

HOOD CANAL BASIN

Water Resource Inventory Area 16

Streams draining this area originate on the Olympic Peninsula and flow eastward emptying into Hood Canal along its western shore. The four principal river systems are the Skokomish, Hamma Hamma, Duckabush, and Dosewallips. All of these headwaters originate in the extremely rugged, forested areas of the National Park and Forest in the Olympic Mountains. Numerous smaller independent streams drain the lower foothills of the Olympic Mountains between the major river systems. There are 557 identified streams providing over 825 linear miles of rivers, tributaries, and independent streams in this drainage basin. The principal characteristics of these watersheds are the steep, rugged terrain found throughout most of the basin with the exception of the lower Skokomish River which passes through a broad flood plain. Stream gradient in both the large and small watersheds is relatively steep. Anadromous fish migration on a number of these streams is limited by falls, cascades, or by the overall steep terrain.

The Skokomish River enters Hood Canal at its southernmost point. It is comprised of 9.0 miles of mainstem, 33.3 miles in the North Fork, and 27.5 miles in the South Fork. Tributary streams total 270 miles with Vance Creek (11.0 miles) being the largest and most important. Other impor-

tant tributaries include Purdy Creek on the mainstem, Brown Creek and LeBar Creek on the South Fork, and McTaggart Creek on the North Fork. Both forks head in the high, rugged, mountainous areas of Olympic National Park and Forest. The heavily timbered area of the uppermost watershed gives way downstream to sections where extensive logging has taken place over many years. Much of this area has been reseeded and supports stands of young coniferous timber. Both major forks of the Skokomish River have an upper basin section bounded on the downstream end by deep, steep-walled canyons. Two hydroelectric dam projects are located in the canyon on the North Fork. A major portion of the stream flow from the North Fork is directly diverted from the lower dam through a tunnel to generators located at Potlatch on Hood Canal.

Below the canyons, the valley floor broadens to the forks. The river has formed a broad, fertile valley, extensively used for farming, throughout the mainstem and the lowermost sections of the forks. All of the populated area within the drainage lies in this section. The Skokomish Indian Reservation is located on the delta at the mouth of the river and extends upstream for about 5½ miles.

Stream gradient, in general, is steep in the uppermost



PHOTO 16-1. River deltas form an important link in the ecology of Hood Canal (mouth of Skokomish River).

watershed, becoming moderate in the upper basin, increasing again in the canyon areas, and returning to a moderate to shallow grade in the broad, lower valley. The stream has formed an extensive intertidal estuary roughly two miles square that is rich in shellfish resources.

Other features of the Skokomish watershed include Lake Cushman, a pre-existing lake that was increased substantially in size with construction of the upper North Fork dam. The Staircase Recreational Area of Olympic National Park is located on the North Fork a short distance upstream from Lake Cushman. Another popular outdoor recreational site is the National Forest's Brown Creek campground on the South Fork.



PHOTO 16-2. Upper Cushman Dam (North Fork Skokomish River).

The Washington Department of Fisheries operates the George Adams Hatchery on Purdy Creek, approximately one mile above its confluence with the lower Skokomish River. This hatchery was constructed with the cooperation of the City of Tacoma to mitigate for losses of salmon resources that occurred with construction of the North Fork hydroelectric projects.

Proceeding northward along Hood Canal, a number of small independent drainages flow from the Olympic Peninsula foothills. The more important of these streams, from south to north, are Hill Creek, Finch Creek, Miller Creek, Sund Creek, Little Lilliwaup Creek, Lilliwaup River, Eagle Creek, and Jorsted Creek. All have sections of steep gradient in their upper reaches, but become moderate as they approach Hood Canal. All are short in length with the Lilliwaup River being the longest with 6.9 miles of mainstem and 6.2 miles of tributaries. In spite of their small size, the lower sections of these streams provide some of the highest quality salmon spawning area in Puget Sound, particularly for chum salmon.

Virtually all human habitation along this section of the Hood Canal basin is located along the immediate shoreline of Hood Canal. With the exception of Lilliwaup Creek, which drains a swampy plateau area, the streams flow through narrow valleys covered with dense second growth coniferous and deciduous timber. The center of population in lower Hood Canal is the community of Hoodport. This is

the site of the Department's Hood Canal Salmon Hatchery located at the mouth of Finch Creek. This hatchery is situated on the shores of Hood Canal and is uniquely adapted for either fresh-water or salt-water rearing of salmon. Four of the five species of Pacific salmon native to Washington are produced at this hatchery.

Midway along the west shore of Hood Canal is the Hamma Hamma River drainage. This system has only 17.8 miles of mainstem, but has extensive tributaries totalling 74.1 miles. With its headwaters high in the Olympics, the Hamma Hamma is similar to other streams of this area with steep gradients in its upper reaches. One major falls and a long series of cascades in a steep canyon 2.5 miles above the mouth form a block to anadromous fish migration. Stream gradient below this point is shallow to moderate and includes some extremely productive salmon spawning area. Major tributaries include Jefferson, Washington, and John creeks of which only John Creek is accessible to salmon migration.

With the exception of several rural homes and one farm located near the river mouth, the entire watershed is unpopulated. Most of the upper watershed is located in the Olympic National Forest. Coniferous forests predominate, although extensive logging has been done in portions of the drainage. Access is available to much of the watershed for recreational use.

Waketickah and Fulton creeks are the largest of several small independent drainages north of the Hamma Hamma River to the Duckabush River. Watershed cover, stream gradient, population density, and general features are very similar to those described for small independent drainages to the south. Stream gradient near the mouth of Waketickah Creek is very steep and anadromous fish production is extremely limited. Fulton Creek is accessible for approximately $\frac{3}{4}$ miles below a major falls and supports important runs of coho and chum salmon. Schaerer Creek is also utilized by anadromous fish in its lower reaches.

The glacial headwaters of the Duckabush River lie deep in the Olympic National Park section of the Olympic Peninsula and flows through a deep valley throughout the entire length of 24.1 miles. Its numerous tributaries, all of which are relatively short with steep gradients, total 34.2 miles. The mountainous terrain of the upper river watershed remains in its near virgin state with little logging and only seasonal recreational usage. Stands of coniferous timber predominate. A number of rural homes are located on the lower four miles of stream and during recent years recreational homesite development has increased sharply near the river mouth.

The Duckabush River is accessible to salmon upstream to a falls approximately 7.0 miles above the mouth. Stream gradient is relatively steep both above and below the falls, but is interspersed with sections of moderate slope. A canyon section from RM 3.0 to 4.0 contains several cascades that form a partial block to certain species. Below this the gradient shallows considerably and provides extensive riffles of prime spawning gravel.

Two small independent drainages, immediately north of the mouth of the Duckabush River, support salmon runs. These unnamed streams drain short, wooded, uninhabited valleys to their confluence with the Duckabush River estuary.

The Dosewallips River is the largest drainage entering the northern area of Hood Canal with 28.3 mainstem stream miles and 104.5 miles of tributaries. Like the Duckabush River, the Dosewallips originates in the glacier fields of the central portion of Olympic National Park. Downstream from this, in the Olympic National Forest, some logging has been done, particularly on watersheds of tributary streams, but basically the entire system has remained largely undisturbed with coniferous forests forming the primary vegetation. Along the lower 5 miles, below the National Forest boundary, a number of rural homes and small farms border the river. The stream follows a deep, steep-walled valley throughout most of its length and only broadens near the mouth at the community of Brinnon. Some recreational home development has recently begun along lower portions of the river. Recreational usage includes several forest camps along the accessible portions of the stream, approximately 16 miles, and at Dosewallips State Park on the south bank of the river at its mouth. Certain upper river areas are accessible by trail.

Salmon accessibility is limited to the lower 14 miles of stream by a major waterfall. Gradient downstream from this point is relatively steep with numerous cascade sections interspersed with moderate gradient areas of high quality gravel suitable for salmon utilization. Continuing downstream, stream gradient gradually moderates all the way to the mouth. Tributary streams are generally small and are

accessible to salmon only at the stream mouth, if at all. The only major tributary supporting salmon runs is Rocky Brook Creek at river mile 3.6. The Brinnon flats (or Dosewallips flats), the broad shoal off the mouth of the river, is rich in shellfish and aquatic life.

Fish Inventory and Distribution

Four species of Pacific salmon, chinook, coho, pink, and chum, currently utilize the rivers and independent streams of the Hood Canal basin. A few sockeye are observed incidentally in the Hamma Hamma, Duckabush, and Dosewallips rivers; however, their numbers are insignificant and sporadically distributed. There are approximately 70 miles of available rivers, their tributaries, and independent streams in this basin for these species of fish to use for migration, spawning, and rearing.

Chinook Salmon — This largest of all salmon species utilizes the four rivers in this basin in preference to the smaller drainages. These fish require greater flows and depths with larger gravel than normally occurs in the smaller streams. Fall chinook comprise the major portion of the runs while a few distinct summer or spring chinook races are recorded in some of these rivers. Spring chinook formerly utilized the South Fork Skokomish River in the 1950's; however, only a remnant of the run now exists. In the North Fork Skokomish River there has been insufficient

Timing of salmon fresh-water life phases in the Hood Canal Basin WRIA 16

Species	Fresh-water Life Phase	Month											
		J	F	M	A	M	J	J	A	S	O	N	D
Spring Chinook	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing												
	Juv. out migration												
Summer-Fall Chinook	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing												
	Juv. out migration												
Coho	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing												
	Juv. out migration												
Pink	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing												
	Juv. out migration												
Chum	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing												
	Juv. out migration												

flow releases from Cushman Reservoir to sustain the former race of spring chinook that utilized this system.

Since the spring run chinook enter the rivers in early summer, they require cool glacier-fed waters to reside in until spawning time in September. The spring-summer chinook races are observed annually in the Duckabush and Dosewallips rivers while only fall chinook utilize the Hamma Hamma River. Fall run chinook inhabit all the river sections throughout the accessible lengths of each of the four major rivers in the lower Hood Canal basin. Fall chinook use of the independent streams is minimal due to very low flows during normal chinook migration and spawning periods. Juvenile chinook rear in all the accessible stretches of these rivers and the tributary streams inhabited by the adult spawners.

The spawning migration of adult fall chinook generally begins in late July; however, the peak of the upstream movement occurs about the last week of September and terminates by mid-November (Table 16-1). Spawning commences in these rivers in mid-September and is normally completed throughout the basin by the end of November.

The timing of the fall chinook spawning migration to the Hamma Hamma usually lags behind that of the other rivers in this basin by approximately two weeks. Intergravel development of the fry is normally completed by the last week in February and emergence from the gravel follows closely thereafter. The majority of the fry rear in these river systems for about three months with major out-migration occurring in late March to late June during the high spring freshets. A minor portion of the fry are known to remain for longer periods. The spring chinook fry rear in the river until the winter rains increase the flows or until the following spring run-off period.



PHOTO 16-3. Upper South Fork Skokomish River provides spawning for spring and summer chinook.

Annual escapements of wild fall chinook from 1965 to 1971 ranged from 800 to 3,000 for the Skokomish River system with a desired level of 2,700 adults. The Hamma Hamma's natural escapements ranged from 100 to 400 adult spawners with 400 the desired level. The Duckabush River's

natural fall chinook runs ranged from 50 to 200 with the desired level at 300 spawners. The Dosewallips River's escapements for this period have ranged from 200 to 700 with 1,000 chinook as the desired minimum level (Table 16-2).

Coho Salmon — All the rivers and streams in the Hood Canal basin are inhabited by coho salmon throughout their accessible lengths. Spawning occurs in every stream where suitable conditions prevail, including many sections along the fringes and side channels of the mainstem rivers. Streams known to be particularly important for coho production include Vance Creek on the South Fork and Mc-Taggart Creek on the North Fork Skokomish River and two independent drainages, Eagle and Fulton creeks. All other river tributaries and independent streams in this basin are typical short run types of moderate coho production value. However, collectively they are very important and provide significant contributions to commercial and sports fisheries. Miller Creek and Sund Creek are two independent drainages that have no coho production since they both contain intermittent flows and are normally dry during summer months.

The adult coho return to the rivers in this basin starts in mid-September, while the return to the smaller independent streams commences after the fall rains in mid-October. Spawning begins immediately after the water rises from fall rains in mid-October and extends to the end of January. After fry emergence in early March the juveniles remain in these systems for more than a year, migrating seaward in the spring of their second year. Major out-migration occurs from late February to mid-April.

Juvenile coho rear throughout the accessible areas of all basin streams as well as in the mainstem rivers. Spacial pressures force large numbers of juveniles to move out of the fresh-water habitat in their first year to rear in the estuaries and shallow river deltas of the canal.

Based on spawning ground surveys and rearing capacity determinations, it is estimated that coho escapements to the Hood Canal basin have ranged from 9,600 to 35,200 for the period 1960 to 1971 with a desired minimum escapement of 10,000 adults annually.

Pink Salmon — Odd-numbered year runs of pink salmon are the predominant species in the Dosewallips, Duckabush, and Hamma Hamma rivers, while the Skokomish River maintains a run of only a few hundred fish. A few stray pinks ascend the larger of the small independent streams in this basin but no established runs are to be found here. Glacial-fed rivers and streams appear to be required for the perpetuation of pinks. Although minor populations are produced from non-glacial systems, they do not fare as well.

Adult pink salmon enter the basin drainages beginning the first week of August with the run continuing into October. Spawning occurs from mid-September to the end of October. These pink salmon are mainstem spawners with few tributaries providing adequate spawning flows and habitat. Following incubation and emergence of fry from the gravel, the juveniles immediately drift seaward. This downstream movement occurs from mid-February to the first part of June. The quality of the estuaries and marine waters of Hood Canal is the major factor in survival and successful rearing of pink fry from these rivers.

Spawning population surveys have been conducted on these rivers since 1963 and pink salmon escapements (1965 to 1971) have ranged from 20,000 to 190,000 for the Dose-

wallips River, averaging 85,000 for these odd-year returns. In the Duckabush River total spawning escapements have ranged from 20,000 to 70,000, averaging 46,000 adults. The Hamma Hamma River escapements ranged from 2,000 to 9,000 averaging 7,000 spawners.

Chum Salmon — The four major rivers in the Hood Canal basin contain significant runs of chum salmon. This species also inhabits the river mouth sloughs as well as all the accessible portions of the small independent streams in this area. These include Hill, Finch, Clark, Miller, Sund, Little Lilliwaup, Lilliwaup, Eagle, Jorsted, Johns, Wake-tickeh, Fulton, and McDonald creeks plus four unnamed creeks.



PHOTO 16-4. The lower reaches of most streams in Hood Canal support chum salmon runs (Eagle Creek).

There are two distinct runs of chum salmon that return to these four major rivers; early (September-October) and late (November-December-January). Except for Johns Creek which has an early run of chums, all the other small independent streams contain only late-run spawners. The early-run chums enter the rivers in late August and early September with spawning extending from mid-September to the end of October. The late-run chums migrate upstream starting the first week of November through mid-December with spawning extending from December 1 to late January. Following incubation and subsequent fry emergence, the juveniles move downstream to the estuaries. This seaward migration extends from late February into May.

For the period 1966 to 1971 the annual chum escapements to the individual Hood Canal rivers are separated as follows:

River	Range	Average	% Early run	% Late run
Skokomish	14,000—21,000	16,000	2	98
Hamma Hamma	2,500—18,000	7,000	35	65
Duckabush	1,000—10,000	6,000	97	3
Dosewallips	500—2,000	1,500	50	50

Collectively the annual early chum runs amount to approximately 9,340 adults while the late chum runs total 21,160 adults for these rivers. Estimates of spawning ground escapements based on annual index surveys indicate the ear-

ly-run chum population is gradually increasing in proportion to the late-run segment. The Skokomish early-run chum population is the only group remaining at a negligible level of abundance.

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 naturally and artificially produced fish, as well as escapement and harvest figures.

TABLE 16-2. Salmon Escapement Level for the Hood Canal Basin WRIA 16.

Species	1966-1971 Escapements ¹	
	Range	Average
Chinook	2,350—13,650	12,000
Coho	9600—35,200	23,400
Pink	42,400—269,800	140,000
Chum	18,000—51,000	30,500

Natural Escapement Potential

Chinook	4,200
Coho	10,000
Pink	234,500
Chum	52,000

¹ Includes natural plus artificial combined escapements.

The Fisheries Department maintains two salmon hatcheries within this basin, the first known as George Adams, is located at Purdy Creek on the lower Skokomish River and the other is the Hood Canal Hatchery, located at the mouth of Finch Creek in Hoodsport. This station has both fresh and salt water facilities for experimental studies on salmon. Four species are handled here; chinook, coho, pink, and chum, while only chinook and coho are reared at the George Adams Hatchery.

The George Adams Hatchery has a hatching capacity of 9,700,000 fry. Present rearing capacity is approximately 2,200,000 yearlings and 1,700,000 fingerling salmon.

The Hood Canal station has an inside hatching capacity of 12,000,000 fry plus 6,000,000 in pond trays. Present rearing capacity is approximately 400,000 yearlings and 5,000,000 fingerling salmon.

For the period 1966 to 1971, chinook returns to the George Adams Hatchery on Purdy Creek ranged from 411 to 2,076 adults, averaging 1,180 annually. Coho rack counts ranged from 4,504 to 24,398, averaging 12,878 spawners annually.

For the same period at the Finch Creek station on Hood Canal the chinook returns ranged from 2,856 to 12,042 averaging 6,701 annually. Coho spawners ranged from 1,816 to 7,272 averaging 4,422 annually. Chum salmon spawners ranged from 1,824 to 5,508 averaging 3,113.



PHOTO 16-5. The Hood Canal salmon hatchery on Finch Creek.

Between 1966 and 1971, juvenile chinook planted into the Hood Canal drainages averaged 4,938,000 annually while coho averaged 2,719,000. In 1971, chinook juveniles released from the Purdy Creek station amounted to 3,014,800 fish (26,700 lbs.). Coho juvenile releases into the Shelton and Hood Canal watersheds totaled 2,753,500 fish (165,700 lbs.). Plants from the Hood Canal stations in 1971 included 4,745,400 juvenile chinook (36,600 lbs.); 605,100 juvenile coho (20,900 lbs.) and 1,547,400 chum (3,000 lbs.).¹

The pink salmon run to Finch Creek at the Hood Canal Hatchery was artificially induced through transfer of Skeena River eggs in 1954 and the run has maintained itself on a relatively low level. Releases of pink fry are normally direct from the hatchery saltwater ponds while occasional experimental plants have been made into the Skokomish, Dewatto, and other Hood Canal streams where no runs existed with results of minor or no success.

The quantity of good spawning area in Finch Creek above the hatchery rack is limited and can only support a small number of spawners. Therefore, the chum runs returning to this system are handled at the hatchery with the majority of these progeny surplus to this station. Adult returns (1966-71) ranged from 1,824 to 5,508, averaging 3,100 chums. In recent years these eggs and fry have been utilized in many ventures including fry releases into the Hood Canal and Kitsap systems where runs are depleted; providing eggs for artificial spawning channels and for Indian aquaculture programs; providing eggs to sports groups and others for incubation and release; and providing fry to other fisheries agencies and universities for experimental programs, as well as transplanting adult spawners to local streams.

Coho returns to Hoodsport are used primarily to bolster streams in the area where runs are depleted and to provide surplus eggs to fulfill demands for coho stock by other states and foreign countries.

¹ The average weight of juvenile salmon from hatchery releases is 20 coho/lb. and 125 chinook/lb.

