Glyphosate
Analysis of Risks
to
Endangered and Threatened Salmon and Steelhead

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Summary

Glyphosate is one of the most widely used pesticides. In 1990-1991 it ranked eleventh among pesticides used in the United States. Between 13 to 20 million acres were treated with 18.7 million pounds of Glyphosate. The largest use sites include hay/pasture, soybeans, and field corn. It is a non-selective herbicide for use on many food and non-food crops. It is also used on non-crop areas where total vegetation control is desired. At low application rates it also acts as a plant growth regulator to promote rapid fruiting. The salts of glyphosate are registered, plus the technical grade, are contained in 56 products. The isopropylamine salt is an ingredient in 53 products used to control broadleaf plants and grasses in food, non-food crops, and a variety of other sites including ornamentals, lawns and turf, residential areas, greenhouses, forest plantings and industrial rights-of-way.

The sodium salt is an ingredient in two products and is used as a plant growth regulator. The monoammonium salt is an active ingredient in an additional seven herbicide/growth regulators.

This review covers 11 salmon and steelhead ESU's within California. In one ESU consideration is also given to use in a few Oregon counties that are a component of the Northern California/Southern Oregon Coho salmon ESU.

Scope - Although this analysis is specific to certain listed western salmon and steelhead and the watersheds in which they occur, it is acknowledged that glyphosate is registered for uses that may occur outside this geographic scope and that additional analyses may be required to address other T&E species in the Pacific states as well as across the United States. I understand that any subsequent analyses, requests for consultation, and resulting Biological Opinions may necessitate that Biological Opinions relative to this request be revisited, and could be modified. Much of the quantitative information presented and used was derived from the Registration Eligibility Decision (RED) Ecological Risk Assessment (Attachment 1).

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

Contents

1. Background

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

When there is a concern with the comparison of toxicity with the EECs identified in

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The Ecological Risk Assessment SEP (pages 2-6) discusses the quantitative estimates of how the acute toxicity data, in combination with the slope of the dose-response curve, can be used to predict the percentage mortality that would occur at the various risk quotients. The discussion indicates that using a "safety factor" of 10, as applies for restricted use classification, one individual in 30,000,000 exposed to the concentration would be likely to die. Using a "safety factor" of 20, as applies to aquatic T&E species, would exponentially increase the margin of safety. It has been calculated by one pesticide registrant (without sufficient information for OPP to validate that number), that the probability of mortality occurring when the LC50 is 1/20th of the EEC is 2.39×10^{-9}, or less than one individual in ten billion. It should be noted that the discussion (originally part of the 1975 regulations for FIFRA) is based upon slopes of primarily organochlorine pesticides, stated to be 4.5 probits per log cycle at that time. As organochlorine pesticides were phased out, OPP undertook an analysis of more current pesticides based on data reported by Johnson and Finley (1980), and determined that the "typical" slope for aquatic toxicity tests for the "more current" pesticides was 9.95. Because the slopes are based upon logarithmically transformed data, the probability of mortality for a pesticide with a 9.95 slope is again exponentially less than for the originally analyzed slope of 4.5.

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

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

In recent years, Moore and Waring (1996) challenged Atlantic salmon with diazinon and observed effects on olfaction as relates to reproductive physiology and behavior. Their work indicated that diazinon could have sublethal effects of concern for salmon reproduction. However, the nature of their test system, direct exposure of olfactory rosettes, could not be quantitatively related to exposures in the natural environment. Subsequently, Scholz et al.

(2000) conducted a non-reproductive behavioral study using whole Chinook salmon in a model stream system that mimicked a natural exposure that is far more relevant to ecological risk assessment than the system used by Moore and Waring (1996). The Scholz et al. (2000) data indicate potential effects of diazinon on Chinook salmon behavior at very low levels, with statistically significant effects at nominal diazinon exposures of 1 ppb, with apparent, but non-significant effects at 0.1 ppb.

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

2. Description of Glyphosate:

A. Chemical History: EPA issued a Registration Standard for glyphosate in 1986 (NTIS PB87-103214). The Registration Standard required additional phytotoxicity, environmental fate, toxicology, product chemistry, and residue chemistry. All of the data required have been submitted and reviewed, or were waived. The current Reregistration Eligibility Decision was completed in September, 1993.

B: Chemical Description:

- Common Name: Glyphosate
- Chemical Class: Organophosphate
- Chemical Name: N-phosphomethyl glycine
- Case Number: 0178
- CAS Registry Number: 38641-94-0
- OPP Chemical Code: 103601 (isopropylamine salt)
  103603 (sodium salt)
- Empirical Formula: $C_3H_8NO_5P$

- ❑ Trade and Other Names: Acigate®, Agrotop®, Amiphosate®, Total®, Glialka®, Ammo®, Asset®, Glyphomobeed®, Glysate®, Tiller®, Cosmic®, Arbex®, Bannox®, Gltfonox®, Supex®, Glifochem®, Knock-out®, Gly-tox®, Yerbimat®, Inter-Glyphosat®, Korforsat®, Glyfolux®, Glifoplus®, Phomac®, Stopper®, Herbanil®, Fozmazia®, Tomcato®, Crossout®, Destroyer®, Glyweed®, Lyphoxin®, Woproglyp®, Thorrado®, Vifoset®, Ground-up®, Brake®, Roundup Custom®, Roundup Original®, Roundup Pro®, Roundup Solugran®, Roundup Ultra®.

- ❑ Basic Manufacturer: Monsanto Company
800 N. Lindbergh Blvd.
St. Louis, MO 63167

Glyphosate is a clear, crystalline solid with a melting point of 200° C and a molecular weight of 269.08. In the more commonly supplied forms (Roundup®, Ranger®, Glifonox®) it is supplied as a clear, viscous, amber colored solution, pH 4.4 to 4.9 with a specific gravity of 1.17.It is practically odorless to having a slight amine odor. Glyphosate is 1% soluble in water, insoluble in ethanol, acetone, and benzene.

C. Chemical Use: The following is based on the currently registered uses of glyphosate:

- ❑ Type of Agent: Non-selective herbicide

- ❑ Classification: General Use

- ❑ Summary of Sites:

  - <u>Aquatic uses:</u> agricultural drainage systems, irrigation systems, lakes/ponds, reservoirs, streams, rivers, channeled water.

  - <u>Forestry:</u> conifer release, forest plantings, forest trees.

  - <u>Food</u>: acerola, apricot, artichoke, asparagus, atemoya, avocado, banana, beech nuts, blackberry, boysenberry, brazil nut, breadfruit, broccoli, brussels sprouts, butternut, cabbage, carambola, carrot, cashew, cauliflower, celery, chard, cherimoya, cherry, chestnut, chicory, cocoa, coffee, collards, cranberry, cress, cucumber, currant, date, dewberry, eggfruit tree, eggplant, elderberry, endive, fig, filbert, garlic, gooseberry, gourds, ground cherry, guava, hickory nut, horseradish, huckleberry, jaboticaba, jackfruit, kale, kitembilla, kiwi fruit, kohlrabi, leek, lettuce, litchi nut, loganberry, logan, loquat, macadamia nut, mamey, mango, marmalade box, mayhaw, melons, mustard, nectarine, okra, olive, onion, papaya, parsley, passion fruit, peach, pear, pecan, pepper, persimmon, pistachio, plantain, plum, pomegranate, prune, pumpkin, quince, radish, raspberry, rhubarb, rutabaga, sapodilla, sapota, soursop, spinach, squash, sugar apple, sweet potato, tamarind, taro, tea, walnut, yam.

- <u>Feed Crops:</u> alfalfa, barley, beans, buckwheat, corn, grass/fodder/hay, lentils, millet, nongrass/forage/fodder/straw/hay, oats, pastures, rye, sorghum, wheat.

- <u>Food + Feed Crops:</u> almond, anole, barley, beans, beets, buckwheat, calamodin, citron, citrus hybrids other than tangelo, corn, cotton, grapefruit, grapes, kumquat, lemon, lentils, lime, millet proso, mustard, orange, parsnip, peanuts, peas, pineapple, potato, pummelo, rape, rice, wild rice, rye, sorghum, soybeans, sugar beet, sugarcane, tangelo, tangerines, tomato, tritricale, turnip, wheat.

- <u>Other Non-Food/Feed Use</u>: agricultural fallow/idleland, rights-of-way/fences/hedgerows, agricultural uncultivated areas, airports/landing fields, Christmas tree plantations, golf course turf, industrial sites (outdoor), nonagricultural outdoor buildings and structures, ornamental and/or shade trees, ornamental lawns and turf, ornamental woody shrubs and vines, paths/patios, paved areas, recreational sites, urban areas.

- <u>Residential</u>: ornamental and/or shade trees, ornamental herbaceous plants, ornamental lawns and turf, ornamental shrubs and vines.

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- <u>Target Pests</u>: As mentioned previously, glyphosate is used on an extensive range of broadleaf plants and grasses. Complete tabulation can be found in the attached product labels (Attachment 2).

❑ Formulation Types Registered: <u>Technical Grade/Manufacturing-Use Product (MUP)</u>, technical 94% a.i (isopropylamine salt)

❑ <u>End-use Product</u>: Solid, 76% a.i., Liquid-Ready to Use, 19.7%,18.30%, 15.8%, 1.00%, 0.96%, 0.520% a.i. Pelleted/Tablet 8305% and 60% a.i. Pressurized Liquid 0.96% and 0.75% a.i. Soluble Concentrate/Liquid 62%, 58.30%, 41.50%, 41%, 28.60%, 25.10%, 18%, 10%, 8.20%, 7%, and 5% a.i.

❑ Method and Rate of Application:

- Equipment: Ground boom, hand wand, pressurized bottle, aerial, backpack, wiper

- Method:. Broadcast, spray, spot spray (pressurized bottle)

- Timing: As needed, but generally pre-plant or pre-emergence in non-resistant crops. As needed in Roundup Ready Soybeans and Roundup Ready Wheat.

- Rate: In many crops multiple applications are suggested. The overall annual maximum rate (with few exceptions) is 8 lbs a.i/A.

Table 3: National Use data for Glyphosate (RED 1993)

Site	Acres Treated (x 1,000)	Pounds a.i. (x 1,000)
Corn (field)	1,300-3,500	225-375
Corn (sweet)	10-30	5-15
Wheat (spring)	200-225	50-60
Wheat (winter)	350-1,150	250-450
Sorghum	450-550	100-150
Barley	550-600	275-375
Cotton	300-1,000	225-375
Rice	30-55	25-30
Apples	75-275	65-200
Cherries	15-95	20-125
Hay/pasture	3,000-3,500	1,500-1,700
Dry edible beans/peas	50	20

Grapefruit	70-140	183-375
Grapes	45-550	25-265
Lemons	5-75	10-70
Oranges	300-600	650-1,300
Peaches	10-150	10-110
Peanuts	10-30	5-10
Pears	15-50	15-65
Pecans	5-300	5-150
Plums/prunes	5-80	5-40
Soybeans	2,600-4,800	2,200-2,400
Sugarcane	10-70	5-35
Potatoes	20-40	25-30
Sunflowers	60-70	25-40
Tomatoes	30-40	15-30
Green beans/peas	20-40	5-20
Walnuts	150-175	100-125
Other ag sites	3,00-3,500	1,000-1,500
Almonds	350-390	500-550
Non-ag areas	Unknown	3,000-7,000

D. Incidents: 125 incident report packages, many containing numerous reports of adverse effects following application of glyphosate. Most involve human exposure and unwanted damage to non-target plants. In most cases glyphosate was used in conjunction with or a close time span with other chemicals, including atrazine, diflubenzuron, captan, and many others. Because of this it is unclear if glyphosate was the specific cause of human and animal incidents. The intended use of the product, does imply it played a role in the damage to non-target plants. Two fish deaths and one crayfish kill are in the data base, however because of the presence of other chemicals, it is uncertain if glyphosate was the causative agent.

E. Environmental Fate Assessment: Under aerobic soil conditions glyphosate degrades to aminomethyl phosphoric acid (AMPA) a half life of 1.85-2.06 days. The principal mechanism is microbial metabolism, as glyphosate is stable to hydrolysis and photo degradation.

In the aquatic environment, under aerobic conditions typical of salmon and steelhead ranges, glyphosate has a half life of 7 days in flooded silty clay, incubated in the dark at 24.6 ± 0.5° C for 30 days. AMPA was the major degradate.

Field dissipation rates were determined at 8 sites. The median half-life (DT_{50}) when applied at maximum rates, 7.95 lbs a.i/A, 13.9 days with a range of 2.8 (Texas) to 140 days (Iowa). It was apparent that glyphosate degrades slower in colder climates, presumed to be due to reduced microbial metabolism. Glyphosate at most sites remained in the 0-6" level.

In the aquatic environment glyphosate dissipated from the source (irrigation site) with a calculated half-life of 7.5 days to 120 days (farm pond sediment). Accumulation in the farm pond was more significant than stream sediment. In the pond it could be detected in the sediment at levels ≥1 ppm for at least a year (Michigan and Oregon).

In forestry applications (aerial) glyphosate averaged 652-1,273 ppm immediately after application, and then declined rapidly with half-lives of < 1 day in Michigan and Georgia and < 14 days in Oregon. Under normal silviculture use the maximum concentration of glyphosate and AMPA combined was less than 5 ppm, which dissipated with a half-life of 100 days.

K_d values of 62, for Drummer silty clay loam, 90 for Ray silt, 70 for Spinks sandy loam, 22 for Lintonia sandy loam, and 125 for Cattail Swamp sediment indicate minimal leaching to be expected. This is consistent with the observed field where it was noted the glyphosate and AMPA where generally confined to the 0-6" layer.

F. Ecological Toxicity Data

i. Freshwater Fish: The minimum data required to establish the toxicity of glyphosate to freshwater fish is from two species. The preferred species are rainbow trout and bluegill sunfish. Results of these tests are shown in Table 4. These data are derived from the RED.

Table 4: Freshwater Fish, Acute Toxicity (RED)

Species	% a.i.	96-hour LC_{50}	Toxicity Class
Oncorhynchus mykiss (rainbow trout)	83.0	86 ppm	Slightly Toxic
Oncorhynchus mykiss (rainbow trout)	96.7	140 ppm	Practically Non-Toxic
Lepomis macrochirus (bluegill sunfish)	96.5	>24 ppm	Slightly Toxic
Lepomis macrochirus (bluegill sunfish)	83.0	120 ppm	Practically Non-Toxic
Lepomis macrochirus (bluegill sunfish)	96.7	140 ppm	Practically Non-Toxic

Ictalurus punctatus (channel catfish)	96.7	130 ppm	Practically Non-Toxic
Pimephales promelas (fathead minnow)	87.3	85 ppm	Slightly Toxic
Pimephales promelas (fathead minnow)	96.7	97 ppm	Slightly Toxic

These data indicate that glyphosate is slightly toxic to practically non-toxic to freshwater fish.

ii. Acute Toxicity to Freshwater Fish from Formulated Products

Testing was performed with formulated products, in addition to glyphosate alone. Results are given in Table 5.

