WILLAPA BASIN

Water Resource Inventory Area 24

The Willapa basin includes those drainages south of the Pacific-Grays Harbor county line near Grayland, south to the mouth of the Columbia River, and several minor drainages in the Columbia River west of Knappton. Most of this area drains into Willapa Harbor with the largest watersheds being the Naselle, Willapa, and North rivers. There are a number of smaller drainages entering Willapa Harbor and the lower Columbia River in this area. The majority of these streams provide suitable spawning and rearing habitat for salmon. There are 754 rivers and streams with over 1,470 linear stream miles in this drainage.

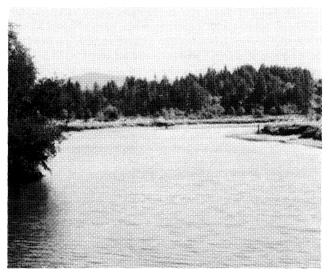


PHOTO 24-1. Willapa Bay tributaries contain excellent estuary conversion zones for migrating salmon (South Fork Palix River).

Fish Inventory and Distribution

Salmon commonly found in the streams of the Willapa basin include chinook, coho, and chum. A few spring chinook may spawn in the Naselle and North rivers.

Streams in the Willapa basin provide over 630 miles of channel in which salmon migrate, spawn, and rear. Adult salmon can be expected in the smaller streams from October through mid-January and streams supporting runs of fall chinook will be inhabited by adults from late August through mid-January. Timing of residence of salmon in the streams and rivers in the basin is shown in Table 24-1.

Chinook Salmon — Fall chinook utilize various reaches of the North River, Willapa River, Palix River, Nemah River, Naselle River, and Bear River. There are unconfirmed reports of spring chinook in the Naselle and North rivers.

Fall chinook spawn in a limited amount of suitable spawning area of the lower North River and in its upper reaches below the confluence of Redfield and Martin creeks. Very little suitable spawning area is found between lower Salmon Creek and the Fall River. Chinook also utilize the lower reaches of Raimie Creek, Pioneer Creek, and lower Salmon Creek. Smith Creek, in its lower five miles, and Clearwater Creek, a tributary of Smith Creek, have runs of fall chinook.

Fall chinook spawn on all suitable riffles in the Willapa River upstream from tidewater to near the falls, a total of approximately 25 miles and significant runs of chinook also spawn in several of its tributaries. The South Fork Willapa River provides excellent chinook spawning habitat although the upper limit of chinook spawning in this stream has not been determined. However, chinook are known to spawn in at least the lower 12 miles above tidewater. Trap Creek, a tributary of Willapa River, has a significant run of chinook salmon which spawn downstream from the falls near mile 2.5. Chinook are also known to spawn in the lower reaches of Mill Creek below the cascade area near mile 0.5. Chinook entering Forks Creek are trapped at the Willapa State Salmon Hatchery where few fish are permitted to spawn naturally above the hatchery rack.

Chinook spawning in the Palix River watershed is confined to the Canyon River, a tributary of the Middle Fork, as a cascade in the middle reach probably prevents further upstream passage of chinook.

Natural spawning of fall chinook occurs in the Nemah River system in the North Fork downstream from the hatchery rack and in the lower reaches of the Middle Fork Nemah River, but the upper extent of spawning on the Middle Fork has not been determined. A small number of chinook also spawn in Williams Creek, a tributary of the North Nemah River. While suitable spawning area exists upstream from the hatchery rack, the number of females beyond that required for the egg-take at the hatchery is seldom sufficient for release upstream.

The Naselle River is probably the most important natural chinook production area in the Willapa basin. Chinook spawn in approximately 15 miles of the mainstem and in several tributaries. The South Fork Naselle River has chinook spawning area in its lower reaches and chinook are also known to spawn in Bean Creek and probably utilize the

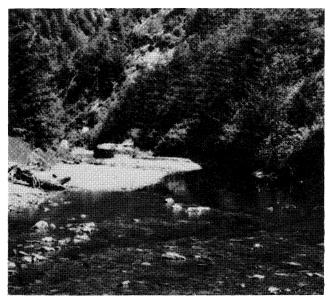


PHOTO 24-2. Chinook inhabit all major Willapa basin streams (upper Naselle River riffles).

lower reaches of both Davis and Cement creeks, all in the South Fork drainage. Salmon Creek, a tributary of the mainstem Naselle River supports a fall chinook run in at least its lower ten miles. The North Fork Naselle River and Alder Creek, both tributaries of the upper Naselle River, have excellent characteristics for chinook spawning in their lower three to four miles. The present extent of chinook utilization of these upper tributaries is not known.

The Bear River provides approximately five miles of good chinook spawning area. Most of the chinook spawning occurs in the mainstem since the tributaries are generally small and do not contain suitable chinook spawning material.

Estimates of annual spawning escapement are based on observations on the spawning grounds and in the fisheries. During the base year period of 1966 through 1971 the average chinook escapement from natural production was 6,000 fish. The escapement ranged from approximately 2,000 to 18,000 fish during the period.

Returns from artificial propagation of chinook at Willapa and Nemah hatcheries averaged 2,500 fish annually and ranged from 1,215 to 4,119.

Coho Salmon — Coho spawning occurs in virtually all accessible streams of this basin. Major coho production areas include: North River, Willapa River, Palix River, and Bear River. Spawning is generally confined to the smaller tributaries rather than in the larger mainstem channels.

Many of the tributaries of the lower North River contain only a small amount of suitable spawning area for coho. Significant amounts of coho spawning area are found in some of the upper North River tributaries including the Fall River and Pioneer, Archer, Raimie, Redfield, and Martin creeks. Coho production from these tributaries is very good while at least some production occurs from other tributaries. Coho production in Smith Creek is limited to spawning in several of the tributaries in its lower 15 miles, but little spawning gravel is found in tributaries upstream from Butte Creek. Elkhorn, Clearwater, and Butte creeks have fair to good runs annually.



PHOTO 24-3. West Fork Vesta Creek is one of many excellent small coho streams (North River tributary).

Many Willapa River tributaries provide excellent coho spawning and rearing habitat and are well utilized by this species. The most important tributaries include the South Fork Willapa River and several of its tributaries; Mill, Stringer, Trap, Forks, Half Moon, and Fern creeks. Most of the other tributaries, except those in the Wilson Creek watershed, have significant coho production. Elk and Wilson creeks and their tributaries lack suitable spawning area.

The accessible portions of the Palix River watershed provide some excellent coho spawning and rearing habitat with most of this production occurring in the Canon River and several of its tributaries. The South and Middle forks of the Palix River contain little suitable habitat and a series of high falls prevents salmon from entering the North Fork Palix River.

The Nemah River system contains many miles of suitable coho habitat. The upper mainstem of the North Nemah River and several of its smaller tributaries provide excellent spawning and rearing area while Williams Creek, a tributary of the lower reaches of the North Nemah, also provides many miles of coho production area. Good coho runs also utilize the Middle and South Nemah rivers.

The Naselle River tributaries annually have good to excellent runs of coho. These are found in the South Fork Naselle River and several of its tributaries, notably Bean, Cement, and Davis creeks. The upper reaches of Salmon Creek, a tributary of the mainstem Naselle, also have good coho runs; however, many of the other smaller tributaries to the Naselle River, downstream from its North Fork, have coho production in the lower reaches only. The North Fork Naselle River and several of its tributaries have been extensively logged in the past few years and present production is limited. Alder Creek, a tributary of the upper Naselle, has over ten miles of coho spawning and rearing habitat and some coho spawning undoubtedly occurs in the Naselle River upstream from Alder Creek.

The Bear River and several of its tributaries provide excellent production area for coho salmon. Some of this area has been limited in the past few years from extensive logging; however, most of the upper river remains untouched.

Virtually all of the other smaller, independent drainages in this basin have at least some coho production.

In the base year period of 1966 through 1971, escapement of coho from natural spawning ranged from 5,000 to 40,000 fish and averaged 15,200 coho annually. Average return from hatchery production during this same period was 14,300 coho and ranged from 8,100 to 21,500.

Chum Salmon — Chum salmon are found in the lower reaches of most of the streams in the Willapa basin that contain suitable spawning material. This species seldom migrates as far upstream as chinook or coho.

Several of the tributaries of the lower ten miles of the North River have excellent chum salmon runs annually. These include lower Salmon Creek, Bitter Creek, and Smith Creek, but chums also spawn in suitable riffles in the lower ten miles of the mainstem. Chum salmon have not been found upstream from the U.S. Highway 101 bridge near river mile 27.0.

The majority of the chum salmon utilizing the Willapa River watershed appear to spawn in the South Fork Willapa downstream from the canyon near mile 5.0. A few chum pass through the canyon area to spawn in the middle reaches of the South Fork Willapa River and in Rue Creek. Chum are also known to spawn in Trap Creek, a tributary of the Willapa River, and probably utilize suitable spawning areas located near the mouths of other creeks downstream from Trap Creek. No major chum spawning activity has been noted in the mainstem of the Willapa.

The Canon River, tributary of the Middle Fork Palix River, has an excellent chum salmon run in its lower two miles. Cascades above this point probably bar further migration and no other tributaries in the Palix system are known to support this species, except that a few may spawn near the falls on the North Fork Palix River.

The Nemah River system also has excellent runs of chum and intensive spawning generally occurs in the lower reaches of Williams Creek, a tributary of North Nemah River. Good runs also utilize the mainstem of the North Nemah and Middle Nemah rivers, but no chum inhabit the South Nemah River.

The Naselle River watershed produces one of the major chum salmon runs in the Willapa basin where they spawn in the mainstem, probably as far upstream as the North Fork. Large populations spawn annually in Ellsworth Creek and a number of other tributaries, including the South Fork Naselle River and several of its tributaries, and in Smith and Salmon creeks. Chum are known to utilize accessible tributaries at least as far upstream as Brock Creek.

Chum salmon escapement during the period of 1966 through 1971 ranged from 10,000 to 80,000 and averaged 30,000 annually. An additional 1,300 chum returned annually to the rack at the Nemah Hatchery with returns ranging from 400 to 2,100 chums.

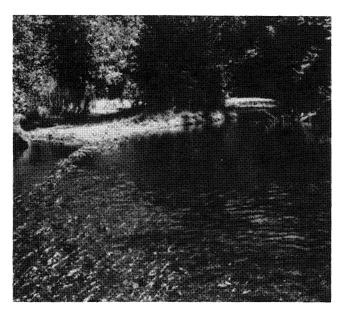


PHOTO 24-4. Chum salmon utilize the lower sections of most Willapa basin streams (Williams Creek).

Salmon Production

A six-year base period, 1966 through 1971, has been selected for the presentation of all salmon production figures. This span of years is used for both natural and artificially produced fish, as well as escapement and harvest figures.

Natural production of salmon in the Willapa basin during 1966 through 1971 returned an average of 51,200 fish to the streams and rivers for spawning.

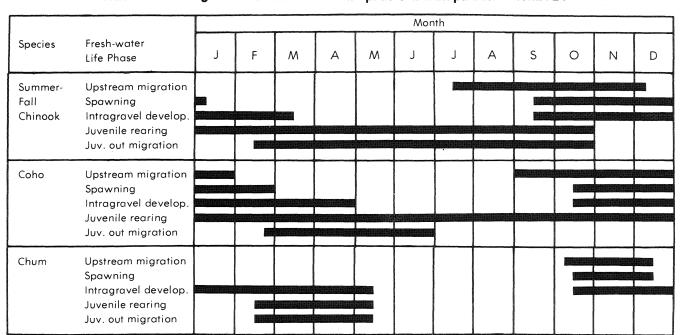


Table 24-1. Timing of salmon fresh-water life phases in Willapa Basin WRIA 24

Table 24-2. Salmon Spawning Escapement Levels for Willapa Basin WRIA 24.

1966-1971 Escapements

Species	Range	Average
Chinook	3,200—24,000	8,500
Coho	13,100—61,500	29,500
Chum	10,400—82,000	32,100

The Department of Fisheries presently operates two salmon hatcheries on streams in the Willapa basin. Production from these hatcheries is usually released into Willapa basin drainages.

Willapa River Salmon Hatchery is located on Forks Creek near its confluence with the Willapa River and began operation in 1899. The station utilizes water from Forks Creek and has a capacity to incubate 5.5 million eggs and rear approximately 2.5 million fry for 60 to 100 days and an additional 1.0 million yearling salmon annually. Only fall chinook and coho are handled here.

The Nemah River Salmon Hatchery is located on the North Nemah River. The station, which was constructed in 1953, obtains its water supply from the main river and has a capacity to incubate 6.5 million eggs and rear approximately 3.5 million fry for 60 to 100 days in addition to 0.9 million yearlings annually. Fall chinook, coho, and chum are propagated at this station.

During the period 1966 through 1971, a total of 4,928,000 coho fry and fingerling, 17,457,000 chinook fry and fingerling, 9,235,000 coho yearling, and 3,553,000 chum fingerling were planted in the Willapa basin.

Harvest

The salmon production from the waters of the Willapa basin contribute to sport and commercial fisheries of the Pacific coast from California to Alaska. Commercial troll and sport fisheries operate in the ocean waters while gill net fisheries harvest production within Willapa Bay. Sport fisheries ply Willapa Bay and several of the freshwater areas, but the estimated total contribution, both from natural and artificial production, to these fisheries is unknown.

Willapa Bay supports an intensive gill-net fishery with the majority of the catch being landed at Tokeland, South Bend, and Bay Center. This fishery landed an average of 15,070 chinook, 19,310 chum, and 20,000 coho from 1966 through 1971.

An intensive sport fishery operates in the ocean waters offshore from this basin. These fisheries are centered at Ilwaco, at the mouth of the Columbia River (In Willapa WRIA), and at Westport in Grays Harbor. An average of 48,700 chinook and 219,000 coho were landed at Ilwaco annually during the base year period. An annual average of over 132,000 angler-trips were made out of this port. The bulk of these fish were destined for Columbia River waters and an unknown, but undoubtedly large, percentage of the fish landed by the sport fishermen at Westport in the Chehalis basin were caught in these marine waters also. Catches by the small sport fishery conducted out of Willapa Bay ports are not separable from catch statistics for Westport.

Freshwater salmon angling is permitted in the Naselle, Nemah, North, Palix, Willapa, and South Fork Willapa rivers and in Smith Creek. An average of 2,480 salmon were landed annually from 1967 through 1971.

Limiting Factors

Various factors limit fish production in the Willapa basin (Table 10) and Grays-Elochoman area. Lack of recent stream surveys in the Grays-Elochoman area prevent inclusion of a detailed listing of limiting factors.

Stream flow — Seasonal flooding occurs in most of the drainage areas, but does not normally result in excessive damage to the fisheries resource except on some of the smaller, more precipitous streams and certain reaches of some of the larger streams.

Seasonal low flows occur in all of the streams in this basin and are most detrimental to fish life in the small tributaries by limiting the amount of rearing area. Low flows in the Willapa and Nemah rivers hinder movement of chinook to the hatchery racks.

Physical barriers — A number of streams in this basin have barriers which inhibit or delay salmon migration to potential spawning and rearing areas. Most of these barriers are natural features consisting of falls, cascades, and beaver dams. Log jams consisting of both natural and logging debris are problems in many areas.



PHOTO 24-5. Rearing area for coho and chinook is seriously reduced by seasonal low flows (North Nemah River).

Some barriers have resulted from construction activities and a number of small tributaries are blocked by improper culverts on county, state, and private roads. Culverts that are improperly installed create outfall drops and velocities sufficient to prevent upstream passage of adults.

Aerial surveys indicate the existence of old mill ponds or splash dams on several small tributaries in the Willapa basin. Such dams were constructed on many streams in the early days of logging and blocked many miles of spawning and rearing area. Most of these have now decayed and washed out or have been removed from the stream.



PHOTO 24-7. Road culverts often become migration barriers for adult salmon due to erosion or improper installation (unnamed tributary of Willapa River).

Natural barriers preventing fish passage to stream reaches with significant salmon production potential are found on Pioneer Creek (tributary to the North River), the Willapa River, the North Fork Palix River, and the Naselle River in the Willapa basin. A number of lesser, but still important, potential production areas are blocked on smaller streams.



PHOTO 24-6. Natural falls and barriers eliminate many miles of stream from salmon production (North Fork Palix River).

A dam on Burnham Creek, tributary to the South Fork Naselle River, is a barrier to chum and coho. A water supply reservoir on Butte Creek, tributary of Smith Creek, may also block coho. Water quality — Water quality is generally good throughout the basin, but excessive siltation occurs in streams where extensive logging and road building construction have denuded stream bank areas and where slides have encroached on the streambeds. Domestic wastes are discharged into many streams of the basin; however, the effect of present waste levels on salmon production is not known.

Limited spawning and rearing — A number of streams in the Willapa basin have little or no spawning area since their streambeds are composed almost entirely of silt and sand. This is particularly pronounced in several of the tributaries to the north end of Willapa Harbor and the Elk and Wilson creek drainages, tributaries of lower Willapa River, have virtually no suitable spawning area for salmon. Smith Creek near Raymond has gravel only in its lower reaches while streams that have spawning area in their lower and middle extremities include Joe, Salmon, Lower Salmon, and Tuttle creeks. No spawning gravel was found in the South Palix River and lack of spawning facilities in these streams is a natural occurrence not associated with watershed disturbance.

Most of the streams in the remainder of the Willapa basin have sufficient spawning area and the lack of it is generally not a limiting factor in those streams in the south half of the Willapa basin although local exceptions can be found.

Streams experiencing very low summer flows have limited rearing area for juvenile salmon. Streams in the south coastal basin are dependent on rainfall during the summer months for their flows and abnormally dry summers result in low stream flows which reduce the success of juvenile coho rearing. The streams in this basin have not been adequately surveyed during the summer to determine the more critical areas of low flow.

Watershed development — Development of riverfront property for summer and permanent homes has not been extensive, but can be expected in the future. This will result in demands for diking and channel alterations incompatible with fish production.

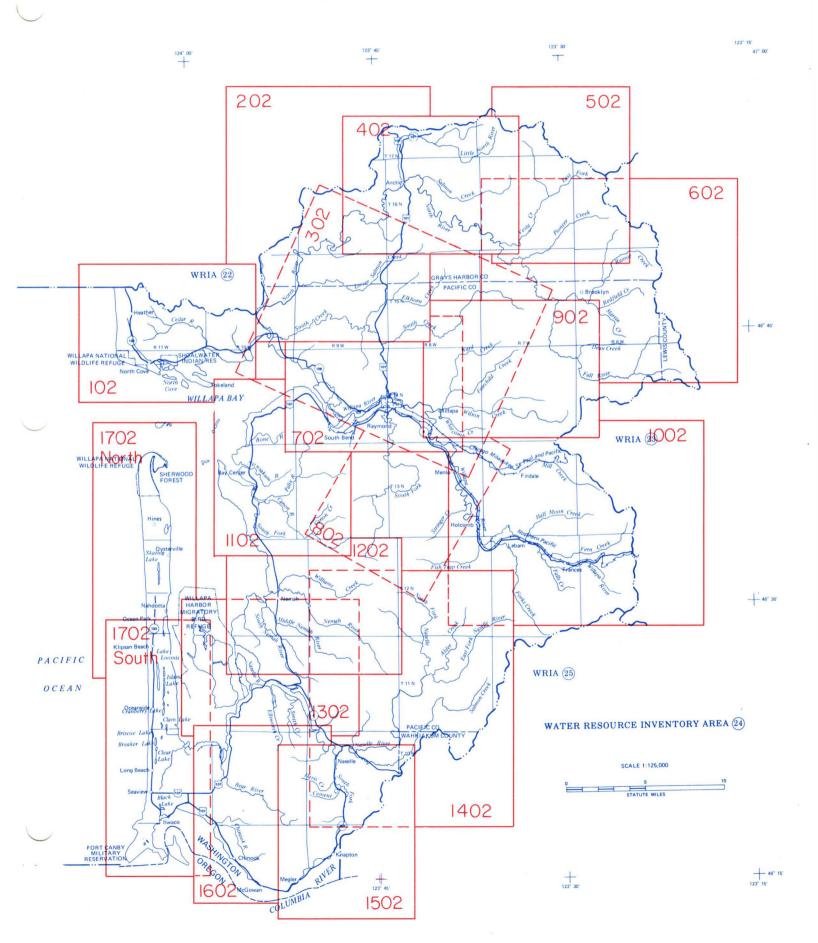
Physical alterations of the stream channel for road construction are found on many streams with this resulting in increased gradient and loss of spawning and rearing area. Former practices in construction of logging roads and railroad grades resulted in a number of such losses.

Gravel removal from the natural streambeds reduces the amount of available spawning areas and may result in a reduction of streambed stability. No major gravel removal operations are conducted in the Willapa basin, but small quantities of gravel are occasionally removed for personal use.