Finch Creek fall chinooks were artificially developed from transplanted stocks from the Elwha River in 1953 and the Green River in 1954. Impressive runs have been established which provide annual fry and fingerling plants to the Skokomish as well as the other Hood Canal rivers and larger streams. Occasionally chinook fingerlings are also planted outside the basin such as the fish farms at Little Clam Bay and Capitol Lake.

Estimates from marking programs and hatchery returns indicate that the present salmon planting programs from these two salmon hatcheries contribute approximately 58,724 chinook, 132,046 coho, 8,136 chum, and 10,180 pink salmon to the Puget Sound and ocean commercial, Indian, and sport fisheries annually.

Harvest

Salmon produced and reared in the Hood Canal basin contribute to U.S. and Canadian, Pacific Ocean sport and commercial fisheries and to sport and commercial fisheries existing through the Strait of Juan de Fuca, Puget Sound, and Hood Canal. The estimated total contribution (all species) to these various fisheries has in recent years ranged from 142,150 to 766,250 salmon.

No commercial fishing for salmon species is permitted in lower Hood Canal. The Strait of Juan de Fuca and Discovery Bay to Admiralty Inlet purse seine and gill net fisheries intercept and harvest segments of the runs of salmon destined for Hood Canal rivers and streams. Chinook enter these fisheries from mid-July to mid-August while the peak of the pink salmon run occurs the last week of August. The coho runs extend from September 1 to mid-October with the heaviest fishery in the Discovery Bay to Point No Point area. Chum salmon have two distinct runs (early and late) which enter this fishery in early September and extend through November. Approximately 50% of the chums harvested in this net fishery is contributed by the lower Hood Canal drainages.

The question of Indian fishing rights has been contested for many years and adjudication now in progress may cause significant alterations in both fishing patterns and distribution of catch. The Skokomish Indian net fishery is conducted within the reservation boundaries on the lower 5.7 miles of main river. This fishery takes a significant portion of the adult escapements.

Prior to the operation of George Adams Hatchery in 1961, chinook catches never exceeded 1,000 fish with an average of 315 from 1935 to 1961. Similarly, coho catches only exceeded 6,000 fish one time (in 1945) during this period and averaged 2,433 fish. Since 1966 the catches have accelerated, exceeding 12,000 chinook and 32,000 coho of which 90% are from the hatchery production.

Sport angling is extremely popular in the marine waters of lower Hood Canal with heaviest pressures concentrated near the river mouths and adjacent to the Hoodsport Hatchery where adult chinook congregate each fall. Only two public boat launching ramps exist in these marine waters and they are insufficient at times to handle the growing boating pressures. Parking facilities for cars and boat trailers are difficult to obtain in this area due to the terrain and high values of beach frontage. These marine waters are semi-protected from winds and rough waters and contain both shallow river deltas as well as rocky, rugged shorelines with

deep water extending to the middle of the canal which ranges from 50 to 99 fathoms. Immature feeding salmon are present in these waters throughout the year, accounting for much of the fishing effort. Salmon punch card returns show that approximately 55,000 angler days were spent in the entire Hood Canal marine waters in recent years, of which over 50% could be attributed to the lower canal.

Sport salmon angling is permitted in the four major rivers within this basin with the Hamma Hamma, Duckabush, and Dosewallips open downstream from their Highway 101 bridges from October 15 to January 31 of each year. The Skokomish River is open during the same period downstream from the mouth of Vance Creek to the boundary of the Skokomish Indian Reservation. Both adult and jack salmon may be harvested. No sport salmon angling is allowed in any of the small independent streams of this basin.

Limiting Factors

Limiting factors refer to conditions that lead to a complete loss or reduction of the environment's fish production potential, excluding harvest or exploitation. They include only those conditions presently considered alterable. Within the lower Hood Canal basin major limiting factors include seasonal flooding, low summer flows, unstable streambeds, impassable falls or cascades, limited spawning areas, demands for municipal and industrial water supplies, and water quality problems.



PHOTO 16-6. Poor water quality and streambed siltation are the results of landslides (Hamma Hamma River).

Stream flow — Destructive seasonal flooding occurs within some of the basin's drainages; however, many of these rivers and streams are quite stable even with high water conditions. The South Fork Skokomish has been extensively logged and flooding here has severely damaged and reduced the salmon habitat. Jorsted Creek and John Creek also receive heavy flood flows from flash runoffs in the headwaters. The Duckabush and Dosewallips rivers are quite stable as their headwaters lie within the national forest and

national park. Likewise the Hamma Hamma headwaters lie within the national forest lands, but in areas where considerable logging occurs. However, the lower river below Jefferson Creek remains quite stable.

Seasonal low flows are a serious limiting factor in all the streams of the basin. The reduced quantity of rearing area for salmon fingerlings drastically curtails production in the small independent streams. There is little opportunity for storage or flow augmentation for these small independent streams.

Physical barriers — Due to the steep terrain at the base of the Olympic mountain range where it joins Hood Canal, there are impassable falls or barriers on practically every river and stream. Those water courses having considerable potential for salmon production upstream from such barriers include the Hamma Hamma, Duckabush, and Dosewallips. In the Skokomish River there is an impassable falls at RM 21.3 on the South Fork and the lower Cushman Dam obstructs fish passage on the North Fork at RM 17.3. The Hoodspout salmon hatchery racks block salmon migration at the mouth of Finch Creek below Highway 101. In Clark Creek there is an impassable cascade at RM 0.3; in Miller Creek an impassable falls at RM 0.5; in Sund Creek an impassable falls at RM 0.3; in Lilliwaup Creek an impassable falls at RM 0.8; in Eagle Creek an impassable cascade at RM 1.7; in Jorsted Creek an impassable falls at RM 0.9; in the Hamma Hamma River an impassable falls at RM 2.6; in Waketickeh Creek an impassable cascade at RM 0.3; in Schroeder Creek an impassable falls at RM 0.1; and in Fulton Creek an impassable falls at RM 0.9.

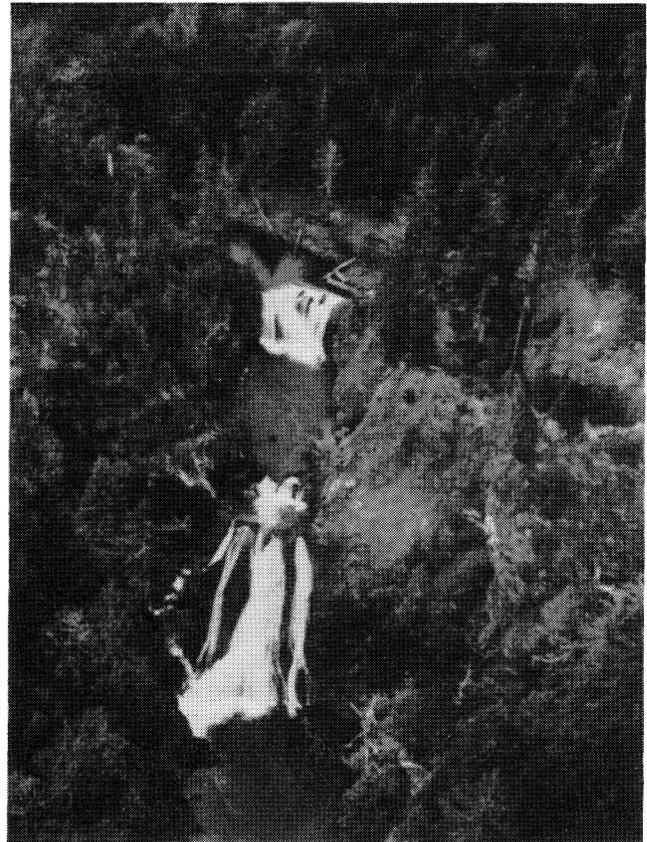


PHOTO 16-7. Natural waterfall barriers occur on most Hood Canal streams (Lilliwaup River).

Impassable cascades are located at RM 16.9 in the Duckabush River and at RM 22.2 in the Dosewallips River. These cascade areas in both rivers are complete blocks to fish migration on certain flow levels and yet some species of salmon, such as chinook and coho, can negotiate these falls under some water conditions.

Water quality — Poor water quality is not a particularly significant factor within the basin at this time. The South Fork Skokomish River is the most seriously altered watershed from logging activities and suffers from heavy silt depositions and erosion. The upper watersheds in the Hamma Hamma and Lilliwaup drainages have been heavily logged in the past and are still being selectively logged; however, the deposition of mud, silt, and debris has not been serious. Increasing summer home developments both along the rivers and reservoirs in the basin as well as the marine beach areas, form a potential water quality threat.



PHOTO 16-8. Techniques have been developed to clean streambed materials and control erosion (Jorsted Creek).

Limited spawning and rearing — The accessible water courses for fish production in the basin provide a generally good balance of spawning and rearing area. Extreme low summer flows in all the rivers and independent streams reduce the rearing potentials of this basin for coho salmon. The impassable falls and barriers to fish migration also limit salmon production. Heavy snow melts and rain run-offs in the mountains contribute to gravel bed shifting and erosion. Siltation from summer home developments and logging will become more serious to streams in this area in the future.

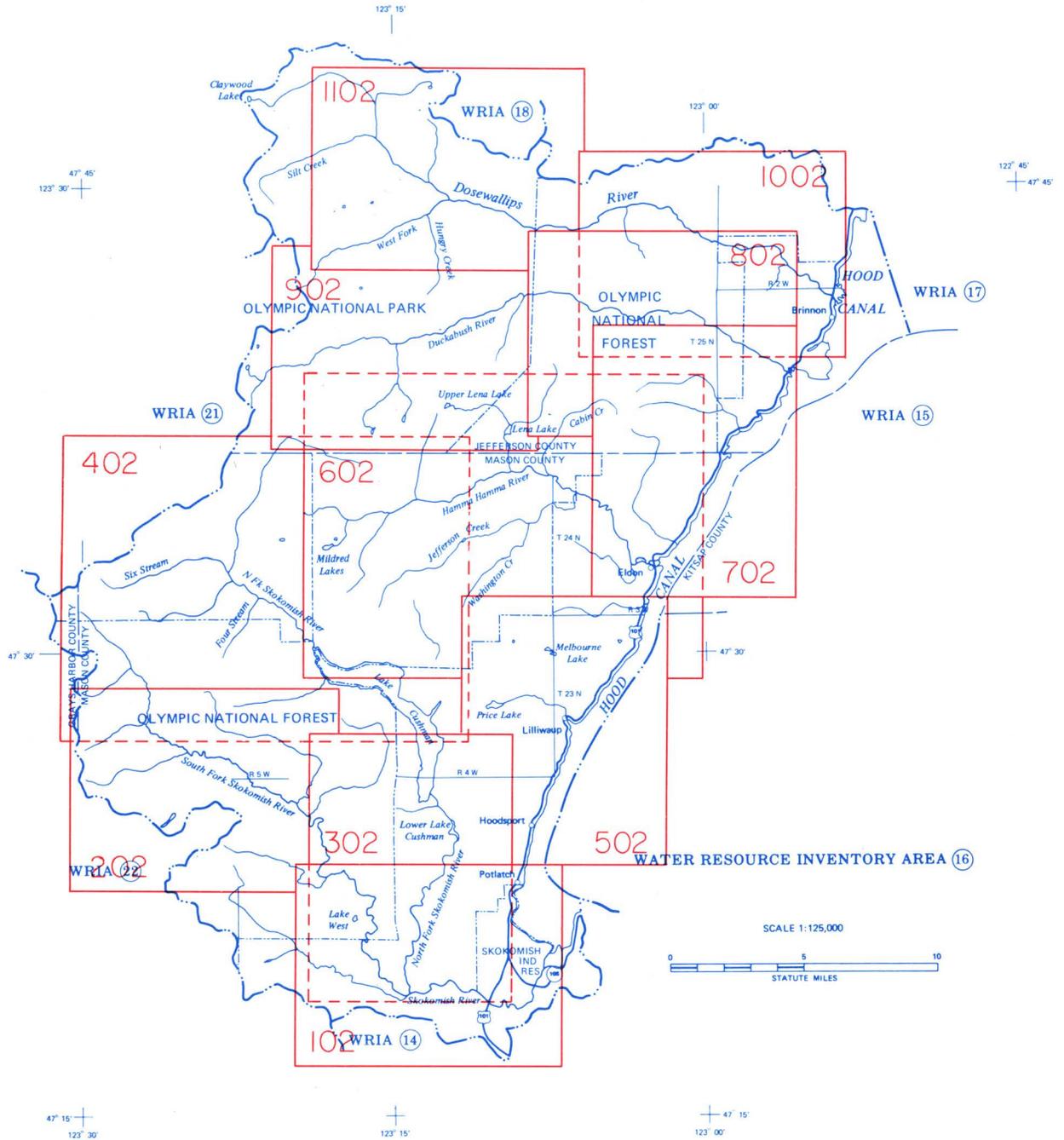
Watershed development — Logging over the upper Skokomish River watershed remains one of the major activities affecting the aquatic habitat. This is also prevalent in the Hamma Hamma and Lilliwaup drainages. Construction of summer homes and recreational developments all along lower Hood Canal adjacent to the rivers, streams, and marine waterfront is accelerating at a rapid rate. The removal of trees and vegetation and construction of roads for these developments will influence the rain run-off patterns, siltation and erosion, and water quality in the lower river and stream sections as well as the estuaries.

The removal of water from the basin's drainages for municipal and agricultural purposes presents a limiting factor. However, the proposed threat of extensive withdrawals and transfers of water from the Hamma Hamma or Dosewallips to the Kitsap Peninsula for municipal and industrial users could be a serious threat to the salmon production of the Hood Canal basin.

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HOOD CANAL BASIN WRIA-16



LOWER SKOKOMISH RIVER Potlatch Area

Included in this drainage are the 9.0 miles of mainstem Skokomish River below the confluence of North and South forks, plus the lower 7.0 miles of South Fork. The North Fork Skokomish is the continuance of the mainstem, while the South Fork becomes a tributary. Total tributary stream mileage includes 11.3 within the mainstem (six tributaries) plus 36.7 miles in the South Fork (four tributaries). This stream reach is located in central Mason County, about 10 miles north of the City of Shelton, and enters Hood Canal near the community of Union.

Stream Description

The South Fork Skokomish River above mile 3.5 and upper portion of Vance Creek lie within Olympic National Forest. The lower 5.9 miles of the mainstem river to its mouth is bordered by the Skokomish Indian Reservation. The remaining mainstem watershed, lower South Fork, and lower Vance Creek, drains the broad, fertile, lower Skokomish Valley. The South Fork from the upstream boundary of this section at mile 7.0 flows through a narrow, deep, steep-walled valley for four miles, then abruptly opens into the broad, lower river valley. Within the upper area, canyon walls are precipitous which limits vegetation, while downstream areas are predominantly farmland with intermittent deciduous bank cover. Large expanses of the upper South Fork watershed have been heavily logged. Rural home development increases toward the river mouth. South Fork stream flow is measured at a gaging station at mile 3. Average discharge over 42 years has been 732 cfs, with a range of 62 to 21,600 cfs.

Gradient in the canyon section of the South Fork is moderately steep, with boulder areas and patch gravel separated by deep pools. In the lower South Fork and mainstem Skokomish it moderates and excellent gravel substrate is abundant. It is unstable, however, and influenced by erosion, channel changes, and shifting gravel bars.

Vance Creek enters the South Fork at mile 0.8. It contains 10.3 miles of mainstem, plus 33.9 miles of tributary waters. Gradient is moderate through the lower 4 miles, then abruptly steepens until cascades and falls block access at approximately mile 4.5. The lower sections of Vance Creek contain excellent gravel; however, flows are intermittent in late summer and early fall below mile 2.5. There has been extensive logging within much of the upper watershed.

Other tributaries are Purdy, Weaver, Hunter and Swift creeks, and a springs area (Richert Springs) entering the left bank mainstem at mile 7.95. Purdy Creek is a stable spring-fed tributary entering the lower Skokomish at river mile 4.1, with falls at mile 1.8. Weaver Creek (tributary of Purdy Creek), Hunter Creek, and Richert Springs all originate as upwelling springs within the valley floor, and contain shallow gradient. Their predominant substrate is sand and fine gravel.

Salmon Utilization

The lower Skokomish, South Fork, and Vance Creek are important for chinook, coho, and chum production. A small upriver run of spring chinook passes through the lower

river, and matures in deep pools within the canyon during summer months. The major Skokomish fall run of chinook enters in September and October and spawns in the mainstem, South Fork, and occasionally Vance Creek. All accessible tributaries contribute to coho production. Chum salmon spawning occurs in the mainstem and tributaries, with heaviest utilization of Richert Springs, Vance Creek, and Swift Creek. Typical spawning populations within this drainage section are 600 chinook and 1,800 coho. The desired chum escapement within this area is 16,000 adults.

Limiting Factors

Low summer stream flows limit rearing area availability. High winter stream flows have intensified the problem of unstable streambed in the lower South Fork and mainstem. Within the spring-fed tributaries, shallow gradient and lack of gravel recruitment reduces these potentially productive areas. Flow regulation of the North Fork has an impact on the mainstem below the confluence of the South Fork. This contributes to unnaturally low summer flows, and high winter flows when reservoir spilling occurs at peak discharge.

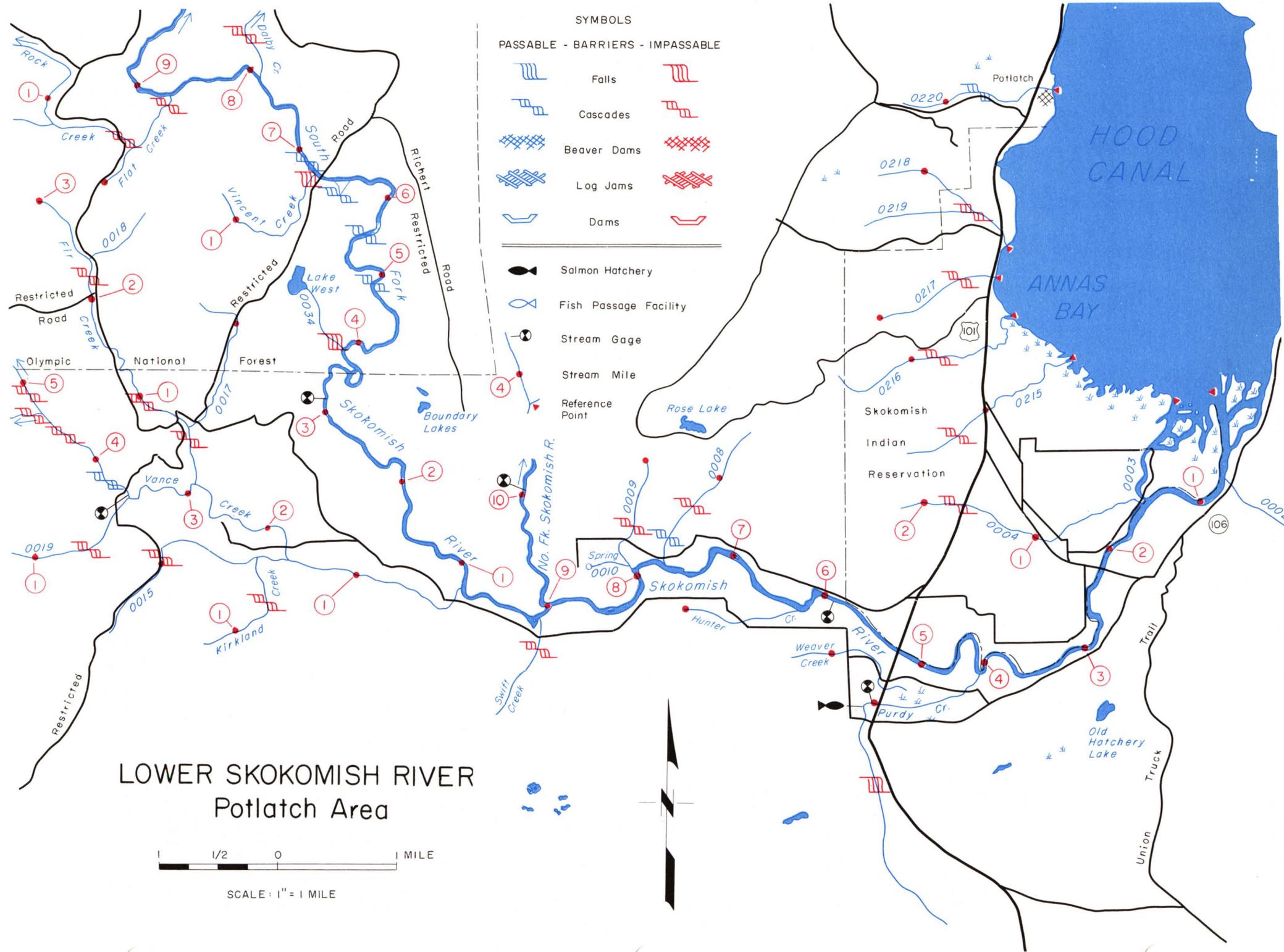
Lack of past effective regulation of the Skokomish Indian Reservation fishery may have impacted salmon stocks. The intensive harvest effort of surplus artificially propagated stocks, from George Adams Hatchery, may have depleted wild stocks of coho and chinook which are produced at a much lower rate.

