TILLAMOOK BAY
RAPID BIO-ASSESSMENT 2007

PREPARED FOR:

Tillamook Estuaries Partnership

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INTRODUCTION

The 2007 Rapid Bio-Assessment inventory conducted for the Tillamook Estuaries Partnership (TEP) marked the final year of a three year inventory which included all of the watersheds that contribute to the Tillamook Bay Complex: the Tillamook, Trask, Wilson, Kilchis, and Miami. The intent of the project was 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 began at the head of tidal influence and continued 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, Bureau of Land Management (BLM), and Oregon Department of Forestry (ODF), and from the contribution of partners from the Tillamook Bay Watershed Council and Oregon Department of Fish and Wildlife (ODFW).

The escapement of adult Coho in all of the surveyed basins during the 2004, 2005, and 2006 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 again, moderately, during the 2007 survey season. Select reaches during each of these years 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 coast wide trend in the adult escapement of Oregon Coast Natural (OCN) Coho from 1990 to 2002 was positive, peaking at 255,372 for the entire ESU in 2002. From 2002 through 2007 that trend has reversed and is indicating a significant decline in adult escapement for the ESU. There are however indications that the situation in the Tillamook complex of streams does not follow the trend for the ESU. Based on juvenile abundance data collected during the RBA inventory, it appears that adult escapement (back calculated from juvenile abundance) in the Tillamook Bay Watershed increased each year between the 2004 and 2006 brood years.

The Rapid Bio-Assessments expanded juvenile estimate in 2005 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. The ODFW estimate of wild coho spawners for the basin has been corrected to 2,290. 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 escapement estimates for the entire Tillamook Bay complex for that year.

These two methods diverged significantly however for the 2005 winter brood. The ODFW adult SRS estimate declined to 1,995 (95% confidence +/- 583) 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 adult escapement realized in the basin.

ODFW adult SRS adult escapement estimates for the 2006 brood year increased to 8,774 (95% confidence +/- 1,746), while the 2007 juvenile expanded estimate continued to rise by 14% and totaled 705,350 (including 20% visual bias). Back-calculating from this juvenile estimate indicates an adult escapement of between 5,643 – 6,412 adults for the 2006 brood year. Both of these methods agree that the 2006 brood year was the strongest of all three cohorts monitored in this inventory.

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 was 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 broods (2002 / 2005). The 2003 wild adult brood (estimated at 14,584) appeared similar in strength to the 2002 adult brood, as were the 2006 / 2007 summer estimates of juvenile abundance. The 2003 adult cohort appeared to decrease in abundance, based on summer parr estimates, by 59% between parent cycles (2003 / 2006).

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. Beaver dam frequency was also recorded during both the 2006 and the 2007 surveys.

The 2007 database contains the results of 313.2 stream miles that were surveyed. This included the full extent of Coho distribution in the Tillamook River (55.4 miles), the Wilson River (105.1 miles), the Kilchis River (50 miles), and the Miami River (26.1 miles), as well as several small direct tributaries to Tillamook Bay. The Trask River (76 miles) did not include the full extent of coho distribution in 2007 in one of its significant tributaries Mill Cr. This was because access was denied from multiple small private landowners that terminated inventories pre-maturely. Both the 2005 and 2006 inventories in Mill Cr however describe the full extent of normal coho distribution. 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 (2nd 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. For many reaches hip chain calibration was not possible in the 2007 inventory because of landowner complaints of string being left within the stream corridor in previous years. 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:

Visibility
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.

Beaver dam presence was recorded during the 2006 and 2007 inventories. 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. This variable may then be sorted in the database for presence, absence and trend 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 a field designed to facilitate the development of a GIS data layer. These LLID location numbers 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 ODFW's adult Coho SRS estimated for the 2006 brood year coincided with increases in juvenile abundance estimates from the summer of 2007. Results from both sampling methods indicated that adult escapement during the 2006 brood year was the strongest of all three years of

the Rapid Bio-Assessment. Juvenile Coho abundance increased by 14% throughout the Tillamook Bay Watershed between the summer surveys of 2006 and 2007. The Rapid Bio-Assessment's expanded estimate for Coho summer parr during the 2007 field season totaled 705,350 (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 5,643 – 6,412 adult Coho for the 2006 brood year. The ODFW adult SRS estimate was 8,774 (95% confidence +/- 1,746). This was the only brood year between 2004 and 2006 that the adult SRS estimate was higher than the adult estimate back-calculated from the following summer's RBA juvenile abundance.

In general, juvenile Coho abundance increased each year in all 5 major basins of the Watershed during the summer surveys of 2006 and 2007, except for the Tillamook (which exhibited no change between 2005 and 2006), and the Trask (which was the only basin to exhibit a decline in abundance during the 2007 inventory). Expanded estimates for Coho in the Trask basin declined 23% in 2007 (139,719 with 20% visual bias), following the impressive productivity observed throughout the North Fork Trask in 2006. Coho declines were heaviest in the NF Trask mainstem (down 60%), the Trask mainstem (down 53%), and Elkhorn (down 29%). The summer rearing Coho population in the Trask basin remained the second largest in the Watershed (20% of total) during each survey year.

Three years of inventory have observed the Wilson basin to be the most productive for all species of salmonids. The longest Coho distribution (105 miles) and the largest expanded estimates for Coho (320,738 with 20% visual bias), 1+Steelhead (8,750 – pool rearing), and Cutthroat (6,985) in 2007 were observed. Summer rearing Coho abundance in the Wilson basin increased 20% in 2007 and accounted for 45%, almost half, of the Watershed total. Huge increases were observed in Jordan Cr. (up 153%), Rogers Cr. (up 136%), the WFNF Wilson (up 79%), the NF Wilson (up 58%), and the mainstem Wilson (up 39%). Coho production in the Little North Fork Wilson decreased slightly by 5% in 2007. It was interesting that Coho production in 2007 decreased in the LNF Wilson and Elkhorn, two of the most productive sub-basins for Coho during all three survey years, while adult escapement in the Tillamook Bay Complex appeared to continue to increase.

The differential in Coho production between the Trask and the Wilson has grown consistently through this three year inventory. The Wilson basin Coho population was about 21% larger than the Trask basin population in 2005, 47% larger in 2006, and 130% larger in 2007. This may reflect a greater production potential in the Wilson during years of increasing adult abundance. This also reflects the severe decline in productivity observed in the Trask mainstem and NF Trask mainstem habitats during the final 2007 summer survey.

After two years of continued increases in the Kilchis basin Coho population (50 miles), its 2007 expanded estimate of 131,744 (including 20% visual bias) approached that of the Trask's. This was the third largest estimate in the inventory during all three survey years and represented 19% of the 2007 Watershed total. Tremendous increases in Coho production were noted in the South Fork Kilchis (up 216%), and in the North Fork Kilchis (up 73%) - which accounted for 35% of the basin-wide total. Expanded estimates of 45,825 (with 20% visual bias) summer parr in the NF Kilchis sub-basin (12.3 miles) in 2007 matched estimates from Elkhorn/NF Trask sub-basin (11 miles) for the first time in three survey years.

After two years of similar production estimates (2005-2006) in the Tillamook basin, Coho abundance rose 107% in 2007, the largest basin-wide improvement of the 2007 inventory. It was not clear why the apparently large increase in adult Coho escapement observed throughout the Watershed during the 2005 brood year had such little effect on juvenile abundance in the Tillamook basin during the 2006 summer surveys. The total expanded estimate for summer parr in the Tillamook River basin reached 78,944 (with 20% visual bias) in 2007 and accounted for 11% of the Watershed total. The most improved populations were found in Esther Cr. (up 842%), Munson Cr. (up 169%), Faucett Cr. (up 133%), and the Tillamook mainstem (up 90%).

The Miami basin exhibited the lowest Coho distribution and production levels of all the major basins during all three years of this inventory. This basin accounted for 5% - 6% of the total Watershed Coho estimate each year between 2005 and 2007, and exhibited between 26.1 - 28.8 miles of Coho

distribution. Expanded estimates for Coho in the Miami basin rose 64% in 2006, then again by 8% in 2007 to reach 33,763 summer parr (with 20% visual bias). Almost all Coho in the Miami basin were found in the mainstem during each survey year (69% in 2007), although abundance levels in that segment fell 8% during the third (2007) survey while rising 227% in Peterson Cr. and 127% in Illingsworth Cr. For comparison, Coho production estimates from the Little North Fork Wilson, Jordan Cr./Wilson, North Fork Kilchis, and Elkhorn/NF Trask sub-basins all surpassed the basin-wide estimate for the Miami in 2007. With little tributary habitat to work with in the Miami, anadromous production is dependent largely on the mainstem, where most land use impacts have been concentrated. Channel entrenchment, high water temperatures and water withdrawals have reduced the production potential of the lower half of the mainstem. The upper half of the mainstem was in good condition and adult escapement appeared to be the primary limiting factor.

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, sub standard riparian condition and water quality were common factors influencing fish distribution throughout the agricultural lands. Knotweed infestation is also a significant invasive species of concern for the lower Tillamook, Trask, Wilson, and Miami Rivers.

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, steep boulder gorges, or dry channel conditions. 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.

Considering the past three years of monitoring, the most important anchor habitats for Coho in the Tillamook Bay complex of streams appear to be the Little North Fork Wilson, Elkhorn Cr., the North Fork Kilchis, Jordan Cr./Wilson, the Little South Fork Kilchis, and Cedar Cr./Wilson. The mainstem reaches of the Wilson, NF Wilson, WFNF Wilson, Devils Lake Fork Wilson, Kilchis, North Fork Trask, East Fork Trask, and Miami rivers also exhibited consistently high numbers of summer rearing Coho, mostly due to their longer distribution lengths and the fact that adult spawning in several of the above listed tributaries contributed to their summer rearing estimates. Production rates over the last three survey years throughout the Tillamook and Miami basins (except for the Miami mainstem) remained low relative to the above mentioned reaches. The leading producers of Coho during the 2007 summer inventory, including the Little North Fork Wilson (76,700 expanded with 20% visual bias), Jordan Cr. (49,219), the NF Kilchis (45,825), and Elkhorn Cr. (45,019), accounted for 31% of the Watershed total. The largest mainstem populations in the Wilson (39,813) and the Kilchis (37,581) accounted for another 11%.

