United States Department of the Interior

FISH AND WILDLIFE SERVICE

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February 9, 1995

Memorandum
Reference Number: 1-7-95-F-26

To: Area Manager, Bureau of Reclamation
Klamath Basin Area, Klamath Falls, Oregon

From: State Supervisor, U.S. Fish and Wildlife Service
Oregon State Office, Portland, Oregon

Subject: Final Biological Opinion on the Use of Pesticides and Fertilizers on Federal Lease Lands and Acrolein and Herbicide Use on the Klamath Project Rights-of-way located on the Klamath Project (reinitiation of consultation on the use of acrolein for Aquatic Weed Control in Bureau Canals and Drains)

This memorandum transmits the subject final biological opinion. Transmittal will occur by facsimile (without the appendices), with a hard copy of the entire document being sent via Federal Express.

The Service looks forward to working with the Bureau on planning the monitoring and sampling activities outlined in the Terms and Conditions of the Reasonable and Prudent Measures.

Please contact Russ Peterson, Carol Schuler, or Gary Miller of the Oregon State Office at (503) 231-6179 if you have any questions.

Attachment

cc: ARD/DARD California and Klamath Ecoregion, Portland, Oregon
Ecological Services, Division of Consultation and Conservation Planning (L. Salata), Region 1, Portland, Oregon
Ecological Services, Division of Environmental Contaminants, Region 1, Portland, Oregon
ARD Refuges and Wildlife, Region 1, Portland, Oregon
Sacramento Field Office, Sacramento, California

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To: Area Manager, Klamath Basin Area Office, Bureau of Reclamation, Klamath Falls, Oregon

From: Regional Director, Fish and Wildlife Service, Region 1, Portland, Oregon

Subject: Biological Opinion on the Use of Pesticides and Fertilizers on Federal Lease Lands and Acrolein and Herbicide Use on the Klamath Project Rights-of-way located on the Klamath Project (reinitiation of consultation on the use of acrolein for Aquatic Weed Control in Bureau Canals and Drains)

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has reviewed the Biological Assessment for the use of Pesticides and Fertilizers on Federal Lease Lands and Acrolein and Herbicide Use on the Klamath Project Rights-of-way (hereafter, "Biological Assessment"). The Bureau of Reclamation, Klamath Project's (Bureau), October 6, 1994, request for formal consultation was received on October 7, 1994. On November 4, 1994, the Service requested additional information regarding the potential impacts of the proposed action on listed species. On December 14, 1994, the Service received the Bureau's supplement to the Biological Assessment. On January 9, 1995, the Service received the Bureau's January 5, 1995, clarification of its consultation request indicating that the Service should treat the request as a reinitiation of the June 14, 1989, Jeopardy Biological Opinion (reference number 1-1-89-F-43) on the use of acrolein for aquatic weed control in Bureau canals and drains (hereafter, "acrolein opinion"). This memorandum further clarified that this consultation should not be considered a reinitiation of the Bureau's July 22, 1992, Formal Consultation on the Effects of the Long-term Operation of the Klamath Project on the Lost River Sucker (*Deltistes luxatus*), Shortnose Sucker (*Chasmistes brevirostris*), Bald Eagle (*Haliaeetus leucocephalus*), and American Peregrine Falcon (*Falco peregrinus anatum*) (LTBO; reference number 1-1-92-F-34).

This document represents the Service's biological opinion on the effects of the Bureau's proposed action on the Lost River sucker, shortnose sucker, the Bald Eagle , American Peregrine Falcon, and Applegate's milkvetch (*Astragalus applegatei*), in accordance with section 7 of the Endangered Species Act of 1973, as amended, (16 U.S.C. 1531 et seq.)(Act). This consultation has been conducted under the terms of an August 19, 1994, settlement agreement number 94-6339-TC between the Oregon Natural Resources Council (ONRC) and Northwest Coalition for

Alternatives to Pesticides (NCAP), as plaintiffs, and Secretary of the Interior Bruce Babbitt, and several Department of Interior agencies as Defendants. The original settlement agreement stipulated that the biological opinion would be completed no later than December 31, 1994, however this date was extended in a negotiated agreement to January 31, 1995, because the Service did not receive the Bureau's supplement to their Biological Assessment until December 14, 1994. Under the provisions of the Act, the Service is normally allowed 145 days to complete consultation, but because of time constraints associated with the Department's leasing program, it was necessary to complete an opinion by January 31, 1995, allowing only 45 days to complete the opinion.

This opinion does not represent a formal conference report on the proposed critical habitat for Lost River and shortnose suckers. The proposed critical habitat rule was not published in the Federal Register until December 1, 1994, which was after the Biological Assessment had been prepared and received by the Service. The Bureau must review their proposed action in light of the proposed rule and determine if the action is likely to adversely modify or destroy critical habitat. If so, then the Bureau must request a formal conference report.

This biological opinion is based on information provided in the October 6, 1994, Biological Assessment, as well as the following: 1) previous biological opinions provided by the Oregon State Office to the Bureau; 2) the Lost River and Shortnose Sucker Recovery Plan of March 1993; 3) the Service's proposed rule to designate critical habitat for the Lost River and shortnose sucker, plus its supporting documents; 4) file information from the Oregon State Office, the Regional Office, and the Sacramento Field Office; 5) published and unpublished reports, papers, or other documents as listed in the literature cited section; 6) supplemental information provided by the Bureau in response to Service's November 4, 1994, request for additional information; 7) information gathered during site visits and meetings in the Klamath Basin by Service staff; 8) information gathered during informal consultation between the Bureau and the Service since the Bureau's December 20, 1993, request for informal consultation; 9) information gathered during telephone conversations between Bureau and Service staff, 10) the "Final Biological Opinion (EHC/BFA/9-89-1) in Response to U.S. Environmental Protection Agency's September 30, 1988, Request for Consultation on Their Pesticide Labeling Program" (hereafter, "1989 EPA opinion"); and, 11) Information provided by the Bureau is response to their receipt of a draft of this opinion on February 3, 1995. A complete administrative record of this consultation is on file in the Oregon State Office.

The Service concurs with the Bureau's determination that the proposed action is not likely to affect the American Peregrine Falcon, thus this species is not discussed further in this biological opinion. The Service also concurs with the Bureau's determination of that the proposed action is not likely to adversely affect Applegate's milkvetch and the Bald Eagle. The bases for these concurrences are discussed in the "Effects of Action" section.

BIOLOGICAL OPINION

It is the Service's biological opinion that the use of Pesticides and Fertilizer on Federal Lease Lands and Acrolein and Herbicide Use on the Klamath Project

Rights-of-way located on the Klamath Project as described under the Description of the Proposed Action, below, is not likely to jeopardize the continued existence of the Lost River sucker and the shortnose sucker. Critical Habitat has been proposed for these species, and will be addressed, if necessary, in a separate conference report.

DESCRIPTION OF PROPOSED ACTION

The Bureau's Biological Assessment generally describes three types of agrochemical usages that are being addressed in this consultation. The first is the use of pesticides and fertilizers on the Lease lands of Tule Lake National Wildlife Refuge (NWR) and Lower Klamath NWR. The second general category of agrochemical use is the applications of herbicides occurring within Project rights-of-way, and where pesticides are used for mosquito control. The third type of usage is within canals and drains where the herbicide acrolein is used to remove dense beds of aquatic macrophytes. Although the Bureau's Biological Assessment describes all of these programs and types of uses as a single action for the purposes of consultation, the Service has chosen to treat each separately in terms of the analysis of potential effects to listed species. The biological opinion constitutes the Service's opinion of the overall action, and treats all three types of chemical uses as a single action for the purposes of consultation.

Lease Lands Chemical Use

As originally described in the Bureau's Biological Assessment, the action being consulted on includes the application of pesticides and fertilizers on Federal Lease Lands within the Tule Lake and Lower Klamath refuges. The Bureau administers 223 lease contracts on 22,095 acres within these refuges for agricultural uses. The application of pesticides, which occurs on most crops grown on Lease lands, is made for the purpose of controlling pests that affect production of these crops.

The National Wildlife Refuge Administration Act of 1966 requires that uses which are permitted to occur on refuges must be compatible with the primary purposes for which the refuge was established. Lower Klamath NWR was established, "... as a preserve and breeding ground for native birds." (Executive Order 924, dated August 8, 1908), while Tule Lake NWR was established "... as a refuge and breeding ground for wild birds and mammals." (Executive Order 5945, dated November 3, 1932). In 1964, the Kuchel Act (43 U.S.C. 601-612, as amended) stabilized the ownership of lands within the Klamath Federal Reclamation Project, California-Oregon, which was originally authorized on February 9, 1909. The Act states:

> "... the policy of Congress (is) to stabilize the ownership of the land in the Klamath Federal reclamation project, Oregon and California, as well as the administration and management of the Klamath Federal reclamation project and the Tule Lake National Wildlife Refuge, Lower Klamath National Wildlife Refuge, Upper Klamath National Wildlife Refuge, and Clear Lake National Wildlife Refuge, to preserve intact the necessary existing habitat for migratory waterfowl in this vital area of the Pacific Flyway, and to

prevent depredations of migratory waterfowl on agricultural crops in the Pacific Coast States.

...Such lands shall be administered by the Secretary of Interior for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith. ...The leases shall provide for the growing of grain, forage, and soil-building crops, except not more than 25 per centum of the total leased lands may be planted to row crops. All other reserved public lands included in section 2 of this Act shall continued to be managed by the Secretary for waterfowl purposes, including the growing of agricultural crops by direct planting and sharecrop agreements with local cooperators as necessary."

A contract is being awarded to the National Center for Appropriate Technology to initiate phased development of an integrated pest management (IPM) plan and National Environmental Policy Act document for agricultural and non-agricultural pest management activities on Tule Lake and Lower Klamath refuges. The plan is scheduled for completion by January 1, 1997, with phased implementation beginning in 1997.

Implementation of this plan will allow the Service and the Bureau to satisfy Departmental and Bureau pest management and pesticide policies. These policies indicate that pesticides will be used only after full consideration of alternatives - based on competent analysis of environmental effects, safety, specificity, effectiveness, and costs. The full range of alternatives including chemical, biological, and physical methods, and no action will be considered. When it is determined that a pesticide must be used to meet important management goals, the least hazardous material that will meet such goals will be used.

Pesticides that lessees wish to use on crops grown on the Lease lands must first go through a Department of Interior mandated Pesticide Use Proposal (PUP) process. As an outcome of the PUP process, pesticides are either recommended for approval, or are disallowed. Because of the time constraints imposed by the settlement agreement, even with the negotiated extension, the Service has reduced the number of chemicals being considered in this consultation to those that are recommended for approval under the PUP process because these are the chemicals most likely to be used. However, it is possible that some chemicals that were denied may be petitioned for later approval or emergency use. The settlement agreement clearly indicates how such petitions are to be handled (see items 5 and 6 of the settlement agreement).

The Service has limited the temporal scope of this consultation to the 1995 agricultural year because the PUP review is required each year, and the allowance or denial of a given usage in a given year does not necessarily mean that the same will occur in subsequent years. This consultation could be effective for multiple years provided that the effects of pesticides recommended for approval in the PUP process in subsequent years are not significantly different from those in the 1995 agricultural year, and no other significant changes in the action were to occur.

During the PUP process, specific chemicals proposed for application by specific methods are reviewed for their relative toxicities. Because of the complexity of

the chemicals proposed for use on all possible leases and all possible crops, the Service hereby incorporates by reference the descriptions presented in the PUP's as a portion of the description of action section of this biological opinion. The list of pesticides recommended for approval, including some revisions of previously allowed buffer areas and other changes, are detailed in the Service's January 13, 1995, memorandum from Regional Director Michael Spear to Director Mollie Beattie. This memorandum, while not as detailed as the complete PUP's, provides an accurate reflection of the most likely usages of given chemicals, and is incorporated by reference (see Appendix A).

The Bureau and Service developed buffer zones during the PUP process within which no pesticides could be applied. The buffer zone conditions for the 1995 PUP's for the Lease lands are listed below:

1) Increase buffer zones from 135 feet (1994) to 150 feet (1995) around sumps regardless of application method (ground, aerial, chemigation). For wicking/wiping application, no buffer zone needed.

2) For aerial application on lands away from the sumps, the buffer zone is 100 feet where water is present.

3) For ground application on lands away from sumps, the buffer zone is 25 feet where water is present.

4) Chemigation in general will have a buffer zone of 50 feet from canals and drains where water is present.

5) For specific pesticides (trade name Sencor, Lexone, and 2,4-D/Banvel) which were found in the sump (Boyer and Grue 1994), increase buffer zone to 150 feet (1995) for aerial applications around canals, drains, and sumps. For ground application, the buffer zone is 25 feet from canals and drains; no buffer zone is needed for wicking/wiping application.

Nonchemical Pest Control

The Biological Assessment describes means by which pests can be controlled without the use of chemical pesticides. The Service, as explained in our November 4, 1994, memorandum, assumes that all non-chemical means of pest control that are described in the Biological Assessment as being contract requirements or as being mandatory are a part of the action. The known mandatory or contract-required practices are as follows: crop rotation in all lots of sump 2 and lots 5, 41, 43, 44, 45 and 48 of sump 3; equipment washing to remove soil-borne pests; alfalfa rotation; and the use of certified seed. Those non-chemical means of pest control that are not contract requirements and that are described as management practices are assumed not to occur, for the purposes of this consultation, and may be addressed in the Conservation Recommendations section of this biological opinion.

Rights-of-Way

The use of herbicides and insecticides on Project rights-of-way is assumed to proceed generally as described in the Biological Assessment, as amended by the

proposed PUP's provided to the Service by the Bureau for those chemicals. The Service assumes that no chemical shall be used without an approved PUP.

Acrolein Use in Irrigation Systems

The use of acrolein is as described in the acrolein opinion, of which this consultation is a reinitiation. Specifically, the use of acrolein is as described in the "Description of Action" section of the 1989 biological opinion, as amended by the reasonable and prudent alternatives to jeopardy, which read as follow:

> "1. Systematic pretreatment surveys by qualified biologists of the canal reaches targeted for application of [a]crolein by the irrigation districts. Seines, traps, nets, electroshockers, or fish anesthetics (e.g. MS-222) may be used in the survey effort. Rotenone may also be used if fish from the treated areas are immediately revived in freshwater, and if agents (e.g. potassium permanganate) are used to neutralize rotenone outside of the target application areas. All fishes collected during the pretreatment surveys shall be identified to species to determine if either of the endangered suckers are present.
>
> 2. If no endangered fishes are found in a canal reach during the pretreatment survey, that canal reach may be treated with [a]crolein in the typical manner. A follow-up survey shall immediately follow application of the herbicide to determine if any endangered fishes were killed.
>
> 3. If endangered fishes are found to be present in a canal reach during the pretreatment survey, all endangered suckers that can be collected shall be removed from the canal and transferred to a safe holding area. Reasonable procedures shall be employed to apply [a]crolein in a manner that will minimize mortality to the endangered fishes. Reasonable procedures shall include, but are not limited to: (a) treating half the target area so as to allow fish to disperse to untreated segments of the canal, or (b) applying trace quantities of the herbicide prior to full application in an attempt to drive fish out of the target area. After toxic effects have dissipated, endangered suckers shall be returned to their collection site or a nearby canal reach not targeted for treatment.
>
> 4. The Bureau shall encourage removal of aquatic plants by physical rather than chemical methods where feasible."

The adoption of these reasonable and prudent alternatives as the description of the action for the acrolein component of this consultation is done only to allow for a meaningful analysis of the action.

Pesticide Labels

In addition to the above described components of the action, this biological opinion assumes that all pesticide applications will occur in a manner consistent with the label restrictions provided by the U.S. Environmental Protection Agency (EPA) for each given pesticide.

It is possible that different parts of the action may have different requirements for the use of a given chemical or pesticide. For example, the PUP for a pesticide may require that a particular compound be used with a 150-foot buffer from all water bodies, whereas the label for the same chemical may not require a buffer to water bodies. In cases where such discrepancies exist, the Service has assumed that the most restrictive guidance for a given chemical will be the one followed. In the example just described, the Service would assume that the chemical is to be applied with the 150-foot buffer.

Compliance with Terms of the Proposed Action

In describing an action that is to undergo section 7 consultation, it is the responsibility of the action agency (here, the Bureau) to describe the action and all of its predictable effects using the best available scientific and commercial data. In this consultation, the Service has had to make a variety of assumptions, as outlined above, and in a November 4, 1994, memorandum, as to the exact action being consulted on. The Service has attempted to describe the action as closely as possible to how it is likely to occur. However, the need to make assumptions may result in inaccurate descriptions of the action or of its effects due to the Service's lack of familiarity with the action. The Bureau had the opportunity to review this opinion in draft form and correct or clarify any such errors. As a result of this review, the Bureau has adopted modifications to their proposed action as described below (see Modifications to Proposed Action).

Modifications to Proposed Action

After reviewing the draft Jeopardy Biological Opinion provided by the Service the Bureau notified the Service by memorandum that their proposed action would be modified. First, the Bureau adopted as a part of their action the two reasonable and prudent alternatives of the draft opinion, which are hereby incorporated by reference. These have additionally been modified to read as follow:

1. The Bureau shall not authorize or otherwise allow applications of carbaryl (Sevin XLR Plus), malathion (Malathion 8 Aquamul), chlorothalonil (Bravo 720), mancozeb (Dithane F-45), metalaxyl with chlorothalonil (Ridomil Bravo), or metalaxyl with mancozeb (Ridomil MZ 58) on the Federal Lease Lands within 300 feet of water's edge for aerial applications and 60 feet for ground applications at sites containing known populations of Lost River or shortnose suckers (refer to definition of "known populations of listed species"). For purposes of clarification, it is important to note that the proposed action (the 1995 PUP decisions) require that the Bureau not authorize or otherwise allow ground applications of these pesticides on the lease lands within 150 feet of Tule Lake.

2. Because the Service is unable to determine the extent of contamination to water bodies containing endangered suckers of the active ingredients 2,4-D,B, diuron, and petroleum distillate, the Bureau shall not authorize or otherwise allow applications of 2,4-D and 2,4-D,B (Weedone 638, Weedone LV4), bromacil and diuron (Krovar I, Krovar I DF), diuron (Karmex DF), and petroleum distillate (Mosquito Larvicide GB-1111). An exception is the use of Karmex DF for specific purposes. The Bureau has provided additional information on its use for public safety and fire hazard uses. It will only be used after other alternatives for weed control have been tried, and

after insuring that the product will not get into water. The pesticide will be applied with calibrated equipment on the following areas only: around pumping plants, on bridges, around control structures, and at intersections of canal roads. There will be a 10-foot buffer zone from water's edge for the use of Karmex DF.

Although these are slightly modified from the original reasonable and prudent alternatives (RPA's) of the draft opinion, the Service has determined that they are consistent with the draft opinion and their adoption by the Bureau will avoid jeopardy.

In addition to the adoption of the above RPA's, the Bureau identified another action that is already underway and had not been mentioned in the Biological Assessment. The Bureau monitors health of fish collected during sucker salvage operations, including periodic checks of gills of suckers and other fish species to better assess impacts of herbicides and fertilizers on these species.

Useful Definitions

In developing this opinion, the Service has found that there are a variety of terms or concepts that are open to interpretation, which could in turn result in wide ranging means of carrying out the proposed action. To prevent misinterpretations and to promote a clearer understanding, we here define several of the terms that may be subject to interpretation.

1) "*known populations of listed species*" - In the case of the listed suckers, this term refers to areas where sucker populations are known to exist as evidenced by status surveys or yearly sucker salvages. In response to Service recommendations that the Bureau consider areas within the Klamath Project's water delivery system where suckers have been collected during yearly salvage operations as areas supporting populations of suckers, the Bureau reviewed their salvage data. Through this review, the Bureau has determined that the Lost River, Tule Lake sumps 1A and 1B, and the English Channel area of Tule Lake are to be considered as areas currently supporting known sucker populations. The Bureau should add additional habitats to this list if new data indicate the need to do so.

2) "*water bodies*" - These would include any area holding water at a given moment in time. In particular, this includes sumps, rivers, canals, drains, laterals, ditches, and water fallow areas (used for quackgrass control), and may include other areas as well.

3) "*fish-bearing water bodies*" - Any area holding water that contains a fish of any species. The Service recommends that the Bureau consider areas within the Klamath Project's water delivery system where fish of any species have been collected during yearly salvage operations as areas supporting populations of suckers. At a minimum, this interpretation would, if adopted, include the Tule Lake sumps, the Lost River, the J Canal, the R Canal, and the Q Canal.

SPECIES ACCOUNTS/SPECIES STATUS

Bald Eagle

A detailed account of the general status and life history information of the bald eagle can be found in the Pacific States Bald Eagle Recovery Plan and is herein incorporated by reference (U.S. Fish and Wildlife Service 1986). Specific information on bald eagles in the Klamath Basin is described below.

The Klamath Basin supports one of the largest concentrations of nesting and wintering bald eagles in the lower 48 states. The Basin lies within Recovery Zone 22, which includes eagle territories in Klamath County, Oregon, and Modoc and Siskiyou Counties, California. The eagle populations consist of breeding adult pairs, nonbreeding immature and subadults, and migratory adults which breed in other areas. Important foraging area for these eagles include the Upper and Lower Klamath Lakes and Tule Lake (Keister et al. 1987).

Large numbers of nonbreeders and adults from throughout the Pacific Northwest migrate into the Basin during the late fall and winter months. Winter surveys show a population between 500 and 600 individuals, and the area may be used by over 1000 birds throughout the season (Ralph Opp, Oregon Department of Fish and Wildlife, pers. comm.). The wintering population generally arrives in the Basin in mid-October and reaches a peak density in January and February. Bald eagles begin to disperse in late March and into April, depending on weather and food conditions.

The wintering eagle population is linked to the seasonal waterfowl migration and other food resources available in the Klamath Basin. Wintering eagles feed on crippled waterfowl and waterfowl weakened or killed by fowl cholera and lead poisoning (Keister 1981). Birds comprise over 82 percent of the prey taken by eagles on Upper Klamath Lake from October through February, and only 20 percent of the avian prey are scavenged (Frenzel 1984). Similarly, flood irrigation of fields in the Klamath Basin during the late winter months and spring provide opportunities for bald eagles to feed upon displaced voles (*Microtus montanus*) (Opp 1980, Keister 1981).

Breeding bald eagles tend to be nonmigratory provided their are adequate food sources in the vicinity throughout the winter. Based on Oregon data, breeding bald eagles may occupy a nesting territory from January 1 through August 31, with initiation of nest selection and nest building in mid-February. Adult pairs begin egg laying between early March and mid-April. Clutch sizes range from one to three eggs, and eggs are incubated for 5 weeks before hatching. Eaglets remain on the nest for 10 to 12 weeks before their first flight. Fledged young may remain near a nest site for several weeks before leaving the area. A further description of the species' biology and nesting chronology may be found in Palmer (1988) and Isaacs et al. (1983).

In 1994, 84 of Oregon's 230 occupied bald eagle territories and 15 of California's 142 occupied territories were located in the Klamath Basin (Isaacs and Anthony 1994; Ron Jurek, California Department of Fish and Game, Sacramento, unpubl. data.). Over 30 nesting sites are located within 1/4 mile of Upper Klamath Lake. In Oregon, the number of occupied territories exceeded the Bald Eagle Recovery Plan population goal of 80 for the zone. The average 5 year

productivity (1990-1995) for the Klamath Basin in Oregon was 0.91 young per occupied territory, which is near the standard of 1.0 young per occupied site set by the Recovery Plan (Isaacs and Anthony 1994). Breeding pairs from 2-8 territories, as well as nonbreeding individuals, may forage at Lower Klamath and Tule Lake refuges during the spring and summer months.

