Phosmet
Analysis of Risks
to
Endangered and Threatened Salmon and Steelhead

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Summary

Phosmet is an organophosphate pesticide registered for control of insects on a variety of crops, mainly fruits and nuts, and for direct animal treatments to control pests on cattle, swine, and dogs. Phosmet is slightly to highly toxic to a variety of fish species and is very highly toxic to aquatic invertebrates. An ecological risk assessment that includes nontarget aquatic organisms was prepared by OPP's Environmental Fate and Effects Division (EFED) in 1998, and an Interim Reregistration Eligibility Decision (IRED) was issued in October of 2001. That assessment identified overall concerns, except for alfalfa, for endangered fish and was the basis for this current, more site-specific assessment for Federally listed Pacific salmon and steelhead. A subsequent agreement between the phosmet registrant and the Agency resulted in voluntary cancellation of all products used in or around homes and pets, high-pressure hose use on cattle, and agricultural use on sweet corn and citrus. In addition, eight uses will be granted a time-limited registration for five years; application intervals and rates were also modified for many uses.

In this assessment, OPP has determined that the use of phosmet in accordance with label conditions will have no effect on 13 salmon and steelhead Evolutionarily Significant Units (ESUs) and that phosmet may affect, but is not likely to adversely affect 13 ESUs. These determinations are based on the known or potential use of phosmet on various use sites in each county where there is habitat or a migration corridor for an ESU, the acute risk of phosmet, and the expected bioavailability of phosmet.

Introduction

Problem Formulation: The purpose of this analysis is to determine whether the registration of phosmet as an insecticide for use on various treatment sites may affect threatened and endangered (T&E or listed) Pacific anadromous salmon and steelhead, either directly or indirectly, or may adversely affect their designated critical habitat. We have used the Interim Reregistration Eligibility Decision (IRED, attachment 1) and the Environmental Fate and Effects Division's Ecological Risk Assessment (EFED ERA, attachment 2) as a basis

for this analysis. These have been adapted to the areas and habitats occupied by the Pacific salmon and steelhead.

Scope: Although this analysis is specific to listed Pacific anadromous salmon and steelhead and the watersheds in which they occur, it is acknowledged that phosmet 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. We understand that any subsequent analyses, requests for consultation and resulting Biological Opinions may necessitate that Biological Opinions relative to this request be revisited, and could be modified.

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 and use of phosmet

Phosmet is a broad-spectrum organophosphate insecticide/acaricide currently registered for control of a variety of insect pests on the following crops: fruit trees (apple, pear, peach, nectarine, plum, prune, apricot, cherry), citrus trees, and nut trees (almond, beechnut, Brazil nut, butternut, cashew, chestnut, walnut, pecan, filbert, pistachio), grapes, kiwi, blueberries, cranberries, alfalfa, cotton, peas (succulent and dried), potato, sweet potato (foliar and post-harvest), and sweet corn. In addition, phosmet is registered for direct animal treatments to control fleas, lice, hornflies, sarcoptic mange, and ticks on cattle, swine, and dogs. There are uses for Christmas trees, forestry (seed orchards and seedling transplants), and ornamentals, including residential sites treated by professional applicators. Phosmet can be used by homeowners to treat trees, shrubs, ornamental plants, pets (dogs only), and home gardens. It can be used for fire ant control by professional applicators. Phosmet is in the phosphorothioate group of organophosphates.

Currently there are 45 registered uses for phosmet. The current phosmet labels do not clearly describe product use (i.e maximum number of applications, application methods). In the 2001 IRED, the Agency requested and received updated label use information from the registrant. Also, some uses and application rates are being voluntarily cancelled or reduced as part of the mitigation measures for the RED. This information is not reflected in the current product labels, however, the IRED states that the registrant intends to update the labels accordingly. Product labels have been revised by the registrant to omit uses and more adequately describe application procedures. However, the Agency has not yet officially accepted those labels, because spray-drift language issues are still being finalized. The labels are expected to be reviewed, finalized and accepted in the near future. Because some uses are being canceled, we do not address those uses in this assessment. Uses for which phosmet will continue to be registered include the following:

> Kiwifruit, green and dry peas, sweet potatoes, alfalfa, clover, blueberries, cherries, **apples**, crabapples (California only), **apricots**, cotton, cranberries (except California), **grapes, nectarines, peaches, pears**, almonds, pistachios, pecans, filberts, Brazil nuts, beechnuts, butternuts, cashew, chestnut, chinquapin, hickory nuts, macadamia nut,

plums, prunes, potatoes, Christmas trees, conifer tree seed orchards, nursery trees, pine seedlings, cattle & swine, and fire ant control by professional applicator.

The sites in bold font above are eligible for a time limited 5-year registration until October 30, 2006. At that time, they will be re-evaluated, particularly with respect to health effects, and a decision made as to whether registration will be continued. In addition, the following uses of phosmet are being voluntarily cancelled now, as labels are revised:

Sweet corn, citrus, household ornamentals and fruit trees, domestic pets, and the high-pressure hose use on cattle

All products are classified for general use except one label for commercial applications on residential fruit trees in Washington state which is being cancelled. Phosmet end-use formulations include emulsifiable concentrate, wettable powder, dust, and water soluble bags. Additionally, CA, ID, WA, and OR Special Local Needs (SLN) registrations for phosmet include kiwifruit (soil treatment) (CA); clover (seed crop foliar treatment) (ID); blueberries (foliar treatment) and sweet cherries (delayed dormant application) (OR); and grapes (delayed dormant application), sweet cherries (foliar treatment), apples (foliar treatment), and blueberries (foliar treatment) (WA). The application of phosmet under these SLNs is not expected to result in greater expected environmental concentrations (EECs) than those modeled from the national use label. Phosmet can be applied by aircraft, various types of ground applications (ground spray boom, air blast), or via irrigation water. Direct dermal application to livestock is permitted via sprays and a backrubber.

Table 3. Phosmet use sites and application information

Use site	Max. appl. rate (lb ai/acre)	Max. no. appl. per crop season	Appl. interval (days)	Max lb ai/season
Kiwi fruit	1	3	14	3
Peas	1	3	5	3
Sweet potatoes	1	3	10	3
Alfalfa/clover	1	3	14	3
Blueberries (lowbush)	1	5	7	3.6
Blueberries (highbush)	1	5	7	5
Cherries (sweet) [OR - 24(c)]	1.5	3.5	7	5.25
Cherries (tart)	1.5	3.5	7	5.25
Apples/crabapples (Western U.S. only)[1]	4	3	7	12

Table 3. Phosmet use sites and application information

Use site	Max. appl. rate (lb ai/acre)	Max. no. appl. per crop season	Appl. interval (days)	Max lb ai/season
Apricots[1]	3	3	7	9.1
Cotton	1	3	3	3
Cranberries	2.8	3	3	8.4
Grapes[1]	1.5	3	20	4.55
Nectarines[1]	3	3	7	9.1
Peaches[1]	3	3	7	9
Pears[1]	4	2.8	21	11.2
Almonds (CA only)	3.7	3	20	11.1
Pistachios	3	4	18	12
Pecans	3	3	18	7
Walnuts	5.95	3	18	12
Filberts, Brazil nuts, beechnuts, butternuts, cashew, chestnut, chinquapin, hickory nuts, macadamia nut	5.95	3	18	12
Plums/prunes[1]	3	3	14	9.1
Potatoes	1	3	10	3
Christmas trees/evergreen trees	1	3	13	3
Pine seedlings (for transplants)	0.35	3	13	1.1
Cattle/swine	0.02-0.004	3	n/a	0.06
Pine Seed Orchards	1	3	13	3
Ornamental (nursery)	0.008	3	13	0.024
Fire ant control	0.009	3	n/a	0.027

1 Time limited registration - 5 years, expiring October 30, 2006; at that time, the continued registration for these uses will be re-evaluated and continued, modified, or canceled

Table 4. Application methods/equipment for phosmet applications	
Application method	Use site
Air Blast	kiwifruit, peas, sweet potatoes, alfalfa, blueberries, cherries, apples/crabapples, apricots, cotton, cranberries, grapes, nectarines, peaches, pears, almonds, pistachios, pecans, walnuts, filberts, Brazil nuts, beechnuts, butternuts, cashew, chestnut, chinquapin, hickory nuts, macadamia nut, plums/prunes, potatoes, Christmas/evergreen trees, pine seed orchards
Aerial	sweet potatoes, alfalfa, cherries, apples/crabapples, apricots, cotton, grapes, nectarines, peaches, pears, almonds, pistachios, pecans, walnuts, filberts, brazil nuts, beechnuts, butternuts, cashew, chestnut, chinquapin, hickory nuts, macadamia nut, plums/prunes, Christmas/evergreen trees, pine seed orchards
Ground Spray Boom	cotton
Dipping	pine seedlings
Back Rubber	cattle & swine

Agricultural usage of phosmet from 1988 through 1997 is presented in Table 5 for the major nationwide use sites and for those use sites for which either California, Oregon, Washington, or Idaho is a state of high usage. According to OPP/BEAD's 1999 Quantitative Usage Analysis for Phosmet (attachment 3), an average of one million pounds of active ingredient (ai) was applied to about 402 thousand acres of crop annually from 1988 through 1997. Values in Table 5 are weighted averages; the most recent years and more reliable data are weighted more heavily. Most use was in California, Mississippi, Louisiana, Washington, and Idaho. In terms of total pounds of active ingredient applied, 42% was applied to apples, 11% to peaches, 7% to walnuts, 6% to almonds, 5% to pears, and 4% to alfalfa. The remaining usage is primarily on cherries, pecans, potatoes, grapes, cattle/swine, and dogs.

Table 5. Nationwide use of phosmet from 1988 through 1997. (source OPP/BEAD Quantitative Usage Analysis for Phosmet, 1999)

Site	acres grown	acres treated	% crop treated	lb ai applied	states of most usage (% of total lb ai used on the crop)
Apples	523,000	120,000	23	420,000	MI, NY, OH, CA, IN, WA (51%)
Peaches	265,000	35,000	13	110,000	CA AL GA TX SC CT (57%)

Table 5. Nationwide use of phosmet from 1988 through 1997. (source OPP/BEAD Quantitative Usage Analysis for Phosmet, 1999)

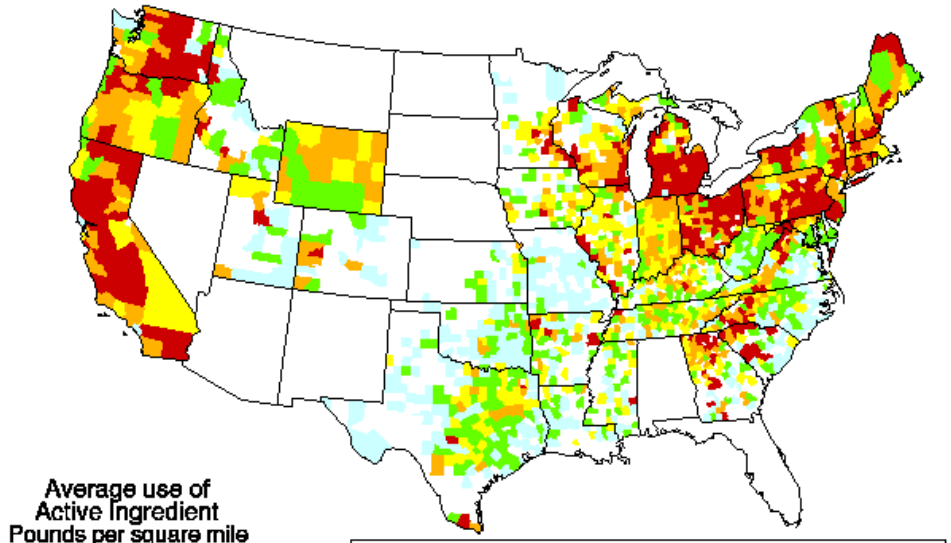
Site	acres grown	acres treated	% crop treated	lb ai applied	states of most usage (% of total lb ai used on the crop)
Walnuts	204,000	19,000	9	87,000	CA (100%)
Almonds	435,000	19,000	4	61,000	CA (100%)
Pears	75,000	15,000	20	54,000	OR CA WA (83%)
Alfalfa	23,701,000	53,000	0.2	37,000	CA OR WY NM MO (81%)
Cherries	109,000	17,000	15	35,000	MI NY WI OR (85%)
Pecans	470,000	16,000	3	30,000	GA OK (81%)
Potatoes	1,433,000	20,000	1	28,000	MI ME NY PA OR VA (83%)
Grapes	830,000	13,000	2	21,000	CA (81%)
Cattle /Swine	n/a	n/a	n/a	19,000	n/a
Blueberries	59,000	12,000	20	19,000	MI NJ (90%)
Plums/Prunes	140,000	5,000	4	15,000	CA MI OH (85%)
Sweet Potatoes	84,000	3,000	4	14,000	MS LA(100%)
Nectarines	37,000	5,000	14	13,000	
Peas (dry)	166,000	22,000	13	12,000	WA ID(94%)
Apricots	19,000	4,000	21	10,000	CA (99%)
Canine (dog)	n/a	n/a	n/a	10,000	n/a
Peas (green)	321,000	9,000	3	7,000	OR WA (86%)
Other Crops	n/a	4,000	n/a	5,000	CA PA ME MA (81%)
Cotton	12,780,000	5,000	0.04	2,000	TX MS (85%)
Kiwifruit	7,000	1,000	1[a]	54[a]	
Woodland	62,089,000	4,000	0.01	0	MD (88%)
Total[b]		402,000		1,008,000	

[a] Reflects revision in the IRED

[b] does not include home and garden uses

Some data from the early to mid-1990s are available from the U.S. Geological Survey (USGS). The USGS estimated county pesticide use for the conterminous United States by combining (1) state-level information on pesticide use rates over a 4-year period (1992–1995),

and (2) county-level information on harvested crop acreage from the 1992 Census of Agriculture. Pesticide use was ranked by compound and crop on the basis of the amount of each compound applied to 86 selected crops. The data indicate that the crop with the highest phosmet usage during the mid-1990s was apples (~506K lb ai). Pears (~96K lb ai), alfalfa hay (~87K lb ai), and peaches (~81K lb ai) also were major crops treated with phosmet. USGS also mapped phosmet use on selected crops (Figure 1). This map is included here as a quick and



Crops	Total Pounds Applied	Percent National Use
apples	506,042	54.45
pears	95,769	10.30
alfalfa hay	87,319	9.40
peaches	81,368	8.76
almonds	44,483	4.79
potatoes	28,701	3.09
cherries	20,381	2.19
plums	15,757	1.70
green peas	13,464	1.45
grapes	11,548	1.24

easy visual depiction of where phosmet may have been used on agricultural crops. However, it should not be used for any quantitative analysis, because it is based on 1992 crop acreage data and was developed from 1990-1995 statewide estimates of use that were then applied to that county acreage without consideration of local practices and usage.

California requires full pesticide-use reporting by all applicators except homeowners, and the California Department of Pesticide Regulation provides the information at the county level (www.cdpr.ca.gov/docs/pur/purmain.htm). Reported use (lb ai/A) of phosmet from 1993-2001 is listed in Table 6. Usage by crop in 2001 is provided in Table 7. Almost 20% of the phosmet applied in 2001 was to almonds, and 10% or more was applied to peaches, apples, walnuts, and nectarines. County-level usage information is not provided here but is tabulated

in section 4 of this analysis where the potential for exposure of individual salmon and steelhead ESUs is addressed. We note that phosmet use in California increased substantially in the 1990s, but recently decreased slightly. However, limitations imposed recently on other insecticides (e.g., diazinon, chlorpyrifos) may result in increased use of phosmet as an alternative to the other insecticides. In their 2001 report, DPR stated: "Pest control applicators (PCAs) report that most growers are using phosmet as an in-season insecticide in place of other, more toxic chemicals, such as methomyl."

Table 6. Reported use of phosmet in California, 1993-2001, in pounds of active ingredient (source: California DPR Summary of Pesticide Use Report Data)

1993	1994	1995	1996	1997	1998	1999	2000	2001
204,157	189,415	266,349	395,160	566,484	644,898	638,822	583,116	483,685

Table 7. Major uses (excluding homeowner uses) of phosmet in California in 2001 (source: California DPR Summary of Pesticide Use Report Data)

crop or site	pounds active	acres treated
almonds	98,204	31,783
peaches	79,477	29,885
apples	72,698	23,260
walnut	69,018	20,363
nectarines	61,474	25,292
plums	26,622	9,855
pears	24,694	6,657
pistachios	16,116	8,974
grapes	14,297	11,057
alfalfa	12,770	19,135
prunes	3,366	1,298
apricots	3,349	1,356
lemon	1215	243
nursery outdoor container plants	196	107
cherries	113	47
kiwi	39	24
nursery-outdoor flowers	24	17

research commodity	11	nr
landscape maintenance	2	nr
uncultivated agriculture	1	1
state total	483,685	

The Agency is not aware of any comprehensive sources of annual pesticide-use information for Washington, Oregon and Idaho. Oregon has passed legislation to implement full pesticide-use reporting but budgetary constraints are delaying implementation. Some use-report data is available from the USDA's National Agricultural Statistics Service's Agricultural Chemical Usage report (http://usda.mannlib.cornell.edu/reports/nassr/other/pcu-bb/). This report presents application rates and acres treated for selected nursery/floriculture crops, fruit crops, and vegetable crops for the major state producers. The report includes California data for use of phosmet on apples, apricots, grapes, nectarines, peaches, pears and plums (Table 8); Washington state data on apples and pears (Table 9); and Oregon data on apples, sweet cherries and pears (Table 10). These data indicate that much less phosmet is used in agriculture in Oregon than in either California or Washington. No information is provided for phosmet use in Idaho. The nursery/floriculture use is not included in tables because use was negligible or none. In Oregon, 1% of the nursery operations used phosmet, presumably on 1% of the nursery acreage. Only 1000 pounds ai of phosmet was applied to this category in all of the surveyed states (CA, FL, MI, OR, PA, and TX) and 600 of those pounds were on fruit and nut trees in California, leaving a maximum of 400 pounds for all other varieties of nursery crops in all of the other surveyed states.

Table 8. Reported crop uses of phosmet in California in 2000 or 2001 (source: USDA/NASS Agricultural Chemical Usage)

Crop	acreage grown	% acreage treated	lb ai/acre/ application	application number	lb ai per acre per year	lb ai applied annually
Apples	30,000	20	2.90	1.9	5.71	35,000
Apricots	19,000	6	1.3	2.29	3.15	3,800
Grapes, all	961,000	<1	1.34	1.2	1.66	8,300
Grapes, wine	530,000	<1	1.36	1.2	1.74	6,500
Nectarines	41,500	39	2.15	1.4	3.18	51,100
Peaches	76,000	29	2.40	1.3	3.23	70,900
Pears	19,000	22	3.68	1.4	5.14	21,300
Plums	40,000	14	2.34	2.3	5.47	30,500

Table 9. Reported crop uses of phosmet in Washington state in 2000 or 2001 (source: USDA/NASS Agricultural Chemical Usage)

Crop	acreage grown	% acreage treated	lb ai/acre/ application	application number	lb ai per acre per year	lb ai applied annually
Apples	168,000	18	3.06	1.5	4.57	138,300
Pears	24,800	28	3.0	1.4	4.37	29,900

Table 10. Reported crop uses of phosmet in Oregon in 2000 or 2001 (source: USDA/NASS Agricultural Chemical Usage)

Crop	acreage grown	% acreage treated	lb ai/acre/ application	application number	lb ai per acre per year	lb ai applied annually
Apples	8,700	37	2.05	1.4	2.91	9,400
Sweet cherries	11,000	5	1.09	1	1.09	600
Pears	17,000	49	2.69	1.4	3.90	32,200

The Washington State Department of Agriculture (WSDA) has provided information on the acreage of major phosmet-treated crops and additional details on amounts used for certain of these crops (WSDA, 2003). These are in Table 11; additional information is in the full report, which is included as Attachment 4. Actual rates of application are markedly lower than allowed on the labels.

Table 11. Major usage of phosmet in Washington (WSDA, 2003)

crop	acres planted[1]	acres treated (% treated)	lbs ai/A	# apps	est lbs ai applied
apples	168,000	75,600 (45%)	2.8	1.5	317,520
blueberries	2,000	phosmet not currently used[2]			
cranberries[3]	1,600				
peaches & nectarines	4,200	420 (10%)	0.5-0.7		
pears	24,800	5000 (20%)	2.8	1	14,000
potatoes (western WA only)	15,000	phosmet not currently used[4]			
potatoes (eastern WA only)	149,000	phosmet not currently used[4]			

[1] Estimated 2001 acres from Washington Agricultural Statistics Service

[2] Phosmet may be used in the future if other pesticides being used are limited. Rate would be 0.7 lb ai/A
[3] Information not yet available beyond acres planted
[4] Phosmet may be used in eastern Washington at a rate of 0.9 lb ai/A when aldicarb is not available, but is not expected to be used in western Washington

a. Aquatic toxicity of phosmet

(i) Acute toxicity to fish and aquatic invertebrates

The acute toxicity data for freshwater fish indicate that both technical-grade and formulated phosmet is slightly to highly toxic to a variety of fish species and are very highly toxic to aquatic invertebrates (Table 12). It is noteworthy that rainbow trout and bluegill sunfish yielded roughly similar estimates of toxicity while channel catfish and fathead minnows were roughly an order of magnitude less sensitive.