These reaches currently represent the most critical habitat for the survival of Coho within the Tillamook Bay Watershed. They also represent the best spawning gravels, highest wood complexities, and, in most cases, the lowest land use impacts encountered during the inventory. This was especially true in the Little North Fork Wilson and Elkhorn Cr. At or near full seeding was achieved for summer Coho parr, in the Little North Fork Wilson in 2006, in Elkhorn in 2006, in Jordan Cr. in 2007, and in the NF Kilchis in 2007. At or near fully seeded conditions were also observed in the following habitats during this three year inventory (though expanded estimates were comparably lower): Esther/Tillamook (2007), Mills/Tillamook (2007), Munson/Tillamook (2007), Pleasant Valley/Tillamook (2007),

Simmons/Tillamook (2007), Boundary/EF Trask (2006), Clear Cr./NF Trask (2006), Edwards Cr./SF Trask (2007), Trib. D/EF Trask (2007), Trib. D/NF Trask (2006), Ben Smith/Wilson (2007), Elliot/Devils Lake Fork Wilson (2006), Rogers Cr./WFNF Wilson (2007), the WFNF Wilson (2007), Trib. A/Devils Lake Fork Wilson (2007), Trib. A/SF Wilson (2007), Trib. C/Cedar/Wilson (2007), Company Cr./SF Kilchis (2006), Sam Downs/Little SF Kilchis (2007), Trib. A/Kilchis (2007), Illingsworth/Miami (2007), and Trib. G/Miami (2007).

Basin-wide estimates for pool-rearing juvenile Steelhead decreased in four out of the five basins in the Tillamook Bay complex in 2006 and 2007. The Trask basin was the only to register an increase in abundance (18%) in 2006, and the Tillamook exhibited the only increase (4%) in 2007. Declines appeared more severe and widespread in 2007 (down 53%) than in 2006 (6%) across the Watershed. An expanded estimate of 23,290 pool-rearing 1+Steelhead were present in 2007 compared to 49,380 in 2006 and 52,290 in 2005. A significant negative trend has emerged for this species in the Tillamook Bay Watershed during the last three years. Declines totaled 63% in the Trask basin, 61% in the Wilson, 40% in the Kilchis, and 15% in the Miami between the 2006 and 2007 summer surveys. Huge declines were experienced in the largest populations, including the Wilson mainstem, the Little North Fork Wilson, the Trask mainstem, the NF Trask mainstem, the EF Trask mainstem, and the SF Trask mainstem. The highest numbers of remaining 1+Steelhead in 2007 were found summer rearing in the mainstem Wilson (4,455 expanded), the mainstem Miami (2,590), the mainstem Kilchis (2,135), the SF Trask mainstem (1,420), the EF Trask mainstem (1,175), the NF Kilchis (1,025), the Little North Fork Wilson (995), Jordan Cr. (950), the Little South Fork Kilchis (825), Elkhorn Cr. (820), Cedar Cr. (780), and the mainstem Trask (510).

Actual population sizes for Steelhead, Cutthroat and O+ trout are much higher than documented because rapid/riffle habitats were not sampled during this RBA inventory. Steelhead, Cutthroat and 0+ numbers from this analysis can only be utilized to identify key reaches and monitor inter-annual trends.

Cutthroat abundance also declined approximately 17% across the Tillamook Bay Watershed between 2006 and 2007 and about 20% since 2005. The expanded estimate for this species totaled 23,025 in 2007 for the entire Tillamook Complex.

It is suspected that the severe flood event experienced in Tillamook complex of streams during the fall of 2006 may have contributed to the widespread declines noted above. If 1+ steelhead were negatively impacted by this event, it is likely that over-wintering juvenile Coho would also have been negatively effected. A second severe flood event was experienced in Tillamook during the fall of 2007, which may have also effected over-wintering juvenile Coho and replicated the loss experienced for older age class Steelhead and Cutthroat. The survival rates of pre-smolts flushed to the estuary are not well documented. It is possible that juvenile salmonids originating from the steep basaltic tributaries of the Tillamook complex of streams have developed a life history strategy to deal with frequent torrent activity and minimal upper basin winter rearing habitat by seeking refugia within the estuarine complex of habitats. Adult Coho returns during the 2009 and 2010 brood years may help illustrate the effects of these floods on winter juvenile rearing.

It is likely that these flood surges have also had positive morphological effects on stream habitats within the Watershed, particularly on the sorting and cleaning of spawning gravels, and the recruitment of upslope wood and substrate resources to the active channel. These effects may have contributed, through higher egg-to-fry survival rates, to the extremely high rearing densities for juvenile Coho that were observed in many parts of the Wilson and Kilchis basins during the 2007 summer inventory.

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

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

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

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

(4) Clear, Vaughn (culvert passage problems), and the Little South Fork mainstem 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
Bay Tribs.	486	4 – 5
Total :	291,264	2,331 – 2,649

-ODFW adult SRS data indicated a total escapement of 2,290 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 1,995 Coho

Basin	2007 Coho Summer Parr(w/ 20% snorkel bias)	Estimated 2006 Adult escapement
Tillamook	78,944	632 – 718
Trask	139,719	1,118 – 1,270
Wilson	320,738	2,566 – 2,916
Kilchis	131,744	1,054 – 1,198
Miami	33,763	270 – 307
Bay Tribs.	688	5 – 6
Total :	705,350	5,643 – 6,412

-ODFW adult SRS data indicated a total escapement of 8,774 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 an average of 1.5 fish/sq.meter a fully seeded density for Coho. A small number of streams surpassed this level during the 2006 and 2007 inventories, including Cruiser Cr. and Trib. C on Elkhorn of the North Fork Trask, Clear Cr. and Trib. D on the North Fork Trask, Boundary Cr., Bales Cr., and Trib. D on the East Fork Trask, Ben Smith and the South Fork of Jordan Cr. on the Wilson, Elliot Cr. and Trib. A on the Devils Lake Fork Wilson, Berry Cr. and White Cr. on the Little North Fork Wilson, Rogers Cr. and the WFNF on the North Fork Wilson, Trib. C on Cedar Cr./Wilson, Company Cr. on the South Fork Kilchis, the North Fork Kilchis mainstem, Sam Downs Cr. on the Little South Fork Kilchis, Trib. A of the Kilchis, and Esther Cr., Mills Cr., and Pleasant Valley on the Tillamook. Most of these reaches were rearing over 2.0 Coho/sq.m. during the summer of either 2006 or 2007. There are concerns from many biologists that the above estimate of fully seeded (1.5 fish/sq.m.)

does not represent the production potential that exists in completely functional Coho habitat. 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 averaged 4.6 fish/sq.m. (Trib. D of the NF Trask) and 4.0 fish/sq.m. (Trib. C of Elkhorn). In 2007, the highest levels averaged 6.9 fish/sq.m. (Trib. A of the Devils Lake Fork), 3.7 fish/sq.m. (Trib. C of Elkhorn and Esther Cr.), and 3.4 fish/sq.m. (SF Jordan). 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 beaver dam frequency and location is detailed in the Access database under its own heading with further description 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. It is interesting to observe that no active beaver dams were found in the Kilchis basin. Stream gradients were consistently high there except for Coal Cr., Trib. A, Vaughn Cr., and Murphy Cr., all of which supported high levels of human development and livestock use. The continued collection of this data could be very revealing as land use patterns, stream gradients, and anadromous fish production change in the future.

(Table 2) Beaver Dam Summary

Year	Tillamook	Trask	Wilson	Kilchis	Miami	Bay Tribs	Total
2006	99	16	7	-	9	5	136
2007	70	23	13	-	7	-	113

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 2007 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

Large scale increases in Coho production were observed in the Tillamook 5th field in 2007 after a year of almost no change in 2006. Coho abundance increased 14% across the entire Tillamook complex of streams in 2007, however the Tillamook River basin population more than doubled. This was the largest increase observed among all five basins. The Tillamook basin ranked third in Coho distribution for 2007 (55.4 miles) and fourth in expanded population estimate (63,155 summer parr, not including 20% visual bias).

Most Coho were found in the Tillamook mainstem, Bewley Cr., and Simmons Cr. during all survey years. The most radical observation of increased production in the basin was observed in Esther Cr. where the Coho estimate increased 842% from the previous year and rearing densities averaged an exceptional 3.7 fish/sq.m. Large increases were noted also in the Tillamook mainstem, Faucett, Killam, and Munson. All of the major sub-basins in the Tillamook 5th field exhibited improvements in Coho production during the 2007 inventory.

The 2007 Coho population here remained about twice as large as the Miami basin population and slightly more than half the size of the Kilchis population. Tillamook basin Coho accounted for 11% of the total Tillamook Bay Watershed summer rearing population in 2007, compared to 6% in 2006 and 13% in 2005. Most habitats were still summer rearing well below seeded capacity for Coho, with only Esther, Simmons, Mills, Munson, and Pleasant Valley exhibiting significant rearing densities. The basin-wide expanded estimate for 1+ Steelhead totaled 1,465 in 2007 and has shown almost no change over three years of inventories. The Tillamook basin 1+Steelhead population has also been consistently the smallest in the Watershed during the three year inventory.

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 stream gradients were low. Coho distribution in these areas typically ended in large beaver impoundments or low flow marshes. The best spawning gravels for Coho in this part of the basin were documented in the upper mainstem (about 3 miles) and in Bewley Cr. (upper 3 miles and Trib. E). These two sub-basins were the largest producers of Coho within the Tillamook River basin for all three years. Average rearing densities for Coho in these two reaches during the 2007 inventory rose just slightly to 0.5 fish/sq.m. in the mainstem and 0.4 fish/sq.m. in Bewley Cr., their highest levels of the 3 year inventory. These levels indicate the potential for significantly higher seeding and rearing densities relative to Coho. The relatively small 2.4 mile Esther Cr. sub-basin is also located on the western side of the sub-basin, feeding into the tidally influenced zone of the Tillamook River. Stream gradients here were higher than other western tributaries as the stream winds up onto Cape Meares. The relatively higher hydraulic potential, cooler summer stream temperatures and the higher abundance of spawning substrates may have contributed to the significant increase in production in 2007.

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 (4.3 miles), Munson (2.7 miles), and Faucett (5.4 miles) ranked as the fourth, fifth, and sixth largest producers of Coho in the basin. Actual Coho production in Killam (5.5 miles) is likely to be higher since surveyor access has been denied during all three years to a one mile reach just upstream of the mouth. The largest increases in Coho production among the eastern tributaries for 2007 were found in Munson (up 169%) and Faucett (up 133%). The highest average rearing densities were found in Pleasant Valley and Mills (1.9 fish/sq.m.). The second highest in Munson and Simmons (1.6 fish/sq.m.). These four sub-basins appeared close to their carrying capacity for Coho during the summer of 2007. Results from the three year inventory as a whole indicate that the spawning beds in Bewley, Simmons, Faucett, Munson, and the upper Tillamook mainstem were consistently the most important target zones for spawning adult Coho in the basin.

As in 2005 and 2006, nearly all of the basin's 1+Steelhead production for 2007 occurred among the four eastern sub-basins (primarily in Faucett for 2005 and 2007, and in Simmons for 2006). Actual 1+Steelhead populations in Killam were likely to be much higher for all years due to the denied access. The small abundances of 1+Steelhead found in the mainstem Tillamook were associated almost exclusively with the mouths of these four streams during all three inventories. 70 active beaver dams were noted in the Tillamook River basin in 2007, mostly in the mainstem, Beaver Cr., Bewley Cr., and Trib. E. This was more than half of all the beaver dams found within juvenile Coho distribution in the Tillamook Bay Watershed.

