STATE OF WASHINGTON September 1998

Washington State Status Report for the Pygmy Whitefish

by Molly Hallock and Paul E. Mongillo

Washington Department of
FISH AND WILDLIFE
Fish Management Program
Freshwater Resource Division

Washington State Status Report

for the

Pygmy Whitefish

by

Molly Hallock
and
Paul E. Mongillo

Washington Department of Fish and Wildlife
Fish Management Program
600 Capitol Way North
Olympia, Washington 98501-1091

September 1998

The Washington Department of Fish and Wildlife maintains a list of endangered, threatened and sensitive species (Washington Administrative Codes 232-12-014 and 232-12-011, Appendix A). In 1990, the Washington Fish and Wildlife Commission adopted listing procedures developed by a group of citizens, interest groups, and state and federal agencies (Washington Administrative Code 232-12-297, Appendix B). The procedures include how species listing will be initiated, criteria for listing and de-listing, public review and recovery and management of listed species.

The first step in the process is to develop a preliminary species status report. The report includes a review of information relevant to the species' status in Washington and addresses factors affecting its status including, but not limited to: historic, current, and future species population trends, natural history including ecological relationships, historic and current habitat trends, population demographics and their relationship to long term sustainability, and historic and current species management activities.

The procedures then provide for a 90-day public review opportunity for interested parties to submit new scientific data relevant to the status report, classification recommendation, and any State Environmental Policy Act findings. During the 90-day review period, the Department holds statewide public meetings to answer questions and take comments. At the close of the comment period, the Department completes the Final Status Report and Listing Recommendation for presentation to the Washington Fish and Wildlife Commission. The Final Report and Recommendation are then released 30 days prior to the Commission presentation for public review.

This is the Final Status Report for the Pygmy Whitefish. **Submit written comments on this report by 1 October 1998 to: Endangered Species Program Manger, Washington Department of Fish and Wildlife, 600 Capitol Way N, Olympia, WA 98501-1091.** The Department will present the results of this status review to the Fish and Wildlife Commission for action at its October 27, 1998 meeting.

This report should be cited as:

Hallock, M., and P.E. Mongillo. 1998. Washington State status report for the pygmy whitefish. Wash. Dept. Fish and Wildl., Olympia. 20 pp.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

EXECUTIVE SUMMARY

Pygmy whitefish (*Prosopium coulteri*) are remnants from the last ice age. In North America they are distributed across the northern tier of the United States, throughout western Canada and north into southeast Alaska. Pygmy whitefish are also found in one lake in Russia. Washington State is at the extreme southern edge of their native range in North America.

Pygmy whitefish are most commonly found in cool lakes and streams of mountainous regions. Streams they inhabit are of moderate to swift current, and may be silty or clear. In lakes, pygmy whitefish are frequently found in deep unproductive waters. However, they have been collected from smaller, shallow, more productive lakes in British Columbia and Washington. Washington lakes containing pygmy whitefish are typically unproductive. Pygmy whitefish have been caught in water depths ranging from 7 to 92 m in Washington.

Depending upon availability, food items consumed by pygmy whitefish include crustaceans, aquatic insect larvae and pupae, fish eggs and small molluscs.

Pygmy whitefish spawn in streams or lakes from late summer to early winter, depending upon geographic location and elevation. They probably scatter their eggs over coarse gravel, as do other species in this genus. Presumed spawning runs have been noted in several streams. Lake spawning by pygmy whitefish may have been observed in Priest Lake, Idaho in late October. Although lake spawning had not previously been documented in Washington, the presence of pygmy whitefish in Bead Lake, which has no spawning streams, verifies its occurrence.

Pygmy whitefish presence in heavily sampled lakes has often gone undetected because of the fish's small size (usually under 20 cm) and tendency to inhabit the deeper portions of lakes. Only recently, when sampling techniques were modified to target pygmy whitefish, was the Washington Department of Fish and Wildlife able to pinpoint their distribution in Washington State.

Historically, pygmy whitefish resided in at least 15 lakes in Washington. Currently they inhabit only nine. We do not know the status of the populations in these lakes. Their demise in six lakes is attributed to piscicides, introduction of exotic fish species and/or declining water quality. Pygmy whitefish, particularly in smaller lakes, are vulnerable to exotic fish species introductions and declining water quality, both of which may constrict their habitat.

Because of the very limited range of the pygmy whitefish in Washington, we believe they are vulnerable and likely to become endangered or threatened in a significant portion of their remaining range without cooperative management. For these reasons, the Department recommends that pygmy whitefish be listed as a sensitive species in the state of Washington.

TAXONOMY

The pygmy whitefish (*Prosopium coulteri*) is a member of the family Salmonidae, subfamily Coregoninae. It was first described in 1892 by Eigenmann and Eigenmann (1892) from a specimen in Kicking Horse River, British Columbia, Canada.

DESCRIPTION

Like all salmonids, pygmy whitefish have an adipose fin. They are cigar-shaped, brown backed with silver-sides and have a blunt snout. Other distinguishing characteristics include a single nostril flap, dorsal fin ray count of 7-13, anal fin ray count of 8-10 and lateral line scale count of 54-70. Adult pygmy whitefish attain an average length of 12-15 cm (4.7 to 5.9 in). The largest measured was 28.5 cm (11.2 in) from Horseshoe Lake, Washington.

Similar Species

There are two other whitefish species present in Washington, the lake whitefish (*Coregonus clupeaformis*) and the mountain whitefish (*Prosopium williamsoni*). Lake whitefish are not native to Washington and are distinguished from the pygmy whitefish by the presence of a double nostril flap. Mountain whitefish have a single nostril flap, a pointed snout, 11-14 dorsal fin rays, 10-13 anal fin rays and 74-90 lateral line scale count. Mountain whitefish inhabit many of the same lakes as pygmy whitefish.

GEOGRAPHIC DISTRIBUTION

Worldwide

The range of pygmy whitefish is still open to discovery. Previously found only in North America, within the last decade they have also been found on the Chukotski Peninsula in Russia (Chereshnev and Skopets 1992).

North America

Pygmy whitefish are remnants from the last ice age, with a spotty distribution across northern North America. They are in Lake Superior, western Montana, northern Idaho, Washington, southwest Alaska and western Canada. Most of the Canadian observations are in British Columbia, but pygmy whitefish have been reported in Athabaska Lake, Saskatchewan and Great Bear Lake, Northwest Territories (D. McPhail, pers. comm.).