Table 5: Acute Toxicity of Glyphosate Formulations to Freshwater Fish (RED)

Species	**% A.I.**	**96 Hour LC_{50}**	**Toxicity Class**
Oncorhynchus mykiss (rainbow trout)	41.8%	8.2 ppm	Moderately Toxic
Oncorhynchus mykiss (rainbow trout)	41.36%	42 ppm	Slightly Toxic
Oncorhynchus mykiss (rainbow trout)	62.4%	>1,000 ppm	Practically Non-Toxic
Oncorhynchus mykiss (rainbow trout)	41.2% + 15% “AA”	120 ppm	Practically Non-Toxic
Oncorhynchus mykiss (rainbow trout)	40.7% + 15% “WW”	150 ppm	Practically Non-Toxic
Oncorhynchus mykiss (rainbow trout)	7.03% + 0.5% “X-77"	240 ppm	Practically Non-Toxic
Oncorhynchus mykiss (rainbow trout)	51%	8.3 ppm	Slightly Toxic
Oncorhynchus mykiss (rainbow trout)	41%	9 ppm	Slightly Toxic
Oncorhynchus mykiss (rainbow trout)	41%	1.3 ppm	Moderately Toxic
Lepomis macrochirus (bluegill sunfish)	41.8%	5.8 ppm	Moderately Toxic
Lepomis macrochirus (bluegill sunfish)	41.36%	11 ppm	Slightly Toxic
Lepomis macrochirus (bluegill sunfish)	62.4%	>1,000 ppm	Practically Non-Toxic

Lepomis macrochirus (bluegill sunfish)	40.7% + 15% "W"	>100 ppm	Practically Non-Toxic
Lepomis macrochirus (bluegill sunfish)	41.2% + 15.3% "AA"	>180 ppm	Practically Non-Toxic
Lepomis macrochirus (bluegill sunfish)	7.03% + 0.5% "X-77"	830 ppm	Practically Non-Toxic
Lepomis macrochirus (bluegill sunfish)	41%	13 ppm	Slightly Toxic
Lepomis macrochirus (bluegill sunfish)	41%	5 ppm	Moderately Toxic
Ictalurus punctatus (channel catfish)	41.36%	16 ppm	Slightly Toxic
Ictalurus punctatus (channel catfish)	41%	13 ppm	Slightly Toxic
Pimephales promelas (fathead minnow)	41.36%	9.4 ppm	Moderately Toxic

These data indicate that glyphosate is moderately toxic to practically non-toxic to freshwater fish. The large variations appear more related to the formulation additives, generally surfactants, than the active ingredient.

iii. Freshwater Fish, Chronic: A freshwater fish early life-cycle test was performed. Results available are listed in Table 6.

Table 6: Freshwater Fish Life Cycle Testing (RED)

Species	**MATC**	**EFFECT**
Oncorhynchus mykiss (rainbow trout)	>25.7 ppm	No Effects Observed at this Level

No effects were observed at the level tested.

iv. Formulation Surfactant ingredients. Testing for acute toxicity of the additive agents, mainly surfactants, and the results are shown in Table 7.

Table 7: Acute Toxicity of Glyphosate Formulations (RED)

Species	**%**	**96-hour LC_{50}**	**Toxicity Class**

Oncorhynchus mykiss (rainbow trout)	MONO818 100%	1 ppm	Highly Toxic
Oncorhynchus mykiss (rainbow trout)	MONO818	0.65 ppm	Highly Toxic
Lepomis macrochirus (bluegill sunfish)	MONO818 100%	3 ppm	Moderately Toxic
Lepomis macrochirus (bluegill sunfish)	MONO818 100%	1 ppm	Highly Toxic
Ictalurus punctatus (channel catfish)	MONO818 100%	13 ppm	Slightly Toxic
Pimephales promelas (fathead minnow)	MONO818 100%	1 ppm	Highly Toxic

As was predicted by testing on formulated products, the additives appear significantly more toxic than glyphosate alone.

v. Freshwater Invertebrates, Acute: The preferred species for testing glyphosate toxicity in freshwater invertebrates is the waterflea. Results of acute toxicity tests are shown in Table 8:

Table 8: Acute Toxicity of glyphosate in Freshwater Invertebrates (RED)

Species	**% a.i.**	**48-hour LC_{50}/EC_{50} (ppm)**	**Toxicity Class**
Daphnia magna (Waterflea)	83%	780 ppm	Practically Non-Toxic
Chironomus plumosa (midge)	96.7%	55 ppm	Slightly Toxic

Glyphosate is categorized as ranging from practically non-toxic to slightly toxic to freshwater invertebrates.

vi. Freshwater Aquatic Invertebrate Life Cycle Testing (RED)
Table 9 shows data obtained for chronic/life cycle testing with glyphosate.

Table 9: Chronic Toxicity of Glyphosate to Freshwater Invertebrates

Species	**% A.I.**	**MATC**	**Effects**
Daphnia magna (Waterflea)	99.7%	96 ppm	Reduced Reproductive Capacity

This study indicates a reduction in reproductive capacity at the level of 96 ppm.

vii. Acute Toxicity of Formulated Products: Testing of formulations containing glyphosate were conducted. Results are given in Table 10.

Table 10: Acute Toxicity of Formulated Products Containing Glyphosate on Freshwater Invertebrates (RED)

Species	**% A.I.**	**48-Hour LC_{50}**	**Toxicity Class**
Daphnia magna (Waterflea)	62.4%	869 ppm	Practically Non-Toxic
Daphnia magna (Waterflea)	41.2% + 15.3% “AA”	310 ppm	Practically Non-Toxic
Daphnia magna (Waterflea)	40.7% + 15% “WW” MON2139	72 ppm	Slightly Toxic
Daphnia magna (Waterflea)	41%	3 ppm	Moderately Toxic
Daphnia magna (Waterflea)	41.36%	5.3 ppm	Moderately Toxic
Daphnia magna (Waterflea)	7.03% + 0.5% “X-77"	>1,000 ppm	Practically Non-Toxic
Daphnia pulex (Waterflea)	51% MON2139	242	Practically Non-Toxic
Chironomus plumosa (midge)	41%	18 ppm	Slightly Toxic
Gammarus pseudolimnaeus (amphipod)	41%	62 ppm	Slightly Toxic
Gammarus pseudolimnaeus (amphipod	41.89%	41.9 ppm	Slightly Toxic
	Non-Lethal Effects		

Ephemerella walkeri (Mayfly)	41%		Mayflies avoided glyphosate at 10 ppm, but not at 1 ppm
Chironomus plumosa (midge)	41%		Stream drift of larvae was increased at 2 ppm, but not at 0.02 or 0.2 ppm

Glyphosate was moderately toxic to practically non-toxic in formulated products. Since this is somewhat increased over results with the pure chemical it appears likely due to the added agents, generally surfactants.

viii. Surfactant Effects on Freshwater Invertebrates: Testing of a common surfactant used in glyphosate formulations is shown in Table 11.

Table 11: Toxicity of MONO818 to Freshwater Invertebrates (RED)

Species	% A.I.	48-Hour LC50	Toxicity Class
Daphnia magna (Waterflea	100%	13 ppm	Slightly Toxic

Testing of the surfactant MONO818 indicates slight toxicity to freshwater invertebrates. Although the exact role this may play in the increased toxicity of some formulated products, a synergistic role can not be eliminated.

ix. Acute testing on select marine organisms was performed. Results of these studies are shown in Table 12.

Table12: Estuarine/Marine Organism Acute Toxicity (RED)

Species	% a.i.	48 hour LC_{50}	Toxicity Category
Crassostrea virginica (oyster)	96.7%	TL_{50} > 10 ppm 48 hours	-------------
Uca pugilator (fiddler crab)	96.7%	934 ppm	Practically Non-Toxic
Palaemonetes pugio (grass shrimp)	96.7%	281 ppm	Practically Non-Toxic

These studies indicate that pure glyphosate is practically non-toxic to the species examined.

x. Acute testing on Aquatic Plants

Table 13: Aquatic Plants (RED)

Species	**% a.i.**	**4-day EC50**
Lemna gibba	96.6	21.5 ppm (7-day)
Selenastrum capricornutum	96.6	12.5 ppm
Navicula pelliculosa	96.6	39.9 ppm
Skeletonema costatum	96.6	0.85 ppm
Anabaena flos-aquae	96.6	11.7 ppm

OPP does not categorize toxicity to plants. However, the data indicate that glyphosate is generally less toxic to aquatic vascular plants than to algae.

G. Estimated and actual concentrations of glyphosate in water: Glyphosate is not a closely monitored chemical in surface water samples and accurate data are not available. It closely adheres to soil particles and relatively rapidly degrades in aerobic, aqueous environments, to which this review is addressed.

The 1993 EFED Risk Assessment used a rough-cut exposure model to estimate the amount of glyphosate likely to enter shallow waters from its application to surrounding drainage areas. The model was based on the maximum concentration in six inches of water immediately following a direct application of one pound active ingredient per acre to water. This is equivalent to 734 ppb in shallow water. It does not take into account any degradation or dissipation of the chemical, so the resulting concentration is very conservative compared to either the GENEEC or PRZM/EXAMS models currently used by EFED. This rough-cut model is no longer used by EFED but is cited here. The 1993 assessment indicated that 5.062 lb a.i./A was the maximum application rate for glyphosate, including its direct application to water. Therefore, the following EEC was calculated:

5.062 lb a.i./A X 734 ppb = 3716 ppm or 3.72 ppm

Section C of this document indicates that the maximum rate is currently 8 lb a.i./A. The direct spray of this amount of glyphosate into a 6-inch layer of water would produce an EEC of 5.87 ppm.

H. Discussion and Characterization of Risk Assessment.

Table 14. Acute risk quotients for freshwater and estuarine fish and invertebrates and aquatic vascular plants, based on toxicity for the most sensitive species from technical grade testing of the active ingredient (Tables 4 to 13) and the EEC derived in the 1993 Risk Assessment

Acute Risk Quotients[5]				
5.062 lb a.i./A				
Peak EEC ppm	**RQ FW Fish[1]**	**RQ FW Inv[2]**	**RQ Est. Inv[3]**	**RQ Plant[4]**
3.72	0.038	0.068	0.013	0.173
8 lb a.i./A				
5.87	0.069	0.107	0.021	0.273

[1]Fathead minnow LC50 = 85ppm.
[2]Midge LC50 = 55 ppm.
[3]Grass shrimp LC50 = 281 ppm.
[4]Duckweed EC50 = 21.5 ppm.
[5]Peak EEC/LC50 or EC50; the acute LOC is >0.05 for endangered fish, >0.5 for aquatic-invertebrate populations, and >1 for aquatic-plant populations.

The risk quotient analysis indicates that glyphosate applied at 5.062 lb a.i./A does not present an acute risk to endangered and threatened salmonids from direct effects as the calculated RQ is less than the LOC of 0.05. Neither does this rate of application present indirect effects from loss of food or loss of cover, as the RQs for invertebrates are less than 0.5 and the RQ for plants is less than 1.0.

However, when glyphosate is applied at the current maximum rate of 8 lb a.i./A, the RQ of 0.069 exceeds the LOC for direct effects to endangered and threatened salmonids. It does not exceed the criteria for indirect effects from loss of food supply or loss of cover.

As discussed above, the method used to calculate exposure is taken from the 1993 EFED assessment and is overly conservative as it does not account for the fate of glyphosate through degradation and dissipation processes. Also, as discussed in the background information, when there is a concern (the RQ analysis indicates that criteria are exceeded) a more sophisticated PRZM-EXAMS model is run to refine the EECs derived from the lower tier model if a suitable scenario has been developed and validated. However, as there are currently no valid scenarios for the forestry and rights-of-way uses it was decided to use the model 1993 assessment for all uses for this consultation. A more realistic assessment of exposure would likely produce EEC values less than those listed above, but the magnitude of the decrease in calculated EEC values cannot be predicted. Finally, the older conservative model and the PRZM/EXAMS models are based on runoff and drift into farm ponds, whereas the salmonids are located in flowing stream waters. The flow and turbulence of the streams aid in the dissipation of a chemical that enters the stream following an application to nearby areas. These stream dynamics also cause the actual levels of the pesticide to be lower than predicted, but again, the magnitude of the decrease is not known.

Based upon the risk quotients and conservatism of the model used in this assessment, it can be concluded that the use of glyphosate may affect but is not likely to adversely affect endangered and threatened Pacific salmonids.

Existing Protections: Specific buffer zones have been established for aerial spraying, mainly in forestry applications. The size of these buffers is directly associated with the height of the aircraft and application rates. For the silviculture sites where it is applied as a top coat, a 75 foot buffer zone is required at rate of 2 lbs a.i/A and a 125 foot zone for higher rates. A 400 foot zone is required for applications on rights-of way when applied at heights of 75 feet or more above the ground. An exception to these guidelines is made for helicopters using True-Valve® boom (TVB-45), or equivalent equipment, where a 50 foot buffer is required.

For non-aquatic sites, typical cautions against contaminating water are included in the label language. For aquatic sites cautions are given regarding the potential oxygen depletion due to plant decomposition.

Some formulations contain “inert” ingredients that are more toxic than the a.i, and those products must be labeled “*Toxic to Fish*”. Another Agency concern is the direct aquatic use of glyphosate. This concern is not for direct toxicity to aquatic fauna, but due to the intended use of the products to control weeds

I. Proposed Protections: None are under consideration at this time.

3. Description of Pacific salmon and steelhead Evolutionarily Significant Units relative to glyphosate use sites.

The following review of glyphosate use in California and the Pacific Northwest is derived from several sources. California data is taken directly from the Department of Pesticide Regulations published census and tabulation of actual chemical used. The tables for Oregon are constructed with the 1997 USDA Census of Agriculture as the basis for crops present in each county. Specific estimates are derived from the USDA Census and the EPA estimated use table, contained in the RED. It is anticipated that this amount is an significant overestimate of actual use in Oregon , however it represents the best available at the time of review. In all counties if the reported or calculated level of pesticide use is less than 1 pound, they are listed as no use.

All available crops are included in reported data for Oregon counties. Within California, only the specific crops and pesticide usage, as reported by the California DPR for 2002 are considered. For purposes of this review, all forms of glyphosate are included as a single entry.

<u>1. Southern California Steelhead ESU</u>

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). Hydro logic 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, but unlikely, Topanga Creek. Neither of these creeks drain agricultural areas. There is a potential for steelhead in waters that drain agricultural areas in Ventura, Santa Barbara, and San Luis Obispo counties, but the small quantifies of glyphosate used make effects highly unlikely. Usage of glyphosate in counties where this ESU occurs are presented in Table 15.