(Table 4) Tillamook River 2007 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Mainstem	11,910*	18.9	435*	13.1	170*	11.6	775*	19.6
Beaver	1,715	2.7	45	1.4	-		60	1.5
Bewley	10,050*	15.9	160	4.8	20	1.4	825*	20.9
Esther	8,475*	13.4	300	9.0	-		90	2.3
Faucett	7,020	11.1	875*	26.3	700*	47.8	285	7.2
Joe	-		-		-		-	
Killam	3,955	6.3	335*	10.1	140*	9.6	775*	19.6
Mills	1,630	2.6	35	1.1	-		30	-
Munson	7,535*	11.9	335*	10.1	65*	4.4	455*	11.5
Pleasant Valley	1,910	3.0	-		-		15	-
Simmons	8,300*	13.1	525*	15.8	365*	24.9	300*	7.6
Basin Total	**62,500**	**99**	**3,045**	**91.4**	**1,460**	**99.6**	**3,610**	**91.5**

* 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%)
2007	11,910	435	170	775
	(19%)	(13%)	(12%)	(20%)

- 20% visual bias not included

A significant 90% increase in Coho production was observed this year in the mainstem after a decline of 38% in 2006. This brought the 13.9 mile mainstem population of summer parr back to a level roughly equal to that observed in 2005. While the 2007 mainstem Coho population appears just 18% higher than in 2005, the basin-wide Tillamook River population has more than doubled. This effect has led to a decreasing trend in the mainstem's percent contribution to Coho in the 5th field – from 33% to 21% to 19%. This trend is especially notable during a year of apparently high adult escapement for Coho

in the basin and seems to suggest a steadily diminishing role for summer rearing in mainstem relative to the rest of the system.

The Tillamook mainstem is the largest habitat component within the Tillamook basin. A low average rearing density for Coho of 0.3 fish/sq.m. during the first two years of surveys rose slightly to 0.5 fish/sq.m. in 2007. The two mile reach of mainstem at the end of distribution appeared to be the main spawning destination for adult Coho during all three inventoried 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 42% of the mainstem Coho population was observed rearing in this reach in 2007 where individual pool densities reached 3.7 fish/sq.m.

Most mainstem habitats downstream of the Yellow Fir Road Bridge were 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 rearing 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 during all survey years. Water samples were taken throughout this reach in conjunction with the 2007 surveys and provided to TEP for analysis.

A strong legacy of beaver activity remained in many reaches of the mainstem throughout the three year inventory. 14 beaver dams in all were counted in 2006 and 13 in 2007. 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 abundance here. All 1+Steelhead in the mainstem were observed below RM 4.1 during all survey years. This reach was where Killam Cr., Faucett Cr., Simmons Cr., and Munson Cr. all join the mainstem Tillamook. These streams were the four major high gradient eastern tributaries to the Tillamook mainstem and the greatest suppliers of cold water, gravel, and Steelhead habitat. Juvenile Chinook (an expanded estimate of 3,970 for 2007) were observed from the head of tide up to RM 5 in 2007, RM 4 in 2006, and RM 7 in 2005. Cutthroat were observed primarily near the mouths of the previously mentioned major eastern tributaries although continued to the end of Coho distribution. 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.).

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, and Esther with 2). For the last three years the Beaver sub-basin has exhibited the lowest levels of fish production between these three. The low 2005 expanded estimate for Coho summer parr fell 50% in 2006 and then made a dramatic recovery in 2007, an increase of 404%, to reach a level almost three times as high as the 2005 estimate. The expanded estimate for 2007 of 1,715 Coho summer parr represents an increase from approximately two successful spawning pair to approximately eight spawning pairs.

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. No Coho were observed here in 2006 or 2007.

The 2007 Coho distribution in the mainstem of Beaver Cr. extended 2.4 miles upstream from this point at a low average rearing density of 0.4 fish/sq.m. with the highest peak density reaching 1.4 fish/sq.m. near RM 1.7 (upstream of the Beaver Cr. Road crossing). The short reach surrounding RM 1.7 appeared to be the zone most targeted by adult spawners during all three years of inventory. The expanded estimate for Coho in the mainstem totaled 850 summer parr, about 50% of the sub-basin total. 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. 11 beaver dams were noted.

Trib. C meets Beaver Cr. just above the Beaver Cr. Road crossing and also heads north, following the road upstream. A moderate Coho distribution of 0.9 miles and 115 summer parr (expanded) were observed in Trib. C in 2007 after an expanded estimate in 2006 of just 10 summer parr. Expanded estimates totaled 150 summer parr here in 2005. Potential anadromous distribution in this tributary ends at a 6ft foot clay falls below a massive beaver dam complex which appears to reach all the way to the headwaters of the stream. 3 separate beaver dams were noted throughout the survey. An improvement in Coho production was observed this year in Trib. D where expanded estimates reached 750 summer parr and extended for 0.8 miles. Rearing density averaged a healthy 1.4 fish/sq.m. in this very small stream. Only a minor upstream migration of juveniles was noted here during the previous two years of surveys.

Spawning gravel appeared to be the main limiting factor in the sub-basin 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 any year and Cutthroat abundance decreased noticeably in 2007. No knotweed was observed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	685	0.1	135	-	200
2006	340	0.1	45	-	195
2007	1,715	0.4	45	-	60

- 20% visual bias not included

Bewley

Bewley Cr. and the Tillamook mainstem remained the two most important components of Coho production for the Tillamook 5th field in 2007. Expanded estimates for Coho from these two components were nearly identical in 2007 and 2006 while in 2005 the Bewley Cr. estimate was about 30% lower. Summer parr abundance here in 2006 did not respond to the dramatic increase in adult Coho escapement to the rest of the Tillamook Bay complex of streams. The 2007 inventory however, observed a 44% increase in summer parr abundance for the Bewley sub-basin, 10,050 Coho - expanded. About 70% of that population was observed in the mainstem. Coho production in Bewley represented 23% of the basin-wide population in 2005 and 2006, and 16% in 2007.

Average rearing densities for Coho remained low in most of the sub-basin but increased to 1.0 fish/sq.m. in Trib. E. The mainstem averaged 0.4 fish/sq.m. and Trib. D rose to 0.8 fish/sq.m. (only 395 summer parr – expanded). These levels indicate a substantial potential for higher summer production rates with greater adult escapement. During all three 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 1.4 fish/sq.m. in 2007. Tribs. D and E represented the most productive tributary habitats during all 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 has dropped each year from 10.4 to 9.6 to 8.4 miles in 2007 despite this last year's rise in population estimate.

This is probably due to the fact that most of the distribution loss has occurred in Tribs. C, F, and G, where production potential for anadromous fish appears relatively low.

Distribution for Coho in the mainstem dropped from 6.2 miles to 5.7 miles in 2007. Rearing density rose consistently upstream toward the main spawning peaks at RM 4.3 and 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 the upper reach. Three exhibited minor upstream migrations of Coho and two, Tribs. D and E, exhibited signs of adult spawning. Beaver impoundments and the resultant low abundance of spawning gravel in Trib. D appeared to be limiting production potential there. Trib. E appeared to be the most productive tributary to Bewley Cr. during all years of survey. Expanded estimates increased 115% there in 2007 to 2,510 Coho (about 25% of the sub-basin total). Rearing density doubled and averaged 1.0 fish/sq.m. with a spawning peak of 2.9 fish/sq.m. near RM 0.6. Coho distribution in Trib. E actually increased in 2007 from 1.5 miles to 1.7 miles.

Several sill-log structures and debris torrent jams were present in Trib. E, both supporting high Coho counts in the resulting pools. 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 Trib. E and the upper 2-3 miles of mainstem Bewley characterize these reaches as the most important spawning habitats present in the sub-basin. Given the relative rates of production observed there during three years of surveys they also appear to be among the most targeted spawning destinations for adult Coho in the whole Tillamook basin.

Expanded estimates for 1+Steelhead in the sub-basin have remained extremely low. Cutthroat sightings increased 67% during the 2006 survey then declined to nearly the 2005 level in 2007. No knotweed was noted in 2005 or 2006 but was found in 2007 surrounding the mainstem bridge at RM 1.2. This sighting deserves attention as soon as possible while its size is still small. 20 beaver dams were recorded in the sub-basin, 9 in the mainstem.

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
2007	10,050	0.4	160	20	825

- 20% visual bias not included

Esther

A stunning 842% increase in abundance in 2007 for Coho parr in the short 2.4 miles of Esther Cr. nearly reached the level of production of Bewley Cr. and the Tillamook mainstem. With an expanded estimate of 8,475 summer parr, this small tributary represented 13% of the Tillamook River basin-wide total. This included 0.5 miles of distribution both in Trib. A and in the Tomlinson Cr. tributary. A decrease in the Coho population was observed here in 2006 and average rearing densities were low in 2005 and 2006 (0.8 fish/sq.m. and 0.4 fish/sq.m., respectively). Apparently large increases in adult escapement here led to extremely high rearing densities for summer parr throughout the 1.5 miles of mainstem Esther – averaging 3.7 fish/sq.m. and peaking at 7.8 fish/sq.m. near RM 0.3. The entire mainstem reach appeared seeded to its fullest capacity. With the second highest tributary estimate in the basin it is very revealing of system potential to observe that Coho production in this relatively small sub-basin could surpass estimates from much larger and colder eastern tributaries to the Tillamook such as

Faucett and Munson and roughly equal the estimate from Simmons (the Killam Cr. estimate is missing 0.7 miles of potentially high density distribution – see discussion).

Esther Cr. is 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 connects 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.

The mainstem of Esther was rearing 91% of the Coho observed in the sub-basin in 2007. The best reach for spawning can be found between RM 0.3 and RM 0.6 in the transition zone between the lower pasture habitats and the upper mixed forest canopies. This is where rearing densities peaked in 2005 and 2007. The density profile for Coho in 2006 peaked further upstream near the end of distribution at RM 0.9. This upper 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. These longer pools were packed with Coho summer parr during the 2007 survey. 3.7 fish/sq.m. was the highest average rearing density in the Tillamook band a rare occurrence anywhere for juvenile Coho. 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 three years of surveys suggests that the summer inhabitants of Trib A have resulted from upstream migrations of juveniles from mainstem Esther. Low level spawning potential is also present in this small stream. 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 2 small 4 ft. driveway culverts (where a significant patch of Knotweed was observed easily visible alongside the Cape Meares bayside road), and turned westward into steeper stream gradients. The first culvert exhibited a perch of 1.5 ft. which appeared to be a juvenile barrier. Expanded estimates for Coho doubled in Tomlinson in 2007 reaching 425 summer parr, about 5% of the sub-basin total. This represents about 2 spawning pair while the population in the mainstem of Esther Cr. represents about 34 spawning pairs. Rearing density here averaged 1.1 fish/sq.m. and distribution totaled 0.5 miles. 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 or 2007.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,650	0.8	230	15	170
2006	900	0.4	405	-	280
2007	8,475	3.7	300	-	90

- 20% visual bias not included

Faucett

2007 Coho production in the Faucett Cr. sub-basin increased a significant 133% from the previous year but it's ranking among other Tillamook River tributary estimates dropped from third to fifth. Production increases in Esther and Munson were much greater. Roughly 11% of all summer parr in the basin were found rearing in Faucett Cr. during the 2007 survey. Expanded estimates here have risen steadily for two years in a row now (up 44% in 2006) along with only four other components in the 5th

field – Mills, Killam, Pleasant Valley, and Simmons. All of these drainages share a common geology and originate from neighboring high ridges along the eastern side of the Tillamook River basin.