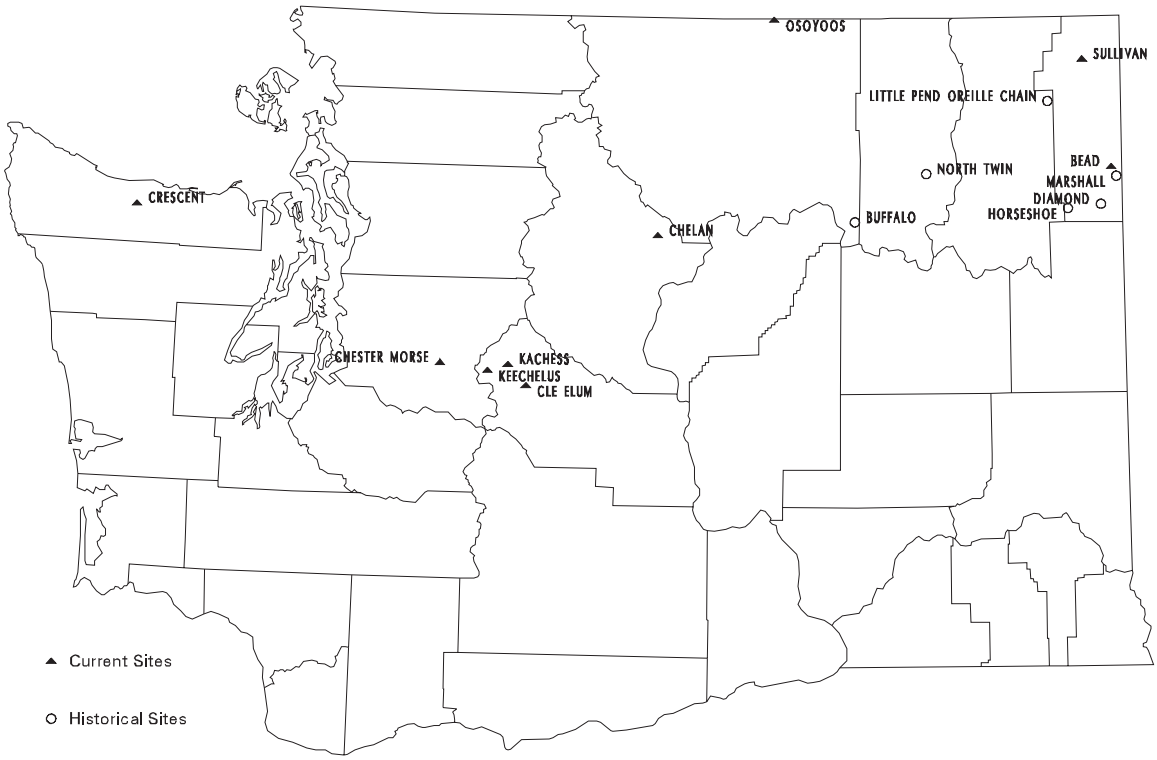

Figure 1. Historical and current distribution of pygmy whitefish in Washington.

Washington

Pygmy whitefish have historical distribution in 15 lakes and current distribution in nine (Fig. 1). Information on the waters that have/had pygmy whitefish is presented in Table 1. It is unlikely pygmy whitefish were introduced by man into any of these waters. They are difficult to capture and would have been of little interest to individuals trying to improve fishing.

Current distribution of pygmy whitefish in Washington was documented through a survey conducted by the Washington Department of Fish and Wildlife (WDFW) between 1993 and 1997. Eight thousand natural lakes around the state were subjected to the following criteria: maximum depth greater that 15 m (49.5 ft) and a late summer bottom temperature of less than 10°C (50°F). Lakes which met these criteria were further studied for factors such as past piscicide treatment, introduced fish species and dissolved oxygen levels. WDFW records were also examined for clues regarding distribution of pygmy whitefish. Thirty lakes were ultimately selected for survey effort.

Surveys were conducted on six lakes from April through October each year. Each lake was sampled for two consecutive nights, using 5-7 gillnets per night. Nets were pulled and reset every 18-24 hours. Multifilament, single mesh size nets were used. Net sizes were: one net of 13 mm (0.5 in) stretch mesh (1.8 m by 30 m; 6 ft by 100 ft), two nets of 25 mm (1.0 in) stretch mesh and two of 38 mm (1.5 in) stretch mesh (2.4 m by 37.8 m; 8 ft by 125 ft).

Table 1. Elevation, size and depth of former and current pygmy whitefish waters.

Lake	County	Elev. (m)	Size (ha)	Max Depth (m)	Presence Past	Present
Bead	Pend Oreille	877	291	52	Yes	Yes
Buffalo	Okanogan	733	219	37	Yes	No
Chelan	Chelan	341	13402	486	Yes	Yes
Chester Morse	King	474	681	35	Yes	Yes
Cle Elum	Kittitas	682	1948	102	Yes	Yes
Crescent	Clallam	177	2075	189	Yes	Yes
Diamond	Pend Oreille	720	305	18	Yes	No
Horseshoe	Pend Oreille	608	57	44	Yes	No
Kachess	Kittitas	689	1837	131	Yes	Yes
Keechelus	Kittitas	767	1039	99	Yes	Yes
Little Pend Oreille Lakes	Stevens	966	4-66	27	Yes	No
Marshall	Pend Oreille	846	79	28	Yes	No
North Twin	Ferry	784	301	15	Yes	No
Osoyoos	Okanogan	280	2319	63	Yes	Yes
Sullivan	Pend Oreille	796	574	102	Yes	Yes

Nets were set in the deepest part of the lake for lakes less than 40 m (132 ft) deep and at approximately 40-60 m (132 to 198 ft) for deeper lakes. Occasionally sets of nearly 100 m (330 ft) deep were used. In addition, two experimental (variable mesh size) gillnets were set at various depths to determine associated species.

Three lakes not sampled by WDFW that contain pygmy whitefish are Lake Osoyoos, Lake Crescent and Chester Morse Lake. Pygmy whitefish were last documented in Lake Osoyoos by Northcote et. al (1973) in 1971. Much of Lake Osoyoos, in particular, the deeper waters, lie in British Columbia, Canada. Lake Crescent is within the boundaries of Olympic National Park. The first documented pygmy whitefish observation from Lake Crescent was in the early 1900's (Myers 1932), but no others were observed until recently. In 1993 a pygmy whitefish was found floating on Lake Crescent. Its identification was verified by WDFW. Sampling in Chester Morse Lake was conducted by a private consulting firm (R2 Resource Consultants 1995) during the 1990's.