Beneficial Developments

The George Adams Hatchery, located on Purdy Creek, has successfully produced large numbers of chinook and coho. Plants have included numerous off-station releases within the Skokomish River system.

Habitat Needs

Proper forest management, enforcement of the state hydraulics codes, and the restriction of summertime diversion of water is required to maintain natural production habitat. Restoration of the damage done to the stream must come through long-term reforestation. Richert Springs, Hunter Creek, and Weaver Creek offer potential for spawning gravel enhancement projects.



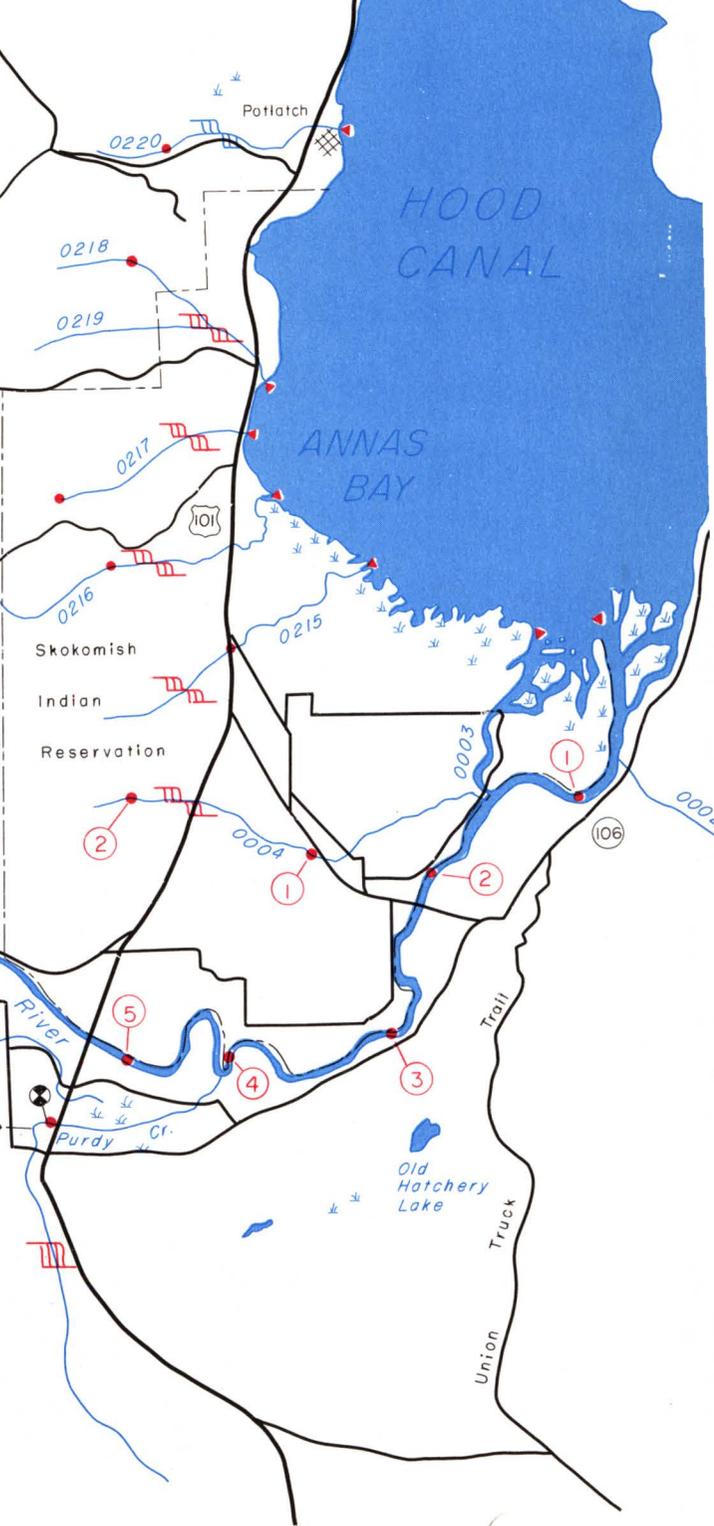
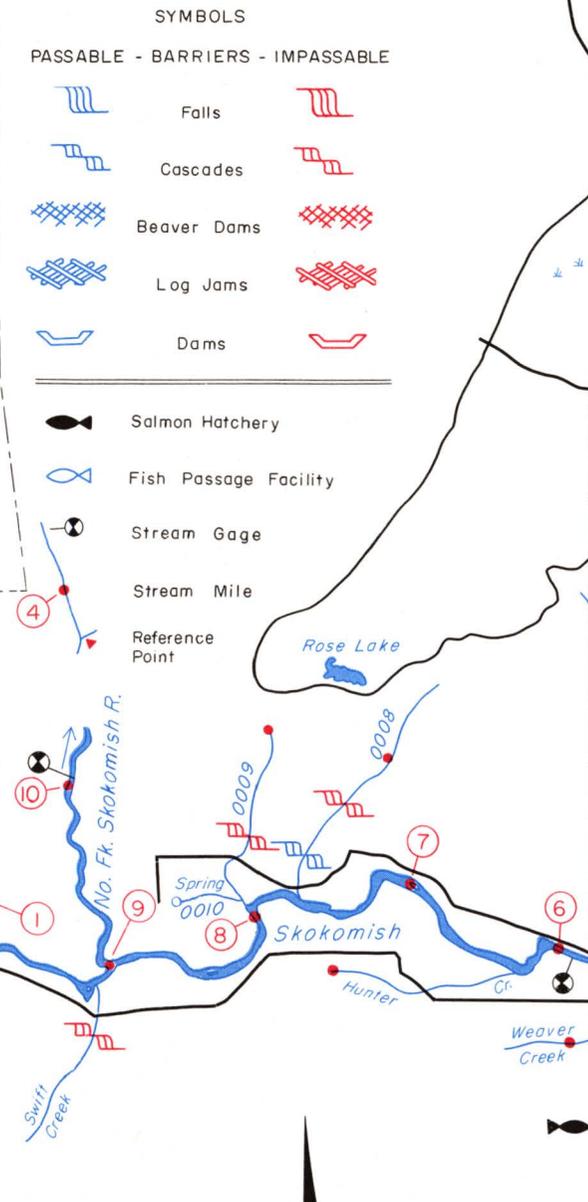
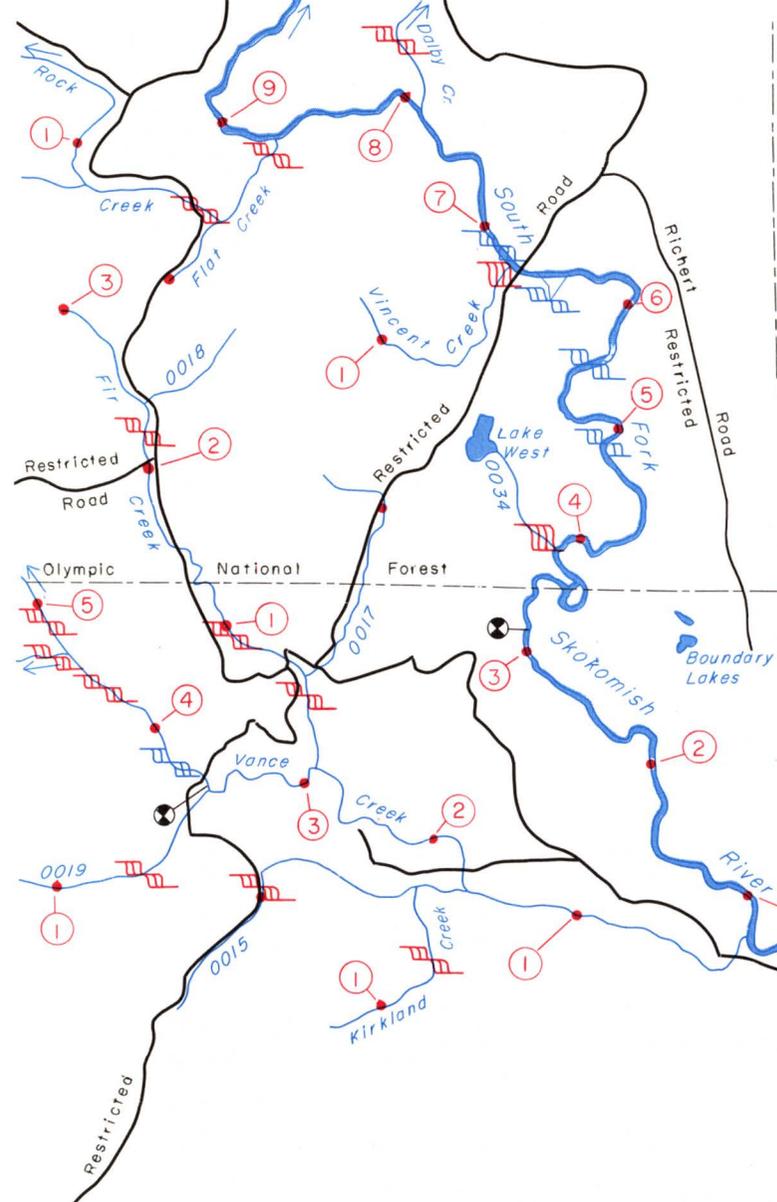
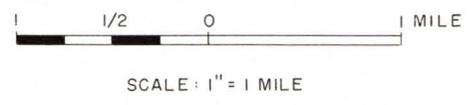
SYMBOLS

PASSABLE - BARRIERS - IMPASSABLE

- | | | |
|--|-------------|--|
| | Falls | |
| | Cascades | |
| | Beaver Dams | |
| | Log Jams | |
| | Dams | |

- | | |
|--|-----------------------|
| | Salmon Hatchery |
| | Fish Passage Facility |
| | Stream Gage |
| | Stream Mile |
| | Reference Point |

**LOWER SKOKOMISH RIVER
Potlatch Area**



LOWER SKOKOMISH RIVER — POTLATCH AREA
Hood Canal Basin — WRIA 16

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0001	Skokomish River	Sec6,T21N,R3W	41.9	240.0	Chin., Coho, Pink, Chum
0004	Unnamed	LB-1.51	2.2	—	Coho, Chum
0005	Purdy Creek	RB-4.1	3.15	—	Chin., Coho, Chum
0006	Weaver Creek	LB-0.6	1.3	—	Coho, Chum
0007	Hunter Creek	RB-6.3	1.0	—	Coho, (Chum)
0008	Unnamed	LB-7.65	1.5	—	
0009	Unnamed	LB-7.95	1.0	—	Coho, (Chum)
0011	S. Fk. Skokomish R.	RB-9.0	27.5	—	Chin., Coho, Pink, Chum
0013	Vance Creek	RB-0.8	10.3	—	Chin., Coho, Chum
0014	Kirkland Creek	RB-1.6	1.3	—	Coho, (Chum)
0015	Unnamed	LB-0.25	1.7	—	Unknown
0016	Fir Creek	LB-2.9	3.0	—	Coho, (Chum)
0017	Unnamed	LB-0.5	1.4	—	None
0019	Unnamed	RB-3.55	1.15	—	Coho, (Chum)
0020	Aristine Creek	RB-4.7	3.0	—	None
	Lake Haven	Outlet-1.0	—	—	
0023	Nicklund Creek	LB-5.65	1.4	—	None
0026	Unnamed	RB-7.1	1.05	—	None
0028	Cabin Creek	LB-7.95	1.7	—	None
0029	Unnamed	LB-0.8	1.0	—	None
0031	Unnamed	RB-9.0	1.5	—	None
0035	Vincent Creek	RB-6.8	1.3	—	None
	(Cont. Hood Canal 203)				
	TRIBUTARIES TO HOOD CANAL NORTHWEST OF SKOKOMISH RIVER				
0215	Unnamed	Sec2,T22N,R4W	1.8	—	Unknown
0216	Unnamed	Sec35,T22N,R4W	1.7	—	Unknown
0217	Unnamed	Sec35,T22N,R4W	1.0	—	Unknown
0218	Unnamed	Sec26,T22N,R4W	1.4	—	Coho, (Chum)
0220	Unnamed	Sec23,T22N,R4W	1.35	—	Unknown

SOUTH FORK SKOKOMISH Headwaters

This section covers the upper 20 miles of South Fork Skokomish River, from a point about 2 miles above the North Fork, upstream to its Olympic Mountain headwaters. Nearly 30 tributaries present about 87 additional stream miles. The area is located a few miles southwest of Lake Cushman in northeast Mason County. Access to the lower portion of this section is via county roads off Highway 101 north of Shelton, with private logging roads extending into much of the basin. The entire area is within Olympic National Forest.

Stream Description

From the Capitol Peak region of the southern Olympic Range the South Fork Skokomish drains generally southeast for more than 20 miles through mountainous terrain. Principal tributaries are LeBar and Brown creeks, which enter the lower portion.

The upper 4-5 miles cut through a very narrow, steep-sloped valley, with most side hills maintaining dense conifer forest. Near Steel Creek (R.M. 22.9) the valley floor broadens slightly, alternately widening and narrowing over the remaining 16 miles. Steepness of side slopes moderates over the lower portion of this section, with dense conifer cover. Development is limited within this section, and principal activities are logging and recreation. Clear-cut patch logging is common, with most of these areas in various stages of reforestation.

The South Fork is steep over its upper 4-5 miles, containing falls, cascades, and rapids, and a predominantly boulder-rubble stream bottom. Over the next few miles, to the vicinity of Church Creek (R.M. 21.4), the gradient remains moderately steep, producing fast riffles and some rapids, with a few small cascades. The bottom is mainly rubble and boulders, some bedrock, and little gravel. Below Church Creek the gradient decreases over the next 5-6 miles, the confined channel ranging 6-10 yards in width, and consisting of fast riffles, some rapids, and a few relatively good pool-riffle stretches. The bottom is mainly rubble with some boulder-strewn areas, a few gravel riffles and patch gravel strips.

From about 2 miles below Cedar Creek, the South Fork contains a moderate gradient for the next 6 miles to near the U.S.G.S. gage (R.M. 9.7). The channel consists of numerous splits, plus a number of large, deep pools and broad, lengthy riffles. Stream widths range from 7 to over 15 yards. The bottom through this stretch is predominantly clean gravel and rubble, with only a few boulders. Banks are mostly stable, low natural earth or rock cuts, alternating with relatively broad, gently sloping gravel-rubble side beaches. Stream-side cover is moderate to dense mixed deciduous trees and underbrush, with some conifer timber.

The remaining 3 miles downstream from the U.S.G.S. gage is moderately steep. The channel is more restricted, with mostly fast riffles and cascades. Few relatively short pool-riffle stretches occur, and the bottom is mainly rubble, boulder, and a few gravel riffles and patch gravel areas.

Most tributaries exhibit steep mountain stream character over much of their lengths, their narrowly confined channels

being mostly cascades and rapids, with bottoms of rubble and boulder. Some streams, particularly Brown and LeBar creeks, offer some moderate gradient over their lower reaches. Fast riffles with some pools, and bottoms mostly rubble with a few gravel riffles and patch gravel stretches are present. Except where logging has occurred, South Fork tributaries generally have dense forest cover.

Salmon Utilization

The upper South Fork is utilized by fall chinook, some spring chinook, and possibly by coho salmon, with adult fish ascending to above Church Creek. Chinook spawn in the mainstem river as well as in the accessible reaches of larger tributaries, and coho primarily in the upper tributaries. Juvenile fall chinook rear through the spring months, with young spring chinook and coho inhabiting these waters year-round.

Limiting Factors

One of the main factors limiting salmon production in this section has been loss of stream-side cover associated with certain logging and road building practices. Low summer flows are sometimes believed a problem in this area.

Beneficial Developments

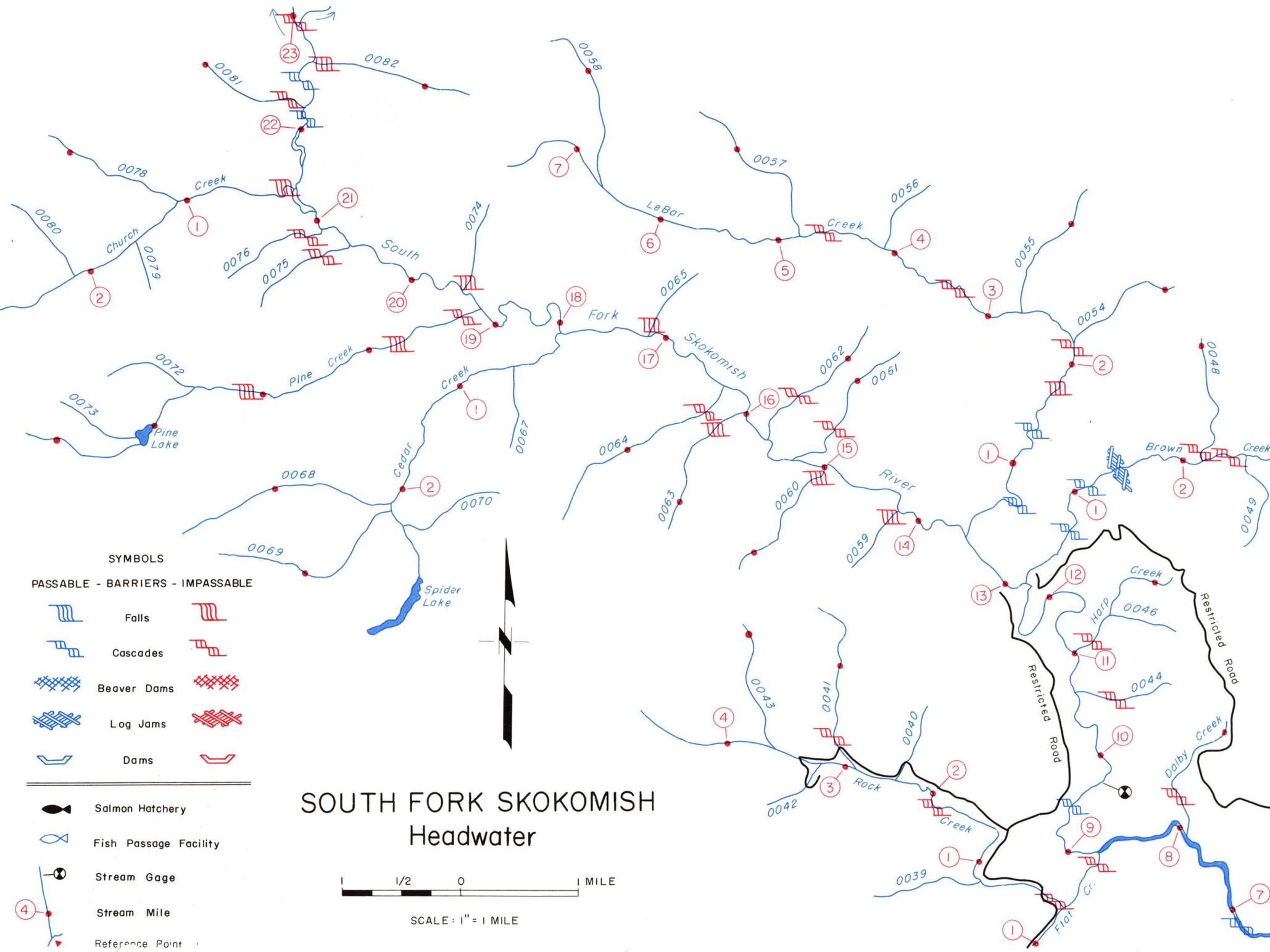
Other than occasional planting of hatchery produced juvenile salmon, there have been no facilities or projects to specifically benefit salmon production in this section. The area holds promise for rehabilitation of spring chinook stock.