Table 12. Acute toxicity of phosmet to freshwater fish and invertebrates (source: EFED ERA)

Fish				
Species	Scientific name	% ai	96-h LC50 (ppm)	Toxicity Category
Rainbow trout	*Oncorhynchus mykiss*	97.0	0.23	Highly toxic
		95.8	0.56	Highly toxic
		11.55[1]	1.56	Moderately toxic
		50.0[2]	0.29	Highly toxic
		50.0[2]	0.50	Highly toxic
Bluegill sunfish	*Lepomis macrochirus*	95.8	0.07	Very highly toxic
		95.3	0.12	Highly toxic
Channel catfish	*Ictalarus punctatus*	95.8	11.0	Slightly toxic
Fathead minnow	*Pimephales promelas*	95.8	7.3	Moderately toxic
		50.0[2]	9.0	Moderately toxic
		50.0[2]	7.5	Moderately toxic
Invertebrates				
Species	Scientific Name	% ai	48-h EC50 (ppb)	Toxicity Category
Water flea	*Daphnia magna*	95.8	5.6	Very highly toxic
		51.0[2]	24.0	Very highly toxic

Table 12. Acute toxicity of phosmet to freshwater fish and invertebrates (source: EFED ERA)				
		51.0[2]	8.64	Very highly toxic
Fairy Shrimp	*Streptocephalus seali*	95.3	170 (96 hr)	Highly toxic
Scud	*Gammarus fasciatus*	95.8	2.0 (96 hr)	Very highly toxic

[1] Emulsifiable concentrate formulation
[2] Wettable powder formulation

In addition to the data presented in the EFED ERA, Mayer and Ellersieck (1986) reported on over 70 tests with phosmet. Mayer and Ellersieck data, generated at the then FWS Columbia National Fisheries Research Laboratory, are all considered core data by EFED with respect to the species and conditions tested. Several of their values were used in the EFED ERA and are in Table 12 above. Additional data are presented in Table 13.

Table 13. Additional acute toxicity of phosmet to freshwater fish and invertebrates (source: Mayer and Ellersieck, 1986)				
Fish				
Species	Scientific name	% ai	96-h LC50 (ppm)	Toxicity Category
Chinook salmon	*Oncorhynchus tshawytscha*	95.3	0.150	Highly toxic
		95.3	0.285 (48 hr)	Highly toxic
Channel catfish	*Ictalarus punctatus*	95.8	10.6	Slightly toxic
		50.0[1]	7.5	Moderately toxic
Smallmouth bass	*Micropterus dolomieui*	95.3	0.150	Highly toxic
Largemouth bass	*Micropterus salmoides*	95.3	0.160	Highly toxic
Invertebrates				
Species	Scientific Name	% ai	48-h EC50 (ppb)	Toxicity Category
Water flea	*Daphnia magna*	50.0[1]	10.9	Very highly toxic
Sowbug	*Asellus brevicaudus*	95.3	90 (96-hr)	Very highly toxic
		95.3	72 (96-hr)	Very highly toxic
Scud	*Gammarus fasciatus*	95.8	4.2 (96 hr)	very highly toxic
Midge	*Chironomus plumosus*	95.3	3150	Moderately toxic
		50.0[1]	3400	Moderately toxic

[1] Wettable powder formulation

Tests with bluegill and rainbow trout on the technical phosmet were done with varying sizes of fish (rainbow), different temperatures (bluegill), pHs, and hardness, typically varying only one parameter at a time. Two characteristics seemed to follow a pattern. Toxicity increased with increasing temperature, with a correlation coefficient for r^2 of 0.92 for bluegill (Table 14). Toxicity decreased with increasing pH, with correlation coefficients for r^2 of 0.85 for rainbow and 0.97 for bluegill (Table 15). There were insufficient data to establish trends for other parameters, but the data did suggest that very small trout or bluegill (0.2 g) were less sensitive than larger individuals of 0.5 g and up. Mayer and Ellersieck (1986) also reported that there was no effect of phosmet, at up to 10 ppm, on the "eyed egg" and "yolk sac fry" stages of rainbow trout.

Table 14. Acute toxicity of phosmet to bluegill weighing 0.5 g at different temperatures and a constant pH of 7.2. (source: Mayer & Ellersieck, 1986)

10° C	15° C	20° C	25° C
560 ppb	180 ppb	70 ppb	60 ppb

Table 15. Acute toxicity of phosmet to rainbow trout of two weights at different pHs and a constant temperature of 10° C. (source: Mayer & Ellersieck, 1986)

weight	pH 6.5	pH 7.5	pH 8.5	pH 9.0	pH 9.5
1.3 g	105 ppb	130 ppb	420 ppb	1600 ppb	4700 ppb
0.6 g		490 ppb		1200 ppb	3700 ppb

(ii) Chronic toxicity to freshwater fish and invertebrates

Adverse chronic effects on survival or growth of freshwater fish and invertebrates occurred at exposure concentrations of 1.1 to 6.1 ppb (Table 16). Exposure to a little as1.1 ppb phosmet can result in growth effects to adult and young freshwater invertebrates.

Table 16. Chronic toxicity of phosmet to freshwater fish and invertebrates (source: EFED ERA)

Species	Scientific name	test duration (days)	% ai	Endpoints affected	NOEC (ppb)	LOEC (ppb)
Fish						
Rainbow trout	*Oncorhynchus mykiss*	60	94.3	Fry survival, growth	3.2	6.1

Invertebrates						
Water flea	*Daphnia magna*	21	99.0	Adult length young/adult	0.75	1.1

(iii) Acute and chronic toxicity to estuarine fish and invertebrates

The available acute toxicity data categorize technical-grade phosmet as highly toxic to estuarine fish and moderately to very highly toxic to estuarine invertebrates (Table 17). These toxicity values are comparable to those for freshwater organisms. Bivalves appeared to be more tolerant of phosmet with moderate toxicity values of >1000 ppb.

Table 17. Aquatic organisms: acute toxicity of phosmet to estuarine fish and invertebrates (source: EFED ERA & EFED files)

Species	Scientific name	% ai	96-h LC50 (ppm)	Toxicity Category
Fish				
Sheepshead minnow	*Cyprinodon variegatus*	94	0.17	Highly toxic
Longnose killifish	*Fundulus similis*	95	0.032 (48-hr)	Very highly toxic
Striped mullet	*Mugil cephalus*	95	0.032 (48-hr)	Very highly toxic
Invertebrates				
Species	Scientific Name	% ai	48-h EC50 (ppb)	Toxicity Category
Brown shrimp	*Penaeus aztecus*	95	2.5	Very highly toxic
Mysid	*Americamysis bahia*	94.3	1.6	Very highly toxic
Quahog clam	*Mercenaria mercenaria*	100	94,000	Slightly toxic
Eastern Oyster	*Crassostrea virginica*	95.0	>1000 (96 hr)	Moderately toxic

Chronic toxicity data are not available for estuarine fish, and will not be required because the sites of phosmet use are not generally in the vicinity of estuarine and marine environments. The available data indicate chronic effects at low levels for the estuarine mysid shrimp. Adverse chronic effects on survival for adults and second generation occurred at exposure concentrations of 0.69 ppb (Table 18).

Table 18. Aquatic organisms: chronic toxicity of phosmet to estuarine invertebrates (source: EFED ERA)

Species	Scientific name	test duration (days)	% ai	Endpoints affected	NOEC (ppb)	LOEC (ppb)
Mysid	*Americamysis bahia*	21	95.5	Survival reduced for adults and second generation	0.37	0.69

(iv) Additional toxicity information

The USEPA ORD NHEERL Ecotoxicity database (www.epa.gov/ecotox) was searched for additional data to characterize acute toxicity of phosmet to fish. Nearly all of the toxicity values in this database, such as those cited as EPA OPP, Mayer and Ellersieck 1986, and Johnson and Finley 1980, also are contained in EFED's ecotoxicity database and were presented in Tables 12-18. The only additional fish toxicity, other than in foreign journals, are on carp, *Cyprinus carpio*, which had LC50 values from 20-26 ppm.

(v) Toxicity of inert ingredients and degradates

There are no data available on the 'other' (formerly 'inert') ingredients in phosmet products. However, there are data on several of the formulated products. Toxicity of formulated products is slightly less than for the active ingredient, but these are within the bounds of normal variation among tests. The data do not show any indication of synergism or enhanced toxicity of formulated products.

Similarly, there are no data on the primary degradate phosmet-oxon. The IRED considered that any toxicological aspects of the oxon would not be significant because residues on food were less than 10% of the parent phosmet and because of the relative instability of either the parent or the oxon. With respect to aquatic toxicity, the only indication (and it is a weak indication) is that static fish and invertebrate tests show no evidence of different toxicity from the flow-through tests. Where a pesticide is quick to hydrolyze or undergo aqueous photolysis, such as with phosmet, a static test is likely to have the quick-forming degradates present before the end of the test. Conversely, a flow-through test does not allow for the presence of degradates to any degree. Therefore, a static test showing more toxicity, considerable normal test variability, than a flow-through test is an indication that the degradates can be more toxic than the parent compound. Good comparative data for phosmet exist only for the sowbug, *Asellus brevicaudus*, where the static LC50 was 90 ppb and the flow-through LC50 was 72 ppb. There is also a pair of tests with the same material on rainbow trout, where the static LC50 was 105 ppb and the flow-through LC50 was 120 ppb; however the fish in the static test were much larger (1.3 g) than those in the flow-through test (0.1 g), which limits the comparison. For each species, the data are reasonably similar for static and flow-through results. Because phosmet has a half-life of 9.4 hours in neutral water, and fish tests are typically conducted near neutral or slightly alkaline pHs, it would be expected that phosmet-oxon would be formed and its toxicity expressed. Mayer and Ellersieck (1986) report pH

values of 7.2 to 7.5 for 23 of 24 phosmet tests. The 24th was at a pH of 6.5 where phosmet would be more likely to exist as the parent material than the oxon degradate; this test also produced the greatest toxicity of the 6 rainbow trout tests with technical material.

Mayer and Ellersieck (1986) also tested "aged solutions" of phosmet against the bluegill sunfish and the midge, *Chironomus plumosus*. In four series of 1-4 day "aged" material, toxicity decreased relative to "new" material. Reductions in toxicity were presumed to be a result of loss of the test material through any means, physical removal, chemical degradation, or biological deactivation. The four tests represent one for each species with the technical material and one for each species with the 50% WP. The results are in Table 19. The rate of deactivation found for phosmet and bluegill was >25.3, at least three times greater than the next highest deactivation rate of any of the 22 chemicals they tested in this manner. In addition to the strong indication of rapidly decreasing toxicity over time, these data also support the idea that the oxon, which is more likely than the parent phosmet to be found in aged solutions, is less toxic than the parent material.

Table 19. LC50 values (in ppb) for bluegill and midge exposed to aged solutions of phosmet (from Mayer and Ellersieck, 1986)

species and material	0 days (not aged)	aged 1 day	aged 2 days	aged 4 days
Bluegill - tech	420	3200	5100	>10,000
Bluegill - 50% WP	360	2900	>10,000	>10,000
Midge - tech	3150	>3200	>10,000	>10,000
Midge - 50% WP	3400	>3200	>10,000	>10,000

b. Environmental fate and transport

Phosmet is stable to soil photolysis, but degrades quickly under aqueous photolysis. Phosmet is subject to rapid hydrolysis under alkaline and neutral conditions and to a much lesser degree under acidic conditions. Microbial-mediated degradation is a major route of dissipation. In soils where microbial activity is minimal, leaching may be a significant route of dissipation for the chemical. Phosmet degrades rapidly under aerobic conditions in soil (pH 7.4), and more slowly under anaerobic conditions (pH 7.1). Since phosmet hydrolyzes at neutral to alkaline pHs, these soil half-lives are reflective of both chemical hydrolysis as well as microbial degradation. In three field dissipation studies, phosmet stayed in the upper layer of soil; it is not expected to leach. The environmental fate characteristics for phosmet are listed in Table 20.

Table 20. Environmental Fate Characteristics for phosmet	
Parameter	*Value*
Molecular weight	
Water solubility	25 mg/L (ppm) at 20°C
Vapor pressure	4.5 10^{-7} mm Hg
Henry's law constant	7.5×10^{-9} atm m^3 mol^{-1}
Octanol/Water partition	Log K_{ow} = 2.78 - 3.04
Hydrolysis ($t_{1/2}$) pH 5 pH 7 pH 9	179 hours 9.4 hours 5.5 minutes
Aqueous photolysis ($t_{½}$)	2.4 days (pH 5)
Soil photolysis	assumed stable (loam soil)
Aerobic soil metabolism ($t_{½}$)	3 days (loam soil)
Anaerobic soil metabolism ($t_{½}$)	15 days
K_{oc}	10400 (sand) 975 (sandy loam) 757 (loam) 716 (silt loam)

Phosmet-oxon, the only known degradate of toxicological concern, was identified in a number of the environmental fate studies conducted. Phosmet-oxon appears to be less mobile than phosmet as evidenced by its absence in leachates in the aged and unaged mobility study. In addition, phosmet-oxon was limited to the upper soil layer in the field studies while phosmet was detected as low as the 10.5-inch soil layer. Phosmet-oxon was not specifically identified in the soil leachate of the aged mobility study. In the anaerobic soil metabolism study, phosmet-oxon was identified in very small amounts relative to the parent and other degradates. The pattern of formation and decline of phosmet-oxon was not characterized well enough to formulate a full fate assessment.

A number of other degradates were identified in the aerobic soil metabolism and hydrolysis studies. These degradates are various conjugates of the phthalimide, phthalamic acid, and phthalic acid moieties of the parent. All degradates appear to have greater mobility in soils, especially the anionic forms, under environmental conditions. No pattern of decline for the degradates was reported in the aerobic or anaerobic soil metabolism studies, therefore, persistence relative to the parent is unclear. The degradate N-methoxymethylphthalimide (maximum concentration 0.076 ppm immediately after 3rd app.) and phosmet-oxon (maximum concentration 0.06 ppm on day 14 after final application) were identified in the field dissipation

studies exclusively within the 0- to 3.5-inch soil layer. Phthalimide was not identified in the two studies for which it was monitored.

Based on the laboratory and field studies conducted, phosmet and phosmet-oxon would appear to pose a threat to groundwater resources underlaying vulnerable soils. However, the relatively short half-life should reduce migration in most microbially active soils. Phosmet and possibly phosmet-oxon, may contaminate surface waters in the dissolved phase mainly as a result of runoff-producing storm events shortly after field applications.

c. Incidents

OPP maintains two databases of reported incidents. The Ecological Incident Information System (EIIS) contains information on environmental incidents which are provided voluntarily to OPP by state and federal agencies and others. There have been periodic solicitations for such information to the states and the U. S. Fish and Wildlife Service. The second database is a compilation of incident information known to pesticide registrants and any data conducted by them that shows results differing from those contained in studies provided to support registration. These data and studies (together termed incidents) are required to be submitted to OPP under regulations implementing FIFRA section 6(a)(2). OPP is aware of two incident reports for phosmet, both of these involved mortality to bees visiting orchards, one apple orchard in North Carolina and one almond orchard in California

d. Estimated and actual concentrations of phosmet in surface waters

Estimated environmental concentrations (EECs)

In the IRED environmental risk assessment (2001), aquatic EECs are modeled for several sites using PRZM/EXAMS scenarios. The sites include alfalfa in Oregon, almonds in California, apples in New York and Oregon, berries in Michigan, cherries in Wisconsin, citrus in Florida, cotton in Mississippi, grapes in New York, kiwi in California, peaches in Georgia, pears in Oregon, pecans in Georgia, plums/prunes in Oregon, potatoes in Maine, sweet potatoes in Louisiana, and walnuts in Oregon. As previously stated, some uses and application rates are being voluntarily cancelled or reduced as part of the mitigation measures for the RED (see Table 3 for uses being supported for reregistration). Therefore, the application rate scenarios used in the 2001 IRED generated larger EECs than those expected from the supported uses. As a result, the Risk Quotients (RQs) calculated in the IRED aquatic animal exposure assessment are also expected to be lower. Because some uses are being canceled, we do not address those uses in this assessment. However, we do address those uses that have a 5-year time limited registration.

Several values in the IRED looked anomalous and the primary registrant submitted information that they believed that the anomalies were decimal errors. EFED redid these PRZM-EXAMS EECs; chemical-specific input parameters were slightly updated, but these modified parameters did not affect peak values. The results are reflected in the table below and subsequent tables relating to risk quotients. The crops which were subject to revision are

identified in Table 21 by italic font. These revisions do not include expected label changes, which primarily involve numbers of applications.

There still appears to be an inconsistency in the peak EECs for the high application rate for apples and the low application rate, but this is not a "real" inconsistency. The higher peak EEC for the low application rate results from more applications and some additional accumulation from one application to the next. The low rate peak EEC occurs later in the season than does the high rate peak EEC. These differences are reduced in the longer term EECs.

Table 21. PRZM/EXAMS Surface Water Concentrations for Phosmet (PPB). 1 in 10 Years Concentrations Except Mean

Crop	*Peak*	*4-Day*	*21-Day*	*60-day*	*90-day*
Alfalfa	3.0	0.60	0.20	0.10	0.10
Almonds	10.3	1.30	0.50	0.20	0.10
Apples, Eastern-high	26.7	5.00	1.40	0.80	0.50
Apples, Eastern-low	15.6	2.10	0.60	0.30	0.30
Apples, Western-high	11.2	1.50	0.80	0.50	0.30
Apples, Western-low	*14.0*	*2.08*	*0.45*	*0.39*	*0.06*
Berries	11.8	1.60	0.40	0.20	0.10
Cherries	9.5	1.80	0.60	0.30	0.20
Citrus	12.9	1.90	0.60	0.30	0.20
Cotton	29.9	4.40	1.00	0.40	0.20
Grapes	18.7	4.20	1.00	0.60	0.40
Kiwi	*19.7*	*3.23*	*0.83*	*0.29*	*0.09*
Peaches-high	16.2	2.70	1.00	0.50	0.30
Peaches-low	8.9	1.70	0.50	0.20	0.20
Pears	*14.0*	*2.08*	*0.45*	*0.39*	*0.06*
Pecans	23.7	3.30	0.80	0.40	0.30
Plums	8.4	1.00	0.40	0.40	0.20
Potatoes	7.9	1.20	0.50	0.20	0.20
Potatoes, sweet	20.6	3.50	1.00	0.40	0.30
Walnuts	8.4	1.00	0.40	0.30	0.20

Crop Specific Inputs to PRZM/EXAMS for Phosmet

Crop	*App Rate (lbs)*	*App No*	*App. Interval (days)*	*App Method*	*Scenario Location*
Alfalfa	1	8	14	Aerial	Oregon
Almonds	3.7	3	20 and 1 dormant	Air Blast	California
Apples, Eastern-high	4	5	7	Air Blast	New York
Apples, Eastern-low	1.5	10	7	Air Blast	New York
Apples, Western-high	4	5	7	Air Blast	Oregon
Apples, Western-low	1.5	10	7	Air Blast	Oregon
Berries	1	5	7	Ground Spray Boom	Michigan
Cherries	1.75	4	7	Air Blast	Wisconsin
Citrus	2	3	30	Air Blast	Florida
Cotton	1	5	3	Ground Spray Boom	Mississippi
Grapes	1.5	4	At specific Growth Points[1]	Air Blast	New York
Kiwi	2	6	14 and 1 dormant	Air Blast	California
Peaches-high	3	4	7	Air Blast	Georgia
Peaches-low	2	5	7	Air Blast	Georgia
Pears	5	3	21	Air Blast	Oregon
Pecans	2.25	5	18	Air Blast	Georgia
Plums/Prunes	3	5	14	Air Blast	Oregon
Potatoes	1	5	10	Aerial	Maine
Potatoes, Sweet	1	5	10	Aerial	Louisiana
Walnuts	6	5	18	Air Blast	Oregon

[1] Based on historical data, the average frequency is 20 days.

Environmental fate studies indicate that phosmet will tend to sorb to sediments and soils. Monitoring studies conducted in 1990 in the Columbia Basin, Umatilla, Oregon, suggest that phosmet will tend to be higher in benthic sediments than dissolved or sorbed to suspended material in the pelagic zone. Concentrations in sediments may pose a greater risk to aquatic organisms because of this behavior.

