This public information document has been prepared specifically for Westslope Cutthroat Trout restoration in the Pend Oreille Basin. The information provided is a summary from many sources. This sheet is an attempt to provide the most critical information and is not exhaustive. Project managers can provide additional information sources if requested.

Westslope Cutthroat Trout Conservation in the Pend Oreille Basin:
Non-Native Fish Removal Options and Rotenone Safety
Public Information Sheet II: April 28, 2015

Why do we need to remove non-native fish in order to conserve native species?
Westslope Cutthroat Trout (WCT) are native to the Pend Oreille Basin, historically occupying over 99% of tributary streams. Today, WCT are present in only 35% of these streams. Declining throughout their historic range, WCT were petitioned to be listed as threatened under the Endangered Species Act in 1998. Following a status review, it was determined that an ESA listing was not warranted; although the status of WCT was again reconsidered and reviewed, in 2003 the latest ruling occurred with no ESA listing warranted. Competition for resources, predation, and interbreeding with non-native species are among the greatest contributors to the decline of native fish species such as WCT. Long-term persistence of restored WCT populations is unlikely when reestablished in streams containing non-native species such as Eastern Brook Trout. In order to successfully restore WCT populations, invasive fish species must be removed from specific reaches or tributaries identified for restoration. By reestablishing local WCT populations, we will help conserve WCT by increasing their distribution and numbers throughout their historical range, thus reducing the risk of a future ESA listing.

Why is rotenone application the preferred method for removal of non-native fish?
Widely used in the United States as a conservation tool, piscicide (pesticide for fish) applications have been demonstrated to be a cost-effective and very low-risk fish removal technique. Rotenone is one of the only piscicides approved by the EPA for use in streams, and it has been used safely and successfully throughout the world. Alternative methods of fish removal include electrofishing, netting, dewatering, and traditional angling techniques. These methods can be expensive, difficult or impractical, and with the exception of dewatering, largely ineffective at completely removing fish populations from a stream.

What is rotenone?
Rotenone is one of several naturally occurring rotenoids found in the roots of several varieties of bean plants (Leguminosae). Plant roots are dried and ground into a powder that is used as a piscicide in standing water or formulated as a liquid for use in flowing systems. Rotenone has long been used by indigenous people for fishing purposes.

How and when is rotenone applied?
Rotenone is available in both liquid and powder form. Since rotenone is relatively insoluble in water in its pure form, it is often formulated as a liquid emulsion to allow for dispersion and improved efficacy in stream applications. The most common method for stream application is dispersal from drip cans, calibrated to discharge a predetermined amount of liquid rotenone based on the amount of water flowing in the stream. Drip cans are often used in combination with backpack sprayers or a powdered rotenone-gelatin-sand mixture to treat pools of standing water. Rotenone may be applied at any time of the year, but most applications typically occur during warm months (such as early fall) because low water levels and warm temperatures limit the size of area treated and amount of piscicide required to be effective.

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What concentration of rotenone would be used for removal of non-native fish in the Pend Oreille Basin?
For applications to streams in Pend Oreille County where target non-native species are salmonids such as trout and char, application concentrations of rotenone will range from 0.5-1.0 parts per million of the product containing 5% active ingredient (rotenone). During the Cee Cee Ah Creek pilot project in 2008, for example, rotenone concentrations never exceeded 1 ppm.

How does rotenone affect aquatic animals?
Rotenone is selectively toxic to gill breathing animals. Fish are the most sensitive, followed by aquatic invertebrates and gill breathing forms of amphibians. Reductions in aquatic invertebrates and amphibians are temporary, as studies have shown that invertebrates and amphibians will repopulate the treatment area after rotenone breaks down.

Does rotenone affect all animals the same?
No, it is selectively toxic to gill breathing animals. Birds and mammals are tolerant of rotenone as they have natural enzymes in the digestive tract that neutralize rotenone. Birds and mammals that eat dead fish and drink treated water will not be affected. A bird weighing 0.25 lb (0.113 kg) would need to consume 25 gallons of treated water in a single sitting to receive a lethal dose. Rotenone does not concentrate in fish tissue, is quickly broken down in the environment, and is not readily absorbed through the gut of an animal eating the fish or drinking the water. These factors make risk to non-gill breathing animals extraordinarily low.

Is rotenone an immediate risk to human health?
No. At the maximum treatment concentration (4 ppm), well above concentrations used for stream treatments, a 160 lb person would have to drink more than 23,000 gallons of treated water at one sitting to achieve a lethal dose.

Is rotenone a long-term risk to human health?
Rotenone is not considered by the U.S. EPA to be a carcinogen (capable of causing cancer), mutagen (capable of causing genetic mutation), teratogen (interferes with normal embryonic development), or reproductive toxin (affects reproductive capabilities). The EPA lists a safe level for rotenone in drinking water of 0.8 ppm and a safe level for water contact (e.g. swimming) of 1.8 ppm. These safe levels assume a worst-case, lifetime exposure to rotenone. In other words, a person would need to be exposed for their entire life for negative effects to develop. Because rotenone breaks down quickly in the environment and because of safety procedures used in the application, there is absolutely no long-term exposure risk as part of this project. As additional precautionary measures, trained personnel wear appropriate personal protective equipment and the public is always excluded from treatment areas until rotenone residues have dissipated.