Average rearing density remained relatively low in 2007 at 0.7 fish/sq.m. throughout 5.4 miles of the mainstem. The two main peaks in spawning activity observed during the previous two years appeared to move slightly upstream in 2007 to RM 1.9 (3.1 fish/sq.m.) and RM 4.1 (1.3 fish/sq.m.). The expanded estimate for 1+Steelhead in Faucett Cr. was up in 2007 to 700, the #1 largest population in the basin representing 48% of the basin-wide total. 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 sub-basins 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 in-stream wood complexity. The 3 ft. plunge over the first dam is a juvenile barrier but is passable for adults. In contrast to the past two survey years, there appeared to be at least twice as many 1+Steelhead and Cutthroat upstream of this dam in 2007. More than half of the juvenile Coho population was observed downstream of the dam. Juvenile Chinook were present upstream of the dam to RM 3.8. The condition of the 10 ft. culvert at RM 0.5 has declined over three years of surveys and in 2007 was perched by 2 feet and unraveling quickly. A bridge replacement at this site should be a high priority.

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. Coho distribution ended below the reservoir where stream gradients climbed up to 5% and numerous large boulder falls were encountered. 2007 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.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	2,095	0.3	485	925	550
2006	3,015	0.4	420	440	365
2007	7,020	0.7	875	700	285

- 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 or 2007 although visibility was very poor. 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, warm water, and fine sediments characterize Joe Cr. and 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.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	65	0.03	70	-	40
2006	-	-	30	-	30
2007	-	-	-	-	-

- 20% visual bias not included

Killam

Stream habitat in Killam was very similar to Faucett. Estimates from Killam, however, are difficult to compare since access was denied by landowners for three years in row to a 0.7 mile reach near the stream's mouth. Rearing densities above and below this reach suggest that a significant portion of the stream's Coho population has been missed during each of these years. 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. Coho production increased another 89% in 2007. Average rearing densities for Coho have also consistently risen during each survey from just 0.1 fish/sq.m. to 0.6 fish/sq.m. Distribution distance in the mainstem of 4.6 miles has changed little while distribution in Tribs. C and D has dropped 50% to just 0.9 miles (combined). Based only on the portions of Killam that were surveyed it would appear that Coho seeding levels were lowest here all years relative to the neighboring eastern sub-basins and well below the capacity of the habitat.

In 2005, 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. The higher levels of Coho production observed in 2007 displayed much less of an effect from the dam. Their peak density of 1.5 fish/sq.m. was found 0.5 miles upstream of the dam and the total surveyed population upstream and downstream of the dam was fairly equal (not including the 0.7 miles of denied access). In addition there were higher abundances of 1+Steelhead and Cutthroat upstream of the dam in 2007 than downstream of the dam. Juvenile Chinook distribution ended below the dam in 2007 at RM 1.6.

Trib. C contained some of the best spawning and rearing habitat in Killam Cr. and contributed 9% (360-expanded) of the total Coho in the sub-basin for 2007. This population was roughly equal to the 2006 Trib. C population (only 40-expanded-for 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 fell slightly here in 2007 (0.8 fish/sq.m.) along with total distribution (0.6 miles). 2 beaver dams were noted, the only in the sub-basin.

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. Considering the 409% and 89% increases in Coho abundance observed in the last two years in the portions surveyed, it is suspected that good production is also occurring in the un-surveyed 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
2007	3,955	0.6	335	140	775

- 20% visual bias not included

Mills

Increases in Coho production have been less dramatic in Mills Cr., though just as steady. The summer rearing Coho population here has increased by about 7% for the last two years in a row. Average rearing density has increased each year also and reached a healthy 1.9 fish/sq.m. in 2007. It is likely that this habitat was seeded to capacity with respect to Coho during the summer of 2007. Peak rearing densities in 2007 reached 3.4 fish/sq.m. at the mouth, probably due to upstream migrations from the Tillamook River, and 3.3 fish/sq.m. further upstream at RM 0.7, probably due to in-stream spawning. Total distribution for Coho in Mills Cr. has changed little at 1.3 miles. Average rearing densities for Coho in Mills were identical to those in the nearby Pleasant Valley and were the second highest in the Tillamook basin after Esther Cr. 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 appears to be highly variable in Mills while Cutthroat abundance dropped sharply during the last year of survey. 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
2007	1,630	1.9	35	0	30

- 20% visual bias not included

Munson

2007 Coho production in Munson ranked as the fifth highest in the basin. The expanded estimate of 7,535 summer parr was slightly higher than that from Faucett Cr. and exhibited a 169% improvement over the depressed 2006 Munson Cr. population. This was the only eastern tributary that exhibited a decline in Coho abundance for 2006.

A healthy rearing density averaging 1.6 fish/sq.m. was maintained for 2.1 miles in the mainstem with two main spawning peaks at RM 0.2 (3.6 fish/sq.m.) and RM 1.8 (3.0 fish/sq.m.). Most summer Coho were rearing in the lower gradient habitat below RM 1. The summer carrying capacity for Coho in Munson is probably very close to the 2007 expanded estimate.

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. Evidence of in-stream Coho spawning was detected in Trib. A during the 2007 survey only when an expanded estimate of 155 summer parr extended for 0.6 miles upstream. Juvenile distribution extended beyond the juvenile barrier culvert at RM 0.14 (1 ft. perch). A minor upstream migration was detected here in 2005 and no Coho were found here in 2006. Anadromous production potential in Trib. A upstream of the culvert appeared relatively low and culvert repair should therefore be low priority.

1+Steelhead abundance appeared to recover slightly in 2007 while Cutthroat abundance has risen considerably over the three survey years. Distribution for these two species was relatively even over the 2.1 mile length of survey. An expanded estimate of 35 juvenile Chinook were present up to RM 0.5.

Knotweed was noted at the mouth in 2007 for the first time in this three year inventory (the furthest upstream sighting on the Tillamook River) as well as at the 101 Bridge at RM 0.2.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	3,560	0.7	80	90	160
2006	2,805	0.7	155	45	260
2007	7,535	1.6	335	65	455

- 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. This stream exhibited the most improvement in Coho production in the 2006 Tillamook River inventory and continued to increase in 2007 by another 67%. Expanded estimates and rearing densities for Coho this year were very similar to those from Mills. 1.9 fish/sq.m. here and in Mills was the second highest average rearing density for Coho in the basin in 2007 and the carrying capacity for this species in this short 1.1 reach appears to be very close to 2000 summer parr. High rearing densities were observed throughout the entire distribution and reached peaks of 2.7 fish/sq.m. at RM 0.2 and 4.7 fish/sq.m. at RM 0.7.

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. Out of 4 total culverts 2 were noted as juvenile barriers – the first (RM 0.4) and the third (RM 0.6). No Knotweed was located.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	155	0.4	-	-	10
2006	1,145	1.3	-	-	45
2007	1,910	1.9	-	-	15

- 20% visual bias not included

Simmons

Coho estimates have climbed steadily for two years in the Simmons sub-basin. This population ranked as the fourth largest in the basin for 2007. One of the main eastern sub-basins, Simmons provides at least 4 miles of high quality stream habitat to Coho, Steelhead, and Cutthroat. The absence of any dam, fish ladder, or falls in this large sub-basin is notable and has probably contributed significantly to its resilience and productivity for Coho. 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 climbed another 61% in 2007. Average rearing density for Coho has increased from 0.4 fish/sq.m. to 1.02 fish/sq.m. to 1.6 fish/sq.m. over the last three years of survey. This was the same summer rearing density as seen in Munson Cr. this year but with about twice as long a distribution.

Highest rearing densities were observed throughout the first 2 miles of stream, peaking at 4.7 fish/sq.m. about 800 ft. up from the mouth (upstream migrations likely) and again at 4.5 fish/sq.m. near RM 1 (main spawning peak). An average rearing density of 2.6 fish/sq.m. was sustained throughout the first two miles of the Simmons Cr. survey. This reach contained 86% of the sub-basin Coho population and appeared to be one of the most targeted spawning zones for adult Coho in the Tillamook River system. Carrying capacity for Coho in upper Simmons could be higher still than the levels observed in 2007.

1+Steelhead production remained relatively strong in Simmons throughout the three year inventory. This population ranked as the second largest in the 5th field behind Faucett Cr. in 2007 and represented about 20% of the total population. Most were found in the lower two miles of survey. Cutthroat abundance has remained steady and was evenly distributed in 2007. Juvenile Chinook were present in low numbers up to RM 0.6. All culverts were passable and no Knotweed was found.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	2,465	0.4	190	260	325
2006	5,170	1.0	985	505	250
2007	8,300	1.6	525	365	300

- 20% visual bias not included

Unnamed Tributaries

8 unnamed tributaries to the Tillamook were surveyed in 2007: C, E, F, L, M, N, Q, and R. Small Coho populations were found in 6 (E, F, M, N, Q, and R). Tributaries with Coho in 2005 included: Tribs. C, E, M, O, and Q, and in 2006: Tribs. C, E, F, O, and Q. Most streams below Trib. M on the Tillamook were 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. Tributaries upstream of Trib. M were considerably rockier with greater elevation change and little beaver presence.

Coho distribution in the mainstem Tillamook extended into and upstream of Trib. R for the first time in three years in 2007. This turned out to be the most productive of the unnamed tributaries for 2007 with an expanded estimate of 210 Coho summer parr. It appears that adult spawning may have occurred there in a short 0.4 mile reach of low gradient fine spawning gravel. Rearing density averaged a healthy 1.7 fish/sq.m. Spawning habitat in Trib. R looked better than the habitat remaining in the Tillamook mainstem upstream of Trib. R, which quickly climbed into larger rocks and steeper gradients with fewer pools. A single active beaver dam was also noted in Trib. R.

Trib. E has represented the most consistent potential for Coho production during each of the three years of this inventory. Potential anadromous distribution extends for 1.8 miles and ends in successive, well established beaver impoundments. Adult spawning appears to have occurred in this stream somewhere around RM 1 in 2005 and 2006. Distribution in 2007 appeared to be due to upstream juvenile migration only and lasted just 0.8 miles (90 Coho-expanded). 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 this tributary's production potential. 16 beaver dams were counted here in 2007.

