TRASK WATERSHED ASSESSMENT

TILLAMOOK BAY NATIONAL ESTUARY PROJECT

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Start Up

This watershed Assessment of the Trask River watershed (Tillamook County, Oregon) was completed using the draft Oregon Watershed Assessment Manual (10/97 version) and funded by a grant from the Governor's Watershed Enhancement Board (GWEB). **The master copy of this assessment including all maps, mylars, forms, computations and notes is housed in the Tillamook Coastal Watershed Resource Center (TCWRC) in Bay City, OR and is available for public use on the premises. The TCWRC can be reached at (503)377-4000.**

The Trask River is one of five rivers in the Tillamook Basin draining to Tillamook Bay. The Trask Watershed encompasses approximately 162 square miles or 103,763 acres. The river runs approximately east to west with steep, mountainous terrain vegetated with coniferous forest comprising the eastern 85% of the watershed. The western 15% leading to Tillamook Bay is a floodplain dominated by dairy farming and urban development. Figure 1-1 shows land ownership in the watershed.

A basemap for the Trask Watershed was prepared by taping together all or portions of nine topographic maps (7 ½ minute, 1:24,000 scale). The names of the topographic maps are: Tillamook, The Peninsula, Blaine, Trask, Dovre Peak, Woods Point, Gobblers Knob, Trask Mtn., and Turner Creek.

The Watershed was divided into eight subwatersheds for this assessment (Figure 1-2). They are: Mainstem (tidal - river mile [RM] 0–2, and middle mainstem RM 2–10), Mainstem (RM 10 to the confluence with North and South Forks), North Fork (confluence with mainstem to confluence with North and Middle Forks of North Fork), North Fork of North Fork, Middle Fork of North Fork, South Fork, and East Fork of South Fork.

Figure 1-1. Land owners in the Trask watershed

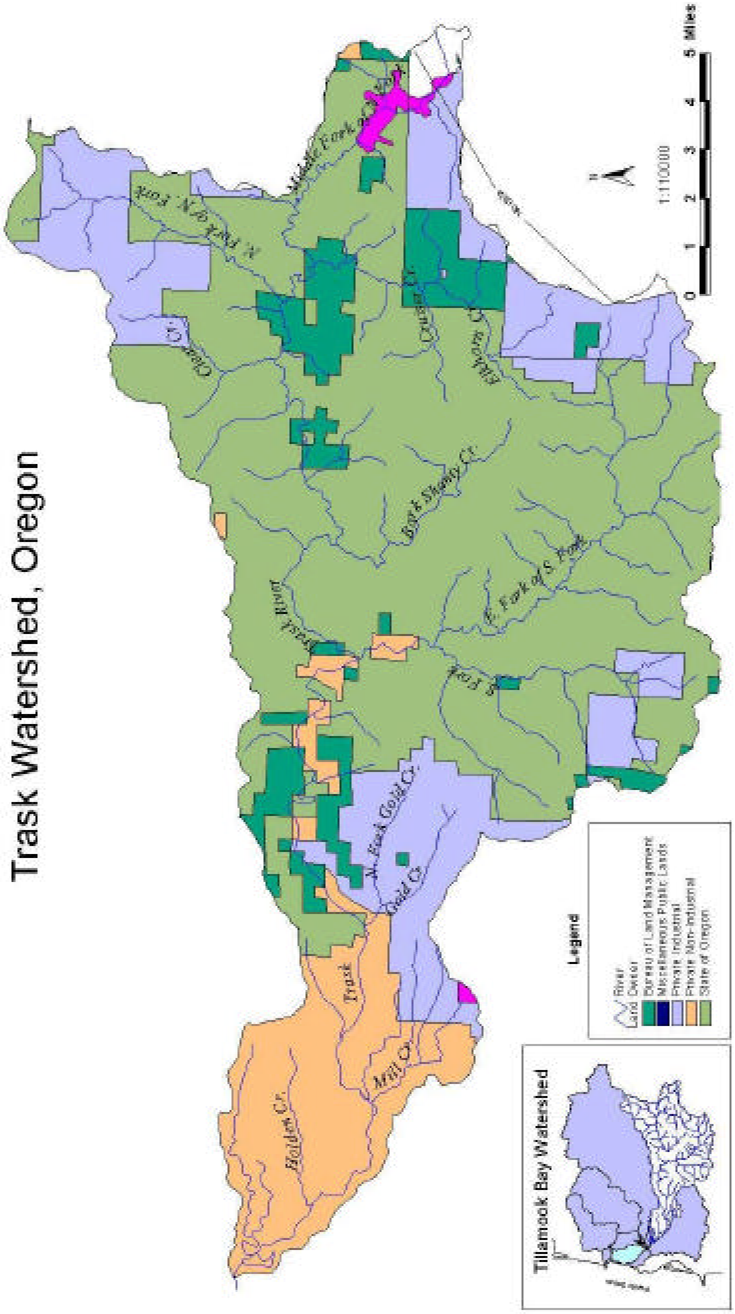
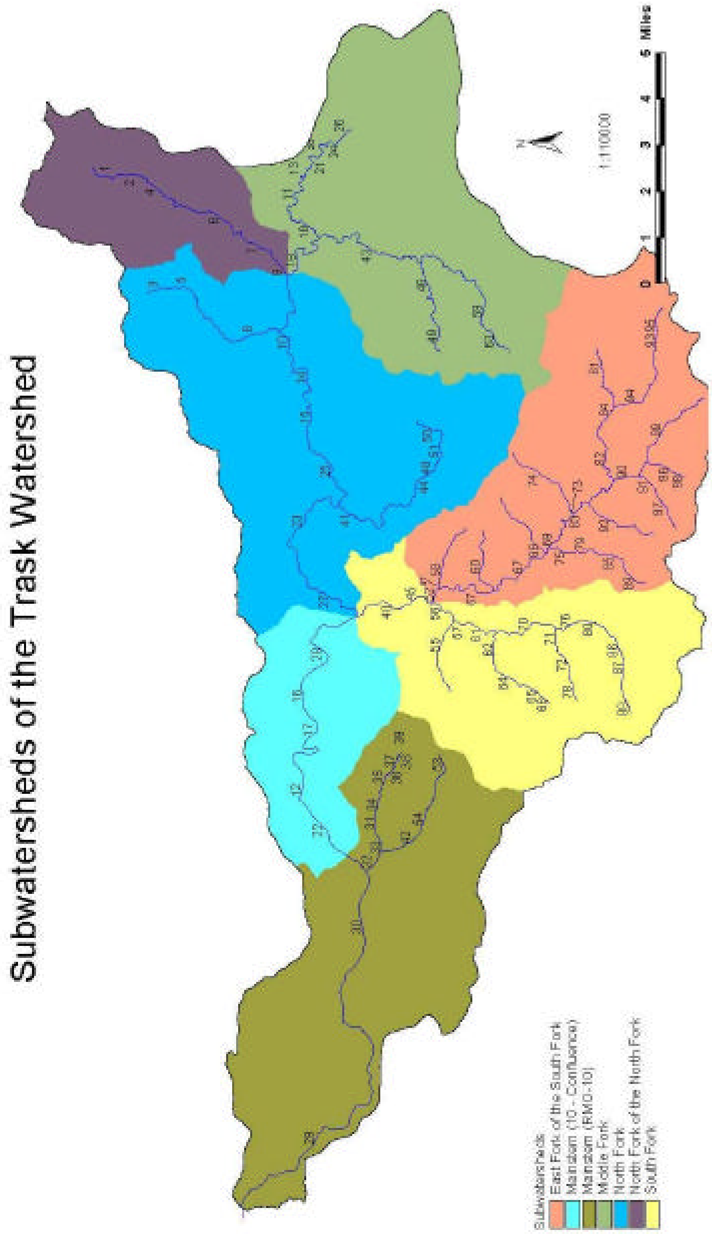


