaho, Latah, Lewis, Nez Perce, Shoshone, and Valley counties in Idaho. I note that Custer and Lemhi counties in Idaho are not listed as part of the fall-run ESU, although they are included for the spring/summer-run ESU. Because only high elevation forested areas of Baker and Umatilla counties in Oregon are in the spawning and rearing areas for this fall-run chinook, they were excluded from consideration because ethoprop would not be used in these areas.

Tables 39 and 40 show the cropping information for Pacific Northwest counties where the Snake River fall-run chinook salmon ESU is located and for the Oregon and Washington counties where this ESU migrates, respectively.

Table 39

St	County	Crops and acres planted	Acres	Ethoprop Use (lbs)
ID	Adams			none
ID	Benewah			none
ID	Clearwater	Beans	218	386
ID	Idaho	**Cabbage**	20	39
ID	Idaho	Corn	117	61
ID	Idaho	Beans	793	1,404
ID	Latah	Beans	1,135	2,009
ID	Lewis			none
ID	Nez Perce	Corn	15	60
ID	Nez Perce	Beans	4,561	8,073
ID	Shoshone			none
ID	Valley	Potatoes	1,317	1,791
OR	Union	Beans	681	1,170
OR	Union	Potatoes	660	356
OR	Wallowa			none
WA	Adams	Potatoes	27,914	3,350

WA	Adams	Beans	103	31
WA	Adams	Corn		none
WA	Asotin			none
WA	Franklin	Potatoes	37,770	4,532
WA	Franklin	**Cucumbers**	2	4
WA	Franklin	Corn		none
WA	Franklin	Beans	1,224	367
WA	Garfield			none
WA	Walla Walla	Beans	5,457	5,525
WA	Walla Walla	**Cucumbers**	140	273
WA	Walla Walla	Potatoes	9,256	1,111
WA	Walla Walla	Corn		none
WA	Walla Walla	**Cabbage**	6	12
WA	Whitman	Beans	708	212

Table 40

OR	Clatsop	Corn	5	3
OR	Columbia	Corn	48	23
OR	Gilliam			none
OR	Hood River	Corn	4	3
OR	Morrow	Corn	12,996	6,757
OR	Morrow	Potatoes	17,030	9,198
OR	Multnomah	Beans	77	136
OR	Multnomah	**Cucumbers**	297	579
OR	Multnomah	Corn	1,405	731
OR	Multnomah	Potatoes	336	181
OR	Multnomah	Cabbage	459	895
OR	Sherman			none
OR	Umatilla	**Cucumbers**	4	8
OR	Umatilla	Potatoes	15,003	8,102
OR	Umatilla	Corn	9,980	1,963

OR	Umatilla	Beans	3,327	1,963
OR	Wasco	Corn	1	0.5
St	County	Crops	Acres	Ethoprop Use (lbs)
WA	Benton	**Ornamentals**	161	483
WA	Benton	Potatoes	25,914	4,121
WA	Benton	Corn	16,086	3,109
WA	Clark	**Ornamentals**	122	366
WA	Clark	Corn		none
WA	Cowlitz	Corn		none
WA	Cowlitz	**Ornamentals**	54	162
WA	Klickitat			none
WA	Pacific			none
WA	Skamania			none
WA	Wahkiakum			none

A moderate amount of product is applied in the area of this ESU, particularly in a few largely agricultural counties (including Benton, Adams, and Walla Walla WA, and Umatilla and Morrow OR). The presence of major agriculture facilities, located in the upper reaches of large waterways, prevents the total exclusion of all effects from ethoprop use, however, ethoprop use is not likely to adversely affect this species.

3. Snake River Spring/Summer-run Chinook Salmon

The Snake River Spring/Summer-run chinook salmon ESU was proposed as threatened in 1991 (56FR29542-29547, June 27, 1991) and listed about a year later (57FR14653-14663, April 22, 1992). Critical habitat was designated on December 28, 1993 (58FR68543-68554) to include all tributaries of the Snake and Salmon Rivers (except the Clearwater River) accessible to Snake River spring/summer chinook salmon. Like the fall-run chinook, the spring/summer-run chinook ESU was proposed for reclassification on December 28, 1994 (59FR66784-57403) as endangered because of critically low levels, based on very sparse runs. However, because of increased runs in subsequent year, this proposed reclassification was withdrawn (63FR1807-1811, January 12, 1998).

Hydrologic units in the potential spawning and rearing areas include Hells Canyon, Imnaha, Lemhi, Little Salmon, Lower Grande Ronde, Lower Middle Fork Salmon, Lower Salmon, Lower Snake-Asotin, Lower Snake-Tucannon, Middle Salmon-Chamberlain, Middle Salmon - Panther, Pahsimerol, South Fork Salmon, Upper Middle Fork Salmon, Upper Grande Ronde, Upper Salmon, and Wallowa. Areas above Hells Canyon Dam are excluded, along with unnamed “impassable natural falls”. Napias Creek Falls, near Salmon, Idaho, was later named an upstream barrier (64FR57399-57403, October 25, 1999). The Grande Ronde, Imnaha, Salmon, and

Tucannon subbasins, and Asotin, Granite, and Sheep Creeks were specifically named in the Critical Habitat Notice.

Spawning and rearing counties mentioned in the Critical Habitat Notice include Union, Umatilla, Wallowa, and Baker counties in Oregon; Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, and Valley counties in Idaho; and Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman counties in Washington. However, Umatilla and Baker counties in Oregon and Blaine County in Idaho are excluded from this analysis because accessible river reaches are all well above areas where Ethoprop can be used. Counties with migratory corridors are all of those down stream from the confluence of the Snake and Columbia Rivers.

Table 41 shows the cropping information for Oregon and Washington counties where the Snake River spring/summer-run chinook salmon ESU occurs. The cropping information for the migratory corridors is the same as for the Snake River fall-run chinook salmon and is in the table 40 above.

Table 41

St	County	Crops planted	Acres	Ethoprop Use (lbs)
ID	Adams			none
ID	Custer	Potatoes	507	152
ID	Idaho	Beans	793	1,404
ID	Idaho	**Cabbage**	20	39
ID	Idaho	Corn	117	468
ID	Latah	Beans	1,135	2,009
ID	Lemhi			none
ID	Lewis			none
ID	Nez Perce	Corn	117	60
ID	Nez Perce	Beans	4,561	8,072
ID	Valley	Potatoes	225	395
OR	Union	Beans	861	1,524
OR	Union	Potatoes	660	257
OR	Wallowa			none
WA	Asotin			none
WA	Columbia	Beans		none
WA	Franklin	Corn		none
WA	Franklin	Potatoes	37,770	14,731
WA	Franklin	**Cucumbers**	2	3.9

WA	Franklin	Beans	1224	367
WA	Garfield			none
WA	Walla Walla	**Cabbage**	6	12
WA	Walla Walla	Corn		none
WA	Walla Walla	Potatoes	9,256	1,111
WA	Walla Walla	Beans	708	212
WA	Whitman	Beans		none

A moderate amount of product is applied in the area of this ESU, particularly in a few largely agricultural counties (including Benton, Adams, and Walla Walla WA, and Umatilla and Morrow OR). The presence of major agriculture facilities, located in the upper reaches of large waterways, prevents the total exclusion of all effects from ethoprop use, however, I conclude that ethoprop in the Snake River Chinook Spring/Summer-Run ESU may affect, but is not likely to adversely affect.this species.

