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Hon. John C. Coughenour

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF WASHINGTON

WASHINGTON TOXICS COALITION, NORTHWEST COALITION FOR ALTERNATIVES TO PESTICIDES, PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, and INSTITUTE FOR FISHERIES RESOURCES, Plaintiffs, vs. ENVIRONMENTAL PROTECTION AGENCY, and CHRISTINE T. WHITMAN Defendants. vs. AMERICAN CROP PROTECTION ASSOC. et al Intervenor-Defendants	Case No. C01-0132C DECLARATION OF NORMAN B. BIRCHFIELD, PH.D.

I, Norman B. Birchfield, Ph.D., hereby declare as follows:

1. I am currently a Senior Biologist and acting Risk Assessment Process Leader in the Environmental Fate and Effects Division (EFED) of the Office of Pesticide Programs (OPP), Office of Prevention, Pesticides and Toxic Substances, at the United States Environmental Protection Agency (EPA). My current duties include developing and reviewing environmental risk assessments for currently used pesticides. In connection with these duties, I regularly assess exposures to non-target organisms resulting from runoff and spray drift and am the EFED technical lead for spray drift exposure assessment. I started working at OPP in December 1997. From 1996 to 1997 I worked as a post graduate research assistant in the Environmental Chemistry and Toxicology Laboratory at the University of California Berkeley.

2. I received my B.A. from the University of California Santa Cruz in Biochemistry and Molecular Biology in 1990 and my Ph.D. in Agricultural and Environmental Chemistry from the University of California Berkeley in 1996. My doctoral and postdoctoral research focused on pesticide mode of action. From 1990 until 1992 I worked as an analytical chemist at ToxScan Inc. in Watsonville, California, where a large part of my duties was pesticide residue analysis. A further description of my expertise and experience, including publications, is contained in my CV which is attached as Exhibit 1.

3. It is well established that pesticides can move off-target through a number of pathways, including through runoff, drift and volatilization. It is similarly well established that non-target organisms, including people and wildlife, can be exposed to pesticides moving off the target site through these pathways. An important question to ask in assessing the need for regulating pesticides, however, is what is the extent to which such exposures results in risks to non-target organisms? Risk to a particular species is a function of both the toxicity of the pesticide to the organism of concern and the amount of exposure to the pesticide. Therefore, in order to evaluate

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whether a particular pesticide poses an unacceptable risk to certain species, and in order to determine whether a given regulatory restriction is necessary to protect a given resource, it is important to understand how toxic the pesticide is to the organism and whether the organism will be exposed to the pesticide in toxic amounts.

4. EFED is responsible for performing environmental risk assessments for non-target plants and animals. EFED reviews and evaluates data submitted by pesticide registrants and any other available data pertinent to pesticide toxicity and exposure. In performing exposure assessments, EFED uses the results of studies on pesticide persistence and mobility in the environment in its computer-based exposure models. Specifically, these data include rates of aerobic soil metabolism, soil photolysis, aqueous photolysis, hydrolysis as well as soil partitioning coefficients. The models then use these data to generate estimates of the environmental concentrations of pesticides, including water concentrations that may occur in water bodies near or adjacent to the target site. The quality of the estimated environmental concentrations (EECs) is dependent on the accuracy of the model in reflecting the site of concern (i.e., the area where the pesticide will be used) and the quality of the data used in modeling. Developing accurate EECs for a specific site requires a model that adequately describes that site (e.g., matching soil characteristics, rainfall frequency and intensity, and crop management practices) and relevant chemical data. It would be very labor intensive to develop exposure estimates for each possible use site, given the wide range of possible locations and environmental conditions where pesticides can be used. For this reason, EFED generally starts with a screening-level risk assessment methodology where a high-end, or reasonable worst case, exposure scenario is used in exposure assessment. EFED's farm pond models (see below for specific models), modeling a treated field, vulnerable to runoff, draining into an adjacent pond with no outlet, are used to provide reasonable worst-case EECs. The field conditions and rainfall levels in the farm pond models capture relatively high runoff levels which, when combined with maximum

application rates and minimum application intervals, result in relatively high estimated pond concentrations that are used as EECs to compare to toxicity values. The screening models, when used according to standard operating procedures with adequate data, generally predict EECs that are higher than most, if not all, analogous concentrations in the environment resulting from labeled uses. If exposures from the screening level assessment do not indicate the potential for a risk of concern when compared with relevant toxicity data, then it is unlikely that any risks of concern will occur from actual use.

