Volume VI, Chapter 1
Population Ranking

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1.0 Population Ranking

1.1 Population Persistence

Table 1-1. Population Persistence Score Definitions

Category	Description	Application
0	Either extinct or very high risk of extinction	0-40% probability of persistence for 100 years
1	Relatively high risk of extinction	40-75% probability of persistence for 100 years
2	Moderate risk of extinction	75-95% probability of persistence for 100 years
3	Low (negligible) risk of extinction	95-99% probability of persistence for 100 years
4	Very low risk of extinction	>99% probability of persistence for 100 years

Table 1-2. Chum Salmon Population Persistence

Population Persistence						
Strata	State	Population	score	data	criteria	comments
Coast	WA	Grays/Chinook	2.2		75-95% probability of persistence for 100 years	Grays River peak spawner counts from 1945-2000 averaged 1,149 fish; peak counts represent 80% of total return under optimal conditions. Survey results indicate a small, but stable population. NMFS status assessment indicates 0.38 risk of 90% decline in 50 years.
	WA	Elochoman/Skamokawa	1.2		40-75% probability of persistence for 100 years	A small remnant run has persisted in the basin; population is small and expected to be relatively unstable.
	WA	Mill/Abernathy/Germany	1.0		40-75% probability of persistence for 100 years	A small remnant run has persisted in the basin; population is small and expected to be relatively unstable.
	OR	Youngs				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
			1.4		40-75% probability of persistence for 100 years	
Cascade	WA	Cowlitz Chum	1.0		40-75% probability of persistence for 100 years	A small remnant run has persisted in the basin; population is small and expected to be relatively unstable. Typically, less than 20 adults are collected annually at the Cowlitz Salmon Hatchery.
	WA	Kalama Chum	1.0		40-75% probability of persistence for 100 years	A small remnant run has persisted in the basin; population is small and expected to be relatively unstable.
	WA	Lewis Chum	1.0		40-75% probability of persistence for 100 years	A small remnant run has persisted in the basin; population is small and expected to be relatively unstable. Chum are occasionally observed during fall chinook surveys; 3-4 adult chum are collected annually at the Merwin fish trap.
	WA	Salmon Chum	0.4		0-40% probability of persistence for 100 years	Chum salmon not known to utilize Salmon Creek; historic chum run likely extirpated.
	WA	Washougal Chum	1.7		40-75% probability of persistence for 100 years	A small remnant run has persisted in the basin; population is small and expected to be somewhat unstable.
	OR	Clackamas				
	OR	Sandy				
			1.0		40-75% probability of persistence for 100 years	

Gorge	WA	Lower Gorge	2.9	75-95% probability of persistence for 100 years	After Grays River, these tributaries support the most productive wild chum salmon population in the lower Columbia. NMFS status assessment indicated 0.01 risk of 90% decline in 50 years for Hardy Creek and 0.86 risk of 90% decline in 50 years for Hamilton Creek.
	WA	Upper Gorge	0.9	0-40% probability of persistence for 100 years	Chum salmon not known to utilize the Wind or Little White Salmon Rivers; historic chum run likely extirpated.
			1.9	40-75% probability of persistence for 100 years	

Table 1-3. Chinook Population Persistence

Strata	State	Population	Population Persistence score	data	criteria	comments
Coast Fall						
	WA	Grays	1.5		40-75% probability of persistence for 100 years	Wild fish contribution to the annual escapement is expected to be small; first generation hatchery fish comprise most of the annual escapement. NMFS status assessment indicated the risk of extinction in 50 years was 0.58.
	WA	Elochoman	1.5		40-75% probability of persistence for 100 years	Wild fish contribution to the annual escapement is expected to be small; first generation hatchery fish comprise most of the annual escapement. NMFS status assessment indicated the risk of extinction in 50 years was 0.03.
	WA	Mill/Abernathy/Germany	1.8		40-75% probability of persistence for 100 years	Fall chinook may not be native to Mill, Germany, or Abernathy Creek; first generation hatchery fish comprise most of the annual escapement. However, the fall chinook hatchery program was discontinued in 1995 and the 2001 escapement for Germany and Abernathy Creeks was each over 1,500 fish. NMFS status assessment indicated the risk of extinction in 50 years for Mill Creek was 0.4; the risk of 90% decline in 50 years was 0.17 and 0.15 for Abernathy Creek and Germany Creek, respectively.
	OR	Youngs Bay				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
			1.6		40-75% probability of persistence for 100 years	
Cascade Fall						
	WA	Lower Cowlitz	1.7		40-75% probability of persistence for 100 years	Historic abundance of natural fall chinook escapement was estimated to be over 100,000 fish; recent escapements have been less that 2,000. Currently, hatchery production accounts for most fish returning to the basin. NMFS status assessment indicated a 0.33 risk of 90% decline in 50 years.
	WA	Coweeman	2.2		75-95% probability of persistence for 100 years	Run is considered wild production with minimal hatchery influence. Historic escapement was about 5,000 fall chinook; recent escapements have fluctuated near 500 fish. NMFS status assessment indicated zero risk of 90% decline in 25 years, 90% decline in 50 years, or extinction in 50 years.

WA	Toutle	1.6	40-75% probability of persistence for 100 years	Historic abundance of natural fall chinook escapement was estimated to be over 6,000 fish. Currently, hatchery production accounts for most fish returning to the basin. Fall chinook populations in the basin are recovering from the 1980 Mt. St. Helens eruption.
WA	Upper Cowlitz	1.2	40-75% probability of persistence for 100 years	Historically, the Cispus River was the major area of production for fall chinook salmon, with an annual escapement over 8,000 fish.
WA	Kalama	1.8	40-75% probability of persistence for 100 years	Fall chinook were historically abundant in the Kalama (at least 20,000 fish), however, estimates of wild run size are difficult as hatchery operations began in the basin in 1895. In recent decades, spawning escapement has fluctuated around 5,000 fish; first generation hatchery fish account for most natural spawners. NMFS status assessment indicated a 0.03 risk of extinction in 50 years.
WA	Lewis/Salmon	2.2	75-95% probability of persistence for 100 years	Lewis River fall chinook are a native stock of wild production. Escapement to the NF Lewis represent about 85% of the lower Columbia wild fall chinook natural production; the remaining 15% comes from the EF Lewis and Sandy Rivers. NMFS status assessment of NF Lewis fall chinook indicated a 0.19 risk of 90% decline in 50 years and zero risk of extinction in 50 years. NMFS status assessment of EF Lewis fall chinook indicated a 0.06 risk of 90% decline in 50 years and zero risk of extinction in 50 years.
WA	Washougal	1.7	40-75% probability of persistence for 100 years	In the early 1950s, fall chinook spawner escapement was estimated at 3,000 fish. By the late 1960s, escapement had declined to hundreds of fish. Since 1970, spawner escapement has steadily increased to current levels that fluctuate near 3,000 fish. NMFS status assessment indicated a 0.0 risk of 90% decline or extinction in 50 years. A significant portion of natural spawners are first generation hatchery fish.
OR	Sandy			
OR	Clackamas			
		1.7	40-75% probability of persistence for 100 years	

Gorge Fall					
	WA	Lower Gorge	1.8	40-75% probability of persistence for 100 years	Bonneville upriver bright fall chinook stock was discovered in 1994; stock origin is unknown, but is likely from hatchery strays. The current population remains low but stable.
	WA	Upper Gorge	1.8	40-75% probability of persistence for 100 years	Average return of fall chinook to the Wind River in the 1950s was estimated at 1,500 fish; annual spawner escapement has been less than 250 fall chinook since 1989. NMFS status assessment for the Wind River indicated a 0.74 risk of extinction in 50 years. The current fall chinook run in the Wind is a derivative of Spring Creek NFH stock. Fall chinook were thought to be historically abundant in the Little White Salmon River, based on egg take records at the Little White Salmon NFH starting in 1897. Recent natural escapement estimates are not available but are expected to be low.
	WA	Big White Salmon	1.7	40-75% probability of persistence for 100 years	
	OR	Hood			
			1.8	40-75% probability of persistence for 100 years	
Cascade late fall					
	WA	Lewis NF	3.1	95-99% probability of persistence for 100 years	
	OR	Sandy			
			3.1	95-99% probability of persistence for 100 years	
Cascade spring					
	WA	Upper Cowlitz	1.7	40-75% probability of persistence for 100 years	Escapement estimates in the mid 1900s indicate approximately 10,000 spring chinook spawned above the Mayfield Dam site. The highest recorded spring chinook return to the upper Cowlitz was 20,761 fish in 1965. Current production is maintained from hatchery plants and a trap and haul program. NMFS status assessment for the Cowlitz River indicated a 0.25 risk of 90% decline in 50 years.
	WA	Cispus	1.7	40-75% probability of persistence for 100 years	

	WA	Tilton	0.0	0-40% probability of persistence for 100 years	In the early 1950s, spawning escapement to the Tilton was about 200 spring chinook. Spring chinook have not been observed in the Tilton since that time.
	WA	Toutle	0.7	0-40% probability of persistence for 100 years	Toutle River spring chinook are not considered a separate stock by WDFW. Annual escapement in the early 1950s was estimated at 400 fish and 1990s annual escapement was about 150 fish.
	WA	Kalama	1.2	40-75% probability of persistence for 100 years	Spring chinook were not believed to be historically abundant in the Kalama River; by the 1950s, only a remnant (<100) wild population remained. NMFS status assessment indicated a 0.82 risk of 90% decline in 50 years. Current spawning escapement is primarily first generation hatchery fish.
	WA	Lewis NF	0.2	0-40% probability of persistence for 100 years	Pre-Merwin Dam (1931) escapement of spring chinook was at least 3,000 fish; by the 1950s, only a remnant (<100) population remained. The native component of the run may have been extirpated and replaced with a hybridized hatchery stock, although more research is necessary to confirm this. NMFS status assessment indicated the risk of extinction in 50 years was 0.2. Current spawning escapement is primarily first generation hatchery fish.
	OR	Sandy	0.9	0-40% probability of persistence for 100 years	
Gorge spring					
	WA	Big White Salmon	0.0	0-40% probability of persistence for 100 years	
	OR	Hood	0.0	0-40% probability of persistence for 100 years	

Table 1-4. Steelhead Population Persistence

Population Persistence

Strata	State	Population	Score	Data	Criteria	Comments
Coast winter						
	WA	Grays	1.9		40-75% probability of persistence for 100 years	Historical abundance of Grays winter steelhead was about 2,000 fish (1920s to 1930s). Today, a small bu persistent run exists (estimated 400-600 fish escapement). The annual return is composed primarily of hatchery fish.
	WA	Elochoman/Skamokawa	1.7		40-75% probability of persistence for 100 years	Historic abundance data for Elochoman steelhead are limited; 1960s annual spawning escapement was estimated near 5,200 fish. Recent escapements have been below 400 fish. The annual return is composed primarily of hatchery fish.
	WA	Mill/Abernathy/Gemany	2.2		75-95% probability of persistence for 100 years	Historic steelhead abundance data for these basins are limited, although steelhead runs were expected to be relatively small. Recent escapements have been below 300 fish. The annual return is composed primarily of hatchery fish.
			1.9		40-75% probability of persistence for 100 years	
Cascade winter						
	WA	Lower Cowlitz	1.3		40-75% probability of persistence for 100 years	Winter steelhead were historically abundant throughout the Cowlitz River. Average annual escapement from 1983 to 1995 was 16,240 winter steelhead; the run is composed primarily of first generation hatchery fish.
	WA	Upper Cowlitz	1.6		40-75% probability of persistence for 100 years	Winter steelhead were historically abundant throughout the Cowlitz River. During the 1960s, an average of 11,081 adult steelhead were collected annually at the Mayfield Dam facility. Escapement to the upper basin is composed primarily of first generation hatchery fish transported around the hydro projects.
	WA	Cispus	1.6		40-75% probability of persistence for 100 years	
	WA	Tilton	1.4		40-75% probability of persistence for 100 years	

WA	Coweeman	1.9	40-75% probability of persistence for 100 years	Historic production levels are not known for this stock. Wild winter steelhead escapement in recent years has fluctuated near 200. Most adult winter steelhead returning to the Coweeman are hatchery fish.
WA	N.F. Toutle	2.0	40-75% probability of persistence for 100 years	Historic production levels are not known for this stock. Wild winter steelhead escapement in recent years has fluctuated near 300. Most adult winter steelhead returning to the North Toutle are from natural production. NMFS status assessment indicated that the risk of extinction in 50 years for Green River winter steelhead was 0.73.
WA	S.F. Toutle	2.2	75-95% probability of persistence for 100 years	Historic abundance estimates for this stock are not available. Wild fish escapement in the 1980s was around 2,000; current day escapements have fluctuated near 400 fish. NMFS status assessment indicated a 1.0 risk of 90% decline in 25 and 50 years.
WA	Kalama	3.0	95-99% probability of persistence for 100 years	Historically, winter steelhead were moderately abundant in the Kalama River. Wild winter steelhead escapement has fluctuated around 1,000 fish since the mid 1980s. NMFS status assessment indicated a 0.0 risk of extinction in 50 years.
WA	E.F. Lewis	2.1	75-95% probability of persistence for 100 years	Historic annual wild winter steelhead escapement estimates for the Lewis River ranged from 1,000 to 11,000 fish. East Fork wild winter steelhead redd index escapements from 1991-1996 averaged 76. An estimated 51% of annual spawners are of hatchery origin. NMFS status assessment for the East Fork winter steelhead indicated a 1.0 risk of 90% decline in both 25 and 50 years.
WA	N.F. Lewis	1.8	40-75% probability of persistence for 100 years	Historic annual wild winter steelhead escapement estimates for the Lewis River ranged from 1,000 to 11,000 fish. North Fork wild winter steelhead redd index escapements from 1991-1996 averaged 70. An estimated 93% of annual spawners are of hatchery origin.