Habitat Needs

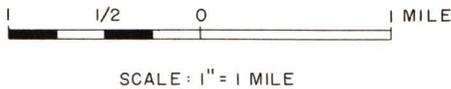
Maintaining fish production potential in this section involves preserving stream-side cover, and stream bank and streambed integrity. Re-establishment of cover where it has been extensively removed would be beneficial. Continuing logging and road building practices should incorporate stream habitat protection measures.



PHOTO 16-9. South Fork Skokomish near slide area above R.M. 10.0.



SOUTH FORK SKOKOMISH Headwater



- SYMBOLS**
- | | |
|---|-----------------------|
| PASSABLE - BARRIERS - IMPASSABLE | |
| | Falls |
| | Cascades |
| | Beaver Dams |
| | Log Jams |
| | Dams |
| | Salmon Hatchery |
| | Fish Passage Facility |
| | Stream Gage |
| | Stream Mile |
| | Reference Point |

SOUTH FORK SKOKOMISH — HEADWATERS
Hood Canal Basin — WRIA 16

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0001	Skokomish River				Chin., Coho, Pink, Chum
0011	S. Fk. Skokomish R.	RB-9.0	27.5	—	Chin., Coho, Pink, Chum
0036	Dalby Creek	LB-7.9	1.1	—	Unknown
0037	Flat Creek	RB-8.7	1.0	—	Unknown
0038	Rock Creek	LB-0.55	4.8	—	None
0041	Unnamed	LB-2.9	1.6	—	None
0043	Unnamed	LB-3.6	1.1	—	None
0045	Harp Creek	LB-11.0	1.2	—	Unknown
0047	Brown Creek	LB-12.8	7.2	—	Chin., Coho
0048	Unnamed	RB-2.2	1.1	—	None
0051	Unnamed	RB-5.35	1.35	—	None
0053	LeBar Creek	LB-13.5	7.7	9.76	Chin., Coho
0054	Unnamed	LB-2.2	1.1	—	None
0055	Unnamed	LB-2.7	1.3	—	None
0057	Unnamed	LB-4.8	1.4	—	None
0058	Unnamed	LB-6.6	1.5	—	None
0060	Unnamed	RB-15.0	1.2	—	Unknown
0061	Unnamed	LB-15.3	1.4	—	Unknown
0062	Unnamed	LB-15.7	1.3	—	Unknown
0063	Unnamed	RB-16.0	1.25	—	Unknown
0064	Unnamed	RB-16.4	1.9	—	Unknown
0066	Cedar Creek	RB-17.9	2.9	—	(Chin.),(Coho)
0068	Unnamed	LB-2.2	1.85	—	Unknown
0069	Unnamed	LB-2.25	1.7	—	Unknown
	Spider Lake	Outlet-2.9	—	—	
0071	Pine Creek	RB-19.2	4.3	—	Unknown
	Pine Lake	Outlet-3.0	—	—	
0077	Church Creek	RB-21.4	2.9	—	Unknown
0078	Unnamed	LB-1.1	1.2	—	None
0081	Unnamed	RB-22.2	1.0	—	None
0082	Unnamed	LB-22.6	1.3	—	None
0083	Steel Creek	LB-22.9	1.9	—	None
0086	Rule Creek	RB-23.9	2.25	—	None
0093	Snowfield Creek	LB-25.8	1.1	—	None
0094	Unnamed	RB-25.9	1.2	—	None
	(Cont. Hood Canal 303)				

LOWER NORTH FORK SKOKOMISH

This section of the Skokomish River includes the North Fork from a mid point in Lake Cushman downstream to its confluence with the South Fork, a distance of 13.4 stream miles. Tributary streams within this section total 27.0 miles. Major features are the two Cushman hydroelectric dams and reservoirs of the City of Tacoma. The area lies in northern Mason County, and has intermittent road access.

Stream Description

The lower North Fork Skokomish River flows from Lake Cushman through Upper Cushman Dam at R.M. 19.6, directly into lower Lake Cushman Reservoir. Two tributaries, Deer Meadow Creek and Dow Creek enter this reservoir. Below Lower Cushman Dam, at R.M. 17.3, the stream continues to flow in a southerly direction until it joins the South Fork. One major tributary, McTaggart Creek, enters at R.M. 13.3.

The valley in the upper half of the North Fork is narrow, deep, and steep-walled, but gradually broadens below R.M. 16.0 to a width of 0.25 to 0.5 mile. The lower mile of the North Fork Skokomish opens up into the broad alluvial mainstem valley. Most of the watershed has been logged in earlier years, with revegetation of dense second growth timber, both conifers and deciduous. Present land usage includes hydroelectric production facilities, recreational development along shore of Upper Lake Cushman, several Christmas tree farms, and a large cattle ranch in the lower mile. Downstream from Lower Cushman Dam, there has been little or no stream bank development and consequently bank cover is excellent.

The most important feature of the North Fork Skokomish River is its stream flow. The entire flow is diverted through a tunnel, at Lower Cushman Dam, to supply a power plant at Portlatch on Hood Canal. Discharge goes directly into salt water, several miles from the natural river mouth. The only downstream flow from Lower Cushman Dam occurs during freshet conditions or power shutdown periods to repair facilities or remove debris. Stream flow is further regulated by diversion of the upper portion of McTaggart Creek into the lower Cushman Reservoir, via Deer Meadow Creek.

U.S.G.S. stream gaging records indicate the degree of artificial flow impact on the downstream river. Mean annual flow at R.M. 10.0 ranges from less than 70 cfs to more than 300 cfs, according to the amount of spillage during winter flooding conditions. During most periods of the year McTaggart Creek, below its diversion, contributes the majority of water present in the lower river. As a consequence of the flow manipulation, 4.0 miles of stream normally considered accessible above the mouth of McTaggart Creek, below Lower Cushman Dam, is either virtually dry or is experiencing a flood.

In spite of these flow manipulations, the streambed is relatively stable, since the channel originally handled the entire North Fork River that is now diverted. Above McTaggart Creek there is moderate gradient; however, riffle areas are composed of mostly coarse material unsuitable for salmon spawning. Numerous large pools remain in the old river bed. Below McTaggart Creek the gradient remains moderate and excellent quality gravel is abundant. The pool-

rifle relationship provides excellent salmon habitat throughout the section.

McTaggart Creek is accessible for the lower 0.9 miles below a falls, as is the lower reach of Frigid Creek, a right bank tributary. Stream gradient is moderately steep but gravel areas and pools are available. Other lower North Fork Skokomish tributaries have little or no salmon access or usage.

Salmon Utilization

The lower North Fork Skokomish River is heavily spawned by chum and coho salmon. Chum spawning is concentrated in the mainstem, particularly within the lower 3.5 miles. Coho are distributed throughout accessible areas of the mainstem and McTaggart Creek. Fall chinook usage depends upon stream flow during the period of adult migration. They have been observed, on occasion, as far upstream as the mouth of McTaggart Creek. Stream flow during the October chinook migration typically is only 10 to 20 cfs and passage is difficult. Typical spawner populations are 4,000 chum, 450 coho, and 150 chinook.

Limiting Factors

The major limiting factor to North Fork Skokomish River salmon production is the artificially regulated stream flow pattern described above. Other limiting factors to salmon production are minor.

Beneficial Developments

No programs have been devised for benefit of salmon production within this stream section. Occasional hatchery plants have been made in past years.

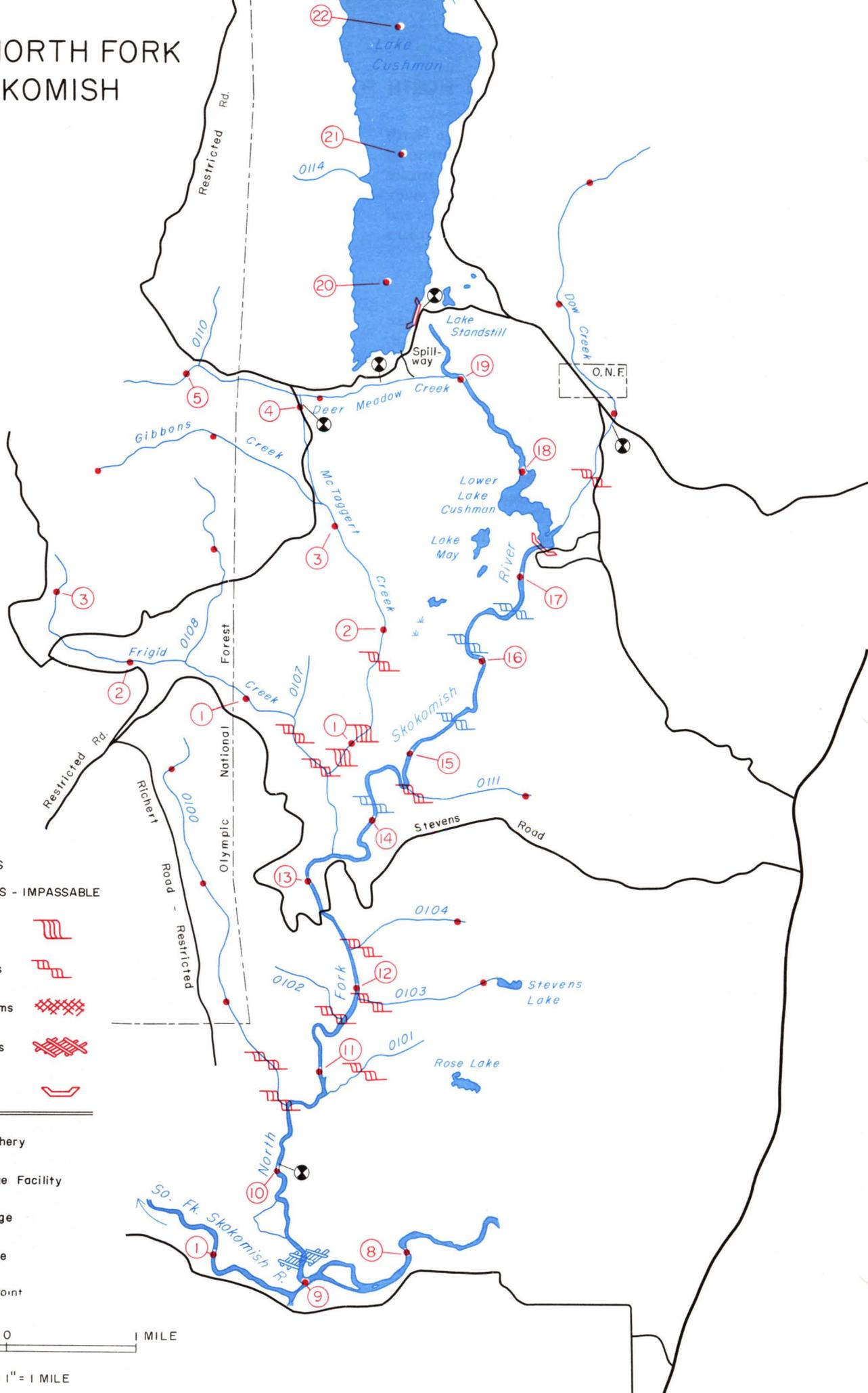
Habitat Needs

The obvious requirement to restore this stream section to somewhat of its original productivity would be to obtain flow regulation, and to eliminate the extremes of summer lows and winter flood flows. The immediate need is to observe the state hydraulic code to preserve existing productivity, and to permit no additional consumptive use of water from the stream.



PHOTO 16-10. Lower North Fork Skokomish in confined channel.

LOWER NORTH FORK SKOKOMISH



SYMBOLS

PASSABLE - BARRIERS - IMPASSABLE

	Falls	
	Cascades	
	Beaver Dams	
	Log Jams	
	Dams	

- Salmon Hatchery
- Fish Passage Facility
- Stream Gage
- Stream Mile
- Reference Point

1/2 0 MILE

SCALE: 1" = 1 MILE

**LOWER NORTH FORK SKOKOMISH
Hood Canal — WRIA 16**

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0001	Skokomish River				Chin., Coho, Pink, Chum
	Skokomish R. cont. as N. Fork Skokomish R.	@ mi. 9.01			
0100	Unnamed	RB-10.5	3.3	—	Unknown
0103	Unnamed	LB-11.9	1.1	—	Unknown
0104	Unnamed	LB-12.3	1.1	—	Unknown
0105	McTaggart Creek	RB-13.3	5.55	—	(Chin.), (Coho),(Chum)
0106	Frigid Creek	RB-0.7	3.3	—	Unknown
0108	Unnamed	LB-1.6	1.6	—	None
0109	Gibbons Creek	RB-3.2	2.0	—	None
0111	Unnamed	LB-14.7	1.0	—	Unknown
	Lower Lake Cushman (Lake Kokanee)	Outlet-17.31	—	—	
0112	Dow Creek	LB-17.4	3.5	—	None
0113	Deer Meadow Creek	RB-19.1	1.15	—	None
	(Cont. Hood Canal 403)				

UPPER NORTH FORK SKOKOMISH

This segment includes upper Lake Cushman plus the North Fork Skokomish River from the lake upstream nearly 14 miles to its Olympic Mountain headwaters. Some 40 tributaries enter in this section adding nearly 100 stream miles. The area is located northwest of Hoodspport, mostly in northern Mason County. Access is via the Staircase Road from Highway 101 at Hoodspport. The river and most tributaries above Lake Cushman are within Olympic National Park, with National Forest below.

Stream Description

From the Mount Skokomish-Mount Stone vicinity, the North Fork circles first west-northwest nearly three miles, southwest more than five miles, then southeast about five miles to Lake Cushman (R.M. 28.0). Lake Cushman, a 4,000-acre basin impoundment, continues generally southeast 8.5 miles to the City of Tacoma's upper Lake Cushman Dam. Principal tributaries to the North Fork include the streams named Four, Five, Six, and Seven, with Dry and Big creeks entering Lake Cushman.

The entire upper drainage flows through thickly forested mountainous terrain, all but the lower three miles confined to a very narrow, steep-sloped valley. Some side hills rise sharply to well over 5,000 feet. The valley floor broadens slightly below Four Stream (R.M. 31.4), the bottomland containing some deciduous trees, but mostly large conifers. There is virtually no development within the upper drainage. Some summer-vacation residences are constructed along Lake Cushman. Recreation is the principal activity in this area, with some section logging occurring over hillsides outside the park.

Over its upper 4 miles the North Fork presents a precipitous gradient. A narrow channel contains a nearly continuous series of falls and cascades, with a predominantly boulder and rubble stream bottom. The next 6-7 miles the gradient remains mostly steep, the restricted channel presenting numerous cascades and some falls, with a few relatively short pool-riffle stretches. The bottom is predominantly boulder and rubble with a few small gravel riffles and patch gravel areas. From just above Four Creek downstream approximately one mile, the gradient ranges from moderate to moderately steep, with some channel splitting. Stream width ranges from 7 to 15 yards, being mostly fast riffles with a few rapids and some relatively good pool-riffle stretches. The bottom is mainly rubble with a few boulder-strewn sections, some gravel riffles and patch gravel strips. Downstream, the river channel constricts once again, and just below Slate Creek (R.M. 29.9) it falls over the spectacular Staircase Rapids, a series of cascades and relatively large falls, dropping more than 30 feet in a short distance.

Below Staircase Rapids the gradient becomes moderate to gentle just before entering Lake Cushman. Through this lower stretch the channel remains confined. The stream presents generally good pool-riffle conditions, with a number of broad, lengthy riffles. Stream width ranges from 6 to over 15 yards in some areas. The bottom is mostly rubble and gravel, with only a few boulder-strewn stretches over the first mile below the rapids. Banks are naturally stable, relatively low earth or rock cuts, or broad, gently sloping gravel-rubble side beaches. Cover is mostly dense conifer timber with

some mixed growth along the lower stretches.

Virtually all North Fork tributaries exhibit steep mountain stream characteristics over their entire length. They present numerous falls, cascades, and rapids, with predominantly boulder-rubble stream bottoms. All have relatively dense forest cover. Tributaries entering Lake Cushman tend to present moderate gradients over their lowermost reaches, offering some good pool-riffle conditions and smaller-size bottom materials. While most are densely forested, a few have experienced some cover loss through section logging operations.

Salmon Utilization

Anadromous salmon species do not ascend the North Fork above Cushman Dam. A landlocked race of chinook salmon inhabits Lake Cushman, with the lower North Fork serving as a principal spawning area. Kokanee salmon also spawn here, and in Big Creek.

Limiting Factors

Salmon are prevented from reaching this section of the North Fork by two dams located downstream. Landlocked salmon are restricted by Staircase Rapids on the North Fork, and by steepening gradients in Lake Cushman tributary streams.

Beneficial Developments

No facilities, projects, or programs have been undertaken in this area to benefit salmon production. A portion of the state's Skokomish River hatchery production serves as mitigation for upriver production losses resulting from dam construction.

Habitat Needs

The principal requirements to maintain salmon production potential within this section include preserving existing stream-side cover, and maintaining in as near a natural state as possible the existing stream and streambed conditions.

