Chlorothalonil
Analysis of Risks
to
Endangered and Threatened Salmon and Steelhead

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Larry Turner, Ph.D.
Environmental Field Branch
Office of Pesticide Programs

Summary

Chlorothalonil is a fungicide used on a variety of crop sites and on various non-crop sites, including nursery, home and garden (except lawns), and golf courses. It is has very high toxicity to fish, somewhat less toxicity to aquatic invertebrates and less toxicity to plants. Turf uses can have rather high application rates and resulting exposure. Exposure from agricultural uses can potentially be moderately high in a few situations, but many rates and numbers of applications have been reduced since the regeregistration process has begun.

An endangered species risk assessment is developed for federally listed Pacific salmon and steelhead. This assessment applies the findings of the Office of Pesticide Program's Environmental Risk Assessment developed for non-target fish and wildlife as part of the reregistration process to determine the potential risks to the 26 listed threatened and endangered Evolutionarily Significant Units (ESUs) of Pacific salmon and steelhead. The use of chlorothalonil on crops and certain non-crop sites may affect 9 ESUs when used according to labeled application directions, may affect but is not likely to adversely affect 11 ESUs, and will have no effect on 6 ESUs. Potential effects are limited and any that occur are likely only in breeding and rearing areas. No effects are expected from home and garden use.

Introduction

This analysis was prepared by the U.S. Environmental Protection Agency (EPA) Office of Pesticides Progams (OPP) to evaluate the risks of chlorothalonil to threatened and endangered Pacific salmon and steelhead. The format of this analysis is the same as for previous analyses. The background section explaining the risk assessment process is the same as was presented in a previous assessment for diazinon, except that we have updated our criteria for indirect effects on aquatic plant cover to bring this in line with the acute risk concerns used by the Environmental Fate and Effects Division of OPP (EFED). Several other minor wording changes have also been made that have no bearing on the technical analysis.

I have used the general aquatic risk assessment presented in the "Reregistration Eligibility Decision (RED) Chlorothalonil" issued in April, 1999 as the starting basis for my assessment

(Attachment 1). This document (US EPA, 1999) is on line at: http://cfpub.epa.gov/oppref/rereg/status.cfm?show=rereg#C. In addition, GB Biosciences Corporation, the primary registrant, has developed an ancillary analysis of potential effects on salmon and steelhead and provided this for our use in developing our effects determination (Hamer, 2003). We have used and cited information from this analysis. We will be providing it for the Service's use when Service personnel have been cleared for Confidential Business Information (CBI), but it contains proprietary data on usage developed by another party and can not be made available to persons not cleared for CBI. While we use certain factual data, and refer to it, all conclusions in this current analysis are those of OPP.

Problem Formulation - The purpose of this analysis is to determine whether the registration of chlorothalonil as a fungicide for use on various crop and non-crop sites may affect threatened and endangered (T&E or listed) Pacific anadromous salmon and steelhead or adversely modify their designated critical habitat.

Scope - This analysis is specific to listed Pacific salmon and steelhead and the watersheds in which they occur. It is acknowledged that chlorothalonil 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.

Contents

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 of chlorothalonil

a. Chemical overview

Common Name: Chlorothalonil
Chemical Name: 2,4,5,6-Tetrachloroisophthalonitrile
Chemical Family: Polychlorinated aromatic
CAS Registry Number: 1897-45-6
OPP Chemical Code: 081901
Empirical Formula: $C_8 Cl_4 N_2$
Basic Manufacturers GB Biosciences; Veterans Ilex; Sipcam Agro USA, Inc.
Trade and Other Names: Bravo, Daconil, Tuffgard

b. Registered uses

Chlorothalonil is a broad-spectrum, non-systemic fungicide registered for a wide variety of agricultural and non-agricultural uses. The primary agricultural uses of chlorothalonil, in terms of amounts used, are peanuts in the southeastern states, which accounts for 34% of the use, potatoes (about 12%), tomatoes (about 7%), and cucurbits (about 5%). It is also registered on coffee, celery, cole crops, onions (dry and green), carrot, garlic, leek, potato, shallot, beans (succulent and dry), cranberry, strawberry, sweet and field corn, apricot, cherry, nectarine, peach, plum, prune, mint soybeans, parsnip, sugar beets, and forage grasses.

As indicated in the RED, about 30% of the chlorothalonil is used on non-agricultural sites, dominated by use as a preservative in paints (about 13%) and on golf courses (about 10%). An additional 4% was used on home lawns, but this use has been discontinued. Other registered non-agricultural sites are ornamentals plants, wood treatment, Christmas trees, and forests. The use in forests is for nursery beds and other young transplants, according to academic plant pathologists, there is no operational use of chlorothalonil in forests, *per se*[1]. In western salmon states, there are a few additional uses under Special Local Needs labels that are not nationally registered. These include gladiolus in California, chickpeas in Oregon, Washington, and Idaho, ornamental bulb production in Oregon and Washington, nursery conifers in Washington, and grass seed in Oregon.

There are currently 87 products registered for use nationally, along with 17 Special Local Needs registrations in western salmon states. Most products are formulated as wettable powders, emulsifiable concentrates, soluble concentrates, or water dispersible granules for spray applications. The "water dispersible granules" are not applied as granules; rather they are mixed with water and applied as a spray. There are two 5% granular products for turf use only. A "smoke generator" product is available for use in commercial greenhouses only. Some products contain additional active ingredients beyond chlorothalonil. These are typically other fungicides, such as mefenoxam, propamocarb HCl, copper oxychloride, sulfur, thiophanate-methyl or flutolanil but one home and garden product for roses contains the insecticide carbaryl.

As a contact fungicide, chlorothalonil is normally applied as a foliar spray. It may be applied repeatedly throughout the growing season, especially the wetter parts of the growing season when fungal diseases are more prevalent. Turf uses of granular products appear to be oriented towards diseases that occur where stems emerge from the soil; to be efficacious, granular products should not be applied before rain or watering.

Chlorothalonil may be used as the primary fungicide on some crops. But on many crops, it is used much less frequently than the maximum number of applications because it is used with other, often more crop-specific, fungicides to reduce the potential development of resistance by the target fungi.

c. Application rates and Methods

Chlorothalonil is applied as a spray to foliage; because it is not a systemic pesticide, good coverage is needed on foliar surfaces to bring the material into contact with the target fungus. It may be applied by aerial or ground equipment or through sprinkler irrigation. Table 3 presents the rates, application intervals, and the maximum amount to be applied in a year, as taken from the RED. Many labels have incorporated these new provisions; others are in the process of doing so. In most cases, the application rates have not been changed from those that were analyzed in the ecological assessment. Maximum rate reductions were significant for golf courses, going from 22.4 to 11.3 lb ai/A per application, and for stone fruits, going from 8.3 to 3.1 lb ai/A per application. The old labels used in the RED analysis typically did not have a maximum number of applications or amount per year; all uses now have a maximum amount per year except homeowner and other landscape ornamental use.

Table 3. Registered crops and maximum application rates/methods for chlorothalonil in western salmon and steelhead states[a].

[1] email communication, Jennifer Shaw, Syngenta Corporation, November 13, 2003

<table>
<tr><th colspan="2">Crop or Site</th><th>Maximum rate per application (lb ai/A)</th><th>application interval (days)</th><th>Maximum amount per year (lb ai/A)</th></tr>
<tr><td colspan="2">Beans, snap</td><td>1.5</td><td>7</td><td>9</td></tr>
<tr><td colspan="2">Beans, dry</td><td>2.25</td><td>7</td><td>6</td></tr>
<tr><td colspan="2">Blueberry</td><td>3.0</td><td>10</td><td>9</td></tr>
<tr><td colspan="2">Carrot</td><td>1.5</td><td>7</td><td>15</td></tr>
<tr><td colspan="2">Celery</td><td>2.25</td><td>7</td><td>18</td></tr>
<tr><td colspan="2">Christmas trees & other nursery conifers (established trees)</td><td>4.1</td><td>21</td><td>16.5</td></tr>
<tr><td colspan="2">Christmas trees & other nursery conifer seed beds (young trees)</td><td>4.1</td><td>7</td><td>16.5</td></tr>
<tr><td colspan="2">Cole crops (cabbage, broccoli, cauliflower, Brussel sprouts, etc)</td><td>1.5</td><td>7</td><td>12</td></tr>
<tr><td colspan="2">Corn, sweet & grown for seed</td><td>1.5</td><td>7</td><td>9</td></tr>
<tr><td colspan="2">Cranberry</td><td>5</td><td>10</td><td>15</td></tr>
<tr><td colspan="2">Cucurbits (squash, pumpkins, melons, cantaloupe)</td><td>2.25</td><td>7</td><td>15.75</td></tr>
<tr><td colspan="2">Filberts</td><td>3</td><td>14</td><td>9</td></tr>
<tr><td rowspan="6">Golf courses[b]</td><td rowspan="2">greens</td><td>11.3</td><td>14</td><td rowspan="2">73</td></tr>
<tr><td>7.3</td><td>7</td></tr>
<tr><td rowspan="2">tees</td><td>11.3</td><td>14</td><td rowspan="2">52</td></tr>
<tr><td>7.3</td><td>7</td></tr>
<tr><td rowspan="2">fairways</td><td>11.3</td><td>14</td><td rowspan="2">26</td></tr>
<tr><td>7.3</td><td>7</td></tr>
<tr><td colspan="2">Grass grown for seed</td><td>1.5</td><td>14</td><td>4.5</td></tr>
<tr><td colspan="2">Mint</td><td>1</td><td>7</td><td>3</td></tr>
<tr><td colspan="2">Onions, dry</td><td>2.25</td><td>7</td><td>15</td></tr>
<tr><td colspan="2">Onions, green; leeks, shallots, garlic</td><td>2.25</td><td>7</td><td>6.7</td></tr>
<tr><td rowspan="3">Ornamentals</td><td>Roses</td><td>1.1</td><td rowspan="3">7</td><td rowspan="3">36.4[c]</td></tr>
<tr><td>Pachysandra</td><td>3.1</td></tr>
<tr><td>others</td><td>1.55</td></tr>
<tr><td colspan="2">Parsnip</td><td>1.5</td><td>7</td><td>6</td></tr>
<tr><td colspan="2">Potato</td><td>1.125</td><td>5</td><td>11.25</td></tr>
</table>

Sod farms	11.3 (one application) + 7.3	7	26
Soybeans	1.8	14	4.5
Stone fruit (cherry, peach, nectarine, apricot, plum, prune)	3.1	10	15.5
Tomato	2.16	7	15.1
Turf (other than sod or golf courses)	11.3 (one application) + 8.2	7	26

[a] All rates apply also to home & garden uses except that chlorothalonil may not be used on home lawns
[b] Golf course use may have either a high rate with 14 day interval or a low rate with 7 day interval
[c] Applies to field grown ornamentals only; no limit on landscape ornamentals

d. chlorothalonil usage

According to OPP's Quantitative Use Assessment (QUA) for chlorothalonil (summarized on pages 4-7 of the RED) and based on available pesticide survey usage information for the years of 1990 through 1999, an annual estimate of chlorothalonil's total domestic annual usage is almost 15,000,000 pounds active ingredient (lb ai). About 4,500,000 lb ai are used on non-agricultural sites. The greatest use, slightly over 5,000,000 lb ai, is on peanuts which are not grown in western salmon and steelhead areas. Potatoes and tomatoes are the other largest crop uses with 1,810,000 and 1,040,000 lb ai, respectively.

The largest portion of the non-agricultural use is in paints, followed closely by golf courses with about 2,000,000 and 1,440,000 lb ai/yr, respectively. According to Hamer (2003), in the western United States, the golf course use, and nurseries to a lesser extent, comprise most of the non-agricultural outdoor use. In a court declaration, Shaw (2003) stated that there was no chlorothalonil use in many western counties, including 56 counties within salmon and steelhead ESUs. These will be indicated in section 4 discussions of the individual salmon and steelhead ESUs.

The latest information for California pesticide use is for the year 2001 [URL: http://www.cdpr.ca.gov/docs/pur/purmain.htm]. The reported information to the County Agricultural Commissioners includes pounds used, acres treated for agricultural and certain other uses, 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. Table 4 presents chlorothalonil usage from 1993-2001 in California. Table 5 presents all of the chlorothalonil uses in California for 2001. For the major crop uses (>1000 lb ai/yr), a comparison of the acreage treated and the pounds used indicates that average application rates for California are consistently below 2 lb ai/A except for stone fruits and turf. Stone fruit average rates were generally 2.3 to 2.8 lb ai/A, although prunes had an average of 3.5 lb ai/A. Turf use averaged 3.8 lb ai/A. These data cannot be used to estimate the numbers of applications per year nor the actual acreage treated for agricultural crops because each application is counted as being applied to separate acreage (e.g., 5 applications to the same 200 acres, will be counted as application to 1000 acres).

Table 4. Reported use of chlorothalonil in California, 1993-2001 (lb ai)

1993	1994	1995	1996	1997	1998	1999	2000	2001
826,918	832,228	1,125,790	1,053,319	779, 328	1,181,163	763,840	679,746	519,291

Table 5. Use of chlorothalonil by crop or site in California in 2001

Crop	pounds of active ingredient used	acres treated
Tomato	189,406	114,260
Onions, dry	57,254	42,696
Landscape maintenance	55,722	NR
Celery	53,387	31,582
Potato	46,646	42,959
Carrot	15,486	14,062
Nursery - outdoor flowers	9,915	9,148
Broccoli	8,951 +34[1]	8,323
Peach	8,755	3,599
Nursery - outdoor transplants	8,551 + 3,044[1]	10,540
Turf/sod	6,461	1,693
Brussel sprout	6,008	4,173
Nectarines	5,689	2,236
Prunes	5,567	1,599
Nursery - outdoor container plants	5,379	2,947
Garlic	5,026	3,234
Nursery greenhouse	4,865	NR
Cauliflower	3,639	3,146
Apricot	3,496	1,562
Cabbage	2,661	2,334
Plum	2,475	875
Cotton	1,955	271
Onions, green	1,409	981
Watermelon	935	493
Cherry	801	278
Beans	777	499
Gai Lon	766	595

Strawberries	729	1,538
Cantaloupe	447	380
Leek	414	205
Pepper, fruiting	376	192
Cucumber	369	208
Chinese cabbage	323	254
Squash	266	375
Structural pest control	233	NR
Pumpkin	210	146
Corn, sweet	139	91
Uncultivated ag & non-ag	128	87
Melon	100	75
Chinese greens	85	75
Research	84	NR
Spinach	68	60
Lettuce	65	30
Rights-of-way	49 +45	44
Soil fumigation	36	25
Bok Choy	20	24
Kale	17	15
Christmas trees	13	13
Peas	9	4
Commodity & other fumigation	5	NR
Apples	2	2
Stone fruit	1	2
Corn, field	<1	291[2]
Vertebrate control	<1	NR
total	519,291	

[1] The first number relates to the acres treated; additional chlorothalonil use for the second number did not report the number of acres treated.

[2] Treating 291 acres with less than one pound seems incorrect, but this is what DPR reported.

The Washington State Department of Agriculture (WSDA) has provided information on the acreage of major chlorothalonil-treated crops and additional details on amounts used for certain of these crops (WSDA, 2003). These are in Table 6; additional information is in the full report, which is included as Attachment 3.

Table 6. Major usage of chlorothalonil in Washington (WSDA, 2003)

crop	acres planted[1]	acres treated (% treated)	lbs ai/A	# apps	est lbs ai applied
blueberries	2,000	<100 (<5%)	1.3-1.5	1	150
carrots[2]	7,000				
cranberries[2]	1,600				
onions[2]	1,600				
peaches & nectarines	4,200	210 (5%)	2.5	3	1,575
plums & prunes[2]	1,000				
potatoes (western WA only)	15,000	15,000 (100%)	1.125	4	67,500
potatoes (eastern WA only)[2]	149,000				

1 Estimated 2001 acres from Washington Agricultural Statistics Service
2 Information not yet available beyond acres planted

There are limited data available on the amount of chlorothalonil used for Idaho and Oregon, and for "less than major" crops in Washington. In addition to proprietary data provided in Hamer (2003), the National Agricultural Statistics Service provides some information on chlorothalonil usage in the Pacific Northwest.

For nursery uses, estimates are provided only for Oregon; chlorothalonil is used on about 22% of all Oregon nursery and floriculture operations (USDA 2002b). Please note that these are percentages of operations using chlorothalonil and not percentages of acreage treated; it seems likely that this number roughly approximates the percentage of acres treated. The highest percentage of operations using chlorothalonil was 36% for cut flowers. However, 31% of the Christmas tree operations used chlorothalonil, with a typical rate of 1.94 lb ai/A per year.

Fruit (USDA 2002a) and vegetable (USDA 2003) usage of chlorothalonil is presented in Table 7; only a few crops from the Pacific Northwest are included in the USDA analyses and all such crops are included in the table if chlorothalonil is registered for the use.

Table 7. Estimated usage of chlorothalonil on fruit, vegetable, and nursery crops in Oregon and Washington.

Site and state[1]	% crop treated	acres of crop	rate/year (#ai/A)	total lb ai applied
blueberries, OR[2]		2,800 A		no chlorothalonil use
cherries (sweet), OR[2]		11,000 A		no chlorothalonil use
cherries (sweet), WA[2]		22,000 A		no chlorothalonil use

nursery and floriculture operations, OR[3] cut flowers Christmas trees	22% 36% 31%	NR 1,235 A 58,510[5] A	NR NR 1.94 lb ai/A[6]	NR NR NR
Snap beans for processing (OR)[4]		18,700 A		no chlorothalonil use
Sweet Corn for processing (OR)[4]		33,000 A		no fungicide use
Sweet corn for processing (WA)[4]		97,700 A		no fungicide use
Bulb onions (OR)[4]	51%	17,400 A	1.47 #/A/yr	12,900
Bulb onions (WA)[4]	61%	17,100 A	2.72 #/A/yr	28,100
Carrots, processing (WA)[4]		4,700 A		no fungicide use

[1] Only sites where chlorothalonil is registered are included

[2] Fruits are from USDA, 2002a

[3] Nursery crops are from USDA, 2002b; number of pounds used was not reported

[4] Vegetables are from USDA, 2003

[5] Acreage includes harvested Christmas trees (18,628 A) as well as "other nursery crops" (39,882 A) which includes unharvested Christmas trees and unknown other acreage, as noted in the 1997 USDA Agricultural Census

[6] Average application rate is fo the whole U. S.; no specific data on rate in Oregon.

3. General aquatic risk assessment for endangered and threatened salmon and steelhead

a. Aquatic toxicity of chlorothalonil

There is a modest amount of aquatic toxicity data on chlorothalonil. Data submitted to support registration were generated in accordance with Good Laboratory Practice regulations and have been through OPP's rigorous validation requirements for data used in assessments; these data are used in preference to other data. Additional literature data have been provided by Hamer (2003); these data have not been validated and are provided as supplemental information.

(1) Acute toxicity to freshwater fish

Table 8 shows that the 96-hour acute toxicity of technical chlorothalonil to freshwater fish ranges from 23 ppb for fathead minnow to 430 ppb for channel catfish. There are several tests with formulated products. The emulsifiable concentrate formulation (Bravo 720) demonstrates more toxicity, and the water dispersible granules (Bravo 75-W) demonstrates less toxicity than the technical chlorothalonil. The differences are not outside the 95% confidence limits and typical test variation, but could reflect a slightly enhanced toxicity of the emulsifiable concentrate.

Table 8. Acute toxicity of chlorothalonil to freshwater fish.