	WA	Salmon	1.5	40-75% probability of persistence for 100 years	Historic abundance estimates for this stock are not available. Wild fish escapement in 1989 was around 80; current day escapement data are not available. The annual return is likely composed of mostly hatchery fish.
	WA	Washougal	1.9	40-75% probability of persistence for 100 years	Historic abundance estimates are scarce; 539 steelhead were documented during 1936 escapement surveys. Wild winter steelhead redd index escapement counts since 1991 have averaged 237. Hatchery winter steelhead are thought to account for most of the annual escapement.
	OR	Clackamas			
	OR	Sandy			
			1.8	40-75% probability of persistence for 100 years	
Gorge winter					
	WA	Lower Gorge Tribs	1.9	40-75% probability of persistence for 100 years	Historic and current abundance estimates for Hamilton Creek wild winter steelhead are not available.
	WA	Upper Gorge Tribs	1.9	40-75% probability of persistence for 100 years	Historic run size has been estimated at 2,500 fish (contribution of summer and winter steelhead to this run size is not clear). Wild winter steelhead escapement estimates in recent years are not available. The winter steelhead run is expected to be small and sustained primarily by wild fish.
	OR	Hood			
			1.9	40-75% probability of persistence for 100 years	
Cascade summer					
	WA	Kalama	2.3	75-95% probability of persistence for 100 years	Historically, summer steelhead were moderately abundant in the Kalama River. Run size estimate in the 1950s was about 1,500 fish. Wild summer steelhead escapement has fluctuated around 1,000 fish from the mid 1970s to the mid 1990s; recent year escapements have been below 500 fish. NMFS status assessment indicated a 0.01 risk of extinction in 50 years.

	WA	N.F. Lewis	0.3	0-40% probability of persistence for 100 years	From 1925 to 1933, annual escapement of wild summer steelhead to the Lewis River was estimated at 4,000 fish. In 1984, North Fork Lewis wild summer steelhead escapement was estimated to be less than 50 fish. Recent year escapement estimates of wild summer steelhead are not available; the current return is thought to be primarily hatchery fish.
	WA	E.F. Lewis	2.1	75-95% probability of persistence for 100 years	From 1925 to 1933, annual escapement of wild summer steelhead to the Lewis River was estimated at 4,000 fish. In 1984, East Fork Lewis wild summer steelhead escapement was estimated to be 600 fish. 1990s escapement estimates of wild summer steelhead averaged 851. Wild summer steelhead comprise about 30% of the annual return.
	WA	Washougal	2.0	75-95% probability of persistence for 100 years	From 1925 to 1933, annual escapement of wild summer steelhead to the Washougal River was estimated at 2,500 fish. 539 steelhead were documented during 1936 escapement surveys; most of these were expected to be summer steelhead. Recent wild winter steelhead redd index escapement counts have fluctuated near 100. Hatchery winter steelhead are thought to account for most of the annual escapement. NMFS status assessment estimated a 1.0 risk of 90% decline in 50 years.
			1.7	40-75% probability of persistence for 100 years	
Gorge summer					
	WA	Wind	2.8	75-95% probability of persistence for 100 years	Historic run size has been estimated at 2,500 fish (contribution of summer and winter steelhead to this run size is not clear). Recent snorkel index escapement counts of wild summer steelhead have been below 100 fish. The summer steelhead run is expected to be small and sustained primarily by wild fish. The NMFS status assessment estimated a 0.0 risk of extinction in 50 years.
	OR	Hood			
			2.8		

1.2 Adult Abundance and Productivity

Table 1-5. Adult Abundance and Productivity Score Despriptions

Category	Description	Application
0	Numbers & productivity consistent with either functional extinction or very high risk of extinction	Risk analysis (PCC) estimates 0-40% persistence probability.
1	Numbers & productivity consistent with relatively high risk of extinction	Risk analysis (PCC) estimates 40-75% persistence probability.
2	Numbers & productivity consistent with moderate risk of extinction	Risk analysis (PCC) estimates 75-95% persistence probability.
3	Numbers and productivity consistent with low (negligible) risk of extinction	Risk analysis (PCC) estimates 95-99% persistence probability.
4	Numbers & productivity consistent with very low risk of extinction	Risk analysis (PCC) estimates >99% persistence probability.

Table 1-6. Chum Adult Abundance and Productivity

Adult Abundance and Productivity

Strata	State	Population	Score	Data	Criteria	Comments
Coast	WA	Grays/Chinook	2	2.5	Risk analysis (PCC) estimates 75-95% persistence probability.	Since 1987, peak counts of live and dead fish have been performed in the mainstem, West Fork, Crazy Johnson Creek, and Gorley Creek. The recent average (1987-2000) peak count for the basin was 1,078 chum. Peak counts represent 80% of total return under optimal conditions. Survey results indicate a small, but stable population. NMFS status assessment indicates 0.38 risk of 90% decline in 50 years.
	WA	Elochoman/Skamokawa	1	2.5	Risk analysis (PCC) estimates 40-75% persistence probability.	Annual spawning surveys are not conducted in the basin; adult adundance and production is expected to be low.
	WA	Mill/Abernathy/Germany	0.5	2.5	Risk analysis (PCC) estimates 0-40% persistence probability.	Annual spawning surveys are not conducted in the basin; adult adundance and production is expected to be extremely low.
	OR	Youngs				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
Cascade						
	WA	Cowlitz Chum	0.5	2.5	Risk analysis (PCC) estimates 0-40% persistence probability.	Annual spawning surveys are not conducted in the basin. Typically, less than 20 adults are collected annually at the Cowlitz Salmon Hatchery. Production is expected to be extremely low.
	WA	Kalama Chum	0.5	2.5	Risk analysis (PCC) estimates 0-40% persistence probability.	Annual spawning surveys are not conducted in the basin; adult adundance and production is expected to be extremely low.

	WA	Lewis Chum	0.5	2.5	Risk analysis (PCC) estimates 0-40% persistence probability.	Annual spawning surveys are not conducted in the basin; chum are occasionally observed during fall chinook surveys. 3-4 adult chum are collected annually at the Merwin fish trap. Historically, the most dense spawning aggregation was observed in the lower East Fork (up to rm 6). 4 adult carcasses found in Cedar Creek in 1998. Production is expected to be extremely low.
	WA	Salmon Chum	0	1	Risk analysis (PCC) estimates 0-40% persistence probability.	Chum salmon not known to utilize Salmon Creek; historic chum run likely extirpated.
	WA	Washougal Chum	1.5	2.5	Risk analysis (PCC) estimates 40-75% persistence probability.	Annual spawning surveys are not conducted in the basin; adult adundance and production is expected to be low. In 1998, one chum was found in the mainstem Washougal during spawning surveys. In 2000 non-index surveys, one chum was observed in Lacamas Creek (lower tributary at rm 0.8).
	OR	Clackamas				
	OR	Sandy				
Gorge						
	WA	Lower Gorge	3	3	Risk analysis (PCC) estimates 95-99% persistence probability.	Peak live and dead fish/mile index escapement counts for Bonneville chum ranged from 20 to 849 from 1986-2001. After Grays River, these tributaries support the most productive wild chum salmon population in the lower Columbia.
	WA	Upper Gorge	1	4	Risk analysis (PCC) estimates 40-75% persistence probability.	From 1938-1954, Bonneville Dam chum counts ranged from 788-3,636. Since 1971, chum counts at Bonneville Dam have ranged from 1 to 147; subsequent migration to the Wind or Little White Salmon has not been documented. Chum runs to these basins are believed to be extirpated.

Table 1-7. Chinook Adult Abundance and Productivity

Adult Abundance and Productivity

Strata	State	Population	Score	Data	Criteria	Comments
Coast Fall						
		Grays	0.5		Risk analysis (PCC) estimates 0-40% persistence probability.	Spawning escapement from 1964-2001 ranged from 4 to 2,685 (average 523). Natural escapement was over 1,000 chinook in the late 1980s, but has been below 400 since 1990. The 1987-2000 average escapement was 310 adults. Evidence suggests few natural fall chinook juveniles are produced annually.
		Elochoman	1		Risk analysis (PCC) estimates 40-75% persistence probability.	Spawning escapement in the Elochoman River from 1964-2001 ranged from 53 to 2,392 (average 624). The 1987-2000 average escapement was 636 adults. Spawning escapement in Skamokawa Creek from 1964-2001 ranged from 25 to 5,596 (average 1,056). Skamokawa fall chinook escapement has been below 1,000 fish since 1990. Natural escapement is dominated by hatchery strays and fall chinook juvenile production is presumed to be low.
		Mill/Abernathy/Germany	1		Risk analysis (PCC) estimates 40-75% persistence probability.	Mill Creek spawning escapement during 1984-2001 ranged from 2 to 1,867 (average 316). Abernathy Creek spawning escapement during 1981-2001 ranged from 200 to 3,807 (average 1,094). Germany Creek spawning escapement during 1981-2001 ranged from 15 to 2,158 (average 340). Natural escapement was assumed to be dominated by hatchery strays and fall chinook juvenile production was presumed to be low, however, the 2001 fall chinook escapement to Germany and Abernathy Creeks was each over 1,500 fish and the hatchery program was discontinued in 1995.
		Youngs Bay				
		Big Creek				
		Clatskanie				
		Scappoose				
Cascade Fall						
	WA	Lower Cowlitz	1		Risk analysis (PCC) estimates 40-75% persistence probability.	Cowlitz River spawning escapement from 1964-2001 ranged from 1,045 to 23,345 (average 5,522); however, annual escapement since the early 1990s has been about 2,500 fish. Natural escapement is dominated by hatchery strays and fall chinook juvenile production is presumed to be low.

WA	Coweeman	2	Risk analysis (PCC) estimates 75-95% persistence probability.	Historic escapement was about 5,000 fall chinook. Spawning escapement from 1964-2001 ranged from 40 to 2,148 (average 302). The run is sustained completely by natural production.
WA	Toutle	1.5	Risk analysis (PCC) estimates 40-75% persistence probability.	Historic abundance of natural fall chinook escapement was estimated to be over 6,000 fish. From 1964-1979, average annual escapement to the Toutle basin was 10,756 fall chinook. South Fork Toutle spawning escapement from 1964-2001 ranged from 0 to 578 (average 177). Green River spawning escapement from 1964-2001 ranged from 10 to 6,654 (average 1,900). Currently, hatchery production accounts for most fish returning to the basin, as chinook continue to re-establish a population after the 1980 Mt. St. Helens eruption.
WA	Upper Cowlitz	0	Risk analysis (PCC) estimates 0-40% persistence probability.	Reliable current natural spawner escapement estimates are not available for the upper Cowlitz, although the only fall chinook found in the upper basin are those collected at Mayfield Dam and passed upstream of Cowlitz Falls Dam. Two different adult production models have estimated the upper Cowlitz production potential at 63,818 and 93,015 adults, respectively.
WA	Kalama	1	Risk analysis (PCC) estimates 40-75% persistence probability.	Spawning escapement in the mid 1900s was estimated at 20,000 fall chinook. From 1964-2001, spawning escapement ranged from 1,055 to 24,297 (average 5,514). Spawning escapement is sustained primarily by first generation hatchery fish.
WA	Lewis/Salmon	2	Risk analysis (PCC) estimates 75-95% persistence probability.	Spawning escapement in the 1950s was estimated at 5,000 and 4,000 fall chinook for the NF and EF Lewis respectively. From 1964-2001, NF Lewis spawning escapement ranged from 3,184 to 21,726 (average 11,232). From 1986-2001, EF Lewis spawning escapement ranged from 52 to 591 (average 279). Natural spawning escapement is sustained primarily by wild fish, with little hatchery influence.
WA	Washougal	1	Risk analysis (PCC) estimates 40-75% persistence probability.	In the early 1950s, fall chinook spawner escapement was estimated at 3,000 fish. By the late 1960s, escapement had declined to hundreds of fish. Spawning escapement from 1964-2001 ranged from 70 to 4,669 (average 2,000). Since 1970, spawner escapement has steadily increased to current levels that fluctuate near 3,000 fish. Spawning escapement is sustained primarily by first generation hatchery fish.
OR	Sandy			

	OR	Clackamas			
Gorge Fall					
	WA	Lower Gorge	1	Risk analysis (PCC) estimates 40-75% persistence probability.	Hamilton Creek spawning escapement from 1995-2001 ranged from 47 to 300 (average 144). Bonneville area spawning escapement from 1995-2001 ranged from 477 to 5,151 (average 2,143).
	WA	Upper Gorge	1.5	Risk analysis (PCC) estimates 40-75% persistence probability.	Average return of fall chinook to the Wind River in the 1950s was estimated at 1,500 fish. Spawner escapement from 1964-2001 ranged from 0 to 1,845 (average 416). Since the late 1970s, fall chinook natural escapement in the Wind River has been a result of natural production or strays from other basins; the run is thought to be a derivative of Spring Creek NFH stock. Natural escapement estimates are not available for Little White Salmon fall chinook, although natural production is expected to be low.
	WA	Big White Salmon	1.5	Risk analysis (PCC) estimates 40-75% persistence probability.	
	OR	Hood			
Cascade late falls					
	WA	Lewis NF	3	Risk analysis (PCC) estimates 95-99% persistence probability.	
	OR	Sandy			
Cascade spring					
	WA	Upper Cowlitz	0.5	Risk analysis (PCC) estimates 0-40% persistence probability.	The highest recorded spring chinook return to the upper Cowlitz was 20,761 fish in 1965. From 1962-1966, an average of 9,928 spring chinook were counted annually at Mayfield Dam. From 1978-1985 (excluding 1984), an average of 3,894 spring chinook were counted annually at Mayfield Dam. Current production in the upper basin is maintained from juvenile hatchery plants and an adult trap and haul program.
	WA	Cispus	0.5	Risk analysis (PCC) estimates 0-40% persistence probability.	