4. Central Valley Spring-run Chinook Salmon ESU

The Central valley Spring-run chinook salmon ESU was proposed as threatened in 1998 (63FR11482-11520, March 9, 1998) and listed on September 16, 1999 (64FR50393-50415). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches accessible to listed chinook salmon in the Sacramento River and its tributaries in California, along with the down stream river reaches into San Francisco Bay, north of the Oakland Bay Bridge, and to the Golden Gate Bridge

Hydrologic units and upstream barriers within this ESU are the Sacramento-Lower Cow-Lower Clear, Lower Cottonwood, Sacramento-Lower Thomas (upstream barrier - Black Butte Dam), Sacramento-Stone Corral, Lower Butte (upstream barrier - Chesterville Dam), Lower Feather (upstream barrier - Orville Dam), Lower Yuba, Lower Bear (upstream barrier - Camp Far West Dam), Lower Sacramento, Sacramento-Upper Clear (upstream barriers - Keswick Dam, Whiskey town dam), Upper Elder-Upper Thomas, Upper Cow-Battle, Mill-Big Chico, Upper Butte, Upper Yuba (upstream barrier - Englebright Dam), Suisin Bay, San Pablo Bay, and San Francisco Bay. These areas are said to be in the counties of Shasta, Tehama, Butte, Glenn, Colusa, Sutter, Yolo, Yuba, Placer, Sacramento, Solano, Nevada, Contra Costa, Napa, Alameda, Marin, Sonoma, San Mateo, and San Francisco. However, with San Mateo County being well south of the Oakland Bay Bridge, it is difficult to see why this county was included.

Table 42 contains usage information for the California counties supporting the Central Valley spring-run chinook salmon ESU.

Table 42

County	Crop(s)	Acres	Ethoprop Applied (lbs)
Alameda			none
Amador			none
Butte			none
Calaveras			none
Colusa			none
Contra Costa			none
Glenn			none
Marin			none
Merced			none
Nevada			none
Placer			none
Sacramento			none
San Mateo			none
San Francisco			none
San Joaquin	Bean	436	1,176
San Joaquin	Potatoes	795	9,425
Shasta			none
Solano			none
Sonoma			none
Stanislaus	Bean	238	642
Sutter			none
Tehama			none
Tuloumne			none
Yolo			none

Beyond the boundaries of San Joaquin county, there is little ethoprop use in this ESU. Due to the size of this ESU and relatively low useage, in my opinion the use of ethoprop in the Central Valley Spring-run Chinook ESU may affectis not likely to adversely affect this species.

5. California Coastal Chinook Salmon ESU

The California coastal chinook salmon ESU was proposed as threatened in 1998 (63FR11482-11520, March 9, 1998) and listed on September 16, 1999 (64FR50393-50415). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches and estuary areas accessible to listed chinook salmon from Redwood Creek (Humboldt County, California) to the Russian River (Sonoma County, California), inclusive.

The Hydrologic units and upstream barriers are Mad-Redwood, Upper Eel (upstream barrier - Scott Dam), Middle Fort Eel, Lower Eel, South Fork Eel, Mattole, Big-Navarro-Garcia, Gualala-Salmon, Russian (upstream barriers - Coyote Dam; Warm Springs Dam), and Bodega Bay. Counties with agricultural areas where Ethoprop could be used are Humboldt, Trinity, Mendocino, Lake, Sonoma, and Marin. A small portion of Glenn County is also included in the Critical Habitat, but Ethoprop would not be used in the forested upper elevation areas.

Table 43 contains usage information for the California counties supporting the California coastal chinook salmon ESU.

Table 43

County	Crop(s)	Acres treated	Ethoprop usage (pounds)
Humboldt			none
Lake			none
Marin			none
Mendocino	Potato	15	72
Sonoma			none
Trinity			none

There is minimal use of ethoprop in the counties supporting this ESU. Ethoprop would, in my opinion, will have no effect within the California Coastal Chinook ESU.

6. Puget Sound Chinook Salmon ESU

The Puget Sound chinook salmon ESU was proposed as threatened in 1998 (63FR11482-11520, March 9, 1998) and listed a year later (64FR14308-14328, March 24, 1999). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all marine, estuary, and river reaches accessible to listed chinook salmon in Puget Sound and its tributaries, extending out to the Pacific Ocean.

The Hydrologic units and upstream barriers are the Strait of Georgia, San Juan Islands, Nooksack, Upper Skagit, SaNR, Lower Skagit, Stillaguamish, Skykomish, Snoqualmie (upstream barrier - Tolt Dam), Snohomish, Lake Washington (upstream barrier - Landsburg Diversion), Duwamish, Puyallup, Nisqually (upstream barrier - Alder Dam), Deschutes, Skokomish, Hood Canal, Puget Sound, Dungeness-Elwha (upstream barrier - Elwha Dam). Affected counties in Washington, apparently all of which could have spawning and rearing habitat, are Skagit, Whatcom, San Juan, Island, Snohomish, King, Pierce, Thurston, Lewis, Grays Harbor, Mason, Clallam, Jefferson, and Kitsap.

Table 44 shows the cropping information for Washington counties where the Puget Sound chinook salmon ESU is located.

Table 44

St	County	Crops planted	Acres	Ethoprop Use (lbs)
WA	Clallam			none
WA	Island	**Ornamentals**	14	42
WA	Island	Corn		none
WA	Jefferson	**Ornamentals**	17	51
WA	King	**Ornamentals**	436	1,308
WA	King	Cabbage	88	172
WA	King	Corn		none
WA	King	**Cucumbers**	19	37
WA	Kitsap	Corn		none
WA	Kitsap	Potatoes	2	0.24
WA	Kitsap	**Ornamentals**	86	258
WA	Lewis	Corn		none
WA	Mason	**Ornamentals**	33	99
WA	Mason	Corn		none
WA	Mason	**Cucumbers**	2	4
WA	Pierce	**Cabbage**	242	472
WA	Pierce	Potatoes	7	1
WA	Pierce	**Ornamentals**	160	480
WA	Pierce	Corn		none
WA	San Juan	Potatoes	1	<1
WA	Skagit	Potatoes	6,948	833
WA	Skagit	**Ornamentals**	350	1,050
WA	Skagit	**Cucumbers**	2,540	4,953
WA	Skagit	Corn		none
WA	Snohomish	**Ornamentals**	414	1,242
WA	Snohomish	Corn		none
WA	Thurston	**Cucumbers**	9	18

WA	Thurston	**Ornamentals**	615	1,845
WA	Thurston	Corn		none
WA	Whatcom	Potatoes	1,585	190
WA	Whatcom	Beans	1	<1
WA	Whatcom	Corn		none
WA	Whatcom	**Ornamentals**	386	42

Although this is not a major agricultural site, it is the location of several urban areas, including Seattle, Tacoma, Everett, and Olympia, with a variety of modest, potential applications of ethoprop. In view of the proximity of the area to Puget Sound, with large tidal changes and strong currents influencing water flow in rivers and streams, the dissipation effects should be substantial. I conclude that there may be effects to the Puget Sound Chinook ESU from ethoprop use, but ethoprop is not likely to adverselky affect this ESU.