Species	Scientific name	% a.i.	96-hour LC50 (ppb)	Toxicity Category	Reference
Technical material					
Rainbow trout	*Oncorhynchus mykiss*	96	42.3[a]	very highly toxic	EFED
Rainbow trout	*Oncorhynchus mykiss*	tech	250	highly toxic	EFED
Bluegill sunfish	*Lepomis macrochirus*	96	59.5[a]	very highly toxic	EFED
Bluegill sunfish	*Lepomis macrochirus*	99.7	84	very highly toxic	EFED
Bluegill sunfish	*Lepomis macrochirus*	98	51	very highly toxic	EFED

Species	Scientific name	% a.i.	96-hour LC50 (ppb)	Toxicity Category	Reference
Bluegill sunfish	*Lepomis macrochirus*	tech	386	highly toxic	EFED
Fathead minnow	*Pimephales promelas*	96	23	very highly toxic	EFED
Channel catfish	*Ictalurus punctatus*	96	48	very highly toxic	EFED
Channel catfish	*Ictalurus punctatus*	tech	430	highly toxic	EFED
Formulated product[b]					
Bluegill sunfish	*Lepomis macrochirus*	75 (Bravo W-75)	167 (125)[c]	highly toxic	EFED
Bluegill sunfish	*Lepomis macrochirus*	54 (Bravo 720)	49 (26)[c]	very highly toxic	EFED
Rainbow trout	*Oncorhynchus mykiss*	54 (Bravo 720)	61 (33)[c]	very highly toxic	EFED
Rainbow trout	*Oncorhynchus mykiss*	75 (Bravo W-75)	152 (48 hr)	highly toxic	EFED
Rainbow trout	*Oncorhynchus mykiss*	75 (Bravo W-75)	103 (77)[c]	highly toxic	EFED

a. Value adjusted to reflect 100% ai

b Bravo 720 is an emulsifiable concentrate; Bravo 75-W is "water dispersible granules" applied as a spray

c. Value in parentheses adjusted to reflect 100% ai

Table 9 presents some additional fish toxicity information that were in an analysis of chlorothalonil by Hamer (2003), who did not report the test material. Referenced papers, some found independently and some provided by Hamer, were used to determine the specific test material, where feasible. These data have not been validated, but many were published in peer-reviewed journals.

Table 9. Additional data on acute toxicity of chlorothalonil to fish.

Species	Scientific name	endpoint	material	value(ppb)	Reference
Rainbow trout	*Oncorhynchus mykiss*	96-hr LC50		17	Douglas et al (1992)[1]
Rainbow trout	*Oncorhynchus mykiss*	96-hr LC50	tech	76	Ernst et al (1991)
Rainbow trout	*Oncorhynchus mykiss*	96-hr LC50	Bravo 500	69	Ernst et al (1991)
Rainbow trout	*Oncorhynchus mykiss*	96-hr LC50		32-57	Ernst et al (1993)[1]
Rainbow trout	*Oncorhynchus mykiss*	96-hr LC50 (flow through)	99%?[2]	17.1	Davies & White (1985)
Rainbow trout	*Oncorhynchus mykiss*	96-hr LC50 (flow through)	99%?[2]	10.5[3]	Davies & White (1985)
Rainbow trout	*Oncorhynchus mykiss*	96-hr LC50 (static)	99%?[2]	18	Davies & White (1985)
Rainbow trout	*Oncorhynchus mykiss*	28-day		54	Ernst et al (1993)[1]
Bluegill	*Lepomis macrochirus*	8-day LC50		16	Sleight (1972)[1]
Channel catfish	*Ictalurus punctatus*	96-hr LC50	99%	52	Gallagher et al (1992)
Carp	*Cyprinus sp.*	96-hr LC50		60	Douglas et al (1982a)[1]
Carp	*Cyprinus carpio*	48-hr LC50	tech	110	Hashimoto & Nishiuchi (1981)
Carp	*Cyprinus carpio*	48-hr LC50		67	Nishiuchi (1977)
Goldfish	*Carrasius auratus*	48-hr LC50	tech	170	Hashimoto & Nishiuchi (1981)
Common jollytail	*Galaxias maculatus*	96-hr LC50	99%?[2]	16.3	Davies & White (1985)
Spotted galaxius	*Galaxias truttaceous*	96-hr LC50	99%?[2]	18.9	Davies & White (1985)
Golden galaxius	*Galaxias auratus*	96-hr LC50	99%?[2]	29.2	Davies & White (1985)
Roach		48-hr LC50		100	Perevoznikov (1977)[1]
Guppy	*Poecilia reticulata*	48-hr LC50		200	Nishiuchi (1977)[1]
Japanese killifish	*Oryzias latipes*	48-hr LC50		90	Nishiuchi (1977)[1]
Japanese killifish	*Oryzias latipes*	48-hr LC50	tech	88	Hashimoto & Nishiuchi (1981)
Mosquito fish	*Gambusia affinis*	48-hr LC50		90	Nishiuchi (1977)[1]

Loach	*Misgurnus anguilicaudatus*	48-hr LC50	tech	150	Hashimoto & Nishiuchi (1981)
Stickleback		96-hr LC50		27	Ernst et al (1993)[1]

1 As cited in Hamer, 2003. (source paper not seen)
2 Material tested not entirely clear; appears to have been 99% chlorothalonil as derived by purifying a Bravo 72% ai formulation
3 Test with intentional low oxygen to surrogate for trout farm ponds in summer

(2) Acute toxicity to freshwater invertebrates

Chlorothalonil is very highly toxic to *Daphnia magna*. The emulsifiable concentrate toxicity is slightly less than the technical material, but they are comparable (Table 10). Additional information (Table 11) were provided in Hamer (2003); these additional data have not been validated, but some were peer-reviewed. Invertebrates serve as a food source for juvenile salmon and steelhead. However, chlorothalonil exhibits less toxicity to aquatic invertebrates than it does to fish. Therefore, concerns for invertebrates that may serve as food supply for T&E salmon and steelhead are considerably less than for direct effects to the fish.

Table 10. Acute toxicity of chlorothalonil to freshwater invertebrates (from RED).

Species	Scientific name	% a.i.	48-hour LC50 (ppb)	Toxicity Category	Reference
Water flea	*Daphnia magna*	96	68[a]	very highly toxic	EFED
Water flea	*Daphnia magna*	54 (Bravo 720)[b]	180 (97)[c]	highly toxic	EFED

a. Value adjusted to reflect 100% ai
b Bravo 720 is an emulsifiable concentrate
c. Value in parentheses adjusted to reflect 100% ai

Table 11. Additional data on acute toxicity of chlorothalonil to freshwater invertebrates (from Hamer, 2003).

Species	Scientific name	end point	material	value (ppb)	Reference
Insects					
Caddis fly	*Leptocerus sp*	EC50	tech (98.1%)	38	Hamer & Gentle (1999)
Midge	*Chironomus riparius*		tech (98.1%)	110	Hamer & Gentle (1999)
Midge	*Chaoborus crystallinus*	LC50	tech (98.1%)	>1600	Hamer & Gentle (1999)
Mayfly	*Cloeon dipterum*	LC50	tech (98.1%)	600	Hamer & Gentle (1999)
Mayfly	*Cloeon dipterum*	LC50	"formulation"	1800	Hashimoto & Nishiuchi (1981)
Beetle	*Dytiscus sp*	EC50	tech (98.1%)	>1600	Hamer & Gentle (1999)
Damselfly	*Ischnura elegans*	LC50	tech (98.1%)	>1600	Hamer & Gentle (1999)
Water boatman	*Corixa sp*	LC50	tech (98.1%)	>1600	Hamer & Gentle (1999)
Crustaceans					
Water flea	*Daphnia magna*		tech (98.1%)	170	Hamer & Gentle (1999)
Water flea	*Daphnia magna*	EC50	Bravo 500	97	Ernst et al (1991)
Cladoceran	*Chydorus sp.*		tech (98.1%)	74	Hamer & Gentle (1999)
Amphipod	*Crangonyx pseudogracilis*		tech (98.1%)	64	Hamer & Gentle (1999)
Amphipod	*Gammarus pulex*		tech (98.1%)	240	Hamer & Gentle (1999)
Amphipod	*Hyalella azteca*		tech (98.1%)	250	Hamer & Gentle (1999)
Copepod	*Macrocyclops fuscus*		tech (98.1%)	260	Hamer & Gentle (1999)
Ostracod	*Ostracoda sp*	LC50	tech (98.1%)	390	Hamer & Gentle (1999)
Isopod	*Asellus aquaticus*	EC50	tech (98.1%)	450	Hamer & Gentle (1999)
Other aquatic invertebrates					
Rotifer	*Brachionus calyciflorus*	EC50	tech (98.1%)	24	Hamer & Gentle (1999)
Flatworm	*Planaria sp*		tech (98.1%)	200	Hamer & Gentle (1999)
Snail	*Planorbis sp*		tech (98.1%)	120	Hamer & Gentle (1999)

Snail	*Lymnaea stagnalis*		tech (98.1%)	100	Hamer & Gentle (1999)
Red snail	*Indoplanorbis exustus*	LC50	"formulation"	15,000	Hashimoto & Nishiuchi (1981)
Marsh snail	*Semisulcospira libertina*	LC50	"formulation"	9,000	Hashimoto & Nishiuchi (1981)
Snail	*Physa acuta*	LC50	"formulation"	37,000	Hashimoto & Nishiuchi (1981)
Leech	*Erpobdella sp*		tech (98.1%)	160	Hamer & Gentle (1999)
Oyster	*Crassostrea virginica*	EC50		4.9	Shults et al (1983)[1]
Blue mussel	*Mytilus edulis*	LC50	Bravo 500	5,940	Ernst et al (1991)
Soft-shell clam	*Mya arena*	LC50	Bravo 500	34,780	Ernst et al (1991)

[1] As cited in Hamer, 2003. (source paper not seen)

(3) Chronic toxicity to freshwater fish and invertebrates

The chronic toxicity data cited in the RED for chlorothalonil are summarized in Table 12. Similarly to acute toxicity, fathead minnows, with a NOEC of 3.0 ppb, are considerably more sensitive than the aquatic invertebrate, *Daphnia magna*, with a NOEC of 39 ppb.

Table 12. Chronic toxicity of chlorothalonil to freshwater fish and invertebrates (from RED).

Species	Scientific name	Duration	% a.i.	Endpoints affected	NOEC (ppb)	LOEC (ppb)	Reference
Fathead minnow	*Pimephales promelas*	168 d	96	hatching success & survivability	3.0	6.5	EFED
Water flea	*Daphnia magna*	21 d	99.8	survivors/female	39	79	EFED

(4) Acute toxicity to estuarine and marine fish

Acute results indicate that technical grade chlorothalonil is very highly toxic to estuarine and marine fish (Table 13). Acute LC50 values are very similar for the two species tested.

Table 13. Acute toxicity of chlorothalonil to estuarine and marine fish (from RED).

Species	Scientific name	% a.i.	96-hour LC50 (ppb)	Toxicity Category	Reference
Spot	*Leiostomus xanthurus*	tech	32 (48 hr)	very highly toxic	Mayer
Sheepshead minnow	*Cyprinodon variegatus*	tech	32	very highly toxic	EFED

(5) Acute toxicity to estuarine and marine invertebrates

Acute toxicity tests with estuarine and marine invertebrates (Table 14) indicate that technical grade chlorothalonil is highly toxic to arthropods and very highly toxic to oysters. As with freshwater species, the aquatic arthropods that may serve as food for salmon and steelhead are less sensitive than fish.

Table 14. Acute toxicity of chlorothalonil to estuarine & marine invertebrates (from RED).

Species	Scientific name	% a.i.	96-hour LC50 (ppb)	Toxicity category	Reference
Pink shrimp	*Penaeus duorarum*	tech	320	highly toxic	Mayer
Pink shrimp	*Penaeus duorarum*	96%	165[a]	highly toxic	EFED
Dungeness crab	*Cancer magister*	75%	140	highly toxic	EFED
Eastern oyster (shell deposition)	*Crassostrea virginica*	tech	3.6	very highly toxic	EFED
Eastern oyster (shell deposition)	*Crassostrea virginica*	tech	26	very highly toxic	Mayer

(6) Chronic toxicity to estuarine and marine fish and invertebrates

Chronic toxicity data for the estuarine/marine mysid shrimp indicates considerable sensitivity to chlorothalonil (Table 15). There are no data on chronic toxicity to estuarine fish; such data have been requested. While possible, it seems unlikely that fish will exhibit more sensitivity in chronic tests than the mysid shrimp.

Table 15. Chronic toxicity of chlorothalonil to estuarine invertebrates (from RED).

Species	Scientific name	Duration	% a.i.	Endpoints affected	NOEC (ppb)	LOEC (ppb)
Mysid shrimp	*Americamysis bahia*	28 d	100%	Growth, reproduction	1.2	0.83

(7) Toxicity to aquatic plants and algae

There was only one reported algae test in the RED, but additional data have been developed. All algae and aquatic plant data are combined in Table 16. Data referenced to EFED in the table have been validated; others have not. These data indicate that algae are very sensitive but that the vascular plant, *Lemna gibba*, is considerably less sensitive. Because the vascular plant is less sensitive than fish, there appears to be no concern for plant cover for salmon and steelhead that would not be subsumed by concerns for direct effects on the fish.

Table 16. Acute toxicity of chlorothalonil to algae and vascular plants (from RED, EFED, and Hamer, 2003).

Species	Scientific name	% a.i.	EC50 (ppb)	Reference
Green algae	*Scenedesmus subspicatum*	not reported	450 (96 hr)	Douglas et al (1992b)[1]
Green algae	*Selanastrum capricornutum*	97.9	190 (120 hr)	EFED
Green algae	*Selanastrum capricornutum*	not reported	210 (120 hr)	Hughes & Williams (1992)[1]
Green algae	*Selanastrum capricornutum*	not reported	8500 (7-day IC50)	Ernst et al (1993)[1]
Blue-green algae	*Anabaena flos-aquae*	not reported	65 (5-day)	Smyth et al (1998)[1]
marine diatom	*Skeletonema costatum*	98.1	13 (14-day)	EFED
marine diatom	*Skeletonema costatum*	not reported	11 (5-day)	Smyth et al (1998b)[1]
freshwater diatom	*Navicula pelliculosa*	98.1	14 (5-day)	EFED
freshwater diatom	*Navicula pelliculosa*	not reported	5.1 (72-hr)	Smyth et al (1998a)[1]
duckweed	*Lemna gibba*	98.1	630 (14-day)	EFED
duckweed	*Lemna gibba*	not reported	510 (14-day)	Smyth et al (1998c)[1]

[1] As cited in Hamer, 2003. (source paper not seen)

(8) Toxicity of multiple active ingredient products

There are no known fish toxicity data on chlorothalonil products that contain other active pesticide ingredients. Table 17 presents fish toxicity data on these ingredients that are formulated with chlorothalonil. None of these ingredients is as toxic as chlorothalonil itself. In all combined products except two types, chlorothalonil is the predominant active ingredient. One homeowner product for use on roses only contains 3.75% chlorothalonil and 5% carbaryl. The toxicity of carbaryl is not greatly less than chlorothalonil, but the low percentage of each ingredient and the very narrow use profile indicate no concern. Several products are formulated with 19% chlorothalonil and 27% sulfur. The sulfur has very low toxicity and there is no basis for considering that the toxicity will be any greater than for the chlorothalonil ingredient alone.

Table 17. Fish toxicity of other pesticide active ingredients in chlorothalonil products.

Pesticide	Most sensitive species	Lowest LC50 value for technical material	Reference	Note
mefenoxam	rainbow trout	>121 ppm	EFED	only species tested with technical
propamocarb HCL	bluegill sunfish	>92 ppm	EFED	
copper oxychloride	rainbow trout	1.98 ppm	EFED	48-hour test; 96-hour LC50=3.75 ppm
sulfur	bluegill, rainbow trout	>180 ppm	EFED	
thiophanate-methyl	rainbow trout	8.3 ppm	EFED	
flutolanil	carp	2.5 ppm	EFED	
carbaryl	bluegill	250 ppb	EFED	

(9) Toxicity of degradates

The only degradate formed at greater than 10% is the SDS-3701. The RED states: "A primary degradate of chlorothalonil, SDS-3701, is substantially more toxic to birds and mammals, but is less toxic to fish and aquatic invertebrates than parent chlorothalonil. Therefore, the Agency spent considerable time investigating the possibility that SDS-3701 may represent a risk. It is concluded, with some certainty, that SDS-3701 does not represent a significant risk to aquatic organisms."

Table 18. Acute toxicity of SDS-3701 to aquatic organisms (from RED).

Species	Scientific name	% a.i.	LC50 (ppm)	Toxicity Category	Reference
Bluegill	*Lepomis macrochirus*	99	15 (96-hr)	slightly toxic	EFED
Bluegill	*Lepomis macrochirus*	not reported	45 (96-hr)	slightly toxic	EFED
Water flea	*Daphnia magna*	99	26 (48-hr)	slightly toxic	EFED

Testing has been done on degradates that form in lower amounts than the SDS-3701. These have fish toxicity at 18->100 ppm (Hamer (2003).

(10) Toxicity of inerts

The formulated product testing presented in Table 8 and the Ernst et al (1991) data in Table 9 do not indicate that inert products add significantly (i.e., beyond confidence limits) to the toxicity of chlorothalonil. There may be some minor amount of toxicity added by the inert ingredients in the emulsifiable concentrate.

Although not an "inert" ingredient, hexachlorobenzene does occur as an impurity in chlorothalonil. Hexachlorobenzene is a very highly persistent compound with known human and ecological effects. A limit of 0.05% of hexachlorobenzene was established for technical chlorothalonil products in the 1984 Registration Standard. In the 1999 RED, a requirement was included that the limit should be reduced to 0.004%. Because the material is an impurity in the technical chlorothalonil, any toxicity that it may have contributed would have been reflected in aquatic tests on the technical material. Because it is not separate from technical chlorothalonil and was included in toxicity tests with chlorothalonil, and also would be incorporated into any protections for chlorothalonil, it is not being considered separately in this analysis.

(11) Sublethal and endocrine effects

None of the available data indicated sublethal effects occurring at markedly lower levels than lethality occurred. Gallagher et al (1992) specifically looked at sublethal effects. They reported a significant difference from controls for total glutathione concentrations in certain tissues at 0.25x the LC50, but observed no sublethal effects on plasma chloride concentrations, aspartate aminotransferase activity, or hematocrit ratios.

The RED does not indicate any evidence that chlorothalonil exhibits endocrine effects in mammals. I am not aware of any other evidence regarding other taxa other than the effects assessed in the full life cycle testing with chlorothalonil. The available information does not indicate that sublethal effects occur at substantially lower than lethal levels, and therefore, sublethal effects are accounted for by the factors used in setting in levels of concern.

Should any such information become available, be considered valid, and indicate a risk to fish, we will re-evaluate our conclusions for the effects of chlorothalonil on Pacific salmon and steelhead.

(12) Field effects

Because chlorothalonil is extensively used on potatoes on the Atlantic coast, Environment Canada conducted laboratory studies and a field study on chlorothalonil on Prince Edward Island (Ernst et al., 1991). Their laboratory studies indicated that the 96-hour LC50 values for rainbow trout were 76 ppb for the technical material and 69 ppb for the Bravo 500 formulation (40% ai), as compared with EFED data on rainbow trout with an LC50 of 42.3 ppb. Their field study site was a small 0.2 hectare pond, 0.5 meters deep; a nearby control was somewhat larger at 0.4 hectare and 2-3 meters deep. For comparative purposes, I note that the model pond used in EFED's EEC calculations is 1 hectare in area and 2 meters deep; i.e., the treated study pond was 20% of the area and 25% of the depth of the model pond. The Bravo 500 formulation was applied at a rate of 875 g ai/ha (0.78 lb ai/A) by aircraft directly over the pond, a much more severe exposure than would occur through runoff and drift from labeled applications. Three applications were made on day 1, day 7, and day 15. Spray collectors on the pond indicated an application efficiency of 67-88%, and measured concentrations taken from surface water near the top,15 minutes after the applications showed mean concentrations from 10 stations of 171 ppb, 388 ppb, and 883 ppb after the three spray events. Caged fish and aquatic invertebrates were placed in the ponds near the surface.

Despite the initial concentrations that were well above the LC50 values for rainbow trout, there was no mortality in any of the caged rainbow trout in the treatment pond throughout the entire study. There were some effects on threespine sticklebacks and water boatmen which were attributed to chlorothalonil. The authors suggested that the lack of response by rainbow was probably due to loss of chlorothalonil from the pond system through physical (e.g., volatility) and chemical processes. I note that the rainbow trout used in the field study were one year old. Although the length and weight were not indicated for these one year old trout, the trout used in the laboratory tests were fingerlings weighing 3.5-4.0 g, with a length of 6.7-7.0 cm.. The trout in the field study would have been larger, and that could contribute to the lowered sensitivity. Nevertheless, these data do strongly suggest that the laboratory toxicity is unlikely to occur to the same degree in the field, even in a rather small pond receiving direct spray.

Hamer (2003) (attachment 4; available to those cleared for Confidential Business Information) refers to an aquatic mesocosm study that is not further discussed here because it included no fish, and fish are more sensitive than other tested aquatic taxa.

b. Environmental fate and transport

The environmental fate and transport of chlorothalonil are presented in the RED on pages 114-122. An assessment of water resources, including surface and ground water monitoring, is on pages 122-127. EECs and model inputs are on pages 138-140.