	WA	Tilton	0	Risk analysis (PCC) estimates 0-40% persistence probability.	Spawning escapement has not been observed in the Tilton River since the early 1950s; natural production in the basin is expected to be non-existent.
	WA	Toutle	0	Risk analysis (PCC) estimates 0-40% persistence probability.	Annual escapement in the early 1950s was estimated at 400 fish and 1990s annual escapement was about 150 fish. Natural production is presumed to be low; most fish are harvested in the sport fishery.
	WA	Kalama	0.5	Risk analysis (PCC) estimates 0-40% persistence probability.	Spring chinook were not believed to be historically abundant in the Kalama River; by the 1950s, only a remnant (<100) wild population remained. Spawning escapement from 1980-2001 ranged from 0 to 2,892 (average 444); spawning escapement is primarily first generation hatchery fish.
	WA	Lewis NF	0.5	Risk analysis (PCC) estimates 0-40% persistence probability.	Pre-Merwin Dam (1931) escapement of spring chinook was at least 3,000 fish; by the 1950s, only a remnant (<100) population remained. Spawning escapement from 1980-2001 ranged from 213 to 6,939, but generally fluctuated near 1,000 fish. Current spawning escapement is primarily first generation hatchery fish.
	OR	Sandy			
Gorge spring					
	WA	Big White Salmon	0	Risk analysis (PCC) estimates 0-40% persistence probability.	
	OR	Hood			

Table 1-8. Steelhead Adult Abundance and Productivity

Adult Abundance and Productivity

Strata	State	Population	Score	Data	Criteria	Comments
Coast winter						
	WA	Grays	1.5		Risk analysis (PCC) estimates 40-75% persistence probability.	Historical abundance of Grays winter steelhead was about 2,000 fish (1920s to 1930s). Escapement counts from 1991 to 2000 ranged from 158 to 1,224 (average 658). Natural production is expected to be low.
	WA	Elochoman/Skamokawa	1		Risk analysis (PCC) estimates 40-75% persistence probability.	Annual spawning escapement from 1963 to 1967 was estimated at 5,200 fish. Recent escapement counts for the Elochoman from 1991 to 2001 have ranged from 52 to 402 (average 197). Recent escapement counts for the Skamokawa from 1991 to 2001 have ranged from 92 to 304 (average 202). Natural production is expected to be low.
	WA	Mill/Abernathy/Gemany	1.5		Risk analysis (PCC) estimates 40-75% persistence probability.	Recent escapement counts for Abernathy Creek from 1991 to 2001 have ranged from 16 to 280 (average 130). Recent escapement counts for Germany Creek from 1993 to 2001 have ranged from 40 to 252 (average 119). Natural production is expected to be low.
Cascade winter						
	WA	Lower Cowlitz	1		Risk analysis (PCC) estimates 40-75% persistence probability.	Winter steelhead were historically abundant throughout the Cowlitz River. Wild winter steelhead average run size during the late 1970s and 1980s was estimated at 309 fish. Annual escapement from 1983 to 1995 ranged from 4,067 to 30,200 (average 16,240); this production was primarily hatchery returns. Wild steelhead production is likely minimal, however, key production areas still exist in the lower river tributaries.
	WA	Upper Cowlitz	1		Risk analysis (PCC) estimates 40-75% persistence probability.	Winter steelhead were historically abundant throughout the Cowlitz River. From 1961 to 1965, adult steelhead collected annually at the Mayfield Dam facility ranged from 8,821 to 13,155 (average 11,081). Current escapement to the upper basin is composed primarily of first generation hatchery fish transported around the hydro projects (274 in 2000-01). Spawning has been observed in the mainstem Cowlitz and Cispus Rivers; juvenile steelhead/rainbow trout have been found in many tributaries.

WA	Cispus	1		Risk analysis (PCC) estimates 40-75% persistence probability.	
WA	Tilton	0.5		Risk analysis (PCC) estimates 0-40% persistence probability.	
WA	Coweeman	1.5		Risk analysis (PCC) estimates 40-75% persistence probability.	Total escapement counts of wild winter steelhead from 1987-2001 have ranged from 44 to 1,008 (average 393). Hatchery returns from 1986-1990 ranged from 1,795 to 2,427. Hatchery fish contribute little to natural production; wild fish production is expected to be low.
WA	N.F. Toutle	2		Risk analysis (PCC) estimates 75-95% persistence probability.	Total escapement counts of wild winter steelhead in the North Toutle River from 1989-2001 have ranged from 18 to 322 (average 157). Total escapement counts of wild winter steelhead in the Green River from 1985-2001 have ranged from 44 to 775 (average 193). Hatchery releases have not occurred in recent years; escapement is expected to be completely from natural production.
WA	S.F. Toutle	2		Risk analysis (PCC) estimates 75-95% persistence probability.	Total escapement counts of wild winter steelhead in the South Toutle River from 1981-2001 have ranged from 51 to 2,222 (average 857). Hatchery releases have been minimal; escapement is expected to be completely from natural production.
WA	Kalama	3	3.5	Risk analysis (PCC) estimates 95-99% persistence probability.	Total escapement counts of wild winter steelhead in the Kalama River from 1977-2001 have ranged from 371 to 2,322. Annual escapement is expected to be a mixture of natural and hatchery production. From 1991-1996, annual winter steelhead escapement was estimated to be 31% hatchery spawners.
WA	E.F. Lewis	1.5		Risk analysis (PCC) estimates 40-75% persistence probability.	Redd index escapement counts from 1986-2001 ranged from 53 to 282 (average 157); a new index was instituted in 1997 and the relationship to the previous index is unknown. Annual escapement is expected to be a mixture of natural and hatchery production. From 1991-1996, annual winter steelhead escapement was estimated to be 51% hatchery spawners.
WA	N.F. Lewis	1.5		Risk analysis (PCC) estimates 40-75% persistence probability.	Redd index escapement counts from 1991-1996 averaged 70. Annual escapement is expected to be primarily hatchery production. From 1991-1996, annual winter steelhead escapement was estimated to be 93% hatchery spawners.

	WA	Salmon	1		Risk analysis (PCC) estimates 40-75% persistence probability.	Wild fish escapement in 1989 was around 80; current day escapement data are not available. Natural production is expected to be low; the annual return is likely composed of mostly hatchery fish.
	WA	Washougal	1.5		Risk analysis (PCC) estimates 40-75% persistence probability.	Wild winter steelhead redd index escapement counts from 1991-2001 ranged from 92 to 839 (average 237). Natural production is expected to be low; hatchery fish comprise most of the annual escapement.
	OR	Clackamas				
	OR	Sandy				
Gorge winter						
	WA	Lower Gorge Tribs	1.5		Risk analysis (PCC) estimates 40-75% persistence probability.	Historic and current abundance estimates for Hamilton Creek wild winter steelhead are not available. Natural production is expected to be low.
	WA	Upper Gorge Tribs	1.5		Risk analysis (PCC) estimates 40-75% persistence probability.	Wild steelhead escapement to Trout Creek was estimated at 100 in the 1980s and only 30 in the 1990s. Wild winter steelhead escapement estimates in recent years are not available. The winter steelhead run is expected to be small and sustained primarily by wild fish.
	OR	Hood				
Cascade summer						
	WA	Kalama	1.5	3.5	Risk analysis (PCC) estimates 40-75% persistence probability.	Total escapement counts of wild summer steelhead in the Kalama River from 1977-2001 have ranged from 140 to 2,926. Annual escapement is expected to be a mixture of natural and hatchery production. From 1991-1996, annual winter steelhead escapement was estimated to be 64% hatchery spawners.
	WA	N.F. Lewis	0	4	Risk analysis (PCC) estimates 0-40% persistence probability.	Recent year escapement estimates of wild summer steelhead are not available; the current return is thought to be primarily hatchery fish. Hatchery rack counts of summer steelhead from 1996-2002 at the Lewis River Hatchery have ranged between 500 and 2,000 and at the Merwin Hatchery have ranged between 500 and 1,000.

	WA	E.F. Lewis	1.5	2.5	Risk analysis (PCC) estimates 40-75% persistence probability.	In 1984, East Fork Lewis wild summer steelhead escapement was estimated to be 600 fish. Escapement estimates of East Fork wild summer steelhead from 1991-1996 averaged 851. Snorkel index escapements counts from 1996-2001 fluctuated around 80. Wild summer steelhead comprise about 30% of the annual return. Natural production is expected to be moderate.
	WA	Washougal	1.5	2.5	Risk analysis (PCC) estimates 40-75% persistence probability.	Wild summer steelhead snorkel index escapement counts from 1953-2001 ranged from about 30 to 450. The 1991-1996 average annual wild steelhead escapement in the mainstem Washougal was estimated at 571. Natural production is expected to be moderate. Hatchery fish comprise the majority of the spawning escapement.
Gorge summer						
	WA	Wind	2	3	Risk analysis (PCC) estimates 75-95% persistence probability.	Wild steelhead escapement to Trout Creek was estimated at 100 in the 1980s and only 30 in the 1990s. Snorkel index escapement counts in the Wind River from 1989-2000 have steadily decreased from 274 to 26 adults. The summer steelhead run is expected to be small and sustained primarily by wild fish.
	OR	Hood				

1.3 Juvenile Outmigrants

Table 1-9. Juvenile Outmigrants Score Description

Categor y	Description	Application
0	Declining with high confidence in slope or extrapolated from other data sources	Includes cases where no data available
1	Stable, extrapolated from other data sources	Includes case where limited sample data indicate natural production occurs but data are insufficient to identify a trend
2	Stable or increasing, low confidence in trend or extrapolated from other data sources	Includes case where extended data time series is available but trend fit is poor
3	Stable or increasing, medium confidence in trend	Requires extended data time series
4	Stable or increasing, high confidence in trend	Requires extended data time series

Table 1-10. Chum Juvenile Out-migrants

Juvenile Out-migrants

Strata	State	Population	Score	Data	Criteria	Comments
Coast						
	WA	Grays/Chinook	2	1	Includes case where extended data time series is available but trend fit is poor	Survey results since 1999 indicate slowly increasing productivity; time series not sufficient to establish trend.
	WA	Elochoman/Skamokawa	0	1	Includes cases where no data available	No basin-specific data is available; natural production of juveniles expected to be minimal.
	WA	Mill/Abernathy/Germany	0	1	Includes cases where no data available	Natural production of juveniles expected to be minimal. 7 chum juveniles captured during seining operations in Abernathy Creek in 1995.
	OR	Youngs				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
Cascade						
	WA	Cowlitz Chum	0	1	Includes cases where no data available	No basin-specific data is available; natural production of juveniles expected to be minimal.
	WA	Kalama Chum	0	1	Includes cases where no data available	No basin-specific data is available; natural production of juveniles expected to be minimal.
	WA	Lewis Chum	0	1	Includes cases where no data available	Natural production of juveniles is expected to be minimal. In 1998, 45 juvenile chum salmon were captured during seining operations related to a hatchery smolt residualization study.
	WA	Salmon Chum	0	1	Includes cases where no data available	No basin-specific data is available; natural production of juveniles expected to be non-existent.
	WA	Washougal Chum	0	1	Includes cases where no data available	No basin-specific data is available; natural production of juveniles expected to be minimal.
	OR	Clackamas				
	OR	Sandy				
Gorge						
	WA	Lower Gorge	2	3	Includes case where extended data time series is available but trend fit is poor	Limited basin-specific data is available, but juvenile porduction is expected to be stable.
	WA	Upper Gorge	0	1	Includes cases where no data available	No basin-specific data is available; natural production of juveniles expected to be non-existent.

Table 1-11 Chinook Juvenile Out-migrants

Juvenile Out-migrants

Strata	State	Population	Score	Data	Criteria	Comments
Coast Fall						
	WA	Grays	0		Includes cases where no data available	No basin-specific juvenile data are available; natural juvenile production is expected to be low.
	WA	Elochoman	0		Includes cases where no data available	No basin-specific juvenile data are available; natural juvenile production is expected to be low.
	WA	Mill/Abernathy/Germany	1		Includes case where limited sample data indicate natural production occurs but data are insufficient to identify a trend	Natural juvenile production has been assumed to be low. In 1995, 910 fall chinook juveniles were captured in 10 seining trips to Abernathy Creek. Recent spawner escapement suggests that substantial natural production is occurring in Germany and Abernathy Creeks, or hatchery strays from other basins are utilizing these creeks.
	OR	Youngs Bay				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
Cascade Fall						
	WA	Lower Cowlitz	0		Includes cases where no data available	No basin-specific juvenile data are available. A smolt density model predicted the natural production potential for the Cowlitz River below Mayfield Dam of 2,183,000 smolts. Natural juvenile production is presumed to be low.
	WA	Coweeman	0		Includes cases where no data available	No basin-specific juvenile data are available. A smolt density model predicted the natural production potential for the Coweeman River of 602,000 smolts.
	WA	Toutle	0		Includes cases where no data available	No basin-specific juvenile data are available. A smolt density model predicted the natural production potential for the Toutle River of 2,799,000 smolts. Current natural juvenile production is presumed to be low.