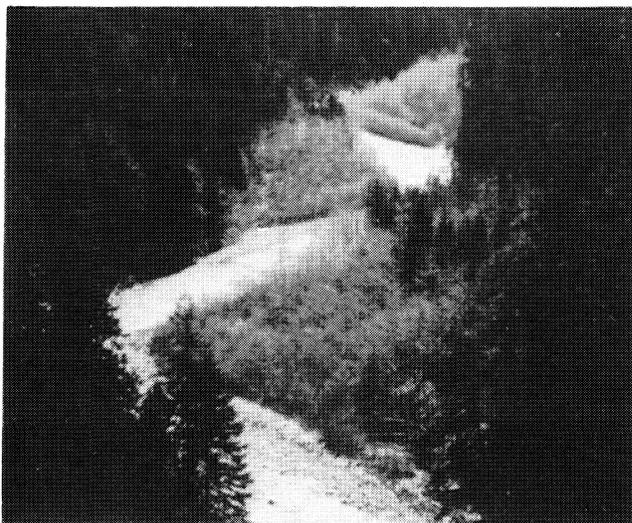
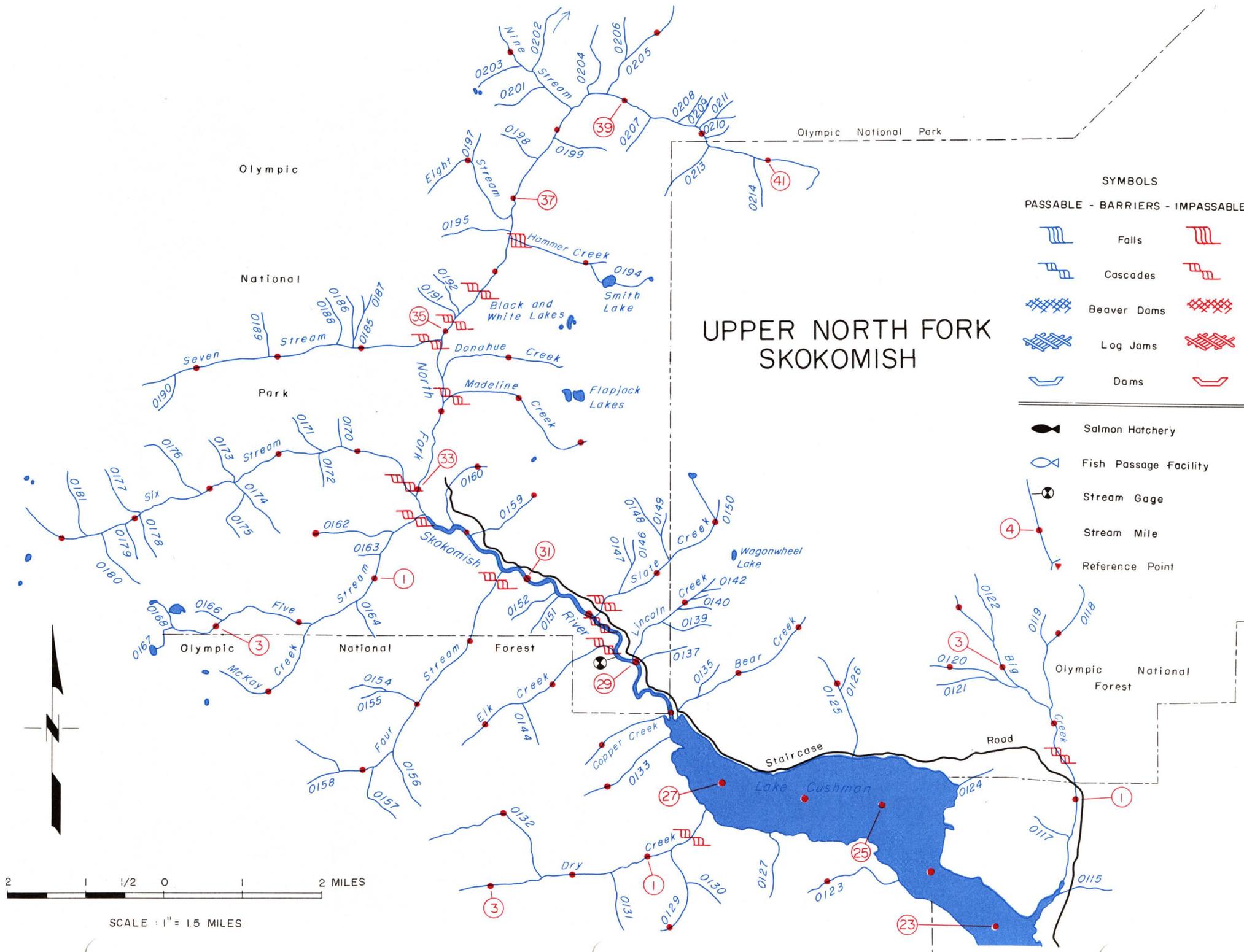
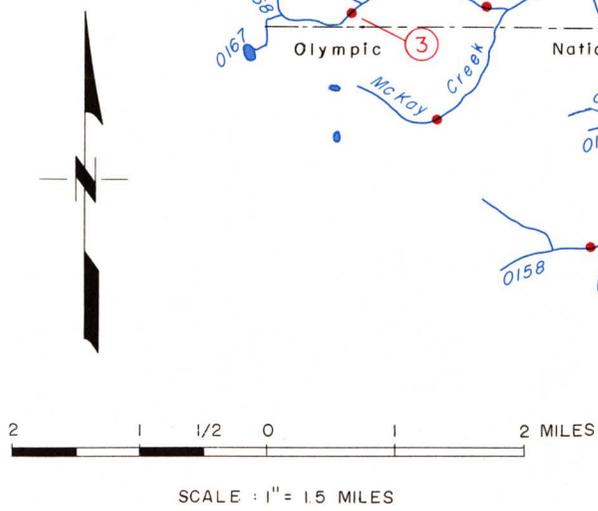


PHOTO 16-11. Steep gradients and dense forests prevail in the upper North Fork.



SYMBOLS

PASSABLE - BARRIERS - IMPASSABLE		
	Falls	
	Cascades	
	Beaver Dams	
	Log Jams	
	Dams	
	Salmon Hatcherly	
	Fish Passage Facility	
	Stream Gage	
	Stream Mile	
	Reference Point	



UPPER NORTH FORK SKOKOMISH

**UPPER NORTH FORK SKOKOMISH
Hood Canal Basin — WRIA 16**

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0001	Skokomish River				Chin., Coho, Pink, Chum
	Skokomish R. cont. as N. Fk. Skokomish R.	@ mi. 9.01			
0116	Big Creek	LS-22.7	4.15	—	None
0118	Unnamed	LB-2.2	1.7	—	None
0120	Unnamed	RB-2.7	1.2	—	None
0123	Unnamed	RS-24.15	1.3	—	None
0125	Unnamed	LS-25.4	1.4	—	None
0128	Dry Creek	RS-27.0	3.4	—	None
0129	Unnamed	RB-0.7	1.1	—	None
0132	Unnamed	LB-2.4	1.85	—	None
0133	Unnamed	RS-27.8	1.3	—	None
0134	Bear Creek	LS-27.9	2.15	—	None
0136	Copper Creek	RS-27.95	1.3	—	None
0138	Lincoln Creek	LB-29.05	1.4	—	None
0143	Elk Creek	RB-29.3	2.4	—	None
0145	Slate Creek	LB-29.9	2.6	—	None
	Unnamed Lake	Outlet-2.6	—	—	
0153	Four Stream	RB-31.35	3.9	—	None
0159	Unnamed	LB-31.95	1.0	—	None
0160	Unnamed	LB-32.2	1.1	—	None
0161	Five Stream	RB-32.65	3.8	—	None
0162	Unnamed	LB-0.4	1.0	—	None
0165	McKay Creek	RB-1.85	1.7	—	None
	Unnamed Lake	Outlet-3.8	—	—	
0169	Six Stream	RB-32.9	5.6	9.58	None
0182	Madeline Creek	LB-34.1	2.05	—	None
0183	Donahue Creek	LB-34.4	1.7	—	None
0184	Seven Stream	RB-34.9	3.6	—	None
0193	Hammer Creek	LB-36.5	1.95	—	None
	Smith Lake	Outlet-1.3	—	—	
	Unnamed Lake	Outlet-1.95	—	—	
0196	Eight Stream	RB-36.8	1.6	—	None
0200	Nine Stream	RB-38.3	1.3	—	None
0202	Unnamed	LB-0.6	1.15	—	None
0205	Unnamed	RB-38.75	1.4	—	None

HOOD CANAL DRAINAGES

Hoodsport Area

These drainages are located along the western shore of Hood Canal from the southern edge of the community of Hoodsport northward to the Hamma Hamma River, all within Mason County. This group of streams includes nine independent drainages, mostly small, that flow in an easterly direction into Hood Canal. Combined they total 47.5 stream miles. All streams are accessible at or near their mouths via U.S. Highway 101 that parallels the shoreline of Hood Canal.

Stream Description

The streams from south to north include Hill, Finch, Clark, Miller, Sund, Lilliwaup, Eagle, and Jorsted creeks, plus one unnamed stream known locally as Little Lilliwaup Creek. They range in size from Hill Creek (1.0 stream miles) to Lilliwaup Creek (6.9 miles mainstem plus 10.8 miles of tributaries). All have a number of characteristics in common, including steep gradient except in the lower stream reaches, sparsely developed watersheds, favorable stream bank cover, and excellent water quality. Terrain is rather rugged, and land use and development has been limited to upper watershed logging and recreational or permanent home developments along the margin of Hood Canal. The community of Hoodsport is the largest settlement within the area.

The streams also have individual characteristics that are either different or unique that require separate description. For example, Hill Creek and Little Lilliwaup Creek are small in size, but have a stable water supply from apparent spring sources. Clark, Miller, and Sund creeks flow only seasonally from late November through mid-May, which restricts their salmon productivity. Jorsted and Eagle creeks provide much suitable gravel for their size; however, steep gradient and periodic instability have reduced their productivity. Lilliwaup Creek, the largest drainage, has a beautiful watershed but it is almost totally inaccessible to salmon. A spectacular falls at mile 0.7 precludes further access.

There are little data on measured stream flow available for these streams. All exhibit low summer and early fall discharge, which is in contrast to the heavy winter precipitation and rapid runoff within the area. For example, nearby Cushman Power House No. 2 measured more than 99 inches of precipitation during calendar year 1974.

Salmon Utilization

Salmon are produced in the lower reaches of all of the nine drainages. Chum salmon is the predominate species, with Jorsted and Eagle creeks being the most important. Lilliwaup, Little Lilliwaup, and Finch creeks also contain important populations. Hill, Clark, Miller, and Sund creeks have small runs, typically 100 adults or less per stream. Coho are also produced in all but the intermittent Sund, Miller, and Clark creeks, but are limited by available area and low summer stream flow conditions. The combined chum escapement to these streams is approximately 10,000 adults annually, while coho total 600 spawners.

Limiting Factors

Natural limiting factors regulate salmon production in this drainage area. Most summer flows preclude heavy coho production, while steep gradient limits access to stream areas for all species. The gradient has also limited the amount and quality of gravel in some areas, as well as creating the potential for erosion.

Beneficial Developments

A major salmon hatchery is located at Hoodsport, on Finch Creek. This station is rather unique in that it can be operated on either fresh or salt water for the rearing of juvenile salmon. The hatchery has been very successful in production of chinook, coho, pink, and chum salmon. Over the years many streams within all of Hood Canal have been out-planted from this station; however, this practice has been modified in recent years and present releases are predominantly into Finch Creek or the Skokomish River.

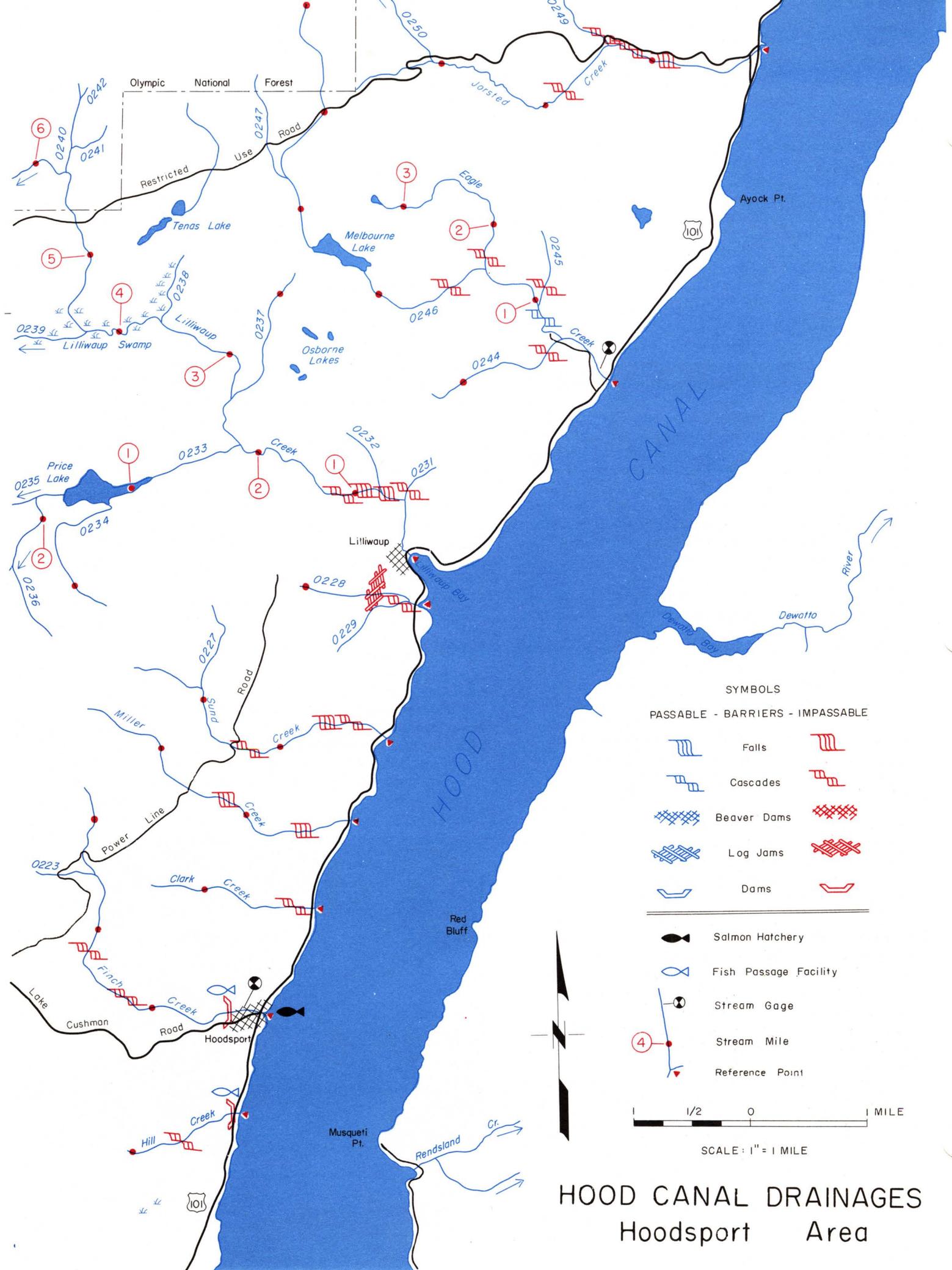
A gravel stabilization and improvement project has been conducted in Jorsted Creek within an area of heavy chum utilization. Early evaluation of this enhancement project has been extremely encouraging. Spawning area has been increased and egg-to-fry survival rate improved. Eagle Creek has suffered from the same substrate instability and scouring that had caused the inconsistent production in Jorsted Creek, and an improvement project is planned here in the near future.

Habitat Needs

The environment within this drainage area is relatively healthy, and fish production is at a high level. Therefore, it is important to maintain the habitat through close observance of the state hydraulic code. Special attention should also be given to logging management practices within each watershed, and consumptive water diversion applications should be closely scrutinized. Within the area of artificial enhancement, additional stream sections may be suited for projects such as those on Jorsted Creek, and planned on Eagle Creek.



PHOTO 16-12. Mouth of Lilliwaup Creek.



Olympic National Forest

Restricted Use Road

Tenas Lake

Melbourne Lake

Osborne Lakes

Lilliwaup Swamp

Price Lake

Lilliwaup

Lilliwaup Bay

Miller Creek

Power Line

Clark Creek

Finch Creek

Cushman Road

Hill Creek

Hoodspout

Musqueti Pt.

Rendsland Cr.

HOOD CANAL

HOOD

Ayock Pt.

101

Dewatto River

Dewatto Bay

SYMBOLS

PASSABLE - BARRIERS - IMPASSABLE

- Falls
- Cascades
- Beaver Dams
- Log Jams
- Dams
- Falls
- Cascades
- Beaver Dams
- Log Jams
- Dams

- Salmon Hatchery
- Fish Passage Facility
- Stream Gage
- Stream Mile
- Reference Point

1/2 0 1 MILE

SCALE: 1" = 1 MILE

HOOD CANAL DRAINAGES
Hoodspout Area

HOOD CANAL DRAINAGES — HOODSPORT AREA
Hood Canal Basin — WRIA 16

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
	TRIBUTARIES TO HOOD CANAL				
0221	Hill Creek	Sec14,T22N,R4W	1.0	—	Coho, Chum
0222	Finch Creek	Sec12,T22N,R4W	3.3	—	Chin., Coho, Pink, Chum
0224	Clark Creek	Sec1,T22N,R4W	1.4	—	Coho, Chum
0225	Miller Creek	Sec1,T22N,R4W	2.7	—	Coho, Chum
0226	Sund Creek	Sec31,T23N,R4W	2.7	—	Coho, Chum
0228	Unnamed (Ltl. Lilliwaup Cr)	Sec30,T23N,R4W	1.05	—	Coho, Chum
0230	Lilliwaup Creek	Sec19,T23N,R4W	6.9	—	(Chin.), Coho, Chum
0233	Unnamed	RB-2.2	3.7	—	None
	Price Lake	Outlet-0.8	—	—	
0234	Unnamed	RB-1.2	1.3	—	None
0237	Unnamed	LB-2.6	1.2	—	None
0243	Eagle Creek	Sec16,T23N,R3W	3.2	—	Coho, Chum
0244	Unnamed	RB-0.6	1.3	—	Coho, Chum
0246	Unnamed	RB-1.6	4.0	—	Coho
	Melbourne Lake	Outlet-1.2	—	—	
	Unnamed Lake	Outlet-3.2	—	—	
0248	Jorsted Creek	Sec34,T24N,R3W	3.8	—	Coho, Chum

HAMMA HAMMA RIVER DRAINAGE

The Hamma Hamma River enters the west shoreline of Hood Canal in northern Mason County. It contains 17.8 miles of mainstem river plus 23 tributaries, several of major size, adding 93.0 miles to the total. The river and tributaries above Jefferson Creek are within Olympic National Forest. The Murdock Lakes form the headwaters of the Hamma Hamma and lie within Olympic National Park.

Stream Description

From the northeast slopes of Mt. Cruiser, in the Sawtooth Range of Olympic National Forest, the Hamma Hamma travels east-northeast nearly ten miles to Phantom Creek (R.M. 8.0), then generally southeast for eight miles to Hood Canal at Eldon. Principal tributaries include Boulder, Lena, Cabin and Jefferson creeks.

The upper six-seven miles of river fall over steep mountain terrain cutting through a narrow, steep-walled valley, with forested side slopes rising sharply to over 5,000 feet. The stable and narrowly confined channel contains small falls, cascades, and rapids, with scattered pool-riffle stretches. Widths range from 3-7 yards along the lower portion, with the bottom mainly large rock, boulder, some bedrock, and patch gravel strips. Stream-side cover is moderate, primarily low-growing conifers with some deciduous growth. The lower ten-mile section has been logged in recent years and is in various stages of reforestation. Activities within the watershed are logging and recreation.