Tribs. F, M, N, and Q exhibited small Coho populations in 2007, all less than 80 summer parr (expanded) and 0.2 miles of distribution. 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

A 23% decline in juvenile Coho abundance was observed in the Trask basin during the summer surveys of 2007. This was the only one of five basins in the Watershed to exhibit a basin scale decline. The unusually high production estimates from the summer of 2006 that reached 144,575 summer parr (expanded, without 20% visual bias) helped set the stage for this year's relative decline to 111,775

summer parr (expanded, without 20% visual bias). Shifts in adult escapement and the significant flood event in the fall of 2006 may have also contributed to this decline. Coho abundance in 2005 totaling 71,785 summer parr (expanded, without 20% visual bias) remained the lowest out of three years of inventory in the Trask basin. It is most likely that adult escapement during the 2005 winter brood was stronger in the Trask than during the 2006 winter brood, in contrast to findings in the Tillamook, Wilson, Kilchis, and Miami basins, which indicate stronger returns from the 2006 winter brood based on higher juvenile abundances during the summer of 2007.

Total Coho distribution also dropped in the Trask basin in 2007 from 82.2 to 76 miles. This population was the second largest among the Tillamook Bay 5th fields (behind the Wilson) during all three years of surveys, and in 2007 was responsible for 20% of all Coho in the Tillamook Bay Watershed. 58% of all Coho in the Trask basin were observed rearing in the North Fork sub-basin while 40% were found in the South Fork sub-basin. Coho estimates dropped 53% in the Trask mainstem and 33% in the North Fork sub-basin, while increasing by 7% in the South Fork sub-basin. Only 5 streams showed improvements in Coho production in 2007, 4 of them in the South Fork sub-basin: Trib. D of the East Fork (up 32%), the South Fork mainstem (up 29%), Edwards Cr. (up 7%), and Boundary Cr. (up 5%).

Three years of surveys in the Trask basin verify Elkhorn Cr. and the East Fork Trask as the main destinations for adult spawners. Juvenile abundance for Coho decreased substantially by 29% in Elkhorn during the 2007 inventory and showed little change in the East Fork (down 4%). In combination, these two sub-basins accounted for 55% of the Trask's total Coho production for 2007, 53% for 2006, and 40% for 2005 (a year of significantly lower abundance). In 2007, roughly 42% more Coho were found in Elkhorn's 10.9 miles than in the East Fork's 13.9 miles. Average rearing densities for Coho remained high in these two areas: 3.7 fish/sq.m. in Trib. C of Elkhorn, 2.1 fish/sq.m. in Trib. B of Cruiser (Elkhorn), and 3.2 fish/sq.m. in Trib. D of the East Fork. Even the mainstem of Elkhorn maintained an average summer parr density of 1.5 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, Clear Cr., and Bales Cr. (East Fork). It is suspected that these habitats were seeded to capacity during the summer of 2007. Significant potential for expanded production exists in most of the under-seeded habitats of the North, South, and East Fork mainstems.

Limiting factors including heavy sedimentation and poor water quality have reduced productivity in Mill Cr., where survey efforts upstream of RM 1.3 were terminated in 2007 due to a denial of access from local landowners. The hatchery intake dam in Gold Cr. restricted almost all wild adult escapement in the sub-basin during all three years of this inventory. Prime habitat in Bark Shanty was under-utilized all three years due to poor adult escapement and an impassable fresh log jam in winter of 2006. Also worth noting was the singular two-year declining trend observed in the Trask mainstem. Coho production there first fell by 35% in 2006 followed by a second significant 53% decline in 2007. These two years appeared to be years of significant adult escapement for the basin. Several mainstem reaches were noted during the 2007 survey as exhibiting a total absence of Coho.

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 sub-basins 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, as well as an overall lack of fine spawning gravels. 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. Expanded estimates for these two basins dropped significantly in 2007, for unknown reasons. A 63% decrease was observed in the Trask basin 1+Steelhead (pool rearing) population (down to 5,245) while estimates fell 60% in the Wilson down to 8,750. Estimates fell dramatically for both species (Cutthroat and Steelhead)

and age classes (0+ and 1+) in most reaches of the Trask basin during the summer of 2007. Most remaining 1+Steelhead were found in the mainstem habitats of the South (27%) and East (22%) Forks, as well as Elkhorn Cr. (16%), the Trask mainstem (10%), and Edwards Cr. (8%). There appeared to be a clear preference among adult Coho for the North Fork sub-basin (58%) and among adult Steelhead for the South Fork sub-basin (59%) in 2007 as well as during the previous two survey years. This may have been partially related to the Steelhead rearing facility on the East Fork of the South Fork. 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 winter 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 23 beaver dams were noted in the basin, mostly in upper Elkhorn, the upper East Fork, and Edwards.

(Table 6) Trask River 2007 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Trask mainstem - To Fk	1,640	1.5	1,025	4.2	510*	9.7	675*	9.7
- Gold	60		330	1.3	10		125	1.8
- Green	210		35		-		20	
- Mill	690		45		-		60	
- Sampson	35		55		5		25	
NF Trask mainstem	5,475	4.9	2,995*	12.2	260	5.0	465	6.7
-Bark Shanty	2,440	2.2	365	1.5	110	2.1	120	1.7
-Clear	6,205	5.6	475	1.9	80	1.5	110	1.6
-Hembre	30		130		5		35	
-Trib. D	3,905	3.5	2,170	8.8	140	2.7	60	
-MFNF Trask mainstem	1,325	1.2	105		45		25	
-Elkhorn	36,015*	32.2	2,980*	12.1	820*	15.6	875*	12.6
-NFNF Trask mainstem	8,520*	7.6	2,700*	11.0	140	2.7	235	3.4
SF Trask mainstem	11,020*	9.9	3,700*	15.0	1,420*	27.1	1,630*	23.5
-Edwards	7,910*	7.1	2,565	10.4	445*	8.5	530*	7.6
EF Trask mainstem	17,090*	15.3	3,135*	12.7	1,175*	22.4	1,290*	18.6
-Bales	1,280	1.1	100		15		95	1.4
-Boundary	4,780	4.3	375	1.5	30		170	2.5
-Trib. D	1,615	1.4	115		25		145	2.1
Basin Total	110,245	98.6	23,400	95.1	5,235	99.8	6,690	96.5

* 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 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%)
2007	1,640	1,025	510	675
	(2%)	(4%)	(10%)	(10%)

-20% visual bias not included

Coho production has dropped significantly for two years in a row in the Trask mainstem, by 35% in 2006 and by 53% in 2007. This was the only stream segment in the basin where a decrease in Coho was observed in 2006. Coho production dropped across the basin by 23% in 2007, the only basin in the Tillamook Complex of streams to observe a decrease in Coho between 2006 and 2007. Population estimates decreased by at least 50% for all species during the 2007 inventory (by 85% for 1+Steelhead). The reason for such large declines across species is not apparent. The 6 week later date of survey for the mainstem in 2007 (September 19) compared to 2006 (August 6) may be an indication that high quality mainstem summer rearing habitats become less available as the summer progresses (this is easily conceivable if late summer temperatures start to limit distribution, no temperature data has been reviewed to corroborate this assumption). Predation and water quality pressures are likely to decrease juvenile salmonid abundance in the larger mainstem habitats as the summer progresses. The fact that 2007 juvenile Coho abundance appeared to increase in all other mainstem reaches in the Tillamook Bay Watershed conflicts with this theory.

The mainstem Coho population accounted for just 2% of basin-wide Coho in 2007 and 2006 and just 7% in 2005. This reach has been one of the smallest components of Coho production in the 5th field throughout the three year inventory and adult returns here seem to be diminishing. A large 60% decline was also observed for Coho in the 10 mile North Fork mainstem in 2007 while abundance in the 8 mile South Fork mainstem increased substantially by 29%.

A contributing factor to such low abundance in the Trask mainstem is the lack of any substantial tributary spawning habitats in the first 14 miles of stream (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 and summer rearing capacity in upper basin tributaries are adequate for current levels of adult escapement.

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.

Coho rearing density declined from low to almost non-existent in 2007 at 0.02 fish/sq.m., and numerous pools were observed with zero counts. The first main zone of Coho absence in 2007 coincided with the main zone of absence in 2006 between RM 5.6 and RM 8. This zone stretched approximately from just above Gold Cr. to just below Bill Cr. and exhibited no obvious relationship to physical habitat features. The second zone of absence in 2007 stretched from RM 11 to RM 13, almost to the forks at RM 14.1. Habitat conditions in this reach also appeared relatively healthy. Wood complexity was very low, but that was a common condition across most of the larger mainstem reaches. Some of the highest counts

for Coho summer parr during the last two surveyed years have occurred around RM 10. 1+Steelhead and Cutthroat have seemed to concentrate in this zone as well (RM 8 –11 for 2007) which is located roughly near the Peninsula Park (RM 10). Cutthroat abundance in 2007 was also high throughout the lowest 4 miles of the mainstem and upstream near the forks. The continued drop in 0+trout numbers signifies further declines in adult trout populations for 2008. The 2007 abundance level for this age class of trout was roughly one-fifth the level observed during the first year of the inventory.

Juvenile Chinook were present in decreasing densities from the head of tide all the way to the forks. The relatively large 2005 abundance of juvenile Chinook (12,555 expanded) in the mainstem roughly doubled in 2006 (24,920 expanded). The dramatically lower abundance for this species in 2007 to just 1,220 (expanded) was due to the difference in the date of survey for the 2007 data (September 19). This provides an excellent illustration of the summer migration habits for this species which tend to lead juveniles downstream toward estuary habitats as the summer progresses.

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.

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 sub-basin 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.

Three years of survey have observed Coho distributed along about 1 – 1.3 miles of mainstem Gold and 0.2 - 0.6 miles of North Fork Gold. The presence of summer parr upstream of the dam during all survey years indicates that in-stream adult spawning has taken place there. 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
2007	60	0.05	330	10	125

- 20% visual bias not included

Green

Coho spawning appears to have occurred all three 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 remained low all years, representing between 1 and 2 adult spawning pair. 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 in three years of survey. 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
2007	210	0.6	35	-	20

- 20% visual bias not included

Mill

Coho production could be significantly greater in the Mill Cr. sub-basin than the levels observed during this three year inventory. The expanded estimate for 2007 represents only habitat downstream of RM 1.3. Surveyor access was denied upstream of that point by the local landowners. Results from that year are sufficient to determine Coho presence and the fact that adult spawning took place in the sub-basin. 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.

Comparing only the first 1.3 miles of mainstem Mill Cr. to normalize the 3 years of data collected, indicates little change in Coho abundance between years: 720 summer parr (expanded) in 2005, 870 in 2006, and 690 in 2007. Average rearing density has remained around 0.2 fish/sq.m. in this reach despite the fact that some of the stream's best spawning gravel, deepest pools, and highest wood complexities can be found there.

