2006 BIOLOGICAL ASSESSMENTS - NOAA FISHERIES

FOR USDA APHIS RANGELAND GRASSHOPPER /MORMON CRIKET SUPPRESSION PROGRAMS IN OREGON

BACKGROUND

The USDA Animal and Plant Health Inspection Service (APHIS), in conjunction with Federal agencies, State departments of agriculture, Native American tribes, and private individuals is planning for potential grasshopper/Mormon cricket suppression programs to protect rangeland from economic infestations. APHIS' authority for carrying out control programs is found in the Plant Protection Act (PPA), Title IV, Agricultural Risk Protection Act of 2000, Section 417. The PPA mandates that APHIS control economic infestations of grasshoppers/Mormon crickets in order to protect rangeland, when requested, and provided funding is available.

Many species listed in the Endangered Species Act occur in counties where the potential exists for APHIS Rangeland Grasshopper Suppression Program activities. Some of these listed species fall under the jurisdiction of NOAA Fisheries, Office of Protected Resources.

In anticipation of possible suppression activities there is a need for consultation with NOAA Fisheries to determine protective measures which will allow APHIS to conduct grasshopper control programs while assuring that the programs will not cause an adverse effect to any listed species. APHIS is beginning Section 7 consultation with NOAA Fisheries on a national level. However, a nationwide biological assessment (BA) and biological opinion (BO) will likely take several years to complete. Therefore, it is necessary to consult on a state by state basis for those states where the potential exists for grasshopper/Mormon cricket control programs. APHIS consulted with NOAA Fisheries in Oregon in 2003 resulting in concurrence letter from NOAA Fisheries good for one year. The process was repeated in 2004 resulting in a concurrence letter that was to remain in effect until 2007 provided there were no changes to the proposed action or to the listed speces. Since there has been recent changes to the status of some of the listed species (critical habitat designation) APHIS has requested new consultation to address these changes and to clarify the buffers for some of the proposed actions.

PURPOSE

This biological assessment will address the following five species (eleven evolutionarily significant units (ESUs)): chinook salmon, *Oncorhynchus* *tshawytscha,* lower Columbia River ESU, upper Columbia River spring-run ESU, Snake River spring/summer-run, and Snake River fall-run ESUs; coho salmon, *Oncorhynchus kisutch*, lower Columbia River /SW Washington ESU: chum salmon, *Oncorhynchus keta*, Columbia River ESU; sockeye salmon, *Oncorhynchus nerka*, Snake River ESU; steelhead, *Oncorhynchus mykiss*, lower, middle, upper Columbia River ESUs, and Snake River Basin ESU.

This biological assessment is for grasshopper/Mormon cricket suppression activities in the state of Oregon. Activities will be limited to rangeland in Baker, Crook, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Lake, Klamath, Malheur, Morrow, Sherman, Umatilla, Union, Wallowa, Wasco, and, Wheeler counties. APHIS has requested Endangered Species Act, section 7, informal consultation for federally listed or proposed species regulated by NOAA Fisheries. APHIS respectfully requests informal ESA, section 7, consultation on the eleven listed ESUs in the grasshopper program area of Oregon. The agreements reached for Oregon, between APHIS and NOAA Fisheries, will be in effect for a stated annual or multi-year period, or until a BO for the entire Rangeland Grasshopper Suppression Program is issued and the nationwide, formal consultation process is completed. A timely written response from NOAA Fisheries is requested should NOAA Fisheries concur with the “not likely to adversely affect” determinations in this biological assessment, for listed species and their critical habitat.

DESCRIPTION OF ACTION

This document incorporates by reference portions of the Rangeland Grasshopper and Mormon Cricket Suppression Program Final Environmental Impact Statement (2002 APHIS FEIS) which discusses the purpose and needs, alternative strategies, affected environments, environmental consequences, and other environmental considerations of the APHIS grasshopper suppression program. This 2002 FEIS updates alternatives available to APHIS from the previous 1987 FEIS.

