UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

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Arthur-Jean Williams
Associate Director
Environmental Fate and Effects Division
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Subject: Request for Endangered Species Act Section 7 Informal Consultation on the Environmental Protection Agency's Re-Registration and Use of Racemic Metolachlor in Idaho, Washington, California, and Oregon in relation to listed Pacific salmon and steelhead.

This responds to the Environmental Protection Agency's (EPA) June 19, 2006, request to the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) to review and concur with EPA's racemic metolachlor effect determinations for 26 threatened and endangered Pacific salmon and steelhead prepared pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1536). EPA's effect determinations conclude that the re-registration and continued use of racemic metolachlor is not likely to adversely affect listed salmonids or any designated critical habitat for those species. NMFS reviewed EPA's effect determinations using the substantive requirements of section 7, the relevant scientific and commercially available data on the exposure and toxicity of racemic metolachlor, and the ecology of Pacific salmon and steelhead considered herein and does not concur with EPA's determination.

In NMFS' evaluation of EPA's conclusions regarding re-registration and continued use of racemic metolachlor in the states of Idaho, Oregon, Washington, and California, NMFS used information that was not considered by EPA in the preparation of the effect determinations. NMFS considers these materials among the best available science. NMFS reviewed how the assessment adhered to methods described in your January 23, 2004, document entitled Overview of the Ecological Risk Assessment Process for Threatened and Endangered Species Effect determinations (Overview Document). We also reviewed your Nov 29, 2002, Metolachlor Analysis of Risks to Endangered and Threatened Salmon and Steelhead and your April 1995 re-registration eligibility decision (RED) for metolachlor. Other information and analyses relied on in reviewing the effect determinations included the open literature on the toxicological effects of racemic metolachlor, s-metolachlor, and other pesticides that interact with metolachlor, and the ecology of the listed species.

The available information supports that salmon and steelhead individuals and their habitat will likely be exposed to racemic metolachlor throughout their freshwater residency and in some circumstances exposed in estuarine and near shore saltwater habitats. Based on limited

monitoring data, NMFS is aware that racemic metolachlor has reached concentrations of up to 143 ug/L in surface waters (Battaglin et al. 2000). No studies were available that directly targeted racemic metolachlor applications coinciding with runoff events, so environmentally realistic peak concentrations were not available. Surface water monitoring data from agriculturally dominated regions indicated that racemic metolachlor concentrations can exceed 100 ug /L and frequently are detected in the low ug/L range (Gilliom et al. 2006, Battaglin et al. 2000). Field incident data indicated fish kills following label approved metolachlor uses, which, when measured, resulted in 28 and 57 ug/L metolachlor (EPA 2002, 2006). NMFS expects that there may be locations and durations when salmon and steelhead would be exposed to racemic metolachlor concentrations of up to or greater than 1 mg/L in shallow, low flow, off-channel habitats. Toxicity data suggest these concentrations are likely to adversely affect listed salmonids either directly, or indirectly via habitat associated impacts.

EPA's generated estimated exposure concentrations (EECs) are not expected to represent potential high end exposure to salmonids and their habitat for several reasons (listed below). In aggregate, these issues result in an underestimation of potential exposure to Pacific salmon and steelhead from racemic metolachlor.

- Off-channel habitats were not considered although they are utilized by salmonids and provide substantially less initial dilution of racemic metolachlor from runoff and drift events compared to the "farm pond" habitat modeled in the Biological Evaluation (BE) (Table 2 of technical appendix);
- NMFS' examples of adjusted EECs for off-channel habitats were substantially greater than BE estimates (Table 2 of technical appendix);
- All EPA exposure simulations failed to assess the maximum single and/or seasonal application rate that is permitted based on NMFS' review of two of the currently registered racemic metolachlor labels (Table 3 of technical appendix);
- Exposure estimates for other chloroacetanalides that share a common mode of action were not generated or discussed except racemic metolachlor's degradates, although use and monitoring data indicated co-occurrence of multiple chloroacetanilides with racemic metolachlor.