What procedures are in place to ensure safe and effective use of rotenone?
Project leads and applicators are professionally trained and licensed to conduct aquatic piscicide applications. To ensure project success and safety for the public, applicators, livestock, and the environment, EPA-approved product labels and instructions will be followed. A significant amount of preparation and data collection takes place prior to implementing rotenone applications. This data ensures effective project design, application, and safety protocols.

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All entry points and shorelines along the treatment area are posted with information regarding the project and reentry. Contact is made with landowners and regular land users (livestock owners) to ensure they are aware of the project and any precautions they need to take during the treatment. Rotenone is deactivated immediately below the treatment area using potassium permanganate (an oxidizer) to ensure water and fish remain unaffected downstream. Trained and certified project leads stay on-site until rotenone is no longer detected in the area.

What happens to rotenone after it is applied to the water?
Rotenone breaks down rapidly in the environment once exposed to oxygen or sunlight. Increases in temperature or sunlight increase the breakdown rate of rotenone.

How long does rotenone persist in water and sediment?
Numerous monitoring projects have shown that rotenone residues typically disappear within about one week to one month, depending on environmental conditions. The half-life (time required for ½ of the material to break-down) of rotenone varies from about 12 hours to 7.5 days, and is inversely related to temperature. Rotenone is typically applied when water temperatures are warm to optimize effect on the fish and the break-down rate in the environment. As an added measure of control, potassium permanganate will be used to speed the break-down of rotenone.

How is rotenone prevented from leaving the treatment area and killing fish downstream?
Project managers apply potassium permanganate to deactivate rotenone. Potassium permanganate, used worldwide to purify drinking water, is applied to the stream at the point where the effects of rotenone are no longer desired.

Are there dangers of contaminating ground water?
No. Rotenone is highly insoluble in water and strongly binds to soil particles in bottom sediments and to suspended particles in the water column. It moves no deeper than 1 inch of sediment at the lake or river bottom. As a result, it poses virtually no chance of getting into the groundwater.

When can the public access the water after treatment?
The public is not allowed in contact with the treated water until rotenone residues have dissipated below 1.8 ppm. Treatments in Pend Oreille Basin tributaries will occur at rotenone levels less than 1.8 ppm and in these cases contact can commence immediately after the treatment process has been completed and residual levels have been checked. The EPA minimizes risks of exposure for swimmers during rotenone treatments by requiring area closures (and swimming prohibition) post-treatment until levels are safe for swimming and/or consumption per EPA guidelines.

Can rotenone-treated water be used for irrigation of crops?
Research has not shown any health hazards from using water containing rotenone. However as an additional precaution, water containing residues of rotenone cannot be used on crops. This does not mean that doing this is actually unsafe, but that no allowable levels have been established.

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What safeguards are in place to protect citizens and property?
Personnel licensed by the Washington State Department of Agriculture to apply aquatic pesticides manage all rotenone-related fish conservation efforts in the Pend Oreille Basin. Additionally, personnel will follow all best practices established in the MSDS (materials safety data sheet) and EPA-approved product labels. Staff will also be guided by experience gained through the many other past rotenone application projects throughout the state.

Are there dangers from consuming fish from rotenone treated water?
Fish killed by rotenone should not be consumed by humans due to the risk of possible salmonella and other bacteriological poisoning that can occur from consuming fish that have been dead for a period of time. The rotenone residues in dead fish carcasses are quickly broken down by physical and biological reactions.

What is the impact on wildlife and the loss of food supply of fish?
During rotenone treatments, fish-eating birds and mammals can be found foraging on dying and recently dead fish for up to several days after treatment. Following this abundance of dead fish, a temporary reduction in food supplies may result until fish and invertebrates have been restored. However, most of the affected fish-eating species are mobile and will seek alternate food sources or forage in other areas.

Where can I find additional information?
Links to additional information are provided below.

http://wdfw.wa.gov/licensing/sepa/2010/10064_ceecee.pdf (More information about the Cee Cee Ah Creek pilot project from WDFW)
http://www.fisheriessociety.org/rotenone/EradicatingIASFishNA.pdf (Overview of fish conservation using rotenone and detailed answers to common questions about its use and utility in fish conservation)
http://www.epa.gov/oppsrrd1/reregistration/REDs/rotenone_red.pdf (Technical information about the EPA approval of rotenone as a piscicide)
http://www.azgfd.gov/h_f/documents/ROTENONE%20FAQ%20committee%20final%20report%20section%201-6-12.pdf (Maintaining North America's Healthy Native Aquatic Ecosystems" by the American Fisheries Society on invasive species management.)

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