Figure 1-2. Subwatersheds of the Trask watershed and reach numbers showing extent of stream habitat surveys



2. Channel Habitat Typing

The classification of all stream channels into channel habitat types (CHT) was designed to help identify which portions of the watershed have the highest potential for fish utilization, and how these channel types respond to land use impacts or restoration actions (GWEB 1998).

The assessment methodology for determining CHTs was used to classify all of the perennial streams in the Trask Watershed. The CHTs in the lowlands were:

- Floodplain 1 and 2 (FP1 and FP2; floodplain portion of Trask mainstem);
- Floodplain 3 (FP3; lowest portion of tributaries crossing the floodplain);
- Large Estuarine Channel (EL; lower tidal portion of Trask mainstem);
- Connected Wetlands (WC; tidal portion of sloughs);
- Moderate-gradient Headwater (MH; upper end of floodplain tributaries); and
- Ditch (channelized watercourses in agricultural land).

The CHTs in the uplands were:

- Moderate-gradient, Moderately-constrained (MM; portions of Trask mainstem, portions of several Forks, lower portion of some large tributaries);
- Moderate-gradient, Constrained (MC; portions of Trask mainstem, lower portion of some large tributaries);
- Moderately-steep, Narrow Valley (MV; lower portion of many tributaries);
- Steep, Narrow Valley (SV; mid- to upper section of almost all tributaries); and
- Very Steep Headwater (VH; upper portion of almost all tributaries).

A full compilation of the length of all CHTs by subwatershed (Form CHT1) is included in the complete assessment on file at the TCWRC.

3. Fisheries Assessment

Fish species found in the Trask that are threatened or endangered are:

- river and Pacific lamprey (species of concern),
- coastal cutthroat trout (species of concern),
- chum salmon (species of concern),
- coho salmon (threatened), and
- winter steelhead trout (proposed threatened).

Other salmonids found in the watershed are fall and spring chinook, and summer steelhead (introduced).

The following species are being stocked in the watershed: fall and spring chinook, coho, and rainbow trout. Winter and summer steelhead, cutthroat trout, and largemouth bass were formerly stocked in the watershed.

There are combinations of wild and stocked fish in the watershed that may lead to negative interactions. One potential negative interaction is between rainbow trout (stocked) and cutthroat trout (native). Their interaction is thought to be nonexistent in the Trask because the rainbow trout are only stocked in one lake (Lake Tahoe) that they cannot easily escape. Negative interactions due to the timing of runs have been established between hatchery and wild coho stocks, and cutthroat may also have been impacted due to the release of out-of-basin stocks from the Alsea and Nehalem Rivers. Another potential negative interaction is between wild and stocked salmon (coho, spring chinook, fall chinook). Due to egg collection procedures (*e.g.*, eggs were historically collected from the earliest returning fish) at the Gold Creek Hatchery, the spawning time of the hatchery fish was advanced to earlier in the year. There is a small chance that interbreeding of wild and hatchery fish may have passed this trait on to the wild population to some extent; the effect is thought to have been negligible for fall chinook. The hatchery egg collection procedure has been modified to eliminate the problem.

A number of migration barriers have been identified in the watershed. Two are due to hatchery dams (Gold Creek and the East Fork of South Fork), one is a natural barrier (Bark Shanty Creek RM~1.5), and the rest are culverts. No systematic survey of the migration barriers has been completed for the forest road culverts or the agricultural road culverts. It is quite likely that there are additional unidentified culverts in both the forest and agricultural lands which are barriers to migrating juvenile or adult fish species.

The habitat condition summary used a composite rating of four parameters (pool area, pool frequency, gravel availability and gravel quality) to evaluate habitat conditions; the data used in the evaluation was collected in stream surveys conducted by ODFW. The pools are used as resting and feeding areas and the riffle gravels are used for spawning. The benchmark values used to rate the habitat quality of these parameters are presented in Table 3-1.

Table 3-1. Habitat parameters and their benchmark values* used to evaluate habitat conditions in the Trask Watershed

Parameter	Measure	Good	Fair	Poor
Pool Area	% of channel area	$x \geq 43.75$	$43.75>x>26.25$	$x \leq 26.25$
Pool Frequency	# of channel widths	$x \leq 6$	$6<x<10$	$x \geq 10$
Gravel Availability	% gravel in riffles	$x \geq 43.75$	$43.75>x>26.25$	$x \leq 26.25$
Gravel Quality	% sand/organic in riffles	$x \leq 7.5$	$7.5<x<12.5$	$x \geq 12.5$

* Benchmark values are 25% above ODFW benchmark values per the recommendation in the manual.

Figure 3-1 presents the individual ratings for pool characteristics and Figure 3-2 presents the individual ratings for spawning gravel characteristics.

The habitat condition summary was only completed for stream reaches that had been surveyed (and the data processed) prior to February 1998 using the Oregon Department of Fish and Wildlife (ODFW) stream habitat survey protocol; the extent of completed surveys is shown on Figure 1-2. A summary of habitat conditions is presented for the forested subwatersheds in Table 3-2.

The ratings in Table 3-2 portray a watershed with generally fair to poor habitat quality based on the four characters rated in this exercise. Many more reaches received a rating of good or fair than are apparent in the summary because the summary ratings combine four characters and multiple reaches; this process tends to obscure individual reaches that rated higher than the average.