EPA concluded that no sublethal effects to listed salmonids are expected following racemic metolachlor exposure. Substantial uncertainty remains in the use of EPA's selected toxicity estimates to represent biologically relevant salmonid responses due to the absence of studies evaluating sublethal responses such as chemosensory systems, behaviors, reproduction, endocrine disruption, growth, and smoltification. NMFS does not concur with the BE's conclusion that sublethal toxicity will not occur. Toxicity data with another aquatic species suggests that racemic metolachlor may affect chemosensory function. An experiment with crayfish indicated olfaction was affected following racemic metolachlor exposures at environmentally realistic concentrations (25-75 ug/L) (Wolf and Moore 2002). Olfaction is a critical chemosensory function for Pacific salmon and steelhead that underlies ecologically important behaviors including detecting and avoiding predators, participating in reproduction, locating food, imprinting, and navigating migratory routes. No studies were located that evaluated whether metolachlor affected olfactory processes in salmonids or any fish species for that matter. If olfaction in salmonids is as sensitive as observed effects to crayfish chemosensory

systems, racemic metolachlor may adversely affect listed individuals at concentrations less than or equal to 25 ug/L.

NMFS does not concur with the BE's conclusions or the rationale used to support the conclusions regarding the likelihood of adverse effects to listed salmonids via habitat responses. The available information on the ecology of Pacific salmon and steelhead and their use of aquatic habitats throughout their range does not support the effect determination that racemic metolachlor is not likely to adversely affect salmonids via habitat effects. Racemic metolachlor use within salmonid watersheds would likely degrade freshwater habitats utilized by salmonids during various lifestages, particularly juveniles, and potentially result in cascading ecological effects. Salmonid habitats are expected to be adversely affected following racemic metolachlor exposures as low as 8 ug/L (primary producers). The lowest EC_{50} for aquatic plants, 8 ug/L, was not used in the BE's risk quotient although it is 1.25 times more toxic than the value in the BE, 10 ug/L (Table 4). Additionally, vascular plant toxicity data indicated toxicity at lower concentrations than were used in the BE (Table 4).

The BE based its conclusions regarding effects to aquatic plants on four assumptions that are not supported by the scientific information NMFS reviewed. For example, one assumption stated was that, "Effects from metolachlor to aquatic plants appeared to be limited to algae." However the effect concentrations to aquatic plants indicate that metolachlor is "very highly toxic" according to EPA's classification system. Two "core" studies with duck weed (*Lemna gibba*) also showed that metolachlor is "very highly toxic" to aquatic vascular plants. *Lemna gibba* EC_{50}s were 48 ug/L (racemic metolachlor) and 21 ug/L (s-metolachlor). These data do not support the claim that metolachlor toxicity is limited to algae, but rather indicate that metolachlor is "very highly toxic" to aquatic plants. Metolachlor's herbicidal properties are well documented as evidenced by its efficacy and toxicity to multiple primary producers including target plants, i.e., weeds, non-target terrestrial plants including crops, and non-target aquatic plants. NMFS expects that exposures to racemic metolachlor that are sufficient to reduce primary production, i.e., at or above 8 ug/L, could lead to adverse cascading ecological effects within listed salmonid habitats, potentially affecting listed salmonids themselves. Additionally, NMFS expects concentrations to persist especially in shallow, off-channel habitats, inhibiting the recovery of primary producers. This is supported by metolachlor's aerobic aquatic half-life of 141 days and the frequency of detection in monitoring programs. Therefore NMFS believes that effects to primary producers are expected within the habitat of each of the exposed salmonid ESUs.

NMFS' review of the available information indicates that salmonid prey are likely to be exposed at higher concentrations than estimated by EPA and that adverse effects are likely for sensitive taxa. For example, the chronic toxicity value used in the BE, a no observable effect concentration (NOEC), was 3200 fold less toxic than a NOEC from an experiment with the invertebrate *Daphnia magna* (Liu et al. 2006). By affecting an invertebrate population's intrinsic growth rate, racemic metolachlor could lead to reduced prey availability for foraging salmonids, particularly in areas where multiple applications are applied year after year. Reduced populations of prey may affect growth and development at critical life stage transitions of salmonids, e.g., alevin-fry.