Chlorothalonil is a polychlorinated aromatic fungicide, but it is atypical in that it does not have the high degree of persistence associated with many other chlorinated organics. The difference is attributed to the two nitrile groups which activate the molecule. Its primary mode of transformation is through aerobic and anaerobic microbial metabolism. Based on all observations, degradation rates strongly depend on local physical and biochemical conditions. Metabolism is faster under wet, flooded or aquatic conditions, especially when there is aeration and mixing.

Chlorothalonil is considered stable at hydrolysis at pH 5 & 7, and has a half life of 40-60 days at pH 9. The aquatic photolysis half-life is estimated at 65 days. These pathways are not important relative to the microbial metabolism pathways.

Chlorothalonil does not bioaccumulate to any major degree. Whole fish BCF values were 264X for bluegill and 16X for catfish. There is some indication that certain degradates may accumulate up to 500X, but there is no indication of either bioavailability or significant toxicity of these degradates.

Mobility of parent chlorothalonil in the soil appears to be low. Three of the metabolites were found to be somewhat mobile, while two were not. The parent material is rarely found in groundwater monitoring, but several of the metabolites have been detected.

There is some debate regarding the rate of aquatic aerobic metabolism, the primary route of degradation. The registrant has provided data indicating a 2-hour half life. The Agency considers that other data indicating a 44-hour half life is more appropriate. There is a discussion of this in the RED on pages 118-120. The EECs developed in the RED for chlorothalonil use sites provided results based upon both of these half-lives. In addition, Hamer (2003, pages 5-6) discusses data from indoor and outdoor microcosm studies (referred to Gentle, 1999), and to additional replicated outdoor systems (referred to Gentle and Tattersfield, 2000) that were conducted subsequent to the issuance of the RED, and claims that there will be very rapid dissipation (<8 hr) in natural aquatic environments. As a result, Hamer (2003) claims that there will be no long term exposure, and that a risk assessment should be based on effects from short-term exposures.

After reviewing some of the available data, summaries for other data, and talking to the EFED fate chemist who did the reviews and data analysis in the RED, I conclude that there is some merit in the registrant's position. However, the modeled EECs based upon the 44-hour life are the most appropriate from a comparative risk aspect. The study cited in the RED that indicated a 2-hour half life was done in an unusual manner. Therefore, using that endpoint would result in EECs that are not comparable with other EECs generated. In addition, from the perspective of the RED, there may be numerous repeated applications of chlorothalonil for many uses, thus calling into question the focus by Hamer (2003) on short term effects.

Although the EECs modeled with the longer half-life are appropriate for comparative risk assessment, one purpose of this present analysis is to apply the more generic risk assessment in the RED to the specific situations associated with chlorothalonil and its potential effects to salmon and steelhead that occur in certain areas. In that context, I note that the study indicating a shorter-half life did attempt to maximize the aerobicity of the study, which is consistent with the more oxygenated waters where salmon, especially very young salmon, are likely to occur. In addition, usage data indicate that the numerous repeated applications allowed on the label at maximum rates are very unlikely in drier areas such as most of those occupied by western salmon and steelhead. Therefore, Hamer's (2003) focus on short term effects, which may be generally inappropriate, may be very appropriate for areas under consideration here.

c. Incidents

A small number of fish kills have been reported for chlorothalonil. These are discussed in the RED on pages 143-144. Several of these were the result of accidental spills or misuse and are not further considered here. The most significant incident was on Prince Edward Island in Canada where 40,000 salmon parr and a large number of trout were killed. Many toxic pesticides were used, including endosulfan and cyhalothrin, but only chlorothalonil was detected in the water, albeit at low levels. Endosulfan was considered the most likely cause. Fish killed by chlorothalonil have a very characteristic appearance involving reddening at the base of fins and an overall light bronze coloration, and the dead fish in this incident did not exhibit those symptoms. In the incident on the Maine-New Brunswick border, maneb and esfenvalerate were applied as well as chlorothalonil. Esfenvalerate was considered "highly probable" as the causative agent; chlorothalonil and maneb were considered "possible." In the golf course incident in Missouri, dacthal, benomyl, cycloheximide, and mancozeb were used in addition to chlorothalonil.

An additional incident has been reported since the RED was issued. In an incident in Turner County, GA, a fish kill appears to have occurred in a pond near where cucumbers were sprayed with chlorothalonil and endosulfan. There are differing accounts on whether there was actually a fish kill; if so, it appears that less than 10 fish were involved. Water samples showed 0.75 ppb of endosulfan and <0.06 ppb chlorothalonil. Endosulfan was considered as the "probable" causative agent.

There appear to be no incidents where chlorothalonil was used according to label directions in which chlorothalonil was considered the causative agent in any fish kills.

d. Estimated and actual concentrations of chlorothalonil in water

(1) EECs from models

In the RED, chlorothalonil aquatic EECs were estimated using two models, depending upon the site. Turf, orchard, and cranberry EECs were estimated from EFED's Tier I GENEEC surface water model, whereas cucurbit, tomato, potato, and peanut EECs were based upon the tier 2 PRZM2-EXAMS surface water model. All of the sites were based on climate and soils relative to the southeastern U.S., and are not likely to be representative of the western U. S. Consequently, additional efforts were made by EFED to use more recently developed sites to be more representative of the areas where Pacific salmon and steelhead occur. EFED provided western PRZMS-EXAMS results for the tomatoes, potatoes, Christmas trees, and stone fruits. In addition, the golf course turf, which had previously been modeled with GENEEC was done with a PRZM-EXAMS model for Pennsylvania because there is no current western golf course scenario (Table 19). The cucurbits (PRZM-EXAMS) and cranberries (GENEEC) are the same as presented in the RED.

In both models, it is considered that a 10-hectare watershed will all be treated with the maximum rate, maximum numbers of applications, and minimum intervals between applications. Runoff and drift from this 10-hectare watershed will go into a 1-hectare pond, 2 meters deep. This is a conservative model for salmon and steelhead. While first order streams may be reasonably predicted for a single application, salmon and steelhead, except sockeye, occur primarily in streams and rivers where natural flow of water, and any contaminants in the water column, will move downstream and preclude continued exposure from a single application. Multiple applications may provide for chronic exposure, most likely in a pulsed mode.

The EEC values of various, mostly western, crops and rates at various durations using aerial or ground application rates are presented in Table 19.

Table 19. Estimated Environmental Concentrations (EECs) for Chlorothalonil on Turf, Fruits and Vegetables using PRZM-EXAMS models, and Cranberries using GENEEC.

Crop	Application Method	Application Rate in lbs. a.i./A (No.apps; intervals in days)	Peak EEC (ppb)	Average 4-Day EEC (ppb)	Average 21-Day EEC (ppb)	Average 90 Day EEC (ppb)
Turf[1] (PA) - tees	foliar	10.4 (5;14)[2]	89.4	50.8	22.2	10.4
Turf[1] (PA) - greens	foliar	10.4 (7;14)[3]	88.8	75.8	51.1	28.8
Turf[1] (PA) - fairways	foliar	8.67 (3,7)[4]	74.1	50.2	22.9	7.1
Tomato (CA)	foliar	2.16 (7;7)	36.7	25.8	13.3	4.2
Potato (ID)	foliar	1.125 (10;5)	8.3	6.1	3.4	2.0
Christmas trees (OR)	foliar	4.125 (4;21)	12.8	9.7	4.3	3.4
Stone fruits[5] (CA)	foliar	3.1 (5,10)	17.6	12.4	5.9	1.7
Cucurbits[6] (FL)	foliar	2.25 (8;7)	33.1	16.9	6.0	3.6
Cranberries[7]	ground	5.3(3;10)	81.9	50.7	12.3	4.6[8]

[1] Turf labels specify several rates and intervals, including "mix and match". The above EECs are based on a single rate at the specified interval to reach the maximum seasonal application amount.

[2] Maximum annual amount for tees is 52 lb ai/A

[3] Maximum annual amount for greens is 73 lb ai/A
[4] Maximum annual amount for fairways is 26 lb ai/A
[5] Stone fruits in California were based on plums
[6] Cucurbit EECs are PRZM-EXAMS based and are taken from the RED; they have not been revised
[7] Cranberry EECs are GENEEC based and are taken from the RED; they have not been revised. The GENEEC model is not site-specific The concentration in the table is the concentrations in the discharge from the bog. This concentration would decrease by dilution when added to water in the receiving water.
[8] 56-day EEC from GENEEC

Inputs for PRZM-EXAMS model:
KOC = 1380
Aerobic Soil T1/2 = 30 days
Anaerobic Soil T1/2 =15 days
Solubility = 0.80 ppm
Aerobic Aquatic T1/2 = 44 hr (~59 hrs adj); see discussion in text - better conforms with current EFED guidance.
Foliar application with 5 Percent spray drift; 95 Percent application efficiency - conforms with current EFED guidance.
Note: Previous assessment included an aerobic aquatic half-life of 2 hr (~8 hrs adj) and application efficiency of 75 percent were used.

(2) Other uses

There is use of chlorothalonil in paints, adhesives, grouts, and similar materials. These are all intended for terrestrial use, typically on buildings, fences, and other outdoor structures, as well as indoors. The low percentage of chlorothalonil in such materials, along with the small amount that would be used and an expected low rate of release (which we cannot quantitate) from painted surfaces result in no concern. I conclude there will be no effect of chlorothalonil from its additive use in such materials.

(3) Measured residues in the environment

NAWQA data

Monitoring data on chlorothalonil are available from the NAQWA program, as obtained from the USGS "data warehouse" (at URL http://infotrek.er.usgs.gov/servlet/page?_pageid=543&_dad=portal30&_schema=PORTAL30). Table 20 presents a summary of these monitoring data for the U. S. as a whole, and in study sites in states within the range of Pacific salmon and steelhead. A total of 6439 samples were available for chlorothalonil. At the time of the RED, there were 1850 samples taken from 1993-1995. There were 6 detects for chlorothalonil, with a maximum value of 0.68 ppb. Hamer (2003) updated this information through summer, 2001; of 5762 samples at this time, there were 28 detects, with the highest being 0.71 ppb in Long Island, NY and coastal NJ.

When I revisited the NAWQA "data warehouse" in October, 2003, I found that an additional 677 samples had been added for chlorothalonil. Among these were 43 samples taken in December 2001 in which chlorothalonil had been detected in 14 samples, a rate of 33% detection, as compared with 0.5% in the first 5762 samples. In addition, four of the measurements were above 1 ppb, being 3.3 ppb near Atlanta, GA, 4.2 ppb in Dallas, TX, 11.1 ppb in OH, and a very high 62.2 ppb in northern Virginia. Because these were so much higher than previous measurements and because the samples were from December, a season when chlorothalonil is not likely to be used, I contacted the USGS NAWQA program to see if they had an explanation.

NAWQA Study Unit personnel indicated that the high measurements had been noted initially. They were considered outliers or anomalies, but not necessarily incorrect. However, they requested the NAWQA laboratory to investigate. Samples had been retained and were re-analyzed by both liquid chromatography/mass spectrometry and gas chromatography/mass spectrometry. In summary, the laboratory determined that there had been some kind of interference that looked like chlorothalonil, but apparently was not, upon furtherinvestigation. Neither analytical method was able to verify the presence of any chlorothalonil of the four samples, i.e., those that had been reported previously to be above 1 ppb.[2] Only the four high samples were re-analyzed; however, it seems likely that some of the other numerous detections from December, 2001 may also have had similar interference.

The revised, available data now indicate that chlorothalonil has not been detected at concentrations above 1 ppb in samples taken by USGS in the NAWQA program.

We still must note that the NAWQA sampling data, while considered high quality, are not targeted to sites and times where chlorothalonil is used. Even regular sampling according to a predetermined schedule may not detect peak residues unless the samples happen to be taken shortly afterwards and adjacent to sites treated with chlorothalonil. It seems likely, but may not be correct, that when thousands of samples are taken, the highest NAWQA residues may actually represent peaks that occur in natural waters.

Table 20. Chlorothalonil residues: detection frequency and maximum amounts found.

State	# sam ples	% det ects	max residue (ug/L)	# >1 ug/L	Note
National	6439	44	62.2	4	samples with values above 1 ppb have been re-analyzed and no chlorothalonil was detected; see text discussion above.
California	312	1	0.29	0	
Oregon	215	3	0.64	0	
Washington	413	0	no detects		
Idaho	104	0	no detects		

<u>Targeted studies</u>

The RED summarized chlorothalonil detections in samples collected by the South Florida Water Management District every two to three months from 27 surface water sites from November 1988 through November 1993. Approximately 810 samples (30 sampling intervals X 27 sites sampled/interval) were collected from the 27 sites from November 1988 through November 1993. Chlorothalonil was detected in 25 samples at concentrations ranging from 0.003 to 0.035

[2] Email communication, Michael Schroeder, USGS National Water Quality Laboratory, December 1, 2003.

ppb. Detection limits ranged from 0.001 to 0.006 ppb, with a quantification limit of approximately 0.2 ppb. Six of the samples had concentrations above 0.01 ppb.

e. Water Quality Criteria

EPA's Office of Water has not established Water Quality Criteria for chlorothalonil for aquatic organisms, but has established a 500 ppb criterion for drinking water. Canada has set an interim freshwater aquatic life guideline of 0.18 ppb for chlorothalonil (Hamilton, et al 2003). It is not clear how this value was derived. Hamilton et al (2003) state that the derivation of an aquatic life criterion in Canada is supposed to be based on 0.1 times the chronic LOEL for the most sensitive Canadian species in any taxa, which suggests that the guideline value was based upon a freshwater chronic test with a LOEL of 1.8 ppb. I could find no such data among those available to me.

f. Recent changes in chlorothalonil registrations

A few changes are being made in chlorothalonil registrations. The most significant are the deletion of use on home lawns, whether commercial or by homeowners, and the specification of maximum amounts per year for the various crops. Previous labels indicated the single application rate and the interval between applications, but generally not a maximum amount per year. In addition, there have been several rate reductions. The most significant of these is the reduction on turf from 22.7 lb ai/A for snow mold, and from 15.6 lb ai/A for anthracnose and red thread to a maximum of 11.3 lb ai/A for any turf use including sod farms. The rate for stone fruits has been reduced from 4.17 lb ai/A to 3.1 lb ai/A.

g. Existing protections

The current "master label" for the 40.4% emulsifiable concentrate states in the environmental hazard section:

"This product is toxic to fish, aquatic invertebrates and marine/estuarine organisms. Runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high-water mark.. Do not contaminate water when disposing of equipment washwater. Do not apply when weather conditions favor drift from treated areas."

Other chlorothalonil labels have similar statements, but there is minor variation depending upon the age of the label. New labels that are being currently prepared will also contain, in addition to the above (slightly modified) a statement limiting estuarine use due to the high sensitivity of oysters to chlorothalonil. Application by aircraft or air-blast equipment will not be allowed within 150 feet, nor ground applications within 25 feet, of marine/estuarine water bodies.

Chlorothalonil is also included in bulletins for California. There, the Department of Pesticide Regulation (DPR)in the California Environmental Protection Agency creates county bulletins consistent with those developed by OPP. However, California also has a system of County Agricultural Commissioners responsible for pesticide regulation, and all agricultural and commercial applicators must get a permit for the use of any restricted use pesticide and must report all pesticide use, restricted or not. The California bulletins for protecting endangered species have been in use for about 5 years. Although they are currently “voluntary ” in nature, the Agricultural Commissioners strongly promote their use by pesticide applicators. Chlorothalonil is currently included in these bulletins for the protection of aquatic organisms. The specific limitations are:

> #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.

Agricultural and other commercial applicators are well sensitized to the need for protecting endangered and threatened species. DPR believes that the vast majority of agricultural applicators in California are following the limitations in these bulletins (Richard Marovich, Endangered Species Project, DPR, telephone communication, July 19, 2002).

OPP currently has proposed (67 *Federal Register* 231, 71549-71561, December 2, 2002) a final implementation program that includes labeling products to require pesticide applicators to follow provisions in county bulletins. The comment period has closed, and a final *Federal Register* Notice is under development and is anticipated to be published in early 2004. After this notice becomes final, it is expected that pesticide registrants will be required, as appropriate, to put on their products label statements mandating that applicators follow the label and county bulletins. It is also anticipated that these will be enforceable under FIFRA, including the California bulletins. Any measures necessary to protect T&E salmon and steelhead from chlorothalonil would most likely be promulgated through this system.

h. Discussion and general risk conclusions for chlorothalonil

Based solely on the most sensitive species and maximum EECs, the criteria of concern (RQ > 0.05) for chlorothalonil are exceeded for direct acute effects on fish from all uses. In addition, the criteria of concern (RQ > 1.0) are exceeded for direct chronic effects from all uses except potatoes and stone fruits. With respect to indirect effects that chlorothalonil may have on invertebrate food sources for T&E salmon and steelhead, the criteria of concern (RQ > 0.5) for acute effects are exceeded for golf courses, tomatoes, and cranberries, while only the use on golf greens exceeds the criteria of concern (RQ > 1.0) for indirect, chronic effects. The specific values by crop or site are presented in Table 21.

Table 21. Risk Quotients (RQ) for Freshwater Fish and Invertebrates[1]

Crop	Peak EEC	Acute fish RQ	Acute invert RQ	21-day EEC	chronic invert RQ	90-day EEC	Chronic fish RQ
golf tees (PA)	89.4	3.9	1.3	22.2	0.57	10.4	3.5
golf greens (PA)	88.8	3.9	1.3	51.1	1.3	28.8	9.6
golf fairways (PA)	74.1	3.2	1.1	22.9	0.59	7.1	2.4
tomatoes (CA)	36.7	1.6	0.54	13.3	0.34	4.2	1.4
potatoes (ID)	8.3	0.36	0.12	3.4	0.087	2.0	0.67
cucurbits (FL)	33.1	1.4	0.49	6.0	0.15	3.6	1.2
stone fruits (CA)	17.6	0.77	0.26	5.9	0.15	1.7	0.57
Christmas trees (OR)	12.8	0.56	0.19	4.3	0.11	3.4	1.1
cranberries	81.9	3.6	1.2	12.3	0.32	4.6	1.5

[1] Based on fish LC_{50} (fathead minnow) = 23 ppb; invertebrate LC_{50} (waterflea) = 68 ppb; chronic invertebrate NOEC (waterflea) = 39 ppb; chronic fish NOEC (fathead minnow) = 3 ppb. Acute RQ = peak EEC/LC_{50}; chronic invertebrate RQ = 21-day EEC/invertebrate NOEC; chronic fish RQ = 60-day EEC/chronic fish NOEC

With a most sensitive fish LC50 of 23 ppb, the LOCs for direct acute effects would be exceeded when chlorothalonil concentrations in water exceed 1.15 ppb. The concern for chronic risk is less at 3 ppb, based on the fish NOEL of 3 ppb, and chronic exposure is not likely for chlorothalonil.

In the RED, RQs for chlorothalonil were found to exceed the endangered species acute level of concern (LOC) for all uses regardless of whether the tier 1 GENEEC or tier 2 PRZM-EXAMS models were used to determine EECs. RQs for turf uses were also found to exceed the endangered species chronic LOC, based on the tier 1 GENEEC model. However, chronic fish endangered species LOCs in the RED were not exceeded by any crop uses, regardless of which model was used. I note, however, that based upon the more site-specific and updated models, chronic LOCs are exceeded for golf courses, tomatoes, cucurbits, cranberries, and Christmas trees.

(2) Invertebrates

Aquatic invertebrates, which may serve as a food source for T&E fish, are less sensitive than fish, with a *Daphnia magna* LC50 of 68 ppb and a chronic NOEC at 39 ppb. Only the golf course use exceeds any criteria for aquatic invertebrates as a food source. Exceedances are slight. If there were concerns for fish in ponds, a risk might exist. However, any exposed salmon or steelhead would be in waters passing through the golf course, and under such circumstances, the criteria for population effects would not be exceeded when the untreated "rough" of a golf course is considered along with those areas that may be treated. Therefore, there will be no impact on the food supply for the listed Pacific salmon and steelhead.

(3) Cover

Chlorothalonil exhibits a wide range of toxicity to algae from 5.1 ppb to 8500 ppb. But effects on vascular plants, as based on duckweed studies, are seen at 510-630 ppb. EECs at new label rates will all be well below 0.5 times those values. There will be no effect on aquatic vascular plant cover for listed fish.