NATURAL HISTORY

Reproduction

Pygmy whitefish spawn in streams or lakes from late summer to early winter, depending upon geographic location and elevation. They probably scatter their eggs over coarse gravel, as do other species in this genus (Scott and Crossman 1973; Wydoski and Whitney 1979). Lake Superior pygmy whitefish spawn in November or December (Eschmeyer and Bailey 1954) as do pygmy whitefish in Flathead Lake, Montana (Weisel *et al*. 1973) and Brooks Lake, Alaska (Heard and Hartman 1966). Lake spawning by pygmy whitefish may have been observed in Priest Lake, Idaho in late October. Fish were observed moving into the shallows of the lake in late afternoon and back out into deep water towards daylight (Wallace and Simpson 1978). The presence of pygmy whitefish in Bead Lake, which has no suitable spawning streams, verifies that lake spawning occurs.

Pygmy whitefish in Chester Morse Lake, Washington, spawn December to early January, after migrating into the Cedar and Rex Rivers. In early December 1997, schools of pygmy whitefish were observed holding in pools just below riffles in these rivers. By mid-December no more fish were observed (E. Greenberg, pers. comm.). Lake-dwelling species of whitefish usually complete spawning within a three week interval (C. Foote, pers. comm). Sullivan Lake is the only other Washington lake from which we have circumstantial spawning data. Ripe and spawned out females were collected in early September and late October 1994 (Mongillo and Hallock 1995), which may imply two separate spawning populations.

Little water temperature data has been collected during the spawning period. A water temperature of 0°C (32°F) was recorded in the Cedar River during December, 1996 by WDFW and 4°C (39.2°F) in December, 1997 (E. Greenberg, pers. comm.). Heard and Hartman (1966) also documented mature, ripe fish and a water temperature of 3.9°C (39°F) near the mouth of Brooks River, Alaska, in November 1962. Fish were still present near the mouth but spawned out by mid-December, when the water temperature had dropped to 0.3°C (32.5°F).

Pygmy whitefish mature early in life, age 1 to 2 for males and age 2 to 3 for females. In Flathead Lake, Montana, 74 percent of age 1 males collected were mature, and all males age 2 and older were mature. Twenty-eight percent of age 1 females were mature, 90 percent of age 2 females were mature, and all older females were mature. The presence of developing eggs in the ovaries of mature females (mature eggs in abdominal cavity) indicated females spawn in consecutive years (Weisel *et al*. 1973). In Lake Superior, Michigan, more than 50 percent of males were mature at age 2 and more than 50 percent of females were mature at age 3 (Eschmeyer and Bailey 1954). In Brooks and South Bay Lakes, Alaska more than 95 percent of age 2 pygmy whitefish were mature (Heard and Hartman 1966). Weisel *et al*. (1973) considers the small size and early maturation age of pygmy whitefish as a survival adaptation during glaciation when waters were cold and very low in nutrients.

Age and Growth

Although variable across its range, pygmy whitefish are generally short-lived and grow slowly. The two oldest females collected from Lake Superior were age 7 and averaged 13.6 cm (5.4 in) total length. Most fish were under age 6 and measured less than 13 cm (5.2 in) (Eschmeyer and Bailey 1954). Age determination of 272 pygmy whitefish from Flathead Lake, Montana indicated the majority of fish were age 1 or 2. Three females were age 4 and averaged 16.5 cm (6.5 in) total length. One age 3 male measured 13.2 cm (5.2 in) total length (Weisel *et al*. 1973). The oldest and second largest pygmy whitefish to date is a 9 year old 27.1 cm (10.7 in) female collected from Maclure Lake, British Columbia (McCart 1965).

Age and growth analysis has been conducted in Washington on 52 pygmy whitefish from Chester Morse Lake by R2 Consultants, Inc. (1995). Sample gear bias may have selected for larger fish. Fifty fish were age 2 or 3 and two were age 4. Age 2 fish ranged from 19.5 to 22.0 cm (7.6 to 8.7 in), age 3 fish were 20.8 to 21.6 cm (8.2 to 8.5 in) and age 4 fish were 21.0 to 24.6 cm (8.3 to 9.7 in).

Mortality

Little is known about pygmy whitefish mortality. However, being a small, delicate fish, they are preyed upon by piscivorous fishes and birds. In Chester Morse Lake, pygmy whitefish were present in Dolly Varden (*Salvelinus malma*) stomachs 5-10% of the time (Wyman 1975). Bull trout/Dolly Varden and pygmy whitefish often occur together in Washington lakes. In Diamond Lake, Snyder (1917) observed pygmy whitefish being taken by kingfishers. Adult mortality may be greatest when pygmy whitefish migrate to the shallows of streams or lakes to spawn.

Foraging and Food

Pygmy whitefish consume crustaceans, aquatic insect larvae and pupae, fish eggs and small molluscs (Wydoski and Whitney 1979). In Lake Superior, crustaceans (mainly ostracods and amphipods) comprised 77% of the total volume consumed, followed by aquatic insect larvae and pupae (8%), molluscs (3%), and fish eggs (11%) (Eschmeyer and Bailey 1954). In Flathead Lake, Montana, chironomid larvae and pupae were the main food source, followed by crustaceans (mainly cladocerans). During spawning, pygmy whitefish consume their own eggs (Weisel *et al*. 1973). The diet of pygmy whitefish in Chester Morse Lake consisted primarily of chironomids, small clams, amphipods and zooplankton (R2 Resource Consultants 1995).

Feeding behavior of pygmy whitefish was observed by Heard and Hartman (1966) in the lower Brooks River, Alaska. Food items were taken often from the bottom, but also up in the current. When feeding on the bottom, pygmy whitefish would make a quick dart at a targeted food item, passing any sand or debris through their gill openings.

Associated Fishes

Table 2 shows native fishes that occur with pygmy whitefish in Washington. Similar native assemblages occur with pygmy whitefish in Priest and Pend Oreille Lakes in northern Idaho (N. Horner, pers. comm.), Flathead Lake in western Montana (Weisel *et al*. 1973) and four lakes studied in British Columbia by McCart (1965). Exotic warmwater and trout species have been introduced into most of the Washington lakes containing pygmy whitefish.

Table 2. Native fishes and their percent occurrence in 12 pygmy whitefish lakes in Washington.