The BE did not address the occurrence of exposure to pesticide mixtures and the effects to habitat and listed individual salmonids. This contributed to the likelihood that risk to listed species was underestimated. The best scientific and commercial data available predict likely exposure of threatened and endangered Pacific salmonids to racemic metolachlor-containing pesticide mixtures, including other pesticides within racemic metolachlor formulations such as atrazine, tank mixtures, and environmental mixtures containing other chloroacetanilides. Watersheds containing listed salmonids are expected to contain other chloroacetanilides, atrazine, and metribuzin, all of which have been shown to interact with racemic metolachlor resulting in additive toxicity. Monitoring and use data indicated that metolachlor is a common constituent of pesticide mixtures in agricultural (occurring in 50% of samples containing mixtures) and urban watersheds (Gilliom et al. 2006). Given the frequent co-occurrence of atrazine, metolachlor, and alachlor-containing mixtures, we expect that aquatic primary producers will respond to the mixture and not to racemic metolachlor alone. Environmentally realistic concentrations of atrazine, metolachlor, and alachlor are sufficient to adversely affect primary production and when combined, would lead to greater toxicity than expected from any one of the pesticides alone. This is supported by several studies that showed additive effects to primary producers following exposure to metolachlor in combination with other pesticides (Junghans et al. 2003, Carter and Hoagland 1998; Krieger et al. 1988). The likely reduced feeding efficiency and subsequent reduced growth of consumer species such as invertebrate salmonid prey items after feeding on fewer, smaller, primary producers potentially affects juvenile salmonids. Consequently, the actual risk to listed species from racemic metolachlor use in salmonid-bearing watersheds may be substantially underestimated in the BE.

Therefore, NMFS expects that racemic metolachlor contamination of designated critical habitats will adversely affect water quality and forage, both of which are primary constituent elements for salmonid designated critical habitats.

In conclusion, NMFS does not concur with the effect determinations for Pacific salmonids and steelhead and recommends that EPA initiate formal consultation on the re-registration and use of racemic metolachlor products for the following ESA-listed salmonid ESUs and associated designated critical habitat:

> Threatened Puget Sound steelhead (*Oncorhynchus mykiss*); Central California Coast steelhead; Snake River Basin steelhead; Upper Columbia River steelhead; Middle Columbia River steelhead; Lower Columbia River steelhead; Northern California steelhead; South-Central California Coast steelhead; California Central Valley steelhead; California Coastal Chinook (*Oncorhynchus tshawytscha*); Central Valley spring-run Chinook; Lower Columbia River Chinook; Puget Sound Chinook; Snake River fall-run Chinook; Snake River spring/ summer-run Chinook; Upper Willamette River Chinook; Columbia River chum (*Oncorhynchus keta*); Hood Canal summer-run chum; Lower Columbia River coho (*Oncorhynchus kisutch*); Southern Oregon and Northern California coasts coho; and Endangered Upper Columbia River chinook; Sacramento River winter-run Chinook; Central California coast coho; Snake River sockeye (*Oncorhynchus nerka*); Southern California steelhead.

NMFS concurs with the NLAA determination for Ozette Lake Sockeye ESU which is not likely to be exposed to racemic metolachlor products. It is unlikely that Ozette Lake sockeye

individuals or their habitat will be exposed based on current and future land uses within the ESU's geographic local i.e., the majority of the ESU is in the Olympic National Park and Forest and the remaining portions of the ESU's watershed is largely private, coastal, temperate rainforest where racemic metolachlor is not expected to be used.

NMFS also recommends that EPA address the substantive issues raised in the attached technical appendix to ensure that the initiation package includes all necessary and relevant information to complete formal consultation in a timely manner. NMFS also suggests the initiation package includes all information required in 50 CFR 402.14(c), including an assessment of the inter-related and inter-dependent effects of the action, e.g., the effects of all registered racemic metolachlor end use products and authorized tank mixes. Additionally, an assessment is warranted of other pesticides that are known to act in an additive manner to primary producers and are commonly co-located in surface waters with racemic metolachlor. These pesticides include atrazine, s-metolachlor, and the commonly applied chloroacetanilides, acetochlor and alachlor.

We appreciate the opportunity to comment on your effect determinations and look forward to your continued cooperation in the conservation of listed Pacific salmon and steelhead. Should you have any questions or concerns regarding this response please contact Dr. Scott Hecht of my staff at 360-534-9306.

Sincerely,

James H. Lecky, Director
Office of Protected Resources

cc: Rick Sayers, USFWS