5. For aquatic assessments, EFED's first tier screening level model is the (Gen)eric (E)stimated (E)nvironmental (C)oncentration Model (GENEEC2) which uses the farm pond scenario. If the conservative assessment generated by the GENEEC2 model suggests EECs of a pesticide could pose a risk to non-target species, EFED then generally conducts an assessment using the more complex Pesticide Root Zone Model / EXposure Analysis Modeling System (PRZM/EXAMS) to provide a somewhat more refined estimate of pesticide concentrations in water. Both the GENEEC2 and PRZM/EXAMS models require a number of inputs related to application rate, application timing, application method, soil half life, water half life, pesticide mobility in soil, and spray drift loading. These are important parameters in estimating aquatic concentrations to a water body adjacent to the treatment area where aquatic concentrations are expected to be highest. However, PRZM/EXAMS offers the ability to refine EECs by offering more inputs and options, such as different soil types, weather conditions, aquatic conditions, and spray drift values. Despite refining EECs from GENEEC2, the PRZM/EXAMS modeling results used in EPA's Reregistration Eligibility Determinations (REDs) cited by plaintiffs generally represent higher-end EECs that are uncommon in the environment. Conservative aspects in PRZM/EXAMS model results used in REDs include the scenario of an entire treated field draining into a small pond, which precludes any dilution from untreated areas, and conservative inputs such as the maximum permitted application rate and the minimum time interval between

applications occurring every year for decades. Quantitative Use Analyses from OPP's Biological and Economic Analysis Division suggest that pesticides are far more commonly used at rates lower than that allowed on the label. The selection of soils and site conditions for the model are intended to represent those that would result in an upper 90th percentile EEC. Further, since the modeled water body is a pond with no outlet rather than a moving water body, material that is washed into the pond cannot dissipate by being washed farther downslope. Adding to the conservatism of the approach is the selection of outputs typically used: peak and time-averaged residue concentrations are the highest values occurring over approximately 30 years of simulated applications and rainfall.

6. The farm pond scenario, the soil characteristics, and the chemical fate and transport behaviors used in GENEEC2 and PRZM/EXAMS modeling are intended to represent a generic high-end exposure scenario, not a specific site. Thus the exposures are not intended to be specific to any one location or species, but instead may be useful in ruling out unacceptable exposures resulting from a particular pesticide use in general. The models and their supporting documentation are available on EPA's website at http://www.epa.gov/oppefed1/models/water/index.htm.

7. Computer-based exposure models like those discussed above provide risk assessors with useful tools for assessing exposure. Depending on the application conditions, environmental conditions, and chemical properties EECs can vary greatly. Toxicity can also vary greatly across pesticides. Toxicity to particular organisms can be highly dependent on the specific pesticide and the conditions and route(s) of exposure. Since risk is a function of toxicity and exposure, risk estimates can be greatly affected by variables affecting exposure and toxicity such as:

- Application conditions: application method, application equipment, use site, application

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rate and frequency, and droplet size.

- Environmental fate and transport: chemical properties, soil affinity, persistence in water and soil under a range of conditions, and the production of toxic transformation products.
- Pesticide toxicity: Route of exposure; acute, chronic, reproductive, and developmental to a range of organisms.

The risks of pesticides to non-target organisms are expected to be highly dependent on these factors which vary greatly from pesticide to pesticide and use to use.

Chemical Properties

8. A particular pesticide's basic physical and chemical properties can have a large effect on its ability to move off-target and result in unintended exposures. For example, pesticides that contain carboxylic acid groups, such as the herbicide dicamba, can ionize under many environmental conditions, which affects how the chemical will bind to soil and its solubility, making it distinctly different from many other pesticides which do not ionize under environmental conditions. In certain instances, when soil pH is adequately low, carboxylic acid groups are not ionized which can greatly increase a pesticide's binding to soil, considerably reducing runoff. For pesticides with moderate to relatively high vapor pressures, such as dichlobenil, their ability to volatilize can be very important in affecting their potential for off-target movement. For these pesticides, volatilization may be the predominant route of dissipation from a use site.