WA	Upper Cowlitz	1	Includes case where limited sample data indicate natural production occurs but data are insufficient to identify a trend	No basin-specific juvenile data are available, although naturally produced smolts, as well as hatchery smolts released in the upper basin, are collected at the Cowlitz Falls Dam and released to stress relief ponds at the Cowlitz Salmon Hatchery. A smolt density model predicted the natural production potential for the Cowlitz River above Cowlitz Falls of 4,058,000 smolts and 357,000 smolts for the Tilton River. Natural juvenile production is presumed to be low.
WA	Kalama	0	Includes cases where no data available	A natural spawning escapement of 24,549 fall chinook in 1988 produced an estimated 522,312 to 964,439 juveniles in 1989 (estimated 43 to 79 juveniles produced per female). A smolt density model predicted natural production potential of 162,000 fingerlings above Kalama Falls and 428,670 fingerlings below Kalama Falls.
WA	Lewis/Salmon	0	Includes cases where no data available	Estimates of annual natural juvenile fall chinook emigration from the Lewis River during 1977-1979 and 1982-1987 ranged from 1,540,000 to 4,650,000 (average 2,786,667). Substantial natural juvenile production occurs today as the Lewis River fall chinook run is maintained by natural production.
WA	Washougal	0	Includes cases where no data available	A moderate amount of natural juvenile production is expected to occur. In 1980, WDFW estimated that 5,000,000 fall chinook juveniles emigrated from the Washougal basin.
OR	Sandy			
OR	Clackamas			
Gorge Fall				
WA	Lower Gorge	1	Includes case where limited sample data indicate natural production occurs but data are insufficient to identify a trend	Productivity data are limited, but seining operations have shown consistent juvenile production from late spawning fall chinook in the mainstem Columbia near Bonneville.
WA	Upper Gorge	1	Includes case where limited sample data indicate natural production occurs but data are insufficient to identify a trend	Naturally produced fall chinook juveniles are captured each year in the lower Wind River smolt trap, indicating some natural production is occurring. A smolt density model predicted natural smolt production potential of 206,608 fall chinook in the Wind and 73,652 fall chinook fingerlings in the Little White Salmon.

	WA	Big White Salmon	1	Includes case where limited sample data indicate natural production occurs but data are insufficient to identify a trend	
	OR	Hood			
Cascade late falls					
		Lewis NF	3	Requires extended data time series	Estimates of annual natural juvenile fall chinook emigration from the Lewis River during 1977-1979 and 1982-1987 ranged from 1,540,000 to 4,650,000 (average 2,786,667). Substantial natural juvenile production occurs today as the Lewis River fall chinook run is maintained by natural production.
		Sandy			
Cascade spring					
		Upper Cowlitz	3	Requires extended data time series	Records of natural production from juvenile trap and haul at Cowlitz Falls Project? A smolt density model predicted natural smolt production potential of 1,600,000 spring chinook in the Cowlitz above Mayfield Dam.
		Cispus	3	Requires extended data time series	
		Tilton	0	Includes cases where no data available	No basin-specific juvenile data are available; natural juvenile production is expected to be absent.
		Toutle	0	Includes cases where no data available	A smolt density model predicted natural smolt production potential of 788,400 spring chinook in the Toutle River.
		Kalama	0	Includes cases where no data available	No basin-specific juvenile data are available; natural juvenile production is expected to be low. A smolt density model predicted natural smolt production potential of 111,192 spring chinook smolts below Kalama Falls and 465,160 smolts above Kalama Falls.
		Lewis NF	0	Includes cases where no data available	No basin-specific juvenile data are available; natural juvenile production is expected to be low.
		Sandy			
Gorge spring					
		Big White Salmon	0	Includes cases where no data available	
		Hood			

Table 1-12. Steelhead Juvenile Out-migrants

Juvenile Out-migrants

Strata	State	Population	Score	Data	Criteria	Comments
Coast winter						
	WA	Grays	0		Includes cases where no data available	Basin-specific data are not available. A smolt density model predicted that the Grays could produce 45,300 winter steelhead smolts.
	WA	Elochoman/Skamokawa	0		Includes cases where no data available	A juvenile trap on Beaver Creek began operation in 1961; juvenile outmigration peaks in April and May. Annual trap counts have not been located; natural juvenile production in the basin is expected to be low.
	WA	Mill/Abernathy/Gemany	2		Includes case where extended data time series is available but trend fit is poor	Basin-specific data are not available; natural juvenile production in the basin is expected to be low.
Cascade winter						
	WA	Lower Cowlitz	0		Includes cases where no data available	Basin-specific data are not available; natural juvenile production in the basin is expected to be low. A smolt density model predicted potential production in the Cowlitz of 63,399 winter steelhead smolts.
	WA	Upper Cowlitz	2		Includes case where extended data time series is available but trend fit is poor	Moderate juvenile production has occurred from adult winter steelhead released in the upper Cowlitz. Juveniles have been collected at the Cowlitz Falls Project since 1996 and transported below the barrier dam.
	WA	Cispus	2		Includes case where extended data time series is available but trend fit is poor	
	WA	Tilton	2		Includes case where extended data time series is available but trend fit is poor	
	WA	Coweeman	0		Includes cases where no data available	Basin-specific data are not available; natural juvenile production in the basin is expected to be low. A smolt density model predicted potential production in the Coweeman of 38,229 winter steelhead smolts.

	WA	N.F. Toutle	0	0	Includes cases where no data available	Basin-specific data are not available; natural juvenile production in the basin is expected to be moderate. A smolt density model predicted potential production in the Toutle of 135,573 winter steelhead smolts.
	WA	S.F. Toutle	0	0	Includes cases where no data available	Basin-specific data are not available; natural juvenile production in the basin is expected to be moderate. A smolt density model predicted potential production in the Toutle of 135,573 winter steelhead smolts.
	WA	Kalama	2	3	Includes case where extended data time series is available but trend fit is poor	WDFW has estimated potential summer and winter steelhead smolt production in the Kalama at 34,850. The number of naturally-produced steelhead smolts migrating annually from the Kalama during 1978-1984 ranged from 11,175 to 46,659.
	WA	E.F. Lewis	1		Includes case where limited sample data indicate natural production occurs but data are insufficient to identify a trend	Basin-specific data are not available; natural juvenile production in the basin is expected to be moderate.
	WA	N.F. Lewis	2		Includes case where extended data time series is available but trend fit is poor	Basin-specific data are not available; natural juvenile production in the basin is expected to be low.
	WA	Salmon	0		Includes cases where no data available	Basin-specific data are not available; natural juvenile production in the basin is expected to be low.
	WA	Washougal	0		Includes cases where no data available	Basin-specific data are not available; natural juvenile production in the basin is expected to be low.
	OR	Clackamas				
	OR	Sandy				
Gorge winter						
	WA	Lower Gorge Tribs	0		Includes cases where no data available	Basin-specific data are not available; natural juvenile production in the basin is expected to be low.
	WA	Upper Gorge Tribs	2		Includes case where extended data time series is available but trend fit is poor	Wild steelhead smolt yield from 1995 to 1999 showed increasing production with a low of about 8,000 smolts in 1995 to a high of about 24,000 smolts in 1998 (contribution of winter and summer steelhead in these estimates is not known).
	OR	Hood				
Cascade summer						

	WA	Kalama	2	3	Includes case where extended data time series is available but trend fit is poor	WDFW has estimated potential summer and winter steelhead smolt production in the Kalama at 34,850. The number of naturally-produced steelhead smolts migrating annually from the Kalama during 1978-1984 ranged from 11,175 to 46,659.
	WA	N.F. Lewis	0	1	Includes cases where no data available	Basin-specific data are not available; natural juvenile production in the basin is expected to be low.
	WA	E.F. Lewis	1	1	Includes case where limited sample data indicate natural production occurs but data are insufficient to identify a trend	Basin-specific data are not available; natural juvenile production in the basin is expected to be moderate.
	WA	Washougal	0	0	Includes cases where no data available	Basin-specific data are not available; natural juvenile production in the basin is expected to be moderate.
Gorge summer						
	WA	Wind	2.5	3.5	Includes case where extended data time series is available but trend fit is poor	Wild steelhead smolt yield from 1995 to 1999 showed increasing production with a low of about 8,000 smolts in 1995 to a high of about 24,000 smolts in 1998 (contribution of winter and summer steelhead in these estimates is not known). A smolt density model predicted potential summer steelhead smolt production in the Wind basin at 62,273.
	OR	Hood				

1.4 Within-Population Spatial Structure

Table 1-13. Within-Population Spatial Structure Score Description

Category	Description	Application[1]
0	Spatial structure is inadequate in quantity, quality[2], and connectivity to support a population at all.	Quantity was based on whether all areas that were historically used remain accessible. Connectivity based on whether all accessible areas of historic use remain in use. Catastrophic risk based on whether key use areas are dispersed among multiple reaches or tributaries. Spatial scores of 0 were typically assigned to populations that were functionally extirpated by passage blockages.
1	Spatial structure is adequate in quantity, quality[2], and connectivity to support a population far below viable size	The majority of the historic range is no longer accessible and fish are currently concentrated in a small portion of the accessible area.
2	Spatial structure is adequate in quantity, quality[2], and connectivity to support a population of moderate but less than viable size.	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.
3	Spatial structure is adequate in quantity, quality[2], and connectivity to support population of viable size, but subcriteria for dynamics and/or catastrophic risk are not met	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.
4	Spatial structure is adequate in quantity, quality, connectivity, dynamics, and catastrophic risk to support viable population.	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.

Table 1-14. Chum Within-Population Spatial Structure

Within-Population Spatial Structure

Strata	State	Population	Score	Data	Criteria	Comments
Coast						
	WA	Grays/Chinook	2	3	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	Spawning is concentrated in mainstem Grays River from rm 9.5-13.0, the lower 1.4 miles of the West Fork, the lower 0.5 miles of Crazy Johnson Creek, and Gorley Creek. Substantial tributary spawning occurs in years of higher flow. Lack of stable spawning habitat is considered the primary physical limitation on chum production.
	WA	Elochoman/Skamokawa	3	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Chum have access to all historical habitat; however, current spawning activity is concentrated to the lower reaches of the basin above tidal influence.
	WA	Mill/Abernathy/Germany	3	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Chum have access to all historical habitat; however, current spawning activity is concentrated in the lower 0.4 miles of Abernathy Creek and the lower reaches of other creeks above tidal influence.
	OR	Youngs				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
Cascade						

WA	Cowlitz Chum	3	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Historically, chum were thought to primarily utilize the lower Cowlitz and its tributaries below the Mayfield Dam site, although chum were also observed in the upper basin. Access to the upper watershed was blocked by the construction of Mayfield Dam in 1962. Recent observations identified chum in the headwaters of Lacamas Creek. The remaining few chum salmon are thought to be distributed throughout the lower watershed.
WA	Kalama Chum	3	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Chum have access to all historic habitat. Current chum habitat is limited to the mainstem Kalama between Modrow Bridge (rm 2.4) and lower Kalama Falls (rm 10).
WA	Lewis Chum	3	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Construction of Merwin Dam in 1932 blocked access to most of the productive habitat in the basin, however, the degree to which chum salmon historically utilized the upper basin is not clear. Chum salmon have been observed spawning in the mainstem downstream of Merwin Dam. Today, chum spawning in the East Fork occurs up to rm 10 and available habitat likely extends up to Lucia Falls (rm 21.3).
WA	Salmon Chum	1.5	1	The majority of the historic range is no longer accessible and fish are currently concentrated in a small portion of the accessible area.	Minimal work on chum salmon has been performed leading to a high degree of uncertainty in the population spatial structure. Most of the historic habitat accessible to salmonids is expected to be accessible today, although quality has been degraded.
WA	Washougal Chum	3	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all	Chum have access to all historic habitat. Spawning is believed to occur in the Little Washougal and the lower reaches of the mainstem Washougal.

					historical areas remain accessible and are used but key use areas are not broadly distributed.	
	OR	Clackamas				
	OR	Sandy				
Gorge						
	WA	Lower Gorge	3	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Chum have access to all historic habitat. Spawning occurs in the lower 1.0 mile of Hardy, Hamilton, Duncan, Greenleaf, and Indian Mary Creeks, as well as side channel habitat in the Columbia River near the I-205 Bridge and Ives and Pierce Islands. However, spawning habitat water flow is affected by Bonneville Dam operations; thus, habitat productivity varies annually.
	WA	Upper Gorge	1.5	2	The majority of the historic range is no longer accessible and fish are currently concentrated in a small portion of the accessible area.	Historic chum production occurred in the lower reaches of these basins, below impassable falls. These areas were inundated with the Bonneville Pool (1938) and are not expected to be suitable habitat. Shipherd Falls on the Wind River was laddered in 1956, providing access to the upper watershed.

