May 28, 2002

Memorandum

From: Larry Turner, Ph. D. **|signed|**
Environmental Field Branch
Field and External Affairs Division

To: Arthur-Jean Williams, Chief
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Subject: Effects Determination for Bentazon for Pacific Anadromous Salmonids

I reviewed data and other information for bentazon and its potential effects on Pacific anadromous salmonids and their critical habitat. This pesticide does not seem to warrant action under the Endangered Species Act because I conclude that it will cause 'no effect' on the listed Pacific salmon and steelhead and their critical habitat.

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

Relevant acute data are derived from toxicity tests with lethality as the primary endpoint. The standardized acute tests for pesticide registration include analysis of observable sublethal effects as well. Typically, a standard fish acute test will include concentrations that cause no mortality, and often no observable sublethal effects, as well as concentrations that would cause 100% mortality. By looking at the effects at various test concentrations, one can statistically predict the effects likely to occur at various pesticide concentrations. A well done test can even be extrapolated to concentrations below those tested or above the test concentrations if the highest concentration did not produce 100% mortality.

OPP evaluates the potential chronic effects of a pesticide on the basis of several types of tests. These tests are often required, but not always. If a pesticide has essentially no acute toxicity at relevant concentrations, or if it degrades very rapidly in water, or if the nature of the use is such that the pesticide will not reach water, then chronic fish tests may not be required. Chronic fish tests primarily evaluate the potential for reproductive effects and effects on the offspring. Other observed sublethal effects are also required to be reported. An abbreviated chronic test, the fish early-life stage test, is usually the first chronic test conducted and will indicate the likelihood of reproductive or chronic effects at relevant concentrations. If such effects are found, then a full fish life-cycle test will be conducted. If the nature of the chemical is such that reproductive effects are expected, the abbreviated test may be skipped in favor of the full life-cycle test. These chronic tests are designed to determine a “no observed effect level” (NOEL) and a “lowest observed effect level” (LOEL).

An analysis of toxicity, whether acute or chronic, must be combined with an analysis of how much will be in the water, for fish. Risk is a combination of exposure and toxicity. Even a very highly toxic chemical will not pose a risk if there is no exposure, or very minimal exposure relative to the toxicity. OPP uses a variety of chemical fate and transport data to develop “estimated environmental concentrations” (EECs) from a suite of established models. The acute or chronic EEC is compared with the acute or chronic (respectively) toxicity to determine if there is risk. Generous safety margins are used for both acute risk and for chronic risk in rivers and streams. For ponds, there is still a safety margin for chronic risk, but it is not as “generous”. While our risk assessment criteria (levels of concern) are intended to protect populations of non-target species that are not listed as endangered or threatened, our criteria for endangered and threatened species are intended to protect individuals of these species.

We also attempt to protect listed species from indirect effects of pesticides. We note that there is not a clear distinction between indirect effects on a listed species and adverse modification of critical habitat (discussed below). By considering indirect effects first, we can provide appropriate protection to listed species even where critical habitat has not been designated. In the case of fish, the indirect concerns are for food and cover. In general, pesticides, including most herbicides, applied in terrestrial environments will not reach aquatic environments in sufficient amounts to affect the plant material in the water that provides aquatic cover for listed fish. Thus the primary indirect effect of concern would be for the food source for listed fish. However, it is not necessary to protect individual organisms that serve as food for listed fish. Thus, our goal is to ensure that pesticides will not impair populations of these food organisms. For fish, this is primarily

aquatic invertebrates, although aquatic plants may be relevant food for some fish species. We already are protecting food fish at the individual level because we are protecting the listed fish at the individual level, so there is nothing extra we need to do to ensure an adequate supply of fish for food of listed fish. As you know, comparative toxicology has demonstrated that various species of scaled fish generally have equivalent sensitivity, within an order of magnitude, to other species of scaled fish tested under the same conditions.

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

As you are aware, all of our risk assessment procedures, toxicity test methods, and EEC models have been subject to public comments and have been peer-reviewed by OPP’s Science Advisory Panel.