More detailed site-specific environmental assessments (EA’s), tiered to the 2002 APHIS FEIS, are prepared to better describe the local site characteristics. Grasshopper suppression program decisions are then based on the conclusions reached in the site-specific EA’s. Only the program alternatives found in the 2002 APHIS FEIS are available to APHIS for use in any site-specific treatment. APHIS will issue a Finding(s) of No Significant Impact (FONSI) based on the EA’s. When APHIS receives a treatment request from a landowner/manager, and treatment is determined to be necessary and possible, a preferred alternative will be chosen. The proposed treatment site will be examined to determine if environmental issues exist that were not covered in the EA. A supplement to the EA will be issued to address any site specific environmental concerns that were not thoroughly addressed in the original EA, and it will address any comments received during the initial EA 30 day comment period.

Two Environmental Assessments have been prepared to cover Oregon Rangeland Grasshopper and Mormon Cricket Suppression Programs, OR-06-01 and OR-06-02 and are incorporated in this Biological Assessment by reference. These EAs were prepared by APHIS in 2006 to address site specific issues with respect to potential grasshopper suppression programs in the above 18 county area. APHIS treatment programs follow guidelines set forth by the Agency in the Grasshopper Program Guidelines and Operational Procedures (included in the EA as Appendix 1), and the Grasshopper Program Prospectus. Suppression treatments could begin as early as May, but generally take place in June and July.

The chemical control methods available include the use of ULV sprays of carbaryl, diflubenzuron, and malathion, and carbaryl bait applied at conventional rates. These chemicals can be applied to an area either by air or ground equipment. Also considered is the application of these same chemicals at reduced rates, and where untreated swaths (refuges) are alternated with treated swaths. This method is known as Reduced Agent-Area Treatments (RAATs). Diflubenzuron and the RAATs application technology are a result of the APHIS Grasshopper IPM Program, 1987-2000.

Conventional rates of carbaryl (.5 lb a.i./acre) and malathion (.62 lb a.i./acre) are the same as those in the 1987 APHIS FEIS. Conventional rate for diflubenzuron is .016 lb a.i./acre. The RAATs system uses approximately half the concentration of each chemical as conventional rate applications, and is applied to 33-60% of the total area. The rates are 0.25 lb a.i./acre of carbaryl spray, 0.20 lb a.i./acre of carbaryl bait, 0.012 lb a.i./acre of diflubenzuron, and 0.31 lb a.i./acre of malathion. (FEIS page 18-22) Normally program chemicals would be applied to area only one time per year, and programs do not generally take place in the same location in consecutive years. The infrequent nature of grasshopper suppression programs reduces the likelihood of cumulative effects.

Diflubenzuron

Diflubenzuron is a new chemical that has been labeled for grasshopper control since the 1987 APHIS FEIS. It is classified as an insect growth regulator that affects the formation and/or deposition of chitin in an insect’s exoskeleton. An insect larva/nymph exposed to diflubenzuron is unable to successfully molt and thus dies. APHIS completed a risk assessment for the use of diflubenzuron in grasshopper suppression in March 2000. This report, “Chemical Risk Assessment for Diflubenzuron Use in Grasshopper Cooperative Control Program” is considered incorporated in this BA by reference. It is normally applied by air for grasshopper suppression on rangeland, but it can also be applied using ground equipment.

Because of its mode of action and low toxicity, diflubenzuron would not be toxic to, or directly affect, humans, mammals, reptiles, amphibians, plants, or fish at the applications rates proposed (FEIS pg 42). It has no significant effect on non-target, adult arthropods, including honey bees. Diflubenzuron is considered much less toxic, to most groups of organisms, than either carbaryl or malathion. However, all three chemicals are highly toxic to aquatic invertebrates. Diflubenzuron has only slight toxicity to fish, but if it found its way into water, it could cause an indirect effect by temporarily reducing a food source for juvenile fish. Any reduction in the food base would be temporary, and would likely be compensated for by other food items (FEIS pg 45). Protective measures are used to prevent chemicals from contaminating water.

Diflubenzuron is highly toxic to aquatic insects and crustaceans. The Dimilin 2L label instructions require it not be applied within 25 feet by ground or 150 feet by air of any body of water. Protective measures are imposed to prevent pesticide drift from reaching water or areas of concern (Oregon EA II.D.1, and Appendix 1).

Metabolites from diflubenzuron tend to degrade or are metabolized rapidly, and will occur at concentrations low enough that there should be no toxicological effects. The oils used as carriers and adjuvants may have an adverse effect on nesting birds. Paraffinic oils will be avoided when treating areas with sensitive species. Diflubenzuron may have synergistic effects with the defoliant DEF, and cumulative effects with certain compounds know to bind hemoglobin. DEF is not likely in a grasshopper control area. Methemoglobinemia is only a concern with human exposure.

