Propargite
Analysis of Risks
to
Endangered and Threatened Salmon and Steelhead

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Summary

Propargite is an acaricide used on a variety of crops, primarily fruit, nut, and tree crops, mostly in the western United States. Propargite exhibits high toxicity to fish, but relatively low environmental exposure. An endangered species risk assessment is developed for federally listed Pacific salmon and steelhead. This assessment applies the findings of the Environmental Risk Assessment developed for non-target fish and wildlife as part of the reregistration process to determine the potential risks to the 26 listed Evolutionarily Significant Units of Pacific salmon and steelhead. The use of propargite may affect 7 of these ESUs, may affect but is not likely to adversely affect 12 ESUs, and will not affect 7 ESUs.

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. 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 to concentrations below those tested (or above the test concentrations if the highest concentration did not produce 100% mortality).

OPP evaluates the potential chronic effects of a pesticide on the basis of several types of tests. These tests are often required, 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. 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).

An analysis of toxicity, whether acute or chronic, 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 acute or chronic EEC is compared with the acute or chronic toxicity, respectively, to determine if there is risk. Generous safety margins are used for both acute risk and for chronic risk in rivers and streams. For ponds, there is still a reasonable safety margin for chronic risk, but it is not “generous”. While our risk assessment criteria are intended to protect populations of non-target species that are not listed as endangered or threatened, our criteria (levels of concern) for endangered and threatened species are intended to protect individuals of these species from not only lethal effects, but also sublethal, reproductive, and chronic 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 for food and cover. In general, pesticides applied in terrestrial environments will not affect the plant material in the water that provides aquatic cover for listed fish. Thus the primary indirect effect of concern would be for the food source for listed fish. 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 food organisms. For fish, this is primarily for aquatic invertebrates, although aquatic plants or plankton may be relevant food for some fish species. We already are protecting prey fish at the individual level because we are protecting the listed fish at the individual level, so there is nothing extra we need to do to ensure an adequate supply of fish as food of listed fish. 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. Dwyer et al. (1995) and Beyers et al. (1994), among others, have shown that endangered and threatened fish tested to date are similarly sensitive to a variety of pesticides and other chemicals as their non-endangered counterparts.

OPP is also required to consult if a pesticide may adversely modify designated critical habitat. 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 for 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.

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.

2. Description of propargite

Propargite is an organosulfur chemical registered for use as a miticide/acaracide on a

variety of bearing and non-bearing agricultural food and non-food crops. In California, Oregon, Washington, and Idaho, registered food-use crops include grapes, citrus, nectarines, almonds, beans, corn, hops, potatoes, and mint. Non-bearing crops include berries and various stone and pome fruits. Other non-food agricultural sites include cotton, alfalfa for seed, clover for seed, carrots for seed, roses and conifers grown as Christmas trees or nursery stock. There are no existing residential uses for propargite. Use on a variety of bearing fruit trees, most prominently apples, pears, plums, and strawberries, was stopped in the late 1990s, and food tolerances were revoked for these in 1999 (64FR39068-39072, July 21, 1999). Although use is still allowed on these crops for non-bearing (young) trees, there is very little. The uses are considered more completely in section 4 below.

Formulations: Propargite is sold in the United States under the trade names Omite® and Comite®. There are two types of formulations: emulsifiable concentrates and wettable powders.

Registrant: Uniroyal Chemical Company is the sole registrant for federal section 3 registrations. There are a large number of section 24c (Special Local Needs) registrations. Current section 3 and 24c labels are included in this package as Attachment 1.

Methods of Application: Propargite is applied aerially, through groundboom, and via chemigation, airblast sprayer, and high pressure handwand.

Use Rates: Depending on the crop, propargite rates range from 0.5 lb ai/acre for non-bearing nursery stock up to 4.5 lb ai/acre for tree nuts, a variety of fruit crops, and ornamentals; up to 3 applications may be made per year, depending upon the particular crop.

Annual Poundage: Approximately 2 million pounds of propargite active ingredient are applied annually. The vast majority of propargite use is west of the Mississippi River, with approximately two-thirds being applied in California. Sites on which propargite has the highest percent of crop treated include grapes, walnuts, almonds, nectarines, and mint.

Attachment 2 is a "Qualitative Use Assessment" (QUA) providing more detailed information on the amount of propargite used on each of the various crops. This QUA was last modified in August, 2000.

a. Aquatic toxicity of propargite

The acute toxicity data for freshwater organisms (Table 1) indicate that propargite is highly to very highly toxic. Tests on most formulated products are consistent with those on the active ingredient, indicating that ingredients other than active ones, provide no meaningful addition to the toxicity of the active ingredient. However, the data on Omite 57E, used only on field grown roses, indicate the likelihood of other ingredients adding to the toxicity of the propargite in that formulation..

Table 1. Aquatic organisms: acute toxicity of propargite to freshwater fish and invertebrates.				
Species	Scientific name	% a. i.	96-hour LC50 (ppb)	Toxicity Category
Waterflea	*Daphnia magna*	76.2[a]	74 (48 hr EC50)	Very highly toxic
Waterflea	*Daphnia magna*	100 (pure)	91 (48 hr EC50)	Very highly toxic
Rainbow trout	*Oncorhynchus mykiss*	76.2[a]	143	Highly toxic
Rainbow trout	*Oncorhynchus mykiss*	"tech"	118	Highly toxic
Rainbow trout	*Oncorhynchus mykiss*	30[b]	445	Highly toxic
Bluegill sunfish	*Lepomis macrochirus*	88 (tech)	167	Highly toxic
Bluegill sunfish	*Lepomis macrochirus*	57[c]	31	Very highly toxic
Carp	*Cyprinus carpio*	35[d]	330 (48 hr LC50)	Highly toxic

a. Comite agricultural miticide
b. Omite - unknown formulation, probably 30S
c. Omite 57E
d. Unknown formulation

Technical propargite exhibits high chronic toxicity to aquatic organisms that are exposed over a period of time (Table 2).

Table 2. Aquatic organisms: chronic toxicity of propargite to freshwater fish and invertebrates						
Species	Scientific name	duration	% a. i.	Endpoints affected	NOEC (ppb)	LOEC (ppb)
Waterflea	*Daphnia magna*	21 d	88 (tech)	reproduction	9	14
Fathead minnow	*Pimephales promelas*	30 d	88 (tech)	growth, survival, day to mean hatch	16	28

Estuarine fish and invertebrates exhibit acute toxicity similar to freshwater organisms (Table 3). The very low toxicity to fiddler crab is likely to be partially due to the test system which allows the crabs to escape continuous exposure to the treated water. The grass shrimp data are considered more appropriate for addressing estuarine arthropods.

Table 3. Aquatic organisms: acute toxicity of propargite to estuarine fish and invertebrates.				
Species	Scientific name	% a. i.	LC50/EC50	Toxicity Category
Sheepshead minnow	*Cyprinodon variegatus*	87.4 (tech)	96-hr LC50=60 ppb	Very highly toxic
Quahog clam	*Mercenaria mercenaria*	87.4 (tech)	48-hr EC50=80 ppb	Very highly toxic

Table 3. Aquatic organisms: acute toxicity of propargite to estuarine fish and invertebrates.				
Grass shrimp	*Palaeomonetes pugio*	87.4 (tech)	96-hr LC50=101 ppb	Highly toxic
Fiddler crab	*Uca pugilator*	"tech"	96-hr LC50>500 ppm	Practically non-toxic

There is a moderate amount of data relating to health effects and terrestrial uses of propargite. These are considered in detail in the Health Effects Assessment on OPP's website (URL: http://www.epa.gov/oppsrrd1/reregistration/propargite/) and are summarized on page 41 of the Environmental Risk Assessment (Attachment 3). In summary, propargite is considered to be practically non-toxic to mammals from acute oral, inhalation, or dermal exposure. In longer term mouse and rat studies, the low-observed-effect-level was 400. Propargite is classified as a B2 chemical carcinogen based on the results of one test, but not in two others; effect levels are not of concern for risks to humans through exposure in food.

Propargite is considered slightly toxic to practically non-toxic to birds on a dietary basis, and practically non-toxic to birds on an acute oral basis. In chronic, reproductive effects tests, the lowest no-observed-adverse-effect-level was 43.2 ppm; the lowest-observed-effect-level was 84.7 ppm. These are presented in more detail on page 40 in the attached Environmental Risk Assessment.

b. Environmental fate and transport

Propargite is moderately persistent and immobile in soils. In water, it hydrolyzes rapidly (half-life 2.2 days) under alkaline conditions (pH=9), is moderately persistent at pH=7 (half-life 75 days), and very persistent at pH=5 (half-life 120 days). Photolysis is not a major degradation route in water (half-life 140 days); aerobic and anaerobic metabolism occurs a fair amount faster with half-lives of 38 and 47 days, respectively. Major degradates are primarily carbon dioxide, propargite glycol ether, and p-tertiary butylphenoxy cyclohexanol, with the proportions being formed depending upon the type of degradation. Because of the relatively slow degradation rates, these are unlikely to be present in significant amounts. An exception would be the rapid alkaline hydrolysis wherein the principle degradate is propargite glycol ether. It is expected that the primary means of transport to aquatic environments after propargite application are as the parent propargite adsorbed to sediments that may run off during rainfall or irrigation. In terrestrial field studies, propargite was not detectable in runoff from treated areas within 2-3 weeks after the final application. The primary route of aquatic exposure is expected to be through spray drift from aerial applications. While propargite may run off adsorbed to soil and particulate matter, rather than dissolved in the runoff water, in the arid areas where it is most used, neither precipitation nor irrigation are likely to be sufficient to result in much runoff. Propargite is not expected to bioaccumulate significantly in fish. A steady state was reached in 10 days, and residues were eliminated from fish after 14 days in untreated water. Environmental fate and transport data are discussed in more detail in the attached Environmental Risk Assessment on pages 7-11.

c. Incidents

There are no reported incidents of propargite involving terrestrial or aquatic animals. There are two incidents where non-target plants were adversely affected. One of these incidents was reported in the Environmental Risk Assessment, while the other occurred subsequent to that time.

d. Estimated and actual concentrations of propargite in water.

The attached Environmental Risk Assessment includes surface water modeling for estimated environmental concentrations (EECs). The results are presented and discussed on pages 12 and 13, and summarized below. The inputs for these models are on pages 38 and 39 of the attached Environmental Risk Assessment.

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. The model is based on a 10 hectare watershed that surrounds a one hectare pond, two meters deep. The GENEEC model for propargite indicates that the peak surface water concentration following two applications at 4.5 lb ai/A (as on walnuts - the highest labeled rate) would be 69 ppm.