WILLAPA BASIN WRIA 24 Index to Key Maps

Map Title	Stream Numbers	Page
CEDAR RIVER (North Cove Area)	(24.0001—24.0033)	Willapa— 102
NORTH RIVER (Lower Mainstem)	(24.0034)	Willapa— 202
SMITH CREEK	(24.0035—24.0078)	Willapa— 302
NORTH RIVER (Little North River Area)	(24.0134—24.0152)	Willapa— 402
VESTA CREEK	(24.0153—24.0178)	Willapa— 502
NORTH RIVER (Headwaters)	(24.0179—24.0245)	Willapa— 602
WILLAPA RIVER (Lower Mainstem)	(24.0246—24.0276)	Willapa— 702
SOUTH FORK WILLAPA RIVER	(24.0277—24.0298)	Willapa— 802
WILSON CREEK	(24.0305—24.0320)	Willapa— 902
WILLAPA RIVER (Headwaters)	(24.0322—24.0392)	Willapa—1002
PALIX RIVER	(24.0393—24.0458)	Willapa—1102
NEMAH RIVER	(24.0459—24.0542)	Willapa—1202
NASELLE RIVER (Lower Mainstem)	(24.0543—24.0580)	Willapa—1302
NASELLE RIVER (Headwaters)	(24.0581—24.0583)	Willapa—1402
SOUTH FORK NASELLE RIVER	(24.0584—24.0615)	Willapa—1502
BEAR RIVER	(24.0678—24.0717)	Willapa—1602
LONG BEACH PENINSULA	(24.0718—24.0754)	Willapa—1702

WILLAPA RIVER BASIN WRIA - 24



CEDAR RIVER North Cove Area

This section discusses the number of small independent tributaries along the north shore of Willapa Bay between Cape Shoalwater and the mouth of North River. These small tributaries drain the low hill area north of Willapa Bay and west of North River, and contain a total of 47.15 miles of stream length. Cedar River is the largest watershed in this area and comprises over half of the stream length (23.95 R.M.) of the section.

Stream Description

Most of the land in this section is less than 400 feet in elevation and under private-ownership timber production. Some farmland is found in the vicinity of lower Cedar River, Teal Duck Slough, and Kindred Slough. The communities of Tokeland and North Cove are located on the shores of Willapa Bay. State Highway 105 parallels the Pacific Ocean and Willapa Harbor. There are a large number of residences scattered along this highway as well as paralleling roads in the bench land between the Pacific Ocean beach and the low ridge of hills to the east. Access to this ridge is available on private logging roads.

Much of the land along the Pacific County Drainage Ditch No. 1 has been developed as cranberry bogs. This drainage ditch drains the lowland between the ocean sand dunes and the low hilly country. There is little surface drainage from the western slopes of this low ridge into this ditch.

Cedar River has its source along the south slope of Seastrand Ridge. This stream has a very low gradient throughout its entire length as it flows through second growth timberland. Most of the Cedar River watershed drains into the North Fork Cedar River. This stream also has a low gradient; however, several tributaries are somewhat steeper. Much of the watershed has been clear-cut logged in recent years and stream bank cover is less than adequate in many areas. Streambeds are composed primarily of sand with very few suitable gravel riffles for spawning. Other lesser drainages in this section include Freshwater Creek, a small stream entering Willapa Harbor west of Hawks Point, and three small sloughs entering the harbor north of Toke Point. Freshwater Creek has very little gravel in its streambed shich is composed primarily of silt and sand. Norris, Teal Duck, and Kindred Sloughs drain low marsh land along most of their channel length. Teal Duck Slough is fed by several tributaries draining the southerly slopes of a low ridge. Tidal gates are located on these sloughs to prevent saltwater intrusion in the marshy areas.

Salmon Utilization

There is little salmon utilization of the streams in this section. Small runs of coho salmon are known to have formerly used Cedar River watershed and likely were present in Freshwater Creek. Present status of these runs is unknown. Small numbers of fish may utilize other accessible reaches of the smaller drainages which contain suitable spawning material. Total miles of salmon usage in this watershed is unknown but expected to be quite low.

Limiting Factors

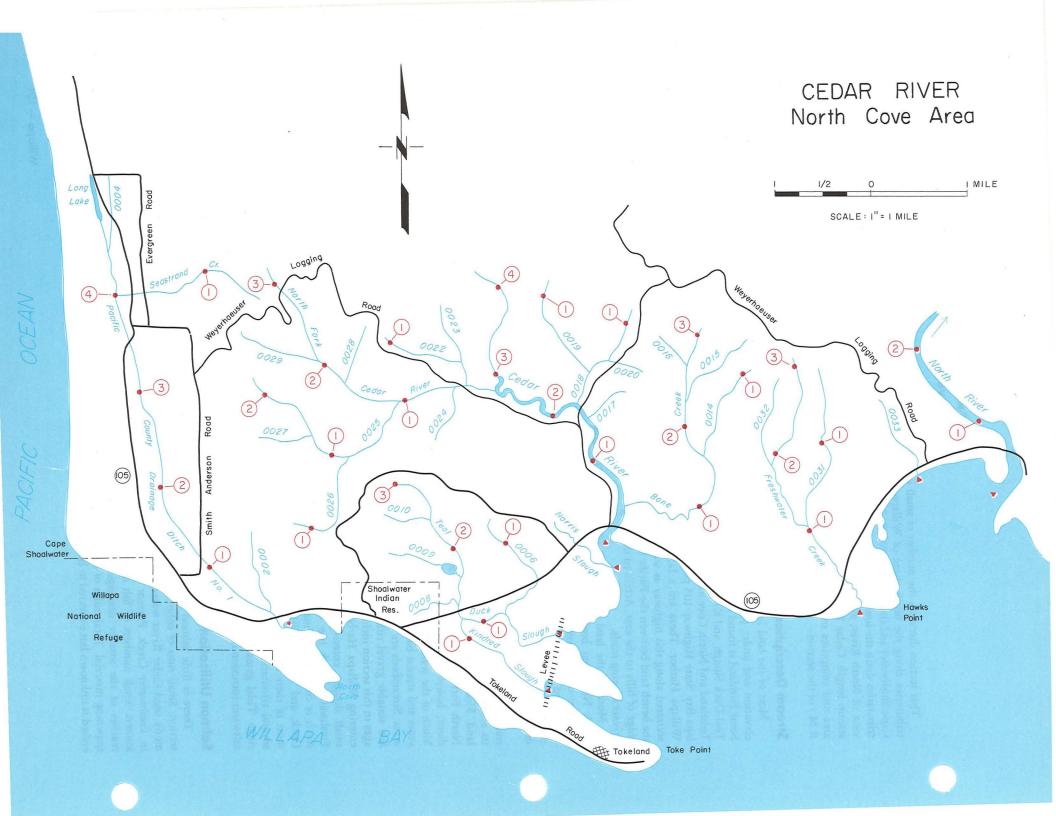
The primary factor limiting salmon production in the Cedar River area is lack of suitable spawning material. Limited spawning area formerly known to be present on Cedar River was severely damaged by logging activities. The waters of most of the streams in this section are quite warm during the summer months due to low stream flow and insufficient stream bank cover.

Beneficial Developments

There have been no beneficial developments for salmon production in these drainages.

Habitat Needs

Additional environmental surveys are required to determine the suitability of these streams to rear coho salmon during the summer months. Suitable areas may exist for plants of coho fry or use of gravel egg incubation boxes.



CEDAR RIVER North Cove Area Willapa Basin — WRIA 24

Stream		Location			
Number	Stream Name	Of Mouth	Length	Drainage Area	Salmon Use
0001	Pacific Co. Drainage Ditch No. 1	SE1/4,Sec4, T14N,R11W	4.8	_	None
0003	Seastrand Creek	LB-4.0	1.7	_	None
	Long Lake	Outlet-4.8	, 	_	
0005	Teal Duck Slough	SE1/4,SW1/4,Sec1, T14N,R11W	3.0	_	None
0006	Unnamed	LB-0.7	1.4	-	None
0007	Kindred Slough	RB-1.2	1.3	_	None
0012	Cedar River	SW 1/4 ,SW 1/4 ,Sec31, T15N,R10W	4.3	12.6	Coho
0013	Bone Creek	LB-0.4	3.1	-	Unknown
0014	Unnamed	LB-1.6	1.1	_	Unknown
0018	Unnamed	LB-1.75	1.2		Unknown
0019	Unnamed	RB-0.35	1.2	_	Unknown
0021	N. F. Cedar River	RB-2.1	3.2		Unknown
0022	Unnamed	LB-0.3	1.1		Unknown
0025	Unnamed	RB-1.1	2.2	_	Unknown
0026	Unnamed	RB-0.8	1.2	_	Unknown
0030	Freshwater Creek	SE1/4,Sec4, T14N,R10W	3.1	_	Unknown
0031	Unnamed	LB-1.0	1.8	_	Unknown

NORTH RIVER Lower Mainstem

This section describes the North River from its mouth upstream to the U.S. Highway 101 bridge and all of the tributaries to this reach except Smith Creek (see Willapa 300). The mainstem North River is 26.5 miles in length with 19 tributaries totalling 86.6 miles.

Stream Description

Virtually the entire watershed in this section is in timber production. Limited areas of cleared farmland are found in the North River valley. Scattered rural residences are also located here. North River is crossed by State Highway 105 near its entry to Willapa Harbor while U.S. Highway 101 bridges the river at the upper limit of this section. This latter route also provides access to middle reaches of Joe and Lower Salmon creeks. Both private and public roads provide access to other portions of the watershed.

North River has a very low gradient throughout this section. Tidal influence is noticeable upstream to at least river mile 7.4. Only an occasional gravel area suited for salmon spawning is found in this reach. Most of the stream consists of low velocity pools with alder and conifer timber along the banks. The streambed in this pool area consists primarily of sand and silt. The stream channel has an average summer width of 25 yards and a winter width of 30 yards above tidal influence.

Lower Salmon Creek is the largest tributary included in this section. The creek heads in the low hills southeast of North River and flows westerly to its confluence with North River. Summer and winter widths in its lower reaches average 7 and 10 yards respectively. The stream narrows to 1 and 3 yards in the summer and winter in the upper area of salmon use. Log and debris jams are common throughout its length. Gravel and sand are the dominant bottom materials in the moderate gradient channel. Most of the tributaries of Lower Salmon Creek are less than 1.5 miles in length and have widths of 1 to 3 yards. Their channels are composed primarily of gravel and sand with log and debris jams common.

There are other lesser tributaries of North River in this reach. Among these are North Branch, Bitter Creek, East Fork, Joe Creek, and other unnamed streams. These creeks are generally less than 6 yards wide during the winter and 3 yards during the summer in their lower reaches. Bitter Creek is one of the few which has significant amounts of gravel in the streambed. Only occasional gravel patches are found in the other tributaries where silt and sand are the dominant bottom materials. Most of these streams reportedly contain numerous log and debris jams.

Salmon Utilization

The mainstem of North River provides transportation, spawning, and rearing area for runs of fall chinook, chum, and coho. Chum spawning occurs primarily near the head of tidal water while chinook spawning occurs in all of the limited gravel riffle areas. An excellent run of chum enters Bitter and Lower Salmon creeks annually. Coho production occurs in all accessible areas with suitable spawning area. Lower Salmon Creek is the most important coho production

area. All of the mainstem North River and approximately 50 linear miles of tributary streams in this section are presently utilized by salmon.

Limiting Factors

Salmon production in the mainstem North River is restricted by limited quantities of spawning area which have not been heavily silted. Logging and road construction have severely impacted salmon production on most of the tributary streams. Several streams which were formerly very productive, such as Hatchery Creek, are no longer suited for salmon rearing or spawning. Several of the smaller tributaries have natural barriers at or near their mouths. Log and debris jams hinder or prevent salmon movement on many tributaries.

Beneficial Developments

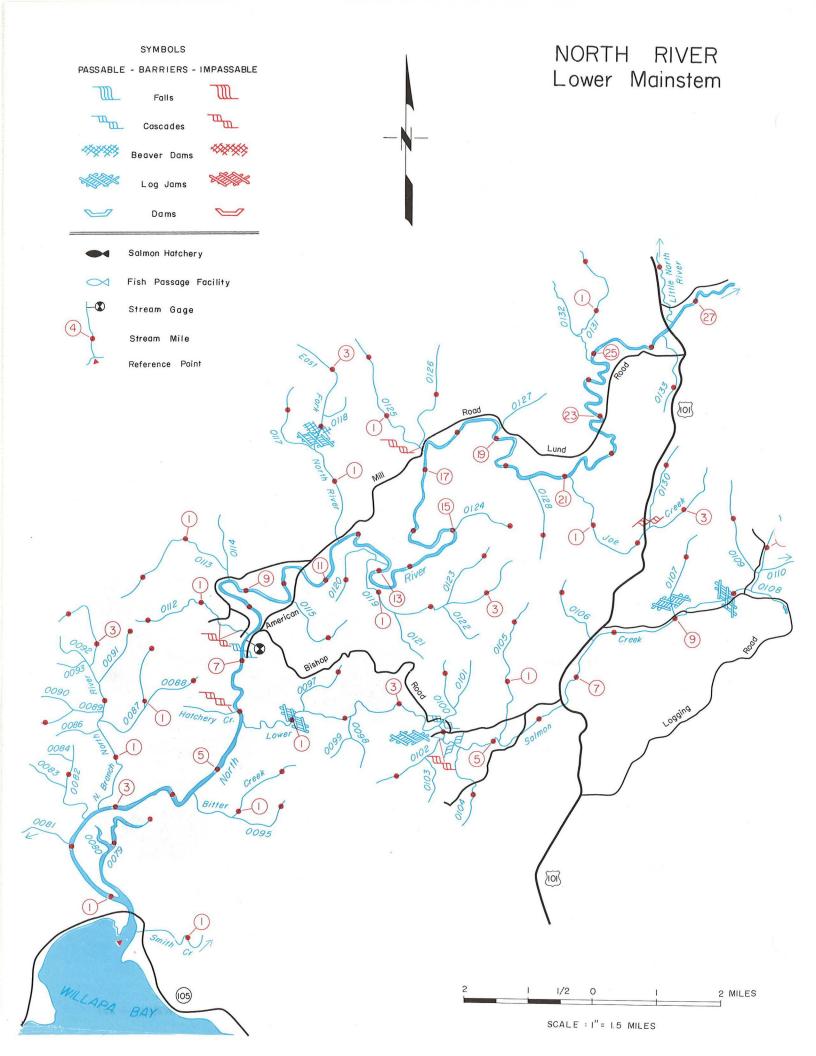
With the exception of the removal of several major log jams, particularly on Lower Salmon Creek, no beneficial developments for salmon production have been undertaken.

Habitat Needs

Additional environmental surveys are required before improvement projects can be recommended. Far more concern for the aquatic ecology must be displayed during future logging and road construction activities if the remaining production habitat is to be maintained.



PHOTO 24-8. Coho production habitat on lower Salmon Creek.



NORTH RIVER Lower Mainstem Willapa Basin — WRIA 24

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0034	North River	NW ¼ ,Sec35, T15N,R10W	61.7	319.2	Coho,Chum,Chin.
0035	Smith Creek	LB-0.2	27.9	67.2	Coho,Chum,Chin.
	(See Willapa 303)		21		
0079	Unnamed Slough	LB-0.8	2.0	_	Coho, Chum
0081	Unnamed	RB-2.0	1.0	_	Chum, Coho
0082	Unnamed	RB-2.5	1.4	_	Chum, Coho
0085	N. Br. North River	RB-2.75	4.2	_	Chum, Coho
0087	Unnamed	LB-1.6	2.0	_	Unknown
8800	Unnamed	LB-0.8	1.1		Unknown
0089	Unnamed	RB-1.8	1.1	_	Unknown
0091	Unnamed	LB-2.3	1.0	_	Unknown
0094	Bitter Creek	LB-4.4	2.3	_	Chum, Coho
0095	Unnamed	RB-0.8	1.1	_	Coho
0096	Lower Salmon Cr.	LB-5.7	11.6	_	Chum,Coho,Chin.
0097	Unnamed	RB-1.3	1.2	_	Coho
0100	Unnamed	RB-3.9	1.2	_	Unknown
0102	Unnamed	LB-4.1	1.3	_	Coho
0104	Unnamed	LB-4.4	1.4	_	Coho
0105	Unnamed	RB-5.2	2.4	_	Coho
0106	Unnamed	RB-7.6	1.2	_	Coho
0107	Unnamed	RB-9.0	1.4	_	Coho
0109	Unnamed	RB-10.6	1.6	_	Unknown
0112	Unnamed	RB-7.4	2.2	_	None
0113	Unnamed	RB-8.7	2.4	_	Coho
0115	Unnamed	LB-9.7	1.4	_	Coho
0116	E. F. North River	RB-11.7	3.7	_	Coho
0117	Unnamed	RB-1.6	1.4	_	Coho
0119	Unnamed	LB-12.8	3.7	_	Coho
0120	Unnamed	LB-0.2	1.4	_	Unknown
0123	Unnamed	RB-2.3	1.2	_	Unknown
0124	Unnamed	LB-15.0	1.0	_	Unknown
0125	Unnamed	RB-17.4	2.4	_	Unknown
0126	Unnamed	LB-O.1	1.8	_	Unknown

NORTH RIVER Lower Mainstem Willapa Basin — WRIA 24

Stream		Location		Drainage	* 1
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
0128	Unnamed	LB-20.4	1.4	_	Coho
0129	Joe Creek	LB-21.1	3.8		Coho
0130	Unnamed	RB-2.3	1.4	_	Coho
0131	Unnamed	RB-24.9	2.2	_	Coho
0133	Unnamed	LB-26.3	1.4		Coho
0133	Little North River	RB-26.6	12.8	20.2	Cono
0134	(See Willapa 403)	NB 20.0	12.0	20.2	
	(Cont. Willapa 403)				
	(com. wmapa 400)				

SMITH CREEK

Smith Creek and its tributaries are discussed in this section. Smith Creek is the largest tributary of North River and has a drainage area of 67.2 square miles. The creek is 27.9 miles long and has 17 tributaries providing an additional 84.; linear miles of tributary stream.

Stream Description

The Smith Creek watershed is devoted almost entirely to timber production. A few scattered rural residences are found in the watershed with little cleared farmland. State Highway 105 crosses the stream just above its confluence with North River and U.S. Highway 101 runs through the middle of the drainage in a north-south direction. Private and county roads provide access to other reaches of Smith Creek and many of its tributaries.

Smith Creek has its source in the low hills in north Pacific County northeast of Raymond. The stream flows in a westerly direction through a varying width valley until it reaches the tidal estuary. Above U.S. Highway 101 the streambed is primarily composed of sand and silt with an occasional patch of gravel. The low-gradient channel is well shaded by mixed timber. During the winter and summer the creek averages 10 and 6 yards wide, respectively, and is predominantly pool area.

The character of Smith Creek changes little below Highway 101; however, gravel and rubble become more abundant. Average stream width during the summer months is 10 yards and during the winter, 15 yards. The stream is affected by tidal influence up to at least mile 1.0.

A large number of tributaries enter Smith Creek along its course. Elkhorn Creek, the largest of these, is 10.1 miles long and has 20.3 miles of tributary stream. The streambed is primarily sand and silt with infrequent patches of gravel. Elkhorn Creek has an average summer width of 5 yards and a winter width of 8 yards in its lower three miles. These average widths diminish to 2 and 4 yards, respectively, in the upper area of salmon use. Tributaries of Elkhorn Creek are generally less than 2 miles in length. These streams have very little gravel in their streambeds.

Other tributaries of Smith Creek are generally less than 3.5 miles long. Most of the tributaries upstream from U.S. Highway 101 are silt and sand bottomed with little gravel present. Butte Creek is the primary exception to this. Butte Creek, while consisting mainly of silt and sand, does contain intermittent gravel areas. All of these tributaries are 4 yards or less in width during the winter and 2 yards or less during the summer.

Several tributaries of Smith Creek below Highway 101 have salmon production characteristics. Clearwater Creek is the best of these. This stream has an abundance of gravel and rubble in its well-shaded channel. The creek has an average summer width of 3 yards and a winter width of 5 yards.

Salmon Utilization

The Smith Creek drainage maintains runs of chum, chinook and coho. Spawning in the mainstem by all three of these species occurs on gravel riffles below Highway 101. Coho also spawn in the upper reaches of the creek where

suitable material is found. Chinook are known to also spawn in Clearwater Creek and may be present in several other tributaries. Butte and Clearwater Creeks are the better coho production areas in the watershed; however, these fish utilize all streams where spawnable gravel exists. An estimated 26 miles of Smith Creek and approximately 56 linear miles of tributaries are presently utilized by salmon.

