Frequently Asked Questions

Change to 2008 Mountain Lakes Fisheries Management Plan

National Park Service
U.S. Department of the Interior

North Cascades National Park Complex

1. WHAT IS THE MOUNTAIN LAKES FISHERIES MANAGEMENT PLAN (MLFMP)?

In 2008, North Cascades National Park Complex finalized the Mountain Lakes Fisheries Management Plan (MLFMP) with the goal of restoring mountain lake ecosystems in the park by eliminating high density populations of reproducing non-native fish from up to 27 naturally fishless mountain lakes. The plan identified several methods of fish removal, including the piscicide antimycin, which was identified as the preferred method for lakes that are larger than 3 hectares and/or deeper than 10 meters.

2. WHAT RESULTS HAVE BEEN DOCUMENTED THROUGH THE IMPLEMENTATION OF THE MOUNTAIN LAKES FISHERIES MANAGEMENT PLAN?

Thus far, monitoring results indicate that fish removal is successful in helping to restore mountain lake ecosystems in the park complex. Over the past four years, the National Park Service has implemented the MLFMP by successfully removing non-native, self-sustaining populations of fish from several lakes. Spawning habitat exclusion has been tested in one lake, intensive gill netting is currently being used to remove fish from six lakes, and antimycin has been used in two lakes. Monitoring results following these efforts indicate native species such as the tailed frog and long-toed salamander are rapidly returning to these naturally fishless ecosystems as the non-native populations of fish are removed.

The tailed frog is native to mountain lake ecosystems in North Cascades National Park Complex. Thanks to restoration efforts over the past four years, North Cascades National Park Complex has begun to see this species, and others, return to these unique ecosystems. NPS photo.

3. HOW DOES FISH ERADICATION RESTORE MOUNTAIN LAKE ECOSYSTEMS IN THE NORTH CASCADES?

Historically, the mountain lakes of North Cascades National Park Complex were naturally free of fish due to natural fish barriers (such as waterfalls) in streams connecting these water bodies with those located downstream. In the absence of fish, these lakes developed unique ecosystems where frogs and salamanders became the top predators. Despite this natural history, North Cascades National Park Complex currently has 62 lakes containing introduced fish, 25 of which contain high-density reproducing populations. Research conducted in the park complex has demonstrated that these populations of fish are the most damaging to native ecosystems. Reproducing fish populations in naturally fishless lakes tend to over-populate these systems, eliminating or reducing the abundance of many of the native species such as amphibians, insects, and zooplankton and leading to unhealthy and poor- quality fish. Of particular concern are situations where non-native Eastern Brook Trout have established reproducing populations in lakes because these fish have the ability to harm downstream federally threatened bull trout populations by cross-breeding with them and destroying their genetics. In these situations, restoring the ecological integrity of mountain lakes requires the complete eradication of non-native fish fauna. Complete removal is necessary to ensure that non-native fish do not reproduce and reestablish their populations and to remove the pressure of predation in mountain lakes and downstream in the watershed.

In mountain lakes where fish have established reproducing populations, North Cascades National Park Complex has documented a decrease, if not elimination, of many native species such as amphibians, insects, and zooplankton. Due to their ability to out compete other species, these fish tend to over-populate the ecosystem, stunting even their own growth as seen in this photo of an Eastern Brook Trout documented in Blum Lakes in 2008. NPS photo.

4. WHAT CHANGES TO THE MOUNTAIN LAKES FISHERY MANAGEMENT PLAN IS THE NPS PROPOSING?

The NPS is proposing to continue the restoration of naturally fishless mountain lakes as outlined in the 2008 Mountain Lakes Fisheries Management Plan but proceed with non-native fish removal by using CFT Legumine™ (a liquid formulation of rotenone, a fish toxicant) rather than antimycin, which had been identified in the plan as one of the preferred methods for fish eradication in lakes of a specific size and/or depth. Removing non-native fish using rotenone was envisioned by the plan, however, the plan noted that if rotenone was to be used for fish removal actions in the future, additional analysis would be completed and opportunities for public comment would be made available.