9. The "affinity" of a pesticide for soil (that is, the extent to which binds to soil rather than move through the soil in water) greatly affects how much of the pesticide will be available to dissolve in water and runoff. Pesticide affinity for soil varies greatly from chemical to chemical. Pesticides bind to soil components such as organic matter, clay, and sand with

different affinity. As a result, a pesticide's runoff potential is expected to vary with the pesticide and the soil that it contacts. Soil affinity is commonly expressed as a partition coefficient, a ratio of bound versus free pesticide. The higher the ratio the more pesticide will bind to soil and the less likely it is to runoff in water. When looking at soil binding in isolation, a chemical with a soil binding coefficient of 10 has approximately 10 times less pesticide available for runoff than a pesticide with a coefficient of 1.

10. To demonstrate the range of soil binding coefficients that are associated with different pesticides that plaintiffs have identified as a potential concern for Pacific salmonids, it is worth comparing the values for the herbicide norflurazon and the insecticide chlorpyrifos. Norflurazon, which has partition coefficients ranging from 0.14 to 7.11, depending on the soil, is considered to be significantly more mobile than chlorpyrifos, which has coefficients ranging from 77 to 242. Thus, in general, for every pound of norflurazon and chlorpyrifos applied to a field, at least 10-times more norflurazon would be expected to be available for runoff than chlorpyrifos. Based on the difference in soil affinity alone, concentrations of these pesticides in runoff water and receiving surface water would be expected to vary greatly and thus resulting aquatic exposures would also vary greatly.

11. Persistence of pesticides in the environment can vary greatly depending on environmental conditions. While some pesticides may be relatively stable under almost all environmental conditions, many degrade rapidly depending upon the conditions associated with the use of the pesticide. Since the "environment" can be divided into many compartments, e.g., oxygen rich (aerobic) soil, oxygen depleted (anaerobic) soil, oxygen rich water, oxygen depleted water, it is important to understand environmental persistence in each of the compartments a pesticide is likely to contact. Since most agricultural pesticides come in contact with the soil exposed to the air in the field where they were applied, aerobic soil persistence is generally an

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important factor in determining the amount of material that may be available for runoff some period of time after application. Some of the chemicals that plaintiffs have identified as a potential concern for Pacific salmonids can be used to exemplify the wide range of aerobic soil half lives. For example, the insecticide carbaryl generally degrades rapidly in aerobic soil, with a half around a day, while the herbicide atrazine degrades much more slowly in soil, with a half life around 100 days. Thus, in general, the amount of carbaryl expected to be available for runoff, and therefore exposure to non-target organisms, a week after application is expected to be much less than for atrazine.

12. Along with determining how fast a chemical degrades, it can be just as important to identify what chemicals are formed as a pesticide degrades in order to evaluate the impact of the material that may actually reach non-target locations. Most pesticides become less toxic as they degrade, while others may become more toxic with relatively minor changes in their structures. Some organophosphate insecticides, such as chlorpyrifos, can undergo oxidation under some circumstances to form oxons which are generally more toxic than the parent pesticide. If the pesticide is likely to reach environments where it may be converted to a chemical with a significantly different toxicological profile than the parent compound, that should be considered in the assessment.

Pesticide Use Considerations

13. In assessing the risks associated with a pesticide use and the need for and effectiveness of any mitigation options, it is important, at a minimum, to have some understanding the above factors as they relate to contributing to off-target exposures. In performing environmental risk assessments it is also important to consider the *pesticide use* being assessed. Aspects of pesticide use such as application rate, formulation type, application

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method, application timing, and droplet size of spray applications can all greatly affect the movement of pesticides from the application area to off-site areas. Each of these factors may vary by pesticide and the specific use of the pesticide.

