

Reasonable and Prudent Alternative

This Opinion has concluded that EPA's proposed registration of pesticides containing chlorpyrifos, diazinon, and malathion is likely to jeopardize the continued existence of 27 endangered and threatened Pacific salmonids and is likely to destroy or adversely modify designated critical habitat for 25 threatened and endangered salmonids. The clause "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR §402.02).

Regulations (50 CFR §402.02) implementing section 7 of the ESA define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technologically feasible; and (4) NMFS believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

NMFS reached this conclusion because measured and predicted concentrations of the three active ingredients in salmonid habitats, particularly in off-channel habitats, are likely to cause adverse effects to listed species including significant reductions in survival, reproduction, migration, and growth. Further, all but one population of listed Pacific salmonids are likely to suffer reductions in viability given the severity of expected changes in abundance and productivity associated with the proposed action. These adverse effects are expected to appreciably reduce the likelihood of both the survival and recovery of the listed Pacific salmonids. EPA's proposed registration of chlorpyrifos, diazinon, and malathion is likely to result in the destruction or adverse modification of critical habitat of these endangered and threatened species because of adverse effects on salmonid prey and water quality in freshwater rearing, spawning, migration, and foraging areas.

The Reasonable and Prudent Alternative (RPA) accounts for the following issues: (1) the action will result in exposure to other chemical stressors that may increase the risk of the action to listed species including unspecified inert ingredients, adjuvants, and tank mixes; (2) exposure to chemical mixtures containing chlorpyrifos, diazinon, and malathion and other cholinesterase-inhibiting compounds result in additive and synergistic responses; (3) exposure to other chemicals and physical stressors (e.g., temperature) in the baseline habitat will likely intensify response to chlorpyrifos, diazinon, and malathion.

The action as implemented under the RPA will remove the likelihood of jeopardy and of destruction or adverse modification of critical habitat. In the proposed RPA, NMFS is not attempting to ensure that there is no take of listed species. NMFS believes take will occur, and has provided an incidental take statement exempting that take from the take prohibitions, as long as the action is conducted according to the RPA and reasonable and prudent measures (RPM). Avoiding take would most likely entail cancelling registration, or prohibiting use in watersheds inhabited by salmonids. The goal of the RPA is to

reduce exposure to ensure that the action is not likely to jeopardize listed species or destroy or adversely modify critical habitat.

The RPA is comprised of six required elements that must be implemented in its entirety within one year of the receipt of the Opinion to ensure that the proposed registration of these pesticides is not likely to jeopardize endangered or threatened species under the jurisdiction of NMFS or destroy or adversely modify critical habitat that has been designated for these species. These elements rely upon recognized practices for reducing drift and runoff of pesticide products into aquatic habitats.

Specific Elements of the Reasonable and Prudent Alternative

Elements 1-5 shall be specified on FIFRA labels of all pesticide products containing chlorpyrifos, diazinon, and malathion used in California, Idaho, Oregon and Washington. Alternatively, the label could direct pesticide users to the EPA Endangered Species Protection Program's bulletins that specify elements 1-5.

Element 1. Apply the following no-application buffers/setbacks (buffers):

A. Where ground applications are permitted. Do not apply pesticide products¹³ within 500 ft (152.4 m) of salmonid habitats¹⁴.

B. Where aerial applications are permitted. Do not apply pesticide products within 1,000 ft (304.8 m) of salmonid habitats.

Rationale:

1). Use of buffers in other programs.

Pesticide buffers are recognized tools to reduce pesticide loading into aquatic habitats from drift. EPA, USFWS, NMFS, courts, and state agencies routinely enlist buffers as pesticide load reduction measures. EPA requires the use of buffers on end-use product labels for ground and/or aerial applications for some products that pose risk to aquatic systems. For example, many chlorpyrifos containing end-use products have mandated buffers of 25, 50, and 100 ft for ground, airblast, and aerial applications, respectively. Malathion containing pesticides have mandated buffers for aerial applications of 25 and

¹³ Use of the term "pesticide products" in the Reasonable and Prudent Alternative section of the Opinion refers to pesticide products containing chlorpyrifos, diazinon, or malathion.