Measured Concentrations in Surface Water

According to the IRED, surface water monitoring data collected and reported to the STORET system on the occurrence of phosmet between 1978 and 1994 indicate its presence in

surface water in association with known use areas. That there was actual detection appears to be unclear, but in no case was the amount of phosmet present sufficient to quantify it. Table 22 provides a summary of that data.

Table 22. Phosmet Occurrences in Surface Waters (STORET)

Location	*Sampling Dates*	*Source Water*	*Sample Number*	*Results*[1]
Washington, Yakima County	7/23/82	Sediment-dry weight	2	<1 ug/kg
Washington, Whatcom County	7/16/87 to 7/28/87	Sediment-dry weight	6	<1 ug/kg
Wisconsin, Milwaukee County	6/17/92 to 6/28/94	Whole-water Ambient Stream	24	<1 ug/l
Wisconsin, Dane County	7/13/92 to 7/8/93	Whole-water Ambient Stream	8	<1 ug/l
Wisconsin, Dane County	5/30/93 to 6/23/94	Municipal Non-ambient stormwater	17	<1 ug/l
Oregon, Umatilla County[2]	4/11/90 to 9/18/90	Canals, sediments	10	<32 to <390 ug/kg
Oregon, Umatilla County[2]	4/11/90 to 9/18/90	Canals, Water	2	<0.03 and <2 ug/l
California, Fresno County	11/18/69?	Ambient Stream	1	<0.005 ug/l

[1]For values reported as "<" the result is either off-scale low actual value not known but known to be less than this value or below the level of detection and the detection limit is reported.
[2]Samples reported for Umatilla County are in association with the well data collected. The sampling locations occurred at specified distances from a specific well head.

It is important to note that surface water monitoring data are extremely limited for phosmet. It has not been routinely included in the NAWQA monitoring programs which apparently analyzed only three samples for phosmet. Two samples were collected in Merced county, California, and one in Stanislaus county, California. The maximum residue detected for all three samples was 0.0079 ug/L.

California's DPR also collects monitoring data developed by various agencies in California (http://www.cdpr.ca.gov/docs/sw/surfcont.htm). The primary registrant[1] has summarized these data, which included 1139 samples analyzed for phosmet as of July 15, 2000, and has stated, "There were no detectable residues in any instance." The level of quantification in 95% of these samples was 0.1 ppb or less. The database has now been updated as of April, 2003; there are now two samples where phosmet was detected, but these are both under 1 ppb (maximum 0.63 ppb) and not in counties where salmon or steelhead may occur. I note also that in a few counties, samples were also analyzed for the phosmet-oxon degradate. There were no detections.

[1] Letter from Elizabeth Codrea, Manager - Regulatory and Labeling, Gowan Company, Yuma, AZ to Arthur-Jean Williams, Chief, Environmental Field Branch, OPP. August 21, 2003.

Gowan Company also conducted a field study to address drift from aerial application on blueberries in Maine. I have only the company's summary of this study, but it indicates that 11 surface water samples showed a maximum of 0.52 ppb of phosmet in the water. The company states that samples were taken within two hours of application and treated fields were positioned as closely as possible to the water, which is what OPP requests in a targeted monitoring study. However, the study would not address any residues that might result from runoff.

e. Changes in registration status

As noted, a few of the phosmet uses are currently being canceled and a number of other uses will be given a time-limited registration of 5 years, expiring October 30, 2006. In addition, the number of applications per season will be reduced to three, unless otherwise specified. These use restrictions are outlined above in section 2: "Description and use of phosmet" of this assessment. The following summarizes the uses being supported, those being supported with a time-limited registration of five years, and those being voluntarily cancelled.

- Phosmet uses being supported for reregistration include:

  Kiwifruit, Peas (Green), Peas (Dry), Sweet potatoes, Alfalfa/Clover, Blueberries (lowbush), Blueberries (highbush), Cherries (Sweet), Cherries (Tart), Apples/Crabapples (Eastern and Western U.S. only), Apricots, Cotton, Cranberries, Grapes, Nectarines, Peaches, Pears, Almonds, Pistachios, Pecans, Filberts, Brazil nuts, Beechnuts, Butternuts, Cashew, Chestnut, Chinquapin, Hickory nuts, Macadamia nut, Plums/Prunes, Potatoes, Christmas trees/Evergreen trees, Pine Seedlings, Cattle/Swine, Fire Ant Control by professional applicator

- Phosmet uses being supported with a time-limited registration of five years include:

  Apples/Crabapples, Apricots, high-bush Blueberries, Peaches, Pears, Plums/Prunes, Nectarines, and Grapes

The time-limited registration does not necessarily mean that these uses will be continued for only five years. Rather, additional data on risks to workers are required and after these data are available, these uses will be re-evaluated in five years from both a toxicological perspective and from a risk-benefit assessment.

- Phosmet uses being voluntarily cancelled are:

  Sweet Corn, Citrus, Household Ornamental, Household Fruit Tree, Domestic Pet, High-pressure hose use on cattle

f. Discussion and general risk conclusions

The hazard assessment conducted by EFED in 1998 for the phosmet RED was based on the existing labeled uses of phosmet and do not reflect use changes as noted above. According to EFED's ERA for the IRED, including EEC revisions noted above, phosmet poses direct acute risks to endangered fish from all uses except alfalfa (Table 23). In addition, phosmet poses acute risks to aquatic invertebrate populations from all uses. The LOC exceedances for acute risk are higher for aquatic invertebrates than for fish. Depletion of aquatic invertebrate populations, especially insects and crustaceans, could have severe indirect effects on endangered fish if foods become scarce.

In spite of the high chronic toxicity of phosmet to freshwater fish, there are no uses that exceed the LOCs for chronic risk. Chronic concern for freshwater invertebrates was identified for some of the orchard crops (apples, grapes, kiwi, peaches, pecans) and sweet potatoes. The chronic risk to aquatic invertebrates is expected to be less due to mitigation measures in the IRED which decrease application rates and reduce the number of applications for these uses of concern. Chronic risk is not likely in flowing waters where phosmet should be rapidly dissipated but could adversely impact aquatic invertebrates inhabiting lentic waters.

Table 23. Freshwater Aquatic Organisms Acute and Chronic Risk Quotients for Multiple Application of Phosmet to Various Crops Associated with CA, OR, WA, ID

Crop App. Rate (lbs ai/A), App. No. (Days)	*Organism*	*LC_{50} (ppb)[1]*	*NOEC (ppb)[2]*	*EEC Peak (ppb)[3]*	*EEC 60-Day and 21-Day Ave. (ppb)[4]*	*Acute RQ (EEC/LC50)[5]*	*Chronic RQ[6] (EEC/NOEC)*
Almonds 3.7(3)	Fish	70	3.2	10.3	0.20	0.14	0.06
	Invertebrates	2.0	0.75	10.3	0.50	5.15	0.67
Alfalfa 1(8)	Fish	70	3.2	3.0	0.10	0.04	0.03
	Invertebrates	2.0	0.75	3.0	0.20	1.5	0.27
Apples (Western High) 4(5)	Fish	70	3.2	11.2	0.50	0.16	0.15
	Invertebrates	2.0	0.75	11.2	0.80	5.6	1.07
Apples (Western Low) 1.5(10)	Fish	70	3.2	14.0	0.39	0.2	0.12
	Invertebrates	2.0	0.75	14.0	0.45	7.0	0.6
Berries 1(5)	Fish	70	3.2	11.8	0.20	0.17	0.06
	Invertebrates	2.0	0.75	11.8	0.40	5.9	0.53
Cherries 1.75(4)	Fish	70	3.2	9.5	0.30	0.14	0.09
	Invertebrates	2.0	0.75	9.5	0.60	4.75	0.80
Citrus 2(3)	Fish	70	3.2	12.9	0.30	0.18	0.09
	Invertebrate	2.0	0.75	12.9	0.60	6.45	0.80

Table 23. Freshwater Aquatic Organisms Acute and Chronic Risk Quotients for Multiple Application of Phosmet to Various Crops Associated with CA, OR, WA, ID

Crop App. Rate (lbs ai/A), App. No. (Days)	*Organism*	*LC_{50} (ppb)[1]*	*NOEC (ppb)[2]*	*EEC Peak (ppb)[3]*	*EEC 60-Day and 21-Day Ave. (ppb)[4]*	*Acute RQ (EEC/LC50)[5]*	*Chronic RQ[6] (EEC/NOEC)*
Grapes 1.5(4)	Fish	70	3.2	18.7	0.6	0.27	0.19
	Invertebrate	2.0	0.75	18.7	1.0	9.4	1.3
Kiwi 2(6)	Fish	70	3.2	19.7	0.29	0.28	0.09
	Invertebrate	2.0	0.75	19.7	0.83	9.85	1.1
Peaches–High 3(4)	Fish	70	3.2	16.2	0.5	0.23	0.16
	Invertebrate	2.0	0.75	16.2	1.0	8.1	1.33
Peaches–Low 2(5)	Fish	70	3.2	8.9	0.2	0.13	0.06
	Invertebrate	2.0	0.75	8.9	0.5	4.45	0.67
Pears 5(3)	Fish	70	3.2	14.0	0.39	0.2	0.12
	Invertebrate	2.0	0.75	14.0	0.45	0.7	0.6
Pecans 2.25(5)	Fish	70	3.2	23.7	0.4	0.34	0.13
	Invertebrate	2.0	0.75	23.7	0.8	11.9	1.1
Potatoes 1(5)	Fish	70	3.2	8.4	0.2	0.12	0.06
	Invertebrate	2.0	0.75	8.4	0.5	4.2	0.67
Sweet Potatoes 1(5)	Fish	70	3.2	8.4	0.4	0.12	0.13
	Invertebrate	2.0	0.75	8.4	1.0	4.2	1.33
Plums/Prunes 3(5)	Fish	70	3.2	8.4	0.4	0.12	0.13
	Invertebrate	2.0	0.75	8.4	0.4	4.2	0.53
Walnuts 6(5)	Fish	70	3.2	8.4	0.3	0.12	0.09
	Invertebrates	2.0	0.75	8.4	0.4	4.2	0.53

1) Bluegill sunfish LC50 = 70 ppb; Gammarus fasciatus LC50 = 2.0 ppb
2) Rainbow trout NOEC = 3.2 ppb; Daphnia NOEC = 0.75 ppb.
3) Peak EEC values derived through PRZM/EXAMS modeling.
4) For each crop, two PRZM/EXAMS EEC values are provided: the upper value represents the 60-day EEC value used in calculating chronic RQ values for fish; the lower value represents the 21-day EEC value used in calculating chronic RQ values for invertebrates.
5) Acute RQ values were calculated by dividing the peak EEC by the LC50.
6) Chronic RQ values for fish were calculated by dividing the 60-day EEC by the NOEC; chronic RQ values for invertebrates were calculated by dividing the 21-day EEC by the NOEC.

Based solely on the LOC exceedances as identified in Table 23, there would appear to be a moderately high risk for T&E fish and their aquatic invertebrate food supply. However, there are a number of additional factors, some quite important, that also need to be considered:

1. The most sensitive trout LC50 identified in the IRED was 230 ppb, three times less sensitive than the LC50 of 70 ppb for bluegill, which is a less appropriate model for salmon and steelhead than is the rainbow trout (Table 12) . Conversely, Mayer and Ellersieck (1986) had a rainbow trout LC50 as low as 105 ppb at pH 6.5 and 130 ppb at pH 7.5 (Table 15).
2. The LC50 for chinook salmon was 150 ppb for 1.0g fish and 285 ppb for the smaller "swim-up fry" (Table 13). These would also be more relevant models than bluegill.
3. There are marked effects relative to pH and temperature. Salmon and steelhead are primarily coldwater fish, and toxicity is less at lower temperatures (Table 14). The places where water temperatures might be higher are primarily in drier areas where the higher pH would reduce toxicity (Table 15).
4. Amphipods appear to be very sensitive to phosmet and were used to determine risks to populations of aquatic invertebrates that may serve as a fish food source. Data are rather limited for aquatic invertebrates (Tables 12 & 13), and indicate that daphnids are quite sensitive also. However, other aquatic invertebrates, while sensitive, do not have the level of sensitivity to exceed criteria for indirect effects. With the exception of pecans, which were not treated with phosmet in California in 2001, all risk quotients for aquatic invertebrates are less than 10, based upon an LC50 of 2 ppb. This means that invertebrates for which the LC50 is 40 ppb or higher would not have risk quotients exceeding the indirect effects criteria. About half (5 of 11) of the invertebrate tests in tables 12 and 13 have LC50 values above 40 ppb.
5. Phosmet hydrolyzes extremely quickly ($T_{1/2}$=5.5 minutes) at pH 9, and fairly quickly ($T_{1/2}$=9.4 hours) at pH 7. Water in the arid parts of salmon and steelhead range are generally alkaline as reported by the U.S. Geological Survey (URL: http://waterdata.usgs.gov/nwis/qw) and the Washington Department of Ecology (URL: http://www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html). Even in the western wetter areas that drain coastal mountains and forests, pH values are more often on the alkaline side than on the acid side, although they are less alkaline than in the arid areas. Thus the bioavailability of phosmet should be reduced or considerably reduced relative to the EECs which are modeled at a neutral pH.
6. The reduction in numbers of applications per year, as specified in the IRED, will reduce the EECs relative to those modeled and presented in Table 21. Application rates were also reduced for kiwi fruit and pears.
7. As has been frequently pointed out, the EECs are based upon a pond model, whereas salmon and steelhead live in streams and rivers. In all such cases, phosmet would be dissipated rapidly by transport downstream, and in some cases there would be much greater dilution. The sockeye salmon are an exception to the stream and river scenario, in part, but are not in agricultural areas where phosmet would be used.
8. There have been no reported fish incidents of which we are aware, despite the moderate usage of phosmet over many years.
9. While there were limited monitoring data for phosmet in the IRED, the samples that have been analyzed have consistently not found phosmet at levels high enough to be quantified, if found at all. The primary registrant has reported that phosmet was not found above limits of quantification in over 1100 surface water samples in California.

10. A targeted monitoring study by the registrant, which has not been validated by OPP, indicates that drift of aerially applied phosmet resulted in residues up to 0.52 ppb in adjacent waters in Maine.
11. In California, DPR has recommended limitations on the use of phosmet near water to protect aquatic organisms. The specific measures are in section 3.g. below.

Based upon all of the above factors, I believe that a good case could be made that phosmet will have no effect on listed Pacific salmon and steelhead or populations of their invertebrate food supply. However, there is a low possibility that a series of labeled applications near salmon and steelhead habitat could occur, produce drift greater than observed in the Maine study cited above, and be just before a runoff event into water with a relatively low pH and a relatively high temperature. Under these circumstances, and if the bluegill is a better surrogate for the salmon and steelhead than is the rainbow trout or the chinook salmon, or if other life stages are more sensitive than those tested, there could be a limited effect. Therefore, in my best professional judgement, I believe that the maximum risk of phosmet is such that it would be very unlikely to adversely affect listed salmon and steelhead. In certain circumstances described for individual ESUs in section 4 below, there may be no effect, based on lack of use or the protections provided by the California DPR bulletins.

Because criteria are not exceeded for alfalfa, there will be no effect from the use of phosmet on alfalfa. There is no EEC that has been developed for Christmas trees and nursery stock. Application rates are low at 1 lb ai/A with a maximum of three applications, and USDA data indicate negligible or no use on nursery stock and Christmas trees. Therefore, exposure will not exceed levels of concern and there will be no effect from phosmet for nursery stock and Christmas trees.

g. Existing protective measures

Nationally, there are no specific protective measures for endangered and threatened species beyond the generic statements on the product labels. As stated on all pesticide labels, "It is a violation of Federal law to use a product in a manner inconsistent with its labeling." FIFRA labels for phosmet currently contain the following "Environmental Hazards" statements:

> "This product is extremely toxic to fish. 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 washwaters." *OR* "This product is extremely toxic to fish. Do not apply directly to water or wetlands (swamps, bogs, marshes, and potholes). Do not contaminate water by cleaning of equipment or disposal of wastes. Drift or runoff from treated areas may be hazardous to aquatic organisms in neighboring areas."

> "This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area."

FIFRA labels for phosmet are currently being revised and will contain the following "Environmental Hazards" statements for end-use products:

> "This product is extremely toxic to fish and aquatic invertebrates. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high-water mark. Drift or runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwaters or rinsate."

> "This product is highly toxic to bees exposed directly to treatment of residues on crops. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area. Protective information may be obtained from your Cooperative Agricultural Extension."

> "This chemical can contaminate surface water through spray applications. Under some conditions, it may also have a high potential for runoff into surface water after application. These include poorly draining or wet soils with readily visible slopes toward adjacent surface waters, frequently flooded areas, areas overlaying extremely shallow ground water, areas with in-field canals or ditches that drain to surface water, areas not separated from adjacent surface waters with vegetated filter strips, and areas over-laying tile drainage systems that drain to surface water."

FIFRA labels for phosmet are currently being revised and will contain the following "Environmental Hazards" statements for manufacturing-use products:

> "This pesticide is toxic to fish and aquatic invertebrates. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless the action is in accordance with the requirements of the National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to the discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA."

OPP's endangered species program has developed a series of county bulletins which provide information to pesticide users on steps that would be appropriate for protecting endangered or threatened species. Bulletin development is an ongoing process, and there are no bulletins yet developed that would address fish in the Pacific Northwest. OPP is preparing such bulletins. The California Department of Pesticide Regulation (DPR), California Environmental Protection Agency, also creates county bulletins consistent with those developed by OPP.

Phosmet is addressed in these bulletins. California also has a system of County Agricultural Commissioners form whom commercial applicators must obtain a permit before using any restricted use pesticide. Before issuing a permit, the County Commissioner may require that applicators adhere to the use limitations in the California county bulletins. The DPR believes that the vast majority of agricultural applicators in California follow the use limitations in these bulletins (Richard Marovich, Endangered Species Project, DPR, telephone communication, July 19, 2002). Those that apply to phosmet are as follows:

> "Do not use in currently occupied habitat (see Species Descriptions for possible exceptions)."
>
> "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."
>
> "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 run-off 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 time of use."
>
> "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 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."

Requirements for a no-spray buffer between treatment sites and surface waters and the California DPR's requirement for a vegetative filter strip should reduce exposure of aquatic organisms. However, we need to confer with NMFS to determine if these requirements are sufficient to mitigate risks to listed steelhead and salmon.

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

This section presents available information on the listed Pacific salmon and steelhead ESUs and evaluates potential exposure and risk based on known or potential use of phosmet in each ESU. Our information on the various ESUs is taken almost entirely from various Federal Register Notices relating to listing, critical habitat, or status reviews. Phosmet usage data for California was obtained from the DPR's 2001 Pesticide Use Summary Report Data, which provides county-level data for individual use sites. Statewide data for crops treated with phosmet in the Pacific Northwest states are based on USDA/NASS (Tables 8-10) and WSDA (Table 11). Crop acreage for individual counties in those states was obtained from the 1997 Agricultural Census.

A. Steelhead

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

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

Biologically, steelhead can be divided into two reproductive ecotypes. "Stream maturing" or "summer steelhead" enter fresh water in a sexually immature condition and require several months to mature and spawn. "Ocean maturing," or "winter steelhead" enter fresh water with well-developed gonads and spawn shortly after river entry. There are also two major genetic groups, applying to both anadromous and 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). 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. There is a potential for steelhead waters to drain agricultural areas in Ventura, Santa Barbara, and San Luis Obispo counties.

Usage of phosmet in 2001 in counties where this ESU occurs is presented in Table 24.

Table 24. Use of phosmet in counties with the Southern California steelhead ESU.

County	Crop or other use site	Usage (pounds)	Acres treated
San Diego	apple[1]	388	197
	outdoor flowers	6	12
	outdoor container plants	28	13
	pear[1]	38	21
Los Angeles	apple[1]	1560	420
	outdoor container plants	7	4
	nectarine[1]	39	14
	peach[1]	173	67
	pear[1]	34	22
Ventura	lemon[2]	1215	243
San Luis Obispo	alfalfa	21	60
	apple[1]	23	16
	grape[1]	168	122
	peach[1]	1035	348

Table 24. Use of phosmet in counties with the Southern California steelhead ESU.			
County	Crop or other use site	Usage (pounds)	Acres treated
Santa Barbara	outdoor container plants	1	nr
	peach[1]	101	36
	walnut	939	245

[1] Time limited registration of 5 years

[2] Citrus use pattern being voluntarily cancelled, although some uses of existing stocks may occur

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the existence of protections provided by the bulletins developed by California DPR, I conclude that there will be no effect of phosmet on 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, San Benito, Monterey, and San Luis Obispo. There are agricultural areas in these counties, and these areas would be drained by waters where steelhead critical habitat occurs.