(4) Conclusions

The EFED ERA is intended to determine the maximum potential risk that may occur from the use of chlorothalonil. Therefore, it can be expected that any site-specific or species-specific analysis is likely to determine that risks are less than the maximum potential. In part, this is reflected in the western EEC scenarios, which are modified by less runoff and somewhat higher drift than eastern scenarios. A number of considerations are relevant to the risks of chlorothalonil and Pacific salmon and steelhead.

1. The persistence of chlorothalonil in water should be less, perhaps considerably less, than is reflected in the EEC determinations. This is even acknowledged in the RED, where EECs were calculated with both a 2-hour and a 44-hour aerobic aquatic metabolism half life. (see EFED ERA, pages 20-23 for a more thorough discussion.) I opted to use the 44-hour half life in this analysis because the standardized nature of the test providing that value would permit more appropriate comparisons with EECs developed for other pesticides. The 2-hour test was unusual, but probably relevant for salmon and steelhead because it used techniques to enhance mixing and aeration. The EFED ERA states that the method "would not reliably reflect behavior in a quiescent body of water such as a lake or a pond;" (p 21, EFED ERA) however, it has more applicability to relatively fast moving, aerated streams that are typical salmon and steelhead habitats. In the EFED ERA, there was a modest decrease in peak EECs for the two different approaches, but there was substantial difference in 4-day to 90-day EECs; based upon the 2-hour half life, the non-peak EECs were typically 1/3 to 1/4 as much as those modeled with the longer half life. On the basis of these data and the discussion in the RED, there is sufficient reason to believe that there will be no chronic exposure.

I do note the potential, however, for pulsed exposures that occur from multiple applications of chlorothalonil. Between the degradation and the flowing waters of most salmon and steelhead, there should be no enhancement of subsequent EECs from residual chlorothalonil applied earlier. The limited data on pulsed exposures is mostly with insecticides and aquatic arthropods (e.g., Naddy et al., 2000), is equivocal, and is of limited utility in looking at less frequent intervals of application relative to fish.

2. The study by Ernst et al.(1991) discussed in section 3(a)(12) above found no mortality, and no apparent effect, on rainbow trout that were subject to a direct overspray of a pond, even though measured chlorothalonil residues in the pond were 171-883 ppb, considerably higher than their measured trout LC50s of 69 and 76 ppb for the formulation and technical material, respectively. The results indicate that something in the field is mitigating the effects found in the laboratory; the authors suggested that this was due to loss of chlorothalonil through physical and chemical means. Such loss appears to account for part, perhaps most, of the mitigation, but the trout in the ponds were larger than those used to establish the LC50, and there was some mortality of the sticklebacks in the pond, although Ernst et al (1993, as cited in Hamer, 2003) did report that stickleback were at least twice as sensitive as rainbow trout in their reported data.

Hamer (2003) states that this study, conducted under "worse than actual use" conditions, indicates that there will be no effect under actual use conditions. This conclusion has merit. It seems more likely than not to be correct, but I am not persuaded that it provides a sufficient basis leading to a generic "no effect" or "not likely to adversely affect" conclusion. If the trout in the ponds were the same younger age used in the laboratory and if there had been no stickleback mortality, I would most likely agree that there is no concern. However, in making ESU-specific conclusions, I will consider the results of this study in conjunction with data on the amount of chlorothalonil used within an ESU.

3. The most sensitive species is a cyprinid fish. Rainbow trout are less sensitive in EFED validated tests. There are some lower LC50 values than used by EFED, but these have not been validated and some of these data obviously apply to fish under less than optimum conditions, as when Davies and White (1985) intentionally lowered the dissolved oxygen.

4. Chlorothalonil is not used very often as the only fungicide for a crop. To control resistance, fungicides are often alternated, and chlorothalonil may only be used once or twice in a season. The models based upon the maximum number of applications and minimum intervals between sprays would overestimate the accumulated residues between applications, particularly when the longer aerobic aquatic metabolic half life is used in the models.

5. Application rates per acre are generally lower in California than label rates. Based upon Table 5 above, the actual rate per application (labeled rate in parentheses), for crops on which over 10,000 lb ai was used in 2001, was 1.66 (2.16) lb ai/A for tomatoes, 1.34 (2.25) lb ai/A for dry onions, 1.69 (2.25) lb ai/A for celery, 1.09 (1.125) lb ai/A for potatoes, and 1.1 (1.5) lb ai/A for carrots. Potatoes were treated essentially at the maximum rate. Stone fruits were treated at higher rates ranging from 2.24 to 3.48 lb ai/A, as compared to current labeled rates of 3.1 lb ai/A, which was 6.2 lb ai/A prior to label revisions. The available data from DPR cannot be used to determine the typical numbers or frequency of applications for a crop because each application is reported independently, relative to the number of acres treated for that application.

Data are not as good for the Pacific northwest. As in California, it appears that potatoes are treated in Washington with the maximum labeled rate and numbers of applications (WSDA, 2003). Other rates used in practice appear to be lower than labeled rates (Tables 6 and 7).

6. For golf courses, the primary use of chlorothalonil is on tees and greens. Although the rates are high and numbers of applications frequent, the area treated is quite small and the methods are with hand-held or small mechanical equipment that would nearly eliminate drift, but not runoff. Hamer (2003) states that fairways are "not commonly treated" and the "rough" is not treated at all. There is some disagreement about how much area tees and greens comprise; Hamer (2003) claims 4%, whereas EFED has used 11%. But in either case, the percentage area of a golf course treated will typically be small, or moderate if fairways are treated.

Some golf courses border on streams and rivers which may be used as migratory corridors for salmon and steelhead. We are not aware of golf courses that have smaller streams that may be in spawning and rearing areas for listed salmon and steelhead. There may be some, but they would likely be few.

7. NAWQA monitoring for chlorothalonil has resulted of no samples in more than 6000 taken being above 1 ppb. (See discussion, pages 29-30, regarding false readings above 1 ppb.) While such sampling may not pick up peak residues that could occur adjacent to and immediately after applications, concentrations below 1 ppb are below the 1.15 ppb concern level for fish.

8. The potential for runoff appears to be less likely, possibly much less likely, than is modeled to estimate EECs, even where those models are based upon the more arid, western scenarios. Chlorothalonil is a contact fungicide. Precipitation would wash the material off of the foliage to be treated, and therefore, efficacy dictates that chlorothalonil would not typically be applied when significant precipitation, such as that which would result in a runoff event, is likely. In some parts of the country, including western Oregon and Washington, it may not be feasible to time applications when there is no precipitation. In addition, the vagaries of weather predictions preclude applications in other areas from being made only when there will be no rain.

9. In California, chlorothalonil is included in DPR's county bulletins. While they are expected to be enforceable in the relatively near future after OPP's program becomes final, they are not currently. However, most county Agricultural Commissioners are expecting that applicators are following the protections indicated in these bulletins.

Agricultural uses

Use of chlorothalonil exceeds LOCs for all uses for acute effects. For chronic effects, LOCs are exceeded for tomatoes, cucurbits, cranberries, and Christmas trees, but not for potatoes or stone fruits. Based upon the fate and transport data for chlorothalonil, the residues found in sampling, and that the listed salmon and steelhead in agricultural areas are in flowing water, I conclude generically that there will be no chronic effect of chlorothalonil on listed Pacific salmon and steelhead.

Turf uses

The highest application rates for chlorothalonil are for turf. Most of the turf use is on golf courses, but there is use on sod farms. Use on home lawns is prohibited and use on other ornamental turf (e.g., parks, athletic fields) appears to be very limited. Although the rates are high, the potential area to be treated for golf course greens and tees is quite limited. For this reason, and also because of the various factors discussed above, I conclude generically that there will be no effect on listed Pacific salmon and steelhead from the use of chlorothalonil on golf course greens and tees.

Home and garden use

The application rates for home and garden uses of chlorothalonil are the same as for the agricultural uses, and therefore the risk quotients would be the same if the 10-hectare application area feeding into a 1-hectare pond were reflective of home and garden situations. However, even if the runoff that may occur across paved surfaces were taken into account, the pond scenario would not be applicable for a pesticide that cannot be applied to lawns. Only a small fraction of residential areas could be treated. The vast majority of urban and suburban acreage would be the lawns that cannot be treated. Therefore, I conclude that the use of chlorothalonil on residential fruits and vegetables will have no effect on listed Pacific salmon and steelhead.

4. Listed salmon and steelhead ESUs and comparison with chlorothalonil use areas

Please note that OPP will be transmitting a separate analysis of ESUs and their critical habitat to NMFS. We have noted this in previous consultation requests, but it is taking somewhat longer than anticipated. This analysis will include what we perceive to be the most appropriate boundaries for designated critical habitat. We will be requesting comments from NMFS on the counties to be included. Depending upon NMFS comments, we will make any corrections and then will compare the results with those consultation packages previously transmitted. We do not believe that any corrections will materially change the risk assessments. However, adjustments may result in changes on where protective measures need to be taken after consultation is completed. We are not asking for comments on ESU locations as part of this particular package.

A number of counties in the tables below are highlighted with bold font. This indicates that there is no reported use of chlorothalonil in those counties, according to Shaw (2003).

(a) Steelhead

Steelhead, *Oncorhynchus mykiss*, exhibit one of the most complex suites 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 (spawning beds) 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 nonanadromous 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). The San Mateo Creek watershed also includes a small portion of the southwest corner of Riverside County, but the area is in the Cleveland National Forest. Chlorothalonil would not be used in this kind of forest, so Riverside County was excluded from the analysis. 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). Counties comprising this ESU show a very high percentage of declining and extinct populations.

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 Topanga Creek. Neither of these creeks drain agricultural areas.
Reportable usage of chlorothalonil in counties where this ESU occurs are presented in Table 22.

Table 22. Use of chlorothalonil in counties with the Southern California steelhead ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
San Diego	Bean	67	42
	Corn, Human Consumption	5	5
	Cucumber	2	1
	Landscape Maintenance	7,445	NR
	Melon	6	6
	N-outdr Flower	872	609
	N-outdr Plants in Containers	1,241	905
	N-outdr Transplants	22	697
	Onion, Green	12	8
	Peas	8	2
	Potato	57	49
	Pumpkin	6	4
	Squash	89	62
	Structural Pest Control	45	NR
	Tomato	31,824	19,717
	Turf/sod	25	NR
	Watermelon	3	2
	Chemical Total	41,729	
Los Angeles	Carrot	3,668	3,219
	Cucumber	10	5
	Landscape Maintenance	10,065	NR
	Leek	140	62
	N-outdr Flower	19	25
	N-outdr Plants in Containers	540	NR
	N-outdr Transplants	37	43
	Onion, Dry	4	3
	Onion, Green	151	94
	Potato	2,782	2,292
	Tomato	93	56
	Chemical Total	16,969	

County	Crop or other use site	Usage (pounds)	Acres treated
Ventura	Broccoli	463	407
	Cabbage	1,419	1,202
	Cauliflower	683	592
	Celery	38,839	23,075
	Cucumber	22	13
	Gai Lon	2	2
	Landscape Maintenance	2,093	NR
	Leek	264	131
	Melon	2	2
	N-outdr Flower	1,405	2,022
	N-outdr Plants in Containers	499	355
	N-outdr Transplants	62	82
	Onion, Dry	638	458
	Onion, Green	358	325
	Pumpkin	127	88
	Rights of Way	49	44
	Squash	63	28
	Strawberry	415	1,200
	Structural Pest Control	75	NR
	Tomato	637	314
	Turf/sod	6,208	1,655
	Watermelon	16	27
	Chemical Total	54,339	
San Luis Obispo	Broccoli	9	8
	Brussel Sprout	31	27
	Cabbage	25	23
	Carrot	1,343	1,178
	Cauliflower	189	166
	Celery	2,083	1,194
	Chinese Cabbage (Nappa)	169	141
	Landscape Maintenance	473	NR
	N-outdr Flower	546	504
	N-outdr Plants in Containers	22	22
	N-outdr Transplants	467	375
	Peas	2	2
	Potato	1,424	1,358
	Tomato	112	70
	Chemical Total	6,895	

County	Crop or other use site	Usage (pounds)	Acres treated
Santa Barbara	Bean	30	20
	Broccoli	100	88
	Cabbage	236	286
	Carrot	3,469	3,065
	Cauliflower	330	296
	Celery	4,657	2,620
	Chinese Cabbage (Nappa)	27	23
	Landscape Maintenance	1,560	NR
	Lettuce, Head	33	16
	N-outdr Flower	3,024	3,828
	N-outdr Plants in Containers	66	23
	N-outdr Transplants	2,395	48
	Potato	842	766
	Tomato	3	4
	Uncultivated Non-ag	11	24
	Chemical Total	16,783	

There is considerable chlorothalonil usage on crops and non-crop sites within this ESU. In particular tomatoes (in San Diego County), celery, and landscape maintenance (presumably golf) have high usage. Because the area occupied by this ESU in San Diego County is nearly all military or scrub forests, tomato production would not result in exposure, and therefore I conclude that the chlorothalonil use on tomatoes in San Diego County will have no effect. Given the factors discussed in section 3h(4) above, the likelihood for effects from other uses seems low, especially in conjunction with the county bulletins. Therefore, I conclude that the use of chlorothalonil on other agricultural crops, nursery crops, and golf course fairways may affect, but is not likely to adversely affect, the Southern California Steelhead 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, Santa Clara, San Benito, Monterey, and San Luis Obispo.

There is considerable agricultural use in most counties within this ESU. There is a potential for steelhead waters to drain agricultural areas. Reportable usage of chlorothalonil in counties where this ESU occurs are presented in Table 23.

Table 23. Use of chlorothalonil in counties with the South Central California steelhead ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
Santa Cruz	Broccoli	7	12
	Brussel Sprout	1,774	1,261
	Cauliflower	34	38
	Celery	86	43
	Landscape Maintenance	157	NR
	N-outdr Plants in Containers	134	54
	N-outdr Transplants	127	78
	Research Commodity	2	NR
	Rights of Way	2	NR
	Chemical Total	2,323	
San Benito	Broccoli	15	14
	Cabbage	535	367
	Cauliflower	266	223
	Celery	1,042	599
	Landscape Maintenance	108	NR
	N-outdr Flower	8	9
	N-outdr Plants in Containers	10	NR
	Onion, Dry	2,333	1,659
	Research Commodity	27	NR
	Tomato	3,343	2,020
	Chemical Total	7,687	
Monterey	Broccoli	5,572	5,057
	Brussel Sprout	1,605	820
	Cabbage	10	10
	Carrot	232	154
	Cauliflower	900	821
	Celery	4,626	3,205
	Landscape Maintenance	2,274	NR
	N-outdr Flower	350	309
	N-outdr Transplants	527	449
	Onion, Green	127	82
	Potato	205	181
	Research Commodity	9	<1
	Squash	41	38
	Tomato	3001	1977
	Chemical Total	19,479	

County	Crop or other use site	Usage (pounds)	Acres treated
San Luis Obispo	Broccoli	9	8
	Brussel Sprout	31	27
	Cabbage	25	23
	Carrot	1,343	1,178
	Cauliflower	189	166
	Celery	2,083	1,194
	Chinese Cabbage (Nappa)	169	141
	Landscape Maintenance	473	NR
	N-outdr Flower	546	504
	N-outdr Plants in Containers	22	22
	N-outdr Transplants	467	375
	Peas	2	2
	Potato	1,424	1,358
	Tomato	112	70
	Chemical Total	6,895	

There is a moderate amount of chlorothalonil used on crops within this ESU, along with some usage on golf course turf. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, especially in conjunction with the county bulletins. Therefore, I conclude that the use of chlorothalonil on other agricultural crops, nursery crops, and golf course fairways may affect, but is not likely to adversely affect, the South Central California Steelhead 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 drainages 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 (Table 24).

Table 24. Use of chlorothalonil in counties with the Central California Coast steelhead ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
Santa Cruz	Broccoli	7	12
	Brussel Sprout	1,774	1,261
	Cauliflower	34	38
	Celery	86	43
	Landscape Maintenance	157	NR
	N-outdr Plants in Containers	134	54
	N-outdr Transplants	127	78
	Research Commodity	2	NR
	Rights of Way	2	NR
	Chemical Total	2,323	
San Mateo	Bean	39	31
	Brussel Sprout	2,597	2,064
	Landscape Maintenance	659	NR
	N-outdr Flower	405	226
	N-outdr Plants in Containers	62	61
	Chemical Total	3,762	
San Francisco	Landscape Maintenance	423	NR
Marin	Landscape Maintenance	211	NR
	Structural Pest Control	15	NR
	Chemical Total	226	
Sonoma	Apple	2	39
	Landscape Maintenance	301	NR
	N-outdr Flower	25	7
	N-outdr Plants in Containers	4	2
	Chemical Total	332	NR
Mendocino	none (except greenhouse)		
Napa	Landscape Maintenance	325	NR
Alameda	Landscape maintenance	1,359	NR
	Nursery - outdoor container	15	NR
	Chemical total	1,374	
Contra Costa	Landscape Maintenance	1,731	NR
	N-outdr Transplants	2	5
	Onion, Dry	50	35
	Structural Pest Control	16	NR
	Tomato	1,867	898
	Chemical Total	3,666	

County	Crop or other use site	Usage (pounds)	Acres treated
Solano	Apricot	6	2
	Landscape Maintenance	749	NR
	N-outdr Plants in Containers	133	66
	Onion, Dry	45	30
	Peach	2	1
	Prune	11	18
	Squash	57	75
	Structural Pest Control	5	NR
	Tomato, Processing	4,827	2,544
	Uncultivated Ag	116	63
	Chemical Total	5,951	
Santa Clara	Bean	77	34
	Broccoli	38	19
	Celery	101	67
	Chinese Cabbage (Nappa)	54	36
	Landscape Maintenance	2210	NR
	Lettuce, Leaf	32	14
	N-outdr Plants in Containers	24	29
	N-outdr Transplants	13	8
	Onion, Dry	884	608
	Research Commodity	18	22
	Squash	8	5
	Stone Fruit	1	2
	Tomato	927	571
	Chemical Total	4,387	

There is modest use of chlorothalonil within this ESU, both on crops and on golf course turf. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, especially in conjunction with the county bulletins. Therefore, I conclude that the use of chlorothalonil on other agricultural crops, nursery crops, and golf course fairways may affect, but is not likely to adversely affect, 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, Napa, Nevada, Placer, Sacramento, San Benito, San Francisco, San Joaquin, San Mateo, San Francisco, Santa Clara, Shasta, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tuloumne, Yolo, and Yuba. A large proportion of this area is heavily agricultural, but there are also large amounts of urban and suburban areas. Usage of chlorothalonil in counties where the California Central Valley steelhead ESU occurs is presented in Table 25.