Species	Percent Occurrence
Kokanee (*Oncorhynchus nerka*)	83
Rainbow trout (*Oncorhynchus mykiss*)	75
Cutthroat trout (*Oncorhynchyus clarki*)	58
Redside shiner (*Richardsonius balteatus*)	58
Largescale sucker (*Catostomus macrocheilus*)	50
Mountain whitefish (*Prosopium williamsoni*)	50
Longnose sucker (*Catostomus catostomus*)	42
Northern squawfish (*Ptychocheilus oregonensis*)	42
Bull trout (*Salvelinus confluentus*)	33
Burbot (*Lota lota*)	33
Peamouth (*Mylocheilus caurinus*)	33
Prickly sculpin (*Cottus asper*)	16
Torrent sculpin (*Cottus rhotheus*)	16
Chiselmouth (*Acrocheilus alutaceus*)	8
Speckled dace (*Rhinichthys osculus*)	8
Sockeye salmon (*Oncorhynchus nerka*)	8

HABITAT REQUIREMENTS

Temperature preferences and tolerances have not been determined. Temperature profiles were recorded in all lakes surveyed by WDFW for pygmy whitefish. Temperature at pygmy whitefish capture depths was estimated using these profiles (Table 3). Pygmy whitefish were almost always captured in water temperatures below 10°C (50°F). McPhail and Carveth (1992) classify pygmy whitefish as a coldwater stenotherm (narrow range of temperature requirements).

Table 3. Water temperature at capture depths for pygmy whitefish in Washington lakes.

Lake	Date	Pygmy whitefish Capture Depth(m)	Temperature(°C) at Capture Depth
Bead	07-01-93	21	6.0
Cle Elum	11-09-78	64	5.0
Horseshoe	05-12-93	6	9.0
Kachees	06-26-96	86	5.0
Kachess	06-26-96	9-18	6.0-10.5
Kachess	06-25-96	7-15	5.0-10.0
Kachess	06-25-96	46	4.5
Kecheelus	06-04-96	54-61	5.0
Sullivan	06-23-94	5-10	10.5-13.5
Sullivan	06-23-94	7-14	7.0-12.0
Sullivan	06-24-94	27-35	5.0

Dissolved oxygen requirements are not known for pygmy whitefish. However, it is recommended by the United States Environmental Protection Agency (1976) that dissolved oxygen levels not fall below five mg/l for salmonids.

Streams inhabited by pygmy whitefish may be of moderate to swift current, and be silty or clear. Pygmy whitefish are most commonly found in large, deep, unproductive lakes. However, they have been collected from small, shallow, more productive lakes in British Columbia (McCart 1965), western Montana (Weisel *et al*. 1973) and Washington (Mongillo and Hallock 1995). In shallow lakes, they appear to be more vulnerable to predation from exotic fish species. If an exotic predator such as largemouth bass (*Micropterus salmoides*) is introduced into a shallow lake pygmy whitefish may have nowhere to escape. This situation appears to be the case in Diamond, North Twin and Horseshoe Lakes in Washington. The introduction of exotic predators into larger, deeper lakes such as Chelan and Cle Elum has not caused extirpation of pygmy whitefish. Pygmy whitefish appear to need habitat that either has an escape refuge (deep water) from predators or, barring no refuge, has no predators at all.

Generally, adults are found in deep water habitats or in the shallows during spawning season. However, in the Naknek System in Alaska, Heard and Hartman (1966) found pygmy whitefish in a wide variety of habitats, from deep water benthic (168 m; 554 ft) to littoral (1 m; 3.3 ft). They were also found in open water areas at or near the surface. Age 0 pygmy whitefish were found in both open water and nearshore habitats.

POPULATION STATUS

Past

The first Washington pygmy whitefish observation was recorded in 1894 at Diamond Lake (Pend Oreille County) by Snyder (1917). Another observation was made in the early 1900's from Lake Crescent in Clallam County. No other observations were noted until the 1950's when the Washington Department of Game used piscicides in some eastern Washington lakes. In most cases, biologists were unaware of the pygmy whitefish's presence until after the chemical treatment. Piscicides used in Buffalo Lake (Okanogan County), Little Pend Oreille Chain (Stevens County) and Marshall Lake (Pend Oreille County) extirpated the pygmy whitefish populations in these lakes. In the late 1950's a piscicide was also used in Diamond Lake, the first documented pygmy whitefish water, but no pygmy whitefish were present. Early introduction of largemouth and smallmouth bass (*Micropterus dolomieui*) were likely responsible for this loss.

There may have been other lakes in Washington which historically contained pygmy whitefish, but suffered the same fate as Diamond Lake. In the 1890's the United States Fish Commission introduced exotic fish species into many Washington waters (Lampman 1946).

No more observations were recorded until the 1970's when Wyman (1975) documented their presence in Chester Morse Lake (King County) and the Colville Confederated Tribes confirmed their presence in North Twin Lake on the Colville Indian Reservation in 1978. Largemouth bass were illegally introduced into North Twin Lake in the early 1980's, and by 1987 pygmy whitefish were no longer collected (K. Truscott, pers. comm.). With a maximum depth of 15 m (49.5 ft), North Twin Lake was the shallowest of all lakes in Washington containing pygmy whitefish. The shallow water combined with the introduction of an exotic predator likely resulted in the demise of pygmy whitefish in North Twin Lake.

In 1978 pygmy whitefish were collected in Lake Cle Elum (Mongillo and Faulconer 1980) and in 1980 in Lake Kecheelus and Lake Kachess (Mongillo and Faulconer 1982).

Pygmy whitefish were first documented in Horseshoe Lake, Pend Oreille County in 1993 (Mongillo and Hallock 1995). No pygmy whitefish have been collected in annual sampling by WDFW since. Horseshoe Lake is a small (57 ha; 141 ac), moderately deep (44 m; 145 ft) lake with introduced exotic species, including lake trout (*Salvelinus namaycush*). Lake trout were introduced in the 1980's and are now reproducing. Horseshoe Lake also has an oxygen deficit in the deeper waters, limiting available habitat. In October 1995, dissolved oxygen measured only 2.5 mg/l at 29 m (95.7 ft). Lake trout have been introduced into other pygmy whitefish lakes without eliminating pygmy whitefish. However, in Horseshoe Lake, a combination of limited habitat due to decreased water quality and an introduced predator likely caused the extirpation of the pygmy whitefish. In our judgement pygmy whitefish no longer exist in Horseshoe Lake.