At Upper Klamath Lake, fish comprised 62 to 69 percent of the diet from March through September among bald eagles observed by Frenzel (1984), and eagles foraging at Tule or Lower Klamath Lake probably exhibit similar feeding behavior. The most important prey species during the eagle nesting season included tui chub (*Gila bicolor*), blue chub (*G. coerulea*), and suckers (Frenzel 1984).

Applegate's Milkvetch

Astragalus applegatei is a narrow regional endemic restricted to seasonally moist meadows/bunch grass flats near Klamath Falls, Klamath County, Oregon. This plant was listed by the Service as endangered in 1993 (58 FR 40547). A detailed account of the taxonomy, ecology, and general life history attributes can be found in the final rule and is hereby incorporated by reference.

Astragalus applegatei is a metapopulation and today is known to exist in at least six polygons (islands of contiguous habitat) including Klamath Falls (three polygons at Maywood Drive, Onyx Street, Laverne Avenue) and Miller Island (three polygons). Each polygon varies in size and contains from one to 30,000 plants. The specific habitat found supporting these plants is a seasonally moist, lightly vegetated, alkaline grassland community dominated by *Poa nevadensis, Puccinellia lemmonii* and rabbit brush (*Chrysosthamnsu* spp.) and characterized by poorly drained, alkaline soils (Henley/Malin clay loams). Greasewood (*Sarcobatus vermiculatus*) also is intermittently scattered throughout the habitat. However, where the greasewood has become established, no *Astragalus applegatei* was observed (Testa 1994). This is likely due to the inability of *Astragalus applegatei* to colonize the drier community types generally associated with this shrub (58 FR 40547).

The major threat facing the population is urban development. The Maywood Drive polygon has been dissected by a twelve-foot wide ditch, a major avenue, and neighboring business developments that have destroyed some *Astragalus applegatei* plants and divided the population into separate polygons. Expansion of existing roads and future development into occupied habitat is being planned by the county.

According to Service file information, there are areas of suitable habitat near portions of the Bureau's A-3 Canal but plants have yet to be detected at this locale. However, *Astragalus applegatei* is difficult to detect during certain times of the year and so these areas of suitable habitat may actually constitute population sites.

Lost River and Shortnose Suckers

The Lost River sucker is native to Upper Klamath Lake (Williams et al. 1985), its tributaries, including the Williamson River, Sprague River, Wood River, Crooked Creek, Seven Mile Creek, Four Mile Creek and slough, Odessa Creek, Crystal Creek (Stine 1982), the Lost River system, Tule Lake, Lower Klamath Lake, and Sheepy

Lake (Moyle 1976). The present distribution of Lost River suckers includes Upper Klamath Lake and its tributaries (Buettner and Scoppettone 1990), Clear Lake Reservoir and its tributaries (Buettner, pers. comm. as cited in U.S. Fish and Wildlife Service 1993), Tule Lake and the Lost River up to Anderson-Rose Dam (Scoppettone, pers. comm. as cited in U.S. Fish and Wildlife Service 1993), Klamath River downstream to Copco Reservoir (Beak Consultants Incorporated 1987), and probably Iron Gate Reservoir (Maria, pers. comm. as cited in U.S. Fish and Wildlife Service 1993). In the Upper Klamath Lake watershed, spawning runs are primarily limited to Sprague and Williamson Rivers, but runs also occur in Wood River and Crooked Creek (Markle and Simon 1993). An additional run may occur in Sheepy Lake in the Lower Klamath Lake watershed (Johnson, pers. comm. as cited in U.S. Fish and Wildlife Service 1993).

Shortnose suckers historically occurred in Upper Klamath Lake and its tributaries (Miller and Smith 1981, Williams et al. 1985), although Moyle (1976) includes Lake of the Woods, Oregon, and probably the Lost River system (Scoppettone and Vinyard 1991). The current distribution of the shortnose sucker includes Upper Klamath Lake and its tributaries, Klamath River downstream to Iron Gate Reservoir, Clear Lake Reservoir and its tributaries, Gerber Reservoir and its tributaries, the Lost River, and Tule Lake. Gerber Reservoir represents the only habitat with a shortnose sucker population that does not also have a Lost River sucker population. Shortnose suckers have also been collected in the Klamath River from Link River Dam to Copco Reservoir (Bureau of Reclamation 1992).

Both species are primarily lake residents that spawn in rivers, streams, or springs associated with lake habitats. After hatching, larval suckers migrate out of spawning substrates, which are usually gravels or cobbles, and drift downstream into lake habitats. Shoreline river and lake habitats with vegetative structure are known to be important during larval and juvenile rearing (Klamath Tribe 1991, Markle and Simon 1993). The Lost River and shortnose sucker are omnivorous bottom feeders whose diets include detritus, zooplankton, algae, and aquatic insects (Buettner and Scoppettone 1990). Sexual maturity for Lost River suckers sampled in Upper Klamath Lake occurs between the ages of 6 to 14 years with most maturing at age nine (Buettner and Scoppettone 1990). Most shortnose suckers reach sexual maturity at age six or seven (Buettner and Scoppettone 1990). Both sucker species are extremely long lived, with Lost River suckers from Upper Klamath Lake documented to reach at least 43 years of age, and shortnose suckers from Copco Reservoir reaching a documented 33 years of age (Scoppettone 1988).

The historical range of the Lost River and shortnose suckers has been fragmented by construction of dams, instream diversion structures, irrigation canals, and the general development of the Bureau's Klamath Project and related agricultural processes. Because habitat fragmentation limits or prevents genetic interchange among populations, extinction could result as genetic diversity decreases and populations become more susceptible to environmental change. The combined effects of damming of rivers, instream flow diversions, draining of marshes, dredging of Upper Klamath Lake, and other water manipulations has threatened both species with extinction (53 FR 27130). Additionally, water quality degradation in the Upper Klamath Lake watershed has led to large-scale fish kills related to algal bloom cycles in the lake (Kann and Smith 1993). Introduced exotic fishes may reduce recruitment through competition with, or predation upon, suckers and sucker larvae (U.S. Fish and Wildlife Service 1993, Dunsmoor 1993). Conservation

of the Lost River and shortnose suckers will require the identification of actions to reduce threats of water quality-induced fish kills, provide the wide range of habitats needed by all size and age classes of the fishes, reduce the impacts of exotic fishes, improve migration corridors between habitats and populations, and establish refugial populations (U.S. Fish and Wildlife Service 1993).

In 1994, Upper Klamath Lake reached a record low surface elevation, and stayed below the 4137.0 foot elevation required in the LTBO for almost 6 weeks. As the lake elevation dropped to and below 4137.0 feet, water quality monitoring conducted by the Klamath Tribe and others indicated that water quality conditions were extremely poor. Observations of fish kills (including suckers) were made, as well as heavy feeding activity by large numbers of piscivorous birds. It is difficult to predict the exact effects of such conditions on the population of Lost River and shortnose suckers resident to Upper Klamath Lake, however the Service believes that large numbers of adult suckers may not have survived these conditions. Additionally, the Bureau's end of year salvage data and data collected by Oregon State University indicate that the 1994 year class of suckers in Upper Klamath Lake was almost completely extirpated. The loss of yet another year class from this population, and possibly of sub-populations within the lake, has increased the risk these species face of extinction due to natural stochastic events, or from other causes.

Tule Lake Sucker Populations

The Tule Lake populations of Lost River and shortnose suckers are those most likely to be impacted by the proposed action. Both the Lost River and shortnose sucker are considered native to Tule Lake (Moyle 1976, Scoppettone and Vinyard 1991). Little is known about the sucker populations inhabiting Tule Lake and the lower Lost River either before or after the construction of the Klamath Project, in part because the Tule Lake sump was not thought to provide suitable habitat until suckers were found in Tule Lake in recent years. Given the size of the historic Tule Lake and marsh complex, it likely provided suitable habitat for a very large population of both listed sucker species prior to alteration by the Bureau.

Recent surveys of Tule Lake began in 1992 after suckers were observed spawning at Anderson-Rose Dam, where many were subsequently stranded and killed when flows were diverted for irrigation purposes. In both 1993 and 1994, Lost River and shortnose suckers migrated from Tule Lake up the Lost River and spawned at the base of Anderson-Rose Dam. Suckers spawned during the first two weeks of May in 1993 and 1994, and although no estimate was made of the number of fish spawning, the Bureau reports that the number was likely less than 200 (Bureau of Reclamation 1994). In April, 1993, the Bureau radio-tagged five adult Lost River suckers and five adult shortnose suckers in Tule Lake. In 1993 and 1994, none of the radio-tagged suckers migrated upstream of Tule Lake.

Spawning runs at Anderson-Rose Dam were supported by flow releases of 50 cfs maintained from April 1 to about June 15 during both years, as required in the reasonable and prudent alternative to jeopardy of the LTBO. During 1994, the U.S. National Biological Service (NBS) sampled the spawning site for eggs on one occasion and found several dead sucker eggs. In both 1993 and 1994, NBS and the Bureau conducted nocturnal drift net surveys after the spawning season to

determine spawning success. No sucker larvae were collected either year. The apparent spawning failure appeared to be related to the lack of adequate spawning habitat. The Bureau monitored water quality during both years and found that such parameters as temperature, dissolved oxygen, pH, and specific conductance were adequate for sucker spawning and incubation.

Water quality in Tule Lake, and the Lost River within this unit, reflects the use of water in this area. During the irrigation season, water quality conditions can vary widely depending on nutrient enrichment from fertilizers or as a result of contaminants, such as pesticides, used on agricultural lands. During extreme water quality conditions, suckers radio-tagged by the Bureau remain clustered in a single, small deep area near the middle of the upper sump (Green 1993). Water quality conditions in this small area appear to remain better and vary less on a daily basis than in the rest of the sump, and the area lacks the dense growths of aquatic macrophytes typical of the rest of the sump. This variation in aquatic plant growth appears to be related to a difference in the character of the bottom sediments in this small area. Because the quality of water coming into the Klamath Project from upstream sources such as Upper Klamath Lake is often poor, additional degradations in quality as a result of use on agricultural lands only worsen the water quality conditions in Tule Lake.

The quantity of water in Tule Lake is adequate for maintaining a small population of suckers, although depths in the lake through winter freezes may reduce the overall population size if water quality problems develop. Tule Lake is both more stable (in terms of surface elevations) and more shallow than either Upper Klamath Lake or Clear Lake Reservoirs.

Spawning habitat at the base of Anderson-Rose Dam is limited both by flows and the amount of suitable substrates. The Bureau is currently improving both the access to, and quality of, available spawning habitat under the flows currently available during the spawning period. These efforts are required in the reasonable and prudent alternatives to jeopardy in the LTBO. Rearing habitat in the lower Lost River is limited both by water quality and structural features of the channelized river. The lower Lost River is, at high lake levels, made up almost entirely of backed-up Tule Lake water, and so water quality conditions reflect lake water quality parameters. A few small irrigation return drains empty into the river in this reach and may contribute to water quality degradation.

To date, little else has been learned about the Tule Lake population beyond that it exists, and that the suckers inhabiting Tule Lake have a high condition factor (ratio of weight to length) relative to that of other populations. This is probably related to the high productivity of Tule Lake. Not enough suckers have been tagged and recaptured to allow a meaningful population estimate. No current evidence exists indicating that the Tule Lake population of either species has reproduced successfully in recent years. Year classes indicative of recent recruitment into the adult population have not been collected in significant numbers. However, recruitment gaps exceeding 10 years have been observed in other populations, so assuming that the Tule Lake population is incapable of reproducing on the basis of two years of surveys may be erroneous. While it is possible that the Tule Lake population of both species represents an "orphan" population of suckers that have ended up in Tule Lake after passing through various portions of the Klamath Project, it is also possible that this population

is an otherwise viable population that is on the brink of collapse due to recruitment failure, poor habitat quality, and other impacts. Additional information about the Lost River sucker and shortnose sucker is presented in the Service's Recovery Plan for these species.

Conservation Measures

Independent of any requirements from previous consultations (see "Previous Consultations" section, below), the Bureau has funded numerous activities that can variously be described as fitting into the "ecosystem restoration" category. Much of this funding has been provided by the Bureau to the Klamath Basin Ecosystem Restoration Office (ERO), a joint Service and Bureau office dedicated to bringing about ecosystem restoration activities through public-private partnership. Most of the projects implemented so far through the ERO have been riparian fencing, wetland creation, conservation easements, or other small-scale restoration projects. These projects are strongly dependant upon the cooperation and assistance of private landowners and others interested in the protection of the Klamath Basin ecosystem. While these projects represent important first steps in bringing about the recovery of the ecosystem upon which the Lost River and shortnose suckers depend, in and of themselves, they are not yet occurring at a sufficient frequency or scale to have a measurable or demonstrable effect on moving these species away from the threshold of jeopardy of extinction at this time. Many of these tasks are addressed in the recovery plan for the suckers (U.S. Fish and Wildlife Service 1993).

ENVIRONMENTAL BASELINE

The direct, indirect, interrelated, and interdependent effects of the action, and cumulative effects, are added to the environmental baseline that is evaluated together with the current status of the species or critical habitat to ascertain the likelihood of a given action jeopardizing the continued existence of the listed species or adversely modifying or destroying critical habitat under consideration. The environmental baseline includes the past and present effects of all Federal, State, or private actions and other human activities in the action area, the anticipated effects of Federal actions that have undergone formal or early section 7 consultation, and the impact of State and private activities that are contemporaneous with the consultation process. In examining the current status of a listed species, the Service considers the species' needs, including its breeding, feeding, and sheltering requirements.

PREVIOUS CONSULTATIONS

Since the listing of the Lost River and shortnose sucker as endangered, there have been numerous consultations with Federal agencies whose actions were determined to affect these species. Of specific note were the series of consultations undertaken with the Bureau on various effects of the operation of the Klamath Project on these species. These began in 1989 with the acrolein consultation (discussed above), which is being reinitiated in this consultation. Because this is a reinitiation of the acrolein opinion, the effects of that action are not considered in the baseline for this consultation, primarily because the action is being modified in this instance. Following the acrolein

consultation, the Service provided six additional biological opinions to the Bureau between November of 1991 and August of 1994.
Of these biological opinions, the LTBO is considered to supersede all the previous opinions except the acrolein opinion. The LTBO, therefore, represents a significant portion of the baseline of past Federal actions that have been consulted on in the Klamath Project's action area. The LTBO was subsequently modified in a re-initiation addressing a change in the management of Clear Lake Reservoir, one of the Klamath Project's reservoirs. The August 11, 1994, Clear Lake opinion also provided the LTBO with a revised (and more complete) Incidental Take statement authorizing take associated with normal Project operations provided the Bureau was in compliance with the action as consulted upon.

The LTBO contains numerous actions described as conservation actions or mitigation measures. While these activities are biologically relevant to the status of the suckers, in that their implementation has potentially helped prevent the extinction of these fishes, these actions were either a part of the described action in that consultation, or were the reasonable and prudent measures (to reduce incidental take) or reasonable and prudent alternatives to avoid jeopardy in the LTBO. In short, any actions described as mandatory in the LTBO are not relevant to the determination in this particular biological opinion because they were accounted for in the jeopardy determination and avoidance thereof through the implementation of reasonable and prudent alternatives to jeopardy in the LTBO. Any failure of the Bureau to implement any of these conservation-oriented actions as required in the LTBO would result in the Bureau's need to reinitiate the LTBO.

In addition to the consultations conducted with the Bureau, as described above, the Service has provided a number of formal and informal consultations to the USDA Forest Service (Fremont National Forest, Winema National Forest, Modoc National Forest) and the USDI Bureau of Land Management (Lakeview District, Klamath Falls Resource Area) on the effects of grazing and other land management actions on the shortnose sucker. None of these consultations have resulted in jeopardy determinations, but many have received biological opinions of "likely to adversely affect" largely due to the watershed impacts of the actions under consultation. These actions have resulted in detrimental impacts to normal watershed function, reduced availability and quality of stream habitats, and have contributed to water quality problems in Upper Klamath Lake.

Previous Pesticide Consultations

In addition to general land management and previous Klamath Project consultations, the Service has provided input on several consultations related to pesticide use. One of these was an informal, and internal, consultation with Tule Lake and Lower Klamath refuges on their use of several pesticides (dicamba/2,4-D [trade names Banvel/Weedar 64 2,4-D Amine], malathion [trade name Malathion 8 Aquamul]) on non-leased Refuge lands. This consultation was concluded informally April 20, 1994, with a concurrence that the activities were not likely to adversely affect listed species, and is therefore not considered to contribute to the overall status of listed species in regards to the jeopardy threshold.

The Service has also been involved in consultations with the EPA on the effects of nationwide pesticide labeling programs on listed species. In one such

consultation, the Service provided "jeopardy" and "Not likely to jeopardize" determinations to EPA on Lost River and shortnose suckers for a variety of chemicals, including four chemicals (in six formulations) that are described as a part of the action currently under consultation. These chemicals, as well as those found "not likely to jeopardize" the suckers are addressed below.

Pesticides that were determined in the 1989 EPA opinion to be likely to jeopardize the continued existence of both the Lost River sucker and the shortnose sucker that are also a part of this proposed action include: carbaryl, chlorothalonil, malathion, and mancozeb. These pesticides also received RPA's to avoid jeopardy. All four pesticides received the same RPA number one, which states:

"1. Prohibit use of the chemical within 20 yards of the water's edge at the time of application for ground applications and 100 yards for aerial applications at sites of known populations or within designated critical habitat, whichever is larger."

In addition, the pesticide chlorothalonil received RPA number four, which states:

"4. Use only granular formulations or soil incorporation"

The Service reviewed the manufacturer's data for chlorothalonil and determined that a true granular formulation, as was the intent of the above RPA, is not currently available for this active ingredient. Therefore, requiring the use of a granular formulation of chlorothalonil would not be technologically feasible and would not meet the definition of an RPA.

The pesticide diuron was determined in the 1989 EPA opinion to affect, but not likely to jeopardize the continued existence of the suckers, and is also a part of this proposed action.

Those chemicals that received a jeopardy determination in the 1989 EPA opinion could potentially receive a non-jeopardy opinion (or, put another way, not cause this opinion to be jeopardy) if both of the following conditions are met. First, if the use of that chemical as proposed in the "Description of Proposed Action" (above) is consistent with the reasonable and prudent alternatives to jeopardy provided in the 1989 EPA opinion. Second, if there is no significant new information that has come to light since the 1989 EPA opinion indicating that the predicted adverse effects of the chemical exceed those considered in the 1989 EPA opinion. If the first two items (above) are not met, but the Bureau decides to adopt as a part of its proposed action any and all reasonable and prudent alternatives to jeopardy that may be provided in this draft jeopardy biological opinion, then the resultant opinion would be a non-jeopardy opinion.

CUMULATIVE EFFECTS

Cumulative effects are those effects of future non-Federal (State, local governments, or private) activities on endangered and threatened species or critical habitat that are reasonably certain to occur within the action area of the Federal activity subject to consultation. Future Federal actions are subject

to the consultation requirements established in section 7 and, therefore, are not considered cumulative to the proposed action.

The Bureau identified several potential sources of pesticide residues in its assessment of cumulative effects, including pesticides and fertilizers used off the lease lands (i.e., from private lands within the Project Service Area) that may reach the Tule Lake sump via the irrigation drain system or the Lost River. In addition, the Bureau identified two privately-owned drainage pumps that service the Westside Improvement District that discharge into Tule Lake sump. The Bureau did not provide any quantification of these other sources relative to the amounts and frequency of use described for Lease Land pesticides and fertilizers.

In considering these potential "cumulative effects" the Service has determined that they do not truly meet the definition of cumulative effects because they are in fact interdependent upon another action, that being the operation of the Klamath Project as a whole. As such, these effects should have been considered, and consulted on, in the LTBO, but were not. The Bureau should, thus, consider whether the effects of these activities are significant enough to warrant reinitiation. The Service is aware of no other cumulative effects.

EFFECTS OF THE ACTION ON LISTED SPECIES

Bald Eagle

Wintering Birds

Use of agricultural chemicals on the lease lands is not believed to directly or indirectly affect wintering eagles in the Klamath Basin because of (1) the timing of chemical application (chemicals are not applied when wintering birds are in the area) and (2) the major food source during the winter is migratory waterfowl and to a lesser extent, microtus. These food sources are not anticipated to be affected by chemical applications during the farming season.

Breeding Birds

Bald eagle reproductive rates are subject to several secondary variables such as weather, contaminants, and disturbance factors. Because bald eagles evolved in the climate of the Pacific Northwest, weather is believed rarely to be a serious factor. Serious storms that occur at the time of incubation or hatching create an exception. Low productivity in the Klamath Basin in 1982 was believed to be the result of such storms (Frenzel 1984). While several persistent contaminants have been documented in eagle tissues in the project area, Frenzel (1984) concluded that contaminant levels had no significant effect on bald eagle reproduction in the Klamath Basin in the early 1980's. Human disturbance may be a factor at certain sites and during critical periods during the species breeding cycle, but is not believed to be pervasive in the project area at this time.

The prolonged presence of a predator and scavenger such as the bald eagle in the project area is an indication of a relatively consistent availability of prey. Prey availability is believed to be the primary limiting factor for these eagle populations in the absence of secondary effects, and the number of available prey items is a function of prey population size as expressed through prey behavior

and mortality rates. Prey availability also influences eagle reproductive rates, because the pre-breeding condition of a female raptor determines its ability to produce eggs (Newton 1979), and because food must be available not only for the adults but for their young. Lack of food at various points in the breeding cycle may inhibit nesting attempts, cause abandonment of the nesting effort, or result in starvation of young. Bowerman (1986) documented low bald eagle reproduction in years following removal of rough fish by rotenone treatments in northern Michigan, and a similar result was observed in years following rotenone treatment of a northern California reservoir. In 1990 ospreys, another piscivorous raptor, abandoned young at Oregon's Hyatt Reservoir, where rotenone treatment had dramatically reduced prey abundance and availability.

Fish bioassays (measuring effects of insecticides, herbicides, dissolved oxygen, pH, temperature, ammonia, and other water quality parameters) and health surveys (measuring anatomical or developmental abnormalities) indicated poor water quality is having a detrimental effect on fishes around Tule Lake and Lower Klamath refuges (Littleton 1993). The proposed action contributes to these adverse conditions which cause fish to have poor health and may impact survival. Actions affecting the numbers or reproduction of fishes in these lakes may indirectly impact prey availability and diversity for the eagles. Because sucker numbers are limited and reproductive success is unknown, chubs may be the most important food source for breeding eagles. Tui chub and blue chub are the most abundant fish in Tule Lake, and numerous predacious birds in addition to eagles feed on the fish species (M. Buettner, Bureau of Reclamation, Klamath, Oregon, pers. comm.).

At the present time, the Services believes the proposed action is not likely to adversely affect bald eagles using the project area during the breeding season due to the abundance of tui and blue chub as prey species. However, efforts should be taken to minimize impact of the action to all fish species that are prey for eagles.

Applegate's Milkvetch

Communications with Bureau staff indicate that the Bureau has no rights-of-way in the immediate area of known populations of Applegate's milkvetch (B. Davis, pers. comm.). However, the right-of-way along the A-3 canal passes to within 100 yards (and possibly closer) to an area of known potential habitat (Yamamoto 1985). Because the plant could be present in this area, and because the effects of herbicide use as proposed in the rights-of-way are unknown on this species, it is possible that the proposed action may affect this plant. However, the lack of data suggesting that the plant is present in this particular right-of-way means that any effects are of very low probability. Regardless, the Service has provided the Bureau with a discretionary conservation recommendation to assure that no effects occur whatsoever (see "Conservation Recommendations", below).

Lost River and Shortnose Sucker

The use of pesticides, fertilizers, and other chemicals as described in the "Description of Action," above, may have effects to listed species if chemicals are introduced into the waters inhabited by, or draining into waters inhabited by, the listed suckers. The environmental fate of these chemicals is dependent to a large extent on a chemical's molecular structure and the physicochemical

properties that are influenced by molecular structure. These factors were considered by the Service in making determinations of the effect of the proposed action on listed species. The Service attempted to gather as much information as possible, with the assistance of the Bureau in many cases, concerning the factors related to chemical use that would potentially influence environmental fate. This information is presented in chemical profiles in Appendix B of this opinion. Each chemical profile includes a summary of the data the Service considered in determining the potential effects of a given chemical.