7. Lower Columbia River Chinook Salmon ESU

The Lower Columbia River chinook salmon ESU was proposed as threatened in 1998 (63FR11482-11520, March 9, 1998) and listed a year later (64FR14308-14328, March 24, 1999). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches accessible to listed chinook salmon in Columbia River tributaries between the Grays and White Salmon Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive, along with the lower Columbia River reaches to the Pacific Ocean.

The Hydrologic units and upstream barriers are the Middle Columbia-Hood (upstream barriers - Condit Dam, The Dalles Dam), Lower Columbia-Sandy (upstream barrier - Bull Run Dam 2), Lewis (upstream barrier - Merlin Dam), Lower Columbia-Clatskanie, Upper Cowlitz, Lower Cowlitz, Lower Columbia, Clackamas, and the Lower Willamette. Spawning and rearing habitat would be in the counties of Hood River, Waco, Columbia, Clackamas, Marion, Multnomah, and Washington in Oregon, and Klickitat, Skamania, Clark, Cowlitz, Lewis, Wahkiakum, Pacific, Yakima, and Pierce in Washington. Clatsop County appears to be the only county in the critical habitat that does not contain spawning and rearing habitat, although there is only a small part of Marion County that is included as critical habitat. Pierce County, Washington was excluded from this analysis because the very small part of the Cowlitz River watershed in this county is at a high elevation where ethoprop would not be used.

Tables 45 shows the cropping information for Oregon and Washington counties where the Lower Columbia River chinook salmon ESU occurs.

Table 45

St	County	Crops planted	Acres	Ethoprop Use (lbs)
OR	Clackamas	Corn	1,807	940
OR	Clackamas	Potatoes	1	0.5
OR	Clackamas	Beans	337	597

OR	Clackamas	**Cucumbers**	830	1,619
OR	Clackamus	**Cabbage**	72	140
OR	Clatsop	Corn	5	3
OR	Columbia	Corn	48	25
OR	Hood River	Corn	4	2
OR	Marion	Corn	16,691	8,679
OR	Marion	Beans	12,216	21,622
OR	Marion	**Cabbage**	157	306
OR	Multnomah	Potatoes	336	181
OR	Multnomah	Cabbage	459	895
OR	Multnomah	Corn	1,405	731
OR	Multnomah	Beans	77	136
OR	Multnomah	**Cucumbers**	297	579
OR	Wasco	Corn	1	0.5
OR	Washington	Corn	8,155	4,241
OR	Washington	**Cabbage**	4	8
OR	Washington	**Cucumbers**	88	172
WA	Clark	Corn		none
WA	Clark	**Ornamentals**	157	471
WA	Cowlitz	Corn		
WA	Cowlitz	**Ornamentals**		none
WA	Klickitat			none
WA	Lewis	Corn		none
WA	Pacific			none
WA	Skamania			none
WA	Wahkiakum			none

The use of ethoprop in this ESU is generally modest, however several large, agricultural use sites are noted. These commercial sites, combined with the generally downstream location of the ESU suggest that ethoprop use may affect the Lower Columbia Chinook ESU, but is not likely to adversely affect this ESU.

8. Upper Willamette River Chinook Salmon ESU

The Upper Willamette River Chinook Salmon ESU was proposed as threatened in 1998 (63FR11482-11520, March 9, 1998) and listed a year later (64FR14308-14328, March 24, 1999). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches accessible to listed chinook salmon in the Clackamas River and the Willamette River and its tributaries above Willamette Falls, in addition to all down stream river reaches of the Willamette and Columbia Rivers to the Pacific Ocean.

The Hydrologic units included are the Lower Columbia-Sandy, Lower Columbia-Clatskanie, Lower Columbia, Middle Fork Willamette, Coast Fork Willamette (upstream barriers - Cottage Grove Dam, Dorena Dam), Upper Willamette (upstream barrier - Fern Ridge Dam), McKenzie (upstream barrier - Blue River Dam), North Santiam (upstream barrier - Big Cliff Dam), South Santiam (upstream barrier - Green Peter Dam), Middle Willamette, Yamhill, Molalla-Pudding, Tualatin, Clackamas, and Lower Willamette. Spawning and rearing habitat is in the Oregon counties of Clackamas, Douglas, Lane, Benton, Lincoln, Linn, Polk, Marion, Yamhill, Washington, and Tillamook. However, Lincoln and Tillamook counties include salmon habitat only in the forested parts of the coast range where Ethoprop would not be used. Salmon habitat for this ESU is exceedingly limited in Douglas County also, but we cannot rule out future Ethoprop use in Douglas County.

Tables 46 and 47 show the cropping information for Oregon counties where the Upper Willamette River chinook salmon ESU occurs and for the Oregon and Washington counties where this ESU migrates, respectively.

Table 46

OR	Benton	**Cucumbers**	3	6
OR	Benton	Corn	6,260	8,455
OR	Benton	Potatoes	3	2
OR	Benton	Beans	3,080	5,452
OR	Clackamas	**Cucumbers**	830	1,619
OR	Clackamas	Potatoes	1	0.5
OR	Clackamas	Corn	1,807	940
OR	Clackamas	Beans	337	597
OR	Clackamus	**Cabbage**	72	140
OR	Douglas	Beans	19	34
OR	Douglas	**Cucumbers**	9	18
OR	Douglas	Corn	175	91
OR	Douglas	**Cabbage**	4	7.8
OR	Lane	**Cabbage**	11	22
OR	Lane	Beans	1,796	3,179

OR	Lane	Potatoes	9	5
OR	Lane	**Cucumbers**	21	41
OR	Lane	Corn	3,093	1,608
OR	Linn	Corn	7,749	4,030
OR	Linn	**Cucumbers**	4	8
OR	Linn	**Cabbage**	3	6
OR	Linn	Beans	2,688	4,758
OR	Marion	Beans	12,216	21,622
OR	Marion	Corn	6,691	8,419
OR	Marion	**Cabbage**	157	306
OR	Polk	Beans	598	1,059
OR	Polk	**Cabbage**	3	6
OR	Polk	Corn	3,307	1,720
OR	Washington	Beans	988	1,749
OR	Washington	**Cabbage**	4	7.8
OR	Washington	Corn	8,155	3,181
OR	Washington	**Cucumbers**	188	367
OR	Yamhill	Beans	1,838	3,253
OR	Yamhill	Corn	6,392	3,323
OR	Yamhill	Potatoes	1	0.5
St	County	Crops planted	Acres	Ethoprop Use (lbs)

