RAPID BIO-ASSESSMENT 2006

PREPARED FOR:

Tillamook Estuaries Partnership

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INTRODUCTION

The 2006 Rapid Bio-Assessment inventory conducted for the Tillamook Estuaries Partnership (TEP) marked the second consecutive year of a proposed three year inventory which includes all of the watersheds that contribute to the Tillamook Bay Complex: the Tillamook, Trask, Wilson, Kilchis, and Miami. The intent of the project is to gather information on the status of juvenile salmonid summer distributions and summer rearing densities. The inventory consisted of extensive snorkel surveys in each basin that begin at the head of tidal influence and continue to the end of juvenile Coho distribution in each stream and its tributaries. These surveys will be used to develop base line data for each of three successive cohorts and to eventually identify long term trends in the distribution and abundance of juvenile Coho, Steelhead, Cutthroat and Chinook at the 6th field level in response to restoration and watershed management issues. These surveys were conducted using funds granted by Oregon Watershed Enhancement Board (OWEB), TEP, and the Bureau of Land Management (BLM), and from the contribution of partners from the Tillamook Bay Watershed Council, Oregon Department of Forestry (ODF), and Oregon Department of Fish and Wildlife (ODFW).

The escapement of adult Coho in all of the surveyed basins during the 2004 and 2005 brood years was insufficient to adequately seed the summer habitat currently available on a watershed scale throughout the Tillamook management area. Summer parr estimates increased significantly during the 2006 survey season and select reaches in the upper Trask, Wilson, and Kilchis Basins were seeded to capacity. For many of the basins and sub-basins, the lack of high quality winter habitat is the dominant limiting factor for upper basin smolt production. The trend in the adult escapement of Oregon Coast Natural (OCN) Coho since 1990 has been positive for most basins.

The 2004 ODFW estimated adult escapement for Tillamook Bay was 3,039. The Rapid Bio-Assessments expanded estimate was 291,264 Coho summer parr (utilizing ODFW's snorkel observation bias of 20%) for the entire Tillamook Bay Watershed. Back-calculating adults from this juvenile estimate (using a range of egg-summer parr survival rates between 8.8% and 10%) suggested an escapement of between 2,331 and 2,649 adult Coho for the 2004 brood year. This level of agreement between ODFW adult SRS data and back calculation of adults from RBA juvenile estimates during 2004 / 2005 surveys increased confidence in the accuracy of the combined adult escapement estimate for the entire Tillamook Bay complex for that year.

These two estimates diverged significantly for the 2005 winter brood. The ODFW adult SRS estimate fell 35% and indicated an adult escapement of 1,976 (95% conf.= 600) Coho for the Tillamook Bay complex while the 2006 summer snorkel inventory reported a significant 112% increase in juvenile abundance. The expanded estimate for summer parr increased to 616,394 (including the 20% visual bias) which suggested an escapement of between 4,931 and 5,604 adult Coho for the 2005 brood year.

It is likely that extended periods of high stream flow during the winter of 2005/2006 complicated adult survey efforts due to poor visibility. The lack of agreement between these two methodologies for the 2005 brood year suggests that the 2005 SRS estimate of adult escapement was significantly less than the actual level of abundance.

The most likely source of error involved with back-calculating adults from juvenile abundance is associated with the modeled egg-summer parr survival rate. A wide variety of factors may influence this rate, including winter flow regimes, spawning success rates and spring/summer flow regimes and their effects on egg survival and newly emergent fry. The annual variation in predatory pressures from juvenile Steelhead and Cutthroat also play into this

survival rate. One of the goals of this three year study is to assess the inter-annual agreement in the trends produced by these different methodologies.

It was expected that adult escapement for Coho would be large in the Tillamook Bay Complex for the 2005 winter brood based on the unusually large run of approximately 15,000 Coho calculated by ODFW's SRS inventory for the 2002 winter brood. Utilizing the RBA estimate of adult abundance (back calculated from summer parr abundance), it would appear that the strong 2002 cohort decreased in abundance by approximately 65% between parent cycles (2002 / 2005).

An even larger adult escapement occurred for 2006 (8,399 adult coho reported by ODFW as a preliminary estimate, personal communication w/ Mark Lewis) following the strong 2003 wild adult brood (14,584) which suggests that there is potential for high juvenile abundances and broad distribution for the 2007 summer inventory.

The Tillamook complex has been classified by Nickelson (Population Assessment: Oregon Coastal Coho, 2001) as exhibiting a coastal Coho population that is non-viable and at risk of extinction if the critical threshold (the level at which a population is at relatively high risk of extinction in the near future) of 1,000 adults is not maintained (the Tillamook complex was at or below this threshold most years between 1990 and 1998).

Recent strong adult escapements of coho documented in 2002, 2003, 2005 and 2006 indicate that stock recovery is highly dependant on ocean condition and that sub threshold abundances do not necessarily indicate a lack of population viability.

The juvenile survey method was designed to look at a sub-sample (20%) of rearing habitats using a Rapid Assay technique that could cover large distances and succeed in describing the current distribution of Coho and quantify the rearing densities of Coho and the relative abundance of Cutthroat, Steelhead, and Chinook in all of the surveyed streams and their tributaries. Landslide and beaver dam frequency was also recorded during the 2006 survey year.

The 2006 database contains the results of 326.5 stream miles that were surveyed. This included the full extent of Coho distribution in the Tillamook River (56.4 miles), the Trask River (82.2 miles), the Wilson River (110 miles), the Kilchis River (46.6 miles), and the Miami River (28.8 miles), as well as several small direct tributaries to Tillamook Bay. If a stream is not included in the database it was not surveyed. This will occur only in situations where a mapped tributary was dry or where there was a lack of suitable visibility for the survey methodology.

METHODS

The basins and sub-basins surveyed were selected and prioritized by ODFW, BLM, TEP and ODF technical advisors. Survey crews were concentrated within a basin to complete the sampling activity within a concise window of time. This approach led to transportation efficiency and eliminated any possibility of population shifts in response to changes in flow or temperature. Land owner contacts were made for all of the private, industrial and public ownerships that existed on both sides of every stream reach surveyed. Developing these contacts involved extensive research in the county tax assessor's office and then a personal contact to describe the survey and request permission for access. The land owner information was recorded (name, contact #, tax lot # and location) and will be available as a byproduct of this contract.

Most surveys were initiated by randomly selecting any one of the first five pools encountered. The protocol however was altered for small tributaries (2^{nd} order) where Coho presence or absence was undetermined. In these tributaries, the first pool above the confluence

was selected as unit number one. This alteration in protocol was adopted to identify minor upstream temperature dependant migrations that may not have extended more than a few hundred feet. The identification of this type of migratory pattern in juvenile salmonids is critical for understanding potential limiting factors within the basin (temperature, passage, etc.). Some surveys were initiated at a point above brackish water influence or above agricultural influence where visibility conditions shifted from poor to good. In these surveys the start point of the survey will be indicated separately on the USGS quads available through TEP.

The survey continued sampling at a 20% frequency (every fifth pool) until at least two units without Coho were observed. In addition, pools that were perceived by the surveyor as having good rearing potential (beaver ponds, complex pools, and tributary junctions) were selected as supplemental sample units to insure that the best habitat was not excluded with the random 20 percent sample. This method suggests that the data existing in the database could tend to overestimate average rearing density if these non-random units were not removed prior to a data query (the selected units are flagged as non-random in the database).

In sub-basins with low rearing densities, there were situations where Coho were not detected for more than two sampled units. These situations were left to the surveyor's discretion, whether to continue or terminate the survey. There is a possibility that very minor, isolated populations of juvenile Coho could be overlooked in head water reaches of small 2nd order tributaries. This tributary would have to include a strong beaver population that would impound emergent fry and truncate their normal downstream fry distribution patterns.

Pools had to meet minimum criteria of being at least as long as the average stream width. They also had to exhibit a scour element (this factor eliminates most glide habitats) and a hydraulic control at the downstream end. There were no minimum criteria established for depth. Only main channel pools were sampled. Side channel pools, back waters and alcoves were not incorporated into the surveyed pool habitats. The primary reasons for not including these secondary and off channel pools is that they are typically not highly productive summer rearing locations and they compromise the consistency of measuring, summarizing and reporting lineal stream distances.

The lineal distances represented in the database were estimated by pacing from the beginning of one sampled unit to the beginning of the next sampled unit. The length of the sampled pool is an independent quantity, which was always measured and not estimated. A minimum of three lineal estimates were also measured with a hip chain for each surveyed stream to develop a calibration factor for each surveyor's estimate of distance. Total distances represented in the database are consistently greater than map wheeled distances using USGS 1:24,000 series maps. This is related to the level of sinuosity within the floodplain that is not incorporated in mapping. If you are attempting to overlay this database on existing stream layer information there would be a need to justify lineal distances with known tributary junctions (these can be found in the comments column). In addition, TEP (by contract) will be producing a digitized stream layer of Coho distribution for incorporation into the current GIS database.

Pool widths were generally estimated. Because pool widths vary significantly within a single unit, a visual estimate of the average width was considered adequate. Pool widths were typically measured at intervals throughout the survey to calibrate the surveyor's ability to judge distance.

The snorkeler entered the pool from the downstream end and proceeded to the transition from pool to riffle at the head of the pool. In pools with large numbers of juveniles of different species, multiple passes were completed to enumerate by species. (Coho first pass, 0+ trout

second pass, etc.). This allowed the surveyor to concentrate on a single species and is important to the collection of an accurate value. In addition, older age class Steelhead and Cutthroat were often easier to enumerate on the second pass because they were concentrating on locating food items stirred up during the surveyor's first pass and appeared to exhibit less of their initial avoidance behavior.

In large order stream corridors two snorkelers surveyed parallel to each other, splitting the difference to the center from each bank.

A cover/complexity rating was attributed to each pool sampled. This rating was an attempt to qualify the habitat sampled within the reach. The 1 - 5 rating is based on the abundance of multiple cover components within a sampled unit (wood, large substrate, undercut bank, overhanging vegetation). Excessive depth (>3 ft) was not considered a significant cover component. The following criteria were utilized:

1 0 cover present
2 1-25 % of the pool surface area is associated with cover
3 26-50 % of the pool surface area is associated with cover
4 51-75 % of the pool surface area is associated with cover
5 > 75 % of the pool surface area is associated with cover

A point to consider here is that the frequency of higher complexity pools increases with a decrease in stream order. This inverse relationship is primarily a function of average channel width and the resultant ability of narrow channels to retain higher densities of migratory wood. Channel morphology begins to play a much more significant role in this relationship during winter flow regimes where increases in floodplain interaction and the abundance of low velocity habitat may become as significant as wood complexity.

A numerical rating was given to each sampled unit for the surveyor's estimate of visibility. The following criteria were utilized:

<u>Visibility</u>
1 excellent
2 moderate
3 poor

This variable delivers a measure of confidence to the collected data. Survey segments with a measure of 1 can assume normal probabilities of detection (the observed is within 20 percent of the actual for Coho). Segments with a measure of 2 suggest that less confidence can be applied to the observed number (uncalibrated) and segments with a visibility rating of 3 suggest that the observation can probably be used for only an assessment of presence or absence.

Landslides and beaver dams were two additional variables which were recorded during the inventory of 2006. Landslides were given a rating of small (less than 10 meters), medium (10 – 50 meters), or large (greater than 50 meters), and were also noted as being on the left or right side of the stream (only in comments field). Beaver dams were simply counted along the survey and given a sum total at the end of each stream. Only intact full spanning dams were counted. These two variables may then be sorted in the database for presence or absence within each basin. Table 2 in the General Observations below summarizes these results.

There was also commentary recorded within each of the surveyed reaches that included information on temperature, tributary junctions, culvert function, the abundance of other species and adjacent land use. This commentary is included in only the raw Access database under the "comments" field and not in the Excel cd.

The database contains fields designed to facilitate the development of a GIS data layer. These are LLID location numbers that are unique for each stream segment. Latitude and longitude values were not collected for start points because these values already exist in the actual LLID number used to initiate a surveyed reach.

GENERAL OBSERVATIONS

Substantial increases in Coho production were observed during the 2006 inventory throughout most regions of the Watershed. This appeared to be mostly the result of improved adult escapement. The 2005 ODFW estimated adult escapement for Tillamook Bay was 1,976 and represented a 35% decline relative to the 2004 estimate. The Rapid Bio-Assessments expanded estimate for Coho summer parr, on the other hand, rose 112% during the 2006 field season to reach 616,394 (utilizing ODFW's snorkel observation bias of 20%). Back-calculating adults from this juvenile estimate (using a range of egg-summer parr survival rates between 8.8% and 10%) suggests an escapement of between 4,931 and 5,604 adult Coho for the 2005 brood year. Juvenile abundance in many sub-basins more than doubled and some were seeded to capacity.

The Wilson Basin again exhibited the longest distribution for Coho (110 miles) as well as the highest productivity (see table below). 43% of all Coho in the Tillamook Bay Watershed were found there. Expanded estimates for Coho in the Wilson increased 135% in 2006. The Wilson Basin also remained, by far, the most productive for Steelhead (21,985 1+juveniles).

The Miami exhibited 28.8 miles of Coho distribution. The smallest basin by watershed area, again represented the lowest productivity for Coho (5% of the total Tillamook Complex Coho), although expanded summer parr estimates increased 64% from 2005 levels of abundance. Steelhead production in the Miami decreased significantly by 51% during the 2006 survey. Improvements in Coho production appeared highest in the Kilchis Basin, where expanded summer parr estimates increased by 157% and in the Little North Fork Wilson, where juvenile abundance increased by an amazing 38,970 summer parr (expanded). Uniquely, the Tillamook Basin showed practically no change in Coho production between survey years and the Trask mainstem exhibited the only significant decline (35%) in abundance.

Most of the basins spread out to the south and east of Tillamook Bay through extensive low gradient tidal channels and the large flat expanse of the Tillamook Bay Floodplain. Winter rearing habitats are high quality and abundant within the estuary. Channel entrenchment, riparian condition and water quality were common factors influencing fish distribution throughout the complex's agricultural lands. Knotweed infestation is also a significant invasive species of concern for the lower Tillamook, Trask, Wilson, and Miami Rivers. A data field in the Access database displays the presence or absence of Knotweed for each surveyed segment of 5 contiguous pools.

Most basins, except for the Tillamook River, climb rapidly out of the Tillamook Bay floodplain and are supported by high gradient tributaries of basaltic origin. The Tillamook system is lower gradient and uniquely dominated by sandstone geology. East side tributaries of

the Tillamook River (Faucett, Killam, Munson, and Simmons) exhibit the morphology and underlying geology similar to the other major basins of the Tillamook complex. These habitats are typically characterized across the basins by high stream gradients, low pool/riffle ratios, extensive boulder rapids, frequent bedrock exposures, low floodplain interaction, and low wood complexity due to extreme winter flows. Coho distribution ended in many of these streams at bedrock waterfalls or in steep boulder gorges. In-stream over winter survival (as opposed to estuarine survival) for Coho pre-smolts in these habitats may be a dominant limiting factor due to the lack of channel-spanning wood/debris jams and the general absence of low interactive floodplains. The Tillamook River, in contrast, and all of its western tributaries, continued south and west out of the Tillamook Bay into low gradient sandstone and clay geomorphologies. Fine gravels were abundant in these reaches along with beaver impoundments, tannic conditions, low summer flows, and heavy siltation.

The most important anchor habitats for Coho in the Tillamook Bay complex of streams are, in order of current 2006 production levels, the Little North Fork Wilson, Elkhorn Cr. (NF Trask), the mainstem Kilchis, the mainstem Devils Lake Fork (Wilson), the mainstem Wilson, the mainstem Miami, Cedar Cr. (Wilson), the East Fork Trask, the North Fork Kilchis, the South Fork Wilson, Jordan Cr. (Wilson), and the Little South Fork Kilchis. These reaches were supporting the largest summer rearing Coho populations in 2006 and, theoretically, the highest 2005 adult escapements. They also represent the best spawning gravels, highest wood complexities, and, in most cases, the lowest land use impacts encountered during the inventory. The Little North Fork Wilson (11.8 miles) and Elkhorn Cr. (10.6 miles) have been leaders in Coho production during both survey years and in 2006 accounted for 23% of all summer parr in the Tillamook Bay complex of streams (13% in the Little North Fork and 10% in Elkhorn). The Elkhorn sub-basin may have reached its summer rearing capacity for Coho in 2006 and summer parr densities in the Little North Fork were very close to full seeding.

Basin-wide estimates for juvenile Steelhead decreased in four out of the five Basins in the Tillamook Bay complex in 2006. The Trask Basin was the only to register an increase in abundance - 18% across the 5th field. The highest numbers of summer rearing 1+Steelhead were found, in order of magnitude, in the mainstem Wilson, the Little North Fork Wilson, the mainstem Trask, the mainstem Miami, the mainstem Kilchis, the South Fork Trask, the East Fork Trask, and the Little South Fork Kilchis. Large decreases in Steelhead abundance were observed in the mainstem Miami (54%), the Devils Lake Fork (63%), and Jordan Cr. (43%), while significant gains were documented in the North Fork Kilchis (296%), Cedar Cr. (244%), the Little South Fork Kilchis (109%), the North Fork Trask (91%), and the South Fork Trask (83%). Actual population sizes for Steelhead are much higher than documented because rapid/riffle habitats were not part of the habitat inventoried in the 2006 RBA inventory. Steelhead, Cutthroat and 0+ numbers from this analysis can only be utilized to identify key reaches and monitor inter-annual trends.

Several streams continued to lack adequate adult escapement despite the presence of suitable Coho spawning conditions. These included:

(1) Bewley, Simmons, Munson, Faucett, and Killam on the Tillamook

(2) Mill (water quality problems), Bark Shanty, Gold (passage barrier at hatchery dam), and the North, East, and South Fork mainstems of the Trask

(3) Jordan, Elk, and the North and South Fork mainstems of the Wilson

(4) Vaughn (culvert passage problems) and the Little South Fork of the Kilchis

(5) Moss, Peterson, and Prouty on the Miami.

(6)Patterson Cr., a small tributary to the Tillamook Bay, also exhibited anadromous potential despite low productivity (due mainly to culvert passage problems). Culvert and other passage issues along with restoration recommendations are discussed individually by stream and highlighted at the end of the Site Specific Observations.

(Table 1) **Back-Calculation of Adult Escapement from Juvenile Expanded Estimates**
(based on an 8.8% - 10% egg-to-summer parr survival rate and 2,500 eggs)

Basin	2005 Coho Summer Parr(w/ 20% snorkel bias)	Estimated 2004 Adult escapement
Tillamook	36,522	292 – 332
Trask	89,730	718 – 816
Wilson	108,870	871 – 990
Kilchis	37,326	299 – 339
Miami	18,330	147 – 167
Other Tribs.	486	4 – 5
Total :	291,264	2,331 – 2,649

-ODFW adult SRS data indicated a total escapement of 3,039 Coho

Basin	2006 Coho Summer Parr(w/ 20% snorkel bias)	Estimated 2005 Adult escapement
Tillamook	38,144	305 – 347
Trask	180,719	1,446 – 1,643
Wilson	266,225	2,130 – 2,420
Kilchis	99,775	798 – 907
Miami	31,294	250 – 284
Bay Tribs.	238	1 – 2
Total :	616,394	4,931 – 5,604

-ODFW adult SRS data indicated a total escapement of 1,976 Coho

Most habitats were not seeded to capacity in the inventoried sub-basins and there remains extensive summer habitat available to salmonids that are currently under-utilized. For the following review, we are considering 1.5 fish/sq.meter a fully seeded density for Coho. A small number of streams reached, or surpassed, this level during the 2006 inventory, including Elkhorn Cr. and its tributaries Cruiser Cr. and Trib. C, Trib. D on the North Fork Trask, Boundary Cr. and Bales Cr. on the East Fork Trask, Ben Smith on the Wilson, the South Fork of Jordan Cr., Elliot Cr. and Trib. A on the Devils Lake Fork Wilson, Berry Cr. and White Cr. on the Little North Fork Wilson, Company Cr. on the South Fork Kilchis, the North Fork Kilchis mainstem, and Trib. G on the Miami. There are concerns from many biologists that this estimate of fully seeded (1.5 fish/sq.m.) does not represent the production potential that exists in completely functional Coho habitat that is benefiting from the nutrient loading of adult spawning salmonids (eggs, carcasses). There are excellent examples in a wide range of habitats from across the entire coastal ESU of stream reaches that far exceeded the level of 1.5 fish/sq.m. of pool surface area. High density rearing in some habitats from the 2006 Tillamook inventory reached 4.6 fish/sq.m. (Trib. D of the NF Trask) and 4.0 fish/sq.m. (Trib. C of Elkhorn and Trib. A of the Devils Lake Fork). The intent of establishing this target of full seeding is to provide a platform for comparing stream reaches to each other and to themselves over time. The graphics available in the Excel Pivot Table that accompanies this document utilize this value to normalize scaling.

The average density for a surveyed reach is an excellent measure of trend that can be monitored from year to year. However, it tends to portray only a general description of the current status within a reach. Understanding how each reach is functioning is more accurately interpreted in a review of how the rearing density changes within the reach. The pivot table graphics provided in electronic format with this summary are essential for the proper interpretation of this review.

Information on landslide and beaver dam frequency, location, and size is detailed in the Access database under their own headings with further descriptions in writing under the comments heading. This information is summarized by basin below with predictable results. Most beaver activity was found in the low stream gradients and sedimentary geologies of the Tillamook Basin while most slides were found in the steeper basalt canyons of the upper Wilson, Trask, and Kilchis Basins. The continued collection of this data will be very revealing as land use patterns and anadromous fish production change in the future. More detailed locations for slides are listed in the separate Basin introductions below as well as at the end of particular stream discussions. Slide identification was problematic in that there was not a clear delineation in the age of a slide to be counted. To complicate this inventory, there were significant differences in the surveyor's ability to recognize an older slide track with stabilized vegetation. Therefore, the slide data should be considered a significant under estimate of actual slide abundance and only representative of recent slide activity (slide tracts with easily observable alterations in vegetation).

(Table 2) **Landslide and Beaver Dam Summary**

Basin	Small Slides	Medium Slides	Large Slides	Total Slides	Beaver Dams
Tillamook	6	8	3	17	99
Trask	18	15	4	37	16
Wilson	24	23	13	60	7
Kilchis	11	14	5	30	-
Miami	5	3	1	9	9
Bay Tribs.	-	2	-	2	5
Total :	64	42	26	155	136

Distribution profiles

The distribution of juveniles and their observed rearing densities for each surveyed reach provide a basis for understanding how each reach is functioning in relation to the remainder of the basin or sub-basin. These profiles can help identify spawning locations, identify potential barriers to upstream adult and juvenile migration, identify the end point of Coho distribution and they may also indicate how juvenile salmonid populations are responding to environmental variables such as increased temperature. You will find a review of these distribution profiles within this document for each of the major basins and sub-basins surveyed during the 2006 field season.

Location of spawning destinations

The approximate locations of spawning pairs was observable in many of the sampled sub basins by the presence of a distinct spike in rearing density that trailed off rapidly just upstream. The physical location of a spawning destination has a range of variance plus or minus 4 pools due to the 20 percent sample methodology. Depending on the average distance between pools, this typically describes a maximum lineal distance that varies between 150 ft. in a small 2nd order tributary to 800 ft. in a fourth order tributary. To utilize the database to identify spawning destinations, an additional precaution is necessary. Surveyed lineal distances are typically longer than calculated distances (map wheel, GIS, etc.) due to the sinuosity of the active channel that is not displayed in the 1:24,000 series USGS maps. To accurately evaluate site specific locations it is important to utilize the digitized map layer that has been justified to known end points and tributary junctions. This layer has been developed by the BLM for the 2005 data layer and is available to the public.

The average densities generated represent a snapshot in time of the current condition that can be compared to known levels of abundance that exist in fully seeded and fully functional Coho habitats. These densities also provide a method for quantifying changes in rearing densities by reach or sub-basin over time. Average densities utilized as a metric in this analysis are calculated for pool surface areas only. Lower levels of Coho abundance exist in fast water (riffle/rapid) and glide habitats. Replicate surveys conducted in these same reaches in subsequent years will function as an indicator of response to future restoration and enhancement strategies and potential changes in land use. It does not however, provide any indication of actual smolt production because of the distinct relationship between juvenile Coho survival and the abundance of high quality winter habitat.

Adult and Juvenile Barriers

Adult migration barriers are verified by determining that no juvenile production is occurring above a given obstruction (culvert, falls, debris jam, beaver dam, etc.). There are many barriers, both natural and manmade, that impact the migration of salmonids in coastal basins. Some are definitive barriers that are obvious obstructions (such as a bedrock falls). Many barriers however, only impede adult salmonid migrations during low flow regimes. Summer juvenile inventories allow us to definitively quantify whether passage was obtained at any point during the season of adult migration.

Juvenile salmonids typically migrate upstream for a variety of reasons (temperature, winter hydraulic refuge, food resources). Hydraulic refuge and food resources are typically fall, winter and spring migrations that would not be detectable during summer population inventories. Temperature however, is probably the most significant driver of upstream juvenile salmonid migrations during summer flow regimes. Juvenile barriers are subjective to the eye of the observer. The trend in juvenile density can be a method of detecting either partial or full barriers to upstream migration. Each of the surveyed reaches contains a comments section in the Access database to note the presence of culverts, jams and other physical factors that may influence the ability of salmonid populations to make full use of aquatic corridors.

Temperature Dependant Migrations

Potential temperature dependant migrations can be observed in the database by looking for densities that decrease significantly as the lineal distance increases from the mouth of the stream or tributary. This is more likely to be observed in the case of low abundance years where tributary habitats that are seeded to capacity are the exception. During years of high abundance there is a more significant potential for density dependant upstream migrations that would be indistinguishable from the distribution pattern mentioned above. The recognition of this migration pattern allows us, during years of low escapement, to identify important sources of high water quality within the basin that may be traditionally overlooked because of some other morphological condition that suggests to us that there is no significant potential for rearing salmonids (i.e. lack of spawning gravel). These stream reaches typically exhibit declining densities with increased distance from the mouth and no indication of a spawning peak (a point near the upper distribution of the population with significantly higher rearing densities). These tributaries may be functioning as important summer refugia for salmonid juveniles threatened by increasing temperatures in the mainstems.

Precautions

The specific location of spawning sites does not infer that the highest quality spawning gravels were targeted by adult salmonids or that there is any relationship between the location of a redd and the quality of the rearing habitat that exists adjacent to these locations.

The location and distribution of juvenile Coho represented in the database is not related to the quality of the rearing habitat that exists in the aquatic corridor adjacent to these sites.

The average densities that can be generated as an end product for each stream reach are the result of a 20 percent sample. Consequently, they probably vary significantly around the true average density. There are many sources of potential variation, start point, number of units sampled within the reach, surveyor variability, etc. The range of variability for at least one of these variables (start point), was documented in the final review of the 1998 Rapid Bio-Assessment conducted by Bio-Surveys for the Midcoast Watershed Council. To facilitate the proper utilization of the data included in this inventory, the 1998 results are included below. The true average density of a stream reach was retrieved by querying the database from an ODFW survey on East Fk. Lobster where every pool was sampled. Comparisons could then be made between the true average density and a randomly selected 20 percent sub sample (every 5th pool). Only mainstem pools were utilized within the range of Coho distribution to match the protocol for the Rapid Bio-Assessment.

(Table 3)

SAMPLE FREQUENCY	AVG. COHO DENSITY	AVG. SH DENSITY	AVG. CUT DENSITY	AVG. 0+ DENSITY
100 %	1.07	.03	.04	.13
50 %	1.10	.04	.03	.14
20 % Start Pool 1	0.87	.04	.03	.13
20 % Start Pool 3	1.01	.03	.03	.13
20 % Start Pool 5	1.13	.05	.04	.12

When calculating the average density of juvenile Coho in a particular stream reach, it is important that only the data be utilized that falls within the distribution of Coho. Many stream

reaches contain sample sites that extend well above the actual distribution of juvenile Coho. Including these data points significantly underestimates the average rearing density and provides a poor foundation for monitoring trends in subsequent years. There are also many streams surveyed that have a downstream point of Coho distribution that is well above the start of the survey reach. Two factors for each stream reach surveyed are key elements for trend analysis, the extent of the distribution and the average density within that distribution.