Lease Lands - Pesticides

Pesticides used on the Federal Lease Lands that may affect but are not likely to adversely affect the continued existence of the Lost River and shortnose suckers are imidacloprid (Admire), iprodione (Rovral, Rovral 4F), propiconazole (Tilt), triadimefon (Bayleton), vinclozolin (Ronilan), 2,4-D (Weedar 64, Amine 4), desmedipham/phenmedipham (Betamix), clopyralid (Stinger), dicamba (Banvel), difenzoquat methyl sulfate (Avenge), diquat dibromide (Diquat), EPTC (Eptam 7E), glyphosate (Roundup, Rodeo), MCPA (MCP 4 Amine), metribuzin (Sencor DF, Lexone DF), sethoxydim (Poast), ethephon (Cerone Plant Growth Regulator), maleic hydrazide (Royal MH-30), and metam sodium (Metam 426). A summary of the physicochemical properties and other characteristics of each of these pesticides is included in Appendix B. In general, these pesticides have relatively low bioconcentration factors and estimated environmental concentrations (EEC) in water that are less than acute toxicity values for fish and other aquatic species. Dicamba, metribuzin, and 2,4-D were found in Tule Lake in 1994 at concentrations that are not known to adversely affect fish or aquatic invertebrates under laboratory conditions (Boyer and Grue 1994). Boyer and Grue (1994) state that the impacts of chronic or sublethal exposure to these pesticides under the conditions characteristic of Tule Lake (elevated pH, high dissolved oxygen) are not known. Metribuzin and 2,4-D are both reported to have reproductive and estrogen-disrupting effects (Colborn et al. 1993). However, the buffer zones established during the PUP review for aerial application of these chemicals during the 1995 growing season should eliminate adverse impacts to the Lost River and shortnose suckers.

Pesticides used on the Federal Lease Lands that are likely to have adverse impacts to the Lost River and shortnose suckers are carbaryl (Sevin XLR Plus), malathion (Malathion 8 Aquamul), chlorothalonil (Bravo 720), mancozeb (Dithane F-45), metalaxyl with mancozeb (Ridomil MZ 58), metalaxyl with chlorothalonil (Ridomil Bravo), copper hydroxide (Champ, Kocide 606), and metalaxyl with copper hydroxide (Ridomil Copper 70W). In the 1989 EPA opinion, carbaryl, malathion, chlorothalonil, and mancozeb received "Jeopardy" calls to the Lost River and shortnose suckers. The Service was not presented with any new information in the Bureau's assessment nor were any new data located independently by the Service that would change this determination for these chemicals. The products Ridomil Bravo (9% metalaxyl/72% chlorothalonil) and Ridomil MZ 58 (10% metalaxyl/48% mancozeb) are primarily composed of chlorothalonil and mancozeb, respectively, and the Service believes that Ridomil Bravo and Ridomil MZ 58 will exhibit the same general characteristics as their primary constituents. A summary of the physicochemical properties and other characteristics of each of these pesticides is included in Appendix B. Also see Appendix B for definitions of toxicologic terms and toxicity data. The toxicity data were obtained primarily from the

supplement to the Biological Assessment with the Service augmenting these data as necessary.

For malathion, the EEC in water (0.74 ppm) is within an order of magnitude of the acute toxicities for this pesticide to carp (*Cyprinus carpio*; LC50 = 4.92-8.82 ppm) and goldfish (*Carassius auratus*; LC50 = 8.34-13.8 ppm), which are the closest relatives to the suckers of the species tested. The EEC exceeds the LC50 value for the trout species tested. The repeated applications of malathion (potatoes and onions - every 7 days following infestation; grains - ≤4/season; alfalfa - 1 per cutting) and the number of crops on which it is used contribute to exposure to the suckers and potential adverse effects.

The EEC for carbaryl (0.15 ppm) also is relatively close to the acute toxicities to carp (LC50 = 4.62-6.05 ppm) and goldfish (LC50 = 8.31-20.8 ppm), and within an order of magnitude of the toxicity to rainbow trout (*Oncorhynchus mykiss [Salmo gairdneri]*; LC50 = 1.42 - 2.63 ppm). The multiple applications that are planned for sugar beets (≤2 applications/season) and alfalfa (≤11 applications/season) contribute to potential adverse effects. Carbaryl is reported to have reproductive and estrogen-disrupting effects (Colborn et al. 1993) and chronic exposure from multiple applications increases the possibility of such effects.

Toxicity data for chlorothalonil (formulated as Bravo 720 and Ridomil Bravo) to species closely related to the suckers are not available. However, according to the Biological Assessment, chlorothalonil is generally considered to be highly toxic to fish and aquatic invertebrates. Toxicity to rainbow trout (LC50 = 0.25 ppm) and channel catfish (*Ictalurus punctatus*; LC50 = 0.43 ppm) are nearly equal to the EEC (0.18 ppm). The widespread use of this fungicide on potatoes and the multiple applications (≤4 applications/season) contribute to potential adverse effects.

Mancozeb (formulated as Dithane and Ridomil MZ 58) has an EEC in water of 0.64 ppm, which is within an order of magnitude of the toxicity to carp (LC50 = 4.0 ppm) and relatively close to the toxicity value for goldfish (LC50 = 9.0 ppm). Additionally, multiple applications are planned for potatoes and onions (≤4-8 applications/season depending on the formulation), which increases the potential for adverse effects to the listed suckers. These repeated applications and potential chronic exposure increase the possibility of reproductive and estrogen-disrupting effects reported for mancozeb (Colborn et al. 1993). Boyer and Grue (1994) found manganese as Dithane at low concentrations in Tule Lake in June providing direct evidence that this fungicide reaches sucker habitat.

Champ, Kocide 606, and Ridomil Copper 70W contain 23%, 37.5%, and 70% copper hydroxide, respectively. The EEC for Ridomil Copper 70W was not provided in the supplement to the Biological Assessment, but the EEC for Champ and Kocide 606 is 0.28 ppm, which is greater than the LC50 value for rainbow trout (0.08 ppm) and less than the LC50 value for bluegill (>180 ppm; *Lepomis macrochirus*). Upon contact with water, copper hydroxide dissociates and the cupric ion (Cu^{+2}) is formed. However, free Cu^{+2} ion is usually low in natural waters because this ion is readily complexed with both inorganic carbon (especially as pH and alkalinity increase) and organic complexing agents (Sorenson 1991). Tule Lake has medium alkalinity (100-200 mg/L $CaCO_3$) and high total organic carbon, so most of the total dissolved copper would be bound (Boyer and Grue 1994). While this chemical

behavior reduces free Cu^{+2} in the water column, it also allows for accumulation of copper in sediments.

Boyer and Grue (1994) reported total copper levels in water from Tule Lake as high as 35 µg/L (ppb), which exceeds the acute water quality criterion of 12 µg/L at 100 mg/L $CaCO_3$ (U.S. Environmental Protection Agency 1986) and approaches the copper hydroxide LC50 value for rainbow trout (0.08 ppm). In 1988, sediment samples from below Pumping Station 11 in Tule Lake had copper concentrations of 51 µg/g and 45 µg/g in the 0.062 mm and <2.0 mm size fractions, respectively (Sorenson and Schwarzbach 1991). It is apparent that copper is reaching Tule Lake from the surrounding area and that this element is found in both water and sediments. Boyer and Grue (1994) argue that invertebrate toxicity data and sediment copper concentrations suggest that suckers may be adversely affected by ingestion of contaminated prey. Given the existing and historic copper concentrations in Tule Lake, the Service believes that the use of copper-containing pesticides on the Federal Lease Lands may exacerbate the problem and impact the listed suckers.

Lease Lands - Fertilizers

A variety of fertilizers are applied to lease lands around the Tule Lake and Area K of the Lower Klamath Refuge (Table 1). The fertilizers contain varying percentages of primarily one to four nutrients (Table 1). They are applied by injection into the soil as a gas (anhydrous ammonia) or in a granular or liquid formulation by broadcasting, banding, side-dressing, or through the irrigation delivery system. No information was reported in the Biological Assessment regarding usage of fertilizers based on formulation, the number of applications that occur per season to a single lease unit, or the total quantity of fertilizers applied to the lease lands.

Table 1. Formulations and nutrient ratios of fertilizers used on lease lands around Tule Lake (Laura Allen, Bureau of Reclamation, pers. comm.).

	NUTRIENT RATIOS (%)			
FORMULATION	Nitrogen (N)	Potassium (K_2O)	Phosphorus (P_2O_5)	Sulfur
Anhydrous Ammonia	82	--	--	--
Ammonia Sulfate	21	0	0	24
Urea [$(NH_2)_2CO$]	46	0	0	0
16-20-0	16	20	0	15
Triple 12	12	12	12	10
Triple 15	15	15	15	0
Muriate of Potash (KCl)	0	0	62	0

The Biological Assessment provides data from the Intermountain Research and Extension Center indicating that nitrogen and phosphorus are typically applied to lease lands at rates ranging from 60-240 lbs/acre and 40-60 lbs/acre, respectively, and are removed by crops at rates ranging from 150-360 lbs/acre and 55-84 lbs/acre, respectively. The information suggests much more nitrogen and phosphorus are removed by the crops than the recommended rate of application, and therefore the added fertilizers do not contribute to the poor water quality conditions found in Tule Lake. However, no information was provided on the amount of nutrients naturally present in the soil, or the rate of uptake of organic nutrients for the various crops. Most soils may contain over 90% of the nitrogen content in organic form, and inorganic nitrogen from fertilizers and rainwater is largely lost by leaching (Manahan 1993). Much of the nitrogen applied to the lease lands could be lost or washed away soon after application and the remaining nutrient uptake could occur naturally. All of the fertilizer types used on the lease lands can form readily leachable un-ionized ammonia (NH_3) or nitrate (R.V. Thurston, Montana State University, pers. comm.) which may contribute to the hypereutrophic conditions found in Tule Lake and Lower Klamath Lake.

Fertilizer constituents have been found in Tule Lake at levels potentially damaging to fish species. Total ammonia concentrations were identified in the Tule Lake (MacCoy 1994). All samples collected by Boyer and Grue (1994) exhibited detectable levels of nitrate, and all samples except one had detectable levels of nitrite (Table 2). The highest concentrations of total soluble nitrogen, nitrates, and ammonia were found in drainwater return flows entering Tule Lake and at Lower Klamath Refuge (T. Maurer, U.S. Fish and Wildlife Service, Sacramento, California, pers. comm.). Phosphorus was also found to be abundant in the waterways around the lease lands. Information on concentrations of potassium, sulfur, micronutrients, or other fertilizer components in waters of the Tule Lake have not been evaluated or reported in the Biological Assessment.

Ammonia was found in the Tule Lake at levels potentially damaging to suckers. MacCoy (1994) reported total ammonia in the Tule Lake up to 1.12 mg/L, which exceeds the LC50 for larval Lost River suckers and juvenile shortnose suckers exposed to un-ionized ammonia (Table 2). Mean concentration of ammonia (1.21 mg/L) in lease land drains was greater than individual samples collected in the Tule Lake (T. Maurer, U.S. Fish and Wildlife Service, Sacramento, California, pers. comm.). Although toxicity of total and un-ionized ammonia are not directly comparable, the conditions in Tule Lake (high pH and elevated temperature) favor the presence of the un-ionized form (Thurston et al. 1981). In addition to mortality, un-ionized ammonia concentrations can reduce egg hatching success, growth rates, morphological development, and can cause pathological changes in the gill, liver, and kidney.

Nitrate was found in the Tule Lake up to 2.94 mg/L (Table 2). Nitrate may not pose a direct toxic threat to the suckers, but it increases primary productivity in the lake, resulting in algal blooms, decreasing dissolved oxygen, and increasing pH. Indirect effects of this eutrophication process on suckers in Upper Klamath Lake have been documented by Kann and Smith (1993).

Nitrite in water is generally short-lived and is rapidly oxidized to nitrate (Russo 1985). However, even at low concentrations nitrite can directly impact

Table 2. Fertilizer components detected in Tule Lake Tule Lake and toxicities to Lost River and shortnose suckers.

Fertilizer Product	Tule Lake (mg/L)[b]	Pump Stn.9, 10, 11 (mg/L)[c]	LC50s (mg/L)[a]	
			Larval Lost River Suckers	Juvenile Shortnose Suckers
Total ammonia (NH_3 + NH_4^+)	NA[d]	0.56 - 1.12	0.54[e]	0.34[f]
Nitrate (NO_2^-)	0.05-2.94	NA	NA	NA
Nitrite (NO_3^-)	0.01-0.25	NA	NA	NA

[a]Un-ionized ammonia; [b]Boyer and Grue (1994); [c]MacCoy (1994); [d]Not available or data not yet evaluated; [e]Monda and Saiki (1994); [f]Monda and Saiki (1993)

fish. Acute LC50 values (48 or 96 hour) for nitrite vary from 0.1-0.4 mg/L for rainbow trout to >67 mg/L for mottled sculpin (*Cottus bairdi*) (Russo 1985). Nitrite oxidizes hemoglobin in fish blood to methemoglobin, which does not combine reversibly with oxygen and may result in hypoxia, anoxia, and death (Russo and Thurston 1991). Concentrations as little as 0.0015 mg/L have resulted in elevated methemoglobin concentrations in fish (Russo 1985). Sublethal or chronic exposure to nitrite can produce also produce pathological changes (Watenpaugh and Beitinger 1985, Stickney 1994). No information is available on the specific toxicity of nitrite to Lost River and shortnose suckers.

The specific source of the nutrients found in the Tule Lake or lease land drains is generally unknown. Many lakes in the Basin are historically eutrophic, receiving nutrient loads from organic sources and experiencing algal blooms during some months of the year. Nutrients leaching from croplands also have been documented in many agricultural areas, which contributes to the total nutrient load (T. Maurer, U.S. Fish and Wildlife Service, Sacramento, California, pers. comm.). Excess nutrients result in severe eutrophication and produce hazardous water quality conditions with low dissolved oxygen, high pH, and toxic amounts of ammonia. Poor water quality related to these conditions have been identified around Upper and Lower Klamath Lake refuges and at Tule Lake (Sorenson and Schwarzbach 1991, Littleton 1993, Bennett 1994, Boyer and Grue 1994). Water conditions at Upper Klamath Lake may be partially responsible for the poor water quality observed in the lower lakes as irrigation return flows ultimately drain into the Tule Lake and Lower Klamath Lake. Water received into the lease lands from Upper Klamath Lake generally contains dense populations of blue-green algae, which can liberate microbially-mediated production of nitrate and ammonia as cells grow and decompose (T. Maurer, U.S. Fish and Wildlife Service, Sacramento, California, pers. comm.). However, mean concentrations of ammonia in lease land drains was significantly higher than found in canals delivering water to the lease lands (T. Maurer, U.S. Fish and Wildlife Service, Sacramento, California, pers. comm.). Fertilizers used on the lease lands could contribute to the high nutrient concentrations and hypereutrophic conditions found in Tule Lake and Lower Klamath Lake.

Acrolein

As mentioned previously, on June 14, 1989, the Service issued a Jeopardy Biological Opinion on the use of acrolein within the canals and drains of the Klamath Project Service Area. As a component of that opinion, reasonable and prudent alternatives to jeopardy were stipulated. As stated in the Bureau's present Biological Assessment, the PUP's for acrolein from Tulelake Irrigation District (TID) and Klamath Irrigation District (KID) specify the conditions of use.

As stated by the Bureau in their letter dated January 5, 1995, this consultation is a reinitiation of the 1989 acrolein consultation. In an effort to provide more data on acrolein use near Tule Lake, the Bureau contracted with the California Regional Water Quality Control Board (CRWQCB) and Baker Performance Chemicals Inc. (the registrant of acrolein [Magnacide H]) to conduct an acrolein monitoring project in 1994. The conclusion of the CRWQCB "was that acrolein, applied under the conditions of this study (routine Tulelake Irrigation District practices), was not reaching natural receiving waters." In a letter to CRWQCB, the Service's Sacramento Field Office, Ecological Services, provided the following review of the study.

> "The study results provided several important pieces of information concerning the transport of acrolein in the Tulelake irrigation system. The study showed that acrolein can be transported large distances within the system. For example, acrolein was transported 1.7 miles to Sampling Station #6 during the July 13, 1994, monitoring. At Sampling Station #6, acrolein was measured at 72 ppb, 76 ppb, and 69 ppb, concentrations that, according to the U.S. Environmental Protection Agency's (USEPA) *Quality Criteria for Water 1986*, are acutely toxic to aquatic life.
>
> The study also showed that leakages in the system are a frequent occurrence; leakage acrolein concentrations of 5.9 ppb, 16-17 ppb, and 120-160 ppb, were measured at Sampling Station #6A on July 13, July 27, and August 10, 1994, respectively. The leakage concentrations on August 10, 1994, were higher than the USEPA acute (68 ppb) and chronic (21 ppb) values for the protection of aquatic life.
>
> In the 1994 acrolein monitoring study, the outlet of the J-1 canal to the 40-B drain was closed and the number 3 pump was off (we assume). Whether these precautions are taken on every canal or drain that is treated with acrolein each day is, however, a remaining concern. This study was restricted to individual acrolein applications in a single canal. Under the routine Tulelake Irrigation District's treatment schedule, a different series of canal or drain sections (5-10) are treated each day, 3 days each week, on a repeating cycle of 2 weeks, as needed. Therefore, this study did not address the chronic exposure of acrolein throughout the system surrounding Tulelake. Under the routine acrolein treatment schedule and the strict adherence to the USEPA label restrictions of no release of treated water to fish bearing waters

for 6 days, half of the irrigation system would be shut down on any given day of the week.

The 1994 acrolein monitoring study was valuable in assessing three different acrolein treatments under three different flow regimes. The conclusion of the study, that acrolein was not reaching natural receiving waters, can only be applied to this particular study, and not to the routine applications of acrolein. In order to reach the conclusions made by Baker Chemical Inc. on the impact of the Tulelake Irrigation District's routine acrolein applications on downstream receiving waters, more frequent water monitoring for acrolein on an unannounced basis, at locations of direct input into Tulelake and the N-Canal closest to acrolein application areas, would need to be done."

It is apparent that additional monitoring of routine acrolein treatments is needed to determine if acrolein is reaching receiving waters and to address potential chronic exposure to this herbicide.

The acrolein application rate currently used by TID and KID, as stipulated in the PUP's, is up to 15 ppm. The LC50 value for acrolein in the white sucker (*Castostomus commersoni*) is 14 ppb (Holcombe et al. 1987). Since the maximum application rate of acrolein is nearly 1,000 times the LC50 value of this closely-related species, acrolein is likely to adversely affect the listed suckers that are present in the irrigation system. If acrolein is applied to portions of the irrigation system that do not contain sucker populations, these applications are not likely to adversely affect the suckers provided that the label restrictions are followed. The label specifies "do not release treated water for 6 days after application into any fish bearing waters or where it will drain into them." Therefore, all treated irrigation waters must be held for six days or applied to cropland.

Rights-of-way

Pesticides used on rights-of-way that may affect but are not likely to adversely affect the continued existence of the Lost River and shortnose suckers are BTI (VectoBac CG, VectoBac 12AS, Acrobe), methoprene (Altosid), 2,4-D (Weedar 64), 2,4-D and dicamba (Weedmaster), dicamba (Banvel), dicamba and 2,4-D (Banvel 720), and glyphosate (Roundup, Rodeo). A summary of the physicochemical properties and other characteristics of these pesticides is included in Appendix B. There was little information provided in the Biological Assessment or the supplement on characteristics of pesticides used on the rights-of-way and not on the lease lands (i.e., data were only available for pesticides proposed for use in both locations). However, the Service has determined that the rights-of-way pesticides listed above generally have EECs in water that are less than acute toxicity values for fish. Therefore, these pesticides should not adversely affect the listed suckers.

Pesticides used on the rights-of-way that are likely to have adverse impacts to the Lost River and shortnose suckers are 2,4-D and 2,4-D,B (Weedone 638, Weedone LV4), bromacil and diuron (Krovar I, Krovar I DF), diuron (Karmex DF), and petroleum distillate (Mosquito Larvicide GB-1111). The 2,4-D,B component of Weedone 638 and Weedone LV4 has an EEC (0.46 ppm) that is within an order of

magnitude of the LC50 for rainbow trout (2 ppm) and which is close to the LC50 value for bluegill (7.5 ppm). Weedone 638 is proposed for use along the canals (240 miles) and drains (330 miles) of TID and Weedone LV4 is requested for canal, lateral, and drain (banks, dikes, and berms) rights-of-way in KID. Therefore, the exposure potential to 2,4-D,B is high and this contributes to possible adverse affects to the suckers. Both TID and KID have requested to use other herbicides that are not likely to adversely affect the suckers.

The diuron in Karmex DF, Krovar I, and Krovar I DF has an EEC (4.4 ppm) that is nearly identical to the LC50 for rainbow trout (4.9 ppm) and is within an order of magnitude of the LC50 value for bluegill (8.2 ppm). TID is proposing to apply Karmex DF and Krovar I DF near 37 pumping plants and 200 irrigation control structures. While TID states that these herbicides will not be applied to the dikes around the Tule Lake sumps, the possibility exists that applications at other sites may contaminate water and this may adversely affect any suckers in those waters. KID is proposing to apply Krovar I to their equipment storage yard and the Service does not believe that such an application has the potential to contaminate water and therefore this proposed use is not likely to adversely affect suckers.

No information was provided in the Biological Assessment or the supplement on the toxicity or physical characteristics of petroleum distillate (Mosquito Larvicide GB-1111). The Service determined through examination of the Material Safety Data Sheet and discussions with the manufacturer (Witco Corporation) that there are no acute toxicity data available for this specific pesticide. However, the product label contains the following environmental hazards statement: "Product toxic to fish and wildlife and aquatic organisms, do not apply directly to water (except when applied for mosquito larvae control, and then only around the borders of these areas and in shallow water)." Klamath County Vector Control is proposing to apply petroleum distillate to water as needed at 150 sites. The Service must assume from the label hazard statement that this product will adversely affect suckers. Although petroleum distillate kills encephalitis-carrying mosquitoes, other BTI-containing insecticides proposed for use will also control these organisms.

Incidental Take

Sections 4(d) and 9 of the Act as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the Bureau so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The Bureau has a continuing duty to regulate the activity covered by this incidental take statement. If the Bureau (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

The Service anticipates that incidental take of larval, juvenile, adult, and embryonic Lost River suckers and shortnose suckers will be difficult to detect for the following reason(s): 1) finding a dead or impaired specimen is unlikely; 2) rapid rates of decomposition under predicted habitat conditions; 3) behavioral modifications associated with lethal or sublethal (chronic) effects; 4) the high likelihood of scavenging of dead or injured specimens by any of several common fish-eating birds of the area; and 5) sucker deaths may not occur in an area where they would be readily observable. Therefore, even though the Service expects incidental take associated with the proposed action, the best scientific and commercial data available are not sufficient to enable the Service to estimate a specific amount of incidental take of Lost River or shortnose suckers. In instances such as these, the Service has designated the expected level of take as unquantifiable.

Based on available information, the Service anticipates the incidental take of an unquantified number of Lost River suckers and of shortnose suckers due to the effects of the action as proposed.

To ensure protection for species assigned unquantifiable levels of incidental take due to agrochemical use related impacts, reinitiation of consultation is required if the effects of the action exceed those considered in this opinion. Because of the difficulty associated with monitoring such effects, the Service will assume that any application that is not in compliance with the proposed action shall have resulted in unauthorized incidental take. Specifically, this means that any application in violation of the pesticide label, the approved PUP, buffer areas, or other terms defining appropriate use of pesticides as included in the Description of Action, above, shall be considered to have resulted in unauthorized incidental take.