The second tier of modeling, used when there are concerns identified with the results of the screening model, is a PRZM-EXAMS model, which is used widely throughout academia, government, and industry. 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. Two scenarios relate well to propargite uses in areas where salmon and steelhead may be exposed. One of these is for walnuts in California, and the other is for potatoes in Idaho. I have extracted the results of all modeled scenarios from the Environmental Risk Assessment (Table 8, p.17):

Table 4. Estimated environmental concentrations in surface water as predicted from PRZM-EXAMS standard scenarios.

crop	geographic site	applica-tion rate (lb ai/A)	number and interval between applications	peak EEC for acute risk (ug/L)	acute risk quotient	chronic mean EEC (ug/L)	chronic risk quotient
citrus	Florida	3.0 x 2	2 at 21-days	13.11	0.11	4.54	0.28
corn	Kansas	1.6 x 2	2 at 7-days	22.20	0.19	7.68	0.48
cotton	Mississippi	1.6 x 3	3 at 7-days	31.4	0.27	15.91	1
potatoes	Idaho	2.0 x 2	2 at 7-days	11.34	0.10	4.72	0.30
walnuts	California	4.5 x 2	2 at 7-days	25.79	0.11	12.1	0.28

While these scenarios may be used for other crops, they would not apply to single applications. The use of propargite on seed alfalfa is a single application use. To determine an EEC for seed alfalfa, I used the GENEEC program and the same parameters for propargite as were used in the walnut GENEEC scenario. However, the application rate was 2 lb ai/A for Oregon and Idaho and 2.4 lb ai/A for Washington, in accordance with those section 24c labels. The results indicated an EEC of 26.8 ppb for the 2 lb rate and 32.1 ppb for the 2.4 lb rate. I note that the PRZM-EXAMS model for walnuts yielded an EEC that was 37.4% of that found in the screening GENEEC model. While the site scenario for walnuts is different than it would be for alfalfa, applying the same percentage to the alfalfa GENEEC concentrations would yield PRZM-EXAMS-comparable EECs of 10 and 12 ppb for the 2 and 2.4 lb ai/A rates, respectively.

Both the GENEEC and the PRZM-EXAMS models are based on the 1 hectare farm pond surrounded by 10 hectares of crop, all of which is treated with the pesticide. However, except for the sockeye salmon, all of the listed salmon and steelhead occur in streams, some of which are moderate size even where spawning occurs. OPP has determined that this model does approximate what might be found in first order streams, and those salmon that spawn in first order streams could be exposed to concentrations as modeled. Larger streams would have lower concentrations because modeled inputs are maximized relative to the crops at the edge of the stream. OPP cannot quantitate the amount of likely reduction in EECs that would result in larger streams except to note that it would be qualitatively less, perhaps much less.

It should also be noted that the pond scenario is not representative of the duration of exposure that would occur even in first order streams. Again, this can only be stated qualitatively because quantitative differences would be very site-specific based upon both size and flow rate of the stream. In addition, propargite is rather stable at acid and neutral pH values (pH 7 half-life=75 days), but degrades rather rapidly under alkaline conditions (pH 9 half-life=2.2 days). Based upon interpolation from the hydrolysis data at pH 5, 7, and 9, it would be expected that the hydrolysis half-life would be 43.5 days at pH 7.5, 18.7 days at pH 8.0, and 6.7 days at pH 8.5.

Although pH data are temporally and spatially variable for both biological and geological reasons, most of the salmon and steelhead ESUs tend to be in water that is slightly acid to strongly alkaline. In the Upper Columbia drainage, pH values at many different sites monitored by the Washington Department of Ecology (URL: http://www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html) are mostly 6.8 to 8.5, with 2 of 36 sites having the range extend below 6 (5.9-9.7 and 5.8-8,6) and with 11 sites having a high end pH above 9. This pattern holds for other areas in Washington east of the Cascades. Even with all of the forests in western Washington, pH values along the streams draining into the Pacific Ocean or Puget Sound are more often on the alkaline side than on the acid side, although they do tend be less alkaline than in the eastern part of the state.

USGS monitoring (URL: http://waterdata.usgs.gov/nwis/qw) indicates that pH values in the Salmon, Clearwater, and Snake River areas of Idaho (HUCs 170602 & 170603) range from 5.6 to 9.2. Mean lower end pHs are 6.4 and mean higher end pHs are 8.7 at the various sites. In eastern Oregon (HUCs 170601, 170701, & 170702), mean lower end pHs were 6.9 (range 6.1-7.6) and mean upper end pHs were 8.7 (range 7.7-9.2). As with Washington, western and coastal Oregon pH values still tend to be above 7, but not as pronounced as east of the Cascades. In California, USGS measured pH values in salmon and steelhead ESUs again tend to be slightly acid to strongly alkaline, although several extremely acid or extremely alkaline values were reported. Of the sampled sites in these ESUs (n=86), about one-third had low end values above 7 (n=26) and about one-third had high end values above 9 (n=24); some of these are the same sites.

Based on these pH data, it appears that propargite will be rather less persistent than projected in the Environmental Risk Assessment. There are insufficient data to quantify this, and the data are confounded by natural pH variability. However, even a relatively brief exposure to strongly alkaline pH water (e.g., pH=9), could result in significant hydrolysis of propargite.

In addition to modeling results for estimated environmental concentrations, actual measured residues found by USGS are relevant to the risks for aquatic species. For propargite, the highest concentration found was 20 ppb in the Orestimba Creek watershed in the southern part of Stanislaus County, California in 1993. The next highest concentration of propargite was 3.7 ppb, which occurred at the same sampling site in 1992. Fully 67% of this watershed has agricultural crops (walnuts, beans, almonds) on which propargite is registered for use (Panshin et al. 1998).

USGS detected propargite twice in the Willamette Basin from April, 1993 through September, 1995 (Rinella and Janet, 1997). The detection frequency was 1.2% and the highest propargite residue was 0.054 ppb. In the Central Columbia Plateau, Wagner et al. (1996) sampled four agricultural drainage areas for propargite. They found propargite at up to 1.3 ppb in 20 out of 104 samples. All of the positive samples were associated with irrigated crops; none were from dryland agricultural areas. However, sales data for propargite suggest very little use in the dryland areas. Williamson et al. (1998) reported a detection frequency for propargite of 9% in the Columbia Plateau region, somewhat higher than was found by Wagner et al. (1996).

The highest residue concentration in the later study, as interpreted from a graphical display, was approximately 2 ppb. The sites where Williamson et al. (1998) sampled are not clear; they could have been only the same sites Wagner et al. (1996) had sampled earlier, or additional sites could have been added.

Nationwide, the detection frequency of propargite for 1000 samples taken from agricultural streams was 5.3% and the 95th percentile concentration was 0.004 ppb (URL:http://water.wr.usgs.gov/pnsp/allsum/#t1). These results are from the original 20 study units of the National Water Quality Assessment (NAWQA) program. Samples were also taken in a later study in the Sacramento River Basin (Domagalski, 2000). Residues of propargite were found at a detection rate of 4.8% in the Colusa Basin agricultural drain site, with 0.052 ppb being measured in the single positive sample. Propargite residues were not found at the Arcade Creek site, the Sacramento River site at Freeport, or the Yolo Basin Bypass site.

In general, USGS monitoring occurs on a schedule independent of the use of any particular pesticide. Thus, the USGS measured residues may not represent the worst case scenario typically used by OPP. The worst case scenario demonstrates residues that could occur immediately after and adjacent to application to the crop. Orestimba Creek residue of 20 ppb probably does represent very close to "immediately after and adjacent to" propargite applications in this watershed, and this mimics OPP's modeled environmental concentrations in the agricultural areas.

At the same time, I believe that the USGS measured residues, where they are not taken from agricultural drains, do represent the kinds of concentrations that fish can encounter downstream from agricultural sites and in migration corridors for salmon and steelhead. The amount of these kinds of residues of propargite indicate a maximum of about 2 ppb in the Columbia Plateau (although it is not clear if this was a drain or a natural site) and a more likely amount of less than 1 ppb, often much less.

The lowest acute fish toxicity LC50 on technical propargite is 118 ppb. Using the standard endangered species criterion of the Risk Quotient exceeding 0.05, then concentrations exceeding 5.9 ppb would yield concerns for direct acute effects on endangered or threatened fish. It can be seen from Table 4 that EECs from all uses exceed this number. Risk quotients range from 0.085 for seed alfalfa (as calculated by GENEEC for 2 lb ai/A and adjusted to resemble PRZM-EXAMS) to 0.22 for walnuts (using PRZM-EXAMS). None of these exceed the high risk concern for fish populations, but all exceed the endangered species levels of concern for individuals.

e. Changes in registration status

The development of a Reregistration Eligibility Decision (RED) document is a step in the process of reregistering existing pesticide products. The Environmental Risk Assessment used and referred to throughout much of this analysis provides an assessment at the point in time at which it is developed. Subsequent to the development of the RED, changes in uses may occur,

label changes may be required, and additional data may be requested. As a result, there are nearly always changes in certain aspects of the registration that occur after the development of the RED.

Changes that may alter the aquatic risk analysis for propargite since the Environmental Risk Assessment was completed are:

- Section 3 labels now require a 21-day or 28-day interval between applications. Previously, no interval was on the label. This change would result in lower EECs, more pronounced for acute toxicity than for chronic toxicity with propargite. There would be more time for degradation and thus less compounding of two or three applications in EEC modeling.
- Propargite is now a "restricted use" pesticide. In general, this means that all applicators of propargite must be "certified" as trained in the appropriate use of pesticides. Different states have different training programs, but all must meet minimum federal standards. In California, restricted use means that an applicator must obtain a permit from the County Agricultural Commissioner at least 48 hours before applying propargite.
- Labels now require a no-spray buffer of 50 feet for ground applications and 75 feet for aerial applications. This will result in a reduction of runoff potential and probably a significant reduction in transport to water by drift.
- Additional label directions regarding droplet size, wind speed and direction, application height, and a prohibition of applications during temperature inversions should also reduce drift into aquatic habitats.
- Labels now prohibit treating frequently flooded areas and prohibit applications when significant rainfall is expected. "Best management practices" to reduce runoff are included. These provisions should reduce runoff into nearby aquatic habitats.

Incorporation of these provisions will definitely reduce the aquatic risks. However, there are no methods by which the reduction can be quantified for certain of these and for the combination of all of them.

f. General risk conclusions

There are concerns for acute risk to fish, including endangered and threatened salmon and steelhead, based upon the Environmental Risk Assessment and my modification of it to represent western salmon states. Both of these analyses use a "worst-case" scenario where OPP uses the highest application rates, shortest spray intervals, lowest toxicity values, longest degradation rates, the farm pond model for EECs, and a very conservative criterion of concern. These risks exceed our criteria for the protection of individuals, but are not high enough to expect population effects. It is relevant that no fish kills have been reported over the decades of propargite use. The Environmental Risk Assessment noted that, when transported to water, propargite would tend to be adsorbed to organic matter and sediment.

Concerns were identified for chronic risk to fish from use on cotton in the Environmental

Risk Assessment. However, the modeled concentrations (15.91 ppb) are actually below the chronic fish no-observed-effect-level (16 ppb). In addition, the modeled concentrations for cotton were based upon a Mississippi site and a farm pond as the receiving water. There is a much higher likelihood of runoff in Mississippi than in California, especially in the summer. In addition, any runoff that did occur would have a much shorter residence time in flowing water than would occur in the farm pond. And finally, the pH of western waters is much more alkaline and degradation of propargite would be more rapid. Therefore, I conclude that there is no chronic concern for salmon and steelhead from the use of propargite.

g. Existing protective measures

Nationally, there are no specific protective measures for endangered and threatened species beyond the generic statements on the current propargite labels. As stated on all pesticide labels, it is a violation of Federal law to use this product in a manner inconsistent with its labeling. There are a variety of measures on propargite labels for the protection of agricultural workers and other humans, which are not discussed here, but which may be seen on the attached labels. The Environmental Hazards section, for all section 3 labels for propargite products that may be applied to the various use sites, states: "This pesticide is 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. Drift or runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwaters." Additional limitations on use will be specified on future labels, as required in the RED (Attachment 4), as noted above; the registrant has agreed with these changes (Attachment 5).

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.