Limiting Factors

The primary factor restricting salmon production in this watershed is the limited amount of spawning gravel available. Upper Smith Creek, for example, has extremely little spawning area and it is non-existent on many tributaries. Road construction and logging activities have reduced the quality of existing spawning area. Log and debris jams are common on many of the stream reaches.

Beneficial Developments

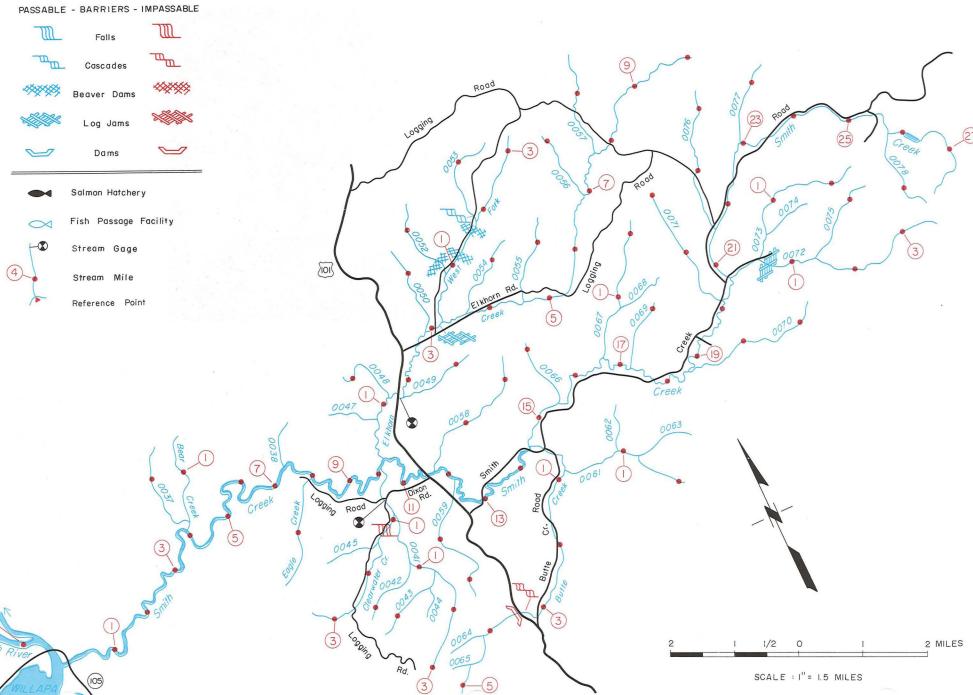
There have been no beneficial developments for salmon production in this watershed.

Habitat Needs

Coho fry plants should be made in this watershed to utilize existing rearing area. The feasibility of constructing controls and emplacing gravel for natural spawning should be explored, particularly on upper Smith and Elkhorn creeks.



PHOTO 24-9. Three species of salmon spawn below the falls on Clearwater Creek.



SYMBOLS

SMITH CREEK Willapa Basin — WRIA 24

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0034	North River				Coho,Chum,Chin.
0035	Smith Creek	LB-0.2	27.9	67.2	Coho,Chum,Chin.
0036	Bear Creek	RB-3.9	1.7		Unknown
0037	Unnamed	RB-0.2	1.5	_	Unknown
0039	Eagle Creek	LB-8.1	1.9	_	Coho, Chum
0040	Clearwater Creek	LB-10.2	3.4	4.10	Coho,Chin.,Chum
0041	Unnamed	RB-0.9	3.0		Coho
0042	Unnamed	LB-0.9	1.2		Unknown
0043	Unnamed	LB-1.3	1.4	_	Unknown
0046	Elkhorn Creek	RB-10.4	10.1	17.2	Coho, Chinook
0048	Unnamed	RB-1.3	1.2		Coho
0049	Unnamed	LB-1.7	1.3		Coho
0050	Unnamed	RB-2.9	1.4	_	Coho
0051	W.F. Elkhorn Cr.	RB-3.2	3.3		Coho
0052	Unnamed	RB-0.8	1.4	_	Unknown
0053	Unnamed	RB-1.8	1.6	-	Unknown
0054	Unnamed	RB-3.6	1.3		Unknown
0055	Unnamed	RB-4.6	1.4		Unknown
0056	Unnamed	RB-6.9	1.1		Unknown
0057	Unnamed	RB-7.6	1.6		Unknown
0058	Unnamed	RB-11.7	2.4	-	Unknown
0059	Unnamed	LB-12.1	2.3	_	Unknown
0060	Butte Creek	LB-14.5	5.1		Coho
0061	Unnamed	RB-0.8	2.1	_	Coho
0066	Unnamed	RB-15.4	1.1	_	Unknown
0067	Unnamed	RB-16.6	2.2	_	Unknown
0069	Unnamed	RB-17.3	1.1	·	Unknown
0070	Unnamed	LB-18.6	2.3		Unknown
0071	Unnamed	RB-20.2	2.0		Unknown
0072	Unnamed	LB-20.7	3.5	5.07	Unknown
0073	Unnamed	RB-0.5	2.4	_	Unknown
0075	Unnamed	RB-1.4	1.3		Unknown
0076	Unnamed	RB-21.6	2.3	_	Unknown
0077	Unnamed	RB-23.0	1.3	_	Unknown
0078	Unnamed	LB-25.8	1.5	_	Unknown
	Unnamed Lake	Outlet-26.0			

NORTH RIVER Little North River Area

The Little North River area discusses the North River watershed between U.S. Highway 101 bridge and the mouth of Vesta Creek. This section contains 16.1 miles of the mainstem North River along with 7 tributaries totalling 53.6 linear miles of tributary streams.

Stream Description

North River flows in a northwesterly direction downstream from the confluence of Vesta Creek to the Highway 101 crossing. This reach is paralleled by the North River Road. Both private and public roads provide access to the main tributary streams. Most of the river in this reach is confined to a deeply-cut channel which has an average summer width of 20 yards and a winter width of 25 yards near the lower end of this section. Below Vesta Creek the river averages 13 and 18 yards during the summer and winter, respectively. The streambed is predominantly sand and silt with an infrequent riffle of gravel and rubble. This low gradient, meandering stream channel is moderately shaded by mixed timber and brush.

This reach of the North River has two major tributaries. Little North River, the largest of these, enters the right bank of North River a short distance upstream of Highway 101 crossing. This stream heads in a low ridge of hills separating the Chehalis and North River watersheds. The stream is 12.8 miles in length and has 78.5 miles of tributary stream. The lower reaches of Little North River have an average summer width of 6 yards and a winter width of 10 yards. The streambed here, as well as the remainder of the river, is composed primarily of silt and sand with an occasional gravel area. The stream channel meanders through predominantly alder-covered ravine and bottomland. The stream is moderately shaded by deciduous vegetation. The upper reaches of the stream narrow to 2 and 3 yards during the summer and winter months, respectively. Except in the lower mile where riffle area is common, the stream is composed primarily of slow-moving pools. A number of small tributaries feed into Little North River. These streams for the most part are less than 2.5 miles in length. These channels are generally less than 4 yards in width during the winter months and 2 yards in the summer. The streambeds are composed predominantly of silt and sand with infrequent patches of gravel.

Salmon Creek is also a right bank tributary of the North River and is 8.2 miles long. The lower reaches of Salmon Creek have summer and winter widths of 6 to 8 yards, respectively. The streambed in the lower mile consists of gravel, silt and sand. Above this point only an occasional patch of gravel is found in an otherwise silt and sand streambed. The upper reaches of this stream narrow to 3 and 1 yards during the winter and summer months. The stream is generally well shaded by deciduous vegetation. The moderate gradient stream channel consists of both pool and riffle areas. Salmon Creek tributaries are less than 3 miles in length. Logging debris and sand characterize a small tributary stream.

The remaining tributaries of North River and this reach are less than 3 miles in length. Their streambeds are composed primarily of silt and sand with infrequent gravel riffles.

Salmon Utilization

This reach of North River provides spawning, transportation and rearing area for runs of chinook, coho and chum salmon. Limited chinook and chum spawning areas exist in the mainstem. Coho spawning is confined to the limited areas of suitable gravel riffle in the tributary streams. Chinook and chum have not been observed in these tributaries. The majority of the salmon passing through this reach are destined for upriver spawning areas. All 16 miles of the mainstem North River along with an estimated 46 linear miles of tributary streams are presently utilized by salmon.

Limiting Factors

As is the case of the North Lower River area, salmon production in this section is restricted by limited spawning area both in the mainstem and in the tributary stream. Logging activities have made noticeable impact on several of the tributary streams. Logging debris is common throughout most of the tributaries. Stream bank cover has also been removed from many of these during recent logging operations

Beneficial Developments

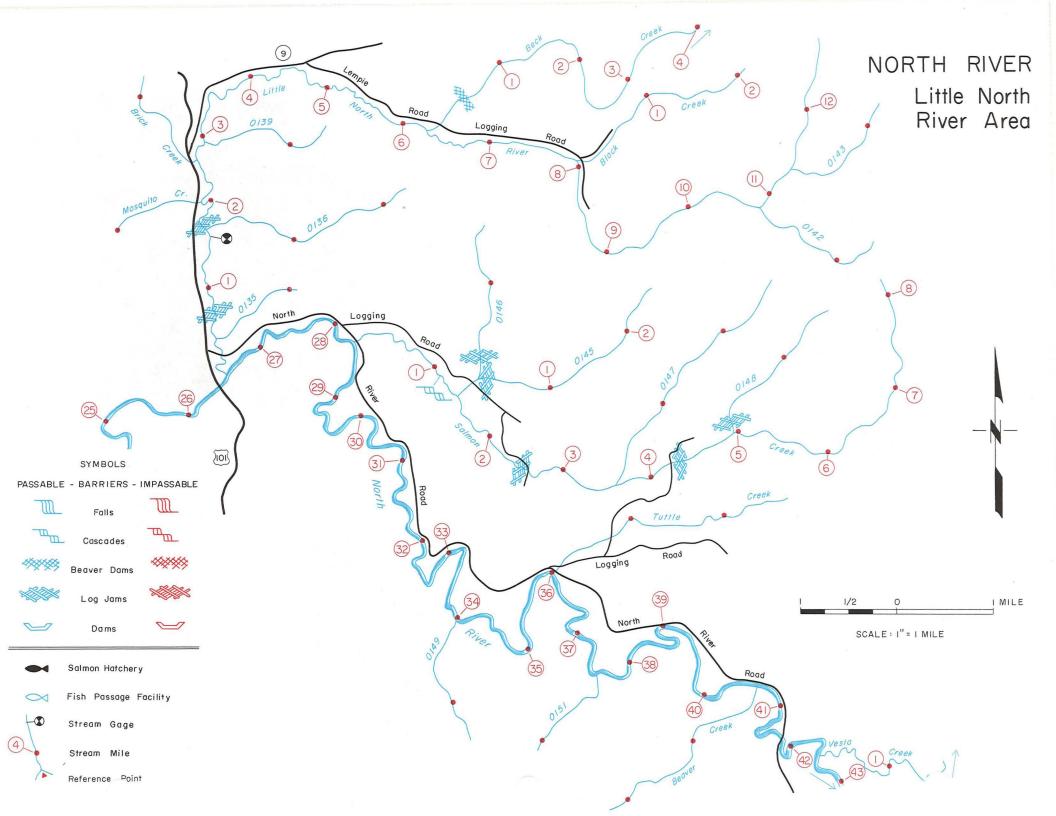
There have been no beneficial developments in this section of the North River.

Habitat Needs

Additional concern for the aquatic environment must be shown in future logging and road construction programs. Coho fry plants in tributary streams could make use of existing, underseeded rearing area. Installation of gravel spawning areas may be feasible on Little North River and Salmon Creek.



PHOTO 24-10. Many areas such as this on Salmon Creek contain little spawning gravel.



NORTH RIVER Little North River Area Willapa Basin — WRIA 24

Stream		Location		Drainage	
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
0034	North River				Chum,Chin.,Coh
0134	Little North River	RB-26.6	12.8	20.2	Coho
0135	Unnamed	LB-0.5	1.1	_	Coho
0136	Unnamed	LB-1.6	2.3	_	Coho
0137	Mosquito Creek	RB-2.1	1.0	_	Coho
0138	Brick Creek	RB-2.7	1.2	_	Coho
0139	Unnamed	LB-2.9	1.5	_	Coho
0140	Beck Creek	RB-6.3	5.5	_	Coho
	Unnamed Lake	Outlet-4.05	_	_	
0141	Black Creek	RB-7.9	2.1	_	Coho
0142	Unnamed	LB-10.8	1.5	_	Unknown
0143	Unnamed	LB-11.4	1.3	_	Unknown
0144	Salmon Creek	RB-28.3	8.2		Coho
0145	Unnamed	RB-1.4	2.5	_	Coho
0146	Unnamed	RB-0.25	1.7	_	Unknown
0147	Unnamed	RB-3.7	2.8	_	Unknown
0148	Unnamed	RB-5.0	1.7	_	Unknown
0149	Unnamed	LB-34.0	1.4	_	Unknown
0150	Tuttle Creek	RB-36.0	2.7	_	Coho
0151	Unnamed	LB-37.6	1.1	_	Unknown
0152	Beaver Creek	LB-40.6	2.2	_	Coho
0153	Vesta Creek	RB-42.6	11.9		
	(See Willapa 503)				
	36				

VESTA CREEK

This section describes the entire Vesta Creek watershed. Vesta Creek is a major North River tributary and has a drainage area of 31.2 square miles. Vesta Creek is 6.5 miles in length and has 13 tributaries containing 42.6 linear miles of tributary stream.

Stream Description

Vesta Creek lies within timber production land with the exception of a limited amount of farmland near its confluence with North River. Private logging roads provide the only access to this watershed. Vesta Creek, formed by the confluence of its East and West forks, flows southwesterly through a broad stream valley. This stream has a very low gradient and is well shaded by mixed timber. The stream has an average width of 7 and 9 yards during thensummer and winter in its lower extremities. These diminish to 4 and 6 yards, respectively, nearer the confluence of the East and West forks. The streambed in the lower 5 miles is composed almost entirely of silt and sand. Gravel and bedrock outcroppings are found interspersed with silt and sand in the upper 1.5 miles.

East and West Fork Vesta Creek drainages are nearly identical in size. The West Fork, however, is a larger stream averaging 6 and 3 yards in width during the winter and summer, respectively, in its lower reaches. Lower East Fork has winter and summer widths of 4 and 2 yards, respectively. Both branches are moderately shaded by deciduous vegetation. Buffer zones of alder have been retained on much of the lower reaches of the West Fork. Their streambeds consist primarily of silt and sand with gravel becoming increasingly abundant in the upper reaches.

Other tributaries of Vesta Creek and the two forks range up to 3.5 miles in length. Most of these are less than 3 yards in width during the winter and less than 2 yards in the summer. The tributaries of Vesta Creek and the lower-most tributaries of East and West forks have very little gravel in the silt and sand streambeds. Gravel is more abundant in the upper tributaries of the two forks.

Salmon Utilization

Vesta Creek watershed supports rüns of coho as well as a limited number of chum salmon. Small numbers of chinook may also enter this stream. Chum spawning occurs in the limited suitable riffles below the cascades near mile 3.0. Potential chinook spawning area is limited to Vesta Creek below the forks. Coho utilize all accessible stream reaches containing suitable spawning material. The better production areas are the upper reaches of both the East and West Fork as well as their upper tributaries. Salmon production in smaller Vesta Creek tributaries, including Deer, Fir, and Leach creeks, is poor. All of the mainstem Vesta Creek and an estimated 34 linear miles of tributary stream are presently utilized by salmon.

Limiting Factors

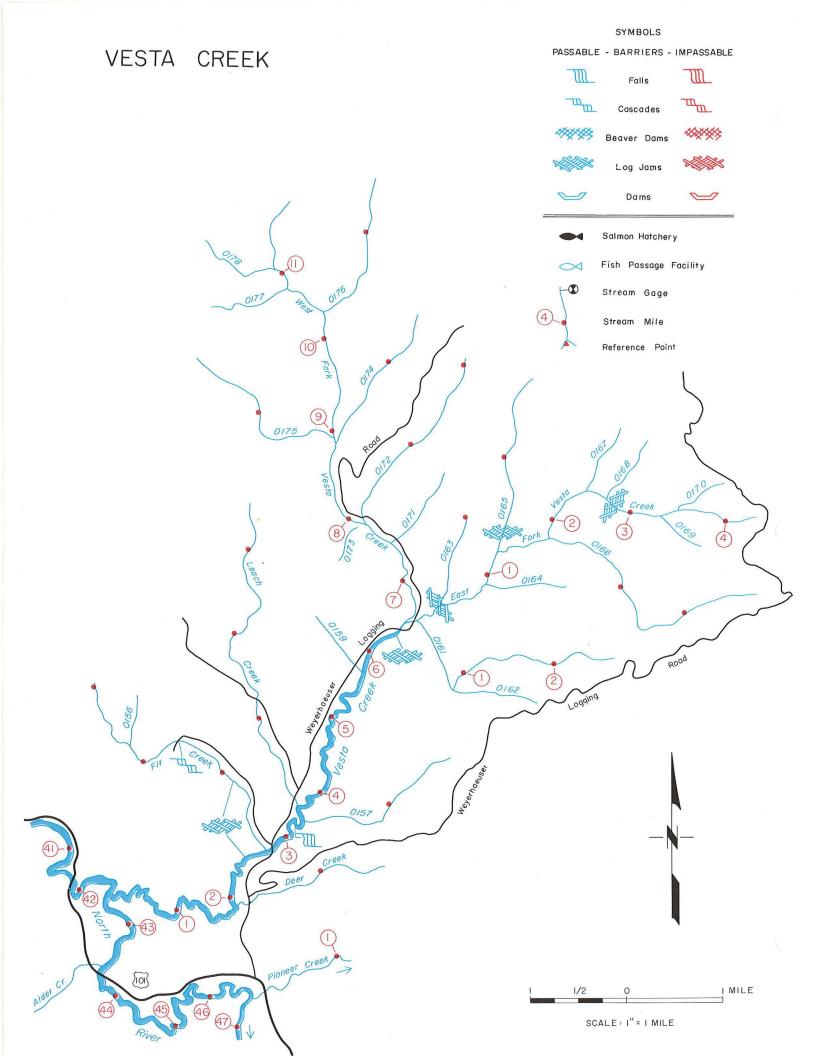
Lack of suitable spawning material is the major factor restricting salmon production in the Vesta Creek watershed. Spawning area is almost completely absent in several tributaries. Extensive clear-cut logging has removed much of the protective stream margin vegetation; however, buffer strips have been left standing along certain stream sections. Existing spawning areas have been impacted for siltation resulting from road and logging operations. Log and debris accumulations are common on several tributaries, as well as on East Fork Vesta Creek. These may hinder movement of adult coho. A cascade area on Vesta Creek near mile 3.0 may be a block to adult chum salmon.

Beneficial Developments

There have been no beneficial developments for salmon production in this watershed.

Habitat Needs

The lack of significant quantities of suitable spawning in Vesta Creek drainage can be particularly compensated for the stocking of coho fry. Installation of gravel spawning beds on tributaries may be feasible.



VESTA CREEK Willapa Basin — WRIA 24

Stream	_	Location		Drainage	
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
0034	North River				Coho,Chin.,Chur
0153	Vesta Creek	RB-42.6	11.9	31.2	Coho, Chum
0154	Deer Creek	LB-1.9	1.7	_	Coho
0155	Fir Creek	RB-2.75	3.1		Coho
0157	Unnamed Tributary	LB-3.5	1.8		Unknown
0158	Leach Creek	RB-3.65	3.5	_	Coho
0160	E. F. Vesta Creek	LB-6.5	4.3	9.11	Coho
0161	Unnamed	LB-0.1	2.6	-	Unknown
0163	Unnamed	RB-0.4	1.0	_	Unknown
0165	Unnamed	RB-1.3	1.9	_	Coho
0166	Unnamed	LB-1.8	2.8	_	Coho
	Vesta Cr. cont. as W. F. Vesta Creek	@ mi. 6.5		9.65	Coho
0172	Unnamed	LB-7.85	2.1	_	Coho
0174	Unnamed	LB-8.9	1.6	National Property Control of Cont	Coho
0175	Unnamed	RB-8.95	1.9	_	Coho
0176	Unnamed	LB-10.3	1.6		Unknown

*

NORTH RIVER Headwaters

This section includes the uppermost reaches of the North River drainage upstream from the mouth of Vesta Creek. In total, 16.6 miles of mainstem North River and 123.9 linear miles of streams are included in the 15 tributaries.