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take:

1. Continue to reduce the amount of pesticides and their breakdown products entering water bodies supporting sucker populations.

2. Reduce the amount of fertilizers entering water bodies supporting sucker populations.

3. Reduce the use of toxic chemicals and/or pesticides throughout the Klamath Project rights-of-way regardless of the presence of known sucker populations.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of ESA, the Bureau must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. The Bureau shall implement a Service-approved monitoring program to ensure that rinse-water produced during the washing of equipment for control of soil-borne pests does not contain pesticide concentrations likely to impact listed suckers if the rinse-water enters drains emptying into Tule Lake. Labels on most of the pesticides under consideration in this consultation contain warning statements prohibiting contamination of water when disposing of equipment wash waters.

2. The Bureau shall implement a Service-approved monitoring program for 1) the use of acrolein in the Klamath Project Area irrigation system; and 2) the use of pesticides on the lease lands. This monitoring program will ensure that the label stipulations and the terms and conditions of the PUP's are being implemented. The monitoring of the applications of pesticides should be random or semi-random, and should be designed to monitor typical use of acrolein and other pesticides in the Project throughout the application season.

3. The Bureau shall require cooperators to report specific fertilizer formulations, rates and number of application, and total area treated on individual crops/lease units. A summation of this usage shall be made available to the Service prior to the next growing season. If Service and Bureau review of these records reveal areas of concern, the Bureau will determine: 1) nutrient concentrations in drains and canals entering and leaving the lease lands, and in Tule Lake and Lower Klamath Lake; and 2) identify the potential sources of nutrients entering these waters.

4. The Bureau shall, through a Service-approved sampling protocol: 1) determine copper concentrations in drains and canals entering and leaving the lease lands, and in Tule Lake and Lower Klamath Lake; and 2) identify the potential sources of copper entering these waters.

Reporting Requirements

Upon locating a dead, injured, or sick endangered or threatened species specimen, initial notification must be made to the nearest Service Law Enforcement Office. In Oregon, contact the U.S. Fish and Wildlife Service, Division of Law Enforcement, District 1, P.O. Box 1910, Klamath Falls, Oregon 97601 (503/883-6900). In California, contact the U.S. Fish and Wildlife Service, Division of Law Enforcement, District 1, 2800 Cottage Way, Room E-1924, Sacramento, California 95825 (916/978-4861). Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological

materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

The Service is to be notified within three (3) working days of the finding of any endangered or threatened species found dead or injured in the Klamath Project Service Area. Notification must include the date, time, and precise location of the injured animal or carcass, and any other pertinent information. In Oregon, the Service contact person for this information is Mr. Russell D. Peterson (503/231-6179) and in California, the contact person is Mr. Joel Medlin (916/978-4613). Any Lost River suckers or shortnose suckers found dead or injured in California shall be turned into the California Department of Fish and Game. The agency contact is Ms. Susan Ellis (916/355-7114).

If, during the course of the action, the amount or extent of the incidental take limit is exceeded, the Federal agency must reinitiate consultation with the Service immediately.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Bureau should continue to incorporate IPM techniques into project operations. New techniques should be used on an interim basis, with the intent of expanding non-chemical means of pest control and investigating the efficacy of available IPM techniques on a small scale. This process should remain in place until such time as the large-scale IPM plan is developed and implemented as discussed in the Description of Action, above. The techniques should be directed toward minimizing use of pesticides and fertilizers on lease lands; minimizing use of herbicides such as acrolein in canals and drains; reducing herbicide and insecticide use near rights-of-way; and utilizing native perennial vegetation to enhance nutrient uptake from excess fertilizer, promote beneficial insects, and provide wildlife cover. IPM strategies should be developed in cooperation with the Service's Regional IPM Coordinator, the Tule Lake and Lower Klamath refuges, Oregon State Office personnel, and the University of California, Davis, Agricultural Experiment Station. The following are examples of IPM strategies that might be attempted:

> a. *Planting perennial herbaceous or grassy vegetation.* Perennial vegetation, preferably of native seed mixes, planted in buffer zones and boundary areas can prevent colonization of noxious weeds into crop areas, promote beneficial insects, reduce runoff of fertilizers by enhancing nutrient uptake, provide wildlife cover, minimize water losses, and impede spread of viral and fungal diseases. Experimenters at the University of California, Davis, have developed successful "farmscaping" projects using plant mixes in border zones which reduced the need for herbicides and tilling. Some species planted in these areas have the potential to remove

as much as 80% of the nitrate concentrations in subsurface water (Kovacic et al 1991).

b. *Aquatic vegetation planted in drains and canals.* Some aquatic plants can reduce or eliminate the need for maintenance and clearing of nuisance vegetation using chemicals such as acrolein. Certain species of low-growing, mat-like water plants have been used to competitively displace common weeds and prevent new ones from becoming established (Yeo 1980, Daar 1991). Some of these plants include dwarf spikerush (*Eleocharis coloradoensis*), barbed spikerush (*E. parvula*), and slender spikerush (*E. acicularis*).

c. *Multicropping, intercropping, and strip harvesting techniques.* These techniques promote beneficial insects and can reduce or eventually eliminate the need for insecticides. A strip harvesting technique has been developed and successfully used by experimenters at University of California to provide biological control of insects in alfalfa. A review of the effectiveness of some of these techniques can be found in Risch et al. (1983).

d. *Use of nontraditional fertilizers.* Alternatives to traditional fertilizer uses include crop rotation with leguminous plants and use of very low analysis nontraditional fertilizers, slow release formulations, or compost materials. The contribution of nitrogen from leguminous plants used in one season could be accounted for during the next season to minimize fertilizer use. Other techniques for minimizing fertilizer use involve identifying areas on lease lands where nutrients may be insufficient and distributing fertilizers to those specific areas where a nutrient might be lacking. Oregon State University is developing a program to identify specific areas in a field where fertilizers may be limited, and developing techniques to distribute the nutrients more effectively.

2. Because of the proximity of the Bureau's right-of-way along the A-3 canal to suitable habitat for Applegate's milkvetch, *Astragelus applegatei*, the Service recommends that the Bureau require adequate surveys for the plant prior to authorizing use of herbicides along this right-of-way. The Service hereby offers assistance in developing a survey protocol, and in developing alternate means of managing weeds within this right-of-way.

3. Because of the potential for effects of the action to bald eagles, the Bureau should cooperate and assist refuge personnel in amending management plans for bald eagles on the Lower Klamath and Tule Lake refuges to include information on the use of the two refuges by breeding and nonbreeding eagles during the spring and summer. Additional information should be collected on the density of breeding and nonbreeding eagles using the area and on the foraging behavior and territory size of breeding pairs. The study should be conducted in cooperation with the Klamath Lake NWR Complex, the California Department of Fish and Game, and the Oregon Eagle Foundation.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

CONCLUSION

After reviewing the current status of the Lost River sucker and the shortnose sucker, the environmental baseline, the effects of the proposed action and the cumulative effects, and the effects of the draft reasonable and prudent alternatives that the Bureau has chosen to adopt as part of the proposed action, it is the Service's biological opinion that the action is not likely to jeopardize the continued existence of the Lost River sucker and the shortnose sucker. Conferencing on proposed critical habitat for these species is expected to occur after completion of this consultation. The proposed action is not likely to effect the American peregrine falcon, and may affect, but is not likely to adversely affect, the bald eagle and Applegate's milkvetch.

This concludes formal consultation on the action outlined in the "Description of Proposed Action" section, above. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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Appendix A

January 13, 1995
Memorandum from
Service Regional Director Michael Spear
to
Director Mollie Beattie.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
911 NE. 11th Avenue
Portland, Oregon 97232-4181

IN REPLY REFER TO:

JAN 13 1995

Memorandum

To: Director, U.S. Fish and Wildlife Service
Washington, D.C.

From: Acting
Regional Director, Region 1
Portland, Oregon (ARW-OPR)

Subject: Washington Office Pesticide Review, Bureau of Reclamation and U.S. Fish and Wildlife Service Agricultural Leased Lands, Tule Lake and Lower Klamath Refuges, and FWS-R1-95-KB-02

RESPONSE: National Integrated Pest Management Coordinator (Linda Lyon, ES-EC)

Washington Office Pesticide Review, Leased Lands

This memorandum responds to your December 17, 1994, request to Scott Stenquist for a memorandum covering U.S. Fish and Wildlife Service (Service) Regional Office review of leased land pesticide use proposals for 1995.

Table I shows the pesticide use proposals for leased agricultural land under the Kuchel Act on Tule Lake and Lower Klamath national wildlife refuges, California, that require Washington Office review. The formal request, and pesticide use proposals were sent to you on December 15, 1994, by James K. Bryant, Chief, Water and Lands Division, Klamath Project Office, Bureau of Reclamation (Reclamation). Two proposals (trade name Admire, an insecticide; trade name Telone II, a fumigant) are submitted this year that were not proposed for last year. They were sent to you in a separate mailing from the other leased-land proposals on December 22, 1994, by Michael J. Ryan, Area Manager, Klamath Project Office. Admire and Telone II were recently registered for use in California.

Tables II and III show pesticides approved and disapproved, respectively, by the Service Regional Office.

These proposals (Tables I, II, and III) were not reviewed or signed at Reclamation's Sacramento, California, Regional Office or at Reclamation's Denver office (Reclamation's Interior Pesticide Work Group representative) (see attachment 1). It is vital, we think, that this review strategy by Reclamation offices on these proposals be documented. We understand that Reclamation's interdisciplinary team for pesticide review may be developed sometime in the future by their Sacramento Regional Office. In light of this situation and the highly controversial nature of pesticide use on the refuges, we believe that it is essential to secure a concurrence signature on these proposals from Reclamation's headquarters office.

Leased Land Pesticide Review Process, 1995

Laura Allen (Natural Resource Specialist, Bureau of Reclamation, Klamath Project Office, Klamath Falls, Oregon (503) 883-6935), Ted Buerger (Environmental Contaminants Specialist, Oregon State Office, Portland, Oregon (503) 231-6179), and Scott Stenquist (Regional IPM Coordinator) reviewed the proposals during the week of December 5, 1994. We did not recommend approval of any rejected pesticides from the January 1994 review process. In addition, Linda Watters, Assistant Associate Manager, California/Nevada, Refuges and Wildlife, also reviewed the proposals.

During the review, we carefully considered the methods of application, toxicological effects, possibility for off-site movement, and other pest management options. We also evaluated the proposals against the biological assessment for leased lands recently completed by Reclamation. The Service's Oregon State Office will provide formal comments on Reclamation's biological assessment in the forthcoming biological opinion.

Further Pesticide Buffer Zone Considerations

We also added the following conditions for the 1995 leased land proposals (these conditions will be added to each pesticide use proposal by Reclamation after your review):

1. Increase buffer zone from 135 ft (1994) to 150 ft (1995) around sumps regardless of application method (ground, aerial, chemigation). For wicking/wiping application, no buffer zone is needed.

2. For aerial application on lands away from the sumps, the buffer zone is 100 ft where water is present.

3. For ground application on lands away from sumps, the buffer zone is 25 ft where water is present.

4. Chemigation in general will have a buffer zone of 50 ft from canals and drains where water is present.

5. For specific pesticides (trade name Sencor, Lexone, and 2,4-D/Banvel) that were found in the sump (Boyer and Grue, 1994), increase buffer zone to 150 ft (1995) for aerial application around canals, drains, and sumps. For ground application, the buffer zone is 25 ft from canals and drains; no buffer zone is needed for wicking/wiping application.

Metam 426, Vapam, and Telone II Fumigant Proposals

In 1994, Metam 426 (chemical name, sodium methyldithiocarbamate) was approved by the Service's Regional Office and Reclamation's Pesticide Workgroup member. This year two additional fumigants have been proposed (Vapam [chemical name, sodium methylidithiocarbamate] and Telone II [chemical name, 1,3-dichloropropene]). Metam 426, Vapam, and Telone II are labeled for the Columbia root-knot nematode (*Meloidogyne chitwoodi*, race 1 and 2) and the northern root-knot nematode (*M. hapla*) in potatoes.

Telone II is more effective on target and non-target species in the soil to a greater depth. Telone II is labeled for wireworms (Pacific Coast wireworm

[*Limonius canus*] and sugarbeet wireworm [*L. californicus*], both nematodes) and Verticillium wilt (*Verticillium dahliae*). We have concerns for Metam 426, Vapam, and Telone II because these soil fumigants are not pest-specific. They are general biocides that are toxic to a wide-range of soil micro-organisms (e.g. rotifers and others). Hence, these fumigants adversely impact soil biodiversity.

While these products (Metam 426, Vapam, and Telone II) have high aquatic toxicities, they are not expected to move to the water table or off-site (personal communication, Dr. Jim Sanborn, California EPA, Department of Pesticide Regulation, Sacramento). Soil micro-organisms (e.g., rotifers and others) will be killed with the use of any of the 3 fumigants. Soil organisms tend to be mobile in the soil and will recolonize the soil after the fumigant dissipates. The amount of time for soil organisms to recolonize and their specific ability to recolonize on these refuge sites are unknown at this time. We concluded, however, that although soil organisms will recolonize the area after the fumigant dissipates (personal communication Dr. Hanna Daoud, Soil Microbiology, University of California, Davis), they are general biocides and will kill beneficial soil organisms.

Based on discussions among the Deputy Regional Director, Refuges and Wildlife, and Ecological Services on January 9, 1994, we recommend that the proposed new fumigants not be approved (Vapam and Telone II). The leased lands are opened for bids on a 5-year basis for approximately 20% of the leased area. We do recommend that Metam 426, approved in 1994, be approved for 1995 with the condition that in 1995 no fumigants will be allowed on Service lands for new leases and only Metam 426 can be used on existing leases. Using this approach, by 1999, no fumigants will be used on Service lands. This will allow Reclamation lessees a logical sequence to investigate other options. We make this recommendation based on the soil health perspective.

Other options were considered to replace fumigants. Although solarization (e.g., the use of clear plastic sheeting as mulch) has been used in strawberries for nematodes and Verticillium wilt, we do not propose implementing this method at this time for this crop (Liebman, 1994). Grossman and Quarles (1993) noted that rapeseed (*Brassica napus*) has been shown to suppress the Columbia root-knot nematode. We think these options need to be explored in the future as part of the upcoming integrated pest management planning.

2,4-D Amine, Proposal FWS R1-95-KB-02

In response to your December 12, 1994, question concerning aerial and ground application of 2,4-D amine (trade name Weedar 64), we will provide further information (including section 7 review and concurrence) under separate cover in the near future.

More Information

Please contact Scott Stenquist, Regional Integrated Pest Management Coordinator, Portland, Oregon (ARW-OPR) at (503) 231-6172, fax (503) 231-2364, or cc:Mail (StenquistS 1PO~Main) with further comments.

Thomas Dwyer

Literature Reviewed (Not Attached)

Boyer, Robin and C.E. Grue. 1994. Water analysis for agrochemical input at Tule Lake National Wildlife Refuge. Washington Coop. Fish and Wildl. Res. Unit, University of Washington, Seattle, WA. 53 pp.

Grossman, J. and W. Quarles. 1993. Strip intercropping for biological control. IPM Practitioner XV (4):15. Bio-Integral Resource Center, Berkeley, CA.

Liebman, Jamie. 1994. Alternatives to methyl bromide in California strawberry production. IPM Practitioner XVI (7):1-12. Bio-Integral Resource Center, Berkeley, CA.

Attachments

Recommendations for 1995 Pesticide Use Proposals, Agricultural Leased Lands, Tule Lake and Lower Klamath NWRs

Table I. Washington Office Reviews (Regional Office recommends approval)*

Pesticide	Crop/Application	Comparison with 1994	Rationale
1. Bayleton	grains/aerial	Same for both years. Submitted in spring, approved in April for emergency use.	Only used in emergency. Registered in California.
2. Tilt	grains/aerial	Same as above.	Same as above, but not registered in California.
3. Ridomil Bravo	onions/aerial	Rejected for aerial application, approved for ground and chemigation in 1994. Rejected for chemigation in 1995.	See Bravo. Ridomil only 10% ai.
4. Ridomil Bravo	potatoes/aerial	Same as above.	Same as above.
5. Ridomil MZ 58	onions/aerial	Approved for aerial, ground, and chemigation in 1994. Rejected for chemigation in 1995.	See Dithane. Ridomil only 10% ai.
6. Ridomil MZ 58	potatoes/aerial	Same as above.	Same as above.
7. Ridomil Copper	potatoes/aerial	Not submitted in 1994.	Low toxicity, low EEC.
8. Dithane	onions/aerial	Same as last year.	Ground application preferred, but low EECs for toxicity concerns. Buffer zones mitigate aerial concerns.
9. Dithane	potatoes/aerial	Dithane for potatoes was accidentally left out of decision process, finally approved in June 1994.	Same as above
10. Rovral	onions/aerial	Rejected for aerial application, approved for ground and chemigation in 1994. Approved for all application in 1995.	Field monitoring; low EEC compared to toxicity.
11. Rovral	potatoes/aerial	Same as above.	Same as above.
12. Rovral	onions/aerial	Same as above.	Same as above.
13. Rovral	potatoes/aerial	Same as above.	Same as above.

Table I. Washington Office Reviews (Regional Office recommends approval)*

Pesticide	Crop/Application	Comparison with 1994	Rationale
14. Bravo	potatoes/aerial	Rejected for aerial application, approved for ground and chemigation in 1994. Rejected for chemigation in 1995.	High aquatic toxicity, but buffer zones should keep it out of water.
15. Kocide	potatoes/aerial	Approved for all applications in 1994. Rejected for chemigation in 1995.	Same as above.
16. Champ	potatoes/aerial	Same as above.	Same as above.
17. Sevin XLR Plus	alfalfa/aerial	Not submitted for use on alfalfa in 1994.	Same as above. Beneficial insect habitat added in 1996.
18. Sevin XLR Plus	sugar beets/aerial	Same approval both years. Added requirement to plant beneficial insect habitat by 1996.	Same as above.
19. Malathion 8	alfalfa/aerial	Same as above.	Same as above.
20. Malathion 8	grains/aerial	Same as above.	Same as above.
21. Malathion 8	onions/aerial	Same as above.	Same as above.
22. Malathion 8	potatoes/aerial	Same as above.	Same as above.
23. Sencor DF	potatoes/aerial	Approved for ground and aerial applications in 1994. Approved for ground and aerial applications in 1995; but found in the sump, so buffer zones were increased to 150 ft from all water for aerial application in 1995.	Found in Sump 1A; increase buffer zones to 150 ft around sump, 100 ft around drains with presence of water.
24. Lexone	potatoes/aerial	Same as above.	Same as above.
25. Sencor DF	alfalfa/aerial	Same as above.	Same as above.
26. Lexone	alfalfa/aerial	Same as above.	Same as above.
27. Roundup	potatoes/aerial	Same for both years.	High aquatic toxicity, low EEC.

Table I. Washington Office Reviews (Regional Office recommends approval)*

Pesticide	Crop/Application	Comparison with 1994	Rationale
28. Roundup	onions/aerial	Same as above.	Same as above.
29. Roundup	sugar beets/aerial	Same as above.	Same as above.
30. Roundup	grains/aerial	Same as above.	Same as above.
31. Poast	sugar beets/aerial	Same for both years for sugar beets. In 1994 it was also submitted for use on potatoes.	High aquatic toxicity, low EEC.
32. Betamix	sugar beets/aerial	Same for both years.	High aquatic toxicity, low EEC.
33. Weedar 64	grains/aerial	Approved for ground and aerial applications in 1994. Approved for ground and aerial applications in 1995; but found in the sump, so buffer zones were increased to 150 ft from all water for aerial application in 1995.	Found in sump; increased buffer zones.
34. Amine 4	grains/aerial	Same as above, but Amine 4 was not approved for aerial application in 1994.	Same as above.
35. Avenge	grains/aerial	Same for both years.	Low aquatic and bird toxicities.
36. Banvel	grains/aerial	Approved for ground and aerial applications in 1994. Approved for ground and aerial applications in 1995; but found in the sump, so buffer zones were increased to 150 ft from all water for aerial application in 1995.	Found in sump; will reduce use of 2,4-D, increase buffers.
37. MCP-4 Amine	grains/aerial	Same for both years.	Low toxicity; may reduce use of 2,4-D

Recommendations for 1995 Pesticide Use Proposals, Agricultural Leased Lands, Tule Lake and Lower Klamath NWRs

Table I. Washington Office Reviews (Regional Office recommends approval)*

Pesticide	Crop/Application	Comparison with 1994	Rationale
38. Cerone Plant Regulator	grains/aerial	Same for both years.	Low toxicity.
39. Royal MH-30	potatoes/aerial	Same for both years.	Low toxicity.
40. Metam 426	potatoes/ground	Approved for 1994 by FWS Regional Office and BR Pesticide Work Group representative. Not restricted use.	Soil injection only. No movement to ground water likely. Toxic to soil organism. Same material approved for 1994. See phase-out recomendation in memo.

*Buffer zone conditions for 1995 pesticide use proposals, leased lands:

1. Increase buffer zone from 135 ft (1994) to 150 ft (1995) around sumps regardless of application method (ground, aerial, chemigation). For wicking/wiping application, no buffer zone needed.

2. For aerial application on lands away from the sumps, the buffer zone is 100 ft where water is present.

3. For ground application on lands away from sumps, the buffer zone is 25 ft where water is present.

4. Chemigation in general will have a buffer zone of 50 ft from canals and drains where water is present.

5. For specific pesticides (trade name Sencor, Lexone, and 2,4-D/Banvel) which were found in the sump (Boyer and Grue, 1994), increase buffer zone to 150 ft (1995) for aerial application around canals, drains, and sumps. For ground application, the buffer zone is 25 ft from canals and drains; no buffer zone is needed for wicking/wiping application.

These proposals (Tables I, II, and III) were not reviewed or signed at Reclamation's Sacramento, California, Regional Office or its Denver office (Reclamation's Interior Pesticide Work Group representative.

Table II. Regional Office Approvals*

Pesticide	Crop/Application	Comparison with 1994	Rationale
1. Dithane	onions/ground	See discussion in previous table.	Toxic to fish, high EEC (643 ppb); round application should keep product out of sump.
2. Dithane	potatoes/ground	Same as above.	Same as above.
3. Rovral 4F	onions/ground	Same as above.	Toxic to fish, low EEC; ground application should keep product out of sump.
4. Rovral 4F	onions/chemigation	Same as above.	Low EEC minimizes threat to fish, minimizes risk of chemigation.
5. Rovral 4F	potatoes/chemigation	Same as above.	Same as above.
6. Rovral	onions/chemigation	Same as above.	Same as above.
7. Rovral	potatoes/chemigation	Same as above.	Same as above.
8. Diquat	potatoes/ground	Same as above.	See conditions.
9. Eptam 7	potatoes/ground	Proposal was submitted late in 1994; approved in April for ground spray.	High bird toxicity, mitigated by ground incorporation.
10. Sencor	potatoes/ground	See discussion in previous table.	Increase buffer zones to 100 ft.
11. Lexone	potatoes/ground	See discussion in previous table.	Same as above.
12. Sencor	alfalfa/ground	Same as above.	Same as above.
13. Lexone	alfalfa/ground	Same as above.	Same as above.
14. Roundup	potatoes/ground	Same as above.	High aquatic toxicity, low EEC.
15. Roundup	onions/ground	Same as above.	Same as above.
16. Roundup	sugar beets/ground	Same as above.	Same as above.
17. Roundup	grains/ground	Same as above	Same as above.
18. Poast	sugar beets/ground	Same as above.	Same as above.
19. Betamix	sugar beets/ground	Same as above.	Same as above.