Table 1-15. Chinook Within-Population Spatial Structure

Within-Population Spatial Structure Strata	State	Population	Score	Data	Criteria	Comments
Coast Fall						
	WA	Grays	4		All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Spawning occurs in the mainstem Grays River from tidewater (rm 8) to above the confluence with the West Fork (rm 14) and also in the lower 1.5 miles of the West Fork from the mouth to the hatchery. Historical habitat in the basin remains accessible today, however, low seasonal water flows have been a chronic problem for natural and hatchery chinook production.
	WA	Elochoman	3		Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Spawning occurs in the mainstem Elochoman River from tidewater (rm 4) to the Elokomin Salmon Hatchery (rm 9.2); the upper portions of this reach are only accessible during favorable water flows. Spawning occurs in Skamokawa Creek from Wilson Creek upstream to Standard and McDonald Creeks (~4.5 miles). Historical habitat in the basin remains accessible today.
	WA	Mill/Abernathy/Germany	4		All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	In Mill Creek, spawning occurs from the Mill Creek Bridge downstream to the mouth (2 miles). In Abernathy Creek, spawning occurs from the Abernathy NFH downstream to the mouth (3 miles). In Germany Creek, spawning occurs in the lower 3.5 miles of the basin. Historical habitat in the basin remains accessible today.
	OR	Youngs Bay				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
Cascade Fall						

WA	Lower Cowlitz	4	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Spawning occurs throughout the mainstem Cowlitz from the Cowlitz Salmon Hatchery downstream to the Kelso Bridge (~45 miles), but is concentrated in the 8-mile stretch between the Cowlitz Salmon and Trout Hatcheries. Historical habitat in the basin remains accessible today.
WA	Coweeman	4	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Spawning occurs primarily in the mainstem from Mulholland Creek (rm 18.4) downstream to the Jeep Club Bridge (~6 miles). Historical habitat in the basin remains accessible today.
WA	Toutle	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Most historic spawning occurred in the lower 5 miles of the mainstem Toutle, although spawning was observed far into the headwaters (Coldwater Creek on the North Fork ~46 miles from the mouth). Most historic spawning areas in the basin were destroyed in the 1980 Mt. St. Helens eruption. In the South Fork Toutle, spawning occurs primarily from the 4700 Bridge to the confluence with the mainstem (~2.6 miles). In the Green River, spawning occurs primarily from the North Toutle Hatchery to the river mouth (~0.5 miles).
WA	Upper Cowlitz	2	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	An estimated 46% of the total Cowlitz fall chinook run historically came from areas above Mayfield Dam; 28% of the spawning grounds were inundated by the Mayfield and Mossyrock Reservoirs. The completion of Mayfield Dam in 1962 blocked access to the upper watershed; all fish were passed over the dam from 1962-1966 and small numbers of fall chinook were hauled to the Tilton and upper Cowlitz from 1967-1980. An adult trap and haul program began in 1994; fall chinook collected at Mayfield Dam have been released in the Tilton, upper Cowlitz, and Cispus Rivers. Collection efficiency and the ability to pass juvenile production through the system varies annually and is affected by flow and operations at the Cowlitz Falls Project.

	WA	Kalama	4	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Historic fall chinook spawning occurred primarily in the mainstem Kalama between lower Kalama Falls (rm 10) and the Modrow Bridge (rm 2.4); this reach remains accessible today. Also, fall chinook surplus to hatchery broodstock needs are passed above the falls and allowed to spawn naturally in the upper river.
	WA	Lewis/Salmon	4	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	NF Lewis fall chinook historically spawned in the mainstem Lewis up to the Yale Dam site. Construction of Merwin Dam in 1931 blocked access to approximately half of the fall chinook spawning habitat in the NF Lewis. In the EF Lewis, fall chinook historically spawned from Lucia Falls (rm 21.3) downstream to below Daybreak Park near rm 6.2; this reach remains accessible today.
	WA	Washougal	4	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	A ladder was constructed at Salmon Falls (rm 14.5) in the late 1950s, providing access to Dougan Falls (rm 21.6). Fall chinook have generally spawned from Salmon Falls downstream about 4 miles; this area remains accessible today.
	OR	Sandy			
	OR	Clackamas			
Gorge Fall					
	WA	Lower Gorge	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Available habitat today is expected to be similar to habitat that existed in 1994 when the population was discovered.

	WA	Upper Gorge	2	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	Historically, fall chinook spawned in the lower 2 miles of the Wind River below Shipherd Falls. The Bonneville Pool inundated the primary fall chinook spawning area in 1938. The falls were laddered in 1956, providing access to the upper basin. Fall chinook have been observed up to the Carson NFH (rm 18), but spawning in the mainstem above Shipherd Falls is limited. Limited fall chinook spawning occurs in the lower river below Shipherd Falls. Historic fall chinook spawning in the Little White Salmon was also concentrated to the lower 2 miles of river below a barrier; this lower reach was also inundated by the Bonneville Pool (1938). Natural spawning in the Little White Salmon River is primarily from hatchery strays.
	WA	Big White Salmon	2	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	
	OR	Hood			
Cascade late falls					
	WA	Lewis NF	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Construction of Merwin Dam in 1931 blocked access to approximately half of the fall chinook spawning habitat in the NF Lewis.
	OR	Sandy			
Cascade spring					

WA	Upper Cowlitz	2	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	In the 1950s, 96% of the spring chinook production in the Cowlitz River was estimated to have occurred above Mayfield Dam; completion if the dam in 1962 blocked access to the upper Cowlitz. All fish were passed over the dam from 1962-1966; from 1974-1980, an annual average of 2,838 spring chinook were hauled to the Tilton and upper Cowlitz. A trap and haul program began at Mayfield in 1994; spring chinook are released in the upper Cowlitz and Cispus.
WA	Cispus	2	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	Historically, spring chinook spawning occurred in the Cispus between Iron and East Canyon Creeks. Access to the Cispus was blocked by the construction of Mayfield Dam in 1962.Returning spring chinook captured at Mayfield Dam have been released in the Cispus since 1994.
WA	Tilton	0	Quantity was based on whether all areas that were historically used remain accessible. Connectivity based on whether all accessible areas of historic use remain in use. Catastrophic risk based on whether key use areas are dispersed among multiple reaches or tributaries. Spatial scores of 0 were typically assigned to populations that were functionally extirpated by passage blockages.	Access to the Tilton was blocked by the construction of Mayfield Dam in 1962. Adults captured at Mayfield were released in the basin in the late 1970s, primarily for the sport fishery. The Tilton is not included in the current Mayfield trap and haul program that began in 1994.
WA	Toutle	4	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Natural spawning in the Toutle is expected to be minimal; little is known about specific spring chinook spawning areas in the Toutle. Most of the quality spawning habitat was destroyed by the 1980 Mt. St. Helens eruption; the system continues to recover through natural processes. Fish access has not been blocked by hydro projects.

	WA	Kalama	4	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Historic spring chinook spawning occurred primarily in the mainstem Kalama between lower Kalama Falls (rm 10) and the Lower Kalama Hatchery (Fallert Creek; rm 4.8); this reach remains accessible today. Also, spring chinook surplus to hatchery broodstock needs are passed above the falls and allowed to spawn naturally in the upper river; spring chinook have been observed up to upper Kalama Falls (rm 36).
	WA	Lewis NF	0	Quantity was based on whether all areas that were historically used remain accessible. Connectivity based on whether all accessible areas of historic use remain in use. Catastrophic risk based on whether key use areas are dispersed among multiple reaches or tributaries. Spatial scores of 0 were typically assigned to populations that were functionally extirpated by passage blockages.	NF Lewis fall chinook historically spawned in the mainstem Lewis upstream of the Merwin Dam site. Construction of Merwin Dam in 1931 blocked access to approximately 80% of the spring chinook spawning habitat in the NF Lewis. Currently, spawning occurs in the mainstem Lewis and tributaries between Merwin Dam and the Lewis River Hatchery (~4 miles); however, spawning is concentrated below Merwin Dam and in Cedar Creek.
	OR	Sandy			
Gorge spring					
	WA	Big White Salmon	0	Quantity was based on whether all areas that were historically used remain accessible. Connectivity based on whether all accessible areas of historic use remain in use. Catastrophic risk based on whether key use areas are dispersed among multiple reaches or tributaries. Spatial scores of 0 were typically assigned to populations that were functionally extirpated by passage blockages.	

	OR	Hood				

Table 1-16. Steelhead Within-Population Spatial Structure

Within-Population Spatial Structure

Strata	State	Population	Score	Data	Criteria	Comments
Coast winter						
	WA	Grays	4		All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Steelhead were historically distributed throughout the Grays basin. Grays River Falls (rm 13) was lowered with explosives in 1957; numerous other natural and man-made barriers above Grays Falls were cleared to improve steelhead access in the 1950s. Currently, steelhead are thought to be distributed throughout the entire basin.
	WA	Elochoman/Skamokawa	4		All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Steelhead are distributed throughout the mainstem Elochoman and Skamokawa, as well as the lower reaches of most tributaries. Areas thought to be historically used by steelhead remain accessible today.
	WA	Mill/Abernathy/Gemany	4		All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Steelhead are distributed throughout the mainstem Mill, Germany, and Abernathy Creeks, as well as many tributaries. Areas thought to be historically used by steelhead remain accessible today.
Cascade winter						
	WA	Lower Cowlitz	2		The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	Historically, the lower Cowlitz provided about 20% of the steelhead production area in the Cowlitz basin. These areas remain accessible today, although minimal steelhead production occurs in just a few key production areas.

WA	Upper Cowlitz	2	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	Historically, the upper Cowlitz provided about 80% of the steelhead production area in the Cowlitz basin. Completion of Mayfield Dam in 1962 blocked access to this production area. A trap and haul program to reintroduce salmonids to the upper basin began in 1994; winter steelhead are released in the upper Cowlitz, Cispus, and Tilton basins. Juveniles have been collected at the Cowlitz Falls Project since 1996 and transported below the barrier dam.
WA	Cispus	2	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	
WA	Tilton	2	The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	
WA	Coweeman	4	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Winter steelhead were historically distributed throughout the Coweeman basin. Historic habitat remains accessible today.
WA	N.F. Toutle	3	Areas may have been blocked or are no long used but fish continue to be broadly distributed among multiple reaches and tributaries. Also includes populations where all historical areas remain accessible and are used but key use areas are not broadly distributed.	Winter steelhead were historically distributed throughout the North Fork Toutle and Green River basins. Historic habitat remains accessible today. In the North Fork, spawning occurs in the mainstem and Alder and Deer Creeks. In the Green, spawning occurs in the mainstem and Devil, Elk, and Shultz Creek.
WA	S.F. Toutle	4	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Winter steelhead were historically distributed throughout the South Fork Toutle. Historic habitat remains accessible today. Spawning occurs in the mainstem and Studebaker, Johnson, and Bear Creeks.

	WA	Kalama	4	3	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Historically, steelhead were confined to below lower Kalama Falls; steelhead could only navigate the falls under certain water conditions. A fishway was constructed at the falls in 1936, providing easier access to the upper watershed. Historic habitat remains accessible today. Spawning occurs in the mainstem and many tributaries, including Gobar, Elk, and Fossil Creeks. Upper Kalama Falls at rm 36.8 blocks all upstream migration.
	WA	E.F. Lewis	4		All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Winter steelhead were historically distributed throughout the basin below Sunset Falls; the falls were lowered in 1982, providing access in the basin up to Lucia Falls (rm 21.3). Thus, more habitat is accessible today than was available historically. About 12% of the annual return currently spawns above Sunset Falls; spawning occurs throughout the mainstem and in many tributaries, including Rock Creek.
	WA	N.F. Lewis	2		The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	Construction of Merwin Dam in 1932 blocked access to about 80% of the North Fork's historical production area. A mill dam on Cedar Creek blocked passage until 1946 when the dam was removed. Current natural production is limited; spawning is concentrated in Cedar Creek.
	WA	Salmon	4		All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Historically, winter steelhead were believed to be distributed throughout Salmon Creek. Historic habitat remains accessible today. Spawning currently occurs throughout Salmon Creek, portions of Lake River, and the lower reaches of Gee, Whipple, and Burntbridge Creek.
	WA	Washougal	4		All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Steelhead were historically distributed throughout the Washougal basin. Historic habitat remains accessible today. Several small dams that impeded/blocked steelhead migration have been removed or bypassed, providing access in the basin up to Dougan Falls (rm 21.6). Spawning is thought to occur throughout the mainstem and in many tributaries, including the West Fork, the Little Washougal, and Stebbins and Cougar Creeks.
	OR	Clackamas				
	OR	Sandy				
Gorge						

winte r						
	WA	Lower Gorge Tribs	4		All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Winter steelhead were historically distributed throughout the lower reaches (~2 miles) of Hamilton Creek. Historic habitat remains accessible today, although spawning usage is not well documented.
	WA	Upper Gorge Tribs	2		The majority of the historic range is accessible but fish are currently concentrated in a small portion of the accessible area.	Winter steelhead were historically distributed throughout the Wind basin; Shipherd Falls (rm 2.1) was expected to be a natural barrier to most salmonids, except for steelhead. The Bonneville Pool inundated spawning and rearing habitat in the lower river below Shipherd Falls. Shipherd Falls was laddered in 1956, providing easier access to the upper watershed. Historic habitat remains accessible today. Numerous drop-offs and waterfalls exist throughout the basin; some have been modified to promote fish passage while others remain and impede migration. Winter steelhead are thought to be distributed through the lower 11 miles of the mainstem and Trout Creek.
	OR	Hood				
Cascade summer						
	WA	Kalama	4	3	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Historically, steelhead were confined to below lower Kalama Falls; steelhead could only navigate the falls under certain water conditions. A fishway was constructed at the falls in 1936, providing easier access to the upper watershed. Historic habitat remains accessible today. Spawning occurs in the mainstem and many tributaries, including the North Fork, Gobar, Elk, Fossil, and Wild Horse Creeks. Upper Kalama Falls at rm 36.8 blocks all upstream migration.
	WA	N.F. Lewis	0	4	Quantity was based on whether all areas that were historically used remain accessible. Connectivity based on whether all accessible areas of historic use remain in use. Catastrophic risk based on whether key use areas are dispersed among multiple	Construction of Merwin Dam in 1932 blocked access to about 80% of the North Fork's historical production area. A mill dam on Cedar Creek blocked passage until 1946 when the dam was removed. Current natural production is limited; spawning is concentrated in Cedar Creek and in the mainstem between rm 7 and rm 20.