14. Application rate (the amount of pesticide active ingredient applied per unit area) can have a very large effect on off-target concentrations. Pesticide concentrations in runoff and spray drift are generally expected to be directly correlated to a pesticide's application rate. Application rate can vary greatly between pesticides and pesticide uses. Some pesticides require application rates of more than 10 pounds per acre in order to be effective at controlling a target pest. Other pesticides can be effective with applications rate of less than an ounce per acre. Thus pesticide application rate can vary by over 160-fold from pesticide-to-pesticide. Even for a single pesticide the application rate can vary based on a wide range of factors including the target pest, the application site, and environmental conditions. For example, the application rate for chlorpyrifos can vary from less than 0.008 lbs/acre for ant control (treating a single mound), 1 lb/acre for an alfalfa field, 2 lbs/acre for cherries, to 6 lbs/acre on citrus orchards. For some uses such as chlorpyrifos treated cattle ear tags it is difficult to accurately estimate the low level of material that would be released to the environment. Given the importance of application rate to magnitude of off-target exposures and the wide range of applications rates that occur across pesticides and uses, it is necessary to consider application rate when assessing the need for, and effectiveness of, mitigation options.

15. Pesticides are not normally applied as pure active ingredient. They are commonly mixed with other substances to improve their effectiveness. Different types of formulations include those intended to be mixed with water such as wettable powders, emulsifiable concentrates, or water dispersable granules. Other formulations like dusts and granulars maybe applied dry. Formulation can greatly affect the droplet size of the pesticide product when the

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material is pumped through a spray nozzle, which in turn can affect the amount of material likely to move off-target via spray drift. Small droplet size (droplets less than approximately 150 microns, 0.15 mm) can be one of the most important factors contributing to high drift levels. For example, the drift levels associated with fine liquid spray formulations are quite different from those observed for granular applications. Because of their particle size and weight, granular products have very low potential to move laterally during application, while liquid sprays may contain fine droplets which can more easily be carried off-target by air currents. Spray drift field studies, models, and review of drift incidents all support that granular applications have far lower drift potential than liquid sprays.

16. Pesticide application methods vary tremendously and have a major effect on off-target spray drift and runoff of pesticides. Some pesticides may be applied in enclosed bait stations, in drip or overhead irrigation systems, in furrow, soil incorporated, or as banded applications. Pesticides that are applied in furrow, by seed treatment, or incorporated into the soil after application (commonly done by tilling) generally have much less pesticide available at the soil surface available for runoff. Insecticides, fungicides, and herbicides may all be applied in some way that results in much of the applied pesticide being unavailable at the soil surface. Runoff studies and models both suggest that applying pesticides below the soil surface significantly reduces runoff concentrations. Application method can also greatly affect the amount of pesticide that can drift off-target via secondary drift. Application methods that reduce the amount of material at the soil surface reduce the amount of secondary drift such as wind blown soil bound pesticide. If the amount of pesticide remaining at the surface is 1 to 10% of that applied, the range of values used in EFED risk assessment to account for soil incorporation in ecological exposure assessments, the amount of material available to blow off-target would be reduced by a factor of 10 to 100.

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17. Application equipment specified on labels can include irrigation systems, ground boom sprayers, airblast or air assisted sprayers, fixed wing or rotary aircraft, and backpack sprayers. Application equipment can greatly affect the amount of off-target spray drift (the spray droplets being carried off-target during or shortly after application). When a pesticide is applied in irrigation water with a drip irrigation system there will be no suspended droplets available to drift (watering in a pesticide application can also reduce the amount available for runoff).

18. The drift potential from different types of sprayers can vary greatly. Aerial applications are generally associated with the highest drift levels but even aerial drift levels can vary greatly depending on a number factors including the droplet size, release height, and wind speed. Helicopters, under certain circumstances, such as some forestry and agricultural applications, are capable of relatively low drift values by using very coarse sprays, such as a solid stream, and low release heights. Results from the AgDRIFT model (a computer-based predictive spray drift model) estimating off-target drift levels for a low release height (4 ft) coarse helicopter application (wind speed 10 mph) and a representative fixed wing release height (10 ft) with a fine spray (wind speed also 10 mph) demonstrate (see graph below) the differences in downwind off-target deposition levels expected under these conditions. The horizontal axis of the graph shows distance from the downwind edge of the target area and the vertical axis shows the amount of material, as fraction of the target application rate, depositing at particular distances downwind.