Table II. Regional Office Approvals*

Pesticide	Crop/Application	Comparison with 1994	Rationale
20. Stinger	sugar beets/ground	Not submitted for 1994.	Low toxicities.
21. Weedar	grains/ground	See discussion in previous table.	Found in sump; increased buffer zones to 100 ft.
22. Amine 4	grains/ground	Same as above.	Same as above.
23. Avenge	grains/ground	Same as above.	Low bird and aquatic toxicities, high mammalian toxicity, low EEC.
24. Banvel	grains/ground	Same as above.	Found in sump; increased buffer zones.
25. MCP-4 Amine	grains/ground	Same as above.	Low toxicities; will reduce use of 2,4-D.
26. Admire	potatoes/ground	Not submitted for 1994, just registered for use on potatoes in California.	Moderately high bird toxicity; field tests show low concern.

*Buffer zone conditions for 1995 pesticide use proposals, leased lands:

1. Increase buffer zone from 135 ft (1994) to 150 ft (1995) around sumps regardless of application method (ground, aerial, chemigation). For wicking/wiping application, no buffer zone needed.

2. For aerial application on lands away from the sumps, the buffer zone is 100 ft where water is present.

3. For ground application on lands away from sumps, the buffer zone is 25 ft where water is present.

4. Chemigation in general will have a buffer zone of 50 ft from canals and drains where water is present.

5. For specific pesticides (trade name Sencor, Lexone, and 2,4-D/Banvel) which were found in the sump (Boyer and Grue, 1994), increase buffer zone to 150 ft (1995) for aerial application around canals, drains, and sumps. For ground application, the buffer zone is 25 ft from canals and drains; no buffer zone is needed for wicking/wiping application.

These proposals (Tables I, II, and III) were not reviewed or signed at Reclamation's Sacramento, California, Regional Office or its Denver office (Reclamation's Interior Pesticide Work Group representative.

Table III. Regional Offices Disapproved

Pesticide	Crop/Application	Comparison with 1994	Rationale
1. Bravo	potatoes/chemigation	Approved chemigation and ground, rejected aerial application in 1994. In 1995, rejected chemigation, approved aerial and ground applications.	Toxic to fish; high EEC = toxic to trout (0.25 ppm). Risk that this product will reach water is greater with chemigation than with ground or aerial application.
2. Champ	potatoes/chemigation	Same as above.	Same as above.
3. Dithane	onions/chemigation	Same as above.	Toxic to fish, high EEC. Risk that this product will reach water is greater with chemigation than with ground or aerial application.
4. Dithane	potatoes/chemigation	Same as above.	Same as above.
5. Kocide	potatoes/chemigation	Same as above.	Same as above.
6. Ridomil MZ 58	onions/chemigation	Approved aerial, chemigation, and ground applications in 1994.	Mainly Mancozeb; same concerns as for Dithane.
7. Ridomil MZ 58	potatoes/chemigation	Same as above.	Same as above.
8. Ridomil Bravo	onions/chemigation	Approved chemigation and ground, rejected aerial application in 1994. In 1995, rejected chemigation, approved aerial and ground applications.	Mainly Bravo; same concerns as for Bravo.
9. Ridomil Bravo	potatoes/chemigation	Same as above.	Same as above.
10. Diquat	potatoes/aerial	Same as above.	Bird and mammalian toxicities.
11. Sencor	potatoes/chemigation	Same as above.	Greater chance of getting into sump.
12. Lexone	potatoes/chemigation	Same as above.	Same as above.
13. Fusilade 2000	onions/ground	Approved in 1994.	EEC = toxic for fish. High bioaccumulation potential. Use Roundup preplant.

Table III. Regional Offices Disapproved

Pesticide	Crop/Application	Comparison with 1994	Rationale
14. Fusilade 2000	onions/aerial	Approved in 1994.	Same as above.
15. Nortron	sugar beets/ground	Not submitted for 1994.	EEC = toxic for fish.
16. Goal	onions/ground	Same as above.	EEC = toxic for fish; bioaccumulation potential.
17. 2,4-D,B	alfalfa/aerial	Not submitted for 1994.	Use Sencor instead.
18. 2,4-D,B	alfalfa/ground	Not submitted for 1994.	Use Sencor instead.
19. Lorsban 4E	alfalfa/aerial	Same as last year.	High bird toxicity.
20. Rodent bait	potatoes/ground	Same as last year.	Secondary poisoning.
21. Pounce	potatoes/aerial	Same as last year.	High toxicity.
22. Pounce	onions/aerial	Same as above.	Same as above.
23. Penncap-M	grains/aerial	Same as above.	Same as above.
24. Penncap-M	onions/aerial	Same as above.	Same as above.
25. Lorsban 15G	onions/ground	Same as above.	Same as above.
26. Lorsban 4E	onions/ground	Same as above.	Same as above.
27. Disyston	grains/aerial	Same as above.	Same as above.
28. Disyston	grains/ground	Same as above.	Same as above.
29. Disyston 8	grains/aerial	Same as above.	Same as above.
30. Disyston 8	grains/ground	Same as above.	Same as above.
31. Monitor	potatoes/aerial	Same as above.	Same as above.
32. Mocap EC	potatoes/chemigation	Same as above.	Same as above.
33. Mocap 10G	potatoes/ground	Same as above.	Same as above.
34. Mocap 10G	potatoes/aerial	Same as last year.	High toxicity.

Table III. Regional Offices Disapproved

Pesticide	Crop/Application	Comparison with 1994	Rationale
35. Telone II	potatoes/ground	Not submitted for 1994. Not labeled for California use in 1994.	Restricted use. Soil organism concerns – see PUP. Soil injection only. No movement to groundwater likely. Toxic to soil organisms at greater depths. Longer efficacy. Will recolonize area after fumigant dissipates. No new fumigants to be approved. See memo.
36. Vapam	potatoes/ground	Not submitted for 1994. Not restricted use.	Soil injection only. No movement to ground water likely. Toxic to soil organisms; will recolonize after fumigant dissipates. No new fumigants to be approved. See memo.

D-5620
ENV-1.10

MEMORANDUM

To: Regional Director, LC, UC, GP, PN, MP

From: Dan Beard
Commissioner, Bureau Of Reclamation

Subject: Pesticide Use Proposal Policy Change

The Department recently modified Policy Implementation and Oversight requirements regarding pesticide use on Interior Lands and Waters. The June 16, 1994 memorandum (Attached) from the Department authorizes each Interior Agency to approve pesticide use proposals (PUPs) at some delegated level within each individual agency. It is intended that the regional and/or area offices will eventually assume review and oversight of pesticide applications. At this time, however, until interdisciplinary teams (IDTs) are established and appropriate procedures implemented in the Regions, review and oversight of "Restricted Use" pesticides, pesticide applications expected to impact threatened or endangered species, aerially applied pesticides, aquatically applied pesticides, and pesticides listed within the Departmental memorandum including the Table 1 addenda will be accomplished in the Program Analysis Office (PAO) by the Pesticide Specialist.

Interdisciplinary Teams should be established at the Regional and Area levels to review and approve PUPs developed independently or in conjunction with Integrated Pest Management Plans. Integrated Pest Management Plans should eventually take the place of individual PUPs. This policy change sets the stage for future policy modifications which should permit the PAO ultimately to establish a programmatic review process and place PUP approval authority at the Regional and Area office levels.

The Region and Area Offices should begin immediately to define their Integrated Pest Management Program requirements and establish Interdisciplinary Teams to Review and Approve PUPs and IPM plans. In the interim, the following PUP approval procedures will be authorized:

1. All pesticides and biological organisms utilized on Reclamation lands waters or facilities for pest management purposes will receive approval within the PUP process, as indicated in items 2 and 3 below, prior to application/utilization.

2. All PUPs which would have previously required Department Approval (see attachment) will be reviewed and approved prior to implementation, by the Program Analysis Office Pesticide Specialist.

3. All PUPs which would have required Regional approval (those not specifically listed in Departmental Memorandum including Table 1 of the Memorandum) prior to this date will still require final Regional approval before the pesticide may be applied.

4. Appropriate approval authority will be formally delegated by memorandum to each Region and Area Office at a later date.

5. Reclamation is presently working with other Interior Agencies to develop a Pesticide Reporting Data Base. All applications of biologicals and chemicals will need to be tracked in FY-95. Information regarding proposed applications as well as actual amounts and acreages of treatment will probably be requested by the department at the end of the calendar year. Please make certain this record material is available to plug into the data base in FY-95.

I-376.14 will be re-drafted during FY-95 to reflect these modifications.

Please ensure that all managers whose programs are associated with any form of pest management or pesticide use are aware of these policy changes.

The 4 attachments

For additional information, please contact Allan Ardoin at (303) 236-1061, extension 248.

Attachments

cc: Assistant Commissioner - Program, Budget, and Liaison
Attention: W-6550
(w/o attachment)

bc: D-5000, D-5100, D-5140, D-5500, D-5510, D-5510
(w/o attachment to each)
D-5620(3)
(w/attachment)

WBR:AArdoin:ceg::236-1061/248
(p:pest\POLICY94.fin :)

Date: 01/06/1995 03:28 pm (Friday)
From: Ardoin, Allan L.
To: ,IOSCCMAIL:"LyonL at ~IFWS"
Subject: Reclamation Policy Deleg.Authority PUP

nda,

The attached memo should help clear the dust regarding recent policy changes. We haven't totally sold out to the Regions. The authority still remains with me until such time that the Regions develop a fully functioning Interdisciplinary Team to review PUP use. Then and only then, will I officially delegate to the region that authority under memorandum to that region.

Allan

(303) 236-9336 ext 248

Files: C:\SYS\WP\ALLAN\POLICY\POLICY.94

Appendix B

Profiles for Lease Land and Rights-of-way Chemicals Considered in this Consultation

Key to Appendix B
Definitions and Descriptions of Empirical Information

MOA

Mode of action of a pesticide.

Partitioning

The distribution relationships for a chemical between the environmental compartments of air, soil, water, and biota, usually expressed by a series of partition coefficients.

Kh index

Henry's Law Constant index value. Air-water partition coefficient. Henry's law constant (Kh) is the ratio of the partial pressure of a compound in air to the concentration of the compound in water at a given temperature and equilibrium. The law describes the tendency of a pesticide to volatilize from moist soil or the surface of water bodies. The Kh index value is defined as Kh x 10^9. An index value greater than 10,000 indicates a high potential for a compound to volatilize.

Koc

The soil or sediment partition or sorption coefficient. Ratio of adsorbed chemical per unit weight of organic carbon to the aqueous solute concentration. Gives an indication of the tendency of a compound to partition between particles containing organic carbon and water, or the tendency of a compound to bind to a soil/sediment particle. A high Koc value indicates a high sorption potential and slower movement in soil (e.g., less leachability).

Kow

The n-octanol/water partition coefficient. Ratio of solute concentration in the less polar, water-saturated n-octanol phase to the solute concentration in the more polar, n-octanol-saturated water phase. Kow is large for nonpolar compounds such as many organochlorines, which indicate a compound has a higher affinity for tissue than for water and a more likely chance of bioaccumulating. Hydrophobic, nonpolar compounds such as the organochlorines DDT and PCBs exhibit Kows of 10^6 and 10^7, respectively.

BCF

Bioconcentration factor. A measure of the partitioning of a chemical between water and aquatic organisms (usually fish). Values in appendices were obtained from Kenaga (1980) or calculated by substituting the Kow value into the regression equation (log BCF = (1.53 x log Kow) - 3.03) that describes the relationship between Kow and BCF (Kanazawa 1981). A BCF value of 1 is typical of hydrophilic compounds and a value of 1 million is typical of hydrophobic compounds, such as PCBs or DDT.

t1/2

Half life. The time it takes for a chemical to reach one-half of its original concentration. For pesticides in general: <30 d non-persistent, 30-100 d moderately persistent, > 100 d persistent.

EEC

Estimated environmental concentration. Maximum expected pesticide residue concentrations likely to be found in 1 acre-foot of water or in or on vegetation immediately following application (Urban and Cook 1986).

Pesticide movement rating

Derived from the Groundwater Ubiquity Score (GUS), which relates to the pesticide's half-life and sorption (Koc) in soil. Values <0.1 represent chemicals with low movement toward groundwater and values around 4.0 describe chemicals with a very high potential to move toward groundwater.

Toxicities

LD50: Median lethal dose. Statistically-derived single dose of a chemical that will cause death to 50% of the test species under a specific set of conditions.

LC50: Median lethal concentration. The concentration of chemical, usually in food or water, that will cause death to 50% of the test species under a specific set of conditions.

NOEL: No Observable Effect Level. The highest dosage of a chemical administered to a test population over a specific time period that does not produce a toxic affect.

1989 Consultation Call

Jeopardy (J) or non-jeopardy (NJ) decisions made for shortnose and Lost River suckers and other species in the "Final Biological Opinion (EHC/BFA/9-89-1) in Response to U.S. Environmental Protection Agency's September 30, 1988, Request for Consultation on Their Pesticide Labeling Program"

NR

Not reported by the Bureau of Reclamation in the biological assessment. Information does not exist or is not readily available.

Note: The majority of the information presented in this appendix is taken from the supplement to the Bureau's biological assessment and the Pesticide Use Proposals. However, the Service supplemented these data with additional information as necessary.

REFERENCES

D.J. Urban, and N.J. Cook. 1986. Hazard evaluation division standard evaluation procedure, ecological risk assessment. U.S. Environmental Protection Agency, Office of Pesticide Programs, Hazard Evaluation Division, Washington, D.C. 540/9-86/167. 102pp.

Kenaga, E.E. 1980. Predicted bioconcentration factors and soil sorption coefficients of pesticides and other chemicals. Ecotoxicol. Environ. Saf. 4:26-38.

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Propiconazole (Tilt)

TYPE: Systemic foliar fungicide
FORMULATION: Liquid emulsion, 41.8% AI
APPLICATION/USAGE: *Grains*-Aerial at 4 oz/ac for yellow barley stripe rust
NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 10,200 ac barley (150 sites), 1,700 ac wheat (55 sites)
CHEMICAL FAMILY: Triazole or conazole
MOA: NR
Kh index: 70
Koc: 650
Kow: 892
BCF: 30.48
EEC: Water= **0.037** ppm; wheat=0.02 ppm.
PESTICIDE MOVEMENT RATING: Moderate
ENVIRON. FATE: Aerobic soils t1/2 at 25°C = **40-70 d**. Aerobic/aquatic t1/2 at 25°C = **25-85 d**. Distilled/deionized water t1/2 at pH 9.0 w/ borate buffer=**442 d**.
METABOLITES: NR
TOXICITIES:

Mammalian	LD50, acute oral, rats = 1517 mg/kg.
Bird:	LD50 (acute oral, mg/kg) mallard >2510; bobwhite = 2825.
Aquatic:	LC50 (96 hours, mg/L) carp >100, brown trout = 20; rainbow = 0.9-13.2; bluegill=1.3 - 10.2.

1989 CONSULTATION CALL: NR

USE IN 1994: NOT USED.

USE/EXPOSURE: Emergency use for yellow barley stripe rust if it invades basin. Not labeled for use in California; has not been used on the lease lands in Oregon before.

Chlorothalonil (Bravo 720)

TYPE: Non-systemic organochlorine fungicide.
FORMULATION: Liquid, 54% AI
APPLICATION/USAGE: *Potatoes*-Aerial, 0.75-1.5 pts/ac, early blight.
NO. APPLICATIONS: up to 4/season
PROJECTED USE 1995: 3,600 ac potatoes (100 sites)
CHEMICAL FAMILY: Phthalimide
MOA: NR
Kh index: 24,000,000
Koc: 1380
Kow: 436.5
BCF: 10.21
EEC: Water = 0.18364 ppm, leafy = 61 ppm.
PESTICIDE MOVEMENT RATING: Low (except in sand)
ENVIRON. FATE: Soil t1/2= **4.1 d-3 mo** depending moisture, temp. Aquatic t1/2 **few hours to few d** under aerobic and anaerobic conditions. Not accumulated in treated soils. At pH 9 converted to metabolites. This breakdown appears to be primarily the result of microbial degradation, since chlorothalonil is relatively stable to hydrolysis and photolysis. Chlorothalonil is immobile in most soil types, except sand, in which it is relatively mobile.
METABOLITES: 1,3-dicyano-4-hydroxy-2,5,6-trichlorobenzene; 1,3-dicarbamoyl-2,4,5,6-tetrachlorobenzene, and 1-carbamoyl-3-cyano-4-hydroxy-2,5,6-trichlorobenzine. Mammals excrete largely unchanged, although there is some metabolism to the 4 hydroxy derivative, which is more acutely toxic than the parent compound.
TOXICITIES:
Mammalian: LD50 (mg/kg), acute oral, rat >10,000.
Bird: LD50 (mg/kg), acute oral, mallard >4640; LC50, 8-d, mallard >21,500 diet.
Aquatic: LC50 (96 h, mg/L), rainbow=0.25, channel catfish=0.43. Farm Chemicals Handbook - LC50 (96 h, mg/L), rainbow=0.049, bluegill=0.062. Chlorothalonil and its 4-hydroxy degradate are highly toxic to fish and aquatic invertebrates. Low amounts of residues will affect the reproduction of these organisms.
1989 CONSULTATION CALL:
J on crop/forest use to fish, toad, mussels, amphipod, shrimp
J to Lost River and shortnose suckers (RPA 1/4; IT/RPM 3a)
USE IN 1994:
Sump 2 lease lands: 564 pints applied on 451 acres at an average rate of 1.25 pints per acre.
Sump 3 lease lands: 178 pints applied on 140 acres at an average rate of 1.27 pints per acre.
Out of this total, , 28 pints and 34 pints were applied to 28 acres and 33 acres of potatoes, respectively in units 40 and 41 (adjacent to Tule Lake Sump 1A).

USE/EXPOSURE: Toxic to fish and other aquatics. Some studies show rapid dissipation in aquatic environment. Listed as carcinogen by EPA (RENCY). Label states: "DO NOT apply directly to water, to areas where surface water is present..." DO NOT contaminate water when disposing of equipment wash waters. DO NOT apply when weather conditions favor run-off and/or drift from target area."

Triadimefon (Bayleton)

TYPE: Systemic foliar fungicide
FORMULATION: Wettable powder, 50% AI
APPLICATION/USAGE: *Grains*-Aerial, 4-8 oz/ac, yellow barley stripe rust.
NO. APPLICATIONS: Only used if infection occurs
PROJECTED USE 1995: 10,200 ac barley; 1,700 ac wheat
CHEMICAL FAMILY: Triazole or conazole
MOA: NR
Kh index: 3.3
Koc: 300
Kow: 811
BCF: 26.35
EEC: Water = 0.0918 ppm; long grass = 29 ppm.
PESTICIDE MOVEMENT RATING: Moderate
ENVIRON. FATE: Soil t1/2 40-70 days; t1/2 > **1 year** at pH 3, pH 6, and pH 9; sandy loam t1/2 = **18 d** (Triadimefon), 110-375 d (triadimenol).
METABOLITES: Soil: carbonyl group reduced to hydroxyl group = triadimenol. Liver: to triadenol and glucuronic acid conjugates.

TOXICITIES:

Mammalian: LD50 (mg/kg), acute oral, rat, male= 568; female 313; mice = 989-1071.
Bird: LD50 (mg/kg), acute oral, mallard >4000; LC50, 8-d, mallard >10,000 diet; LC50, 8-d dietary, Bobwhite > 4640 diet..
Aquatic: LC50 (96 h, mg/L) bluegill=11, rainbow=14, carp=7.6 (48 h).

1989 CONSULTATION CALL: NR

USE IN 1994: NOT USED.

USE/EXPOSURE: Emergency for yellow barley stripe rust if it invades the basin. Has not been used on the lease lands before. Label states: "Keep out of lakes, streams, and ponds. Do not contaminate water by cleaning of equipment or disposal of wastes. "

Mancozeb (Dithane F-45)

TYPE: Protectant fungicide.
FORMULATION: Liquid (37% AI on potato, 47% AI on onion)
APPLICATION/USAGE: *Potatoes*-Ground/aerial, 0.8-1.6 qts/ac, early blight.
Onion-Ground/aerial, 2.4 qts/ac, downy mildew and neck rot.
NO. APPLICATIONS: Up to 8/season
PROJECTED USE 1995: 3600 ac potatoes (100 sites), 100 ac onions (10 sites)
CHEMICAL FAMILY: Dithiocarbamate, organomanganese, or organozinc
MOA: NR
Kh index: 0
Koc: 2000
Kow: 0.11-21.4
BCF: 0.10
EEC: Water = 0.643 ppm, leafy = 210 ppm.
PESTICIDE MOVEMENT RATING: Low
ENVIRON. FATE: Distilled water t1/2, pH 8.5, **<0.125 d**; Soil t1/2= **6-70 d**. Low bioaccumulation potential, rapidly degraded in the environment by hydrolysis, oxidation, photolysis, and metabolism. Rapidly excreted by animals.
METABOLITES: Ethylene thiourea (ETU), ethylene thiuram disulfide, thiuram monosulfide, sulfur.

TOXICITIES:

Mammalian: LD50 (mg/kg), acute oral, rats >5000; mice = 600.
Avian: In 10-day dietary studies, no mortalities in mallard at 6400 mg/kg/day and in Japanese quail at 3200 mg/kg/day.
Aquatic: LC50(48 hrs, mg/L), goldfish=9.0; rainbow trout=2.2; catfish=5.2; carp= 4.0.

1989 CONSULTATION CALL: J on crop/forest to fish, toad, **shortnose and Lost River suckers** (RPA 1; IT/RPM 3a)

USE IN 1994:
Sump 2 lease lands, 2565.6 pints applied on 873 acres, average rate 2.94 pints per acre.
Sump 3 lease lands, 4792 pints applied on 1723 acres, average rate 2.78 pints per acre.
Three units adjacent to Sump 1A used this product three times each on potatoes:
1) #37- 80, 96, and 88.48 pints on 30 acres
2) #40- 40, 96, and 96 on 32 acres
3) #41- 40, 96, and 96 pints on 32 acres.

USE/EXPOSURE: Listed as an endocrine disrupter. The major reported toxicological concern from exposure to mancozeb is the hazard to the human thyroid from the presence of ethylenethiourea (ETU), a contaminant, degradation product, and metabolite present in mancozeb. Boyer and Grue (1994) found Mn as Dithane only in June and at concentrations ranging from 4.4 - 43 ppb. Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

Copper Hydroxide (Champ, Kocide 606)

TYPE: Protectant fungicide.
FORMULATION: Liquid (Champ-Flowable)
APPLICATION/USAGE: *Potatoes*-Aerial, **0.66-2.66 pts/ac**, 23% AI (Champ); **0.7-2.8 qts/ac**, 37.5% AI (Kocide), early blight.
Onions-Chemigation/aerial, **1.5 qts/ac**, 37.5 % AI (Kocide), downy mildew and botrytis.
NO. APPLICATIONS: up to 4/season
PROJECTED USE 1995: 3,600 ac potatoes (100 sites)
CHEMICAL FAMILY: Copper
MOA: NR
Kh index: NR
Koc: NR
Kow: NR
BCF: NR
EEC: Water=approx. 0.27545 ppm, leafy crops 85 ppm.
PESTICIDE MOVEMENT RATING: NR
ENVIRON. FATE: NR
METABOLITES: NR
TOXICITIES:

Mammalian:	LD50 (mg/kg), acute oral, rats=1000
Avian:	LD50 (mg/kg), acute oral, mallard >5000
Aquatic:	LC50 (96 h, mg/L), rainbow= 0.08, bluegill sunfish >180.

1989 CONSULTATION CALL: NR

USE IN 1994:
Kocide-
Sump 2 lease lands, 224 pints applied over 85 acres, average rate 2.64 pints per acre.
Sump 3 lease lands, 712 pints applied over 647 acres, average rate 1.1 pints per acre.