					reaches or tributaries. Spatial scores of 0 were typically assigned to populations that were functionally extirpated by passage blockages.	
	WA	E.F. Lewis	4	2.5	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Summer steelhead were historically distributed throughout the basin below Sunset Falls; the falls were lowered in 1982, providing access in the basin up to Lucia Falls (rm 21.3). Thus, more habitat is accessible today than was available historically. About 12% of the annual return currently spawns above Sunset Falls; spawning occurs throughout the mainstem and in many tributaries, including Rock Creek.
	WA	Washougal	4	2.5	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Steelhead were historically distributed throughout the Washougal basin. Historic habitat remains accessible today. Several small dams that impeded/blocked steelhead migration have been removed or bypassed, providing access in the basin up to Dougan Falls (rm 21.6). Spawning is thought to occur throughout the mainstem and in many tributaries, including the West Fork, the Little Washougal, and Stebbins and Cougar Creeks.
Gorge summer						
	WA	Wind	4	2.5	All areas that were historically used remain accessible, all accessible areas remain in use, and key use areas are broadly distributed among multiple reaches or tributaries.	Summer steelhead were historically distributed throughout the Wind basin; Shipherd Falls (rm 2.1) was expected to be a natural barrier to most salmonids, except for steelhead. The Bonneville Pool inundated spawning and rearing habitat in the lower river below Shipherd Falls. Shipherd Falls was laddered in 1956, providing easier access to the upper watershed. Historic habitat remains accessible today. Numerous drop-offs and waterfalls exist throughout the basin; some have been modified to promote fish passage while others remain and impede migration. Summer steelhead are thought to be distributed through the mainstem and numerous tributaries, including the Little Wind River, Panther Creek, Bear Creek, Trout Creek, Trapper Creek, Dry Creek, and Paradise Creek.

	OR	Hood

1.5 Within Population Diversity

Table 1-17. Within-Population Diversity Score Description

Category	Description	Application[1]
0	All four diversity elements (life history diversity, gene flow and genetic diversity, utilization of diverse habitats[2], and resilience and adaptation to environmental fluctuations) are well below predicted historical levels, extirpated populations, or remnant populations of unknown lineage	Life history diversity was based on comparison of adult and juvenile migration timing and age composition. Genetic diversity was based on the occurrence of small population bottlenecks in historic spawning escapement and degree of hatchery influence especially by non local stocks. Resiliency was based on observed rebounds from periodic small escapement. Diversity scores of 0 were typically assigned to populations that were functionally extirpated or consisted primarily of stray hatchery fish.
1	At least two diversity elements are well below historical levels. Population may not have adequate diversity to buffer the population against relatively minor environmental changes or utilize diverse habitats. Loss of major presumed life history phenotypes is evident; genetic estimates indicate major loss in genetic variation and/or small effective population size. Factors that severely limit the potential for local adaptation are present.	Natural spawning populations have been affected by large fractions of non-local hatchery stocks, substantial shifts in life history have been documented, and wild populations have experienced very low escapements over multiple years.
2	At least one diversity element is well below predicted historical levels; population diversity may not be adequate to buffer strong environmental variation and/or utilize available diverse habitats. Loss of life history phenotypes, especially among important life history traits, and/or reduction in genetic variation is evident. Factors that limit the potential for local adaptation are present.	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.
3	Diversity elements are not at predicted historical levels, but are at levels able to maintain a population. Minor shifts in proportions of historical life-history variants, and/or genetic estimates, indicate some loss in variation (e.g. number of alleles and heterozygosity), and conditions for local adaptation processes are present.	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.
4	All four diversity elements are similar to predicted historical levels. A suite of life-history variants, appropriate levels of genetic variation, and conditions for local adaptation processes are present.	Stable life history patterns, minimal hatchery influence, no extended interval of critical low escapements, and rapid rebounds from periodic declines in numbers.

Table 1-18. Chum Within-Population Diversity

Within-Population Diversity

Strata	State	Population	Score	Data	Criteria	Comments
Coast						
	WA	Grays/Chinook	3	3	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.	Historic hatchery releases were intermittent and unsuccessful at establishing a hatchery run. Population has remained relatively stable over time.
	WA	Elochoman/Skamokawa	1	3	Natural spawning populations have been affected by large fractions of non-local hatchery stocks, substantial shifts in life history have been documented, and wild populations have experienced very low escapements over multiple years.	Regular hatchery releases of outside stocks occurred through 1983. Although spawning surveys are not conducted, wild runs are believed to have consistently experienced very low escapements.
	WA	Mill/Abernathy/Germany	1	3	Natural spawning populations have been affected by large fractions of non-local hatchery stocks, substantial shifts in life history have been documented, and wild populations have experienced very low escapements over multiple years.	Regular hatchery releases of outside stocks occurred through 1991. Although spawning surveys are not conducted, wild runs are believed to have consistently experienced very low escapements.
	OR	Youngs				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
Cascade						
	WA	Cowlitz Chum	1	3	Natural spawning populations have been affected by large fractions of non-local hatchery stocks, substantial shifts in life history have been documented, and wild populations have experienced very low escapements over multiple years.	Hatchery releases of chum salmon have not occurred in the Cowlitz basin; however, the wild run is believed to have consistently experienced very low escapements.
	WA	Kalama Chum	1	3	Natural spawning populations have been affected by large fractions of non-local hatchery stocks, substantial shifts in life history have been documented, and wild populations have experienced very low escapements over multiple	Hatchery releases of chum salmon have not occurred in the Kalama basin; however, the wild run is believed to have consistently experienced very low escapements.

					years.	
	WA	Lewis Chum	1	3	Natural spawning populations have been affected by large fractions of non-local hatchery stocks, substantial shifts in life history have been documented, and wild populations have experienced very low escapements over multiple years.	Hatchery releases of chum salmon have not occurred in the Lewis basin; however, the wild run is believed to have consistently experienced very low escapements.
	WA	Salmon Chum	1	1	Natural spawning populations have been affected by large fractions of non-local hatchery stocks, substantial shifts in life history have been documented, and wild populations have experienced very low escapements over multiple years.	Hatchery releases of chum salmon have not been documented in the Salmon Creek basin; however, the wild run is believed to have consistently experienced very low escapements.
	WA	Washougal Chum	2	3	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases of chum salmon have not occurred in the Washougal basin; however, the wild run is believed to have consistently experienced low escapements.
	OR	Clackamas				
	OR	Sandy				
Gorge						
	WA	Lower Gorge	4	3	Stable life history patterns, minimal hatchery influence, no extended interval of critical low escapements, and rapid rebounds from periodic declines in numbers.	Historic hatchery releases in chum salmon did not occur in these tributaries. The Washougal Hatchery is currently rearing wild Hardy Creek chum stock for enhancement efforts in Duncan Creek.
	WA	Upper Gorge	1	3	Natural spawning populations have been affected by large fractions of non-local hatchery stocks, substantial shifts in life history have been documented, and wild populations have experienced very low escapements over multiple years.	Hatchery releases of chum salmon have not occurred in the Wind or Little White Salmon basins; however, the wild run is believed to have consistently experienced very low escapements.

Table 1-19. Chinook Within-Population Diversity

Strata	State	Population	Score	Data	Criteria	Comments
Coast Fall						
	WA	Grays	2.5		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases of fall chinook began in the basin in 1947; annual releases generally ranged between 2 to 4 million, although about 17 million smolts were released in 1980. Straying and transfer of fall chinook stock has resulted in a blended hatchery stock. The last release of fall chinook in the Grays occurred in 1997; the program was discontinued because of funding cuts.
	WA	Elochoman	2		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases of fall chinook began in the basin in 1950; annual releases generally ranged between 2 to 4 million, although about 7 million smolts were released in 1980. Straying and transfer of fall chinook stock has resulted in a blended hatchery stock. Current annual fall chinook release goal is 2 million smolts in the Elochoman River; hatchery fall chinook are not released in Skamokawa Creek.
	WA	Mill/Abernathy/Germany	2		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases of fall chinook began in Abernathy Creek in 1960. Annual releases from the Abernathy Creek NFH averaged 1 million fish from 1974-1994; the program was discontinued in 1995 because of funding cuts. Approximately 1 million fall chinook from other hatchery programs were released annually in Abernathy Creek from 1960-1977. Straying and transfer of fall chinook stock has resulted in a blended hatchery stock.
	OR	Youngs Bay				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
Cascade Fall						

WA	Lower Cowlitz	2.5	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases of fall chinook in the Cowlitz began in 1952; since the late 1960s, hatchery annual releases have generally ranged from 4 to 8 million, but have been as high as 14 million. The current Cowlitz Salmon Hatchery fall chinook annual production goal is 5 million juveniles; some juveniles are released in the upper Cowlitz to rear and others are reared to smolts in the hatchery and released in the lower Cowlitz.
WA	Coweeman	3	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.	Hatchery influence on this stock has been fairly limited; the stock is representative of indigenous fall chinook populations in the Cowlitz River basin. Hatchery releases of fall chinook in the Coweeman from out of basin stocks occurred from 1951-1979; releases were discontinued in 1980. Only one CWT hatchery stray has ever been recovered in spawning surveys.
WA	Toutle	2	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases of fall chinook in the Toutle began in 1951; since the mid 1960s, hatchery annual releases have generally ranged from 2 to 6 million. The current North Toutle Hatchery fall chinook annual production goal is 2.5 million sub-yearlings. The hatchery was destroyed in the 1980 eruption of Mt. St. Helens; rearing ponds in the basin began operation in 1985 and the hatchery resumed broodstock collection in 1990.
WA	Upper Cowlitz	2	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	The current Cowlitz Salmon Hatchery fall chinook annual production goal is 5 million juveniles; some juveniles are released in the upper Cowlitz to rear and others are reared to smolts in the hatchery and released in the lower Cowlitz.

	WA	Kalama	2.5	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases of fall chinook in the Kalama began in 1895; releases since the 1960s have generally ranged from 2 to 6 million, but have been as high as 15 million annually. Current annual hatchery fall chinook production goal is 5 million smolts. Natural spawning in the basin is sustained by first generation hatchery fish.
	WA	Lewis/Salmon	3	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.	Hatchery releases of fall chinook began in the NF Lewis in the early 1900s. Hatchery releases were generally under 1 million fish, however, were as high as 2.5 million annually. Hatchery releases were discontinued in 1986 to eliminate interaction with the healthy wild population. The run today is maintained by natural production with little hatchery influence. Hatchery fall chinook were not released in the EF Lewis.
	WA	Washougal	2	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases of fall chinook in the Washougal began in the 1950s; releases since the 1960s have generally ranged from 1 to 6 million, but have been as high as 12 million annually. Current annual hatchery fall chinook production goal is 3.5 million. Natural spawning in the basin is sustained by first generation hatchery fish.
	OR	Sandy			
	OR	Clackamas			
Gorge Fall					
	WA	Lower Gorge	2.5	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	The Spring Creek NFH released 50,160 fall chinook in Hamilton Creek in 1977. Origin of the existing population is not known, however, likely is from hatchery strays. Hatcheries in the area that produce the bright fall chinook stock include the Bonneville Hatchery, the Little White Salmon NFH, and the Spring Creek NFH?

	WA	Upper Gorge	2.5	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery fall chinook production began in the Wind River in 1899. Fall chinook releases average 2 million fish annually from 1952-1976. Fall chinook hatchery releases in the Wind River were discontinued in 1976. The current fall chinook run in the Wind River is thought to be a derivative of Spring Creek NFH stock. Hatchery fall chinook production began in the Wind River in 1899. Hatchery production shifted from tules to upriver brights in 1988 as part of mitigation agreements; current annual release goals in the Little White Salmon are 2 million.
	WA	Big White Salmon	2.5	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	
	OR	Hood			
Cascade late falls					
	WA	Lewis NF	3.5	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.	
	OR	Sandy			
Cascade spring					
	WA	Upper Cowlitz	2	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery juvenile spring chinook are released above Cowlitz Falls Dam to rear in the upper Cowlitz; outmigrating juveniles are captured at the Cowlitz Falls Project and released in the lower Cowlitz. Adults collected at Mayfield since 1994 and released in the upper Cowlitz are primarily first generation hatchery fish. Production is sustained through hatchery adults and juveniles.