SITE SPECIFIC OBSERVATIONS

Site specific observations within this document have been organized in a format that utilizes GIS definitions to describe basins and sub-basins. The area within the Tillamook Watershed management zone includes five major basins. Each of these basins has been summarized separately: (1) the Tillamook, (2) the Trask, (3) the Wilson, (4) the Kilchis, (5) the Miami, and (6) lastly the small order Tillamook Bay tributaries.

These production estimates are based on an expansion of the 20% snorkel sample in pools only and therefore do not constitute an entire production estimate for the basin. These estimates greatly under estimate the standing crop of 0+, Steelhead and Cutthroat because a large component of their standing crop is summer rearing in riffle / rapid and glide habitats that were not inventoried. In addition, there is also production for these three groups that extends upstream beyond the end point of Coho distribution where the surveys were terminated. These figures, however, can be utilized to establish a baseline for trend monitoring for subsequent survey years on the basin wide scale and by tributary. The basin-wide summary tables at the start of each section below function well to establish relative production potentials between tributaries that can be utilized as a foundation for prioritizing restoration opportunities.

Tillamook River Basin

56.4 miles of stream were surveyed within this basin in June of 2006. This was 5.6 miles less habitat than was surveyed in 2005 due to a combination of decreased Coho distribution in some tributaries and the decision not to re-survey several of the extensive beaver marsh habitats from 2005 that showed either no spawning potential or no visibility. This is the third largest basin, based on stream miles, in the Tillamook Bay Complex of streams. Total Coho production remained low in the Tillamook River, 30,515 (not including 20% bias) during the 2006 inventory, and showed no change from the 2005 figure of 30,435 (not including 20% bias). This lack of change in production was highly unusual when compared to the significant and widespread increases observed in the rest of the Tillamook Bay streams (100% and higher in most basins). Four sub-basins on the eastern side of the Tillamook River Basin did actually show improvements in Coho production this year, but these were in turn balanced by decreased production rates on the western side of the Basin and in the Mainstem. The largest increases in 2006 were observed in Pleasant Valley (highest average rearing density - 1.3 fish/sq.m.), Killam, and Simmons. The greatest decreases were observed in the Tillamook Mainstem.

The 2006 Coho population here remained larger than the Miami Basin population (by 22%), but was less than half the size of the 2006 Kilchis Basin population. Tillamook Basin Coho accounted for only 6.2% of the 2006 total Tillamook Bay Watershed summer rearing

population (compared to a 13% contribution in 2005). All habitats were summer rearing well below seeded capacity for Coho, with only Simmons, Mills, and Pleasant Valley exhibiting significant production. The 2006 expanded abundance of 1+ Steelhead for the basin of 1,405 also exhibited little change from the 2005 estimate of 1,525. This population was much smaller than any of the other basins in the Tillamook Bay Watershed.

Much of the mainstem (13.4 miles) and western tributaries exhibited low gradient stream habitats with high levels of sediment accumulation and abundant beaver activity. Geology on this side of the basin was dominated by sandstone and clay and surrounding elevations and resultant gradients were low. The best spawning gravels for Coho in these areas were documented in the upper mainstem and in the Bewley Cr. subbasin (9.5 miles). These two sub-basins were the largest producers of Coho within the Tillamook River basin in both 2005 and 2006 despite decreased production levels in 2006. Rearing densities for Coho in these two reaches during the 2006 inventory remained at an average of just 0.3 fish/sq.m. each, indicating significant additional summer rearing potential. Coho distribution ended in a series of beaver dams and / or low gradient wetlands.

The main eastern tributaries to the Tillamook River, including Faucett, Killam, Munson, and Simmons, all originated from higher elevations and basaltic geologies. Stream flows in general were higher and colder and spawning gravel more abundant. Coho distribution on this side of the basin typically ended in steep boulders or waterfalls. Simmons (3.6 miles), Faucett (5 miles), and Munson (2.2 miles) ranked as the third, fourth, and fifth largest producers of Coho in the basin. Actual Coho production in Killam (6.7 miles) is likely to be higher since surveyor access has been denied during both years to a one mile reach just upstream of the mouth. Significant increases in Coho production were noted this year in Simmons, Faucett, Killam, and Pleasant Valley. The highest average rearing density for Coho in the Basin was observed in Pleasant Valley (1.3 fish/sq.m.), but extended for only one mile. Results from the 2006 inventory agreed strongly with the pattern which emerged in 2005 indicating the spawning beds in Bewley, Simmons, Faucett, Munson, and the upper mainstem as the most important target zones for spawning adult Coho in the basin.

As in 2005, nearly all of the basin's 1+Steelhead production occurred among the four eastern subbasins (primarily in Faucett for 2005, and in Simmons for 2006). Actual 1+Steelhead estimates in Killam were likely to be much higher for both years due to the denied access. The small population of 1+Steelhead found in the mainstem Tillamook were associated almost exclusively with the mouths of these four streams during both the 2005 and the 2006 inventories. A total of 17 slides were noted in the Tillamook Basin, mostly in Simmons (5), Faucett (5), and the Mainstem (4). The largest slides were found on the Mainstem and in Faucett.

(Table 4) Tillamook River 2006 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Mainstem	6,270*	20.5	165	5.6	65*	4.6	575*	14.6
Beaver	340	1.1	45	1.5	-		195	4.9
Bewley	6,970*	22.8	260*	8.9	20	1.4	1,355*	34.3
Esther	900	2.9	405*	13.8	-		280*	7.1
Fagan	-		15		-		5	
Faucett	3,015*	9.9	420*	14.3	440*	31.3	365*	9.3
Joe	-		30	1.0	-		30	
Killam	2,085	6.8	180*	6.1	300*	21.4	340*	8.6
Mills	1,530	5.0	145	4.9	30	2.1	140	3.5
Munson	2,805*	9.2	155	5.3	45*	3.2	260	6.6
Pleasant Valley	1,145	3.8	-		-		45	1.1
Simmons	5,170*	16.9	985*	33.6	505*	35.9	250	6.3
Basin Total	**30,230**	**99**	**2,805**	**96**	**1,405**	**100**	**3,840**	**97**

* Highlighted estimates represent the top 5 producers by species and age class
- Percent contributions are indicated for only those sub-basins that contributed greater than 1% of the total.
- 20% visual bias not included

Mainstem Tillamook

(Table 5)
Expanded Mainstem Tillamook Estimates of Juvenile Salmonid Production and Percent Contribution to the 5th field

Survey Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	10,120	275	100	685
	(33%)	(11%)	(7%)	(18%)
2006	6,270	165	65	575
	(21%)	(6%)	(5%)	(15%)

- 20% visual bias not included

The Mainstem fell behind Bewley Cr. in 2006 as the single most productive component for Coho in the Tillamook 5th field. While production estimates for Coho basin-wide, showed little change, a drop of 38% was observed in the Mainstem population. The decrease of 3,850 (expanded) Coho summer parr was the largest Basin-wide. This trend went sharply against the large production increases observed in the Trask, Wilson, Kilchis, and Miami Basins. It is a significant observation that adult escapement for Coho could increase so dramatically across the majority of the Tillamook Bay complex of streams with no effect in the Tillamook River. This evidence could suggest that a severe fresh water limitation may be present within the Tillamook 5th field to Coho production. Addition years of data for intra basin comparisons would be necessary to detect a verifiable trend.

About one-fifth of all the summer parr in the basin were found in the mainstem. This fraction has decreased from 2005 inventories and appears considerably depressed when compared to the length of distribution observed, 13.4 miles - the largest habitat component within the Tillamook basin. A low average rearing density of 0.3 fish/sq.m. was observed in the mainstem for two consecutive years. The two mile reach of mainstem at the end of distribution appeared to be the main spawning destination for adult Coho during both inventory years. This

reach was located upstream of the end of Yellow Fir Road and downstream of the last major logging road culvert (near the end of Coho distribution). This zone displayed healthy riparian conditions including an intact mixed forest canopy, low and interactive floodplain terraces, closely grouped pools, moderate water flow, and well sorted, clean gravels. About 37% of the Mainstem Coho population was found rearing in this reach.

Most mainstem habitat downstream of the Yellow Fir Road Bridge was dominated by low gradient, tannic water, a deeply entrenched stream channel, and heavy siltation. Visibility was poor through most of this lower mainstem resulting in lower confidence in the snorkel observations. Habitats in this lower mainstem did not exhibit any spawning potential and water quality limitations to summer production are likely. The 3 mile stretch of mainstem from the confluence of Trib C to a point just above the Yellow Fir Road Bridge (RM 6-9) exhibited extremely low juvenile Coho abundance for the second year in a row.

A strong legacy of beaver activity was noted in many reaches. 14 beaver dams in all were counted in the mainstem during the 2006 survey. Beaver ponds were also abundant on many of the small tributaries. The low gradient stream profile throughout the majority of the Tillamook river system prevents the rapid transport of sediments and fines and facilitates the deposition of these mobile substrates. This morphological condition increases the systems sensitivity to accelerated contribution rates from upslope management activities. The resultant impacts include embedded spawning gravels and low egg/ fry survival rates.

Juvenile Steelhead, Cutthroat, and Chinook were also seen in low levels here. All 1+Steelhead in the mainstem were observed below RM 4.1 for both 2005 and 2006. This reach was where Killam Cr., Fawcett Cr., Simmons Cr., and Munson Cr. all met the Tillamook. These streams were the four major high gradient eastern tributaries to the Tillamook mainstem and the greatest suppliers of cold water, rock, gravel, and Steelhead habitat. Juvenile Chinook (an expanded estimate of 1,400) were observed from the head of tide up to RM 4 (3 miles less distribution than in 2005). Cutthroat were evenly distributed. All mainstem road culverts were in good shape and passable for adults and juveniles. Knotweed was noted in several locations between the head of tide and RM 5.4 (near the mouth of Joe Cr.). Three slides were noted on the lower Mainstem (between the confluences of Faucett and Simmons) and a fourth large slide was noted at the end of the survey.

Beaver

Beaver Cr., Bewley Cr., and Esther Cr. represent the three most important sub-basins on the western side of the Tillamook Basin for anadromous spawners (Beaver with around 6 miles of potential Coho habitat, Bewley with 10.4, and Esther with 1.7). Both 2005 and 2006 inventories found the Beaver subbasin with the lowest levels of fish production between the three. The already low 2005 expanded estimate for Coho summer parr fell 50% in 2006 to just 340. This small population was most likely the result of no more than two successful spawning events.

Beaver Cr. meets the Tillamook mainstem below the head of tide and the start point for the survey was about 0.5 miles upstream of this junction. Trib. A leaves Beaver Cr. at this point and heads to the North. 170 (expanded) Coho were observed in Trib. A during the 2005 survey, in a low average rearing density of 0.35 fish/sq.m. across 1.4 miles of stream habitat. No Coho were observed here in 2006.

The 2006 Coho distribution in the mainstem of Beaver Cr. extended 2.8 miles upstream from this point at an extremely low average rearing density of 0.1 fish/sq.m. with the highest peak density of 0.3 fish/sq.m. observed at RM 2 (upstream of the Beaver Cr. Road crossing). The expanded estimate for Coho in the mainstem totaled 205 summer parr. The stream channel here wound back and forth across a wide pasture floodplain with minimal riparian canopy and a deep entrenchment ranging from six to eight feet. These conditions along with little change in elevation have led to poor pool diversity in general within mainstem Beaver. Very few pool breaks or tail-outs were observed where anadromous adults could successfully spawn and most occurrences of gravel were poorly sorted and contained high percentages of sand and silt. Many Sticklebacks were noted, indicating elevated summer stream temperatures.

Trib. C meets Beaver Cr. just above the Beaver Cr. Road crossing and also heads north, following the road upstream. 1.3 miles of Coho distribution were observed in Trib. C, in 2005, at an average rearing density of 0.24 fish/sq.m. Expanded estimates totaled 150 summer parr. Only 10 (expanded) Coho summer parr were observed here during the 2006 survey. 2005 Distribution ended at a 6ft foot clay falls below a massive beaver dam complex which appeared to reach all the way to the headwaters of the stream. Minor juvenile migrations were observed also in Tribs. B (2005) and D (2005-2006). Spawning gravel appeared to be the main limiting factor in the subbasin with only minor abundances found in Trib. A, Trib. D, and the upper half of the mainstem. Beaver Cr. geology was largely dominated by sand, mud, and clay, low stream gradients, and extensive wetlands at the upper end of the mainstem and tributaries. No Steelhead were seen in either year and the 2006 expanded estimate of 195 Cutthroat showed little change. No knotweed was observed. No slides were noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	685	0.1	135	0	200
2006	340	0.1	45	0	195

- 20% visual bias not included

Bewley

Bewley Cr. was the single most important component of Coho production in the Tillamook 5th field for the 2006 inventory (and was second behind the Mainstem Tillamook in 2005). Expanded estimates for summer parr in 2006 fell slightly (1%) and, consistent with the rest of the Tillamook basin, exhibited no effect from the dramatic increases in adult Coho escapement to the Tillamook Bay. Coho production in Bewley represented 23% of the basin-wide population in 2006, as in 2005. Rearing densities remained low in the subbasin, averaging 0.28 fish/sq.m. in the mainstem, 0.5 fish/sq.m. in Trib. E, and 0.5 fish/sq.m. in Trib. G (a short upstream migration of 0.2 miles). These levels indicate a substantial potential for higher production rates given a greater adult escapement. During both years of the inventory most of the adult spawning for Coho has centered on the upper two miles of mainstem distribution (RM 4.3 – 5.8), where peak rearing densities reached 0.76 fish/sq.m. in 2006. Tribs. D and E represented the most productive tributary habitats during both years also. This consistent pattern suggests that these reaches are probably the main anchor habitats for Coho within the Bewley Cr. sub-basin. Total distribution for Coho in the sub-basin dropped from 10.4 to 9.6 miles in 2006. A significant 3.3 miles of this 2006 distribution was provided by the many tributary habitats present in upper Bewley.

75% of the Bewley Cr. Coho were documented in the mainstem, where expanded estimates totaled 5,170 over 6.2 miles of stream. This percentage is up slightly from 69% in 2005. Rearing density rose consistently upstream toward the main spawning peak at RM 5.3. Excellent summer rearing habitat was present in the lower half of Bewley where pools were long and deep and substrates were dominated by sand and old wood. The stream channel here exhibited high sinuosity and deep entrenchment through open pasture lands with intermittent forest coverage. Above the main road bridge the forest canopy became more consistent and pool diversity began to increase. Fine gravels were abundant through the upper reaches and fairly well scoured and sorted. Larger rocky substrates were also present through a stretch of steeper gradients between Tribs. D and E.

Five tributaries of significant flow branched off of the mainstem in this upper reach. Two exhibited minor upstream migrations of Coho and two, Tribs. D and E, showed signs of adult spawning. No Coho were observed in Trib. C. An expanded estimate of 525 Coho were found in Trib D in an average rearing density of 0.2 fish/sq.m. with a distribution reaching 1.5 miles. This was a slight decrease in size and density from the 2005 population. Beaver dams terminated distribution in this tributary. Trib. E appeared slightly more productive during both years of survey with an expanded estimate of 1,170 Coho (about 17% of the subbasin total), an average rearing density of 0.5 fish/sq.m., and a distribution of 1.5 miles. This stream segment exhibited no change from 2005 levels.

Several sill-log structures and debris torrent jams were present in Trib. E, both supporting high Coho counts in the resulting pools. Small spawning peaks can be detected in the rearing density profiles for these two streams. No culvert passage problems were detected in Trib. D or E. The low stream gradient, high pool diversity, and abundance of spawning gravel present in Tribs. D, E, and the upper 2-3 miles of mainstem Bewley characterize these reaches as the most important spawning habitats present in the subbasin. Given the relative rates of production observed there in the 2005 and 2006 surveys they also appear to be among the most targeted spawning destinations for adult Coho in the whole Tillamook Basin.

Short distributions were terminated in Trib. F by beaver dams and in Trib. G by a large sill log just below a beaver impoundment. Stream flow and future potential in these two tributaries appears low. 2005 and 2006 expanded estimates for 1+Steelhead in the sub-basin were extremely low at 15 and 20, respectively. Cutthroat sightings increased a notable 67% during the 2006 survey. Many Lamprey redds were noted. No knotweed was noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	7,025	0.3	430	15	810
2006	6,970	0.3	260	20	1,355

- 20% visual bias not included

Esther

Esther Cr. was the furthest downstream of all the Tillamook River tributaries with its mouth just up from the Tillamook Bay on the west side. An extensive tidal slough connected Tomlinson Cr. to Esther Cr. and to the Tillamook mainstem. A large tide-gate opens and closes the 8 ft. entrance to this slough underneath an old road bed. The main stream channel remained tidally influenced for another 500 ft. upstream before the next 4 ft. culvert under Tomlinson Rd. was encountered. Both of these culverts appeared in good shape and passable for adults and juveniles. Trib. A branched to the right just upstream of this crossing.

Expanded estimates for Coho dropped 45% in 2006 within the sub-basin while total distribution (1.8 miles) showed little change. This was the greatest Coho decrease (percentage) observed in the Tillamook River Basin. Average rearing densities for Coho have been comparably higher here than in other streams on the western side of the Basin – 0.84 fish/sq.m. in 2005 (mainstem Esther) and 0.4 fish/sq.m. in 2006. The highest Coho densities in 2006 were found in Tomlinson (27% of Esther Cr. Coho) where an average of 0.7 fish/sq.m. extended for 0.6 miles.

The mainstem of Esther provided 1.2 miles of habitat to 71% of the Coho observed in the sub-basin. The best reach for spawning can be found around RM 0.5 in the transition zone between the lower pasture habitats and the upper mixed forest canopies. This is where rearing densities peaked in 2005. The density profile for Coho in 2006 peaked further upstream near the end of distribution at RM 0.9. This reach exhibited much higher stream gradients and larger rock and gravel sizes. The stream channel was deeply entrenched through the pasture habitat but exhibited a high level of sinuosity and several deeply scoured pools. Above this point stream gradient increased along with rock size and several outcroppings of bedrock were observed within the channel. Increases in gradient were greater in Esther Cr. than in other western tributaries to the Tillamook.

Trib. A to Esther Cr. was low flow with a narrow, entrenched channel. Spawning gravel was present but suitable spawning sites were limited. Analysis of Coho density profiles from the 2005 survey suggested that the population here had resulted from upstream migration. An expanded estimate of 115 Coho were observed here over 0.25 miles of stream. The 2006 survey found just 20 Coho (expanded). Summer rearing potential in this tributary was good. Upstream of a short stretch of pasture the stream entered the forest where several deeply scoured pools were observed.

Tomlinson branched off of Esther through its own tidal slough to the north, continued under a small private driveway culvert (where a significant patch of Knotweed was observed easily visible alongside the Cape Meares bayside road), and turned westward into steeper stream gradients. Expanded estimates for Coho totaled 245 in Tomlinson along 0.6 miles of stream in what was likely a single spawning event. Some spawning potential exists here in the mixed gravels just above the tidal slough but stream gradient increases quickly once the stream leaves the main road and heads west.

An expanded estimate of 15 1+Steelhead were observed in mainstem Esther in 2005. None were seen in 2006. No culvert problems were identified.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,650	0.8	230	15	170
2006	900	0.4	405	-	280

- 20% visual bias not included

Fagan

Spawning and rearing habitat appeared to be minimal along Fagan Cr. though 5 juvenile Coho were found 0.3 miles up from the head of tide during the 2005 survey. It is doubtful that a spawning event occurred in Fagan as much of the surveyed portion appeared swampy and dominated by sand and silt. Trib. A branched to the right 1.1 miles upstream from the head of tide and provided a good source of gravel and summer flow. The active channel was very narrow and pool size small. No Coho were seen in Trib. A and spawning potential for Coho was

minimal. Cutthroat and 0+trout only were found here in 2006. No Steelhead have been observed. Approximately 0.6 miles upstream from the head of tide was a 3 ft. diameter culvert that was observed to be collapsing but was still passable for adults and juveniles. No Knotweed was noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	25	0.2	-	-	20
2006	-	-	15	-	5

- 20% visual bias not included

Faucett

2006 Coho production in the Faucett Cr. sub-basin ranked third among the Tillamook River tributaries behind Bewley and Simmons. Expanded estimates here rose 44% in 2006 and represented one of only four sub-basins (along with Simmons, Killam, and Pleasant Valley) in the Tillamook 5th field to exhibit an increase in Coho summer parr. All of these drainages share a common geology and originate from neighboring high ridges along the eastern side of the Tillamook River Basin. All of these increases observed in 2006 were neatly balanced by decreases throughout the Basin's western tributaries.

Average rearing density remained a low 0.4 fish/sq.m. throughout 5 miles of the mainstem. Spawning activity during both inventory years appeared to be centered on 2 rearing density peaks at RM 0.8 and RM 3. The 2006 expanded estimate of 440 1+Steelhead within the Faucett Cr. mainstem ranked as the second largest population in the Tillamook River Basin, behind Simmons Cr., despite a 52% decline since 2005. Faucett, Killam, Munson, and Simmons represent the four largest eastern sub-basins to the Tillamook River and were all major suppliers of cold water, substrate, and high quality salmonid habitat. Stream gradients rose quickly in all these subbasins and substrates were dominated by hard basaltic rock. Summer flows were high.

Forest canopy associated with Faucett Cr was intermittent for the first two miles up to a municipal water intake structure where a mixed species canopy became more the norm for the remainder of the survey. The reserve of trees in the upper reaches leading up to the reservoir and the steep canyon walls have maintained low summer stream temperatures and provided a source of stable instream wood complexity. The 3 ft. plunge over the first dam is a juvenile barrier but is passable for adults. A small spike in juvenile Steelhead density was noted below this dam and slightly more than half of the total population appeared to be rearing downstream of this point. A similar pattern was observed in the Cutthroat population. The distribution pattern from two years of inventory suggests that many of these juveniles may have migrated up Faucett Cr. from the mainstem in a temperature dependant migration. This dam did not appear to be a factor in the distribution of Coho juveniles. A 10 ft. culvert at RM 0.5 is perched by 16 inches and also appears to be a juvenile barrier at summer flow regimes. The condition of this culvert has visibly degraded since 2005 and is currently rusted through the bottom. A bridge replacement at this site is highly recommended.

Spawning and rearing conditions were ideal for Coho and Steelhead in upper Faucett. Channel braids were common around low gravel bars, pool diversity and depth of scour were high, productive riffle habitats were common, riparian vegetation was abundant, and forest coverage was complete. 5 miles of Coho distribution ended below the reservoir where stream

gradients climbed up to 5% and numerous large boulder falls were encountered. 2006 Coho seeding in Faucett Cr. remained well below its carrying capacity.

A large patch of Knotweed was identified on the Tillamook mainstem directly across from the mouth of Faucett. 5 slides were noted in upper Faucett. Lamprey redds were common in the lower reaches.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	2,095	0.3	485	925	550
2006	3,015	0.4	420	440	365

- 20% visual bias not included

Joe

Average rearing density (0.03 fish/sq.m.) and expanded estimates (65) for Coho in Joe Cr. were extremely low in 2005. Distribution distance however reached 1.3 miles including a short 977 ft. in Trib. A. No Coho were seen here in 2006. It was difficult to determine if the minor abundance of Coho in 2005 was the result of an in-stream spawning event. Based on the low total estimate and the poor quality of spawning sites, an upstream migration was suspected. Low stream gradient, abundant beaver activity, and fine sediments characterize Joe Cr. Future spawning potential is low. No Steelhead have been observed. Beaver activity in this sub-basin was abundant. 17 active dams were noted during the 2006 survey in just 1.3 miles. The suspected source of Knotweed infestation along the Tillamook Mainstem can be seen directly across from the mouth of Joe Cr. (the furthest upstream sighting).

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	65	0.03	70	-	40
2006	-	-	30	-	30

- 20% visual bias not included

Killam

Stream habitat in Killam Cr. resembled Faucett Cr. with similar 2006 production estimates for Coho. The lower estimate for Killam most likely results from access being denied in the first mile of stream. Coho numbers in Killam during the 2005 survey were severely depressed and rebounded a dramatic 409% in 2006. This may have been due to a problem in 2005 with adult passage and stream flow timing at the RM 2 dam and fish ladder. Average rearing densities for Coho rose from just 0.1 fish/sq.m. to 0.55 fish/sq.m., while distribution distance in the mainstem (4.8 miles) increased by one mile. An additional 2 miles of the 2006 Coho distribution was provided by Tribs. C and D. Based only on the portions of Killam that were surveyed it would appear that Coho seeding levels were lowest here relative to the neighboring eastern sub-basins and well below the capacity of the habitat.

In 2006, the low level of Coho abundance was evenly spread throughout the survey without much indication of a spawning peak. Their presence upstream of the dam and fish ladder at RM 2 suggested that spawning had occurred in upper Killam. Higher levels of Coho production in 2006 revealed a significant pattern of interference surrounding the series of bedrock falls just upstream of the dam (RM 2.4). A high density spike of 1.7 fish/sq.m. was observed just downstream of these falls. In addition, 86% of the mainstem Coho population was found to be rearing below this point. A significant spike in 1+Steelhead density was also

observed just below the falls in 2006 with 78% of that population rearing in the first 2.4 miles of stream. Cutthroat distribution matched this pattern exactly: 89% below the falls. The combined agreement between all three species seen in the 2006 data mutually support the assessment that a partial barrier to both adults and juveniles exists at this location. Total Coho distribution ended in steep boulder habitat upstream of the 50-50 forks with Trib. D.

Trib. C contained some of the best spawning and rearing habitat in Killam Cr. and contributed 18% (385-expanded) of the total Coho and 15% (45-expanded) of the total 1+Steelhead for the Killam sub-basin. Only 40 (expanded) Coho were observed here in 2005. Trib. C represents about 25% of the stream flow at its junction with Killam. Low stream gradients, good gravel, and well scoured pools were noted throughout the first 1,200 ft. of this tributary. The average rearing density for Coho of 0.95 fish/sq.m. in Trib. C was the highest in the sub-basin and was sustained for 1.1 miles.

Significant portions of the Coho and 1+Steelhead populations in adjacent sub-basins were observed in the lowest reaches of each stream. This evidence suggests that an important portion of the Killam Cr. Coho and 1+Steelhead population was not quantified within this survey because of denied access to the lower 0.7 miles of stream. Considering the 409% increase in Coho abundance and a 161% increase in 1+Steelhead abundance for the portions surveyed, it is suspected that good production is also occurring in the unsurveyed stream segment. Permission to survey was also denied in Trib. A. All culverts appeared in good shape and were passable. Knotweed was noted at the stream mouth.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	410	0.1	180	115	505
2006	2,085	0.55	180	300	340

- 20% visual bias not included

Mills

Increases in Coho production were less dramatic in Mills Cr. in 2006. The bulk of the population (78%) was documented in the first half-mile where rearing density averaged 1.8 fish/sq.m., a good portion of this probably due to upstream migrations from the Tillamook River. Total distribution for Coho in Mills Cr. extended 1.3 miles and averaged 1.1 fish/sq.m. with signs of in-stream spawning. This was the second highest average rearing density for Coho in the Basin behind Pleasant Valley. Spawning gravel was most abundant between the mouth of Mills and the Highway 101 crossing. Upstream of this point stream gradients increased and larger substrates became more abundant. 1+Steelhead abundance appeared to increase slightly between inventoried years. Both culverts were in good shape and passable. No Knotweed was observed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,460	0.4	45	5	135
2006	1,530	1.1	145	30	140

- 20% visual bias not included

Munson

2005 Coho production in Munson ranked as the second highest among the Tillamook River tributaries. The 2006 inventory detected a 21% decline in production for Munson Cr. This was the only eastern tributary exhibiting a decline in Coho abundance.

A moderate rearing density of 0.7 fish/sq.m. was maintained for 2.2 miles in the mainstem with signs of multiple spawning peaks between RM 0.5 and RM 1. Seventy five percent of the summer Coho present were rearing in the lower gradient habitat below RM 1. The summer carrying capacity for Coho in Munson is clearly greater than the current level of seeding.