Diflubenzuron binds readily to organic matter in soils and is relatively immobile in the environment. The half-life is from 7-19 days depending on soil type. Diflubenzuron does not persist more than a few days in water. However, it adsorbs to plant surfaces and may persist there for several months. It can find its way to water from leaf material as it drops in the fall. Bioaccumulation of diflubenzuron is minimal (Eisler, 2000).

Extensive studies were completed to determine the amount of chemical that would be expected to reach aquatic environments as a result of an APHIS grasshopper suppression project, and what effect that exposure will have on the environment. Appendix C of the FEIS analyses the environmental fate and transport of diflubenzuron. Table C-6 indicates the concentrations of insecticide expected to be found in moving and standing bodies of water when no buffer is used and also when water is directly sprayed. Using the full rate of 0.016 lb a.i./acre and no buffer, the amount of diflubenzuron detected in a 0.76m stream is .017 ppb, and .008 ppb in a 2 m pond. According to Eisler, 2000, only one species of mosquito larvae would experience lethal effects from these concentrations. When program buffers are used, concentrations would be much lower.

Appendix B of the FEIS analyses the risk of diflubenzuron on humans and non-target organisms, including aquatic species. Based on the values from the no buffer models in Appendix C, diflubenzuron in aquatic ecosystems would affect a few invertebrate species and have little or no effect on vertebrates.

Carbaryl

Carbaryl is a carbamate insecticide. It's mode of toxic action occurs through inhibition of acetylcholinesterase (AChE) function in the nervous system. This inhibition reverses over time when exposure ceases. Carbaryl is not subject to significant bioaccumulation.

At program rates carbaryl is unlikely to be directly toxic to birds, mammals, or reptiles (FEIS pg39). It will most likely affect insects exposed to ULV spray or that consume carbaryl bait. Field studies have shown that affected insect populations recover rapidly and generally do not suffer long term effects (FEIS pg40). The use of carbaryl in bait form has considerable environmental advantages over liquid sprays. Since the chemical is incorporated into a solid media it must be ingested to be effective, thus eliminating many non-target effects. It can be more accurately applied with less potential for drift, and is less likely to be transported in the soil or runoff.

Should carbaryl enter water, there is the potential to effect aquatic invertebrates, especially amphipods. Field studies have concluded that there is no biologically significant effect on aquatic resources, although invertebrate downstream drift increased for a short period after treatment due to toxic effects (FEIS pg42). Carbaryl is moderately toxic to fish, but they are at extremely low risk of adverse effects from carbaryl applications at expected exposure rates (FEIS pg B-47). Buffers and other protective measures are included in the guidelines to prevent the chemical from entering water. (Oregon EA II.D.1, and Appendix 1)

Appendix B of the FEIS analyses the environmental risk of Carbaryl. It has a relatively short half-life in soil due to rapid degradation, 7- 28 days depending on soil type. Carbaryl does not transport well due to low water solubility, moderate sorbtion, and rapid degradation. It degrades rapidly in water, 1-2 days in freshwater. It remains active on vegetation for 3-10 days. Carbaryl does not bioacumulate, and mammals and fishes readily breakdown and excrete it. Carbaryl is extremely toxic to honey bees and predatory mites.

Inert ingredients and metabolites are less toxic than carbaryl itself. There are no known synergistic effects.

Extensive studies were completed to determine the amount of chemical that would be expected to reach aquatic environments as a result of an APHIS grasshopper suppression project, and what effect that exposure will have on the environment. Appendix C of the FEIS analyses the environmental fate and transport of carbaryl. Table C-5 indicates the concentrations of insecticide expected to be found in moving and standing bodies of water when no buffer is used and when water is directly sprayed. Using the full rate of 0.5 lb a.i./acre and no buffer, the amount of carbaryl detected in a 0.76m stream is 5.3 ppb, and 12.0 ppb in a 2 m pond.