Table 15. Counties supporting the Southern California steelhead ESU

County	Site	Acres Treated	lbs a.i. Applied
Los Angeles	Alfalfa	34	167
Los Angeles	Apple	6	7
Los Angeles	Apricot	5	6
Los Angeles	Avocado	1	2
Los Angeles	Carrot	170	191
Los Angeles	Cherry	4	2
Los Angeles	Corn (forage)	3	10
Los Angeles	Forage Hay	220	221
Los Angeles	Grape	47	67
Los Angeles	Landscape	NR	67

Los Angeles	Outdr Plants	1,492	3,821
Los Angeles	Outdr Transplant	39	19
Los Angeles	Nectarine	48	61
Los Angeles	Orange	16	14
Los Angeles	Peach	465	561
Los Angeles	Pear	4	2
Los Angeles	Plum	27	6
Los Angeles	Public Health	NR	12
Los Angeles	Rights of Way	NR	327,996
Los Angeles	Structural Pest Control	NR	183
Los Angeles	Turf/Sod	16	128
Los Angeles	Uncultivated ag	<1	1
Los Angeles	Water Area	4	1
San Diego	Citrus	64	71
San Diego	Apple	72	63
San Diego	Cherimoya	1	1
San Diego	Avocado	18,267	12,344
San Diego	Fig	25	23
San Diego	Grape	78	79
San Diego	Grape for Wine	20	45
San Diego	Corn (sweet)	65	27
San Diego	Grapefruit	2,607	1,143
San Diego	Kumquat	40	28
San Diego	Landscape	NR	18,306
San Diego	Outdr Plants	273	23

San Diego	Outdr Transplant	77	63
San Diego	Lemon	4,178	4,277
San Diego	Orange	11,694	5,916
San Diego	Lime	57	30
San Diego	Pear	8	83
San Diego	Peach	4	3
San Diego	Public Health	NR	361
San Diego	Persimmon	175	173
San Diego	Pastureland	5	10
San Diego	Plumb	5	5
San Diego	Rights of Way	NR	20,971
San Diego	Structural Pest Control	NR	2,334
San Diego	Turf/Sod	60	60
San Diego	Uncultivated ag	28	43
San Diego	Tangelo	2	8
San Diego	Tangerine	475	321
San Diego	Tomato	21	20
San Diego	Vertebrate Control	NR	36
San Diego	Regulatory Pest Control	NR	5,721
San Luis Obispo	Grape, wine	38,012	38,978
San Luis Obispo	Grape	333	15
San Luis Obispo	Outdr Plants	207	131
San Luis Obispo	Outdr Transplant	203	10
San Luis Obispo	Rights of Way	NR	10,062

San Luis Obispo	Avocado	1,033	1,058
San Luis Obispo	Almond	2	3
San Luis Obispo	Landscape	NR	5,459
San Luis Obispo	Turf/sod	10	29
San Luis Obispo	Apricot	8	6
San Luis Obispo	Apple	398	147
San Luis Obispo	Water Area	<1	3
San Luis Obispo	Walnut	137	167
San Luis Obispo	Vertebrate Control	NR	98
San Luis Obispo	Barley	1,033	1,056
San Luis Obispo	Blueberry	1,952	761
San Luis Obispo	Bok Choy	11	18
San Luis Obispo	Broccoli	312	443
San Luis Obispo	Carrot	186	209
San Luis Obispo	Celery	27	54
San Luis Obispo	Chinese Cabbage	12	8
San Luis Obispo	Citrus	14	6
San Luis Obispo	Hay, forage	245	126
San Luis Obispo	Fumigation	NR	15
San Luis Obispo	Grapefruit	7	6
San Luis Obispo	Leek	2	4
San Luis Obispo	Lemon	1,750	2,588
San Luis Obispo	Lettuce, head	97	203
San Luis Obispo	Lettuce, leaf	42	40
San Luis Obispo	Orange	161	130

San Luis Obispo	Peach	4	4
San Luis Obispo	Persimmon	4	1
San Luis Obispo	Pistachio	114	82
San Luis Obispo	Pomegranate	8	6
San Luis Obispo	Pumpkin	2	7
San Luis Obispo	Rangeland	6	9
San Luis Obispo	Spinach	2	4
San Luis Obispo	Squash	8	16
San Luis Obispo	Structural Pest Cont	NR	11
San Luis Obispo	Uncultivated ag	1,545	1,016
San Luis Obispo	Uncultivated non-ag	34	19
Santa Barbara	Grape, wine	779	1,070
Santa Barbara	Grape	774	1,057
Santa Barbara	Outdr Plants	675	988
Santa Barbara	Outdr Transplant	56	106
Santa Barbara	Rights of Way	NR	18,097
Santa Barbara	Avocado	8,052	6,758
Santa Barbara	Asparagus	9,278	6,857
Santa Barbara	Landscape	NR	4,041
Santa Barbara	Vertebrate Control	NR	216
Santa Barbara	Bean	144	299
Santa Barbara	Cauliflower	88	104
Santa Barbara	Broccoli	379	740
Santa Barbara	Carrot	383	435

Santa Barbara	Celery	66	88
Santa Barbara	Grapefruit	39,438	21,275
Santa Barbara	Cherimoya	13	38
Santa Barbara	Lemon	5,638	3,755
Santa Barbara	Lettuce, head	343	676
Santa Barbara	Lettuce, leaf	254	462
Santa Barbara	Orange	23	32
Santa Barbara	Peach	49	95
Santa Barbara	Persimmon	31	903
Santa Barbara	Pistachio	665	552
Santa Barbara	Lime	57	136
Santa Barbara	Pepper, fruiting	125	245
Santa Barbara	Rangeland	1,060	1,678
Santa Barbara	Spinach	1	1
Santa Barbara	Squash	17	43
Santa Barbara	Structural Pest Cont	NR	566
Santa Barbara	Uncultivated ag	1,262	1,625
Santa Barbara	Uncultivated non-ag	2,423	237
Santa Barbara	Rangeland	1,060	1,678
Santa Barbara	Tomatillo	2	5
Santa Barbara	Tangerine	15	18
Santa Barbara	Strawberry	36	37
Santa Barbara	Peas	12	30
Ventura	Grape, wine	3	4
Ventura	Outdr Plants	1,890,030	253

Ventura	Outdr Transplant	30	54
Ventura	Rights of Way	NR	25,696
Ventura	Avocado	160,038	280
Ventura	Kiwi	2.5	4
Ventura	Landscape	NR	3,651
Ventura	Vertebrate Control	39	88
Ventura	Olive	8	9
Ventura	Christmas Tree	39	114
Ventura	Chicory	3	5
Ventura	Ditch Bank	142	262
Ventura	Celery	15	34
Ventura	Grapefruit	39	38
Ventura	Cherimoya	15	13
Ventura	Industrial Site	2	8
Ventura	Lettuce, head		
Ventura	Lettuce, leaf		
Ventura	Orange		
Ventura	Peach		
Ventura	Persimmon		
Ventura	Pistachio		
Ventura	Lime		
Ventura	Pepper, fruiting		
Ventura	Rangeland		
Ventura	Spinach		
Ventura	Squash		

Ventura	Structural Pest Cont		
Ventura	Uncultivated ag		
Ventura	Uncultivated non-ag		
Ventura	Rangeland		
Ventura	Tomatillo		
Ventura	Tangerine		
Ventura	Strawberry		
Ventura	Peas		
Ventura	Celery	15	34
Ventura	Turf/Sod	30	114
Ventura	Apple	10	2
Ventura	Avocado	160,000	20,446
Ventura	Bean	47	140
Ventura	Uncultivated ag	123	266
Ventura	Cherimoya	15	12
Ventura	Chicory	3	5
Ventura	Christmas Trees	39	114
Ventura	Ditch Bank	142	262
Ventura	Fumigation	45	45
Ventura	Grape, wine	2	1
Ventura	Grapefruit	39	38
Ventura	Industrial site	2	8
Ventura	Kiwi	2	8
Ventura	Landscape	NR	3,651
Ventura	Mustard	10	29

Ventura	Outdr Plants	7,362	3,537
Ventura	Outdr Transplants	30	56
Ventura	Nectarine	10	5
Ventura	Olive	8	9
Ventura	Onion	28	54
Ventura	Orange	10,259	9,579
Ventura	Orchard Floor	40	40
Ventura	Pastureland	64	16
Ventura	Peach	119	93
Ventura	Pepper	53	100
Ventura	Plum	10	5
Ventura	Public Health	NR	10
Ventura	Raspberry	41	11
Ventura	Recreation Area	1	14
Ventura	Rights-of-way	NR	25,695
Ventura	Spinach	5	13
Ventura	Strawberry	40	330
Ventura	Structural Pest	NR	14
Ventura	Tangerine	14	
Ventura	Uncultivated non-ag	NR	16
Ventura	Water Area	39	88
Ventura	Lemon	1,314	2,745
Ventura	Orange	54	182

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), Alisa-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 16: Counties supporting the South Central California steelhead ESU

County	Site	Acres Treated	lbs. a.i. Applied
Monterey	Broccoli	95	45
Monterey	Landscape	NR	198
Monterey	Rights-of-way	NR	41,019
Monterey	Uncultivated ag	7,676	16,608
Monterey	Grape, wine	48,680	50,979
Monterey	Asparagus	202	784
Monterey	Cauliflower	49	64
Monterey	Celery	8	16
Monterey	Fumigation	NR	2
Monterey	Grass, seed	3	3
Monterey	Landscape	NR	7,845
Monterey	Lemon	91	225
Monterey	Lettuce, head	345	526
Monterey	Lettuce, leaf	40	40

Monterey	Outdr plants	30	67
Monterey	Pepper	57	151
Monterey	Public Health	NR	301
Monterey	Rangeland	143	342
Monterey	Strawberry	68	17
Monterey	Structural Pest Cont.	1	2
Monterey	Walnut	266	466
Monterey	Water Area	9	43
Monterey	Vertebrate Cont	NR	13
San Benito	Landscape	NR	568
San Benito	Rights-of-way	NR	59
San Benito	Uncultivated ag	2,903	6,059
San Benito	Uncultivated non-ag	12	28
San Benito	Unknown	309	402
San Benito	Apple	238	152
San Benito	Apricot	12	15
San Benito	Asparagus	138	204
San Benito	Barley	40	60
San Benito	Cherry	293	170
San Benito	Corn (sweet)	110	207
San Benito	Grape, wine	6,091	5.282
San Benito	Lettuce, Head	48	75
San Benito	Lettuce, leaf	20	50
San Benito	Mustard	118	178
San Benito	Outdr Plants	NR	599
San Benito	Outdr transplants	NR	33
San Benito	Onion	25	38

San Benito	Pepper	443	633
San Benito	Rangeland	766	1,543
San Benito	Research	NR	126
San Benito	Soil Fumigation	223	425
San Benito	Walnut	571	261
San Mateo	Landscape	NR	3,599
San Mateo	Rights-of-way	NR	5,273
San Mateo	Structural Pest Cont.	NR	114
San Mateo	Bean	83	128
San Mateo	Brussels Sprout	3	6
San Mateo	Christmas Tree	74	51
San Mateo	Grape, wine	23	17
San Mateo	Leek	2	4
San Mateo	Outdr Plants	10	45
San Mateo	Pastureland	76	152
San Mateo	Peas	3	6
San Mateo	Regulatory Pest Cont	NR	2
San Mateo	Uncultivated ag	216	720
San Mateo	Uncultivated non-ag	2	1
San Luis Obispo	Grape, wine	38,012	38,978
San Luis Obispo	Grape	333	15
San Luis Obispo	Outdr Plants	207	131
San Luis Obispo	Outdr Transplant	203	10
San Luis Obispo	Rights of Way	NR	10,062
San Luis Obispo	Avocado	1,033	1,058
San Luis Obispo	Almond	2	3
San Luis Obispo	Landscape	NR	5,459

San Luis Obispo	Turf/sod	10	29
San Luis Obispo	Apricot	8	6
San Luis Obispo	Apple	398	147
San Luis Obispo	Water Area	<1	3
San Luis Obispo	Walnut	137	167
San Luis Obispo	Vertebrate Control	NR	98
San Luis Obispo	Barley	1,033	1,056
San Luis Obispo	Blueberry	1,952	761
San Luis Obispo	Bok Choy	11	18
San Luis Obispo	Broccoli	312	443
San Luis Obispo	Carrot	186	209
San Luis Obispo	Celery	27	54
San Luis Obispo	Chinese Cabbage	12	8
San Luis Obispo	Citrus	14	6
San Luis Obispo	Hay, forage	245	126
San Luis Obispo	Fumigation	NR	15
San Luis Obispo	Grapefruit	7	6
San Luis Obispo	Leek	2	4
San Luis Obispo	Lemon	1,750	2,588
San Luis Obispo	Lettuce, head	97	203
San Luis Obispo	Lettuce, leaf	42	40
San Luis Obispo	Orange	161	130
San Luis Obispo	Peach	4	4
San Luis Obispo	Persimmon	4	1
San Luis Obispo	Pistachio	114	82
San Luis Obispo	Pomegranate	8	6
San Luis Obispo	Pumpkin	2	7

San Luis Obispo	Rangeland	6	9
9San Luis Obispo	Spinach	2	4
San Luis Obispo	Squash	8	16
San Luis Obispo	Structural Pest Cont	NR	11
San Luis Obispo	Uncultivated ag	1,545	1,016
San Luis Obispo	Uncultivated non-ag	34	19
Santa Clara	Landscape	NR	15,030
Santa Clara	Rights-of-way	NR	20,237
Santa Clara	Structural Pest Cont	NR	82
Santa Clara	Uncultivated ag	888	2,388
Santa Clara	Airport	NR	78
Santa Clara	Apple	16	20
Santa Clara	Bean	48	124
Santa Clara	Celery	17	17
Santa Clara	Cherry	360	257
Santa Clara	Chinese Cabbage	16	44
Santa Clara	Christmas Tree	44	37
Santa Clara	Corn (sweet)	205	370
Santa Clara	Cucumber	23	23
Santa Clara	Hay (forage))	85	26
Santa Clara	Grape	20	35
Santa Clara	Grape, wine	1,171	107
Santa Clara	Kiwi	5	10
Santa Clara	Leek	6	3
Santa Clara	Lettuce, head	15	12
Santa Clara	Outdr plants	36	79
Santa Clara	Outdr transplants	145	117

Santa Clara	Pepper	401	487
Santa Clara	Research	NR	1
Santa Clara	Turf/sod	1	1
Santa Clara	Tomato (processing)	40	52
Santa Clara	Vertebrate Cont	NR	2
Santa Cruz	Landscape	NR	1,356
Santa Cruz	Structural Pest cont	NR	507
Santa Cruz	Uncultivated ag	202	360
Santa Cruz	Rights-of-way	NR	3,277
Santa Cruz	Apple	1,629	1,110
Santa Cruz	Avocado	35	31
Santa Cruz	Bean	6	6
Santa Cruz	Blackberry	22	20
Santa Cruz	Blueberry	4	2
Santa Cruz	Cauliflower	15	32
Santa Cruz	Timberland	16	26
Santa Cruz	Grape, wine	102	137
Santa Cruz	Lettuce, head	130	256
Santa Cruz	Lettuce, leaf	90	180
Santa Cruz	Mint	1	1
Santa Cruz	Outdr Plants	211	175
Santa Cruz	Outdr transplants	107	299
Santa Cruz	Olive	6	10
Santa Cruz	Pastureland	2	4
Santa Cruz	Persimmon	6	5
Santa Cruz	Public Health	NR	40
Santa Cruz	Strawberry	12	40

3. Central California Coast Steelhead ESU

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

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

Counties of occurrence for this ESU are Santa Cruz, San Mateo, San Francisco, Marin, Sonoma, Mendocino, Napa, Alameda, Contra Costa, Solano, and Santa Clara counties. Usage of glyphosate in the counties where the Central California coast steelhead ESU is presented in Table 17.