Stream Description

This section of the North River drainage is almost entirely in timber production. A small number of rural home sites are scattered throughout the area, most being found along the mainstem valley. Access to the mainstem is by the North River road; both private and public roads provide access to the major tributaries. The logging community of Brooklyn is the only settlement in the section. It is located at the confluence of Fall River and North River. The majority of the drainage is well shaded by mixed stands of deciduous and coniferous trees.

The mainstem North River flows generally in a westerly direction in this reach. The gradient is relatively flat with a 90-10 pool to riffle ratio. The bottom is principally sand and gravel. Spawning areas are few in number and poor in quality throughout this section. Average flows range from 25-75 cfs during the summer to 750-1500 cfs during the winter at the lower end of this section.

This drainage is characteristic of other headwater systems in the basin in that it is made up of a number of nearly equal drainages. The longest and most southerly of these is Fall River which drains an area of approximately 41 square miles. Fall River has a predominantly rubble and gravel bottom. The average summer width ranges from 3 to 7 yards, from the lower to upper end, expanding to 5-10 yards during winter runoff. Other main tributaries include Pioneer Creek, Raimie Creek, and Redfield Creek. Pioneer Creek drains an area of approximately 108 square miles and is 7.8 miles in length. The estimated summer width ranges from 3 to 6 yards and the winter width 6 to 8 yards. The bottom in this creek is predominantly gravel with a fairly steep gradient throughout its length. Raimie Creek is formed by two main forks with a total length of 11.5 miles. The left fork of Raimie Creek is steep in gradient with rubble and gravel being the predominant bottom types. The right fork has a slightly flatter gradient and a rubble-sand bottom. Of the two, the left fork is the most important salmon producer. Redfield Creek is the uppermost tributary to the North River. It has a steep gradient with the bottom materials being principally gravel and sand. The average width of Redfield Creek ranges from 1 to 4 yards during the summer, and 3 to 6 yards during the winter months.

Salmon Utilization

This area provides transportation, spawning and rearing for significant numbers of chinook and coho salmon. A small number of chum salmon may utilize Pioneer Creek in good years. Chinook utilize Fall River, Pioneer Creek, Raimie Creek and the mainstem for spawning. Fall River is the most important tributary for chinook. Coho utilize all accessible areas within this section; the most important tributaries being Pioneer, Raimie and Redfield creeks. Production in

other tributary streams is generally low. Approximately 15.5 miles of mainstem North River in this section and some 63 linear miles of tributary stream are presently utilized by salmon.

Limiting Factors

Lack of suitable spawning material is the major factor limiting salmon production in this section. A number of natural barriers also exist in this drainage that prohibit utilization of some good spawning and rearing areas. Beaver dams are prevalent and also limit upstream usage in some areas. Poor logging practices have resulted in heavy siltation in some portions of this drainage.

Beneficial Developments

In the fall of 1965 a falls near the mouth of Fall River was laddered to allow fish passage. Also in 1965, a second falls approximately one mile upstream from the ladder was removed by blasting.

Habitat Needs

Coho fry plants in barren and under-utilized tributary streams could increase salmon production in this section. Further removal of natural and man-made barriers would also be desirable. Control of summer low flows to streams in this section could greatly increase coho production.

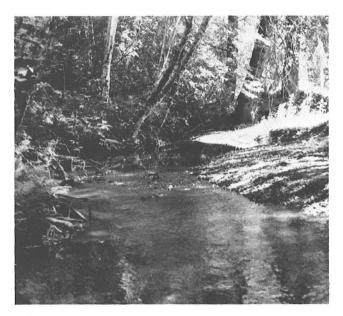
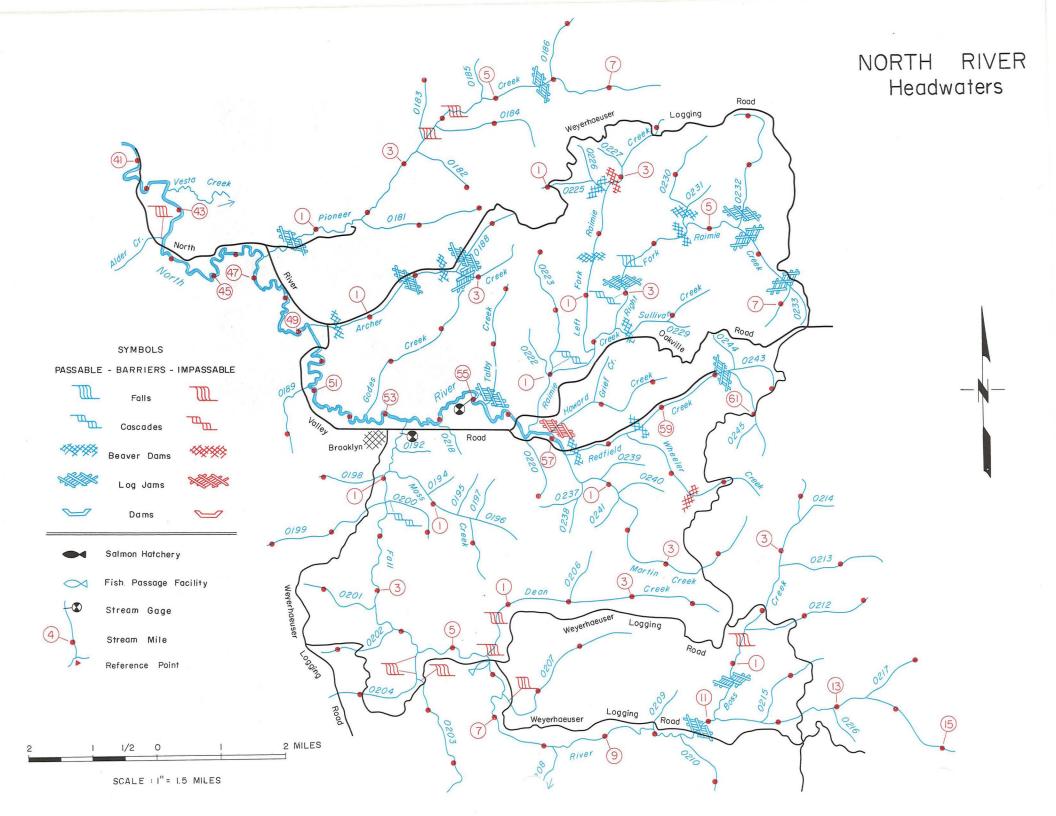


PHOTO 24-11. Many tributaries like Pioneer Creek provide suitable salmon habitat.



NORTH RIVER Headwaters Willapa Basin — WRIA 24

Stream		Location		Drainage	
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
0034	North River				Coho,Chin.,Chum
0153	Vesta Creek	RB-42.6	11.9	_	Coho, Chum
	(See Willapa 503)				
0180	Pioneer Creek	RB-46.6	7.8	_	Coho, Chinook
0181	Unnamed	LB-1.8	2.0	_	Coho
0182	Unnamed	LB-3.3	1.0	_	Coho
0183	Unnamed	RB-3.5	1.0	_	Coho
0184	Unnamed	LB-3.8	1.8	-	None
0186	Unnamed	RB-6.0	1.1	_	None
0187	Archer Creek	RB-49.2	3.8	_	Coho
0188	Unnamed	LB-2.6	1.4	-	Coho
0189	Unnamed	LB-50.9	1.3	_	
0190	Godes Creek	RB-52.5	2.8	_	Coho
0191	Fall River	LB-53.3	15.2	_	Coho, Chinook
0193	Moss Creek	RB-0.9	2.6	_	Coho
0198	Unnamed	LB-0.9	1.1	-	Unknown
0199	Unnamed	LB-1.4	2.1	_	Unknown
0200	Unnamed	RB-1.41	1.1	_	Unknown
0201	Unnamed	LB-3.2	1.3	_	Unknown
0202	Unnamed	LB-3.9	1.3	_	Unknown
0203	Unnamed	LB-4.4	2.6	_	None
0204	Unnamed	LB-0.5	1.5	_	None
0205	Dean Creek	RB-5.6	4.4	4.07	None
0207	Unnamed	RB-6.4	2.9	_	Coho
0208	Unnamed	LB-8.1	1.0	_	Coho
0210	Unnamed	LB-10.4	1.2	_	Coho
0211	Boss Creek	RB-11.1	4.3		Coho
0212	Unnamed	LB-1.6	2.0	_	None
0213	Unnamed	LB-2.8	1.7	_	None
0215	Unnamed	RB-11.8	1.6		Unknown
0217	Unnamed	RB-13.5	1.0	_	Unknown
0219	Talby Creek	RB-55.3	2.1	_	Coho
0220	Unnamed	LB-56.4	1.0	_	Unknown
0221	Raimie Creek	RB-56.5	7.4	15.2	Coho, Chinook

NORTH RIVER Headwaters Willapa Basin — WRIA 24

itream		Location		Drainage	
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
)223	Unnamed	RB-1.0	2.0	_	Coho
)224	L. F. Raimie Creek	RB-1.9	4.2	_	Coho
225	Unnamed	RB-2.6	1.1	_	None
	Raimie Cr. cont. as R. F. Raimie Creek	@ mi. 1.9		9.33	Coho
228	Sullivan Creek	LB-2.4	1.6	_	Coho
230	Unnamed	RB-4.6	1.7	_	None
232	Unnamed	RB-5.5	2.2		None
234	Howard Creek	RB-56.9	2.2		Coho
236	Martin Creek	LB-57.3	4.8	_	Coho
	North River cont. as Redfield Creek	@ mi. 57.31		5.39	Coho
0242	Wheeler Creek	LB-58.3	2.6	_	Coho
243	Unnamed	RB-60.2	1.0	_	Unknown

WILLAPA RIVER Lower Mainstem

This section includes the lower Willapa River and tributaries from its mouth on Willapa Bay upstream to the mouth of Mill Creek. There are 18.1 miles of mainstem river and 7 tributaries contributing 43.7 miles of stream drainage within this section. (All of the mainstem and approximately 13.0 miles of tributaries are presently utilized by salmon.) In addition, 3 independent streams enter Willapa Bay in this section.

Stream Description

The Willapa River channel flows westerly in this section through the towns of Raymond and South Bend. The lower portions of river within this section are densely populated while the upper reach flows through sparsely populated farmland. Access to this reach of the Willapa River is plentiful and provided by both public and private roads. The mainstem river in this section (from the mouth to R.M. 18.1) is entirely within tidal influence. The bottom is principally sand, silt, and mud with a scattering of gravel in the upper portions of this reach. The stream channel has an average width of 300 to 400 yards at its mouth, and 40 to 50 yards at the mouth of Mill Creek.

Most of the tributaries in this section are either totally or substantially within tidal influence. These sloughs are primarily unshaded with the surrounding vegetation consisting of various marsh grasses. Only occasional gravel areas suitable for spawning are found and these are generally poor in quality. The principal bottom types are mud and silt. Coho utilize the upper reaches of several of these tributaries, but their over-all value as spawning areas is limited.

The most important tributaries from the standpoint of salmon production are Johnson Slough, Fleiss Creek, Electric Light Creek, Pottea Slough, Skidmore Slough, Elk Creek and Ellis Slough. All of these streams are short in over-all length and carry little fresh water into the drainage, even though some have impressively large estuaries.

Salmon Utilization

This reach of the mainstem Willapa River provides transportation, spawning, and rearing areas for chinook, coho, and chum salmon. The tributary streams and sloughs in this section provides limited spawning and rearing areas for coho. This reach of the Willapa River also serves as the transitional area for juvenile salmon between leaving the freshwater portion of their life cycle and entering the marine environment. There are 18 miles of mainstem Willapa River plus approximately 13 linear miles of tributaries presently being utilized by salmon.

Limiting Factors

Salmon production in this section is limited primarily by the lack of suitable spawning areas. Bottom types in this area are typically silt and mud and very few high quality spawning areas exist. Logging and industrial activities have limited the production potential in this section by an unknown amount.

Beneficial Developments

There have been no beneficial developments for salmon production in this section except for some private aquacultural experiments carried out in Johnson Slough.

Habitat Needs

Some of the lower tributaries have potential for aquacultural purposes, particularly for chum salmon. Maintenance dredging; industrial, residential, and agricultural activities, and logging operations all compete with salmon in this section for the water resource. More concern for the aquatic environment must be displayed if the remaining production is to be maintained or enhanced.

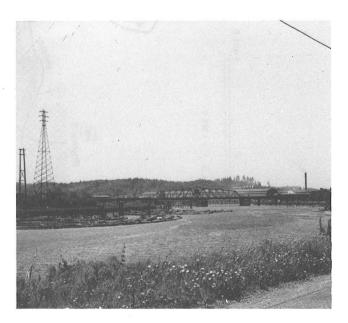
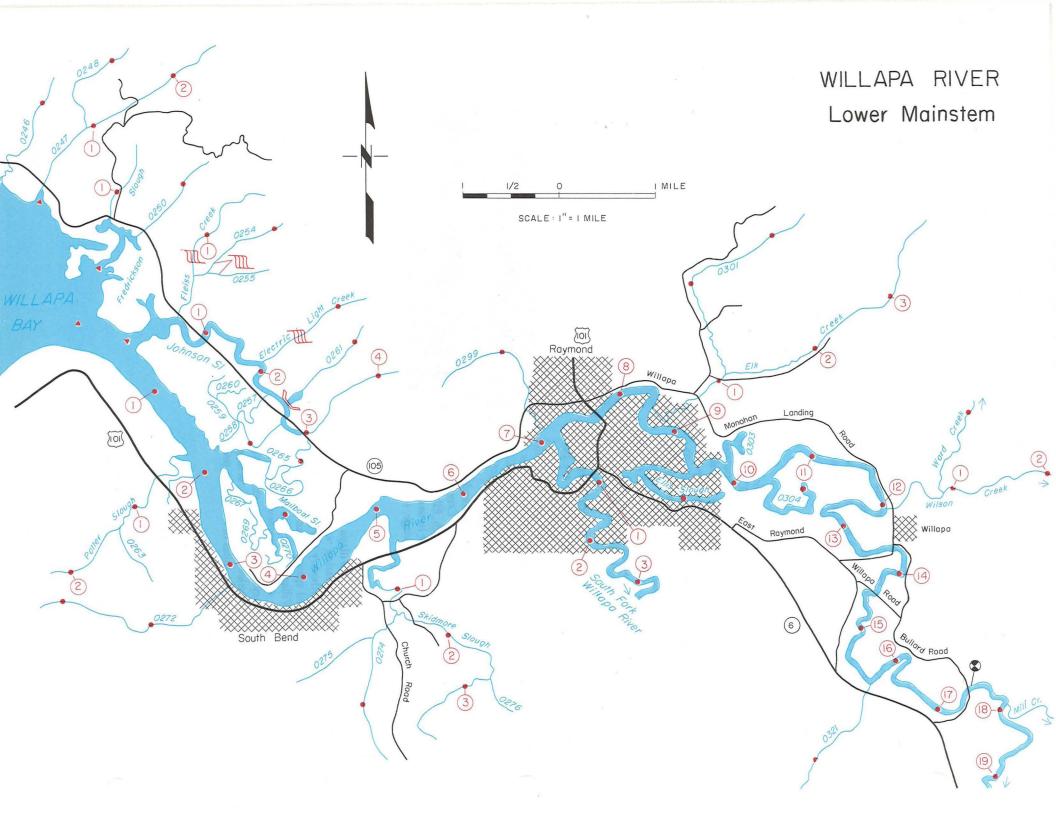


PHOTO 24-12. Willapa River estuary.



WILLAPA RIVER Lower Mainstem Willapa Basin — WRIA 24

Stream		Location		Drainage	
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
0246	Unnamed	NE1/4,Sec1, T14N,R10W	1.3	_	Unknown
0247	Unnamed	SW ¼ ,Sec6, T14N,R9W	2.5	_	Coho
0248	Unnamed	RB-0.9	1.2	_	Unknown
0249	Fredrickson Slough	SW½,NW¼,Sec8, T14W,R9W	1.6	_	Unknown
0250	Unnamed	LB-0.5	1.4	_	Unknown
0251	Willapa River	NE1/4,Sec18, T14N,R9W	44.6	258.0	Coho,Chin.,Chum
0252	Johnson Slough	RB-0.4	4.2	_	Coho
0253	Fleiss Creek	RB-0.55	1.8	_	Chum, Coho
0254	Unnamed	LB-0.5	1.1		Unknown
0256	Electric Light Cr.	RB-1.9	1.3	_	Coho
0257	Unnamed Slough	LB-2.3	1.5	_	Coho
0261	Unnamed	RB-2.5	1.2	_	Coho
0262	Potter Slough	LB-1.8	2.2		Coho
0264	Mailboat Slough	RB-1.9	1.4	_	Unknown
0265	Unnamed Slough	RB-0.15	1.4	_	Unknown
0272	Unnamed	LB-3.1	2.3	_	Coho
0273	Skidmore Slough	LB-5.3	3.9	_	Coho
0274	Unnamed	LB-1.4	1.6	_	Unknown
0277	S. F. Willapa River	LB-7.1	21.5	_	Coho,Chum,Chin.
	(See Willapa 803)				
0299	Unnamed	RB-7.11	1.7	_	Unknown
0300	Elk Creek	RB-8.5	3.9	5.69	Coho
0301	Unnamed	RB-1.1	2.4	_	Coho
0302	Ellis Slough	LB-9.5	1.4	_	Coho
0304	Unnamed Slough	LB-10.4	1.1	_	Coho
0305	Wilson Creek	RB-12.0	11.2	_	Coho, Chum
	(See Willapa 903)				
0321	Unnamed	LB-15.6	1.3	_	Unknown
0322	Mill Creek	RB-17.9	13.0	-	Coho,Chum,Chin.
	(See Willapa 1003)				



SOUTH FORK WILLAPA RIVER

This section includes the entire South Fork Willapa drainage from its headwaters to its mouth. The mainstem of the South Fork is 21.5 miles in length with 14 tributaries providing an additional 30.1 miles of stream drainage in this section.

Stream Description

The South Fork Willapa River is a short coastal stream about 22.0 miles in length which flows through the Willapa Hills in a northerly direction and enters the Willapa River estuary at Raymond, Washington. Elevations range from sea level up to about 2,000 feet in the surrounding hills. The watershed is largely coniferous forest, composed of western hemlock, Douglas fir, Western Red cedar, and Sitka spruce. Hemlock is particularly abundant. Logging has been carried on since the late 1800's and stands of timber of various ages exist. There is some cleared farmland in the mainstem valley area in the vicinity of Rue Creek, and in the Rue Creek Valley, also. A golf course borders a portion of the lower river on the outskirts of Raymond. Before entering the Willapa River the South Fork meanders through a marshy tidal flat for several miles.

Access to this area is extensive, consisting of both public roads and private logging roads. The amount of watershed area drained by the South Fork is probably less than 50 square miles. According to the U.S. Geological Survey, their gaging station one-quarter mile downstream from Rue Creek drains an area of 27.3 square miles. Fall Creek, Donaldson Creek and about a dozen minor tributaries enter the South Fork downstream from this station.

The lower 5.0 miles of the main channel of the South Fork is under tidal influence. In this reach the channel varies from 10 to 35 yards in width, from the upper to the lower end. The bottom material grades from mud and silt near the mouth to gravel at the upper end. The gradient in this portion of the South Fork is slight. The mid-section of the river, from tidewater to Fall Creek (4 miles), is rather steep. The lower mile contains good spawning gravel but the upper end is primarily bedrock. Several falls are located in this section, and all are now open to fish migration with the construction of a fish ladder and blasting done in the early 1950's. The upper mainstem and tributaries are typically steep with gravel spawning sites intermixed with bedrock. The average width of the mainstem ranges from 10 yards in the summer to 15 yards in the winter at the mouth of Rue Creek to 3 yards in summer and 6 yards in winter at mile 20.0 near the source.

Rue Creek, the major tributary of the South Fork, drains an area of primarily deciduous trees. It ranges in width from 1.5 yards during the summer low flow period to 3 yards during the winter in the headwaters and 5 yards to 7 yards, respectively, at its mouth. Portions of Rue Creek contain high percentages of good spawning gravel.

Salmon Utilization

The South Fork Willapa drainage provides transportation, spawning and rearing areas for chinook, chum and coho salmon. Significant numbers of chinook spawn in the lower mainstem and in portions of Lower Rue Creek. Chum salmon utilize the lower 5 or 6 miles of the South Fork and

to a limited extent spawn in Gamage and Ellsworth Creeks. Coho utilize all accessible and available areas within the drainage, the most important of these being Rue Creek. All of the mainstem South Fork Willapa River and over 15 linear miles of tributary stream are judged to presently provide salmon production.