Figure 3-1. Pool characteristics of the Trask watershed

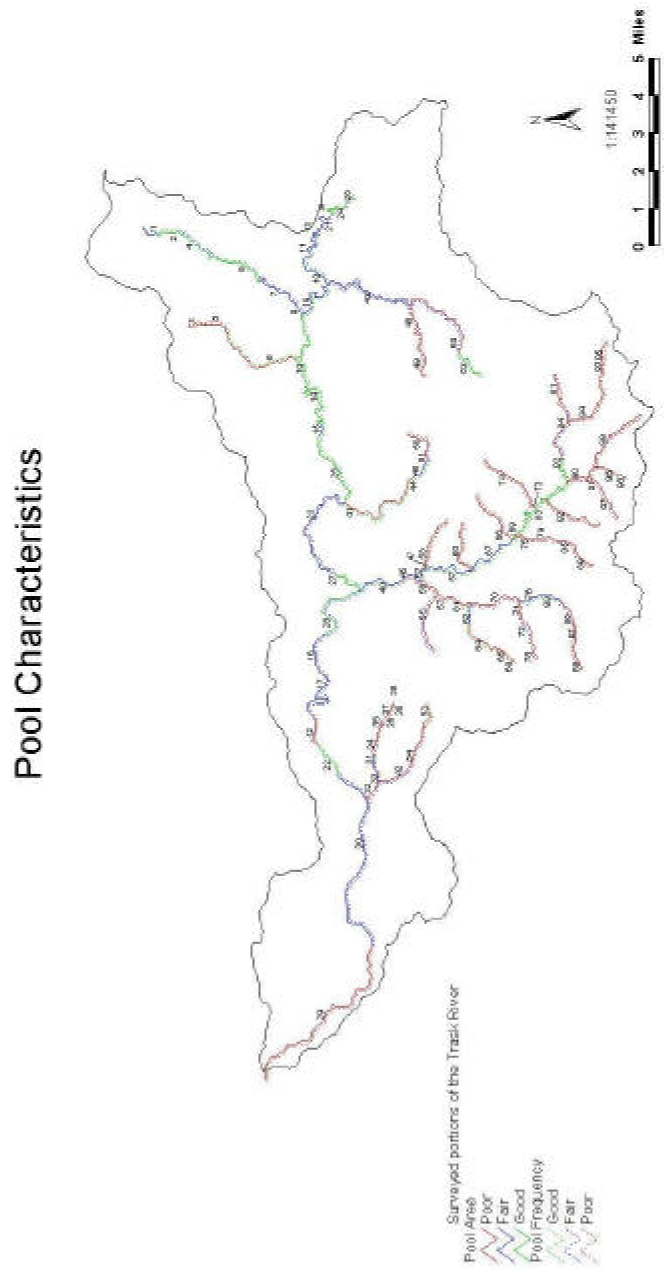


Figure 3-2. Gravel characteristics of the Trask

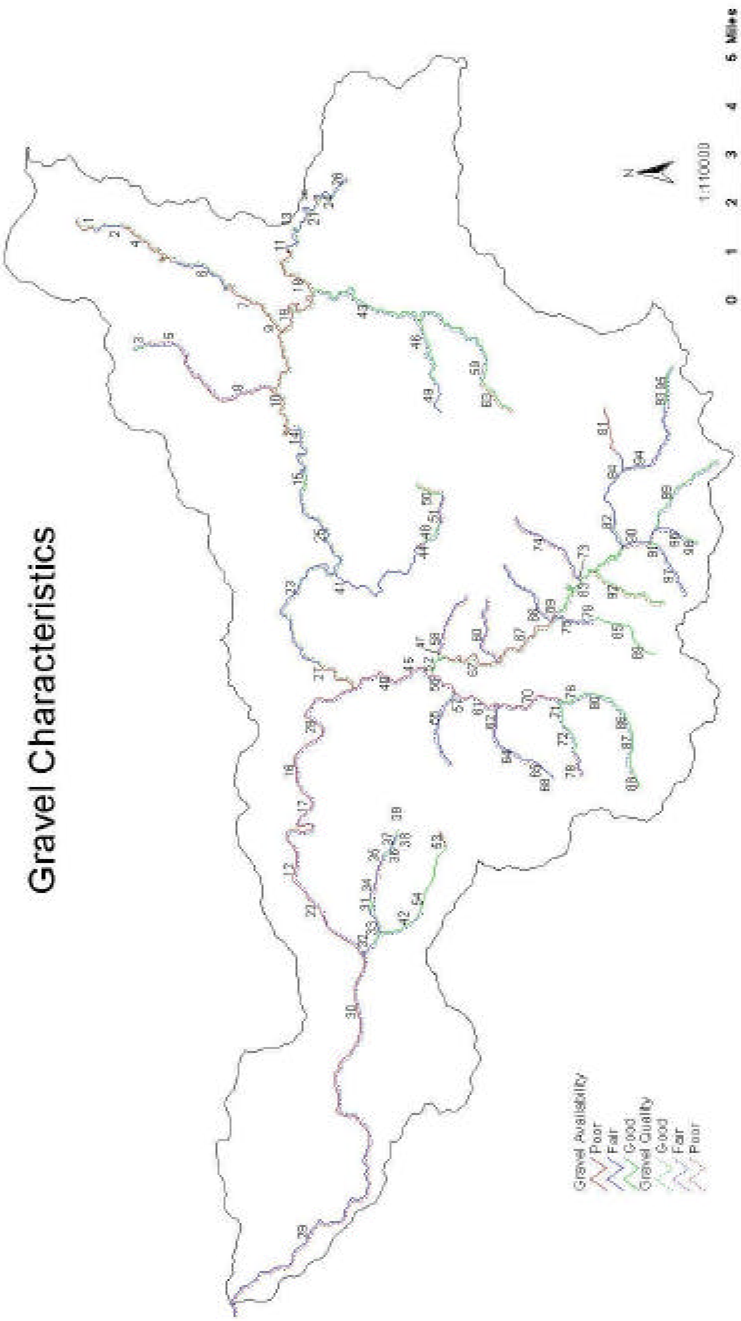


Table 3-2. Habitat condition summary ratings for the forested subwatersheds in the Trask watershed.

Channel Type Subwatershed	MM*	MC*	MV*	SV*	VH*	MH*
North Fk.		I	I	P	I	
N. Fk. of N. Fk.		I				
Mid. Fk. of N. Fk.		P			P	I
South Fk.		I	I	P	P	
E. Fk. of S. Fk.	G	I	P	P	P	

Explanation of ratings:
G (good): all parameters rated good or fair;
I (intermediate): 1 or 2 parameters are rated poor, others fair or good;
P (poor): 3 or more parameters are rated poor;
Blank: no data.
* Channel Habitat Type descriptions are listed on the acronym page.

4. Channel Modifications

Channel modifications are classified as either current or historic disturbances to the river channel. Historic disturbances are important primarily if they could have a lasting effect on the channel, adjacent riparian or wetland ecosystems, or aquatic species populations. Current disturbances may be the direct result of a local activity, or they may be an indirect effect from upstream activities.

The historic disturbances on the Trask were: log drives, yarding in channels during timber harvest operations, stream cleaning for fish passage, and beaver eradication. The Trask has experienced log drives on the North and South Forks, the lower portion of Bark Shanty Creek, and the mainstem from the confluence of the North and South Forks to the bay (USDA Forest Service Gen. Tech. Rpt. PNW-186, Chpt. 5, 1985). There are indications that the logs were stored on the bank until winter high flows when they were pushed into the water for transport downstream. The associated impacts include: riparian trees were cut and snags were pulled from the channels to facilitate log passage; channels and banks were heavily scoured; large amounts of sediment were generated by scour and remobilization; and a diverse array of aquatic species were impacted.