Given these considerations, I have evaluated the potential effects of this pesticide on threatened and endangered species. Most of the information used in the assessment below is derived from the Reregistration Eligibility Document (RED) for bentazon issued September 1994[1]. Typically, a RED will indicate if there are risks of concern, i.e., exposure that exceeds a “level of concern” (LOC), where there is one level of concern for “high risk”, a second as a trigger for “restricted use classification”, and a third, more sensitive level of concern for threatened and endangered species. Of course, this RED, like REDs generally, addresses all kinds of species groups, but does not deal with particular species; I have attempted to apply the more general

findings of the RED to the specific listed salmonids.

The bentazon RED stated that the results of aquatic animal tests indicate that sodium bentazon is practically non-toxic to fish and aquatic invertebrates on an acute basis. The RED further stated, "Minimal acute risk to aquatic animals is expected. Moreover, chronic risk to aquatic animals is not anticipated because of the relatively low exposure values when compared to the acute toxicity test results." The estimated environmental concentrations in water were as high as 0.22 ppm for a 3.6 lb ai/A application in the table of EECs, although there is some confusion relative to the text indicating the maximum EEC as 2.65 ppm for that application rate. The RED did not indicate the method for deriving the EEC. To ensure that we are using the most up-to-date approach, I ran the current GENEEC2 model for estimating concentrations, using the same environmental fate and transport parameters cited in the RED, and I obtained a maximum EEC of 50 ppb for a 2 pound ai/A application rate, the highest application rate per year based on label changes resulting after issuance of the RED. All of these EEC values are well below our level of concern for endangered species considering that all of the aquatic LC50 and EC50 values were greater than 100 ppm. USGS monitoring data showed peak surface water residues of bentazon of 1 ppb (estimated from graphical representation) in the Willamette Basin[2] and 2 ppb in Central Columbia Plateau[3], and 0.2 ppb in the Sacramento River Basin[4]. No residues were found in the San Joaquin-Tulare Basin[5]. These are all well below the modeled residues. I conclude that there is no effect of the labeled use of bentazon on listed salmon and steelhead, nor on their food supply.

Bentazon is labeled for use on a variety of crops, including caneberries, grapes, tree fruits & nuts, beans, peas, corn, sorghum, alfalfa, mint, peanuts, soybeans, rice (except California), ornamental herbaceous plants, and warm-season grasses. California reported 1210 pounds ai used in 2000, the most recent year for which data are available, most of which (1108 pounds ai) was used on beans. The rather general USGS usage data for 1992[6] show the vast majority of bentazon is used on soybeans and other midwestern crops. Parts of Oregon, Washington, and Idaho have higher usage than California, most likely on peas and beans, but these are not definitive data.

Bentazon is used to control early-emergent herbaceous weeds, including on a variety of woody crops. There is no evidence that it would affect any woody vegetation. Therefore, the effect on riparian vegetation critical to salmonids would be negligible or none. Therefore, I conclude that the labeled use of bentazon will not adversely modify critical habitat of listed Pacific salmon and steelhead.

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1. Reregistration Eligibility Decision - Bentazon. Office of Pesticides and Toxic Substances, U. S. Environmental Protection Agency, EPA 738-R-94-029, September, 1994.

2. Wentz DA, Bonn BA, Carpenter KD, Hinkle SR, Janet ML, Rinella FA, Uhrich MA, Waite IR, Laenen A, Bencala KE. Water Quality in the Willamette Basin, Oregon, 1991-95. U.S. Geological Survey Circular 1161.

3. Williamson AK, Munn MD, Ryker SJ, Wagner RJ, Ebbert JC, Vanderpool AM. 1998. Water Quality in the Central Columbia Plateau, Washington and Idaho, 1992-95. U.S. Geological Survey Circular 1144.

4. Domagalski JL, Knifong DL, Dileanis PD, Brown LR, May JT, Connor V, Alpers CN. 2000. Water Quality in the Sacramento River Basin, 1994-98. U. S. Geological Survey Circular 1215.

5. Dubrovsky NM, Kratzer CR, Brown LR, Gronberg JM, Burow KR. 1998. Water Quality in the San Joaquin-Tulare Basins, California, 1992-95. U.S. Geological Survey Circular 1159.

6. USGS, National Water Quality Assessment, Pesticide National Synthesis Project, at http://ca.water.usgs.gov/use92/bentazon.html