Table 47

St	County	Crops planted	Acres	Ethoprop Use (lbs)
OR	Mulnomah	Potatoes	336	181
OR	Multnomah	**Cucumbers**	297	579
OR	Clatsop	Corn	5	3
OR	Columbia	Corn	48	25
OR	Multnomah	**Cabbage**	157	895
OR	Multnomah	Corn	1,405	731
OR	Multnomah	Beans	77	436

WA	Clark	**Ornamentals**	157	471
WA	Cowlitz	**Ornamentals**	457	1,371
WA	Clark	Corn	1,817	872
WA	Cowlitz	Corn	1,604	770
WA	Pacific			none
WA	Wahkiakum			none

Several areas of large scale agricultural application are noted in this ESU, in addition to widespread areas with limited applications. The large size and widespread use of ethoprop suggests there may be an effect on the Upper Willamette River ESU

9. Upper Columbia River Spring-run Chinook Salmon ESU

The Upper Columbia River Spring-run Chinook Salmon ESU was proposed as endangered in 1998 (63FR11482-11520, March 9, 1998) and listed a year later (64FR14308-14328, March 24, 1999). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches accessible to listed chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River, as well as all down stream migratory corridors to the Pacific Ocean. Hydrologic units and their upstream barriers are Chief Joseph (Chief Joseph Dam), Similkameen, Methow, Upper Columbia-Entiat, Wenatchee, Upper Columbia-Priest Rapids, Middle Columbia-Lake Wallula, Middle Columbia-Hood, Lower Columbia-Sandy, Lower Columbia-Clatskanie, Lower Columbia, and Lower Willamette. Counties in which spawning and rearing occur are Chelan, Douglas, Okanogan, Grant, Kittitas, and Benton, with the lower river reaches being migratory corridors .

Confidential sales data from the registrant indicate considerable use of ethoprop, almost all on potatoes, vegetables, wheat, and barley. Most of this usage occurs upstream from the confluence of the Snake River with the Columbia River, but not as far north as Chelan, and Okanogan counties, where there is limited acreage of the major crops for ethoprop. However, a modest amount is used on the same crops below that confluence in counties on either side of the Columbia River, but all upstream of the John Day Dam.

Tables 48 and 49 show the cropping information for Washington counties that support the Upper Columbia River chinook salmon ESU and for the Oregon and Washington counties where this ESU migrates.

Table 48

St	County	Crops planted	Acres	Ethoprop Use (lbs)
WA	Benton	**Ornamentals**	216	648
WA	Benton	Potatoes	25,914	3,109
WA	Benton	Corn		none

WA	Chelan			none
WA	Douglas	**Ornamentals**	7	21
WA	Grant	Beans	4,549	1,365
WA	Grant	**Ornamentals**	6,453	19,359
WA	Grant	**Ornamentals**	91	273
WA	Grant	**Cucumbers**	1	2
WA	Grant	Corn		none
WA	Grant	Potatoes	44,263	5,311
WA	Kittitas	**Ornamentals**	134	402
WA	Okanogan	**Ornamentals**	111	333
WA	Okanogan	Corn		none

Table 49

St	County	Crops planted	Acres	Ethoprop Use (lbs)
OR	Clatsop	Corn	5	3
OR	Columbia	Corn	48	25
OR	Gilliam			none
OR	Hood River	Corn	4	2
OR	Morrow	Corn	12,996	6,753
OR	Morrow	Potatoes	17,030	9,196
OR	Multnomah	**Cucumbers**	297	579
OR	Multnomah	Potatoes	336	181
OR	Multnomah	Corn	1,405	731
OR	Multnomah	**Cabbage**	157	895
OR	Multnomah	Beans	77	136
OR	Sherman			none
OR	Umailla	Potatoes	15,003	2,522
OR	Umatilla	**Cucumbers**	4	8
OR	Umatilla	Corn	9,980	5,191
OR	Umatilla	Beans	3,227	1,298
OR	Wasco	Corn	1	1

WA	Clark	Corn		none
WA	Clark	**Ornamentals**	157	1,371
WA	Cowlitz	**Ornamentals**	230	690
WA	Cowlitz	Corn		none
WA	Franklin	**Ornamentals**	1,982	5,946
WA	Franklin	Corn		none
WA	Franklin	Beans	1,224	367
WA	Franklin	**Cucumbers**	2	3.9
WA	Klickitat			none
WA	Pacific			none
WA	Skamania			none
WA	Wahkiakum			none
WA	Walla Walla	**Cucumbers**	140	273
WA	Walla Walla	**Ornamentals**	2,706	8,194
WA	Walla Walla	Potatoes	9,256	1,333
WA	Walla Walla	Cabbage	6	12
WA	Walla Walla	Beans	708	212
WA	Walla Walla	Corn		none
WA	Yakima	Potatoes	1,929	228
WA	Yakima	**Cabbage**	144	281
WA	Yakima	**Cucumbers**	13	378
WA	Yakima	**Ornamentals**	133	399
WA	Yakima	Beans	837	251
WA	Yakima	Corn		none

This large, complex ESU contains numerous areas of significant agriculture with associated ethoprop use. I conclude ethoprop use may affect the Upper Columbia Spring-run Chinook ESU.

C. Coho Salmon

Coho salmon, *Oncorhynchus kisutch*, were historically distributed throughout the North Pacific Ocean from central California to Point Hope, AK, through the Aleutian Islands into Asia. Historically, this species probably inhabited most coastal streams in Washington, Oregon, and central and northern California. Some populations may once have migrated hundreds of miles inland to spawn in tributaries of the upper Columbia River in Washington and the Snake River in Idaho.

Coho salmon generally exhibit a relatively simple, 3 year life cycle. Adults typically begin their freshwater spawning migration in the late summer and fall, spawn by mid-winter, then die. Southern populations are somewhat later and spend much less time in the river prior to spawning than do northern coho. Homing fidelity in coho salmon is generally strong; however their small tributary habitats experience relatively frequent, temporary blockages, and there are a number of examples in which coho salmon have rapidly re-colonized vacant habitat that had only recently become accessible to anadromous fish.

After spawning in late fall and early winter, eggs incubate in redds for 1.5 to 4 months, depending upon the temperature, before hatching as alevins. Following yolk sac absorption, alevins emerge and begin actively feeding as fry. Juveniles rear in fresh water for up to 15 months, then migrate to the ocean as ''smolts'' in the spring. Coho salmon typically spend two growing seasons in the ocean before returning to their natal stream. They are most frequently recovered from ocean waters in the vicinity of their spawning streams, with a minority being recovered at adjacent coastal areas, decreasing in number with distance from the natal streams. However, those coho released from Puget Sound, Hood Canal, and the Strait of Juan de Fuca are caught at high levels in Puget Sound, an area not entered by coho salmon from other areas.

1. Central California Coast Coho Salmon ESU

The Central California Coast Coho Salmon ESU includes all coho naturally reproduced in streams between Punta Gorda, Humboldt County, CA and San Lorenzo River, Santa Cruz County, CA, inclusive. This ESU was proposed in 1995 (60FR38011-38030, July 25, 1995) and listed as threatened, with critical habitat designated, on May 5, 1999 (64FR24049-24062). Critical habitat consists of accessible reaches along the coast, including Arroyo Corte Madera Del Presidio and Corte Madera Creek, tributaries to San Francisco Bay.