No 1+Steelhead were found in the Mill Cr. sub-basin during any survey year. 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
2007	690	0.2	45	-	60

- 20% visual bias not included

Sampson

Results from the first two years of survey in this small stream seem to indicate the occurrence of in-stream adult spawning (at most 3 pairs for 2006 summer parr). The summer survey of 2007 found just 7 Coho summer parr in the first pool of the survey that had probably migrated upstream from the Trask mainstem. 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 in 2005 and 2006. 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
2007	35	0.9	55	5	25

- 20% visual bias not included

NF Trask

Significant escapement of adult Coho occurred in this sub-basin during the 2005 winter brood. This appeared to be the strongest of the three cohorts observed within this inventory for the NF Trask and for the Trask basin as a whole. In contrast, the 2006 winter brood appeared to be stronger in the Tillamook, Wilson, Kilchis, and Miami basins. A 33% decline in juvenile Coho abundance was observed for the NF Trask sub-basin during the summer of 2007. Despite these decreases, the North Fork of the Trask River and its associated tributaries again contained the largest portion of Coho summer parr in the basin (58%) as well as some of the highest average rearing densities in the whole Tillamook Bay Watershed. Three years of inventory have maintained this pattern, one of low adult abundance, one of high, and one of moderate. Expanded estimates and average rearing densities for Coho from Elkhorn Cr. were again the highest in the basin for 2007. The East Fork Trask was close behind. Surveys to the end of Coho distribution in the NF Trask sub-basin totaled 31 miles, also making it the largest single segment of aquatic habitat (27.6 miles in the SF Trask). Coho production here totaled 64,405 (expanded) summer parr in 2007. This figure remains about 15% higher than the estimate from 2005. The percent contribution to basin-wide production from the NF Trask sub-basin shows a declining trend over the last three years from 75% in 2005 to 67% in 2006 to 58% in 2007. This decline simply indicates in years of higher abundance, adults successfully find additional spawning habitats outside the clear anchor sites existing in the NF sub basin.

Substantial declines were noted for all species in almost all reaches of the NF Trask sub-basin in 2007. Coho estimates decreased 60% in the mainstem, 76% in the MFNF, and 29% in Elkhorn. The most productive reaches were observed in Elkhorn (36,015-expanded) and the NFNF Trask (8,520-expanded). Average rearing densities continued to soar in Trib. C of Elkhorn (3.7 fish/sq.m.) and Trib. D of the NF Trask (3.0 fish/sq.m.) despite decreases in overall abundance. The NFNF was the only stream reach in the sub-basin that actually exhibited an increase (5%) in Coho production from the previous year. Pool-rearing estimates declined most alarmingly for Steelhead and Cutthroat in almost every reach. 1+Steelhead estimates declined 65% across the sub-basin, mostly in the mainstem (down 87%) and in Elkhorn (down 32%). The highest 2007 estimate for this species came from Elkhorn (820-expanded). The total pool-rearing 1+Steelhead estimate for 2007 in the NF Trask sub-basin was 1,600 (expanded), compared to a total of 3,120 (expanded) in the SF Trask sub-basin.

When looking simply at the declines noted above for Coho it would be easy to surmise that differential adult escapement was likely the primary issue. However, the 2006 adult Coho cohort was actually stronger in every other basin in the Tillamook Bay Watershed. Considering this with the coinciding declines in 0+trout, 1+Steelhead, and Cutthroat, suggests that there may be other compounding relationships. This is merely an observation and no conclusion of cause and effect is being presented.

Three years of data indicate that the North Fork sub-basin, especially Elkhorn, is currently functioning as one of the most important summer rearing anchor habitats for Coho in the entire Tillamook complex of streams. Comparably important summer habitat refugia has been identified in the Little North Fork of the Wilson (11.1 miles), where expanded estimates for Coho were higher than in Elkhorn for all three survey years, and in Jordan Cr. of the Wilson River (10 miles) and the North Fork Kilchis (12.3 miles) where expanded estimates for 2007 (only) were higher than in Elkhorn. Land use management surrounding these four key anchor habitats is critical to the long term persistence of salmonids in the Tillamook complex.

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%)	(22%)	(14%)	(12%)
2007	5,475	2,995	260	465
	(5%)	(12%)	(5%)	(7%)

- 20% visual bias not included

A wide-scale 23% reduction in Coho abundance was observed across the Trask basin in 2007 with some of the largest losses recorded in the Trask mainstem (down 53%) and the North Fork Trask mainstem (down 60%). The decline of Coho in 2007 in the NF Trask was conspicuous because of the increases observed in 2006. Declines in the Trask basin as a whole were unexpected in 2007 because Coho abundance increased in every other basin in the Watershed. Coho estimates in the South Fork Trask mainstem increased 29% in 2007. Shifting patterns of adult escapement certainly play a role within basin.

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 including Elkhorn, Clear, Bark Shanty, the NF-NF, and Trib. D. Coho rearing densities during all surveyed years on the mainstem were 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 in 2007 were centered between RM 3.7 and 6.5, just upstream from the mouth of Bark Shanty, where 70% of the mainstem Coho were observed. A second spike in abundance was observed just a mile down from the RM 10 forks (the meeting of the NFNF and the MFNF) where rearing density reached 0.7 fish/sq.m. A complete absence of Coho was observed in several pools within the last three miles of the NF Trask. 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 even the 2006 seeding level remained far below the potential for this reach's carrying capacity.

The abundance of pool rearing 1+Steelhead in the NF Trask mainstem increased by 91% during the 2006 survey then decreased by 87% in 2007. This decline was unexpected given the stability of 0+trout estimates between 2005 and 2006. The marked decline in 0+trout abundance in 2007 suggests even further declines for 1+Steelhead and Cutthroat in 2008. The highest 1+Steelhead count of the 2007 survey was from the first pool of the survey near the Trask county park and the mouth of the SF Trask. A consistent decline in density from the mouth of the SF Trask to the mouth of the NFNF Trask was observed during all years for 1+Steelhead. This population accounted for 16% of NF sub-basin 1+Steelhead in 2007 compared to 43% in 2006. Cutthroat observations also declined substantially in 2007 and exhibited a similar decline in density as the survey progressed upstream.

Juvenile Chinook were observed in the first pool only. As in the Trask mainstem, the later date of survey for the NF Trask mainstem in 2007 was the main reason for the decline observed in this species since most juveniles had probably moved downstream by that time. No culverts exist on the NF Trask mainstem and no Knotweed was located. Surveyor comments indicate increases in sedimentation in this reach compared to previous years (unquantified).

Bark Shanty

This stream was one of the largest tributaries to the NF Trask. Coho production in this sub-basin remained below habitat potential during all three years of this inventory. The largest Coho population in 2006 averaged 1.0 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 up to RM 3 during the surveys of 2005 and 2006 but were terminated by a fresh debris jam in the RM 0.6 boulder gorge in 2006. Average rearing density increased to 1.6 fish/sq.m. for this shortened distribution. A 14 ft. falls near RM 3.7 ends all anadromous passage. The potential for interactive floodplain habitats was greater in the lowest reach where braided channels, abundant spawning gravels, and old debris jams were common. Good spawning sites and fine gravels were also present for a short stretch just upstream of the gorge. Drops in other fish species for 2007 were largely due to the shortened survey distance.

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

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
2007	2,440	1.6	365	110	120

- 20% visual bias not included

Clear

Coho production more than tripled in Clear Cr. in 2006. Average rearing densities reached 1.4 fish/sq.m. and peaked at 2.5 fish/sq.m. just below the falls (RM 0.7). Estimates in 2007 declined 14%. Densities peaked at 3.1 fish/sq.m. near the mouth of the stream. Distribution, limited all years by a substantial boulder falls, totaled 1.1 miles with a short upstream juvenile migration in Trib. B of 340 ft. A continuous series of wood jams near the mouth limit potential in Trib. B. Considering the rearing capacity standard for Coho of 1.5 fish/sq.m. it would appear that this short reach was functioning at or near its capacity in 2006 and 2007. As one of the top three producers in the NF Trask sub-basin, the summer Coho parr here in 2007 accounted for 10% of the total sub-basin population, and about 6% of the total Trask basin population.

Estimates for 1+Steelhead have declined for two continuous years by about 50%. Cutthroat and 0+trout estimates also decreased in 2007, but exhibited little change when compared with estimates from 2005. Numerous high quality pools were encountered in this short reach providing perfect conditions for anadromous spawning and rearing. Fine gravels were moderately abundant while occurrences of boulders and large cobble were more frequent. It is probable that adults could pass the boulder falls under the right conditions. No culverts or Knotweed were encountered.

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
2007	6,205	1.8	475	80	110

- 20% visual bias not included

Hembre

Minor abundances of Coho were observed in Hembre Cr. during all 3 years up to a 6 ft. log-jam falls. Coho estimates and distribution have displayed a declining trend over the last three years. A single adult spawning event may have occurred in Hembre during the 2004 winter brood which was responsible

for the 2005 summer population. Estimates from 2006 and 2007 look more like upstream juvenile migrations. 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
2007	30	0.5	130	5	35

- 20% visual bias not included

Unnamed tributaries

Small populations of Coho were observed in Tribs. C, E, F, and G during all three years of the inventory. Upstream migrations were consistently the source of summer residents in Tribs. C, E, and F, where downstream habitat and forest conditions looked very healthy. Spawning seems to have occurred in Trib. G for three survey years in a row. Average rearing density in Trib. G climbed to 2.6 fish/sq.m. in 2007 with an expanded estimate of 350. This stream displayed small pools and low flows and appeared to be near full capacity in 2006 and 2007. An impassable bedrock falls ends distribution at RM 0.2.

Large populations of Coho were observed in Trib. D for three consecutive years. The 2005 expanded estimate of 1,815 increased 160% in 2006 to reach 4,715 then declined 17% in 2007 to 3,905. In 2006 and 2007 this stream displayed some of the highest rearing densities for Coho in the entire Tillamook Bay Watershed. With an average rearing density up to 4.6 fish/sq.m. in 2006 and 3.0 fish/sq.m. in 2007, and peak densities reaching 8.0 fish/sq.m. in 2006 and 12.0 fish/sq.m. in 2007, this stream exhibited rearing densities that exceeded all published levels of full seeding for Coho parr. High counts and high densities continued to the last pool with juvenile distribution extending beyond 2 enormous log jams (the second one with an 8 ft. pour). This tributary has attracted significant numbers of adult Coho during the last two cohorts. Expanded estimates for 1+Steelhead in Trib. D have also improved since 2005 from 60 to 140 in 2007. This stream is also known as Michael Cr. No culverts were encountered.

MFNF Trask

The Middle Fork of the North Fork Trask supplied most of the flow and Coho production for the sub-basin. 37,340 (expanded) Coho were present in 3.1 miles of the mainstem and 10.9 miles in Elkhorn, it's only tributary. Only 4% of these Coho were found in the MFNF mainstem. A significant 34% decline in abundance was observed between 2006 and 2007 (56,310, expanded). This branch of the NF Trask still accounted for the highest percentage of Coho in the sub-basin (58%) for 2007 as well as for the Trask basin as a whole (33%). Spawning beds here in the Middle Fork, Elkhorn, and in the North Fork North Fork Trask appeared to be primary destinations for adult Coho returning to the Trask River throughout this three year inventory.