Limiting Factors

Salmon production in this section is restricted by limited spawning area both in the mainstem and in the tributaries. Logging activities in this section have resulted in numerous problems relating to fish passage, siltation and temperature effects. There are numerous falls and beaver dams within the drainage, some of which are complete blocks to fish migration.

Beneficial Developments

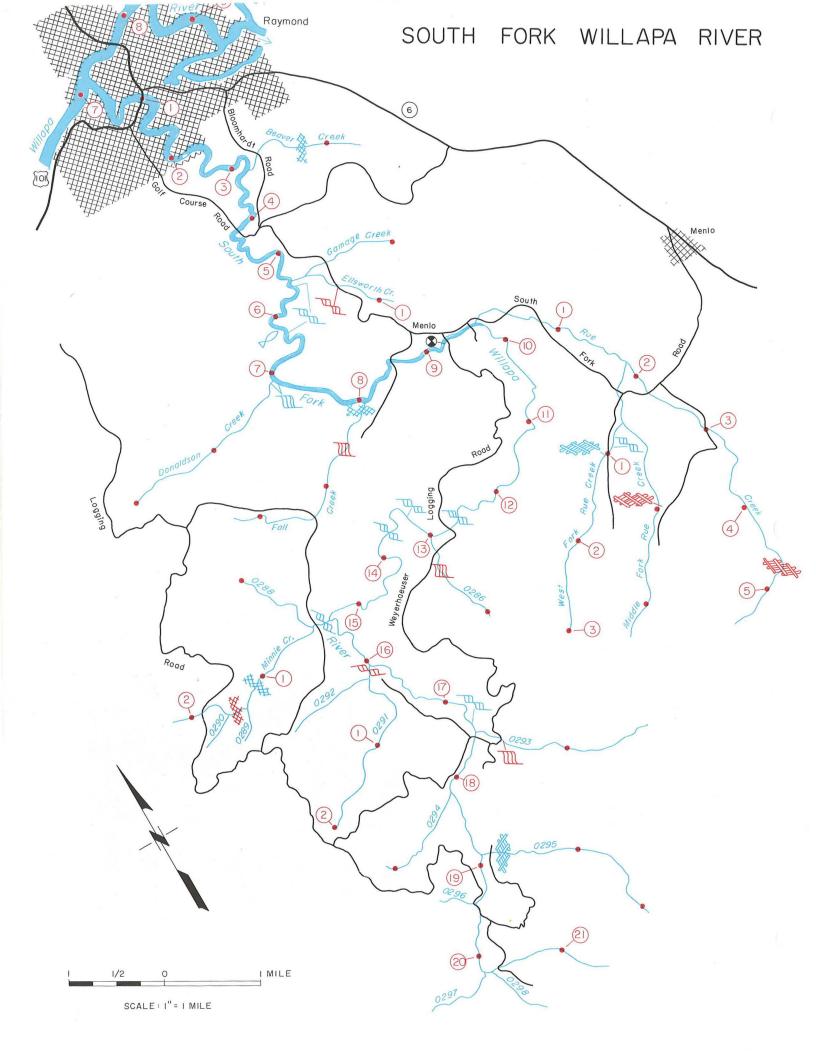
Several beneficial developments have occurred in this section, resulting in opening new areas to utilization by salmon. The most important development was the construction of a fish ladder in the 1950's to improve fish passage over a fifteen-foot falls on the mainstem downstream from the mouth of Donaldson Creek. Several splash dams have been removed from this watershed.

Habitat Needs

Additional concern for the aquatic environment must be shown in future logging and road construction programs. Coho fry plants may aid in seeding areas presently not utilized because of existing migration blocks. Gamage and Ellsworth creeks could be improved artificially to increase chum production.



PHOTO 24-13. Buffer strips retained along the South Fork Willapa



SOUTH FORK WILLAPA RIVER Willapa Basin — WRIA 24

Stream		Location		Drainage		
Number	Stream Name	Of Mouth	Length	Area	Salmon Use	
0251	Willapa River				Coho,Chin.,Chun	
0272	S. F. Willapa River	LB-7.1	21.5	40.9	Coho,Chum,Chin	
0278	Beaver Creek	RB-3.3	1.3	_	Coho	
0279	Ellsworth Creek	RB-5.4	1.2	_	Chum, Coho	
0280	Gamage Creek	RB-0.2	1.0	-	Chum, Coho	
0281	Donaldson Creek	LB-7.1	2.0	_	Coho	
0282	Fall Creek	LB-8.1	2.3	_	Coho	
0283	Rue Creek	RB-9.65	5.5	7.42	Coho, Chinook	
0284	W. F. Rue Creek	LB-1.8	3.0	_	Coho	
0285	M. F. Rue Cr.	RB-0.7	2.4	_	Coho	
0286	Unnamed	RB-13.0	1.1	_	Coho	
0287	Minnie Creek	LB-15.3	2.2	_	Coho	
0288	Unnamed	LB-0.25	1.0	_	Coho	
0291	Unnamed	LB-16.1	2.0	_	Coho	
0293	Unnamed	RB-17.5	1.9		Coho	
0294	Unnamed	LB-18.2	1.1	_	Coho	
0295	Unnamed	RB-18.9	2.1	_	Coho	

WILSON CREEK

This section includes the entire Wilson Creek drainage from its headwaters to where it enters the Willapa River at river mile 12.1. This watershed is composed of 11.2 miles of mainstem channel plus 6 tributaries containing some 43.1 miles of stream drainage.

Stream Description

Wilson Creek is a right bank tributary entering the Willapa River at mile 12.1. The drainage area is almost entirely in timber production, but a number of rural residences are found at the lower end of the drainage. Access to the mainstem is by the Wilson Creek road and to the tributaries by various public and private roads.

Wilson Creek is a slow moving, low gradient stream with a very high percentage of pool areas. The mainstem flows westerly through mixed stands of alder and maple. Logging debris and beaver dams abound in this section, causing heavy siltation and settling. The bottom is almost completely composed of sand and silt with only a minute amount of low quality spawning gravel present in the upper stream.

The major tributaries to Wilson Creek are Whitcomb, Ward, and Fairchild creeks, and the North Fork of Wilson Creek. All of these streams are similar in character, being slow moving and nearly devoid of suitable spawning gravel.

Ward Creek enters Wilson Creek about 0.8 mile from its mouth. The lower-most 0.5 mile is influenced by the tide. The gradient and flow conditions are similar to the mainstem Wilson Creek. It has an average summer width of 5 yards and a winter width of 7 yards. Spawning gravel is practically non-existent. The entire stream is choked with logging debris and beaver dams.

Fairchild Creek is a large left bank tributary to Ward Creek. It too, is slow-moving with a high percentage of pool areas and low gradient. Little or no exposed spawning gravel is present in this stream or its tributaries. The average summer width is 4.5 yards and average winter width is 9 yards.

The North Fork of Wilson Creek and Whitcomb Creek are also poor quality salmon production areas. Little or no spawning gravel exists on either one and logging debris is scattered throughout the creek. Both streams have an average summer width of 2 yards.

Salmon Utilization

This drainage of the Willapa River provides limited transportation, spawning and rearing area for coho salmon. Chinook and chum salmon are not known to utilize Wilson Creek or its tributaries. Coho spawn in all the major tributaries to Wilson Creek, but outside of some "fair" spawning areas in the mainstem the overall value of this drainage is small. The Wilson Creek watershed contains an estimated 9 miles of mainstem and about 25 linear miles of tributaries presently providing salmon production.

Limiting Factors

The primary factor limiting production of fish in this system is the absence of suitable spawning substrate. There are only a few isolated patches of suitable spawning gravel

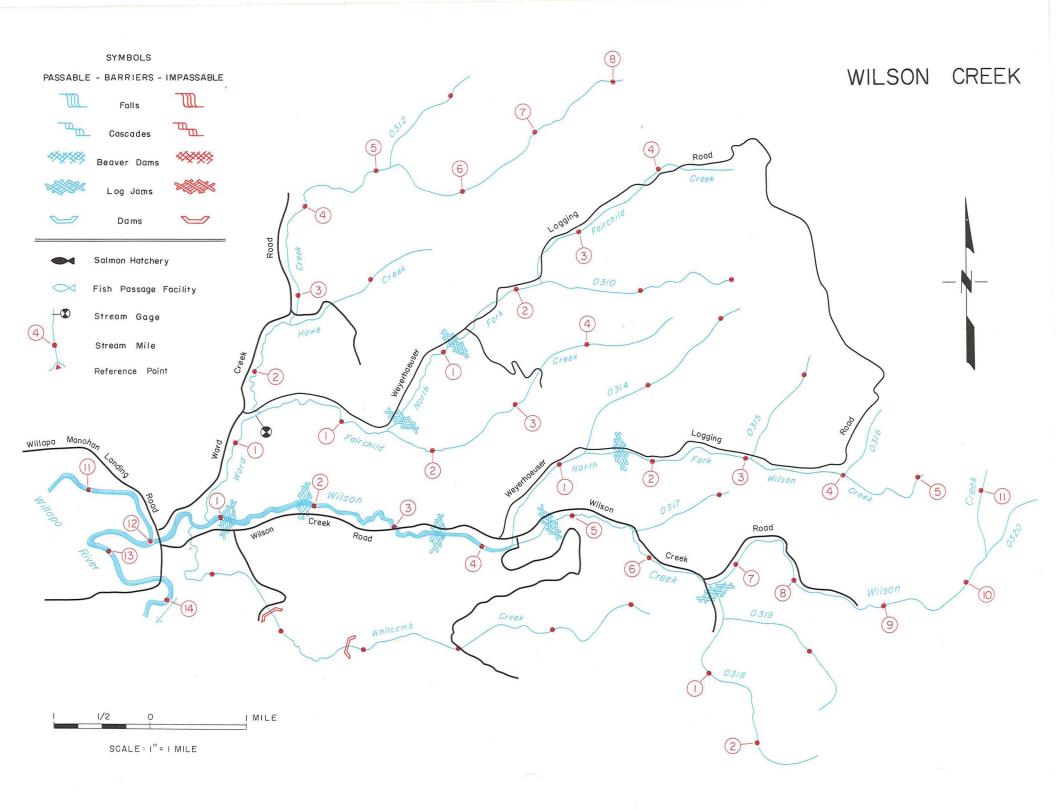
with well over 90% of the bottom being either sand or silt. Numerous beaver dams and log jams occur throughout the system along with logging debris from previous timber operations.

Beneficial Developments

There have been no beneficial developments in this section of the Willapa drainage.

Habitat Needs

In order to improve this area for salmon production, suitable spawning areas would have to be created. The removal of logging debris and beaver dams might increase flows enough to wash out the deposits of silt and sand, but more likely this increase in spawning substrated would have to occur artificially with the construction of a spawning channel or reconstruction of a section of the stream with spawning gravel.



WILSON CREEK Willapa Basin — WRIA 24

Stream		Location		Drainage	
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
0251	Willapa River				
0305	Wilson Creek	RB-12.0	11.2	_	Coho
0306	Whitcomb Creek	LB-0.7	6.2	5.86	Coho
0307	Ward Creek	RB-0.9	8.1	20.2	Coho
0308	Fairchild Creek	LB-1.41	4.9	10.0	Coho
0309	North Fork Fairchild Cr.	RB-1.5	4.8	-	Coho
0310	Unnamed	LB-2.25	2.0	_	Unknown
0311	Howe Creek	LB-2.7	1.7	_	Coho
0312	Unnamed	RB-5.1	1.3	_	Coho
0313	N. F. Wilson Creek	RB-4.3	5.1	6.56	Coho
0314	Unnamed	RB-1.3	2.2	_	Unknown
0315	Unnamed	RB-3.05	1.2	_	Unknown
0317	Unnamed	RB-5.7	1.1	>	Coho
0318	Unnamed	LB-6.61	2.7	_	Coho
0319	Unnamed	RB-0.4	1.8	_	Unknown

WILLAPA RIVER Headwaters

This section describes the upper Willapa River drainage extending from Mill Creek upstream to its source. This drainage includes 26.5 miles of the upper mainstem and 23 tributaries with an additional 153.3 linear miles of stream drainage.

Stream Description

This section of the Willapa River drainage grades from nearly 100% mixed timberland at the headwaters to 50-50 farmland-forest in the lower portions of the drainage. State Highway 6 parallels the Willapa River through this section, crossing it several times. Both public and private roads provide access to the tributaries. Rural residences are scattered throughout the watershed, but the only town in the drainage is Lebam. The gradient is steep in the upper reaches draining the Willapa hills, and moderate in the river valley.

The mainstem channel flows from very steeply inclined headwaters, where falls and cascades are common, to a more moderate gradient at the mouth of Mill Creek, the lower end of this section. The river flows through mixed stands of deciduous timber and brush interspersed with cleared private and farmland. The bottom materials are principally gravel and sand. Bedrock is common in the upper tributary areas and in some sections of the mainstem. The average width of the channel ranges from 15 yards in summer to 25 yards in winter above the mouth of Mill Creek to 1.5 yards summer and 3 yards in winter at the upper portion of the section.

The largest and most important of the numerous tributary streams in this section are Mill Creek, Trap Creek, Forks Creek, Half Moon Creek and Fern Creek. Mill Creek is a right bank tributary emptying into the Willapa River at mile 18.1. The creek flows through an open bottom with gently rising hills on either side. The mainstem itself is bordered with alders and in places, scattered conifers. The mainstem is easily accessible by road except for the extreme upper reaches. The bottom is predominantly gravel with small amounts of sand and clay. The average width at its mouth ranges from 8 yards in the summer to 10 yards in winter. Brown Creek, the major tributary to Mill Creek, also has an abundance of good spawning gravel but, as with Mill Creek, both streams have fish passage problems caused by logging and windfall debris.

Trap Creek and Forks Ceek are both left bank tributaries entering the Willapa River at river miles 29.9 and 30.5, respectively. Less than half the length of Trap Creek is accessible to fish migration because of a falls at mile 2.35. The lower portion of Trap Creek contain good quantities of suitable spawning gravel. A Fisheries Department salmon hatchery is located on the lower portion of Forks Creek. Suitable spawning gravel is available below the hatchery and upstream to river mile 7.1 where a falls blocks upstream migration. Both streams have steep gradients and drain areas of mixed deciduous vegetation.

Half Moon and Fern creeks, the other major tributaries in the system, are similar in character. They flow from flat, broad valleys surrounded by cleared farmland and alder bottoms. Both streams flow over moderate to slight gradients and have low percentage of riffle areas. Spawning gravel is abundant in these areas, but beaver dams and debris are also common.

Salmon Utilization

This section of the Willapa River provides transportation, spawning and rearing areas for chinook, coho and chum salmon. Chinook spawning takes place primarily in the mainstem and lower tributary reaches. Coho spawn throughout the accessible tributaries and in the upper mainstem. Chum salmon utilize Mill Creek and Trap Creek, as well as some mainstem areas. Natural chinook and chum runs have shown a steady decline in numbers in this section over recent years. It is estimated that about 23.5 miles of the mainstem Willapa River and some 79 linear miles of tributary stream are presently utilized by salmon.

Limiting Factors

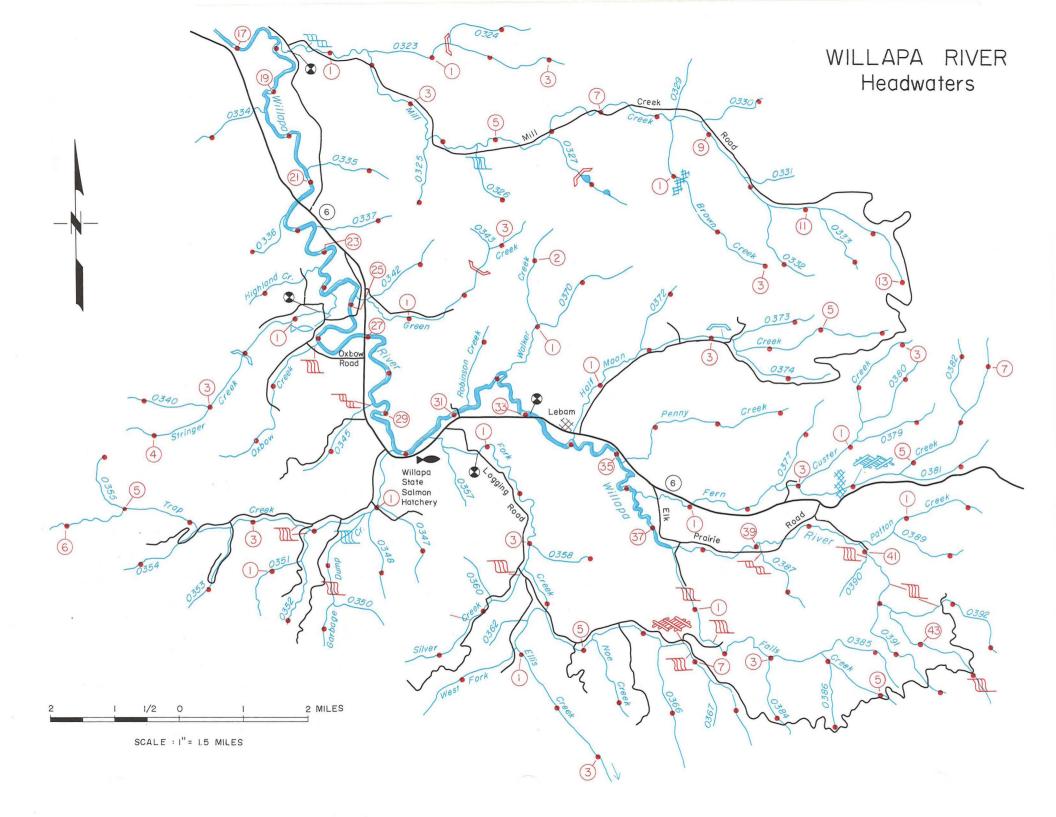
The principal limiting factor in this section is the occurrence of numerous fish passage blocks, primarily natural falls. A large amount of potential spawning and rearing area is inaccessible to fish because of these barriers. Logging has damaged several tributary streams in this section and has caused siltation of spawning beds. Natural and man-caused log jams and debris limit full utilization of some streams in this section. Summer flows are a problem for rearing coho in nearly all these streams.

Beneficial Developments

A Washington State Department of Fisheries salmon hatchery is located on Forks Creek.

Habitat Needs

Additional spawning and rearing areas would be available if sections of existing streams were opened up by removal of both natural and man-made barriers. Some tributaries could be improved by gravel cleaning operations to remove silt loads caused by past poor logging activities. Regulation to maintain higher summer stream flows has the potential for greatly increasing coho production in this section.