Table 17: Counties supporting the Central California Coast steelhead ESU

County	Site	Acres Treated	lbs. a.i. Applied
Alameda	Landscape	NR	931
Alameda	Outdr Plants	316	451
Alameda	Rights-of-way	NR	17,739
Alameda	Structural pest cont	NR	1,113
Alameda	Grape	8	18

Alameda	Grape, win	2,603	1,411
Alameda	Olive	20	2
Alameda	Rangeland	10	7
Alameda	Uncultivated ag	13	28
Alameda	Wheat	80	40
Contra Costa	Apple	59	57
Contra Costa	Rights-of-way	NR	47,8898
Contra Costa	Apricot	735	467
Contra Costa	Asparagus	1,092	1,332
Contra Costa	Barley	11	5
Contra Costa	Cherry	10	10
Contra Costa	Corn (forage)	2,999	3,053
Contra Costa	Corn (sweet)	415	474
Contra Costa	Grape	16	32
Contra Costa	Grape, wine	1,200	713
Contra Costa	Landscape	NR	25,576
Contra Costa	Outdr Plants	NR	485
Contra Costa	Pastureland	1	1
Contra Costa	Peach	16	11
Contra Costa	Pear	33	15
Contra Costa	Potato	280	245
Contra Costa	Rangeland	210	16
Contra Costa	Regulatory Pest cont	NR	187
Contra Costa	Soil Fumigation	612	768
Contra Costa	Strawberry	5	16
Contra Costa	Tomato (processing)	311	308
Contra Costa	Uncultivated ag	1,576	2,278

Contra Costa	Uncultivated non-ag	278	280
Contra Costa	Walnut	77	69
Contra Costa	Wheat	400	407
Marin	Industrial site	10	28
Marin	Landscape	NR	2,903
Marin	Rights-of-way	NR	775
Marin	Hay, forage	20	58
Marin	Grape	10	10
Marin	Grape, wine	87	88
Marin	Outdr Plants	NR	7
Marin	Pastureland	27	6
Marin	Structural Pest cont	NR	16
Marin	Uncultivated ag	123	376
Mendocino	Grape, wine	15,724	14,023
Mendocino	Structural Pest cont	NR	214
Mendocino	Animal Premise	3	6
Mendocino	Apple	80	174
Mendocino	Timberland	67	50
Mendocino	Landscape	13,752	136
Mendocino	Olive	3	5
Mendocino	Pastureland	1	1
Mendocino	Peach	8	12
Mendocino	Pear	2,403	1,859
Mendocino	Rangeland	20	6
Mendocino	Rights-of-way	NR	345
Mendocino	Strawberry	4	4
Mendocino	Uncultivated ag	11	12

Mendocino	Uncultivated non-ag	22	57
Mendocino	Vertebrate cont	NR	36
Mendocino	Water Area	16	53
Napa	Landscape	NR	42
Napa	Rights-of-way	NR	117
Napa	Ditch, Bank	1	2
Napa	Grape, wine	32,387	43,840
Napa	Olive	17	13
Napa	Public Health	NR	849
Napa	Regulatory Pest cont	NR	18
Napa	Strawberry	8	9
Napa	Uncultivated ag	10	35
Napa	Walnut	12	17
Napa	Water Area	20	55
Napa	Peach	2	13
San Francisco	Landscape	NR	5,570
San Francisco	Structural Pest cont	NR	1
San Francisco	Rights-of-way	NR	676
San Mateo	Landscape	NR	3,599
San Mateo	Rights-of-way	NR	5,273
San Mateo	Structural Pest Cont.	NR	114
San Mateo	Bean	83	128
San Mateo	Brussels Sprout	3	6
San Mateo	Christmas Tree	74	51
San Mateo	Grape, wine	23	17
San Mateo	Leek	2	4
San Mateo	Outdr Plants	10	45

San Mateo	Pastureland	76	152
San Mateo	Peas	3	6
San Mateo	Regulatory Pest Cont	NR	2
San Mateo	Uncultivated ag	216	720
San Mateo	Uncultivated non-ag	2	1
Santa Clara	Landscape	NR	15,030
Santa Clara	Rights-of-way	NR	20,237
Santa Clara	Structural Pest Cont	NR	82
Santa Clara	Uncultivated ag	888	2,388
Santa Clara	Airport	NR	78
Santa Clara	Apple	16	20
Santa Clara	Bean	48	124
Santa Clara	Celery	17	17
Santa Clara	Cherry	360	257
Santa Clara	Chinese Cabbage	16	44
Santa Clara	Christmas Tree	44	37
Santa Clara	Corn (sweet)	205	370
Santa Clara	Cucumber	23	23
Santa Clara	Hay (forage))	85	26
Santa Clara	Grape	20	35
Santa Clara	Grape, wine	1,171	107
Santa Clara	Kiwi	5	10
Santa Clara	Leek	6	3
Santa Clara	Lettuce, head	15	12
Santa Clara	Outdr plants	36	79
Santa Clara	Outdr transplants	145	117
Santa Clara	Pepper	401	487

Santa Clara	Research	NR	1
Santa Clara	Turf/sod	1	1
Santa Clara	Tomato (processing)	40	52
Santa Clara	Vertebrate Cont	NR	2
Santa Cruz	Landscape	NR	1,356
Santa Cruz	Structural Pest cont	NR	507
Santa Cruz	Uncultivated ag	202	360
Santa Cruz	Rights-of-way	NR	3,277
Santa Cruz	Apple	1,629	1,110
Santa Cruz	Avocado	35	31
Santa Cruz	Bean	6	6
Santa Cruz	Blackberry	22	20
Santa Cruz	Blueberry	4	2
Santa Cruz	Cauliflower	15	32
Santa Cruz	Timberland	16	26
Santa Cruz	Grape, wine	102	137
Santa Cruz	Lettuce, head	130	256
Santa Cruz	Lettuce, leaf	90	180
Santa Cruz	Mint	1	1
Santa Cruz	Outdr Plants	211	175
Santa Cruz	Outdr transplants	107	299
Santa Cruz	Olive	6	10
Santa Cruz	Pastureland	2	4
Santa Cruz	Persimmon	6	5
Santa Cruz	Public Health	NR	40
Santa Cruz	Strawberry	12	40
Solano	Landscape	NR	7,505

Solano	Outdr Plants	NR	29
Solano	Prune	615	749
Solano	Public Health	NR	22
Solano	Rights-of-way	NR	15,828
Solano	Structural Pest cont	NR	126
Solano	Bean	15	18
Solano	Tomato (processing)	1,249	790
Solano	Uncultivated ag	17,106	12,699
Solano	Uncultivated non-ag	231	303
Solano	Alfalfa	145	176
Solano	Almond	1,227	1,038
Solano	Apple	75	52
Solano	Apricot	6	6
Solano	Bean	74	46
Solano	Cherry	9	12
Solano	Christmas Trees	127	249
Solano	Fumigation	NR	3
Solano	Corn (forage)	1,492	1,606
Solano	Ditch Bank	22	16
Solano	Grape	64	20
Solano	Grape, wine	2,604	2,051
Solano	Industrial site	2	3
Solano	Nectarine	2	5
Solano	Oat	90	98
Solano	Pastureland	418	377
Solano	Peach	25	51
Solano	Pear	426	318

Solano	Pepper	94	66
Solano	Plum	>1	1
Solano	Prune	708	533
Solano	Rangeland	50	32
Solano	Research	NR	6
Solano	Safflower	202	127
Solano	Sorghum (fodder)	75	74
Solano	Sorghum (Milo)	30	26
Solano	Soybean	22	28
Solano	Sunflower	318	290
Solano	Tomato (processing)	1,134	763
Solano	Turf/Sod	118	106
Solano	Walnut	6,605	4,510
Solano	Wheat	452	338
Solano	Almond	95	76
Solano	Melon	34	32
Sonoma	Landscape	NR	6,154
Sonoma	Uncultivated non-ag	NR	116
Sonoma	Apple	148	147
Sonoma	Blueberry	9	13
Sonoma	Chestnut	3	2
Sonoma	Christmas Tree	3	8
Sonoma	Corn (forage)	248	341
Sonoma	Timberland	8	8
Sonoma	Grape, wine	53,510	55,406
Sonoma	Outdr Plants	468	556
Sonoma	Outdr transplants	1,700	4

Sonoma	Oat	3,046	2,554
Sonoma	Olive	27	51
Sonoma	Pastureland	10	40
Sonoma	Peach	>1	1
Sonoma	Pear	1	1
Sonoma	Public Health	NR	1
Sonoma	Pumpkin	22	24
Sonoma	Rangeland	820	396
Sonoma	Rights-of-way	NR	8,968
Sonoma	Strawberry	30	13
Sonoma	Structural Pest cont	NR	510
Sonoma	Walnut	15	1
Sonoma	Water Area	6	50
Sonoma	Uncultivated ag	239	2

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 glyphosate in counties where the California Central Valley steelhead ESU occurs is presented in Table 18

Table 18 Counties supporting the California Central Valley steelhead ESU.

County	Site	Acres Treated	lbs. a.i. Applied
Alameda	Landscape	NR	931
Alameda	Outdr Plants	316	451
Alameda	Rights-of-way	NR	17,739
Alameda	Structural pest cont	NR	1,113
Alameda	Grape	8	18
Alameda	Grape, win	2,603	1,411
Alameda	Olive	20	2
Alameda	Rangeland	10	7
Alameda	Uncultivated ag	13	28
Alameda	Wheat	80	40
Amador	Landscape	NR	1,028
Amador	Timberland	487	295
Amador	Grape, wine	1,881	1,507
Amador	Outdr plants	7	4
Amador	Pastureland	90	123
Amador	Rangeland	4	2
Amador	Regulatory Pest cont	NR	223
Amador	Rights-of-way	NR	2,092
Amador	Structural Pest cont	NR	57
Amador	Walnut	27	28
Butte	Almond	77,517	80,624
Butte	Walnut	821	819
Butte	Apple	174	159
Butte	Bean	67	56
Butte	Beet	6	7
Butte	Cherry	115	96

Butte	Citrus	58	93
Butte	Corn (fodder)	157	171
Butte	Cucumber	16	19
Butte	Timberland	1,993	2,899
Butte	Grape, wine	55	100
Butte	Kiwi	196	364
Butte	Landscape	NR	3,626
Butte	Outdr Plants	61	60
Butte	Outdr transplants	175	716
Butte	Nectarine	2	5
Butte	Olive	1,803	683
Butte	Orange	75	38
Butte	Pastureland	1,118	1,025
Butte	Peach	90	45
Butte	Pecan	12	20
Butte	Persimmon	12	20-
Butte	Pistachio	519	1,109
Butte	Plum	2	2
Butte	Prune	8,837	8,080
Butte	Public Health	NR	10
Butte	Rice	722	1,010
Butte	Rights-of-way	NR	15,317
Butte	Safflower	35	53
Butte	Squash	14	17
Butte	Structural Pest cont	NR	20
Butte	Sunflower	152	149
Butte	Uncultivated ag	1,740	1,925

Butte	Uncultivated non-ag	1,988	2,700
Butte	Vegetable	1	1
Butte	Walnut	32,250	28,246
Butte	Watermelon	25	30
Butte	Almond	2,043	1,405
Calveras	Landscape	NR	170
Calveras	Rights-of-way	NR	4,355
Calveras	Structural Pest cont	NR	50
Calveras	Apple	1	2
Calveras	Cherry	22	18
Calveras	Timberland	2,184	2,682
Calveras	Grape, wine	431	415
Calveras	Outdr plants	48	41
Calveras	Nectarine	3	1
Calveras	Oat	32	32
Calveras	Olive	26	19
Calveras	Regulatory Pest cont	NR	492
Calveras	Rangeland	48	56
Calveras	Uncultivated non-ag	50	103
Calveras	Walnut	413	524
Calveras	Water area	5	28
Contra Costa	Apple	59	57
Contra Costa	Rights-of-way	NR	47,8898
Contra Costa	Apricot	735	467
Contra Costa	Asparagus	1,092	1,332
Contra Costa	Barley	11	5
Contra Costa	Cherry	10	10

Contra Costa	Corn (forage)	2,999	3,053
Contra Costa	Corn (sweet)	415	474
Contra Costa	Grape	16	32
Contra Costa	Grape, wine	1,200	713
Contra Costa	Landscape	NR	25,576
Contra Costa	Outdr Plants	NR	485
Contra Costa	Pastureland	1	1
Contra Costa	Peach	16	11
Contra Costa	Pear	33	15
Contra Costa	Potato	280	245
Contra Costa	Rangeland	210	16
Contra Costa	Regulatory Pest cont	NR	187
Contra Costa	Soil Fumigation	612	768
Contra Costa	Strawberry	5	16
Contra Costa	Tomato (processing)	311	308
Contra Costa	Uncultivated ag	1,576	2,278
Contra Costa	Uncultivated non-ag	278	280
Contra Costa	Walnut	77	69
Contra Costa	Wheat	400	407
Glenn			
Marin	Rights-of-way	NR	775
Marin	Hay, forage	20	58
Marin	Grape	10	10
Marin	Grape, wine	87	88
Marin	Outdr Plants	NR	7
Marin	Pastureland	27	6
Marin	Structural Pest cont	NR	16

Marin	Uncultivated ag	123	376
Marin	Industrial site	10	28
Marin	Landscape	NR	2,903
Merced	Almond	139,089	129,877
Merced	Animal Premise	6,553	1,016
Merced	Cherry	114	86
Merced	Cotton	54,809	48,350
Merced	Fig	4,368	3,206
Merced	Landscape	NR	2,769
Merced	Peach	8,090	7,882
Merced	Pistachio	8,704	7,421
Merced	Prune	2,631	1,466
Merced	Rights-of-way	NR	69,318
Merced	Walnut	6,480	4,418
Merced	Corn (forage)	6,370	5,921
Merced	Grape, wine	11,656	12,668
Merced	Alfalfa	2,344	2,106
Merced	Apple	49	42
Merced	Apricot	549	408
Merced	Bean	416	362
Merced	Blueberry	273	262
Merced	Nectarine	223	202
Merced	Plum	29	56
Merced	Cantaloupe	1,060	1,527
Merced	Christmas Tree	20	15
Merced	Citrus	7	9
Merced	Corn (sweet)	1,692	1,782

Merced	Ditch Bank	40	186
Merced	Grape	328	168
Merced	Industrial Site	10	2
Merced	Kiwi	30	39
Merced	Lettuce, head	58	43
Merced	Melon	85	366
Merced	Outdr Plants	477	1,101
Merced	Nuts	1	1
Merced	Oat	109	77
Merced	Oat (forage)	48	62
Merced	Orange	48	118
Merced	Pastureland	290	84
Merced	Pepper	161	133
Merced	Public Health	NR	26
Merced	Rangeland	120	120
Merced	Squash	16	13
Merced	Strawberry	9	10
Merced	Sugarbeet	282	183
Merced	Sweet Potato	50	200
Merced	Tomato	4,624	4,591
Merced	Tomato (processing)	8,660	8,276
Merced	Turf/sod	5	16
Merced	Uncultivated ag	49	53
Merced	Uncultivated non-ag	56	1,333
Merced	Vertebrate cont	NR	40
Merced	Water area	10	10
Nevada	Landscape	NR	1,418