In California, the Department of Pesticide Regulation (DPR) in the California Environmental Protection Agency creates county bulletins consistent with those developed by OPP. However, California also has a system of County Agricultural Commissioners responsible for pesticide regulation, and all commercial applicators must get a permit for the use of any restricted use pesticide and must report all pesticide use, restricted or not. The California bulletins for protecting endangered species have been in use for about 5 years. Although they are "voluntary" in nature, the Agricultural Commissioners strongly promote their use by pesticide applicators. In some cases, commissioners may even require, before a permit will be issued, that applicators follow the bulletins. Thus, agricultural and other commercial applicators are well sensitized to the need for protecting endangered and threatened species. DPR believes that the vast majority of agricultural applicators in California are following the limitations in these

bulletins (Richard Marovich, Endangered Species Project, DPR, telephone communication, July

19, 2002).

The California bulletins include salmon and steelhead locations, and propargite is listed as an aquatic hazard. The primary limitation on pesticide use for propargite is a no-spray area (buffer) of 40 yards for ground application and 200 yards for aerial applications from the habitat of any endangered or threatened aquatic animal. The bulletins also recommend a 20 foot vegetated buffer strip along aquatic habitats. An example bulletin for California is included as Attachment 6; the limitations on pesticide applications are the same for each county. In addition, I have extracted the limitations that apply to propargite and fish, and these are presented separately in Attachment 7.

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

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

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

On a statewide basis, the use of propargite in California (Table 5) remained fairly steady from 1992 through 1997, when it dropped by about 20%, and then was roughly steady again from 1998 through 2000. This reduction in use was apparently due to competition with new miticides on the market (telephone communication, July 17, 2002, Fred Hageman, registration specialist, Uniroyal Chemical Company), although the company also cancelled some of the uses on bearing fruit crops at about this time. For uses in California, I have shown, in the tables below presenting county level information, the actual amount of propargite reported to have been used in the year 2000. On a statewide basis, most of the propargite used in California in the year 2000 was on almonds (298,206 lb), sweet and field corn (389,004 lb), table and wine grapes (344,997 lb), cotton (80,335 lb), walnuts (81,543 lb), and beans (55,254 lb). The total use on these crops was 1,249,339 lb or 95.6% of the usage in California. Additional details are available at DPR's website (URL - http://www.cdpr.ca.gov/docs/pur/purmain.htm).

Table 5. Reported use of propargite in California, 1992-2000, in pounds of active ingredient

1992	1993	1994	1995	1996	1997	1998	1999	2000
1,702,328	1,653,855	1,742,736	1,770,065	1,743,278	1,816,028	1,385,327	1,472,263	1,306,767

In Oregon, Washington, and Idaho, information on the actual amount of propargite used

is rather limited. For ESUs in these three states, I have indicated the amount of acreage, by county, where propargite could be used according to the labels. The actual 1997 acreage is provided where the crop size in a county exceeded 100 acres, and simply listed for crops with less than 100 acres. The Qualitative Usage Analysis (QUA) (Attachment 2) prepared for use with the propargite RED indicates that usage nationwide averages almost 2 million pounds per year for 1 million acres. Given that California uses about 1.3 million pounds per year, this means that only about 700,000 pounds would be used throughout the rest of the United States. The QUA indicates that potatoes (43,000 lb), sweet corn (10,000 lb), dry beans (50,000 lb), alfalfa (54,000 lb), hops (33,000 lb), strawberries (4000 lb), and apples (32,000 lb) are the crops where propargite is likely to be used in the Pacific Northwest, along with the weighted average amount of pounds used on that crop (in parentheses). I note that propargite can be used only on "non-bearing" plums, strawberries, apples, apricots, pears, and peaches, and the alfalfa use is for seed alfalfa only. Use on bearing fruits and alfalfa used as forage was voluntarily cancelled in 1999, although use stopped on most of these sites a year or two earlier. The non-bearing plants may constitute 10-15% of the acreage for a given crop.

For the Pacific Northwest, I have supplemented the use site and crop acreage data with a qualitative summary of sales information. The details of sales information are considered to be confidential business information (CBI). If this information is considered critical by NMFS, training to provide a CBI security clearance for NMFS personnel may be feasible. However, I believe that my summary should be sufficient to make the necessary points. In decreasing order, I use the terms 'considerable', 'moderate', 'modest', and 'some' (or 'small') to avoid compromising confidential details. For California, the registrant relies on DPR's detailed pesticide reporting for sales and usage information.

For either California or the Pacific Northwest, crop lists for specific counties in the tables below begin with the highest acreage (Pacific Northwest) or highest propargite use (California). Actual use in California is a reasonable predictor of future use. However, acreage planted to a specific crop in the Pacific Northwest is not a reasonable predictor of use. For example, according to the 1997 USDA Agricultural census, there were 607,704 acres of potatoes grown in Oregon, Washington, and Idaho. However, according to OPP's Qualitative Use Assessment, an average of 2.1 % (maximum 5.9%) of the potato crop is treated with propargite, nationally. Registrant-provided sales data indicate approximately 3.9% of the Pacific Northwest potato crop is treated. As another example, of the 1,862,530 acres (1997) of alfalfa in the Pacific Northwest, only 52,761 acres are alfalfa grown for seed on which propargite may be used. If applicators used the maximum 2 lb ai/A rate on seed alfalfa, then approximately 36% of the alfalfa seed crop in the Pacific Northwest was treated.

In the Pacific Northwest, sales data indicate usage primarily on seed alfalfa, mint, hops, and potatoes, with smaller amounts used on beans, sweet and field corn, Christmas trees, seed clover, grapes, and cherries. The only crops for which more than 10% of the Pacific Northwest

crop is treated are seed alfalfa (estimated 36%), mint (estimated 22%), and hops (estimated 10.7%).

In the following discussion of specific ESUs and propargite use, I present information on the listed salmon and steelhead ESUs and discuss the potential for the use of propargite where they occur. My information on the various ESUs was taken almost entirely from various Federal Register Notices relating to listing, critical habitat, or status reviews. As noted above, usage data were derived from 1997 Agricultural Census, DPR's pesticide use reporting, and confidential sales information from the registrant. In the Pacific Northwest tables, I have also indicated, in the last column, the total acreage of land in each county and the acreage and percentage of land in farms, which includes ranches. Following this section, I make and discuss my conclusions.

A. Steelhead

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

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

Biologically, steelhead can be divided into two reproductive ecotypes. "Stream maturing," or "summer steelhead" enter fresh water in a sexually immature condition and require several months to mature and spawn. "Ocean maturing," or "winter steelhead" enter fresh water with well-developed gonads and spawn shortly after river entry. There are also two major genetic groups, applying to both anadromous and 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. Since home uses are not registered, there is little likelihood that propargite would be used in these watersheds. In addition, there is no use of propargite reported by DPR for either Los Angeles or San Diego counties for the year 2000. There is a potential for steelhead waters to drain agricultural areas in Ventura, Santa Barbara, and San Luis Obispo counties, but usage of propargite is relatively low in these counties. Usage of propargite in counties where this ESU occurs are presented in Table 6.

Table 6. Use of propargite in counties with the Southern California steelhead ESU

County	Crop	Propargite usage (pounds)	Acres treated
San Diego		none	
Los Angeles		none	
Ventura		none	
San Luis Obispo	grapes	1970	1209
Santa Barbara	beans	1045	591

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 7 shows that propargite usage is low in those counties where this ESU occurs.

Table 7. Use of propargite in counties with the South Central California steelhead ESU

County	Crop(s)	Propargite usage (pounds)	Acres treated
Santa Cruz	strawberries	3	4
San Benito	grapes	38	18
Monterey	grapes	2023	1149
San Luis Obispo	grapes	1970	1209

3. Central California Coast Steelhead ESU

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

Only winter steelhead are found in this ESU and those to the south. River entry ranges from October in the larger basins, late November in the smaller coastal basins, and continues

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

Counties of occurrence for this ESU are Santa Cruz, San Mateo, San Francisco, Marin, Sonoma, Mendocino, Napa, Alameda, Contra Costa, Solano, and Santa Clara counties. Again, usage of propargite in the coastal counties is low, but it is somewhat higher in Solano County. Usage of propargite in the counties where the Central California coast steelhead ESU is presented in Table 8. Within a county, crops are listed in order from greatest propargite use to smallest.

Table 8. Use of propargite in counties with the Central California Coast steelhead ESU.

County	Crop(s)	Propargite usage (pounds)	Acres treated
Santa Cruz	strawberries	3	4
San Mateo		none	
San Francisco		none	
Marin		none	
Sonoma	grapes	1503	1091
Mendocino	grapes	592	391
Napa	grapes	40	26
Alameda		none	
Contra Costa	corn, cherries, walnuts, grapes	3768	2119
Solano	beans, corn, grapes, walnuts, almonds	13,546	7658
Santa Clara	nursery-greenhouse flowers	0.06	1/4

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 propargite is heaviest in areas where nuts, corn, beans, and grapes are grown. Usage of propargite in counties where the California Central Valley steelhead ESU occurs is presented in Table 9. Within a county, crops are listed in order from greatest propargite use to smallest.

Table 9. Use of propargite in counties with the California Central Valley steelhead ESU.

County	Crop(s)	Propargite usage (pounds)	Acres treated
Alameda		none	
Amador	grapes	91	89
Butte	almonds, walnuts, beans, corn, nursery containerized plants, cotton, carrots,	22,981	14,142
Calaveras	walnut, grapes	166	71
Colusa	Beans, almonds, cotton, corn, grapes, walnuts	14,918	9270
Contra Costa	corn, cherries, walnuts, grapes	3768	2119
Glenn	almonds, clover, beans, corn, walnuts, cotton, melon, grapes, oats, alfalfa, carrots	22,901	16,923
Marin		none	
Merced	corn, almonds, walnuts, beans, cotton, grapes, cherries, nursery container plants, sorghum, nectarine, peaches	99,735	58,432

Nevada	grapes	25	16
Placer		none	
Sacramento	grapes, corn, beans, uncultivated agriculture, alfalfa, cherries, walnuts	15,801	9,913
San Joaquin	corn, walnuts, grapes, almonds, cherries, beans, nursery plants, forage, pastureland, apples, rice	114,021	68,869
San Mateo		none	
San Francisco		none	
Shasta	Mint, walnut	790	499
Solano	beans, corn, grapes, walnuts, almonds	13,546	7658
Sonoma	grapes	1503	1091
Stanislaus	corn, almonds, beans, walnuts, grapes, alfalfa, cherries, tomatoes (post harvest), nurseries, rights-of-way	124,764	67,181
Sutter	beans, corn, walnuts, almonds, uncultivated agriculture, wheat, cotton, nurseries	11,277	6642
Tehama	almonds, walnuts, corn, prunes	8576	5934
Tuloumne		none	
Yolo	corn, grapes, cotton, almonds, walnuts, cucumbers, beans, research	18,976	12,844
Yuba	walnuts, almonds	943	780

5. Northern California Steelhead ESU

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

This Northern California coastal steelhead ESU occupies river basins from Redwood Creek in Humboldt County, CA to the Gualala River, inclusive, in Mendocino County, CA. River entry ranges from August through June and spawning from December through April, with peak spawning in January in the larger basins and in late February and March in the smaller coastal basins. The Northern California ESU has both winter and summer steelhead, including what is presently considered to be the southernmost population of summer steelhead, in the Middle Fork Eel River. Counties included appear to be Humboldt, Mendocino, Trinity, and Lake. Table 10 shows that use of propargite in the counties where the Northern California steelhead ESU occurs is very limited and is on grapes.

Table 10. Use of propargite in counties with the Northern California steelhead ESU

County	Crop(s)	Propargite usage (pounds)	Acres treated
Humboldt		none	
Mendocino	grapes	593	391
Trinity		none	
Lake	grapes	44	27.5

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.