Table 25. Use of chlorothalonil in counties with the California Central Valley steelhead ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
Alameda	Landscape maintenance	1,359	NR
	Nursery - outdoor container	15	NR
	Chemical total	1,374	
Amador	Landscape maintenance	30	NR
Butte	Landscape maintenance	121	NR
	Onion, dry	4	2.5
	Structural pest control	11	NR
	Chemical total	136	
Calaveras	Landscape maintenance	152	NR
Colusa	Cabbage	30	28
	Carrot	48	34
	Cauliflower	3	3
	Landscape Maintenance	23	NR
	Onion, Dry	1,614	1,296
	Pumpkin	31	19
	Rights of Way	15	NR
	Tomato, Processing	3,357	1,539
	Chemical Total	5,121	
Contra Costa	Landscape Maintenance	1,731	NR
	N-outdr Transplants	2	5
	Onion, Dry	50	35
	Structural Pest Control	16	NR
	Tomato	1,867	898
	Chemical Total	3,666	
Glenn	Cauliflower	9	10
	Landscape Maintenance	30	NR
	N-outdr Transplants	122	132
	Onion, Dry	302	242
	Prune	741	275
	Tomato	<1	<1
	Chemical Total	1204	

County	Crop or other use site	Usage (pounds)	Acres treated
Marin	Landscape Maintenance	211	NR
	Structural Pest Control	15	NR
	Chemical Total	226	
Merced	Cauliflower	21	20
	Cotton	1,955	271
	Landscape Maintenance	131	NR
	N-outdr Plants in	30	16
	Containers	148	131
	N-outdr Transplants	79	42
	Nectarine	65	45
	Onion, Dry	1,235	470
	Peach	8	10
	Pepper, Fruiting	45	20
	Plum	193	85
	Prune	19,261	11,950
	Tomato	195	33
	Turf/sod	23,366	
	Chemical Total		
Nevada	Landscape Maintenance	<1	NR
Placer	Landscape Maintenance	691	NR
	N-outdr Plants in	7	6
	Containers	3	1
	Nectarine	6	2
	Peach	3	NR
	Structural Pest Control	710	
	Chemical Total		
Sacramento	Corn, Sweet	104	46
	Landscape Maintenance	1,947	NR
	N-outdr Plants in	124	141
	Containers	82	62
	Onion, Dry	1	NR
	Structural Pest Control	3,658	2,122
	Tomato	5,916	
	Chemical Total		

County	Crop or other use site	Usage (pounds)	Acres treated
San Joaquin	Apricot Cabbage Cauliflower Landscape Maintenance N-outdr Plants in Containers N-outdr Transplants Onion, Dry Onion, Green Peach Potato Tomato Chemical Total	1,450 11 41 519 773 245 257 124 461 212 8,819 12,912	692 10 38 NR 303 217 193 86 115 206 5,563
San Francisco	Landscape Maintenance	423	NR
San Mateo	Bean Brussel Sprout Landscape Maintenance N-outdr Flower N-outdr Plants in Containers Chemical Total	39 2,597 659 405 62 3,762	31 2,064 NR 226 61
Shasta	Landscape Maintenance N-outdr Transplants Strawberry Chemical Total	177 154 45 376	NR 152 51
Solano	Apricot Landscape Maintenance N-outdr Plants in Containers Onion, Dry Peach Prune Squash Structural Pest Control Tomato, Processing Uncultivated Ag Chemical Total	6 749 133 45 2 11 57 5 4,827 116 5,951	2 NR 66 30 1 18 75 NR 2,544 63
Sonoma	Apple Landscape Maintenance N-outdr Flower N-outdr Plants in Containers Chemical Total	2 301 25 4 332	39 NR 7 2 NR

County	Crop or other use site	Usage (pounds)	Acres treated
Stanislaus	Apricot Bean Cabbage Landscape Maintenance Leek N-outdr Plants in Containers N-outdr Transplants Onion, Dry Peach Rights of Way Tomato Chemical Total	392 156 16 138 10 116 88 1 1,382 27 11,578 13,904	314 150 17 NR 12 52 18 2 636 NR 7,107
Sutter	Cabbage Landscape Maintenance N-outdr Transplants Onion, Dry Prune Pumpkin Tomato Chemical Total	28 6 2 513 393 25 5,597 6,564	29 NR 2 312 107 21 3,118
Tehama	Landscape Maintenance N-outdr Transplants Nectarine Peach Chemical Total	2 86 8 8 104	NR 77 9 9
Tuolumne	none		
Yolo	Broccoli Cabbage Landscape Maintenance Melon Onion, Dry Pumpkin Research Commodity Tomato Chemical Total	1 6 283 16 502 21 28 15,462 16,319	1 5 NR 10 402 14 6 10,893
Yuba	Landscape Maintenance Prune Chemical Total	96 60 156	NR 20

There is substantial use of chlorothalonil within this ESU, primarily on tomatoes, but also on other crops and on golf course turf. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, especially in conjunction with the county bulletins. Therefore, I conclude that the use of chlorothalonil on other agricultural crops, nursery crops, and golf course fairways may affect, but is not likely to adversely affect, the California Central Valley Steelhead 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, Glenn, Lake, and Sonoma. Glenn and Lake counties are excluded from this particular analysis because the hydrologic units in these counties are entirely within the Mendocino National Forest, where there would be no chlorothalonil usage. Table 26 shows the reported use of chlorothalonil in these counties.

Table 26. Use of chlorothalonil in counties with the Northern California steelhead ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
Humboldt	Landscape Maintenance N-outdr Flower N-outdr Transplants Chemical Total	7 869 48 924	NR 591 18
Mendocino	none (except greenhouse)		
Trinity	none		
Lake	none		

There is a low amount of chlorothalonil used within this ESU, essentially on nursery crops. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low enough that in conjunction with the county bulletins, I conclude that the use of chlorothalonil will have no effect on 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.

Note: Adams County, WA was not one of the counties named in the critical habitat FR Notice, but appears to be included in a hydrologic unit named in that notice. We have included it here, but seek NMFS guidance for future efforts.

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

Table 27 shows the cropping information where chlorothalonil can be used in Washington counties where the Upper Columbia River steelhead ESU is located. Table 28 shows the information for the Oregon and Washington counties where this ESU migrates. In these tables, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 27. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Upper Columbia River steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
WA	Adams	Potatoes (27,914) Mint (7,328) Corn for grain or seed (5,388) Vegetables[3] (3,668) Sugar beets (1,570) Nursery & greenhouse[4] (1,331) Cherries	47,199	1,231,999

[3] Vegetables includes asparagus, beans (except dry), beets, broccoli, cabbage, cantaloup, carrot, cauliflower, celery, collards, cucumbers & pickles, eggplant, garlic, fresh herbs, lettuce, melons, mustard greens, onions, peas (except dry), peppers, pumpkins, radish, rhubarb, spinach, squash, sweet corn, tomatoes, turnips.

[4] Nursery and greenhouse crops include perennial and annual nursery plants to be used as ornamentals, flower and vegetable seed crops, sod farms, Christmas trees, etc., but only "acres in the open" are reported (i.e., not acres under glass).

State	County	Crops and acreage planted	Acres	Total acreage
WA	Benton	Potatoes (25,317) Vegetables (23,417) Sugar beets (4,284) Cherries (3,219) Nursery & greenhouse (218) Plums & prunes (180) Apricots (174) Peaches (149) Nectarines (106) Walnuts (41) Corn for grain or seed Mint	57,105	1,089,993
WA	Chelan	Cherries (3,704) Apricots (81) Nursery & greenhouse (56) Nectarines (22) Peaches (21) Vegetables (12) Plums & prunes (3) Walnuts	3,899	1,869,848
WA	Douglas	Cherries (1,842) Apricots (315) Peaches (167) Nectarines (91) Nursery & greenhouse (11) Vegetables	2,426	1,165,168
WA	Franklin	Potatoes (35,570) Vegetables (30,118) Corn for grain or seed (11,337) Cherries (2,165) Nursery & greenhouse (1,982) Mint (1,586) Grass for seed (1,576) Peaches (262) Nectarines (129) Apricots (68) Plums & prunes (43) Strawberries (17) Walnuts	84,853	794,999

State	County	Crops and acreage planted	Acres	Total acreage
WA	Grant	Vegetables (57,812) Potatoes (44,263) Corn for grain or seed (29,953) Mint (15,610) Sugar beets (10,792) Nursery & greenhouse (6,454) Cherries (3,470) Apricots (266) Peaches (261) Nectarines (163) Walnuts (5) Plums & prunes (5) Strawberries (2) Filberts	169,056	1,712,881
WA	**Kittitas**	Vegetables (4,437) Potatoes (442) Mint (409) Nursery & greenhouse (224) Filberts (1) Peaches (1) Plums & prunes (1) Cherries	5,515	1,469,862
WA	**Okanogan**	Cherries (1,003) Nursery & greenhouse (111) Peaches (67) Nectarines (38) Walnuts (29) Vegetables (22) Apricots (13) Filberts (10) Plums & prunes (1)	1,294	3,371,698
WA	Yakima	Vegetables (18,424) Corn for grain or seed (12,680) Mint (12,577) Cherries (6,129) Potatoes (1,929) Peaches (1,438) Nursery & greenhouse (821) Nectarines (605) Plums & prunes (478) Apricots (285) Walnuts (11) Filberts (6)	55,383	2,749,514

Table 28. Crops on which chlorothalonil can be used in counties in the migration corridor of the Upper Columbia River steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	**Gilliam**	none	0	770,664
OR	**Hood River**	Cherries (1,081) Nursery & greenhouse (243) Blueberries (29) Peaches (13) Vegetables	1,366	334,328
OR	Morrow	Potatoes (17,030) Corn for grain or seed (9,276) Vegetables (5,830) Grass for seed (689) Nursery & greenhouse	32,825	1,301,021
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2))	8,221	278,570
OR	**Sherman**	Nursery & greenhouse (113)	113	526,911

State	County	Crops and acreage planted	Acres	Total acreage
OR	Umatilla	Vegetables (39,638) Potatoes (15,003) Corn for grain or seed (6,901) Grass for seed (4,229) Nursery & greenhouse (396) Plums & prunes (365) Cherries (349) Apricots (14) Strawberries (9) Peaches (7) Mint Nectarines Blueberries	66,911	2,057,809
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16)[5] Plums & prunes (10) Cherries Mint	1,783	401,850
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	Klickitat	Cherries (457) Peaches (199) Apricots (18) Plums & prunes (1) Walnuts Vegetables Potatoes Nursery & greenhouse	675	1,198,385

5 Apparently planted since last ag census in 1997; data are from WSDA.

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	Skamania	Nursery & greenhouse	unknown	1,337,179
WA	**Wahkiakum**	none	0	169,125
WA	Walla Walla	Vegetables (21,183) Potatoes (9,256) Corn for grain or seed (6,539) Nursery & greenhouse (2,714) Grass for seed (543) Cherries (280) Plums & prunes (22)	42,940	813,108

There is a rather large amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially potatoes. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, but cannot be precluded. Therefore, I conclude that the use of chlorothalonil may affect the Upper Columbia River Steelhead ESU within its breeding areas.

(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, Walla Walla, Adams, Lincoln, and Spokane in Washington; and Adams, Idaho, Nez Perce, Blaine, Custer, Lemhi, Boise, Valley, Lewis, Clearwater, and Latah in Idaho.

We have excluded Baker County, Oregon, which has a tiny fragment of the Imnaha River. 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 chlorothalonil use in agricultural and registered non-crop areas. We have similarly excluded the Upper Grande Ronde watershed tributaries (e.g., Looking Glass and Cabin Creeks) that are barely into higher elevation forested areas of Umatilla County. 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. These areas are not relevant to use of chlorothalonil. 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 it was included.

Note: We are uncertain about the inclusion of Adams, Lincoln and Spokane counties in Washington in this ESU. They are not named in the Critical Habitat FR Notice, but they appear to include waters in the listed hydrologic unit. We have included them below, but will be seeking NMFS guidance in a separate request.

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 Walla Walla, Benton, Klickitat, Skamania, Clark, Cowlitz, Wahkiakum, and Pacific in Washington.

Table 29 and Table 30 show 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. In these tables, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 29. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Snake River Basin steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
ID	Adams	Corn for grain or seed (104) Nursery & greenhouse (8)	152	873,399
ID	Clearwater	Nursery & greenhouse (336) Vegetables (19)	355	1,575,396
ID	Custer	Potatoes (507) Nursery & greenhouse	507	3,152,382
ID	Idaho	Cherries (2) Plums & prunes (2) Filberts Vegetables Nursery & greenhouse Peaches	4	5,430,522
ID	Latah	Nursery & greenhouse (2,193) Cherries (19) Vegetables	2,212	689,089
ID	Lemhi	Cherries (9) Peaches (3) Apricots	12	2,921,172
ID	**Lewis**	Vegetables	NR	306,601

State	County	Crops and acreage planted	Acres	Total acreage
ID	Valley	Potatoes (225) Vegetables (19) Nursery & greenhouse	244	2,354,043
OR	**Union**	Mint (9,226) Grass for seed (1,848) Sugar beets (1,035) Potatoes (660) Cherries (596) Nursery & greenhouse (465) Peaches (12) Vegetables Plums & prunes Apricots	13,842	1,303,476
OR	**Wallowa**	Nursery & greenhouse Peaches	unknown	2,013,071
WA	Adams	Potatoes (27,914) Mint (7,328) Corn for grain or seed (5,388) Vegetables (3,668) Sugar beets (1,570) Nursery & greenhouse (1,331) Cherries	47,199	1,231,999
WA	**Asotin**	Peaches (18) Cherries (17) Apricots (5) Nursery & greenhouse	40	406,983
WA	Benton	Potatoes (25,317) Vegetables (23,417) Sugar beets (4,284) Cherries (3,219) Nursery & greenhouse (218) Plums & prunes (180) Apricots (174) Peaches (149) Nectarines (106) Walnuts (41) Corn for grain or seed Mint	57,105	1,089,993
WA	**Columbia**	Vegetables (1,787) Corn for grain or seed (51)	1,838	556,034

State	County	Crops and acreage planted	Acres	Total acreage
WA	Franklin	Potatoes (35,570) Vegetables (30,118) Corn for grain or seed (11,337) Cherries (2,165) Nursery & greenhouse (1,982) Mint (1,586) Grass for seed (1,576) Peaches (262) Nectarines (129) Apricots (68) Plums & prunes (43) Strawberries (17) Walnuts	84,853	794,999
WA	**Garfield**	none	0	454,744
WA	**Lincoln**	Potatoes (771) Nursery & greenhouse (662) Corn for grain or seed (564) Cherries (1) Vegetables	1,998	1,479,196
WA	Spokane	Vegetables (449) Nursery & greenhouse (378) Cherries (50) Peaches (42) Strawberries (30) Apricots (11) Plums & prunes (1) Potatoes Corn for grain or seed	961	1,128,835
WA	Walla Walla	Vegetables (21,183) Potatoes (9,256) Corn for grain or seed (6,539) Nursery & greenhouse (2,714) Grass for seed (543) Cherries (280) Plums & prunes (22)	42,940	813,108
WA	**Whitman**	Vegetables (5,792) Nursery & greenhouse (980) Corn for grain or seed (101) Cherries	6,873	1,382,006

Table 30. Crops on which chlorothalonil can be used in counties in the migration corridor of the Snake River Basin steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	**Gilliam**	none	0	770,664
OR	**Hood River**	Cherries (1,081) Nursery & greenhouse (243) Blueberries (29) Peaches (13) Vegetables	1,366	334,328
OR	Morrow	Potatoes (17,030) Corn for grain or seed (9,276) Vegetables (5,830) Grass for seed (689) Nursery & greenhouse	32,825	1,301,021
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
OR	**Sherman**	Nursery & greenhouse (113)	113	526,911

State	County	Crops and acreage planted	Acres	Total acreage
OR	Umatilla	Vegetables (39,638) Potatoes (15,003) Corn for grain or seed (6,901) Grass for seed (4,229) Nursery & greenhouse (396) Plums & prunes (365) Cherries (349) Apricots (14) Strawberries (9) Peaches (7) Mint Nectarines Blueberries	66,911	2,057,809
OR	Wasco	Cherries (7,352) Nursery & greenhouse (144) Apricots (32) Peaches (30) Vegetables Plums & prunes Strawberries	7,588	1,523,958
WA	Benton	Potatoes (25,317) Vegetables (23,417) Sugar beets (4,284) Cherries (3,219) Nursery & greenhouse (218) Plums & prunes (180) Apricots (174) Peaches (149) Nectarines (106) Walnuts (41) Corn for grain or seed Mint	57,105	1,089,993
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781

State	County	Crops and acreage planted	Acres	Total acreage
WA	Klickitat	Cherries (457) Peaches (199) Apricots (18) Plums & prunes (1) Walnuts Vegetables Potatoes Nursery & greenhouse	675	1,198,385
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	Skamania	Nursery & greenhouse	unknown	1,337,179
WA	**Wahkiakum**	none	0	169,125

There is a rather large amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially potatoes. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, but cannot be precluded. Therefore, I conclude that the use of chlorothalonil may affect the Snake River Basin Steelhead ESU within its breeding areas.

(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 mountainous forested areas where chlorothalonil would not likely be used, and these counties are excluded from the analysis.

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 migration corridors, and include Multnomah, Columbia, and Clatsop counties, Oregon, and Clark, Cowlitz, Wahkiakum, and Pacific counties, Washington.

Table 31 and Table 32 show the cropping information for Oregon counties where the Upper Willamette River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates. In these tables, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 31. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Upper Willamette River steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Benton**	Grass for seed (33,344) Vegetables (10,295) Nursery & greenhouse (6,212) Mint (2,925) Sugar beets (687) Filberts (493) Blueberries (109) Walnuts (23) Cherries (18) Strawberries (17) Peaches (8) Plums & prunes (5) Potatoes (3)	54,139	432,961
OR	Clackamas	Nursery & greenhouse (29,217) Grass for seed (8,594) Vegetables (4,933) Filberts (3,994) Strawberries (608) Blueberries (334) Sugar beets (106) Peaches (78) Cherries (53) Walnuts (51) Plums & prunes (37) Corn for grain or seed (14) Potatoes (1)	48,020	1,195,712

State	County	Crops and acreage planted	Acres	Total acreage
OR	Linn	Grass for seed (190,438) Vegetables (9,877) Mint (4,105) Filberts (1,820) Nursery & greenhouse (1,563) Sugar beets (281) Cherries (157) Peaches (73) Blueberries (58) Walnuts (55) Strawberries (52) Plums & prunes (14) Corn for grain or seed (4) Nectarines (3)	208,510	1,466,507
OR	Marion	Grass for seed (97,276) Vegetables (37,290) Nursery & greenhouse (21,309) Filberts (7,061) Mint (3,695) Strawberries (1,858) Cherries (1,568) Sugar beets (940) Blueberries (545) Peaches (179) Walnuts (155) Plums & prunes (145) Corn for grain or seed (16) Nectarines Potatoes	172,047	758,394
OR	Polk	Grass for seed (50,183) Nursery & greenhouse (6,638) Vegetables (2,565) Mint (2,448) Filberts (2,394) Cherries (1,888) Plums & prunes (595) Sugar beets (130) Peaches (51) Walnuts (33) Strawberries (22) Blueberries (21)	66,968	474,296

State	County	Crops and acreage planted	Acres	Total acreage
OR	Washington	Vegetables (8,152) Grass for seed (7,672) Nursery & greenhouse (7,538) Filberts (5,595) Strawberries (1,257) Walnuts (679) Blueberries (654) Plums & prunes (358) Cherries (211) Peaches (168) Potatoes	32,284	463,231
OR	Yamhill	Grass for seed (24,993) Vegetables (7,147) Filberts (7,110) Nursery & greenhouse (5,590) Cherries (1,693) Walnuts (608) Plums & prunes (369) Blueberries (324) Strawberries (265) Sugar beets (151) Peaches (104) Potatoes (1) Corn for grain or seed Nectarines	48,355	457,986

Table 32. Crops on which chlorothalonil can be used in counties in the migration corridor of the Upper Willamette River steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	**Wahkiakum**	none	0	169,125

There is a rather large amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially grass seed and nursery crops, including Christmas trees; USDA estimates 31% of the Christmas tree operations in Oregon use chlorothalonil. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, but cannot be precluded. Therefore, I conclude that the use of chlorothalonil may affect the Upper Willamette River Steelhead ESU within its breeding areas.

(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 Hood River, Clackamas, and Multnomah counties in Oregon, and Skamania, Clark, Cowlitz, and Lewis 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.

Table 33 and Table 34 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. In these tables, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 33. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Lower Columbia River steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clackamas	Nursery & greenhouse (29,217) Grass for seed (8,594) Vegetables (4,933) Filberts (3,994) Strawberries (608) Blueberries (334) Sugar beets (106) Peaches (78) Cherries (53) Walnuts (51) Plums & prunes (37) Corn for grain or seed (14) Potatoes (1)	48,020	1,195,712
O R	**Hood River**	Cherries (1,081) Nursery & greenhouse (243) Blueberries (29) Peaches (13) Vegetables	1,366	334,328
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	**Lewis**	Nursery & greenhouse (7,663) Vegetables (2,176) Blueberries (137) Filberts (25) Cherries (10) Plums & prunes (3) Strawberries	10,014	1,540,991
WA	Skamania	Nursery & greenhouse	unknown	1,337,179

Table 34. Crops on which chlorothalonil can be used in counties in the migration corridor of the Lower Columbia River steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	**Wahkiakum**	none	0	169,125

There is a moderate amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially nursery crops and Christmas trees. However, the bulk of Clackamas

County acreage is most likely not in the watershed of this ESU, and there are many counties in which there is no reported usage of chlorothalonil. For these reasons, along with the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems very low. I conclude that the use of chlorothalonil may affect, but is not likely to affect, the Lower Columbia River Steelhead 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." 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.

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, we 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. Union and Wallowa Counties, Oregon were excluded because the small reaches of the Umatilla and Walla Walla Rivers in these counties occur in high elevation areas where crops are not grown.