WA	Cispus	2	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery juvenile spring chinook are released in the Cispus to rear; outmigrating juveniles are captured at the Cowlitz Falls Project and released in the lower Cowlitz. Adults collected at Mayfield since 1994 and released in the Cispus are primarily first generation hatchery fish. Production is sustained through hatchery adults and juveniles.
WA	Tilton	0	Life history diversity was based on comparison of adult and juvenile migration timing and age composition. Genetic diversity was based on the occurrence of small population bottlenecks in historic spawning escapement and degree of hatchery influence especially by non local stocks. Resiliency was based on observed rebounds from periodic small escapement. Diversity scores of 0 were typically assigned to populations that were functionally extirpated or consisted primarily of stray hatchery fish.	Natural spawning escapements have not been observed in the Tilton since the 1950s; hatchery fish have not been planted in the basin since 1980. The Tilton spring chinook run has likely been extirpated.
WA	Toutle	0	Life history diversity was based on comparison of adult and juvenile migration timing and age composition. Genetic diversity was based on the occurrence of small population bottlenecks in historic spawning escapement and degree of hatchery influence especially by non local stocks. Resiliency was based on observed rebounds from periodic small escapement. Diversity scores of 0 were typically assigned to populations that were functionally extirpated or consisted primarily of stray hatchery fish.	Natural spring chinook production in the Toutle has historically been low. Hatchery releases in the basin from the late 1960s through the present have been to provide for the sport fishery. Any production in the basin is likely from hatchery strays.
WA	Kalama	1	Natural spawning populations have been affected by large fractions of non-local hatchery stocks, substantial shifts in life history have been documented, and wild populations have experienced very low escapements over multiple years.	A spring chinook hatchery program in the Kalama began in 1959; releases since the 1960s have generally ranged from 200,000 to 500,000 smolts annually. Spring chinook releases from 1967-2001 averaged 378,280; the 2002 hatchery spring chinook release total was 332,200 smolts. Natural spawning in the basin is sustained by first generation hatchery fish.

WA	Lewis NF	0	Life history diversity was based on comparison of adult and juvenile migration timing and age composition. Genetic diversity was based on the occurrence of small population bottlenecks in historic spawning escapement and degree of hatchery influence especially by non local stocks. Resiliency was based on observed rebounds from periodic small escapement. Diversity scores of 0 were typically assigned to populations that were functionally extirpated or consisted primarily of stray hatchery fish.	Hatchery releases of spring chinook began in the NF Lewis in the early 1900s. Annual hatchery releases from 1972-1990 averaged 601,184; recent year releases have fluctuated near 1.2 million spring chinook. Natural spawning in the basin is sustained by first generation hatchery fish.
OR	Sandy			
Gorge spring				
OR	Big White Salmon	0	Life history diversity was based on comparison of adult and juvenile migration timing and age composition. Genetic diversity was based on the occurrence of small population bottlenecks in historic spawning escapement and degree of hatchery influence especially by non local stocks. Resiliency was based on observed rebounds from periodic small escapement. Diversity scores of 0 were typically assigned to populations that were functionally extirpated or consisted primarily of stray hatchery fish.	
OR	Hood			

Table 1-20. Steelhead Within-Population Diversity

Within-Population Diversity						
Strata	**State**	**Population**	**Score**	**Data**	**Criteria**	**Comments**
Coast winter						
	WA	Grays	2.5		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Winter steelhead hatchery fish have been planted in the basin since 1957. Releases since the early 1980s has generally fluctuated between 30,000 and 50,000; from 1990-2000, annual releases have average about 45,000.
	WA	Elochoman/Skamokawa	2		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Winter steelhead hatchery fish have been planted in the basin since 1955. Annual releases have fluctuated near 100,000 smolts since the early 1980s. The Beaver Creek Hatchery, which produced steelhead for release in the basin, closed in 1999.
	WA	Mill/Abernathy/Gemany	2		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery steelhead have rarely been planted in Mill Creek; winter steelhead have been released in Abernathy and Germany Creeks since 1961. Releases since the early 1980s have fluctuated between 5,000 and 15,000 for both Abernathy and Germany Creeks; the largest winter steelhead release was about 32,000 smolts to Germany Creek in the late 1980s.
Cascade winter						
	WA	Lower Cowlitz	2		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery winter steelhead have been planted in the basin since 1957. Hatchery releases since 1980 have generally fluctuated between 400,000 and 800,000 smolts. WDFW is currently managing for an annual smolt production of 750,000. Wild steelhead escapement has been extremely low since the 1970s.
	WA	Upper Cowlitz	2		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Wild steelhead have not had access to the upper watershed since the completion of Mayfield Dam in 1962. Hatchery adults have been released in the upper Cowlitz, Cispus, and Tilton River basins since 1994; naturally-produced juveniles are collected at the Cowlitz Falls Project and transported to the lower Cowlitz.

WA	Cispus	2	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	
WA	Tilton	2	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	
WA	Coweeman	2.5	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery winter steelhead have been planted in the Coweeman since 1957; most plants came from an out of basin brood source. Hatchery releases generally ranged from 30,000 to 50,000, but recent releases have been under 20,000. Hatchery adults comprise most of the annual return.
WA	N.F. Toutle	3	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.	Hatchery winter steelhead have been planted in the North Fork Toutle since 1953; hatchery releases generally ranged from 20,000 to 25,000. Winter steelhead hatchery plants have not occurred in recent years. Aside from small releases of winter steelhead fry in the the Green River after the 1980 Mt. St. Helens eruption, hatchery fish have not been released in the Green River. Current day returns are expected to be completely from natural production.
WA	S.F. Toutle	3	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.	Hatchery winter steelhead influence in the South Fork Toutle has been minimal. Total winter steelhead hatchery releases in the basin from 1968-1985 have been estimated at 58,079. Current returns are expected to be completely from natural production.

	WA	Kalama	3.5	3.5	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.	Intermittent hatchery winter steelhead releases began in the Kalama in 1938; annual releases began in 1955. Hatchery releases since the early 1980s have fluctuated near 100,000, except for 1999 when about 300,000 hatchery winter steelhead were released. From 1991-1996, approximately 31% of the annual return was hatchery spawners.
	WA	E.F. Lewis	2.5		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases in the East Fork from 1982-2002 have fluctuated near 100,000 fish. Current East Fork winter steelhead hatchery program goal is the annual release of 90,000 smolts. From 1991-1996, approximately 51% of the annual return was hatchery spawners.
	WA	N.F. Lewis	2		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases in the North Fork from 1982-2002 have fluctuated near 150,000 fish. Current North Fork winter steelhead hatchery program goal is the annual release of 100,000 smolts, however, recent year releases have been around 300,000. From 1991-1996, approximately 93% of the annual return was hatchery spawners.
	WA	Salmon	2		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery winter steelhead have been released in the Salmon Creek basin since 1957. Releases from 1982 to 2002 ranged between 10,000 and about 42,500. Current release goals to Salmon Creek are 25,000 Skamania winter steelhead smolts. Hatchery fish are expected to compose most of the annual return.
	WA	Washougal	2.5		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery winter steelhead have been planted in the Washougal since 1957. Hatchery releases in the 1980s generally fluctuated near 150,000 smolts. Current release goals to the Washougal are 60,000 Skamania winter steelhead smolts. Hatchery fish are expected to compose most of the annual return, although interbreeding with wild fish is expected to be low because of a separation in run timing.
	OR	Clackamas				
	OR	Sandy				
Gorge winter						

	WA	Lower Gorge Tribs	2.5		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Intermittent releases of hatchery winter steelhead have occurred in Hamilton Creek since 1958. Hatchery releases from 1988 to 1996 ranged from about 5,000 to 10,000 smolts. Estimates of hatchery adult winter steelhead are not available.
	WA	Upper Gorge Tribs	2.5		Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery winter steelhead have been released in the Wind River intermittently since the early 1950s; releases have generally been small (<10,000 smolts). Releases of hatchery steelhead were discontinued in 1997 because of potential concerns with the remaining wild stock. Only unmarked steelhead are allowed to pass the adult trap on Trout Creek.
	OR	Hood				
Cascade summer						
	WA	Kalama	2.5	3.5	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Summer steelhead hatchery releases since the early 1980s have fluctuated near 100,000. From 1991-1996, approximately 64% of the annual return was hatchery spawners.
	WA	N.F. Lewis	0	0	Life history diversity was based on comparison of adult and juvenile migration timing and age composition. Genetic diversity was based on the occurrence of small population bottlenecks in historic spawning escapement and degree of hatchery influence especially by non local stocks. Resiliency was based on observed rebounds from periodic small escapement. Diversity scores of 0 were typically assigned to populations that were functionally extirpated or consisted primarily of stray hatchery fish.	Hatchery releases of summer steelhead in the North Fork since 1982 have ranged from 25,000 to 225,000 annually. The Merwin net pen operation has an annual production goal of 235,000 summer steelhead smolts. Also, about 50,000 Skamania summer steelhead are released in the North Fork annually. The current annual return is expected to be primarily hatchery fish.

	WA	E.F. Lewis	2.5	2	Hatchery influence has been significant and potentially detrimental or populations have experienced periods of critical low escapement.	Hatchery releases of summer steelhead in the East Fork from 1982-1991 have fluctuated near 80,000 fish. Recent year releases have fluctuated near 30,000 fish. Current East Fork summer steelhead hatchery program goal is the annual release of 25,000 Skamania smolts. From 1991-1996, approximately 71% of the annual return was hatchery spawners; snorkel escapement counts from 1996-2001 confirmed that hatchery fish comprise about 70% of the annual spawning escapement.
	WA	Washougal	3	2	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.	Hatchery summer steelhead have been planted in the Washougal since the 1950s. Hatchery releases in the 1980s generally fluctuated near 200,000 smolts, although about 550,000 were released one year. Current release goals to the Washougal are 60,000 Skamania summer steelhead smolts. Escapement estimates from 1991-1996 indicate that hatchery summer steelhead comprise 87% and 1% of the spawning escapement in the North Fork Washougal and mainstem Washougal, respectively. Hatchery fish are expected to compose most of the current annual return.
Gorge summer						
	WA	Wind	3	3	Wild stock is subject to limited hatchery influence but life history patterns are stable. Extended intervals of critical low escapements have not occurred and population rapidly rebounded from periodic declines in numbers.	Hatchery summer steelhead have been released in the Wind River most years since 1960. Releases since 1983 have generally ranged between 20,000 and 50,000 smolts. Releases of hatchery steelhead were discontinued in 1997 because of potential concerns with the remaining wild stock. Snorkel surveys in the Wind from 1989-1998 indicated that hatchery summer steelhead comprised 41-60% of the annual spawning escapement. Only unmarked steelhead are allowed to pass the adult trap on Trout Creek.
	OR	Hood				

1.6 Habitat

Table 1-21. Habitat Description

Category	Description	Application
0	Habitat is incapable of supporting fish or is likely to be incapable of supporting fish in the foreseeable future	Unsuitable habitat. Quality is not suitable for salmon production. Includes only areas that are currently accessible. Inaccessible portions of the historic range are addressed by spatial structure criteria[2].
1	Habitat exhibits a combination of impairment and likely future conditions such that population is at high risk of extinction	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.
2	Habitat exhibits a combination of current impairment and likely future condition such that the population is at moderate risk of extinction	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.
3	Habitat in unimpaired and likely future conditions will support a viable salmon population	Intact habitat. Some degradation in habitat quality has occurred but habitat is sufficient to produce significant numbers of fish. (Equivalent to low bound in abundance target planning range.)
4	Habitat conditions and likely future conditions support a population with an extinction risk lower than that defined by a viable salmon population. Habitat conditions consistent with this category are likely comparable to those that historically existed.	Favorable habitat. Quality is near or at optimums for salmon. Includes properly functioning through pristine historical conditions.

Table 1-22. Chum Habitat

Habitat Strata	State	Population	Score	Data	Criteria	Comments
Coast						
	WA	Grays/Chinook	2	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Logging and agriculture in the watershed and the resulting landslides, erosion, and channel changes have damaged salmon spawning habitat. Recent habitat improvement projects have been undertaken in the basin.
	WA	Elochoman/Skamokawa	1	3	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Logging, road construction, and agriculture in the basin has decreased habitat diversity, bank stability, and fish access while increasing sediment load.
	WA	Mill/Abernathy/Germany	1	3	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Logging, road construction, and agriculture in the basin has decreased habitat diversity, bank stability, and fish access while increasing sediment load.
	OR	Youngs				
	OR	Big Creek				
	OR	Clatskanie				
	OR	Scappoose				
Cascade						
	WA	Cowlitz Chum	1	3	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Construction of Mayfield Dam in 1962 blocked access to approximately 80% of the basin's historical production area. Grazing, agriculture, forestry, and development have substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity has been lost because of channelization and diking.