The Stream channel in Munson started off low gradient with intermittent beaver activity then transitioned into steeper habitats more similar to the other eastern Tillamook tributaries Killam, Faucett, and Simmons. Long rocky riffles and hard basaltic substrates led up to the end of fish distribution at the impassable Munson Cr. Falls. An upstream migration of 50 (expanded) Coho was observed up 750 ft. of Trib. A in 2005, where a culvert with a 1 ft perch terminated additional upstream migration. No Coho were observed here in 2006.

1+Steelhead observations also declined by 50%, in 2006. Mainstem culverts all appeared passable. Two slides were noted at the start of the stream.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	3,560	0.7	80	90	160
2006	2,805	0.7	155	45	260

- 20% visual bias not included

Pleasant Valley

This stream was located in between Munson Cr. and Mills Cr. on the east side of the Tillamook River. The small population of Coho summer parr found here in 2005 was replaced by a much larger summer abundance in 2006. This stream exhibited the most improvement in Coho production in the 2006 Tillamook River inventory. Coho from both years appear to be the result of in-stream spawning. Sustained high rearing densities were observed in the 2006 distribution profile (up to 3 fish/sq.m. at RM 0.4) throughout the one mile of distribution. The average rearing density for Coho in Pleasant Valley was 1.3 fish/sq.m., the highest recorded in the Basin for 2006. This level of seeding is approaching summer carrying capacity for Coho. An upstream migration from the Tillamook River was noted in the first pool of the survey (1.9 fish/sq.m.).

High quality spawning gravels were noted near the end of the survey, upstream from numerous high quality summer-rearing pools. Channel entrenchment was a problem throughout most of lower Pleasant Valley as the stream wound through numerous pastures and along fence-lines. A problem culvert was identified 0.5 miles up from the mouth (the third culvert up). It was “splitting in two and getting crushed” and noted as impeding adults but considered marginally passable. No Knotweed was located.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	155	0.4	0	0	10
2006	1,145	1.3	0	0	45

- 20% visual bias not included

Simmons

Simmons Cr. ranked as the second highest Coho producer among the Tillamook River tributaries behind Bewley. One of the main eastern subbasins, Simmons provides at least 4 miles of high quality stream habitat to Coho, Steelhead, and Cutthroat. Abundant gravel flats and wood jams coupled with high stream flow and good forest canopy portray this stream as important

anchor habitat for Coho in the Tillamook River 5th field. Coho summer parr numbers doubled here in 2006 and represented the single largest gain in population of any reach in the Basin. Average rearing density increased from 0.4 fish/sq.m. in 2005 to 1.02 fish/sq.m. in 2006. This was also one of the highest average densities in the Tillamook River basin. Sustained high densities were observed throughout the first 2.5 miles of stream with a spawning peak observed at RM 1.0 of 2.5 fish/sq.m. Total Coho distribution reached 3.6 miles in 2006. Carrying capacity for Coho in Simmons is still higher than observed in 2006.

42% of the 2005 1+Steelhead were found within the first mile of survey. That ranked as the second largest 1+Steelhead population in the basin that year. The 2006 survey saw that population increase by 100% with more even distribution. This was the greatest abundance of 1+Steelhead observed anywhere in the Tillamook River basin for 2006. All culverts were passable and no Knotweed was found. 5 slides were noted in the upper reaches.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	2,465	0.4	190	260	325
2006	5,170	1.0	985	505	250

- 20% visual bias not included

Unnamed Tributaries

18 unnamed tributaries to the Tillamook were surveyed and given letters from A to Q. Only 5 of these supported Coho populations in 2005 (C, E, M, O, and Q), and again only 5 (C, E, F, O, and Q) in 2006. A through J were mostly low gradient, draining wetlands with large beaver impoundments and generally limited by a lack of spawning gravel. Survey efforts generally extended beyond the end of Coho if beaver ponds were encountered or visibility was compromised in hopes of encountering better visibility or gravel upstream. Several exhibited flows that were too low to support either summer rearing or adult spawning.

Tribs. C and E had the highest Coho populations both years (with 2006 expanded estimates of 70 and 135, respectively). Distribution was sustained for only 1000 ft. in Trib. C with no further potential noted. This population appeared to be the result of upstream juvenile migrations. Coho distribution extended much further in Trib. E, reaching 1.8 miles, and ended in successive, well established beaver impoundments. Adult spawning appears to have occurred in this stream somewhere around RM 1. This tributary appeared to represent the highest potential for Coho production of all the unnamed tributaries. Adult passage looked difficult at several points in this stream due to several full spanning debris jams in deep channel entrenchments. Heavy siltation was burying the upper two culverts in Trib. E along with significant stretches of spawning gravels. Minor summer flows also limit the tributaries production potential. A small upstream migration of 10 (expanded) juvenile Coho was observed in Trib. F.

Tribs. K through Q were considerably more rocky with more elevation change and little beaver presence. Tribs. O and Q had small Coho populations in 2006 of 15 (expanded) and 55 (expanded), respectively. These streams exhibited moderate flows, numerous pools, and spawnable gravel. All have future potential for both spawning and rearing with summer habitat size the most significant limiting factor. It is unlikely that Coho distribution could extend beyond 0.6 miles in any of these tributaries. Culvert passages were all adequate.

Trask River Basin

Total Coho distribution of 82.2 miles exhibited little change from 2005 for the Trask River basin, however, expanded estimates increased by 93%. 144,575 (expanded) Coho summer parr were present, 67% in the North Fork and 29% in the South Fork. It would appear that adult escapement for this species almost doubled in the Trask River during the 2005 winter brood. Reaches in Elkhorn Cr. which were noted as approaching summer rearing capacity in 2005 sustained average rearing densities two to three times higher in 2006. Other reaches in the East Fork Trask, which were clearly functioning well below their potential in 2005, were seeded to capacity in 2006. The Trask River Coho population was again the second largest among the Tillamook Bay 5th fields (Wilson River 212,980 Coho over 110 miles).

Elkhorn Cr. and the East Fork Trask were the main destinations for adult spawners. In combination, these two sub-basins accounted for 53% of the Trask's total Coho production. Roughly twice as many Coho were found in Elkhorn's 10.6 miles as in the East Fork's 13.7 miles. Average rearing densities for Coho reached unusually high levels in these two areas: 4.0 fish/sq.m. in Trib. C of Elkhorn, 3.5 fish/sq.m. in Cruiser (Elkhorn), 3.3 fish/sq.m. in Trib. D of the East Fork, and 2.2 fish/sq.m. in Boundary (East Fork). Even the mainstem of Elkhorn maintained an average summer parr density of 1.6 fish/sq.m.. Significant, high density Coho production also took place in small tributaries such as Edwards Cr. (South Fork), Trib. D of the North Fork, and Bales Cr. (East Fork). It is suspected that the above habitats were seeded to capacity during the summer of 2006.

Improvements in Coho production were greatest in the South Fork sub-basin where severely depressed 2005 distributions increased 1,160% in Boundary, 463% in Bales, 299% in the EF mainstem, and 273% in the SF mainstem. Significant potential for expanded production exists in most of the under-seeded habitats of the North, South, and East Fork mainstems.

Important sub-basins least effected by the sizeable increase in 2005 adult escapement included Mill Cr., Gold Cr., Bark Shanty, and the NFNF Trask. These streams experienced little, if any, improvement in Coho production during the 2006 inventory. Limiting factors appeared to be heavy sedimentation and poor water quality in Mill, the hatchery intake dam in Gold Cr., adult escapement only in Bark Shanty, and the overall lack of spawning gravel in the NFNF Trask. Also worth noting was the unusual and singular 35% decline in Coho abundance observed in the Trask mainstem.

Most of the Trask basin stream habitat upstream of Mill Cr. and the Tillamook Bay floodplain was high gradient and rocky. High elevations surrounded most of the subbasins and many tributaries were too steep to support Coho spawning. High flow mainstem habitats were characterized by long boulder rapids and large deep pools with little cover or wood complexity. Steep bedrock walls and low floodplain interaction were typical mainstem observations. Mainstem winter habitats for Coho pre-smolts are virtually non-existent until reaching the Tillamook Bay floodplain and its associated estuarine habitats. Waterfalls and boulder gorges terminated fish distribution in most streams.

These conditions describe excellent Steelhead habitat and the basin-wide expanded estimate for 1+Steelhead, in pool habitats only, reached 14,260 in 2006. This was the second highest abundance in the Tillamook Bay Complex of streams behind the Wilson's expanded estimate of 21,985. The Trask Basins Steelhead population increased by 18% in 2006 and summer rearing has been centered during both 2005 and 2006 inventories on the Trask mainstem (24%), the South Fork mainstem (21%), the East Fork mainstem (14%), the North Fork

mainstem (14%), and Elkhorn (8%). There appeared to be a clear preference among adult Coho for the North Fork sub-basin (67%) and among adult Steelhead for the South Fork sub-basin (43%). This trend was also observed in 2005. The basin wide review below is broken down by sub-basin – Main, North Fork, and South Fork.

Most culvert problems were observed in the Mill Cr. sub-basin. Most of the upper basin road crossings were bridges due to the extreme range in stream flows. The most serious Knotweed infestation (possibly in the entire Tillamook Bay Watershed) was observed along the first 10.9 miles of the Trask mainstem from the head of tide to the Peninsula County Park where an old private dwelling appears to have been the original source. A total of 37 slides were noted in the Trask Basin, 27 of these in the North Fork sub-basin, 12 of these in Elkhorn. The largest 4 slides were found in the MFNF Trask and its tributary, Elkhorn Creek.

(Table 6) Trask River 2006 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Trask mainstem - To fk	3,460	2.4	4,560*	10.8	3,405*	23.9	1,835*	19.5
- Gold	240		355		90		235	2.5
- Green	125		75		0		135	1.4
- Mill	1,815	1.3	225		0		110	1.2
- Sampson	600		90		15		75	
NF Trask mainstem	13,535*	9.4	9,255*	22.0	1,965*	13.8	1,165*	12.4
-Bark Shanty	5,895	4.1	430	1.0	205	1.4	240	2.6
-Clear	7,190	5.0	1,390	3.3	190	1.3	160	1.7
-Hembre	45		150		0		25	
-Trib. D	4,715	3.3	880	2.1	85		100	1.1
-MFNF Trask mainstem	5,455	3.8	695	1.7	310	2.2	125	1.3
-Elkhorn	50,855*	35.2	5,675*	13.5	1,205*	8.5	1,005*	10.7
-NFNF Trask mainstem	8,080*	5.6	3,550*	8.4	550	3.9	185	2.0
SF Trask mainstem	8,570*	5.9	5,260*	12.5	3,015*	21.1	1,090*	11.6
-Edwards	7,395	5.1	2,715	6.5	940	6.6	355	3.8
-EF Trask mainstem	17,715*	12.3	2,960	7.0	2,000*	14.0	1,310*	14.0
-Boundary	4,535	3.1	665	1.6	35		485	5.2
Basin Total	**140,225**	**97**	**38,930**	**93**	**14,010**	**98**	**8,635**	**92**

* Highlighted estimates represent the top 5 producers by species and age class

- Percent contributions are indicated for only those subbasins that contributed greater than 1% of the total.

- 20% visual bias not included

Mainstem Trask

(Table 7)

Expanded Mainstem Trask Estimates of Juvenile Salmonid Production and Percent Contribution to the 5th field

Survey Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	5,335	5,085	2,370	1,790
	(7%)	(12%)	(20%)	(15%)
2006	3,460	4,560	3,405	1,835
	(2.4%)	(11%)	(24%)	(20%)

-20% visual bias not included

The Trask mainstem stretched 14.1 miles from the head of tide near Highway 101 to the junction of the North Fork Trask and the South Fork Trask at the county park campground. The lower reaches exhibited enormous pool surface areas with long cobbly tail-outs and high solar exposure. The stream channel in the upper reaches was often confined by steep canyon walls and sheer bedrock with large boulders and deep pools. High flows and good water quality were supplied by the North and South Fork drainages.

A notable 35% drop in Coho abundance was observed in the Trask mainstem during the 2006 inventory. This was the only stream segment where a decrease in Coho was observed. This observation was unusual in a year where basin-wide totals for this species nearly doubled in size. The Mainstem population accounted for just 2.4% of Basin-wide Coho, one of the smallest components of Coho production in the 5th field. One possible explanation for such low abundance in this reach, even in 2005, may be due to the lack of any substantial tributary spawning habitats in the first 14 miles of the Trask River (Gold Cr. habitat *is* substantial, but is effectively blocked by the hatchery intake dam just above the mouth). Most of the adult spawners are clearly not lower mainstem spawners.

Summer rearing capacity in upper basin tributaries are adequate for current levels of adult escapement. The abundance of juvenile Chinook, however, in the Trask mainstem, increased by 100% in 2006 (this observation is relatively insignificant because Chinook juvenile life history includes a spring / summer migration towards estuary habitats).

Coho rearing density remained extremely low throughout the mainstem, averaging just 0.04 fish/sq.m. and peaking at 0.5 fish/sq.m. near RM 11. The most conspicuous feature of the distribution profile was the absence of Coho between RM 6.7 and 8.6. This zone stretched approximately from just above Gold Cr. to just below Bill Cr. and exhibited no obvious relationship to physical habitat features.

Some of the highest pool counts for Coho were observed during both years of survey near the mouth of Mill Cr. suggesting a contribution of out migrant fry from the tributary to the mainstem.

The continued summer distribution of Coho to the head of tide is significant because it is an indicator that these mainstem habitats exhibit some level of summer rearing potential (although lower densities should be expected because environmental stresses such as elevated temperatures have been documented). In addition, it is an indication that fry have likely seeded estuarine habitats and that the potential for this early estuarine life history exists in the Tillamook Bay complex.

Habitat in the mainstem was more suited to the basin's Steelhead and Cutthroat population with increases in abundance noted for each (44% for 1+Steelhead). Some 1+Steelhead counts in 2006 remained over 50 per pool. Rearing densities for both these species increased upstream toward the Forks during both survey years. The relatively large 2005 abundance of (12,555 expanded) Chinook summer parr observed in the mainstem roughly doubled in 2006 (24,920 expanded). This represented 74% of the juvenile Chinook observed in the Trask Basin for 2006 (72% in 2005).

A long stretch of continuous Knotweed was observed along most of the mainstem Trask from the head of tide all the way upstream past the Peninsula Park, about 11 stream miles. An older overgrown private residence around RM 11 appeared to be the source (a better description of this site, including the address, can be found in the 2006 Access database comments field). This is a serious problem presently and poses a significant future threat to the expansive riparian

gravel bar habitats in the lower Trask and neighboring rivers around the Tillamook Bay floodplain.

Gold

Gold Cr. is a major subbasin of the Trask despite its current low level of Coho production. The 5 ft. hatchery dam and fish ladder most likely impedes the transfer of wild migrants from the mainstem. This effect was especially noticeable after the greatly increased escapement of the 2005 adult brood when 2006 Coho summer parr abundance indicated no more than one successful adult spawning event. The large drainage area here has led to high flows and abundant gravel reserves along several miles of stream with numerous deep pools. Steep stream gradients and long rocky riffles typify Gold Cr. habitat.

Two years of survey have seen Coho distributed along about 1.2 – 1.3 miles of mainstem Gold and 0.2 - 0.6 miles of North Fork Gold. Higher abundances of Coho could be expected given the relative health and abundance of habitat available in this tributary. Distribution and productivity for Coho would be substantially higher in this sub-basin with the provision of adequate adult passage.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	95	0.05	60	180	135
2006	240	0.5	355	90	235

- 20% visual bias not included

Green

Coho spawning appears to have occurred both inventoried years in Green Cr. in the first 0.6 miles of stream below the Trask River Road culvert (in good shape and passable). Juvenile abundance dropped 77% in 2006. Poor water quality and poor pool formation were observed in the channel below the Trask River Rd crossing. Above the main road culvert, stream gradients climb quickly through a long series of bedrock chutes. A few small rocky pools were found upstream of these chutes without Coho. No good spawning sites were seen above the Trask River Road. No 1+Steelhead were found. The first 1,100 ft. of Green was infested with Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	550	0.7	50	-	95
2006	125	1.1	75	-	135

- 20% visual bias not included

Mill

Coho production could be significantly greater in the Mill Cr. sub-basin than the levels observed in 2005 and 2006. Total population size increased by 56% in 2006, but rearing density and distribution distance (3.1 miles) remained well below capacity. Approximately 4 miles of spawnable habitat are available in the sub-basin which should be capable of sustaining a Coho population 2-3 times as large as that observed in 2006 (1,815 expanded). The average rearing density of 0.5 fish/sq.m. observed in 2006 supports this hypothesis. The most significant limiting factors appear to be low stream flow (seasonal withdrawal) and intensive land use and development which has resulted in poor water quality and heavy siltation.

2005 data found 72% of Mill Cr. Coho in the mainstem in 3.1 river miles. 2006 data indicated that the mainstem rearing percentage had increased to 95% as the population in Trib. A fell from 380 (expanded) to just 55 (expanded) with distribution distance dropping from 0.9 to 0.2 miles. Highest mainstem densities were found between RM 1.6 – 2.2 (up to 1.8 fish/sq.m.) with significantly lower counts above and below. Sub-basin spawning potential appeared highest in the reach which ended around the junction of Trib. A. The active channel was the widest here and spawning gravels plentiful. Many deep lateral scour pools were observed with intermittent occurrences of old growth wood being incorporated into the stream above RM 1. Water quality appeared poor due to low flows and extensive residential impacts.

Stream flows divided quickly around RM 2 between Trib. A, Trib. B, and the mainstem. Stream habitat in Trib. A and the upper mainstem was similar and climbed quickly through cobbles and rocks and small pools. Signs of adult spawning were detected in Trib. A during the 2005 survey. Stream gradients were low in Trib. B and several small tributaries divided the flow. What minor spawning potential existed in Trib. B was found within the first 0.6 miles of stream below Trib. B1 in small cobbly pools. The remaining stream habitats above this point consisted only of beaver marsh with very low anadromous spawning potential. Water quality in this tributary was notably the worst in the sub-basin. Only small upstream juvenile migrations were noted in these two tribs. in 2006.

Several small culverts were encountered. A juvenile barrier was encountered at the first mainstem culvert 0.2 miles upstream of the Brickyard Rd. culvert. The 5 ft. steel pipe was perched by 1 ft.. In addition, 380 ft. up from the mouth of Trib. A the 4 ft. steel pipe under Brickyard Rd. was also perched by 1 ft.. Numerous small culverts on upper Mill Cr. looked marginally passable for juveniles (the worst - a 6 inch drop at RM 2.5).

Coho production in the mainstem and in Trib. A was well below full capacity and the potential for restoration significant. No 1+Steelhead were found in the Mill Cr. sub-basin during either survey. Cutthroat abundance changed little between inventoried years. No Knotweed was noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,160	0.2	50	-	185
2006	1,815	0.5	225	-	110

- 20% visual bias not included

Sampson

Coho spawning seems to have occurred in this small tributary during both years of survey. A perched culvert with a 1 ft. plunge presented a juvenile barrier about 300 ft. up from the mouth. Coho distribution totaled 0.7 miles during both years and expanded estimates doubled in 2006. This evidence suggests that adult spawning has been taking place upstream of the culvert. Coho rearing density rose dramatically from 0.7 fish/sq.m. in 2005 to 2.8 fish/sq.m. in 2006. below the culvert. Upstream temperature dependent migrations were also occurring here. Steep stream gradients limit further upstream distribution for anadromous fish.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	295	0.7	150	20	125
2006	600	2.8	90	15	75

- 20% visual bias not included

NF Trask

A spectacular increase in adult Coho escapement must have occurred in this sub-basin during the 2005 winter brood. The North Fork of the Trask River and its associated tributaries again contained the most productive reaches for Coho within the Trask basin. Two years of inventory so far have maintained this pattern, one of low adult abundance and one of moderate. Surveys to the end of Coho distribution in the NF Trask subbasin totaled 34 miles also making it the largest single segment of aquatic habitat. Coho production here rose 72% in 2006 and totaled 96,390 (expanded) summer parr, 67% of the total Trask Basin population (compared to 75% last year).

The most productive reaches for Coho within the NF Trask sub-basin during the 2006 survey were found in Elkhorn Cr. (50,855-expanded), the NF Trask mainstem (13,535-expanded), and the NFNF Trask (8,080-expanded). These were also the highest producers in 2005. Production rates rose 100%, 29%, and 11%, respectively, in each of these streams. The highest average rearing densities for Coho in the entire Tillamook Bay Complex of streams were found in the Elkhorn tributaries (up to 4.0 fish/sq.m.) and in Trib. D of the NF Trask (4.6 fish/sq.m.). These levels were more than twice as high as the published rearing capacity for juvenile Coho. The greatest population increases were seen in Trib. C of Elkhorn (222%) and in Trib. D of the NF Trask (160%).

Two years of data indicate that the North Fork sub-basin, especially Elkhorn, is functioning currently as one of the most important summer rearing anchor habitats for Coho on the North Coast of Oregon. A comparably summer habitat refugia has been identified in the Little North Fork of the Wilson (11.8 miles) where expanded estimates for Coho were higher in 2006 (64,515) than in Elkhorn, but where average rearing densities were substantially lower (2.2 fish/sq.m.).

The 2006 expanded estimate of 4,535 1+Steelhead for the NF Trask sub-basin showed a moderate gain of 8% since the 2005 survey. This represented 32% of the Trask Basin total (little change). Most of the NF Trask 1+Steelhead were again observed in the mainstem (1,965-expanded) and in Elkhorn (1,205-expanded).

Mainstem NF Trask

(Table 8)

Expanded Mainstem NF Trask Estimates of Juvenile Salmonid Production and Percent Contribution to the 5th Field

Survey Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	10,465	9,320	1,030	890
	(14%)	(22%)	(9%)	(8%)
2006	13,535	9,255	1,965	1,165
	(9.4%)	(22%)	(14%)	(12%)

- 20% visual bias not included

2005 Coho production in the NF Trask mainstem was approximately twice as high as in the Trask mainstem over a shorter stream segment (11 miles). In 2006 this population increased by 29% and was roughly four times as large as in the Trask mainstem. Most of the adult escapement for Coho in the Basin appears to be centered on this stretch of river and its five main

tributaries. The mainstem population here is probably largely a result of density dependant downstream migrations of fry from tributaries with consistently high rearing densities, Elkhorn, Clear, Bark Shanty, the NF-NF, and Trib. D. Coho rearing density during both surveys of the mainstem was very low, averaging 0.1 - 0.14 fish/sq.m., mainly due to the large surface areas of most of the pools. The highest counts and densities (0.4 fish/sq.m.) during the 2006 survey were found around RM 4.5, just upstream from the confluence of Bark Shanty.

Avian predation (merganser) in these mainstem pool habitats appeared heavy (visual observation and large volumes of scat) and wood complexity for the provision of cover was rare.

Spawning gravels were abundant in the NF mainstem and the 2006 seeding level remained far below the potential for this reach's carrying capacity. The mainstem NF Trask was the second largest contributor to summer Coho production within the sub-basin, behind Elkhorn Cr., during both years of survey.

The abundance of pool rearing 1+Steelhead in the NF Trask mainstem rose a substantial 91% during the 2006 survey. This figure remained significantly lower than the abundance levels recorded in the Trask mainstem and the SF mainstem and was roughly the same as in the EF mainstem. Highest counts for 1+Steelhead in the NF mainstem were seen below RM 5.3. This lower reach accounted for 83% of the population. A consistent decline in density was observed upstream of that point. A similar pattern was observed during the 2005 survey. 43% of NF sub-basin 1+Steelhead were found rearing in the Mainstem (with 27% found in Elkhorn). Cutthroat sightings in the Mainstem rose moderately in 2006 and exhibited a similar decline in density as the survey progressed upstream. The Cutthroat population here was comparable to the Elkhorn population and, together, they accounted for 72% of the NF sub-basin total. Juvenile Chinook were seen up to RM 7.5 during both survey years although the 2006 population was twice as large (6,030 expanded). No culverts exist on the NF Trask mainstem and no Knotweed was located. 5 slides were counted in the upper half of the survey.

Bark Shanty

This stream was one of the largest tributaries to the NF Trask. Coho production in this sub-basin in 2006 remained below habitat potential. A 25% increase was observed in population size and average rearing density reached 1.0 fish/sq.m.. Heaviest spawning activity was observed in the first 0.5 miles during the 2005 survey but appeared to shift to the end of distribution in 2006 where peak rearing densities reached 1.8 fish/sq.m. A steep gorge begins at RM 0.6 with a large debris jam at RM 1.1. Coho were observed above both of these potential obstacles to RM 3.2. A 14 ft. falls near RM 3.7 ends anadromous passage. The potential for interactive floodplain habitats was greater in the lower reach where braided channels, abundant spawning gravels, and old debris jams were common.

All tributaries appeared too steep or low flow for anadromous spawning. No culverts or occurrences of Knotweed were encountered. 3 slides were noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	4,710	0.6	1,545	575	495
2006	5,895	1.0	430	205	240

- 20% visual bias not included

Clear

A 230% increase was observed in Clear Cr. in 2006. Distribution, limited both years by a substantial boulder falls, totaled 1.1 miles with a short upstream juvenile migration in Trib. A of 880 ft.. Average rearing density reached 1.4 fish/sq.m. and increased to 2.5 fish/sq.m. just below the falls (RM 0.7). The lack of well sorted spawning gravels may limit Coho production for the tributary. High abundances of boulders and large cobble were encountered. No culverts or Knotweed were encountered. 3 slides were noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	2,180	0.3	275	260	120
2006	7,190	1.4	1,390	190	160

- 20% visual bias not included

Hembre

Minor abundances of Coho were observed in Hembre Cr. during both surveys up to a 6 ft. log-jam falls. Roughly 25% as many Coho were seen here in 2006 as in 2005. Stream flows were excellent but stream gradient reduces the potential for the development of pool habitats appropriate for significant Coho production. Large boulders and debris jams were numerous. Potential for Coho in Hembre appears to be the lowest of all the named North Fork tributaries.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	170	0.3	95	30	25
2006	45	0.2	150	0	25

- 20% visual bias not included

Unnamed tributaries

Small populations of Coho were observed in Tribs. C, E, F, and G. Upstream migration was the source of summer residents in Tribs. C, E, and F, while spawning seems to have occurred in G during both survey years. Average rearing density in Trib. G reached 1.8 fish/sq.m. in 2006 but the expanded estimate remained low at 225. This stream appears to be near full capacity for its small pools and low flows. An impassable bedrock falls ends distribution at RM 0.2.

Large populations of Coho have been observed in Trib. D for two consecutive years. The 2005 expanded estimate of 1,815 rose 160% in 2006 to reach 4,715 and average rearing density reached a surprising 4.6 fish/sq.m.. A spawning peak of 2.9 fish/sq.m. was noted at RM 0.45 last year and another reaching 8.0 fish/sq.m. was observed in 2006 at RM 0.33. This stream was choked with summer parr and exceeded published levels of full seeding. High counts and high densities continued to the last pool where an enormous log jam ended adult passage. Expanded estimates for 1+Steelhead in Trib. D totaled 60 in 2005 and 85 in 2006. No culverts were encountered. 3 slides were noted.

MFNF Trask

The Middle Fork of the North Fork Trask supplied most of the flow and Coho production for the subbasin. 56,310 (expanded) Coho were present in 3 miles of the mainstem and 10.6

miles in Elkhorn, it's only tributary. Only 10% of total Coho documented were observed in the mainstem. Almost twice as many Coho were encountered in the sub-basin in 2006 as in 2005. This represented 58% of the North Fork sub-basin total and 39% of the Trask basin total. Spawning beds in the Middle Fork, Elkhorn, and in the North Fork North Fork Trask were primary destinations for adult Coho returning to the Trask River during both 2004 and 2005.

Only 3 miles of stream in the MFNF Trask mainstem are passable to adult Coho before a series of 8 ft. and 10 ft. bedrock falls end their distribution (not a barrier for steelhead). This narrow pinch in the steep canyon occurs about one mile upstream from the mouth of Elkhorn. A long series of braided gravel flats ideal for Coho spawning were observed just upstream of this pinch.

Mainstem Coho abundance increased by 39% in 2006. Rearing density for Coho in the mainstem averaged 0.5 fish/sq.m. and peaked at 1.3 fish/sq.m. at RM 1.7. Highest counts for all species were observed both years in the first mile of survey where pools were large and gravel supplies more abundant. The mainstem stream channel straightens and narrows considerably upstream of the Elkhorn junction and the overall quality of habitat begins to decline.