The Oregon counties then that appear to have spawning and rearing habitat are Gilliam, Morrow, Umatilla, Sherman, Wasco, Crook, Grant, Wheeler, and Jefferson counties. Washington counties providing spawning and rearing habitat would be Benton, Franklin, Kittitas, Klickitat, Skamania, Walla Walla, and Yakima. Only small portions of Franklin and Skamania Counties intersect with the spawning and rearing habitat of this ESU.

Migratory corridors include Hood River, Multnomah, Columbia, and Clatsop counties in Oregon, and Skamania, Clark, Cowlitz, Wahkiakum, and Pacific Counties in Washington.

Table 35 and Table 36 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. In these tables, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 35. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Middle Columbia River steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Crook	Mint (5,501) Sugar beets (1,510) Vegetables (388) Nursery & greenhouse (281)	7,680	1,906,892
OR	**Gilliam**	none	0	770,664
OR	**Grant**	Apricots (19) Nursery & greenhouse	19	2,898,444
OR	Jefferson	Nursery & greenhouse (3,897) Mint (3,105) Sugar beets (2,396) Vegetables (1,152) Potatoes (973)	11,523	1,139,744
OR	Morrow	Potatoes (17,030) Corn for grain or seed (9,276) Vegetables (5,830) Grass for seed (689) Nursery & greenhouse	32,825	1,301,021
OR	**Sherman**	Nursery & greenhouse (113)	113	526,911
OR	Umatilla	Vegetables (39,638) Potatoes (15,003) Corn for grain or seed (6,901) Grass for seed (4,229) Nursery & greenhouse (396) Plums & prunes (365) Cherries (349) Apricots (14) Strawberries (9) Peaches (7) Mint Nectarines Blueberries	66,911	2,057,809
OR	Wasco	Cherries (7,352) Nursery & greenhouse (144) Apricots (32) Peaches (30) Vegetables Plums & prunes Strawberries	7,588	1,523,958
OR	**Wheeler**	Nursery & greenhouse	unknown	1,097,601

State	County	Crops and acreage planted	Acres	Total acreage
WA	Benton	Potatoes (25,317) Vegetables (23,417) Sugar beets (4,284) Cherries (3,219) Nursery & greenhouse (218) Plums & prunes (180) Apricots (174) Peaches (149) Nectarines (106) Walnuts (41) Corn for grain or seed Mint	57,105	1,089,993
WA	Franklin	Potatoes (35,570) Vegetables (30,118) Corn for grain or seed (11,337) Cherries (2,165) Nursery & greenhouse (1,982) Mint (1,586) Grass for seed (1,576) Peaches (262) Nectarines (129) Apricots (68) Plums & prunes (43) Strawberries (17) Walnuts	84,853	794,999
WA	**Kittitas**	Vegetables (4,437) Potatoes (442) Mint (409) Nursery & greenhouse (224) Filberts (1) Peaches (1) Plums & prunes (1) Cherries	5,515	1,469,862
WA	Klickitat	Cherries (457) Peaches (199) Apricots (18) Plums & prunes (1) Walnuts Vegetables Potatoes Nursery & greenhouse	675	1,198,385
WA	Skamania	Nursery & greenhouse	unknown	1,337,179

State	County	Crops and acreage planted	Acres	Total acreage
WA	Walla Walla	Vegetables (21,183) Potatoes (9,256) Corn for grain or seed (6,539) Nursery & greenhouse (2,714) Grass for seed (543) Cherries (280) Plums & prunes (22)	42,940	813,108
WA	Yakima	Vegetables (18,424) Corn for grain or seed (12,680) Mint (12,577) Cherries (6,129) Potatoes (1,929) Peaches (1,438) Nursery & greenhouse (821) Nectarines (605) Plums & prunes (478) Apricots (285) Walnuts (11) Filberts (6)	55,383	2,749,514

Table 36. Crops on which chlorothalonil can be used in counties in the migration corridor of the Middle Columbia River steelhead ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	**Hood River**	Cherries (1,081) Nursery & greenhouse (243) Blueberries (29) Peaches (13) Vegetables	1,366	334,328

State	County	Crops and acreage planted	Acres	Total acreage
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	Skamania	Nursery & greenhouse	unknown	1,337,179
WA	**Wahkiakum**	none	0	169,125

There is a rather large amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially potatoes. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, but cannot be precluded. Therefore, I conclude that the use of chlorothalonil may affect the Middle Columbia River Steelhead ESU within its breeding areas.

(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 younger ocean-type counterparts and are therefore able to move offshore relatively quickly.

Coastwide, 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 redd, in a stream area with suitable gravel composition, water depth and velocity. After laying eggs in a redd, adult chinook will guard the redd 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 estuarine 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 estuarine waters, north of the

Oakland Bay Bridge, to the ocean. Estuarine sloughs in San Pablo and San Francisco bays (including San Mateo and Santa Clara counties) are excluded (58FR33212-33219, June 16, 1993).

Table 37 shows the chlorothalonil usage in California counties supporting the Sacramento River winter-run chinook salmon ESU.

Table 37. Use of chlorothalonil in counties with the Sacramento River winter-run Chinook salmon ESU. Spawning areas are primarily in Shasta and Tehama counties above the Red Bluff diversion dam.

County	Crop or other use site	Usage (pounds)	Acres treated
Alameda	Landscape maintenance	1,359	NR
	Nursery - outdoor container	15	NR
	Chemical total	1,374	
Amador	Landscape maintenance	30	NR
Butte	Landscape maintenance	121	NR
	Onion, dry	4	2.5
	Structural pest control	11	NR
	Chemical total	136	
Colusa	Cabbage	30	28
	Carrot	48	34
	Cauliflower	3	3
	Landscape Maintenance	23	NR
	Onion, Dry	1,614	1,296
	Pumpkin	31	19
	Rights of Way	15	NR
	Tomato, Processing	3,357	1,539
	Chemical Total	5,121	
Contra Costa	Landscape Maintenance	1,731	NR
	N-outdr Transplants	2	5
	Onion, Dry	50	35
	Structural Pest Control	16	NR
	Tomato	1,867	898
	Chemical Total	3,666	
Glenn	Cauliflower	9	10
	Landscape Maintenance	30	NR
	N-outdr Transplants	122	132
	Onion, Dry	302	242
	Prune	741	275
	Tomato	<1	<1
	Chemical Total	1204	
Marin	Landscape Maintenance	211	NR
	Structural Pest Control	15	NR
	Chemical Total	226	

County	Crop or other use site	Usage (pounds)	Acres treated
Sacramento	Corn, Sweet	104	46
	Landscape Maintenance	1,947	NR
	N-outdr Plants in Containers	124	141
	Onion, Dry	82	62
	Structural Pest Control	1	NR
	Tomato	3,658	2,122
	Chemical Total	5,916	
San Joaquin	Apricot	1,450	692
	Cabbage	11	10
	Cauliflower	41	38
	Landscape Maintenance	519	NR
	N-outdr Plants in Containers	773	303
	N-outdr Transplants	245	217
	Onion, Dry	257	193
	Onion, Green	124	86
	Peach	461	115
	Potato	212	206
	Tomato	8,819	5,563
	Chemical Total	12,912	
San Francisco	Landscape Maintenance	423	NR
San Mateo	Bean	39	31
	Brussel Sprout	2,597	2,064
	Landscape Maintenance	659	NR
	N-outdr Flower	405	226
	N-outdr Plants in Containers	62	61
	Chemical Total	3,762	
Shasta	Landscape Maintenance	177	NR
	N-outdr Transplants	154	152
	Strawberry	45	51
	Chemical Total	376	
Solano	Apricot	6	2
	Landscape Maintenance	749	NR
	N-outdr Plants in Containers	133	66
	Onion, Dry	45	30
	Peach	2	1
	Prune	11	18
	Squash	57	75
	Structural Pest Control	5	NR
	Tomato, Processing	4,827	2,544
	Uncultivated Ag	116	63
	Chemical Total	5,951	

County	Crop or other use site	Usage (pounds)	Acres treated
Sonoma	Apple	2	39
	Landscape Maintenance	301	NR
	N-outdr Flower	25	7
	N-outdr Plants in Containers	4	2
	Chemical Total	332	NR
Tehama	Landscape Maintenance	2	NR
	N-outdr Transplants	86	77
	Nectarine	8	9
	Peach	8	9
	Chemical Total	104	
Yolo	Broccoli	1	1
	Cabbage	6	5
	Landscape Maintenance	283	NR
	Melon	16	10
	Onion, Dry	502	402
	Pumpkin	21	14
	Research Commodity	28	6
	Tomato	15,462	10,893
	Chemical Total	16,319	

There is a moderately large amount of chlorothalonil usage within this ESU, especially on tomatoes, along with some additional use on other vegetables and golf courses. The breeding area of the Sacramento River Winter-run chinook salmon is in the Sacramento River rather than tributaries. Despite the acreage, the factors discussed in section 3h(4) above lead me to believe that the likelihood for effects is low, especially in conjunction with the county bulletins. I conclude that the use of chlorothalonil may affect, but is not likely to adversely affect the Sacramento River Winter-run Chinook Salmon ESU.

(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.

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. The proposed revision of the ESU adds the Lower Deschutes, Trout, Lower John Day, Upper John Day, North Fork - John Day, Middle Fork - John Day, Willow, Umatilla, and Walla Walla hydrologic units. It appears that no additions have been proposed for Washington tributaries to the Columbia River. These units are in Wasco, Jefferson, Crook, Sherman, Gilliam, Wheeler, Morrow, Baker, Umatilla, Grant, Harney, 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. Wasco, Jefferson, Sherman, Gilliam, Wheeler, Morrow, Crook, Harney, and Grant Counties were included to encompass the more recent definition including the Deschutes and John Day Rivers. However, because the FR Notice indicated that this ESU was extirpated in the John Day, Umatilla, and Walla Walla rivers, we have excluded Wheeler, Grant, and Harney counties from the analysis, and also Umatilla County except as part of the migratory corridor. We have retained Wasco, Sherman, and Jefferson counties along the lower Deschutes River and Gilliam and Morrow counties along Willow Creek as potential spawning and rearing habitat. We also excluded Crook County because it is above Pelton Dam.

As explained previously, we have excluded the high elevation sliver of Imnaha Creek in Baker County. In addition, we have re-examined other watershed considerations that we made in previous consultation analyses. Because Palouse Falls is an upstream barrier to passage, we are now excluding Adams, Lincoln, and Spokane counties in Washington from this ESU analysis. As best as we can tell, it appears that Benewah County, ID was also included in the counties in the Critical Habitat FR Notice as part of the Palouse River watershed, and we have therefore excluded it also. Finally, it appears that waters in Shoshone County, ID are all above Dworshak Dam, which is an upstream barrier. As a result of this re-examination, we now consider that spawning and rearing habitat for the Snake River fall chinook includes Nez Perce, Latah, Lewis, Clearwater, Adams, Idaho, and Valley counties in Idaho; Wallowa, Union, and the newly added Wasco, Sherman, Jefferson, Gilliam and Morrow counties in Oregon; and Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman counties in Washington. For this particular analysis, we have excluded Valley County, Idaho because that portion in the Salmon River watershed is all in forested areas where chlorothalonil would not be used; the private land areas of Valley County where chlorothalonil could be used are in the Payette River watershed. As always, we solicit NMFS comments on these counties to included or excluded.

The migratory corridor of Snake River fall-run chinook includes the additional counties of Umatilla, Hood River, Multnomah, Columbia, and Clatsop in Oregon, and Benton, Klickitat, Skamania, Clark, Cowlitz, Wahkiakum, and Pacific in Washington.

Tables 38 and Table 39 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. In these tables, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 38. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Snake River fall-run chinook salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
ID	Adams	Corn for grain or seed (104) Nursery & greenhouse (8)	152	873,399
ID	Clearwater	Nursery & greenhouse (336) Vegetables (19)	355	1,575,396
ID	Idaho	Cherries (2) Plums & prunes (2) Filberts Vegetables Nursery & greenhouse Peaches	4	5,430,522
ID	Latah	Nursery & greenhouse (2,193) Cherries (19) Vegetables	2,212	689,089
ID	**Lewis**	Vegetables	NR	306,601
ID	Nez Perce	Vegetables (1,835) Peaches (22) Cherries (4) Apricots (1) Corn for grain or seed Nursery & greenhouse Potatoes	1,862	543,434
OR	**Gilliam**	none	0	770,664
OR	Jefferson	Nursery & greenhouse (3,897) Mint (3,105) Sugar beets (2,396) Vegetables (1,152) Potatoes (973)	11,523	1,139,744
OR	Morrow	Potatoes (17,030) Corn for grain or seed (9,276) Vegetables (5,830) Grass for seed (689) Nursery & greenhouse	32,825	1,301,021
OR	**Sherman**	Nursery & greenhouse (113)	113	526,911

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Union**	Mint (9,226) Grass for seed (1,848) Sugar beets (1,035) Potatoes (660) Cherries (596) Nursery & greenhouse (465) Peaches (12) Vegetables Plums & prunes Apricots	13,842	1,303,476
OR	**Wallowa**	Nursery & greenhouse Peaches	unknown	2,013,071
OR	Wasco	Cherries (7,352) Nursery & greenhouse (144) Apricots (32) Peaches (30) Vegetables Plums & prunes Strawberries	7,588	1,523,958
WA	**Asotin**	Peaches (18) Cherries (17) Apricots (5) Nursery & greenhouse	40	406,983
WA	**Columbia**	Vegetables (1,787) Corn for grain or seed (51)	1,838	556,034
WA	Franklin	Potatoes (35,570) Vegetables (30,118) Corn for grain or seed (11,337) Cherries (2,165) Nursery & greenhouse (1,982) Mint (1,586) Grass for seed (1,576) Peaches (262) Nectarines (129) Apricots (68) Plums & prunes (43) Strawberries (17) Walnuts	84,853	794,999
WA	**Garfield**	none	0	454,744

State	County	Crops and acreage planted	Acres	Total acreage
WA	Walla Walla	Vegetables (21,183) Potatoes (9,256) Corn for grain or seed (6,539) Nursery & greenhouse (2,714) Grass for seed (543) Cherries (280) Plums & prunes (22)	42,940	813,108
WA	**Whitman**	Vegetables (5,792) Nursery & greenhouse (980) Corn for grain or seed (101) Cherries	6,873	1,382,006

Table 39. Crops on which chlorothalonil can be used in counties in the migration corridor of the Snake River fall-run chinook salmon and the Snake River spring-summer-run chinook salmon ESUs.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	**Hood River**	Cherries (1,081) Nursery & greenhouse (243) Blueberries (29) Peaches (13) Vegetables	1,366	334,328

State	County	Crops and acreage planted	Acres	Total acreage
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
OR	Umatilla	Vegetables (39,638) Potatoes (15,003) Corn for grain or seed (6,901) Grass for seed (4,229) Nursery & greenhouse (396) Plums & prunes (365) Cherries (349) Apricots (14) Strawberries (9) Peaches (7) Mint Nectarines Blueberries	66,911	2,057,809
WA	Benton	Potatoes (25,317) Vegetables (23,417) Sugar beets (4,284) Cherries (3,219) Nursery & greenhouse (218) Plums & prunes (180) Apricots (174) Peaches (149) Nectarines (106) Walnuts (41) Corn for grain or seed Mint	57,105	1,089,993

State	County	Crops and acreage planted	Acres	Total acreage
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	Klickitat	Cherries (457) Peaches (199) Apricots (18) Plums & prunes (1) Walnuts Vegetables Potatoes Nursery & greenhouse	675	1,198,385
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	Skamania	Nursery & greenhouse	unknown	1,337,179
WA	**Wahkiakum**	none	0	169,125

There is a rather large amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially potatoes. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, but cannot be precluded. Therefore, I conclude that the use of chlorothalonil may affect the Snake River Fall-run Chinook Salmon ESU within its breeding areas.

(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, Pashimerol, 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, and Wallowa, and Baker counties in Oregon; Adams, Blaine, Custer, Idaho, Lemhi, Lewis, and Nez Perce, and Valley counties in Idaho; and Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman counties in Washington. We have excluded Umatilla and Baker County in Oregon and Blaine County in Idaho because accessible river reaches are all well above areas where chlorothalonil can be used. We have excluded Valley County, Idaho because that portion in the Salmon River watershed is all in forested areas where chlorothalonil would not be used; the private land areas of Valley County where chlorothalonil could be used are in the Payette River watershed. Other counties within migratory corridors are all of those down stream from the confluence of the Snake and Columbia Rivers: Umatilla, Morrow, Gilliam, Sherman, Wasco, Hood River, Multnomah, Columbia, and Clatsop Counties in Oregon, and Klickitat, Skamania, Clark, Cowlitz, Wahkiakum, and Pacific Counties in Washington.

Table 40 shows the crop-acreage 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 shown in Table 39. If there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 40. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Snake River spring-summer-run chinook salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
ID	Adams	Corn for grain or seed (104) Nursery & greenhouse (8)	152	873,399
ID	Blaine	Potatoes (848) Nursery & greenhouse (28)	876	1,692,735
ID	Custer	Potatoes (507) Nursery & greenhouse	507	3,152,382

State	County	Crops and acreage planted	Acres	Total acreage
ID	Idaho	Cherries (2) Plums & prunes (2) Filberts Vegetables Nursery & greenhouse Peaches	4	5,430,522
ID	Lemhi	Cherries (9) Peaches (3) Apricots	12	2,921,172
ID	**Lewis**	Vegetables	NR	306,601
ID	Nez Perce	Vegetables (1,835) Peaches (22) Cherries (4) Apricots (1) Corn for grain or seed Nursery & greenhouse Potatoes	1,862	543,434
OR	**Union**	Mint (9,226) Grass for seed (1,848) Sugar beets (1,035) Potatoes (660) Cherries (596) Nursery & greenhouse (465) Peaches (12) Vegetables Plums & prunes Apricots	13,842	1,303,476
OR	**Wallowa**	Nursery & greenhouse Peaches	unknown	2,013,071
WA	Adams	Potatoes (27,914) Mint (7,328) Corn for grain or seed (5,388) Vegetables (3,668) Sugar beets (1,570) Nursery & greenhouse (1,331) Cherries	47,199	1,231,999
WA	**Asotin**	Peaches (18) Cherries (17) Apricots (5) Nursery & greenhouse	40	406,983

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Columbia**	Vegetables (1,787) Corn for grain or seed (51)	1,838	556,034
WA	Franklin	Potatoes (35,570) Vegetables (30,118) Corn for grain or seed (11,337) Cherries (2,165) Nursery & greenhouse (1,982) Mint (1,586) Grass for seed (1,576) Peaches (262) Nectarines (129) Apricots (68) Plums & prunes (43) Strawberries (17) Walnuts	84,853	794,999
WA	**Garfield**	none	0	454,744
WA	Walla Walla	Vegetables (21,183) Potatoes (9,256) Corn for grain or seed (6,539) Nursery & greenhouse (2,714) Grass for seed (543) Cherries (280) Plums & prunes (22)	42,940	813,108
WA	**Whitman**	Vegetables (5,792) Nursery & greenhouse (980) Corn for grain or seed (101) Cherries	6,873	1,382,006

Table 41. Crops on which chlorothalonil can be used in counties in the migration corridor of the Snake River spring-summer-run chinook salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	**Gilliam**	none	0	770,664
OR	**Hood River**	Cherries (1,081) Nursery & greenhouse (243) Blueberries (29) Peaches (13) Vegetables	1,366	334,328
OR	Morrow	Potatoes (17,030) Corn for grain or seed (9,276) Vegetables (5,830) Grass for seed (689) Nursery & greenhouse	32,825	1,301,021
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
OR	**Sherman**	Nursery & greenhouse (113)	113	526,911

State	County	Crops and acreage planted	Acres	Total acreage
OR	Umatilla	Vegetables (39,638) Potatoes (15,003) Corn for grain or seed (6,901) Grass for seed (4,229) Nursery & greenhouse (396) Plums & prunes (365) Cherries (349) Apricots (14) Strawberries (9) Peaches (7) Mint Nectarines Blueberries	66,911	2,057,809
OR	Wasco	Cherries (7,352) Nursery & greenhouse (144) Apricots (32) Peaches (30) Vegetables Plums & prunes Strawberries	7,588	1,523,958
WA	Benton	Potatoes (25,317) Vegetables (23,417) Sugar beets (4,284) Cherries (3,219) Nursery & greenhouse (218) Plums & prunes (180) Apricots (174) Peaches (149) Nectarines (106) Walnuts (41) Corn for grain or seed Mint	57,105	1,089,993
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	Klickitat	Cherries (457) Peaches (199) Apricots (18) Plums & prunes (1) Walnuts Vegetables Potatoes Nursery & greenhouse	675	1,198,385
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	Skamania	Nursery & greenhouse	unknown	1,337,179
WA	**Wahkiakum**	none	0	169,125

There is a rather large amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially potatoes. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, but cannot be precluded. Therefore, I conclude that the use of chlorothalonil may affect the Snake River Spring/summer-run Chinook Salmon ESU within its breeding areas.