Sales data indicate considerable use of propargite, almost all on potatoes, mint, seed alfalfa, and hops. Most of this usage occurs upstream from the confluence of the Snake River with the Columbia River, but not as far north as Douglas, Chelan, and Okanogan counties, where there is limited acreage of the major crops for propargite. However, a modest amount is used on the same crops below that confluence in counties on either side of the Columbia River, but all upstream of the John Day Dam.

Tables 11 and 12 show the cropping information for Washington counties where the Upper Columbia River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates. In these tables, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 11. Crops on which propargite can be used in Washington counties where there is spawning and growth of the Upper Columbia River steelhead ESU

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Benton	Potatoes (25,317), apples (18,425), corn (16,086), grapes (15,929), hops (4412), sugar beets (4284), cherries (3219), pears (472), plums (180), apricots (174), nursery crops (161), peaches (149), nectarines (106), walnuts	88,955	1,089,993 640,370 58.7%
WA	Franklin	Potatoes (35,770), corn (24,428), apples (9000), carrots (3574), grapes (2813), cherries (2165), beans (2706), mint (1586), seed alfalfa (967), peaches (262), pears (156), nectarines (129), clover seeds (126), raspberries, apricots, plums, strawberries	83,766	794,999 670,149 84.3%
WA	Kittitas	Corn (4542), apples (1859), potatoes (442), mint (409), pears (331), Christmas trees, filberts, peaches, plums	7609	1,469,862 355,360 24.2%

WA	Yakima	Apples (75,264), corn (30,531), hops (27,449), grapes (15,529), mint (12,577), pears (10,190), cherries (6129), beans (2251), potatoes (1929), peaches (1438), lima beans (731), nectarines (605), plums (478), apricots (285), walnuts, raspberries, filberts	185,413	2,749,514 1,639,965 59.6%
WA	Chelan	Apples (17,096), pears (8298), apricots, Christmas trees, nectarines, peaches, plums	25,563	1,869,848 112,085 6%
WA	Douglas	Apples (14,383), cherries (1842), pears (1104), apricots (315), peaches (167), nectarines	17,902	1,165,168 918,033 78.8%
WA	Okanogan	Apples (24,164), pears (3280), cherries (1003), peaches, nectarines, walnuts, Christmas trees, apricots, filberts, corn, carrots, plums, raspberries	28,616	3,371,698 1,291,118 38.3%
WA	Grant	Corn (67,663), potatoes (44,263), apples (33,615), beans (18,024), mint (15,610), sugar beets (10,792), seed alfalfa (4742), lima beans (3878), cherries (3470), grapes (3132), carrots (2207), nursery crops (1562), pears (998), apricots (266), peaches (261), nectarines (163), walnuts, plums, strawberries, raspberries	210,681	1,712,881 1,086,045 63.4%

Table 12. Crops on which propargite can be used in Oregon and Washington counties that are migration corridors for the Upper Columbia River steelhead ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Walla Walla	Corn (14,601), potatoes (9256), seed alfalfa (5760), beans (5707), apples (5222), lima beans (458), cherries (280), plums	41,306	813,108 710,546 87.4%
WA	Klickitat	Pears (923), apples (516), cherries (457), grapes (419), peaches (199), apricots, plums	2533	1,198,385 689,639 57.5%

WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%
WA	Wahkiakum	none	0	169,125 12,611 7.5%
WA	Pacific	Christmas trees	17	623,722 32,637 5.2%
OR	Gilliam	none	0	770,664 766,373 99.4%
OR	Umatilla	Potatoes (15,003), corn (9980), apples (3927), beans, lima beans (1239), seed alfalfa (1020), plums (365), cherries (349), grapes (163), apricots, strawberries, peaches, raspberries, pears	34,175	2,057,809 1,466,580 71.3%
OR	Sherman	none	0	526,911 487,534 92.5%
OR	Morrow	Potatoes (17,030), corn (12,996)	30,026	1,301,021 1,119,004 86%
OR	Wasco	Cherries (7352), apples (463), pears (385), grapes (110), apricots, peaches, corn	8373	1,523,958 1,152,965 75.7%

OR	Hood River	Pears (11,788), apples (2592), cherries (1081), Christmas trees (161), grapes, peaches, corn, raspberries	15,703	334,328 27,201 8.1%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

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. I 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 propargite use in agricultural areas. I 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. I have excluded these areas because they are not relevant to use of propargite. 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 I was 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.

Propargite sales data show no propargite sales in Idaho counties within this ESU, nor in the Washington counties bordering on Idaho. There is moderate usage in the counties along the lower Snake River and some usage along the Columbia River between the Snake River and the John Day Dam.

Tables 13 and 14 show the cropping information for the Pacific Northwest counties where the Snake River Basin steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates. In these tables, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 13. Crops on which propargite can be used in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River Basin steelhead ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
ID	Adams	Corn (104)	104	873,399 221,209 25.3%
ID	Idaho	Corn (117), Christmas trees, apples, cherries, plums, pears, grapes	150	5,430,522 744,295 13.7%
ID	Nez Perce	Beans (4561), peaches, corn, apples, cherries, apricots	4612	543,434 477,839 87.9%
ID	Custer	Potatoes (507)	507	3,152,382 140,701 4.5%
ID	Lemhi	Cherries, apples, peaches, pears	20	2,921,172 193,908 6.6%
ID	Valley	Potatoes (225)	225	2,354,043 78,813 3.3%

ID	Lewis	none	0	306,601 211,039 68.8%
ID	Clearwater	Beans (218)	218	1,575,396 103,246 6.6%
ID	Latah	Beans (1135), Christmas trees, cherries, apples	1235	689,089 347,293 50.4%
WA	Adams	Potatoes (27914), beans (8250), corn (8167), mint (7238), apples (3457), sugar beets (1570), seed alfalfa (1110)	57,706	1,231,999 996,742 80.9%
WA	Asotin	Apples, cherries, pears, apricots	70	406,983 274,546 67.5%
WA	Garfield	none	0	454,744 325,472 84.3%
WA	Columbia	Corn	51	556,034 304,928 54.8%
WA	Whitman	Beans (1283), corn (101), apples, Christmas trees, pears	1409	1,382,006 1,404,289 101.6%
WA	Franklin	Potatoes (35,770), corn (24,428), apples (9000), carrots (3574), grapes (2813), cherries (2165), beans (2706), mint (1586), seed alfalfa (967), peaches (262), pears (156), nectarines (129), clover seeds (126), raspberries, apricots, plums, strawberries	83,766	794,999 670,149 84.3%
WA	Walla Walla	Corn (14,601), potatoes (9256), seed alfalfa (5760), beans (5707), apples (5222), lima beans (458), cherries (280), plums	41,306	813,108 710,546 87.4%
OR	Wallowa	Apples, nursery crops	12	2,013,071 694,304 34.5%

OR	Union	Mint (9226), sugar beets (1035), beans (661), potatoes (660), cherries (596), apples, Christmas trees, peaches	12,246	1,303,476 473,316 36.3%

Table 14. Crops on which propargite can be used in Washington and Oregon counties through which the Snake River Basin steelhead ESU migrates

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Walla Walla	Corn (14,601), potatoes (9256), seed alfalfa (5760), beans (5707), apples (5222), lima beans (458), cherries (280), plums	41,306	813,108 710,546 87.4%
WA	Benton	Potatoes (25,317), apples (18,425), corn (16,086), grapes (15,929), hops (4412), sugar beets (4284), cherries (3219), pears (472), plums (180), apricots (174), nursery crops (161), peaches (149), nectarines (106), walnuts	88,955	1,089,993 640,370 58.7%
WA	Klickitat	Pears (923), apples (516), cherries (457), grapes (419), peaches (199), apricots, plums	2533	1,198,385 689,639 57.5%
WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%
WA	Wahkiakum	none	0	169,125 12,611 7.5%

WA	Pacific	Christmas trees	17	623,722 32,637 5.2%
OR	Umatilla	Potatoes (15,003), corn (9980), apples (3927), beans, lima beans (1239), seed alfalfa (1020), plums (365), cherries (349), grapes (163), apricots, strawberries, peaches, raspberries, pears	34,175	2,057,809 1,466,580 71.3%
OR	Morrow	Potatoes (17,030), corn (12,996)	30,026	1,301,021 1,119,004 86%
OR	Gilliam	none	0	770,664 766,373 99.4%
OR	Sherman	none	0	526,911 487,534 92.5%
OR	Wasco	Cherries (7352), apples (463), pears (385), grapes (110), apricots, peaches, corn	8373	1,523,958 1,152,965 75.7%
OR	Hood River	Pears (11,788), apples (2592), cherries (1081), Christmas trees (161), grapes, peaches, corn, raspberries	15,703	334,328 27,201 8.1%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

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

Sales data indicate modest usage on mint and somewhat less on Christmas trees in two counties in the Willamette Valley. No sales, and therefore no likely usage, occurred in the migratory corridors below Willamette Falls.

Tables 15 and 16 show the cropping information for Oregon counties where the Upper Willamette River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates. In these tables, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 15. Crops on which propargite can be used that are part of the spawning and rearing habitat of the Upper Willamette River steelhead ESU.

St	County	Crops and acres planted	Acres	<u>total acreage</u> land in farms % farmed

OR	Benton	Corn (6260), beans (3080), mint (2925), Christmas trees (1983), sugar beets (687), filberts (493), grapes (242), apples, walnuts, cherries, strawberries, peaches, pears, plums, potatoes, raspberries	15,815	432,961 118,818 27.4%
OR	Linn	Corn (7747), mint (4105), beans (2688), filberts (1820), clover seeds (1522), raspberries (387), Christmas trees (292), sugar beets (281), cherries (157), apples (133), grapes, peaches, walnuts, strawberries, pears, plums, nectarines	19,448	1,466,507 380,464 25.9%
OR	Polk	Corn (3307), mint (2448), filberts (2394), cherries (1888), clover seeds (1115), grapes (1123), Christmas trees (644), beans (598), plums (595), apples (157), sugar beets (130), pears, peaches, walnuts, strawberries	14,598	474,296 167,880 35.4%
OR	Clackamas	Christmas trees (7532), filberts (3994), corn (1807), raspberries (1435), clover seeds (965), strawberries (608), beans (337), boysenberries (253), grapes (207), apples (167), sugar beets (106), peaches, cherries, walnuts, pears, plums, potatoes	17,368	1,195,712 148,848 12.4%
OR	Marion	Corn (16,691), beans (12,101), hops (7407), filberts (7061), mint (3695), Christmas trees (3712), blackberries (3609) strawberries (1858), cherries (1568), sugar beets (940), grapes (761), apples (555), raspberries (546), clover seeds (526), peaches (179), walnuts (155), pears (150), plums (145), lima beans (115), carrots	61,850	758,394 302,462 39.9%

OR	Yamhill	Filberts (7110), clover seeds (6509), corn (6322), nursery crops (3444), grapes (2887), beans (1838), cherries (1693), walnuts (608), Christmas trees (556), plums (369), strawberries (265), apples (310), boysenberries (153), sugar beets (151), raspberries (114), peaches (104), pears, currants, potatoes	32,518	457,986 179,787 39.3%
OR	Washington	Clover seeds (9767), corn (8155), filberts (5595), nursery crops (4130), Christmas trees (1411), strawberries (1257), raspberries (1150), grapes (989), beans (988), walnuts (679), plums (358), apples (279), cherries (211), peaches (168), boysenberries (150), pears, carrots	35,357	463,231 139,820 30.2%

Table 16. Crops on which propargite can be used in Oregon and Washington counties that are part of the migration corridors of the Upper Willamette River steelhead ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%
WA	Wahkiakum	none	0	169,125 12,611 7.5%
WA	Pacific	Christmas trees	17	623,722 32,637 5.2%

OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

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 17 and 18 show the cropping information for Oregon and Washington counties where the Lower Columbia River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates. In these tables, crops where there is less than 100 acres in the

county do not indicate the specific acres planted. However, there were no sales and presumably no propargite usage in counties within this ESU.