¹⁴ Salmonid habitats are defined as freshwaters, estuarine habitats, and nearshore marine habitats including bays within the ESU/DPS' ranges including migratory corridors. The freshwater habitats include intermittent streams and other temporally connected habitats to salmonid-bearing waters. Freshwater habitats also include all known types of off-channel habitats as well as drainages, ditches, and other man-made conveyances to salmonid habitats that lack salmonid exclusion devices.

50 ft, for non-ULV and ULV, respectively (RED). CDPR has pesticide use limitations of 120 and 600 ft buffers for chlorpyrifos, diazinon, and malathion-containing pesticides when the wind is blowing toward sensitive areas. On June 14, 1989, USFWS issued a Biological Opinion for 165 listed species and 112 pesticide active ingredients. Prescribed buffers under species-specific RPAs ranged from 60 ft (ground applications) to one half mile (aerial applications). Many of EPA’s historical county bulletins for endangered species referenced a 60 ft buffer for ground applications and a 300 ft buffer for aerial spraying. One court decision prescribed mandatory 60 ft (ground) and 300 ft (aerial) buffers for applications within the ranges of ESA-listed Pacific salmonids. NMFS has prescribed a range of buffers in ESA consultations for herbicide and insecticide application actions by agencies such as the U.S. Forest Service and Bureau of Land Management overlapping with ESA-listed salmonid habitats. Herbicide buffers ranged from 0 ft to 500 ft depending on application type, rate, and frequency. Insecticide buffers ranged from 0 ft to 200 ft depending on application type, rate, and frequency.

2). *AgDrift modeling results for ground and aerial applications into off-channel habitats.* NMFS generated estimated environmental concentrations for the three OPs for off-channel habitats using the AgDrift model (set to EPA Tier 1 simulation defaults). NMFS generated values for a range of buffer sizes in 100 ft increments for ground applications (0 -1,000 ft), and aerial applications (0 – 1,000 ft). The dimensions of the off-channel habitat modeled were 32.8 ft (10 m) wide and 0.328 ft (0.1 m) deep. The estimated concentrations decline as buffer size increases (Table 66). We note the disparity between the concentrations predicted at the 500 ft ground application buffer versus the 1,000 ft aerial buffer. The two results are not directly comparable because the models use different methods to predict amount of drift. Additionally, the buffer for ground applications addresses both drift and potential runoff, where as the aerial buffer applies primarily to drift as runoff is expected to be minimal relative to drift at 1,000 ft.

Table 66. Estimated environmental concentrations of chlorpyrifos, diazinon, and malathion applied at the rate or 1lb per acre for ground and aerial applications.

Ground application, low boom, ASAE very fine-fine droplet distribution, 50 th percentile estimates. EPA Tier 1 simulation	
Buffer	Off-Channel (10 m * 0.1 m)
0	76.427
10	20.168
100	4.406
200	2.568
300	1.813
400	1.392

500	1.122
600	0.933
700	0.794
800	0.688
900	0.604
997	0.583
Aerial application, fine-medium droplet distribution. EPA Tier 1 simulation	
Buffer	Off-Channel (10 m * 0.1 m)
0	333.566
10	260.482
100	92.888
200	48.985
300	33.096
400	25.289
500	20.902
600	18.010
700	16.035
800	14.692
900	13.719
997	12.983

3). *Comparisons of estimated concentrations from AgDrift model runs with biological effects information presented in the Opinion.*

With a 1,000 ft buffer, an aerial application of 1 lb/acre resulted in a pesticide concentration of approximately 13 ug/L in an off-channel habitat 10 m wide, 0.1 m deep. If juvenile salmonids were present, we would expect mortalities for each of the OPs, with the greatest number of mortalities for chlorpyrifos-exposed fish. We would also expect other non-lethal fish endpoints to be affected. Salmonid prey items would be severely affected by these concentrations. With a 500 ft buffer, a ground application of 1 lb/acre resulted in a predicted pesticide concentration of approximately 1.12 ug/L in off-channel habitats. Some juvenile salmonids would die from this exposure and other sub-lethal effects would also be expected. Sensitive salmonid prey items would also be adversely affected at 1.12 ug/L.