Champ flowable-
Sump 2 lease lands, 622.64 pints applied over 308 acres, average rate 2.0 pints per acre.
Sump 3 lease lands, 2020.96 pints applied over 832 acres, average rate 2.43 pints per acre.
Out of this total, 60 pints were applied to 30 acres of potatoes on lot 37 (adjacent to Sump 1-A).

USE/EXPOSURE:
Boyer and Grue (1994) found copper at Tule at **<1.0 - 35 ppb** at all sites. Copper toxicity decreases as pH increases. Tule lake has medium alkalinity of 100-200 mg/l $CaCO_3$ and high total organic carbon. Threat exists of copper to accumulate in invertebrates and fish (Boyer and Grue 1994). Label states not to apply product directly to water or to areas where surface water is present, and do not apply when weather conditions favor run-off and/or drift from target area. The label also states not to contaminate water when disposing of equipment wash waters.

Malathion (Malathion 8 Aquamul)

TYPE: Non-systemic insecticide and acaricide
FORMULATION: Liquid, 81.8% AI
APPLICATION/USAGE: Applied several times per season.
Grains-Aerial, 1-1.25 pts/ac, (Malathion 8 Aquamul), Russian wheat aphid, oat bird-cherry aphid, English grain aphid, green bug
Potato-Aerial, 1-3 pts/ac, green peach aphid
Onion--Aerial, 1-2 pts/ac, thrips, onion maggot
Alfalfa-Aerial, 1.25-2 pts/ac, pea aphid
NO. APPLICATIONS: Every 7 days following infestation (potatoes, onions)
Up to 4/season (grains)
1 per cutting (alfalfa)
PROJECTED USE 1995: 3,100 ac potatoes (100 sites); 100 ac onions (10 sites); 10,200 ac barley; 1,700 ac wheat; 3,400 ac oats; 631 ac alfalfa (11 sites)
CHEMICAL FAMILY: Organophosphorus
MOA: Contact stomach and respiratory action, cholinesterase inhibitor.
Kh index: 1000
Koc: 1800
Kow: 182
BCF: 2.68 calculated. 37 (Kenaga 1980).
EEC: Water= 0.73525 ppm, leafy =250 ppm, long grasses= 230 ppm, alfalfa= 105 ppm

PESTICIDE MOVEMENT RATING: extremely low
ENVIRON. FATE:
Organic-rich soil t1/2 about **1 d**. Hydrolysis t1/2 (pH 7.4, 20 and 37.5°C = **10.5 and 1.3 d**. After 7 days (pHs 9.0 and 11.0) 25 and 100% hydrolyzed. t1/2 at pH 8, 0°C= **40 d**, 27°C=**36 h**, and 40°C= **1 h**. Relatively stable in neutral aqueous media, but decomposed by acids and alkalis. Degrades rapidly in soils and losses of 50-90% in 24 hours have been reported
METABOLITES:
Metabolism and degradation are through several different pathways and one metabolic intermediate, malaoxon, is known to be more toxic than the parent compound, but very transitory. Degradation of Malathion in organic-rich soils is 3-6 times higher than in soils not containing organic matter. In soil, degraded by Arthrobacter sp. to Malathion monoacid, Malathion dicarboxylic acid, potassium dimethylphosphorothioate, and potassium dimethylphosphorodithioate. Hydrolyzes in water forming cis-diethyl fumarate, trans-diethyl fumarate, thiomalic acid, and dimethyl thiophosphate. Under alkaline conditions (pH 8 and 27°C), Malathion degraded in water to Malathion monoacid, diethyl fumarate, ethyl hydrogen fumarate, and O,O-diethyl phosphorodithioic acid.
TOXICITIES:
Mammalian:
LD50 (mg/kg), acute oral, rat =1375-2800, mice= 775-3320
Avian:
LD50 (mg/kg) horned lark=403, mallard=1485, ring-necked pheasant=167. NOEL starling and red-winged blackbird =100 mg/kg. Six-month old Japanese quail had LC50 of 2968 diet.

Six-month old mallard ducks = no mortality to 5000 ppm. Six-month old northern bobwhite had LC50= 3497 diet. Four-month old ring-necked pheasant dietary LC50= 2639 ppm. LC50s for mallard eggs determined for external applications were less than 11 times the maximum field application level; some teratogenic effects observed.

Aquatic:

LC50 (mg/L, 96 h): Coho salmon is =**0.16-0.18**; cutthroat trout =**0. 27-0.31**; rainbow trout= **0.16-0.24**; brown trout=**0.84-0.115**; lake trout=**0.047-0.123**; goldfish= **8.34-13.8**; carp= **4.92-8.82**; fathead minnow= **8.65**; bluegill= **0.103**, green sunfish=**0.175**; largemouth bass=**0.285**, channel catfish=**8.97**; black bullhead=**12.9**. Lake trout fry (0.3 g) 2x as sensitive as fingerlings (4.5 g). Increase from 7-29°C caused 4x increase in toxicity to bluegills. Salmonids exposed to 0.12-0.30 mg/l Malathion showed acetylcholinesterase (AChE) inhibition of 70-80%, and activity indices were reduced by 50-70% of that of unexposed fish. Goldfish exposed to sub-lethal levels showed a significantly reduced frequency of avoidance response at levels below that causing a reduced AChE activity.

1989 CONSULTATION CALL:

J on crops/forest/mosquito larvicide/rangeland to salamanders, toads, fish, mussel, amphipod, isopod, shrimp.

J to Lost River and shortnose suckers (RPA 1, IT/RPM 3a)

USE IN 1994:

Sump 2, 4483.4 pints applied on 2143 acres, average rate of 2.1 pints per acre.
Sump 3, 8776.2 pints applied to 5404 acres, average rate of 1.6 pints per acre.
Out of this total, 231.12 pints were applied once to 183.7 acres of wheat, and 185.36 pints were applied once to 146.7 acres of barley on units 1, 2, 6 and 7.
Lots 3 and 4: 34 and 35 acres of onions respectively, were sprayed 6 times.
Lot 3, the applications were 68, 67, 67, 68, 69 and 68 pints.
Lot 4, the applications were 70, 70, 69, 69, 69 and 68 pints.
Lot 37, 75 pints were applied once to 30 acres of potatoes.
Both Lots 40 and 41 have 32 acres of potatoes, each lot was sprayed twice and each application was 96 pints. (adjacent to Tule Lake Sump 1A).

USE/EXPOSURE:

Malathion applied at 0.6-1.1 kg/ha (0.5-1.0 lb/ac) resulted in no observed mortality of wild birds in one study conducted, and bird counts after spraying were either higher or nearly the same as before spraying. Applied at rates of 852-1140 g/ha (12-16 oz/ac) to fields containing caged quail, evidence of mortality or population changes of wild birds were not observed. Malathion was aerially applied to a forested watershed at the rate of 0.81 kg/ha, and birds reacted to the spraying for 2 days without lasting effects.

Tadpoles exposed to 5 mg/l Malathion through a continuous-flow apparatus did not bioaccumulate levels that were toxic when fed to 2-week old mallard ducklings in a single meal. Degradation is by oxidative desulphuration by liver microsomal enzymes, leading to the formation of malaoxon; Malathion and malaoxon are hydrolyzed and thus detoxified by carboxylesterases. Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

Carbaryl (Sevin XLR Plus)

TYPE: Contact insecticide
FORMULATION: Liquid, 41.2% AI
APPLICATION/USAGE: *Sugar beets*-Aerial, 1-1.2 qts/ac, cutworms
Alfalfa-Aerial, 0.5-1.5 qts/ac, for alfalfa weevil and Egyptian alfalfa weevil
CHEMICAL FAMILY: Carbamate
NO. APPLICATIONS: up to 2/season (sugar beets); 11/season (alfalfa)
PROJECTED USE 1995: 600 ac sugar beets (20 sites); 631 ac alfalfa
MOA: Contact and stomach action, and slight systemic properties. Weak cholinesterase inhibitor. Also acts as a plant growth regulator.
Kh index: 100
Koc: 300
Kow: 70.8
BCF: 18.59 calculated. 12 (Kenaga 1980).
EEC: Water= 0.14691 ppm, long grasses= 44 ppm, leafy= 52 ppm

PESTICIDE MOVEMENT RATING: low
ENVIRON. FATE:
Sandy loam t1/2, aerobic conditions, 1 ppm, **7 -14 d** and **14-28 d** clay loam. Estuarine water t1/2, 8°C, w/o mud = **38 d**; w/ mud, both carbaryl and 1-naphthol decreased to < 10% after 10 d. Hydrolysis increased with temperature, and increases of pH > 7.0. Insecticidal activity > 2 weeks unusual, although oil carrier increases persistence. Disappearance of carbaryl residue from plant surfaces is attributed to mechanical attribution, volatilization, and uptake into the plant. Soil fungi also attack carbaryl by hydroxylation of the side chain and ring structure.
METABOLITES: Hydrolyzed in alkaline media to 1-naphthol. In mammals, rapidly metabolized to non-toxic substances, particularly 1-naphthol.

TOXICITIES:
Mammalian: LD50 (mg/kg), acute oral, rat 850, female rat=500
Avian: LD50 (mg/kg, 50% carbaryl), acute oral, Canada geese=1790; LD50 (mg/kg) 3-mo female mallard (85%) >2564; 3-mo male pheasants (95% C) >2000.
Aquatic: LC50 (mg/L, 96 h) Cutthroat trout =**5.24-9.62**; rainbow trout= **1.42-2.63**; brown trout = **5.52-7.19**; brook trout = **1.68-2.62**; lake trout = **0.52-0.91**; goldfish = **8.31-20.8**; carp = **4.62-6.05**. When temperatures are increased from 7-17°C, brook trout toxicity significantly increased 4-11-fold. **Alkaline test solutions (pH 8.5-9) were 1.4-11.4 times more toxic to trout, than were test solutions with lower pH.** Test solutions aged for 3 weeks were more toxic to cutthroat trout.

1989 CONSULTATION CALL:
J on crops/forests/pasture/rangeland to salamander, toad, fish, mussel, amphipod, isopod, crayfish, shrimp.
J to Lost River and shortnose suckers (RPA 1, IT/RPM 3a)

USE IN 1994:
Sump 2, 340 pints applied on 165 acres, average rate of 2.1 pints per acre.
Sump 3, 596 pints applied to 298 acres, average rate of 2.0 pints per acre. There were no sugar beets grown in the lots adjacent to Sump 1A in 1994.

USE/EXPOSURE:
Preliminary data indicate that there may be a potential for carbaryl and its residue to accumulate in catfish, crayfish, snail, duckweed and algae. Teratogenicity trials have so far been inconclusive and two studies did produce teratogenicity in the beagle dog.

A 1.1 kg/ha (1 lb/ac) aerial application of carbaryl was believed to have caused some nesting fatalities in tree swallows through ingestion of poisoned insects; however, a cause-effect relation was not completely demonstrated. Many studies have investigated possible changes in forest bird populations following the application of carbaryl. Of these studies, 2 have found a low occurrence of ChE-inhibited birds. Other studies have not observed detectible changes in bird numbers following applications of carbaryl. A review of field tests of carbaryl applied at rates of 483-1136 g/ha (6.8-16.0 fl oz/ac) concluded that no wildlife mortality was observed, although some decreases in bird numbers did occur.

Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

Desmedipham/Phenmedipham (Betamix)

TYPE: Mixture of two selective, systemic herbicides
FORMULATION: Liquid emulsion, 16% AI (8% phenmedipham and 8% desmedipham)
APPLICATION/USAGE: *Sugar beets*-ground or aerially applied at 4.5-7.5 pints/acre for kochia, pigweed, lambsquarters, wild mustard, annual sowthistle, shepherds purse, black nightshade, chickweed
NO. APPLICATIONS: Up to 3/season (not to exceed 12 pints/acre per season)
PROJECTED USE 1995: 600 ac sugar beets (20 sites).
CHEMICAL FAMILY: Both carbamates
MOA: Absorbed through the leaves with translocation primarily in the apoplast, inhibits photosynthesis (same for both herbicides).

	Desmedipham	**Phenmedipham**
Kh index:	6.0	4100
Koc:	1500	2400
Kow:	398	385

EEC: **Betamix**: Water = 0.11018 ppm at rate of 1.7 pts/ac; leafy crops = 36 ppm
BCF: **Desmedipham**: 8.87
Phenmedipham: 8.43 calculated and 330 (Kenaga 1980)
PESTICIDE MOVEMENT RATING: **Desmedipham** = low; **Phenmedipham** = very low.
ENVIRON. FATE:
Desmedipham: Soil t1/2, pH 5 = **70 d**; pH 7 = **20 h**; pH 9 = **10** min. 50% hydrolysis occurs in 31 d at pH 5, in 14 h at pH 7, and in 20 min at pH 9.
Phenmedipham: Soil t1/2 (slightly acidic soil), **22-55 d**. At 22°C, 50% hydrolysis occurs in 70 d at pH 5, in 24 h at pH 7, and 10 min at pH 9.
METABOLITES:
Desmedipham: Degrades in soil forming the intermediate 3-hydroxycarbanilate. In sugar beet, ethyl N-(3-hydroxyphenyl)carbamate is the major metabolite, with m-aminophenol as a further metabolite. In mammals following oral administration, 80% of the parent compound and its metabolites are eliminated in the urine within 24 hours.
Phenmedipham: Metabolites include methyl N-(3-hydroxyphenol)carbamate and m-aminophenol, and subsequently complexes with soil components. Methyl N(3-hydroxyphenol)carbamate is the major metabolite in plants. In mammals, following oral administration, 99% is excreted within 72 hours, mainly in the urine.

TOXICITIES:
Desmedipham:
Mammalian LD50 (mg/kg), acute oral, rat >10,250, male mice = 3160, male mouse (product) = 1325-1500.
Avian: LC50(mg/kg, 5 d) bobwhite quail and mallard > 10,000 diet.
LC50(mg/kg, 4 d) northern bobwhite = 2,480 diet.
Aquatic: LC50(mg/L, 96 hrs), rainbow trout=1.7-3.8; bluegill = 6.0-13.4.

Phenmedipham:

Mammalian LD50 (mg/kg), acute oral, rats and mice >8,000.

Avian: LD50 (mg/kg), acute oral, chickens >3000, mallard > 2100 mg/kg.
LC50(mg/kg, 8 d) mallard and bobwhite quail > 10,000 diet.

Aquatic: LC50(mg/L, 96 hrs) harlequin fish = 16.5 (15.9% EC formulation); bluegill sunfish = 3.98 (Tech); rainbow trout = 1.4-3.0 (Tech).

1989 CONSULTATION CALL: NR

USE IN 1994: **Betamix**:
Sump 2 - 274.5 pints were applied on 165 acres at an average rate of 1.7 pints per acre.
Sump 3 - 51 pints were applied on 55 acres, at an average rate of 0.92 pints per acre.
None was applied adjacent to Sump 1A.

USE/EXPOSURE: Not found in the sumps in 1994 or earlier studies. Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

Diuron (Karmex DF)
Bromacil, Diuron (Krovar I and Krovar I DF)

TYPE: Herbicides (Diuron is a systemic)
FORMULATION: Krovar I (40% Bomacil, 40% Diuron): powder
Krovar I DF (40% Bomacil, 40% Diuron): dispersible granules
Karmex DF (Diuron): 80% AI, dispersible granules.
APPLICATION/USAGE:
Rights-of-way
Krovar I: 19-30 lbs/ac, Mar-Apr, ground for annuals and perennials, no application will be made to water surface (PUP)
Krovar I DF: 4-30 lbs/ac, by boom and hand
Karmex DF: 5-15 lbs/ac, by boom and hand

NO. APPLICATIONS: 1 (all formulations)
PROJECTED USE 1995:
Krovar I: 1 site (3 ac)
Krovar I DF: 37 pumping stations, 200 irrigation control structures and road crossings
Karmex DF: 37 pumping plants, 200 irrigation control structures and road crossings

CHEMICAL FAMILY: **Diuron**: urea **Bromacil**: uracil
MOA: **Diruron**: Inhibits photosynthesis. Systemic, absorbed mainly by roots, translocation acropetally in the xylem.
Bromacil: Inhibits photosynthesis. Absorbed mainly though the roots, slight absorption through leaves and stem.

	Diuron	**Bromacil**
Kh index:	NR	NR
Koc:	NR	NR
Kow:	700±50 (25°C)	42.6 (pH 9)
EEC:	NR	NR
BCF:	NR	NR

PESTICIDE MOVEMENT RATING: NR
ENVIRON. FATE:
Diuron Soil: enzymatic and microbial demethylation of the nitrogen atom and hydroxylation at position 2 of the benzene ring. Residual activity in soil about 4-8 months.
Bromacil: Soil: Can seep or leach through soil and can enter groundwater. Residual activity in soil about 5 months.

METABOLITES: NR

TOXICITIES:

Diuron:

Mammalian: LD50 (mg/kg), acute oral, rat, 3,400; mice=1,350; (Krovar I: rat 5,980)

Avian: LC50(mg/kg, 5 d) Japanese quail >5,000 (tech); bobwhite quail (8 d) =1,730 ring-necked pheasant >5,000 (NOEL); mallard (8 d)>5,000 (NOEL).

Aquatic: LC50(mg/L, 96 hrs):0.8 g rainbow trout=4.9 (95% Tech); 1.2 g rainbow trout=16 (80% wet powder); rainbow trout (48 h)=4.3; salmon (48 h)=16; largemouth bass (48 h)=42; bluegill (48 h) > 60; 0.8 g bluegill=8.2 (95% Tech); 0.3 g cutthroat trout=1.4 (95% Tech); striped bass fingerlings (48 h) =8; *Pteronarcys*=1.2 (95% Tech); *Daphnia pulex* = 1.4 (95% Tech); scuds (amphipods)=1.8 (48 h). Krovar I: Rainbow (96 h)=11.6

Bromacil:

Mammalian: LD50 (mg/kg), acute oral, male rat =2,000; female rat=1,320; mouse= 3,040

Avian: NR
LC50(mg/kg, 5 d) Japanese quail >5000 (tech)

Aquatic: LC50(mg/L, 96 hrs): bluegill=71; rainbow trout=78
From Stenquist: rainbow trout=36 (28 from Farm Chemicals Handbook); fathead minnow=182; bluegill=127; carp (48 h)=164; tadpoles (48 h)=230; crawfish (72 h)=40.

1989 CONSULTATION CALL: Diuron: NJ on crops to Lost River and shortnose suckers (IT/RPM 3a)
Bromacil: NR

USE IN 1994: 200 lbs of Krovar II DF and 200 lbs of Karmex DF applied in 1994

USE/EXPOSURE: NR

Methoprene (Altosid Liquid Larvicide)

TYPE: Insect growth regulator
FORMULATION: 3-4 oz/ac, AI 20%
APPLICATION/USAGE: *Rights-of-way*-ground/aerial for disease vectors and nuisance mosquito larvae (excluding encephalitis-bearing species)
NO. APPLICATIONS: NR
PROJECTED USE 1995: NR
CHEMICAL FAMILY: NR
MOA: Mimics action of juvenile hormone

Kh index: NR
Koc: NR
Kow: NR
EEC: NR
BCF: NR
PESTICIDE MOVEMENT RATING: NR
ENVIRON. FATE: NR

METABOLITES: NR

TOXICITIES:

Mammalian	LD50 (mg/kg), acute oral, rat >5,000; rabbit (dermal) > 2,000
Avian:	LD50(mg/kg), mallard >2,000, signs of intoxication at 500; quail >10,000 LC50(mg/kg, 5 d) Japanese quail >5000 (tech 68.9%); mallard (8 d)>10,000
Aquatic:	LC50(mg/L, 96 hrs): 0.6 g rainbow trout=1.6 (68.9% tech); 1.2 g channel catfish >100 (68.9% tech); 0.6 g bluegill=2.9 (68.9% tech), bluegill= 1.52; 0.7 g fathead minnow >10 (tech and slow release); adult diving beetle=2; mayfly >10 (NOEL); back swimmers 1.2; bullfrog tadpole >10 (NOEL); grass shrimp (96 h)>10; *Daphnia magna* EC50=0.089

1989 CONSULTATION CALL: J to 1 fish, but no opinion on Lost River or shortnose suckers.

USE IN 1994: Not used

USE/EXPOSURE: NR

Petroleum Distillate (Mosquito Larvicide GB1111)

TYPE: Petroleum
FORMULATION: 2-5 gal/ac, AI 98.7%
APPLICATION/USAGE: *Rights-of-way*-ground for disease vectors and nuisance mosquito larvae (including encephalitis bearing species)
NO. APPLICATIONS: NR
PROJECTED USE 1995: NR
CHEMICAL FAMILY: NR
MOA: NR

Kh index: NR
Koc: NR
Kow: NR
EEC: NR
BCF: NR
PESTICIDE MOVEMENT RATING: NR
ENVIRON. FATE: NR

METABOLITES: NR

TOXICITIES: Toxicities of Golden Bear (GB) 1356 petroleum distillate.

Mammalian LD50 (mg/kg, acute oral): rat >10,000
Avian: NR
Aquatic: NOEL: mayfly naiad (2 or 4 gal GB 1356/ac); dragonfly naiad (2 or 4 gal GB 1356/ac); damselfly naiad (4 gal GB 1356/ac); tadpole (2 or 4 gal GB 1356/ac).

1989 CONSULTATION CALL: NR

USE IN 1994: NOT USED

USE/EXPOSURE: Label:"Product toxic to fish and wildlife and aquatic organisms, do not apply directly to water (except when applied for mosquito larvae control, and then only around the borders of these areas and in shallow water). Consult your Fish and Game Agency before applying this product."

Sethoxydim (Poast)

TYPE: Selective systemic herbicides.
FORMULATION: Liquid, 18% AI,
APPLICATION/USAGE:
Sugar beets-Aerial/ground, 1.5-2.5 pts/ac, wild oats, annual rye grass, volunteer grains, foxtails.
NO. APPLICATIONS: 1-2/season
PROJECTED USE 1995: 600 ac sugar beets (20 sites).
CHEMICAL FAMILY: Cyclohexene or oxime
MOA: Absorbed predominately by the foliage, and to a lesser extent by the roots, translocated rapidly both acropetally and basipetally. Inhibits mitosis.
Kh index: 95
Koc: 100
Kow: 0.93-3260
BCF: 221
EEC: Water= 0.03673 ppm, leafy= 6 ppm, long grasses=1 ppm.

PESTICIDE MOVEMENT RATING: low
ENVIRON. FATE: Soil t1/2 = **25 d.**
METABOLITES: Metabolism in soil involves molecular rearrangement, oxidation, and conjugation processes.
TOXICITIES:
Mammalian LD50 (mg/kg), acute oral, male mice=5600, female mice=6300
Avian: LD50 (mg/kg), acute oral, Japanese quail >5000; LC50 (5 d) for bobwhite quail and mallard >4000 mg/kg diet.
Aquatic: LC50 (mg/L, 96 h) trout=30, carp= 1.6.

1989 CONSULTATION CALL: NR
USE IN 1994:
Sump 2, 842.1 pints applied on 521 acres, average rate 1.6 pints per acre.
Sump 3, 333.2 pints applied on 237 acres, average rate 1.4 pints per acre.
Out of this total, 104.32 pints were applied to 64 acres of potatoes, in units 40 and 41 (adjacent to Tule Lake Sump 1A).

USE/EXPOSURE: Label states not to apply product directly to water wetlands. The label also states not to contaminate water when disposing of equipment wash waters.