Appendix B of the FEIS analyses the risk of carbaryl on humans and non-target organisms, including aquatic species. Based on the values from the no buffer models in Appendix C, carbaryl in aquatic ecosystems, would affect a few invertebrate species and have little or no effect on vertebrates. Concentrations generally known to begin to affect invertebrates is 2-1900 ppb, (Winks, et. al., IPM Manual Study III.8).

Studies in the Little Missouri River during a drought year (1991), when discharge and the dilution potential of the river was low, detected an increase in invertebrate drift during the first 3 hours after pesticide application (Beyers et al. 1995). This increase was primarily composed of Ephemeroptera, especially Heptageniidae. There was no change in drift at the reference site. Subsequent sampling during the day of pesticide application showed that the increase in invertebrate drift was transient and undetectable after 3 hours. The increase in invertebrate drift was mostly due to Ephemeroptera; other taxa were unaffected. Analyses of brain AChE activity in flathead chub (a T&E species) showed that fish were not affected by the pesticide application. Similar monitoring studies conducted during a year when precipitation was above average (1993) did not detect any increase in aquatic invertebrate drift or effects on fish (Beyers et al. 1995). The overall conclusion was that these grasshopper control operations had no biologically significant affect on aquatic resources (Beyers and McEwen, IPM Manual III.6).

Carbaryl is normally applied by air for grasshopper suppression on rangeland, but it can also be applied using ground equipment. APHIS can use carbaryl in either ULV liquid or bait formulations. APHIS' standard buffers of 500 feet for aerial ULV applications, 200 feet for aerial bait applications, and 50 feet for all ground applications have been shown through monitoring programs to keep measurable amounts of chemical from reaching water. A study of aerial bait application by APHIS in 2003 (unpublished) indicated the maximum particle drift to be 150 feet in cross winds up to 13mph. (Foster 2003)

Malathion

Malathion is an organophosphate. It is also a AChE inhibitor, but unlike carbaryl, AChE inhibition from malathion is not readily reversible if exposure ceases.

At program rates, there is little possibility malathion will to be directly toxic to birds, mammals, or reptiles. No direct toxic effects have been observed in field trials (FEIS pg46). It will most likely affect insects exposed to ULV spray. While the number of insects in the treated area would diminish, there would be insects remaining. The remaining insects, and those migrating in from outside the treated area would be available prey for insectivors. Those insects with short generations would soon increase in number (FEIS pg 47).

Malathion is highly toxic to some fish and aquatic invertebrates. However, buffers and other protective measures are included in the guidelines to prevent the chemical from entering water. (Oregon EA II.D.1, and Appendix 1)

Appendix B of the FEIS analyses the environmental risk of Malathion. It has a short half-life in soil due to rapid degradation, 1-6 days depending on soil type. Malathion does not penetrate far into soil due to adsorption to organic matter and rapid degradation. Heavy rain after treatment could lead to runoff. It degrades by photolysis in water, a half-life of 8-32 hours during the 1997 Florida Medfly program. The half-life of Malathion on vegetation 1-6 days. Malathion does not bioacumulate in mammals. Concentrations in fishes decreases consistently with decreasing malathion in water. Malathion is extremely toxic to aquatic and terrestrial invertebrates, including honey bees.

Inert ingredients and metabolites are not known to have adverse effects at program application rates. Synergistic effects could occur if applied in combination with some other organophosphates. A thorough analysis of the proposed treatment area would need to be done to assure no synergistic effects.

Extensive studies were completed to determine the amount of chemical that would be expected to reach aquatic environments as a result of an APHIS grasshopper suppression project, and what effect that exposure will have on the environment. Appendix C of the FEIS analyses the environmental fate and transport of malathion. Table C-7 indicates the concentrations of insecticide expected to be found in moving and standing bodies of water when no buffer is used and when the water is directly sprayed. Using the full rate of 0.61 lb a.i./acre and no buffer, the amount of malathion detected in a 0.76m stream is 4.5 ppb, and 10.2 ppb in a 2 m pond.

Appendix B of the FEIS analyses the risk of malathion on humans and non-target organisms, including aquatic species. Based on the values from the no buffer models in Appendix C malathion, in aquatic ecosystems, would affect a few invertebrate species and have little or no effect on vertebrates. Malathion was found to be many times less toxic to sensitive fishes than carbaryl (Beyers and McEwen, IPM Manual III.6).