Table 17. Crops and acreage where propargite can be used in counties that provide spawning and rearing habitat for the Lower Columbia River Steelhead ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
OR	Hood River	Pears (11,788), apples (2592), cherries (1081), Christmas trees (161), grapes, peaches, corn, raspberries	15,703	334,328 27,201 8.1%
OR	Clackamas	Christmas trees (7532), filberts (3994), corn (1807), raspberries (1435), clover seeds (965), strawberries (608), beans (337), boysenberries (253), grapes (207), apples (167), sugar beets (106), peaches, cherries, walnuts, pears, plums, potatoes	17,368	1,195,712 148,848 12.4%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%
WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%

Table 18. Crops and acreage where propargite can be used in counties that are migratory

corridors for the Lower Columbia River Steelhead ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%
WA	Pacific	Christmas trees	17	623,722 32,637 5.2%
WA	Wahkiakum	none	0	169,125 12,611 7.5%

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. Although I am unsure of the status of these Dog and Collins creeks, they have little relevance to the analysis of propargite because there are only 716 acres of potential use sites in Skamania for propargite, and it would be expected that these acres would be in the agricultural rather than forest areas of the county.

The only other upstream barrier, in addition to Condit Dam on the White Salmon River is the Pelton Dam on the Deschutes River. As an upstream barrier, this dam would preclude

steelhead from reaching the Metolius and Crooked Rivers as well the upper Deschutes River and its tributaries.

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

Sales data for propargite indicate a moderate amount of use above the John Day Dam and no use below that point in the counties along the Columbia River. There is some use in the Deschutes River watershed, most likely down stream from Pelton Dam.

Tables 19 and 20 show the cropping information for Oregon and Washington counties where the Middle Columbia River steelhead ESU is located and for the Oregon and Washington counties where this ESU migrates. In these tables, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 19. Crops and acreage where propargite can be used in counties that provide spawning and rearing habitat for the Middle Columbia River Steelhead ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
OR	Gilliam	none	0	770,664 766,373 99.4%
OR	Morrow	Potatoes (17,030), corn (12,996)	30,026	1,301,021 1,119,004 86%

OR	Umatilla	Potatoes (15,003), corn (9980), apples (3927), beans, lima beans (1239), seed alfalfa (1020), plums (365), cherries (349), grapes (163), apricots, strawberries, peaches, raspberries, pears	34,175	2,057,809 1,466,580 71.3%
OR	Sherman	none	0	526,911 487,534 92.5%
OR	Wasco	Cherries (7352), apples (463), pears (385), grapes (110), apricots, peaches, corn	8373	1,523,958 1,152,965 75.7%
OR	Crook	Mint (5501), sugar beets (1510)	7011	1,906,892 894,853 46.9%
OR	Grant	Apricots	19	2,898,444 1,154,399 39.8%
OR	Wheeler	Apples	23	1,097,601 728,131 66.3%
OR	Jefferson	Mint (3103), sugar beets (2396), potatoes (973), beans (220), apples	6696	1,139,744 530,960 46.6%
WA	Benton	Potatoes (25,317), apples (18,425), corn (16,086), grapes (15,929), hops (4412), sugar beets (4284), cherries (3219), pears (472), plums (180), apricots (174), nursery crops (161), peaches (149), nectarines (106), walnuts	88,955	1,089,993 640,370 58.7%
WA	Columbia	Corn	51	556,034 304,928 54.8%

WA	Franklin	Potatoes (35,770), corn (24,428), apples (9000), carrots (3574), grapes (2813), cherries (2165), beans (2706), mint (1586), seed alfalfa (967), peaches (262), pears (156), nectarines (129), clover seeds (126), raspberries, apricots, plums, strawberries	83,766	794,999 670,149 84.3%
WA	Kittitas	Corn (4542), apples (1859), potatoes (442), mint (409), pears (331), Christmas trees, filberts, peaches, plums	7609	1,469,862 355,360 24.2%
WA	Klickitat	Pears (923), apples (516), cherries (457), grapes (419), peaches (199), apricots, plums	2533	1,198,385 689,639 57.5%
WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%
WA	Walla Walla	Corn (14,601), potatoes (9256), seed alfalfa (5760), beans (5707), apples (5222), lima beans (458), cherries (280), plums	41,306	813,108 710,546 87.4%
WA	Yakima	Apples (75,264), corn (30,531), hops (27,449), grapes (15,529), mint (12,577), pears (10,190), cherries (6129), beans (2251), potatoes (1929), peaches (1438), lima beans (731), nectarines (605), plums (478), apricots (285), walnuts, raspberries, filberts	185,413	2,749,514 1,639,965 59.6%

Table 20. Crops on which propargite can be used in Washington and Oregon counties through which the Middle Columbia River steelhead ESU migrates

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%

WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%
WA	Pacific	Christmas trees	17	623,722 32,637 5.2%
WA	Wahkiakum	none	0	169,125 12,611 7.5%
OR	Hood River	Pears (11,788), apples (2592), cherries (1081), Christmas trees (161), grapes, peaches, corn, raspberries	15,703	334,328 27,201 8.1%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

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).

Table 21 shows the propargite usage in California counties supporting the Sacramento River winter-run chinook salmon ESU. In these tables, crops are listed in order of the greatest use of propargite to the smallest.

Table 21. Use of propargite 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(s)	Propargite usage (pounds)	Acres treated
Alameda		none	
Butte	almonds, walnuts, beans, corn, nursery containerized plants, cotton, carrots,	22,981	14,142
Colusa	Beans, almonds, cotton, corn, grapes, walnuts	14,918	9270
Contra Costa	corn, cherries, walnuts, grapes	3768	2119
Glenn	almonds, clover, beans, corn, walnuts, cotton, melon, grapes, oats, alfalfa, carrots	22,901	16,923
Marin		none	
Sacramento	grapes, corn, beans, uncultivated agriculture, alfalfa, cherries, walnuts	15,801	9,913
San Mateo		none	
San Francisco		none	
Shasta	Mint, walnut	790	499
Solano	beans, corn, grapes, walnuts, almonds	13,546	7658
Sonoma	grapes	1503	1091
Sutter	beans, corn, walnuts, almonds, uncultivated agriculture, wheat, cotton, nurseries	11,277	6642

Tehama	almonds, walnuts, corn, prunes	8576	5934
Yolo	corn, grapes, cotton, almonds, walnuts, cucumbers, beans, research	18,976	12,844

2. Snake River Fall-run Chinook Salmon ESU

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

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

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

Propargite sales data show no propargite sales in Idaho counties within this ESU, nor in the Washington counties bordering on Idaho. A small amount of propargite was sold in the Palouse watershed. There is moderate usage in the counties in the lower Snake River and modest usage along the Columbia River between the Snake River and the John Day Dam.

Tables 22 and 23 show the cropping information for Pacific Northwest counties where the Snake River fall-run chinook salmon ESU is located and for the Oregon and Washington counties where this ESU migrates. In these tables, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 22. Crops on which propargite can be used in Pacific Northwest counties which provide spawning and rearing habitat for the Snake River fall-run chinook ESU

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
ID	Adams	Corn (104)	104	873,399 221,209 25.3%
ID	Idaho	Corn (117), Christmas trees, apples, cherries, plums, pears, grapes	150	5,430,522 744,295 13.7%
ID	Nez Perce	Beans (4561), peaches, corn, apples, cherries, apricots	4612	543,434 477,839 87.9%
ID	Valley	Potatoes (225)	225	2,354,043 78,813 3.3%
ID	Lewis	none	0	306,601 211,039 68.8%
ID	Benewah	Nursery crops (149), Christmas trees, apples	211	496,662 111,510 22.5%
ID	Shoshone	none	0	1,685,770 4,428 0.3%
ID	Clearwater	Beans (218)	218	1,575,396 103,246 6.6%
ID	Latah	Beans (1135), Christmas trees, cherries, apples	1235	689,089 347,293 50.4%

WA	Adams	Potatoes (27914), beans (8250), corn (8167), mint (7238), apples (3457), sugar beets (1570), seed alfalfa (1110)	57,706	1,231,999 996,742 80.9%
WA	Lincoln	Potatoes (771), corn (564), cherries	1336	1,479,196 1,465,788 99.1%
WA	Spokane	Corn (280), apples (227), nursery crops (128), Christmas trees, cherries, peaches, carrots, strawberries, pears, raspberries, apricots, grapes, plums	663	1,128,835 625,769 55.4%
WA	Asotin	Apples, cherries, pears, apricots	70	406,983 274,546 67.5%
WA	Garfield	none	0	454,744 325,472 84.3%
WA	Columbia	Corn	51	556,034 304,928 54.8%
WA	Whitman	Beans (1283), corn (101), apples, Christmas trees, pears	1409	1,382,006 1,404,289 101.6%
WA	Franklin	Potatoes (35,770), corn (24,428), apples (9000), carrots (3574), grapes (2813), cherries (2165), beans (2706), mint (1586), seed alfalfa (967), peaches (262), pears (156), nectarines (129), clover seeds (126), raspberries, apricots, plums, strawberries	83,766	794,999 670,149 84.3%
WA	Walla Walla	Corn (14,601), potatoes (9256), seed alfalfa (5760), beans (5707), apples (5222), lima beans (458), cherries (280), plums	41,306	813,108 710,546 87.4%
OR	Wallowa	Apples, nursery crops	12	2,013,071 694,304 34.5%
OR	Union	Mint (9226), sugar beets (1035), beans (661), potatoes (660), cherries (596), apples, Christmas trees, peaches	12,246	1,303,476 473,316 36.3%

Table 23. Crops on which propargite can be used in Washington and Oregon counties through which the Snake River fall-run chinook and the Snake River spring/summer-run chinook ESUs migrate.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Walla Walla	Corn (14,601), potatoes (9256), seed alfalfa (5760), beans (5707), apples (5222), lima beans (458), cherries (280), plums	41,306	813,108 710,546 87.4%
WA	Benton	Potatoes (25,317), apples (18,425), corn (16,086), grapes (15,929), hops (4412), sugar beets (4284), cherries (3219), pears (472), plums (180), apricots (174), nursery crops (161), peaches (149), nectarines (106), walnuts	88,955	1,089,993 640,370 58.7%
WA	Klickitat	Pears (923), apples (516), cherries (457), grapes (419), peaches (199), apricots, plums	2533	1,198,385 689,639 57.5%
WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%
WA	Wahkiakum	none	0	169,125 12,611 7.5%
WA	Pacific	Christmas trees	17	623,722 32,637 5.2%

OR	Umatilla	Potatoes (15,003), corn (9980), apples (3927), beans, lima beans (1239), seed alfalfa (1020), plums (365), cherries (349), grapes (163), apricots, strawberries, peaches, raspberries, pears	34,175	2,057,809 1,466,580 71.3%
OR	Morrow	Potatoes (17,030), corn (12,996)	30,026	1,301,021 1,119,004 86%
OR	Gilliam	none	0	770,664 766,373 99.4%
OR	Sherman	none	0	526,911 487,534 92.5%
OR	Wasco	Cherries (7352), apples (463), pears (385), grapes (110), apricots, peaches, corn	8373	1,523,958 1,152,965 75.7%
OR	Hood River	Pears (11,788), apples (2592), cherries (1081), Christmas trees (161), grapes, peaches, corn, raspberries	15,703	334,328 27,201 8.1%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

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, I have excluded Umatilla and Baker counties in Oregon and Blaine County in Idaho because accessible river reaches are all well above areas where propargite can be used. Counties with migratory corridors are all of those down stream from the confluence of the Snake and Columbia Rivers.