Below Delta Creek, for approximately four miles to Jefferson Creek (R.M. 5.7), the river assumes a moderate gradient with numerous channel split sections and good pool-riffle balance. Stream widths average 9-12 yards. The bottom is clean gravel and rubble, with a number of broad, extensive gravel riffles. The stream banks alternate between low earth or rock cuts and relatively broad, gently sloping gravel-rubble side beaches. Cover is mainly intermittent stands of deciduous trees and underbrush. Below Jefferson Creek the gradient steepens over the next two-three miles, with substrate containing more coarse material.

From R.M. 3.0 to 1.3 the river drops into a canyon section with a steep gradient. A series of sharp cascades and one large falls exceeding 15 feet occur at R.M. 2.7. Steep gradient blocks salmon passage at approximately R.M. 2.0. Below mile 1.5 the stream and the valley characteristics abruptly change. Gradient becomes moderate, with occasional deep pools separating broad expanses of excellent quality gravel.

The valley contains intermittent stands of conifer and deciduous trees, with favorable stream bank cover. Development includes recent logging, one large farm, and several homes near the river mouth. The streambed is stable and well confined. The lower 0.6 miles of stream is tidally influenced, with limited spawning area. Long-term flow records (1951-1970) near the confluence of Jefferson Creek show a combined mean flow at this point of approximately 516 cfs.

One important tributary is John Creek, at R.M. 1.4. It has moderate gradient in the lower mile with gravel and some coarse material. The stream is accessible to approximately mile 1.8, with gradient becoming steeper progressing upstream. Virtually all other tributaries exhibit steep mountain character.

Salmon Utilization

Salmon utilize the mainstem, John Creek, and a small slough that enters Hood Canal independently just north of the river. While accessible mainstem area is limited, this is offset by its exceptional quality. The river is heavily spawned by chum and pink salmon and has moderate use by chinook and coho. Pink, chinook, and chum salmon spawn simultaneously during September. A late chum salmon run spawns in the mainstem and intertidally in Hamma Hamma Slough during December. Coho production is limited by available rearing area. Spawners in this drainage normally total about 100 fall chinook, 500 coho, 11,000 chum, and 5,000 pink salmon.

Limiting Factors

A cascade section that includes several falls begins at R.M. 2.0 and restricts migration to the upper mainstem. Portions of the watershed have been logged rather extensively, and therefore may have some indirect impact upon production. Low summer flows in John Creek, and gravel quality in Hamma Hamma Slough also regulate production.

Beneficial Developments

Fry plants of coho have been made above the falls, where considerable rearing area is available. A gravel improvement project was completed during 1974 in John Creek, to stabilize the stream and improve spawning gravel quality for chum salmon.

Habitat Needs

Gravel improvement is programmed in Hamma Hamma Slough, to replace the poor quality material presently there. Proper management of logging and road building practices within the watershed is important to maintain present production levels. There is also the possibility of further improvement of spawning areas for chum salmon in John Creek.



PHOTO 16-13. Uppermost of two falls at R.M. 2.5.

HAMMA HAMMA RIVER DRAINAGE

SYMBOLS

PASSABLE - BARRIERS - IMPASSABLE

	Falls	
	Cascades	
	Beaver Dams	
	Log Jams	
	Dams	

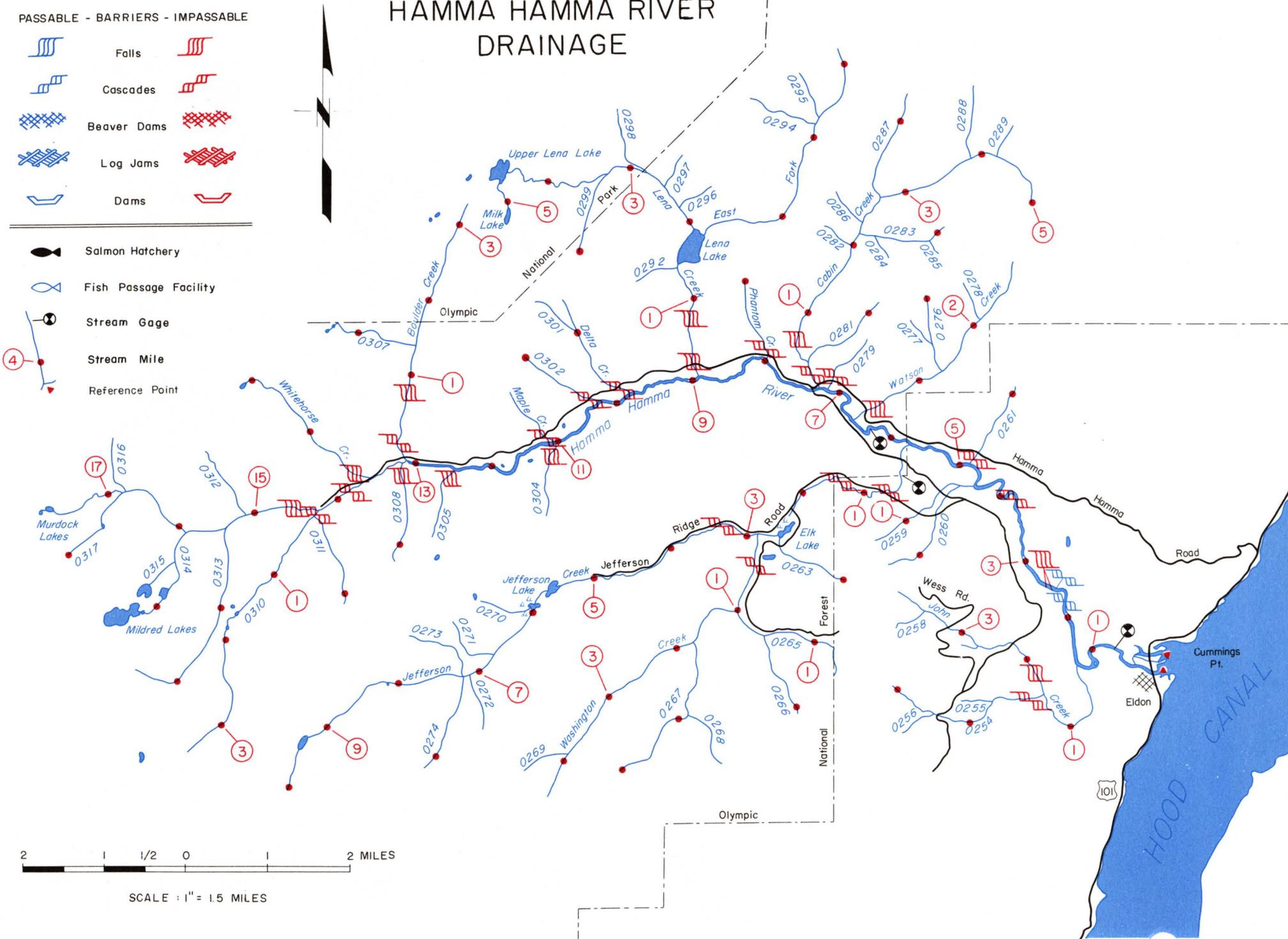
 Salmon Hatchery

 Fish Passage Facility

 Stream Gage

 Stream Mile

 Reference Point



2 | 1/2 | 0 | 2 MILES

SCALE : 1" = 1.5 MILES

HAMMA HAMMA RIVER DRAINAGE
Hood Canal Basin — WRIA 16

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0251	Hamma Hamma River	Sec27,T24N,R3W	17.8	84.6	Chin., Coho, Pink, Chum
0253	John Creek	RB-1.4	3.9	4.38	Coho, Pink, Chum
0254	Unnamed	RB-1.5	2.1	—	Unknown
0259	Unnamed	RB-4.6	1.5	—	None
0260	Unnamed	RB-0.15	1.4	—	None
0261	Unnamed	LB-4.9	1.1	—	None
0262	Jefferson Creek	RB-5.7	10.0	—	None*
	Elk Lake	Outlet-2.4	—	—	
0263	Unnamed	RB-2.59	1.0	—	None
0264	Washington Creek	RB-2.9	4.5	8.61	None
0265	Unnamed	RB-1.0	1.6	—	None
0266	Unnamed	LB-0.4	1.1	—	None
0267	Unnamed	RB-1.8	2.0	—	None
	Jefferson Lake	Outlet-5.5	—	—	
	Unnamed Lake	Outlet-5.9	—	—	
0274	Unnamed	RB-7.2	1.2	—	
	Unnamed Lake	Outlet-9.3	—	—	
0275	Watson Creek	LB-6.6	2.9	—	None*
0276	Unnamed	RB-1.3	1.0	—	None
0280	Cabin Creek	LB-7.2	5.0	—	None*
0281	Unnamed	LB-0.35	1.2	—	None
0283	Unnamed	LB-2.2	1.1	—	None
0287	Unnamed	RB-2.7	1.3	—	None
0290	Phantom Creek	LB-8.0	1.0	—	None
0291	Lena Creek	LB-8.9	5.1	—	None*
	Lena Lake	Outlet-1.5	—	—	
0293	E. Fk. Lena Creek	LB-1.8	3.2	—	None
0299	Unnamed	RB-3.3	1.0	—	None
	Upper Lena Lake	Outlet-4.5	—	—	
	Milk Lake	Outlet-5.1	—	—	
0300	Delta Creek	LB-9.8	1.5	—	None
0302	Unnamed	LB-10.2	1.0	—	None
0306	Boulder Creek	LB-13.1	3.3	4.59	None*
0307	Unnamed	RB-1.4	1.5	—	None
0308	Unnamed	RB-13.15	1.2	—	None

* Above natural anadromous fish use. Juvenile salmon planting program supplies rearing stock to accessible streams.

HAMMA HAMMA RIVER DRAINAGE
Hood Canal Basin — WRIA 16

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0309	Whitehorse Creek	LB-13.5	2.0	—	None*
0310	Unnamed	RB-14.3	3.5	—	None
0311	Unnamed	RB-0.1	1.1	—	None
0313	Unnamed	RB-15.4	2.5	—	None
0314	Unnamed	RB-15.9	1.2	—	None
	Lower Mildred Lake	Outlet-0.8	—	—	
	Upper Mildred Lake	Outlet-1.2	—	—	
0317	Unnamed	RB-16.85	1.0	—	None
	Murdock Lakes	Outlet-17.8	—	—	

HOOD CANAL DRAINAGES Eldon Area

Streams described here include independent drainages entering Hood Canal between the Hamma Hamma River mouth north to the Duckabush River. There are eight streams distributed through this section, with most of them being small and short run. Only two have more than two miles of mainstem length; however, collectively they total 38.1 linear stream miles.

Stream Description

Land bordering Hood Canal shorelines is steep and rugged between the Hamma Hamma and Duckabush rivers, and stream gradient in these small drainages is consequently very steep, and often precipitous. Waketickeh Creek and Fulton Creek are the largest of the eight streams, with 6.6 and 5.6 mainstem miles respectively, and headwaters of both originate near the 3,000-foot level on the Olympic Peninsula. The six smaller drainages, including Schaerer Creek, McDonald Creek, and four unnamed streams, have correspondingly steep gradient.

The watersheds throughout these streams are predominately heavily forested, mostly with second growth timber. Uppermost watersheds, particularly in Waketickeh and Fulton creeks, have been more recently logged. Stream bank cover is dense, frequently with heavy underbrush. Aside from the occasional logging, there has been little development. Rural home sites border Hood Canal where the topography permits.

Streambed materials in these creeks are predominantly coarse rubble and boulder, as would be anticipated with the prevailing gradient. The lone exception is the lower 0.8 miles of Fulton Creek where the stream has a gentle slope and contains suitable spawning gravel and several pools.

Salmon Utilization

Only four of the drainages have salmon runs, and Fulton Creek is the only stream of major importance. Waketickeh Creek and McDonald Creek are accessible for less than 0.1 mile each, and support only a few coho and chum salmon spawners. Schaerer Creek also contains small runs of coho and chum in the 0.2 miles accessible. Fulton Creek is accessible to salmon upstream to a falls at mile 0.9. Excellent reproductive area exists in the lower 0.8 miles of stream, supporting about 100 coho and 1,000 chum spawners annually. All coho streams within this area have excellent stream bank cover; however, rearing potential is limited not only by access, but by very low summer flows.

Limiting Factors

Relatively few salmon are produced in this group of Hood Canal drainages, considering the amount of stream area present. This is almost entirely due to the rugged topography and the limited summer flows. Logging in the upper watershed of Fulton Creek may also have had a minor impact on flows in these streams.

Beneficial Developments

No facilities or programs have been undertaken to ben-

efit salmon production, nor are any intended. Juvenile coho have been planted in Fulton Creek on occasion.

Habitat Needs

Existing Stream cover and flow levels should be maintained in all areas where salmon are produced. Any consumptive diversion of water, particularly from Fulton Creek, should be discouraged. While enhancement projects have not been considered within these drainages, there may be some potential for relatively small improvement projects through stabilization of streambed and addition of spawning gravel. Evaluation of the potential for barren area plants in upstream reaches of Fulton and Waketickeh creeks would also be worthwhile.



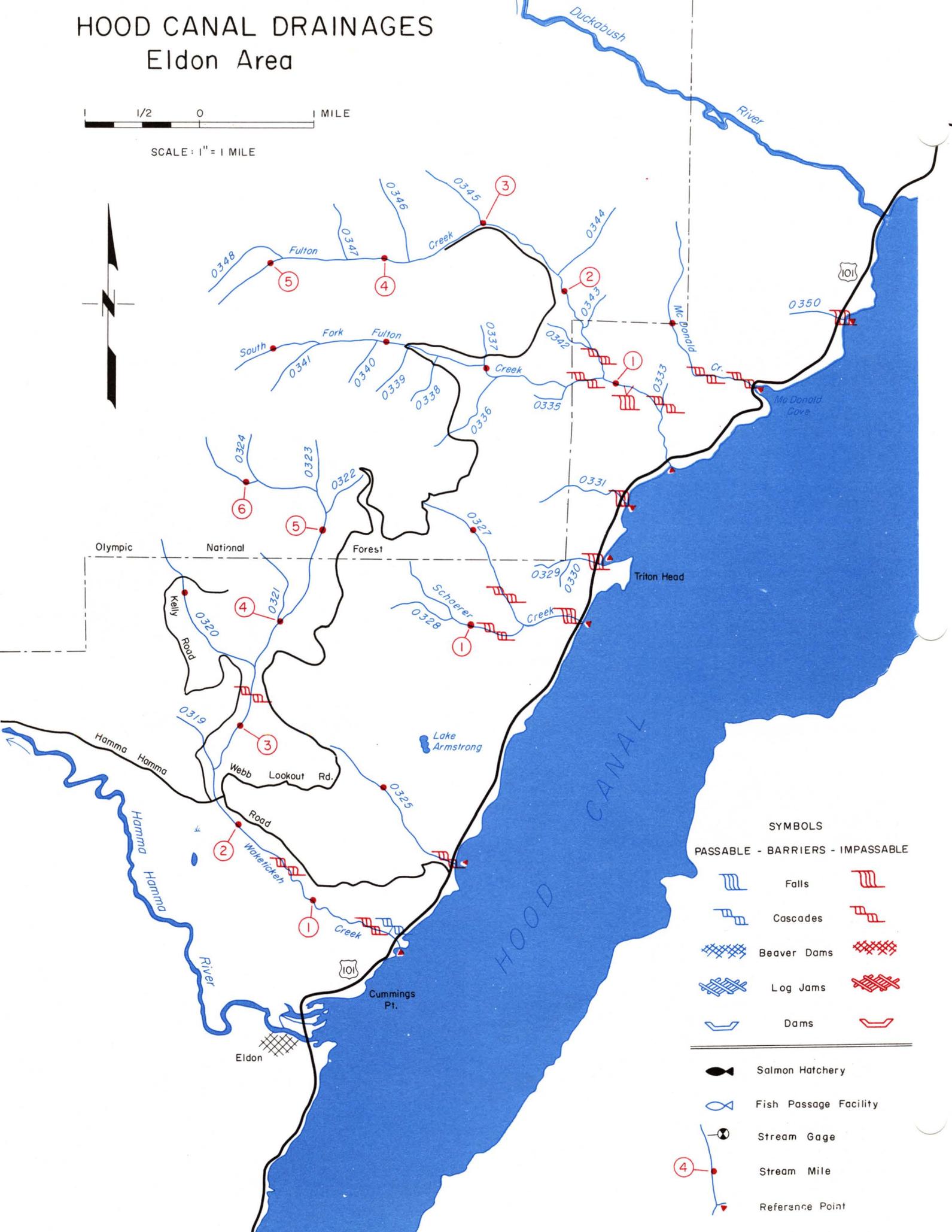
PHOTO 16-14. The lower portion of Fulton Creek has good pool-riffle areas.

HOOD CANAL DRAINAGES

Eldon Area



SCALE: 1" = 1 MILE



PASSABLE - BARRIERS - IMPASSABLE

- | | | |
|--|-----------------------|--|
| | Falls | |
| | Cascades | |
| | Beaver Dams | |
| | Log Jams | |
| | Dams | |
| | Salmon Hatchery | |
| | Fish Passage Facility | |
| | Stream Gage | |
| | Stream Mile | |
| | Reference Point | |

HOOD CANAL DRAINAGE — ELDON AREA
Hood Canal Basin — WRIA 16

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
TRIBUTARIES TO HOOD CANAL NORTH OF HAMMA HAMMA RIVER					
0318	Waketick Creek	Sec23,T24N,R3W	6.6	—	Coho, Chum
0320	Unnamed	RB-3.6	1.6	—	None
0325	Unnamed	Sec13,T24N,R3W	1.6	—	None
0326	Schaerer Creek	Sec6,T24N,R2W	1.8	—	Coho, Chum
0327	Unnamed	LB-0.5	1.5	—	None
0332	Fulton Creek	Sec31,T25N,R2W	5.6	—	Coho, Chum
0334	S. Fk. Fulton Creek	RB-1.1	3.4	—	None
0349	McDonald Creek	Sec29,T25N,R2W	1.9	—	Coho, Chum

LOWER DUCKABUSH RIVER

The lower Duckabush River includes 11.5 stream miles from the Olympic National Park boundary to the river mouth. The major portion of this section, between R.M. 2.3 and 11.5, lies within Olympic National Forest and is sparsely settled or little influenced by man's development. Twenty-two minor tributaries provide a total of 34.3 linear miles. The lower Duckabush is intermittently accessible by road upstream to R.M. 6.3, and above this by Forest Service trails.

Stream Description

The Duckabush River is typical of the moderate sized Olympic Peninsula streams entering Hood Canal. Much of the watershed is undeveloped, lying in Olympic National Park, with the remainder being only slightly disturbed. The valley walls are steep and occasionally precipitous throughout all but the lower 2 miles of the river. Stream bank cover consists of quite dense stand of deciduous and coniferous trees with intermittent coverage in the lower 2 miles.

From the national park boundary at R.M. 11.5, gradient is moderate for about 1.5 miles. Below this, however, a 3-mile section between R.M. 7.0 and 10.0 is very steep and contains numerous falls and cascades which limit anadromous fish migration at R.M. 7.0. Within the river section between mile 4.5 and 7.5, some moderate gradient exists, affording patch gravel spawning habitat interspersed with coarse rubble and boulder material. Another steep gradient section containing cascades lies between mile 3.5 and 4.5. Velocities prohibit upstream migration of pink and chum salmon beyond this area, and it is partial barrier to other species.