1+Steelhead were present upstream of the falls. No culverts. 2 old, large slides were noted downstream of the mouth of Elkhorn.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	3,930	0.4	930	285	325
2006	5,455	0.5	695	310	125

- 20% visual bias not included

Elkhorn

Elkhorn appeared to supply more of the stream flow at its junction with the MFNF Trask. This sub-basin remained the single largest component of Coho production for the entire Trask Basin. Elkhorn and the Little North Fork Wilson (64,515 Coho, expanded) were the largest producers of Coho in the Tillamook Bay Complex of streams and accounted for, in combination, 23% of all Coho parr for the 5 combined watersheds. More than one-third of all summer rearing Coho in the Trask Basin were found here. The already remarkable abundances observed during the 2005 survey increased by another 100% during the 2006 survey to reach 50,855, expanded, summer parr. Rearing densities in all reaches were at or substantially above published levels of full seeding (4.0 fish/sq.m. in Trib. C and 3.5 fish/sq.m. in Cruiser). It is suspected that the Elkhorn sub-basin was at full carrying capacity during the summer of 2006. The 2006 expanded estimate for 1+Steelhead in Elkhorn of 1,205 exhibited little change. For comparison, Steelhead production remained higher only in the Trask mainstem (3,405 over 14.1 miles), the SF Trask mainstem (3,015 over 8.4 miles), and the EF Trask mainstem (2,000 over 9.2 miles). Cutthroat abundance decreased by 33%.

Elkhorn branches to the south of the MFNF Trask into lower elevations than the rest to the NF Trask subbasin. This stream provides high quality, low gradient spawning and rearing potential in 6 miles of mainstem habitat and 4.5 miles of tributary habitat. Coho spawning appears to have occurred in three major tributaries (Trib. A, Trib. C, and Cruiser Cr.) during both survey years. Trib. C and Cruiser Cr. contributed 17.3% and 27.2%, respectively of the total Elkhorn Coho population. The mainstem contributed 54.6%. The highest average rearing densities for Coho Basin-wide were observed in Trib. C, Cruiser, the Elkhorn mainstem, Trib. D of the NF Trask, and Boundary Cr. on the EF Trask.

Coho abundance in the Elkhorn mainstem increased by 73% from the previous year. 27,785 (expanded) Coho were observed there in an average rearing density of 1.6 fish/sq.m. The upper half of this stream, along with Trib. D of the NF Trask, was completely filled with Coho summer parr. Multiple spawning peaks were observed: 3.2 fish/sq.m. at RM 2.7, 2.7 fish/sq.m. at RM 3.9, 2.9 fish/sq.m. at RM 4.9, and 4.7 fish/sq.m. at RM 5.7. Coho distribution in the mainstem of Elkhorn has ended both years shortly upstream of the 50/50 forks with Trib. C at an 8 ft. bedrock slide just below a 10 ft. vertical bedrock falls – a definitive adult barrier. 86% of all Elkhorn 1+Steelhead observed were rearing in the mainstem, most of these were observed between RM 1-3. 58% of all Elkhorn Cutthroat were observed in the mainstem.

Minor spawning occurred again in Trib. A (260 Coho, expanded, 0.4 miles), and also in Trib. B (195 Coho, expanded, 0.3 miles). A 12 ft. bedrock cascade terminated adult passage in Trib. A while distribution in Trib. B ended in a steep boulder cascade.

Significant spawning activity has occurred in Trib. C (1 mile) and in Cruiser (2.9 miles) during both survey years. 2006 expanded estimates for Coho increased dramatically in both of these streams (up 222% in Trib. C and 127% in Cruiser). These two reaches have displayed the highest average rearing densities for Coho anywhere in the Trask Basin for two consecutive years.

8,795 (expanded) Coho summer parr were observed rearing between Trib. C and Trib. C1 (89% in Trib. C). Rearing density averaged an extraordinary 4.0 fish/sq.m. in Trib. C and 5.5 fish/sq.m. in Trib. C1. The main spawning peak in Trib. C for both years has centered on RM 0.5 (6.6 fish/sq.m.). It was previously reported that the 2005 average rearing density for Trib. C of 1.3 fish/sq.m. with a peak of 2.3 fish/sq.m. was approaching the stream's carrying capacity. The ability of these select habitats to maintain such high summer rearing densities may suggest that greater capacity exists in high quality habitats than has been observed in Oregon coast wide studies that have based their evaluations on the capacities of degraded habitats.

Coho distribution ended in steep bedrock cascades below a sizeable beaver impoundment. This beaver impoundment is seated against a legacy debris jam in a tight pinch point. 1+Steelhead observations were low in Trib. C and totaled just 115, expanded.

The 3 miles of Coho habitat in Cruiser Cr. contributed nearly one third of the total Elkhorn Coho population. Coho production in Cruiser (13,820 expanded) was higher than in any of the North Fork tributaries, except the Elkhorn mainstem, and was equal to that observed in the NF Trask mainstem (11.1 miles). As in the rest of the Elkhorn sub-basin, Coho rearing densities in Cruiser were high, averaging 3.5 fish/sq.m. in the mainstem and 3.8 fish/sq.m. in Trib. B. Multiple spawning peaks appeared throughout the entire distribution. 6.0 fish/sq.m. was quantified for the first pool of the mainstem and 6.7 fish/sq.m. in the last. 1.9 miles of Coho distribution in the Cruiser mainstem ended at an 8 ft. bedrock falls.

Coho also spawned heavily in Trib. B of Cruiser in 2005 and 2006. The expanded estimate here increased by 49% in 2006 to reach 3,460. This accounted for 25% of Cruiser Cr. Coho. Total distribution amounted to one mile in Trib. B, including two small upstream juvenile migrations in Tribs. B1 and B2. High Coho densities were recorded throughout this entire tributary from the first pool, 5.8 fish/sq.m., to the last, 3.0 fish/sq.m., with a strong spawning peak of 8.2 fish/sq.m. located at RM 0.3. These figures are exceptional and support the development of new definitions for summer parr carrying capacity. The hypothesis developed in the 2005 Final Report that habitats in Cruiser Cr. were seeded to capacity for Coho was clearly inaccurate.

The Elkhorn mainstem, Trib. C, and Cruiser Cr. appear to be major anchor habitats for Coho in the Trask basin. Some potential for increased Coho production is probably still present in the lower two miles of the mainstem, where rearing densities remained below 1.0 fish/sq.m. even in 2006. Restoration activities focused on increasing the over-winter retention of the summer parr in these headwater habitats should be a high priority for restoring aquatic function and improving salmonid production. No Knotweed was observed. 12 slides were noted along the Elkhorn mainstem.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	25,235	0.55	6,460	1,160	1,595
2006	50,855	1.6	5,675	1,205	1,005

- 20% visual bias not included

NFNF Trask

This reach remained the third most productive stream segment for Coho in the North Fork Trask subbasin (behind Elkhorn and the mainstem NF Trask) and a major contributor of summer flow. An expanded estimate of 8,080 Coho were observed in 2006, a moderate increase of 11.4%. This represented 8.4% of the North Fork sub-basin total and 5.6% of the Trask Basin total. This level of production is significant given that only 2.6 miles of stream were accessible to Coho before a 20 ft. boulder falls terminated distribution. 1+Steelhead were found upstream of this gorge indicating that adult Steelhead passage was occurring and that the falls may not be a definitive barrier for adult Coho every year.

Rearing densities for Coho were relatively high (averaging 0.9 fish/sq.m.) for the Basin, but comparably low for other North Fork tributaries. This level of seeding appears to be well below the production potential of the available habitat in the NFNF Trask, especially when considering the levels achieved in the surrounding sub-basins during the 2006 inventory. Adult escapement and the availability of appropriate spawning gravel are probably the two most limiting factors for this stream. Long exposures of bedrock and steep boulder rapids were frequent channel characteristics. Pool surface areas were large, however, and available rearing habitat was plentiful. A strong spawning peak of 2.3 fish/sq.m. was observed at RM 1.3 in the same location observed for 2005. Highest counts for 1+Steelhead and Cutthroat were centered in this same zone. 0+trout abundance in these 2.6 miles was notably high during both surveyed years. This reach appears to be another important anchor habitat for Coho in the Trask basin and a main destination for adult spawners.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	7,255	0.5	3,400	710	290
2006	8,080	0.93	3,550	550	185

- 20% visual bias not included

South Fork Trask

Low abundances of summer Coho parr in this sub-basin during the 2005 inventory set the stage for large scale increases in 2006. Strong adult escapement was the primary factor in the observed increases in summer rearing. In 2005 only 15% of the total Trask Basin summer rearing Coho population was observed in the SF Trask and tributaries. This percentage doubled during

the 2006 inventory to reach 29% which represented an expanded estimate of 41,795 summer parr. This relative contribution is more likely representative of a normal distribution pattern. There was 27.4 miles of distribution observed for Coho in the sub-basin, approximately 33% of the Basin total. This population experienced a strong increase of 268% when compared between inventory years.

Almost all the reaches in this sub-basin experienced dramatic increases in Coho production this year. Some of the highest were observed in the East Fork tributary which included Boundary Cr. (up 1,160%), Bales Cr. (up 463%), and the East Fork mainstem (up 299%). The East Fork mainstem accounted for 61% of the total South Fork Coho population in 2006 and also exhibited the highest rearing densities anywhere in the Trask Basin outside of Elkhorn and Trib. D of the NF Trask. This stream segment was the primary destination for adult Coho spawners in the South Fork. The highest average rearing densities were documented in Trib. D of the East Fork (3.3 fish/sq.m.), Boundary Cr. (2.2 fish/sq.m.), and Bales Cr. (1.8 fish/sq.m.). These were the only habitats in the South Fork system which appeared to be seeded to capacity.

The Edwards Cr. tributary of the South Fork mainstem also exhibited significant Coho production in 2006 with an average rearing density of 1.4 fish/sq.m. and an expanded estimate of 7,395 summer parr (18% of the South Fork total). Based on the Coho rearing densities observed this year in the NF Trask and EF Trask tributaries, it is believed that the important stream habitat in Edwards Cr. could support roughly twice as many Coho as were found in 2006. Coho rearing densities in the EF and SF mainstem remained quite low in 2006 (around 0.5 fish/sq.m.) and could also sustain significantly larger populations of summer parr. Most other tributaries to the South Fork and East Fork were too steep to support Coho spawning or rearing but appeared very important to mainstem temperature maintenance. The main anchor habitats for Coho in the South Fork sub-basin, considering two years of reviewing habitat distribution, and expanded summer juvenile estimates, appeared to be the upper East Fork mainstem, Edwards Cr., and Boundary Cr..

Over winter survival may be a significant limitation in the SF Trask subbasin. Much of the Coho distribution observed here was in large order mainstem habitats containing long boulder rapids, abundant bedrock and a very low abundance of wood complexity. Few alcove pools or significant backwater habitats were observed for winter refugia. A few rock-weir and log structures were observed in the SF mainstem and in Edwards Cr that were attempting to address this potential limitation.

Stream habitats in the South Fork sub-basin have summer reared excellent numbers of older age class Steelhead during both survey years. This population expanded 22% in 2006 reaching to an estimate of 6,135. This accounted for 43% (as in 2005) of the Trask Basin total. Steelhead production in the South Fork sub-basin was 35% higher than in the North Fork sub-basin and roughly twice as high as in the Trask mainstem. Most production occurred in the South Fork mainstem (49%), the East Fork mainstem (33%), and Edwards (15%). Cutthroat estimates (3,840-expanded) in the South Fork sub-basin were also high and accounted for 41% of the Trask Basin total. This was a 25% decline from summer rearing estimates in 2006. Chinook summer parr abundance increased 79% for the 2006 survey and totaled 2,830 (expanded). Almost all were observed within the first 6.4 miles of the South Fork mainstem.

Mainstem SF Trask

(Table 9)
Expanded Mainstem SF Trask Estimates of Juvenile Production and Contribution to the 5th Field

Survey Year	Coho	0+	Sthd	Cut
2005	2,300	3,210	1,645	1,595
	(3%)	(7%)	(14%)	(13%)
2006	8,570	5,260	3,015	1,090
	(6%)	(12%)	(21%)	(12%)

- 20% visual bias not included

Coho production increased a notable 273% in the SF Trask mainstem in 2006. Coho rearing densities, however, remained low throughout 8.4 miles of the survey, averaging just 0.4 fish/sq.m. This suggests that potential remains for still higher summer parr production rates within mainstem habitats. Spawning peaks were observed of 1.1 fish/sq.m. at RM 2.7, 1.0 fish/sq.m. at RM 7.5, and 2.4 fish/sq.m. at RM 8. The mainstem segment accounted for 21% of the Coho in the South Fork sub-basin.

Spawning conditions appeared best between RM 5 and RM 7.5 where stream gradients decreased and fine gravels were abundant. Much of the SF Trask mainstem was dominated by boulder rapids and bedrock and long straight pools with little scour. Coho distribution ended in steep gradients at a small boulder/debris falls that appeared passable for adults. Steelhead and Cutthroat production has been relatively high in the South Fork mainstem for both inventory years with a substantial 83% increase observed for 1+Steelhead in 2006. This 1+Steelhead abundance was second only to the mainstem Trask. Distribution for this species in the SF mainstem was confined mostly to the lower 5 miles where 77% of its pool-rearing population was observed. Juvenile Chinook abundance increased by 83% (2,685 expanded) in the mainstem and were documented up to RM 6.4.

The low abundance of high quality winter habitat appears to be a significant limiting habitat factor for this reach. No culverts or Knotweed were noted. 2 small slides were noted.

Edwards

This was the most productive tributary in the South Fork sub-basin for Coho (not including the EF Trask mainstem) during both years of inventory. 3.5 miles of high quality spawning and rearing habitat in this stream and 1.7 miles in Boundary Creek represent some of the best opportunities for Coho in the South Fork. The highest average rearing densities in the sub-basin support this conclusion: 1.4 fish/sq.m. in Edwards and 2.2 fish/sq.m. in Boundary. Based on the rearing densities observed during 2006 in the NF Trask sub-basin, Edwards may have reached only half of its potential rearing capacity for Coho in 2006.

Coho production here increased 105% in 2006 with highest counts observed near RM 0.6 (2.3 fish/sq.m.). 60% of the summer rearing Coho population in Edwards was present below RM 1.5. Multiple rock and log structure pools were present in Edwards and Coho densities exhibited moderate improvement in response to these locations. Several wood jams and narrow canyon pinches have trapped a significant abundance of spawning gravels in the upper reaches. Production potential for Coho here is significant and currently adult escapement appears to be

the primary limiting factor. A particularly large full spanning debris torrent jam terminated Coho passage in Edwards.

Small upstream juvenile migrations were found in Tribs. A and C. 1+Steelhead production in Edwards remained high in 2006 despite a small 15% decline. This population represented 7% of the Trask Basin total and 15% of the SF Trask total, and was the second largest tributary population in the Basin behind Elkhorn (10.6 miles). Peak densities for 1+Steelhead in Edwards were observed in the first mile of survey. No Culverts. No Knotweed. 3 slides were encountered.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	3,610	0.3	3,510	1,105	560
2006	7,395	1.4	2,715	940	355

- 20% visual bias not included

Joyce, Summit, South

No Coho were present in these small tributaries in 2005. Spawning potential appeared minimal in steep gradients and high flows. Small upstream migrations of Coho summer parr were observed in each during the 2006 survey with expanded estimates reaching 20 (Joyce), 30 (Summit), and 45 (South). South was a tributary to Summit just upstream of its junction with the SF Trask mainstem. It is likely that these streams supply high quality cold water for the maintenance of summer temperature in the SF Trask mainstem. The protection of upslope riparian canopies on these tributaries in future forest management planning is highly recommended. 1+Steelhead and Cutthroat were present. No problem culverts were identified. No Knotweed.

Unnamed Tributaries

Tribs. A and D supported minor upstream migrations of Coho summer parr. Spawning potential was significant in Trib. A where abundant gravels and several log structures were observed. Anadromous potential in Trib. D appeared smaller although several structure logs were present along with a moderate (unquantified) abundance of spawning gravel. 1+Steelhead were also present in Trib. A. Mainstem temperature maintenance is the most important functional contribution for these streams. No problem culverts were identified. No Knotweed.

EF Trask

The East Fork sub-basin exhibited the greatest increase in Coho production within the Trask basin when compared to observed levels from the previous year. An increase of 378% (almost 5 times as many fish) was observed during the 2006 inventory. Adult escapement appears to have been significant. The East Fork of the South Fork Trask was a major producer for all fish species. A total expanded estimate of 25,700 Coho summer parr were present in the sub-basin in 2006, approximately 18% of the Trask Basin total. 2,120 (expanded) 1+Steelhead were also present, approximately 15% of the Trask Basin total. As the main tributary to the SF Trask, this sub-basin was responsible for 61% of the total South Fork Coho population and 35% of its 1+Steelhead population.

The most dramatic Coho increases were observed in Boundary Cr. (up 1,160%), Bales Cr. (up 463%), and the EF Trask mainstem (up 299%). Two years of data indicate the importance of the EF Trask mainstem and Boundary Cr. as major anchor habitats for Trask basin Coho. Boundary Cr. accounted for 18% of all East Fork Coho. The highest average rearing densities for Coho were found in Trib. D (3.3 fish/sq.m.), Boundary (2.2 fish/sq.m.), and Bales (1.8 fish/sq.m.). These were the highest average rearing densities in the Basin outside of Elkhorn and Trib. D of the NF Trask. Stream habitat in the above three reaches appeared to be very near full capacity for Coho. Substantial production increases are still possible in the EF mainstem.

Marginal Coho rearing was observed also in associated tributaries including Blue Bus, Miller, Rock, Steampot, and Trib. A. Coho distribution in the sub-basin totaled 13.7 miles.

Mainstem EF Trask

(Table 10)

Expanded Mainstem EF Trask Estimates of Juvenile Production and Contribution to the 5th field

Survey Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	4,445	5,055	1,945	1,860
	(6%)	(12%)	(16%)	(16%)
2006	17,715	2,960	2,000	1,310
	(12%)	(7%)	(14%)	(14%)

- 20% visual bias not included

69% of the EF Trask Coho population and 94% of the EF Trask 1+Steelhead population were documented rearing in the mainstem. Summer parr abundance for Coho increased 299%. This rearing segment was the largest contributor to SF Trask Coho production during both inventoried years and contained roughly twice as many summer parr as the SF Trask mainstem in 2006. Rearing densities for Coho in the 9.2 mile mainstem remained unusually low, at an average level of 0.5 fish/sq.m., but improved compared with last year's 0.09 fish/sq.m.. Two zones of significant spawning activity appeared in the density profile at RM 5 (1.2 fish/sq.m.) and RM 7.3 (3.1). These peaks lined up well with data from 2005 when spawning activity was noted at RM 6.2 and RM 7.5.

This first zone of significant spawning potential occurred just downstream from Boundary Cr. where a steep reach of boulders and bedrock has trapped a half-mile or so of gravel and fine sediments. The channel exhibited wide meanders and braids through here with large gravel bars and low floodplains. Solar exposure appeared to be high but several debris jams provided frequent opportunities for juvenile cover. Riparian vegetation was noticeably more diverse and abundant here compared to the rest of the high gradient mainstem. The second zone of high rearing densities was documented just downstream from Trib. D and coincided with a short stretch of high beaver activity contained within a relatively narrow canyon and stream channel. A few of these beaver dam pools also contained smaller debris piles that were packed with Coho parr during the 2006 survey. Channel sinuosity here also appeared unusually high for the East Fork and finer gravels were briefly more abundant. A legacy of beaver activity was apparent in this location.

Long reaches of bedrock and boulder rapids were more common along the EF Trask mainstem with several boulder steps breaking up stream gradients. Abundant spawning gravels and wide braided channels were present in intermittent patches. While production estimates

exhibited excellent improvement in 2006, indications based on NF Trask rearing densities this same year suggest that current Coho production remains well below the habitats potential. A 12 ft. sloped falls terminated Coho distribution. As in the SF Trask mainstem, over winter survival is a significant limiting factor here. 1+Steelhead abundance changed little in the EF Trask mainstem but remained the third largest component of the Basin-wide total. Steelhead distribution in 2006 was even. The intake dam for the EF Trask rearing pond presents a juvenile barrier at RM 0.6 where a small spike in 1+Steelhead densities was observed. No culverts were encountered on the mainstem EF Trask and no Knotweed. 5 slides were noted.

Bales

Bales Cr., Boundary Cr., and Trib. D were the only tributaries of the EF Trask which exhibited signs of Coho spawning in 2006. Production levels in Bales roughly matched production levels in Trib. D. As in most of the EF Trask, dismal Coho abundance in 2005 set these under seeded habitats up for dramatic increases in production in 2006. A stream wide average density of 1.8 fish/sq.m. suggests that the habitat may have been near its carrying capacity for Coho during the summer of 2006. An impassable log jam ended distribution. Much of the aquatic habitat in Bales was steep and rocky with intermittent occurrences of finer gravels, wide turns, and deep pools.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	285	0.24	70	75	50
2006	1,605	1.8	150	25	70

- 20% visual bias not included

Boundary

The single greatest recovery of Coho for all the Trask Basin components was observed in Boundary Creek where the 2006 population was estimated to be 1,160% larger than the 2005 population. The highest rearing densities in the SF Trask were found here (2.2 fish/sq.m., average) and in Trib. D of the EF Trask (3.3 fish/sq.m.). These were second only to Elkhorn and Trib. D of the NF Trask in the whole Trask Basin. Even considering the precedent setting densities in Elkhorn, the stream habitat in Boundary was probably very near its rearing capacity during the 2006 survey. Multiple density peaks were observed in the one mile long mainstem, eventually reaching 3.8 fish/sq.m. by the endpoint, and 0.2 miles of beaver enhanced distribution in the Stretch Cr. tributary averaged 3.3 fish/sq.m.. Coho distribution in Boundary totaled 1.7 miles including 0.5 miles of lower density rearing in the Headquarters Camp tributary. This tributary accounted for 38% of Boundary Creek's Coho production, including 12% from its side tributary, Stretch Creek.

Habitat conditions in the Boundary Cr. sub-basin appeared perfect for Coho. Stream gradients and flows were moderate and the channel displayed a high level of sinuosity and pool complexity. Floodplains were generally low and interactive. Fine sandstone gravels were noticeably more abundant in this sub-basin than in other parts of the South and East Fork Trask. Boundary Cr. and Edwards Cr. appear to be the two most important tributaries for Coho in the SF Trask sub-basin. The large wood jam at the beginning of Headquarters Camp Cr., which ended distribution in 2005, was apparently passed by adults in 2006. The beaver ponds just above this jam, at the mouth of Stretch Cr., exhibited some of the highest rearing densities in the

whole survey. Stream flow was higher in Headquarters Camp Cr. at its junction with Boundary Cr. Low numbers of Steelhead and moderate numbers of Cutthroat were present both years. No culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	360	0.14	800	65	465
2006	4,535	2.2	665	35	485

- 20% visual bias not included

Small Tributaries

Out of 10 small tributaries to the EF Trask, only 3 (Blue Bus, Pigeon, and Trib. A) exhibited minor upstream migrations of Coho in 2005. Coho summer parr were found in 6 of these streams during the 2006 survey, with signs of adult spawning in Trib. D. Small upstream migrations (less than 240-expanded) were observed in Blue Bus (0.2 miles), Miller (0.3 miles), Rock (0.4 miles), Steampot (0.2 miles), and Trib. A (0.2 miles). All these streams were steep and productivity appeared limited mainly by spawning gravel and stream gradient. Rock and Steampot exhibited the highest flows and, consequently, exhibited torrented stream channels dominated by exposed bedrock. Several log structures were noted in Steampot.

Habitats in Trib. D appeared the most promising for Coho. No summer parr were observed here in 2005. An expanded estimate of 1,220 summer parr were present during the 2006 survey at an average rearing density of 3.3 fish/sq.m.. Distribution extended 0.7 miles in this small stream before pool habitats disappeared. High densities were maintained the whole way with a spawning peak of 4.5 fish/sq.m. located near the end of distribution. Similar to Boundary Cr., Trib. D was one of the lowest gradient tributaries to the EF Trask. Stream flow was low although pool scour and gravel sorting appeared prime. Numerous log structures were present which are still just beginning to be incorporated into the stream channel.

1+Steelhead were observed in Miller, Rock, Steampot, and Trib. D. No culvert problems were observed within the range of Coho distribution. No Knotweed was found in this reach.

Wilson River Basin

Large increases in Coho production were observed across the Wilson Basin in 2006 in response to a surge in adult escapement for the 2005 winter brood. The observed 135% increase in summer parr represented a large increase in abundance of 122,255 Coho (roughly equal to 85% of the 2006 Trask Basin total). The total 2006 expanded estimate reached 212,980 Coho and accounted for 43% of the entire Tillamook Bay Watershed population. The Wilson Basin was the largest drainage in the Tillamook Bay Watershed and has been the most productive for Coho and Steelhead two consecutive years. 110 miles of Coho distribution were documented here in 2006.

The Wilson Basin Coho population was about 21% larger than the Trask basin population in 2005, which encompassed 90.6 miles of habitat. That difference grew to 47% during the 2006 inventory, reflecting greater potential for the Wilson during years of increasing adult abundance. Adult escapement in the Wilson for Coho was estimated by Bio-Surveys at 2,130 – 2,420 for the 2005 winter brood (a back-calculation from summer parr abundance). Most Wilson Basin Coho in 2006 were produced in the Little North Fork (30%), the Devils Lake Fork (18%), the North

Fork (13%), and the Wilson mainstem (11%). The most significant improvements in Coho production from the previous years inventory were observed in Cedar Cr. (up 500%), Jordan Cr. (up 392%), and the North Fork mainstem (up 248%). The single greatest improvement in Coho abundance, an increase of 38,970 (expanded) summer parr, was observed in the Little North Fork. The total expanded 2006 population here, within 11.8 miles of useable habitat, was 64,515 Coho. This was the most productive sub-basin in the entire Tillamook Complex of streams and accounted for 13% of all Tillamook Bay Coho production for the 2006 inventory.

The highest average rearing densities for Coho in the Wilson were observed in tributaries to the West Fork North Fork (up to 5.1 fish/sq.m.), Trib. A of the Devils Lake Fork (4.1 fish/sq.m.), tributaries to the Little North Fork (up to 2.2 fish/sq.m.), the South Fork Jordan (2.0 fish/sq.m.), and Ben Smith (1.7 fish/sq.m.). The highest average rearing densities among the larger mainstem habitats were found in the West Fork North Fork (1.4 fish/sq.m.) and the Little North Fork (1.3 fish/sq.m.). The sub-basins listed above appeared to be the most popular destinations for adult spawners and represent important anchor habitats for Coho in the Wilson Basin. Coho seeding in these reaches was probably very close to their rearing capacity during the 2006 inventory.

A minor 9% decline in 1+Steelhead abundance was observed in the Wilson Basin during the 2006 survey, mostly focused in the Devils Lake Fork (down 58%) and Jordan Cr. (down 43%). The Wilson mainstem abundance declined by 17%. Quantities of 1+ Steelhead in the Wilson Basin remained 54% larger than levels observed in the Trask Basin and accounted for 45% of the total Tillamook Bay Watershed population. Significant improvements in Steelhead production were observed in select sub-basins including Cedar Cr. (up 244%) and the West Fork North Fork (up 79%). The largest contributions for this species came from the Wilson mainstem (46%), the Little North Fork (19%), the North Fork (12%), and Cedar Cr. (6%). Most 1+ Steelhead summer rear in riffle and rapid habitats, which were not a part of this survey. A significant portion of the 1+Steelhead population was not included in the total estimates above. These data are for trend analysis only.

Most of the stream habitat present in the Wilson Basin was ideally suited for Steelhead. Long rocky riffles and rapids dominated most reaches and fine gravels were rarely separated from boulders and cobbles. High elevations surrounded most sub-basins and several surveys ended in tight gorges or bedrock waterfalls. Substrates were predominantly hard basaltic rock and boulder with frequent exposures of bedrock.