Malathion is normally applied by air for grasshopper suppression on rangeland, but it can also be applied using ground equipment. APHIS' standard buffers of 500 feet for aerial applications and 50 feet for ground applications have been shown through monitoring programs to keep measurable amounts of chemical from reaching water. Based on the findings for carbaryl mentioned above, from Beyers and McEwen, IPM Manual III.6, the affects of malathion, from suppression programs, on aquatic organisms should be no greater than carbaryl, and therefore have no biologically significant affect on aquatic resources.

RAATs

RAATs, Reduced Agent-Area Treatment, technology is a product of the IPM alternative in the 1987 FEIS. This strategy combines insect suppression and conservation biological control. Rather than treat the entire infested area, treated swaths are alternated with untreated swaths. Grasshoppers are controlled by chemicals in the treated areas. The untreated swaths provide a refuge for naturally occurring grasshopper parasites and predators, as well as other non-target insects. Even those organisms that move into the treated swaths will be largely unaffected unless they feed on treated foliage or bait. Immature grasshoppers are extremely mobile compared to other immature insects and movement into treated areas will contribute to additional mortality. The RAATs system puts less insecticide into the environment and lowers the risk to non-target species, water quality, and humans. The goal of the RAATs alternative is to provide a more economical and environmentally friendly method to suppress grasshopper populations rather than reduce those populations to the greatest extent possible.

A full description of the environmental consequences, environmental fate, and risk evaluation of the chemical alternatives is found in the FEIS chapter V and Appendices B and C.

SPECIES ACCOUNTS AND ASSESSMENTS

Chinook salmon, *Oncorhynchus tshawytscha*.

Chinook salmon are members of the trout family (Salmonidae), and are one of eight species of Pacific salmonids in the genus *Oncorhynchus*. These Pacific salmon are anadromous, spending their adult life in the ocean and traveling into fresh water to spawn and complete their early life histories. Chinook salmon grow larger than the other Pacific salmons, up to 38 inches and 30-40 pounds. Four Chinook ESUs occur in the grasshopper program area of Oregon, lower Columbia River, upper Columbia River spring-run, Snake River spring/summer-run, and Snake River fall-run ESUs.

There are different seasonal runs, spring, summer, fall, or winter in the migration of Chinook salmon from the ocean to fresh water. These runs are identified on the basis of when the adults enter freshwater to begin their spawning migration. Distinct runs differ in the degree of maturation at the time of river entry, the thermal regime and flow characteristics of their spawning site, and their actual time of spawning.

From the Pacific Ocean, Snake River fall, spring, and summer chinook salmon enter the Columbia River and travel upstream about 324 miles (520 kilometers) to the Snake River. The Snake River contains five principle sub-basins that currently provide habitat for these chinooks. Three of the five sub-basins, the Clearwater, Grande Ronde, and Salmon Rivers, are large, complex systems. The Tucannon and Imnaha Rivers are small systems in which the majority of salmon production is in the mainstream rivers. The Asotin, Granite, and Sheep Creeks are small streams that enter the Snake River and provide small spawning and rearing areas.

Snake River fall chinooks enter the Columbia River in July and reach the Snake River from mid-August through October. Their eggs are deposited over gravelly substrate in October and November. The fry emerge from the gravel in March and April. Downstream migration to the ocean begins within a few weeks of emergence. Fall chinook subyearlings are present in the Columbia River estuary from June to October. All reaches of the Columbia River and its tributaries presently or historically accessible (except above impassable dams) to Snake River Chinook is designated as critical habitat.

Spring/summer run chinook lay eggs, over gravelly substrate, in the spring or summer months. Fry remain in their freshwater habitat for one year. The yearling smolts migrate seaward from early April through June.

Lower Columbia River chinooks spawn in the Columbia River and its tributaries from the mouth to a point just east of Hood River and White Salmon River.

Upper Columbia River chinooks include those populations that spawn in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Although they do not spawn in the proposed suppression area of Oregon, they migrate through areas that may be exposed to suppression programs.

In freshwater, juvenile chinook feed opportunistically on terrestrial and aquatic insects. In salt water they eat crustaceans as well as other bottom invertebrates. Adults eat mostly fish. Most chinook return to the spawning grounds after two to three years in the ocean. After spawning, the female chinook guards the nest as long as she is able. The adults usually die within a few days to two weeks after spawning.