The remaining area downstream to the river mouth has moderate gradient with the lower 2.5 miles containing some of the most highly productive salmon spawning areas within the state. The extensive spawning riffles are occasionally separated by pools.

The Duckabush River, being relatively undisturbed by development, has retained its historical flow patterns, physical characteristics, and fish productivity. Flow records (35 years) from the gage at R.M. 4.5, show average discharge to have been 418 cfs. The river channel is stable and well confined throughout its length. Recent subdivision and recreational home development along the lower one-half mile of the stream has had some impact, particularly with respect to stream bank cover.

The steep terrain of the valley precludes the production of salmon in all but the lowermost sections of one or two of the numerous small tributary streams. There are, however, two small independent drainages just north of the Duckabush mouth that are of importance.

Salmon Utilization

Pink and chum salmon are of primary importance in the Duckabush River system. Although these species utilize only the lower few miles of accessible stream area, the exceptional gravel quality and production rate overshadow other anadromous fish usage. Fall chinook also utilize this lower area and coho are distributed throughout the river to mile

7.0. Pink salmon escapements have ranged from 14,000 to 100,000, with 30,000 spawners being the desired escapement level. There are two chum salmon runs, an early segment that spawns in September and a late run that enters in mid-December. The normal early run escapement is approximately 5,000 spawners and the late run 500 adults. Potential coho production has been calculated to be 1,250 spawners annually and, since the watershed remains undisturbed, can be assumed as the present rate of production. Fall chinook return to the Duckabush at a rate of from 100 to 200 per year.

The two independent drainages entering Hood Canal immediately north of the Duckabush River also support salmon populations. Pierce Creek has a late chum run of 100 to 200 spawners annually with many of these fish spawning intertidally at the mouth of the stream. Coho also utilize the lower one-half mile of stream below a barrier falls. The second independent tributary is very small; however, it has year around flow and supports a small coho population.

Limiting Factors

Present limiting factors are the natural terrain of the area, primarily steep gradient that limits access to salmon and regulates the type of habitat available. The impact of civilization on this watershed has not yet been felt and production remains near its potential.

Beneficial Developments

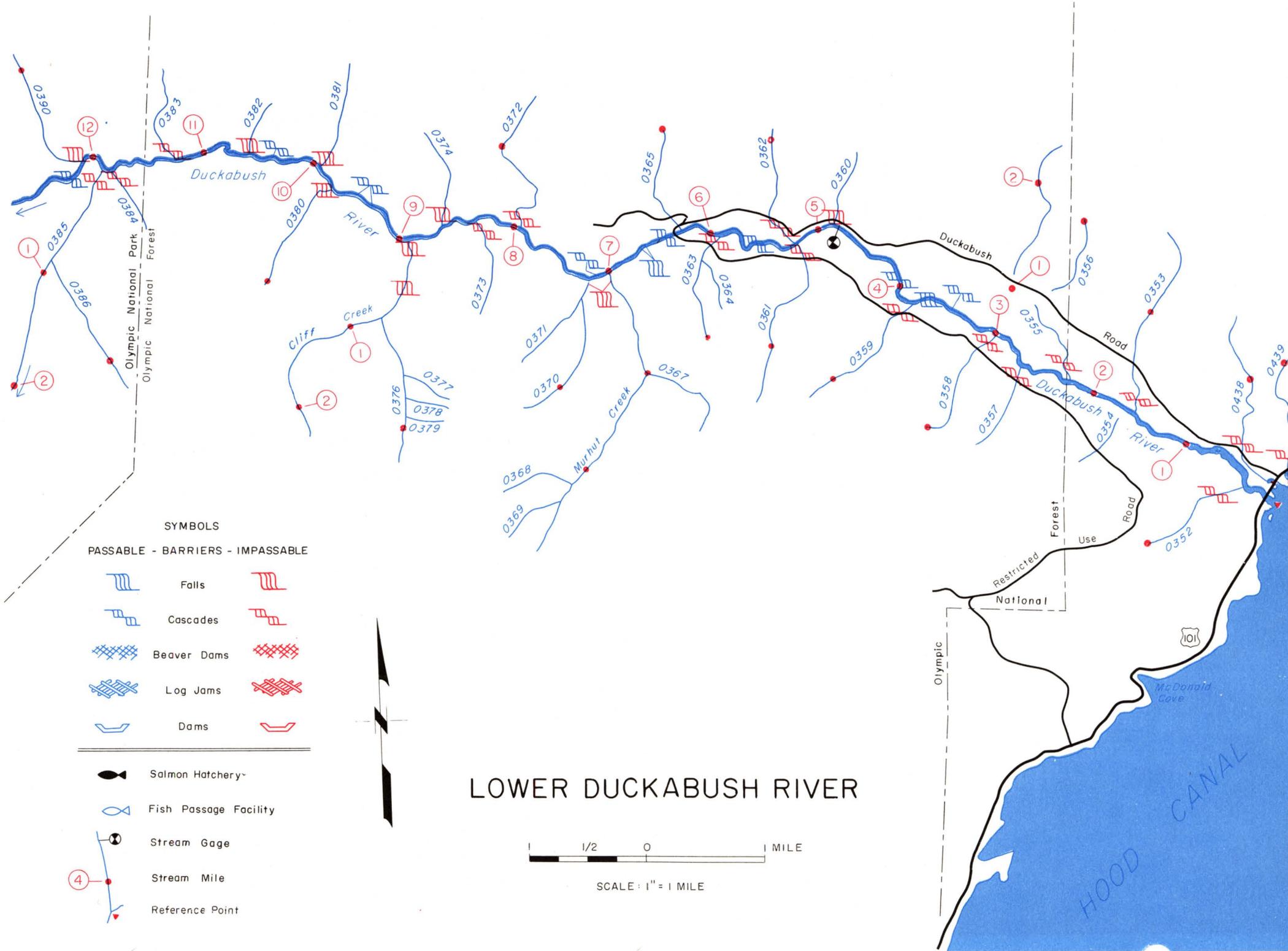
A federal fish hatchery was operated on the Duckabush River a number of years ago and impact is unknown. It is doubtful that it was favorable, since the hatchery was long ago terminated. Releases of chinook and coho have been made into the Duckabush River from Hood Canal Hatchery, but none in recent years.

Habitat Needs

Duckabush River salmon production, particularly within the lower 3 miles, is exceptional and all efforts should be made to retain the existing environment. Careful restrictions should be placed on any hydraulic approvals for work within this watershed, including logging.



PHOTO 16-15. Highly productive salmon habitat in the lower Duckabush River.



**LOWER DUCKABUSH RIVER
Hood Canal Basin — WRIA 16**

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0351	Duckabush River	Sec21,T25N,R2W	24.1	—	Chin., Coho, Pink, Chum
0352	Unnamed	RB-0.35	1.0	—	Unknown
0353	Unnamed	LB-1.55	1.7	—	(Coho), (Chum)
0355	Unnamed	LB-2.24	2.35	—	(Coho), (Chum)
0356	Unnamed	LB-0.8	1.05	—	None
0358	Unnamed	RB-3.0	1.0	—	Unknown
0359	Unnamed	RB-3.8	1.2	—	Unknown
0361	Unnamed	RB-5.2	1.5	—	None
0362	Unnamed	LB-5.21	1.1	—	Unknown
0363	Unnamed	RB-5.9	1.0	—	None
0365	Unnamed	LB-6.25	1.0	—	None
0366	Murhut Creek	RB-7.0	2.9	—	None
0370	Unnamed	RB-7.2	1.4	—	None
0372	Unnamed	LB-7.95	1.5	—	None
0375	Cliff Creek	RB-8.95	2.3	—	None
0376	Unnamed	RB-0.7	1.3	—	None
0380	Unnamed	RB-9.75	1.0	—	None
0385	Unnamed	RB-11.9	3.3	—	None
	(See Hood Canal 903)				
0390	Unnamed	LB-12.1	1.2	—	None
	(Cont. Hood Canal 903)				
	TRIBUTARIES TO HOOD CANAL NORTH OF DUCKABUSH RIVER				
0438	Unnamed (Pierce Creek)	Sec16,T25N,R2W	1.6	—	Coho, Chum
0439	Unnamed	Sec16,T25N,R2W	1.4	—	(Coho), (Chum)

UPPER DUCKABUSH RIVER

This segment encompasses the upper Duckabush River from a point near R.M. 12.0 upstream to its Olympic Mountain headwaters, a total of more than 13 mainstem miles. More than 30 tributaries enter along this stretch, providing nearly 60 additional stream miles. The area is located approximately 12 miles west of Brinnon in southeastern Jefferson County. Access is via trail only, off the end of the Duckabush Road from Highway 101. The entire section is within Olympic National Park.

Stream Description

From the Mount Duckabush-Mount Steel vicinity of the high Olympics the Duckabush River travels east-northeast through this section. Principal tributaries include Crazy Creek (R.M. 17.3) and one unnamed stream (R.M. 11.9).

The upper 10-11 miles of drainage is through a very narrow, steep-sloped, densely forested valley, with many of the side hills rising sharply to over 5,000 feet. The valley floor broadens slightly over the lower mile, with side valley terrain maintaining steep mountain character. There has been no development within this area other than a few trails and trail shelters. The principal activity is recreation.

Over its upper 10-11 miles the Duckabush River has a moderately steep to steep gradient character. The narrowly confined channel presents many falls, sharp cascades, and rapids that are occasionally separated by relatively large, deep pools. The bottom is composed of predominantly very large rock and boulder material, with some bedrock and a few rubble and patch gravel stretches. The banks consist of high sheer rock faces, or steep earth and rock cuts, with only a few boulder-strewn side beaches. Cover is predominantly dense conifer forest.

Through about the lower 1.5 miles of this section the Duckabush gradient moderates somewhat. The channel remains mostly confined, and presents primarily fast riffle conditions, some cascades, and a few relatively good pool-riffle stretches. Here the stream width ranges from 6 to 15 yards and averages about 10 yards. The bottom is mostly rubble-gravel composition with some scattered boulder stretches. Considerable logs and forest debris exists over much of the streambed in this area. Banks range from moderately steep rock or earth cuts to relatively broad, gently sloping rubble-gravel side beaches. Stream-side cover is mostly dense conifer with some mixed deciduous trees and underbrush.

Virtually all tributaries exhibit steep alpine mountain stream character over their entire lengths, with many falling directly into the Duckabush from sheer side slopes. Their narrowly confined channels contain mostly falls, cascades, and rapids, and the substrate consists mainly of boulder and rubble material. Dense cover predominates over virtually all upper drainage tributaries.

Salmon Utilization

There is no salmon utilization within the upper Duckabush drainage. Relatively limited production potential exists within this area.

Limiting Factors

Steep gradient conditions with numerous falls and cascades downstream from this area prevent adult salmon from ascending to this section (see Lower Duckabush-801).

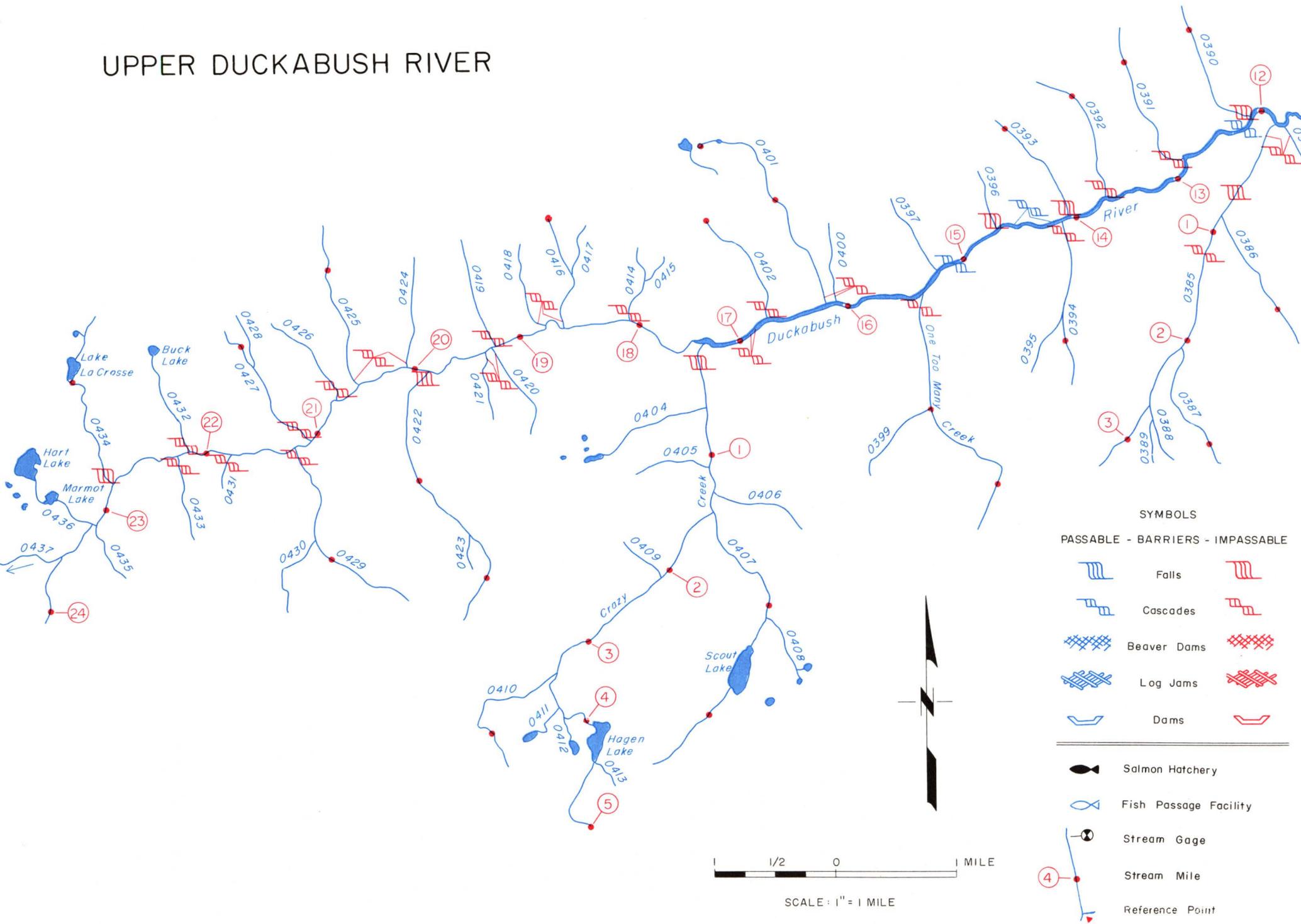
Beneficial Developments

No facilities, projects, or programs have been undertaken to specifically benefit salmon production within this section.

Habitat Needs

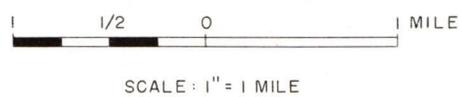
The principal requirements to maintain fish production potential within this section include preserving existing stream-side cover, and maintaining stream and streambed conditions in as near as natural state as possible. Since National Park policy is to prohibit or rigidly control development, no maintenance problems are foreseen.

UPPER DUCKABUSH RIVER



SYMBOLS

PASSABLE - BARRIERS - IMPASSABLE		
	Falls	
	Cascades	
	Beaver Dams	
	Log Jams	
	Dams	
<hr/>		
	Salmon Hatchery	
	Fish Passage Facility	
	Stream Gage	
	Stream Mile	
	Reference Point	



**UPPER DUCKABUSH RIVER
Hood Canal Basin — WRIA 16**

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0351	Duckabush River				Chin., Coho, Pink, Chum
0385	Unnamed	RB-11.9	3.3	—	None
0386	Unnamed	RB-0.9	1.3	—	None
0387	Unnamed	RB-2.1	1.2	—	None
0390	Unnamed	LB-12.1	1.2	—	None
0391	Unnamed	LB-12.8	1.3	—	None
0392	Unnamed	LB-13.7	1.3	—	None
0393	Unnamed	LB-14.05	1.1	—	None
0394	Unnamed	RB-14.1	1.4	—	None
0398	One Too Many Creek	RB-15.4	2.4	—	None
0401	Unnamed	LB-16.2	2.45	—	None
0402	Unnamed	LB-16.7	1.0	—	None
0403	Crazy Creek	RB-17.3	5.0	—	None
0407	Unnamed	RB-1.5	2.6	—	None
	Scout Lake	Outlet-1.4	—	—	
0410	Unnamed	LB-3.4	1.3	—	None
	Hagen Lake	Outlet-4.1	—	—	
0416	Unnamed	LB-18.6	1.0	—	None
0422	Unnamed	RB-19.9	2.4	—	None
0425	Unnamed	LB-20.5	1.4	—	None
0427	Unnamed	LB-21.1	1.2	—	None
0429	Unnamed	RB-21.25	1.7	—	None
0434	Unnamed	LB-22.8	1.6	—	None
	Lake La Crosse	Outlet-1.0	—	—	

LOWER DOSEWALLIPS RIVER

The upper portion of this section, above R.M. 6.1, lies within Olympic National Forest in Jefferson County, while downstream land is mostly privately owned but with limited development. There are numerous minor tributaries (25) and one major tributary, plus five small independent drainages that enter Hood Canal, totalling 54.8 miles. A county road parallels the mainstem lower Dosewallips River along the left bank throughout its length.

Stream Description

The terrain of the 12.0 miles of the lower Dosewallips River ranges from precipitous slopes and canyons eastward to a short alluvial valley before it flows into Hood Canal. The main river valley is narrow throughout most of its length, and includes two short, vertical-walled canyons located at R.M. 1.2 and at R.M. 3.5. Valley walls are steep and covered by coniferous timber, while immediate stream bank cover is dense mixed vegetation.

Gradient is steep throughout most of the river; however, it moderates near the mouth. A very steep one-half-mile section, virtually a cascade, is located from R.M. 11.5 to 12.0, characterized by boulders, little gravel and absence of pools. From R.M. 3.5 to 11.5 the gradient is less precipitous, but boulders and coarse material still predominate, with numerous patch gravel areas and a few major spawning riffles. Pools are also numerous within this section, though most are of small size. Gradient is moderate in the lower 3.5 miles, with excellent pool-riffle relationship and an abundance of suitable spawning gravel.

The stream channel throughout its total length is confined and very stable. Stream width averages 20 yards, and mean annual discharge is 445 cfs at the gaging station at R.M. 7.1.

Development of the Dosewallips River has been minor. The upper two-thirds of the total watershed lies within Olympic National Park and has been entirely undisturbed. The remaining one-third has had limited logging and sparse rural development. Brinnon lies just north of the river near its mouth, while Dosewallips State Park borders the river to the south.

There are numerous small, short tributaries with steep gradient and little or no spawning area. The only major tributary is Rocky Brook, which has steep gradient throughout most of its length and a spectacular waterfall at R.M. 0.3. The lower 0.2 mile of Rocky Brook contains excellent spawning gravel.

Two of the 5 small independent drainages are rather unique and worthy of special mention. They are Walcott Slough, immediately north of the river mouth, and State Park Slough (local name) just to the south. Both are very short, originate as springs, and flow through tidal marshes.

Salmon Utilization

Chinook, chum, coho, and pink are produced in the Dosewallips River. The entire section is accessible to chinook and coho, while pink salmon use areas downstream from the cascades at R.M. 11.5. Chum salmon spawn in the lower 4.5 miles.