Propargite sales data show no propargite sales in Idaho counties within this ESU, nor in the Washington counties bordering on Idaho. There is moderate usage in the counties along the lower Snake River and modest usage along the Columbia River down stream to the John Day Dam.

Table 24 shows the cropping information for Oregon and Washington counties where the Snake River spring/summer-run chinook salmon ESU occurs. The cropping information for the migratory corridors is the same as for the Snake River fall-run chinook salmon and is in table 23 above. In these tables, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 24. Crops on which propargite can be used in Idaho counties which provide spawning and rearing habitat for the Snake River spring/summer run chinook ESU

St	County	Crops and acres planted	Acres	<u>total acreage</u> land in farms % farmed

ID	Adams	Corn (104)	104	873,399 221,209 25.3%
ID	Idaho	Corn (117), Christmas trees, apples, cherries, plums, pears, grapes	150	5,430,522 744,295 13.7%
ID	Nez Perce	Beans (4561), peaches, corn, apples, cherries, apricots	4612	543,434 477,839 87.9%
ID	Custer	Potatoes (507)	507	3,152,382 140,701 4.5%
ID	Lemhi	Cherries, apples, peaches, pears	20	2,921,172 193,908 6.6%
ID	Valley	Potatoes (225)	225	2,354,043 78,813 3.3%
ID	Lewis	none	0	306,601 211,039 68.8%
ID	Latah	Beans (1135), Christmas trees, cherries, apples	1235	689,089 347,293 50.4%
WA	Asotin	Apples, cherries, pears, apricots	70	406,983 274,546 67.5%
WA	Garfield	none	0	454,744 325,472 84.3%
WA	Columbia	Corn	51	556,034 304,928 54.8%
WA	Whitman	Beans (1283), corn (101), apples, Christmas trees, pears	1409	1,382,006 1,404,289 101.6%

WA	Franklin	Potatoes (35,770), corn (24,428), apples (9000), carrots (3574), grapes (2813), cherries (2165), beans (2706), mint (1586), seed alfalfa (967), peaches (262), pears (156), nectarines (129), clover seeds (126), raspberries, apricots, plums, strawberries	83,766	794,999 670,149 84.3%
OR	Wallowa	Apples, nursery crops	12	2,013,071 694,304 34.5%
OR	Union	Mint (9226), sugar beets (1035), beans (661), potatoes (660), cherries (596), apples, Christmas trees, peaches	12,246	1,303,476 473,316 36.3%

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 25 contains usage information for the California counties supporting the Central Valley spring-run chinook salmon ESU. Within a county, crops are listed from the most propargite use to the least.

Table 25. Use of propargite in counties with the Central Valley spring run chinook salmon ESU.

County	Crop(s)	Propargite usage (pounds)	Acres treated

Alameda		none	
Butte	almonds, walnuts, beans, corn, nursery containerized plants, cotton, carrots,	22,981	14,142
Colusa	Beans, almonds, cotton, corn, grapes, walnuts	14,918	9270
Contra Costa	corn, cherries, walnuts, grapes	3768	2119
Glenn	almonds, clover, beans, corn, walnuts, cotton, melon, grapes, oats, alfalfa, carrots	22,901	16,923
Marin		none	
Napa			
Nevada	grapes	25	16
Placer		none	
Sacramento	grapes, corn, beans, ‘uncultivated agriculture’, alfalfa, cherries, walnuts	15,801	9,913
San Mateo		none	
San Francisco		none	
Shasta	Mint, walnut	790	499
Solano	beans, corn, grapes, walnuts, almonds	13,546	7658
Sonoma	grapes	1503	1091
Sutter	beans, corn, walnuts, almonds, ‘uncultivated agriculture’, wheat, cotton, nurseries	11,277	6642
Tehama	almonds, walnuts, corn, prunes	8576	5934
Yolo	corn, grapes, cotton, almonds, walnuts, cucumbers, beans, research	18,976	12,844

Yuba	walnuts, almonds	943	780

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 propargite 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 propargite would not be used in the forested upper elevation areas.

Table 26 contains usage information for the California counties supporting the California coastal chinook salmon ESU.

Table 26. Use of propargite in counties with the California coastal chinook salmon ESU

County	Crop(s)	Propargite usage (pounds)	Acres treated
Humboldt		none	
Mendocino	grapes	593	391
Sonoma	grapes	1504	1091
Marin		none	
Trinity		none	
Lake	grapes	44	27.5

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 27 shows the cropping information for Washington counties where the Puget Sound chinook salmon ESU is located. In this table, crops where there is less than 100 acres in the county do not indicate the specific acres planted. However, no propargite was sold, and presumably none was used, within this ESU.

Table 27. Crops and acreage where propargite can be used in counties that are in the Critical Habitat of the Puget Sound chinook salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Skagit	Corn (7337), potatoes (6948), raspberries (1088), carrots (555), nursery crops (359), apples (357), strawberries (281), Christmas trees, filberts, blackberries, pears, beans	17,015	1,110,583 92,074 8.3%
WA	Whatcom	Corn (15,354), raspberries (5255), potatoes (1585), blueberries (482), strawberries (297), filberts (206), apples (174), pears, grapes, cherries, walnuts, beans	23,384	1,356,835 118,136 8.7%
WA	San Juan	Grapes, berries, pears, plums, filberts, carrots, peaches, potatoes	30	11,963 20,529 18.3%
WA	Island	Corn (865), Christmas trees, apples, grapes, nursery crops, pears	927	133,499 19,526 14.6%
WA	Snohomish	Corn (4017), nursery crops (414), Christmas trees, strawberries, raspberries, apples, pears, filberts, beans, cherries, plums, carrots, grapes	4767	1,337,728 74,153 5.5%

WA	King	Corn (925), nursery crops (328), Christmas trees (207), apples, strawberries, raspberries, pears, carrots, cherries, plums, filberts, walnuts, potatoes, grapes, apricots, peaches	1645	1,360,705 42,290 3.1%
WA	Pierce	Corn (725), beans (200), Christmas trees (196), nursery crops (160), strawberries (125), raspberries (108), apples, blackberries, potatoes, cherries, pears	1618	1,072,350 58,750 5.5%
WA	Thurston	Nursery crops (618), Christmas trees (137), strawberries, corn, apples, pears, cherries, blackberries, beans, filberts	924	465,322 59,890 12.9%
WA	Lewis	Christmas trees (4042), corn (1408), apples, filberts, cherries, pears, grapes, walnuts, plums	5681	1,540,991 112,263 7.3%
WA	Grays Harbor	Corn (1974), apples, Christmas trees, filberts, cherries	1986	1,227,045 44,742 3.6%
WA	Mason	Christmas trees (437), corn (109), nursery crops, apples, beans, pears, cherries,	588	615,108 10,965 1.8%
WA	Clallam	Corn (123), nursery crops, strawberries, cherries, grapes, pears, plums	180	1,116,900 24,253 2.2%
WA	Jefferson	Nursery crops, Christmas trees, apples, raspberries	37	1,157,642 9,603 0.8%
WA	Kitsap	Christmas trees (674), nursery crops, apples, raspberries, grapes, strawberries, cherries, corn, pears, plums, potatoes, carrots, beans	829	253,436 10,302 4.1%

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. I have excluded Pierce County, Washington because the very small part of the Cowlitz River watershed in this county is at a high elevation where propargite would not be used.

Tables 28 shows the cropping information for Oregon and Washington counties where the Lower Columbia River chinook salmon ESU occurs. In this table, crops where there is less than 100 acres in the county do not indicate the specific acres planted. However, no propargite was sold, and presumably none was used, within this ESU.

Table 28. Crops and acreage where propargite can be used in counties that are in the Critical Habitat of the Lower Columbia River chinook salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
OR	Wasco	Cherries (7352), apples (463), pears (385), grapes (110), apricots, peaches, corn	8373	1,523,958 1,152,965 75.7%
OR	Hood River	Pears (11,788), apples (2592), cherries (1081), Christmas trees (161), grapes, peaches, corn, raspberries	15,703	334,328 27,201 8.1%
OR	Marion	Corn (16,691), beans (12,101), hops (7407), filberts (7061), mint (3695), Christmas trees (3712), blackberries (3609) strawberries (1858), cherries (1568), sugar beets (940), grapes (761), apples (555), raspberries (546), clover seeds (526), peaches (179), walnuts (155), pears (150), plums (145), lima beans (115), carrots	61,850	758,394 302,462 39.9%

OR	Clackamas	Christmas trees (7532), filberts (3994), corn (1807), raspberries (1435), clover seeds (965), strawberries (608), beans (337), boysenberries (253), grapes (207), apples (167), sugar beets (106), peaches, cherries, walnuts, pears, plums, potatoes	17,368	1,195,712 148,848 12.4%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Washington	Clover seeds (9767), corn (8155), filberts (5595), nursery crops (4130), Christmas trees (1411), strawberries (1257), raspberries (1150), grapes (989), beans (988), walnuts (679), plums (358), apples (279), cherries (211), peaches (168), boysenberries (150), pears, carrots	35,357	463,231 139,820 30.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%
WA	Pacific	Christmas trees	17	623,722 32,637 5.2%
WA	Wahkiakum	none	0	169,125 12,611 7.5%
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%

WA	Lewis	Christmas trees (4042), corn (1408), apples, filberts, cherries, pears, grapes, walnuts, plums	5681	1,540,991 112,263 7.3%
WA	Klickitat	Pears (923), apples (516), cherries (457), grapes (419), peaches (199), apricots, plums	2533	1,198,385 689,639 57.5%
WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%

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 propargite would not be used. Salmon habitat for this ESU is exceedingly limited in Douglas County also, but we cannot rule out future propargite use in Douglas County.

Sales data indicate modest usage on mint and somewhat less on Christmas trees in two counties in the Willamette Valley. However, no sales, and therefore no likely usage, occurred in the migratory corridors below Willamette Falls.