Extreme winter flows have led to wide open channels and high solar exposures in many streams reaches. Steep side tributaries to these large mainstem reaches which support no salmonid populations of their own are key sources of cold water for the maintenance of mainstem temperatures. It is this abundant high quality tributary flow that facilitates productive mainstem rearing. Upslope land uses should prioritize the protection of riparian canopies in tributaries such as Bear, Fall, Fox, Hughey, Jones, Kansas, Muesial, Ryan, South Wolf, Stanley, Sylvan, Wolf, and Zig-Zag.

High winter flows have also led to a general absence of large wood and channel roughness for the provision of complex cover for juveniles in most mainstem habitats. The best available alternatives for summer parr were the shallow pool margins and tail-outs which were quite extensive and abundant.

Most streams in the basin remained under-seeded for Coho and could support higher adult escapement and higher summer rearing densities. 60 slides were noted in the basin, including 15 in the North Fork and 12 in the Devils Lake Fork. The largest slides were

documented near the mouth of Elk Cr., on the lower Devils Lake Fork mainstem, and in the West Fork North Fork (including Rogers Cr.). The basin wide inventory and review below is organized by sub-basin – (1)Mainstem and tributaries, (2)Devils Lake Fork, (3)Little North Fork, (4)North Fork, and (5)South Fork.

(Table 11) Wilson River 2006 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Mainstem Wilson	22,875*	10.7	12,925*	21.6	10,025*	45.6	3,160*	34.5
-Beaver	575		45		55		75	
-Ben Smith	2,870	1.3	730	1.2	110		145	1.6
-Cedar	17,735*	8.3	5,285*	8.9	1,325*	6.0	605*	6.6
-Elk	5,355	2.5	1,780	3.0	525	2.4	170	1.9
-Fox	-		245		110		50	
-Jones	920		130		25		35	
-Jordan	15,585*	7.3	5,375*	9.0	930	4.2	715*	7.8
-South Wolf	35		95		-		50	
-Stanley	80		125		45		15	
-Wolf	70		215		20		80	
-Trib. B	315		-		-		20	
-Trib. E	535		65		-		65	
Devils Lake Fork	23,115*	10.9	2,320	3.9	600	2.7	205	2.2
-Deyoe	2,690	1.3	20		35		20	
-Drift	1,090		165		10		-	
-Elliot	3,785	1.8	235		60		60	
-Idiot	1,555		375		45		25	
-Trib. A	2,220	1.0	275		-		50	
-Trib. C	1,195		-		-		20	
-Trib. D	1,230		-		-		-	
-Trib. G	645		5		-		5	
Little North Fork	57,565*	27.0	13,905*	23.3	3,535*	16.1	1,115*	12.2
-Berry	2,030	1.0	505		265	1.2	100	1.1
-Blowout	855		235		55		120	1.3
-White	3,510	1.6	1,005	1.7	215	1.0	255	2.8
North Fork	11,825	5.6	3,825*	6.4	1,205*	5.5	415*	4.5
-WF North Fork	10,100	4.7	3,195	5.4	1,080	4.9	235	2.6
--Rogers	4,620	2.2	1,720	2.9	320	1.5	260	2.8
South Fork	13,250	6.2	2,560	4.3	1,145*	5.2	415*	4.5
-Trib. A	1,690		315		65		75	
-Trib. B	155		145		10		45	
-Trib. C	805		125		10		85	
Basin Total	**210,880**	**99**	**57,945**	**97**	**21,825**	**99**	**8,690**	**95**

* Highlighted estimates represent the top 5 producers by species and age class

- Percent contributions are indicated for only those sub-basins that contributed greater than 1% of the total.

- 20% visual bias not included

Mainstem Wilson

(Table 12)

Expanded Mainstem Wilson Estimates of Juvenile Production and Contribution to the 5th field

Survey Year	Coho	0+	Sthd	Cut
2005	17,455	35,310	12,030	1,995
	(19%)	(39%)	(50%)	(19%)
2006	22,875	12,925	10,025	3,160
	(11%)	(22%)	(46%)	(34%)

- 20% visual bias not included

Following basin-wide trends, expanded Coho estimates in the Wilson mainstem increased by 31% during the 2006 survey. This was an expected response as opposed to the decrease documented for the Trask mainstem. Coho rearing density in the Wilson mainstem more than doubled, although rearing density remained low at 0.1 fish/sq.m.. The density profile displayed a gradual climb to at 1.2 fish/sq.m. by the end of the 32 mile distribution (ending at the junction of the Devils Lake Fork and the South Fork). Highest pool counts for Coho were all seen above RM 12 up to the mouth of the South Fork. Two zero counts for Coho and several of the lowest counts were documented between RM 13 – 14.8 (around the mouth of Fall Cr.). Frequent bedrock exposure and an extreme lack of cover from predation were common features of this stream segment.. Avian predation in the mainstem appeared to be heavy and most Coho were found hiding in the shallow side margins of pools or tightly clustered under any small bit of woody debris. Upstream migrations of Coho due to predator or temperature related pressures were observed in most small side tributaries including Cedar (spawning also), Jones (spawning also), South Wolf, Stanley, and Tribs. B (spawning also) and E (spawning also).

Much of the mainstem channel displayed low floodplain terraces and abundant boulder/bedrock glide habitat. Pools were large and deep with very little wood complexity for cover. Stream gradients and substrate size were small through the first 6 miles of survey above the head of tide. Above the confluence of the Little North Fk the channel begins to transition in gradient and average substrate size. This reach provides abundant summer and winter rearing habitat for juveniles with low floodplains and extensive gravel bars. Elevated mainstem temperatures during summer flow regimes were apparent with observations of Stickleback to RM 8.

Wilson mainstem habitats in general are ideal for 1+Steelhead production. Long rapids, excellent pool formation, high stream flow, and rocky substrates are available in high abundance. The Wilson mainstem abundance of Steelhead during both survey years was the largest observed anywhere in the Tillamook Bay Complex. This population was equal to 70% of the entire Trask Basin population for 2006. A 17% decline in abundance for this species was observed in the Wilson mainstem during the 2006 survey, following a Basin-wide decline of 9%. Several pool counts still exceeded 100 individuals with the highest pool observation at 137 individuals (RM 4). Most of the mainstem 1+Steelhead were rearing below RM 26 in a steady decline from the RM 4 peak. A smaller spike in density, seen also in 2005, was again present at the survey's end near the junction of Elk, Devils Lake, and the South Fork (all major Steelhead producers).

Cutthroat numbers have been considerably lower in the mainstem during both inventories. Abundance levels for this species across the entire 32 mile mainstem were only 32% of observed 1+Steelhead abundance. This relationship was different in 2005 when Cutthroat

abundance equaled only 17% of 1+Steelhead abundance. Cutthroat density in general decreased as the survey progressed upstream, just as 1+Steelhead densities. Chinook summer parr were present throughout the entire mainstem survey in a similarly decreasing density profile. Expanded estimates for this species nearly doubled in 2006 to reach 30,900.

Knotweed infestation was high for the first 10 miles of survey, especially at the mouth of the Little North Fork, and was then intermittently present all the way up to Lees Camp. Infestation was particularly noted at the mouths of Fall, Muesial, and Jones Cr. Several large old slides were noted surrounding the steep canyon of Elk Cr. and the mainstem forks.

Beaver

Low level Coho spawning was observed in this small lower mainstem tributary of the Wilson in 2005 and 2006. Expanded estimates increased 311% in 2006 to 575 summer parr. The survey did not encompass the habitat between the north bank road crossing and the mainstem Wilson. The stream-wide average rearing density for Coho increased to 1.1 fish/sq.m. in 2006. A two foot concrete dam presents a juvenile barrier just below the end of Coho distribution and the presence of juveniles upstream of this barrier indicates that adults successfully passed and spawned above the barrier.

Gravel resources, forest cover, and sufficient pool scour were all present. Livestock impacts were high below the start point of the survey. An excellent restoration opportunity is present in this reach for livestock exclusion fencing and the removal of migration barriers. Low numbers of 1+Steelhead were present here in 2006. Cutthroat numbers remained exactly the same. One small slide was noted.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	140	0.5	40	-	75
2006	575	1.1	45	55	75

- 20% visual bias not included

Ben Smith

This sub-basin contained high quality spawning habitat for Coho and was nearly seeded to capacity during the 2006 survey. Coho production in this low gradient tributary increased by 34% since the 2005 inventory. An average rearing density of 1.7 fish/sq.m. in the mainstem exhibited widespread spawning activity throughout the entire 1.6 miles of distribution. Peak spawning may have occurred near RM 0.9 where rearing densities reached 2.9 fish/sq.m. This zone was located just upstream of Trib. A and exhibited a high abundance of fine spawning gravels, wood complexity, and low floodplains along with several log-structure sites that appear to be well placed and highly functional. Large accumulations of woody debris have gathered in this reach of widely braided stream channels. Stream gradient increased quickly upstream and Coho distribution ended in a massive debris torrent jam (20-30 years old).

23% of the total Coho were present in Trib. A with an average rearing density of 2.0 fish/sq.m.. A spawning peak of 2.7 fish/sq.m. was likely at RM 0.3. The small stream channel here displayed a high level of sinuosity and wood complexity with lots of cover for summer and winter rearing juveniles. 0.6 miles of distribution in Trib. A ended before the steep boulder falls near RM 1. Rearing densities for Coho in Trib. A and in the Ben Smith mainstem were among the highest in the Basin.

A steep bouldery entrance off of the mainstem Wilson is a probable obstacle for upstream temperature dependant migrations of juveniles during summer flow regimes. More than twice as many 1+Steelhead were present in 2006 as in 2005, while less than half as many Cutthroat were found. No Culverts were encountered. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	2,140	0.6	1,150	45	355
2006	2,870	1.7	730	110	145

- 20% visual bias not included

Cedar

The greatest increases in Coho production in the Basin were observed in the Cedar Cr. sub-basin. Expanded estimates for Coho rose 500% during the 2006 survey to reach 17,735 summer parr. This was a significant level of production for the Wilson River (8% of the Basin's total Coho) and amounted to the third largest tributary population, behind the Little North Fork and the Devil's Lake mainstem. Total distribution in the sub-basin for Coho summer parr increased by 0.7 miles to reach 6.5 miles, including 3.9 miles in the mainstem and 1.6 miles in Trib. C (the largest tributary). Average rearing densities rose accordingly to reach 1.3 fish/sq.m. in the mainstem, 1.5 fish/sq.m. in Trib. B (spawning), and 1.2 fish/sq.m. in Trib. C (spawning).

81% of the sub-basins Coho population was observed in the mainstem during both the 2005 and the 2006 surveys. The first peak in rearing density was found in the first pool of the survey (1.8 fish/sq.m.) and appeared to be due to a temperature dependent migration of juveniles out of the mainstem Wilson. Two major spawning peaks were identified further upstream, 2.7 fish/sq.m. at RM 1.8, and 1.9 fish/sq.m. near the end of distribution at RM 3.6. A large boulder jam ended Coho distribution. Pool frequency was minor in the mainstem due to long straight reaches of riffle and rapid habitats. This type of channel form exhibits limited winter habitat for the provision of low velocity hiding cover.

15% of Cedar Cr. Coho were observed rearing in Tribs. C and C1. Expanded estimates here for Coho increased 513% in 2006, from 420 to 2,575. Distribution extended for 1.1 miles in Trib. C and 0.5 miles in Trib. C1 (2.6 fish/sq.m. average). 4% of Cedar Cr. Coho were found in Trib. B (775 expanded) over 0.7 miles of distribution. Adult spawning appears to have occurred in all three of these reaches. Small upstream juvenile migrations were detected in Tribs. A and D. Surveys in all tributaries ended in steep gradients with multiple debris jams.

The greatest increases for 1+Steelhead in the Basin were also found in Cedar Cr. where expanded estimates rose 244%. This was notable for the 2006 inventory where most subbasins exhibited 1+Steelhead declines. The Cedar Cr. 1+Steelhead population was the third largest tributary population in the Basin behind the Little North Fork and the West Fork North Fork and accounted for 6% of the Wilson River total. Most were found in the lower half of the Cedar Cr. mainstem. No Culverts. No Knotweed. 4 slides were noted along the upper half of the mainstem and 2 in Trib. B.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	2,960	0.2	3,400	385	765
2006	17,735	1.3	5,285	1,325	605

- 20% visual bias not included

Elk

4.3 miles of low density Coho distribution has been observed for two years here, in steep boulders and high flows. Coho production increased during the 2006 survey, more than doubling in size. Average rearing density also increased but remained well short of full capacity at 0.7 fish/sq.m.. Most good spawning and rearing habitat was found in the first two miles of the survey. Pools were large in mainstem Elk and riparian canopy cover was good. Distribution ended in steep boulder rapids. Coho production potential remains much higher in lower Elk.

The West Fork of Elk has exhibited a small upstream migration of Coho summer parr during each survey. Average rearing density for Coho increased to 1.0 fish/sq.m. here in 2006. Several large boulder falls terminated distribution. Adult passage in this tributary appeared limited beyond 0.5 miles. Little spawning or rearing potential was recognized in Trib. A. No Culverts. No Knotweed. Slides were numerous in this steep canyon, numbering 8 in all.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	2,140	0.24	2,065	440	415
2006	5,355	0.7	1,780	525	170

- 20% visual bias not included

Fall

The area of drainage and active channel size are large in the Fall Cr. sub-basin. No Coho or 1+Steelhead have been detected here in two years of survey. Spawning potential upstream appeared moderate but stream gradient probably increased quickly above the short reach surveyed. The small 3 ft. bedrock falls present below the culvert should be modified for passage by the summer of 2007 when upstream juvenile migrations are occurring. This modification will be the result of a recent ODOT fish passage improvement project.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	-	-	15	-	75
2006	-	-	25	-	55

- 20% visual bias not included

Fox

A 3.5 ft. perched culvert (10 ft. diameter) was noted just upstream of the first pool on Fox Cr. Low level Coho spawning occurred between this culvert and the end of distribution at RM 0.9 in 2005. No Coho were seen here in 2006. 10 (expanded) juvenile Chinook were present. Stream gradient and substrate size increase substantially above RM 1 limiting any further spawning potential. Coho production potential appears higher than present levels. The perched culvert is the greatest limitation to spawning and upstream temperature dependent migrations of juveniles from the mainstem Wilson. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	440	0.3	950	210	180
2006	-	-	245	110	50

- 20% visual bias not included

Jones

Coho production increased by 156% in this small tributary in 2006. Expanded estimates and average rearing density nearly tripled along the short one mile of distribution in Jones. Stream gradients were steep in this stream and spawning gravel was limited. The best spawning potential appeared to be around RM 0.5 where rearing density peaked at 2.7 fish/sq.m.. A steep boulder falls limits distribution. Juvenile rearing densities during the 2006 survey suggest that the habitat was nearly seeded to its capacity for Coho. Significant cold water refuge from the Wilson mainstem is also provided by Jones. Low levels of 1+Steelhead and Cutthroat were present both years. No culverts. Knotweed was observed at the mouth of Jones. One slide was noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	360	0.5	230	40	55
2006	920	1.4	130	25	35

- 20% visual bias not included

Jordan

10 miles of high quality Coho habitat can be found in the Jordan Cr. sub-basin. Stream gradients were relatively high, especially in tributaries, and most substrates were composed of boulder and large rock. Pools were large and deep and summer flows were high. Spawning gravel abundance and pool surface areas appear sufficient to support high seeding densities. Despite the 392% rise in Coho abundance during the 2006 survey, a low average rearing density of 0.4 fish/sq.m. was observed. Indications are that summer production potential is substantially higher than current levels. Considering that the 2006 Coho population here of 15,585 (expanded) summer parr already accounts for 7.3% of the Basin-wide total, it is apparent that this reach exhibits a very high potential for Coho recovery and potential habitat restoration. This is one of the largest tributary sub-basins to the Wilson mainstem (not considering the North, South, or Devils Lake Forks) and one of the most productive for Coho and Steelhead.

57% of Jordan Cr. Coho were observed in the mainstem. 7.2 miles of Coho distribution was present with highest densities reaching 1.8 fish/sq.m. at RM 5.3. Another 41% of Jordan Cr. Coho were observed in high rearing densities (averaging 2.0 fish/sq.m.) along 2.5 miles of the South Fork. This reach exhibited the most dramatic improvement in the sub-basin. Many spawning peaks were detected in the 2006 density profile with the highest reaching 6.1 fish/sq.m. at RM 2. Most pools in the South Fork appeared to have reached their rearing capacity for Coho during the summer of 2006. Expanded estimates here in 2006 for Coho reached 6,440 compared to just 515 in 2005. Stream gradient was steeper in the South Fork than in mainstem Jordan, and the channel displayed less sinuosity and complexity. Coho distribution ended in long boulder rapids at a small bedrock falls.

Steelhead and Cutthroat abundance both declined by roughly 50%. The 1+ Steelhead abundance dropped from the third to the seventh largest in the basin for 2006. Three-quarters of Jordan Cr. 1+Steelhead were rearing in the mainstem, mostly below RM 3.4. Habitat in the Jordan sub-basin appears ideal for Steelhead. The juvenile Chinook population nearly tripled in Jordan Cr. in 2006 reaching 905 (expanded) summer parr and 4 miles of mainstem distribution.

Buck Cr. enters main Jordan in a deep gorge and spills over an impassable 15 ft. falls. Evidence of low level Coho spawning was detected in Spaur Cr. (190 summer parr, expanded)

where rearing density averaged a healthy 1.2 fish/sq.m. and distribution extended 0.3 miles. Phipps Cr. exhibited no Coho in 2006 and is limited by a series of falls (2 ft., 7 ft., and 4 ft.) to less than 500 ft. of available habitat. No culverts. No Knotweed. 4 slides were noted in the South Fork and 2 in the Jordan mainstem.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	3,165	0.2	5,060	1,635	1,545
2006	15,585	0.4	5,375	930	715

- 20% visual bias not included

Kansas

An 8 ft. step falls near the mouth of Kansas Cr. appears to be a partial barrier to anadromous migration. This stream displayed high flows at the mouth and steep forested slopes throughout the upper sub-basin. Kansas Cr. probably provides significant temperature maintenance to the Wilson mainstem.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	-	-	80	-	10
2006	-	-	35	15	15

- 20% visual bias not included

Muesial

No Coho have been found in Muesial. Anadromous distribution is limited by a 12 ft. falls approximately 200 ft. up from the mouth. This sub-basin is most important for its cold water temperature maintenance of the Wilson mainstem and upslope forest management should prioritize the water quality contribution of this Tributary. No culverts. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	-	-	30	10	10
2006	-	-	80	-	30

- 20% visual bias not included

Ryan

A minor upstream migration of Coho summer parr was observed here in 2005. No Coho were found in 2006. Adult passage in Ryan Cr. is limited by a large debris jam barrier 500 ft. up from the mouth. Future anadromous potential appears minimal. Temperature maintenance for the Wilson mainstem is the most important factor for the sub-basin. No culverts. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	20	0.2	20	-	5
2006	-	-	70	-	30

- 20% visual bias not included

South Wolf

Small upstream migrations of Coho summer parr were observed in South Wolf during both survey years. Wood jams and steep bedrock cascades are the main limiting factors here. Temperature maintenance for the Wilson mainstem is significant. No culverts. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	5	0.1	65	-	40
2006	35	0.7	95	-	50

- 20% visual bias not included

Stanley

A small upstream migration of juvenile Coho was observed in Stanley Cr. during the 2006 survey. Distribution ended at the cement culvert under the main road (250 ft. up from the mouth) which was perched by 4.5 feet and plunged onto cement and rock. The debris jam caught upstream of the culvert's trash rack created a second 4 foot falls. Future potential, assuming the culvert were passable, appeared minimal due to steep stream gradients. Temperature maintenance of the Wilson mainstem is the most significant contribution of this stream. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	-	-	10	15	35
2006	80	0.8	125	45	15

- 20% visual bias not included

Wolf

No Coho were present here in 2005. The minimal presence in 2006 of Coho summer parr observed upstream of the 4 ft. bedrock falls near the stream mouth suggests that a single spawning event must have occurred there during the 2005 winter brood. Total distribution extended just 0.2 miles before a 10 ft. debris jam terminated adult passage. Temperature maintenance of the Wilson mainstem is the most important contribution for the sub-basin. No culverts. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	-	-	185	55	85
2006	70	0.5	215	20	80

- 20% visual bias not included

Zig-Zag

Anadromous distribution in this sub-basin is terminated at the main highway crossing by a 5 ft. bedrock falls just below the 10 ft. cement culvert. This culvert has trapped a 20 ft. high wood and boulder jam on its upstream end. Stream gradient and substrate size appear too large for Coho spawning. Temperature maintenance to the Wilson mainstem is probably this stream's most significant contribution to salmonid production. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	-	-	-	10	40
2006	-	-	30	-	35

- 20% visual bias not included

Unnamed Tributaries

Trib. B showed signs of a significant upstream migration of Coho summer parr during both inventory years. 140 (expanded) Coho were present in 2005 over 0.6 miles of distribution and 315 (expanded) Coho were present in 2006 over 0.5 miles of distribution. Low level in-stream spawning may have contributed to the 2006 population which exhibited a 0.7 fish/sq.m. average rearing density. The peak density of 1.4 fish/sq.m. in the first pool of the survey likely represents temperature preferences in association with the mainstem of the Wilson. Spawning habitat here was extremely limited and siltation was heavy. A small 3 ft. culvert at the mouth of Trib. B is badly slumped in the center and nearly buried. This culvert appeared to be under-sized and needs to be repaired to maintain access to this stream. Stream flow and stream gradient were both very low in Trib. B and most pools were shallow and lacked diversity. Distribution ended where flows divided into several small seeps. No Steelhead were detected. No Knotweed.

Trib. E is small and steep and has a 4 ft. falls at the mouth. An 8 ft. square cement culvert with a fish ladder helps adult fish pass this falls but is still impassable for juveniles. No Coho or Steelhead were present in 2005. Low level adult spawning occurred here during the 2005 winter brood and 535 (expanded) Coho summer parr were found in the 2006 survey. A strong average rearing density of 2.4 fish/sq.m. was observed for a total of 0.5 miles before successive log jams and large boulders ended distribution. The main spawning peak appeared to be near the end of distribution where summer rearing densities reached 4.0 fish/sq.m.

This stream is limited mainly by the short distance of habitat available for anadromous spawners and the low abundance of fine spawning gravels available for Coho. The 2006 density profile for Coho suggested that the habitat was seeded to its capacity which means that production potential for this species in Trib. E is relatively low. No Steelhead were observed during either survey year. Cutthroat were present. No Knotweed. 2 slides were noted.

Devils Lake Fork

The Devils Lake Fork sub-basin displayed the most diverse and unique geology of all the tributaries in the Wilson Basin. The Devils Lake itself is an expansive, flat, swampy drainage on the summit of the Coast Range, the remnant of an ancient lake bed. Presently the Devils Lake Fork stream and its many tributaries wind back and forth across this wide floodplain through beaver ponds, slow backwaters, deep depositions of silt and sediment, and open grassy wetlands. Solar exposure through these upper reaches is high and the early successional riparian vegetation is lush. This type of low gradient, fine sediment habitat is rare in the Wilson River basin. Spawning gravels and even large rock were intermittently encountered within the stream channel.

Near the mouth of Deyoe Cr. (RM 6.4) the Devils Lake Fork begins to fall through a series of rocky gorges, getting steeper and steeper downstream, and finally enters the main canyon of the Wilson near the mouths of Elk Cr. and the South Fork Wilson. Stream channel and

vegetation characteristics completely shift in this zone from those of a low gradient wetland to those of a typical upper Wilson tributary – steep bedrock walls, long boulder rapids, no floodplain, etc.. Some of the best spawning opportunities for Coho were found in this transition zone between RM 3 and RM 6 of the mainstem. The only visible difference in the lower reaches of the Devils Lake Fork is the dark tannic water contributed from the headwater wetlands.

This sub-basin is one of the most important anchor habitats for Coho in the Wilson Basin. Coho production in the sub-basin was high during both years of inventory. The 2005 expanded estimate of 16,180 increased 132% in 2006 to 37,525. This was primarily the result of a basin-wide increase in adult escapement. The 2006 Devils Lake Fork Coho presence was the second largest in the Wilson Basin behind the Little North Fork and accounted for roughly 18% of the basin total. 34% more Coho were found here than in the entire North Fork sub-basin.

2006 surveys totaled 13.5 miles in the Devils Lake sub-basin which included the tributaries of Deyoe (0.8 miles), Drift (0.3 miles), Elliot (1.7 miles), Idiot (0.9 mile), and Tribs. A, C, D, and G. 62% of the sub-basin Coho total was observed rearing in the mainstem. Elliot and Deyoe were the two most productive tributaries (10% and 7%, respectively, of total sub-basin Coho). All tributaries displayed very high average rearing densities in 2006, up to 4.1 fish/sq.m. in Trib. A, and appeared to be seeded to capacity with respect to Coho.

1+Steelhead production, on the other hand, plummeted in the Devils Lake Fork during the second survey year. A total decline of 58% was observed. This rate of decline was significantly higher than the basin-wide decline of 9% for 2006. A similar decrease of 48% was observed in Devils Lake Fork Cutthroat abundance (from 755 down to 390, expanded). Expanded estimates for 1+Steelhead in the Devils Lake Fork dropped from 1,845 to just 775. This represented about 4% of the 2006 basin-wide total compared to 8% last year. 1+Steelhead production in this sub-basin was significant in 2005 and ranked as the third highest in the basin that year. Abundance levels in 2006 dropped the subbasin to eighth in the basin. 77% of the Devils Lake Fork 1+Steelhead were observed in the mainstem, almost completely in the first three miles of steep stream gradients.

Mainstem Devils Lake Fork

(Table 13)

Expanded Mainstem Devils Lake Fk Estimates of Juvenile Production and Contribution to 5th field

Survey Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	11,665	4,670	1,640	490
	(13%)	(5%)	(7%)	(5%)
2006	23,115	2,320	600	205
	(11%)	(4%)	(3%)	(2%)

- 20% visual bias not included

The Devils Lake mainstem supported 62% of the sub-basin's Coho and exhibited a 100% increase in abundance during the 2006 survey. Definitive Coho distribution in the mainstem for two survey years has extended 8.2 miles from the mouth of the South Fork Wilson to an 8 ft. bedrock cascade just upstream from Browns Camp. Above this cascade visibility deteriorates rapidly and the stream becomes dominated by ancient beaver pond habitats. Several of the headwater tributaries to this upper reach were surveyed in 2005, all of which displayed low flow habitats with heavy siltation and minimal anadromous spawning potential.

The best spawning and rearing potential for Coho in the Devils Lake Fork is found between RM 3 and RM 6. Excellent spawning gravels and wide channel braids were encountered here, just above a tight bedrock pinch in the canyon. Much of the finer sediments in this reach appear to have been supplied by Elliot Cr.. Mainstem rearing densities for Coho have been highest in this reach during both survey years and peaked at 2.2 fish/sq.m. in 2006. Following the rise in expanded estimates, average Coho rearing density in the mainstem also doubled in 2006 and reached 0.7 fish/sq.m.. Despite the significant improvement observed during 2006, densities suggest that additional production capacity exists.

Extensive beaver marsh habitats were also encountered in the middle of the survey, upstream of the high rearing densities and downstream of Browns Camp. Many good pools with abundant gravel supplies were present and wide braided floodplains surrounded the stream channel. Production potential for Coho appeared to be much higher in this zone than was realized and both summer and winter rearing habitats for juveniles appeared to be unlimited. Visibility was poor for much of the Devils Lake Fork survey and it is possible that Coho numbers were higher than reported.

77% of 1+Steelhead in the sub-basin were observed in the mainstem in 2006. The lower mainstem appeared to be a major Steelhead producer during the 2005 survey and supported the third largest juvenile population in the whole Basin that year (7% of the total). The population here experienced a decline of 63% during the 2006 survey, following Steelhead losses across the basin. As the eighth largest component of the 2006 Wilson Basin 1+Steelhead population, the Devils Lake mainstem accounted for just 3% of Basin-wide production. Almost all of the mainstem Steelhead during both survey years have been found within the first 3 miles of the survey where stream gradients were highest. Many adipose clipped residual steelhead were observed rearing in this reach.