The majority of buffers described earlier are smaller than the 500 ft (ground applications) and 1,000 ft (aerial applications) buffers and for this action would result in substantially greater risk to salmonids and salmonid prey items. For example, a 10 ft buffer for a common application rate of 1 lb/acre would result in an estimated concentration of 20 ug/L for a ground application; a value that is 20 times higher than the concentration

predicted at 500 ft. For an aerial application, a 300 ft buffer would result in a pesticide concentration of 33 ug/L (approximately three times higher than a concentration at 1,000 ft).

While the concentrations predicted by the modeling could result in unknown numbers of lethal and non-lethal takes of salmonids as well as reduction in prey, NMFS believes that even with the selected buffers most pesticide applications will not result in these estimated concentrations. Several factors must be weighed when using these model estimates to describe the relative risk to salmonid habitats. First, these estimates are generated for a level field with wind blowing directly toward aquatic habitats and with no interception of pesticide drift by riparian or other vegetation. Many agricultural fields are not flat and wind may change directions quickly or may not be blowing directly into salmonid habitats. Second, many aquatic habitats are flowing and are much larger than the off-channel habitat modeled in Table 66. Third, the model's predictive capabilities become less certain as buffer size increases (Bird et al. 2002).

The scenario we modeled with AgDrift in this RPA element is expected to occur when all of the modeled variables are present e.g., specific wind speed, wind direction, release height, size of off-channel habitat, droplet size distribution, etc. The input variables are relevant to field conditions, however the frequency of this exact scenario occurring remains unknown. We selected this scenario to represent off-channel habitats utilized by a sensitive salmonid lifestage i.e., juveniles. NMFS believes that these buffers will remove a substantial portion of risk attributed to pesticide drift.

Element 2. Do not apply when wind speeds are greater than or equal to 10 mph as measured using an anemometer immediately prior to application. When applying pesticide products, commence applications on the side nearest the aquatic habitat and proceed away from the aquatic habitat.

Element 3. For agricultural uses, provide a 20 ft (6.1 m) minimum strip of non-crop vegetation (on which no pesticides shall be applied) on the downhill side of the application site immediately adjacent to any surface waters that have a connection to salmonid-bearing waters. This includes drainage systems that have salmonid exclusion devices, but drain to salmonid-bearing waters.

Element 4. Do not apply pesticide products when soil moisture is at field capacity, or when a storm event likely to produce runoff from the treated area is forecasted by NOAA/NWS, (National Weather Service) to occur within 48 hours following application.

Element 5. Report all incidents of fish mortality that occur within four days of application and within the vicinity of the treatment area to EPA Office of Pesticide Programs (703-305-7695).

Element 6. In addition to the labeling requirements above, EPA shall develop and implement a NMFS-approved effectiveness monitoring plan for off-channel habitats with annual reports. The plan shall identify representative off-channel habitats within agricultural areas prone to drift and runoff of pesticides. The number and locations of off-channel habitat sampling sites shall include currently- used off-channel habitats by threatened and endangered Pacific salmonids identified by NMFS biologists and will include at least two sites for each general species (ESU, DPS) i.e., coho salmon, chum salmon, steelhead, sockeye salmon, and ocean-type Chinook and stream-type Chinook salmon. Additionally, each state shall have at least three sites within their borders. One site in each state shall target where juvenile ESA-listed salmonids migrate to the Pacific Ocean. The plan shall collect daily surface water samples targeting at least three periods during the application season for seven days. Collected water samples will be analyzed for current-use OPs and carbamates following USGS schedule for analytical chemistry. The report shall be submitted to NMFS OPR and will summarize annual monitoring data and provide all raw data.

Although NMFS has concluded that EPA's action is likely to jeopardize 27 listed ESUs and destroy or adversely modify 25 designated critical habitats, NMFS does not believe that these effects will occur in the year between issuance of this Opinion and EPA's implementation of the RPA. Products containing these three active ingredients have been in use for some time. NMFS believes that these products have contributed to ESU declines, but not to the extent that one year of additional use as now authorized would lead to likely jeopardy or adverse modification.

Because this Opinion has concluded that the EPA's proposed registration of pesticides containing chlorpyrifos, diazinon, and malathion is likely to jeopardize the continued existence of 27 endangered and threatened Pacific salmonids under the jurisdiction of the NMFS and is likely to result in the destruction or adverse modification of designated critical habitat for 25 threatened and endangered salmonids, the EPA is required to notify NMFS OPR of its final decision on implementation of the reasonable and prudent alternative.