Table 25 shows phosmet usage in 2001 in those counties where this ESU occurs.

Table 25. Use of phosmet in counties with the South Central California steelhead ESU.			
County	Crop	Usage (pounds)	Acres treated
Santa Cruz	apple[1]	2569	933
San Benito	apple[1]	116	49
	apricot[1]	431	218
	walnut	105	16

Table 25. Use of phosmet in counties with the South Central California steelhead ESU.			
County	Crop	Usage (pounds)	Acres treated
Monterey	apple[1]	84	50
	grape[1]	812	742
	walnut	504	120
San Luis Obispo	alfalfa	21	60
	apple[1]	23	16
	grape[1]	168	122
	peach[1]	1035	348

[1] Time limited registration of 5 years

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the existence of protections provided by the bulletins developed by California DPR, I conclude that there will be no effect of phosmet on 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).

Usage of phosmet in 2001 in counties in the Central California coast steelhead ESU is presented in Table 26.

Table 26. Use of phosmet in counties with the Central California Coast steelhead ESU.			
County	Crop	Usage (pounds)	Acres treated
Santa Cruz	apple[1]	2569	933
San Mateo	outdoor container plants	4	nr
San Francisco	none	0	0
Marin	none	0	0
Sonoma	apple[1]	11,525	3640
	grape[1]	16	11
	outdoor flowers	18	5
	pear[1]	120	52
	walnut	4	3
Mendocino	apple[1]	160	47
	grape[1]	46	63
	pear[1]	1500	327
Napa	grape[1]	7	8
Alameda	none	0	0
Contra Costa	alfalfa	45	95
	apple[1]	5207	1489
	apricot[1]	86	29
	grape[1]	27	19
	peach[1]	51	17
	pear[1]	8	8
	uncultivated ag	1	1
	walnut	6	2
Solano	alfalfa	837	1574
	pear[1]	71	18
	walnut	13	21
Santa Clara	alfalfa	8	15
	apple[1]	45	16
	apricot[1]	1	5
	landscape maintenance	2	nr
	pear[1]	8	5

[1] Time limited registration of 5 years

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the existence of protections provided by the bulletins developed by California DPR, I conclude that there will be no effect of phosmet on the Central California Coast Steelhead ESU.

4. California Central Valley Steelhead ESU

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

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

Usage of phosmet in 2001 in this ESU is provided in Table 27.

Table 27. Use of phosmet in counties with the California Central Valley steelhead ESU

County	Crop	Usage (pounds)	Acres treated
Alameda	structural pest control	0.4	nr
Amador	alfalfa	44	126
Butte	alfalfa	557	795
	almond	423	148
	apple[1]	1,209	301
	nectarine[1]	7	3
	peach[1]	170	60
	pear[1]	28	7
	walnut	10,901	2558
Calaveras	apple[1]	194	69
Colusa	alfalfa	188	268
	walnut	147	35
Contra Costa	alfalfa	45	95
	apple[1]	5207	1489
	apricot[1]	86	29
	grape[1]	27	19
	peach[1]	51	17
	pear[1]	8	8
	uncultivated ag	1	1
	walnut	6	2
Glenn	alfalfa	2485	3590
	almond	2936	975
	walnut	1590	476
Marin	none	0	0

Table 27. Use of phosmet in counties with the California Central Valley steelhead ESU			
County	Crop	Usage (pounds)	Acres treated
Merced	alfalfa	687	999
	almond	840	336
	apple[1]	521	209
	apricot[1]	308	110
	nectarine[1]	101	32
	peach[1]	2826	1220
	pistachio	15	5
	plum[1]	91	31
	walnut	3654	1140
Nevada	apple[1]	39	35
Placer	apple[1]	236	79
	cherry	1	nr
	kiwi	4	3
	outdoor container plants	13	5
	peach[1]	29	24
	pear[1]	152	96
	plum[1]	2	4
Sacramento	alfalfa	296	420
	apple[1]	851	245
	pear[1]	6885	1756
San Joaquin	alfalfa	306	460
	almond	161	96
	apple[1]	6566	2354
	apricot[1]	4	2
	cherry	65	21
	grape[1]	381	418
	peach[1]	641	234
	pear[1]	206	78
	walnut	1867	708
San Francisco	none	0	0
San Mateo	outdoor container plants	4	nr
Shasta	apple[1]	247	46
	grape[1]	<1	<1
	peach[1]	<1	<1
	walnut	109	78
Solano	alfalfa	837	1574
	pear[1]	71	18
	walnut	13	21

Table 27. Use of phosmet in counties with the California Central Valley steelhead ESU			
County	Crop	Usage (pounds)	Acres treated
Sonoma	apple[1]	11,525	3640
	grape[1]	16	11
	outdoor flowers	18	5
	pear[1]	120	52
	walnut	4	3
Stanislaus	alfalfa	869	1251
	almond	2670	1013
	apple[1]	2974	1057
	apricot[1]	917	387
	cherry	22	8
	grape[1]	601	410
	nectarine[1]	128	41
	peach[1]	6626	2607
	pear[1]	24	20
	plum[1]	103	35
	prune[1]	98	66
	walnut	5830	1784
Sutter	almond	45	12
	apple[1]	2090	571
	peach[1]	1710	670
	pear[1]	2351	561
	walnut	5970	1593
Tehama	alfalfa	408	623
	almond	521	577
	apple[1]	7	9
	prune[1]	17	24
	walnut	4804	2665
Tuolumne	apple	76	32
Yolo	alfalfa	2412	3650
	apple[1]	29	8
	pear[1]	392	92
	research commodity	11	nr
	walnut	3000	825
Yuba	apple[1]	1198	359
	peach[1]	1860	680
	pear[1]	6300	1515
	walnut	11,176	2848

[1] Time limited registration of 5 years

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the existence of protections

provided by the bulletins developed by California DPR, I conclude that there will be no effect of phosmet on 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, and Lake.

Phosmet use in 2001 in this ESU is presented in Table 28.

Table 28. Use of phosmet in counties with the Northern California steelhead ESU.

County	Crop	Usage (pounds)	Acres treated
Humboldt	none	0	0
Mendocino	apple[1]	160	47
	grape[1]	46	63
	pear[1]	1500	327
Trinity	none	0	0
Lake	alfalfa	12	20
	pear[1]	1362	330
	walnut	76	18

[1] Time limited registration of 5 years

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the existence of protections provided by the bulletins developed by California DPR, I conclude that there will be no effect of phosmet on the Southern California Steelhead ESU.

6. Upper Columbia River steelhead ESU

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

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

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

Crop information for counties within this ESU is provided in Tables 29 and 30.

Table 29. Cropping information (potential for phosmet usage) for Washington counties where there is spawning and growth of the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Benton	268,372	Irish potatoes	25,317
			Apples [b]	18,425
			Grapes [b]	15,929
			Alfalfa hay	13,241
			Cherries, total	3219
			Nursery crops	595
			Pears [b]	472
			Plums and prunes [b]	180
			Apricots [b]	174
			Peaches [b]	149
			Nectarines [b]	106
			English walnuts	41
			Tart cherries	*
			Berries	*
			Sweet cherries	*
			Green peas	*

Table 29. Cropping information (potential for phosmet usage) for Washington counties where there is spawning and growth of the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Franklin	291,696	Alfalfa hay	70,943
			Irish potatoes	35,770
			Apples [b]	9000
			Grapes [b]	2813
			Nursery crops	1982
			Sweet cherries	1665
			Green peas	568
			Dry edible peas	528
			Tart cherries	500
			Peaches [b]	262
			Pears [b]	156
			Nectarines [b]	129
			Berries	87
			Apricots [b]	68
			Plums and prunes [b]	43
			English walnuts	*
WA	Kittitas	57,456	Alfalfa hay	8571
			Apples [b]	1859
			Irish potatoes	442
			Nursery crops	406
			Pears [b]	331
			Cut Christmas trees	23
			Peaches [b]	1
			Plums and prunes [b]	1
			Filberts and hazelnuts	1
			Sweet cherries	*
			Tart cherries	*

Table 29. Cropping information (potential for phosmet usage) for Washington counties where there is spawning and growth of the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Yakima	264,490	Apples [b]	75,264
			Alfalfa hay	33,833
			Grapes [b]	15,529
			Pears [b]	10,190
			Sweet cherries	5922
			Potatoes	1929
			Peaches [b]	1438
			Green peas	1201
			Nursery crops	1194
			Nectarines [b]	605
			Plums and prunes [b]	478
			Apricots [b]	285
			Tart cherries	206
			Berries	23
			English walnuts	11
			Filberts and hazelnuts	6
WA	Chelan	31,423	Apples [b]	17,096
			Pears [b]	8298
			Sweet cherries	3698
			Alfalfa hay	1210
			Nursery crops	94
			Apricots [b]	81
			Cut Christmas trees	42
			Nectarines [b]	22
			Peaches [b]	21
			Tart cherries	6
			Plums and prunes [b]	3
			Berries	1
			English walnuts	*

Table 29. Cropping information (potential for phosmet usage) for Washington counties where there is spawning and growth of the Upper Columbia River steelhead ESU				
State	county	cultivated acreage[a]	crop	crop acreage
WA	Douglas	217,703	Apples [b]	14,383
			Sweet cherries	1834
			Alfalfa hay	1763
			Pears [b]	1104
			Apricots [b]	315
			Peaches [b]	167
			Nectarines [b]	91
			Nursery crops	18
			Tart cherries	7
			Berries	*
WA	Okanogan	72,732	Apples	24,164
			Alfalfa hay	21,880
			Pears [b]	3280
			Sweet cherries	1001
			Nursery crops	116
			Peaches [b]	67
			Nectarines [b]	38
			English walnuts	29
			Cut Christmas trees	22
			Apricots [b]	13
			Filberts and hazelnuts	10
			Tart cherries	2
			Plums and prunes [b]	1
			Berries	*

Table 29. Cropping information (potential for phosmet usage) for Washington counties where there is spawning and growth of the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Grant	529,087	Alfalfa hay	115,509
			Irish potatoes	44,263
			Apples [b]	33,615
			Green peas	12,829
			Dry edible peas	4973
			Grapes [b]	3132
			Nursery crops	1562
			Pears [b]	998
			Apricots [b]	266
			Peaches [b]	261
			Nectarines [b]	163
			English walnuts	5
			Plums and prunes [b]	5
			Tart cherries	*
			Sweet cherries	*
			Filberts and hazelnuts	*
			Berries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Table 30. Cropping information (potential for phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Walla Walla	337,660	Alfalfa hay	11,787
			Green peas	10,962
			Irish potatoes	9256
			Dry edible peas	5696
			Apples [b]	5222
			Sweet cherries	280
			Plums and prunes [b]	22
			Berries	*
			Grapes [b]	*
WA	Klickitat	93,193	Alfalfa hay	28,434
			Pears [b]	923
			Apples [b]	516
			Tart cherries	457
			Grapes [b]	419
			Peaches [b]	199
			Apricots [b]	19
			Plums and prunes [b]	1
			Berries	1
			Sweet cherries	*
			English walnuts	*
			Irish potatoes	*
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*

Table 30. Cropping information (potential for phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and	87
			hazelnuts	85
			Tame blueberries	75
			Pears [b]	51
			English walnuts	46
			Peaches [b]	32
			Grapes [b]	33
			Apples [b]	10
			Plums and prunes [b]	3
			Tart cherries	*
			Sweet cherries	*
			Berries	
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas trees	16
			Apples [b]	14
			English walnuts	5
			Pears [b]	3
			Tart cherries	2
			Sweet cherries	1
			Filberts and	1
			hazelnuts	*
			Grapes [b]	*
			Tame blueberries	
WA	Wahkiakum	3515+	Alfalfa hay	0

Table 30. Cropping information (potential for phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas trees	17
			Apples [b]	*
			Cherries	*
			Grapes [b]	*
OR	Gilliam	100,729+	Alfalfa hay	2450
OR	Umatilla	384,163	Green peas	28,171
			Alfalfa hay	24,013
			Irish potatoes	15,003
			Apples [b]	3927
			Dry edible peas	3016
			Nursery	396
			Plums and prunes [b]	365
			Grapes [b]	163
			Apricots [b]	14
			Peaches [b]	7
			Pears [b]	4
			Nectarines [b]	*
			Nursery crops	*
			Sweet cherries	*
			Tart cherries	*
			Berries	*
OR	Sherman	127,018+	Alfalfa hay	230
			Nursery crops	95
OR	Morrow	220,149 +	Alfalfa hay	22,180
			Irish potatoes	17,030
			Green peas	729
			Apples [b]	*
			Berries	*
			Nursery crops	*

Table 30. Cropping information (potential for phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Wasco	97,230	Alfalfa hay	7239
			Apples [b]	463
			Pears [b]	385
			Grapes [b]	110
			Nursery crops	144
			Apricots [b]	32
			Peaches [b]	30
			Berries	8
			Plums and prunes [b]	*
			Cut Christmas trees	*
			Sweet cherries	*
OR	Hood River	17,346+	Pears [b]	11,788
			Apples [b]	2592
			Alfalfa hay	443
			Nursery crops	243
			Cut Christmas trees	161
			Grapes [b]	63
			Berries	35
			Tame blueberries	29
			Peaches [b]	13
			Sweet cherries	*

Table 30. Cropping information (potential for phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*
OR	Columbia	15,054+	Nursery crops	1660
			Alfalfa hay	421
			Cut Christmas trees	177
			Berries	110
			Tame blueberries	101
			Apples [b]	39
			Pears [b]	12
			English walnuts	11
			Grapes [b]	6
			Kiwifruit	2
			Plums and prunes [b]	2
			Peaches [b]	*
			Filberts and	*
			hazelnuts Sweet	*
			cherries	*
			Tart cherries	

Table 30. Cropping information (potential for phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Upper Columbia River Steelhead ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

7. Snake River Basin steelhead ESU

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

Spawning and early growth areas of this ESU consist of all areas upstream from the confluence of the Snake River and the Columbia River as far as fish passage is possible. Hells Canyon Dam on the Snake River and Dworshak Dam on the Clearwater River, along with Napias Creek Falls near Salmon, Idaho, are named as impassable barriers. These areas include the counties of Wallowa, Baker, Union, and Umatilla (northeastern part) in Oregon; Asotin, Garfield, Columbia, Whitman, Franklin, and Walla Walla in Washington; and Adams, Idaho, Nez Perce, Blaine, Custer, Lemhi, Boise, Valley, Lewis, Clearwater, and Latah in Idaho. We have excluded Baker County, Oregon, which has a tiny fragment of the Imnaha River watershed. While a small part of Rock Creek that 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 phosmet use in agricultural 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. However, crop areas of Umatilla County are considered in the migratory routes. In Idaho, Blaine and Boise counties technically have waters that are part of the steelhead ESU, but again, these are tiny areas which occur in the Sawtooth National Recreation Area and/or National Forest lands. The Agency has excluded these areas because they are not relevant to use of phosmet. The agricultural areas of Valley County, Idaho, appear to be primarily associated with the Payette River watershed, but there is enough of the Salmon River watershed in this county that we were not able to exclude it.

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

Tables 31 and 32 provide the cultivated acreage for the Pacific Northwest counties encompassing spawning and rearing habitat of the Snake River Basin steelhead ESU and for the Oregon and Washington counties where this ESU migrates.

Table 31. Cropping information (potential for phosmet usage) for Pacific Northwest counties which provide spawning and rearing habitat for the Snake River Basin steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Adams	16,779	Alfalfa hay	9223
			Nursery crops	8
			Apples [b]	*
ID	Idaho	147,557	Alfalfa hay	20,266
			Dry edible peas	1517
			Cut Christmas trees	20
			Apples [b]	6
			Pears [b]	2
			Plums and prunes [b]	2
			Sweet cherries	1
			Grapes [b]	1
			Berries	1
			Peaches [b]	*
			Filberts and hazelnuts	*

Table 31. Cropping information (potential for phosmet usage) for Pacific Northwest counties which provide spawning and rearing habitat for the Snake River Basin steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Nez Perce	168,365	Dry edible peas	25,659
			Alfalfa hay	6262
			Green peas	1816
			Peaches [b]	22
			Apples [b]	9
			Sweet cherries	4
			Tart cherries	1
			Apricots [b]	1
			Irish potatoes	*
			Nursery crops	*
ID	Custer	34,754	Alfalfa hay	24,467
			Irish potatoes	507
			Nursery crops	*
ID	Lemhi	41,837+	Alfalfa hay	28,143
			Sweet cherries	9
			Apples [b]	6
			Peaches [b]	3
			Pears [b]	2
			Apricots [b]	*
ID	Valley	6990+	Alfalfa hay	1599
			Irish potatoes	225
			Nursery crops	2
ID	Lewis	119,860	Dry edible peas	8434
			Alfalfa hay	3885
ID	Clearwater	24,266	Alfalfa hay	2640
			Dry edible peas	1369
			Nursery crops	336
			Cut Christmas trees	0

Table 31. Cropping information (potential for phosmet usage) for Pacific Northwest counties which provide spawning and rearing habitat for the Snake River Basin steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Latah	200,691	Dry edible peas	25,651
			Alfalfa hay	7202
			Cut Christmas trees	78
			Sweet cherries	19
			Apples [b]	3
			Berries	1
			Nursery crops	*
			Pears [b]	*
WA	Adams	392,556	Irish potatoes	27,914
			Alfalfa hay	22,350
			Apples [b]	3457
			Dry edible peas	2032
			Nursery crops	1331
			Pears [b]	*
			Grapes [b]	*
			Sweet cherries	*
WA	Asotin	32,892	Alfalfa hay	1648
			Apples [b]	24
			Peaches [b]	18
			Cherries [b]	17
			Pears [b]	6
			Apricots [b]	5
			Nursery crops	*
WA	Garfield	108,553	Alfalfa hay	802
WA	Columbia	97,743	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*

Table 31. Cropping information (potential for phosmet usage) for Pacific Northwest counties which provide spawning and rearing habitat for the Snake River Basin steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Whitman	804,893	Dry edible peas	84,356
			Alfalfa hay	6644
			Green peas	5589
			Nursery crops	980
			Apples [b]	19
			Cut Christmas trees	4
			Pears [b]	2
			Cherries	*
WA	Franklin	291,696	Alfalfa hay	70,943
			Irish potatoes	35,770
			Apples [b]	9000
			Grapes [b]	2813
			Nursery crops	1982
			Sweet cherries	1665
			Green peas	568
			Dry edible peas	528
			Tart cherries	500
			Peaches [b]	262
			Pears [b]	156
			Nectarines [b]	129
			Berries	87
			Apricots [b]	68
			Plums and prunes [b]	43
			English walnuts	*
WA	Walla Walla	337,660	Alfalfa hay	11,787
			Green peas	10,962
			Irish potatoes	9256
			Dry edible peas	5696
			Apples [b]	5222
			Sweet cherries	280
			Plums and prunes [b]	22
			Berries	*
			Grapes [b]	*

Table 31. Cropping information (potential for phosmet usage) for Pacific Northwest counties which provide spawning and rearing habitat for the Snake River Basin steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Wallowa	54,138	Alfalfa hay	18,253
			Apples [b]	19
			Nursery crops	6
			Peaches [b]	*
OR	Union	90.349	Alfalfa hay	25,818
			Irish potatoes	660
			Dry edible peas	390
			Apples [b]	39
			Cut Christmas trees	17
			Peaches [b]	12
			Cherries	*
			Apricots [b]	*
			Nursery crops	*
			Pears [b]	*
			Plums and prunes [b]	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Table 32. Cropping information (potential phosmet usage) for Washington and Oregon counties through which the Snake River Basin steelhead ESU migrates

State	county	cultivated acreage[a]	crop	crop acreage
WA	Benton	268,372	Irish potatoes	25,317
			Apples [b]	18,425
			Grapes [b]	15,929
			Alfalfa hay	13,241
			Cherries, total	3219
			Nursery crops	595
			Pears [b]	472
			Plums and prunes [b]	180
			Apricots [b]	174
			Peaches [b]	149
			Nectarines [b]	106
			English walnuts	41
			Tart cherries	*
			Berries	*
			Sweet cherries	*
			Green peas	*
WA	Klickitat	93,193	Alfalfa hay	28,434
			Pears [b]	923
			Apples [b]	516
			Tart cherries	457
			Grapes [b]	419
			Peaches [b]	199
			Apricots [b]	19
			Plums and prunes [b]	1
			Berries	1
			Sweet cherries	*
			English walnuts	*
			Irish potatoes	*
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*

Table 32. Cropping information (potential phosmet usage) for Washington and Oregon counties through which the Snake River Basin steelhead ESU migrates

State	county	cultivated acreage[a]	crop	crop acreage
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and	87
			hazelnuts	85
			Tame blueberries	75
			Pears [b]	51
			English walnuts	46
			Peaches [b]	32
			Grapes [b]	33
			Apples [b]	10
			Plums and prunes [b]	3
			Tart cherries	*
			Sweet cherries	*
			Berries	
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas trees	16
			Apples [b]	14
			English walnuts	5
			Pears [b]	3
			Tart cherries	2
			Sweet cherries	1
			Filberts and	1
			hazelnuts	*
			Grapes [b]	*
			Tame blueberries	
WA	Wahkiakum	3515+	Alfalfa hay	0

Table 32. Cropping information (potential phosmet usage) for Washington and Oregon counties through which the Snake River Basin steelhead ESU migrates

State	county	cultivated acreage[a]	crop	crop acreage
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas trees	17
			Apples [b]	*
			Cherries	*
			Grapes [b]	*
OR	Umatilla	384,163	Green peas	28,171
			Alfalfa hay	24,013
			Irish potatoes	15,003
			Apples [b]	3927
			Dry edible peas	3016
			Nursery	396
			Plums and prunes [b]	365
			Grapes [b]	163
			Apricots [b]	14
			Peaches [b]	7
			Pears [b]	4
			Nectarines [b]	*
			Nursery crops	*
			Sweet cherries	*
			Tart cherries	*
			Berries	*
OR	Morrow	220,149 +	Alfalfa hay	22,180
			Irish potatoes	17,030
			Green peas	729
			Apples [b]	*
			Berries	*
			Nursery crops	*
OR	Gilliam	100,729+	Alfalfa hay	2450
OR	Sherman	127,018+	Alfalfa hay	230
			Nursery crops	95

Table 32. Cropping information (potential phosmet usage) for Washington and Oregon counties through which the Snake River Basin steelhead ESU migrates

State	county	cultivated acreage[a]	crop	crop acreage
OR	Wasco	97,230	Alfalfa hay	7239
			Apples [b]	463
			Pears [b]	385
			Grapes [b]	110
			Nursery crops	144
			Apricots [b]	32
			Peaches [b]	30
			Berries	8
			Plums and prunes [b]	*
			Cut Christmas trees	*
			Sweet cherries	*
OR	Hood River	17,346+	Pears [b]	11,788
			Apples [b]	2592
			Alfalfa hay	443
			Nursery crops	243
			Cut Christmas trees	161
			Grapes [b]	63
			Berries	35
			Tame blueberries	29
			Peaches [b]	13
			Sweet cherries	*

Table 32. Cropping information (potential phosmet usage) for Washington and Oregon counties through which the Snake River Basin steelhead ESU migrates

State	county	cultivated acreage[a]	crop	crop acreage
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Snake River

Basin Steelhead ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

8 Upper Willamette River steelhead ESU

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

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

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

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

Tables 33 and 34 show the cultivated acreage, including potential phosmet crop uses, for Oregon counties where the Upper Willamette River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates.