The already small 2005 Cutthroat population in the mainstem dropped substantially (58%) during the 2006 survey and also decreased in density as the survey progressed upstream. Mainstem Cutthroat accounted for 53% of the sub-basin total. All culverts were in good shape. No Knotweed was observed in this reach in 2005. Five sightings were reported during the 2006 survey, all downstream of RM 2.5 where the bridge to Idiot Creek crossed. The road-fill under this bridge appears to have been the source. All sightings were of small clusters of young plants, some in the middle of the stream channel. This is a high risk situation for Knotweed because a large portion of the mainstem Wilson could be salvaged from this invasive if rapid treatment is pursued. These plants should be of the highest priority for removal. 5 slides were reported on the mainstem, including 3 large slides in the lower gorge.

Deyoe

Coho spawning has occurred in this small tributary during both survey years. Coho production increased 556% in 2006 and the average rearing density of 2.5 fish/sq.m. seemed to indicate that this stream was seeded to capacity. A peak density of 6.0 fish/sq.m. was reported at RM 0.3. The highest individual pool count of 90 Coho in the first pool of the survey suggests the presence of temperature limitations in the Devils Lake mainstem. Coho distribution extended 0.8 miles and accounted for 7% of the sub-basin population estimate. The lower stream channel in Deyoe was confined (no floodplain) with little sinuosity and clogged with legacy wood. Adult passage is probably difficult through this reach and spawning sites are few. Old beaver flats widened the channel in the middle of the survey. No culvert problems. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	410	0.4	30	30	20
2006	2,690	2.5	20	35	20

- 20% visual bias not included

Drift

The high rearing densities and expanded estimate observed for Coho in Drift Cr. during the 2006 survey suggest that adult spawning may have occurred within the first 0.3 miles of this stream before a large 12 ft. debris jam ended distribution. A long and steep boulder gorge upstream of this wood jam appears to end all anadromous potential in the sub-basin. Rearing density for Coho in this short reach averaged 2.4 fish/sq.m. Stream gradients in Drift Cr. were very high and substrates consisted mostly of boulders and bedrock. Spawning conditions for Coho appeared poor and water temperatures coming out of the steep Drift Cr. canyon were significantly lower than in the Devils Lake mainstem. This short habitat certainly represents important temperature refugia for all juvenile salmonids. No culverts. No Knotweed. One large slide was reported at the end of the survey.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	185	0.3	220	-	10
2006	1,090	2.4	165	10	-

- 20% visual bias not included

Elliot

Elliot Cr. was the largest producer of Coho among the Devils Lake Fork tributaries during both inventories. 9% of all summer parr in the sub-basin were found here in 2005 and 10% in 2006. The average rearing density for Coho in Elliot doubled during the 2006 survey and approached rearing capacity for the stream. Expanded estimates for Coho increased by 149% along with the rest of the sub-basin. Multiple spawning peaks were observed in the density profile with the most significant at RM 1. Coho distribution was terminated by the impassable University Falls at RM 1.5. A high density (4.0 fish/sq.m. average) was observed in Trib. A for 0.2 miles. Low stream gradients in Elliot and abundant supplies of fine gravels give this reach one of the highest production potentials for Coho in the Devils Lake sub-basin. 1+Steelhead and Cutthroat were also present in low numbers. No culverts. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	1,520	0.8	115	65	75
2006	3,785	1.6	235	60	60

- 20% visual bias not included

Idiot

This sub-basin exhibited a more moderate increase of 46% in its total Coho production. About 4% of all sub-basin Coho were produced here in 2006. The average rearing density was

1.3 fish/sq.m. and distribution extended 0.9 miles. The main spawning peak was found at the end of the survey. Much of the stream channel in Idiot Cr. was composed of large rock and bedrock exposures with patchy occurrences of finer gravels. A 20 Ft. bedrock cascade terminated Coho distribution. Future potential for Coho production appears limited mainly by the abundance of appropriate spawning gravel. 1+Steelhead and Cutthroat numbers fell significantly during the 2006 survey. No culverts. No Knotweed. A high frequency of land slides were found in this short reach, numbering 6 in all with one of them noted as large.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,065	0.6	365	85	85
2006	1,555	1.3	375	45	25

- 20% visual bias not included

Unnamed tributaries

High rearing densities for Coho were reported in Tribs. A, C, D, and G during the 2006 survey. Strong upstream migrations of summer parr were observed in all with signs of adult spawning as well. All four of these streams provided important temperature refuge from the Devils Lake mainstem for large numbers of juvenile Coho during the 2006 survey.

The most productive for Coho over two survey years appears to be Trib. A. Expanded estimates for Coho here increased from 485 to 2,220 summer parr in 2006, about 6% of the sub-basin total. Distribution in this small stream extended only 0.5 miles but averaged 4.1 fish/sq.m., one of the highest averages of any reach in the Wilson basin. Peak density reached an incredible 9.4 fish/sq.m This stream has probably reached its full rearing capacity with respect to Coho in 2006. No Steelhead. No culverts. Knotweed was reported at the mouth.

Evidence of Coho spawning was found also in Trib. C where the expanded estimate for Coho increased from 245 to 1,195 summer parr in 2006. Average rearing density reached 2.6 fish/sq.m. and exhibited a spawning peak of 3.3 fish/sq.m. near the end of distribution at RM 0.4. This stream also appeared seeded to full capacity in 2006. Stream gradient was low here and minor abundances of spawning gravels were noted. No Steelhead. Cutthroat were present in low numbers. The one culvert encountered was in good shape. No Knotweed.

Trib. D exhibited a culvert with a 1 ft. perch which appeared to be a juvenile barrier at low summer flow conditions. A significant spike in Coho densities (9.4 fish/sq.m.) was observed downstream of this culvert although Coho were also present upstream of this culvert. This evidence indicates two things: first, that a strong upstream migration of juveniles was occurring out of the Devils Lake mainstem that was terminated by the culvert, and second, that a spawning event occurred upstream of the culvert for the 2005 winter brood. Expanded estimates in Trib. D for Coho, the only species present, totaled 1,230 summer parr and rearing density averaged 4.6 fish/sq.m.. Total distribution extended only1000 feet. This habitat appeared to have reached its rearing capacity in 2006. Numerous beaver ponds encountered in Trib. D all appeared to be abandoned. No Knotweed.

Trib. G supported a smaller population of juvenile Coho during the 2006 survey, numbering 645 (expanded). Rearing densities were high, averaging 3.3 fish/sq.m. and peaking at 4.8 fish/sq.m.. Distribution extended just 0.3 miles. Upstream juvenile migration was occurring here, but spawning was also evident. Anadromous potential in Trib. G was minimal due to low flows and a narrow channel. Cutthroat were present. No Steelhead. No Culverts. No Knotweed.

Little North Fork

This sub-basin has played an extremely important role in the basin-wide production of Coho and Steelhead during both inventoried years. The 2006 increase in Coho production of 153% in the Little North Fork added the production of 38,970 (expanded) summer parr. This was the single largest gain in expanded estimates seen in the whole Tillamook Bay Watershed, surpassing the Elkhorn Cr gain of 25,620 summer parr (on the NF Trask). The Coho summer parr population in the Little North Fork has been the largest in the Watershed through two consecutive inventories. The total expanded estimate here in 2006 of 64,515 was equal to 30% of the total Wilson Basin expanded estimate and accounted for 13% of the Tillamook Bay Watershed population. 2006 Coho production in Elkhorn Cr., the next closest in size, accounted for 10% of the Watershed's population. These two sub-basins were the two most significant producers of summer Coho parr for the inventories conducted in 2005 and 2006. Both streams appear equally as critical to Steelhead production in the Tillamook Bay complex of streams..

A large abundance of high quality stream habitat was present in the Little North Fork. The combination of remote location, limited upslope impacts from harvest and the limited development of a road matrix results in a premier example of a functional 6th field sub-basin. The steepness of the canyon walls generally limit the potential for interactive floodplain habitats but several large debris jams were observed that are currently retaining abundant reserves of high quality spawning gravels. Coniferous riparian canopies were present along most of the stream that provided shade and potential wood recruitment to the mainstem. Stream gradients were moderate in general with boulder cascades and bedrock exposures occurring frequently.

2006 Coho production in the Little North Fork (11.8 miles) was almost twice as high as Devil's Lake Fork (13.5 miles) production and three times as high as production in the Wilson mainstem (32 miles). 89% of all Little North Fork Coho were observed in the 9.1 mile mainstem in an average rearing density of 1.3 fish/sq.m. This was a significant improvement from the 2005 average density of 0.42 fish/sq.m.. Most spawning activity was located both years between RM 5 and RM 7. 57% of the 2006 mainstem population was rearing in these two miles where individual pool counts reached 1,180 summer parr. Peak rearing density for Coho in this reach was 3.1 fish/sq.m.. High peaks in rearing density continued to the end of distribution, reaching 4.1 fish/sq.m. at RM 8 and 3.7 fish/sq.m. at RM 8.8. These levels suggest that large segments of upper mainstem habitats were likely near full capacity. Significantly higher production rates, however, are possible in the Mainstem's lower half. Coho distribution ended in a narrow gorge at a steep boulder falls. The stream climbed about 20 vertical feet here over 100 feet of horizontal distance. The presence of 1+Steelhead upstream of this gorge indicated that this falls was passed by adult Steelhead. Good spawning conditions were still present and abundant upstream of RM 9.3.

Expanded estimates for 1+Steelhead showed little change this year in the mainstem. The Little North Fork was, however, one of the few reaches in the Basin not to register a decline in abundance for this species in 2006. This sub-basin remained the single most productive for Steelhead among the Wilson River tributaries during both inventories. Almost half as many 1+Steelhead were found in the Little North Fork as were found in the entire Wilson mainstem. This stream is clearly a key player in the basin's overall Steelhead production and in 2006 accounted for 19% of the total. 57% of the observed Little North Fork mainstem population (3,535 expanded) was rearing between RM 3.5 and RM 6.5 in 2006. 65% of the 2005 population was observed in this same reach. Cutthroat distribution in the mainstem was more evenly spread

during both survey years, although highest counts also focused on the survey's midpoint. Expanded estimates for Chinook summer parr fell roughly 50% during the 2006 survey and totaled 1,360. Chinook were present in the mainstem up to RM 5. Knotweed infestation was heavy on both banks of the Little North Fork from the mouth up to the confluence of Trib A (RM 1.6). No culverts were encountered on the mainstem. 5 slides were noted in the sub-basin including 4 on the mainstem (2 large) and 1 in Berry.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	25,545	0.4	19,805	3,960	1,590
2006	64,515	1.3	15,990	4.105	1,690

- 20% visual bias not included
- includes all tributaries

Berry

Berry Cr. experienced a 119% increase in Coho production in 2006 and appeared to be seeded to capacity. Only 3% of the total Coho in the sub-basin were found in this short 0.5 mile reach. Adult Coho spawning has occurred here during both survey years within the first 1,200 ft. of stream where 2006 rearing densities peaked at 3.5 fish/sq.m.. Substrates consisted mostly of large cobbles interspersed with pockets of finer spawning gravels. An enormous 35 ft. high wood jam at RM 0.5 in a tight canyon pinch point represents a definitive adult barrier. No culverts. No Knotweed. One slide was noted.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	925	0.5	870	65	400
2006	2,030	1.9	505	265	100

- 20% visual bias not included

Blowout

0.24 miles of Coho distribution in 2005 in Blowout Cr. increased to 0.7 miles in 2006 while expanded estimates grew by 134%. This small tributary accounted for just 1% of sub-basin Coho totals. It appears that some combination of low level spawning and upstream juvenile migration was responsible for the high average rearing density of 1.6 fish/sq.m. observed during the second survey. Peak rearing density, near the mouth, reached 4.5 fish/sq.m.. This habitat was very near its seeding capacity in 2006. Distribution extended beyond several enormous wood jams and ended in low flows and small pools. No culverts. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	365	1.0	165	35	45
2006	855	1.6	235	55	120

- 20% visual bias not included

White

White Cr. was the most productive for Coho among the Little North Fork tributaries in 2006. This population accounted for 5% the total sub-basin Coho population and exhibited the highest average rearing density – 2.2 fish/sq.m.. Signs of in-stream spawning were non-existent here during the 2005 survey, but adult escapement occurred for the 2005 adult brood. One mile of distribution for Coho exhibited consistently high rearing densities which peaked at 5.6 fish/sq.m.. These figures suggest that White Cr., along with the rest of the Little North Fork tributaries, may have reached full summer rearing capacity for Coho during 2006. The series of 4 ft. boulder falls near RM 0.4 that stopped juvenile Coho migrations in 2005 was passed by adults in 2006. Flat stream gradients and ample spawning gravels were present upstream of the falls. No culverts. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	115	0.2	540	150	165
2006	3,510	2.2	1,005	215	255

- 20% visual bias not included

Unnamed Tributaries

Trib. A exhibited a minor upstream migration of 190 (expanded) Coho over 300 ft. before steep stream gradients and bedrock falls terminated distribution. 1+Steelhead and Cutthroat were also present. No culverts. Heavy Knotweed infestation was present at the mouth. This Tributary is a good reference for locating the start of the Knot weed infestation. The actual source location is slightly upstream of the Trib A confluence at an old stringer bridge crossing that no longer exists. The road work was the source of the plant. The fact that 3 different Knot weed sites in the Tillamook Complex of streams (Little NF Wilson, Idiot Cr bridge on the Devils Lake Fk. and the upper Miami River mainstem) are all associated with rock work, may suggest that a Knot weed infestation may exist at a local quarry site.

Trib. B also supported a small upstream migration of 25 (expanded) Coho summer parr. Distribution ended after 300 ft. and steep stream gradients limit production potential beyond 700 ft. in this stream. Cutthroat were also present. No culverts. No Knotweed.

Trib. C supported 340 (expanded) Coho in what looked like a strong upstream migration of juveniles. Peak rearing density of 3.3 fish/sq.m. was observed in the first pool of the survey. Average rearing density was near carrying capacity at 1.6 fish/sq.m. and distribution extended 0.4 miles. 1+Steelhead and Cutthroat were also present. No culverts. No Knotweed.

North Fork Wilson

In response to a basin-wide increase in adult escapement, juvenile Coho production in the North Fork sub-basin increased 195% during the 2006 inventory. Expanded estimates of 28,090 summer Coho parr were documented and distribution increased from 13.6 miles to 17.5 miles. The North Fork Coho population accounted for 13% of the basin-wide total in 2006, 25% less than the Devils Lake Fork and about half as much as the Little North Fork. This included the West Fork North Fork (4.2 miles) and its tributary Rogers Cr. (3.2 miles). Contributions to total

Coho production within the sub-basin were fairly similar between the NF mainstem (42%) and the WFNF mainstem (36%) and totaled 16% in Rogers.

The highest mainstem rearing densities for Coho reached 1.4 fish/sq.m. in the WFNF, but appeared well below full seeding in all three surveyed reaches. Small tributaries to the WFNF and Rogers exhibited significantly higher average rearing densities for Coho, up to 5.1 fish/sq.m., but were limited in distribution to less than 0.4 miles.

Healthy mixed species riparian canopies were encountered throughout much of the system as well as ample summer flows and deep pools. Low wood complexity was a consistent issue for juveniles seeking cover and many were observed rearing in the shallow pool tail-outs (unusual). Stream gradients were generally high and most stream miles were composed of long straight riffles and boulder rapids. Coho distribution in all three branches passed through numerous tight gorges and bedrock falls. Flat, gravelly tail-outs were generally lacking in most pools and the total number of suitable spawning sites may also be a significant limitation for North Fork Coho.

1+Steelhead estimates in the North Fork increased 36% in 2006 and totaled 2,735 (expanded). This represented about 12% of the Basin-wide expanded estimate. Increases in abundance for this species in the North Fork and its neighboring sub-basin, Cedar Cr., were among the only increases noted in the 2006 inventory. Stream habitats in the North Fork appeared ideally suited to Steelhead production and have exhibited some of the largest expanded estimates in the basin during both surveyed years. Individual stream estimates represented a moderate to low level of production and significant potential for improvement is still present in all reaches.

1+Steelhead in the North Fork were found mostly in the NF mainstem (44%) and the WFNF mainstem (39%) with an additional 12% in Rogers. Cutthroat expanded estimates in the sub-basin declined from 1,460 to 1,065 in 2006 and were most abundant in the NF mainstem (39%). More slides were counted in the North Fork sub-basin than anywhere in the Wilson Basin. 15 in all were noted, 5 of them large. No Knotweed was observed.

Mainstem North Fork

(Table 14)

Expanded Mainstem North Fork Estimates of Juvenile Production and Contribution to the 5th field

Survey Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	3,395	3,780	965	665
	(4%)	(4%)	(4%)	(7%)
2006	11,825	3,825	1,205	415
	(6%)	(6%)	(6%)	(5%)

- 20% visual bias not included

Large increases in Coho production were observed in the NF mainstem during the 2006 survey. Expanded estimates increased 248% from the previous year, average rearing density doubled, reaching 0.6 fish/sq.m., and distribution increased from 6.4 miles to 8.2 miles. Spawning peaks were identified at RM 3 (1.9 fish/sq.m.) and at RM 6.8 (1.8 fish/sq.m.). Substrates consisted mostly of cobbles, boulders, and bedrock with occasional patches of gravels. Floodplain interaction was minimal and the wide active channel appeared to support extremely large winter flows. Wood complexity and juvenile cover was minimal. Shallow pool

margins and tail-outs supported most summer parr. Adult passage was terminated by an 18 ft. falls at RM 8.2 that ended all anadromous potential.

Moderate 1+Steelhead production was observed in the North Fork mainstem during both surveyed years. Expanded estimates increased 25% in 2006 with most of the population rearing downstream of RM 4. This was the fourth largest 1+Steelhead tributary population in the Basin for the 2006 inventory (5.5%). Cutthroat densities were evenly distributed throughout the survey. No culverts. No Knotweed. 4 slides were noted.

Coho were present in four separate tributaries to the NF mainstem during the 2006 survey. Low level adult spawning was responsible for occupation of Tribs. A and C (405 and 430, expanded, respectively). 0.8 miles of distribution in Trib. A averaged 1.6 fish/sq.m. with a spawning peak of 4.2 fish/sq.m.. The culvert at the mouth of Trib. A, which is perched by 1 ft., was passed by adults. 0.6 miles of distribution in Trib. C averaged 1.5 fish/sq.m. Habitats in these two tributaries were probably close to full rearing capacity for Coho. Small upstream migrations of juvenile Coho, totaling 50 (expanded), each, were observed in Tribs. B and D. 1+Steelhead were present in all tributaries.

West Fork North Fork

Expanded estimates for Coho have been nearly identical in the WFNF mainstem and in the NF mainstem for two years now. Significant improvements in Coho production, measuring 195%, were documented in the WFNF during the 2006 survey and average rearing density increased to 1.4 fish/sq.m.. This was the highest average density observed in any of the three main sub-basins. Total distribution of 4.2 miles exhibited little change from the previous year. Multiple spawning peaks were observed, the most significant at RM 3. The largest pool counts (fish / pool) were all in the lower half of the survey. Habitat and channel characteristics in the WFNF were similar to the NF mainstem with high abundances of boulders and bedrock. Low abundances of spawning gravel could limit production.

High density Coho rearing was found in Trib. A of the WFNF during the 2006 survey which was the result of adult spawning. 610 (expanded) summer parr were present and the average rearing density was high at 5.1 fish/sq.m. Only 0.2 miles of distribution was observed. While Trib. A may be attractive to adult spawners, production potential appears minimal due to steep, impassable boulders below the stream fork at RM 0.2.

1+ Steelhead production in the WFNF mainstem increased 79% during the second survey year. This was the largest increase observed for the species outside of Cedar Cr. in the 2006 Wilson Basin inventory and was the fifth largest tributary population of 1+Steelhead. Cutthroat estimates fell 36%. Most 1+Steelhead and Cutthroat were observed in the first two miles of the survey. No culverts. No Knotweed. 6 slides were noted, 3 of them large.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	3,415	0.5	3,215	605	370
2006	10,100	1.4	3,195	1,080	235

- 20% visual bias not included

Rogers

Coho production in this tributary was high considering the short 2.6 miles of distribution. More Coho were observed here in 2006 than in the higher density populations of Ben Smith Cr.

(2.2 miles) or Elliot Cr. (1.7 miles). Expanded estimates increased 81% in Rogers during the second survey, in response to increases in adult escapement. Average rearing density remained moderate at 0.9 fish/sq.m. and the available habitat could sustain still higher production rates. The main spawning peak for Rogers has appeared during both survey years near RM 1.7. In 2005, 27% of all North Fork Coho production occurred in Rogers Cr. Following large improvements throughout the sub-basin in 2006, the 2006 Rogers Cr. contribution dropped to 16%. Higher pool frequencies were present in Rogers Cr. relative to the NF and WFNF mainstems. Spawning gravel was similarly limited and stream gradients increased quickly in all tributaries.

Trib. A was the most productive tributary for Coho at 420 (expanded). A high average rearing density of 2.9 fish/sq.m. was observed over 0.4 miles. A small upstream migration of 220 juvenile Coho was observed in Trib. B (500 ft.). Trib. C appeared too steep for anadromous use.

Steelhead and Cutthroat abundance in Rogers Cr. has shown relatively little change. No culverts. No Knotweed. 5 slides were noted in this short survey, 2 of them large.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	2,555	0.5	2,255	410	310
2006	4,620	0.9	1,720	320	260

- 20% visual bias not included

South Fork Wilson

Surveys in the South Fork Wilson started at the mouth of the Devils Lake Fork and continued 5.7 miles (including tributaries) to the end of Coho distribution in a narrow rocky canyon. Spawning gravels eventually disappeared but no definitive barriers to migration were noted in the 4 miles of mainstem distribution. An additional 1.7 miles of Coho distribution was observed in Tribs. A, B, and C. Expanded estimates for Coho in this sub-basin increased 60% in 2006, mimicking basin-wide trends. South Fork Coho totals accounted for 7.5% of the Wilson Rivers summer rearing population. 2006 Coho production in the South Fork was roughly equal to Coho production in Jordan Cr. (10 miles).

Habitat conditions were similar to most upper Wilson tributaries including long rapids, frequent bedrock exposures, and patchy spawning gravels. Maximum winter flow rates appeared substantially lower here than in the North Fork or the Devils Lake Fork. 83% of sub-basin Coho were observed rearing in the mainstem and 11% in Trib. A, the most productive tributary. An average rearing density of 0.8 fish/sq.m. was observed for Coho in the mainstem with a main spawning peak at RM 2.1. Production levels for Coho in this reach could be at least twice as high as 2006 levels with continued increases in adult escapement.

1+Steelhead production was high in the sub-basin, despite an 18% decline in abundance during the 2006 survey. 5.6% of the basin-wide population was observed in the South Fork, the third largest tributary population to the Wilson River after the Little North Fork and Cedar Creek. Large numbers of residualized hatchery Steelhead were present (fin clips). This was a phenomenon also observed during the 2005 survey. 93% of the South Fork population was observed in the mainstem. Cutthroat densities remained low in the sub-basin. No culverts. No Knotweed.

Trib. A traversed the South Fork Prison Camp and exhibited 0.9 miles of Coho distribution during both survey years. Expanded estimates increased from 480 to 1,690 summer

Coho parr. Average rearing densities were high, 3.0 fish/sq.m., and a spawning peak with densities of 6.6 fish/sq.m. was observed at RM 0.5. These levels suggest that the habitat here had probably reached full rearing capacity for Coho during the summer of 2006. Spawning conditions and pool complexities in this stream were some of the best observed in the whole sub-basin. Fine gravels and interactive floodplains were noted. Coho distribution ended in steep gradients. Steelhead and Cutthroat were present in low numbers. No culverts. No Knotweed. One slide was noted.

Trib. B supported low level Coho spawning in 2005 but showed signs of upstream juvenile migration only in 2006. 155 (expanded) summer parr were present during the 2006 survey in an average rearing density of 0.9 fish/sq.m. over 0.3 miles. 1+Steelhead and Cutthroat were present in low numbers. Coho potential in this stream appeared minimal due to steep gradients and a lack of fine gravels. No culverts. No Knotweed.

Trib. C exhibited signs of upstream juvenile migrations of Coho as well as adult Coho spawning during the 2006 survey. Expanded estimates in 2006 reached 805 summer parr with a high average rearing density of 1.9 fish/sq.m. Distribution extended 0.5 miles and was limited by low flows and steep bedrock. Spawning and rearing habitat in Trib. C appeared suitable for Coho although total production potential for the stream appears to have been reached by the 2006 population. 1+Steelhead and Cutthroat were also present in low numbers. No culverts. No Knotweed. One slide was noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	9,920	0.3	5,050	1,500	425
2006	15,900	0.8	3,145	1,230	620

- 20% visual bias not included

Kilchis River Basin

Expanded estimates for Coho in the Kilchis Basin more than doubled from the previous year during the 2006 survey. Increases in adult escapement led to a high summer parr production rates. This was especially in the North Fork and the Little South Fork. The basin-wide total for Coho was 79,820 (expanded) in 2006, just over one-half of the total Trask Basin population (82.2 miles) and more than three times the size of the Miami Basin population (28.8 miles). 46.6 miles of total distribution for Coho summer parr in the Kilchis Basin exhibited no change from 2005 distributions and may be a good representation of the current limit of adult escapement for this species.

The primary anchor habitats for Coho in the Kilchis Basin during both years of inventory have appeared to be the 14.5 mile Mainstem and the 7.6 mile North Fork. Summer production in these two reaches accounted for 34% and 21%, respectively, of the basin total. Both of these habitats experienced large increases in Coho production during the 2006 survey. Improvements, between these two reaches, was greatest in the North Fork (up 169%) where average rearing density increased to 1.8 fish/sq.m. and peak densities were in the range of 10.8 fish/sq.m.(exceptionally high). The upper 2.5 miles of the North Fork displayed the highest sustained average rearing density in the basin, 3.1 fish/sq.m., and appeared to be one of the most heavily targeted zones for adult spawners. A single pool in the Kilchis mainstem was observed rearing 1,426 (not expanded w/ 20% snorkel bias) Coho, the highest individual pool count in the

Tillamook Bay Complex of streams. Indications from this odd distribution of Coho suggest that avian predation is a large factor in the summer survival of Coho parr in the mainstem. Habitats are ideal for the flock hunting behavior exhibited by mergansers (clear, deep and no woody complexity), and many hunting families and heavy scat were observed.

Improvements in Coho production relative to the whole basin were greatest in the Little South Fork where expanded estimates increased 731% from the previous year (1,625 in 2005 to 13,505 in 2006). This was the third largest rearing segment in the basin (17%). Several streams in the basin appeared seeded to capacity with respect to Coho in 2006. These included Murphy Cr. (2.2 fish/sq.m.), Trib. A to the Mainstem (2.4 fish/sq.m.), Company Cr. (2.5 fish/sq.m.), and the North Fork (1.8 fish/sq.m.). These observations indicate substantial improvement over 2005 rearing densities when the highest average rearing densities in the basin were 1.0 fish/sq.m. (Company Cr.).

The 2006 expanded estimate of 8,090 1+Steelhead for the Kilchis Basin indicated a minor 6% decline since the 2005 survey. This was, again, the third highest expanded estimate in the Tillamook Bay Complex of streams after the Wilson (21,985) and the Trask (14,260). 2006 1+Steelhead estimates also declined in the Wilson basin by 9%, and the Miami Basin by 51%. The largest populations of 1+Steelhead in the Kilchis Basin in 2006 were observed in the Mainstem (38%) and the Little South Fork (24%), similar to 2005.

Much of the Kilchis Basin was surrounded by high elevations and intact riparian and upslope forests. Numerous side canyons too steep for Coho were observed delivering high summer flows of cold water to lower mainstem habitats. Canopy cover in these drainages is critical to maintaining the high water quality observed in these large mainstem pools on the valley floor. Upslope coniferous wood resources represented significant potential for future recruitment to tributary habitats. 30 slides were reported in the Basin, mostly in Schroeder Cr. (5) and Sam Downs Cr. (5). Large slides were noted in Clear Cr., the Little South Fork, Sam Downs Cr., and Company Cr..