<u>Chum salmon</u>, *Oncorhynchus keta*

Chum salmon are members of the trout family (Salmonidae). These Pacific salmon are anadromous, spending their adult life in the ocean and traveling into fresh water to spawn and complete their early life histories. The Columbia River chum ESU occurs in the grasshopper program area of Oregon.

In the Columbia River, chum salmon occupy a small remnant of their historic range. Primary habitat today encompasses accessible reaches of the Columbia, including estuarine areas and tributaries, downstream from the Bonneville Dam. Historically, chum may have spawned as far upstream as the Umatilla River.

During spawning migration, adult chum salmon enter natal rivers from June to March. Spawning typically is in the lower reaches of rivers, with redds dug in the main stem or in side channels from just above tidal influence to 16km from the river mouths. After hatching, juvenile chum salmon spend a very limited amount of time in fresh water and typical migrate to estuarine and marine areas soon after emergence. This contrasts with other species of *Oncorhynchus* which usually migrate to the sea at a larger size, after months or years of freshwater rearing.

In freshwater, juvenile chum feed on *Diptera* larvae, diatoms, and cyclops. In salt water they feed on a variety of zoo-plankton. Adults feed on polychaetes, pteropods, squid, crustaceans, copepods, amphipods, and fish. Most chum return to the spawning grounds after three to four years in the ocean. Adults usually die within a few days to two weeks after spawning.

<u>Coho salmon</u>, *Oncorhynchus kisutch*

Coho salmon are members of the trout family (Salmonidae). These Pacific salmon are anadromous, spending their adult life in the ocean and traveling into fresh water to spawn and complete their early life histories.

Historically, Columbia River Coho habitat included all tributaries below the Klickitat and Deschutes Rivers. Coho salmon stocks have been compromised by extensive transfers between genetic groups, and heavy hatchery production. Although several tributaries of the upper Columbia River Basin, including the Snake River, once supported Coho, there is no known production above the Deschutes River today.

Adult Coho typically begin their freshwater spawning migration in August through December. They spawn by mid-winter, and then die. The young spend a few weeks to 15 months in fresh water before migrating to the sea. Juveniles prefer pools at least one meter deep with good overhead cover and temperatures of 10-15°C. Coho typically spend two growing seasons in the ocean before returning to their natal streams to spawn as three year olds.

Fry feed on a variety of small invertebrates. Parr feed on terrestrial and aquatic insects, and some small fishes. In the ocean they feed primarily other fishes.

<u>Sockeye salmon</u>, *Oncorhynchus nerka*

Sockeye salmon are members of the trout family (Salmonidae). These Pacific salmon are anadromous, spending their adult life in the ocean and traveling into fresh water to spawn and complete their early life histories. Some sockeye mature in lakes rather than the ocean and are known as Kokanee. Redfish Lake in Custer County, Idaho supports the only remaining run of Snake River sockeye salmon. The Snake River sockeye ESU does not occur in the grasshopper program area of Oregon, but all reaches of the Columbia River and its tributaries presently or historically accessible (except above impassable dams) are designated as critical habitat.

Adult Snake River sockeye salmon usually enter Redfish Lake in August, and spawning occurs near shoreline shoals in October. Eggs hatch in the spring, and the juveniles remain in Redfish Lake normally for two years before migrating to the ocean. The migrants leave Redfish Lake from late April through May. The smolts migrate almost 900 miles through the Salmon, Snake, and Columbia Rivers to the ocean where they usually spend two years. The adult sockeye begin their return migration to Redfish Lake in June or July at four or five years of age.

In fresh water, young sockeye eat primarily planktonic crustaceans. At sea, young sockeye feed on zooplankton, small fish and insects. As they mature they eat more fish. Young sockeye feed heaviest in the afternoon, lightest at night and early morning.

<u>Steelhead</u>, *Oncorhynchus mykiss*

Steelhead are members of the trout family (Salmonidae). They exhibit one of the most complex life history traits of any salominid species. They may be anadromous, spending their adult life in the ocean and traveling into fresh water to spawn, or reside their entire life in fresh water. Resident forms are called rainbow or redband trout, while anadromous forms are termed steelhead. Four steelhead ESUs occur in the grasshopper program area of Oregon, lower, middle, and upper Columbia River, and Snake river Basin.