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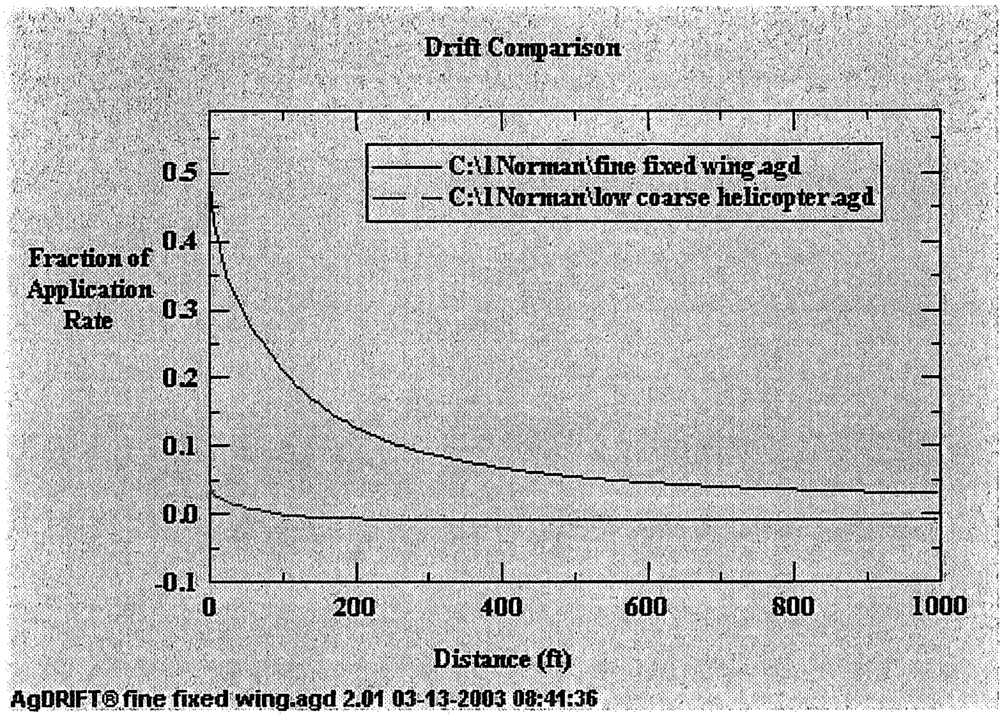

The difference in deposition at 100 feet downwind is 24-fold. Under such circumstances, a restriction needed for fixed-wing aircraft may not be necessary for helicopters.

Default AgDRIFT downwind deposition curves, shown in the figure below, demonstrate some of the different drift levels that can result from different types of ground boom and fixed wing aerial applications.

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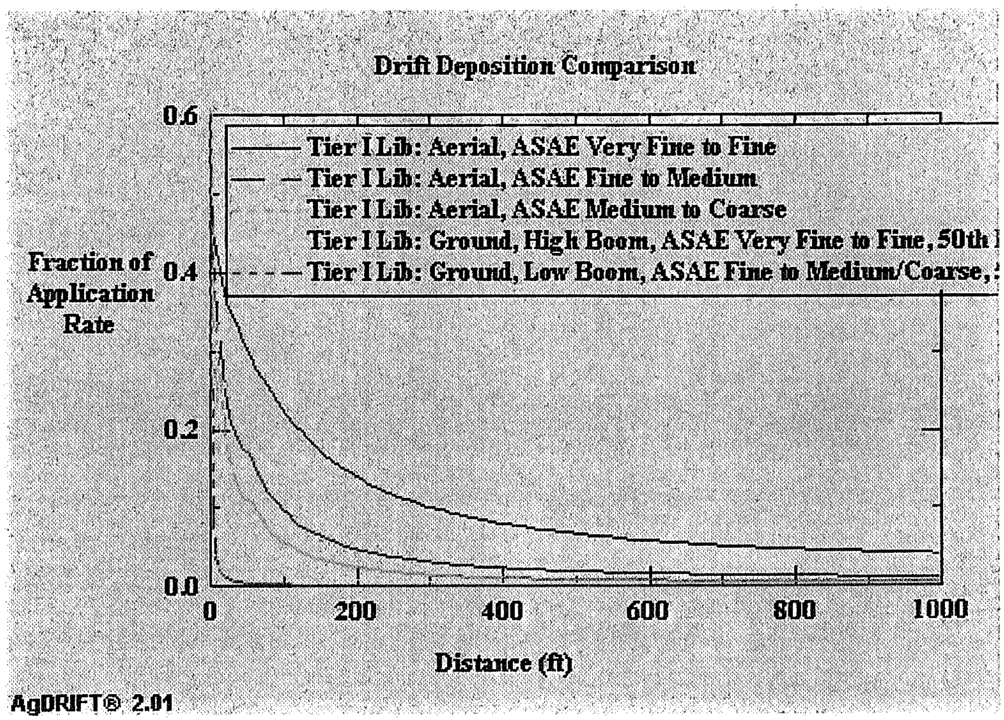