Most mainstem habitats appeared to support large winter flows and limited mainstem roughness was observed associated with wood complexity. Stream gradients were high throughout the Basin with boulder rapids and bedrock dominating the substrates in all reaches except the lower mainstem and the tidewater tributaries. Vast networks of tidal channels and sloughs were present surrounding the mouth of the Kilchis which provide high quality summer and winter rearing for anadromous juveniles. A unique distribution pattern was noted in the Kilchis mainstem in 2005 where the abundance for all four species of salmonid juveniles remained high into intertidal habitats. This pattern was again observed in 2006 and was also present in the Miami mainstem distribution profile as well. This observation suggests that preservation of upper basin contributions of cold water may be the single greatest factor to maintaining extensive summer production within the lower mainstem. No Knotweed has been observed in the Kilchis basin for two consecutive years (this is the only major basin without Knotweed in the Tillamook Bay complex of streams). The basin-wide review below is broken down into two sections: (1) the Mainstem and tributaries and (2) the North Fork sub-basin and tributaries.

(Table 15) Kilchis River 2006 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Mainstem	27,310*	34.2	11,240*	42.4	3,055*	37.8	780*	22.8
-Clear	3,635*	4.6	595*	2.2	400	4.9	430*	12.6
-Coal	1,025	1.3	80		15		100	2.9
-Doty	-		-		-		5	
-Little South Fork	13,505*	16.9	6,945*	26.2	1,920*	23.7	590*	17.2
--Sam Downs	4,795*	6.0	875*	3.3	460*	5.7	255*	7.4
-Murphy	950	1.2	100		20		90	2.6
-Myrtle	25		210		15		110	3.2
-South Fork	1,880	2.4	300	1.1	465*	5.7	75	2.2
--Company	2,775	3.5	320	1.2	140	1.7	105	3.1
-Vaughn	45		-		-		10	
-Trib. A	1,050	1.3	60		5		135	3.9
-Trib. B	60		85		-		35	1.0
-Trib. D	200		20		5		-	
-Trib. E	825	1.0	275	1.0	50		80	2.3
-Trib. J	35		60		-		30	
North Fork Mainstem	16,440*	20.6	3,850*	14.5	1,240*	15.3	235*	6.9
-Fossil	370		135		-		15	
-Schroeder	2,545	3.2	595*	2.2	165	2.0	70	2.0
--French	970	1.2	210		110	1.4	50	1.5
-Triangulation	410		15		-		45	1.3
-Trib. A	135		65		5		-	
-Trib. E	245		5		-		15	
Basin Total	**79,230**	**99.3**	**26,040**	**98.1**	**8,070**	**99.7**	**3,260**	**95.2**

* Highlighted estimates represent the top 5 producers by species and age class

- Percent contributions are indicated for only those sub-basins that contributed greater than 1% of the total.

- 20% visual bias not included

Mainstem Kilchis River

(Table 16)

Expanded Mainstem Kilchis River Estimates of Juvenile Production and Contribution to the 5th field

Survey Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	14,135	14,845	5,575	810
	(45%)	(54%)	(65%)	(26%)
2006	27,310	11,240	3,055	780
	(34%)	(42%)	(38%)	(23%)

- 20% visual bias not included

2006 estimates for summer rearing Coho in the Kilchis mainstem (14.5 miles) were higher than Wilson (32 miles) or Trask (14.1 miles) mainstem estimates. Coho abundance here was nearly identical to that of mainstem Elkhorn Cr. (6 miles) in the Trask Basin and about half that of the Little North Fork Wilson. The mainstem reach of the Kilchis River represented critical habitat for 34% of all Coho and 38% of all 1+Steelhead in the Kilchis Basin during the 2006 survey. Highest counts in the basin for all species have been found in the mainstem Kilchis

during both inventoried years. This river segment, which ends at the North and South Forks confluence, appears to be the most important component of summer fish production in the basin.

In response to increased adult escapement, expanded estimates for Coho in the mainstem increased 93% in 2006. Average rearing density for Coho, however, remained extremely low (0.1 fish/sq.m.). The pool at RM 13.7 contained an unusually large number of summer parr, also the highest count of the survey, 1,426 Coho (not expanded). This was, in fact, the highest count for an individual pool in the whole 2006 inventory, including the Little North Fork Wilson (up to 1,180). Substantial additional carrying capacity is present within the mainstem.

The mainstem channel showed impacts of extreme winter flows. Both wood complexity and floodplain interaction were minimal. Most Coho rearing was observed in shallow pool margins and tail-outs and under bedrock ledges. Fine gravels were present in most pools in the upper mainstem and riparian canopy coverage was excellent. A tight pinch point provided by opposing hillslopes is present immediately upstream of RM 12 with large exposures of bedrock and a few small pours. The North and South Forks diverge just above this prominent bedrock intrusion.

Brush revetments and rock barb structures in the lower portions of the Kilchis River appeared to be providing high quality habitat complexity within the reach. Highly effective cover and the provision of back waters and eddies at these locations was evident in increased local rearing densities of all species of juvenile salmonids.

2006 mainstem estimates for 1+Steelhead decreased 45% while Cutthroat abundance exhibited little change. The decline in 1+Steelhead here was balanced on the basin scale by large increases in abundance for the North Fork (up 296%). As in 2005, 1+Steelhead densities in the mainstem decreased as the survey progressed upstream (an unusual distribution). The highest individual pool count was found at RM 0.7 (140 Steelhead) and all of the lowest counts were above RM 11.4. Several large 20”-22” Cutthroat were again observed in the lower mainstem. Juvenile Chinook were present all the way through the Kilchis mainstem into the NF Kilchis mainstem in 2006. 12,285 (expanded) were estimated for the Kilchis mainstem and 30 (expanded) for the NF Kilchis. No culverts were present. No Knotweed was observed.

Clear

Low Coho production in Clear Cr. in 2005 increased 226% in 2006, more than tripling summer production. Average rearing density was a moderate 0.7 fish/sq.m. and exhibited a spawning peak of 2.2 fish/sq.m. at RM 0.7, very near the location of last year’s spawning peak. There was no evidence of an upstream migration of Coho from the lower Kilchis mainstem at the mouth of Clear. Total distribution extended 2.1 miles. These Coho represented 5% of basin-wide production. Indications are that Clear Cr. could support much higher levels of production.

1+Steelhead production decreased 26% in Clear while Cutthroat estimates increased 132%. Distributions for these species were even throughout their range. Chinook were also present in low numbers. No culverts. No Knotweed. 7 slides were reported along Clear Cr. (1 Large), comparatively a high frequency, indicating steep unstable upslope conditions (2.1 mile survey).

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,115	0.4	710	540	185
2006	3,635	0.7	595	400	430

- 20% visual bias not included

Coal

Coho production also nearly tripled in the Coal Cr. sub-basin. Expanded estimates exhibited a 193% increase and the average rearing density was 1.3 fish/sq.m. In-stream spawning in Coal Cr. was responsible for the 2006 Coho present here. Multiple spawning locations were present in the density profile for Coal Cr. Distribution extended 1.4 miles for Coho which was similar to distributions observed in 2005. A 10 ft. bedrock falls at RM 1.4 ends anadromous potential. Steelhead and Cutthroat were present in low numbers. No culverts. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	350	0.4	110	145	20
2006	1,025	1.3	80	15	100

- 20% visual bias not included

Doty

Surveys in Doty Cr. have extended just under a mile, starting at the head of tide, during both inventory years. This tributary traverses marshy floodplain habitats to the North of the Kilchis tidewater through Idaville. Visibility was poor both years but sufficient to determine presence or absence. No Coho have been observed. Anadromous spawning potential was minimal due to low flows, low stream gradients, and a lack of spawning gravel. Some winter rearing of salmonid juveniles may be occurring in the tidewater portions of Doty. Culverts were all passable for adults and juveniles. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	-	-	10	-	-
2006	-	-	-	-	5

- 20% visual bias not included

Little South Fork

The Little South Fork (6.4 miles) and the North Fork (12.3 miles) have been the two most productive sub-basins in the Kilchis for Coho during both survey years. Coho production estimates increased considerably (486%) in the Little South Fork in 2006 but remained about 14% lower than in the North Fork. Little South Fork Coho totals (18,300 expanded) in 2006 accounted for 23% of Basin-wide estimates, 17% from the mainstem and 6% from its main tributary, Sam Downs Creek. These production levels represent excellent improvement over the unusually small Coho population observed in this sub-basin last year (3,125 expanded) which accounted for only 10% of the Basin-wide population.

The most significant improvement in the 2006 Kilchis basin inventory was documented in the mainstem component of the Little South Fork where expanded estimates for Coho increased 731%. This represented an increase of 11,880 summer parr in the 3.9 miles of habitat present and was the second largest tributary population of Coho in the Basin (13,505 expanded) after the North Fork mainstem (16,440 expanded). The mainstem reach of the Little South Fork was extremely under seeded for all fish species during the 2005 survey. Average rearing density for Coho was 0.8 fish/sq.m. in 2006, which suggested that additional production capacity exists in the reach. Two main spawning peaks were located at RM 2.4 (1.2 fish/sq.m.) and RM 3.4 (2.4

fish/sq.m.). A 10 ft. debris torrent jam terminated Coho distribution. No 1+Steelhead were observed upstream of this jam and it currently functions as a barrier to anadromous migration.

1+Steelhead production in this sub-basin has been significant (2,380, expanded, in 2006) and was again the second largest producer in the basin (29% of the basin total). Abundance levels for this species increased 109% since the 2005 survey (only 13% of basin total). Most 1+Steelhead in the sub-basin (81%) were rearing in the LSF mainstem. No 1+ Steelhead or Cutthroat were observed in the first 1.5 miles of the LSF mainstem during the 2005 survey. No explanation was evident for this unusual distribution. Steelhead and Cutthroat were both present throughout 3.9 miles of Coho distribution in 2006, densities were lowest at the start of the survey. 1+Steelhead densities peaked at RM 2.4. This reach supported the largest tributary population of 1+Steelhead in the basin for 2006 (24% of Basin total). Juvenile Chinook estimates totaled 370 (expanded) in the mainstem and were present up to RM 2.

Upslope elevations surrounding the Little South Fork were high and most tributary habitats in the sub-basin were too steep to support significant anadromous spawning. Small upstream migrations of Coho (145 and 250, expanded) were noted in Tribs. A (0.3 miles) and C (0.4 miles), respectively. The mainstem exhibited ideal spawning substrates for both Steelhead and Coho. Pools were large and clear and high abundances of all substrate sizes were present. Extensive boulder rapid habitats greatly outnumbered pool habitats and significant numbers of 1+Steelhead rearing in these rapids were not documented in this inventory. The second growth forest canopy along the stream provided contiguous shade. High summer flows and low temperatures were noted, due to the influence of many steep 1st and 2nd order tributaries. The retention of riparian canopies in these small drainages will be critical for maintaining the current high water quality observed. No Culverts. No Knotweed. One large slide was noted near the middle of the survey.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,625	0.2	725	895	220
2006	13,505	0.8	6,945	1,920	590

- 20% visual bias not included
- not including the Sam Downs tributary

Sam Downs

Sam Downs was the only major tributary to the Little South Fork. Coho production was significant here, accounting for 6% of the 2006 basin-wide total in just 1.8 miles of distribution. This represented 26% of LSF sub-basin Coho production and was the 4th largest component of the basin-wide summer Coho population. Expanded estimates for Coho increased 220% in Sam Downs and distribution increased by 0.6 miles. Average rearing densities for Coho were the same as in the LSF mainstem, 0.8 fish/sq.m., with the highest levels, up to 1.3 fish/sq.m., occurring in the first 0.5 miles of survey. Evidence of an upstream migration of LSF Coho was visible in the first pool of the Sam Downs survey. As in the LSF mainstem, the above rearing densities suggest that the habitat is capable of higher levels of summer production.

Coho distribution ended at a 4 ft. falls which was passed by Steelhead. 1+Steelhead abundance increased 88% in Sam Downs while Cutthroat abundance exhibited no change. Steelhead densities displayed a steady decline as the survey progressed upstream. Tribs. A and B to Sam Downs showed evidence of minor upstream migrations of juvenile Coho that were stopped by a 12 ft. falls (Trib. A) and steep boulders (Trib. B). A 30 ft. falls in Trib. C prevented

anadromous use. 35 (expanded) juvenile Chinook were also present. No Culverts. No Knotweed. 5 slides were noted in this short survey, one large.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	1,500	0.4	865	245	255
2006	4,795	0.8	875	460	255

- 20% visual bias not included

Murphy

A combination of in-stream Coho spawning and upstream juvenile migration was observed in Murphy Cr. during both survey years. Coho production increased 222% here in 2006 and average rearing density was high at (2.2 fish/sq.m.). Extremely high rearing densities, up to 5.2 fish/sq.m., were observed at the start of the survey reflecting the preference among summer parr for the refuge provided at the mouth of Murphy Cr. relative to the Kilchis mainstem. A steady decline in density was observed from that point on.

Approximately 1,200 ft. of lower Murphy that paralleled the roadside was heavily enshrouded in blackberry and could not be surveyed. These pools were most likely supporting very high Coho rearing densities. It was estimated, based on the adjacent pool frequency and counts, that approximately 850 (expanded) Coho were not quantified, which would bring the total 2006 population up to approximately 1,800 summer Coho parr. This estimate, however, was not included in the table below or in the Kilchis Basin table above since the figures do not exist in the main pivot-table database (only in the comments section of the original Access database). This same portion of stream was also not surveyed in 2005 so comparisons between years are accurate.

The larger estimate is given here to better illustrate the production potential present in the lower 0.5 miles of Murphy. Distribution appears limited beyond 1.1 miles in Murphy due to a rapid increase in stream gradient upstream of the pasture habitats. This stream appeared to be seeded to capacity during the 2006 survey. Production potential beyond the level observed in 2006 appears minimal. Spawning gravel and wood complexity were both present upstream of the influence of the agricultural zone. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	295	1.0	75	30	55
2006	950	2.2	100	20	90

- 20% visual bias not included

South Fork

Increases in Coho production were generally smaller in the South Fork sub-basin than in the North Fork and Little South Fork. Expanded estimates were also much lower. The biggest reason for these differences appears to be the series of 6-8 ft. falls on the mainstem near RM 1. Coho and Steelhead passed this falls during the 2004 winter brood and Coho summer parr were present in the upstream reach during the 2005 survey. Apparently no Coho passed this gorge during the 2005 winter migration and no Coho summer parr were present upstream during the 2006 survey. 1+Steelhead were seen above this gorge both years. With most of the mainstem

unavailable intermittently to adult Coho spawners, the only significant habitat consistently accessible in the sub-basin is Company Creek (1.5 miles).

Steep stream gradients and abundant bedrock exposures describe the general habitat conditions in the lower mile of mainstem and production potential for Coho appears relatively low. An excellent stretch of fine spawning gravels and sinuous pools was observed above the gorge in 2005 with near-perfect conditions that extended to RM 4 where huge bedrock outcroppings and a 4 ft. falls terminated Coho distribution. Expanded estimates for Coho increased 90% in 2006 for the sub-basin as a whole, mostly in Company Cr. This segment of the population (4,655 expanded) represented 6% of the basin-wide total. 40% of these Coho were found in the lower 0.8 miles of the SF mainstem in a low average rearing density of 0.3 fish/sq.m. A 20% increase was observed in Coho production for this small reach during the 2006 survey. Peak rearing density reached 0.7 fish/sq.m. at RM 0.2. It appears that higher production levels for Coho are still possible in the lower SF mainstem.

1+Steelhead production was moderate in the mainstem and appeared to increase considering that the much shorter distance surveyed in 2006 displayed a similar total abundance. 2006 abundance levels for this species were higher upstream of the gorge. Cutthroat abundance decreased predictably with the decreased survey distance. No culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,575	0.1	2,245	445	180
2006	1,880	0.3	300	465	75

- 20% visual bias not included
- not including Company Cr.

Company

Most adult Coho returning to the SF Kilchis during the 2005 winter season targeted Company Creek for spawning. The mouth of Company is just downstream from the steep boulder gorge in the SF Kilchis and probably attracted many of the adults deterred by that barrier. 60% of the SF sub-basin summer parr population was found in Company Cr. in a high average rearing density of 2.5 fish/sq.m. and a distribution totaling 1.5 miles. Production rates for Coho improved significantly in Company Cr. during the 2006 survey in response to increased adult escapement. Expanded estimates for summer parr increased by 186%. Most spawning appeared to be centered on RM 0.9 where a peak rearing density of 4.3 fish/sq.m. was observed. These were among the highest rearing densities for Coho found in the Kilchis Basin during the 2006 inventory (along with the upper North Fork). This tributary was probably seeded to capacity during the summer of 2006.

Stream habitats and upslope forest integrity was classified as excellent throughout the Company Cr. survey. Coho distribution ended in long, steep boulder rapids which exhibited limited additional potential for spawning. 1+Steelhead numbers increased substantially here during the 2006 survey and Cutthroat exhibited little change. No culverts. No Knotweed. 4 slides were noted, 2 of them large.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	970	1.0	245	40	110
2006	2,775	2.5	320	140	105

- 20% visual bias not included

Vaughn

This stream exhibited un-utilized spawning and rearing potential. Spawning gravels were present in Vaughn in close proximity to the expansive tidal rearing habitats provided by the Vaughn/Hathaway Slough system. The upper reaches above the golf course at Idaville are currently inaccessible because of a series of poorly functioning culverts. Channel simplification that has resulted in entrenchment, a lack of sinuosity, and low pool/riffle ratios also decreases production potential on both the agricultural and golf course properties. Pool depth and complexity are missing structural components of the aquatic habitats. High solar exposure in the agricultural corridor below the golf course in addition was a significant detriment to summer water quality.

Coho production dropped off dramatically in Vaughn during the 2006 survey. Summer parr were present in only 2 pools of the survey near RM 0.5 and were probably the result of an upstream migration. The total extent of the 2006 survey was 0.8 miles. It may be that the first problem culvert (a 3 ft. culvert perched 2 ft. over rip-rap) at RM 1 terminated adults. This culvert was near the top end of the golf course and was the fourth culvert above the tide-gate (RM 0). This culvert was identified last year as the highest priority for replacement within Vaughn Cr. No Knotweed was observed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,035	0.6	60	15	80
2006	45	0.4	-	-	10

- 20% visual bias not included

Small Tributaries

Tribs. A and E again showed evidence of in-stream Coho spawning. Expanded estimates in the one mile distribution of Trib. A increased 425% to 1,050 summer parr. The third highest average rearing density in the Basin was observed there, 2.4 fish/sq.m., with the spawning peak at RM 0.2 at 5.1 fish/sq.m.. This stream probably reached its full rearing capacity in 2006. Potential for restoration was high in the lower portion of Trib. A where channel entrenchment has limited stream interaction with the nearby tidal wetland. The culvert was in good shape and no Knotweed was found. Cutthroat and 1+Steelhead were also present in low numbers.

Coho distribution in Trib. E again totaled 0.7 miles although expanded estimates increased 224% to 825 summer parr. Steep stream gradients and lack of well sorted gravels limit spawning potential and upstream migration potential for Coho in this tributary. Rearing density averaged a healthy 1.3 fish/sq.m. with two spawning peaks present. This stream was also probably near full seeding in 2006. Cutthroat and 1+Steelhead were also present in low numbers. No culverts. No Knotweed. One small slide was noted.

Mapes, Myrtle, and Tribs. B, D, and J all displayed short distributions of Coho. The largest of these, 500 (expanded) summer parr over 0.4 miles at 2.0 fish/sq.m., was observed in Mapes. No culvert problems were identified and no Knotweed was found. These streams were small and steep.

School, Sharp, Washout, and Tribs. C, F, and G. No Coho were present in any of these streams. These streams were all too steep for anadromous spawning and several presented impassable bedrock falls or perched culverts. Cold flows in these drainages are critical for

temperature maintenance of the Kilchis mainstem. No Knotweed was present in these tributaries.

North Fork Kilchis

The North Fork was again the largest and most productive sub-basin in the Kilchis for Coho. It appears that much of the increased adult escapement experienced in the basin for the 2005 winter brood spawned in the North Fork. 2006 rearing densities for Coho in the upper NF mainstem were among the highest in the Tillamook Bay Complex of streams. Sub-basin Coho estimates increased 169% and represented 27% of basin-wide production. 12.3 miles of Coho distribution in the sub-basin supported 21,205 (expanded) summer parr. This population remained 22% lower than the Kilchis mainstem population of 27,310 (expanded) summer parr. The North Fork and the Kilchis mainstem appear to be the two main anchor habitats for Coho in the Basin.

The 2006 survey included the tributaries Fossil, Schroeder, Shaw, Triangulation, Western, and Tribs. A, C, D, E, and F. The NF mainstem and Schroeder were extremely productive in 2006 and contributed 78% and 17%, respectively, to sub-basin Coho totals. Average rearing densities for Coho were over 1.0 fish/sq.m. in almost all reaches and up to 1.8 fish/sq.m. in the North Fork mainstem as a whole (7.6 miles). Several reaches in the sub-basin were seeded to capacity with respect to Coho including the NF mainstem, Fossil Cr., and French Cr.. Significantly higher production for Coho is still possible in the Schroeder Cr. mainstem.

A low abundance of fine spawning gravels is the main limitation to Coho production in the North Fork. Stream gradients in all reaches were high with boulders and bedrock dominating the substrates. Pool/riffle ratios throughout the North Fork surveys were very low. All tributaries besides Schroeder were too steep to provide any significant anadromous spawning potential. These numerous high flow streams have an important positive influence on mainstem North Fork temperatures and water quality. 11 slides were reported, 6 of them in the Schroeder sub-basin.

High 1+Steelhead estimates were expected during the 2005 survey based on the aquatic habitat conditions observed in the North Fork. However, only 385 (expanded) 1+Steelhead were observed in the sub-basin (345 of them in the mainstem). This was the smallest population of pool-rearing 1+Steelhead in the Kilchis Basin during 2005 (4.5% of the basin total). A large increase in abundance was observed for this species during the 2006 survey. Abundance increased by 296% throughout the sub-basin (up to 1,525 expanded) and represented 19% of the Kilchis basin total (the third largest segment). Almost all were found in the NF mainstem. A substantial 45% decline was noticed for 1+Steelhead in the Kilchis mainstem in 2006 and it is very likely that the North Fork mainstem was rearing much of this displaced population. 0+trout estimates (4,915 expanded) remained high. Cutthroat abundance was sparse.

Mainstem North Fork

(Table 17)

Expanded Mainstem North Fork Estimates of Juvenile Production and Contribution to the 5th field

Survey Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	6,115	5,685	345	380
	(20%)	(21%)	(4%)	(12%)
2006	16,440	3,850	1,240	235
	(21%)	(15%)	(15%)	(7%)

- 20% visual bias not included

The upper North Fork mainstem was the primary destination for adult Coho spawners for the 2005 winter brood. 2006 expanded estimates for summer parr increased 169% and represented the largest segment of the population in the basin next to the Kilchis mainstem. Average rearing density for this relatively long 7.6 mile reach was 1.8 fish/sq.m. Stream habitat in the last 2.5 miles of Coho distribution, upstream of RM 5, was exhibiting extremely high local rearing densities with 3.6 fish/sq.m. (RM 5.1) and even 10.8 fish/sq.m. (RM 7.2). Rearing densities for Coho averaged 3.1 fish/sq.m. through this upper 2.5 miles of anchor habitat. These were the highest rearing densities for Coho in the Kilchis Basin during the 2006 inventory and represented substantial increases relative to the 2005 average rearing density of 0.2 fish/sq.m. The highest individual pool count for Coho in 2006, 773 (not expanded), was observed at RM 1.4 in the middle of the stream's first visible spawning peak.

Coho distribution ended in steep boulders at a sizable wood jam. Anadromous spawning potential beyond RM 7.6 appeared minimal. High winter flows have minimized wood complexity in the NF mainstem and created long, sinuous rapids interspersed with deep lateral scour pools. The best spawning gravels were found in the last two miles of the survey where peak Coho densities in 2005 were also found.

1+Steelhead counts in the NF mainstem climbed 259% since the 2005 survey. This was the third largest population in the Basin (15% of the total) behind the Kilchis mainstem (3,055 expanded) and the Little South Fork mainstem (1,920 expanded) for 2006. Most NF mainstem 1+Steelhead were observed in two groups, the first below RM 1.7 and the second between RM 5-7. Cutthroat abundance in the NF mainstem has been low during both surveys. A decrease in expanded estimates occurred in 2006 and distribution was inconsistent. No culverts. No Knotweed. 4 slides were noted.

Fossil

Signs of adult spawning were observed in Fossil during the 2006 survey. The relatively small Coho population here likely resulted from two spawning pairs. Average rearing density was high and exhibited a peak of 4.0 fish/sq.m. at RM 0.3. A short 0.5 mile distribution ended at a massive wood jam. This stream appeared to be seeded to capacity with respect to Coho in 2006. Steep stream gradients and multiple large wood jams limit future production potential in this stream. No 1+Steelhead have been found here. Cutthroats were present in low numbers. No culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	85	0.2	25	-	20
2006	370	1.7	135	-	15

- 20% visual bias not included

Schroeder

The most significant tributary to the NF Kilchis is Schroeder and its primary tributary, French. Coho production has been significant in Schroeder during both survey years and evidence of in-stream spawning was observed in French in 2006. An expanded estimate of 3,515 summer parr were present between the two (69% in Schroeder) accounting for about 4% of the basin-wide total. This was an increase of 140% over 2005 production levels.

Distribution totaled 2.2 miles in the mainstem of Schroeder and Coho production there just about doubled from the previous year. Good spawning conditions were noted in Schroeder with an average rearing density of 0.9 fish/sq.m. and one main spawning peak of 1.6 fish/sq.m. at RM 1.7. This level of seeding appears well below the current capacity of Schroeder Cr.. Coho ended in successive large debris jams. Expanded Coho estimates for the mainstem of Schroeder were comparable to Company Cr. while expanded estimates for the sub-basin were nearly equal with Clear Cr.. 1+Steelhead and Cutthroat were also present in low numbers. No culverts. No Knotweed. 5 slides were reported.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,315	0.3	805	25	165
2006	2,545	0.9	595	165	70

- 20% visual bias not included

French

This stream is the main tributary to Schroeder Creek. Evidence of adult Coho spawning was observed in French during the 2006 survey and expanded estimates increased by 547%. The back-to-back 8 ft. high debris jams which ended Coho distribution in 2005 were passed in 2006 and summer parr were present up to RM 0.9 where a 5 ft. falls terminated distribution. A strong average rearing density of 1.6 fish/sq.m. was observed with a spawning peak of 2.9 fish/sq.m. at RM 0.3. Signs of frequent debris torrents were observed in French Cr. upstream of the lower wood jam. Very little pool structure and poor gravel sorting were noted there. No culverts. No Knotweed. One slide was noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	150	0.5	175	-	-
2006	970	1.6	210	110	50

- 20% visual bias not included

Triangulation

Minor Coho spawning has been documented here during both surveyed years. Spawning gravels were present in pockets between long stretches of cobble and bedrock. Coho production improved 156% in Triangulation in 2006 and rearing density increased substantially. A spawning peak of 2.3 fish/sq.m. was noted in the middle of the survey. Coho distribution extended 0.5 miles and ended in steep stream gradients. There appears to be no further Coho spawning or rearing potential above this point. Overall production potential for Coho in Triangulation appears low due to the limited duration of habitat and the lack of well sorted gravels. No 1+Steelhead were present. Cutthroat were present in low numbers. This stream appears to be most important as a significant source of cold flows for the North Fork mainstem and as potential temperature refugia for North Fork mainstem juveniles. No culverts. No Knotweed. One slide.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	160	0.2	25	-	65
2006	410	1.1	15	-	45

- 20% visual bias not included

Small Tributaries

Small upstream migrations of Coho were observed in Western, and Tribs. A, E, and F that extended less than 1000 ft. and totaled less than 245 (expanded) summer parr. The 4 ft. culvert in Trib. E was in good shape. No Coho were found in Shaw, or Tribs. C or D. All these streams were too small and steep for Coho spawning or for significant anadromous use and exhibited numerous debris jams and/or bedrock falls. Their main function currently is the supply of cold flows for maintenance of the NF and mainstem during summer flow regimes. No culvert problems were identified and no Knotweed was sighted.