Present

New observations of pygmy whitefish are still occurring across their range. We believe all remaining populations in Washington have been identified. Pygmy whitefish have been eliminated from a minimum of 40 percent of their range in Washington. They now persist in only nine lakes. Population status in all these lakes is unknown.

Future

Pygmy whitefish are quick to mature and have a short life span. Given these factors, several poor recruitment years in succession could severely impact an individual population.

The future of pygmy whitefish populations is dependent upon our ability to maintain water quality, spawning habitat and prevent introduction of new predators. Burbot were recently illegally introduced into Sullivan Lake. Effects of this action are unknown.

HABITAT STATUS

Past

Over 100 years ago, pygmy whitefish lived in pristine lakes that contained few fish species. This scenario changed in 1890 when the United States Fish Commission introduced exotic species into many Washington waters. Some of these lakes contained favorable pygmy whitefish habitat. Exotic fish species may have eliminated pygmy whitefish from lakes which had no historical records of observation. In the early 1900's many of the lakes containing pygmy whitefish were impounded. Impacts of impoundment are unknown.

Present

The nine remaining lakes containing pygmy whitefish appear to have stable habitat. Cool water temperatures and sufficient oxygen in deep waters are required by pygmy whitefish. Documented trophic status in all pygmy whitefish lakes except Osoyoos is oligotrophic (unproductive) (Sumioka and Dion 1985; Rector and Hallock 1995). Lake Osoyoos is considered mesotrophic (moderately productive) (Rector and Hallock 1995). Bead, Crescent and Chester Morse lakes have not been classified, but would likely be considered oligotrophic. Total shoreline development is minimal to moderate around all the lakes. Lakes Chelan and Osoyoos have clusters of heavy shoreline development. Various government agencies (National Park Service, United States Forest Service) and a public utility (Seattle Public Utility) own the bulk of the watersheds surrounding the lakes. In light of this, watersheds and lakes should have adequate protection from accelerated eutrophication. Forest practices which protect riparian zones and limit erosion need to be strictly observed to prevent siltation of spawning areas and warming of water temperatures.

Future

Smaller lakes, such as Bead and Sullivan, are particularly vulnerable to introduction of predators, water quality changes and watershed changes which could limit pygmy whitefish habitat.

CONSERVATION STATUS

Legal Status

Pygmy whitefish have no federal status. They have been a State Candidate species in Washington since 1994.

Management Activities

Since incidental catches of pygmy whitefish during other fish surveys are rare, the nine remaining populations need to be monitored. Each lake's trophic status and fish community will be reviewed regularly.

As a result of WDFW pygmy whitefish surveys, resource managers with pygmy whitefish under their jurisdiction (WDFW, Olympic National Park, United States Forest Service) are now aware of the fish's presence. This has opened communications between landowners and WDFW concerning pygmy whitefish.

Pygmy whitefish are listed as a Priority Species under WDFW Priority Species and Habitat Program (PHS). This designation represents a proactive approach to help mitigate the increasing pressure of human population growth on the state’s fish and wildlife species and habitat. Locational information and management recommendations provided by PHS aid local governments and others in guiding growth in a manner which will best preserve and protect wildlife species and habitat. Whenever a project that affects fish and wildlife (logging, road building) is reviewed, PHS species and habitats in the project area are identified. Management recommendations are then made to protect PHS species and habitat. Also, when a project will use, divert, obstruct, or change the natural flow or bed of any water a hydraulic project approval (HPA) must be obtained from WDFW. Recommendations in the HPA for the protection of aquatic habitat and species must be closely followed.

Re-establishment of pygmy whitefish into their former lakes has been considered. Marshall Lake is the only lake in which re-introduction is being explored at this time. Other former pygmy whitefish lakes may not be suitable because of declining water quality and exotic species. Re-introduction of pygmy whitefish into any historical habitat would only be conducted in the context of a comprehensive plan.

FACTORS AFFECTING CONTINUED EXISTENCE

Adequacy of Existing Regulatory Mechanisms

Pygmy whitefish have no sport or commercial value. Therefore, there are no harvest issues. Because pygmy whitefish are a PHS species, their requirements are taken in account when a proposed project may impact its habitat. Recommendations for protection are often simply advisory. These measures offer minimal protection for pygmy whitefish. However, when a project will use, divert, obstruct, or change the natural flow or bed of any water a hydraulic project approval (HPA) must be obtained from WDFW. Recommendations in the HPA for the protection of aquatic habitat and species must be closely followed. Forest practices may be altered to protect salmon and trout through the Washington Forest Practices Act. Pygmy whitefish may receive some indirect protection through this Act and other salmonid protection plans.

Present and Threatened Habitat Loss

Water temperature greater than 10°C (50°F) and dissolved oxygen less than five mg/l in deep water zones of lakes may limit pygmy whitefish habitat. Siltation of spawning streams or lake shorelines would limit successful spawning. Water quality degradation and siltation both may stem from poor forest management practices and increased development. Protection of riparian zones is essential for temperature and erosion control.

Construction of roads, bridges and other in-stream structures next to or in pygmy whitefish spawning areas could cause abandonment of spawning areas or disruption of spawning migrations.

Other Natural and Manmade Factors

Threats to pygmy whitefish populations are the use of piscicides and exotic fish introductions. Piscicide use in waters containing pygmy whitefish is not likely in the future. Most lakes are very large and unproductive, and chemical fish removal would provide minimal fishing benefits. Introduction of fish predators may lead to a decline or elimination of pygmy whitefish. Nonpredatory species introductions may also have a negative impact because unknown interactions may reduce or eliminate pygmy whitefish.

CONCLUSIONS AND RECOMMENDATIONS

Washington State is at the extreme southern edge of the pygmy whitefish's range. Once found in 15 or more lakes, pygmy whitefish have been eliminated from at least six waters (40%) due to fish management activities (legal and illegal) and declining water quality. We do not know the population status in the remaining nine lakes. Habitat appears stable, but fish, lake or watershed

mismanagement could reverse this situation. In addition, natural dispersal into new waters is highly unlikely and re-introductions will be difficult. Because of the very limited range of pygmy whitefish in Washington, we believe they are vulnerable and likely to become endangered or threatened in a significant portion of their remaining range without cooperative management. The Department recommends that pygmy whitefish be listed as a sensitive species in Washington.