Nevada	Structural Pest cont	NR	38
Nevada	Christmas trees	4	2
Nevada	Timberland	1,683	1,504
Nevada	Grape, wine	307	174
Nevada	Outdr plants	15	2
Nevada	Outdr transplants	28	2
Nevada	Pastureland	111	70
Nevada	Regulatory pest cont	NR	1
Nevada	Rights-of-way	NR	3,659
Placer	Landscape	NR	4,598
Placer	Outdr plants	40	89
Placer	Regulatory Pest cont	NR	3
Placer	Rights-of-way	NR	10,679
Placer	Rice	30	23
Placer	Apple	<1	1
Placer	Blackberry	5	3
Placer	Christmas tree	2	3
Placer	Citrus	15	13
Placer	Timberland	916	1,323
Placer	Grape	5	4
Placer	Grape, wine	98	73
Placer	Nectarine	1	1
Placer	Pastureland	70	1
Placer	Peach	40	14
Placer	Pear	3	3
Placer	Plum	86	1,007
Placer	Prune	397	109

Placer	Raspberry	2	2
Placer	Strawberry	19	19
Placer	Uncultivated ag	3437	306
Placer	Uncultivated non-ag	2	2
Placer	Vegetable	5	3
Placer	Walnut	1,711	770
San Joaquin	Almond	2,826	248
San Joaquin	Apricot	1,408	1,421
San Joaquin	Grape	42,145	44,905
San Joaquin	Landscape	NR	8,641
San Joaquin	Peach	825	782
San Joaquin	Rights-of-way	NR	56,229
San Joaquin	Structural Pest cont	NR	154
San Joaquin	Uncultivated non-ag	541	425
San Joaquin	Walnut	24,454	17,302
San Joaquin	Alfalfa	1,675	1,513
San Joaquin	Almond	31,753	32,108
San Joaquin	Animal Premise	24	35
San Joaquin	Asparagus	1,359	1,379
San Joaquin	Apple	1,401	1,409
San Joaquin	Bean	4,952	5,119
San Joaquin	Cantaloupe	23	16
San Joaquin	Carrot	80	279
San Joaquin	Cherry	4,145	3,214
San Joaquin	Chestnut	26	25
San Joaquin	Christmas tree	96	70
San Joaquin	Corn (forage)	10,518	9,984

San Joaquin	Corn (sweet)	95	92
San Joaquin	Cucumber	40	35
San Joaquin	Grape, wine	916	516
San Joaquin	Kiwi	8	8
San Joaquin	Outdr Plants	275	640
San Joaquin	Outdr transplants	19	13
San Joaquin	Nectarine	7	12
San Joaquin	Oat	10	10
San Joaquin	Onion	2	9
San Joaquin	Parsley	39	39
San Joaquin	Pastureland	83	102
San Joaquin	Pecan	20	12
San Joaquin	Pepper	223	266
San Joaquin	Persimmon	23	16
San Joaquin	Pistachio	67	23
San Joaquin	Potato	1,641	1,025
San Joaquin	Public Health	NR	918
San Joaquin	Pumpkin	160	174
San Joaquin	Recreation Area	1	1
San Joaquin	Rice	229	117
San Joaquin	Safflower	297	209
San Joaquin	Sorghum (milo)	9	9
San Joaquin	Soil Fumigation	14,695	20,134
San Joaquin	Squash	60	52
San Joaquin	Tomato	2,257	2,311
San Joaquin	Tomato (processing)	3,751	3,637
San Joaquin	Unknown	1	5

San Joaquin	Turf/sod	137	16
San Joaquin	Vertebrate cont	NR	6
San Joaquin	Water area	20	40
San Joaquin	Watermelon	154	294
San Francisco	Landscape	NR	5,570
San Francisco	Structural Pest cont	NR	1
San Francisco	Rights-of-way	NR	676
San Mateo	Landscape	NR	3,599
San Mateo	Rights-of-way	NR	5,273
San Mateo	Structural Pest Cont.	NR	114
San Mateo	Bean	83	128
San Mateo	Brussels Sprout	3	6
San Mateo	Christmas Tree	74	51
San Mateo	Grape, wine	23	17
San Mateo	Leek	2	4
San Mateo	Outdr Plants	10	45
San Mateo	Pastureland	76	152
San Mateo	Peas	3	6
San Mateo	Regulatory Pest Cont	NR	2
San Mateo	Uncultivated non-ag	2	1
Shasta	Landscape	NR	1,251
Shasta	Rights-of-way	NR	6,552
Shasta	Alfalfa	18	36
Shasta	Apple	13	15,005
Shasta	Christmas tree	2	5
Shasta	Hay	50	50
Shasta	Timberland	3,628	4,446

Shasta	Garlic	100	100
Shasta	Grape	<1	1
Shasta	Mint	171	122
Shasta	Outdr plants	5	21
Shasta	Olive	10	4
Shasta	Peach	4	1
Shasta	Pistachio	6	3
Shasta	Prune	313	140
Shasta	Public Health	NR	219
Shasta	Rangeland	20	17
Shasta	Shallot	3	11
Shasta	Uncultivated ag	1,259	1,299
Shasta	Walnut	1,897	999
Solano	Landscape	NR	7,505
Solano	Outdr Plants	NR	29
Solano	Prune	615	749
Solano	Public Health	NR	22
Solano	Rights-of-way	NR	15,828
Solano	Structural Pest cont	NR	126
Solano	Bean	15	18
Solano	Tomato (processing)	1,249	790
Solano	Uncultivated ag	17,106	12,699
Solano	Uncultivated non-ag	231	303
Solano	Alfalfa	145	176
Solano	Almond	1,227	1,038
Solano	Apple	75	52
Solano	Apricot	6	6

Solano	Bean	74	46
Solano	Cherry	9	12
Solano	Christmas Trees	127	249
Solano	Fumigation	NR	3
Solano	Corn (forage)	1,492	1,606
Solano	Ditch Bank	22	16
Solano	Grape	64	20
Solano	Grape, wine	2,604	2,051
Solano	Industrial site	2	3
Solano	Nectarine	2	5
Solano	Oat	90	98
Solano	Pastureland	418	377
Solano	Peach	25	51
Solano	Pear	426	318
Solano	Pepper	94	66
Solano	Plum	>1	1
Solano	Prune	708	533
Solano	Rangeland	50	32
Solano	Research	NR	6
Solano	Safflower	202	127
Solano	Sorghum (fodder)	75	74
Solano	Sorghum (Milo)	30	26
Solano	Soybean	22	28
Solano	Sunflower	318	290
Solano	Tomato (processing)	1,134	763
Solano	Turf/Sod	118	106
Solano	Walnut	6,605	4,510

Solano	Wheat	452	338
Solano	Almond	95	76
Solano	Melon	34	32
Sonoma	Landscape	NR	6,154
Sonoma	Uncultivated non-ag	NR	116
Sonoma	Apple	148	147
Sonoma	Blueberry	9	13
Sonoma	Chestnut	3	2
Sonoma	Christmas Tree	3	8
Sonoma	Corn (forage)	248	341
Sonoma	Timberland	8	8
Sonoma	Grape, wine	53,510	55,406
Sonoma	Outdr Plants	468	556
Sonoma	Outdr transplants	1,700	4
Sonoma	Oat	3,046	2,554
Sonoma	Olive	27	51
Sonoma	Pastureland	10	40
Sonoma	Peach	>1	1
Sonoma	Pear	1	1
Sonoma	Public Health	NR	1
Sonoma	Pumpkin	22	24
Sonoma	Rangeland	820	396
Sonoma	Rights-of-way	NR	8,968
Sonoma	Strawberry	30	13
Sonoma	Structural Pest cont	NR	510
Sonoma	Walnut	15	1
Sonoma	Water Area	6	50

Sonoma	Uncultivated ag	239	2
Sutter	Rights-of-way	NR	23,723
Sutter	Walnut	1,322	11,377
Sutter	Almond	3,456	2,712
Sutter	Peach	2,800	3,415
Sutter	Prune	5,627	7,744
Sutter	Sunflower	198	145
Sutter	Tomato (processing)	2,957	1,740
Sutter	Uncultivated ag	13,195	7,002
Sutter	Alfalfa	334	261
Sutter	Apple	96	48
Sutter	Bean	527	629
Sutter	Citrus	18	23
Sutter	Corn (forage)	2,841	2,713
Sutter	Cotton	2.913	3,175
Sutter	Date	25	31
Sutter	Fumigation	NR	8
Sutter	Melon	825	1,287
Sutter	Kiwi	44	118
Sutter	Outdr plants	870	342
Sutter	Nectarine	2	2
Sutter	Pastureland	10	63
Sutter	Pear	184	161
Sutter	Persimmon	20	33
Sutter	Public Health	NR	63
Sutter	Pumpkin	1	1
Sutter	Regulatory Pest cont	NR	1

Sutter	Rice	210	165
Sutter	Safflower	1,948	1,622
Sutter	Sorghum (milo)	65	44
Sutter	Squash	1	1
Sutter	Structural Pest cont	NR	146
Sutter	Uncultivated non-ag	5	12
Sutter	Vertebrate cont	NR	5,423
Sutter	Watermelon	1	1
Sutter	Wheat	129	186
Tehama	Landscape	NR	786
Tehama	Rights-of-way	NR	53
Tehama	Alfalfa	91	112
Tehama	Almond	14,273	11.727
Tehama	Animal premise	20	7
Tehama	Apricot	1	1
Tehama	Blueberry	4	5
Tehama	Cherry	<1	1
Tehama	Corn (forage)	312	287
Tehama	Timberland	566	653
Tehama	Grape	4	4
Tehama	Grape, wine	8	8
Tehama	Outdr transplants	5	4
Tehama	Nectarine	<1	1
Tehama	Oat	136	53
Tehama	Olive	8,159	7,482
Tehama	Orange	19	28
Tehama	Pastureland	77	57

Tehama	Peach	2	3
Tehama	Pecan	176	139
Tehama	Pistachio	46	45
Tehama	Plum	56	33
Tehama	Prune	10,433	9,009
Tehama	Public Health	NR	30
Tehama	Pumpkin	20	100
Tehama	Rangeland	1,398	409
Tehama	Regulatory Pest cont	NR	143
Tehama	Structural Pest cont	NR	80
Tehama	Vegetable	3	1
Tehama	Water Area	20	103
Tuolumne	Landscape	NR	365
Tuolumne	Rights-of-way	NR	5,735
Tuolumne	Apple	23	21
Tuolumne	Boysenberry	1	1
Tuolumne	Timberland	7,155	22,343
Tuolumne	Grape, wine	15	14
Tuolumne	Outdr plants	2	3
Tuolumne	Olive	3	10
Tuolumne	Pastureland	3,516	51
Tuolumne	Peach	1	1
Tuolumne	Pear	3	2
Tuolumne	Recreation Area	115	2
Tuolumne	Uncultivated ag	123	40
Tuolumne	Unknown	225	3
Tuolumne	Water Area	51	10

Yolo	Bean	188	144
Yolo	Corn (forage)	4,625	3,283
Yolo	Landscape	NR	78
Yolo	Orange	73	31
Yolo	Prune	19,920	1,470
Yolo	Rights-of-way	NR	24,229
Yolo	Structural Pest cont	NR	17
Yolo	Sunflower	1,093	929
Yolo	Tomato (processing)	8,552	7,149
Yolo	Tomato	402	242
Yolo	Walnut	7,622	536
Yolo	Grape, wine	10,043	5,084
Yolo	Uncultivated ag	48,707	37,216
Yolo	Apple	158	62
Yolo	Alfalfa	333	239
Yolo	Almond	5,999	4,439
Yolo	Asparagus	18	40
Yolo	Bean	45	29
Yolo	Cherry	21	44
Yolo	Chestnut	19	19
Yolo	Citrus	9	5
Yolo	Corn (sweet)	114	91
Yolo	Cotton	1,113	988
Yolo	Cucumber	13	32
Yolo	Garlic	93	122
Yolo	Grape	73	75
Yolo	Melon	11	13

Yolo	Outdr Plants	617	181
Yolo	Outdr transplants	3	4
Yolo	Oat	513	449
Yolo	Olive	20	10
Yolo	Pastureland	118	151
Yolo	Pear	585	328
Yolo	Peach	<1	1
Yolo	Pepper	328	232
Yolo	Pistachio	3	2
Yolo	Rangeland	4	11
Yolo	Regulatory Pest cont	NR	1,054
Yolo	Rice	623	582
Yolo	Rice, wild	140	53
Yolo	Safflower	2,263	1,760
Yolo	Sorghum (milo)	510	382
Yolo	Soybean	38	39
Yolo	Soybean oil	38	57
Yolo	Squash	25	54
Yolo	Strawberry	10	49
Yolo	Uncultivated non-ag	34	64
Yolo	Walnut	7,484	4,417
Yolo	Watermelon	52	106
Yolo	Wheat	196	193

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 19 shows the use of glyphosate in the counties where the Northern California steelhead ESU occurs.

Table 19: Counties supporting the Northern California steelhead ESU

County	Site	Acres Treated	lbs. a.i. Applied
Humbolt	Rights-of-way	NR	829
Humbolt	Apple	3	1
Humbolt	Timberland	3,679	2,482
Humbolt	Grape	5	5
Humbolt	Landscape	NR	74
Humbolt	Outdr Plants	108	1129
Humbolt	Outdr transplants	32	62
Humbolt	Structural pest cont	NR	1
Lake	Grape, wine	6,555	7,509
Lake	Landscape	NR	2,613
Lake	Rights-of-way	NR	1,365
Lake	Apple	110	89
Lake	Christmas tree	7	11
Lake	Grape	857	418
Lake	Lumber, treated	45	105
Lake	Pastureland	10	44

Lake	Pear	3,108	3,176
Lake	Rangeland	2	1
Lake	Rice, wild	760	21
Lake	Soil fumigation	29	61
Lake	Strawberry	28	80
Lake	Uncultivated ag	38	54
Lake	Unknown	9	8
Lake	Walnut	369	339
Mendocino	Grape, wine	15,724	14,023
Mendocino	Structural Pest cont	NR	214
Mendocino	Animal Premise	3	6
Mendocino	Apple	80	174
Mendocino	Timberland	67	50
Mendocino	Landscape	13,752	136
Mendocino	Olive	3	5
Mendocino	Pastureland	1	1
Mendocino	Peach	8	12
Mendocino	Pear	2,403	1,859
Mendocino	Rangeland	20	6
Mendocino	Rights-of-way	NR	345
Mendocino	Strawberry	4	4
Mendocino	Uncultivated ag	11	12
Mendocino	Uncultivated non-ag	22	57
Mendocino	Vertebrate cont	NR	36
Mendocino	Water Area	16	53
Trinity	Timberland	2,798	4,152
Trinity	Grape	19	29

Trinity	Grape, wine	9	11
Trinity	Regulatory pest cont	NR	14
Trinity	Rights-of-way	NR	11
Trinity	Structural pest cont	NR	1

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.