5. WHY IS THE NPS PROPOSING TO USE ROTENONE INSTEAD OF ANTIMYCIN?

Three factors have led NOCA to consider the use rotenone rather than antimycin in treating mountain lakes:

1. Antimycin is no longer commercially available and current stocks have been depleted.
2. Rotenone is more effective than antimycin in penetrating the dense layers of thermally stratified deeper lakes that are now on schedule for treatment.
3. Results from recent rotenone applications and toxicity testing demonstrate that newer formulations of rotenone are not as harmful to non-target organisms as was previously thought when the MLFMP was developed. These new formulations of rotenone have reduced and/or eliminated many of the additives that were linked to increases in non-target organism mortality.

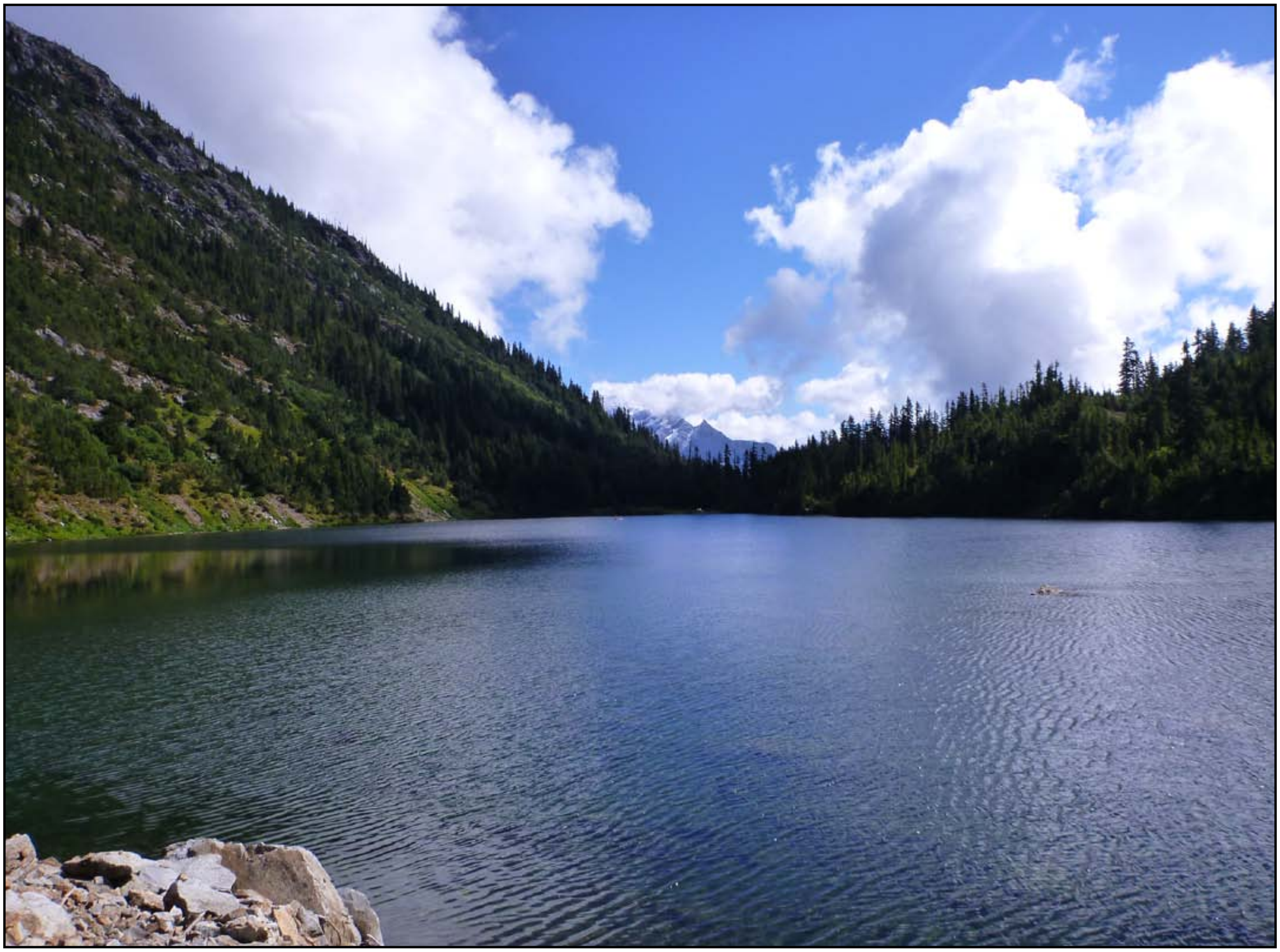
6. WHAT ARE THE DIFFERENCES BETWEEN ANTIMYCIN AND ROTENONE AND HOW DO THESE DIFFERENCES IMPACT FISH REMOVAL?