REFERENCES CITED

Chereshnev, I. A., and M. B. Skopets. 1992. A new record of the pygmy whitefish, *Prosopium coulteri*, from the Amguem River Basin, (Chukotski Peninsula). J. of Ichth. 32(4):46-55.

Eigenmann, C. H., and R. S. Eigenmann. 1892. New fishes from western Canada. Am. Nat. 26:961-964.

Eschmeyer, P. H., and R. M. Bailey. 1954. The pygmy whitefish, *Coregonus coulteri*, in Lake Superior. Trans. Amer. Fish. Soc. 84:161-199.

Heard, W. R., and W. L. Hartman. 1966. Pygmy whitefish, *Prosopium coulteri* in Naknek River system of southwest Alaska. U.S. Fish and Wildl. Serv., Fish Bull. 65:555-579.

Lampman, B. H. 1946. The Coming of the Pond Fishes. Binsford and Mort. Portland, Oregon. 177 pp.

McCart, P. 1965. Growth and morphometry of four British Columbia populations of pygmy whitefish (*Prosopium coulteri*). J. Fish. Res Bd. Can. 22(5):1229-1259.

McPhail, J. D., and R. Carveth. 1992. A foundation for conservation: the nature and origin of the freshwater fish fauna of British Columbia. Univ. of British Columbia, Dept. Zoology, Vancouver, British Columbia, Canada. 39 pp.

Myers, G. S. 1932. A new whitefish, *Prosopium snyderi*, from Crescent Lake, Washington. Copeia 2:62-64.

Mongillo, P. E., and L. Faulconer. 1980. Yakima fisheries enhancement study final report. Washington Department of Game. U.S. Water and Power Resources Service contract #7-07-10-S0038. 171 pp.

Mongillo, P. E., and L. Faulconer. 1982. Yakima fisheries enhancement study phase II final report. Washington Department of Game. U.S. Bureau of Reclamation contract #0-07-10-S0218. 119 pp.

Mongillo, P. E., and M. Hallock. 1995. Resident nongame fish investigations, 1993-94 report. Washington Department of Fish and Wildlife Annual Report IF95-04. 78 pp.

Northcote, T. G., T. G. Halsey and S. J. MacDonald. 1973. Fish as indicators of water quality in the Okanagan basin lakes, British Columbia. British Columbia Fish and Wildlife Branch, Department of Recreation and Conservation. 80 pp.

Rector, J., and D. Hallock. 1995. 1994 statewide water quality assessment lakes chapter. Washington State Department of Ecology publication no. 95-311. 60 pp.

R2 Resource Consultants, Inc. 1995. Preliminary draft report: upper Cedar River watershed fisheries study. Prepared for City of Seattle.

Scott, W. B., and E. J. Crossman. 1973. Freshwater Fishes of Canada. Fish. Res. Board Can. Bull. 184, Ottawa, Canada. 966 pp.

Snyder, J.O. 1917. Coulter's whitefish. Copeia 50:93-94.

Sumioka, S. S., and N. P. Dion. 1985. Trophic classification of Washington lakes using reconnaissance data. Washington State Department of Ecology Water-Supply Bull. 57. 320 pp.

United States Environmental Protection Agency. 1976. Quality Criteria for Water. U.S. Government Printing Office:1977 O-222-904. 256 pp.

Wallace, R. L., and J. C. Simpson. 1978. Fishes of Idaho. The University Press of Idaho, Moscow, Idaho. 237 pp.

Weisel, G. F., D. A. Hansel, and R. L. Newell. 1973. The pygmy whitefish, *Prosopium coulteri*, in western Montana. Fish. Bull. 71(2):587-596.

Wydoski, R. S., and R. R. Whitney. 1979. Inland Fishes of Washington. University of Washington Press, Seattle, Washington. 220 pp.

Wyman, K. H., Jr. 1975. Two unfished salmonid populations in Lake Chester Morse. Masters Thesis. Univ. of Washington. Seattle, Washington. 53 pp.

PERSONAL COMMUNICATIONS

Dr. Chris Foote
University of Washington
Seattle, Washington

Emily S. Greenberg
Seattle Public Utility
North Bend, Washington

Ned Horner
Idaho Fish and Game
Couer d'Alene, Idaho

Dr. Don McPhail
University of British Columbia
Vancouver, British Columbia, Canada

Kirk Truscott
Colville Federated Tribes
Nespelem, Washington

Appendix A. Washington Administrative Codes 232-12-011 and 232-12-014.

WAC 232-12-011 Wildlife classified as protected shall not be hunted or fished.

Protected wildlife are designated into three subcategories: Threatened, sensitive, and other.
(1) Threatened species are any wildlife species native to the state of Washington that are likely to become endangered within the foreseeable future throughout a significant portion of their range within the state without cooperative management or removal of threats. Protected wildlife designated as threatened include:

Common Name	Scientific Name
Western gray squirrel	*Sciurus griseus*
Steller (northern) sea lion	*Eumetopias jubatus*
North American lynx	*Lynx canadensis*
Aleutian Canada goose	*Branta canadensis leucopareia*
Bald eagle	*Haliaeetus leucocephalus*
Ferruginous hawk	*Buteo regalis*
Marbled murrelet	*Brachyramphus marmoratus*
Green sea turtle	*Chelonia mydas*
Loggerhead sea turtle	*Caretta caretta*

(2) Sensitive species are any wildlife species native to the state of Washington that are vulnerable or declining and are likely to become endangered or threatened in a significant portion of their range within the state without cooperative management or removal of threats. Protected wildlife designated as sensitive include:

Common Name	Scientific Name
Gray whale	*Eschrichtius gibbosus*
Larch Mountain salamander	*Plethodon larselli*

(3) Other protected wildlife include:

Common Name	Scientific Name
Cony or pika	*Ochotona princeps*
Least chipmunk	*Tamius minimus*
Yellow-pine chipmunk	*Tamius amoenus*
Townsend's chipmunk	*Tamius townsendii*
Red-tailed chipmunk	*Tamius ruficaudus*
Hoary marmot	*Marmota caligata*
Olympic marmot	*Marmota olympus*
Cascade golden-mantled ground squirrel	*Spermophilus saturatus*
Golden-mantled ground squirrel	*Spermophilus lateralis*
Washington ground squirrel	*Spermophilus washingtoni*
Red squirrel	*Tamiasciurus hudsonicus*
Douglas squirrel	*Tamiasciurus douglasii*
Northern flying squirrel	*Glaucomys sabrinus*
Fisher	*Martes pennanti*
Wolverine	*Gulo gulo*
Painted turtle	*Chrysemys picta*
California mountain kingsnake	*Lampropeltis zonata;*

All birds not classified as game birds, predatory birds or endangered species, or designated as threatened species or sensitive species; all bats, except when found in or immediately adjacent to a dwelling or other occupied building; mammals of the order *Cetacea,* including whales, porpoises, and mammals of the order *Pinnipedia* not otherwise classified as endangered species, or designated as threatened species or sensitive species. This section shall not apply to hair seals and sea lions which are threatening to damage or are damaging commercial fishing gear being utilized in a lawful manner or when said mammals are damaging or threatening to damage commercial fish being lawfully taken with commercial gear.