19. Drift levels from orchard airblast applications are affected greatly by the type of orchard being sprayed. Characteristics such as canopy height, spacing, and density all affect air movement through the orchard, and therefore spray drift movement out of the orchard. The following diagram shows drift levels from similar equipment to different orchard types. Different types of airblast sprayers are also likely to affect drift levels. Radial sprayers that direct spray laterally and upward are likely to push spray higher, increasing the potential for spray to be carried out of the orchard by winds above the canopies. Tower sprayers, which direct spray downward into orchard canopies are likely to reduce the amount of spray moving above the canopy and thereby reduce off-target spray drift.

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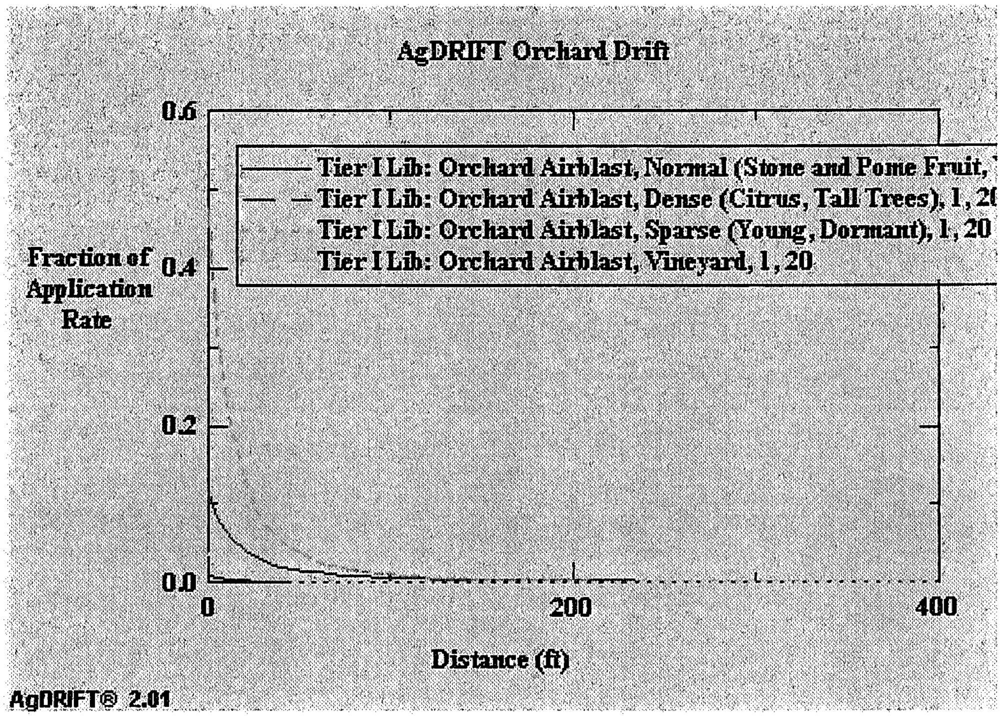

20. Spray drift levels from ground boom sprayers can differ depending on a number of factors including the boom height (see paragraph 18). Most ground boom sprayers can adjust boom height to modify the height above the ground or crop canopy at which spray is released. In general, the higher the spray is released, the higher the drift potential. Some ground boom sprayers may use an air assist system, shields, or shrouds. Air assisted sprayers use a current of air to carry spray from the nozzle downward to the target. The air movement downward can effectively deliver the spray to the target surface reducing the amount of spray that may be carried off-site. Shields and shrouds can be used to block wind around nozzles reducing the amount of droplets that can blow off-target.