Steelhead typically migrate to the sea after spending two years in freshwater. They generally reside in the ocean for two to three years prior to returning to their natal streams to spawn as four or five year olds. Unlike pacific salmon, steelhead are iteroparous, meaning they are capable of spawning more than once before dying. However it is rare for steelhead to spawn more than twice. Most that do so are female.

Steelhead typically spawn between December and June. The eggs incubate in the redds for 1.5-4 months, depending on water temperature. Juveniles rear in fresh water from one to four years, and then migrate to the ocean as smolts. Biologically, steelhead can be divided into two reproductive ecotypes, based on their sexual maturity at the time of river entry and the duration of their migration. Stream maturing steelhead enter fresh water in a sexually immature condition and require several months to mature and spawn. Ocean maturing steelhead are ready to spawn shortly after river entry. These two ecotypes are commonly referred to by their season of freshwater entry, summer and winter steelhead respectively.

In streams steelhead feed primarily on drift organisms, but may ingest aquatic vegetation, probably for attached invertebrates. Diet changes seasonally. In the ocean, their diet consists of fishes and crustaceans. Steelhead may feed at any time, but usually are most active around dusk.

Genetic information indicates a differentiation between coastal and inland populations of steelhead. In the Columbia River, the geographic boundary of these subspecies is the Cascade crest. The rangeland areas of Oregon where grasshopper programs may take place serve as habitat for three distinct populations of steelhead, lower Columbia, middle Columbia, and Snake River.

The lower Columbia River population belongs to the coastal subspecies of steelhead, and includes both summer and winter runs. It occupies tributaries of the Columbia River between the Cowlitz and Hood Rivers.

Middle Columbia steelhead occupy the Columbia basin from Mosier Creek upstream to the Yakima River, including the Deschutes and John Day Rivers. Upper Columbia steelhead are those that spawn in the Columbia River upstream from the Yakima River, Washington, to the US-Canada border. Although they do not spawn in the proposed suppression area of Oregon, they migrate through areas that may be exposed to suppression programs. All steelhead found upstream of the Dalles Dam are summer run, inland steelhead. Most of these fish smolt at two years and spend one or two years at sea prior to re-entering freshwater, where they may remain up to a year before spawning.

Snake River steelhead are inland steelhead that occupy the Snake River Basin of southeast Washington, northeast Oregon, and Idaho. They are summer steelhead and comprise two groups, A-run and B-run, based on migration timing, ocean age, and adult size. A-run steelhead typically spend one year in the ocean, while B-run spend two years. Snake River steelhead usually smolt at age two or three.

Historically steelhead likely inhabited most coastal streams in California, Oregon, and Washington as well as many inland streams in these states and Idaho. As many as 23 stocks have been extripated, and many more are in decline and at moderate to high risk of extinction.

SUMMARY

This biological assessment addresses the possible effects of grasshopper suppression program activities on five species, eleven ESU's, of federally listed fish that could be affected by a grasshopper suppression program in Oregon. Information is provided on the biology and ecology of those species. Protective measures are suggested because program activities may affect those species or their habitats.

All of these fish species are related and will be affected similarly by the proposed action. The main difference is the place and time of the occurance in Oregon rivers. Therefore, APHIS proposes using the same protective measures for all five species.

For grasshopper suppression programs in Oregon, APHIS proposes the following no application buffers around any water body which contains one these listed fish species or their critical habitat. No aerial ULV (liquid) treatments will occur within 0.25 mile, no ground applications of liquids within 200 feet, and carbaryl bait will not be used within 500 feet by air and 200 feet by ground. Known migratory habitats will be treated as occupied habitat unless otherwise directed by NOAA Fisheries personnel prior to treatments. These protective measures in combination with program guidelines should assure that the Grasshopper Suppression Program will "not likely adversely affect" any of the eleven ESU's covered in this BA.

There may also be species in the affected areas that have not been addressed in this assessment, because the species have been newly listed, newly proposed, or the staus of their critical habitat has changed. APHIS will contact NOAA Fisheries prior to undertaking any program to determine if any additional protective measures are needed. This will ensure that grasshopper suppression program activities will not likely jeopardize the continued existence of listed species or species proposed for listing, nor adversely modify critical habitat for those species.

REFERENCES

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