[Statutory Authority: RCW 77.12.020. 97-18-019 (Order 97-167), § 232-12-011, filed 8/25/97, effective 9/25/97. Statutory Authority: RCW 77.12.040, 77.12.020, 77.12.030 and 77.32.220. 97-12-048, § 232-12-011, filed 6/2/97, effective 7/3/97. Statutory Authority: RCW 77.12.020. 93-21-027 (Order 615), § 232-12-011, filed 10/14/93, effective 11/14/93; 90-11-065 (Order 441), § 232-12-011, filed 5/15/90, effective 6/15/90. Statutory Authority: RCW 77.12.040. 89-11-061 (Order 392), § 232-12-011, filed 5/18/89; 82-19-026 (Order 192), § 232-12-011, filed 9/9/82; 81-22-002 (Order 174), § 232-12-011, filed 10/22/81; 81-12-029 (Order 165), § 232-12-011, filed 6/1/81.]

WAC 232-12-014 Wildlife classified as endangered species.

Endangered species include:

Common Name	Scientific Name
Pygmy rabbit	*Brachylagus idahoensis*
Gray wolf	*Canis lupus*
Grizzly bear	*Ursus arctos*
Sea otter	*Enhydra lutris*
Sei whale	*Balaenoptera borealis*
Fin whale	*Balaenoptera physalus*
Blue whale	*Balaenoptera musculus*
Humpback whale	*Megaptera novaeangliae*
Black right whale	*Balaena glacialis*
Sperm whale	*Physeter macrocephalus*
Columbian white-tailed deer	*Odocoileus virginianus leucurus*
Woodland caribou	*Rangifer tarandus caribou*
American white pelican	*Pelecanus erythrorhynchos*
Brown pelican	*Pelecanus occidentalis*
Peregrine falcon	*Falco peregrinus*
Sandhill crane	*Grus canadensis*
Snowy plover	*charadrius alexandrinus*
Upland sandpiper	*Bartramia longicauda*
Spotted owl	*Strix occidentalis*
Western pond turtle	*Clemmys marmorata*
Leatherback sea turtle	*Dermochelys coriacea*
Oregon silverspot butterfly	*Speyeria zerene hippolyta*
Oregon spotted frog	*Rana pretiosa*

[Statutory Authority: RCW 77.12.020. 97-18-019 (Order 97-167), § 232-12-014, filed 8/25/97, effective 9/25/97; 93-21-026 (Order 616), § 232-12-014, filed 10/14/93, effective 11/14/93. Statutory Authority: RCW 77.12.020(6). 88-05-032 (Order 305), § 232-12-014, filed 2/12/88. Statutory Authority: RCW 77.12.040. 82-19-026 (Order 192), § 232-12-014, filed 9/9/82; 81-22-002 (Order 174), § 232-12-014, filed 10/22/81; 81-12-029 (Order 165), § 232-12-014, filed 6/1/81.]

Appendix B. Washington Administrative Code 232-12-297.

WAC 232-12-297
Endangered, threatened, and sensitive wildlife species classification.

PURPOSE

1.1 The purpose of this rule is to identify and classify native wildlife species that have need of protection and/or management to ensure their survival as free-ranging populations in Washington and to define the process by which listing, management, recovery, and delisting of a species can be achieved. These rules are established to ensure that consistent procedures and criteria are followed when classifying wildlife as endangered, or the protected wildlife subcategories threatened or sensitive.

DEFINITIONS

For purposes of this rule, the following definitions apply:

2.1 "Classify" and all derivatives means to list or delist wildlife species to or from endangered, or to or from the protected wildlife subcategories threatened or sensitive.

2.2 "List" and all derivatives means to change the classification status of a wildlife species to endangered, threatened, or sensitive.

2.3 "Delist" and its derivatives means to change the classification of endangered, threatened, or sensitive species to a classification other than endangered, threatened, or sensitive.

2.4 "Endangered" means any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

2.5 "Threatened" means any wildlife species native to the state of Washington that is likely to become an endangered species within the forseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

2.6 "Sensitive" means any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

2.7 "Species" means any group of animals classified as a species or subspecies as commonly accepted by the scientific community.

2.8 "Native" means any wildlife species naturally occurring in Washington for purposes of breeding, resting, or foraging, excluding introduced species not found historically in this state.

2.9 "Significant portion of its range" means that portion of a species' range likely to be essential to the long term survival of the population in Washington.

LISTING CRITERIA

3.1 The commission shall list a wildlife species as endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available, except as noted in section 3.4.

3.2 If a species is listed as endangered or threatened under the federal Endangered Species Act, the agency will recommend to the commission that it be listed as endangered or threatened as specified in section 9.1. If listed, the agency will proceed with development of a recovery plan pursuant to section 11.1.

3.3 Species may be listed as endangered, threatened, or sensitive only when populations are in danger of failing, declining, or are vulnerable, due to factors including but not restricted to limited numbers, disease, predation, exploitation, or habitat loss or change, pursuant to section 7.1.

3.4 Where a species of the class Insecta, based on substantial evidence, is determined to present an unreasonable risk to public health, the commission may make the determination that the species need not be listed as endangered, threatened, or sensitive.

DELISTING CRITERIA

4.1 The commission shall delist a wildlife species from endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available.

4.2 A species may be delisted from endangered, threatened, or sensitive only when populations are no longer in danger of failing, declining, are no longer vulnerable, pursuant to section 3.3, or meet recovery plan goals, and when it no longer meets the definitions in sections 2.4, 2.5, or 2.6.

INITIATION OF LISTING PROCESS

5.1 Any one of the following events may initiate the listing process.

5.1.1 The agency determines that a species population may be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

5.1.2 A petition is received at the agency from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the classification process.