Some of the early logging and some of the salvage logging following the Tillamook Burn used stream channels for yarding of logs. An activity that had similar effects was stream cleaning to improve fish passage. The associated impacts include: clearing obstructions from the channels; extensive channel scouring during the yarding operations; impacts to riparian vegetation; dam-break floods when debris dams blew out during winter storms; and impacts to fish and other aquatic species both on-site and downstream.

Beaver were nearly eradicated very early in Tillamook and the rest of northwest Oregon by fur trappers. They were later reintroduced by ODFW and have since repopulated much of their former range. Beaver are still trapped in small numbers and either killed or relocated when they interfere with human uses of the land.

Current channel modifications in the Trask include: Barney Reservoir, dikes and levees, channelization of streams, dredging of channels, streambank protection, roads constructed next to channels, instream gravel mining, and current channel disturbances.

Barney Reservoir was built in 1966–68 to capture 4,000 acre feet of municipal water for cities along the Tualatin River. The dam was raised in 1996–98 to increase the storage capacity to 20,000 acre feet and will be filled starting in Winter 1998. The associated impacts include: inundation of fringe wetlands, riparian stands and channel habitat; and blockage of fish passage. Water is released from the reservoir in summer to augment low flows for fish habitat.

Much of the agricultural lowland acreage adjacent to the Trask has had dikes constructed to aid in draining them for agricultural use. A levee was constructed by the Army Corps of Engineers around Stillwell Island to secure it as an escape route for coastal residents during flooding. The impacts associated with dikes and levees include: destruction or isolation of wetlands and riparian vegetation; loss of rearing habitat for salmonids; loss of flood storage capacity; and displacement of floodwaters onto adjacent lands.

Several small streams and seasonal drainages have been channelized in agricultural land for various reasons related to farm management. The associated impacts include: loss of riparian vegetation; degradation of habitat for salmonids and other aquatic species; and possible water temperature changes.

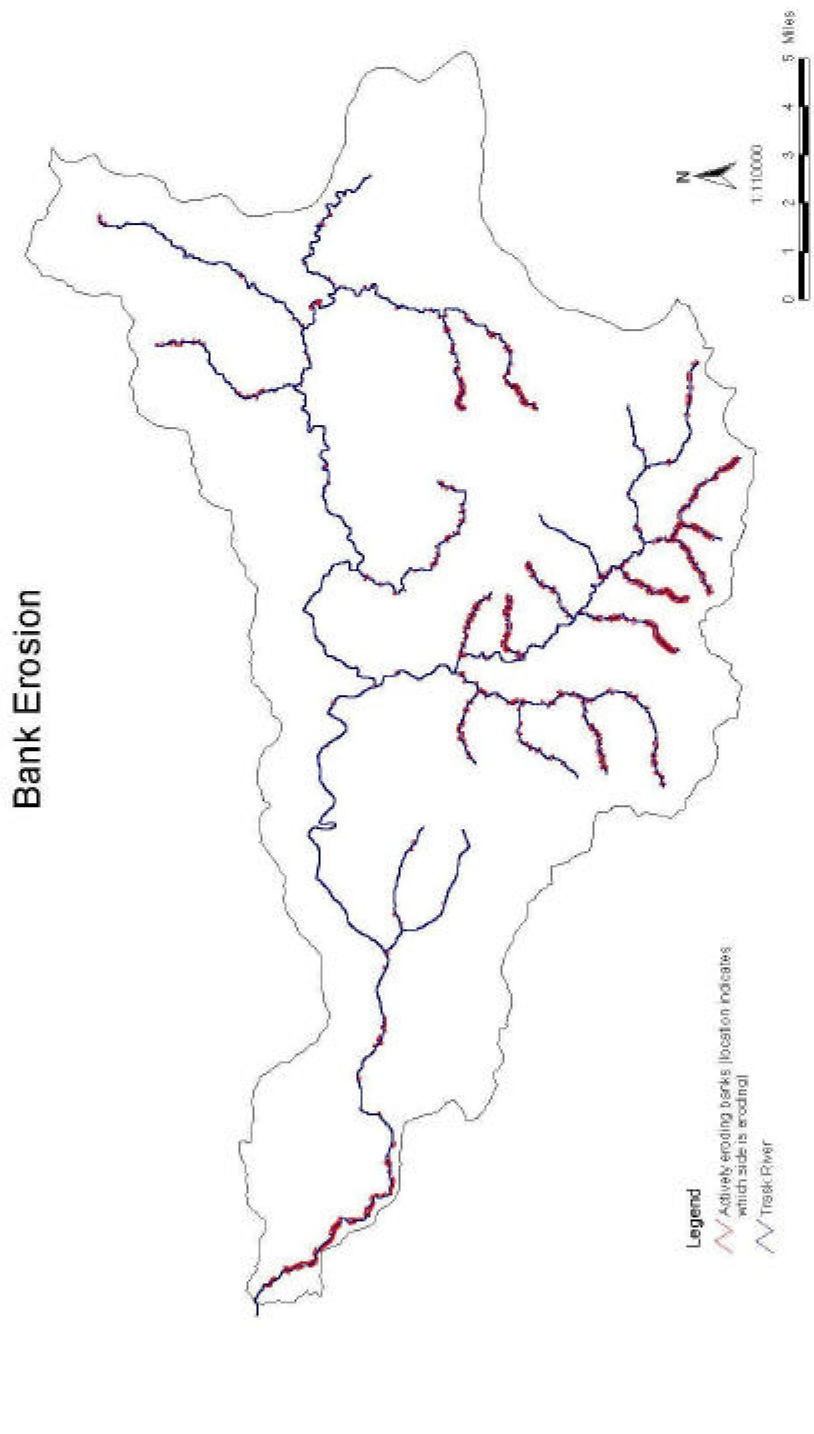
The estuarine channels of the Trask were dredged in 1972 to increase channel capacity for conveyance of flood waters. The associated impacts include: loss of riparian and wetland vegetation buried under dredge spoil; degradation of salmonid habitat; and possible water temperature changes.

Several types of streambank protection have been used in the Trask including riprap, pilings and bulkheads. In various locations around the watershed, roads have been constructed adjacent to stream channels in riparian areas. In most cases some riprap has been installed along portions of the roads to protect them from bank erosion. The impacts associated with streambank protection and roads in riparian areas include: loss of riparian vegetation; loss or degradation of salmonid habitat; increased bank erosion due to loss of energy dissipation by riparian vegetation; and possible water temperature changes.