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

Adult female chinook will prepare a spawning bed, called a redds, in a stream area with suitable gravel composition, water depth and velocity. After laying eggs in a redds, adult chinook will guard the redds from 4 to 25 days before dying. Chinook salmon eggs will hatch, depending upon water temperatures, between 90 to 150 days after deposition. Juvenile chinook may spend from 3 months to 2 years in freshwater after emergence and before migrating to 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 20 shows the Glyphosate usage in California counties supporting the Sacramento River winter-run chinook salmon ESU. Use of Glyphosate 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.

Table 20: California counties supporting the Sacramento River, winter-run chinook ESU.

County	Site	Acres Treated	lbs a.i. Applied
Alameda	Landscape	NR	931
Alameda	Outdr Plants	316	451
Alameda	Rights-of-way	NR	17,739
Alameda	Structural pest cont	NR	1,113
Alameda	Grape	8	18
Alameda	Grape, win	2,603	1,411
Alameda	Olive	20	2
Alameda	Rangeland	10	7
Alameda	Uncultivated ag	13	28
Alameda	Wheat	80	40

Contra Costa	Apple	59	57
Contra Costa	Rights-of-way	NR	47,8898
Contra Costa	Apricot	735	467
Contra Costa	Asparagus	1,092	1,332
Contra Costa	Barley	11	5
Contra Costa	Cherry	10	10
Contra Costa	Corn (forage)	2,999	3,053
Contra Costa	Corn (sweet)	415	474
Contra Costa	Grape	16	32
Contra Costa	Grape, wine	1,200	713
Contra Costa	Landscape	NR	25,576
Contra Costa	Outdr Plants	NR	485
Contra Costa	Pastureland	1	1
Contra Costa	Peach	16	11
Contra Costa	Pear	33	15
Contra Costa	Potato	280	245
Contra Costa	Rangeland	210	16
Contra Costa	Regulatory Pest cont	NR	187
Contra Costa	Soil Fumigation	612	768
Contra Costa	Strawberry	5	16
Contra Costa	Tomato (processing)	311	308
Contra Costa	Uncultivated ag	1,576	2,278
Contra Costa	Uncultivated non-ag	278	280
Contra Costa	Walnut	77	69
Contra Costa	Wheat	400	407
Amador	Landscape	NR	1,028
Amador	Timberland	487	295

Amador	Grape, wine	1,881	1,507
Amador	Outdr plants	7	4
Amador	Pastureland	90	123
Amador	Rangeland	4	2
Amador	Regulatory Pest cont	NR	223
Amador	Rights-of-way	NR	2,092
Amador	Structural Pest cont	NR	57
Amador	Walnut	27	28
Butte	Almond	77,517	80,624
Butte	Walnut	821	819
Butte	Apple	174	159
Butte	Bean	67	56
Butte	Beet	6	7
Butte	Cherry	115	96
Butte	Citrus	58	93
Butte	Corn (fodder)	157	171
Butte	Cucumber	16	19
Butte	Timberland	1,993	2,899
Butte	Grape, wine	55	100
Butte	Kiwi	196	364
Butte	Landscape	NR	3,626
Butte	Outdr Plants	61	60
Butte	Outdr transplants	175	716
Butte	Nectarine	2	5
Butte	Olive	1,803	683
Butte	Orange	75	38
Butte	Pastureland	1,118	1,025

Butte	Peach	90	45
Butte	Pecan	12	20
Butte	Persimmon	12	20-
Butte	Pistachio	519	1,109
Butte	Plum	2	2
Butte	Prune	8,837	8,080
Butte	Public Health	NR	10
Butte	Rice	722	1,010
Butte	Rights-of-way	NR	15,317
Butte	Safflower	35	53
Butte	Squash	14	17
Butte	Structural Pest cont	NR	20
Butte	Sunflower	152	149
Butte	Uncultivated ag	1,740	1,925
Butte	Uncultivated non-ag	1,988	2,700
Butte	Vegetable	1	1
Butte	Walnut	32,250	28,246
Butte	Watermelon	25	30
Colusa	Landscape	NR	163
Colusa	Rights-of-way	NR	9,818
Colusa	Alfalfa	873	751
Colusa	Almond	43,541	25,710
Colusa	Bean	506	494
Colusa	Carrot	5	3
Colusa	Corn (forage)	103	103
Colusa	Corn (sweet)	226	226
Colusa	Cotton	2,752	2,820

Colusa	Grape, wine	805	551
Colusa	Pistachio	4,088	1,552
Colusa	Olive	66	55
Colusa	Prune	1,325	550
Colusa	Rice	485	648
Colusa	Safflower	608	424
Colusa	Soil fumigant	13,233	11,344
Colusa	Structural pest cont	NR	3
Colusa	Tomato (processing)	5,779	4,293
Colusa	Uncultivated non-ag	32	65
Colusa	Walnut	1,944	30,158
Colusa	Wheat	827	1,362
Colusa	Industrial site	25	25
Glenn	Almond	47,244	42,057
Glenn	Rights-of-way	NR	243
Glenn	Walnut	17,740	13,913
Glenn	Alfalfa	365	305
Glenn	Apricot	10	8
Glenn	Barley	233	205
Glenn	Bean	189	178
Glenn	Cherry	1	2
Glenn	Citrus	30	26
Glenn	Corn (forage)	5,840	11,020
Glenn	Cotton	1,122	1,837
Glenn	Grape	839	334
Glenn	Grape, wine	1,471	761
Glenn	Kiwi	9	29

Glenn	Landscape	NR	519
Glenn	Outdr transplants	158	8
Glenn	Olive	6,568	5,749
Glenn	Orange	272	379
Glenn	Pastureland	107	26
Glenn	Pear	20	28
Glenn	Pecan	126	122
Glenn	Pistachio	1,691	2,125
Glenn	Prune	14,387	11,580
Glenn	Rangeland	90	78
Glenn	Rice	510	563
Glenn	Safflower	57	43
Glenn	Sorghum (milo)	60	120
Glenn	Strawberry	3	3
Glenn	Structural pest cont	NR	62
Glenn	Sudan grass	55	73
Glenn	Sunflower	1,504	1,155
Glenn	Uncultivated ag	3,105	2,2663
Glenn	Uncultivated non-ag	105	205
Glenn	Tomato (processing)	558	491
Marin	Rights-of-way	NR	775
Marin	Hay, forage	20	58
Marin	Grape	10	10
Marin	Grape, wine	87	88
Marin	Outdr Plants	NR	7
Marin	Pastureland	27	6
Marin	Structural Pest cont	NR	16

Marin	Uncultivated ag	123	376
Marin	Industrial site	10	28
Marin	Landscape	NR	2,903
Napa	Landscape	NR	42
Napa	Rights-of-way	NR	117
Napa	Ditch, Bank	1	2
Napa	Grape, wine	32,387	43,840
Napa	Olive	17	13
Napa	Public Health	NR	849
Napa	Regulatory Pest cont	NR	18
Napa	Strawberry	8	9
Napa	Uncultivated ag	10	35
Napa	Walnut	12	17
Napa	Water Area	20	55
Napa	Peach	2	13
Nevada	Landscape	NR	1,418
Nevada	Structural Pest cont	NR	38
Nevada	Christmas trees	4	2
Nevada	Timberland	1,683	1,504
Nevada	Grape, wine	307	174
Nevada	Outdr plants	15	2
Nevada	Outdr transplants	28	2
Nevada	Pastureland	111	70
Nevada	Regulatory pest cont	NR	1
Nevada	Rights-of-way	NR	3,659
Placer	Landscape	NR	4,598
Placer	Outdr plants	40	89

Placer	Regulatory Pest cont	NR	3
Placer	Rights-of-way	NR	10,679
Placer	Rice	30	23
Placer	Apple	<1	1
Placer	Blackberry	5	3
Placer	Christmas tree	2	3
Placer	Citrus	15	13
Placer	Timberland	916	1,323
Placer	Grape	5	4
Placer	Grape, wine	98	73
Placer	Nectarine	1	1
Placer	Pastureland	70	1
Placer	Peach	40	14
Placer	Pear	3	3
Placer	Plum	86	1,007
Placer	Prune	397	109
Placer	Raspberry	2	2
Placer	Strawberry	19	19
Placer	Uncultivated ag	3437	306
Placer	Uncultivated non-ag	2	2
Placer	Vegetable	5	3
Placer	Walnut	1,711	770
Sacramento	Apple	303	319
Sacramento	Landscape	NR	16,281
Sacramento	Pear	8,147	6,187
Sacramento	Rights-of-way	NR	6,096
Sacramento	Structural pest cont	581	581

Sacramento	Corn (sweet)	8,790	8,323
Sacramento	Grape, wine	24,863	20,323
Sacramento	Uncultivated ag	9,699	15,834
Sacramento	Alfalfa	473	615
Sacramento	Almond	115	144
Sacramento	Apple	296	300
Sacramento	Asparagus	8	6
Sacramento	Cherry	63	39
Sacramento	Chestnut	2	2
Sacramento	Christmas tree	63	2
Sacramento	Corn (forage)	120	
Sacramento	Cucumber	105	66
Sacramento	Kiwi	8	13
Sacramento	Outdr plants	4	3
Sacramento	Pastureland	28	31
Sacramento	Peach	10	14
Sacramento	Pear	7,125	54,176
Sacramento	Public Health	NR	60
Sacramento	Rangeland	70	44
Sacramento	Rice	120	86
Sacramento	Safflower	595	482
Sacramento	Sudan grass	139	118
Sacramento	Tomato	10	25
Sacramento	Tomato (processing)	956	784
Sacramento	Uncultivated non-ag	24	42
Sacramento	Vertebrate cont	NR	100
Sacramento	Walnut	1,392	2,576

Sacramento	Water area	17	43
Sacramento	Wheat	255	261
San Francisco	Landscape	NR	5,570
San Francisco	Structural Pest cont	NR	1
San Francisco	Rights-of-way	NR	676
Shasta	Landscape	NR	1,251
Shasta	Rights-of-way	NR	6,552
Shasta	Alfalfa	18	36
Shasta	Apple	13	15,005
Shasta	Christmas tree	2	5
Shasta	Hay	50	50
Shasta	Timberland	3,628	4,446
Shasta	Garlic	100	100
Shasta	Grape	<1	1
Shasta	Mint	171	122
Shasta	Outdr plants	5	21
Shasta	Olive	10	4
Shasta	Peach	4	1
Shasta	Pistachio	6	3
Shasta	Prune	313	140
Shasta	Public Health	NR	219
Shasta	Rangeland	20	17
Shasta	Shallot	3	11
Shasta	Uncultivated ag	1,259	1,299
Shasta	Walnut	1,897	999
Solano	Landscape	NR	7,505
Solano	Outdr Plants	NR	29

Solano	Prune	615	749
Solano	Public Health	NR	22
Solano	Rights-of-way	NR	15,828
Solano	Structural Pest cont	NR	126
Solano	Bean	15	18
Solano	Tomato (processing)	1,249	790
Solano	Uncultivated ag	17,106	12,699
Solano	Uncultivated non-ag	231	303
Solano	Alfalfa	145	176
Solano	Almond	1,227	1,038
Solano	Apple	75	52
Solano	Apricot	6	6
Solano	Bean	74	46
Solano	Cherry	9	12
Solano	Christmas Trees	127	249
Solano	Fumigation	NR	3
Solano	Corn (forage)	1,492	1,606
Solano	Ditch Bank	22	16
Solano	Grape	64	20
Solano	Grape, wine	2,604	2,051
Solano	Industrial site	2	3
Solano	Nectarine	2	5
Solano	Oat	90	98
Solano	Pastureland	418	377
Solano	Peach	25	51
Solano	Pear	426	318
Solano	Pepper	94	66

Solano	Plum	>1	1
Solano	Prune	708	533
Solano	Rangeland	50	32
Solano	Research	NR	6
Solano	Safflower	202	127
Solano	Sorghum (fodder)	75	74
Solano	Sorghum (Milo)	30	26
Solano	Soybean	22	28
Solano	Sunflower	318	290
Solano	Tomato (processing)	1,134	763
Solano	Turf/Sod	118	106
Solano	Walnut	6,605	4,510
Solano	Wheat	452	338
Solano	Almond	95	76
Solano	Melon	34	32
Sutter	Almond	3,456	2,712
Sutter	Peach	2,800	3,415
Sutter	Prune	5,627	7,744
Sutter	Sunflower	198	145
Sutter	Tomato (processing)	2,957	1,740
Sutter	Uncultivated ag	13,195	7,002
Sutter	Alfalfa	334	261
Sutter	Apple	96	48
Sutter	Bean	527	629
Sutter	Citrus	18	23
Sutter	Corn (forage)	2,841	2,713
Sutter	Cotton	2.913	3,175

Sutter	Date	25	31
Sutter	Fumigation	NR	8
Sutter	Melon	825	1,287
Sutter	Kiwi	44	118
Sutter	Outdr plants	870	342
Sutter	Nectarine	2	2
Sutter	Pastureland	10	63
Sutter	Pear	184	161
Sutter	Persimmon	20	33
Sutter	Public Health	NR	63
Sutter	Pumpkin	1	1
Sutter	Regulatory Pest cont	NR	1
Sutter	Rice	210	165
Sutter	Safflower	1,948	1,622
Sutter	Sorghum (milo)	65	44
Sutter	Squash	1	1
Sutter	Structural Pest cont	NR	146
Sutter	Uncultivated non-ag	5	12
Sutter	Vertebrate cont	NR	5,423
Sutter	Watermelon	1	1
Sutter	Wheat	129	186
Tehama	Landscape	NR	786
Tehama	Rights-of-way	NR	53
Tehama	Alfalfa	91	112
Tehama	Almond	14,273	11.727
Tehama	Animal premise	20	7
Tehama	Apricot	1	1

Tehama	Blueberry	4	5
Tehama	Cherry	<1	1
Tehama	Corn (forage)	312	287
Tehama	Timberland	566	653
Tehama	Grape	4	4
Tehama	Grape, wine	8	8
Tehama	Outdr transplants	5	4
Tehama	Nectarine	<1	1
Tehama	Oat	136	53
Tehama	Olive	8,159	7,482
Tehama	Orange	19	28
Tehama	Pastureland	77	57
Tehama	Peach	2	3
Tehama	Pecan	176	139
Tehama	Pistachio	46	45
Tehama	Plum	56	33
Tehama	Prune	10,433	9,009
Tehama	Public Health	NR	30
Tehama	Pumpkin	20	100
Tehama	Rangeland	1,398	409
Tehama	Regulatory Pest cont	NR	143
Tehama	Structural Pest cont	NR	80
Tehama	Vegetable	3	1
Tehama	Water Area	20	103
Yolo	Bean	188	144
Yolo	Corn (forage)	4,625	3,283
Yolo	Landscape	NR	78

Yolo	Orange	73	31
Yolo	Prune	19,920	1,470
Yolo	Rights-of-way	NR	24,229
Yolo	Structural Pest cont	NR	17
Yolo	Sunflower	1,093	929
Yolo	Tomato (processing)	8,552	7,149
Yolo	Tomato	402	242
Yolo	Walnut	7,622	536
Yolo	Grape, wine	10,043	5,084
Yolo	Uncultivated ag	48,707	37,216
Yolo	Apple	158	62
Yolo	Alfalfa	333	239
Yolo	Almond	5,999	4,439
Yolo	Asparagus	18	40
Yolo	Bean	45	29
Yolo	Cherry	21	44
Yolo	Chestnut	19	19
Yolo	Citrus	9	5
Yolo	Corn (sweet)	114	91
Yolo	Cotton	1,113	988
Yolo	Cucumber	13	32
Yolo	Garlic	93	122
Yolo	Grape	73	75
Yolo	Melon	11	13
Yolo	Outdr Plants	617	181
Yolo	Outdr transplants	3	4
Yolo	Oat	513	449

Yolo	Olive	20	10
Yolo	Pastureland	118	151
Yolo	Pear	585	328
Yolo	Peach	<1	1
Yolo	Pepper	328	232
Yolo	Pistachio	3	2
Yolo	Rangeland	4	11
Yolo	Regulatory Pest cont	NR	1,054
Yolo	Rice	623	582
Yolo	Rice, wild	140	53
Yolo	Safflower	2,263	1,760
Yolo	Sorghum (milo)	510	382
Yolo	Soybean	38	39
Yolo	Soybean oil	38	57
Yolo	Squash	25	54
Yolo	Strawberry	10	49
Yolo	Uncultivated non-ag	34	64
Yolo	Walnut	7,484	4,417
Yolo	Watermelon	52	106
Yolo	Wheat	196	193

4. Central Valley Spring-run Chinook ESU

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

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

Table 21: California counties supporting the Central Valley spring-run chinook salmon ESU.