Table 33. Cropping information (potential phosmet usage) for Oregon counties in the spawning and rearing habitat of the Upper Willamette River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Benton	69,214	Cut Christmas trees	1983
			Alfalfa hay	570
			Filberts and hazelnuts	493
			Grapes [b]	242
			Nursery crops	149
			Berries	132
			Tame blueberries	109
			Apples [b]	62
			English walnuts	23
			cherries	18
			Sweet cherries	14
			Peaches [b]	8
			Kiwifruit	7
			Pears [b]	7
			Plums and prunes [b]	5
			Tart cherries	4
			Irish potatoes	3
			Green peas	1
OR	Linn	248,392	Alfalfa hay	2507
			Filberts and hazelnuts	1820
			Berries	535
			Cut Christmas trees	292
			Nursery crops	155
			Apples [b]	133
			Grapes [b]	93
			Peaches [b]	73
			English walnuts	55
			Tart cherries	35
			Pears [b]	26
			Plums and prunes [b]	14
			Nectarines [b]	3
			Kiwifruit	3
			Sweet cherries	*

Table 33. Cropping information (potential phosmet usage) for Oregon counties in the spawning and rearing habitat of the Upper Willamette River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Polk	89,599	Filberts and hazelnuts	2394
			Sweet cherries	1484
			Grapes [b]	1123
			Alfalfa hay	774
			Cut Christmas trees	644
			Plums and prunes [b]	595
			Berries	410
			Tart cherries	404
			Apples [b]	157
			Peaches [b]	51
			Pears [b]	63
			English walnuts	33
			Tame blueberries	21
			Green peas	*
			Nursery crops	*
OR	Clackamas	59,923	Nursery crops	10,503
			Cut Christmas trees	7532
			Filberts and hazelnuts	3994
			Berries	3414
			Alfalfa hay	1072
			Tame blueberries	334
			Grapes [b]	207
			Apples [b]	167
			Green peas	104
			Peaches [b]	78
			cherries	53
			English walnuts	51
			Plums and prunes [b]	37
			Pears [b]	37
			Sweet cherries	30
			Tart cherries	23
			Kiwifruit	20
			Irish potatoes	1

Table 33. Cropping information (potential phosmet usage) for Oregon counties in the spawning and rearing habitat of the Upper Willamette River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Marion	202,353	Nursery crops	7090
			Filberts and hazelnuts	7061
			Cut Christmas trees	3712
			Sweet cherries	1459
			Alfalfa hay	1315
			Grapes [b]	761
			Green peas	686
			Apples [b]	555
			Tame blueberries	545
			Peaches [b]	179
			English walnuts	155
			Pears [b]	150
			Plums and prunes [b]	145
			Tart cherries	108
			Kiwifruit	31
			Irish potatoes	*
			Nectarines [b]	*
			Berries	*
OR	Yamhill	95,440	Filberts and hazelnuts	7110
			Nursery crops	3444
			Grapes [b]	2887
			Alfalfa hay	2294
			Sweet cherries	1140
			Berries	1064
			English walnuts	608
			Cut Christmas trees	556
			Tart cherries	553
			Plums and prunes [b]	369
			Tame blueberries	324
			Apples [b]	310
			Peaches [b]	104
			Pears [b]	54
			Kiwifruit	15
			Irish potatoes	1
			Nectarines [b]	*

Table 33. Cropping information (potential phosmet usage) for Oregon counties in the spawning and rearing habitat of the Upper Willamette River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Washington	85,190	Filberts and hazelnuts	5595
			Berries	4140
			Nursery crops	4130
			Alfalfa hay	1680
			Cut Christmas trees	1411
			Grapes [b]	989
			Green peas	840
			English walnuts	679
			Plums and prunes [b]	358
			Apples [b]	279
			Peaches [b]	168
			Sweet cherries	141
			Tart cherries	70
			Pears [b]	69
			Kiwifruit	*
			Irish potatoes	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Table 34. Cropping information (potential phosmet usage) in Oregon and Washington counties that are part of the migration corridors of the Upper Willamette River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and hazelnuts	87
			Tame blueberries	85
			Pears [b]	75
			English walnuts	51
			Peaches [b]	46
			Grapes [b]	32
			Apples [b]	33
			Plums and prunes [b]	10
			Tart cherries	3
			Sweet cherries	*
			Berries	*
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas trees	16
			Apples [b]	14
			English walnuts	5
			Pears [b]	3
			Tart cherries	2
			Sweet cherries	1
			Filberts and hazelnuts	1
			Grapes [b]	*
			Tame blueberries	*
WA	Wahkiakum	3515+	Alfalfa hay	0
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas trees	17
			Apples [b]	*
			Cherries	*
			Grapes [b]	*

Table 34. Cropping information (potential phosmet usage) in Oregon and Washington counties that are part of the migration corridors of the Upper Willamette River steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Upper Columbia

River Steelhead ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

9. Lower Columbia River steelhead ESU

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

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

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

Tables 35 and 36 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.

Table 35. Cropping information (potential phosmet usage) in Oregon and Washington counties that provide spawning and rearing habitat for the Lower Columbia River Steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Hood River	17,346+	Pears [b]	11,788
			Apples [b]	2592
			Alfalfa hay	443
			Nursery crops	243
			Cut Christmas trees	161
			Grapes [b]	63
			Berries	35
			Tame blueberries	29
			Peaches [b]	13
			Sweet cherries	*
OR	Clackamas	59,923	Nursery crops	10,503
			Cut Christmas trees	7532
			Filberts and hazelnuts	3994
			Berries	3414
			Alfalfa hay	1072
			Tame blueberries	334
			Grapes [b]	207
			Apples [b]	167
			Green peas	104
			Peaches [b]	78
			cherries	53
			English walnuts	51
			Plums and prunes [b]	37
			Pears [b]	37
			Sweet cherries	30
			Tart cherries	23
			Kiwifruit	20
			Irish potatoes	1

Table 35. Cropping information (potential phosmet usage) in Oregon and Washington counties that provide spawning and rearing habitat for the Lower Columbia River Steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and hazelnuts	87
			Tame blueberries	85
			Pears [b]	75
			English walnuts	51
			Peaches [b]	46
			Grapes [b]	32
			Apples [b]	33
			Plums and prunes [b]	10
			Tart cherries	3
			Sweet cherries	*
			Berries	*

Table 35. Cropping information (potential phosmet usage) in Oregon and Washington counties that provide spawning and rearing habitat for the Lower Columbia River Steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Lewis	29,569	Cut Christmas trees	4042
			Green peas	1635
			Alfalfa hay	937
			Nursery crops	485
			Berries	184
			Tame blueberries	137
			Filberts and hazelnuts	25
			Other nuts	14
			Apples [b]	14
			English walnuts	5
			Grapes [b]	4
			Tart cherries	3
			Plums and prunes [b]	3
			Pears [b]	3
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas trees	16
			Apples [b]	14
			English walnuts	5
			Pears [b]	3
			Tart cherries	2
			Sweet cherries	1
			Filberts and hazelnuts	1
			Grapes [b]	*
			Tame blueberries	*
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts

for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho
[b] Time limited registration of 5 years
* USDA withheld acreage data because county acreage is limited to one or only a few farms

Table 36. Cropping information (potential phosmet usage) in Oregon and Washington counties that are migratory corridors for the Lower Columbia River Steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas trees	17
			Apples [b]	*
			Cherries	*
			Grapes [b]	*
WA	Wahkiakum	3515+	Alfalfa hay	0

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho
[b] Time limited registration of 5 years
* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Lower Columbia River Steelhead ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

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. We are unsure of the status of these Dog and Collins creeks.

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. Similarly, the Umatilla River and Walla Walla River get barely into Union County OR, and the Walla Walla River even gets into a tiny piece of Wallowa County, Oregon. But again, these are high elevation areas where crops are not grown, and we have excluded these counties for this analysis.

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

Tables 37 and 38 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.

Table 37. Cropping information (potential phosmet usage) in Oregon and Washington counties that provide spawning and rearing habitat for the Middle Columbia River Steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Gilliam	100,729+	Alfalfa hay	2450
OR	Morrow	220,149 +	Alfalfa hay	22,180
			Irish potatoes	17,030
			Green peas	729
			Apples [b]	*
			Berries	*
			Nursery crops	*
OR	Umatilla	384,163	Green peas	28,171
			Alfalfa hay	24,013
			Irish potatoes	15,003
			Apples [b]	3927
			Dry edible peas	3016
			Nursery	396
			Plums and prunes [b]	365
			Grapes [b]	163
			Apricots [b]	14
			Peaches [b]	7
			Pears [b]	4
			Nectarines [b]	*
			Nursery crops	*
			Sweet cherries	*
			Tart cherries	*
			Berries	*
OR	Sherman	127,018+	Alfalfa hay	230
			Nursery crops	95

Table 37. Cropping information (potential phosmet usage) in Oregon and Washington counties that provide spawning and rearing habitat for the Middle Columbia River Steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Wasco	97,230	Alfalfa hay	7239
			Apples [b]	463
			Pears [b]	385
			Grapes [b]	110
			Nursery crops	144
			Apricots [b]	32
			Peaches [b]	30
			Berries	8
			Plums and prunes [b]	*
			Cut Christmas trees	*
			Sweet cherries	*
OR	Crook	35,824	Alfalfa hay	14,023
			Nursery crops	261
OR	Grant	46,399	Apricots [b]	19
			Nursery	*
			Apples [b]	*
			Pears [b]	*
OR	Wheeler	15,523	Alfalfa hay	5494
			Apples [b]	23
			Nursery	0
OR	Jefferson	44,873	Alfalfa hay	10,944
			Nursery	3897
			Irish potatoes	973
			Apples [b]	4

Table 37. Cropping information (potential phosmet usage) in Oregon and Washington counties that provide spawning and rearing habitat for the Middle Columbia River Steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Benton	268,372	Irish potatoes	25,317
			Apples [b]	18,425
			Grapes [b]	15,929
			Alfalfa hay	13,241
			Cherries, total	3219
			Nursery crops	595
			Pears [b]	472
			Plums and prunes [b]	180
			Apricots [b]	174
			Peaches [b]	149
			Nectarines [b]	106
			English walnuts	41
			Tart cherries	*
			Berries	*
			Sweet cherries	*
			Green peas	*
WA	Columbia	97,743	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
WA	Franklin	291,696	Alfalfa hay	70,943
			Irish potatoes	35,770
			Apples [b]	9000
			Grapes [b]	2813
			Nursery crops	1982
			Sweet cherries	1665
			Green peas	568
			Dry edible peas	528
			Tart cherries	500
			Peaches [b]	262
			Pears [b]	156
			Nectarines [b]	129
			Berries	87
			Apricots [b]	68
			Plums and prunes [b]	43
			English walnuts	*

Table 37. Cropping information (potential phosmet usage) in Oregon and Washington counties that provide spawning and rearing habitat for the Middle Columbia River Steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Kittitas	57,456	Alfalfa hay	8571
			Apples [b]	1859
			Irish potatoes	442
			Nursery crops	406
			Pears [b]	331
			Cut Christmas trees	23
			Peaches [b]	1
			Plums and prunes [b]	1
			Filberts and	1
			hazelnuts	*
			Sweet cherries	*
			Tart cherries	
WA	Klickitat	93,193	Alfalfa hay	28,434
			Pears [b]	923
			Apples [b]	516
			Tart cherries	457
			Grapes [b]	419
			Peaches [b]	199
			Apricots [b]	19
			Plums and prunes [b]	1
			Berries	1
			Sweet cherries	*
			English walnuts	*
			Irish potatoes	*
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*

Table 37. Cropping information (potential phosmet usage) in Oregon and Washington counties that provide spawning and rearing habitat for the Middle Columbia River Steelhead ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Walla Walla	337,660	Alfalfa hay	11,787
			Green peas	10,962
			Irish potatoes	9256
			Dry edible peas	5696
			Apples [b]	5222
			Sweet cherries	280
			Plums and prunes [b]	22
			Berries	*
			Grapes [b]	*
WA	Yakima	264,490	Apples [b]	75,264
			Alfalfa hay	33,833
			Grapes [b]	15,529
			Pears [b]	10,190
			Sweet cherries	5922
			Potatoes	1929
			Peaches [b]	1438
			Green peas	1201
			Nursery crops	1194
			Nectarines [b]	605
			Plums and prunes [b]	478
			Apricots [b]	285
			Tart cherries	206
			Berries	23
			English walnuts	11
			Filberts and hazelnuts	6

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Table 38. Cropping information (potential phosmet usage) in Washington and Oregon counties through which the Middle Columbia River steelhead ESU migrates

State	county	cultivated acreage[a]	crop	crop acreage
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and hazelnuts	87
			Tame blueberries	85
			Pears [b]	75
			English walnuts	51
			Peaches [b]	46
			Grapes [b]	32
			Apples [b]	33
			Plums and prunes [b]	10
			Tart cherries	3
			Sweet cherries	*
			Berries	*
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas trees	16
			Apples [b]	14
			English walnuts	5
			Pears [b]	3
			Tart cherries	2
			Sweet cherries	1
			Filberts and hazelnuts	1
			Grapes [b]	*
			Tame blueberries	*

Table 38. Cropping information (potential phosmet usage) in Washington and Oregon counties through which the Middle Columbia River steelhead ESU migrates

State	county	cultivated acreage[a]	crop	crop acreage
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas trees	17
			Apples [b]	*
			Cherries	*
			Grapes [b]	*
WA	Wahkiakum	3515+	Alfalfa hay	0
OR	Hood River	17,346+	Pears [b]	11,788
			Apples [b]	2592
			Alfalfa hay	443
			Nursery crops	243
			Cut Christmas trees	161
			Grapes [b]	63
			Berries	35
			Tame blueberries	29
			Peaches [b]	13
			Sweet cherries	*
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*

Table 38. Cropping information (potential phosmet usage) in Washington and Oregon counties through which the Middle Columbia River steelhead ESU migrates				
State	county	cultivated acreage[a]	crop	crop acreage
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity date, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Middle Columbia River Steelhead ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

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 are excluded (58FR33212-33219, June 16, 1993).

Use of phosmet in this ESU in 2001 is presented in Table 39.

Table 39. Use of phosmet 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	Usage (pounds)	Acres treated
Alameda	structural pest control	0.4	nr
Amador	alfalfa	44	126
Butte	alfalfa	557	795
	almond	423	148
	apple	1,209	301
	nectarine	7	3
	peach	170	60
	pear	28	7
	walnut	10,901	2558
Colusa	alfalfa	188	268
	walnut	147	35
Contra Costa	alfalfa	45	95
	apple	5207	1489
	apricot	86	29
	grape	27	19
	peach	51	17
	pear	8	8
	uncultivated ag	1	1
	walnut	6	2
Glenn	alfalfa	2485	3590
	almond	2936	975
	walnut	1590	476
Marin	none	0	0
Sacramento	alfalfa	296	420
	apple	851	245
	pear	6885	1756
San Joaquin	alfalfa	306	460
	almond	161	96
	apple	6566	2354
	apricot	4	2
	cherry	65	21
	grape	381	418
	peach	641	234
	pear	206	78
	walnut	1867	708
San Francisco	none	0	0
San Mateo	outdoor container plants	4	nr

Table 39. Use of phosmet 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	Usage (pounds)	Acres treated
Shasta	apple	247	46
	grape	<1	<1
	peach	<1	<1
	walnut	109	78
Solano	alfalfa	837	1574
	pear	71	18
	walnut	13	21
Sonoma	apple	11,525	3640
	grape	16	11
	outdoor flowers	18	5
	pear	120	52
	walnut	4	3
Tehama	alfalfa	408	623
	almond	521	577
	apple	7	9
	prune	17	24
	walnut	4804	2665
Yolo	alfalfa	2412	3650
	apple	29	8
	pear	392	92
	research commodity	11	nr
	walnut	3000	825

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the existence of protections provided by the bulletins developed by California DPR, I conclude that there will be no effect of phosmet on 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. We have not included these counties here; however, we would note that the Middle Columbia River steelhead ESU encompasses these basins, and crop information is presented in that section of this analysis.

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

Tables 40 and 41 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.

