Session M7: Detection, Fate and Transport of Pesticides

Room C124
10:00 – 11:30 am

0523
M7-1

Water Quality Monitoring Needs for Evaluating the Risk of Pesticide Registration Actions to Threatened and Endangered Species

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Section 7(a)(2) of the Endangered Species Act (ESA) requires each Federal agency, in consultation with US Fish and Wildlife Service and/or National Marine Fisheries Services (NMFS), insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of their designated critical habitat. The Environmental Protection Agency's (EPA) registration of pesticides under the Federal Insecticide, Rodenticide, and Fungicide Act (FIFRA) is subject to this requirement of interagency consultation. Assessing the impact of EPA's authorization of pesticide use to listed species is an emerging challenge given the ubiquitous use of pesticides, number of pesticide registration actions, and the number and diversity of listed species that may be impacted. In this presentation we outline the pertinent regulatory requirements and species-specific considerations that influence the utility of water quality monitoring data for ESA consultation. We also discuss the need to consider if the monitoring design is sufficient for characterizing exposure in a qualitative, quantitative, or probabilistic manner. Finally, we submit the need for monitoring studies that: (1) are designed to assess the federal action, (2) allow for characterization of risk at the individual, population, or species levels of biological organization, (3) account for spatial and temporal distribution of the listed species, and (4) account for other water quality stressors in the species baseline that can influence response.

0054
M7-2

Continuous Monitoring for Pesticides in a Pacific Northwest Freshwater Off-Channel Habitat Using a Lipid-Free Tubing Passive Sampling Device

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Pesticide exposure to juvenile salmonids utilizing Pacific Northwest freshwater off-channel habitats during rearing and migration is of concern as a result of recent National Marine Fisheries Service Biological Opinions. We deployed a lipid-free tubing passive sampling device (LFT) at 5 locations in the Pudding River basin, Willamette Valley, OR (HUC8: 17090009). This watershed is predominately agricultural and classified as habitat for salmonid species. LFT were deployed continuously in off-channel habitats, including backwaters, channel edge sloughs, and off-channel pools, at 3-4 week intervals from June 2010 to September 2011. Time-weighted average concentrations of freely dissolved pesticides were quantified by dual column gas chromatography with electron capture detection and confirmed with mass selective detection. The use of pesticide off-channel habitat monitoring results in assessing the risk to salmonids will be discussed.

0286
M7-3

Pesticides of Emerging Concern: Adapting Analytical Methods in Support of Field Studies

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Pesticides applied in agricultural and urban areas are transported into aquatic environments and are often the focus of monitoring programs. Changes in pesticide use and registration of new pesticides result in pesticides of emerging concern, presenting a challenge for resource managers and policy makers trying to understand the fate and effects of these contaminants. The USGS Toxics Program conducts field studies on the fate and effects of new or understudied pesticides. An integral part of these focused studies is the development of analytical methods for new pesticides and potential degradates in water, sediment and tissue. One series of field studies has focused on fungicides, a group of pesticides that is rarely monitored and whose registration and use have changed dramatically over the last 5 years in response to the potential threat of soybean rust and late blight. Fungicides are moderately

hydrophobic (log K_{ow} 3-4) and are considered to be relatively persistent in water and sediments. Methods were developed to analyze 37 currently-used fungicides in water and sediments. Another series of field studies has focused on pyrethroid insecticides because of their widespread use and high toxicity to aquatic organisms. Pyrethroid insecticides are highly hydrophobic compounds and tend to bind tightly to sediments (log K_{oc} 5). The high toxicity of these compounds required development of very sensitive analytical methods to be able to measure pyrethroids at environmentally-relevant concentrations (< 1 µg/kg). Other insecticides such as neonicotinoids (acetamiprid, clothianidin, imidacloprid, thiacloprid, thiamethoxam) are beginning to be applied more frequently and have been implicated in the recent decline of native pollinators and colony collapse disorder in honeybees. An analytical method is being developed to measure these insecticides in water. A recent approach is to characterize exposure of aquatic organisms to pesticides by directly measuring pesticide concentrations in tissue. The method was optimized for maximum sensitivity to allow comparison of exposure and biological endpoints in individual organisms. Information about the fate and potential effects of pesticides of emerging concern will be transferred to resource managers and policy makers.

0126
M7-4

An Assessment of Pesticides, Trace Elements, and Their Potential to Affect Salmonids in the Hood River Basin, Oregon, 1999-2009

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Major land uses in Oregon's Hood River basin are agriculture and forestry. Historically, the Hood River and its tributaries served as important spawning and rearing streams for salmonids, three of which are listed as "Threatened" under the U.S. Endangered Species Act in response to declining populations. Water-quality impairment has been identified as a contributor to the population decline.

To begin to address impaired water quality related to agricultural activities, the Oregon Department of Environmental Quality (ODEQ) initiated a pesticide stewardship partnership (PSP) in the Hood River basin in 1999. Working with growers, agricultural extension agents, and local, Tribal, and State organizations, the PSP has encouraged voluntary adoption of best management practices (BMPs) in pesticide management and application. Starting in 1999, water was collected from streams throughout the basin and analyzed for pesticides. Pesticide concentration data were compared to regulatory criteria and shared with local stakeholders so the agricultural community could identify and implement solutions to minimize the offsite movement of pesticides and reduce negative impacts to nontarget organisms. Monitoring has continued during the last decade as growers have implemented BMPs to reduce pesticide-related impacts to water quality in the basin.

At the request of the Confederated Tribes of Warm Springs, USGS conducted a retrospective analysis of the PSP data collected through 2009 to guide future monitoring. Nineteen pesticides and two insecticide degradation products were detected. Six insecticides were present at concentrations exceeding water-quality standards, sublethal effects thresholds, or acute toxicity values. Detected herbicide and fungicide concentrations were less than those thresholds. Many samples contained mixtures of pesticides, but their effects to salmonids at environmentally realistic concentrations for the basin are unknown. Limited data indicate that eight trace elements are of concern for their potential to harm salmonids. The dataset is limited with regard to the spatial and seasonal distribution of pesticides and trace elements in all salmonid-bearing streams, the presence of particle-bound pesticides, and the presence of several unmonitored pesticides known to be used in the basin. These and other information gaps identified by USGS provided a basis for prioritizing pesticide sampling efforts in 2011.