Tables 29 and 30 show the cropping information for Oregon counties where the Upper Willamette River chinook salmon ESU occurs and for the Oregon and Washington counties where this ESU migrates. In these tables, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 29. Crops on which propargite can be used that are part of the spawning and rearing habitat of the Upper Willamette River chinook salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
OR	Douglas	Grapes (581), Christmas trees (431), plums (305), corn (175), walnuts (171), apples (148), nursery crops (121), pears (105), cherries, filberts, peaches, strawberries, beans, raspberries, apricots	2267	3,223,576 402,023 12.5%
OR	Lane	Mint (5350), filberts (3677), corn (3093), Christmas trees (1055), sugar beets (773), grapes (631), nursery crops (325), carrots (270), cherries (249), apples (174), walnuts (105), strawberries, pears, plums, raspberries, boysenberries, potatoes, nectarines	15,903	2,914,656 242,121 8.3%
OR	Benton	Corn (6260), beans (3080), mint (2925), Christmas trees (1983), sugar beets (687), filberts (493), grapes (242), apples, walnuts, cherries, strawberries, peaches, pears, plums, potatoes, raspberries	15,815	432,961 118,818 27.4%
OR	Linn	Corn (7747), mint (4105), beans (2688), filberts (1820), clover seeds (1522), raspberries (387), Christmas trees (292), sugar beets (281), cherries (157), apples (133), grapes, peaches, walnuts, strawberries, pears, plums, nectarines	19,448	1,466,507 380,464 25.9%
OR	Polk	Corn (3307), mint (2448), filberts (2394), cherries (1888), clover seeds (1115), grapes (1123), Christmas trees (644), beans (598), plums (595), apples (157), sugar beets (130), pears, peaches, walnuts, strawberries	14,598	474,296 167,880 35.4%
OR	Clackamas	Christmas trees (7532), filberts (3994), corn (1807), raspberries (1435), clover seeds (965), strawberries (608), beans (337), boysenberries (253), grapes (207), apples (167), sugar beets (106), peaches, cherries, walnuts, pears, plums, potatoes	17,368	1,195,712 148,848 12.4%

OR	Marion	Corn (16,691), beans (12,101), hops (7407), filberts (7061), mint (3695), Christmas trees (3712), blackberries (3609) strawberries (1858), cherries (1568), sugar beets (940), grapes (761), apples (555), raspberries (546), clover seeds (526), peaches (179), walnuts (155), pears (150), plums (145), lima beans (115), carrots	61,850	758,394 302,462 39.9%
OR	Yamhill	Filberts (7110), clover seeds (6509), corn (6322), nursery crops (3444), grapes (2887), beans (1838), cherries (1693), walnuts (608), Christmas trees (556), plums (369), strawberries (265), apples (310), boysenberries (153), sugar beets (151), raspberries (114), peaches (104), pears, currants, potatoes	32,518	457,986 179,787 39.3%
OR	Washington	Clover seeds (9767), corn (8155), filberts (5595), nursery crops (4130), Christmas trees (1411), strawberries (1257), raspberries (1150), grapes (989), beans (988), walnuts (679), plums (358), apples (279), cherries (211), peaches (168), boysenberries (150), pears, carrots	35,357	463,231 139,820 30.2%

Table 30. Crops on which propargite can be used that are part of the migration corridors of the Upper Willamette River chinook salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%

WA	Wahkiakum	none	0	169,125 12,611 7.5%
WA	Pacific	Christmas trees	17	623,722 32,637 5.2%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

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 31), with the lower river reaches being migratory corridors (Table 32).

Sales data indicate considerable use of propargite, almost all on potatoes, mint, seed alfalfa, and hops. Most of this usage occurs upstream from the confluence of the Snake River with the Columbia River, but not as far north as Douglas, Chelan, and Okanogan counties, where there is limited acreage of the major crops for propargite. However, a modest amount is used on the same crops below that confluence in counties on either side of the Columbia River, but all upstream of the John Day Dam.

Tables 31 and 32 show the cropping information for Washington counties that support

the Upper Columbia River chinook salmon ESU and for the Oregon and Washington counties where this ESU migrates. In these tables, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 31. Crops on which propargite can be used in Washington counties where there is spawning and rearing habitat for the Upper Columbia River chinook salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Benton	Potatoes (25,317), apples (18,425), corn (16,086), grapes (15,929), hops (4412), sugar beets (4284), cherries (3219), pears (472), plums (180), apricots (174), nursery crops (161), peaches (149), nectarines (106), walnuts	88,955	1,089,993 640,370 58.7%
WA	Kittitas	Corn (4542), apples (1859), potatoes (442), mint (409), pears (331), Christmas trees, filberts, peaches, plums	7609	1,469,862 355,360 24.2%
WA	Chelan	Apples (17,096), pears (8298), apricots, Christmas trees, nectarines, peaches, plums	25,563	1,869,848 112,085 6%
WA	Douglas	Apples (14,383), cherries (1842), pears (1104), apricots (315), peaches (167), nectarines	17,902	1,165,168 918,033 78.8%
WA	Okanogan	Apples (24,164), pears (3280), cherries (1003), peaches, nectarines, walnuts, Christmas trees, apricots, filberts, corn, carrots, plums, raspberries	28,616	3,371,698 1,291,118 38.3%
WA	Grant	Corn (67,663), potatoes (44,263), apples (33,615), beans (18,024), mint (15,610), sugar beets (10,792), seed alfalfa (4742), lima beans (3878), cherries (3470), grapes (3132), carrots (2207), nursery crops (1562), pears (998), apricots (266), peaches (261), nectarines (163), walnuts, plums, strawberries, raspberries	210,681	1,712,881 1,086,045 63.4%

Table 32. Crops on which propargite can be used that are migration corridors for the Upper Columbia River chinook salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Franklin	Potatoes (35,770), corn (24,428), apples (9000), carrots (3574), grapes (2813), cherries (2165), beans (2706), mint (1586), seed alfalfa (967), peaches (262), pears (156), nectarines (129), clover seeds (126), raspberries, apricots, plums, strawberries	83,766	794,999 670,149 84.3%
WA	Yakima	Apples (75,264), corn (30,531), hops (27,449), grapes (15,529), mint (12,577), pears (10,190), cherries (6129), beans (2251), potatoes (1929), peaches (1438), lima beans (731), nectarines (605), plums (478), apricots (285), walnuts, raspberries, filberts	185,413	2,749,514 1,639,965 59.6%
WA	Walla Walla	Corn (14,601), potatoes (9256), seed alfalfa (5760), beans (5707), apples (5222), lima beans (458), cherries (280), plums	41,306	813,108 710,546 87.4%
WA	Klickitat	Pears (923), apples (516), cherries (457), grapes (419), peaches (199), apricots, plums	2533	1,198,385 689,639 57.5%
WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%
WA	Wahkiakum	none	0	169,125 12,611 7.5%

WA	Pacific	Christmas trees	17	623,722 32,637 5.2%
OR	Gilliam	none	0	770,664 766,373 99.4%
OR	Umatilla	Potatoes (15,003), corn (9980), apples (3927), beans, lima beans (1239), seed alfalfa (1020), plums (365), cherries (349), grapes (163), apricots, strawberries, peaches, raspberries, pears	34,175	2,057,809 1,466,580 71.3%
OR	Sherman	none	0	526,911 487,534 92.5%
OR	Morrow	Potatoes (17,030), corn (12,996)	30,026	1,301,021 1,119,004 86%
OR	Wasco	Cherries (7352), apples (463), pears (385), grapes (110), apricots, peaches, corn	8373	1,523,958 1,152,965 75.7%
OR	Hood River	Pears (11,788), apples (2592), cherries (1081), Christmas trees (161), grapes, peaches, corn, raspberries	15,703	334,328 27,201 8.1%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

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

Table 33. Use of propargite in counties with the Central California Coast coho ESU.

County	Crop(s)	Propargite usage (pounds)	Acres treated
Santa Cruz	strawberries	3	4
San Mateo		none	
Marin		none	
Sonoma	grapes	1503	1091
Mendocino	grapes	592	391
Napa	grapes	40	26

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, I have excluded Glenn County, California from this analysis because the salmon habitat in this county is not near the agricultural areas where propargite can be used.

Sales data indicate a small amount of propargite use on wine grapes and mint in Oregon counties within this ESU, similar to the use in California (Table 35).

Tables 34 shows the usage of propargite in the California counties supporting the Southern Oregon/Northern California coastal coho salmon ESU. Crops are listed in order from the greatest propargite use to the smallest. Table 35 shows the cropping information for Oregon counties where the Southern Oregon/Northern California coastal coho salmon ESU occurs. In Table 35, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 34. Use of propargite in California counties with the Southern Oregon/Northern California coastal coho salmon ESU.

County	Crop(s)	Propargite usage (pounds)	Acres treated
Humboldt		none	
Mendocino	grapes	593	391
Del Norte		none	
Siskiyou	mint, nursery crops	533	359
Trinity		none	
Lake	grapes	44	27.5

Table 35. Propargite use in Oregon counties where there is habitat for the Southern Oregon/Northern California coastal coho salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
OR	Curry	Apples, Christmas trees, plums & prunes, cherries, pears, strawberries, grapes	57	1,041,557 74,375 7.1%
OR	Jackson	Pears (9387), corn (530), grapes (400), apples (360), peaches (198), Christmas trees, cherries, walnuts, strawberries, plums, nectarines, apricots, blackberries, raspberries, carrots	11,055	1,782,633 262,251 14.7%
OR	Josephine	Grapes (355), apples (181), Christmas trees (177), corn, peaches, walnuts, berries, cherries, potatoes, beans	828	1,049,308 31,249 3.0%

OR	Douglas	Grapes (581), Christmas trees (431), plums (305), corn (175), walnuts (171), apples (148), nursery crops (121), pears (105), cherries, filberts, peaches, strawberries, beans, raspberries, apricots	2267	3,223,576 402,023 12.5%
OR	Klamath	Potatoes (8951), sugar beets (3499), strawberries, apples	12,475	3,804,552 720,153 18.9%

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 where propargite can be used, and I have eliminated them in this analysis.

There is a small amount of propargite sold and used on mint and Christmas trees in one of the counties within this ESU. It is very likely that the mint acreage is not in a coastal watershed (i.e., is in the Willamette Valley), but the Christmas trees could be in either watershed.

Table 36 show the cropping information for Oregon counties where the Oregon coast coho salmon ESU occurs. In this table, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 36. Crops on which propargite can be used that are in counties where there is habitat for the Oregon coast coho salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
OR	Curry	Apples, Christmas trees, plums & prunes, cherries, pears, strawberries, grapes	57	1,041,557 74,375 7.1%
OR	Coos	Corn (203), apples, nursery crops, grapes, cherries, pears, plums, walnuts, filberts, nectarines, peaches	286	1,024,346 174,872 17.1%
OR	Douglas	Grapes (581), Christmas trees (431), plums (305), corn (175), walnuts (171), apples (148), nursery crops (121), pears (105), cherries, filberts, peaches, strawberries, beans, raspberries, apricots	2267	3,223,576 402,023 12.5%
OR	Lane	Mint (5350), filberts (3677), corn (3093), Christmas trees (1055), sugar beets (773), grapes (631), nursery crops (325), carrots (270), cherries (249), apples (174), walnuts (105), strawberries, pears, plums, raspberries, boysenberries, potatoes, nectarines	15,903	2,914,656 242,121 8.3%
OR	Lincoln	Christmas trees, apples, raspberries, grapes, pears, beans	102	626,976 34,292 5,5%
OR	Benton	Corn (6260), beans (3080), mint (2925), Christmas trees (1983), sugar beets (687), filberts (493), grapes (242), apples, walnuts, cherries, strawberries, peaches, pears, plums, potatoes, raspberries	15,815	432,961 118,818 27.4%
OR	Polk	Corn (3307), mint (2448), filberts (2394), cherries (1888), clover seeds (1115), grapes (1123), Christmas trees (644), beans (598), plums (595), apples (157), sugar beets (130), pears, peaches, walnuts, strawberries	14,598	474,296 167,880 35.4%

OR	Tillamook	Christmas trees (grown in county, but only 1 or 2 growers - so USDA considers acreage to be confidential)	0	705,417 39,559 5.6%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

D. Chum Salmon

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

Most chum salmon mature between 3 and 5 years of age, usually 4 years, with younger fish being more predominant in southern parts of their range. Chum salmon usually spawn in

coastal areas, typically within 100 km of the ocean where they do not have surmount river blockages and falls. However, in the Skagit River, Washington, they migrate at least 170 km.

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

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

1. Hood Canal Summer-run chum salmon ESU

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

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

Canal, Puget Sound, Dungeness-Elwha, in the counties of Mason, Clallam, Jefferson, Kitsap, and Island.

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

Tables 37 shows the cropping information for Washington counties where the Hood Canal summer-run chum salmon ESU occurs. In this table, crops where there is less than 100 acres in the county do not indicate the specific acres planted. However, there were no sales and presumably no propargite usage in counties within this ESU.