Instream gravel mining in the Trask was confined to several floodplain reaches of the mainstem; a moratorium on instream mining took effect in 1998. The associated impacts of instream mining are numerous and include: destruction or degradation of spawning gravel beds; various other types of degradation of salmonid habitat; loss of riparian vegetation; changes in hydrology and channel configuration; possible changes in water temperature; impacts to other aquatic species populations (*i.e.*, macroinvertebrates, amphibians); and reduction in retention of large woody debris and other resources valuable to the stream ecosystem. A report published by the Division of State lands titled: *Gravel Disturbance Impacts on Salmon Habitat and Stream Health Volume 1: Summary Report* gives a complete listing of impacts caused by instream mining activities (copies available by contacting [503]378-3805).

Current channel disturbances consist of bank erosion or bed aggradation caused by human activities upstream or locally. Figure 4-1 shows the location of bank erosion throughout the watershed and was compiled from the results of stream habitat surveys. Impacts associated with bank erosion and bed aggradation include: addition of excess sediment to the water column; degradation of salmonid habitat; loss of riparian vegetation; bank erosion and channel widening; and possible changes in water temperature.

Figure 4-1. Bank Erosion in the Trask watershed



5. Sediment

The sediment assessment uses several measures to rate whether a subwatershed is at risk for serious erosion. They include: the number of miles of unpaved road per square mile of land; the amount of land with steep slopes (moderate 60–70%, high 70+%); the percentage of the subwatershed with the potential to contribute sediment from mass wasting and soil erosion; and the miles of road contributing sediment to streams. These four characters are presented in Table 5-1 by subwatershed.

Table 5-1. Summary table of erosion ratings for the eight subwatersheds of the Trask Watershed

	Category of Hazard			
Subwatershed	Miles of Road per Square Mile	Slope Hazard Moderate/High (acres)	% Area w/ Sediment Potential	Miles Road Contrib. Sed. (miles)
Tidal Mainstem	0.56	0.0 / 0.0	0.48	0.3
Main RM 2—10	0.56	0.2 / 0.0	0.29	4.4
Main RM 10—confluence	1.83	25.7 / 3.3	0.28	6.1
North Fk.	2.24	17.9 / 1.3	0.08	7.3
N. Fk. of N. Fk.	3.72	2.2 / 0.0	0.06	3.4
Mid. Fk. of N. Fk.	2.62	3.1 / 0.6	0.04	5.0
South Fk.	2.60	1.7 / 0.2	0.09	12.6
E. Fk. of S. Fk.	3.14	1.1 / 0.0	0.12	16.3

The number of miles of unpaved road per square mile of land is a good indication of the level of effects of forest roads on the watershed. A high density (greater than 2 mi/square mile) is indicative of possible elevated sediment delivery. These figures show that all five of the heavily forested subwatersheds have road densities above the cutoff figure and are thus at risk for elevated erosion due to roads. ODF is currently conducting a Forest Road Hazard Inventory to determine the erosion hazard for all of their roads and prioritize them for remedial action. There are numerous off-road-vehicle (ORV) trails int he Trask watershed that might contribute significant sediment loads to streams. ODF is in the process of closing those trails that generate the most sediment.

The areas of hazardous slopes were calculated using a 30m digital elevation model (DEM) and the results were converted to acres of land in the moderate and high hazard categories. The 30m DEM is known to grossly underestimate the areas in these high slope classes because of the coarse size of the cells (approximately 100 feet on a side) and the method of calculation it uses to evaluate the terrain. Therefore the erosion hazard due to steep slopes is probably much higher than the values in Table 5-1 would indicate.

The percentage of each subwatershed with the potential for mass wasting or to generate sediment is a composite measure consisting of: areas of high/moderate slope hazard; roads that pass through hazardous slope areas; cropland; rangeland; urban; mining; and other potential erosion hazards. This measure is used to indicate which subwatersheds are at highest risk of mass wasting and soil erosion. It can be used to prioritize the subwatersheds either for further evaluation of erosion hazard or for remedial work. None of the subwatersheds scored above 0.5% for the combined erosion hazard, which indicates that none of them, in general, pose a serious erosion hazard.

The miles of road that can contribute sediment to streams is the sum of stream crossings by roads and roads that closely parallel streams. If this figure is high, then the individual sites which contribute to that figure can be visited and evaluated for their individual erosion potential. The worst roads can then be prioritized for remedial work. The East Fork of the South Fork and the South Fork subwatersheds have the highest areas of potential road erosion. Fish habitat values in these systems are high and this suggests that road remediation work should be focused in these two subwatersheds.

6. Riparian

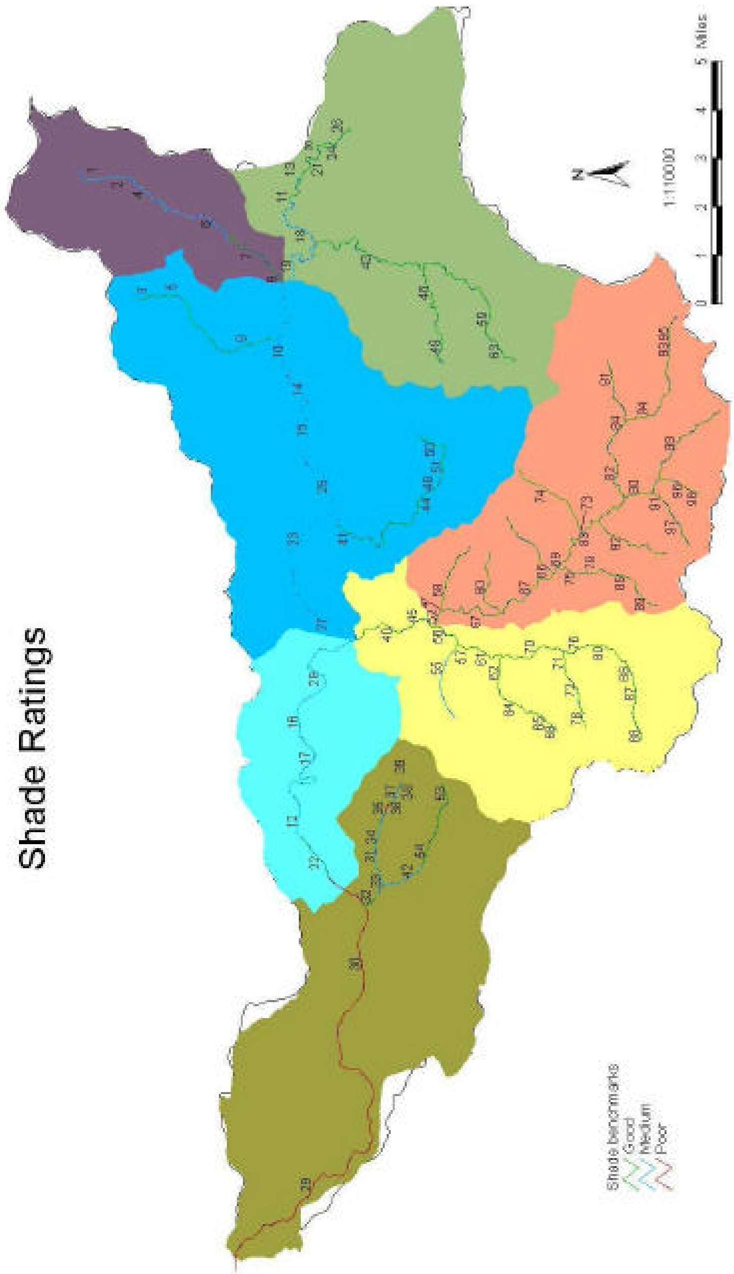
Riparian conditions (width, composition, continuity), current large woody debris (LWD) instream and future LWD potential, and stream shading and temperature were assessed; this information is summarized below by subwatershed starting with riparian condition. Figure 6-1 presents the shade ratings for both banks for all surveyed reaches in the watershed. All quantified evaluations of riparian condition, LWD and shading are based on the ODFW stream habitat surveys. All temperature data were collected by the Department of Environmental Quality (DEQ). All qualitative evaluations of unsurveyed tributaries are based on site visits or aerial photo interpretation with no actual measurements.