Hydrologic units within the boundaries of this ESU are: San Lorenzo-Soquel (upstream barrier - Newell Dam), San Francisco Coastal South, San Pablo Bay (upstream barrier - Phoenix Dam- Phoenix Lake), Tomales-Drake Bays (upstream barriers - Peters Dam-Kent Lake; Seeger Dam-Nicasio Reservoir), Bodega Bay, Russian (upstream barriers - Warm springs dam-Lake Sonoma; Coyote Dam-Lake Mendocino), Gualala-Salmon, and Big-Navarro-Garcia. California counties included are Santa Cruz, San Mateo, Marin, Napa, Sonoma, and Mendocino.

Table 50 contains usage information for the California counties supporting the Central California coast coho salmon ESU.

Table 50

County	Crop(s)	Acres	Ethoprop usage (pounds)
Marin			none
Mendocino	Potato	15	72
Napa			none
San Mateo			none

Santa Cruz			none
Sonoma			none

There is minimal application of ethoprop in this area. In my opinion ethoprop will have no effect on the Central California Coast Coho Salmon ESU.

2. Southern Oregon/Northern California Coast Coho Salmon ESU

The Southern Oregon/Northern California coastal coho salmon ESU was proposed as threatened in 1995 (60FR38011-38030, July 25, 1995) and listed on May 6, 1997 (62FR24588-24609). Critical habitat was proposed later that year (62FR62741-62751, November 25, 1997) and finally designated on May 5, 1999 (64FR24049-24062) to encompass accessible reaches of all rivers (including estuary areas and tributaries) between the Mattole River in California and the Elk River in Oregon, inclusive.

The Southern Oregon/Northern California Coast coho salmon ESU occurs between Punta Gorda, Humboldt County, California and Cape Blanco, Curry County, Oregon. Major basins with this salmon ESU are the Rogue, Klamath, Trinity, and Eel river basins, while the Elk River, Oregon, and the Smith and Mad Rivers, and Redwood Creek, California are smaller basins within the range. Hydrologic units and the upstream barriers are Mattole, South Fork Eel, Lower Eel, Middle Fork Eel, Upper Eel (upstream barrier - Scott Dam-Lake Pillsbury), Mad-Redwood, Smith, South Fork Trinity, Trinity (upstream barrier - Lewiston Dam-Lewiston Reservoir), Salmon, Lower Klamath, Scott, Shasta (upstream barrier - Dwinnell Dam-Dwinnell Reservoir), Upper Klamath (upstream barrier - Irongate Dam-Irongate Reservoir), Chetco, Illinois (upstream barrier - Selmac Dam-Lake Selmac), Lower Rogue, Applegate (upstream barrier - Applegate Dam-Applegate Reservoir), Middle Rogue (upstream barrier - Emigrant Lake Dam-Emigrant Lake), Upper Rogue (upstream barriers - Agate Lake Dam-Agate Lake; Fish Lake Dam-Fish Lake; Willow Lake Dam-Willow Lake; Lost Creek Dam-Lost Creek Reservoir), and Sixes. Related counties are Humboldt, Mendocino, Trinity, Glenn, Lake, Del Norte, Siskiyou in California and Curry, Jackson, Josephine, Klamath, and Douglas, in Oregon. However, I have excluded Glenn County, California from this analysis because the salmon habitat in this county is not near the agricultural areas where ethoprop can be used.

Tables 51 shows the usage of Ethoprop in the California counties supporting the Southern Oregon/Northern California coastal coho salmon ESU. Table 52 shows the cropping information for Oregon counties where the Southern Oregon/Northern California coastal coho salmon ESU migrates.

Table 51

State	County	Crop(s)	Acres treated	Ethoprop usage (pounds)
CA	Humboldt			none
CA	Mendocino	Potato	15	72
CA	Del Norte	Outdoor Transplant	345	1,530
CA	Siskiyou			none
CA	Trinity			none
CA	Lake			none

Table 52

St	County	Crops planted	Acres	Ethoprop use (lbs)
OR	Douglas	Corn	175	91
OR	Douglas	**Cabbage**	3	5.85
OR	Jackson	**Cabbage**	3	6
OR	Jackson	Corn	6,643	3,454
OR	Jackson	Beans	19	31
OR	Curry			none
OR	Josephine	**Cucumbers**	11	22
OR	Josephine	Corn	37	19
OR	Josephine	Beans	1	2
OR	Josephine	**Cabbage**	3	6
OR	Josephine	Potatoes	7	4

There is generally modest use of ethoprop in this ESU, with the most significant site in Jackson OR. near the souther boundry zone. This use pattern suggests that although potential effects may exist, in my opinion they are not likely to adversely affect the Southern Oregon/Northern Califorrnia Coast Coho ESU.

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<u>3. Oregon Coast coho salmon ESU</u>

The Oregon coast coho salmon ESU was first proposed for listing as threatened in 1995 (60FR38011-38030, July 25, 1995), and listed several years later 63FR42587-42591, August 10, 1998). Critical habitat was proposed in 1999 (64FR24998-25007, May 10, 1999) and designated on February 16, 2000 (65FR7764-7787).

This ESU includes coastal populations of coho salmon from Cape Blanco, Curry County, Oregon to the Columbia River. Spawning is spread over many basins, large and small, with higher numbers further south where the coastal lake systems (e.g., the Tenmile, Tahkenitch, and Siltcoos basins) and the Coos and Coquille Rivers have been particularly productive. Critical Habitat includes all accessible reaches in the coastal Hydrologic reaches Necanicum, Nehalem, Wilson-Trask-Nestucca (upstream barrier - McGuire Dam), Siletz-Yaquina, Alsea, Siuslaw, Siltcoos, North Umpqua (upstream barriers - Cooper Creek Dam, Soda Springs Dam), South Umpqua (upstream barrier - Ben Irving Dam, Galesville Dam, Win Walker Reservoir), Umpqua, Coos (upstream barrier - Lower Pony Creek Dam), Coquille, Sixes. Related Oregon counties are Douglas, Lane, Coos, Curry, Benton, Lincoln, Polk, Tillamook, Yamhill, Washington, Columbia, Clatsop. However, the portions of Yamhill, Washington, and Columbia counties that are within the ESU do not include agricultural areas where ethoprop can be used, and they were eliminated from this analysis this analysis.Table 53 show the cropping information for Oregon counties where the Oregon coast coho salmon ESU occurs.