Table 37. Crops on which propargite can be used that are in counties where there is habitat for the Hood Canal Summer-run chum salmon ESU

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Mason	Christmas trees (437), corn (109), nursery crops, apples, beans, pears, cherries,	588	615,108 10,965 1.8%
WA	Clallam	Corn (123), nursery crops, strawberries, cherries, grapes, pears, plums	180	1,116,900 24,253 2.2%
WA	Jefferson	Nursery crops, Christmas trees, apples, raspberries	37	1,157,642 9,603 0.8%
WA	Kitsap	Christmas trees (674), nursery crops, apples, raspberries, grapes, strawberries, cherries, corn, pears, plums, potatoes, carrots, beans	829	253,436 10,302 4.1%
WA	Island	Corn (865), Christmas trees, apples, grapes, nursery crops, pears	927	133,499 19,526 14.6%

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 38 shows the cropping information for Oregon and Washington counties where the Columbia River chum salmon ESU occurs. In this table, crops where there is less than 100 acres in the county do not indicate the specific acres planted. However, there were no sales and presumably no propargite usage in counties within this ESU.

Table 38. Crops on which propargite can be used that are in counties where there is habitat for the Columbia River chum salmon ESU

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Lewis	Christmas trees (4042), corn (1408), apples, filberts, cherries, pears, grapes, walnuts, plums	5681	1,540,991 112,263 7.3%

WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%
WA	Pacific	Christmas trees	17	623,722 32,637 5.2%
WA	Wahkiakum	none	0	169,125 12,611 7.5%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Washington	Clover seeds (9767), corn (8155), filberts (5595), nursery crops (4130), Christmas trees (1411), strawberries (1257), raspberries (1150), grapes (989), beans (988), walnuts (679), plums (358), apples (279), cherries (211), peaches (168), boysenberries (150), pears, carrots	35,357	463,231 139,820 30.2%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

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 39 shows that there are only 180 acres of crops, primarily corn, on which propargite can be used in the county. However, no propargite was sold, and presumably none was used, within this ESU.

Table 39. Crops on which propargite can be used that are in Clallum County where there is habitat for the Ozette Lake sockeye salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
WA	Clallam	Corn (123), nursery crops, strawberries, cherries, grapes, pears, plums	180	1,116,900 24,253 2.2%

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. Propargite cannot be used on such a site, and therefore there will be no exposure in the spawning and rearing habitat. There is a probability that this salmon ESU could be exposed to propargite in the lower and larger river reaches during its juvenile or adult migration.

Table 40 shows the limited acreage of crops in Idaho counties where this ESU reproduces. However, no propargite was sold, and presumably none was used, within Idaho in this ESU.

Table 41 shows the acreage of crops where propargite can be used in Oregon and Washington counties along the migratory corridor for this ESU. A moderate amount of propargite sales occurred along the lower Snake River and the Columbia River above the John Day Dam in this migratory corridor. In this table, crops where there is less than 100 acres in the county do not indicate the specific acres planted.

Table 40. Crops on which propargite can be used that are in Idaho counties where there is spawning and rearing habitat for the Snake River sockeye salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
ID	Custer	Potatoes (507)	507	3,152,382 140,701 4.5%
ID	Blaine	Potatoes (848)	848	1,692,735 266,293 15.7%

Table 41. Crops on which propargite can be used that are in Oregon and Washington counties

that are in the migratory corridors for the Snake River sockeye salmon ESU.

St	County	Crops and acres planted	Acres	total acreage land in farms % farmed
ID	Idaho	Corn (117), Christmas trees, apples, cherries, plums, pears, grapes	150	5,430,522 744,295 13.7%
ID	Lemhi	Cherries, apples, peaches, pears	20	2,921,172 193,908 6.6%
ID	Lewis	none	0	306,601 211,039 68.8%
ID	Nez Perce	Beans (4561), peaches, corn, apples, cherries, apricots	4612	543,434 477,839 87.9%
WA	Asotin	Apples, cherries, pears, apricots	70	406,983 274,546 67.5%
WA	Garfield	none	0	454,744 325,472 84.3%
WA	Whitman	Beans (1283), corn (101), apples, Christmas trees, pears	1409	1,382,006 1,404,289 101.6%
WA	Columbia	Corn	51	556,034 304,928 54.8%
WA	Walla Walla	Corn (14,601), potatoes (9256), seed alfalfa (5760), beans (5707), apples (5222), lima beans (458), cherries (280), plums	41,306	813,108 710,546 87.4%

WA	Franklin	Potatoes (35,770), corn (24,428), apples (9000), carrots (3574), grapes (2813), cherries (2165), beans (2706), mint (1586), seed alfalfa (967), peaches (262), pears (156), nectarines (129), clover seeds (126), raspberries, apricots, plums, strawberries	83,766	794,999 670,149 84.3%
WA	Benton	Potatoes (25,317), apples (18,425), corn (16,086), grapes (15,929), hops (4412), sugar beets (4284), cherries (3219), pears (472), plums (180), apricots (174), nursery crops (161), peaches (149), nectarines (106), walnuts	88,955	1,089,993 640,370 58.7%
WA	Klickitat	Pears (923), apples (516), cherries (457), grapes (419), peaches (199), apricots, plums	2533	1,198,385 689,639 57.5%
WA	Skamania	Pears (477), apples	552	1,337,179 4043 0.4%
WA	Clark	Corn (1817), raspberries (634), Christmas trees (358), clover seeds (316), strawberries (162), filberts, pears, walnuts, peaches, apples, grapes, plums, blackberries, beans	3641	401,850 82,967 20.6
WA	Cowlitz	Corn (1604), raspberries (439), Christmas trees, apples, walnuts, pears, cherries, filberts, beans	2085	728,781 35,678 4.9%
WA	Wahkiakum	none	0	169,125 12,611 7.5%
WA	Pacific	Christmas trees	17	623,722 32,637 5.2%
OR	Wallowa	Apples, nursery crops	12	2,013,071 694,304 34.5%

OR	Umatilla	Potatoes (15,003), corn (9980), apples (3927), beans, lima beans (1239), seed alfalfa (1020), plums (365), cherries (349), grapes (163), apricots, strawberries, peaches, raspberries, pears	34,175	2,057,809 1,466,580 71.3%
OR	Morrow	Potatoes (17,030), corn (12,996)	30,026	1,301,021 1,119,004 86%
OR	Gilliam	none	0	770,664 766,373 99.4%
OR	Sherman	none	0	526,911 487,534 92.5%
OR	Wasco	Cherries (7352), apples (463), pears (385), grapes (110), apricots, peaches, corn	8373	1,523,958 1,152,965 75.7%
OR	Hood River	Pears (11,788), apples (2592), cherries (1081), Christmas trees (161), grapes, peaches, corn, raspberries	15,703	334,328 27,201 8.1%
OR	Multnomah	Corn (1405), raspberries (741), potatoes (336), strawberries (171), Christmas trees (166), beans, blackberries, apples, peaches, grapes, pears, cherries, plums, walnuts	3122	278,570 31,294 11.2%
OR	Columbia	Christmas trees (177), corn, apples, pears, walnuts, cherries, grapes, strawberries, plums, raspberries	319	420,332 71,839 17.1%
OR	Clatsop	Christmas trees, corn	30	529,482 24,740 4.7%

5. Specific conclusions for Pacific salmon and steelhead

1. There is no known propargite use associated with several salmon and steelhead ESUs. Therefore, I conclude that there is "no effect" from the registration of propargite on the Lower Columbia chinook salmon ESU, the Puget Sound chinook salmon ESU, the Hood Canal

summer-run chum salmon ESU, the Columbia River chum salmon ESU, and the Ozette Lake sockeye salmon ESU.

2. The potential use of propargite in the Oregon Coast coho salmon ESU is very low and is for Christmas trees, and existing use of propargite in Benton County is more likely to be in the Willamette Valley than in the coastal watershed of this ESU. In combination with the newly required buffers on the labels, I conclude there is no effect on this ESU also.

3. In California, the new restricted use classification requires propargite applicators to be certified and to obtain a permit from the County Agricultural Commissioners. Many, but not necessarily all, commissioners will not give a permit unless the county bulletins for the protection of endangered and threatened species are followed as a condition of the permit. In addition to certain good management practices, these bulletins specify a no-spray buffer of 40 yards for ground applications and 200 yards for aerial applications. These buffers apply from the edge of the habitat when the wind is blowing towards that habitat.

For the coastal ESUs in California, propargite usage is so low that its use, in conjunction with the new buffers on the label, would be not likely to adversely affect the salmon or steelhead even without the provisions of the bulletins. With the new restricted use classification and the provisions of the California bulletins, especially the no-spray buffer, I conclude that propargite is not likely to adversely affect the Northern California steelhead ESU, the Central California Coast steelhead ESU, the South-Central California Coast steelhead ESU, the Southern California steelhead ESU, the California Central Valley steelhead ESU, the California Coastal chinook salmon ESU, the Central Valley spring-run chinook ESU, the Sacramento River winter-run chinook salmon ESU, and the Central California coho salmon ESU.

4. There is no propargite use in the salmon and steelhead areas of Idaho. The potential for propargite concentrations to reach levels of concern in the migratory corridors of the Snake and Columbia Rivers is so low that I conclude that the use of propargite is not likely to adversely affect the Snake River spring/summer-run chinook salmon ESU, the Snake River Basin steelhead ESU, and the Snake River sockeye salmon ESU.

5. Given the limited acreage of crops in the Pacific Northwest where propargite is likely to be used, it would seem that there are additional ESUs where the use of propargite would be not likely to adversely affect salmon and steelhead. However, we cannot be sure that the limited acreage would not be next to important areas for these species. Therefore, I must conclude that the use of propargite may affect (a) the Snake River chinook salmon fall run in the Palouse watershed, (b) the Southern Oregon/Northern California coho salmon ESU in the Oregon part of the Klamath River watershed, (c) the Upper Willamette chinook salmon ESU in the Willamette Valley, and (d) the Upper Willamette River steelhead ESU in the Willamette Valley.

I believe that the new 50-foot ground, 75-foot aerial buffer is sufficient for most crop uses. However, I believe that a 100-yard buffer for aerial applications would prevent jeopardy and most likely avoid any incidental take if applied to mint, seed alfalfa, potatoes, and hops for these

ESUs.

6. The greatest use of propargite occurs in the lower reaches of the ESUs of the upper Columbia River. In addition, these salmon and steelhead are designated as endangered and have a very precarious status. I conclude that the use of propargite may affect the Upper Columbia chinook salmon ESU and the Upper Columbia River steelhead ESU. The status of these ESUs and the more pronounced use of propargite in this area suggests that a 100-yard buffer should be applied to all uses of propargite within all counties upstream of the confluence of the Snake River and Columbia River. I do not believe that this buffer is necessary for the migratory corridors below that confluence because of limited propargite use, the size of the rivers, and the pH of the water. It may not be necessary for this buffer to apply above the confluence to the Snake River and Columbia River mainstems, primarily because of the size of the rivers, but I cannot reach that conclusion based on the information available to me.

Table 42. Summary conclusions on specific ESUs of salmon and steelhead for propargite

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

Sockeye salmon	Snake River	not likely to adversely affect
Steelhead	Snake River Basin	not likely to adversely affect
Steelhead	Upper Columbia River	may affect
Steelhead	Middle Columbia River	may affect (slightly)
Steelhead	Lower Columbia River	no effect
Steelhead	Upper Willamette River	may affect (slightly)
Steelhead	Northern California	not likely to adversely affect
Steelhead	Central California Coast	not likely to adversely affect
Steelhead	South-Central California Coast	not likely to adversely affect
Steelhead	Southern California	not likely to adversely affect
Steelhead	Central Valley, California	not likely to adversely affect

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