21. Application timing can affect risks to non-target organisms. Many pesticides are applied at specific times of the year to control pests at sensitive life stages or critical points in crop development. If the pesticide is applied the time of year when runoff is most likely to occur, the rainy season, pesticide levels in runoff are likely to be increased. If pesticides are applied in

drier seasons, runoff concentrations would be expected to be lower as the material would have more time to dissipate in the target area prior to a runoff generating rainfall event. In addition, seasonal pesticide applications may or may not occur at times when sensitive species are in proximity to the treatment area.

22. For pesticides that are applied as liquid sprays, the droplet size spectrum that is used in application can vary greatly. Herbicides that may be applied before the emergence of crops or weeds (such as atrazine and simazine) are typically applied onto bare ground in coarse sprays which have a relatively low drift potential. The herbicide on the soil inhibits the growth of weeds either through direct contact or by absorption through the roots. Insecticides with systemic activity, such as methomyl, also may be applied in relatively coarse sprays. Systemic insecticides can act through contacting plant foliage or roots and then being translocated in the plant. Pests feeding on the plant also ingest the absorbed pesticide. Because systemic pesticides can be distributed through the plant a fine spray covering the entire plant is not usually required. Pesticides that generally require a finer spray, and therefore have a higher drift potential, include certain fungicides and contact insecticides. Fine sprays are used for good "coverage." The small droplets of fine sprays are more likely to contact small insects or small fungal infections. Fine sprays can relatively evenly cover plant surfaces, with some deposition on leaf undersides. Thus, the effective droplet size can vary with the chemistry of the pesticide being applied and the target pest.

23. Numerous spray drift field trials, wind tunnel experiments, and computer models show that droplet size is an important parameter affecting the magnitude of off-target spray drift. Using the AgDRIFT model for aerial applications, going from a relatively coarse spray to a relatively fine agricultural spray, holding all other inputs constant, results in more than a 6-fold increase in deposition at 100 feet downwind.

24. In order to assess the need for and effectiveness of mitigation options, it is important to consider the exposure-related factors described above. Absent consideration of the key pesticide and use-specific parameters affecting off-target exposure, there is no sound basis for estimating whether a particular mitigation option, such as a buffer zone, is needed to protect a resource or, conversely, whether it is inadequate to do so.

Toxicity

25. While the factors discussed above are necessary to estimate exposure, as explained in paragraph 3, risk is a function of both exposure and toxicity. In estimating risk, it is equally important to have an understanding of the concentration or exposure level expected to cause adverse effects. Pesticides, by design, are intended to be toxic to certain organisms (pests) but are not intended to adversely affect non-target organisms. Pesticides can selectively impact pest species through having lower exposures to non-target organisms and/or through being less toxic to non-target organisms. In order to evaluate the toxicity of pesticides to non-target species, EPA requires pesticide registrants to submit data on pesticide toxicity to a number of plant, fish, avian, mammalian and invertebrate species.

26. Different pesticides vary greatly in their toxicity to different organisms. As expected, herbicides are generally much more toxic to plants than they are to animals. The herbicide norfluazon can control weeds on a field when applied at rates of 0.75 lbs per acre or less. This converts to less than 8 micrograms per square foot. While norflurazon can be toxic to plants at very low levels, norflurazon shows much lower toxicity to animals. The LC50 (the concentration of pesticide in food or water expected to result in 50% mortality in a group) for bluegill sunfish is 16.3 milligrams per liter (16.3 parts per million). It would take the amount of norflurazon applied to over 2000 square feet concentrated into one liter of water in order to reach the LC50 for bluegill sunfish.

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27. Even pesticides with the same mode of action can vary greatly in toxicity to non-target organisms. Both carbaryl and azinphos-methyl are insecticides that act by inhibiting the enzyme acetylcholinesterase in the insect nervous system. These insecticides can also affect acetylcholinesterase in non-target organisms and can also be toxic to such organisms, as a result. The difference in toxicity to different organisms, however, can be extreme. For azinphos-methyl, the LC50 for a brown trout is 3.5 micrograms per liter (3.5 parts per billion) while the LC50 of carbaryl for brown trout is 6.3 milligrams per liter (6.3 parts per million), a difference of over three orders of magnitude.