Antimycin and rotenone are both derived from natural sources. Antimycin is an antibiotic complex that is isolated from the bacterium Streptomyces griseus. Rotenone is an alkaloid extracted from the roots of plants found in the pea family. Both are absorbed through the gills of fish and other aquatic organisms and block oxidative pathways in the mitochondria. Both piscicides rapidly break down into harmless, naturally occurring compounds within several days. While the piscicidal action of these chemicals is similar, they do possess different characteristics that must be considered when planning field applications.

Rotenone is less toxic than antimycin and unlike antimycin, fish can recover from exposure to rotenone when placed in fresh water. Therefore, rotenone must be applied in higher concentrations than antimycin to remove fish. In the past, these characteristics have resulted in using rotenone at concentrations that have caused increased mortality to non-target organisms when compared to antimycin. Fortunately, new formulations of rotenone (such as CFT Legumine™, a liquid form of rotenone), combined with advances in conducting piscicide applications, have resulted in lower mortality rates to non-target organisms and a reduced risk to the environment.

7. WHAT ARE THE ENVIRONMENTAL IMPACTS OF USING ROTENONE TO REMOVE FISH?

The NPS has determined that using CFT Legumine™, a liquid formulation of rotenone, to remove non-native fish will not have higher adverse environmental impacts than using Fintrol™, a liquid form of antimycin. The scientific evidence supports that both rotenone and antimycin pose the highest risk to larval amphibians and groups of invertebrates that use gills for respiration and that neither compound poses a significant risk to algae, aquatic macrophytes, terrestrial organisms, or human health when applied at prescribed rates and handled with appropriate personal protective equipment. Limited evidence suggests that tailed frog (Aschaphus truei) is one of the most sensitive non-target organisms to rotenone and as such is likely to experience the greatest adverse impact. However, since no studies were found that assessed the impacts of antimycin on tailed frog, a comparison between the two compounds could not be made and impacts to this species are expected to minimal since their primary habitat lies outside of most of the planned treatment areas. For more information, please refer to an assessment of the environmental and human health risks of using rotenone (white paper of this assessment can be found the project's website: www.parkplanning.nps.gov/restore_sourdough).



Sourdough Lake, location of proposed piscicide treatment for fish removal and restoration in 2013.

8. HAS ROTENONE BEEN USED ELSEWHERE IN FISH REMOVAL?

Yes. Of the general purpose piscicides licensed in the United States, rotenone has the longest history of use. Aboriginal peoples have applied rotenone for hundreds of years to collect fish for consumption, and the first application of rotenone in the U.S. for fisheries management dates back to 1934. Today, rotenone is the only piscicide used by the Washington State Department of Fish and Wildlife, who has treated 514 state waters since 1940 (averaging 13 treatments per year). The National Park Service has also successfully used rotenone in 15 of 44 piscicidal treatments in national parks such as Yellowstone, Great Basin, and Yosemite to restore aquatic ecosystems.

9. WHERE CAN I FIND MORE INFORMATION OR COMMENT ON THE PROPOSAL?

1. Visit the project website and download the MLFMP, a whitepaper on the assessment of environmental and human health risk of using rotenone, and supporting documents: www.parkplanning.nps.gov/restore_sourdough.
2. Provide comments on this proposal by visiting the project website (www.parkplanning.nps.gov/restore_sourdough) or mailing North Cascades National Park Complex Headquarters, 810 State Route 20, Sedro-Woolley, Washington, 98284.
3. Act quickly! The public comment period for this proposal closes June 14, 2013.