Miami River Basin

Out of the five basins surveyed in the Tillamook Bay Complex, Coho production and distribution in the Miami has remained the lowest during both inventoried years. An expanded estimate of 25,035 summer parr were rearing in the Miami Basin, almost completely in the mainstem, during the summer of 2006. This represented an increase of 64% over last year's estimate and remained 18% lower than the Tillamook River basin estimate, which exhibited little change since 2005. The 2006 Miami basin Coho population represented about 5% of the total production for the Tillamook Bay Complex of streams. Miami basin Coho distribution for 2006 exhibited little change from the previous year and totaled 28.8 miles, 62% of the lineal distribution observed in the Kilchis basin.

Most of the improvements in Coho production for 2006 occurred in the Mainstem (up 68%), Moss Cr. (up 53%), Illingsworth Cr. (up 168%), and Prouty Cr. (up 154%). The largest tributary populations were documented in Moss, Illingsworth, and Prouty. The only habitat in the Basin which reached rearing capacity for Coho in 2006 was in Trib. G where the average rearing density reached 1.6 fish/sq.m. and distribution extended 0.7 miles. The second highest average rearing density of 1.1 fish/sq.m. was found in Illingsworth where distribution extended 1.1 miles. All other reaches remained far below carrying capacity and production potential. Coho populations in Peterson and in the North Fork exhibited no change in 2006 despite the apparent increases in adult escapements throughout the Tillamook Watershed.

Evidence of high water temperatures in the highly exposed, low gradient reaches of the lower Mainstem and signs of water withdrawals (Moss Cr., Prouty) appear to be the main factors limiting anadromous fish abundance and distribution in the Basin. Low gradients, large pools, and little cover were the dominant habitat characteristics of the lower 5 miles of the Miami mainstem. Riparian canopy coverage and channel diversity increased in the upper reaches where most stream habitats improved in overall function. Many steep, high flow tributaries were present in the upper half of the basin where large rock and boulders dominated the substrates and riffles and rapids dominated the habitat. Many large pools were observed with well sorted gravels in the tail-outs.

The most under-utilized reaches (for rearing) during both years of inventory were observed in the low gradient sandstone and clay habitats present in Minich, Peterson, Trib. F, and Prouty. Fine gravels, low floodplains, and abundant riparian vegetation exhibit significant future production potential in these streams. Dry channel conditions were observed in Prouty and Moss. Spawning potential in these two tributaries remains among the highest in the basin.

1+Steelhead and Cutthroat production fell significantly in the Miami Basin during the 2006 survey (down 51% and 44%, respectively). Almost all of these decreases were experienced in the Miami mainstem. 2006 expanded estimates for 1+Steelhead and Cutthroat totaled 3,620 and 1,680, respectively, for the Basin. For clarification, the portion of the 1+Steelhead population rearing in riffle/rapid habitats was not a part of this inventory.

Knotweed infestation was extreme along the lower Miami mainstem and continued up to RM 8.6 (signs of fresh colonization). The absence of riparian vegetation in the lower mainstem is a significant issue for restoring functionality to the ecosystem. A relatively low total of 9 slides were reported in the basin, 5 of them on the Miami mainstem.

(Table 18) Miami River 2006 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Mainstem	20,240*	80.8	7,400*	66.2	3,105*	85.8	745*	44.3
Hobson	25		-		-		20	1.2
Illingsworth	710*	2.8	245	2.2	55*	1.5	145*	8.6
Minich	-		30		30		30	1.8
Moss	1,260*	5.0	700*	6.3	135*	3.7	45	2.7
NF Miami	275	1.1	960*	8.6	40*	1.1	120*	7.1
Peterson	425	1.7	465*	4.2	180*	5.0	65	3.9
Prouty	710*	2.8	105		15		125*	7.4
Struby	-		10		-		5	
Trib. E	5		440*	3.9	30		110*	6.5
Trib. F	20		65		30		40	2.4
Trib. G	690*	2.8	160	1.4	-		35	2.1
Trib. H	240	1.0	85		-		30	1.8
Trib. J	220		100		-		25	1.5
Trib. K	215		165	1.5	-		35	2.1
Basin Total	**25,035**	**100**	**10,930**	**98**	**3,620**	**100**	**1,575**	**94**

* Highlighted estimates represent the top 5 producers by species and age class

- Percent contributions are indicated for only those sub-basins that contributed greater than 1% of the total.

- 20% visual bias not included

Mainstem Miami

(Table 19)

Expanded Mainstem Miami Estimates of Juvenile Production and Contribution to the 5th field

Survey Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	12,070	14,615	6,695	1,500
	(79%)	(83%)	(91%)	(50%)
2006	20,240	7,400	3,105	745
	(81%)	(66%)	(86%)	(44%)

- 20% visual bias not included

Almost all the fish production in the Miami Basin during both survey years has occurred within the 13.5 miles of mainstem habitat. The basin-wide trends for each species, therefore, seem to follow the population changes observed within this reach. Coho abundance increased 68% in the Miami mainstem in 2006 while 1+Steelhead declined 54% and Cutthroat declined 50%.

With a distribution distance similar to the Kilchis mainstem, the Miami mainstem produced 74% as many Coho and roughly the same amount of 1+Steelhead. This was a relatively high rate of production for Coho and ranked among the largest mainstem Coho populations in the Tillamook Bay Complex of streams. The 1+Steelhead population here, despite decreases, remained the fourth largest in the Watershed behind the Wilson, Little North Fork, and Trask mainstems.

Mainstem surveys began at the head of tide, just upstream from the Highway 101 Bridge, and Coho distribution ended in long straight boulder rapids upstream of the mouth of the North Fork. An average rearing density of 0.3 fish/sq.m. remained low for the mainstem. Most Coho production during both inventories has been found upstream of RM 5. 61% of all mainstem Coho were documented between RM 6.2 - 9.1 in 2006. Two main spawning peaks were observed at RM 7.2 and RM 12.2. Habitat conditions improved dramatically in the upper half of the mainstem where the active channel left the high solar exposures of the lower agricultural lands and entered thick mixed forest canopies and steeper stream gradients. Wide floodplains and high wood complexities were observed in the upper half which contained numerous channel braids and deeply scoured lateral pools.

The Miami mainstem was rearing more 1+Steelhead in 2005 than any other reach in the Tillamook Bay Complex besides the Wilson mainstem (which was 29 miles long). Some individual pool counts were as high as 151. 63% of this population was rearing below RM 5 with gradually decreasing densities further upstream (as observed in the Kilchis). Mainstem Steelhead abundance for 2006 decreased 54% with most 1+Steelhead (50%) observed between RM 6.2 – 8.9. The highest individual pool count during the 2006 survey was 66.

Cutthroat estimates in the mainstem also experienced a dramatic decline of 50%. Most mainstem Cutthroat were observed in the lower half of the survey.

1,420 (expanded) Chinook summer parr were present up to RM 10 in 2006. This total is also down from 2005 when estimates were 3,585 (expanded). Knotweed infestation was abundant in the lower Miami mainstem where it dominated the stream-bank from the head-of-tide to the mouth of Moss Cr. (and was especially abundant around the mouth of Peterson Cr.). Knotweed continued to be present intermittently up to RM 8.6 (upstream of Prouty Cr.) where two isolated clusters were observed on a mid-channel gravel bar upstream of the mainstem concrete bridge. These fresh colonization's should be of the highest priority for eradication. No culverts were found. 5 slides were present.

Hobson

Low flows and small pools limit production in Hobson. Small upstream migrations of Coho were observed during both survey years. Distribution has remained less than 0.5 miles. No 1+Steelhead. Anadromous potential here is minimal. Knotweed was present near the mouth of Hobson.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	85	0.3	80	-	40
2006	25	0.5	-	-	20

- 20% visual bias not included

Illingsworth

Low level Coho spawning has been detected here during both surveys along with evidence of upstream migrations of summer parr from the lower Miami mainstem. Expanded estimates increased 168% in 2006 and average rearing density reached 1.1 fish/sq.m. with two strong spawning peaks at RM 0.2 and RM 0.6. Distribution totaled 1.1 miles. This was the second largest Coho population among the Miami basin tributaries after Moss Cr. and was identical in size to the Prouty Cr. population. Spawning conditions looked good in Illingsworth and higher production is possible with continued increases in adult escapement.

The lower 0.3 miles of stream between the mouth and the main road culvert (good shape) was dominantly a pasture trench channel with low gradient, heavy siltation, and high solar exposure. Abundances of spawning gravel and rock began to appear at the main culvert along with a light deciduous riparian canopy. Pools were well scoured and flows were moderate above the culvert. The first tributary upstream of the culvert on the right exhibits limited anadromous potential. 1+Steelhead and Cutthroat were also present and displayed moderate increases during the 2006 survey. Knotweed was present near the mouth of Illingsworth.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	265	0.4	155	25	100
2006	710	1.1	245	55	145

- 20% visual bias not included

Minich

Spawning conditions appear good for Coho through the lower mile of Minich. The Minich, Peterson, and Prouty sub-basins shared a unique sandstone and clay geology when compared to the rest of the Miami Basin tributaries. Low stream gradients were observed along with large resources of fine sediment and spawning gravel. These three sub-basins all displayed reaches with ideal conditions for Coho spawning and rearing, despite their greatly depressed 2005 and 2006 population estimates. Production and distribution potential in Minich was the lowest of the three.

No Coho were found here in 2006 although visibility near the dairy at the mouth was poor. Channel simplification in much of Minich has resulted in low sinuosity and low pool complexity. Most pools were shallow and provided little cover. Significantly higher Coho production is possible in Minich and rearing conditions could be dramatically improved with the addition of wood complexity. 1+Steelhead and Cutthroat were present in low numbers. Culverts were all in good shape. No Knotweed was noted.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	185	0.2	210	-	80
2006	-	-	30	30	30

- 20% visual bias not included

Moss

This stream remained the most productive tributary for Coho in the Miami Basin, despite low expanded estimates. The fact that the highest ranking tributary accounted for just 5% of the

Basin's total Coho indicates how unproductive the tributaries of the Miami currently are. A 53% increase in Coho abundance was observed here in 2006 while distribution remained the same at 2.9 miles. Dry channel conditions were encountered in Moss Cr. from RM 0.3 – 1.4 with no pools and no flow present. Stream flow and Coho counts gradually became more consistent as a spawning peak of 1.5 fish/sq.m. was reached at RM 1.6. Average rearing density for Coho doubled during the 2006 survey to reach 0.6 fish/sq.m.. Distribution ended at a 4 ft. sill log falls. Habitat conditions appeared good in Moss upstream of the dry channel zone and indicate a significantly higher rearing capacity for Coho. 1+Steelhead abundance declined by 61% and Cutthroat abundance by 69%.

Hard rock substrates were dominant and numerous large tributaries were present. These steep drainages remain important to the Moss Cr. mainstem by supplying cool flows to the valley floor mainstem. The dry channel habitats definitively result in large juvenile salmonid mortalities as pool habitats are isolated and predation and temperature eventually terminate all the production that is spring rearing within this stream segment. This condition definitely limits Moss Cr salmonid production. If the dry channel conditions are the result of water withdrawal activities, then minimum stream flows are not being maintained to the detriment of juvenile salmonid production. No culverts were noted. Knotweed was present at the mouth of the stream but did not extend up Moss Cr.. 2 slides were noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	825	0.3	455	345	145
2006	1,260	0.6	700	135	45

- 20% visual bias not included

NF Miami

Long stretches of straight rocky rapids and large boulder falls dominated this reach. Fine spawning gravel was limited and pool/riffle ratios were low. A young, mostly deciduous forest was present along the stream and wood recruitment to the active channel was sparse. Pool complexity and cover for juvenile salmonids was insignificant. Conditions here were very similar to the upper Miami mainstem above the confluence of the North Fork.

Low level Coho spawning has occurred in the North Fork during both survey years. Expanded estimates for Coho showed practically no change in 2006 despite the large increase in adult escapement throughout the rest of the Basin. Total distribution in 2006 extended 1.1 miles with no Coho present in Tribs. A or B. Steep boulders limit spawning opportunities in these tributaries. Steelhead and Cutthroat were present in low numbers. No culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	270	0.1	150	55	85
2006	275	0.3	960	40	120

- 20% visual bias not included

Peterson

The Peterson sub-basin offers excellent spawning opportunities for Coho. A low gradient sandstone and clay geomorphology was observed in this stream similar to conditions in Minich and Prouty. This has resulted in a high level of channel sinuosity, high wood complexities

(including several log structures), good pool formation, and a high pool/riffle ratio per stream mile. Abundant reserves of fine sandstone gravels were also present. Fine sediment floodplain development was occurring with low interactive terraces supporting abundant vegetation and providing exceptional winter habitat potential. This was unique habitat within the larger Miami River basin.

Production potential for Coho in Peterson appears much higher than the low 2005 and 2006 expanded estimates. This lack of response to increased basin wide adult escapement was surprising in Peterson which provides such high quality habitat for Coho. The high levels of sedimentation observed on gravel beds and its influence on egg / fry survival may be a factor.

Little evidence of a spawning peak was located in the Coho distribution profile for Peterson but the size of the 2005 and 2006 expanded estimates suggests that adult spawning did occur. Minor upstream migrations of summer parr were observed in all three tributaries. Tribs. B and C both exhibited minor spawning potential. Coho distribution extended 1.2 miles in the mainstem and ended without barriers. The only culvert at the mouth was in good shape. Knotweed infestation was extreme at the mouth of Peterson.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	435	0.2	275	20	190
2006	425	0.2	465	180	65

- 20% visual bias not included

Prouty

With physical habitat conditions similar to Minich and Peterson, including low interactive floodplains and fine spawning gravels, Prouty Cr. exhibits significant under- utilized potential. 2006 Coho production levels increased 154% for Prouty and the expanded estimate here was identical in size to the population in Illingsworth. A mix of adult spawning and upstream juvenile migration was observed. The average rearing density of 0.8 fish/sq.m. displayed two peaks, the first was observed in the first pool of the survey (an indicator of upstream migration from the mainstem) and the second a spawning peak at RM 0.7.

Excellent spawning gravels and low stream gradients were noted in the mainstem and in Trib. A (small upstream juvenile migration). Summer flows were low and dry channel conditions were encountered intermittently. A long stretch of dry channel ended Coho distribution during both survey years. Stream gradient was just beginning to increase at the end of the survey. No barriers to migration were noted. Rearing capacity for Coho in Prouty remains much higher than current levels. Steelhead were observed during the second survey along with a moderate increase in Cutthroat abundance. The one culvert encountered was in good shape. No Knotweed was noted.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	280	0.2	120	-	95
2006	710	0.8	105	15	125

- 20% visual bias not included

Struby

No Coho were found here in 2006. Low flows at the mouth of Struby entered a farm trench network just north of the head of tide on the Miami mainstem. Anadromous potential here appeared minimal. The channel upstream of the main highway was steep and confined. No Steelhead were observed. Knotweed was present near the mouth of Struby on the Miami mainstem.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	20	0.3	115	-	40
2006	-	-	10	-	5

- 20% visual bias not included

Unnamed Tributaries

Trib. E: A minor upstream migration of 5 juvenile Coho (expanded) was found here in 2006. Healthy forest conditions and several pockets of spawning gravel were observed in this stream. 1+Steelhead (30 expanded) and Cutthroat (110 expanded) production was high in Trib. E and 30 (expanded) juvenile Chinook were also present.

Trib. F: This stream was just upstream on the Miami from Peterson on the same side. Evidence of adult Coho spawning was observed here in 2005 (260 summer parr, expanded). Only 20 (expanded) summer parr were observed in 2006. Forest and stream conditions were healthy and ideally suited to Coho spawning. High flows and fine sandstone gravels were present along with good pool diversity and wood complexity. Production potential for Coho through the first 0.5 miles of low stream gradient is high and mainly limited by a problem culvert between the mouth and the main road.

This culvert appears to have deterred adults during the 2005 winter brood and is a prime candidate for replacement. A 5 ft. steel pipe running under a farm track is rusted out badly and bent steeply upward on the upstream end. Debris has accumulated on the upstream lip of the culvert creating the potential for a jam and road failure. A large build-up of silt and fine sediment was also present in this first pool above the culvert which indicates historical plugged conditions. Passage for juveniles was impossible and difficult at best for adults. 1+Steelhead and Cutthroat were also present.

Trib. G: Significant improvements in Coho production were observed here with expanded estimates increasing to 690 in 2006 from 115 in 2005. Adult spawning here resulted in the highest average rearing density for Coho in the Basin (1.6 fish/sq.m.). Distribution, however, extended only 0.7 miles. Signs of upstream juvenile migrations out of the Miami mainstem were observed in the first pool where rearing density peaked at 3.6 fish/sq.m.. A spawning peak of 2.3 fish/sq.m. appeared closer to the end of the survey. Patchy spawning gravel, medium stream gradients, and healthy forest conditions were noted. This stream appeared to be seeded to capacity with respect to Coho in 2006. Expanded estimates of 160 0+trout and 35 Cutthroat were also present. No Steelhead. No culverts. No Knotweed. One slide was reported.

Trib. H: Evidence of low level adult spawning was observed here in 2006. An expanded estimate of 240 Coho summer parr were present in an average rearing density of 0.6 fish/sq.m.

which lasted for 0.7 miles. Steep stream gradients after a significant tributary on the right ended distribution and all spawning potential for Coho. Spawning gravels were present and pool structure was good for the first half-mile of stream. No Steelhead were found. No culverts. No Knotweed. One slide was reported.

Trib. J: No Coho were observed here in 2005. 220 (expanded) Coho summer parr were observed during the 2006 survey. Distribution extended for 0.4 miles. Spawning gravels and medium stream gradients were present along with several log structures. Steep gradients and increasing rock size limit production potential above RM 0.5. No Steelhead. No culverts. No Knotweed.

Trib. K: Expanded estimates for Coho in Trib. K doubled during the 2006 survey to reach 215 summer parr. 15 (expanded) of these were found in Trib. K1 in a short upstream migration. Distribution extended for 0.8 miles in the mainstem and 0.2 miles in Trib. K1. Rearing density averaged 0.8 fish/sq.m. and peaked at 2.0 fish/sq.m. in the second pool of the survey (the sixth pool of the stream). It is possible that this population was a result of upstream juvenile migrations out of the Miami mainstem. Spawning potential appears much higher in this tributary although stream gradients were high and large rock and boulders were abundant. No Steelhead. No culverts. No Knotweed.

Tribs. D, O, and P: No Coho were present in any of these streams. Spawning and rearing potential for anadromous fish was minimal due to low flows, steep stream gradients, and large substrate size. Stream flow contribution and temperature maintenance for the Miami mainstem appeared to be the most important contribution for these tributaries. Preservation of upslope riparian integrity in these drainages should be maintained for the protection of water quality.

Tillamook Bay Tributaries

These eight small streams emptied directly into the Tillamook Bay with little to no affiliation with any of the five major basins. Minimal spawning potential was found in any of these streams except Patterson. Low flows and steep stream gradients were the main limiting factors. Extensive tidal marsh habitats were observed associated with these streams and the potential for winter rearing of juvenile salmonids was likely the most important function of these streams.

Dick

A minor upstream migration of Coho summer parr was observed in Dick Cr. during both surveys. High quality spawning gravel was present here and the stream exhibits unutilized production potential. The stream channel appeared to have been recently torrented and pool development remained limited. The stream could benefit from structure placement to enhance pool development. Anadromous potential ended at a 12 ft. bedrock falls about 0.45 miles up from the mouth. 1+Steelhead and Cutthroat were present in low numbers. 125 (expanded)

juvenile Chinook were also present in 2006. The culvert was in good shape. No Knotweed was noted. 2 slides were noted.

Year	Coho	0+	Sthd	Cut
2005	15	30	25	-
2006	30	15	20	15

- 20% visual bias not included

Flower Pot

No Coho have been observed in Flower Pot. Extensive tidal and beaver marsh habitats dominated this stream and represented an enormous rearing opportunity for juvenile salmonids in the Tillamook Bay. Vegetation was lush and complex cover from predators was highly abundant. Steeper stream gradients and minor abundances of spawning gravel were found further upstream. Heavy siltation and low stream flow were found in Trib. A, which entered on the right just upstream of the mouth. This appeared to be an excellent habitat for all estuary species. Cutthroat and 0+trout were present. No Knotweed.

Year	Coho	0+	Sthd	Cut
2005	-	40	-	5
2006	-	5	-	35

- 20% visual bias not included

McCoy Cove

A small upstream migration of 20 (expanded) Coho summer parr was found in McCoy Cove during both surveys. No 1+Steelhead were present. Spawning potential appeared minimal. Low flows and steep stream gradients were limiting factors. The culvert was in good shape. No Knotweed.

Year	Coho	0+	Sthd	Cut
2005	20	-	-	5
2006	20	15	-	15

- 20% visual bias not included

Memaloose

No Coho. No Steelhead. Minimal anadromous spawning potential was present due to low flows and steep stream gradients. The culvert was in good shape. No Knotweed.

Year	Coho	0+	Sthd	Cut
2005	-	-	-	5
2006	-	15	-	-

- 20% visual bias not included

Patterson

Adult spawning appears to have occurred in Patterson during both survey years. This stream runs directly through downtown Bay City. Average rearing densities were extremely low both years. Expanded estimates decreased significantly in 2006, especially in the Jacoby Cr. tributary where the majority of the 2005 population was documented (210, expanded, in 2005 down to 10 in 2006.). Most of the Coho observed were very large and appeared to be either STEP releases or early spawning hatchery stock. Distribution extended 1.1 miles, including Jacoby (0.4 miles).

Seven culverts were encountered on Patterson. Three of them were barriers to juvenile migration and two of them presented obstacles to adult migration as well. The first (Highway 101) and second culverts (6 ft. steel pipe) were in good shape.

The third culvert, (RM 0.37), was a 10 ft. cement culvert with a 1.5 ft. perch which presented the first juvenile barrier. A spike in Coho density was present during both surveys immediately downstream, indicating a propensity for upstream migration. The fourth culvert (RM 0.5) was 3 ft. in diameter, perched by 2 ft. at a 10 degree pitch, was undersized, and was rusted out. This culvert was a definitive juvenile barrier and looked difficult for adults. The fifth culvert (a 4 ft. pipe) was in good shape. The sixth culvert (RM 0.63) was a 3 ft. pipe perched by 3 ft. over the highest pool of a four-step fish ladder. This presented another juvenile barrier as well as another difficult obstacle for adults.

The seventh culvert, another 500 ft. upstream, was a 4 ft. pipe completely submerged but still passable for adults and juveniles. Coho were still present in low numbers upstream of this culvert during both survey years which may also support the theory that juveniles were the result of a presmolt release. All three of these juvenile barrier culverts need attention and/or replacement with highest priorities going to the two which presented adult passage problems as well. No culverts were present in Jacoby.

Low stream gradients and fair spawning gravels were found in both Patterson and Jacoby although siltation was heavy in both reaches. The best spawning gravels in Patterson were found downstream of the fish ladder. High levels of natural wood complexity were reported in upper Jacoby although stream flows were lower and poor pool formation was observed. Higher potentials for Coho production exist in this sub-basin. No 1+Steelhead were found. No Knotweed.

Year	Coho	Coho/sq.m.	0+	Sthd	Cut
2005	360	0.12	240	-	230
2006	135	0.2	50	-	110

- 20% visual bias not included

Smith

No Coho. No Steelhead. Minimal anadromous potential was documented in Smith due to steep stream gradients and large poorly sorted substrates. Pools were few and small. The stream entrance over large jetty rock was complex except during the highest of tidal conditions. Cutthroat were present in low numbers. The culvert was in good shape. No Knotweed.

Year	Coho	0+	Sthd	Cut
2005	-	45	-	25
2006	-	20	-	-

- 20% visual bias not included

Trib. A

No Coho. Low flows and steep stream gradients were observed. No anadromous spawning potential. Estuary rearing potential. The culvert was in good shape. No Knotweed.

Year	Coho	0+	Sthd	Cut
2005	-	5	-	-
2006	-	35	-	5

- 20% visual bias not included

Trib. B

Anadromous spawning potential is limited by low flows and steep stream gradients. The culvert was in good shape and no Knotweed was found.

Year	Coho	0+	Sthd	Cut
2005	55	-	15	15
2006	5	80	-	40

- 20% visual bias not included

Watershed Recommendations

There are several conclusions based on the preceding analysis that lead us to the point of developing some general recommendations.

- The mainstem reaches of the Tillamook, NF Trask, SF Trask, EF Trask, Elkhorn, Wilson, Little North Fork Wilson, Kilchis, NF Kilchis, and Miami were again rearing some of the largest populations of all anadromous species in the Watershed. These areas continue to represent the highest priority for restoration and enhancement because of their observed production potential for all salmonids. This suggests that the maintenance, enhancement and preservation of water quality in these mainstem habitats may be the single most important long term issue for maintaining a functional ecosystem that continues to be capable of salmonid production. It is the cumulative impacts of upslope management strategies that will impact the productivity of these large mainstem habitats in the next few decades. The protection of riparian canopies for both type F and N streams in the upper elevations of each basin is critical to maintaining low mainstem water temperatures during summer low flow regimes. Mainstem conditions currently exhibit temperature limitations that result in truncating the distribution of some salmonid species. With mainstem water quality identified as the single most critical future issue for salmonid production, it seems appropriate to suggest that a well developed monitoring strategy is essential for quantifying the inter / intra annual trends in water quality parameters.

- Address the multiple passage issues described in detail by stream in the body of this document. The highest priority culverts for replacement were observed in Vaughn, Trib. F (Miami), Patterson (in Bay City), Mill (Trask), Faucett (Tillamook, needs a bridge), Pleasant Valley (Tillamook), Trib. E (Tillamook), Mapes (Kilchis), and Trib. B (Wilson). In addition

the trash racks upstream of the main highway culverts on almost all of the lower Wilson tributaries (especially Stanley, Fox, and Zig-Zag) were stacked up to 15 ft. high with debris and need cleaning. Cement dams (with fish ladders) in Faucett (Tillamook), Gold (Trask), EF Trask, and Beaver (Wilson) are barriers to juvenile migrations and may be restricting adult passage as well. A review of the significance of these dams and an investment in passage improvements may be appropriate. Old tide gates in Esther (Tillamook) and Vaughn could be restricting adult passage during certain stream flow and tidal conditions. The installation of fish friendly tidegate in these locations, preferably one that opens horizontally rather than vertically, could greatly benefit adult escapement in these tributary streams. The provision of additional access to spawning habitat may represent some of the more indisputable restoration opportunities in the Tillamook complex.

- Knotweed infestation along the lower Tillamook, Trask, Wilson, Little North Fork Wilson, and Miami Rivers was extreme and demands attention. Diverse inner riparian vegetation communities and the function of floodplain habitats in these locations are rapidly being altered and simplified. Recent colonization of young plants were noted in the upper Miami mainstem and the lower Devils Lake Fork mainstem (very near the top of the Wilson Basin) in 2006. A separate column was added to the Access database in 2005 which displays the presence or absence of Knotweed for each pool surveyed. A lineal profile of Knotweed distribution can be graphed for each stream surveyed.

- Initiate DNA sampling of wild Coho (carcasses) in each of the five major basins and in Netarts Bay streams to explore and document the potential of unique population units (demes) in each of the major basins in the Tillamook Watershed Complex of streams. The future of Coho management within the Coastal ESU may depend highly on how a population is described. If the Tillamook Watershed Complex exhibits unique genetic characteristics, their management may require a different approach than is currently pursued by management agencies.

Distribution and Rearing Density Graphics

An Excel Workbook has been developed from the raw Access data that allows the user to preview distribution, density and abundance graphics by stream and species. This pivot table work book allows managers and users to access information for all of the basins and sub-basins in the Tillamook watershed Complex. Subsequent inventories planned for 2007 will be augmented to this Workbook which will allow trend analysis in each sub-basin for the most important variables (rearing density, distribution distance, and total expanded estimate). Please contact the TEP for an updated version of this tool.

In addition, it is important to note that an extensive amount of supplemental raw data (primarily in the form of surveyor notes and comments) is available in the Access database which can also be obtained through the TEP.

A GIS layer of current fish distribution for the Tillamook Watershed Complex of streams will also be available through the TEP.