	WA	Kalama Chum	1	3	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Forestry and other human activities in the basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity has been lost because of channelization and diking.
	WA	Lewis Chum	1	3	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Construction of Merwin Dam in 1932 blocked access to over half of the North Fork's historical production area. Human activity in the North Fork basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity in the lower river has been lost because of channelization and diking. The upper East Fork basin burned repeatedly during the early part of the century; the watershed is slowly recovering from habitat degradation as a result of these fires.
	WA	Salmon Chum	0	0	Unsuitable habitat. Quality is not suitable for salmon production. Includes only areas that are currently accessible. Inaccessible portions of the historic range are addressed by spatial structure criteria2.	Basin-specific habitat data is not available.
	WA	Washougal Chum	2	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	The Yacolt Burn, forestry, dam construction (removed in 1947), and human development has negatively affected habitat diversity, floodplain connectivity, and side channel habitat while increasing fine sediment in the system.
	OR	Clackamas				
	OR	Sandy				
Gorge						
	WA	Lower Gorge	2.5	2.5	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Basin-specific data is limited but habitat has likely been degraded from human activities within the basins. Current habitat availability and quality assumes consistent future Bonneville Dam operations, with minimal flow impacts.

	WA	Upper Gorge	1	1	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Historic chum habitat in the lower basins below impassable falls was inundated by the Bonneville Pool (1938). Shipherd Falls on the Wind River was laddered in 1956, providing access to the upper watershed. Suitable chum habitat does not exist in the Wind or Little White Salmon Rivers. Timber harvest and road construction in both basins has negatively affected riparian diversity, water flow, and water temperature while increasing sediment load to the system.

Table 1-23. Chinook Habitat

Habitat Strata	State	Population	Score	Data	Criteria	Comments
Coast Fall						
	WA	Grays	1.5		Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Low seasonal water flows have been a chronic problem for natural and hatchery chinook production; return timing is driven by timing of fall rains. Logging and agriculture in the watershed and the resulting landslides, erosion, and channel changes have damaged salmon spawning habitat. Recent habitat improvement projects for chum salmon production have been undertaken in the basin.
	WA	Elochoman	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Logging, road construction, and agriculture in the basin has decreased habitat diversity, bank stability, and fish access while increasing sediment load.
	WA	Mill/Abernathy/Germany	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Logging, road construction, and agriculture in the basin has decreased habitat diversity, bank stability, and fish access while increasing sediment load.
		Youngs Bay				
		Big Creek				
		Clatskanie				
		Scappoose				
Cascade Fall						
	WA	Lower Cowlitz	1.5		Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Grazing, agriculture, forestry, and development have substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity has been lost because of channelization and diking.

WA	Coweeman	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Extensive logging and high road densities have decreased habitat diversity and riparian function while increasing peak flows, sediment input, and water temperature. Diking and deposits from the 1980 Mt. St. Helens eruption in the lower river have decreased floodplain connectivity. Rearing and over-wintering habitat is limited in this lower reach.
WA	Toutle	1.75	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	The 1980 Mt. St. Helens eruption severely impacted habitat in the basin; most streams are naturally recovering from the disturbance. One exception is the North Fork Toutle where natural recovery has lagged, potentially as a result of a sediment retention structure. High road densities and other human activities have limited off-channel habitat, substrate stability, and riparian function while increasing sediment, water temperature, and peak flows.
WA	Upper Cowlitz	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Construction of Mayfield Dam in 1962 blocked access to about half of the basin's historical production area, however, various trap and haul programs have provided some access to the upper basin. Channel alterations and increased sediment inputs have created low-flow passage problems and reduced habitat quality; habitat diversity is also lacking. Any downstream migrants that enter Riffe Lake are unable to navigate the 23-mile long lake successfully. Timber harvest and road construction in the Tilton River basin has decreased riparian function, channel stability, and water quality while increasing peak flows and sediment inputs.
WA	Kalama	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Forestry and other human activities in the basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity has been lost because of channelization and diking.

WA	Lewis/Salmon	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Construction of Merwin Dam in 1932 blocked access to over half of the North Fork's historical production area. Human activity in the North Fork basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity in the lower river has been lost because of channelization and diking. The upper East Fork basin burned repeatedly during the early part of the century; the watershed is slowly recovering from habitat degradation as a result of these fires.
WA	Washougal	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	The Yacolt Burn, forestry, dam construction (removed in 1947), and human development has negatively affected habitat diversity, floodplain connectivity, and side channel habitat while increasing fine sediment in the system.
OR	Sandy			
OR	Clackamas			
Gorge Fall				
WA	Lower Gorge	2.5	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Basin-specific data is limited but habitat has likely been degraded from human activities within the basins. Current habitat availability and quality assumes consistent future Bonneville Dam operations, with minimal flow impacts.
WA	Upper Gorge	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Historic chinook habitat in the lower Wind and Little White Salmon Rivers below impassable falls was inundated by the Bonneville Pool (1938). Shipherd Falls on the Wind River was laddered in 1956, providing access to the upper watershed. Timber harvest and road construction in both basins has negatively affected riparian diversity, water flow, and water temperature while increasing sediment load to the system.

	WA	Big White Salmon	1.5	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	
	OR	Hood			
Cascade late falls					
	WA	Lewis NF	3	Intact habitat. Some degradation in habitat quality has occurred but habitat is sufficient to produce significant numbers of fish. (Equivalent to low bound in abundance target planning range.)	Construction of Merwin Dam in 1932 blocked access to over half of the North Fork's historical production area. Human activity in the North Fork basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity in the lower river has been lost because of channelization and diking.
	OR	Sandy			
Cascade spring					
	WA	Upper Cowlitz	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Construction of Mayfield Dam in 1962 blocked access to about half of the basin's historical production area, however, various trap and haul programs have provided some access to the upper basin. Channel alterations and increased sediment inputs have created low-flow passage problems and reduced habitat quality; habitat diversity is also lacking. Any downstream migrants that enter Riffe Lake are unable to navigate the 23-mile long lake successfully.
	WA	Cispus	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	See upper Cowlitz.
	WA	Tilton	0	Unsuitable habitat. Quality is not suitable for salmon production. Includes only areas that are currently accessible. Inaccessible portions of the historic range are addressed by spatial structure criteria2.	Timber harvest and road construction in the Tilton River basin has decreased riparian function, channel stability, and water quality while increasing peak flows and sediment inputs.

	WA	Toutle	0	Unsuitable habitat. Quality is not suitable for salmon production. Includes only areas that are currently accessible. Inaccessible portions of the historic range are addressed by spatial structure criteria2.	The 1980 Mt. St. Helens eruption severely impacted habitat in the basin; most streams are naturally recovering from the disturbance. One exception is the North Fork Toutle where natural recovery has lagged, potentially as a result of a sediment retention structure. High road densities and other human activities have limited off-channel habitat, substrate stability, and riparian function while increasing sediment, water temperature, and peak flows.
	WA	Kalama	1	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Forestry and other human activities in the basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity has been lost because of channelization and diking.
	WA	Lewis NF	0	Unsuitable habitat. Quality is not suitable for salmon production. Includes only areas that are currently accessible. Inaccessible portions of the historic range are addressed by spatial structure criteria2.	Construction of Merwin Dam in 1932 blocked access to over half of the North Fork's historical production area. Human activity in the North Fork basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity in the lower river has been lost because of channelization and diking.
	OR	Sandy			
Gorge spring					
	WA	Big White Salmon	0	Unsuitable habitat. Quality is not suitable for salmon production. Includes only areas that are currently accessible. Inaccessible portions of the historic range are addressed by spatial structure criteria2.	
	OR	Hood			

Table 1-24. Steelhead Habitat

Habitat Strata	State	Population	Score	Data	Criteria	Comments
Coast winter						
	WA	Grays	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Logging and agriculture in the watershed and the resulting landslides, erosion, and channel changes have damaged salmon spawning habitat. Recent habitat improvement projects for chum salmon production have been undertaken in the basin.
	WA	Elochoman/Skamokawa	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Logging, road construction, and agriculture in the basin has decreased habitat diversity, bank stability, and fish access while increasing sediment load.
	WA	Mill/Abernathy/Gemany	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Logging, road construction, and agriculture in the basin has decreased habitat diversity, bank stability, and fish access while increasing sediment load.
Cascade winter						
	WA	Lower Cowlitz	1.5		Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Grazing, agriculture, forestry, and development have substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity has been lost because of channelization and diking.
	WA	Upper Cowlitz	1.5		Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Construction of Mayfield Dam in 1962 blocked access to about 80% of the basin's historical production area, however, a recent trap and haul program has provided some access to the upper basin. Channel alterations and increased sediment inputs have created low-flow passage problems and reduced habitat quality; habitat diversity is also lacking. Any downstream migrants that enter Riffe Lake are unable to navigate the 23-mile long lake successfully.

WA	Cispus	1.5	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Construction of Mayfield Dam in 1962 blocked access to the basin, however, a recent trap and haul program has provided some access. Channel alterations and increased sediment inputs have created low-flow passage problems and reduced habitat quality; habitat diversity is also lacking.
WA	Tilton	1.5	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Construction of Mayfield Dam in 1962 blocked access to the basin, however, a recent trap and haul program has provided some access. Timber harvest and road construction in the Tilton River basin has decreased riparian function, channel stability, and water quality while increasing peak flows and sediment inputs.
WA	Coweeman	1.75	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Extensive logging and high road densities have decreased habitat diversity and riparian function while increasing peak flows, sediment input, and water temperature. Diking and deposits from the 1980 Mt. St. Helens eruption in the lower river have decreased floodplain connectivity. Rearing and over-wintering habitat is limited in this lower reach.
WA	N.F. Toutle	1.75	Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	The 1980 Mt. St. Helens eruption severely impacted habitat in the basin; most streams are naturally recovering from the disturbance. One exception is the North Fork Toutle where natural recovery has lagged, potentially as a result of a sediment retention structure. High road densities and other human activities have limited off-channel habitat, substrate stability, and riparian function while increasing sediment, water temperature, and peak flows.
WA	S.F. Toutle	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	The 1980 Mt. St. Helens eruption severely impacted habitat in the basin; most streams are naturally recovering from the disturbance. High road densities and other human activities have limited off-channel habitat, substrate stability, and riparian function while increasing sediment, water temperature, and peak flows.

WA	Kalama	2.5	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Forestry and other human activities in the basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity has been lost because of channelization and diking.
WA	E.F. Lewis	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	The upper East Fork basin burned repeatedly during the early part of the century; the watershed is slowly recovering from habitat degradation as a result of these fires. Limiting habitat conditions include low habitat diversity and structure, elevated water temperatures (especially in lower tributaries), erosion and channel stability, and low floodplain connectivity as a result of diking and development in the lower basin.
WA	N.F. Lewis	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Construction of Merwin Dam in 1932 blocked access to about 80% of the North Fork's historical production area. Human activity in the North Fork basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity in the lower river has been lost because of channelization and diking.
WA	Salmon	1		Highly impaired habitat. Quality is substantially less than needed to sustain a viable population size (e.g. low bound in target planning range). Significant natural production may occur only in favorable years.	Human activity in the upper basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity in the lower river has been lost because of channelization and diking related to development
WA	Washougal	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	The Yacolt Burn, forestry, dam construction (removed in 1947), and human development has negatively affected habitat diversity, floodplain connectivity, and side channel habitat while increasing fine sediment in the system.
OR	Clackamas				
OR	Sandy				

Gorge winter

	WA	Lower Gorge Tribs	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Basin-specific data is limited but habitat has likely been degraded from human activities within the basins. Current habitat availability and quality assumes consistent future Bonneville Dam operations, with minimal flow impacts.
	WA	Upper Gorge Tribs	2		Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Historic spawning and rearing habitat in the lower Wind River was inundated by the Bonneville Pool (1938). Shipherd Falls on the Wind River was laddered in 1956, providing easier access to the upper watershed. Timber harvest and road construction in the upper basin has negatively affected riparian diversity, water flow, and water temperature while increasing sediment load to the system.
	OR	Hood				
Cascade summer						
	WA	Kalama	2.5	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Forestry and other human activities in the basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity has been lost because of channelization and diking.
	WA	N.F. Lewis	2	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	Construction of Merwin Dam in 1932 blocked access to about 80% of the North Fork's historical production area. Human activity in the North Fork basin has substantially reduced riparian function and bank stability while adding fine sediment to the system. Habitat diversity, side channel habitat, and floodplain connectivity in the lower river has been lost because of channelization and diking.
	WA	E.F. Lewis	2	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	The upper East Fork basin burned repeatedly during the early part of the century; the watershed is slowly recovering from habitat degradation as a result of these fires. Limiting habitat conditions include low habitat diversity and structure, elevated water temperatures (especially in lower tributaries), erosion and channel stability, and low floodplain connectivity as a result of diking and

						development in the lower basin.
	WA	Washougal	2	2	Moderately impaired habitat. Significant degradation in habitat quality associated with reduced population productivity.	The Yacolt Burn, forestry, dam construction (removed in 1947), and human development has negatively affected habitat diversity, floodplain connectivity, and side channel habitat while increasing fine sediment in the system.
Gorge summer						
	WA	Wind	3	3	Intact habitat. Some degradation in habitat quality has occurred but habitat is sufficient to produce significant numbers of fish. (Equivalent to low bound in abundance target planning range.)	Historic spawning and rearing habitat in the lower Wind River was inundated by the Bonneville Pool (1938). Shipherd Falls on the Wind River was laddered in 1956, providing easier access to the upper watershed. Timber harvest and road construction in the upper basin has negatively affected riparian diversity, water flow, and water temperature while increasing sediment load to the system.
	OR	Hood				