Table 40. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River fall-run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Adams	16,779	Alfalfa hay	9223
			Nursery crops	8
			Apples [b]	*

Table 40. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River fall-run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Idaho	147,557	Alfalfa hay	20,266
			Dry edible peas	1517
			Cut Christmas	20
			trees	6
			Apples [b]	2
			Pears [b]	2
			Plums and prunes [b]	1
			Sweet cherries	1
			Grapes [b]	1
			Berries	*
			Peaches [b]	*
			Filberts and hazelnuts	
ID	Nez Perce	168,365	Dry edible peas	25,659
			Alfalfa hay	6262
			Green peas	1816
			Peaches [b]	22
			Apples [b]	9
			Sweet cherries	4
			Tart cherries	1
			Apricots [b]	1
			Irish potatoes	*
			Nursery crops	*
ID	Valley	6990+	Alfalfa hay	1599
			Irish potatoes	225
			Nursery crops	2
ID	Lewis	119,860	Dry edible peas	8434
			Alfalfa hay	3885
ID	Benewah	59,294	Alfalfa hay	983
			Dry edible peas	370
			Nursery crops	149
			Cut Christmas	56
			trees Apples [b]	6
ID	Shoshone	459+	Alfalfa hay	167
			Nursery crops	0

Table 40. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River fall-run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Clearwater	24,266	Alfalfa hay	2640
			Dry edible peas	1369
			Nursery crops	336
			Cut Christmas trees	0
ID	Latah	200,691	Dry edible peas	25,651
			Alfalfa hay	7202
			Cut Christmas trees	78
			Sweet cherries	19
			Apples [b]	3
			Berries	1
			Nursery crops	*
			Pears [b]	*
WA	Adams	392,556	Irish potatoes	27,914
			Alfalfa hay	22,350
			Apples [b]	3457
			Dry edible peas	2032
			Nursery crops	1331
			Pears [b]	*
			Grapes [b]	*
			Sweet cherries	*
WA	Lincoln	471,220	Alfalfa hay	15,972
			Dry edible peas	1148
			Irish potatoes	771
			Tart cherries	1
			Sweet cherries	*
			Apples [b]	*

Table 40. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River fall-run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Spokane	297,722	Alfalfa hay	35,493
			Dry edible peas	19,596
			Nursery crops	301
			Apples [b]	227
			Cut Christmas trees	98
			Berries	48
			Sweet cherries	47
			Peaches [b]	42
			Pears [b]	24
			Apricots [b]	11
			Tart Cherries	3
			Grapes [b]	3
			Plums and prunes [b]	1
			Irish potatoes	*
			Green peas	*
WA	Asotin	32,892	Alfalfa hay	1648
			Apples [b]	24
			Peaches [b]	18
			Cherries [b]	17
			Pears [b]	6
			Apricots [b]	5
			Nursery crops	*
WA	Garfield	108,553	Alfalfa hay	802
WA	Columbia	97,743	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
WA	Whitman	804,893	Dry edible peas	84,356
			Alfalfa hay	6644
			Green peas	5589
			Nursery crops	980
			Apples [b]	19
			Cut Christmas trees	4
			Pears [b]	2
			Cherries	*

Table 40. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River fall-run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Franklin	291,696	Alfalfa hay	70,943
			Irish potatoes	35,770
			Apples [b]	9000
			Grapes [b]	2813
			Nursery crops	1982
			Sweet cherries	1665
			Green peas	568
			Dry edible peas	528
			Tart cherries	500
			Peaches [b]	262
			Pears [b]	156
			Nectarines [b]	129
			Berries	87
			Apricots [b]	68
			Plums and prunes [b]	43
			English walnuts	*
WA	Walla Walla	337,660	Alfalfa hay	11,787
			Green peas	10,962
			Irish potatoes	9256
			Dry edible peas	5696
			Apples [b]	5222
			Sweet cherries	280
			Plums and prunes [b]	22
			Berries	*
			Grapes [b]	*
OR	Wallowa	54,138	Alfalfa hay	18,253
			Apples [b]	19
			Nursery crops	6
			Peaches [b]	*

Table 40. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River fall-run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Union	90.349	Alfalfa hay	25,818
			Irish potatoes	660
			Dry edible peas	390
			Apples [b]	39
			Cut Christmas trees	17
			Peaches [b]	12
			Cherries	*
			Apricots [b]	*
			Nursery crops	*
			Pears [b]	*
			Plums and prunes [b]	*
OR	Wasco	97,230	Alfalfa hay	7239
			Apples [b]	463
			Pears [b]	385
			Grapes [b]	110
			Nursery crops	144
			Apricots [b]	32
			Peaches [b]	30
			Berries	8
			Plums and prunes [b]	*
			Cut Christmas trees	*
				*
			Sweet cherries	
OR	Jefferson	44,873	Alfalfa hay	10,944
			Nursery	3897
			Irish potatoes	973
			Apples [b]	4
OR	Sherman	127,018+	Alfalfa hay	230
			Nursery crops	95
OR	Gilliam	100,729+	Alfalfa hay	2450
OR	Wheeler	15,523	Alfalfa hay	5494
			Apples [b]	23
			Nursery	0

Table 40. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River fall-run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Morrow	220,149 +	Alfalfa hay	22,180
			Irish potatoes	17,030
			Green peas	729
			Apples [b]	*
			Berries	*
			Nursery crops	*
OR	Grant	46,399	Apricots [b]	19
			Nursery	*
			Apples [b]	*
			Pears [b]	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Table 41. Cropping information (potential phosmet usage) in Washington and Oregon counties through which the Snake River fall-run chinook and the Snake River spring/summer-run chinook ESUs migrate

State	county	cultivated acreage[a]	crop	crop acreage
WA	Benton	268,372	Irish potatoes	25,317
			Apples [b]	18,425
			Grapes [b]	15,929
			Alfalfa hay	13,241
			Cherries, total	3219
			Nursery crops	595
			Pears [b]	472
			Plums and prunes [b]	180
				174
			Apricots [b]	149
			Peaches [b]	106
			Nectarines [b]	41
			English walnuts	*
			Tart cherries	*
			Berries	*
			Sweet cherries	*
			Green peas	
WA	Klickitat	93,193	Alfalfa hay	28,434
			Pears [b]	923
			Apples [b]	516
			Tart cherries	457
			Grapes [b]	419
			Peaches [b]	199
			Apricots [b]	19
			Plums and prunes [b]	1
				1
			Berries	*
			Sweet cherries	*
			English walnuts	*
			Irish potatoes	

Table 41. Cropping information (potential phosmet usage) in Washington and Oregon counties through which the Snake River fall-run chinook and the Snake River spring/summer-run chinook ESUs migrate

State	county	cultivated acreage[a]	crop	crop acreage
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and hazelnuts	87
			Tame blueberries	85
			Pears [b]	75
			English walnuts	51
			Peaches [b]	46
			Grapes [b]	32
			Apples [b]	33
			Plums and prunes [b]	10
			Tart cherries	3
			Sweet cherries	*
			Berries	*

Table 41. Cropping information (potential phosmet usage) in Washington and Oregon counties through which the Snake River fall-run chinook and the Snake River spring/summer-run chinook ESUs migrate

State	county	cultivated acreage[a]	crop	crop acreage
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas	16
			trees	14
			Apples [b]	5
			English walnuts	3
			Pears [b]	2
			Tart cherries	1
			Sweet cherries	1
			Filberts and	*
			hazelnuts	*
			Grapes [b]	
			Tame blueberries	
WA	Wahkiakum	3515+	Alfalfa hay	0
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas	17
			trees	*
			Apples [b]	*
			Cherries	*
			Grapes [b]	

Table 41. Cropping information (potential phosmet usage) in Washington and Oregon counties through which the Snake River fall-run chinook and the Snake River spring/summer-run chinook ESUs migrate

State	county	cultivated acreage[a]	crop	crop acreage
OR	Umatilla	384,163	Green peas	28,171
			Alfalfa hay	24,013
			Irish potatoes	15,003
			Apples [b]	3927
			Dry edible peas	3016
			Nursery	396
			Plums and prunes [b]	365
				163
			Grapes [b]	14
			Apricots [b]	7
			Peaches [b]	4
			Pears [b]	*
			Nectarines [b]	*
			Nursery crops	*
			Sweet cherries	*
			Tart cherries	*
			Berries	
OR	Morrow	220,149 +	Alfalfa hay	22,180
			Irish potatoes	17,030
			Green peas	729
			Apples [b]	*
			Berries	*
			Nursery crops	*
OR	Gilliam	100,729+	Alfalfa hay	2450
OR	Sherman	127,018+	Alfalfa hay	230
			Nursery crops	95

Table 41. Cropping information (potential phosmet usage) in Washington and Oregon counties through which the Snake River fall-run chinook and the Snake River spring/summer-run chinook ESUs migrate

State	county	cultivated acreage[a]	crop	crop acreage
OR	Wasco	97,230	Alfalfa hay	7239
			Apples [b]	463
			Pears [b]	385
			Grapes [b]	110
			Nursery crops	144
			Apricots [b]	32
			Peaches [b]	30
			Berries	8
			Plums and prunes [b]	*
				*
			Cut Christmas trees	*
			Sweet cherries	
OR	Hood River	17,346+	Pears [b]	11,788
			Apples [b]	2592
			Alfalfa hay	443
			Nursery crops	243
			Cut Christmas trees	161
			Grapes [b]	63
			Berries	35
			Tame blueberries	29
			Peaches [b]	13
			Sweet cherries	*

Table 41. Cropping information (potential phosmet usage) in Washington and Oregon counties through which the Snake River fall-run chinook and the Snake River spring/summer-run chinook ESUs migrate

State	county	cultivated acreage[a]	crop	crop acreage
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas	166
			trees	62
			Tame blueberries	51
			Apples [b]	36
			Peaches [b]	28
			Grapes [b]	25
			Pears [b]	4
			Sweet cherries	3
			Tart cherries	3
			Plums and prunes [b]	2
				*
			English walnuts	*
			Other nuts	
			Berries	
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
OR	Clatsop	4772	Berries	34
			Cut Christmas	25
			trees	3
			Nursery crops	*
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Snake River Fall-run Chinook Salmon ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

3. Snake River Spring/Summer-run Chinook Salmon

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

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

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

Table 42 shows the cropping information for Oregon and Washington counties where the Snake River spring/summer-run chinook salmon ESU occurs. The cropping information for the migratory corridors is the same as for the Snake River fall-run chinook salmon (Table 41).

Table 42. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River spring/summer run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Adams	16,779	Alfalfa hay	9223
			Nursery crops	8
			Apples [b]	*
ID	Idaho	147,557	Alfalfa hay	20,266
			Dry edible peas	1517
			Cut Christmas trees	20
			Apples [b]	6
			Pears [b]	2
			Plums and prunes [b]	2
			Sweet cherries	1
			Grapes [b]	1
			Berries	1
			Peaches [b]	*
			Filberts and hazelnuts	*
ID	Nez Perce	168,365	Dry edible peas	25,659
			Alfalfa hay	6262
			Green peas	1816
			Peaches [b]	22
			Apples [b]	9
			Sweet cherries	4
			Tart cherries	1
			Apricots [b]	1
			Irish potatoes	*
			Nursery crops	*
ID	Custer	34,754	Alfalfa hay	24,467
			Irish potatoes	507
			Nursery crops	*
ID	Lemhi	41,837+	Alfalfa hay	28,143
			Sweet cherries	9
			Apples [b]	6
			Peaches [b]	3
			Pears [b]	2
			Apricots [b]	*

Table 42. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River spring/summer run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Valley	6990+	Alfalfa hay	1599
			Irish potatoes	225
			Nursery crops	2
ID	Lewis	119,860	Dry edible peas	8434
			Alfalfa hay	3885
ID	Latah	200,691	Dry edible peas	25,651
			Alfalfa hay	7202
			Cut Christmas trees	78
			Sweet cherries	19
			Apples [b]	3
			Berries	1
			Nursery crops	*
			Pears [b]	*
WA	Asotin	32,892	Alfalfa hay	1648
			Apples [b]	24
			Peaches [b]	18
			Cherries [b]	17
			Pears [b]	6
			Apricots [b]	5
			Nursery crops	*
WA	Garfield	108,553	Alfalfa hay	802
WA	Columbia	97,743	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
WA	Whitman	804,893	Dry edible peas	84,356
			Alfalfa hay	6644
			Green peas	5589
			Nursery crops	980
			Apples [b]	19
			Cut Christmas trees	4
			Pears [b]	2
			Cherries	*

Table 42. Cropping information (potential phosmet usage) in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River spring/summer run chinook ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Franklin	291,696	Alfalfa hay	70,943
			Irish potatoes	35,770
			Apples [b]	9000
			Grapes [b]	2813
			Nursery crops	1982
			Sweet cherries	1665
			Green peas	568
			Dry edible peas	528
			Tart cherries	500
			Peaches [b]	262
			Pears [b]	156
			Nectarines [b]	129
			Berries	87
			Apricots [b]	68
			Plums and prunes [b]	43
			English walnuts	*
OR	Wallowa	54,138	Alfalfa hay	18,253
			Apples [b]	19
			Nursery crops	6
			Peaches [b]	*
OR	Union	90.349	Alfalfa hay	25,818
			Irish potatoes	660
			Dry edible peas	390
			Apples [b]	39
			Cut Christmas trees	17
			Peaches [b]	12
			Cherries	*
			Apricots [b]	*
			Nursery crops	*
			Pears [b]	*
			Plums and prunes [b]	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Snake River Spring/Summer-run Chinook Salmon ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

4. Central Valley Spring-run Chinook Salmon ESU

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

Hydrologic units and upstream barriers within this ESU are the Sacramento-Lower Cow-Lower Clear, Lower Cottonwood, Sacramento-Lower 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 said to be in the counties of Shasta, Tehama, Butte, Glenn, Colusa, Sutter, Yolo, Yuba, Placer, Sacramento, Solano, Nevada, Contra Costa, Napa, Alameda, Marin, Sonoma, San Mateo, and San Francisco. However, with San Mateo County being well south of the Oakland Bay Bridge, it is difficult to see why this county was included.

Table 43 contains usage information for the California counties supporting the Central Valley spring-run chinook salmon ESU.

Table 43. Use of phosmet in counties with the Central Valley spring run chinook salmon ESU.

County	Crop	Usage (pounds)	Acres treated
Alameda	structural pest control	0.4	nr
Butte	alfalfa	557	795
	almond	423	148
	apple	1,209	301
	nectarine	7	3
	peach	170	60
	pear	28	7
	walnut	10,901	2558
Colusa	alfalfa	188	268
	walnut	147	35

Table 43. Use of phosmet in counties with the Central Valley spring run chinook salmon ESU.			
County	Crop	Usage (pounds)	Acres treated
Contra Costa	alfalfa	45	95
	apple	5207	1489
	apricot	86	29
	grape	27	19
	peach	51	17
	pear	8	8
	uncultivated ag	1	1
	walnut	6	2
Glenn	alfalfa	2485	3590
	almond	2936	975
	walnut	1590	476
Marin	none	0	0
Napa	grape	7	8
Nevada	apple	39	35
Placer	apple	236	79
	cherry	1	nr
	kiwi	4	3
	outdoor container plants	13	5
	peach	29	24
	pear	152	96
	plum	2	4
Sacramento	alfalfa	296	420
	apple	851	245
	pear	6885	1756
San Francisco	none	0	0
San Mateo	outdoor container plants	4	nr
Shasta	apple	247	46
	grape	<1	<1
	peach	<1	<1
	walnut	109	78
Solano	alfalfa	837	1574
	pear	71	18
	walnut	13	21
Sonoma	apple	11,525	3640
	grape	16	11
	outdoor flowers	18	5
	pear	120	52
	walnut	4	3

Table 43. Use of phosmet in counties with the Central Valley spring run chinook salmon ESU.			
County	Crop	Usage (pounds)	Acres treated
Sutter	almond	45	12
	apple	2090	571
	peach	1710	670
	pear	2351	561
	walnut	5970	1593
Tehama	alfalfa	408	623
	almond	521	577
	apple	7	9
	prune	17	24
	walnut	4804	2665
Yolo	alfalfa	2412	3650
	apple	29	8
	pear	392	92
	research commodity	11	nr
	walnut	3000	825
Yuba	apple	1198	359
	peach	1860	680
	pear	6300	1515
	walnut	11,176	2848

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the existence of protections provided by the bulletins developed by California DPR, I conclude that there will be no effect of phosmet on 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 phosmet could be used are Humboldt, Trinity, Mendocino, Lake, Sonoma, and Marin. A small portion of Glenn County is also included in the Critical Habitat, but phosmet would not likely be used in the forested upper elevation areas.

Table 44 contains usage information for the California counties supporting the California coastal chinook salmon ESU.

Table 44. Use of phosmet in counties with the California coastal chinook salmon ESU.

County	Crop	Usage (pounds)	Acres treated
Humboldt	none	0	0
Mendocino	apple	160	47
	grape	46	63
	pear	1500	327
Sonoma	apple	11,525	3640
	grape	16	11
	outdoor flowers	18	5
	pear	120	52
	walnut	4	3
Marin	none	0	0
Trinity	none	0	0
Lake	alfalfa	12	20
	pear	1362	330
	walnut	76	18

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the existence of protections provided by the bulletins developed by California DPR, I conclude that there will be no effect of phosmet on 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.

Table 45 shows the cropping information for Washington counties where the Puget Sound chinook salmon ESU is located.

Table 45. Cropping information (potential phosmet usage) in Washington counties within the Critical Habitat of the Puget Sound chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Skagit	57,978	Green peas	10,908
			Irish potatoes	6948
			Nursery crops	4154
			Alfalfa hay	782
			Apples [b]	357
			Cut Christmas trees	63
			Filberts and hazelnuts	12
			Pears [b]	5
			Sweet cherries	*
			Grapes [b]	*
			Berries	*
WA	Whatcom	65,679	Irish potatoes	1585
			Alfalfa hay	708
			Tame blueberries	482
			Nursery crops	396
			Filberts and hazelnuts	206
			Cut Christmas trees	157
			Pears [b]	15
			Grapes [b]	10
			Cherries	4
			Kiwifruit	2
			English walnuts	1
			Green peas	*
			Plums and prunes [b]	*

Table 45. Cropping information (potential phosmet usage) in Washington counties within the Critical Habitat of the Puget Sound chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	San Juan	4057	Alfalfa hay	170
			Apples [b]	64
			Grapes [b]	13
			Pears [b]	5
			Berries	4
			Green peas	3
			Plums and prunes [b]	2
			Filberts and hazelnuts	1
			Peaches [b]	1
			Cherries	1
			Irish potatoes	1
			Nursery crops	*
WA	Island	9764	Alfalfa hay	2100
			Nursery crops	171
			Berries	33
			Cut Christmas trees	27
			apples [b]	18
			Grapes [b]	14
			Pears [b]	1
			Tame blueberries	*
			Green peas	*
WA	Snohomish	28,836	Green peas	3361
			Nursery crops	924
			Alfalfa hay	235
			Cut Christmas trees	82
			Apples [b]	47
			Tame blueberries	27
			Pears [b]	27
			Filberts and hazelnuts	11
			Cherries	3
			Plums and prunes [b]	2
			Grapes [b]	1
			Berries	*

Table 45. Cropping information (potential phosmet usage) in Washington counties within the Critical Habitat of the Puget Sound chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	King	9827	Nursery crops	406
			Cut Christmas trees	207
			Berries	101
			Apples [b]	64
			Tame blueberries	32
			Pears [b]	19
			Cherries	8
			Plums and prunes [b]	4
			English walnuts	3
			Filberts and hazelnuts	3
			Irish potatoes	2
			Grapes [b]	2
			Apricots [b]	1
			Peaches [b]	1
			Green peas	*
WA	Pierce	13,430	Cut Christmas trees	196
			Tame blueberries	70
			Alfalfa hay	70
			Apples [b]	61
			Irish potatoes	7
			Cherries	5
			Pears [b]	4
			Grapes [b]	*
			Filberts and hazelnuts	*
WA	Thurston	12,130+	Nursery crops	618
			Alfalfa hay	543
			Berries	199
			Cut Christmas trees	137
			Tame blueberries	96
			Apples [b]	23
			Pears [b]	5
			Green peas	3
			Filberts and hazelnuts	2
			Grapes [b]	*
			Irish potatoes	*

Table 45. Cropping information (potential phosmet usage) in Washington counties within the Critical Habitat of the Puget Sound chinook salmon ESU				
State	county	cultivated acreage[a]	crop	crop acreage
WA	Lewis	29,569	Cut Christmas trees	4042
			Green peas	1635
			Alfalfa hay	937
			Nursery crops	485
			Berries	184
			Tame blueberries	137
			Filberts and hazelnuts	25
			Other nuts	14
			Apples [b]	14
			English walnuts	5
			Grapes [b]	4
			Tart cherries	3
			Plums and prunes [b]	3
			Pears [b]	3
WA	Mason	1703+	Cut Christmas trees	437
			Nursery crops	186
			Alfalfa hay	125
			Apples [b]	5
			Cherries	2
			Berries	2
			Tame blueberries	1
			Pears [b]	1
			Grapes [b]	*
WA	Clallam	6119	Alfalfa hay	1790
			Berries	83
			Apples [b]	29
			Nursery crops	27
			Cherries	11
			Grapes [b]	4
			Pears [b]	1
			Plums and prunes [b]	1
			Cut Christmas trees	*
			Green peas	*

Table 45. Cropping information (potential phosmet usage) in Washington counties within the Critical Habitat of the Puget Sound chinook salmon ESU				
State	county	cultivated acreage[a]	crop	crop acreage
WA	Jefferson	2151+	Nursery crops	17
			Cut Christmas trees	13
			Apples [b]	5
			Berries	3
			Alfalfa hay	*
WA	Kitsap	1300+	Cut Christmas trees	674
			Nursery crops	88
			Apples [b]	21
			Grapes [b]	8
			Cherries	6
			Tame blueberries	5
			Pears [b]	4
			Plums and prunes [b]	4
			Irish potatoes	2
			Green peas	1
			Alfalfa hay	*
			Berries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Puget Sound Chinook Salmon ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

7. Lower Columbia River Chinook Salmon ESU

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

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

Table 46 shows the cropping information for Oregon and Washington counties where the Lower Columbia River chinook salmon ESU occurs.