The Tidal Mainstem has poor riparian conditions throughout the subwatershed except on Hoquarten Slough. Riparian trees are largely absent from the mainstem and from tributaries passing through agricultural land. The composition of riparian vegetation is primarily blackberries and non-native grasses, and the vegetation is discontinuous. The current LWD, potential LWD and shading are rated poor in all channels where information is available except Hoquarten Slough, which is rated good. The only temperature data available are for the mainstem at RM 1.5, where summer temperatures exceed state standards; the reach is 303(d) listed for temperature.

The Mainstem RM 2–10 subwatershed has two prevailing riparian conditions that correlate with the land use. In the agricultural portion, the riparian is in poor condition with either absent or narrow ratings for width. The composition is brush or young hardwoods and the vegetation is discontinuous. In the forested portion, the width rating is forested (riparian merges with forest), the composition is mature hardwoods or dense, young hardwoods, and the vegetation is continuous. The current LWD is poor in all channels where information is available except for two reaches on Gold Creek in MV and VH CHTs. The future LWD potential is variable ranging from poor in most areas to moderate in some FP2, FP3 and MH reaches, and good in three reaches on Gold Creek. Current shading ranges from 20–40% on the mainstem to 65–90% on the smaller channels in the subwatershed. The only temperature data available are for the mainstem at RM 9.5, where summer temperatures exceed state standards; the reach is 303(d) listed for temperature.

The Mainstem RM 10–confluence subwatershed is in the forested uplands and the width class for all of the CHTs is forested. The composition on MM reaches is generally mature mixed conifer and hardwood, while on all of the other reaches it is young, dense hardwoods. The continuity ratings for all CHTs are continuous vegetation with very few interruptions. The current LWD is poor in all MM reaches surveyed and assumed to be fair in all other CHTs of the subwatershed based on aerial photos. The potential LWD is moderate to good in the MM reaches, and assumed moderate in all other CHTs based on aerial photo assessment. Stream shading is rated moderate on the MM reaches, and assumed to be moderate to good on all other reaches based on aerial photo assessment. The only temperature data available are for the mainstem, where summer temperatures exceed state standards; the reach is 303(d) listed for temperature.

Figure 6-1. Shade ratings for the surveyed reaches in the Trask watershed



The North Fork subwatershed is in the forested uplands and the width class for all of the CHTs is forested. The composition on MM and MC reaches is generally mature mixed conifer and hardwood, while on all of the other CHT reaches it is young, dense hardwoods. The continuity ratings for all CHTs are continuous vegetation with very few interruptions. The current LWD is rated poor on the MM and MC reaches, and is fair on all other reaches. The potential LWD is rated good on the MM and MC reaches, and only moderate on all other reaches. Stream shading is rated fair on the MM and MC reaches and good on all other reaches. Temperature data are available for two points in the subwatershed. Lower Bark Shanty Creek was below state standards and the mainstem downstream of the confluence with Bark Shanty exceeds state standards; the reach is 303(d) listed for temperature.

The North Fork of the North Fork subwatershed is in the forested uplands and the width class for all of the CHTs is forested. The composition on MC reaches is mature, mixed conifer and hardwood, while on all of the other CHT reaches it is young, dense hardwoods. The continuity ratings for all CHTs are continuous vegetation with very few interruptions. The current LWD is rated poor on the MC reaches and is assumed to be fair on all other reaches. The potential for future LWD is rated good on MC reaches and is assumed to be moderate on all other reaches from aerial photo assessment. Stream shading is rated good on MC reaches and is assumed to be good or fair on all other reaches. The only temperature data are for the mouth of the main Fork and it exceeds the state standards for temperature; the reach is 303(d) listed for temperature.

The Middle Fork of the North Fork subwatershed is in the forested uplands and the width class for all of the CHTs is forested. The composition on all reaches is young, dense hardwoods. The continuity ratings for all CHTs are continuous vegetation with very few interruptions. The current LWD is poor in all but one of the MC reaches, and assumed fair in all other reaches. The future LWD potential is moderate to poor in the MC reaches, and assumed to be moderate in all other reaches. Stream shading is good in the MC reaches, and assumed to be good in all other reaches. Temperature data are only available for the mouth of the main Fork and those data are below the state temperature standard. The exception to these ratings is Barney Reservoir, which has no riparian due to a recent raising of the dam level.

The South Fork subwatershed is in the forested uplands and the width class for all of the CHTs is forested. The composition of all CHT reaches is young, dense hardwoods. The continuity ratings for all CHTs are continuous vegetation with very few interruptions. The current LWD ratings are poor for all MM and MC reaches, and fair to good for all other reaches. The future LWD potential for MM and MC reaches is poor, and for all other reaches is moderate to good. Shading is rated as good on all reaches in the subwatershed. Temperature data for three points in the subwatershed (mouth of main Fork, confluence with the East Fork of the South Fork, and main Fork downstream of Bill Creek) are all below state standards.

The East Fork of the South Fork subwatershed is in the forested uplands and the width class for all of the CHTs is forested. The composition of all CHT reaches is young, dense hardwoods. The continuity ratings for all CHTs are continuous vegetation with very few interruptions. The current LWD ratings are poor for all MC reaches, and fair to good for all other reaches. The future LWD potential is moderate in all reaches. Shading is rated as good on all reaches in the subwatershed. There are no temperature data available for this subwatershed.