County	Site	Acres Treated	Lbs a.i. Applied
Alameda	Landscape	NR	931
Alameda	Outdr Plants	316	451
Alameda	Rights-of-way	NR	17,739
Alameda	Structural pest cont	NR	1,113
Alameda	Grape	8	18
Alameda	Grape, win	2,603	1,411
Alameda	Olive	20	2
Alameda	Rangeland	10	7
Alameda	Uncultivated ag	13	28
Alameda	Wheat	80	40
Contra Costa	Apple	59	57
Contra Costa	Rights-of-way	NR	47,8898
Contra Costa	Apricot	735	467
Contra Costa	Asparagus	1,092	1,332
Contra Costa	Barley	11	5
Contra Costa	Cherry	10	10
Contra Costa	Corn (forage)	2,999	3,053

Contra Costa	Corn (sweet)	415	474
Contra Costa	Grape	16	32
Contra Costa	Grape, wine	1,200	713
Contra Costa	Landscape	NR	25,576
Contra Costa	Outdr Plants	NR	485
Contra Costa	Pastureland	1	1
Contra Costa	Peach	16	11
Contra Costa	Pear	33	15
Contra Costa	Potato	280	245
Contra Costa	Rangeland	210	16
Contra Costa	Regulatory Pest cont	NR	187
Contra Costa	Soil Fumigation	612	768
Contra Costa	Strawberry	5	16
Contra Costa	Tomato (processing)	311	308
Contra Costa	Uncultivated ag	1,576	2,278
Contra Costa	Uncultivated non-ag	278	280
Contra Costa	Walnut	77	69
Contra Costa	Wheat	400	407
Amador	Landscape	NR	1,028
Amador	Timberland	487	295
Amador	Grape, wine	1,881	1,507
Amador	Outdr plants	7	4
Amador	Pastureland	90	123
Amador	Rangeland	4	2
Amador	Regulatory Pest cont	NR	223
Amador	Rights-of-way	NR	2,092
Amador	Structural Pest cont	NR	57

Amador	Walnut	27	28
Butte	Almond	77,517	80,624
Butte	Walnut	821	819
Butte	Apple	174	159
Butte	Bean	67	56
Butte	Beet	6	7
Butte	Cherry	115	96
Butte	Citrus	58	93
Butte	Corn (fodder)	157	171
Butte	Cucumber	16	19
Butte	Timberland	1,993	2,899
Butte	Grape, wine	55	100
Butte	Kiwi	196	364
Butte	Landscape	NR	3,626
Butte	Outdr Plants	61	60
Butte	Outdr transplants	175	716
Butte	Nectarine	2	5
Butte	Olive	1,803	683
Butte	Orange	75	38
Butte	Pastureland	1,118	1,025
Butte	Peach	90	45
Butte	Pecan	12	20
Butte	Persimmon	12	20-
Butte	Pistachio	519	1,109
Butte	Plum	2	2
Butte	Prune	8,837	8,080
Butte	Public Health	NR	10

Butte	Rice	722	1,010
Butte	Rights-of-way	NR	15,317
Butte	Safflower	35	53
Butte	Squash	14	17
Butte	Structural Pest cont	NR	20
Butte	Sunflower	152	149
Butte	Uncultivated ag	1,740	1,925
Butte	Uncultivated non-ag	1,988	2,700
Butte	Vegetable	1	1
Butte	Walnut	32,250	28,246
Butte	Watermelon	25	30
Colusa	Landscape	NR	163
Colusa	Rights-of-way	NR	9,818
Colusa	Alfalfa	873	751
Colusa	Almond	43,541	25,710
Colusa	Bean	506	494
Colusa	Carrot	5	3
Colusa	Corn (forage)	103	103
Colusa	Corn (sweet)	226	226
Colusa	Cotton	2,752	2,820
Colusa	Grape, wine	805	551
Colusa	Pistachio	4,088	1,552
Colusa	Olive	66	55
Colusa	Prune	1,325	550
Colusa	Rice	485	648
Colusa	Safflower	608	424
Colusa	Soil fumigant	13,233	11,344

Colusa	Structural pest cont	NR	3
Colusa	Tomato (processing)	5,779	4,293
Colusa	Uncultivated non-ag	32	65
Colusa	Walnut	1,944	30,158
Colusa	Wheat	827	1,362
Colusa	Industrial site	25	25
Glenn	Almond	47,244	42,057
Glenn	Rights-of-way	NR	243
Glenn	Walnut	17,740	13,913
Glenn	Alfalfa	365	305
Glenn	Apricot	10	8
Glenn	Barley	233	205
Glenn	Bean	189	178
Glenn	Cherry	1	2
Glenn	Citrus	30	26
Glenn	Corn (forage)	5,840	11,020
Glenn	Cotton	1,122	1,837
Glenn	Grape	839	334
Glenn	Grape, wine	1,471	761
Glenn	Kiwi	9	29
Glenn	Landscape	NR	519
Glenn	Outdr transplants	158	8
Glenn	Olive	6,568	5,749
Glenn	Orange	272	379
Glenn	Pastureland	107	26
Glenn	Pear	20	28
Glenn	Pecan	126	122

Glenn	Pistachio	1,691	2,125
Glenn	Prune	14,387	11,580
Glenn	Rangeland	90	78
Glenn	Rice	510	563
Glenn	Safflower	57	43
Glenn	Sorghum (milo)	60	120
Glenn	Strawberry	3	3
Glenn	Structural pest cont	NR	62
Glenn	Sudan grass	55	73
Glenn	Sunflower	1,504	1,155
Glenn	Uncultivated ag	3,105	2,2663
Glenn	Uncultivated non-ag	105	205
Glenn	Tomato (processing)	558	491
Marin	Industrial site	10	28
Marin	Landscape	NR	2,903
Marin	Rights-of-way	NR	775
Marin	Hay, forage	20	58
Marin	Grape	10	10
Marin	Grape, wine	87	88
Marin	Outdr Plants	NR	7
Marin	Pastureland	27	6
Marin	Structural Pest cont	NR	16
Marin	Uncultivated ag	123	376
Napa	Landscape	NR	42
Napa	Rights-of-way	NR	117
Napa	Ditch, Bank	1	2
Napa	Grape, wine	32,387	43,840

Napa	Olive	17	13
Napa	Public Health	NR	849
Napa	Regulatory Pest cont	NR	18
Napa	Strawberry	8	9
Napa	Uncultivated ag	10	35
Napa	Walnut	12	17
Napa	Water Area	20	55
Napa	Peach	2	13
Nevada	Landscape	NR	1,418
Nevada	Structural Pest cont	NR	38
Nevada	Christmas trees	4	2
Nevada	Timberland	1,683	1,504
Nevada	Grape, wine	307	174
Nevada	Outdr plants	15	2
Nevada	Outdr transplants	28	2
Nevada	Pastureland	111	70
Nevada	Regulatory pest cont	NR	1
Nevada	Rights-of-way	NR	3,659
Placer	Landscape	NR	4,598
Placer	Outdr plants	40	89
Placer	Regulatory Pest cont	NR	3
Placer	Rights-of-way	NR	10,679
Placer	Rice	30	23
Placer	Apple	<1	1
Placer	Blackberry	5	3
Placer	Christmas tree	2	3
Placer	Citrus	15	13

Placer	Timberland	916	1,323
Placer	Grape	5	4
Placer	Grape, wine	98	73
Placer	Nectarine	1	1
Placer	Pastureland	70	1
Placer	Peach	40	14
Placer	Pear	3	3
Placer	Plum	86	1,007
Placer	Prune	397	109
Placer	Raspberry	2	2
Placer	Strawberry	19	19
Placer	Uncultivated ag	3437	306
Placer	Uncultivated non-ag	2	2
Placer	Vegetable	5	3
Placer	Walnut	1,711	770
Sacramento			None
San Francisco	Landscape	NR	5,570
San Francisco	Structural Pest cont	NR	1
San Francisco	Rights-of-way	NR	676
San Mateo	Landscape	NR	3,599
San Mateo	Rights-of-way	NR	5,273
San Mateo	Structural Pest Cont.	NR	114
San Mateo	Bean	83	128
San Mateo	Brussels Sprout	3	6
San Mateo	Christmas Tree	74	51
San Mateo	Grape, wine	23	17
San Mateo	Leek	2	4

San Mateo	Outdr Plants	10	45
San Mateo	Pastureland	76	152
San Mateo	Peas	3	6
San Mateo	Regulatory Pest Cont	NR	2
San Mateo	Uncultivated non-ag	2	1
Shasta	Landscape	NR	1,251
Shasta	Rights-of-way	NR	6,552
Shasta	Alfalfa	18	36
Shasta	Apple	13	15,005
Shasta	Christmas tree	2	5
Shasta	Hay	50	50
Shasta	Timberland	3,628	4,446
Shasta	Garlic	100	100
Shasta	Grape	<1	1
Shasta	Mint	171	122
Shasta	Outdr plants	5	21
Shasta	Olive	10	4
Shasta	Peach	4	1
Shasta	Pistachio	6	3
Shasta	Prune	313	140
Shasta	Public Health	NR	219
Shasta	Rangeland	20	17
Shasta	Shallot	3	11
Shasta	Uncultivated ag	1,259	1,299
Shasta	Walnut	1,897	999
Solano	Corn (Forage)	89	1
Sonoma	Landscape	NR	6,154

Sonoma	Uncultivated non-ag	NR	116
Sonoma	Apple	148	147
Sonoma	Blueberry	9	13
Sonoma	Chestnut	3	2
Sonoma	Christmas Tree	3	8
Sonoma	Corn (forage)	248	341
Sonoma	Timberland	8	8
Sonoma	Grape, wine	53,510	55,406
Sonoma	Outdr Plants	468	556
Sonoma	Outdr transplants	1,700	4
Sonoma	Oat	3,046	2,554
Sonoma	Olive	27	51
Sonoma	Pastureland	10	40
Sonoma	Peach	>1	1
Sonoma	Pear	1	1
Sonoma	Public Health	NR	1
Sonoma	Pumpkin	22	24
Sonoma	Rangeland	820	396
Sonoma	Rights-of-way	NR	8,968
Sonoma	Strawberry	30	13
Sonoma	Structural Pest cont	NR	510
Sonoma	Walnut	15	1
Sonoma	Water Area	6	50
Sonoma	Uncultivated ag	239	2
Yolo	Bean	188	144
Yolo	Corn (forage)	4,625	3,283
Yolo	Landscape	NR	78

Yolo	Orange	73	31
Yolo	Prune	19,920	1,470
Yolo	Rights-of-way	NR	24,229
Yolo	Structural Pest cont	NR	17
Yolo	Sunflower	1,093	929
Yolo	Tomato (processing)	8,552	7,149
Yolo	Tomato	402	242
Yolo	Walnut	7,622	536
Yolo	Grape, wine	10,043	5,084
Yolo	Uncultivated ag	48,707	37,216
Yolo	Apple	158	62
Yolo	Alfalfa	333	239
Yolo	Almond	5,999	4,439
Yolo	Asparagus	18	40
Yolo	Bean	45	29
Yolo	Cherry	21	44
Yolo	Chestnut	19	19
Yolo	Citrus	9	5
Yolo	Corn (sweet)	114	91
Yolo	Cotton	1,113	988
Yolo	Cucumber	13	32
Yolo	Garlic	93	122
Yolo	Grape	73	75
Yolo	Melon	11	13
Yolo	Outdr Plants	617	181
Yolo	Outdr transplants	3	4
Yolo	Oat	513	449

Yolo	Olive	20	10
Yolo	Pastureland	118	151
Yolo	Pear	585	328
Yolo	Peach	<1	1
Yolo	Pepper	328	232
Yolo	Pistachio	3	2
Yolo	Rangeland	4	11
Yolo	Regulatory Pest cont	NR	1,054
Yolo	Rice	623	582
Yolo	Rice, wild	140	53
Yolo	Safflower	2,263	1,760
Yolo	Sorghum (milo)	510	382
Yolo	Soybean	38	39
Yolo	Soybean oil	38	57
Yolo	Squash	25	54
Yolo	Strawberry	10	49
Yolo	Uncultivated non-ag	34	64
Yolo	Walnut	7,484	4,417
Yolo	Watermelon	52	106
Yolo	Wheat	196	193
Yuba	Structural Pest cont	NR	1
Yuba	Alfalfa	15	16
Yuba	Almond	1,200	1,314
Yuba	Apple	11	12
Yuba	Cherry	97	63
Yuba	Corn (forage)	20	25
Yuba	Timberland	1,063	1,290

Yuba	Grape	1	2
Yuba	Grape, wine	140	164
Yuba	Kiei	49	31
Yuba	Landscape	NR	567
Yuba	Nectarine	4	24
Yuba	Pastureland	102	70
Yuba	Peach	2,496	2,916
Yuba	Pear	503	330
Yuba	Pecan	30	48
Yuba	Pistachio	2	2
Yuba	Plum	17	22
Yuba	Prune	6,060	4,751
Yuba	Regulatory Pest cont	NR	2
Yuba	Rice	416	446
Yuba	Rights-of-way	NR	4,985
Yuba	Walnut	1,116	990

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 glyphosate could be used are Humboldt, Trinity, Mendocino, Lake, Sonoma, and Marin.

Table 22: California counties supporting the California coastal chinook salmon ESU.