Coho numbers in the MFNF mainstem declined sharply by 76% in 2007. The mainstem stream channel was large and appeared to sustain very high winter flows. The majority of this mainstem habitat is dominated by long straight rapids and glides and bedrock is frequently exposed. Boulders and cobble dominated the substrates. The best spawning and rearing zones for Coho can be found within the first 1.5 miles of stream where some finer substrates and deeply scoured pools were present. The highest counts for all species have occurred in this zone during all survey years. The stream narrows considerably upstream of the Elkhorn junction and the quality of habitat begins to decline further from that point. Anadromous distribution in the MFNF Trask mainstem is ended by a series of steep gorges and waterfalls between RM 3 and 5 (with survey distance starting at the mouth of the NFNF Trask).

Mainstem Coho abundance was minor in 2007, averaging just 0.2 fish/sq.m. with several blank spots in distribution. The most conspicuous zone of absence was noted between RM 0.8 and RM 1.9. The

highest count for Coho was in the first pool of the survey (by the mouth of the NFNF) and the highest rearing density (0.9 fish/sq.m.) occurred in one of the last pools at RM 2.7. Powerful flood events are obvious frequent occurrences in this stretch of stream and have resulted in simplified channel morphologies. Steelhead and Cutthroat abundances plummeted here along with the rest of the NF Trask sub-basin in 2007.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	3,930	0.4	930	285	325
2006	5,455	0.5	695	310	125
2007	1,325	0.2	105	45	25

- 20% visual bias not included

Elkhorn

Elkhorn appeared to supply more of the stream flow at its junction with the MFNF Trask. Despite this year's significant 29% reduction in expanded estimates (36,015 Coho), this sub-basin remained the single largest component of Coho production for the entire Trask basin. This observation has been consistent for the summers of 2005, 2006, and 2007. The Little North Fork Wilson (61,360 Coho expanded), Jordan Cr. of the Wilson (39,375 expanded), the North Fork Kilchis (36,660 expanded) and Elkhorn were the largest producers of Coho in the Tillamook Bay Watershed for 2007 and together accounted for 31% of all summer parr in the 5 combined watersheds. Roughly one-third of all summer rearing Coho in the Trask basin were summer rearing in the Elkhorn sub-basin in 2007 (more than one-half of all Coho in the North Fork sub-basin). These figures are significant because only 11 miles of anadromous habitat can be found in the Elkhorn sub-basin (the same in the LNF Wilson, 12.3 miles in the NF Kilchis, and 10 miles in Jordan). The last three years of inventory indicate that Elkhorn Cr. represents perhaps the most critical habitat in the Trask basin for the survival of Coho and Steelhead (with the East Fork Trask a close second).

Elkhorn branches to the south of the MFNF Trask into lower elevations than the rest of the NF Trask sub-basin. This stream provides high quality, low gradient spawning and rearing potential in 6 miles of mainstem habitat and 4.9 miles of tributary habitat. Coho spawning appears to have occurred in three major tributaries (Trib. A, Trib. C, and Cruiser Cr.) during all survey years. Trib. C and Cruiser Cr. contributed 11% and 22%, respectively of the total Elkhorn Coho population in 2007. The mainstem contribution increased in 2007 from 55% to 65%. The highest average rearing densities for Coho basin-wide were observed in Trib. C, Cruiser, the Elkhorn mainstem, Trib. D of the NF Trask, Clear Cr., and Edwards Cr. (on the SF Trask).

Average rearing densities for Coho in 2007 remained at or substantially above published levels of full seeding in all reaches of the sub-basin (1.5 fish/sq.m. in the mainstem, 3.7 fish/sq.m. in Trib. C and 1.6 fish/sq.m. in Cruiser). It is suspected that the Elkhorn sub-basin was at full carrying capacity during the summer of 2006 (56,310 Coho, expanded). Distribution in the mainstem extended 6 miles up to a minor bedrock falls that ended adult passage. The main spawning peaks in 2007 occurred at RM 1.2 (up to 2.7 fish/sq.m.) and RM 5 (up to 3.1 fish/sq.m.). The peak at RM 5 was also observed during the 2006 survey.

1+Steelhead counts in the Elkhorn sub-basin were the third highest in the basin behind the South Fork Trask and East Fork Trask mainstem reaches. This observation illustrates how depressed the Trask mainstem (14 miles) and the NF Trask mainstem (10 miles) populations were in 2007. 88% of all Elkhorn 1+Steelhead were observed rearing in the mainstem, most of these were found near RM 3. Cutthroat estimates in this sub-basin were also the third highest in the Trask basin for 2007 (also behind the SF and EF mainstems). 50% of all Elkhorn Cutthroat were observed in the mainstem.

Minor Coho spawning occurred again in Trib. A (515 Coho, expanded, 0.3 miles) where abundance was up by 98% in 2007. A 3.1 fish/sq.m. average rearing density was maintained in this short distribution before a 12 ft. bedrock cascade terminated adult passage. A smaller abundance of Coho has

been observed in Trib. B for each year of the inventory appearing to be a result of upstream juvenile migrations. Distribution here ended in a steep boulder cascade below RM 0.3.

Significant spawning activity has occurred in Trib. C (1 mile) and in Cruiser (3.2 miles) for three straight years. Average rearing densities in these two streams have remained among the top five in the Trask basin, if not the top two, for each year. 2006 expanded estimates for Coho increased dramatically in both of these streams (up 222% in Trib. C and 127% in Cruiser) then decreased by 54% and 43%, respectively, in 2007.

4,055 (expanded) Coho summer parr were observed rearing between Trib. C and Trib. C1 (93% in Trib. C) in 2007. Rearing density averaged 3.7 fish/sq.m. in Trib. C, the highest in the basin. This level of seeding was similar to that seen in Esther Cr. on the Tillamook River (2007) and slightly higher than that seen in Trib. D of the NF Trask (2007). The highest average rearing density for Coho in the Tillamook Bay Watershed for 2007 was found in Trib. A of the Devil's Lake Fork/Wilson River, at 6.9 fish/sq.m., which was sustained for only 0.4 miles (3,160 Coho, expanded). Expanded estimates for Coho in Trib. C of Elkhorn were similar in 2007 to Trib. D of the NF Trask (1.5 miles). The main spawning peak in Trib. C for all three inventory years has centered on RM 0.5 (7.6 fish/sq.m. in 2007). Coho distribution in Trib. C1 averaged 2.2 fish/sq.m., for 0.2 miles.

The ability of the select habitats mentioned above to maintain much higher 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 in Trib. C ended at a steep bedrock cascade below a sizeable beaver impoundment. This beaver impoundment is seated against a legacy debris jam in a tight pinch point.

The 3.2 miles of Coho habitat in Cruiser Cr. contributed about one-fifth of the total Elkhorn Coho population each year. The expanded estimate here of 7,825 Coho summer parr was nearly identical to the 2007 estimate from Edwards Cr. on the SF Trask and was the third highest in the North Fork sub-basin behind the Elkhorn mainstem and the NFNF Trask. As in the rest of the North Fork sub-basin, adult escapement appeared to decrease substantially in Cruiser Cr. during the 2006 winter brood. Average summer rearing density for Coho fell from 3.5 fish/sq.m. to 1.6 fish/sq.m. in the mainstem and from 3.8 fish/sq.m. to 2.1 fish/sq.m. in Trib. B. The main spawning activity during the 2006 brood year appeared to take place at RM 0.6 and RM 1.7 where the 2007 summer parr rearing density peaked at 3.5 fish/sq.m. and 3.3 fish/sq.m., respectively. 2 miles of Coho distribution in the Cruiser mainstem ended at an 8 ft. bedrock falls. Coho spawning activity has been heavy in Trib. B of Cruiser during all three years of this inventory. The 2007 density profile here showed three separate peaks over 3.0 fish/sq.m. for this short 1 mile reach and in 2006 reached up to 5.8 fish/sq.m. and 8.2 fish/sq.m.. These figures are exceptional and support the development of new definitions for summer parr carrying capacity. The 2007 expanded estimate for Coho fell slightly to 3,295 in Trib. B of Cruiser. This includes a small upstream migration of 45 (expanded) summer parr in Trib. B2.

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 beyond what was observed in this inventory exists in the lower two miles of the mainstem, where rearing densities remained below 1.0 fish/sq.m. during all three survey years. 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.

The force of winter flows in the Elkhorn sub-basin is probably the largest limiting factor present. The recent and severe flood events in the fall of 2006 and 2007 probably took heavy tolls on the large Coho populations observed in Elkhorn Cr. during the previous summers. A winter snorkel survey of this juvenile population occurred in March of 2007 to assess the magnitude of these losses. Initial reports indicated declines as high as 95% in the abundance of juvenile Coho compared to summer abundance. It is not clear what the fate of these pre-smolt migrants is when swept downstream out of headwater rearing locations. It is possible that juvenile Coho populations in the Elkhorn and surrounding sub-basins have evolved with a life history strategy programmed for this winter migration to the lower mainstem or estuary. A second survey is planned for March 2008.

No Knotweed was observed. 3 beaver dams in all were found in the sub-basin, all in the 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
2007	36,015	1.5	2,980	820	875

- 20% visual bias not included

NFNF Trask

This was the only reach in the NF sub-basin to exhibit even a minor increase in Coho abundance during the summer of 2007. Expanded estimates here were up by 5% and represented the second largest population within the North Fork. The NFNF Trask also represented the fourth largest Coho population in the Trask basin as a whole for 2007 (behind the SF, the EF, and Elkhorn), and accounted for about 8% of its total productivity. Expanded estimates for Coho have gone up two years in a row in the NFNF along the first 2.6 miles of stream before a large boulder falls ended adult passage (all years). 1+Steelhead were found upstream of this falls 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 1.0 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 and 2007 inventories. Adult escapement and the availability of appropriate spawning gravel are probably the two most limiting factors for this stream. High winter flows and low wood complexities are also likely to diminish over-winter survival rates. Long exposures of bedrock and steep boulder rapids were frequent channel characteristics. Pool surface areas were large, however, and available summer rearing habitat was plentiful.