Metribuzin (Sencor DF, Lexone DF)

TYPE: Selective systemic herbicide
FORMULATION: Dry flowable powder, granules (aerial) 75%AI
APPLICATION/USAGE:
Potato-Aerial/ground, 0.66 lbs/ac (Sencor or Lexone), pigweed, lamsquarter, Russian thistle, foxtails, barnyard grass.
Alfalfa-Aerial/ground, 0.51-1.33 lbs/ac (Sencor or Lexone), cheatweed, kochia, tansy mustard, shepherds purse, wild oats, seedling dandelion, foxtail barley, curly dock.
NO. APPLICATIONS: up to 2/season (potato); 1/season (Alfalfa)
PROJECTED USE 1995: 3,100 ac potatoes (100 sites), 631 ac alfalfa (11 sites)
CHEMICAL FAMILY: triazine
MOA: Absorbed predominately by the roots, but also by the leaves, with translocation acropetally in the xylem, inhibits photosynthesis.
Kh index: 95
Koc: 60
Kow: 57
BCF: 0.45 and 4-11 (Kenaga 1980)
EEC: water= 0.18364 ppm, leafy =53 ppm
PESTICIDE MOVEMENT RATING: high.
ENVIRON. FATE: Soil t1/2= **1-2 mo**; pond water t1/2 approximately **7 d**.

METABOLITES: Soil, microbial breakdown is the major mechanism of loss. Degradation involves deamination, followed by further degradation to water soluble conjugates. Losses to photodecomposition or volatilization are insignificant.

TOXICITIES:
Mammalian LD50 (mg/kg), acute oral, male rat= 1200, female rat=1100
Avian: LD50 (mg/kg), acute oral, bobwhite quail =164; LC50 (5 d) for bobwhite quail and mallard >4000 mg/kg diet.
Aquatic: LC50 (mg/L, 96 h) rainbow trout=76, bluegill sunfish = 80 mg/l.

1989 CONSULTATION CALL: NR

USE IN 1994:
Sencor DF: Sump 2, 473.3 pounds applied on 735.5 acres, average rate 0.64 pounds per acre. Sump 3, 729.4 pounds applied on 1136 acres, average rate 0.64 pounds per acre.
Out of this total, 62.04 pounds were applied one time to 94 acres of potatoes, in units 37, 40, and 41 (adjacent to Tule Lake Sump 1A).
Lexone DF: Sump 2, 136.8 pounds applied on 205.8 acres, average rate 0.66 pounds per acre. Sump 3, 121.3 pounds applied on 183.8 acres, average rate 0.66 pounds per acre.
Out of this total, 23 pounds were applied one time to 30 acres of potatoes, in unit 1. (adjacent to Tule Lake Sump 1A).
USE/EXPOSURE: Listed as an endocrine disrupter. Detected in Tule lake sump (Boyer and Grue 1994) throughout June and July at 0.02 -0.24 ppb at all 5 sampling sites except Pumping Station 3 in mid-July. Label states not to apply product directly to water wetlands. The label also states not to contaminate water when disposing of equipment wash waters.

Difenzoquat methyl sulfate (Avenge)

TYPE Selective systemic hormone-type herbicide of the pyrazole chemical family.
FORMULATION: Liquid, 31.2% AI
APPLICATION/USAGE: *Grains*-ground/aerial, 2-4 pts/ac for wild oats
NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 10,200 ac barley (150 sites), 1,700 ac wheat (55 sites).
CHEMICAL FAMILY: Pyrazole
MOA: Absorbed by the leaves, with translocation mainly acropetally, and accumulation mostly near the treated area, a meristem inhibitor.
Kh index: NR
Koc: 54,500
Kow: 0.479 (pH 9) - 4.45 (pH 5)
BCF: 0.0003
EEC: Water= 0.36762 ppm, long grasses= 95 ppm
PESTICIDE MOVEMENT RATING: Extremely low
ENVIRON. FATE: Soil t1/2 approximately **3 mo**. Strongly absorbed by soil.
METABOLITES: Difenzoquat is stable to light in aqueous media, thermally stable, stable in acidic media, but decomposed by strong acids and oxidants. Photolytic demethylation occurs readily, giving the monomethyl pyrazole. No significant microbial degradation occurs.

TOXICITIES:

Mammalian LD50 (mg/kg), acute oral, male rat =270-470, male mice=31, female mice= 44

Avian: LC50 (8 d, mg/kg) bobwhite quail >4640 diet, mallard >10388 diet.
Aquatic: LC50 (mg/L, 96 h) rainbow trout =694; bluegill sunfish = 696.

1989 CONSULTATION CALL: NR

USE IN 1994:
Sump 2, 2691 pints applied on 1222 acres, average rate of 2.2 pints per acre.
Sump 3, 4424 pints applied on 1809 acres, average rate of 2.4 pints per acre.
Out of this total, 928.24 pints were applied to 401 acres of grains, in units 1, 2, 6, 7, 36, 37, 38, 39 and 40 (adjacent to Tule Lake Sump 1A).

USE/EXPOSURE: Label states: "DO NOT apply directly to water, or to areas where surface water is present. DO NOT apply when weather conditions favor run-off and/or drift from target area. DO NOT contaminate water when disposing of equipment wash waters. "

MCPA (MCP 4 Amine)

TYPE: Selective systemic hormone-type herbicide
FORMULATION: Liquid, 52.1% AI, dimethylamine salt of MCPA
APPLICATION/USAGE: *Grains*-ground/aerial, 0.5-1 pts/ac, five hooked bassia, kochia, pigweed, lansquarters, wild mustard, annual sowthistle, shepherds purse, white top, morning glory
NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 10,200 ac barley (150 sites), 1,700 ac wheat (55 sites), 3,400 ac oats (65 sites).
CHEMICAL FAMILY: phenoxy
MOA: Absorbed by the leaves and roots with translocation, and concentrates in the meristematic regions where it inhibits growth.
Kh index: 0
Koc: 20
Kow: 0.13 (pH 9) - 636 (pH 1)
BCF: 0.00004
EEC: Water= 0.27545 ppm, long grasses= 70 ppm.
PESTICIDE MOVEMENT RATING: High
ENVIRON. FATE: Duration of residual activity in soil is 3-4 months, following an application rate of 3 kg/ha.
METABOLITES: Degrades to 4-chloro-2-methylphenol, followed by ring hydroxylation and ring opening.

TOXICITIES:

Mammalian: LD50 (mg/kg), acute oral, rat =700, mice=550.

Avian: LD50 (mg/kg), acute oral, bobwhite quail =377-478; LC50 (mg/kg, dietary) >5000.

Aquatic: LC50 (mg/L, 96 h) rainbow trout = 232, bluegill fingerling (27.6% liquid) >10; LC50 (mg/L, 48 h) bluegill sunfish = 100 ppm, LC50 (mg/L, 24 h) bluegill sunfish = 1.5, bluegill fingerling (27.6% liquid) >10, and rainbow trout = 117.

1989 CONSULTATION CALL: J on rangeland use for some plants (RPA 20)

USE IN 1994:
Sump 2, 20 pints applied on 20 acres, average rate 1 pint per acre. None was used in Sump 3.

USE/EXPOSURE: "If this product becomes more popular, persistence and runoff could become a problem." Analysis technique used in Boyer and Grue (1994) was insufficient to detect MCPA. Label states not to apply product directly to water or to areas where surface water is present. The label also states not to contaminate water when disposing of equipment wash waters.

Metam Sodium (Metam 426)

TYPE: Soil fumigant (methyldithiocarbamic acid).
FORMULATION: Liquid fumigant, 42.6% AI,
APPLICATION/USAGE: *Potato*-Ground, 30 gal/ac, northern root-knot nematode, Columbia root-knot nematode
CHEMICAL FAMILY: dithiocarbamate
MOA: Metam is absorbed by roots, is translocated through the plants, decomposition to methyl isothiocyanate, which is volatile and quickly evaporates.
Kh index: 140,000
Koc: 6
Kow: Unavailable, dissipates readily, considered irrelevant.
BCF: extremely low
EEC: Could not be calculated because amt/ac is "off the scale"
PESTICIDE MOVEMENT RATING: moderate.
ENVIRON. FATE:

Decomposition is promoted by acid and heavy metal salt. Generally degrades in soil within five hours, being rapidly decomposed to methylisothiocyanate (MITC), which is volatile and quickly evaporates. Stable in concentrated aqueous solution. MITC is the active form of metam sodium and may have toxicity of its own.

METABOLITES:
TOXICITIES:

Mammalian

Metam Sodium: LD50 (mg/kg), acute oral, male rat=1800, female rat=1700, mice=285.
Metam: LD50 (mg/kg), acute oral, rats =820, mice= 285.
Methylisothiocyanate: LD50 (mg/kg), acute oral, male rat=97.

Avian:

Metam Sodium: LC50 (5 d, mg/kg) mallard and Japanese quail >5000 diet.
Metam: LC50 (mg/kg) 4-mo mallard >5000 diet, 4-mo ring-necked pheasant >5000 diet.

Aquatic:

Metam Sodium: LC50 (mg/L, 96 h) bluegill sunfish = 0.39, rainbow trout= 0.079

1989 CONSULTATION CALL: NR

USE IN 1994:
Metam 426® is a liquid fumigant that converts to its gaseous form upon contact with soil. Ground applied at a rate of 112-240 pints/ac, 42.6% AI, for nematodes on potatoes (Note: 240 pts = 120 qts= 30 gal).
Sump 3, 17,200 pints applied to 110 acres, average rate of 156.4 pints per acre. None was applied adjacent to Sump 1A.

USE/EXPOSURE: Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

Ethephon (Cerone Plant Regulator)

TYPE: Plant growth regulator with systemic properties
FORMULATION: Liquid, 39.7 % AI
APPLICATION/USAGE: *Grain*-Aerial, 0.5-1.0 pts/ac, control lodging within barley and wheat crops
NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 10,200 ac barley (150 sites) 1,700 ac wheat (55 sites)
CHEMICAL FAMILY: organophosphorus (ethylene producing)
MOA: Penetrates into plant tissues, translocated and progressively decomposed to ethylene, which affects growth processes.
Kh index: 0.00063
Koc: 100,000
Kow: 0.0095
BCF: NR
EEC: Water= 0.146 ppm, long grasses= 44 ppm

PESTICIDE MOVEMENT RATING: Extremely low
ENVIRON. FATE: Potential for leaching in sandy soils. Stable in aqueous solutions having pH values less than 3.5. At higher pH, decomposition occurs with the liberation of ethylene. Sensitive to UV irradiation, stable below 75°C.
METABOLITES: In soil, ethephon rapidly undergoes degradation to phosphoric acid, ethylene, and chloride ions. In plants, ethephon rapidly undergoes degradation to phosphoric acid, ethylene and chloride ions.

TOXICITIES:

Mammalian LD50 (mg/kg), acute oral, rat =4229 (24% solution in propylene glycol); mice = 2850.

Avian: LD50 (mg/kg), acute oral, bobwhite quail = 1000; LC50 (mg/kg, 8 d) mallard >10,000 diet.

Aquatic: LC50 (mg/L, 96 h) rainbow trout = 350; bluegill sunfish= 300.

1989 CONSULTATION CALL: NR

USE IN 1994:
Sump 2, 20 pints applied on 25 acres , average rate of 0.8 pints per acre.
Sump 3, 469.7 pints applied to 596 acres, average rate of 0.79 pints per acre.
Of this total, 66 pints were applied once to 78 acres of barley in lots 1, 6, and 7. (adjacent to Sump 1A)

USE/EXPOSURE: Label states: "Do not apply directly to water or wetlands (swamps, bogs, marshes, and potholes. Do not contaminate water when disposing of wash waters."

Iprodione (Rovral, Rovral 4F)

TYPE: Contact fungicide

FORMULATION: Wettable powder mixed w/water (Rovral); liquid (Rovral 4F).

APPLICATION/USAGE:

Potatoes- Chemigation **2 pts/ac, 41.5%** AI (Rovral 4F). Aerial, **<2 lbs/ac, 50%** AI (Rovral); **2 pts/ac, 41.5%** AI (Rovral 4F). For white mold.

Onions- Chemigation, **1.5 lbs/ac, 50%** AI (Rovral); **1.5 pts/ac, 41.6 %** AI (Rovral 4F). Ground, **1.5 pts/ac, 41.6 %** AI (Rovral 4F). Aerial, **1.5 lbs/ac, 50%** AI (Rovral); **1.5 pts/ac, 41.6 %** AI (Rovral 4F). For neck rot and leaf blight (*Botrytis*), white rot, watery soft rot

NO. APPLICATIONS: Up to 3/season; up to 4/season (aerial potatoes); up to 5/season (aerial onions)

PROJECTED USE 1995: 3000 ac potatoes (100 sites), 100 ac onions (10 sites)

CHEMICAL FAMILY: Dicarboximide

MOA: Inhibits germination of spores and growth of fungal mycelium, protective and curative action

Kh index: 130

Koc: 700

Kow: 1,258.93

BCF: 51.64

EEC: Water = 0.18364 ppm, leafy plants = 63 ppm, long grass = 55 ppm.

PESTICIDE MOVEMENT RATING: Low

ENVIRON. FATE: Soil t1/2= **7-40 d**. Readily degrades in soil releasing CO2, metabolized in plants to 3,5-dichloroaniline.

METABOLITES: 3,5-dichloroaniline; in aqueous w/ pH 8.7 produces N-(3,5-dichloroanilinocarbonyl)-N-(isopropylamincarbonyl) glycine

TOXICITIES:

Mammalian	LD50 (mg/kg), acute oral, mouse = 4000.
Avian:	LD50 (mg/kg), acute oral, bobwhite = 930; mallard >6400
Aquatic:	LC50(96 hrs, mg/L), rainbow trout = 6.7; bluegill sunfish = 2.25-3.7.

1989 CONSULTATION CALL: NR

USE IN 1994:

Sump 3 lease lands, 66 pounds applied on 66 acres, average rate 1 pound per acre.

USE/EXPOSURE:

The ecological effects branch of the U.S. EPA estimated the iprodione residues in the adjacent aquatic environment following applications to rice field under extreme worst-case conditions (i.e., a 100 year rainfall) to be 220 µg AI/L (ppb). Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

Metalaxyl w/chlorothalonil (Ridomil Bravo)
Metalaxyl w/mancozeb (Ridomil MZ 58)

TYPE: Systemic fungicide
FORMULATION: Wettable powder (both products)
Ridomil Bravo - 9% metalaxyl/72%chlorothalonil
Ridomil MZ 58 - 10% metalaxyl/48%mancozeb
APPLICATION/USAGE:
Potatoes-Aerial, **2 lbs/ac, 81%** AI (Ridomil Bravo), for tuber rot/storage rot
Aerial, **2 lbs/ac, 58%** AI (Ridomil MZ 58), for tuber rot/storage rot
Onions- Aerial, **1.5-2 lbs/ac,** 81% AI (Ridomil Bravo), for downy mildew
Aerial, **1.5 -2 lbs, 58%** (Ridomil MZ 58), for downy mildew
NO. APPLICATIONS: up to 4/season
PROJECTED USE 1995: 3000 ac potatoes (100 sites), 100 ac onions (10 sites)
CHEMICAL FAMILY: Acylalanine

MOA: Protective and curative action, inhibits protein synthesis in fungi.
NOTE: *Empirical data for Metalaxyl only, not the mixtures.*
Kh index: 70
Koc: 650
Kow: 892
BCF: 30.48
EEC: 81% AI: Water= 0.45944 ppm, leafy= 157 ppm, long grasses =138 ppm.
58% AI: Water= 0.36762 ppm, leafy= 113 ppm, long grasses= 100 ppm.

PESTICIDE MOVEMENT RATING: Moderate
ENVIRON. FATE: Soil: Residual activity **70-90 d.**
METABOLITES:
In soil, metalaxyl acid possible. Metalaxyl acid in plant hydrolysis is further metabolized to form a conjugated derivative of metalaxyl. In mammals (oral route) the ester bond is hydrolyzed and the methyl ether bond oxidatively cleaved.

TOXICITIES:
Mammalian LD50 (mg/kg), acute oral, rat=669
Avian: EPA Fact Sheet: practically nontoxic acutely and subacutely
Aquatic: LC50(96 hrs), rainbow trout, bluegill sunfish, carp >100 mg/l.

1989 CONSULTATION CALL: **Both Chlorothalonil and Mancozeb are listed for forest/crop use as J to Lost River and shortnose suckers.**

USE IN 1994:

Ridomil Bravo (9% metalaxyl/72%chlorothalonil)

Sump 2, 75 pounds applied to 50 acres of potatoes, average rate 0.67 pounds per acre.
Sump 3, 136.5 pounds applied to 91 acres, average rate 1.5 pounds per acre.
This product was not used adjacent to the sumps in 1994.

Ridomil MZ 58 (10% metalaxyl/48%mancozeb)

Sump 2, 150 pounds applied on 93 acres, average rate 1.6 pounds per acre.
Sump 3, 1425 pounds applied to 1225 acres, average rate of 1.16 pounds per acre.
Two units adjacent to the sump 1A applied this product to onions twice: 1)#3-- 55 pounds and 64 pounds on 34 acres; and 2) #4 --55 and 69 pounds on 34 acres.

USE/EXPOSURE:

Mancozeb is listed as an endocrine disrupter. Fish accumulation was found not to exceed 7x when fish were exposed to metalaxyl at 1 ppm in water, and the residues were found to accumulate in the non-edible portions over the edible portions. Studies indicate that metalaxyl is not oncogenic or teratogenic, does not cause increased incidence of tumors or cause embryotoxic, fetotoxic or teratogenic effects. Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

Metalaxyl w/ copper hydroxide (Ridomil Copper 70W)

TYPE: Systemic fungicide
FORMULATION: Wettable powder AI (10% metalaxyl, 70% copper hydroxide)
APPLICATION/USAGE: *Potatoes*-Aerial, **2.5 lbs/ac,** for tuber rot/storage rot
NO. APPLICATIONS: up to 4/season
PROJECTED USE 1995: 3000 ac potatoes (≥100 sites)
CHEMICAL FAMILY: NR
MOA: NR
Kh index: NR
Koc: NR
Kow: NR
BCF: NR
EEC: NR
PESTICIDE MOVEMENT RATING: NR
ENVIRON. FATE: NR
METABOLITES:

In soil, metalaxyl acid possible. Metalaxyl acid in plant hydrolysis is further metabolized to form a conjugated derivative of metalaxyl. In mammals (oral route) the ester bond is hydrolyzed and the methyl ether bond oxidatively cleaved.

TOXICITIES:

Mammalian: NR
Avian: NR
Aquatic: NR

1989 CONSULTATION CALL: NR
USE IN 1994: NR

USE/EXPOSURE: NR

2,4-D (Weedar 64, Amine 4)

TYPE: (2,4-dichlorophenoxy)acetic acid, selective systemic herbicide.
FORMULATION: Liquid, dimethylamine salt (Amine 4 46.5% AI; Weedar 46.8% AI)

APPLICATION/USAGE:

Grains- **Amine 4-** 0.5-2 pts/ac; **Weedar-** 0.5-2 pts/ac. Both applied to grains by ground/aerial for five hooked bassia, kochia, pigweed, lambsquarters, wild mustard, annual sowthistle, shepherds purse, white top, morning glory.

*Rights-of-way-***Weedar 64**: 1-2 qts/ac, AI 46.8%; **2,4-D and 2,4-D,B (Weedone 638 and Weedone LV4):** 1.3-4 qts/ac, AI 39.3%; **2,4-D and Dicamba (Weedmaster)**: 1 oz in 1 gal water, AI 49.1%, ground for Canada thistle, poison hemlock, field bindweed, musk thistle, leafy spurge.

NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 10,200 ac barley (150 sites), 1,700 ac wheat (55 sites), 3,400 ac oats (65 sites).

CHEMICAL FAMILY: Phenoxy
MOA: Salts readily absorbed by roots, while esters readily absorbed by the foliage. Acts as a growth inhibitor.
Kh index: 0
Koc: 20
Kow: 645
BCF: 18.59
EEC: Water = 0.18364 ppm, long grasses= 60 ppm.

PESTICIDE MOVEMENT RATING: Moderate
ENVIRON. FATE: Water t1/2= **10 to > 50 d**. Soil t1/2 < **7 d,** longer in sandy with low OM. In soils other than sandy high OM, rapid biodegradation is expected to prevent significant leaching. 2,4-D will not be expected to appreciably adsorb to soils.
METABOLITES: Soil microbial degradation involves hydroxylation, decarboxylation, cleavage of the acid side-chain, and ring opening.

TOXICITIES:

Mammalian: LD50 (mg/kg), acute oral, rat = 375 (tech.), 666-805 (sodium salt), 700 (isopropyl ester).

Avian: LD50 (mg/kg), acute oral, wild duck >1000, Japanese quail = 668, and pheasants = 472. Use of a non-toxic oil vehicle during application increases toxicity of the chemical to egg embryos.

Aquatic: Some formulations, esters, are toxic to fish, while other formulations are not. Formulations are specified when known in the following data.
Adult tests: LC50 (mg/L, 48 h) for rainbow trout = 1.1 (acid); LC50 (mg/L, 96 h) rainbow >100 (dimethylamine salt, 49% liquid). LC50 (mg/L, 96 h) Channel catfish = 1.16 to >100; bluegill = 1.16 to >100 mg/l; fathead minnow = 335 (dimethylamine salt, 49% liquid). Fry to fingerling tests: LC50s (mg/L, 96 h) at 10° C were as follows: chinook salmon >100, rainbow trout >100,

for tech. material). Moderately toxic to rainbow trout (96 hr LC50 = 8.3 mg/L, 41% liquid), bluegill sunfish (96 hr LC50 = 5.6 mg/L, 41% liquid), and fathead minnow (96 hr LC50 = 2.3 mg/L, 41% liquid). Toxicity increased in increasing temperature. Toxicity increased with increasing pH, toxicity was 2-4 greater to bluegill and rainbow trout at pH 7.5-9.5 than at pH 6.5. The egg stage was the least sensitive stage for both rainbow trout and channel catfish. Tests with sac-fry and swim-up fry yielded 96 hour LC50s ranging from 2.4-4.3 mg/l. Fingerlings yielded LC50s 96 hour from 8.3 mg/l for rainbow trout and 13 mg/l for channel catfish.

1989 CONSULTATION CALL: J on forest use to some plants (RPA 17, 20, 26)

USE IN 1994:
Sump 2, 198.3 pints applied on 153 acres, average rate 1.3 pints per acre.
Sump 3, 500.98 pints applied on 140 acres, average rate 1.35 pints per acre.
Out of this total, 53.22 pints and 54.78 pints were applied to 34 acres and 35 acres of onions, respectively in units 3 and 4 (adjacent to Tule Lake Sump 1A).

USE/EXPOSURE: Rodeo label states not to contaminate water when disposing of equipment wash waters. Roundup label states not to apply product directly to water or to areas where surface water is present, and not to contaminate water when disposing of equipment wash waters.

BTI (Vectobac CG, Vectobac 12 AS, Acrobe Biolarvicide)

TYPE: Biological larvicide, spores and delta-endotoxin crystals of Bacillus thuringiensis

FORMULATION: **Vectobac CG:** Granular, 2.5-10 lbs/ac, AI 0.2%
Vectobac 12 AS: Liquid, 0.5-2 pts/ac, 1.2%
Acrobe Biolarvicide: Liquid, 0.5-2 pts/ac, 1.2%

APPLICATION/USAGE: *Rights-of-way*-ground (Vectobac CG) or ground/aerial (Vectobac 12AS and Acrobe Biolarvicide) for disease vectors and nuisance mosquito larvae (including encephalitis bearing species)

NO. APPLICATIONS: NR
PROJECTED USE 1995: NR
CHEMICAL FAMILY: NR
MOA: NR

Kh index: NR
Koc: NR
Kow: NR
EEC: NR
BCF: NR
PESTICIDE MOVEMENT RATING: NR
ENVIRON. FATE: NR

METABOLITES: NR

TOXICITIES:

Vectobac-G (From Stenquist):

Toxicity testing to date has not indicated any harmful effects on mammals, birds, fish, or aquatic invertebrates.

Vectobac 12AS:

Mammalian LD50 (mg/kg), rat, acute oral, >2,670; rabbit (dermal)=6,280
Toxicity testing to date has not indicated any harmful effects on mammals, birds, fish, or aquatic invertebrates.