WILLAPA RIVER Headwaters Willapa Basin — WRIA 24

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0251	 Willapa River				Coho,Chin.,Chum
0322	Mill Creek	RB-18.1	13.0	_	Coho,Chum,Chin.
0323	Unnamed	RB-1.8	3.3	_	Coho
0324	Unnamed	RB-1.4	1.5	_	None
0325	Unnamed	LB-3.7	1.0	_	Coho
0326	Unnamed	LB-4.6	1.1		Coho
0327	Unnamed	LB-5.9	1.7	_	Coho
0328	Brown Creek	LB-8.3	3.0	_	Coho
0330	Unnamed	RB-8.8	1.1	_	Coho
0332	Unnamed	LB-10.4	1.5	_	Unknown
0333	Unnamed	LB-11.2	1.1	_	Unknown
0334	Unnamed	LB-19.4	1.3	_	Coho
0335	Unnamed	RB-20.8	1.3	_	Coho
0336	Unnamed	LB-21.6	1.0	_	Coho
0337	Unnamed	RB-22.3	1.2	_	Coho
0338	Highland Creek	LB-23.6	1.3	_	Coho
0339	Stringer Creek	LB-24.2	4.4	_	Coho
0340	Unnamed	LB-3.0	1.2	_	
0341	Green Creek	RB-24.8	3.6	_	Coho
0342	Unnamed	RB-0.26	1.5	_	Unknown
0344	Oxbow Creek	LB-26.1	2.6	_	Coho, Chum
0345	Unnamed	LB-28.6	1.6		None
0346	Trap Creek	LB-29.9	6.2	_	Coho,Chin.,Chum
0347	Unnamed	RB-0.95	1.5	—	Coho
0348	Unnamed	RB-1.1	1.4	_	Coho
0349	Garbage Dump Cr.	RB-1.2	2.3	_	Coho,Chin.,Chum
0351	Unnamed	RB-2.05	1.8	_	None
0352	Unnamed	RB-0.55	1.1	_	None
0353	Unnamed	RB-3.35	1.4		None
0354	Unnamed	RB-3.85	1.2	-	None
0355	Unnamed	LB-5.0	1.0	_	None
0356	Fork Creek	LB-30.5	8.6	_	Coho,Chin.,Chum
0358	Unnamed	RB-3.0	1.0	_	Coho
0359	Silver Creek	LB-3.4	2.6		None

WILLAPA RIVER Headwaters Willapa Basin — WRIA 24

Stream	1	Location		Drainage	A
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
0361	Ellis Creek	LB-4.15	5.1	7.06	Coho
0363	W. F. Ellis Cr.	LB-0.9	1.9		Coho
0365	Noe Creek	LB-5.2	1.3	_	Coho
0366	Unnamed	LB-6.4	1.9		Coho
0368	Robinson Creek	RB-31.3	1.3	_	Coho
0369	Walker Creek	RB-32.1	2.6	_	Coho
0370	Unnamed	LB-1.0	1.8		Coho
0371	Half Moon Creek	RB-34.0	6.1		Coho,Chum,Chin
0372	Unnamed	RB-1.9	1.1	_	Coho
0373	Unnamed	RB-3.4	1.3	_	Coho
0374	Unnamed	LB-3.6	1.7		Coho
0375	Penny Creek	RB-35.2	3.2	_	Coho
0376	Fern Creek	RB-36.2	7.5	_	Coho
0377	Unnamed	RB-2.6	1.6	_	Coho
0378	Custer Creek	RB-3.0	3.2	_	Coho
0379	Unnamed	LB-1.1	1.5	_	Unknown
0380	Unnamed	LB-1.4	1.3	_	Unknown
0381	Unnamed	LB-4.7	1.6		Coho
0382	Unnamed	RB-6.2	1.3	_	Unknown
0383	Falls Creek	LB-37.5	5.1	6.34	Coho
0384	Unnamed	LB-3.0	1.4		None
0385	Unnamed	RB-3.9	1.7	_	None
0386	Unnamed	LB-4.0	1.1	_	None
0387	Unnamed	LB-39.05	1.4	0.84	Coho
0388	Patton Creek	RB-40.9	2.2	_	Coho
0389	Unnamed	LB-0.6	1.2	_	Coho
0391	Unnamed	LB-42.0	2.1	_	None
0392	Unnamed	RB-42.2	2.1	_	None

PALIX RIVER

This section describes those tributaries to Willapa Bay from Stuart Slough on the north to Pickernell Creek on the south. The largest of these tributaries is the Palix River system. The Palix River contains 9.4 miles of mainstem plus 6 tributaries providing an additional 48.2 linear miles of stream drainage. In addition, there are 7 independent streams to Willapa Bay containing some 38.8 linear miles of drainage.

Stream Description

This section is characterized by streams with relatively short drainage systems and large estuaries. The watersheds in this area are entirely in timber production. Access to this section is generally poor, although Highway 101 crosses all the major drainages near their mouths. The community of Bay Center is located at the lower end on the Palix River estuary.

The most important stream in this section is the Palix River. The Palix is formed by three forks joining in tidewater about 1.5 miles upstream from the mouth. The North Fork Palix flows through a moderately narrow valley composed of 90-95% deciduous vegetation. The bottom is principally sand with very few areas of spawning gravel. A series of falls near the head of tidewater presently makes upstream migration impossible. The south fork contains very little drainage area not under tidal influence. No spawning gravel is present and the bottom is silt, mud and debris. The middle fork of Canon River is by far the most productive stream in this section for salmon. The upper portion of this stream is characterized by large numbers of bedrock cascades, steeply inclined banks, fast flows and old growth forests. The lower 2 miles of Canon River has a flat gradient and large amounts of spawning gravel. This portion of the river is surrounded by mixed stands of deciduous trees, primarily alder. The average summer width at the head of tide water near the mouth is 8 yards in the summer and 12 yards in the winter.

Bone River is formed by four tributaries flowing from narrow alder draws. The bottom is hard clay with virtually no gravel. The lower 1.5 miles of the river are under tidal influence.

The Niawiakum River flows into Willapa Bay a mile north of the Palix River estuary. The lower 3 miles of this system are within tidal action. The bottom materials are predominantly gravel and sand and a substantial number of gravel spawning areas exist. Past poor logging operations in this area have resulted in heavy siltations of many of these areas. The average width at the head of tide water is 3 yards in the summer and 4 yards in the winter.

A number of lesser tributaries enter Willapa Bay within this section, all of which have little or no value for salmon production. The largest of these are Stuart Slough and Pickernell Creek.

Salmon Utilization

By far the most productive area within this section is the Palix River and tributaries. This area is utilized for transportation, spawning and rearing by chinook, coho and chum salmon. Chinook utilize the middle fork (Canon River) Palix system to a limited degree. Coho are found throughout the accessible spawning areas in the Palix and Niawiakum

rivers. Chum salmon utilize the lower reaches of both the Canon River and possibly the Niawiakum. Of the 104 miles of streams in this section, approximately 48 linear miles are accessible and presently utilized by salmon.

Limiting Factors

The principal limiting factor in this section is the availability of suitable spawning areas. Many of the streams in this section are limited by flat gradients, swamps, beaver dams and heavy siltation caused by poor logging practices. Salmon production in the North Palix is limited by a series of high falls near the head of tidewater.

Beneficial Developments

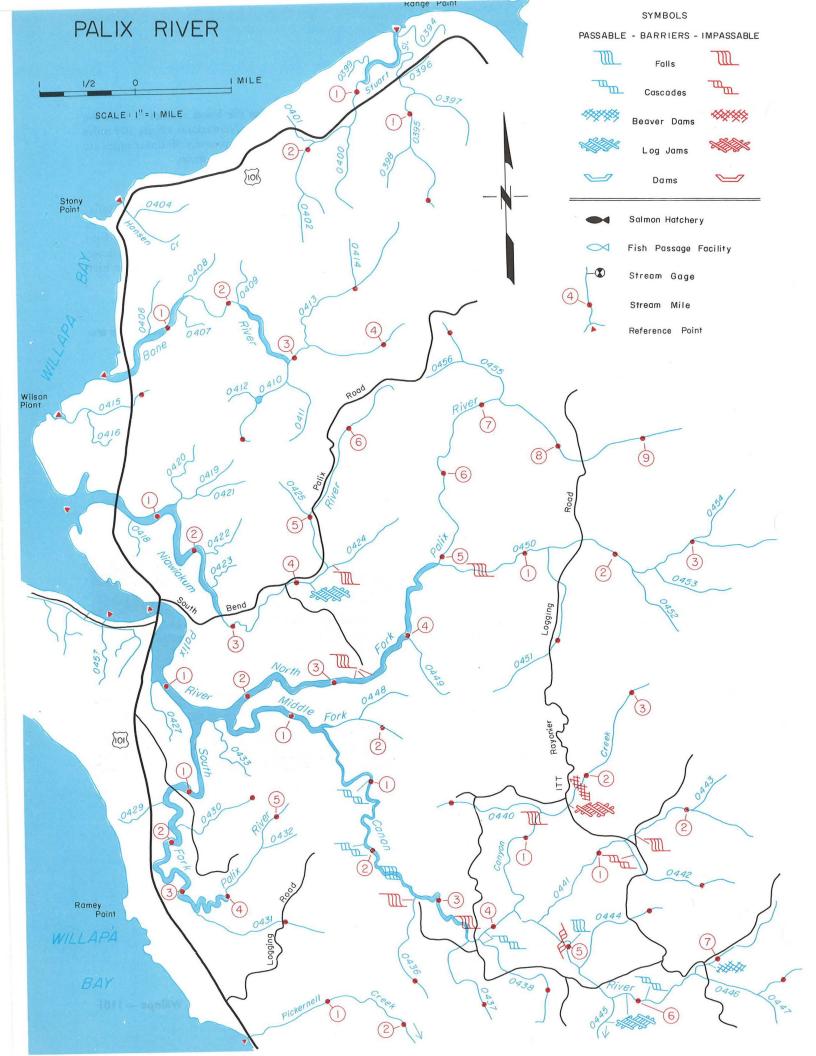
There have been no beneficial developments in this section.

Habitat Needs

Additional environmental surveys are required before improvement projects can be recommended. Installation of gravel spawning areas may be desirable in the Niawiakum River, Bone River and Stuart Slough where large amounts of tidal rearing area exists for chum salmon.



PHOTO 24-14. Larger Willapa Bay tributaries have extensive estuaries (Niawiakum River).



PALIX RIVER Willapa Basin — WRIA 24

Stream		Location		Drainage	
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
0393	Stuart Slough	NW ½, Sec 18, T14N, R9W	2.9	_	Coho
0395	Unnamed				
0405	Bone River	NE1/4, NE1/4, Sec4, T13N, R10W	4.3	_	Coho, Chum
0410	Unnamed	LB-2.9	1.1	_	Coho, Chum
	Unnamed Lake	Outlet-05	_		
0413	Unnamed	RB-3.2	1.8	_	Coho, Chum
0415	Unnamed	N½,SW¼,Sec4, T13N,R10W	1.1	_	Coho
0417	Niawiakum River	W½,Sec9, T13N,R10W	6.7	-	Coho, Chum
0426	Palix River	W½,Sec15, T13N,R10W	9.4	36.8	Coho,Chum,Chii
0428	S. F. Palix River	LB-1.4	5.2	4.52	Coho, Chum
0430	Unnamed	RB-1.8	1.0	_	Unknown
0431	Unnamed	LB-3.3	1.4	_	Unknown
	Palix R. cont. as N. F. Palix R.	@ mi. 1.41		_	
0434	M. F. Palix River	LB-1.7	2.3	_	Coho,Chum,Chir
0435	Canon River	LB-1.3	7.9	16.3	Coho,Chum,Chi
0436	Unnamed	LB-2.7	1.2	-	Unknown
0437	Unnamed	LB-3.7	1.2		None
0438	Unnamed	LB-3.8	1.4	_	Coho
0439	Canyon Creek	RB-4.3	3.2	3.93	Coho
0440	Unnamed	RB-1.3	1.2	_	None
0441	Unnamed	RB-4.6	2.7	_	Coho
0442	Unnamed	LB-1.3	1.4	_	None
0444	Unnamed	RB-5.3	1.1	(water	Unknown
0445	Unnamed	LB-5.7	2.0	_	Unknown
0446	Unnamed	LB-6.7	1.2		Unknown
0450	Unnamed	LB-4.9	3.9	_	None
0451	Unnamed	LB-1.2	1.8	-	None
0455	Unnamed	RB-7.2	1.1	-	None
0457	Bay Center Sloughs	Sec16,17,15, T13N,R10W	~ 7.5	_	
0458	Pickernell Creek	W ½,SE ¼,Sec3, T12N,R10W	2.9		Unknown

NEMAH RIVER

This section includes the watersheds of the North, Middle, and South forks of the Nemah River and several minor drainages entering Willapa Bay. The Nemah River watershed contains 119.0 miles of mainstem channel and tributaries including 63.5 miles of North Fork, 12.8 miles of Middle Fork, and 42.7 miles of South Fork. Two small independent streams provide an additional 7.0 miles of drainage.

Stream Description

The three forks of the Nemah River flow westerly into the middle portion of Willapa Bay. All three of these streams have low gradients and extensive tidal areas in their lower reaches. The drainage area is almost entirely in timber production. Access to the mainstems is good, with Highway 101 crossing all three at their lower ends. Access to the upper reaches and to the major tributaries is provided by a number of public and private roads.

The North Fork of the Nemah system is the largest and most important salmon producing stream in this section. It is 12.4 miles in length and has a total drainage area of approximately 18 square miles. A Washington State Department of Fisheries salmon hatchery is located at river mile 4.0. The North Nemah flows through an area of relatively old second-growth timber, giving the stream a measure of stability from extensive flooding. Gravel is the predominant bottom material throughout its length. The major tributaries to the North Fork are Williams Creek and Finn Creek. Both of these streams have predominantly gravel bottoms along the lower reaches with rubble and sand dominating the upper areas.

The Middle Nemah River is the second largest of the three forks of the Nemah drainage. The Middle Fork is 10.2 miles long with a drainage area of 11.8 square miles. This stream has three distinct sections with varying characteristics. In the lower reach the stream flows through a broad, flat valley with a surrounding vegetation consisting of alders and deciduous brush. This section has a predominantly gravel and rubble bottom averaging 6 yards in width during the summer and 12 yards in the winter. The lowermost reaches of this stream are within the area of tidal influence. The mid -portion of the Middle Fork is steep in gradient with steeply inclined banks on either side. In this section the bottom is principally bedrock and rubble. The stream bank is surrounded by a dense coniferous forest canopy. Here the average summer width is 4 yards and winter width is 12 yards. The uppermost reaches again flow through a broad, flat valley which has recently been logged off. Gravel and sand are the predominant bottom types. The width of the Middle Fork in this section ranges from 2 yards in summer to 5 vards in winter.

The South Fork is the smallest of the three Nemah River reaches. The lower 8 miles of the South Fork contain only isolated patches of suitable spawning gravel. The remainder is sand and silt. This reach of river is well shaded by mixed stands of coniferous and deciduous trees. The average width ranges from 3 to 7 yards in the summer and 4 to 10 yards in the winter. The uppermost 2 miles of stream contain fair amounts of gravel, but much of it is heavily silted. The gradient in this section is moderately steep and the surrounding vegetation densely forested.

Salmon Utilization

This drainage provides transportation, spawning and rearing areas for chinook, coho and chum salmon. Chinook utilize the lower section of the North Nemah, Williams Creek, South Nemah and Middle Nemah rivers. Coho are found in virtually all the accessible tributaries on this section. The most important streams are Williams Creek and the Middle Nemah. A large number of excellent chum spawning sites are found in this section. Williams Creek is the most important chum production stream in this drainage, but North, South and Middle Nemah rivers also support sizeable spawning population. It is estimated that approximately 28.5 miles of mainstem channel from the North, Middle and South forks of the Nemah River, plus 49 linear miles of tributaries, are presently being utilized by salmon.

Limiting Factors

The primary limiting factor in this section is the excessive amount of logging and windfall debris present in most of the major tributaries. This debris has resulted in log jams and other physical blocks to upstream migration. Poor logging practices have also resulted in excessive siltation in some stream areas. Natural cascades and falls also limit salmon production to some extent in this section.

Beneficial Developments

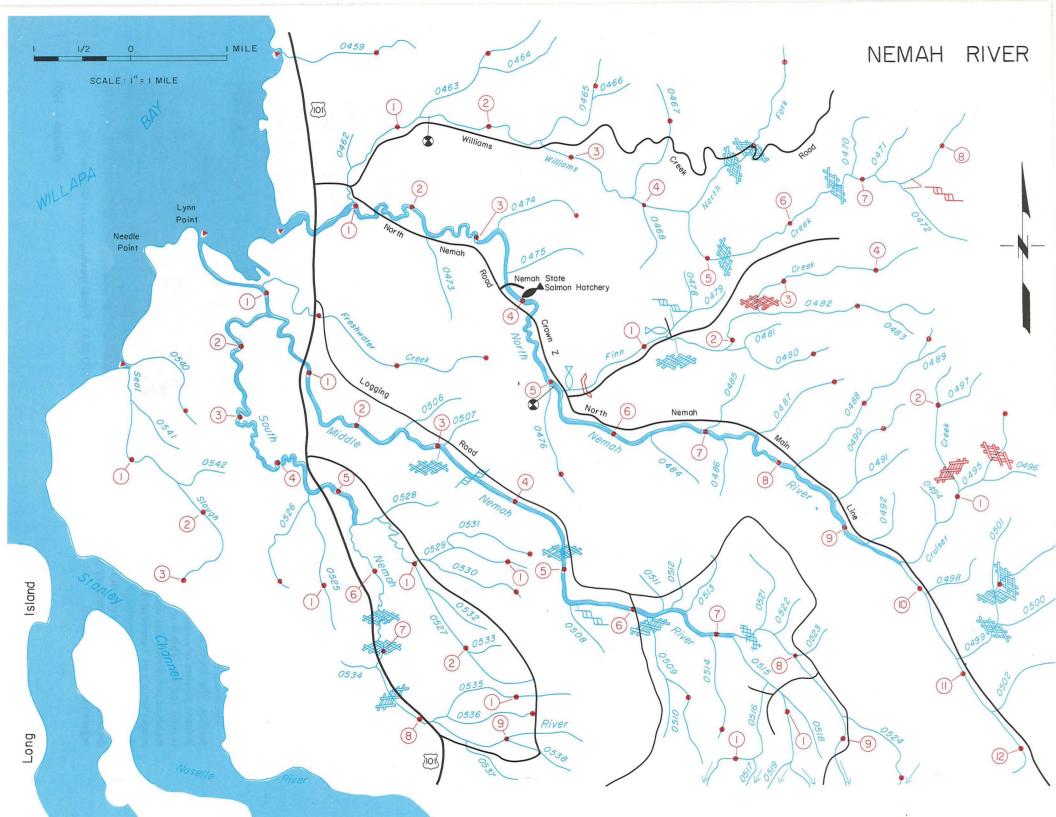
A Washington State Department of Fisheries salmon hatchery is located on the North Fork Nemah River.

Habitat Needs

More care should be taken to protect this valuable watershed from further damage from poor logging practices. In some areas of extensive silting, gravel-cleaning operations should be successful in increasing the production potential.



PHOTO 24-15. Typical spawning area on Williams Creek.



NEMAH RIVER Willapa Basin — WRIA 24

Stream		Location	and the second s	Drainage	
Number	Stream Name	Of Mouth	Length	Area	Salmon Use
0459	Unnamed	SW¼,NE¼,Sec10, T12N,R10W	1.5	_	Unknown
0460	North Nemah River	NE1/4 ,Sec22, T12N,R10W	12.4	-	Coho,Chum,Chin.
0461	Williams Creek	RB-1.0	8.4	-	Chum,Coho,Chin.
0463	Unnamed	RB-1.3	1.6	_	Coho
0465	Unnamed	RB-2.6	1.3	_	Coho
0467	Unnamed	RB-3.8	1.4	_	Coho
0469	N.F. Williams Cr.	RB-4.5	2.2		Coho
0474	Unnamed	RB-3.3	1.0	-	Unknown
0476	Unnamed	RB-5.0	1.2	-	Unknown
0477	Finn Creek	RB-5.2	4.5	4.31	Coho, Chum
0480	Unnamed	LB-1.9	1.2		Coho
0482	Unnamed	LB-2.5	1.8		Coho
0487	Unnamed	RB-7.5	1.1	_	Coho, Chum
0488	Unnamed	RB-8.2	2.1	_	Coho, Chum
0490	Unnamed	RB-8.7	1.3		Coho, Chum
0493	Cruiser Creek	RB-9.7	2.4	_	Coho, Chum
0495	Unnamed	LB-1.1	1.0		Coho
0499	Unnamed	RB-10.8	2.1	_	Coho
0503	South Nemah River	NE1/4,Sec21, T12N,R10W	9.8	-	Coho,Chum,Chin.
0504	Freshwater Creek	RB-0.9	3.0	_	Unknown
0505	Middle Nemah River	RB-1.2	10.2	11.8	Coho,Chum,Chin.
0509	Unnamed	LB-6.15	1.7	_	Coho
0514	Unnamed	LB-6.9	1.1	_	Coho
0515	Unnamed	LB-7.2	2.5	_	Coho
0516	Unnamed	LB-0.6	1.7	_	Unknown
0524	Unnamed	RB-8.8	1.4	_	Unknown
0525	Unnamed	LB-4.65	1.5	_	Unknown
0526	Unnamed	LB-0.1	1.1	_	Unknown
0527	Unnamed	RB-5.4	2.8		Coho, Chum
0529	Unnamed	RB-1.0	1.2	_	Coho
0530	Unnamed	LB-0.1	1.1	_	Unknown
0531	Unnamed	RB-0.4	1.0	_	Unknown
0535	Unnamed	RB-8.2	1.5	_	Coho

NEMAH RIVER Willapa Basin — WRIA 24

Stream			Location		Drainage		
Number	Stream Name		Of Mouth	Length	Area	Salmon U	Jse
			10.00				
0536	Unnamed		LB-0.2	1.0		Coho	
0539	Seal Slough		NW½,SW¼,Sec28, T12N,R10W	3.0	- F-	Unknown	ı
0540	Unnamed		RB-0.1	1.2	<u> </u>		
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NASELLE RIVER Lower Mainstem

This section describes the lower Naselle River drainage from its mouth upstream to Bell Creek. Sawlog Slough and its tributaries draining Long Island are also included in this section. The lower Naselle drainage includes 10.5 miles of the mainstem, and 12 tributaries containing 53.9 linear miles of stream drainage. Eight independent drainages provide an additional 10.7 miles of stream to this section.

Stream Description

The lower mainstem reach of the Naselle River is completely within the area of tidal influence. The main channel displays major fluctuations in size, depending on the tide stage. The channel is characterized by a broad tidal flat with numerous sloughs and tidal marshes. The tributaries to the Naselle in this section drain areas that are primarily in timber production. Highway 101 crosses the river in this section at river mile 3.1. Access to the mainstem and major tributaries is adequately provided by both public and private roads.