Table 53

St	County	Crops planted	Acres	Ethoprop Use (lbs)
OR	Benton	**Cucumbers**	3	6
OR	Benton	Potatoes	3	2
OR	Benton	Beans	3,080	5,452
OR	Benton	Corn	6,260	8,455
OR	Clatsop	Corn	5	3
OR	Coos			none
OR	Curry			none
OR	Douglas	**Cabbage**	4	8
OR	Douglas	Corn	175	91
OR	Douglas	Beans	19	34
OR	Douglas	**Cucumbers**	9	18
OR	Lane	**Cucumbers**	21	41
OR	Lane	**Cabbage**	11	22
OR	Lane	Potatoes	9	5
OR	Lane	Corn	3,093	1,608
OR	Lane	Beans	1,796	3,179
OR	Lincoln	Beans	1	2
OR	Lincoln	**Cucumbers**	1	2
OR	Polk	**Cabbage**	3	6
OR	Polk	Corn	3,307	1,720
OR	Polk	Beans	598	1,059
OR	Tillamook			none

The use of ethoprop in this area is sufficiently large that all potential effects can not be eliminated, however I believe that given the levels of use for ethoprop, it is not likely to adversely affect the Oregon Coast Coho ESU.

D. Chum Salmon

Chum salmon, *Oncorhynchus keta*, have the widest natural geographic and spawning distribution of any Pacific salmonid, primarily because its range extends farther along the shores of the Arctic Ocean. Chum salmon have been documented to spawn from Asia around the rim of the North Pacific Ocean to Monterey Bay in central California. Presently, major spawning populations are found only as far south as Tillamook Bay on the northern Oregon coast.

Most chum salmon mature between 3 and 5 years of age, usually 4 years, with younger fish being more predominant in southern parts of their range. Chum salmon usually spawn in coastal areas, typically within 100 km of the ocean where they do not have to surmount river blockages and falls. However, in the Skagit River, Washington, they migrate at least 170 km.

During the spawning migration, adult chum salmon enter natal river systems from June to March, depending on characteristics of the population or geographic location. . In Washington, a variety of seasonal runs are recognized, including summer, fall, and winter populations. Fall-run fish predominate, but summer runs are found in Hood Canal, the Strait of Juan de Fuca, and in southern Puget Sound, and two rivers in southern Puget Sound have winter-run fish.

Redds are usually dug in the mainstem or in side channels of rivers. Juveniles outmigrate to seawater almost immediately after emerging from the gravel that covers their redds. This means that survival and growth in juvenile chum salmon depend less on freshwater conditions than on favorable estuary and marine conditions.

1. Hood Canal Summer-run chum salmon ESU

The Hood Canal summer-run chum salmon ESU was proposed for listing as threatened, and critical habitat was proposed, in 1998 (63FR11774-11795, March 10, 1998). The final listing was published a year later (63FR14508-14517, March 25, 1999), and critical habitat was designated in 2000 (65FR7764-7787).

Critical habitat for the Hood Canal ESU includes Hood Canal, Admiralty Inlet, and the straits of Juan de Fuca, along with all river reaches accessible to listed chum salmon draining into Hood Canal as well as Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington. The Hydrologic units are Skokomish (upstream boundary - Cushman Dam), Hood Canal, Puget Sound, Dungeness-Elwha, in the counties of Mason, Clallam, Jefferson, Kitsap, and Island.

Streams specifically mentioned, in addition to Hood Canal, in the proposed critical habitat Notice include Union River, Tahuya River, Big Quilcene River, Big Beef Creek, Anderson Creek, Dewatto River, Snow Creek, Salmon Creek, Jimmycomelately Creek, Duckabush ‘stream’, Hamma Hamma ‘stream’, and Dosewallips ‘stream’.

Tables 54 shows the cropping information for Washington counties where the Hood Canal summer-run chum salmon ESU occurs.

Table 54

St	County	Crops planted	Acres	Ethoprop Use (lbs)
WA	Clallam	Corn		none
WA	Island	Corn		none
WA	Jefferson	Beans		none
WA	Jefferson	**Ornamentals**	40	120
WA	Kitsap	Corn		none
WA	Kitsap	Potatoes	2	<1

The Hood canal ESU is largely isolated by the Olympic range to the west, Puget Sound to the east, and the straits of Juan de Fuca to the north. There appears to be limited application within the ESU. In my opinion, ethoprop will have no effect on the Hood Canal Summer- run Chum Salmon ESU.

2. Columbia River Chum Salmon ESU

The Columbia River chum salmon ESU was proposed for listing as threatened, and critical habitat was proposed, in 1998 (63FR11774-11795, March 10, 1998). The final listing was published a year later (63FR14508-14517, March 25, 1999), and critical habitat was designated in 2000 (65FR7764-7787).

Critical habitat for the Columbia River chum salmon ESU encompasses all accessible reaches and adjacent riparian zones of the Columbia River (including estuary areas and tributaries) downstream from Bonneville Dam, excluding Oregon tributaries upstream of Milton Creek at river km 144 near the town of St. Helens. These areas are the Hydrologic units of Lower Columbia - Sandy (upstream barrier - Bonneville Dam, Lewis (upstream barrier - Merlin Dam), Lower Columbia - Clatskanie, Lower Cowlitz, Lower Columbia, Lower Willamette in the counties of Clark, Skamania, Cowlitz, Wahkiakum, Pacific, Lewis, Washington and Multnomah, Clatsop, Columbia, and Washington, Oregon. It appears that there are three extant populations in Pacific, Greys Harbor, Skamania.

Table 55 shows the cropping information for Oregon and Washington counties where the Columbia River chum salmon ESU occurs.

Table 55

St	County	Crops planted	Acres	Ethoprop Use (lbs)
OR	Multnomah	**Cucumbers**	297	579
OR	Multnomah	Beans	77	436
OR	Clatsop	Corn	5	3
OR	Columbia	Corn	48	25
OR	Multnomah	**Cabbage**	459	895
OR	Washington	**Cabbage**	4	8
OR	Washington	**Cucumbers**	188	367
OR	Washington	Corn	8,155	4,242
OR	Mulnomah	Potatoes	336	181
OR	Multnomah	Corn	1,405	731
OR	Washington	Beans	988	1,749
WA	Lewis	**Ornamentals**	485	1,455
WA	Cowlitz	**Ornamentals**	457	690

WA	Skamania			none
WA	Wahkiakum			none
WA	Lewis	Corn		none
WA	Clark	Corn		none
WA	Clark	**Ornamentals**	157	471
WA	Cowlitz	Corn		none
WA	Pacific			none

This large ESU has relatively modest ethoprop use and is associated with the lower reaches of the Columbia, where dissipation can be expected to be rapid due to river flow. I conclude that ethoprop will have no effect on the Columbia River Chum Salmon ESU.

E. Sockeye Salmon

Sockeye salmon, *Oncorhynchus nerka*, are the third most abundant species of Pacific salmon, after pink and chum salmon. Sockeye salmon exhibit a wide variety of life history patterns that reflect varying dependency on the fresh water environment. The vast majority of sockeye salmon typically spawn in inlet or outlet tributaries of lakes or along the shoreline of lakes, where their distribution and abundance is closely related to the location of rivers that provide access to the lakes. Some sockeye, known as kokanee, are non-anadromous and have been observed on the spawning grounds together with their anadromous counterparts. Some sockeye, particularly the more northern populations, spawn in mainstem rivers.