1989 CONSULTATION CALL: NR

USE IN 1994: Not used
USE/EXPOSURE: NR

Dicamba (Banvel)

TYPE: Selective systemic herbicide

FORMULATION: Liquid 48.2% AI

APPLICATION/USAGE:

Grains- 0.5-4 oz/ac, ground/aerial, five hooked bassia, kochia, pigweed, lansquarters, wild mustard, annual sowthistle, shepherds purse, white top, morning glory

*Rights-of-way-***Dicamba**: 1 pt in 1 gal water, AI 48.2%; **Dicamba and 2,4-D (Banvel 720)**: 1-4 qts in 20-100 gal water, AI 38.4%; **2,4-D and Dicamba (Weedmaster)**: 1 oz in 1 gal water, AI 49.1%, ground for Canada thistle, poison hemlock, field bindweed, musk thistle, leafy spurge.

NO. APPLICATIONS: 1/season

PROJECTED USE 1995: 10,200 ac barley (150 sites), 1,700 ac wheat (55 sites), 3,400 ac oats (65 sites).

CHEMICAL FAMILY: Benzoic

MOA: Absorbed by the leaves and the roots, with ready translocation throughout the plant via both the symplastic and apoplastic systems, acts as a auxin-like growth regulator.

Kh index: 0

Koc: 2

Kow: 0.16 - 8.95

BCF: 0.01-5.0 (Kenaga 1980)

EEC: 0.03673= ppm, leafy= 6 ppm, long grasses= 1 ppm.

PESTICIDE MOVEMENT RATING: Very high

ENVIRON. FATE: Distilled water t1/2, pH 9.0, 25°C= **30 d**. Soil t1/2 < **14-25 d**.

METABOLITES: In soil, microbial degradation occurs, with the principle metabolite being 3,6-dichlorosalicylic acid. In a model ecosystem containing sand, water, plants, and biota, dicamba was slowly transformed to 5-hydroxydicamba (10% after 32 d), which slowly underwent decarboxylation.

TOXICITIES:

Mammalian: LD50 (mg/kg), acute oral, rat =1707 (tech.), 2629 (dimethyl-ammonium salt), 6764 (sodium salt).

Avian: LD50 (mg/kg), acute oral, mallard = 2000. LC50 (8 d, mg/kg) mallard ducks and bobwhite quail >10000 diet.

Aquatic: LC50 (mg/L, 96 h) rainbow trout = 28-135; bluegill sunfish = 20-50.

1989 CONSULTATION CALL: J on pasture/rangeland use to some plants

USE IN 1994:

Sump 2, 242.77 pints applied on 2277 acres, average rate 0.11 pints per acre.
Sump 3, 416.98 pints applied on 4084 acres, average rate 0.10 pints per acre.
Out of this total, 22.94 pints were applied to 184 acres of grains, in units 3, 37, 40, and 41 (adjacent to Tule Lake Sump 1A).

USE/EXPOSURE: Boyer and Grue (1994) detected in Tule lake sumps from 0.05 - 0.14 ppb (only analyzed for in June) in 4 of 5 sites. Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

smallmouth bass > 185-300. Variations in pH from 6.5 to 8.5 did affect toxicity to some 2,4-D test chemicals. The acid formulation and the dimethyl amine salt of 2,4-D were about half as toxic to fish at pH 8.5 as at pH 6.5. However, the dodecyl/tetradodecyl amine was nearly 4 times more toxic to fathead minnows at pH 8.5 than at 6.5. Fry and fingerlings were considerably more sensitive than eggs to two amine salts in 2,4-D.

1989 CONSULTATION CALL: J for rangeland use to some plants (RPA 20)

USE IN 1994:
Sump 2 lease lands, 3181.2 pints applied on 3228 acres, average rate of 0.98 pints per acre.
Sump 3 lease lands, 6703.5 pints applied on 6078.5 acres, average rate of 1.1 pints per acre.
Out of this total, 701.54 pints were applied once to grains in lots 1, 2, 3, 5, 6, 7, and 36-41, totalling 950 acres (all adjacent to Tule Lake Sump 1A). This is the only product applied to Area K or Area F. On Area F, 947 pints were applied to 947 acres. On Area K, 3734.1 pints were applied to 3734.1 acres.

USE/EXPOSURE: Listed as an endocrine disrupter. Hard water leads to precipitation of the calcium and magnesium salts, but a sequestering agent is included in formulations to prevent this. A reduction of broad-leaved plants can result in a reduction in numbers of waterfowl and other upland nesting birds. Boyer and Grue (1994) found from ND to 0.58 ppb in Tule Lake sump (analyzed in June only) at 4 of 5 sites. Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

Glyphosate, isopropylamine salt (Roundup, Rodeo)

TYPE: Organophosphorus non-selective systemic herbicide
FORMULATION: Liquid, 41% AI
APPLICATION/USAGE:
Grains- 0.5-2 pts/ac, aerial/ground, quackgrass, Canada thistle, perennial peppercress.
Potato-0.5-2 pts/ac, aerial/ground, pigweed, lamsquarter, Russian thistle, foxtails, barnyard grass.
Onion-0.5-2 pts/ac, aerial/ground, pigweed, lamsquarter, Russian thistle, foxtails, barnyard grass, volunteer grains.
Sugar beets-0.5-2 pts/ac, aerial/ground for lamsquarter, Russian thistle, foxtails, barnyard grass, volunteer grains.
Rights-of-way-1.33 oz in 1 gal, AI 53.8% (Rodeo); 12-16 oz/ac, AI 41% (Roundup), ground for Canada thistle, poison hemlock, field bindweed, musk thistle, leafy spurge.
NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 10,200 ac barley, 1,700 ac wheat, 3,400 ac oats at 25 sites; 3,100 ac potatoes (100 sites), 100 ac onions (10 sites), 600 ac sugar beets (18 sites).
CHEMICAL FAMILY: Phosphinic acid
MOA: On various enzyme systems, interferes with formation of amino acids and other important endogenous chemicals.
Kh index: 0
Koc: 24,000
Kow: 0.0006
BCF: 0.00009-3.0 and 3-180 (Kenaga 1980)
EEC: Water=0.13773 ppm, leafy= 75 ppm, long grasses= 66 ppm.

PESTICIDE MOVEMENT RATING: Extremely low.
ENVIRON. FATE: Natural water t1/2= 7 - 10 weeks; Soil t1/2= 3 to 19 weeks. Strongly adsorbed to soil and therefore becomes practically immobile.

METABOLITES: Principle = aminomethylphosphonic acid. Degrades microbially in soil releasing phosphoric acid, N-nitrosoglyphosate, ammonia, N,N-dimethylphosphinic acid, N-methylphosphinic acid, aminoacetic acid (glycine), N-methylaminoacetic acid, (sarcosine), hydroxymethylphosphonic acid, aminomethylphosphonic acid, and carbon dioxide. N-Nitrosoglyphosate also formed from the nitrosation of glyphosate in soil solutions containing nitrite ions. Metabolism occurs by splitting off of the vinyl group, cleavage of the five-membered ring and eventual formation of 3,5-dichloroaniline .

TOXICITIES:
Mammalian: LD50 (mg/kg), acute oral, rat >5600 (4050 for the isopropylammonium salt)
Avian: LD50 (mg/kg), acute oral, bobwhite quail >3850; LC50 (8 d) for quail and ducks >4640 mg/kg diet.
Aquatic: LC50(96 hrs), trout = 86-156 mg/L(mod toxic); bluegill sunfish = 120-162 mg/l; Channel catfish = 108-156 mg/L; fathead minnow = 97 mg/L (all data

Vinclozolin (Ronilan DF)

TYPE: Non-systemic, contact fungicide
FORMULATION: Dry flowable powder, 50% AI
APPLICATION/USAGE: *Onions*-ground, 1.5-2 lbs/ac, Botrytis, Sclerotina watery soft rot, Sclerotium soft rot

CHEMICAL FAMILY: Oxazolidinedione, dichloroanilide or dicarboximide

MOA: Protective action that inhibits sporulation, or further growth of the germ tube.
Kh index: 130
Koc: 100
Kow: 1050
BCF: 13 (Kenaga 1980); 39.12
EEC: Water= 0.368 ppm, leafy =125 ppm

PESTICIDE MOVEMENT RATING: Moderate
ENVIRON. FATE: Distilled water t1/2, 25°C, pH 7 = **1.3 d**, pH 9=**0.26 d**. Persistent in soil, only partly degraded by soil microorganisms. Silty loam soil t1/2, 2 % organic carbon, 21 % moisture, pH 6.0 = **34 d**.
METABOLITES: Metabolism occurs by splitting off of the vinyl group, cleavage of the five-membered ring and eventual formation of 3,5-dichloroaniline
TOXICITIES:

Mammalian: LD50 (mg/kg), acute oral, rat >7,000; mice >5,000
Avian: LD50 (mg/kg), acute oral, bobwhite quail >2,510; LC50 (mg/L, 8 d) bobwhite >5,620; mallard >5,620.
Aquatic: LC50(96 hrs), rainbow trout >52.5 mg/L; bluegill = 47.3 mg/L; *Daphnia magna* (48 h) = 4.0.

1989 CONSULTATION CALL: NR

USE IN 1994: Not used in 1994.

USE/EXPOSURE: Label states not to apply product directly to water or to areas where surface water is present, and not to contaminate water when disposing of equipment wash waters.

Diquat dibromide (Diquat)

TYPE: Non-selective contact herbicide
FORMULATION: Liquid, 35.3% AI
APPLICATION/USAGE: *Potatoes* - ground application, 1 pt/ac as a vine desiccant (facilitates harvest).
NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 3,100 ac potatoes (100 sites)
CHEMICAL FAMILY: bipyridyl
MOA: Absorbed by the foliage with some translocation in the xylem. During photosynthesis, superoxide is generated, which damages cell membranes and cytoplasm.
Kh index: 0
Koc: 1,000,000
Kow: 0.00025 (20°C)
EEC: Water =0.07346 ppm; leafy crops = 25 ppm
PESTICIDE MOVEMENT RATING: extremely low.
ENVIRON. FATE:

Diquat dibromide is stable in neutral and acidic solutions, but readily hydrolyzed in alkaline solutions. Exhibits "DT50" = 14-56 days at pH 9. Photochemically decomposed by UV irradiation. It is rapidly and completely inactivated on contact with soil. Metabolic breakdown of diquat dibromide does not occur in plants. On plant surfaces, photochemical degradation occurs. In rats, following oral administration of diquat dibromide, the dose is completely eliminated in urine and feces in 4 days.

METABOLITES:
TOXICITIES:

Mammalian LD50 (mg/kg), acute oral, rats = 231, mice = 125.
Avian: LD50 (mg/kg), acute oral, hens = 200-400, partridges = 295.
Aquatic: LC50(96 hrs), rainbow trout = 21; bluegill (fry) = 175-342; mirror carp (adult) = 67; black bullhead (fry) = 113-255; yellow perch (fry) = 39-93. Variations of temperature from 7°-22°C did not alter the toxicity to bluegills. A change in pH to 9.5 increased toxicity two-fold, whereas an increase in hardness from 40-300 ppm decreased toxicity by 1/2-1/3. Similar pH effects were noted in black bullheads and yellow perch.

1989 CONSULTATION CALL: NJ on crops to least bell's vireo

USE IN 1994:

Sump 2 - 54.4 pints were applied on 54 acres at an average rate of 1.01 pints per acre.
Sump 3 - 59 pints were applied on 59 acres at an average rate of 1 pint per acre.
None was applied to the units adjacent to Tule Lake Sump 1A.

USE/EXPOSURE: Diquat cation active ingredient used on aquatic plants. Not found in the sumps in 1994 or earlier studies. Label warns of a drift hazard and water contamination hazard with use of this product.

EPTC (Eptam 7E)

TYPE: Selective systemic herbicide
FORMULATION: Liquid, 87.8% AI
APPLICATION/USAGE:
Potatoes - ground application, 4-7 pts/ac for control of wild oats, annual rye grass, foxtails. Pre-plant or post-plant at cultivation (bed spray).
CHEMICAL FAMILY: carbamate or thiocarbamate
NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 3,100 ac potatoes (100 sites)
MOA: Absorbed by the roots and shoots, with translocation acropetally to the leaves and stems.
Kh index: 1 million
Koc: 200
Kow: 220
EEC: Water = 1.83812 ppm; leafy crops = 650 ppm
BCF: 3.58 and 12-22 (Kenaga 1980)
PESTICIDE MOVEMENT RATING: low
ENVIRON. FATE: Decomposes in 4-6 weeks in warm, moist soils; it is more persistent in dry soils. Rapidly volatilized from plant and soil surfaces, and immediate incorporation into the soil prevents loss of the herbicide.
METABOLITES: In soil, rapidly undergoes microbial degradation to a mercaptan residue, an amino residue, and carbon dioxide. The degradation products are not toxic. In plants, rapidly metabolized to carbon dioxide in other metabolites.
TOXICITIES:
Mammalian: LD50 (mg/kg), acute oral, male rat= 1630 (Tech), male mice = 3160, male mouse (product) = 1325-1500.
Avian: LD50 (mg/kg), acute oral, red-winged blackbird = 100, starling >100. LC50(mg/kg, 7 d) bobwhite quail = 20,000 diet.
Aquatic: LC50(mg/L, 96 hrs), rainbow trout=19; bluegill = 27; cutthroat trout fry=15-19 lake trout fry = 14.8-17.7. The TILC50 for cutthroat trout fry is 7.2 mg/l, and cumulative toxicity is 3.2, indicating only slight cumulative toxic action.

1989 CONSULTATION CALL: J to some plants (RPA 17,20,26)

USE IN 1994: Sump 2 - 1176 pints were applied on 196 acres at an average rate of 6 pints per acre.
Sump 3 - None was applied to these lands.

USE/EXPOSURE: Not found in the sumps in 1994 or earlier studies. Label states not to apply product directly to water or to areas where surface water is present, and that drift and run-off may be hazardous to aquatic organisms. The label also states not to contaminate water when disposing of equipment wash waters.

2,4-D,B dimethylamine salt (Butyrac 200)

TYPE: Selective systemic hormone-type herbicide
FORMULATION: Liquid solution of the dimethylamine salt, 25.9% AI
APPLICATION/USAGE:

Rights-of-way-2,4-D and 2,4-D,B (Weedone 638 and Weedone LV4) 1.3-4 qts/ac, AI 39.3%, ground for Canada thistle, poison hemlock, field bindweed, musk thistle, leafy spurge.

CHEMICAL FAMILY: phenoxy
MOA: Absorbed by the foliage with translocation. In susceptible plants, undergoes β oxidation to 2,4-D and acts like the latter.
Kh index: 0
Koc: 20
Kow: NR
EEC: Water = 0.45944 ppm at rate of 6 pints per acre; alfalfa = 95 ppm
BCF: NR
PESTICIDE MOVEMENT RATING: moderate.
ENVIRON. FATE:

Soil t1/2 < 7 d. Acidic in reaction and forms water-soluble alkali-metal and amine salts, but hard water precipitates the calcium and magnesium salts. The acids and salts are very stable. The esters are sensitive to acids and alkalis. The alkali-metal and amine salts are readily soluble in water (e.g,. sodium salt >200 g/L at 25°C). In soil, microbial degradation leads to the formation of 2,4-D, which subsequently undergoes further degradation.

METABOLITES: In susceptible plants, rapidly undergoes β oxidation to 2,4-D, which is then degraded to 2,4-dichlorophenol, followed by ring hydroxylation and ring opening. In tolerant plants, β oxidation to 2,4-D is very slow.

TOXICITIES:

Mammalian: LD50 (mg/kg), acute oral, rat = 370-700 (sodium salt: rats = 1500 and mice = 400).

Avian: Not available

Aquatic: LC50 (mg/L, 96 h, tech. grade [100%]) rainbow trout = 2, bluegill = 7.5, fathead minnow = 18. Toxicity of the butyl ester and the propylene glycol butyl ether ester was halved by the aging of test solutions for 21 days. Flow through tests with a propylene glycol butyl ester of 2,4-D produced a TILC50 of 0.313 mg/L and a cumulative toxicity index of 0.00105 mg/L in cutthroat trout.

1989 CONSULTATION CALL: See 2,4 D
USE/EXPOSURE: Not used on the lease lands before and would probably be used on a very limited basis. **Based on the lack of information, the Bureau stated that "it is unknown whether there should be an effect for the suckers, peregrine falcons or bald eagles."**

Clopyralid (Stinger)

TYPE: Selective systemic herbicide
FORMULATION: Liquid emulsion, 40.9% AI
APPLICATION/USAGE: *Sugar beets*-Ground application at 0.25-0.66 pts/ac for curly dock, prickly lettuce, hairy nightshade, perennial sowthistle, Canada thistle
NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 600 ac sugar beets (20 sites).
CHEMICAL FAMILY: pyridine or auxin
MOA: Absorbed by the leaves and roots, with translocation both acropetally and basipetally, and accumulation in meristematic tissue. Exhibits an auxin type reaction. Acts on cell elongation and respiration.
Kh index: NR
Koc: NR
Kow: 0.0028 (pH 9)
EEC: Water = 0.11018 ppm at rate of 0.66 pints per acre; leafy = 41 ppm
BCF: NR
PESTICIDE MOVEMENT RATING:
ENVIRON. FATE: Following an application rate of 0.25-1.0 mg/kg, the t1/2 under favorable microbiological conditions is approx. 49 days.
METABOLITES: Stable in acidic media. Clopyralid is acidic, and reacts with alkalis to form water soluble salts. It is stable to UV irradiation. In soil, microbial degradation occurs. Clopyralid is not metabolized in plants.
TOXICITIES:

Mammalian	LD50 (mg/kg), acute oral, rat >4300, mice >5000. Non-teratogenic.
Avian:	LD50 (mg/kg), acute oral, mallard and bobwhite quail = 1465 . LC50 (mg/kg, 8 d) mallard and bobwhite quail >4640 diet.
Aquatic:	LC50 (mg/L, 96 h) rainbow trout = 103.5, bluegill = 125.4.

1989 CONSULTATION CALL: J on rangeland to some plants (RPA 20)

USE/EXPOSURE: Earthworm LC50 (soil concentration) = 1000 mg/kg. Label states not to apply product directly to water or wetlands and not to contaminate water when disposing of equipment wash waters.

Maleic Hydrazide (Royal MH-30)

TYPE: Plant growth regulator
FORMULATION: Liquid, wettable powder mix with water, 21.7 % AI; potassium salt
APPLICATION/USAGE: *Potatoes*-Aerial, 5 lbs/ac, controls sprouting in potatoes
NO. APPLICATIONS: 1/season
PROJECTED USE 1995: 3,100 ac potatoes (100 sites)
CHEMICAL FAMILY: pyridazine
MOA: Absorbed by the leaves and roots, with translocation [in the] xylem and phloem, inhibits cell division in the meristematic regions, but not cell extension, also has some herbicidal activity.
Kh index: 0
Koc: 250 (acid) 20 (potassium salt)
Kow: 0.003 -.21
BCF: 0.000086
EEC: Water= 0.36762 ppm, leafy= 125 ppm

PESTICIDE MOVEMENT RATING: Moderate (acid) or high (potassium salt)
ENVIRON. FATE:
Soil t1/2 approximately **2-8 weeks**. Degraded by light. Stable to hydrolysis, but decomposed by oxidizing agents and strong acids. Maleic hydrazide is a mono-basic acid, and forms water-soluble alkali-metal and amine salts, but in hard water, the calcium salt is precipitated. Stable at 45°C up to 61 days, and at 80°C for 30 days. Very mobile in 5 soils tested. Rapid photochemical degradation occurs in water.
METABOLITES: Various acids, e.g., succinic, fumaric, and maleic, are found as metabolites in plants.

TOXICITIES:
Mammalian LD50 (mg/kg), acute oral, rat >5000 (acid), 6950 (sodium salt), 3900 (potassium salt). A teratogenicity study in rabbits showed that exposure to 300 or 1000 mg/kg resulted in malformed scapulae in offspring, while 100 mg/kg had no effects.
Avian: LD50 (mg/kg), acute oral, mallard > 4640, bobwhite quail >10,000. LC50 for mallard and bobwhite quail was > 10,000 ppm. LC50 for mallard (potassium salt) > 5620 ppm.
Aquatic: LC50 (mg/L, 96 h) rainbow trout =1435 (tech) and >1000 (potassium salt); bluegill sunfish= 1608.
1989 CONSULTATION CALL: NR

USE IN 1994:
USE/EXPOSURE: Low potential to bioaccumulate in fish. High carcinogenic or oncogenic potential (RENCY). Special precautions: Treated grass must not be used for grazing. Label states not to apply product directly to water or to areas where surface water is present, and not to contaminate water when disposing of equipment wash waters.

Imidacloprid (Admire)

TYPE: Systemic insecticide

FORMULATION: Liquid flowable, 21.4% AI (2 lbs of imidacloprid/gal).

APPLICATION/USAGE:

0.9-1.3 ounces per 1000 feet of potato row, ground applied at planting for aphids ("roughly translates to about 1.8 pints per acre if one assumes about 22 rows per acre"). At 1.3 oz/1000' of row, and spacing of 34" (minimum row spacing results in maximum use), then this yields 0.31 lbs AI/ac.

CHEMICAL FAMILY: nitroimidazolidinylideneamine

MOA: Inhibits the nicotinic acetylcholine receptor.

Kh index: NR

Koc: "For a pH 7.4 silty clay, the Koc adsorption rate was 212, and the Koc desorption rate was 330."

Kow: 3.3

EEC: Water = 0.03673 ppm at rate of 1.8 pints per acre; leafy crops = 5 ppm

BCF: 0.006

PESTICIDE MOVEMENT RATING: Medium.

ENVIRON. FATE: Bare soil t1/2 range from 188 days to 1 year. Soil with vegetation t1/2 is approximately 48 days. Dissipates more rapidly in soil (t1/2=7-196 d) under actual field conditions than under lab conditions (t1/2=188- >366 d). Field soil dissipation studies indicate that residues do not leach in soil, but stay within top 6" of soil profile. Hydrolytically stable at pH 5 and (7?), but may degrade slowly at pH 9 (t1/2 of 355 days). The photolytic t1/2 in water= 4.2 hours and in soil=171 days.

METABOLITES: NR

TOXICITIES:

Mammalian LD50 (mg/kg), acute oral, rats =450. Non-teratogenic and non-mutagenic.

Avian: LD50 (mg/kg), acute oral, Japanese quail = 31, northern bobwhite = 152. LC50 (ppm), mallard >4794 (Tech), northern bobwhite = 1420 (Tech 97.4%). Data from Miles (manufacturer): LD50(mg/kg) House sparrow =41 (2.5% granular) or 419 granules/sparrow. LC50 studies showed contaminated feed to be unpalatable or rejected by birds at 150-250 ppm or higher. Repellency studies (J. Wildl Manage. 57:652-656) birds had sig. aversion to seeds treated ≥600 ppm.

Aquatic: LC50 (mg/L, 96 h) golden orfe = 237, bluegill >105 (NOEL=25); rainbow trout = <83-211 (NOEL 50); sheepshead= 161 (NOEL 58); *Daphnia*=85 (NOEL=42); oyster deposition (concent. at which reduction new shell growth apparent) >145 (NOEL 23.3); mysid shrimp=0.034 (NOEL 0.013); *Hyallela azteca*=0.055 (NOEAL 0.00035); *Chironomid tentans*=0.105 (NOEL 0.00124); Algae *Scenedesmus sub.* >10 (NOEL >10), *Scenedesmus cap.* >119 (NOEL >119).

1989 CONSULTATION CALL: NR

USE/EXPOSURE: Newer chemical recently registered for use in California. May replace for methamidiphos. Field use (golf course) at 0.5 lb AI/acre (0.62% granular) showed no differences in survivability between control and treatment plots on each golf course. Label states not to apply product directly to water or to areas where surface water is present and not to contaminate water when disposing of equipment wash waters.