Timing of the chinook run is late summer or early fall. Spawners are typically scattered throughout the river above

the mouth of Rocky Brook. Chinook escapement normally ranges from 300 to 600 annually. Pink salmon utilize all suitable gravel to R.M. 11.5. They are the most conspicuous species in the stream, with heaviest spawning in the lower 3.5 miles of river. Spawning escapement has varied widely, from 20,000 to 400,000, with the average near 100,000. Two distinct chum salmon runs inhabit the stream, one of extremely early timing (September) and one with very late timing (late December-early January). Both are moderate-sized runs, with combined escapement of 2,000-3,000 annually. Limited tributary spawning and rearing area for coho limits production.

The two independent springs support excellent runs of chum salmon that spawn from early December into January. Walcott Slough, just north of the Dosewallips River, is the release and recapture site for artificially propagated chum from the Quilcene Federal Hatchery. Production has been very successful, with recent yearly returns of more than 10,000 fish.

Limiting Factors

Since the river is almost totally undeveloped, man-caused limiting factors are minimal. The physical nature of the stream, particularly the steep gradient of both mainstem and tributaries, restricts productive capacity.

Beneficial Developments

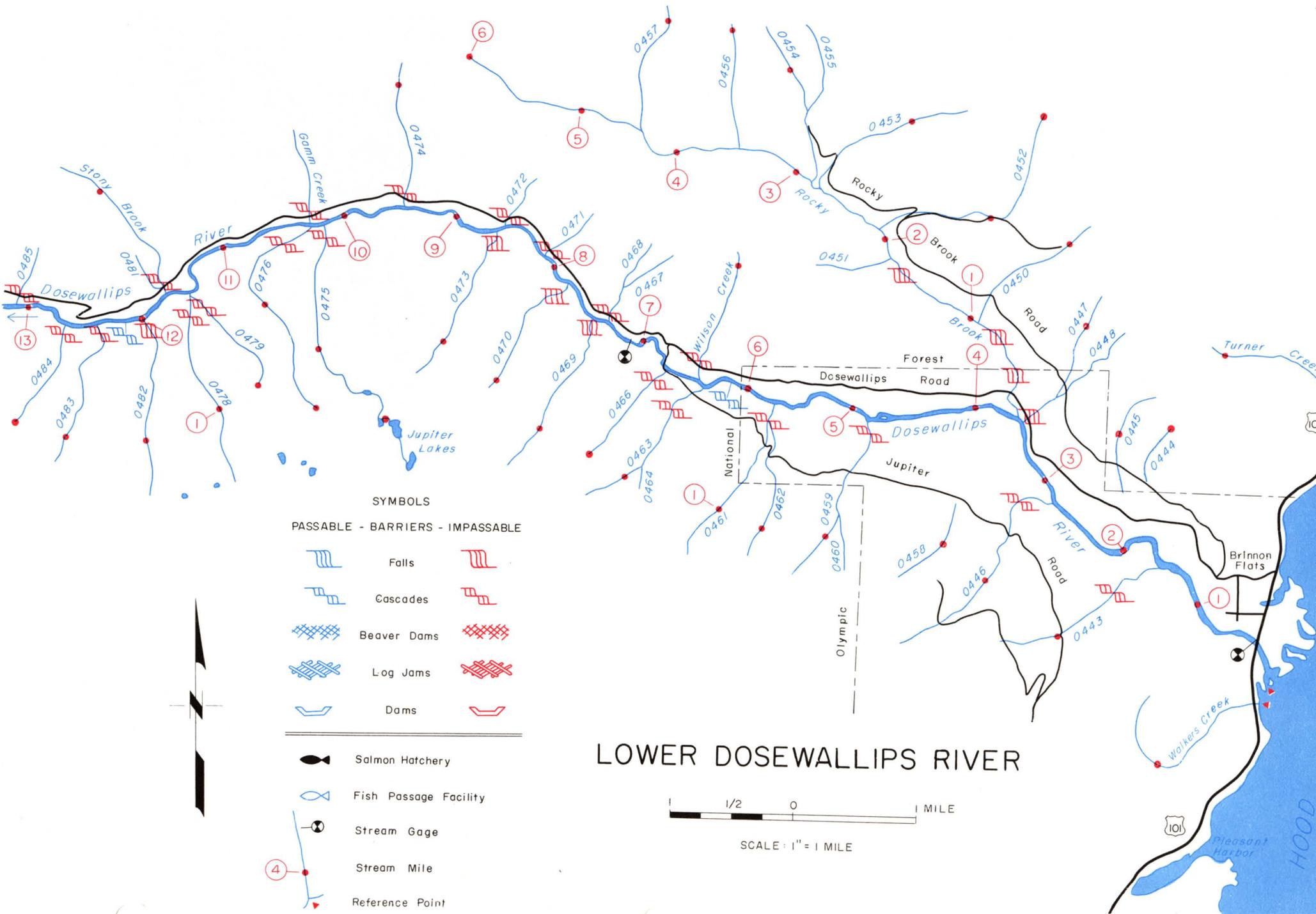
Walcott Slough is utilized as a satellite chum salmon facility by the Quilcene Federal Fish Hatchery. Releases of chinook and coho have been made into the Dosewallips River from Hood Canal Hatchery, but none in recent years.

Habitat Needs

The present natural production is at a high level and all efforts should be taken to maintain the watershed in its stable condition. This should include careful restrictions on any hydraulic approvals dealing with logging or other development within the watershed.



PHOTO 16-16. Moderate gradient section near R.M. 4.0.



SYMBOLS

PASSABLE - BARRIERS - IMPASSABLE

- | | | |
|--|-------------|--|
| | Falls | |
| | Cascades | |
| | Beaver Dams | |
| | Log Jams | |
| | Dams | |

- Salmon Hatchery
- Fish Passage Facility
- Stream Gage
- Stream Mile
- Reference Point

LOWER DOSEWALLIPS RIVER



SCALE: 1" = 1 MILE



**LOWER DOSEWALLIPS RIVER
Hood Canal Basin — WRIA 16**

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0441	Walker Creek	Sec2,T25N,R2W	1.7	—	Unknown
0442	Dosewallips River	Sec2,T25N,R2W	28.3	—	Chin., Coho, Pink, Chum
0443	Unnamed	RB-1.55	1.45	—	(Coho), (Chum)
0444	Unnamed	LB-1.8	1.0	—	(Coho), (Chum)
0445	Unnamed	LB-2.0	1.45	—	Unknown
0446	Unnamed	RB-2.8	1.95	—	Unknown
0447	Unnamed	LB-3.55	1.3	—	None
0449	Rocky Brook	LB-3.6	6.0	—	Coho, Chum
0450	Unnamed	LB-0.95	1.2	—	None
0452	Unnamed	LB-2.1	2.0	—	None
0453	Unnamed	LB-2.7	1.45	—	None
0454	Unnamed	LB-2.85	1.4	—	None
0456	Unnamed	LB-3.5	1.05	—	None
0457	Unnamed	LB-4.45	1.1	—	None
0458	Unnamed	RB-4.1	1.5	—	Unknown
0459	Unnamed	RB-4.85	1.4	—	Unknown
0461	Unnamed	RB-5.65	1.4	—	Unknown
0462	Unnamed	RB-0.15	1.3	—	None
0463	Unnamed	RB-6.35	1.3	—	Unknown
0465	Wilson Creek	LB-6.4	1.1	—	Unknown
0466	Unnamed	RB-6.7	1.0	—	Unknown
0469	Unnamed	RB-7.45	1.4	—	None
0470	Unnamed	RB-7.8	1.1	—	Unknown
0473	Unnamed	RB-8.6	1.3	—	None
0474	Unnamed	LB-9.5	1.2	—	None
0475	Unnamed	RB-10.2	2.45	—	Unknown
	Jupiter Lake No. 2	Outlet-1.95	—	—	
	Jupiter Lake No. 3	Outlet-2.1	—	—	
	Jupiter Lake No. 4	Outlet-2.45	—	—	
0476	Unnamed	RB-10.3	2.0	—	Unknown
0478	Unnamed	RB-11.5	1.6	—	Unknown
0479	Unnamed	RB-0.01	1.0	—	Unknown
0480	Stony Brook	LB-11.7	1.4	—	Unknown
0482	Unnamed	RB-12.0	1.45	—	None
0483	Unnamed	RB-12.4	1.25	—	None
0484	Unnamed	RB-12.65	1.0	—	None
	(Cont. Hood Canal 1103)				
0559	Turner Creek	Sec23&26,T26N,R2W	1.15	—	(Coho), (Chum)

UPPER DOSEWALLIPS RIVER

This segment covers the upper Dosewallips River from about river mile 13 upstream to its Olympic Mountain headwaters, a total of more than 15 stream miles. More than 30 tributaries enter in this section, these presenting nearly 90 additional stream miles. The area is located approximately 12 miles slightly north and east of Brinnon in east-central Jefferson County. Access is via Forest Service roads from Highway 101, and trails leading to the upper drainage. The lower mile of this section is in Olympic National Forest, the remaining portion in Olympic National Park.

Stream Description

From headwaters in the Sentinel Peak-Mount Claywood vicinity of the high Olympics the Dosewallips travels first in a northeast direction nearly 4 miles, then mostly southwest 3 miles to Silt Creek (R.M. 21.3). From here it turns generally southwest 7 miles, then east almost 2 miles through the remainder of this section. Principal tributaries include Deception and Silt creeks, and the West Fork Dosewallips River.

Over its upper 10-11 miles the Dosewallips cuts through a very narrow, steep-sloped valley, having many ravines and short canyons. Densely forested side hills rise sharply to over 6,000 feet. The valley floor begins to broaden a little below the West Fork (R.M. 17.6), alternately widening and narrowing over the lower 4-5 miles of this section. Side slopes remain very steep, densely forested with conifer timber. Limited development in this section includes a Forest Service road extending just into the park, and a few trails and shelters within the park. The principal activity in this area is recreation.

The Dosewallips' upper 7 miles fall over very steep, sometimes precipitous gradient; the narrowly confined channel producing many falls, sharp cascades and rapids, with only a few pool-riffle sections. Stream widths range from 3 to 8 yards along the lower portion of this stretch. The bottom is predominantly large rock, boulder and rubble, some bedrock, and a few small patch gravel areas.

Below Silt Creek the gradient diminishes slightly, the confined channel still presenting moderately steep to steep conditions downstream some 8 miles through the remainder of this section. Here, the Dosewallips presents mixed conditions with mostly fast riffle-cascade sections, many with sharp drops that could present upstream migration barriers. Also in this lower section there are occasional stretches showing some relatively good pool-riffle conditions. Stream widths range 5 to 12 yards. Through the faster water areas the bottom is predominantly large rock, boulder and rubble, while in the pool-riffle areas it is mainly of rubble-gravel composition. Stream banks throughout this section range from sheer rock faces to relatively narrow, sharp sloping boulder-rubble side beaches. Stream-side cover is mostly dense conifer forest with a few short stretches holding mixed deciduous growth.

The West Fork Dosewallips and Silt Creek present similar drainage features, having very steep gradients over their upper 2-3 miles, this producing mainly falls and cascades, and predominantly large rock and boulder stream bottoms. Over their remaining stream lengths, roughly 3 miles on Silt Creek and 4-5 miles on the West Fork, each offers alter-

nately some lengthy, moderate gradient stream sections, and somewhat shorter, steeper gradient stretches. The steeper areas exist mainly over the lower 1 to 2 miles on each stream. Both streams present extensive good quality pool-riffle conditions, with clean gravel-rubble bottoms where the more gentle gradients exist. In the steeper gradient stretches they show a few cascades, some rapids, and fast riffle stretches, the bottom mainly of boulder and rubble, with some short gravel riffles and patch gravel strips. Banks along each stream appear quite stable, mostly low earth or rock cuts, with some gravel-rubble side beaches. Stream-side cover is predominantly dense conifer forest, having some mixed deciduous growth along the lower stretches.

Virtually all other tributaries in this section exhibit steep mountain stream characteristics, their narrow channels providing mostly falls, cascades, and rapids, their bottoms comprised mainly of large rock and boulder material. These streams also are provided with relatively dense forest canopy.

Salmon Utilization

At the present time salmon do not utilize this upper Dosewallips River section.

Limiting Factors

Adult salmon are prevented from reaching this area by a series of cascades and falls located in the lower Dosewallips River (see Lower Dosewallips, 1001).

Beneficial Developments

No facilities, projects or programs have been undertaken to benefit salmon production in this section. Considerable potential could be realized by ensuring fish passage at a number of locations on the stream.

Habitat Needs

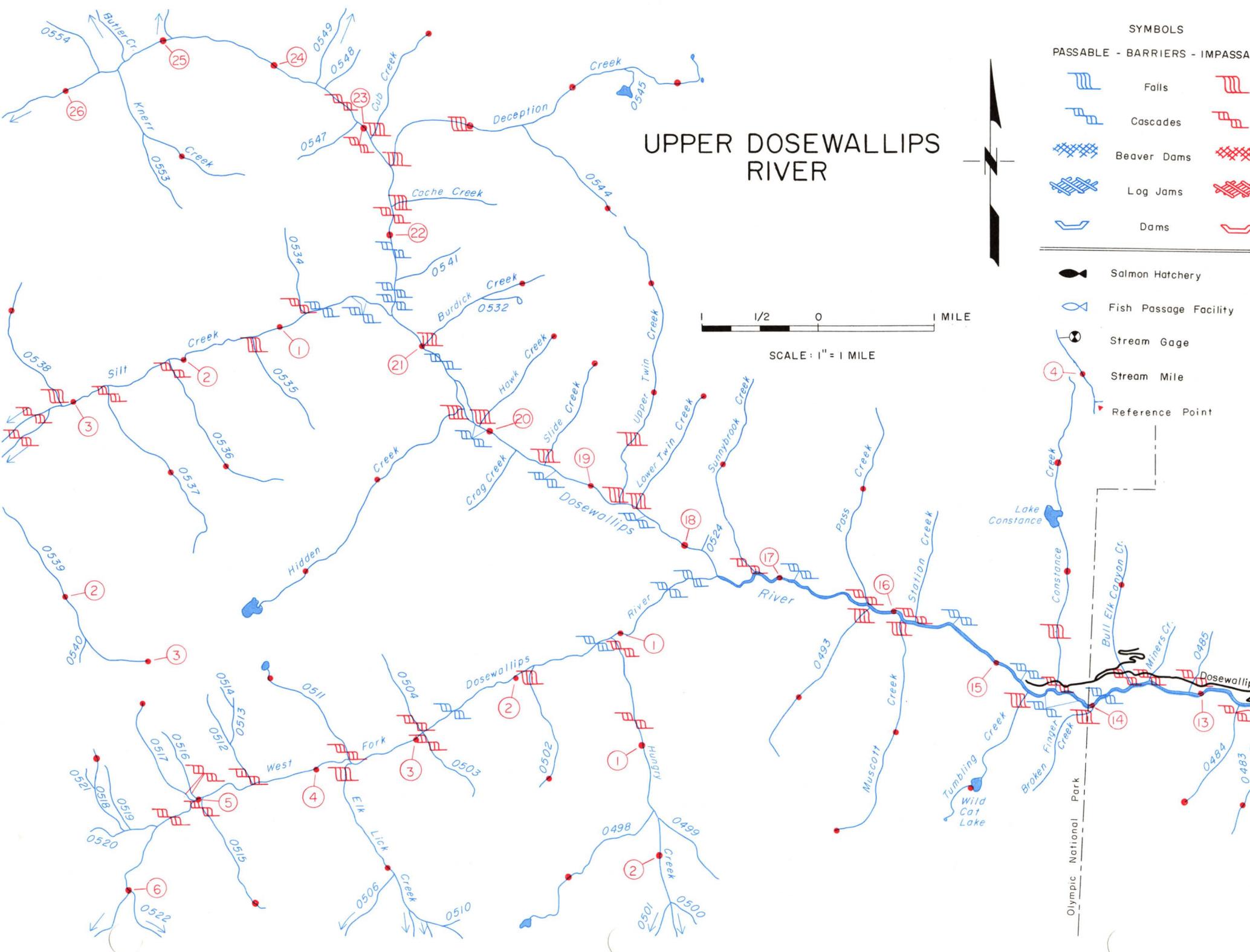
The principal requirements to maintain fish production potential in this section involve preserving stream-side cover and stream and streambed conditions in as near a natural state as possible.

UPPER DOSEWALLIPS RIVER

- SYMBOLS**
- | | |
|----------------------------------|--|
| PASSABLE - BARRIERS - IMPASSABLE | |
| | |
| | |
| | |
| | |
| | |
-
- Salmon Hatchery
 - Fish Passage Facility
 - Stream Gage
 - Stream Mile
 - Reference Point

1/2 0 MILE

SCALE: 1" = 1 MILE



**UPPER DOSEWALLIPS RIVER
Hood Canal Basin — WRIA 16**

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0440	Dosewallips River				Chin., Coho, Pink, Chum
0483	Unnamed	RB-12.4	1.25	—	None
0484	Unnamed	RB-12.65	1.0	—	None
0487	Bull Elk Canyon Cr.	LB-13.6	1.3	—	Unknown
0489	Constance Creek	LB-14.4	2.8	—	None
	Lake Constance	Outlet-1.5	—	—	
0490	Tumbling Creek	RB-14.6	1.4	—	None
	Wild Cat Lake	Outlet-0.9	—	—	
0492	Muscott Creek	RB-15.9	2.0	—	None
0493	Unnamed	RB-16.25	1.5	—	None
0494	Pass Creek	LB-16.3	1.8	—	None
0495	Sunnybrook Creek	LB-17.2	1.8	—	Unknown
0496	W. Fk. Dosewallips R.	RB-17.6	6.7	—	(Chin.), (Coho)
0497	Hungry Creek	RB-1.1	2.9	—	Unknown
0498	Unnamed	LB-1.55	1.6	—	None
0502	Unnamed	RB-1.8	1.1	—	None
0505	Elk Lick Creek	RB-3.65	1.9	—	Unknown
0511	Unnamed	LB-3.7	1.1	—	Unknown
0515	Unnamed	RB-4.95	1.1	—	None
0517	Unnamed	LB-5.05	1.0	—	None
0518	Unnamed	LB-5.4	1.1	—	None
0522	Unnamed	RB-6.0	1.3	—	None
0525	Lower Twin Creek	LB-18.5	1.0	—	None
0526	Upper Twin Creek	LB-18.7	2.5	—	None
0527	Slide Creek	LB-19.4	1.0	—	None
0529	Hawk Creek	LB-20.1	1.0	—	None
0530	Hidden Creek	RB-20.3	2.5	—	None
0531	Burdick Creek	LB-21.0	1.2	—	None
0533	Silt Creek	RB-21.3	5.9	13.8	(Chin.), (Coho)
0536	Unnamed	RB-2.1	1.5	—	Unknown
0537	Unnamed	RB-2.7	1.8	—	Unknown
0538	Unnamed	LB-3.1	1.2	—	Unknown
0539	Unnamed	RB-3.2	3.0	—	Unknown
0543	Deception Creek	LB-22.6	3.3	—	None
0544	Unnamed	LB-1.45	1.1	—	None
0546	Cub Creek	LB-22.9	1.0	—	None
0551	Butler Creek	LB-25.4	1.0	—	None

**UPPER DOSEWALLIPS RIVER
Hood Canal Basin — WRIA 16**

Stream Number	Stream Name	Location Of Mouth	Length	Drainage Area	Salmon Use
0552	Knerr Creek	RB-25.5	1.6	—	None
0555	Unnamed	RB-26.8	1.3	—	None