Ellsworth Creek is the first major tributary emptying into the Naselle River upstream from its mouth. It drains an area of mixed coniferous and deciduous forest, some of which has been recently logged. The creek contains a high percentage of desirable spawning gravel, especially in the lower reaches above tidewater. The lower mile is under tidal influence with the bottom being principally silt and sand. Above tidewater the stream varies in width from 5 yards in the summer to 8 yards in the winter. The gradient is moderate and the channel is well shaded by alders.

Dell Creek is the only other tributary of consequence in this section. It drains an area of mixed deciduous and coniferous forest interspersed with cleared farmland. The creek averages 4 yards in width during the summer and 7 yards during the winter, at its mouth. The lower reaches of Dell Creek are affected only slightly by the tide. The bottom is composed principally of rubble and gravel. The stream bank is well shaded by alder throughout most of its length.

The other minor tributaries within this section are generally too small in size and poor in quality to be important for salmon production. Some limited utilization, primarily by coho salmon, occurs in Holm Creek, Petes Creek and Smith Creek. The lower 10.5 miles of mainstem Naselle River and approximately 21 linear miles of tributary stream are presently accessible to salmon.

Salmon Utilization

The lower Naselle drainage provides transportation, spawning and rearing area for chinook, coho and chum salmon. Chinook spawning areas in the lower mainstem are extremely limited, occurring only in Dell Creek. Coho spawn in some of the tributaries in this section, but not to a great extent. Chum utilize streams in this section extensively, the most important area being Ellsworth Creek.

Limiting Factors

The primary limiting factor in this section is the lack of available spawning area. Spawning gravel areas are few in

number and poor in quality for the most part. Summer low flows have a detrimental effect on coho rearing in the tributary streams in this section. Poor logging practices have damaged several areas, reducing their production potential.

Beneficial Developments

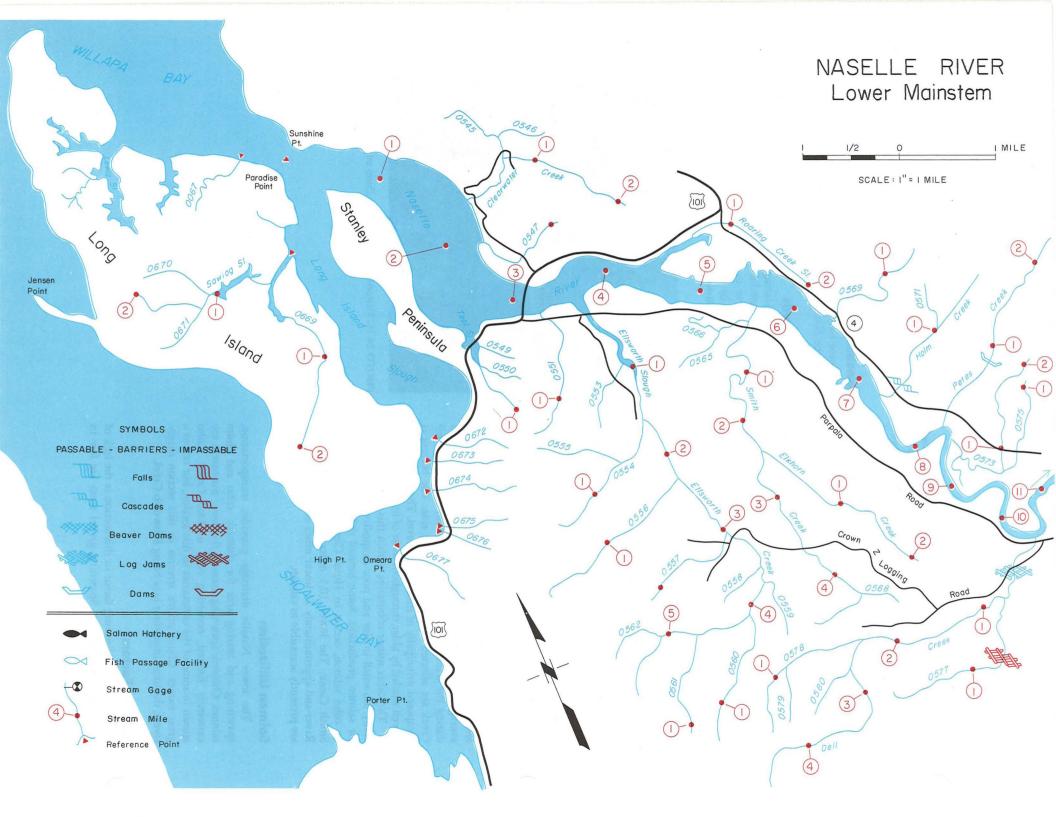
There have been no beneficial developments in this section of the Naselle River.

Habitat Needs

Some areas damaged by poor logging activities have potential for rehabilitation. The large estuary area in this section could serve as an excellent rearing area for chum salmon produced by enhancement projects such as spawning channels or stream-side incubation boxes.



PHOTO 24-16. Elsworth Creek is a prime chum salmon producer.



NASELLE RIVER Lower Mainstem Willapa Basin — WRIA 24

	Location		Drainage	
Stream Name	Of Mouth	Length	Area	Salmon Use
Naselle River	NW 1/4 ,SE 1/4 ,Sec5 , T11N,R10W	35.9		Coho,Chin.,Chun
Clearwater Creek	RB-1.6	2.1	-	Unknown
Unnamed	RB-2.1	, · 1.1	_	Unknown
Teal Slough	LB-2.7	1.0	_	Unknown
Unnamed	LB-3.4	1.5	_	Unknown
Ellsworth Creek	LB-3.6	5.8	_	Chum, Coho
Unnamed	LB-1.5	1.5		Coho, Chum
Unnamed	LB-2.3	1.9	_	Coho
Unnamed	LB-3.05	1.1	_	Coho
Unnamed	RB-4.1	1.4	_	Coho
Unnamed	RB-4.7	1.1	_	Unknown
Roaring Creek Slough	RB-4.4	2.0	_	Coho
Smith Creek	LB-5.6	4.9	-	Coho, Chum
Elkhorn Creek	RB-2.4	2.1		Coho, Chum
Unnamed	RB-6.3	1.4	_	Unknown
Holm Creek	RB-7.3	1.7	-	Coho, Chum
Petes Creek	RB-8.3	2.3		Coho
Unnamed	LB-8.5	2.2		Unknown
Unnamed	LB-0.8	1.1	-	Unknown
Dell Creek	LB-10.5	4.7	4.16	Chum, Coho
Unnamed	RB-0.8	1.9	_	Coho
Unnamed	LB-2.4	1.6	-	Unknown
Sawlog Slough	SW1/4,Sec8, T11N,R10W	2.0	_	Unknown
Unnamed	RB-0.4	2.0	_	Unknown
	Clearwater Creek Unnamed Teal Slough Unnamed Ellsworth Creek Unnamed Unnamed Unnamed Unnamed Coaring Creek Slough Smith Creek Elkhorn Creek Unnamed Unnamed Coaring Creek Unnamed Unnamed Coaring Creek Unnamed Coaring Creek Unnamed Unnamed Coaring Creek Unnamed Unnamed Coaring Creek Unnamed Unnamed Coaring Creek	Naselle River Naselle River NW1/4, SE1/4, Sec5, T11N,R10W Clearwater Creek Unnamed RB-2.1 Teal Slough LB-2.7 Unnamed LB-3.4 Ellsworth Creek Unnamed LB-1.5 Unnamed LB-2.3 Unnamed LB-3.05 Unnamed RB-4.1 Unnamed RB-4.7 Roaring Creek Slough RB-4.4 Smith Creek LB-5.6 Elkhorn Creek RB-7.3 Petes Creek Unnamed LB-8.5 Unnamed LB-8.5 Unnamed LB-8.5 Unnamed LB-0.8 Dell Creek Unnamed RB-0.8 Unnamed RB-0.8 Unnamed RB-0.8 Unnamed RB-0.8 Unnamed RB-0.8 Unnamed RB-0.8 Unnamed RB-2.4 Sawlog Slough SW1/4, Sec8, T11N,R10W	Stream Name Of Mouth Length Naselle River NW1/4, SE1/4, Sec5, T11N,R10W 35.9 Clearwater Creek RB-1.6 2.1 Unnamed RB-2.1 1.1 Teal Slough LB-2.7 1.0 Unnamed LB-3.4 1.5 Ellsworth Creek LB-3.6 5.8 Unnamed LB-3.6 5.8 Unnamed LB-2.3 1.9 Unnamed LB-3.6 5.8 Unnamed LB-2.3 1.9 Unnamed LB-3.6 5.8 Unnamed RB-4.1 1.4 Unnamed RB-4.3 1.1 Unnamed RB-4.1 1.4 Unnamed RB-4.4 2.0 Smith Creek LB-5.6 4.9 Elkhorn Creek RB-2.4 2.1 Unnamed RB-6.3 1.4 Holm Creek RB-7.3 1.7 Petes Creek RB-8.3 2.3 Unnamed LB-0.8 1.1	Stream Name Of Mouth Length Area Naselle River NW¼,SE¼,Sec5, T11N,R10W 35.9 — Clearwater Creek RB-1.6 2.1 — Unnamed RB-2.1 1.1 — Teal Slough LB-2.7 1.0 — Unnamed LB-3.4 1.5 — Ellsworth Creek LB-3.6 5.8 — Unnamed LB-3.6 5.8 — Unnamed LB-1.5 1.5 — Unnamed LB-2.3 1.9 — Unnamed LB-3.05 1.1 — Unnamed RB-4.1 1.4 — Unnamed RB-4.7 1.1 — Roaring Creek Slough RB-4.4 2.0 — Smith Creek LB-5.6 4.9 — Elkhorn Creek RB-2.4 2.1 — Unnamed RB-6.3 1.4 — Holm Creek RB-8.3 2.3 —

NASELLE RIVER Headwaters

This section describes the Naselle River and tributaries from its source to the mouth of Dell Creek, excluding the South Fork drainage. This includes 26.5 miles of mainstem and 27 tributaries providing some 44.9 miles of stream drainage.

Stream Description

The Naselle River is formed in this section by a broad network of tributary systems draining from the Willapa hills. This watershed lies principally in various stages of timber production. Rural residences and scattered farmland are also found throughout the drainage, the highest concentration being at the lower end of the section where the town of Naselle is located. Access to the tributaries of this section is provided by a number of public and private roads. The uppermost reaches of the mainstem are inaccessible by road.

The upper portion of the mainstem Naselle River is commonly referred to as the East Fork. This section of the mainstem lies primarily in a rock canyon. The bottomhis largely bedrock, with patches of suitable spawning gravel. The lower mainstem, below the confluence with the North Fork, grades from moderately steep canyon areas near the upper end to a broad, flat valley at the lower end. Spawning gravel is very abundant in the lower reaches, with increasing amounts of bedrock and rubble occurring progressively upstream. Falls and cascades are the rule on the tributaries to the Naselle River in this reach.

Salmon Creek is the largest tributary to the Naselle River in this section, being just over 17.0 miles in length. It drains an area of mixed forests and farmlands. The stream channel is well shaded in most areas by alders, with the remaining area running through open pastureland. The bottom is principally gravel and mud, with a low to moderate gradient. The channel ranges from 2 yards summer width to 4 yards in the winter at the upper end; to 9 yards and 15 yards, respectively, at its mouth. Scattered debris and windfalls are common throughout the length of Salmon Creek, but cause little if any serious problems to fish.

The North Fork Naselle River flows north to south, entering the mainstem Naselle at RM 26.0. This tributary is moderately steep in its upper reach where it flows through a series of bedrock canyons. There are numerous cascades and falls along its courses, some of which are complete migration blocks. Gravel spawning areas are common between the canyons. Much of the surrounding watershed on the upper North Fork has been logged off recently, leaving debris scattered throughout, to further compound fish transportation problems. The average width of the North Fork is 2 yards in the summer and 4 yards in the winter at its mouth.

Alder Creek is another major tributary in this system. It flows a little over 7 miles to its confluence with the mainstem at R.M. 26.5. Alder Creek averages 8 yards wide in the summer and 12 yards in the winter months at its mouth. The bottom is principally gravel and rubble, with significant amounts of bedrock. A falls at the lower end now limits the usage by adult fish.

Salmon Utilization

This section of the Naselle River provides transportation, spawning, and rearing areas for chinook, coho, and chum salmon. Chinook utilize primarily the mainstem and the major tributaries; Salmon Creek, North Fork, and Alder Creek. Coho are found in virtually every accessible stream within this drainage. Salmon Creek and the mainstem are the most important chum salmon areas in this section. There are 21 miles of mainstem Naselle River and approximately 48 linear miles of tributaries presently accessible and utilized by salmon.

Limiting Factors

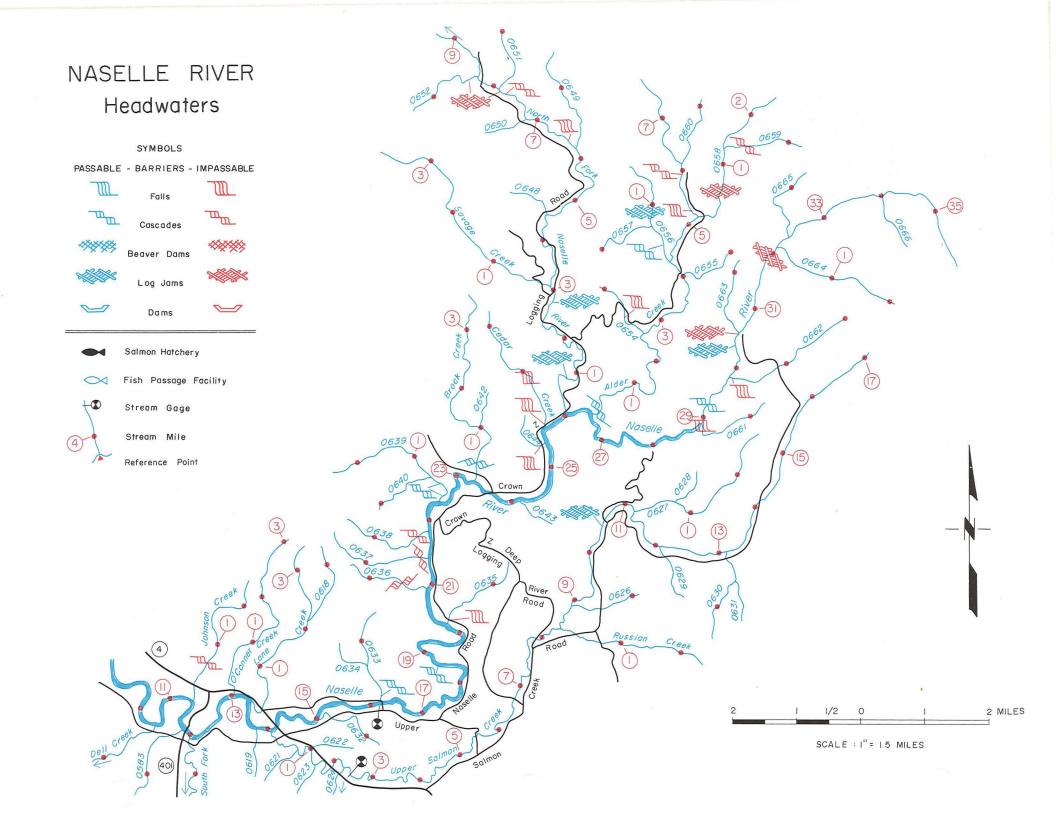
The major limiting factor in this section is an abundance of both natural and artificial barriers. Some otherwise potentially productive areas are now inaccessible to adult fish because of falls, log jams and beaver dams. Poor logging practices have caused siltation of good gravel spawning areas in some streams while debris and windfalls left by loggers have also decreased production potentials. Low summer stream flows are also a limiting factor to coho production in this section.

Beneficial Developments

There have been no beneficial developments in this section of the Naselle River.

Habitat Needs

In order for this section to reach its full potential as a salmon producer, a number of spawning areas need to be opened up by removal of natural and man-caused barriers. More concern for the streams in this section must be shown in future logging operations if their production potentials are to be maintained. Fry plants in the waters above these barriers would supply some immediate benefits by allowing utilization of some of the available rearing area not presently being used.



NASELLE RIVER Headwaters Willapa Basin — WRIA 24

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0543	Naselle River				Coho,Chin.,Chum
0576	Dell Creek	LB-10.5	4.7	_	Chum,Coho,Chin.
	(See Willapa 1303)				
0581	Johnson Creek	RB-11.4	2.4	_	Coho, Chum
0583	Unnamed	LB-11.8	1.6	_	Unknown
0584	S. F. Naselle River	LB-12.0	7.8	101.1	Coho,Chum,Chin.
	(See Willapa 1503)	7 1			
0616	O'Conner Creek	RB-13.0	3.1	_	Coho, Chum
0617	Lane Creek	RB-13.3	3.5	_	Coho, Chum
0618	Unnamed	LB-2.2	1.3	_	None
0620	Upper Salmon Cr.	LB-14.1	1 <i>7</i> .1	_	Coho,Chin.,Chum
0625	Russian Creek	LB-8.4	2.4	_	Coho, Chum
0626	Unnamed	LB-8.9	1.1	_	Coho
0627	Unnamed	RB-11.2	2.8	_	Coho
0630	Unnamed	LB-13.1	1.6	_	Coho
0632	Unnamed	LB-15.0	1.2	_	None
0633	Unnamed	RB-16.2	1.6	_	Coho
0635	Unnamed	LB-20.2	1.5	_	None
0636	Unnamed	RB-20.9	1.4	_	Coho
0637	Unnamed	RB-21.4	1.8	-	Coho
0638	Unnamed	RB-21.9	1.6	_	Coho
0639	Unnamed	RB-22.4	2.4	_	Coho
0640	Unnamed	RB-0.6	1.1	_	Unknown
0641	Brock Creek	RB-23.4	3.6	_	Coho
0645	Cedar Creek	RB-25.6	2.3	_	None
0646	N. F. Naselle River	RB-26.1	10.0	15.2	Coho, Chinook
0647	Savage Creek	RB-3.1	3.8	_	Coho
0649	Unnamed	LB-6.2	1.7	_	Coho
0651	Unnamed	LB-7.9	1.0	_	None
0652	Unnamed	RB-8.3	1.3	_	None
0653	Alder Creek	RB-26.4	7.7	11.6	Coho, Chinook
0654	Unnamed	RB-2.6	1.1	_	Coho
0655	Unnamed	LB-4.0	1.0	_	Coho
0656	Unnamed	RB-4.3	1.8	_	Coho

NASELLE RIVER Headwaters Willapa Basin — WRIA 24

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon	Use
	(4)					
0657	Unnamed	RB-0.6	1.0	_	Coho	
0658	Unnamed	RB-5.2	2.5	_	Coho	
0659	Unnamed	LB-1.3	1.2	_	None	
0660	Unnamed	LB-6.1	1.1	_	None	
0661	Unnamed	LB-28.9	1.3	_	None	
0662	Unnamed	LB-29.8	2.0	_	None	
0663	Unnamed	RB-30.6	1.2	_	None	
0664	Unnamed	LB-32.1	2.1	_	None	
0665	Unnamed	RB-32.4	1.3	- "	None	
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SOUTH FORK NASELLE RIVER

This section describes the entire South Fork Naselle River drainage. Included in this area are 78 miles of mainstem and 14 tributaries, providing an additional 109.7 linear miles of stream drainage.

Stream Description

The South Fork Naselle is a short coastal stream about 7.8 miles in length. It flows in a northerly direction, entering the Naselle River at mile 12.0, at the town of Naselle. The mainstem and right bank tributaries flow from lowland areas of mixed deciduous vegetation and farmland. The left bank tributary streams flow from the Willapa hills and have steeper gradients. The surrounding vegetation of these streams is largely coniferous forest. This section of the Naselle watershed is primarily in timber production, but cleared farmland is common along the river valley. Access to the mainstem is by State Highway 401, which parallels the South Fork throughout its length. Access to the tributaries is limited to a network of private logging roads criss-crossing through this section.

The lowermost portion of the South Fork is under tidal influence. In this reach the stream averages 10 yards in width in the summer and 15 yards in the winter. The gradient in this portion of the stream is moderate to slight. The principal bottom types are sand, silt and mud. Upstream from the mouth of Davis Creek the mainstem contains large percentages of gravel and sand, with average widths of 7 yards in the summer and 12 yards in the winter. The gradient in this portion is moderate and the surrounding vegetation is principally alder. At the headwaters the average width ranges from 6 yards in the summer to 11 yards in the winter. The bottom is heavy to sand and gravel, with a moderate gradient. The surrounding vegetation is nearly 100% forested, with mixed stands of deciduous and coniferous trees.