Table 46. Cropping information (potential phosmet usage) in Oregon and Washington counties that are in the Critical Habitat of the Lower Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Wasco	97,230	Alfalfa hay	7239
			Apples [b]	463
			Pears [b]	385
			Grapes [b]	110
			Nursery crops	144
			Apricots [b]	32
			Peaches [b]	30
			Berries	8
			Plums and prunes [b]	*
			Cut Christmas trees	*
			Sweet cherries	*
OR	Hood River	17,346+	Pears [b]	11,788
			Apples [b]	2592
			Alfalfa hay	443
			Nursery crops	243
			Cut Christmas trees	161
			Grapes [b]	63
			Berries	35
			Tame blueberries	29
			Peaches [b]	13
			Sweet cherries	*

Table 46. Cropping information (potential phosmet usage) in Oregon and Washington counties that are in the Critical Habitat of the Lower Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Marion	202,353	Nursery crops	7090
			Filberts and hazelnuts	7061
			Cut Christmas trees	3712
			Sweet cherries	1459
			Alfalfa hay	1315
			Grapes [b]	761
			Green peas	686
			Apples [b]	555
			Tame blueberries	545
			Peaches [b]	179
			English walnuts	155
			Pears [b]	150
			Plums and prunes [b]	145
			Tart cherries	108
			Kiwifruit	31
			Irish potatoes	*
			Nectarines [b]	*
			Berries	*
OR	Clackamas	59,923	Nursery crops	10,503
			Cut Christmas trees	7532
			Filberts and hazelnuts	3994
			Berries	3414
			Alfalfa hay	1072
			Tame blueberries	334
			Grapes [b]	207
			Apples [b]	167
			Green peas	104
			Peaches [b]	78
			cherries	53
			English walnuts	51
			Plums and prunes [b]	37
			Pears [b]	37
			Sweet cherries	30
			Tart cherries	23
			Kiwifruit	20
			Irish potatoes	1

Table 46. Cropping information (potential phosmet usage) in Oregon and Washington counties that are in the Critical Habitat of the Lower Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*
OR	Washington	85,190	Filberts and hazelnuts	5595
			Berries	4140
			Nursery crops	4130
			Alfalfa hay	1680
			Cut Christmas trees	1411
			Grapes [b]	989
			Green peas	840
			English walnuts	679
			Plums and prunes [b]	358
			Apples [b]	279
			Peaches [b]	168
			Sweet cherries	141
			Tart cherries	70
			Pears [b]	69
			Kiwifruit	*
			Irish potatoes	*
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*

Table 46. Cropping information (potential phosmet usage) in Oregon and Washington counties that are in the Critical Habitat of the Lower Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas trees	17
			Apples [b]	*
			Cherries	*
			Grapes [b]	*
WA	Wahkiakum	3515+	Alfalfa hay	0
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and hazelnuts	87
			Tame blueberries	85
			Pears [b]	75
			English walnuts	51
			Peaches [b]	46
			Grapes [b]	32
			Apples [b]	33
			Plums and prunes [b]	10
			Tart cherries	3
			Sweet cherries	*
			Berries	*

Table 46. Cropping information (potential phosmet usage) in Oregon and Washington counties that are in the Critical Habitat of the Lower Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas trees	16
			Apples [b]	14
			English walnuts	5
			Pears [b]	3
			Tart cherries	2
			Sweet cherries	1
			Filberts and hazelnuts	1
			Grapes [b]	*
			Tame blueberries	*
WA	Lewis	29,569	Cut Christmas trees	4042
			Green peas	1635
			Alfalfa hay	937
			Nursery crops	485
			Berries	184
			Tame blueberries	137
			Filberts and hazelnuts	25
			Other nuts	14
			Apples [b]	14
			English walnuts	5
			Grapes [b]	4
			Tart cherries	3
			Plums and prunes [b]	3
			Pears [b]	3

Table 46. Cropping information (potential phosmet usage) in Oregon and Washington counties that are in the Critical Habitat of the Lower Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Klickitat	93,193	Alfalfa hay	28,434
			Pears [b]	923
			Apples [b]	516
			Tart cherries	457
			Grapes [b]	419
			Peaches [b]	199
			Apricots [b]	19
			Plums and prunes [b]	1
			Berries	1
			Sweet cherries	*
			English walnuts	*
			Irish potatoes	*
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Lower Columbia River Chinook Salmon ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

8. Upper Willamette River Chinook Salmon ESU

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

River and its tributaries above Willamette Falls, in addition to all down stream river reaches of the Willamette and Columbia Rivers to the Pacific Ocean.

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

Tables 47 and 48 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.

Table 47. Cropping information (potential phosmet usage) for Oregon counties encompassing spawning and rearing habitat of the Upper Willamette River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Douglas	37,498	Alfalfa hay	1984
			Grapes [b]	581
			Cut Christmas trees	431
			Plums and prunes [b]	305
			English walnuts	171
			Apples [b]	148
			Nursery crops	121
			Pears [b]	105
			Tame blueberries	108
			Cherries	60
			Filberts and hazelnuts	55
			Peaches [b]	53
			Apricots [b]	1
			Nectarines [b]	*

Table 47. Cropping information (potential phosmet usage) for Oregon counties encompassing spawning and rearing habitat of the Upper Willamette River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Lane	73,841	Filberts and hazelnuts	3677
				1055
			Cut Christmas trees	876
			Alfalfa hay	631
			Grapes [b]	325
			Nursery crops	271
			Berries	174
			Apples [b]	158
			Cherries	105
			English walnuts	74
			Tame blueberries	54
			Peaches [b]	51
			Pears [b]	34
			Plums and prunes [b]	9
			Irish potatoes	*
			Green peas	2
			Nectarines [b]	
OR	Benton	69,214	Cut Christmas trees	1983
			Alfalfa hay	570
			Filberts and	493
			hazelnuts	242
			Grapes [b]	149
			Nursery crops	132
			Berries	109
			Tame blueberries	62
			Apples [b]	23
			English walnuts	18
			cherries	14
			Sweet cherries	8
			Peaches [b]	7
			Kiwifruit	7
			Pears [b]	5
			Plums and prunes [b]	4
			Tart cherries	3
			Irish potatoes	1
			Green peas	

Table 47. Cropping information (potential phosmet usage) for Oregon counties encompassing spawning and rearing habitat of the Upper Willamette River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Linn	248,392	Alfalfa hay	2507
			Filberts and hazelnuts	1820
			Berries	535
			Cut Christmas trees	292
			Nursery crops	155
			Apples [b]	133
			Grapes [b]	93
			Peaches [b]	73
			English walnuts	55
			Tart cherries	35
			Pears [b]	26
			Plums and prunes [b]	14
			Nectarines [b]	3
			Kiwifruit	3
			Sweet cherries	*
OR	Polk	89,599	Filberts and hazelnuts	2394
			Sweet cherries	1484
			Grapes [b]	1123
			Alfalfa hay	774
			Cut Christmas trees	644
			Plums and prunes [b]	595
			Berries	410
			Tart cherries	404
			Apples [b]	157
			Peaches [b]	51
			Pears [b]	63
			English walnuts	33
			Tame blueberries	21
			Green peas	*
			Nursery crops	*

Table 47. Cropping information (potential phosmet usage) for Oregon counties encompassing spawning and rearing habitat of the Upper Willamette River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Clackamas	59,923	Nursery crops	10,503
			Cut Christmas trees	7532
			Filberts and hazelnuts	3994
			Berries	3414
			Alfalfa hay	1072
			Tame blueberries	334
			Grapes [b]	207
			Apples [b]	167
			Green peas	104
			Peaches [b]	78
			cherries	53
			English walnuts	51
			Plums and prunes [b]	37
			Pears [b]	37
			Sweet cherries	30
			Tart cherries	23
			Kiwifruit	20
			Irish potatoes	1
OR	Marion	202,353	Nursery crops	7090
			Filberts and hazelnuts	7061
				3712
			Cut Christmas trees	1459
			Sweet cherries	1315
			Alfalfa hay	761
			Grapes [b]	686
			Green peas	555
			Apples [b]	545
			Tame blueberries	179
			Peaches [b]	155
			English walnuts	150
			Pears [b]	145
			Plums and prunes [b]	108
			Tart cherries	31
			Kiwifruit	*
			Irish potatoes	*
			Nectarines [b]	*
			Berries	

Table 47. Cropping information (potential phosmet usage) for Oregon counties encompassing spawning and rearing habitat of the Upper Willamette River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Yamhill	95,440	Filberts and hazelnuts	7110
			Nursery crops	3444
			Grapes [b]	2887
			Alfalfa hay	2294
			Sweet cherries	1140
			Berries	1064
			English walnuts	608
			Cut Christmas trees	556
			Tart cherries	553
			Plums and prunes [b]	369
			Tame blueberries	324
			Apples [b]	310
			Peaches [b]	104
			Pears [b]	54
			Kiwifruit	15
			Irish potatoes	1
			Nectarines [b]	*
OR	Washington	85,190	Filberts and hazelnuts	5595
			Berries	4140
			Nursery crops	4130
			Alfalfa hay	1680
			Cut Christmas trees	1411
			Grapes [b]	989
			Green peas	840
			English walnuts	679
			Plums and prunes [b]	358
			Apples [b]	279
			Peaches [b]	168
			Sweet cherries	141
			Tart cherries	70
			Pears [b]	69
			Kiwifruit	*
			Irish potatoes	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Table 48. Cropping information (potential phosmet usage) for Washington and Oregon counties that are part of the migration corridors of the Upper Willamette River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and	87
			hazelnuts	85
			Tame blueberries	75
			Pears [b]	51
			English walnuts	46
			Peaches [b]	32
			Grapes [b]	33
			Apples [b]	10
			Plums and prunes [b]	3
			Tart cherries	*
			Sweet cherries	*
			Berries	
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas trees	16
			Apples [b]	14
			English walnuts	5
			Pears [b]	3
			Tart cherries	2
			Sweet cherries	1
			Filberts and	1
			hazelnuts	*
			Grapes [b]	*
			Tame blueberries	
WA	Wahkiakum	3515+	Alfalfa hay	0

Table 48. Cropping information (potential phosmet usage) for Washington and Oregon counties that are part of the migration corridors of the Upper Willamette River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas trees	17
			Apples [b]	*
			Cherries	*
			Grapes [b]	*
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years
* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Upper Willamette River Chinook Salmon ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

9. Upper Columbia River Spring-run Chinook Salmon ESU

The Upper Columbia River Spring-run Chinook Salmon ESU was proposed as endangered in 1998 (63FR11482-11520, March 9, 1998) and listed a year later (64FR14308-14328, March 24, 1999). Critical habitat was designated February 16, 2000 (65FR7764-7787) to encompass all river reaches accessible to listed chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River, as well as all down stream migratory corridors to the Pacific Ocean. Hydrologic units and their upstream barriers are Chief Joseph (Chief Joseph Dam), Similkameen, Methow, Upper Columbia-Entiat, Wenatchee, Upper Columbia-Priest Rapids, Middle Columbia-Lake Wallula, Middle Columbia-Hood, Lower Columbia-Sandy, Lower Columbia-Clatskanie, Lower Columbia, and Lower Willamette. Counties in which spawning and rearing occur are Chelan, Douglas, Okanogan, Grant, Kittitas, and Benton (Table 49), with the lower river reaches being migratory corridors (Table 50).

Tables 49 and 50 present cropping information for those Washington counties that support the Upper Columbia River chinook salmon ESU and for Oregon and Washington counties where this ESU migrates.

Table 49. Cropping information (potential phosmet usage) for Washington counties where there is spawning and rearing habitat for the Upper Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Benton	268,372	Irish potatoes	25,317
			Apples [b]	18,425
			Grapes [b]	15,929
			Alfalfa hay	13,241
			Cherries, total	3219
			Nursery crops	595
			Pears [b]	472
			Plums and prunes [b]	180
			Apricots [b]	174
			Peaches [b]	149
			Nectarines [b]	106
			English walnuts	41
			Tart cherries	*
			Berries	*
			Sweet cherries	*
			Green peas	*
WA	Kittitas	57,456	Alfalfa hay	8571
			Apples [b]	1859
			Irish potatoes	442
			Nursery crops	406
			Pears [b]	331
			Cut Christmas trees	23
			Peaches [b]	1
			Plums and prunes [b]	1
			Filberts and hazelnuts	1
				*
			Sweet cherries	*
			Tart cherries	

Table 49. Cropping information (potential phosmet usage) for Washington counties where there is spawning and rearing habitat for the Upper Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Chelan	31,423	Apples [b]	17,096
			Pears [b]	8298
			Sweet cherries	3698
			Alfalfa hay	1210
			Nursery crops	94
			Apricots [b]	81
			Cut Christmas trees	42
			Nectarines [b]	22
			Peaches [b]	21
			Tart cherries	6
			Plums and prunes [b]	3
			Berries	1
			English walnuts	*
WA	Douglas	217,703	Apples [b]	14,383
			Sweet cherries	1834
			Alfalfa hay	1763
			Pears [b]	1104
			Apricots [b]	315
			Peaches [b]	167
			Nectarines [b]	91
			Nursery crops	18
			Tart cherries	7
			Berries	*

Table 49. Cropping information (potential phosmet usage) for Washington counties where there is spawning and rearing habitat for the Upper Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Okanogan	72,732	Apples	24,164
			Alfalfa hay	21,880
			Pears [b]	3280
			Sweet cherries	1001
			Nursery crops	116
			Peaches [b]	67
			Nectarines [b]	38
			English walnuts	29
			Cut Christmas trees	22
			Apricots [b]	13
			Filberts and hazelnuts	10
			Tart cherries	2
			Plums and prunes [b]	1
			Berries	*
WA	Grant	529,087	Alfalfa hay	115,509
			Irish potatoes	44,263
			Apples [b]	33,615
			Green peas	12,829
			Dry edible peas	4973
			Grapes [b]	3132
			Nursery crops	1562
			Pears [b]	998
			Apricots [b]	266
			Peaches [b]	261
			Nectarines [b]	163
			English walnuts	5
			Plums and prunes [b]	5
			Tart cherries	*
			Sweet cherries	*
			Filberts and hazelnuts	*
			Berries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Table 50. Cropping information (potential phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Franklin	291,696	Alfalfa hay	70,943
			Irish potatoes	35,770
			Apples [b]	9000
			Grapes [b]	2813
			Nursery crops	1982
			Sweet cherries	1665
			Green peas	568
			Dry edible peas	528
			Tart cherries	500
			Peaches [b]	262
			Pears [b]	156
			Nectarines [b]	129
			Berries	87
			Apricots [b]	68
			Plums and prunes [b]	43
			English walnuts	*
WA	Yakima	264,490	Apples [b]	75,264
			Alfalfa hay	33,833
			Grapes [b]	15,529
			Pears [b]	10,190
			Sweet cherries	5922
			Potatoes	1929
			Peaches [b]	1438
			Green peas	1201
			Nursery crops	1194
			Nectarines [b]	605
			Plums and prunes [b]	478
			Apricots [b]	285
			Tart cherries	206
			Berries	23
			English walnuts	11
			Filberts and hazelnuts	6

Table 50. Cropping information (potential phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Walla Walla	337,660	Alfalfa hay	11,787
			Green peas	10,962
			Irish potatoes	9256
			Dry edible peas	5696
			Apples [b]	5222
			Sweet cherries	280
			Plums and prunes [b]	22
			Berries	*
			Grapes [b]	*
WA	Klickitat	93,193	Alfalfa hay	28,434
			Pears [b]	923
			Apples [b]	516
			Tart cherries	457
			Grapes [b]	419
			Peaches [b]	199
			Apricots [b]	19
			Plums and prunes [b]	1
			Berries	1
			Sweet cherries	*
			English walnuts	*
			Irish potatoes	*
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*

Table 50. Cropping information (potential phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and hazelnuts	87
			Tame blueberries	85
			Pears [b]	75
			English walnuts	51
			Peaches [b]	46
			Grapes [b]	32
			Apples [b]	33
			Plums and prunes [b]	10
			Tart cherries	3
			Sweet cherries	*
			Berries	*
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas trees	16
			Apples [b]	14
			English walnuts	5
			Pears [b]	3
			Tart cherries	2
			Sweet cherries	1
			Filberts and hazelnuts	1
			Grapes [b]	*
			Tame blueberries	*
WA	Wahkiakum	3515+	Alfalfa hay	0
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas trees	17
			Apples [b]	*
			Cherries	*
			Grapes [b]	*

Table 50. Cropping information (potential phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Gilliam	100,729+	Alfalfa hay	2450
OR	Umatilla	384,163	Green peas	28,171
			Alfalfa hay	24,013
			Irish potatoes	15,003
			Apples [b]	3927
			Dry edible peas	3016
			Nursery	396
			Plums and prunes [b]	365
			Grapes [b]	163
			Apricots [b]	14
			Peaches [b]	7
			Pears [b]	4
			Nectarines [b]	*
			Nursery crops	*
			Sweet cherries	*
			Tart cherries	*
			Berries	*
OR	Sherman	127,018+	Alfalfa hay	230
			Nursery crops	95
OR	Morrow	220,149 +	Alfalfa hay	22,180
			Irish potatoes	17,030
			Green peas	729
			Apples [b]	*
			Berries	*
			Nursery crops	*

Table 50. Cropping information (potential phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Wasco	97,230	Alfalfa hay	7239
			Apples [b]	463
			Pears [b]	385
			Grapes [b]	110
			Nursery crops	144
			Apricots [b]	32
			Peaches [b]	30
			Berries	8
			Plums and prunes [b]	*
			Cut Christmas trees	*
			Sweet cherries	*
OR	Hood River	17,346+	Pears [b]	11,788
			Apples [b]	2592
			Alfalfa hay	443
			Nursery crops	243
			Cut Christmas trees	161
			Grapes [b]	63
			Berries	35
			Tame blueberries	29
			Peaches [b]	13
			Sweet cherries	*

Table 50. Cropping information (potential phosmet usage) for Washington and Oregon counties that are migration corridors for the Upper Columbia River chinook salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Upper Columbia

River Spring-run Chinook Salmon ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

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.

Table 51 contains usage information for the California counties supporting the Central California coast coho salmon ESU.

Table 51. Use of phosmet in counties with the Central California Coast coho ESU.

County	Crop	Usage (pounds)	Acres treated
Santa Cruz	apple	2569	933
San Mateo	outdoor container plants	4	nr
Marin	none	0	0
Sonoma	apple	11,525	3640
	grape	16	11
	outdoor flowers	18	5
	pear	120	52
	walnut	4	3
Mendocino	apple	160	47
	grape	46	63
	pear	1500	327
Napa	grape	7	8

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the existence of protections provided by the bulletins developed by California DPR, I conclude that there will be no effect of phosmet on the Central California Coast Coho Salmon ESU.

2. Southern Oregon/Northern California Coast Coho Salmon ESU

The Southern Oregon/Northern California coastal coho salmon ESU was proposed as threatened in 1995 (60FR38011-38030, July 25, 1995) and listed on May 6, 1997 (62FR24588-24609). Critical habitat was proposed later that year (62FR62741-62751, November 25, 1997) and finally designated on May 5, 1999 (64FR24049-24062) to encompass accessible reaches of all rivers (including 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, Siskiyou in California and Curry, Jackson, Josephine, Klamath, and Douglas, in Oregon. However, we have excluded Glenn County, California from this analysis because the salmon habitat in this county is not near the agricultural areas.

Use of phosmet in counties occupied by this ESU is presented in Tables 52 and 53.

Table 52. Use of phosmet in California counties with the Southern Oregon/Northern California coastal coho salmon ESU.

County	Crop	Usage (pounds)	Acres treated
Humboldt	none	0	0
Mendocino	apple	160	47
	grape	46	63
	pear	1500	327
Del Norte	none	0	0
Siskiyou	none	0	0
Trinity	none	0	0
Lake	alfalfa	12	20
	pear	1362	330
	walnut	76	18

Table 53. Cropping information (potential phosmet usage) for Oregon counties where there is habitat for the Southern Oregon/Northern California coastal coho salmon ESU

State	county	cultivated acreage[a]	crop	
OR	Curry	1807	Berries	597
			Nursery crops	156
			Cut Christmas trees	48
			Apples [b]	27
			Plums and prunes [b]	6
			Pears [b]	3
			Grapes [b]	*
			Tame blueberries	*
			Cherries	*

State	county	cultivated acreage[a]	crop	crop acreage
OR	Jackson	33,529	Pears [b]	9387
			Alfalfa hay	3954
			Grapes [b]	400
			Apples [b]	360
			Peaches [b]	198
			Cut Christmas trees	55
			Nursery crops	39
			English walnuts	27
			Cherries	22
			Plums and prunes [b]	15
			Nectarines [b]	14
			Apricots [b]	10
			Berries	*
			Filberts and hazelnuts	*
OR	Josephine	9015	Alfalfa hay	1143
			Grapes [b]	355
			Apples [b]	181
			Cut Christmas trees	177
			Peaches [b]	29
			Nursery crops	21
			Berries	12
			Sweet cherries	9
			Irish potatoes	7
			Green peas	2
			Plums and prunes [b]	1
			Pears [b]	*
OR	Douglas	37,498	Alfalfa hay	1984
			Grapes [b]	581
			Cut Christmas trees	431
			Plums and prunes [b]	305
			English walnuts	171
			Apples [b]	148
			Nursery crops	121
			Pears [b]	105
			Tame blueberries	108
			Cherries	60
			Filberts and hazelnuts	55
			Peaches [b]	53
			Apricots [b]	1
			Nectarines [b]	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Southern Oregon/Northern California Coho Salmon ESU in Oregon, but because of DPR's bulletins, there will be no effect in California. There will also be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

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, Clatsop. However, the portions of Yamhill, Washington, and Columbia counties that are within the ESU do not include agricultural areas, and we have eliminated them in this analysis.