(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 downstream 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 Thomes (upstream barrier - Black Butte Dam), Sacramento-Stone Corral, Lower Butte (upstream barrier - Centerville Dam), Lower Feather (upstream barrier - Oroville Dam), Lower Yuba, Lower Bear (upstream barrier – Camp Far West Dam), Lower Sacramento, Sacramento-Upper Clear (upstream barriers – Keswick Dam, Whiskeytown dam), Upper Elder-Upper Thomes, 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 in the counties of Shasta, Tehama, Butte, Glenn, Colusa, Sutter, Yolo, Yuba, Placer, Sacramento, Solano, Nevada, Contra Costa, Napa, Alameda, Marin, Sonoma, San Mateo, San Francisco, and Santa Clara. However, Santa Clara and San Mateo counties are south of the Oakland Bay Bridge and are not included in the analysis.

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

Table 42. Use of chlorothalonil in counties with the Central Valley spring run chinook salmon ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
Alameda	Landscape maintenance	1,359	NR
	Nursery - outdoor container	15	NR
	Chemical total	1,374	
Butte	Landscape maintenance	121	NR
	Onion, dry	4	2.5
	Structural pest control	11	NR
	Chemical total	136	
Colusa	Cabbage	30	28
	Carrot	48	34
	Cauliflower	3	3
	Landscape Maintenance	23	NR
	Onion, Dry	1,614	1,296
	Pumpkin	31	19
	Rights of Way	15	NR
	Tomato, Processing	3,357	1,539
	Chemical Total	5,121	
Contra Costa	Landscape Maintenance	1,731	NR
	N-outdr Transplants	2	5
	Onion, Dry	50	35
	Structural Pest Control	16	NR
	Tomato	1,867	898
	Chemical Total	3,666	
Glenn	Cauliflower	9	10
	Landscape Maintenance	30	NR
	N-outdr Transplants	122	132
	Onion, Dry	302	242
	Prune	741	275
	Tomato	<1	<1
	Chemical Total	1204	

County	Crop or other use site	Usage (pounds)	Acres treated
Marin	Landscape Maintenance	211	NR
	Structural Pest Control	15	NR
	Chemical Total	226	
Napa	Landscape Maintenance	325	NR
Nevada	Landscape Maintenance	<1	NR
Placer	Landscape Maintenance	691	NR
	N-outdr Plants in Containers	7	6
	Nectarine	3	1
	Peach	6	2
	Structural Pest Control	3	NR
	Chemical Total	710	
Sacramento	Corn, Sweet	104	46
	Landscape Maintenance	1,947	NR
	N-outdr Plants in Containers	124	141
	Onion, Dry	82	62
	Structural Pest Control	1	NR
	Tomato	3,658	2,122
	Chemical Total	5,916	
San Francisco	Landscape Maintenance	423	NR
San Mateo	Bean	39	31
	Brussel Sprout	2,597	2,064
	Landscape Maintenance	659	NR
	N-outdr Flower	405	226
	N-outdr Plants in Containers	62	61
	Chemical Total	3,762	
Shasta	Landscape Maintenance	177	NR
	N-outdr Transplants	154	152
	Strawberry	45	51
	Chemical Total	376	
Solano	Apricot	6	2
	Landscape Maintenance	749	NR
	N-outdr Plants in Containers	133	66
	Onion, Dry	45	30
	Peach	2	1
	Prune	11	18
	Squash	57	75
	Structural Pest Control	5	NR
	Tomato, Processing	4,827	2,544
	Uncultivated Ag	116	63
	Chemical Total	5,951	

County	Crop or other use site	Usage (pounds)	Acres treated
Sonoma	Apple	2	39
	Landscape Maintenance	301	NR
	N-outdr Flower	25	7
	N-outdr Plants in Containers	4	2
	Chemical Total	332	NR
Sutter	Cabbage	28	29
	Landscape Maintenance	6	NR
	N-outdr Transplants	2	2
	Onion, Dry	513	312
	Prune	393	107
	Pumpkin	25	21
	Tomato	5,597	3,118
	Chemical Total	6,564	
Tehama	Landscape Maintenance	2	NR
	N-outdr Transplants	86	77
	Nectarine	8	9
	Peach	8	9
	Chemical Total	104	
Yolo	Broccoli	1	1
	Cabbage	6	5
	Landscape Maintenance	283	NR
	Melon	16	10
	Onion, Dry	502	402
	Pumpkin	21	14
	Research Commodity	28	6
	Tomato	15,462	10,893
	Chemical Total	16,319	
Yuba	Landscape Maintenance	96	NR
	Prune	60	20
	Chemical Total	156	

There is substantial use of chlorothalonil within this ESU, primarily on tomatoes, but also on other crops and on golf course turf. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, especially in conjunction with the county bulletins. Therefore, I conclude that the use of chlorothalonil on other agricultural crops, nursery crops, and golf course fairways may affect, but is not likely to adversely affect, the Central Valley Spring-run Chinook Salmon ESU.

(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 estuarine 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 pesticides could be used are Humboldt, Trinity, Mendocino, Sonoma, and Marin. A small portion of Glenn County is also included in the Critical Habitat, but chlorothalonil would not be used in the forested upper elevation areas. A small portion of Lake County contains habitat for this ESU, but is entirely within the Mendocino National Forest.

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

Table 43. Use of chlorothalonil in counties with the California coastal chinook salmon ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
Humboldt	Landscape Maintenance	7	NR
	N-outdr Flower	869	591
	N-outdr Transplants	48	18
	Chemical Total	924	
Mendocino	none (except greenhouse)		
Sonoma	Apple	2	39
	Landscape Maintenance	301	NR
	N-outdr Flower	25	7
	N-outdr Plants in Containers	4	2
	Chemical Total	332	NR
Marin	Landscape Maintenance	211	NR
	Structural Pest Control	15	NR
	Chemical Total	226	
Trinity	none		
Lake	none		

There is a low amount of chlorothalonil used within this ESU, essentially on nursery crops. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low enough that I conclude that the use of chlorothalonil on nursery crops may affect, but is not likely to adversely affect, the California Coastal Chinook Salmon 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, estuarine, 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, Sauk, 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. Grays Harbor County was excluded because the very small amount of habitat is within the Olympic National Forest.

Table 44 shows the acreage information for Washington counties where the Puget Sound chinook salmon ESU is located. In this table, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 44. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Puget Sound chinook salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Clallam**	Nursery & greenhouse (160) Vegetables (96) Strawberries (13) Cherries (11) Plums & prunes (1)	281	1,116,900
WA	**Island**	Nursery & greenhouse (234) Vegetables (106) Strawberries Blueberries	340	133,499
WA	**Jefferson**	Nursery & greenhouse (64) Vegetables (10)	74	1,157,642
WA	King	Vegetables (1,403) Nursery & greenhouse (804) Strawberries (42) Blueberries (32) Corn for grain or seed (30) Cherries (8) Plums & prunes (4) Walnuts (3) Filberts (3) Potatoes (2) Apricots (1) Ginseng (1) Peaches (1)	2,334	1,360,705

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Kitsap**	Nursery & greenhouse (2,202) Vegetables (25) Strawberries (7) Cherries (6) Blueberries (5) Plums & prunes (4) Potatoes (2)	2,251	253,436
WA	**Lewis**	Nursery & greenhouse (7,663) Vegetables (2,176) Blueberries (137) Filberts (25) Cherries (10) Plums & prunes (3) Strawberries	10,014	1,540,991
WA	**Mason**	Nursery & greenhouse (2,445) Vegetables (150) Cherries (1) Blueberries (1)	2,597	615,108
WA	**Pierce**	Vegetables (2,879) Nursery & greenhouse (2,233) Strawberries (125) Blueberries (70) Potatoes (7) Cherries (5) Filberts	5,319	1,072,350
WA	**San Juan**	Nursery & greenhouse (36) Vegetables (23) Filberts (2) Plums & prunes (2) Strawberries (2) Cherries (1) Peaches (1) Potatoes (1)	68	11,963
WA	Skagit	Vegetables (16,686) Nursery & greenhouse (7,084) Potatoes (6,948) Blueberries (330) Strawberries (281) Grass for seed (103) Filberts (12) Cherries	31,444	1,110,583

State	County	Crops and acreage planted	Acres	Total acreage
WA	Snohomish	Vegetables (3,867) Nursery & greenhouse (1,728) Strawberries (81) Blueberries (27) Filberts (11) Cherries (3) Plums & prunes (2)	5,719	1,337,728
WA	Thurston	Nursery & greenhouse (1,723) Vegetables (481) Blueberries (96) Strawberries (74) Cherries (4) Filberts (2) Potatoes	2,380	465,322
WA	Whatcom	Potatoes (1,585) Vegetables (700) Nursery & greenhouse (696) Blueberries (482) Strawberries (297) Filberts (206) Cherries (4) Walnuts (1) Plums & prunes Corn for grain or seed	3,971	1,356,835

There is a moderate amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially potatoes and nursery crops. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, but cannot be precluded. Therefore, I conclude that the use of chlorothalonil may affect the Puget Sound Chinook Salmon 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 River 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, Wasco, Columbia, Clackamas, Marion, Multnomah, and

Washington in Oregon, and Klickitat, Skamania, Clark, Cowlitz, Lewis, Wahkiakum, and Pacific in Washington. Only small forested parts of Wasco County and Marion County intersect the hydrologic units, and these were excluded from the analysis because chlorothalonil would not be used there. The migration corridors include portions of Clatsop and Columbia Counties in Oregon and Pacific County in Washington.

Note: We have made several changes in the counties included in this ESU. We will be providing details and a rationale in a separate submission to NMFS.

Table 45 shows the cropping information for Oregon and Washington counties where the Lower Columbia River chinook salmon ESU occurs. In this table, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 45. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Lower Columbia River chinook salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clackamas	Nursery & greenhouse (29,217) Grass for seed (8,594) Vegetables (4,933) Filberts (3,994) Strawberries (608) Blueberries (334) Sugar beets (106) Peaches (78) Cherries (53) Walnuts (51) Plums & prunes (37) Corn for grain or seed (14) Potatoes (1)	48,020	1,195,712
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Hood River**	Cherries (1,081) Nursery & greenhouse (243) Blueberries (29) Peaches (13) Vegetables	1,366	334,328
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	Klickitat	Cherries (457) Peaches (199) Apricots (18) Plums & prunes (1) Walnuts Vegetables Potatoes Nursery & greenhouse	675	1,198,385

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Lewis**	Nursery & greenhouse (7,663) Vegetables (2,176) Blueberries (137) Filberts (25) Cherries (10) Plums & prunes (3) Strawberries	10,014	1,540,991
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	Skamania	Nursery & greenhouse	unknown	1,337,179
WA	**Wahkiakum**	none	0	169,125

There is a moderate amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially nursery crops and Christmas trees. However, the bulk of Clackamas County acreage is most likely not in the watershed of this ESU, and there are many counties in which there is no reported usage of chlorothalonil. For these reasons, along with the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems very low. I conclude that the use of chlorothalonil may affect, but is not likely to affect, the Lower Columbia River Chinook Salmon 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, Douglas, Lincoln and Tillamook counties include salmon habitat only in the forested areas where crop acreage is not meaningful, and were therefore not included in the tables for this ESU. Migration corridors include Clackamas, Multnomah, Columbia, and Clatsop Counties in Oregon, and Clark, Cowlitz, Wahkiakum, Lewis, and Pacific Counties in Washington.

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. In these tables, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 46. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Upper Willamette River chinook ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Benton**	Grass for seed (33,344) Vegetables (10,295) Nursery & greenhouse (6,212) Mint (2,925) Sugar beets (687) Filberts (493) Blueberries (109) Walnuts (23) Cherries (18) Strawberries (17) Peaches (8) Plums & prunes (5) Potatoes (3)	54,139	432,961
OR	Clackamas	Nursery & greenhouse (29,217) Grass for seed (8,594) Vegetables (4,933) Filberts (3,994) Strawberries (608) Blueberries (334) Sugar beets (106) Peaches (78) Cherries (53) Walnuts (51) Plums & prunes (37) Corn for grain or seed (14) Potatoes (1)	48,020	1,195,712

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Lane**	Grass for seed (32,081) Vegetables (5,442) Mint (5,350) Filberts (3,677) Nursery & greenhouse (3,563) Sugar beets (773) Cherries (249) Walnuts (105) Strawberries (74) Blueberries (74) Peaches (54) Plums & prunes (34) Potatoes (9) Nectarines (2)	51,661	2,914,656
OR	Linn	Grass for seed (190,438) Vegetables (9,877) Mint (4,105) Filberts (1,820) Nursery & greenhouse (1,563) Sugar beets (281) Cherries (157) Peaches (73) Blueberries (58) Walnuts (55) Strawberries (52) Plums & prunes (14) Corn for grain or seed (4) Nectarines (3)	208,510	1,466,507
OR	Marion	Grass for seed (97,276) Vegetables (37,290) Nursery & greenhouse (21,309) Filberts (7,061) Mint (3,695) Strawberries (1,858) Cherries (1,568) Sugar beets (940) Blueberries (545) Peaches (179) Walnuts (155) Plums & prunes (145) Corn for grain or seed (16) Nectarines Potatoes	172,047	758,394

State	County	Crops and acreage planted	Acres	Total acreage
OR	Polk	Grass for seed (50,183) Nursery & greenhouse (6,638) Vegetables (2,565) Mint (2,448) Filberts (2,394) Cherries (1,888) Plums & prunes (595) Sugar beets (130) Peaches (51) Walnuts (33) Strawberries (22) Blueberries (21)	66,968	474,296
OR	Washington	Vegetables (8,152) Grass for seed (7,672) Nursery & greenhouse (7,538) Filberts (5,595) Strawberries (1,257) Walnuts (679) Blueberries (654) Plums & prunes (358) Cherries (211) Peaches (168) Potatoes	32,284	463,231
OR	Yamhill	Grass for seed (24,993) Vegetables (7,147) Filberts (7,110) Nursery & greenhouse (5,590) Cherries (1,693) Walnuts (608) Plums & prunes (369) Blueberries (324) Strawberries (265) Sugar beets (151) Peaches (104) Potatoes (1) Corn for grain or seed Nectarines	48,355	457,986

Table 47. Crops on which chlorothalonil can be used in counties in the migration corridor of the Upper Willamette River chinook ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clackamas	Nursery & greenhouse (29,217) Grass for seed (8,594) Vegetables (4,933) Filberts (3,994) Strawberries (608) Blueberries (334) Sugar beets (106) Peaches (78) Cherries (53) Walnuts (51) Plums & prunes (37) Corn for grain or seed (14) Potatoes (1)	48,020	1,195,712
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570

State	County	Crops and acreage planted	Acres	Total acreage
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	**Lewis**	Nursery & greenhouse (7,663) Vegetables (2,176) Blueberries (137) Filberts (25) Cherries (10) Plums & prunes (3) Strawberries	10,014	1,540,991
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	**Wahkiakum**	none	0	169,125

There is a rather large amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially grass seed and nursery crops, including Christmas trees; USDA estimates 31% of the Christmas tree operations in Oregon use chlorothalonil. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, but cannot be precluded. Therefore, I conclude that the use of chlorothalonil may affect the Upper Willamette River Chinook Salmon ESU within its breeding areas.

(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, and Okanogan (Table 48). The lower river reaches are migratory corridors and include Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Sherman, Umatilla, and Wasco Counties in Oregon, and Benton, Grant, Clark, Cowlitz, Franklin, Kittitas, Klickitat, Skamania, Wahkiakum, Walla Walla, Yakima, and Pacific Counties in Washington (Table 49).

[Note: In previous consultations, we incorrectly included Grant, Kittitas and Benton counties in Washington as part of the spawning and growth habitat. However, these counties are below Rock Island Dam and have been moved to the migratory corridor table.]

Table 48 and Table 49 show the cropping information for Washington counties that support the Upper Columbia River spring-run chinook salmon ESU and for the Oregon and Washington counties where this ESU migrates. In these tables, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 48. Crops on which chlorothalonil can be used in counties containing spawning and rearing habitat for the Upper Columbia River spring-run chinook salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
WA	Chelan	Cherries (3,704) Apricots (81) Nursery & greenhouse (56) Nectarines (22) Peaches (21) Vegetables (12) Plums & prunes (3) Walnuts	3,899	1,869,848
WA	Douglas	Cherries (1,842) Apricots (315) Peaches (167) Nectarines (91) Nursery & greenhouse (11) Vegetables	2,426	1,165,168

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Okanogan**	Cherries (1,003) Nursery & greenhouse (111) Peaches (67) Nectarines (38) Walnuts (29) Vegetables (22) Apricots (13) Filberts (10) Plums & prunes (1)	1,294	3,371,698

Table 49. Crops on which chlorothalonil can be used in counties in the migration corridor of the Upper Columbia River spring-run chinook salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	**Gilliam**	none	0	770,664
OR	**Hood River**	Cherries (1,081) Nursery & greenhouse (243) Blueberries (29) Peaches (13) Vegetables	1,366	334,328
OR	Morrow	Potatoes (17,030) Corn for grain or seed (9,276) Vegetables (5,830) Grass for seed (689) Nursery & greenhouse	32,825	1,301,021

State	County	Crops and acreage planted	Acres	Total acreage
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
OR	**Sherman**	Nursery & greenhouse (113)	113	526,911
OR	Umatilla	Vegetables (39,638) Potatoes (15,003) Corn for grain or seed (6,901) Grass for seed (4,229) Nursery & greenhouse (396) Plums & prunes (365) Cherries (349) Apricots (14) Strawberries (9) Peaches (7) Mint Nectarines Blueberries	66,911	2,057,809
OR	Wasco	Cherries (7,352) Nursery & greenhouse (144) Apricots (32) Peaches (30) Vegetables Plums & prunes Strawberries	7,588	1,523,958
WA	Benton	Potatoes (25,317) Vegetables (23,417) Sugar beets (4,284) Cherries (3,219) Nursery & greenhouse (218) Plums & prunes (180) Apricots (174) Peaches (149) Nectarines (106) Walnuts (41) Corn for grain or seed Mint	57,105	1,089,993

State	County	Crops and acreage planted	Acres	Total acreage
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	Franklin	Potatoes (35,570) Vegetables (30,118) Corn for grain or seed (11,337) Cherries (2,165) Nursery & greenhouse (1,982) Mint (1,586) Grass for seed (1,576) Peaches (262) Nectarines (129) Apricots (68) Plums & prunes (43) Strawberries (17) Walnuts	84,853	794,999

State	County	Crops and acreage planted	Acres	Total acreage
WA	Grant	Vegetables (57,812) Potatoes (44,263) Corn for grain or seed (29,953) Mint (15,610) Sugar beets (10,792) Nursery & greenhouse (6,454) Cherries (3,470) Apricots (266) Peaches (261) Nectarines (163) Walnuts (5) Plums & prunes (5) Strawberries (2) Filberts	169,056	1,712,881
WA	**Kittitas**	Vegetables (4,437) Potatoes (442) Mint (409) Nursery & greenhouse (224) Filberts (1) Peaches (1) Plums & prunes (1) Cherries	5,515	1,469,862
WA	Klickitat	Cherries (457) Peaches (199) Apricots (18) Plums & prunes (1) Walnuts Vegetables Potatoes Nursery & greenhouse	675	1,198,385
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	Skamania	Nursery & greenhouse	unknown	1,337,179
WA	**Wahkiakum**	none	0	169,125

State	County	Crops and acreage planted	Acres	Total acreage
WA	Walla Walla	Vegetables (21,183) Potatoes (9,256) Corn for grain or seed (6,539) Nursery & greenhouse (2,714) Grass for seed (543) Cherries (280) Plums & prunes (22)	42,940	813,108
WA	Yakima	Vegetables (18,424) Corn for grain or seed (12,680) Mint (12,577) Cherries (6,129) Potatoes (1,929) Peaches (1,438) Nursery & greenhouse (821) Nectarines (605) Plums & prunes (478) Apricots (285) Walnuts (11) Filberts (6)	55,383	2,749,514

There is a rather large amount of acreage that could potentially be treated with chlorothalonil within this ESU, especially potatoes. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, but cannot be precluded. Therefore, I conclude that the use of chlorothalonil may affect the Upper Columbia River Spring-run Chinook Salmon ESU within its breeding areas.