In summary, for the forested portions of the Trask Watershed as a whole there is a conspicuous lack of large conifers in the riparian zones, and small conifers are scattered through dense stands of relatively small alders. The riparian stands are capable of shading the stream channels in summer and providing good numbers of small to medium alder logs for LWD, but provide no thermal cover in winter and no large conifer logs for future LWD. The lack of good conifer logs both currently and in the foreseeable future means that the stream channels lack structure and the ability to retain adequate levels of high quality spawning gravels, fine organic matter to fuel the food web, and contributes to a lack of pools and cover from predators in many reaches. In the agricultural portion of the watershed riparian is absent or in poor condition. There are very few conifers and only a few scattered residual large cottonwoods. The riparian is incapable of shading the river and stream channels and provides very little cover or other habitat values. An intensive planting program is required to restore the ecosystem functions of riparian in the agriculture-dominated floodplain.

7. Water Quality

The water quality chapter is intended to act as a screen to identify areas of concern for water quality (exclusive of temperature) where further investigation is necessary. The contaminants covered are: nutrients, bacteria, organic chemicals, heavy metals, and turbidity/sediment. No information on organic chemicals or heavy metals was located for use in this assessment. Organic chemicals used in agriculture could be reaching waterways in the Trask system, but no information was available. Heavy metals in urban runoff (e.g., storm sewer system) or the sewage treatment outfall could also be reaching waterways in the Trask system, but again no information was located on these potential contaminants.

For nutrients, the mainstem of the Trask is listed by DEQ as a waterbody of concern from the confluence of the North and Middle Forks of the North Fork all the way down to the bay. The primary reason is probably the nitrogen resulting from riparian alder trees. All organic matter (OM) from alders has a relatively high nitrogen content, and because of this nitrogen content the OM breaks down readily and releases its nitrogen to the water column.

The Trask River has the highest bacteria loading of all five rivers in the Tillamook Basin. On the 1997/1998 list Dougherty and Hoquarten Sloughs, and Mill and Holden Creeks were listed for bacteria contamination. Various sources could be contributing to these bacteria loads including: the Hampton lumber mill in Tillamook (bacteria breeding on wood waste); the town of Tillamook (bacteria from city streets entering the storm sewer system or from leaking on-site septic systems or the sewage treatment plant); rural residential areas (leaking on-site septic systems, animal waste from hobby farms); dairy agriculture (bacteria from cattle waste reaching surface waters); natural background levels from forested areas; wild animal populations; and other sources. Current research funded by Tillamook Bay National Estuary Project (TBNEP) and Oregon State University (OSU) may be able to more closely identify bacteria sources in these cases. Two research projects are working to identify the bacteria sources through typing of genetic material and through antibiotic resistance.

For turbidity and sediment, the mainstem of the Trask is listed by DEQ as a waterbody of concern from the confluence of the North and Middle Forks of the North Fork all the way down to the bay. The primary reason is probably the increase in erosion due to forest roads coupled with the background level of natural erosion. A road survey currently being conducted by Oregon Department of Forestry (ODF) for the Trask Watershed will help identify and prioritize forest roads that are contributing elevated levels of sediment to surface waters.

Flow modification is not included in the assessment manual chapter, but DEQ considers it important because of its effect on habitat quality for salmonids and other aquatic organisms. The Trask is listed as a waterbody of concern from the confluence of the North and Middle Forks of the North Fork all the way down to the confluence of Gold Creek with the mainstem at RM ~9.5. This listing is for 1994/1996, which was before the raising of the Barney Reservoir Dam was completed. Further withdrawals from the Middle Fork of the North Fork by this dam will probably make this situation worse.

Habitat modification is not included in the assessment manual chapter, but DEQ considers it important because of its effect on habitat quality for salmonids and other aquatic organisms. The Trask is listed as a waterbody of concern from the confluence of Gold Creek with the mainstem at RM ~9.5 to the bay. This section of the mainstem is impacted by instream gravel mining, near elimination of riparian vegetation, sedimentation, removal of LWD, upstream water withdrawals, and numerous channel modifications.

8. Water Use

A total of 168,604.5 acre-feet are committed each year in water rights on the Trask River. The largest single permit (permit #3299 for irrigation dated October 1954) is for 208 cubic feet per second (cfs). The total daily permitted rights vary by month of the year. The net amount of water available per day at the mouth of the Trask after water rights are subtracted from the flow is listed in the table below for each month. Negative values for May and July through November indicate that the river is over committed and would run dry if all water permits were fully exercised.   The daily 80% exceedance streamflows (Q_{80}) for the summer lowflow period of the Trask River are: 118.4 cfs for July, 78.6 cfs for August, 72.8 cfs for September, and 145.4 cfs for October. Since the river does not run dry it can be assumed that many of the water rights are not being exercised to their full extent during summer months.

Table 8-1. Net water availability for the Trask River after permitted water rights are subtracted from the mean daily flow

Month	Jan	Feb	Mar	Apr	May	Jun
Net Water Avail. (cfs)	128	268	253	40	-150	2
Month	Jul	Aug	Sep	Oct	Nov	Dec
Net Water Avail. (cfs)	-76	-59	-57	-166	-182	228

All values are in cubic feet per second (cfs) of average daily flow.
*A negative number indicates that there is enough consumptive use permitted that instream water rights (habitat flows) cannot be fulfilled.

9. Hydrology

The hydrology section summarized statistics on precipitation, river flows, and human uses at a landscape scale (e.g., logging, development, agriculture) that could affect river flows. The Trask River has one gage (US Geological Service [USGS] #14302500) on it near RM 10. The period of record is from 1931–1955 and 1961–1971. The following tables (9-1 and 9-2) present subwatershed size, elevation and precipitation information, and statistics on precipitation and flows for the Trask River and Watershed.

Table 9-1. Trask subwatershed drainage area, minimum and maximum elevations, and annual precipitation

Subwatershed	Drainage Area (acres)	Min. Elevation (feet)	Max. Elevation (feet)	Annual Precip.* (inches)
Tidal MP 0-2 and Main MP 2–10	18,592	0'	2730'	85" 100"
Mainstem MP 10–confl.	8,217	80'	2847'	120"
North Fk.	23,789	280'	3058'	140"
N. Fk. of N. Fk.	8,069	800'	3442'	125"
Mid. Fk. of N. Fk.	19,372	800'	3424'	125"
South Fk.	14,912	280'	3170'	125"
E. Fk. of S. Fk.	18,931	310'	3424'	140"

* Annual precipitation is the mean for the subwatershed

Table 9-2. Monthly mean precipitation, mean streamflow, mean volume, percentage of annual runoff, maximum flow, and minimum flow for the Trask Watershed

Month	Precip. (inches)	Mean Flow (cfs)	Mean Vol. (acre feet)	% Annual Runoff	Max. Flow cfs (year)	Min. Flow cfs (year)
January	13.56	2190	134,422	19.2	5490 (‘53)	644(‘49)
February	9.94	1820	100,900	14.6	3450('49)	577(‘34)
March	10.16	1520	93,297	13.4	2690(‘32)	464(‘41)
April	6.05	955	56,727	8.1	1950(‘37)	383(‘39)
May	4.43	529	32,470	4.6	1110(‘48)	196(‘39)
June	3.20	300	17,820	2.6	636(‘33)	161(‘67)
July	1.60	165	10,127	1.4	273(‘37)	90(‘67)
August	1.75	107	6,567	0.9	183(‘68)	58(‘67)
September	3.76	126	7,484	1.1	492('41)	55(‘67)
October	7.12	450	27,261	4.0	1560(‘48)	50(‘53)
November	13.08	1410	83,754	12.0	3280(‘35)	77(‘37)
December	13.93	2190	134,422	19.2	5490(‘34)	714(‘45)
Annual	88.58	966	58,801	100	1270	563

Source: Oregon Water Resources Department

Low flows have a major effect on fish because they make water temperature swings easier, limit migration, and make it easier for predators to catch fish. The lowest flow of the year comes just before the onset of the fall rainy season. The range of dates when the lowest flow occurs for the period of record is from August 20 to November 30, but it usually falls in late September.