Table 54 shows the cultivated acreage for Oregon counties where the Oregon coast coho salmon ESU occurs.

Table 54. Cropping information (potential phosmet usage) for Oregon counties where there is habitat for the Oregon coast coho salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Curry	1807	Berries	597
			Nursery crops	156
			Cut Christmas trees	48
			Apples [b]	27
			Plums and prunes [b]	6
			Pears [b]	3
			Grapes [b]	*
			Tame blueberries	*
			Cherries	*
OR	Coos	14,115+	apples [b]	28
			Nursery crops	21
			Grapes [b]	12
			cherries	11
			Tame blueberries	9
			Pears [b]	4
			Plums and prunes [b]	3
			Nectarines [b]	1
			Peaches [b]	1
			Filberts and hazelnuts	1
			English walnuts	1
			Alfalfa hay	*
			Berries	*
OR	Douglas	37,498	Alfalfa hay [b]	1984
			Grapes [b]	581
			Cut Christmas trees	431
			Plums and prunes [b]	305
			English walnuts	171
			Apples [b]	148
			Nursery crops	121
			Pears [b]	105
			Tame blueberries	108
			Cherries	60
			Filberts and hazelnuts	55
			Peaches [b]	53
			Apricots [b]	1
			Nectarines [b]	*

Table 54. Cropping information (potential phosmet usage) for Oregon counties where there is habitat for the Oregon coast coho salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Lane	73,841	Filberts and hazelnuts	3677
			Cut Christmas trees	1055
			Alfalfa hay	876
			Grapes [b]	631
			Nursery crops	325
			Berries	271
			Apples [b]	174
			Cherries	158
			English walnuts	105
			Tame blueberries	74
			Peaches [b]	54
			Pears [b]	51
			Plums and prunes [b]	34
			Irish potatoes	9
			Green peas	*
			Nectarines [b]	2
OR	Lincoln	3626+	Cut Christmas trees	76
			Berries	32
			apples [b]	22
			Grapes [b]	1
			Pears [b]	1
			Nursery crops	*
			Tame blueberries	*

Table 54. Cropping information (potential phosmet usage) for Oregon counties where there is habitat for the Oregon coast coho salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Benton	69,214	Cut Christmas trees	1983
			Alfalfa hay	570
			Filberts and hazelnuts	493
			Grapes [b]	242
			Nursery crops	149
			Berries	132
			Tame blueberries	109
			Apples [b]	62
			English walnuts	23
			cherries	18
			Sweet cherries	14
			Peaches [b]	8
			Kiwifruit	7
			Pears [b]	7
			Plums and prunes [b]	5
			Tart cherries	4
			Irish potatoes	3
			Green peas	1
OR	Polk	89,599	Filberts and hazelnuts	2394
			Sweet cherries	1484
			Grapes [b]	1123
			Alfalfa hay	774
			Cut Christmas trees	644
			Plums and prunes [b]	595
			Berries	410
			Tart cherries	404
			Apples [b]	157
			Peaches [b]	51
			Pears [b]	63
			English walnuts	33
			Tame blueberries	21
			Green peas	*
			Nursery crops	*
OR	Tillamook	6448	Nursery crops	11
			Berries	6
			Cut Christmas trees	*
			Tame blueberries	*

Table 54. Cropping information (potential phosmet usage) for Oregon counties where there is habitat for the Oregon coast coho salmon ESU				
State	county	cultivated acreage[a]	crop	crop acreage
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the fact that most of the crop acreage in the counties above is in the Willamette Valley watershed rather than coastal watershed, I conclude that the use of phosmet 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 to surmount river blockages and falls. However, in the Skagit River, Washington, they migrate at least 170 km.

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

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

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

Table 55 shows the cultivated acreage for Washington counties where the Hood Canal summer-run chum salmon ESU occurs.

Table 55. Cropping information (potential phosmet usage) for Washington counties where there is habitat for the Hood Canal Summer-run chum salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Mason	1703+	Cut Christmas trees	437
			Nursery crops	186
			Alfalfa hay	125
			Apples [b]	5
			Cherries	2
			Berries	2
			Tame blueberries	1
			Pears [b]	1
			Grapes [b]	*

Table 55. Cropping information (potential phosmet usage) for Washington counties where there is habitat for the Hood Canal Summer-run chum salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Clallam	6119	Alfalfa hay	1790
			Berries	83
			Apples [b]	29
			Nursery crops	27
			Cherries	11
			Grapes [b]	4
			Pears [b]	1
			Plums and prunes [b]	1
			Cut Christmas trees	*
			Green peas	*
WA	Jefferson	2151+	Nursery crops	17
			Cut Christmas trees	13
			Apples [b]	5
			Berries	3
			Alfalfa hay	*
WA	Kitsap	1300+	Cut Christmas trees	674
			Nursery crops	88
			Apples [b]	21
			Grapes [b]	8
			Cherries	6
			Tame blueberries	5
			Pears [b]	4
			Plums and prunes [b]	4
			Irish potatoes	2
			Green peas	1
			Alfalfa hay	*
			Berries	*

Table 55. Cropping information (potential phosmet usage) for Washington counties where there is habitat for the Hood Canal Summer-run chum salmon ESU				
State	county	cultivated acreage[a]	crop	crop acreage
WA	Island	9764	Alfalfa hay	2100
			Nursery crops	171
			Berries	33
			Cut Christmas trees	27
			apples [b]	18
			Grapes [b]	14
			Pears [b]	1
			Tame blueberries	*
			Green peas	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with the negligible acreage of crops of concern, I conclude that the use of phosmet will have no effect on the Hood River Canal Summer-run Chum Salmon ESU. The only crops with any meaningful acreage are alfalfa and Christmas trees/nursery stock which uses will not result in any effect.

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.

Table 56 shows the cultivated acreage for Oregon and Washington counties where the Columbia River chum salmon ESU occurs.

Table 56. Cultivated acreage and crops on which phosmet can be used in counties where there is habitat for the Columbia River chum salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and hazelnuts	87
			Tame blueberries	85
			Pears [b]	75
			English walnuts	51
			Peaches [b]	46
			Grapes [b]	32
			Apples [b]	33
			Plums and prunes [b]	10
			Tart cherries	3
			Sweet cherries	*
			Berries	*

Table 56. Cultivated acreage and crops on which phosmet can be used in counties where there is habitat for the Columbia River chum salmon ESU				
State	county	cultivated acreage[a]	crop	crop acreage
WA	Lewis	29,569	Cut Christmas trees	4042
			Green peas	1635
			Alfalfa hay	937
			Nursery crops	485
			Berries	184
			Tame blueberries	137
			Filberts and hazelnuts	25
			Other nuts	14
			Apples [b]	14
			English walnuts	5
			Grapes [b]	4
			Tart cherries	3
			Plums and prunes [b]	3
			Pears [b]	3
WA	Cowlitz	8227+	Green peas	771
			Berries	552
			Nursery crops	176
			Alfalfa hay	105
			Cut Christmas trees	16
			Apples [b]	14
			English walnuts	5
			Pears [b]	3
			Tart cherries	2
			Sweet cherries	1
			Filberts and hazelnuts	1
			Grapes [b]	*
			Tame blueberries	*
WA	Pacific	5451	Berries	1316
			Nursery crops	179
			Alfalfa hay	110
			Cut Christmas trees	17
			Apples [b]	*
			Cherries	*
			Grapes [b]	*
WA	Wahkiakum	3515+	Alfalfa hay	0

Table 56. Cultivated acreage and crops on which phosmet can be used in counties where there is habitat for the Columbia River chum salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
OR	Washington	85,190	Filberts and hazelnuts	5595
			Berries	4140
			Nursery crops	4130
			Alfalfa hay	1680
			Cut Christmas trees	1411
			Grapes [b]	989
			Green peas	840
			English walnuts	679
			Plums and prunes [b]	358
			Apples [b]	279
			Peaches [b]	168
			Sweet cherries	141
			Tart cherries	70
			Pears [b]	69
			Kiwifruit	*
			Irish potatoes	*

Table 56. Cultivated acreage and crops on which phosmet can be used in counties where there is habitat for the Columbia River chum salmon ESU				
State	county	cultivated acreage[a]	crop	crop acreage
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, I conclude that the use of phosmet on most crops within this ESU may affect, but is not likely to adversely affect, the Lower Columbia River Chum Salmon ESU. There will be no effect from the use of phosmet on alfalfa and Christmas trees/nursery stock because exposure does not exceed levels of concern.

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 57).

Table 57. Cropping information (potential phosmet usage) for Clallum County where there is habitat for the Ozette Lake sockeye salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Clallam	6119	Alfalfa hay	1790
			Berries	83
			Apples [b]	29
			Nursery crops	27
			Cherries	11
			Grapes [b]	4
			Pears [b]	1
			Plums and prunes [b]	1
			Cut Christmas trees	*
			Green peas	*

[a] cultivated cropland includes all harvested acreage and all failed acreage

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, along with no concern for alfalfa and nursery crop use, and tiny acreage in the county, most of which is away from Ozette Lake, I conclude that the use of phosmet will have no effect 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. Phosmet cannot be used in this area. It is possible that this salmon ESU could be exposed to phosmet in the lower and larger river reaches during its juvenile or adult migration.

Tables 58 and 59 show the cropping information for counties where this ESU occurs.

Table 58. Cropping information (potential phosmet usage) for Idaho counties where there is spawning and rearing habitat for the Snake River sockeye salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Custer	34,754	Alfalfa hay Irish potatoes Nursery crops	24,467 507 *
ID	Blaine	47,565	Alfalfa hay Irish potatoes Nursery crops	17,425 848 28

[a] cultivated cropland includes all harvested acreage and all failed acreage

Table 59. Cropping information for Pacific Northwest counties within the migratory corridors for the Snake River sockeye salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
ID	Idaho	147,557	Alfalfa hay	20,266
			Dry edible peas	1517
			Cut Christmas trees	20
			Apples [b]	6
			Pears [b]	2
			Plums and prunes [b]	2
			Sweet cherries	1
			Grapes [b]	1
			Berries	1
			Peaches [b]	*
			Filberts and hazelnuts	*
ID	Lemhi	41,837+	Alfalfa hay	28,143
			Sweet cherries	9
			Apples [b]	6
			Peaches [b]	3
			Pears [b]	2
			Apricots [b]	*
ID	Lewis	119,860	Dry edible peas	8434
			Alfalfa hay	3885
ID	Nez Perce	168,365	Dry edible peas	25,659
			Alfalfa hay	6262
			Green peas	1816
			Peaches [b]	22
			Apples [b]	9
			Sweet cherries	4
			Tart cherries	1
			Apricots [b]	1
			Irish potatoes	*
			Nursery crops	*
ID	Valley	6990+	Alfalfa hay	1599
			Irish potatoes	225
			Nursery crops	2

Table 59. Cropping information for Pacific Northwest counties within the migratory corridors for the Snake River sockeye salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Asotin	32,892	Alfalfa hay	1648
			Apples [b]	24
			Peaches [b]	18
			Cherries [b]	17
			Pears [b]	6
			Apricots [b]	5
			Nursery crops	*
WA	Garfield	108,553	Alfalfa hay	802
WA	Whitman	804,893	Dry edible peas	84,356
			Alfalfa hay	6644
			Green peas	5589
			Nursery crops	980
			Apples [b]	19
			Cut Christmas trees	4
			Pears [b]	2
			Cherries	*
WA	Columbia	97,743	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
WA	Walla Walla	337,660	Alfalfa hay	11,787
			Green peas	10,962
			Irish potatoes	9256
			Dry edible peas	5696
			Apples [b]	5222
			Sweet cherries	280
			Plums and prunes [b]	22
			Berries	*
			Grapes [b]	*

Table 59. Cropping information for Pacific Northwest counties within the migratory corridors for the Snake River sockeye salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
WA	Franklin	291,696	Alfalfa hay	70,943
			Irish potatoes	35,770
			Apples [b]	9000
			Grapes [b]	2813
			Nursery crops	1982
			Sweet cherries	1665
			Green peas	568
			Dry edible peas	528
			Tart cherries	500
			Peaches [b]	262
			Pears [b]	156
			Nectarines [b]	129
			Berries	87
			Apricots [b]	68
			Plums and prunes [b]	43
			English walnuts	*
WA	Benton	268,372	Irish potatoes	25,317
			Apples [b]	18,425
			Grapes [b]	15,929
			Alfalfa hay	13,241
			Cherries, total	3219
			Nursery crops	595
			Pears [b]	472
			Plums and prunes [b]	180
			Apricots [b]	174
			Peaches [b]	149
			Nectarines [b]	106
			English walnuts	41
			Tart cherries	*
			Berries	*
			Sweet cherries	*
			Green peas	*

Table 59. Cropping information for Pacific Northwest counties within the migratory corridors for the Snake River sockeye salmon ESU				
State	county	cultivated acreage[a]	crop	crop acreage
WA	Klickitat	93,193	Alfalfa hay	28,434
			Pears [b]	923
			Apples [b]	516
			Tart cherries	457
			Grapes [b]	419
			Peaches [b]	199
			Apricots [b]	19
			Plums and prunes [b]	1
			Berries	1
			Sweet cherries	*
			English walnuts	*
			Irish potatoes	*
WA	Skamania	1205+	Pears [b]	477
			Alfalfa hay	64
			Grapes [b]	76
			Apples [b]	75
			Other nuts	4
			Cut Christmas trees	*
			Nursery/greenhouse	*
WA	Clark	27,860	Alfalfa hay	836
			Nursery crops	443
			Cut Christmas trees	358
			Filberts and	87
			hazelnuts	85
			Tame blueberries	75
			Pears [b]	51
			English walnuts	46
			Peaches [b]	32
			Grapes [b]	33
			Apples [b]	10
			Plums and prunes [b]	3
			Tart cherries	*
			Sweet cherries	*
			Berries	

Table 59. Cropping information for Pacific Northwest counties within the migratory corridors for the Snake River sockeye salmon ESU				
State	county	cultivated acreage[a]	crop	crop acreage
WA	Cowlitz	8227+	Green peas Berries Nursery crops Alfalfa hay Cut Christmas trees Apples [b] English walnuts Pears [b] Tart cherries Sweet cherries Filberts and hazelnuts Grapes [b] Tame blueberries	771 552 176 105 16 14 5 3 2 1 1 * *
WA	Wahkiakum	3515+	Alfalfa hay	0
WA	Pacific	5451	Berries Nursery crops Alfalfa hay Cut Christmas trees Apples [b] Cherries Grapes [b]	1316 179 110 17 * * *
OR	Wallowa	54,138	Alfalfa hay Apples [b] Nursery crops Peaches [b]	18,253 19 6 *

Table 59. Cropping information for Pacific Northwest counties within the migratory corridors for the Snake River sockeye salmon ESU				
State	county	cultivated acreage[a]	crop	crop acreage
OR	Umatilla	384,163	Green peas	28,171
			Alfalfa hay	24,013
			Irish potatoes	15,003
			Apples [b]	3927
			Dry edible peas	3016
			Nursery	396
			Plums and prunes [b]	365
			Grapes [b]	163
			Apricots [b]	14
			Peaches [b]	7
			Pears [b]	4
			Nectarines [b]	*
			Nursery crops	*
			Sweet cherries	*
			Tart cherries	*
			Berries	*
OR	Morrow	220,149 +	Alfalfa hay	22,180
			Irish potatoes	17,030
			Green peas	729
			Apples [b]	*
			Berries	*
			Nursery crops	*
OR	Gilliam	100,729+	Alfalfa hay	2450
OR	Sherman	127,018+	Alfalfa hay	230
			Nursery crops	95
OR	Wasco	97,230	Alfalfa hay	7239
			Apples [b]	463
			Pears [b]	385
			Grapes [b]	110
			Nursery crops	144
			Apricots [b]	32
			Peaches [b]	30
			Berries	8
			Plums and prunes [b]	*
			Cut Christmas trees	*
			Sweet cherries	*

Table 59. Cropping information for Pacific Northwest counties within the migratory corridors for the Snake River sockeye salmon ESU

State	county	cultivated acreage[a]	crop	crop acreage
OR	Hood River	17,346+	Pears [b]	11,788
			Apples [b]	2592
			Alfalfa hay	443
			Nursery crops	243
			Cut Christmas trees	161
			Grapes [b]	63
			Berries	35
			Tame blueberries	29
			Peaches [b]	13
			Sweet cherries	*
OR	Multnomah	14,692	Nursery crops	2609
			Green peas	616
			Alfalfa hay	389
			Irish potatoes	336
			Cut Christmas trees	166
			Tame blueberries	62
			Apples [b]	51
			Peaches [b]	36
			Grapes [b]	28
			Pears [b]	25
			Sweet cherries	4
			Tart cherries	3
			Plums and prunes [b]	3
			English walnuts	2
			Other nuts	*
			Berries	*
OR	Columbia	15,054+	Dry edible peas	6401
			Alfalfa hay	1780
			Green peas	*
			Apples [b]	*
OR	Clatsop	4772	Berries	34
			Cut Christmas trees	25
			Nursery crops	3
			Alfalfa hay	*
			Apples [b]	*
			Tame blueberries	*

[a] cultivated cropland includes all harvested acreage and all failed acreage; failed cropland acreage is not reported for

some counties due to privacy concerns when only a few farms report such acreage - we denote this acreage with a "+" in the cultivated cropland column in the relevant tables; such acreage typically is small and statewide accounts for only 0.7% of harvested cropland acreage in Washington, 3.7% in Oregon, and 3.2% in Idaho

[b] Time limited registration of 5 years

* USDA withheld acreage data because county acreage is limited to one or only a few farms

Based on the toxicity data, exposure modeling, information on predicted use, and the general conclusions and discussion in section 3f above, and that the spawning and rearing areas for the Snake River Sockeye Salmon are well above any phosmet use sites, along with the rapid dissipation expected in larger streams and rivers, I conclude that the use of phosmet will have no effect on the Snake River Sockeye Salmon ESU.

5. Summary conclusions for listed Pacific salmon and steelhead

Based on the available information and best professional judgement, our conclusions on potential adverse direct and indirect effects of phosmet on listed Pacific salmon and steelhead are that phosmet may have effects from many uses, primarily edible crops, but these are exceedingly unlikely. OPP concludes that phosmet will have no effect on any salmon or steelhead use from application to alfalfa, Christmas trees, or nursery stock. In addition, phosmet will have no effect on the migratory corridors for listed salmon and steelhead. For the other uses and the breeding and rearing areas, summary conclusions are presented in Table 60.

The factors leading to these conclusions are primarily presented in section 3f, along with some consideration of the differences among various ESUs. For those ESUs in California, we base our no effect determination on the unlikely effects in general along with the protections provided by California Department of Regulation's bulletins. reported usage of phosmet in each county in 2001 and the potential acute risk to endangered fish. Those bulletins include a 200-yard buffer for aerial application and a 40-yard buffer for ground application as well as a 20-foot minimum vegetative strip between the treatment site and surface waters.

Table 60. Summary conclusions on specific ESUs of listed Pacific salmon and steelhead for phosmet.

Species	ESU	Finding
Steelhead	Southern California	no effect
Steelhead	South-Central California Coast	no effect
Steelhead	Central California Coast	no effect
Steelhead	Central Valley, California	no effect
Steelhead	Northern California	no effect

Table 60. Summary conclusions on specific ESUs of listed Pacific salmon and steelhead for phosmet.

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

Table 60. Summary conclusions on specific ESUs of listed Pacific salmon and steelhead for phosmet.		
Species	ESU	Finding
Sockeye salmon	Ozette Lake	no effect
Sockeye salmon	Snake River	no effect

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Attachment 1

Interim Reregistration Eligibility Decision

Phosmet

October 30, 2001

Attachment 2

Phosmet

Ecological Risk Assessment
(revised)

Environmental Fate and Effects Division

April 24, 1998

Attachment 3

Quantitative Usage Analysis

Phosmet

Biological Effects and Analysis Division

June 8, 1999

Attachment 4

Washington State

Phosmet Use Summary

Washington Department of Agriculture

2003