28. Thus in order to accurately assess the risks of pesticides to a specific organism it is very important to evaluate the toxicity of the specific pesticide of concern to the receptor of concern or a reasonable surrogate.

Risk by Pesticide and Use

29. It is possible to see the differences in exposure, and thus risk, to aquatic animals resulting from the differences in chemical properties, pesticide use, and toxicity parameter associated with specific pesticides by reviewing published risk assessments (available on OPP's website at http://www.epa.gov/pesticides/reregistration/status.htm#C).

Phosmet is an organophosphate insecticide that may be applied to a number of crops, including apples and alfalfa. Following label directions the applicator may apply phosmet with different application rates, intervals, and methods to alfalfa and apples. These factors combined with different soil properties contributed to a large difference in estimated exposures in the phosmet risk assessment. The time-averaged aquatic concentrations (expressed in parts per billion) for phosmet resulting from alfalfa and apple scenarios is shown in the table below.

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Crop	Screening-Level Time-Averaged Aquatic Phosmet Concentrations (ppb)				
	Peak	4-day	21-day	60-day	90-day
Alfalfa[1]	3.0	0.6	0.2	0.1	0.1
Apples[2]	26.2	5.0	1.4	0.8	0.5

[1] Alfalfa: 1 lb/acre, 8 aerial applications, 14-day interval, Oregon scenario.

[2] Apples: 4 lbs/acre, 5 airblast applications, 7-day interval, New York scenario.

As apples may be grown under many different weather conditions and soils, the environmental conditions that exist when phosmet is applied to apples may be very different in Oregon from those in upstate New York. The differences in environmental conditions for different apple growing areas was taken into account in the EFED phosmet risk assessment. Below is a table of peak screening-level concentrations (derived from PRZM/EXAMS modeling) taken from the EFED phosmet risk assessment displaying estimated aquatic concentrations resulting from varying environmental conditions.

Application rate	Screening-Level Aquatic Concentration (ppb)	
	Eastern Apples	Western Apples
High[1]	26.7	11.2
Low[2]	15.6	0.4

[1] High: 4 lbs active ingredient / acre, 5 airblast applications, 7 days apart

[2] Low: 1.5 lbs active ingredient / acre, 10 airblast applications, 7 days apart

Thus aquatic exposure, and risk, can vary by over 65-fold by changing application and environmental conditions while maintaining all the same chemical properties.

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30. In addition to differences in exposure, differences in pesticide toxicity can contribute greatly to differences in risk to non-target organisms. Phosmet and chlorpyrifos are both of the same phosphorothioate class of organophosphate insecticides and both are used to control a wide range of invertebrate pests, however, the toxicity of phosmet and chlorpyrifos to fish is markedly different. Whereas rainbow trout LC50s for chlorpyrifos were measured in the range of 5 to 10 ppb the rainbow trout LC50 for phosmet was measured at 230 ppb. Overall risks to fish in general in the chlorpyrifos and phosmet risk assessments differed by 500-fold for the use of both chemicals on alfalfa. Thus, different pesticides, even in the same structural class with the same mode of action, can vary greatly in risk to non-target organisms.

31. To develop an effective mitigation strategy for addressing the risk of a pesticide to particular species, it is important to understand the risk to be mitigated and the major route(s) by which exposure occurs. Critical to this process is determining the toxic level of concern for a particular organism, current exposure levels, and the magnitude of exposure reduction from different mitigation options. Although buffer zones are a simple and relatively effective option in instances where spray drift is a major route of off-target movement, buffer zones may not be effective in many instances for significantly reducing runoff concentrations. In addition, other equally effective mitigation options may be useful in reducing spray drift exposures, such as making applications with a larger droplet size or when wind is blowing away from surface water.

Pursuant to 28 U.S.C. 1746, I declare under penalty of perjury that the forgoing is true and correct. Executed on this 20th day of March, 2003.

Norman Birchfield

Norman B. Birchfield, Ph.D.
U.S. Environmental Protection Agency