The recent, extensive timber harvesting in the lower Trask Watershed may have an effect on the hydrologic response of the river to storm events. The timber harvest is in large, contiguous clearcut blocks and falls primarily in the rain-on-snow elevation zone. Clearcuts collect more snow than forested areas and they have a quicker hydrologic response to precipitation. When a warm, wet storm follows a snowfall, the snow is melted rapidly and produces a flashy runoff response termed a rain-on-snow event. This was the case with the 1996 floods, which caused extensive flood damage in the lower Trask and adjacent areas of the floodplain portion of Tillamook Basin.

10. Watershed Condition Summary

This chapter of the manual uses a summary form and a summary map to gather together the results of all the other sections for synthesis into an integrated picture of watershed conditions by subwatershed. This information is then used to help determine:

- habitat areas (reaches) that are relatively intact and need to be protected;
- habitat areas where restoration is feasible with changes in land use activities or at reasonable cost;
- habitat areas that could be restored but the cost would be high and the probability of success is low; and
- habitat areas where restoration is not technically feasible due to stream alteration, degradation, or sociopolitical limitations.

The results of the synthesis are presented below by subwatershed.

Tidal Mainstem RM 0–2: The only area for immediate protection is Hoquarten Slough, which has intact riparian stands and relatively high habitat values, but some problems with water quality. Areas for restoration are: mainstem from RM 0–2 both branches (riparian planting and addition of LWD), and Dougherty Slough (riparian planting and addition of LWD).

Mainstem RM 2–10: There are no areas for immediate protection. Areas for restoration are: mainstem RM 2–10 (riparian planting and fencing, addition of LWD, other habitat enhancement projects), Mill Creek and Holden creek (reduce contaminant inputs, riparian planting), an unnamed creek that enters the mainstem at Trask River Rd. Bridge (riparian planting), and Hanenkrat Creek (riparian planting). Areas that could be restored, but the cost is high are: Gold Creek (restore fish passage at the hatchery, interplant conifers in riparian), and Green Ck. (replace culvert for fish passage, plant riparian on floodplain reach).

Mainstem RM 10–confluence: The only area for immediate protection is on the mainstem (approximately RM 10.7–11.7), which has high quality riparian and high quality instream habitat. Areas for restoration are: mainstem RM 11.7–confluence (interplant conifers in riparian, other habitat enhancement projects), and small, perennial streams (interplant conifers in riparian). Areas that could be restored, but the cost is high are: the streams between Cedar and Burton Creeks (replace culverts for fish passage under Trask River Rd.).

North Fork: There are no exceptional areas for immediate protection. Areas for restoration are: entire mainstem of North Fork (interplant conifers in riparian), lower Bark Shanty Ck. (instream habitat enhancement projects, if possible remove natural barrier at RM ~1.5), and small, perennial streams (interplant conifers in riparian).

North Fork of North Fork: The only area for immediate protection is the first two miles of the mainstem above the confluence, which has high quality riparian but needs LWD additions to help retain spawning gravels and increase the number of pools. Areas for restoration are: mainstem from RM 2–headwaters (interplant conifers in riparian, addition of LWD), and small, perennial streams (interplant conifers in riparian, addition of LWD).

Middle Fork of North Fork: The only area for protection is the mainstem from RM 3 to Barney Dam, which has both high quality instream and riparian habitat. Areas for restoration are: Elkhorn, Cruiser Creeks and small, perennial streams (interplant conifers in riparian, and addition of LWD). Areas that could be restored but the cost is high are: Barney Reservoir (add fish ladder to allow fish passage to extensive habitat in upper watershed).

South Fork: The only area for immediate protection is the first seven miles of the mainstem above the confluence, which has both high quality instream and riparian habitat. Areas for restoration are: Edwards (RM 0–2.5), Joyce (RM 0–2), and Bill (RM 0–1.5) Creeks and small, perennial streams (interplant conifers in riparian, and addition of LWD).

East Fork of South Fork: The only area for immediate protection is the first seven miles of the mainstem above the confluence, which has both high quality instream and riparian habitat. Areas for restoration are: small, perennial streams (interplant conifers in riparian, and addition of LWD). Areas that could be restored but the probability of success is low are: Bales (RM 0–2), Blue Bus (RM 0–1.5), Scotch (RM 0–1), Pigeon (RM 0–2), Steampot (RM 0–1.5), Miller (RM 0–1.5), Boundary (RM 0–1.5), Headquarters (RM 0–1.5), Stretch (RM 0–0.5), and Rock (RM 0–0.1) Creeks (addition of LWD, and other instream habitat enhancement projects).

Additional actions that are needed in the Trask include:

- a systematic survey of all culverts throughout the watershed (exclusive of ODF land - already surveyed) to determine if they pose barriers to fish migration. ODFW can help with training and culvert rating forms.
- setting up and running a summer monitoring program for water temperature. DEQ has a program to provide equipment and training for citizen monitoring.

11. Acronyms

CHT	Channel Habitat Type
cfs	cubic feet per second
DEM	Digital Elevation Map
DEQ	Department of Environmental Quality
GWEB	Governor's Watershed Enhancement Board
LWD	large woody debris
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OM	organic matter
OSU	Oregon State University
RM	River Mile
TBNEP	Tillamook Bay National Estuary Project
TCWRC	Tillamook Coastal Watershed Resource Center
USGS	US Geological Service
303d list	State list of water quality impaired streams submitted biannually to the EPA

Channel Habitat Types

Ditch	channelized small stream or swale on agricultural land
EL	broad estuarine channel
FP1	broad, well defined floodplain
FP2	broad, well defined floodplain, multiple terraces
FP3	lowest portion of tributaries crossing the floodplain
MC	gentle to narrow v-shaped valley, minimum floodplain
MH	open v-shape, gentle to moderate land forms or broad drainage divides
MM	broad valley, moderately confined between terraces
MV	narrow moderate v-shape valley, narrow floodplain
SV	steep v-shape
VH	very steep v-shape
WC	flat landforms, depressions