County	Site	Acres Treated	Lbs a.i. Applied
Glenn	Almond	47,244	42,057
Glenn	Rights-of-way	NR	243
Glenn	Walnut	17,740	13,913
Glenn	Alfalfa	365	305
Glenn	Apricot	10	8
Glenn	Barley	233	205
Glenn	Bean	189	178
Glenn	Cherry	1	2
Glenn	Citrus	30	26
Glenn	Corn (forage)	5,840	11,020
Glenn	Cotton	1,122	1,837
Glenn	Grape	839	334
Glenn	Grape, wine	1,471	761
Glenn	Kiwi	9	29
Glenn	Landscape	NR	519
Glenn	Outdr transplants	158	8
Glenn	Olive	6,568	5,749
Glenn	Orange	272	379
Glenn	Pastureland	107	26
Glenn	Pear	20	28
Glenn	Pecan	126	122
Glenn	Pistachio	1,691	2,125
Glenn	Prune	14,387	11,580
Glenn	Rangeland	90	78
Glenn	Rice	510	563
Glenn	Safflower	57	43

Glenn	Sorghum (milo)	60	120
Glenn	Strawberry	3	3
Glenn	Structural pest cont	NR	62
Glenn	Sudan grass	55	73
Glenn	Sunflower	1,504	1,155
Glenn	Uncultivated ag	3,105	2,2663
Glenn	Uncultivated non-ag	105	205
Glenn	Tomato (processing)	558	491
Humbolt	Rights-of-way	NR	829
Humbolt	Apple	3	1
Humbolt	Timberland	3,679	2,482
Humbolt	Grape	5	5
Humbolt	Landscape	NR	74
Humbolt	Outdr Plants	108	1129
Humbolt	Outdr transplants	32	62
Humbolt	Structural pest cont	NR	1
Lake	Grape, wine	6,555	7,509
Lake	Landscape	NR	2,613
Lake	Rights-of-way	NR	1,365
Lake	Apple	110	89
Lake	Christmas tree	7	11
Lake	Grape	857	418
Lake	Lumber, treated	45	105
Lake	Pastureland	10	44
Lake	Pear	3,108	3,176
Lake	Rangeland	2	1
Lake	Rice, wild	760	21

Lake	Soil fumigation	29	61
Lake	Strawberry	28	80
Lake	Uncultivated ag	38	54
Lake	Unknown	9	8
Lake	Walnut	369	339
Marin	Rights-of-way	NR	775
Marin	Hay, forage	20	58
Marin	Grape	10	10
Marin	Grape, wine	87	88
Marin	Outdr Plants	NR	7
Marin	Pastureland	27	6
Marin	Structural Pest cont	NR	16
Marin	Uncultivated ag	123	376
Marin	Industrial site	10	28
Marin	Landscape	NR	2,903
Mendocino	Grape, wine	15,724	14,023
Mendocino	Structural Pest cont	NR	214
Mendocino	Animal Premise	3	6
Mendocino	Apple	80	174
Mendocino	Timberland	67	50
Mendocino	Landscape	13,752	136
Mendocino	Olive	3	5
Mendocino	Pastureland	1	1
Mendocino	Peach	8	12
Mendocino	Pear	2,403	1,859
Mendocino	Rangeland	20	6
Mendocino	Rights-of-way	NR	345

Mendocino	Strawberry	4	4
Mendocino	Uncultivated ag	11	12
Mendocino	Uncultivated non-ag	22	57
Mendocino	Vertebrate cont	NR	36
Mendocino	Water Area	16	53
Sonoma	Landscape	NR	6,154
Sonoma	Uncultivated non-ag	NR	116
Sonoma	Apple	148	147
Sonoma	Blueberry	9	13
Sonoma	Chestnut	3	2
Sonoma	Christmas Tree	3	8
Sonoma	Corn (forage)	248	341
Sonoma	Timberland	8	8
Sonoma	Grape, wine	53,510	55,406
Sonoma	Outdr Plants	468	556
Sonoma	Outdr transplants	1,700	4
Sonoma	Oat	3,046	2,554
Sonoma	Olive	27	51
Sonoma	Pastureland	10	40
Sonoma	Peach	>1	1
Sonoma	Pear	1	1
Sonoma	Public Health	NR	1
Sonoma	Pumpkin	22	24
Sonoma	Rangeland	820	396
Sonoma	Rights-of-way	NR	8,968
Sonoma	Strawberry	30	13
Sonoma	Structural Pest cont	NR	510

Sonoma	Walnut	15	1
Sonoma	Water Area	6	50
Sonoma	Uncultivated ag	239	2
Trinity	Timberland	2,798	4,152
Trinity	Grape	19	29
Trinity	Grape, wine	9	11
Trinity	Regulatory pest cont	NR	14
Trinity	Rights-of-way	NR	11
Trinity	Structural pest cont	NR	1

C. Coho Salmon

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

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

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

1. <u>Central California Coast Coho Salmon ESU</u>

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 23: California counties supporting the Central California coast Coho salmon ESU.

County	Site	Acres Treated	Lbs a.i. Applied
Marin	Rights-of-way	NR	775
Marin	Hay, forage	20	58
Marin	Grape	10	10
Marin	Grape, wine	87	88
Marin	Outdr Plants	NR	7
Marin	Pastureland	27	6
Marin	Structural Pest cont	NR	16
Marin	Uncultivated ag	123	376
Marin	Industrial site	10	28
San Mateo	Landscape	NR	3,599
San Mateo	Rights-of-way	NR	5,273
San Mateo	Structural Pest Cont.	NR	114
San Mateo	Bean	83	128
San Mateo	Brussels Sprout	3	6
San Mateo	Christmas Tree	74	51

San Mateo	Grape, wine	23	17
San Mateo	Leek	2	4
San Mateo	Outdr Plants	10	45
San Mateo	Pastureland	76	152
San Mateo	Peas	3	6
San Mateo	Regulatory Pest Cont	NR	2
San Mateo	Uncultivated ag	216	720
San Mateo	Uncultivated non-ag	2	1
Santa Cruz	Landscape	NR	1,356
Santa Cruz	Structural Pest cont	NR	507
Santa Cruz	Uncultivated ag	202	360
Santa Cruz	Rights-of-way	NR	3,277
Santa Cruz	Apple	1,629	1,110
Santa Cruz	Avocado	35	31
Santa Cruz	Bean	6	6
Santa Cruz	Blackberry	22	20
Santa Cruz	Blueberry	4	2
Santa Cruz	Cauliflower	15	32
Santa Cruz	Timberland	16	26
Santa Cruz	Grape, wine	102	137
Santa Cruz	Lettuce, head	130	256
Santa Cruz	Lettuce, leaf	90	180
Santa Cruz	Mint	1	1
Santa Cruz	Outdr Plants	211	175
Santa Cruz	Outdr transplants	107	299
Santa Cruz	Olive	6	10
Santa Cruz	Pastureland	2	4

Santa Cruz	Persimmon	6	5
Santa Cruz	Public Health	NR	40
Santa Cruz	Strawberry	12	40
Sonoma	Landscape	NR	6,154
Sonoma	Uncultivated non-ag	NR	116
Sonoma	Apple	148	147
Sonoma	Blueberry	9	13
Sonoma	Chestnut	3	2
Sonoma	Christmas Tree	3	8
Sonoma	Corn (forage)	248	341
Sonoma	Timberland	8	8
Sonoma	Grape, wine	53,510	55,406
Sonoma	Outdr Plants	468	556
Sonoma	Outdr transplants	1,700	4
Sonoma	Oat	3,046	2,554
Sonoma	Olive	27	51
Sonoma	Pastureland	10	40
Sonoma	Peach	>1	1
Sonoma	Pear	1	1
Sonoma	Public Health	NR	1
Sonoma	Pumpkin	22	24
Sonoma	Rangeland	820	396
Sonoma	Rights-of-way	NR	8,968
Sonoma	Strawberry	30	13
Sonoma	Structural Pest cont	NR	510
Sonoma	Walnut	15	1
Sonoma	Water Area	6	50

Sonoma	Uncultivated ag	239	2

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, 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 glyphosate can be used. Klamath county is excluded because it lies beyond an impassable barrier.

Tables 24 shows the usage of glyphosate in the California counties supporting the Southern Oregon/Northern California coastal coho salmon ESU. Table 25 shows the cropping information for Oregon counties where the Southern Oregon/Northern California coastal coho salmon ESU occurs..

Table 24:California Counties where the Southern Oregon/Northern California Coastal Coho Salmon ESU Occurs

County	Site	Acres Treated	Lbs a.i. Applied
Del Norte	Timberland	8	2

Del Norte	Landscape	NR	147
Del Norte	Outdr plants	NR	1,056
Del Norte	Outdr transplants	608	930
Del Norte	Rights-of-way	NR	126
Humbolt	Rights-of-way	NR	829
Humbolt	Apple	3	1
Humbolt	Timberland	3,679	2,482
Humbolt	Grape	5	5
Humbolt	Landscape	NR	74
Humbolt	Outdr Plants	108	1129
Humbolt	Outdr transplants	32	62
Humbolt	Structural pest cont	NR	1
Lake	Grape, wine	6,555	7,509
Lake	Landscape	NR	2,613
Lake	Rights-of-way	NR	1,365
Lake	Apple	110	89
Lake	Christmas tree	7	11
Lake	Grape	857	418
Lake	Lumber, treated	45	105
Lake	Pastureland	10	44
Lake	Pear	3,108	3,176
Lake	Rangeland	2	1
Lake	Rice, wild	760	21
Lake	Soil fumigation	29	61
Lake	Strawberry	28	80
Lake	Uncultivated ag	38	54
Lake	Unknown	9	8

Lake	Walnut	369	339
Mendocino	Grape, wine	15,724	14,023
Mendocino	Structural Pest cont	NR	214
Mendocino	Animal Premise	3	6
Mendocino	Apple	80	174
Mendocino	Timberland	67	50
Mendocino	Landscape	13,752	136
Mendocino	Olive	3	5
Mendocino	Pastureland	1	1
Mendocino	Peach	8	12
Mendocino	Pear	2,403	1,859
Mendocino	Rangeland	20	6
Mendocino	Rights-of-way	NR	345
Mendocino	Strawberry	4	4
Mendocino	Uncultivated ag	11	12
Mendocino	Uncultivated non-ag	22	57
Mendocino	Vertebrate cont	NR	36
Mendocino	Water Area	16	53
Trinity	Timberland	2,798	4,152
Trinity	Grape	19	29
Trinity	Grape, wine	9	11
Trinity	Regulatory pest cont	NR	14
Trinity	Rights-of-way	NR	11
Trinity	Structural pest cont	NR	1

Table 25: Oregon counties where there is habitat for the Southern Oregon/Northern California coastal coho salmon ESU.

State	County	Site	Acres Treated	lbs a.i. Applied
OR	Curry	Timberland	616,694	4,933,552
OR	Curry	Plums and Prunes	76	
OR	Curry	Hay	1,637	13,096
OR	Curry	Lettuce	1	8
OR	Curry	Blueberry	108	864
OR	Curry	Cranberries	581	4,648
OR	Curry	Strawberries	1	8
OR	Curry	Apples	27	216
OR	Douglas	Timberland	1,002,200	8,017,600
OR	Douglas	Wheat	123	984
OR	Douglas	Oat	64	512
OR	Douglas	Field Seed	2,361	18,888
OR	Douglas	Alfalfa	1,984	15,872
OR	Douglas	Hay	27,300	218,408
OR	Douglas	Vegetables	4	32
OR	Douglas	Squash	17	136
OR	Douglas	Sweet corn	175	1,400
OR	Douglas	Tomato	41	328
OR	Douglas	Watermelon	52	416
OR	Douglas	Blackberries	14	112
OR	Douglas	Raspberries	14	112
OR	Douglas	Apples	148	1,184
OR	Douglas	Cherries	64	512
OR	Douglas	Pears	105	840
OR	Jackson	Timberland	448,524	3,588,192

OR	Jackson	Barley	548	4,384
OR	Jackson	Oat	9	72
OR	Jackson	Field Seed	315	2,520
OR	Jackson	Alfalfa	21,078	171,840
OR	Jackson	Hay	12,480	99,840
OR	Jackson	Vegetables	607	4,856
OR	Jackson	Herbs	1	8
OR	Jackson	Pumpkins	20	160
OR	Jackson	Corn (sweet)	283	2,264
OR	Jackson	Watermelon	5	40
OR	Jackson	Blackberries	7	56
OR	Jackson	Blueberries	11	88
OR	Jackson	Boysenberries	1	8
OR	Jackson	Raspberries	5	40
OR	Jackson	Strawberries	18	144
OR	Jackson	Apples	360	2,880
OR	Jackson	Cherry	27	216
OR	Jackson	Grapes	400	3,200
OR	Jackson	Peach	198	1,584
OR	Jackson	Nectarines	14	112
OR	Josephine	Timberland	401,084	3,208,672
OR	Josephine	Wheat	18	
OR	Josephine	Oat	78	
OR	Josephine	Potato	7	
OR	Josephine	Alfalfa	7,237	
OR	Josephine	Hay	14,356	
OR	Josephine	Vegetable	133	

OR	Josephine	Herbs	89	
OR	Josephine	Lettuce	1	
OR	Josephine	Corn (sweet)	37	
OR	Josephine	Blackberries	7	
OR	Josephine	Raspberries	2	
OR	Josephine	Apple	17	
OR	Josephine	Cherries	355	

4. Specific Conclusions for California Steelhead and Salmon ESUs

Glyphosate is a chemical that the Agency has previously determined to pose a minimal risk to aquatic organisms, including endangered species. Although this chemical is widely used on a number of sites it is practically non-toxic and short lived in the environment. Application rates of 5 lb ai/A and lower result in no effect to the subject listed species either directly or through effects on their food or cover. However, rates of 8 lb ai/A appear to result in concentrations exceeding our level of concern for acute toxicity to listed fresh water fish species. Given the high likelihood that the calculated EECs overestimate the levels in the environment, and given that the environment for the subject listed species is rapidly moving water as opposed to a farm pond, even at application rates above 8 lb ai/A the risk of effects is negligible and discountable. Thus, We have determined that for all uses with application rates of 5 lb ai/A or less, use results in no effect to these 11 ESU of listed salmonids. For application rates above 5 lb ai/A, we conclude the pesticide may affect but is not likely to adversely affect the 11 subject ESUs.

Table 26: Summary of Findings for 11 California and Pacific Northwest Salmon and Steelhead ESUs

Species	ESU	Finding
Steelhead	Southern California	May Affect, but Not likely to Adversely Affect
Steelhead	South-Central California Coast	May Affect, but Not likely to Adversely Affect
Steelhead	Central California Coast	May Affect, but Not likely to Adversely Affect

Steelhead	Central Valley California	May Affect, but Not likely to Adversely Affect
Steelhead	Northern California	May Affect, but Not likely to Adversely Affect
Steelhead	Upper Columbia River	May Affect, but Not likely to Adversely Affect
Chinook Salmon	Sacramento River winter run	May Affect, but Not likely to Adversely Affect
Chinook Salmon	Central Valley spring run	May Affect, but Not likely to Adversely Affect
Chinook Salmon	California Coastal	May Affect, but Not likely to Adversely Affect
Coho Salmon	Central California Coast	May Affect, but Not likely to Adversely Affect
Coho Salmon	Southern Oregon/Northern California	May Affect, but Not likely to Adversely Affect

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Attachment 1
Reregistration Eligibility Decision for Glyphosate

Attachment 2
Sample Labels
Glyphosate

Attachment 3
USGS Usage Map for Glyphosate