5.1.3 An emergency, as defined by the Administrative Procedure Act, chapter 34.05 RCW. The listing of any species previously classified under emergency rule shall be governed by the provisions of this section.

5.1.4 The commission requests the agency review a species of concern.

5.2 Upon initiation of the listing process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the classification process and

calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

INITIATION OF DELISTING PROCESS

6.1 Any one of the following events may initiate the delisting process:

6.1.1 The agency determines that a species population may no longer be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

6.1.2 The agency receives a petition from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may no longer be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the delisting process.

6.1.3 The commission requests the agency review a species of concern.

6.2 Upon initiation of the delisting process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the delisting process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

SPECIES STATUS REVIEW AND AGENCY RECOMMENDATIONS

7.1 Except in an emergency under 5.1.3 above, prior to making a classification recommendation to the commission, the agency shall prepare a preliminary species status report. The report will include a review of information relevant to the species' status in Washington and address factors affecting its status, including those given under section 3.3. The status report shall be reviewed by the public and scientific community. The status report will include, but not be limited to an analysis of:

7.1.1 Historic, current, and future species population trends.

7.1.2 Natural history, including ecological relationships (e.g., food habits, home range, habitat selection patterns).

7.1.3 Historic and current habitat trends.

7.1.4 Population demographics (e.g., survival and mortality rates, reproductive success) and their relationship to long term sustainability.

7.1.5 Historic and current species management activities.

7.2 Except in an emergency under 5.1.3 above, the agency shall prepare recommendations for species classification, based upon scientific data contained in the status report. Documents shall be prepared to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act (SEPA).

7.3 For the purpose of delisting, the status report will include a review of recovery plan goals.

PUBLIC REVIEW

8.1 Except in an emergency under 5.1.3 above, prior to making a recommendation to the commission, the agency shall provide an opportunity for interested parties to submit new scientific data relevant to the status report, classification recommendation, and any SEPA findings.

8.1.1 The agency shall allow at least 90 days for public comment.

8.1.2 The agency will hold at least one public meeting in each of its administrative regions during the public review period.

FINAL RECOMMENDATIONS AND COMMISSION ACTION

9.1 After the close of the public comment period, the agency shall complete a final status report and classification recommendation. SEPA documents will be prepared, as necessary, for the final agency recommendation for classification. The classification recommendation will be presented to the commission for action. The final species status report, agency classification recommendation, and SEPA documents will be made available to the public at least 30 days prior to the commission meeting.

9.2 Notice of the proposed commission action will be published at least 30 days prior to the commission meeting.

PERIODIC SPECIES STATUS REVIEW

10.1 The agency shall conduct a review of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing. This review shall include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification.

10.1.1 The agency shall notify any parties who have expressed their interest to the department of the periodic status review. This notice shall occur at least one year prior to end of the five year period required by section 10.1.

10.2 The status of all delisted species shall be reviewed at least once, five years following the date of delisting.

10.3 The department shall evaluate the necessity of changing the classification of the species being reviewed. The agency shall report its findings to the commission at a commission meeting. The agency shall notify the public of its findings at least 30 days prior to presenting the findings to the commission.

10.3.1 If the agency determines that new information suggests that classification of a species should be changed from its present state, the agency shall initiate classification procedures provided for in these rules starting with section 5.1.

10.3.2 If the agency determines that conditions have not changed significantly and that the classification of the species should remain unchanged, the agency shall recommend to the commission that the species being reviewed shall retain its present classification status.

10.4 Nothing in these rules shall be construed to automatically delist a species without formal commission action.

RECOVERY AND MANAGEMENT OF LISTED SPECIES

11.1 The agency shall write a recovery plan for species listed as endangered or threatened. The agency will write a management plan for species listed as sensitive. Recovery and management plans shall address the listing criteria described in sections 3.1 and 3.3, and shall include, but are not limited to:

11.1.1 Target population objectives.

11.1.2 Criteria for reclassification.

11.1.3 An implementation plan for reaching population objectives which will promote cooperative management and be sensitive to landowner needs and property rights. The plan will specify resources needed from and impacts to the department, other agencies (including federal, state, and local), tribes, landowners, and other interest groups. The plan shall consider various approaches to meeting recovery objectives including, but not limited to regulation, mitigation, acquisition, incentive, and compensation mechanisms.

11.1.4 Public education needs.

11.1.5 A species monitoring plan, which requires periodic review to allow the incorporation of new information into the status report.

11.2 Preparation of recovery and management plans will be initiated by the agency within one year after the date of listing.

11.2.1 Recovery and management plans for species listed prior to 1990 or during the five years following the adoption of these rules shall be completed within five years after the date of listing or adoption of these rules, whichever comes later. Development of recovery plans for endangered species will receive higher priority than threatened or sensitive species.

11.2.2 Recovery and management plans for species listed after five years following the adoption of these rules shall be completed within three years after the date of listing.

11.2.3 The agency will publish a notice in the Washington Register and notify any parties who have expressed interest to the department interested parties of the initiation of recovery plan development.

11.2.4 If the deadlines defined in sections 11.2.1 and 11.2.2 are not met the department shall notify the public and report the reasons for missing the deadline and the strategy for completing the plan at a commission meeting. The intent of this section is to recognize current department personnel resources are limiting and that development of recovery plans for some of the species may require significant involvement by interests outside of the department, and therefore take longer to complete.

11.3 The agency shall provide an opportunity for interested public to comment on the recovery plan and any SEPA documents.

CLASSIFICATION PROCEDURES REVIEW

12.1 The agency and an ad hoc public group with members representing a broad spectrum of interests, shall meet as needed to accomplish the following:

12.1.1 Monitor the progress of the development of recovery and management plans and status reviews, highlight problems, and make recommendations to the department and other interested parties to improve the effectiveness of these processes.

12.1.2 Review these classification procedures six years after the adoption of these rules and report its findings to the commission.

AUTHORITY

13.1 The commission has the authority to classify wildlife as endangered under RCW 77.12.020. Species classified as endangered are listed under WAC 232-12-014, as amended.

13.2 Threatened and sensitive species shall be classified as subcategories of protected wildlife. The commission has the authority to classify wildlife as protected under RCW 77.12.020. Species classified as protected are listed under WAC 232-12-011, as amended. [Statutory Authority: RCW 77.12.020. 90-11-066 (Order 442), § 232-12-297, filed 5/15/90, effective 6/15/90.]