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**To:** [pknowles@spokanecounty.org](mailto:pknowles@spokanecounty.org)  
**Cc:** [SEPADesk2 \(DFW\)](#)  
**Subject:** Comment Reply on SEPA no. 22030  
**Date:** Friday, July 8, 2022 9:21:57 AM  
**Attachments:** [wdfw01990.pdf](#)

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Dear Mr. Paul Knowles,

Thank you very much for your attention, concerns and comments on our State Environmental Policy Act (SEPA) public comment opportunity for the proposed rotenone treatments of Fish Lake, Williams Lake, the ponds at West Medical Lake and Flume Creek. WDFW takes all public comment into consideration before making a final decision to proceed with lake/stream rehabilitations. Your comments and questions are part of the official record for the 2022 proposed treatments. WDFW adheres to strict notification and water quality monitoring requirements according to the conditions stipulated in our current NPDES General Fisheries Management Permit which is administered through the Department of Ecology ([Fisheries resource management - Washington State Department of Ecology](#)). Pertinent sections of the permit for potable water rights holders can be found in sections 5.B.1 and 6.E.1. Herein, the permit stipulates WDFW shall provide an alternative potable water supply for human consumption (for surface waters treated with rotenone) from the time of rotenone application until the treated water body is shown to be below 40 ppb rotenone. On 07/06/2022, WDFW and Spokane County Parks and Recreation staff met at Fish Lake to discuss concerns outlined in your comments. The site visit and discussion were very helpful. Spokane County Parks and Recreation staff provided an overview of the water system at Fish Lake Regional Park which provides water to 3 residences, including the intake and filtration system. The source was determined to be a shallow well (ground water) located approximately 30 feet from the lake shore. The well is almost certainly hydrologically connected to the lake but does not have an apparent surface water connection. Thus, based on literature and well testing conducted by WDFW in Washington State, it is highly unlikely that rotenone would be able to infiltrate the well water, as sediment binds rotenone, preventing it from leaching into ground water ([Finlayson et al. 2001, pp 47- 48](#)). In addition, the water treatment system utilizes chlorine and potassium permanganate (KMnO<sub>4</sub>), both strong oxidizers commonly used to deactivate rotenone. Based on the water source, WDFW would not anticipate rotenone presence in the water system as a result of treatment of Fish Lake. However, we do acknowledge that clogging of the filtration system following the last rehabilitation conducted in 2012 may have been peripherally related to the treatment (perhaps a boom in Bryozoans or other organisms that clogged filters) and represents a significant concern for Spokane County Parks and Recreation. To address that concern, we propose to forego treatment of Fish Lake in 2022 and to work with your staff over the next few months to develop a strategy for implementation in 2023 that meets our collective needs, including a plan for testing of the well water for rotenone during and following treatment, as well as mitigation measures to reduce or prevent clogging of the filtration system. This was discussed with your staff during the site visit, and they agreed that this was a good approach. We will be in contact within the next couple of months to discuss details.

In response to your question about effects of rotenone on human health, the short answer is that at the concentrations used in fisheries management (up to 200 parts per billion), there is little risk to mammals (including humans) or birds. An environmental impact statement assessing the use and health risks of rotenone was completed and published and was included in the documents for

review in this year's proposals. The report in its entirety is attached for comprehensive review; direct address of human health effects begins on page 16. Pertinent excerpts of the text are included below:

"Millions of dollars have been spent by the U.S. Fish and Wildlife Service on research to determine the safety of rotenone in the re-registration approval process (Finlayson et al. 2000). This research demonstrated the environmental and human safety of the use of rotenone as a piscicide in fisheries resource management. Labels and fishery uses of rotenone have been successfully defended. The data developed confirm that rotenone is a safe product when applied by certified applicators according to label instructions. Additionally, rotenone has been in use Washington for fishery management since 1940 with no record of adverse human health effects."

"An Emory University study (Betarbet et al., 2000) reported finding a relationship between Parkinson's disease and rotenone. The Emory University study demonstrated that rotenone produced Parkinson's like anatomical, neurochemical, and behavioral symptoms in laboratory rats when administered chronically and intravenously. In this study, 25 rats were continuously exposed for 5 weeks to 2 to 3 mg rotenone (dissolved in dimethyl sulfoxide [DMSO] and polyethylene glycol [PEG]) per kg body weight per day. The exposure was accomplished by injecting the mixture directly into the right jugular vein of the rats using an osmotic pump. Twelve of the 25 rats developed lesions characteristic of Parkinson's disease. Structures similar to Lewy bodies (microscopic protein deposits) in the neurons of the substantia nigra in the brain (characteristic of Parkinson's disease) were produced in several of the rotenone-exposed rats. Dr. J. T. Greenamyre who directed this study has been quoted as stating: "We have shown that exposure is sufficient to do it in rats and presumably the same can happen in people" (Adam, 2000). Dr. Joseph Borzelleca of the Virginia Commonwealth University Department of Pharmacology and Toxicology critically reviewed the Emory University study to determine its

relevance for humans. Dr. Borzelleca writes in response to Dr. Greenamyre's quoted comment: "Marking (1988) administered rotenone in the diet to male and female rats (320) for 24 months (Lifetime for rats) at doses up to 75-mg/kg-body weight/day. At the end of the study, all surviving rats were sacrificed and autopsied, and all tissues and organs were examined grossly and microscopically. Several dozen tissue sections per animal were examined including all areas of the brain. There were no changes to the brains of the rats that had eaten rotenone daily for two years. This (Marking's) study is relevant for human exposure because entry into the body was with food (simulates the human condition). The doses in this study were about 30 times greater (2.5 versus 75 mg/kg-body weight/day) and the exposure was much longer (5 versus 104 weeks) than in the Greenamyre study. It is also important to note that the rats did not develop any signs of Parkinson's disease during the course of the study" (Borzelleca, letter, 2001). Dr. Borzelleca is an extensively published Pharmacologist/Toxicologist; researcher; journal editor; consultant to the World Health Organization and member of National Academy of Science Committee on Toxicology.

The Rotenone Stewardship Program evaluation (2001) of the Emory research concluded as follows: that the manner that rotenone was administered to the laboratory rats was highly unnatural. Not only was it administered by continuous jugular vein infusion but was also mixed with DMSO and PEG. DMSO enhances tissue penetration of many chemicals. Direct injection is the fastest way to deliver chemicals to the body, as evidenced in intravenous application of medicines. Continuous intravenous injection, as done in the Emory University study, also leads to continuous high levels of the chemical in the bloodstream. The normal exposure to rotenone in humans from its use in fisheries management would be ingestion, inhalation or through the skin...

Several researchers in Parkinson's disease (including J. Langston Director of the Parkinson's Institute) have stated that the Emory University study does not show direct evidence that rotenone causes Parkinson's disease (Rotenone Stewardship Program 2001). Adam (2000) reports in his update paper that Greenamyre does not believe the health risks from rotenone are particularly high. The U.S. Environmental Protection Agency has known for some time of the effects of rotenone on the nervous system when directly injected into animals. In 1993, the U.S. Environmental Protection Agency published the Workers Protection Standards Handbook that listed all the known effects of pesticides and necessary steps for treating pesticide poisoning (Pesticide Regulation Notice 93-7). In the Biologicals section of the handbook, the following statement is made, "When rotenone is injected into animals, tremors, vomiting, incoordination, convulsions, and respiratory arrest have been observed. These effects have not been reported in occupationally exposed humans."

Thank you very much for your comments and to your staff for meeting with us to address concerns,  
Kenny Behen

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