(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 recolonized 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. San Francisco County lies within the north-south boundaries of this ESU, but was not named in the Critical Habitat FR Notice, presumably because there are no coho salmon streams in the county; it is excluded.

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

Table 50. Use of chlorothalonil in counties with the Central California Coast coho ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
Santa Cruz	Broccoli	7	12
	Brussel Sprout	1,774	1,261
	Cauliflower	34	38
	Celery	86	43
	Landscape Maintenance	157	NR
	N-outdr Plants in Containers	134	54
	N-outdr Transplants	127	78
	Research Commodity	2	NR
	Rights of Way	2	NR
	Chemical Total	2,323	

County	Crop or other use site	Usage (pounds)	Acres treated
San Mateo	Bean Brussel Sprout Landscape Maintenance N-outdr Flower N-outdr Plants in Containers Chemical Total	39 2,597 659 405 62 3,762	31 2,064 NR 226 61
Marin	Landscape Maintenance Structural Pest Control Chemical Total	211 15 226	NR NR
Sonoma	Apple Landscape Maintenance N-outdr Flower N-outdr Plants in Containers Chemical Total	2 301 25 4 332	39 NR 7 2 NR
Mendocino	none (except greenhouse)		
Napa	Landscape Maintenance	325	NR

There is moderate chlorothalonil usage on Brussel Sprouts and other sites in San Mateo and Santa Cruz counties. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, especially in conjunction with the county bulletins. Therefore, I conclude that the use of chlorothalonil on other agricultural crops, nursery crops, and golf course fairways may affect, but is not likely to adversely affect, 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 estuarine 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, and Siskiyou in California and Curry, Jackson, Josephine, Klamath, and Douglas in Oregon. The habitat in Glenn and Lake Counties, CA is within the Mendocino National Forest, and that in Douglas County, OR is entirely within the Rogue River and Umpqua National Forests; the use of chlorothalonil would be limited in such areas to young tree plantations. Glenn, Lake, and Douglas Counties are excluded from the crop acreage tables in this analysis.

Note: We previously included Klamath County, OR in this ESU, but have now omitted it because it appears to be entirely above various named upstream barriers. Again we will submit more details in a separate transmittal to NMFS.

The reportable chlorothalonil usage in the California counties supporting the Southern Oregon/Northern California coastal coho salmon ESU is shown in Table 51. Table 52 shows the acreage where chlorothalonil may be used on crops in the Oregon counties where the Southern Oregon/Northern California coastal coho salmon ESU occurs. In Table 52, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 51. Use of chlorothalonil in California counties with the Southern Oregon/Northern California coastal coho salmon ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
Humboldt	Landscape Maintenance	7	NR
	N-outdr Flower	869	591
	N-outdr Transplants	48	18
	Chemical Total	924	
Mendocino	none (except greenhouse)		
Del Norte	N-outdr Flower	1,830	810
	N-outdr Plants in Containers	17	NR
	N-outdr Transplants	7,080	8,016
	Chemical Total	8,927	
Siskiyou	Onion, Dry	1,052	910
	Potato	1,966	2,335
	Strawberry	133	167
	Chemical Total	3,151	
Trinity	none		
Lake	none		

Table 52. Crops on which chlorothalonil can be used in Oregon counties containing habitat for the Southern Oregon/Northern California Coastal coho salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Curry**	Cranberries (581) Nursery & greenhouse (182) Plums & prunes (6) Vegetables (4) Cherries (4) Strawberries (1) Blueberries	778	1,041,557
OR	Jackson	Vegetables (607) Peaches (198) Nursery & greenhouse (178) Grass for seed (149) Walnuts (27) Cherries (27) Strawberries (18) Plums & prunes (15) Nectarines (14) Blueberries (11) Apricots (10) Filberts	1,254	1,782,633
OR	Josephine	Nursery & greenhouse (329) Vegetables (133) Peaches (29) Walnuts (18) Cherries (9) Potatoes (7) Strawberries (3) Plums & prunes (1) Blueberries	529	1,049,308

There is moderate chlorothalonil usage in California on nursery and floriculture crops, especially in Del Norte County. Modest acreage exists in Josephine and Jackson counties in Oregon, but these are not sites commonly treated with chlorothalonil. Given the factors discussed in section 3h(4) above, the likelihood for effects from these uses seems low, especially in conjunction with the county bulletins in California. Therefore, I conclude that the use of chlorothalonil on nursery crops may affect, but is not likely to adversely affect, the Southern Oregon/Northern California Coast Coho Salmon ESU.

(3) Oregon Coast coho salmon ESU

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, and Clatsop. However, the portions of Yamhill, Washington, and Columbia counties that are within the ESU are primarily mountainous forested areas where chlorothalonil would only be used on young tree plantations. They are excluded from the county acreage tables because there are no crops in these areas. Benton and Polk counties are primarily part of the Willamette River watershed, but the small parts that may drain into the Pacific Ocean do include agricultural areas, and therefore they are included in the tables.

Table 53 show the acreage where chlorothalonil can be used for Oregon counties where the Oregon coast coho salmon ESU occurs. In this table, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 53. Crops on which chlorothalonil can be used in counties containing habitat for the Oregon Coast coho salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Benton**	Grass for seed (33,344) Vegetables (10,295) Nursery & greenhouse (6,212) Mint (2,925) Sugar beets (687) Filberts (493) Blueberries (109) Walnuts (23) Cherries (18) Strawberries (17) Peaches (8) Plums & prunes (5) Potatoes (3)	54,139	432,961
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Coos**	Cranberries (1,499) Nursery & greenhouse (74) Cherries (11) Blueberries (9) Vegetables (4) Plums & prunes (3) Walnuts (1) Filberts (1) Nectarines (1) Peaches (1)	1,604	1,024,346
OR	**Curry**	Cranberries (581) Nursery & greenhouse (182) Plums & prunes (6) Vegetables (4) Cherries (4) Strawberries (1) Blueberries	778	1,041,557
OR	**Douglas**	Grass for seed (1,592) Nursery & greenhouse (1,428) Vegetables (639) Plums & prunes (305) Walnuts (171) Blueberries (108) Cherries (64) Filberts (55) Peaches (53) Strawberries (24) Apricots (1) Nectarines	4,440	3,223,576
OR	**Lane**	Grass for seed (32,081) Vegetables (5,442) Mint (5,350) Filberts (3,677) Nursery & greenhouse (3,563) Sugar beets (773) Cherries (249) Walnuts (105) Strawberries (74) Blueberries (74) Peaches (54) Plums & prunes (34) Potatoes (9) Nectarines (2)	51,661	2,914,656

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Lincoln**	Nursery & greenhouse (118) Vegetables (14) Blueberries	132	626,976
OR	Polk	Grass for seed (50,183) Nursery & greenhouse (6,638) Vegetables (2,565) Mint (2,448) Filberts (2,394) Cherries (1,888) Plums & prunes (595) Sugar beets (130) Peaches (51) Walnuts (33) Strawberries (22) Blueberries (21)	66,968	474,296
OR	Tillamook	Nursery & greenhouse (86) Vegetables Blueberries	86	705,417

There is little crop acreage in the coastal watersheds of the counties within this ESU, and there is no usage reported in most counties. Therefore, along with the factors discussed in section 3h(4) above, I conclude that the use of chlorothalonil will have no effect on the Oregon Coast Coho Salmon 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 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 estuarine 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, Island, and Grays Harbor. Grays Harbor County was excluded because the very small amount of habitat is within the Olympic National Forest.

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.'

Table 54 shows the acreage of crops in these counties on which chlorothalonil can be used. In this table, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 54. Crops on which chlorothalonil can be used in counties containing habitat for the Hood Canal summer-run chum salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Clallam**	Nursery & greenhouse (160) Vegetables (96) Strawberries (13) Cherries (11) Plums & prunes (1)	281	1,116,900
WA	**Island**	Nursery & greenhouse (234) Vegetables (106) Strawberries Blueberries	340	133,499
WA	**Jefferson**	Nursery & greenhouse (64) Vegetables (10)	74	1,157,642

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Kitsap**	Nursery & greenhouse (2,202) Vegetables (25) Strawberries (7) Cherries (6) Blueberries (5) Plums & prunes (4) Potatoes (2)	2,251	253,436
WA	**Mason**	Nursery & greenhouse (2,445) Vegetables (150) Cherries (1) Blueberries (1)	2,597	615,108

There is no reported usage of chlorothalonil within this ESU. Even if there were, the acreage is modest and the factors discussed in section 3h(4) would still apply. I conclude that there will be no effect of chlorothalonil 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 estuarine 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 Grays River, Hardy Creek, and Hamilton Creek. Because the ESU extends on the Oregon side only up to Milton Creek, and because we cannot see that Milton Creek reaches into Washington County, we have excluded Washington County from this ESU. Washington County was named in the Critical Habitat FR Notice. It appears that the Washington County connection with the hydrologic unit is with the Willamette River which is upstream from Milton Creek. We solicit NMFS comment.

Table 55 shows the cropping information for Oregon and Washington counties where the Columbia River chum salmon ESU occurs. In this table, if there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 55. Crops on which chlorothalonil can be used in counties containing habitat for the Columbia River chum salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Lewis**	Nursery & greenhouse (7,663) Vegetables (2,176) Blueberries (137) Filberts (25) Cherries (10) Plums & prunes (3) Strawberries	10,014	1,540,991
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	Skamania	Nursery & greenhouse	unknown	1,337,179
WA	**Wahkiakum**	none	0	169,125

Chlorothalonil is not used in most of the counties within this ESU, and there is limited acreage and use in the remaining counties. Breeding populations are known in Skamania County and Pacific/Wahkiakum counties, where there is neglible or no use of chlorothalonil. For these reasons, along with the factors discussed in section 3h(4) above, I conclude that there will be no effect of chlorothalonil 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. There is limited agriculture in the whole of Clallam County. Table 56 shows that there is no acreage within this county for crops where chlorothalonil can be used.

Table 56. Crops on which chlorothalonil can be used in counties containing habitat for the Ozette Lake sockeye salmon ESU.

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Clallam**	Nursery & greenhouse (160) Vegetables (96) Strawberries (13) Cherries (11) Plums & prunes (1)	281	1,116,900

Although there is some potential acreage, most of which would be away from Ozette Lake and its tributaries, there is no apparent use of chlorothalonil in Clallam County. Therefore, I conclude that there will be no effect of chlorothalonil on the Ozette Lake Sockeye Salmon 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. Chlorothalonil cannot be used on such a site, and therefore there will be no exposure in the spawning and rearing habitat. Considering that the migratory corridors are larger rivers any exposure during migration should be well below levels of concern.

Table 57 shows the acreage of crops in counties containing habitat for this ESU. Table 58 shows the acreage in counties containing the migratory corridors for this ESU. If there is no acreage given for a specific crop, this means that there are too few growers in the area for USDA to make the data available.

Table 57. Crops on which chlorothalonil can be used in counties containing habitat for the Snake River sockeye ESU.

State	County	Crops and acreage planted	Acres	Total acreage
ID	Blaine	Potatoes (848) Nursery & greenhouse (28)	876	1,692,735
ID	Custer	Potatoes (507) Nursery & greenhouse	507	3,152,382

Table 58. Crops on which chlorothalonil can be used in counties in the migration corridor of the Snake River sockeye ESU.

State	County	Crops and acreage planted	Acres	Total acreage
ID	Idaho	Cherries (2) Plums & prunes (2) Filberts Vegetables Nursery & greenhouse Peaches	4	5,430,522
ID	Lemhi	Cherries (9) Peaches (3) Apricots	12	2,921,172
ID	**Lewis**	Vegetables	NR	306,601
ID	Nez Perce	Vegetables (1,835) Peaches (22) Cherries (4) Apricots (1) Corn for grain or seed Nursery & greenhouse Potatoes	1,862	543,434
OR	Clatsop	Nursery & greenhouse (82) Cranberries (32) Vegetables (26) Blueberries	140	529,482

State	County	Crops and acreage planted	Acres	Total acreage
OR	**Columbia**	Nursery & greenhouse (1,660) Vegetables (123) Blueberries (101) Corn for grain or seed (48) Walnuts (11) Cherries (7) Strawberries (6) Plums & prunes (2) Filberts Peaches	1,958	420,332
OR	**Gilliam**	none	0	770,664
OR	**Hood River**	Cherries (1,081) Nursery & greenhouse (243) Blueberries (29) Peaches (13) Vegetables	1,366	334,328
OR	Morrow	Potatoes (17,030) Corn for grain or seed (9,276) Vegetables (5,830) Grass for seed (689) Nursery & greenhouse	32,825	1,301,021
OR	Multnomah	Vegetables (4,667) Nursery & greenhouse (2,936) Potatoes (336) Strawberries (171) Blueberries (62) Peaches (36) Cherries (8) Plums & prunes (3) Walnuts (2)	8,221	278,570
OR	**Sherman**	Nursery & greenhouse (113)	113	526,911

State	County	Crops and acreage planted	Acres	Total acreage
OR	Umatilla	Vegetables (39,638) Potatoes (15,003) Corn for grain or seed (6,901) Grass for seed (4,229) Nursery & greenhouse (396) Plums & prunes (365) Cherries (349) Apricots (14) Strawberries (9) Peaches (7) Mint Nectarines Blueberries	66,911	2,057,809
OR	Wasco	Cherries (7,352) Nursery & greenhouse (144) Apricots (32) Peaches (30) Vegetables Plums & prunes Strawberries	7,588	1,523,958
WA	**Asotin**	Peaches (18) Cherries (17) Apricots (5) Nursery & greenhouse	40	406,983
WA	Benton	Potatoes (25,317) Vegetables (23,417) Sugar beets (4,284) Cherries (3,219) Nursery & greenhouse (218) Plums & prunes (180) Apricots (174) Peaches (149) Nectarines (106) Walnuts (41) Corn for grain or seed Mint	57,105	1,089,993

State	County	Crops and acreage planted	Acres	Total acreage
WA	Clark	Nursery & greenhouse (1,115) Vegetables (211) Strawberries (162) Filberts (87) Blueberries (85) Walnuts (51) Peaches (46) Ginseng (~16) Plums & prunes (10) Cherries Mint	1,783	401,850
WA	**Columbia**	Vegetables (1,787) Corn for grain or seed (51)	1,838	556,034
WA	**Cowlitz**	Vegetables (2,263) Nursery & greenhouse (373) Walnuts (5) Cherries (2) Filberts (1) Strawberries Blueberries	2,644	728,781
WA	Franklin	Potatoes (35,570) Vegetables (30,118) Corn for grain or seed (11,337) Cherries (2,165) Nursery & greenhouse (1,982) Mint (1,586) Grass for seed (1,576) Peaches (262) Nectarines (129) Apricots (68) Plums & prunes (43) Strawberries (17) Walnuts	84,853	794,999
WA	**Garfield**	none	0	454,744
WA	Klickitat	Cherries (457) Peaches (199) Apricots (18) Plums & prunes (1) Walnuts Vegetables Potatoes Nursery & greenhouse	675	1,198,385

State	County	Crops and acreage planted	Acres	Total acreage
WA	**Pacific**	Cranberries (1,312) Nursery & greenhouse (179) Vegetables (4) Cherries	1,495	623,722
WA	Skamania	Nursery & greenhouse	unknown	1,337,179
WA	**Wahkiakum**	none	0	169,125
WA	Walla Walla	Vegetables (21,183) Potatoes (9,256) Corn for grain or seed (6,539) Nursery & greenhouse (2,714) Grass for seed (543) Cherries (280) Plums & prunes (22)	42,940	813,108
WA	**Whitman**	Vegetables (5,792) Nursery & greenhouse (980) Corn for grain or seed (101) Cherries	6,873	1,382,006

There are no crops in the spawning and rearing habitat for this precarious sockeye ESU. Conifer use is extremely unlikely because it is primarily for Swiss Needle Cast disease on Douglas Fir in western Oregon and Washington, and then only in reforestation nurseries. Chlorothalonil in migratory corridors is not a concern. Therefore, I conclude that there will be no effect of chlorothalonil on the Snake River sockeye salmon ESU.

5. Specific conclusions for Pacific salmon and steelhead

As discussed in section 3h(4) above, in my professional judgement I conclude that there will be no direct effect of chlorothalonil on any listed Pacific salmon and steelhead ESU from use on golf greens and tees or home and garden use. I also conclude that there will be no effect in any of the migratory corridors that do not serve as breeding and rearing areas prior to downstream migration. I also conclude there will be no chronic effect on any ESU.

Based upon the available data, I conclude that there will be no indirect effects on food or cover for any listed Pacific salmon or steelhead, not any adverse modification of designated Critical Habitat.

The remainder of my findings are ESU-specific, although the same factors may apply to several ESUs:

1. In most California ESUs, there is a modest to large amount of chlorothalonil used. However, because of factors discussed in section 3h(4), and because of the California county bulletins, chlorothalonil may affect, but is not likely to adversely affect the Southern California steelhead

ESU, South Central California steelhead ESU, Central California coastal steelhead ESU, California Central Valley steelhead ESU, Sacramento River winter-run chinook salmon ESU, California Central Valley spring-run chinook salmon ESU, California coastal chinook salmon ESU, and Central California coast coho ESU.

2. Because of low usage and the California county bulletins, there will be no effect of chlorothalonil on the Northern California Steelhead ESU.

3. Although the likelihood of effects is low, the amount of potential usage is sufficient to preclude the mitigating factors in section 3h(4) from eliminating concerns especially in potato and nursery/Christmas tree/grass seed areas. Therefore, chlorothalonil may affect the Upper Columbia River steelhead ESU, Snake River Basin steelhead ESU, Middle Columbia River steelhead ESU, Snake River fall-run chinook salmon ESU, Snake River spring-summer-run chinook salmon ESU, Upper Columbia River spring-run chinook salmon ESU, Upper Willamette steelhead ESU, Puget Sound chinook salmon ESU, and the Upper Willamette River chinook salmon ESU.

4. There is limited usage of chlorothalonil in certain areas of the Pacific northwest. Along with the mitigating factors in section 3h(4), the use of chlorothalonil may affect, but is not likely to adversely affect, the Lower Columbia River chinook salmon ESU, Southern Oregon/Northern California coho salmon ESU, and the Lower Columbia River steelhead ESU

5. There is very little usage in other areas of the northwest, and in conjunction with the factors in section 3h(4), chlorothalonil will have no effect on the Oregon Coast coho salmon ESU, Snake River sockeye salmon ESU, the Ozette Lake sockeye salmon ESU, Hood Canal spring/summer-run chum salmon ESU, and the Lower Columbia River chum salmon ESU.

Recommendations

The areas of concern for chlorothalonil are primarily those in the Pacific northwest. The concerns are sufficient to trigger the need for formal or informal consultation for many ESUs, but not so pronounced as to expect significant effects, even on many individuals, let alone on populations. I recommend that OPP develop county bulletins for use in the Pacific northwest states and that buffers and/or other means of protection be developed in conjunction with these states. It has been OPP policy to work with states, even those without specific programs, to develop implementation methods that have a high potential to be effective within each state. It may be that the WSDA Task Force, which has been working with the Service already, will find alternative methods to bulletins, or to buffers, as the best method. Of course, such an approach is also open to Oregon and Idaho, although we are not aware of any programs in those states to work with the Service on these pesticide issues, other than very specific ones included in the Service's 4d rules.

Because I believe that even the current, non-enforceable use of California's bulletins is sufficient to make adverse effects unlikely, there is no specific need for additional protective measures in California. However, as OPP's program becomes final, it seems appropriate to re-evaluate the protections in these bulletins, and make any adjustments, as necessary, in conjunction with the Service and DPR.

Table 59. Summary conclusions on specific ESUs of salmon and steelhead for chlorothalonil[a].

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

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

a. With respect to crop uses, nursery and Christmas tree use, and golf course fairway use for acute effects in breeding and rearing areas. See initial paragraph of this section.

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