Davis Creek is the first major tributary entering the South Fork upstream from its mouth. It is 4 miles in length and ranges in width from 4 yards in the summer to 8 yards in the winter, at its mouth. The bottom is primarily composed of gravel and sand. The creek is well shaded by alder, and the watershed is composed of a mixture of second-growth hemlock, fir, and cedar. The gradient in Davis Creek is moderate in the lower end, becoming steeper near the headwaters.

Cement Creek, another important left bank tributary, flows into South Fork Naselle approximately 0.6 mile upstream from the mouth of Davis Creek. This stream drains an area similar to that of Davis Creek. The bottom is principally gravel and sand, with an occasional outcropping of bedrock. Cement Creek is 3.7 miles long and varies in width from 2 yards in the summer to 5 yards in the winter, at its mouth.

Burnham Creek and Johnson Creek are the major right bank tributaries in this section. Both streams are characterized by very slight gradient and sand and silt bottoms. Neither of these tributaries has much potential for salmon production.

Bean Creek is the uppermost large tributary in this section. It is 5.7 miles in length and averages 4 yards wide in

the summer and 7 yards in the winter. It flows from a moderate gradient over a sand and gravel bottom. The surrounding vegetation is predominantly mixed conifers and alders.

Salmon Utilization

The South Fork Naselle drainage provides transportation, spawning and rearing areas for chinook, coho and chum salmon. Small numbers of chinook spawn successfully in the mainstem, Davis Creek, Cement Creek and Bean Creek. Coho spawn in virtually every accessible stream in the drainage where adequate spawning gravel exists. The most important areas are the left bank tributaries; Davis, Cement and Bean creeks. Chum utilize this drainage extensively, with Davis Creek being the most important tributary. It is estimated that salmon presently utilize all 78 miles of the mainstem South Fork Naselle River and about 11 linear miles of tributaries.

Limiting Factors

Lack of suitable spawning gravel is the principal factor limiting salmon production in this drainage. The right bank tributaries, in particular, are slow moving and heavily silted and not well suited for salmon spawning. Logging damage in the form of debris, jams and erosion are also serious factors limiting production in this section. Low summer stream flow is a limiting factor to coho production.

Beneficial Developments

There have been no beneficial developments in this section of the Naselle River.

Habitat Needs

The most important need in this section is the protection of the valuable left bank tributaries and mainstem from further logging damage. Once this protection is afforded, natural and manual stream clearance should increase production. Fry plants in left bank tributaries may be useful in increasing the over-all production from this section.

SCALE: I" = I MILE

SOUTH FORK NASELLE RIVER Willapa Basin — WRIA 24

Stream		Location		Drainage		
Number	Stream Name	Of Mouth	Length	Area	Salmon Use	
0543	Naselle River				Coho,Chin.,Chur	
0584	S. F. Naselle River	LB-12.0	7.8	19.6	Coho,Chum,Chir	
0587	Unnamed	RB-1.15	1.0	_	Unknown	
0588	Unnamed	RB-1.9	1.0		Unknown	
0589	Unnamed	LB-2.0	1.1	_	Unknown	
0590	Davis Creek	LB-2.2	4.0	_	Coho,Chum,Chir	
0591	Unnamed	RB-1.1	1.1		Coho	
0593	Burnham Creek	RB-2.6	2.7	_	Coho, Chum	
0598	Cement Creek	LB-2.8	3.7	_	Coho, Chum,Chi	
0600	S. Burnham Creek	RB-4.0	1.0	_	Coho	
0603	Johnson Creek	RB-5.6	2.1	_	Coho, Chum	
0605	Unnamed	LB-0.5	1.1	_	Coho	
0607	Unnamed	RB-1.1	1.5	_	Coho	
0608	Unnamed	RB-1.5	1.0	_	Coho	
0610	Bean Creek	LB-5.7	2.8	_	Coho,Chum,Chir	
0611	Unnamed	LB-0.5	2.0	_	Coho, Chum	
0614	Unnamed	LB-1.4	1.1	_	Coho	
0615	Unnamed	RB-6.3	1.0	_	Unknown	

BEAR RIVER

This section describes the entire Bear River drainage from its headwaters to its confluence at the extreme southern end of Willapa Bay. A total of 12.6 miles of mainstem channel and 13 tributaries, providing 30.7 linear miles of tributary streams, are found in this drainage.

Stream Description

Bear River is a short coastal stream about 13 miles in length and 30 square miles in drainage area. It is the southernmost tributary of Willapa Bay. The watershed is largely mountainous with coniferous timber and alder bottomlands. Highway 101 crosses the river in tidewater and private logging roads provide access to the upper reaches.

The lowermost 3.5 miles of the mainstem lie within tidal influence where the average channel widths vary from 50 to 100 feet wide. The bottom near the mouth is principally silt, grading to gravel near the upstream portion of this section. The surrounding vegetation is mixed deciduous brush and marsh.

The first 2.5 miles upstream from tidewater have a moderate gradient. Here the stream averages 5 yards in width in the summer, and 10 yards in the winter. The bottom is composed principally of medium sized gravel, ideal for spawning and aquatic food production. The stream in this section flows through an open alder bottom with a large number of shallow riffles and pools. At the upper end of this section is a bedrock cascade, where the river drops about 5 feet in 15 yards.

Above the cascade the gradient of Bear River increases and the stream banks become steeper. The bottom in this section is principally bedrock and gravel. Here the stream widths average 4 yards in the summer and 8 yards in the winter. Old second-growth forests, mixed with recently logged-off areas, make up the surrounding watershed. The numerous tributaries in this section are, as a rule, small and rather steep in nature.

Indian Creek, the largest tributary to Bear River, flows into the river at mile 3.2, just upstream from the head of tidewater. Only 2% of the bottom material in Indian Creek is gravel, the remaining 98% being sand and silt. The gradient is moderate and the channel poorly defined in places. The streambed is surrounded by alder flats. Indian Creek has very little potential value for salmon production.

Salmon Utilization

The Bear River drainage provides transportation, spawning and rearing area for chinook, coho and chum salmon. Chinook utilize only the middle reaches of the mainstem for spawning. Coho spawn throughout the watershed, principally in the upper mainstem and tributaries. Chum salmon use the lower mainstem extensively, from the head of tidewater to the falls. It is estimated that salmon presently utilize 12.5 miles of mainstem Bear River as well as some 15.5 linear miles of tributaries.

Limiting Factors

The primary factor limiting salmon production in this section is the lack of suitable spawning area. Logging debris and natural windfalls are plentiful in the tributaries and

upper mainstem. Low summer flow is an important limiting factor in Bear River where more coho are produced annually than can successfully rear over the summer months. Siltation caused by extensive logging has done considerable damage to lower river chum spawning areas.

Beneficial Developments

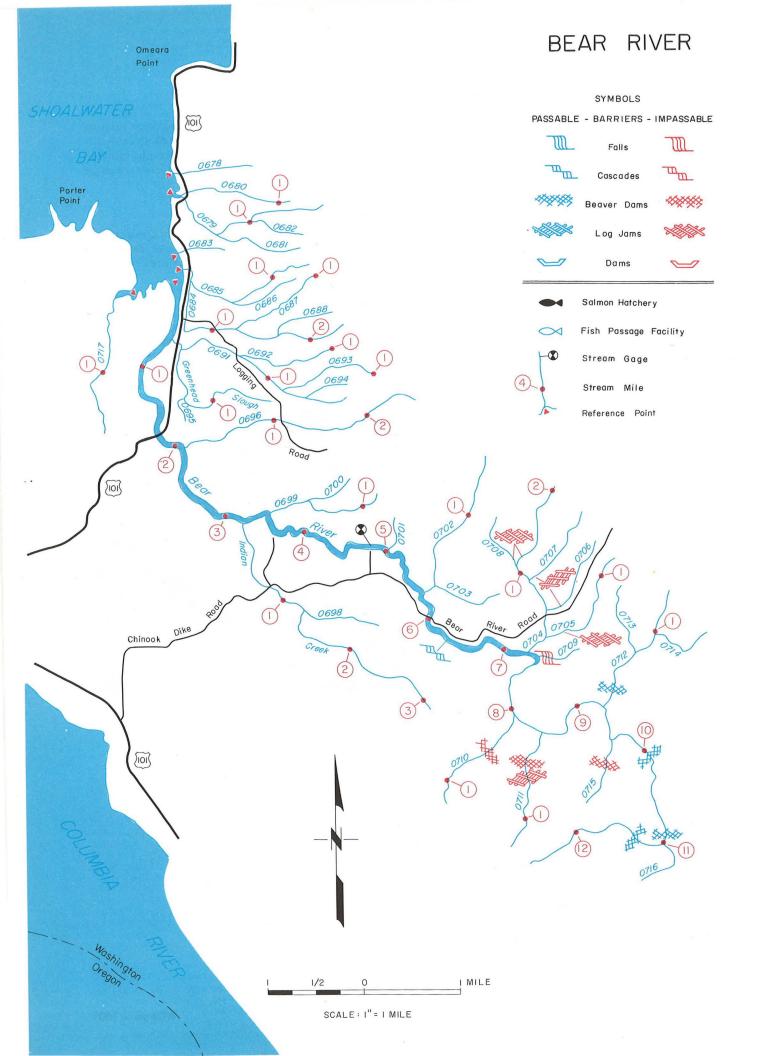
The Department of Fisheries successfully conducted an extensive gravel cleaning operation in lower Bear River during the late 1960's, restoring this area for chum spawning.

Habitat Needs

A flow control facility on Bear River would greatly enhance its productivity for both coho and chum salmon. Continued rehabilitation of desirable spawning areas may be needed if logging activities are not controlled.



PHOTO 24-17. Typical chum production area of lower Bear River.



BEAR RIVER Willapa Basin — WRIA 24

	Location		Drainage	
Stream Name	Of Mouth	Length	Area	Salmon Use
Unnamed	NW 1/4 ,Sec5 , T10N,R10W	1.8	_	Unknown
Unnamed	RB-0.05	1.0	_	Unknown
Unnamed	NW ½, Sec8, T10N,R10W	2.4	_	Unknown
Unnamed	RB-0.1	1.4	-	Unknown
Unnamed	RB-1.2	1.0	_	Unknown
Bear River	NW 1/4 ,NW 1/4 ,Sec8 , T10N,R10W	12.6	22.0	Coho,Chum,Chin
Greenhead Slough	RB-0.6	1.7	_	Coho, Chum
Unnamed	RB-0.15	1.9	_	Coho, Chum
Unnamed	RB-0.65	1.0	_	Coho
Unnamed	RB-1.2	1.0	_	Coho
Unnamed	RB-2.1	2.5	_	Coho
Indian Creek	LB-3.2	3.1	_	Coho
Unnamed	RB-3.4	1.2	_	Coho
Unnamed	RB-5.7	1.6	_	Coho
Unnamed	RB-7.3	2.1	_	Coho
Unnamed	LB-0.2	1.3	_	Coho
Unnamed	LB-8.1	1.2	_	Coho
Unnamed	LB-8.4	1.3	_	Coho
Unnamed	RB-9.3	1.4	_	Coho
Unnamed	NW½,Sec7, T10N,R10W	1.7	_	Unknown
	Unnamed Unnamed Unnamed Unnamed Unnamed Bear River Greenhead Slough Unnamed Unnamed	Stream Name Of Mouth Unnamed NW¼, Sec5, T10N,R10W Unnamed RB-0.05 Unnamed NW¼, Sec8, T10N,R10W Unnamed RB-0.1 Unnamed RB-1.2 Bear River NW¼, NW¼, Sec8, T10N,R10W Greenhead Slough RB-0.6 Unnamed RB-0.15 Unnamed RB-0.65 Unnamed RB-1.2 Unnamed RB-2.1 Indian Creek LB-3.2 Unnamed RB-3.4 Unnamed RB-5.7 Unnamed RB-7.3 Unnamed LB-0.2 Unnamed LB-8.1 Unnamed RB-9.3 Unnamed RB-9.3 Unnamed NW½, Sec7,	Stream Name Of Mouth Length Unnamed NW¼, Sec5, T10N,R10W 1.8 Unnamed RB-0.05 1.0 Unnamed NW¼, Sec8, T10N,R10W 2.4 Unnamed RB-0.1 1.4 Unnamed RB-1.2 1.0 Bear River NW¼, NW¼, Sec8, T10N,R10W 12.6 Greenhead Slough RB-0.6 1.7 Unnamed RB-0.15 1.9 Unnamed RB-0.65 1.0 Unnamed RB-1.2 1.0 Unnamed RB-2.1 2.5 Indian Creek LB-3.2 3.1 Unnamed RB-3.4 1.2 Unnamed RB-5.7 1.6 Unnamed RB-7.3 2.1 Unnamed LB-8.1 1.2 Unnamed LB-8.1 1.2 Unnamed LB-8.4 1.3 Unnamed RB-9.3 1.4 Unnamed RB-9.3 1.4 Unnamed RB-9.3 1.4	Stream Name Of Mouth Length Area Unnamed NW¼, Sec5, T10N,R10W 1.8 — Unnamed RB-0.05 1.0 — Unnamed NW¼, Sec8, T10N,R10W 2.4 — Unnamed RB-0.1 1.4 — Unnamed RB-1.2 1.0 — Bear River NW¼, NW¼, Sec8, T10N,R10W 12.6 22.0 Greenhead Slough RB-0.6 1.7 — Unnamed RB-0.15 1.9 — Unnamed RB-0.65 1.0 — Unnamed RB-1.2 1.0 — Unnamed RB-2.1 2.5 — Indian Creek LB-3.2 3.1 — Unnamed RB-3.4 1.2 — Unnamed RB-7.3 2.1 — Unnamed LB-8.1 1.2 — Unnamed LB-8.1 1.2 — Unnamed LB-8.4 1.3 —

LONG BEACH PENINSULA

This section describes the lakes, sloughs and small streams draining into Willapa Bay and the Pacific Ocean from Long Beach Peninsula. There are a total of 14 small lakes drained and interconnected by 10 independent stream or slough systems. None of these areas are presently utilized by salmon.

Stream Description

Long Beach Peninsula is a spit of land extending approximately 16 miles from the south end of Willapa Bay to its tip, forming the southern boundary of the entrance to the bay. This finger of land ranges in width from one to two miles. As the name implies, the peninsula is surrounded on both sides by water; to the west by the Pacific Ocean and to the east by Willapa Bay.

Long Beach peninsula was formed by a gradual process of sand deposition and build-up. Thus, the stream bottom materials are principally sand, with silt being the only other material present. The topography is very flat and the elevation low, much of the area lying below sea level. There is very little shade in this section, and the stream-side vegetation is primarily tidal marsh and deciduous grasses.

The various streams and sloughs in the section serve as drainages for the numerous freshwater lakes dotting the peninsula. These lakes are typically shallow with irregular shore lines. Because they are shallow and open, they become warm in the summer months, often reaching temperatures near lethal for salmonids. In most cases these lakes are kept full by the area's abundant rainfall, but a few also contain underwater springs. Warm water fish species are present in many of these lakes.

Tarlatt Slough is the most southerly and the largest drainage system in this section. The slough itself is 4.5 miles in length from where it empties from Black Lake into Willapa Bay. Much of this area lies within tidal influence. As the name would indicate, Tarlatt Slough has a low gradient and very little water movement.

Some of the other significant drainage systems include Parker Slough, Giles Slough, Pauls Slough, Espy Slough and Goulfers Slough, all draining into Willapa Bay. A small unnamed stream drains from Loomis Lake into the Pacific Ocean. This is the only stream in this section emptying directly into the ocean.

Salmon Utilization

Salmon do not utilize the streams and sloughs described in this section to any appreciable degree. Coho salmon may utilize Tarlatt Slough in some years with little or no success.

Limiting Factors

The overriding limiting factor in this section is the lack of suitable spawning area. Suitable spawning materials are not present within the waters of this section. High summer temperatures limit some areas which otherwise would have potential for rearing.

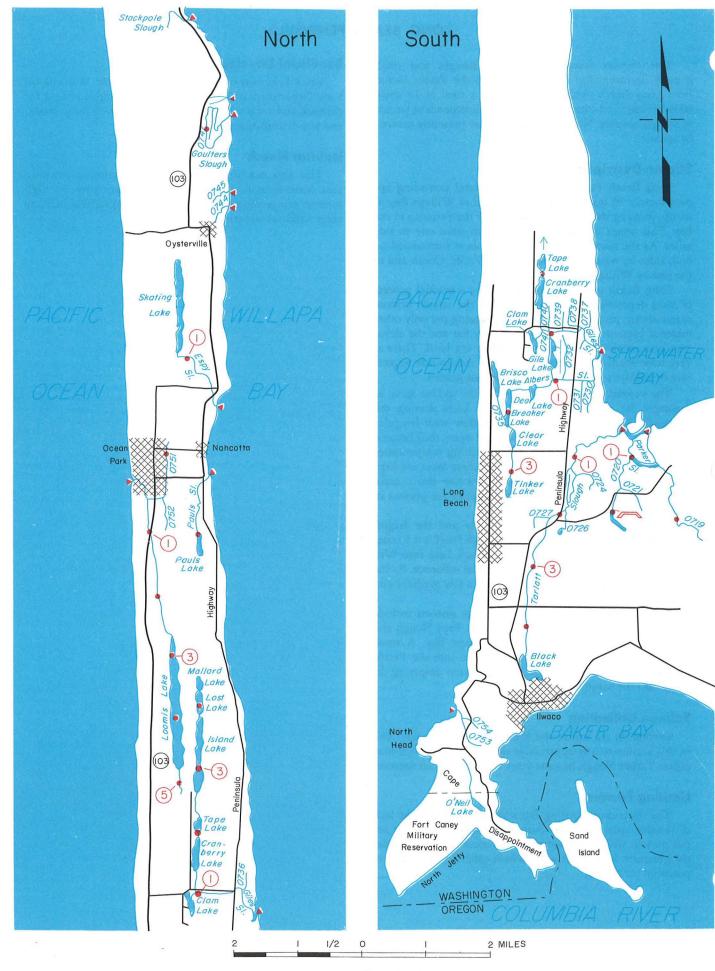
Beneficial Developments

Black Lake was operated for a time by the Washington State Department of Fisheries as a rearing impoundment for chinook and coho salmon. This project proved unsuccessful and was discontinued.

Habitat Needs

This area has little or no value as a salmon spawning area. Some systems could be utilized for rearing fry, but high summer temperatures presently make it impractical in many areas within this section.

LONG BEACH PENINSULA



LONG BEACH PENINSULA Willapa Basin — WRIA 24

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
	LONG BEACH PENINSULA				
0718	Parker Slough	N½,Sec11, T10N,R11W	1.2	_	Unknown
0719	Unnamed	RB-0.5	1.6	_	Unknown
0720	Unnamed	RB-0.9	1.0	_	Unknown
	Mountain Spring Res.	Outlet-1.0	_	_	
0722	Tarlatt Slough	N½,NW¼,Sec11, T10N,R11W	4.5	_	Unknown
	Black Lake	Outlet-4.5		_	
0728	Giles Slough	SE1/4,Sec34, T11N,R11W	4.25	_	Unknown
0729	Albers Slough	RB-0.05	3.15	_	Unknown
	Albers SI. cont. as Drainage Ditch	@ mi. 1.01			
	Deer Lake	Outlet-1.3		_	
	Breaker Lake	Outlet-1.7		-	
	Clear Lake	Outlet-2.35	_	· —	
	Tinker Lake	Outlet-3.15	_	_	
	Giles SI. cont. as Drainage Ditch	@ mi. 0.51			
	Cranberry Lake	Outlet-1.4	_	_	
	Tape Lake	Outlet-2.0	_	_	
	Island Lake	Outlet-2.6	_	_	
	Lost Lake	Outlet-3.85	_	_	
	Mallard Lake	Outlet-4.25	_	_	
0742	Pauls Slough	SW1/4 ,SW1/4 ,Sec27 , T12N,R11W	1.0	_	Unknown
	Pauls Lake	Outlet-1.0	_		
0743	Espy Slough	SW ¹ / ₄ ,Sec22, T12N,R11W	1.2	-	Unknown
	Skating Lake	Outlet-1.2	_	_	
0746	Goulter's Slough	NE1/4,NW1/4,Sec34, T13N,R11W	~ 2.4	-	Unknown
	Goulter's SI. cont. as Drainage Ditch	@ mi. 0.5			
0750	Unnamed	SW ¹ / ₄ ,Sec28, T12N,R11W	5.2	_	Unknown
0751	Unnamed	RB-0.5	1.2	_	Unknown
	Loomis Lake	Outlet-2.8			