Growth is influenced by competition, food supply, water temperature, thermal stratification, and other factors, with lake residence time usually increasing the farther north a nursery lake is located. In Washington and British Columbia, lake residence is normally 1 or 2 years. Incubation, fry emergence, spawning, and adult lake entry often involve intricate patterns of adult and juvenile migration and orientation not seen in other *Oncorhynchus* species.
Upon emergence from the substrate, lake-type sockeye salmon juveniles move either downstream or upstream to rearing lakes, where the juveniles rear for 1 to 3 years prior to migrating to sea. Smolt migration typically occurs beginning in late April and extending through early July.

Once in the ocean, sockeye salmon feed on copepods, euphausiids, amphipods, crustacean larvae, fish larvae, squid, and pteropods. They will spend from 1 to 4 years in the ocean before returning to freshwater to spawn. Adult sockeye salmon home precisely to their natal stream or lake. River-and sea-type sockeye salmon have higher straying rates within river systems than lake-type sockeye salmon.

1. Ozette Lake Sockeye Salmon ESU

The Ozette Lake sockeye salmon ESU was proposed for listing, along with proposed critical habitat in 1998 (63FR11750-11771, March 10, 1998). It was listed as threatened on March 25, 1999 (64FR14528-14536), and critical habitat was designated on February 16, 2000 (65FR7764-7787). This ESU spawns in Lake Ozette, Clallam County, Washington, as well as in its outlet stream and the tributaries to the lake. It has the smallest distribution of any listed Pacific salmon.

While Lake Ozette, itself, is part of Olympic National Park, its tributaries extend outside park boundaries, much of which is private land. Discussions with the Washington State Department of Agriculture indicate no agriculture in direct association with the lake or its tributaries. There is limited agriculture in the whole of Clallam County.

Table 56

St	County	Crops planted	Acres	Ethoprop Use (lbs)
WA	Clallam	Corn		none

Ethoprop is not applied in the Ozette Lake Sockeye Salmon ESU, and will have no effect on this ESU.

2. Snake River Sockeye Salmon ESU

The Snake River sockeye salmon was the first salmon ESU in the Pacific Northwest to be listed. It was proposed and listed in 1991 (56FR14055-14066, April 5, 1991 & 56FR58619-58624, November 20, 1991). Critical habitat was proposed in 1992 (57FR57051-57056, December 2, 1992) and designated a year later (58FR68543-68554, December 28, 1993) to include river reaches of the mainstem Columbia River, Snake River, and Salmon River from its confluence with the outlet of Stanley Lake down stream, along with Alturas Lake Creek, Valley Creek, and Stanley, Redfish, Yellow Belly, Pettit, and Alturas lakes (including their inlet and outlet creeks).

Spawning and rearing habitats are considered to be all of the above-named lakes and creeks, even though at the time of the critical habitat Notice, spawning only still occurred in Redfish Lake. These habitats are in Custer and Blaine counties in Idaho. However, the habitat area for the salmon is high elevation areas in a National Wilderness area and National Forest. Ethoprop cannot be used on such a site, and therefore there will be no exposure in the spawning and rearing habitat. There is a probability that this salmon ESU could be exposed to ethoprop in the lower and larger river reaches during its juvenile or adult migration.

Table 57 shows the limited acreage of crops in Idaho counties where this ESU reproduces.Table 58 shows the acreage of crops where Ethoprop can be used in Oregon and Washington counties along the migratory corridor for this ESU.

Table 57

St	County	Crops planted	Acres	Ethoprop Use (lbs)
ID	Blaine	Potatoes	848	458
ID	Custer	Potatoes	507	274
ID	Lemhi			none

Table 58

St	County	Crops planted	Acres	Ethoprop Use (lbs)
ID	Lemhi			none
ID	Nez Perce	Corn	15	60

ID	Nez Perce	Beans	4,561	8,073
ID	Idaho	Beans	793	1,404
ID	Idaho	**Cabbage**	20	39
ID	Idaho	Corn	117	61
ID	Valley	Potatoes	1,317	711
OR	Clatsop	Corn	5	3
OR	Wasco	Corn	1	1
OR	Columbia	Corn	48	23
OR	Multnomah	**Cabbage**	459	895
OR	Multnomah	Potatoes	336	181
OR	Morrow	Potatoes	17,030	9,196
OR	Umatilla	Beans	3,327	1,963
OR	Morrow	Corn	12,996	6,753
OR	Umatilla	**Cucumbers**	4	8
OR	Umatilla	Potatoes	15,003	8,102
OR	Umatilla	Corn	9,980	5,190
OR	Gilliam			none
OR	Hood River	Corn	4	2
OR	Multnomah	Corn	1,405	731
OR	Multnomah	**Cucumbers**	297	579
OR	Multnomah	Beans	77	136
OR	Wallowa			none
OR	Sherman			none
WA	Benton	Corn		none
WA	Clark	**Ornamentals**	157	872
WA	Klickitat			none
WA	Clark	Corn		none
WA	Columbia	Beans		none
WA	Franklin	Beans	1,224	367
WA	Franklin	Corn		none
WA	Asotin			none

WA	Garfield			none
WA	Benton	**Ornamentals**	216	648
WA	Benton	Potatoes	25,914	25,914
WA	Pacific			none
WA	Cowlitz	**Ornamentals**	457	690
WA	Skamania			none
WA	Franklin	**Ornamentals**	1,982	5,946
WA	Franklin	Potatoes	37,770	4,532
WA	Franklin	**Cucumbers**	2	4
WA	Cowlitz	Corn		none
WA	Wahkiakum			none
WA	Walla Walla	Corn		none
WA	Walla Walla	Beans	708	212
WA	Walla Walla	**Cucumbers**	140	273
WA	Walla Walla	**Cabbage**	6	18
WA	Walla Walla	Potatoes	9,256	1,109
WA	Lewis	**Ornamentals**	485	1,455
WA	Lewis	Corn		none
WA	Whitman	Beans		none

Within this ESU, ethoprop usage in the spawning/rearing areas is very limited. The migration corridor, however, traverses a large geographic area with many large scale agricultural sites present. Because both adults and young must pass through these areas, the cumulative effect of the transit period may be affected by ethoprop use. I conclude that ethoprop may affect the Snake River Sockeye Salmon ESU, but it is not likely to adversely affect the species.

5. Specific conclusions for Pacific salmon and steelhead

The review of ethoprop use in California, Oregon, Washington, and Idaho indicates expected usage and application rates, suggesting that the EPA models and known concentrations based on national data, as available, are appropriate. Several features are of significance. Because the areas of concern are typically flowing, well oxygenated streams, rivers, and tributaries, the levels of ethoprop can be expected to rapidly dissipate after crop treatments. Additionally, the ESU's of concern are often coastal and ethoprop concentrations can be expected to rapidly assume oceanic levels through circulation and, particularly in the northwest, tidal displacements.

We note that for direct effects on the listed salmon and steelhead, even small acreage treated could be a concern if it is adjacent to where the fish are at the time of application, and this could warrent a “may affect” determination. But even with direct effects. limited ethoprop useage in areas would not be likely to cause substantial effects, such as on populations. For individual ESUs discussed above, we have taken into account the amount of ethoprop used in the past. While past usage is only an indicator of future use, we note that ethoprop usage has been declining for a number of years in all long term surveys reviewed. Ethoprop is not applied to corn in Washington.

In the northwest, the largest crops for which ethoprop may be used are potatoes and corn. In California, ethoprop usage, as documented by the state agency, is relatively low, even in areas of intense agriculture. As an example, in the Central California Coast Steelhead ESU, of 12 counties represented, 9 reported no use of ethoprop, with the remaining 3 reporting a total use rate of 99 lbs/year. In the California Central Valley Steelhead ESU, an area affected by large scale agriculture, of 28 counties, 19 reported no ethoprop usage. In the remaining 9, a total of 6,568 lbs of ethoprop were applied, with the majority (4,417 lbs) applied to beans in a single county (Solano). The low usage rates reported support an opinion that ethoprop does not affect designated ESU’s associated solely with California agricultural interests. Because there are no residential sites currently registered for ethoprop application, the high density population centers are also not seen as affecting the designated ESU’s.

The indirect effects of ethoprop on the T&E ESU’s must be considered due the high toxicity of the compound to aquatic invertebrates. These organisms are a principal food source for the young stages of salmon and steelhead. A significant deposition of the agent to water in spawning and early life cycle areas could be seen as an indirect risk through the food supply. The current prohibition of water application and establishment of a “well maintained”, vegetated zone of 140 feet (EC formulation) from permanent bodies of water, and the requirement for immediate soil incorporation (granular and EC formulations) will reduce exposure of aquatic invertebrates. Reductions in application rates and application frequency further reduce exposure of the non-target species. The spawning and early stages of most salmon and seelhead tend to be located in upstream sites, often at higher elevations than are suitable for agriculture. Many are also located in national and state parks or in wilderness areas. Ethoprop use in such areas is greatly reduced or prohibited. This, again, would reduce loss of aquatic invertebrates in areas of greatest significance to salmon and steelhead and preserve food sources.

The data pertaining to Oregon, Washington, and Idaho do not support direct estimation of ethoprop use, leading to the use of estimates based on a “worst case” evaluation. The assumptions for the county use data presented above are applications at the highest application rates and 100% of reported acres being treated. When possible, the total application levels have been reduced based on data from National Center for Food and Agriculture Policy survey (1997, Attachment), registrant, or local and state provided information. This data was used to correct for the ratio of treated acres to total planted acres in each state, except California.

Currently only 4 products, including the technical grade for formulation, remain in active use. These include a 69.5% EC formulation, and 15, and 20% a.i. granular formulations (“Lock ‘n Load”®, closed handling systems) under restricted use control. Others have been withdrawn from the market. These changes are consistent with the overall decline in organo-phosphate insecticides and will continue to reduce the effects of ethoprop on the named ESU’s for pacific salmonids and steelhead.

Table 59: Final conclusions on the use of ethoprop and it's effects on Western Salmon and Steelhead ESU's.

Species	ESU	Finding
Chinook Salmon	Upper Columbia, Spring-run	may affect
Chinook Salmon	Snake River spring/summer-run	may affect, but is unlikely to adversely affect
Chinook Salmon	Snake River fall-run	may affect, but is unlikely to adversely affect
Chinook Salmon	Upper Willamette	may affect
Chinook Salmon	Lower Columbia	may affect, but not not likely to adversely affect
Chinook Salmon	Puget Sound	may affect, but not not likely to adversely affect
Chinook Salmon	California Coastal	no effect
Chinook Salmon	Central Valley spring-run	may affect, but is not likely to adversely affect
Chinook Salmon	Sacramento River winter-run	no effect
Coho salmon	Oregon Coast	may affect, but not not likely to adversely affect
Coho salmon	Southern Oregon/Northern California Coasts	may affect, but not not likely to adversely affect
Coho salmon	Central California Coast	no effect
Chum salmon	Hood Canal summer-run	no effect
Chum salmon	Columbia River	no effect
Sockeye salmon	Ozette Lake	no effect
Sockeye salmon	Snake River	may affect, but not not likely to adversely affect
Steelhead	Snake River Basin	may affect
Steelhead	Upper Columbia River	may affect
Steelhead	Middle Columbia River	may affect
Steelhead	Lower Columbia River	may affect, but not not likely to adversely affect
Steelhead	Upper Willamette River	may affect
Steelhead	Northern California	no effect
Steelhead	Central California Coast	no effect

Steelhead	South-Central California Coast	may affect, but not not likely to adversely affect
Steelhead	Southern California	may affect, but not not likely to adversely affect
Steelhead	Central Valley, California	may affect, but not likely to adversely affect

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Attachment 1

Interim Reregistration Eligibility Decision for Ethoprop

Case 102

Attachment 2

EFED Supplement for Eligibility Decision

Ethoprop

Attachment 3

California Guidelines for Ethoprop Use

#10 Do not use in currently occupied habitat (see Species Descriptions table for possible exceptions)

#15 Provide a 20 foot minimum strip of vegetation (on which pesticides should not be applied) along rivers, creeks, streams, wetlands, vernal pools and stock ponds or on the downhill side of fields where run-off could occur. Prepare land around fields to contain run-off by proper leveling, etc. Contain as much water "on-site" as possible. The planting of legumes, or other cover crops for several rows adjacent to off-target water sites is recommended. Mix pesticides in areas not prone to runoff such as concrete mixing/loading pads, disked soil in flat terrain or graveled mix pads, or use a suitable method to contain spills and/or rinsate. Properly empty and triple-rinse pesticide containers at the time of use.

#16.Conduct irrigations efficiently to prevent excessive loss of irrigation waters through run-off. Schedule irrigations and pesticide applications to maximize the interval of time between the pesticide application and the first subsequent irrigation. Allow at least 24 hours between the application of pesticides listed in this bulletin and any irrigation that results in surface run-off into natural waters. Time applications to allow sprays to dry prior to rain or sprinkler irrigations. Do not make aerial applications while irrigation water is on the field unless surface run-off is contained for 72 hours following the application.

#17 For sprayable or dust formulations: when the air is calm or moving away from habitat, commence applications on the side nearest the habitat and proceed away from the habitat. When air currents are moving toward habitat, do not make applications within 200 yards by air or 40 yards by ground upwind from occupied habitat. The county agricultural commissioner may reduce or waive buffer zones following a site inspection, if there is an adequate hedgerow, windbreak, riparian corridor, or other physical barrier that substantially reduces the probability of drift.

Attachment 4

Correction Factors For Application Computation
(Crops Treated/Crops Planted - 1997)

State/Crop	Acres-Total	Acres-Treated	Correction
WA - Beans	7,749	4,572	0.59
WA - Potatoes	155,074	20,160	0.13
WA - Corn	137,717	16526	0.12
ID - Beans	2,700	2,140	0.79
ID - Potatoes	394,977	39,498	0.10
OR - Beans	25,912	15,288	0.58
OR -Potatoes	57,653	10,954	0.19
OR - Corn	48,621	5,835	0.12

Attachment 5
Product Labels for Ethoprop

Attachment 6

Washington State Department of Agriculture