Strong spawning peaks of 2.3 fish/sq.m. and 2.5 fish/sq.m. were observed at RM 0.6 and RM 1.6 in the same vicinity as peak levels from 2005 and 2006. About three quarters of the 2007 Coho population was observed rearing in the first 1.6 miles of the survey. 1+Steelhead estimates have displayed a severely declining trend over three years of surveys in the NFNF and in the whole North Fork Trask in general. Their 2007 abundance in the NFNF decreased as the survey progressed upstream. Cutthroat abundance was moderate and distribution relatively even throughout the survey. 0+trout abundance has remained notably high in this reach throughout the last three 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	0.9	3,550	550	185
2007	8,520	1.0	2,700	140	235

-20% visual bias not included

South Fork Trask

Expanded estimates of summer Coho parr increased here in 2007 by a minor 7% and totaled 44,735 Coho. This represented 40% of the total Trask basin estimate. Four of the five stream segments that exhibited production increases for Coho in 2007 were in the South Fork sub-basin and included the SF mainstem (up 29%), Trib. D of the East Fork (up 32%), Edwards (up 7%), and Boundary (up 5%). The mainstem habitats on the East Fork (8.9 miles) and South Fork (7.9 miles) of the Trask were the

second and third largest producers of Coho in the basin behind Elkhorn Cr., with expanded estimates of 17,090 and 11,020 summer parr each. Edwards was the fifth largest with an expanded estimate of 7,910 Coho. There was 27.6 miles of distribution observed for Coho in the sub-basin, approximately 36% of the basin total.

Over three years of survey this sub-basin has exhibited a strong positive trend in Coho production. In 2005 Coho summer parr expanded estimates totaled just 11,360 for the sub-basin, 4,445 for the EF mainstem, and 2,300 for the SF mainstem. A substantial potential still exists in almost all reaches of the South Fork sub-basin for increased Coho production, especially in the upper East and South Fork mainstems. Trib. D, a short 0.7 miles, represented the only habitat in 2007 that had reached its full rearing capacity for Coho (3.2 fish/sq.m.). Edwards exhibited the second highest average rearing density for Coho, 1.5 fish/sq.m., which probably only represents about one-half of its full rearing capacity.

Expanded estimates for Steelhead dropped 49% throughout the South Fork sub-basin and totaled 3,120. This was about 38% lower than the expanded estimate from 2005 of 5,045. South Fork Steelhead accounted for 59% of Trask Basin totals during the summer of 2007. Most of the South Fork sub-basin population in 2007 was documented rearing in the SF mainstem (46%), the EF mainstem (38%), and Edwards (14%). 1+Steelhead estimates in the South Fork sub-basin were higher than North Fork sub-basin estimates for all three survey years. Cutthroat estimates (3,840-expanded in 2006) in the South Fork sub-basin remained similar between years at 4,080 in 2007 and 5,120 in 2005. Chinook summer parr abundance in the sub-basin declined (350) as a result of the later survey timing (mid-September).

Many 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.
Over winter survival may be a significant limitation in the SF Trask sub-basin. Much of the Coho distribution observed here was in large order mainstem habitats containing long boulder rapids, abundant bedrock and a very low wood complexity. Few alcove pools or significant backwater habitats were observed for winter refugia. Winter flows appeared to be extreme in the EF and SF mainstems and many reaches looked like they had been completely torrented multiple times during the winter of 2006 / 2007. 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.

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%)
2007	11,020	3,700	1,420	1,630
	(10%)	(15%)	(27%)	(24%)

- 20% visual bias not included

Coho production has increased substantially in the South Fork mainstem over three years of surveys, + 273% in 2006 and + 29% in 2007. This stream segment was the third most productive in the basin in 2007 after Elkhorn and the East Fork mainstem. This population was also one of only five streams in the basin where an increase in Coho production was observed in 2007 (four of which were in the South Fork sub-basin). Coho rearing densities remained low in this 7.9 mile reach, averaging just 0.7 fish/sq.m., which indicates that potential rearing capacity here could be at least twice this high. Spawning peaks were observed at RM 5.2 (1.3 fish/sq.m.) and RM 7.4 (2.8 fish/sq.m.) while most of the highest

pool counts were centered on RM 4 indicating, perhaps, better summer rearing conditions. Spawning density peaks between RM 5 and RM 7.5 were observed during all three survey years. The mainstem segment accounted for 25% of the Coho in the South Fork sub-basin in 2007.

Spawning conditions appeared best upstream of RM 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. Extreme winter surges appear to be a significant limiting factor here for juvenile salmonids. Winter rearing habitat for this age class in the SF mainstem was very rare. Coho distribution ended in steep gradients at a small boulder/debris falls that appeared passable for adults. Clearcuts began on both sides of the stream upstream of this point. Steelhead and Cutthroat production has been relatively high in the South Fork mainstem for all three inventory years with very little change apparent between 2005 and 2007 estimates. Similarly, 0+trout estimates have shown little change over three years. Pool rearing trout estimates in the South Fork mainstem for 2007 were the highest in the Trask basin, and were second highest in the East Fork mainstem (the main tributary of the South Fork). Distribution for these species in the SF mainstem was confined mostly to the lower 5 miles. Juvenile Chinook abundance was low during the 2007 surveys (240-expanded) due to the later date of survey (September 3) relative to the 2005 (July 11) and 2006 (July 31) surveys. Much of their migration toward the estuary had already taken place.

Edwards

This was again the most productive tributary in the South Fork sub-basin for Coho (not including the EF Trask mainstem) and the fifth most productive in the Trask basin. 3.9 miles of high quality spawning and rearing habitat were found in this stream supporting a healthy average rearing density of 1.5 Coho/sq.m., a near fully seeded condition. Considering the average rearing densities found in some NF Trask tributaries during the last two years, this may only be one-half of its actual rearing potential. Coho rearing densities in Edwards were the highest in the South Fork sub-basin, closely followed by Bales Cr. and Boundary Cr.

Coho production here increased 105% in 2006 and by 7% in 2007. Two main spawning peaks were observed at RM 1.1 (2.7 fish/sq.m.) and RM 3.3 (8.3 fish/sq.m.). Distribution extended about 4 miles to a major fork where stream flows diminished. 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.

Small Coho populations were present in Tribs. A and B in 2007 (less than 50-expanded). The main culvert on Trib. A was perched by 2 ft. with a complicated jumble of boulder steps and debris jams just downstream. This was definitely a juvenile barrier and probably also an adult barrier. Juvenile Coho were present upstream of this culvert in 2007 indicating that adult spawning took place. Moderate production potential was present in Trib. A . The main Edwards Cr. road ends just beyond Trib. A which makes culvert removal easily accessible.

1+Steelhead production in Edwards has declined consistently over three years of surveys, along with most reaches in the Trask basin. This was the second largest tributary population in the basin behind Elkhorn in 2006. Peak densities for 1+Steelhead in Edwards were observed in the first mile of survey. Cutthroat and 0+trout estimates have remained strong. No Knotweed was noted.

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
2007	7,910	1.5	2,565	445	530

- 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 during the 2006 and 2007 surveys with expanded estimates reaching 140 (Joyce), 30 (Summit), and 45 (South-2006). 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, B, and D supported minor upstream migrations of Coho summer parr in 2007. 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. Anadromous potential appeared lowest in Trib. B due to high stream gradients and poor pool formation. 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 of the South Fork Trask has been a major producer for all fish species throughout this inventory. Some of the best spawning opportunities in the basin were present in the upper mainstem and the Boundary Cr. sub-basin. A total expanded estimate of 25,310 Coho summer parr were present in the sub-basin in 2007 (no change from 25,700 in 2006), approximately 23% of the Trask basin total. 1+Steelhead estimates fell from 2,120 (expanded) in 2006 to 1,245 in 2007, along with trout estimates throughout the Trask basin. This represented 24% of the Trask basin total and 40% of the South Fork sub-basin total. As the main tributary to the SF Trask, this sub-basin was responsible for 57% of the total South Fork Coho population.

Three 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 19% of all East Fork Coho in 2007 while the EF mainstem ranked as the second largest producer of Coho in the basin behind Elkhorn. The highest average rearing densities for Coho were found in Trib. D (3.2 fish/sq.m.), Stretch/Boundary (1.4 fish/sq.m.), and Bales (1.4 fish/sq.m.). These streams, along with Edwards on the South Fork and Elkhorn, Clear, and Trib. D on the North Fork, exhibited the highest average rearing densities in the basin for Coho. Stream habitat in Trib. D represented the only reach in the sub-basin which appeared to be at full rearing capacity for Coho. Substantial production increases are still possible in the EF mainstem. Coho distribution in the sub-basin totaled 13.9 miles in 2007.

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%)
2007	17,090	3,135	1,175	1,290
	(15%)	(13%)	(22%)	(19%)

- 20% visual bias not included

Little change was noted for Coho (4%), 0+trout, or Cutthroat estimates in the East Fork mainstem during the third year survey. 1+Steelhead estimates fell 41%. This rearing segment was the largest contributor to SF Trask Coho production during all three inventoried years and was second only to Elkhorn basin-wide. Average rearing densities for Coho in the 8.9 mile mainstem remained unusually low each year, peaking at 0.5 fish/sq.m. in 2006. The most significant spawning densities appeared between RM 5 and RM 7.5 all three years of survey. The highest pool counts for Coho in 2007 were centered on RM 5.6. This zone starts just downstream from Boundary Cr. where a steep reach of boulders and bedrock has trapped a half-mile of gravel and fine sediments. The channel here exhibited wide meanders and braids 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. This high density zone ends, after numerous returns to rocky rapids and boulder steps, just downstream from Trib. D in a short stretch of abundant beaver activity contained within a relatively narrow canyon. A few of these beaver dam pools contained smaller debris piles that were packed with Coho parr during the last two surveys. 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. 3 active dams were noted.

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. The wide, straight channel throughout much of the East Fork mainstem looked like it had been well torrented over the years by extreme flood events. While production estimates have exhibited excellent improvement in the last two years, indications based on NF Trask rearing densities suggest that current Coho production remains well below the habitats potential. As in the SF Trask mainstem, over winter survival is a significant limiting factor here for juveniles looking for wood complexity and slow water. After severe declines in 1+Steelhead abundance in the NF Trask sub-basin, the East Fork mainstem abundance was second only to the South Fork mainstem. Steelhead abundance in 2007 increased above the dam and peaked near RM 6.5. The intake dam for the EF Trask rearing pond presents a juvenile barrier at RM 0.6. Siltation rates increased sharply downstream of this dam, limiting productivity between there and the mouth of the East Fork. No culverts were encountered on the mainstem EF Trask and no Knotweed.

Bales

Bales Cr., Boundary Cr., Rock Cr., and Trib. D were the only tributaries of the EF Trask where Coho spawned in 2007. Production levels in Bales roughly matched production levels in Stretch Cr. and Headquarters Camp Cr. (tributaries of Boundary Cr.) and were slightly lower than estimates from Trib. D. A stream wide average rearing density of 1.8 fish/sq.m. in 2006 suggests that the habitat may have been near its carrying capacity for Coho during that summer. An impassable log jam near RM 1 ended

distribution. Much of the aquatic habitat in Bales was steep and rocky with intermittent occurrences of finer gravels, wide turns, and deep pools. 1+Steelhead have declined significantly in Bales Cr. over the three years of surveys.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	285	0.24	70	75	50
2006	1,605	1.8	150	25	70
2007	1,280	1.4	100	15	95

- 20% visual bias not included

Boundary

The largest observed increase in Coho abundance for the Trask basin occurred here in 2006. A similar level of productivity was maintained in 2007 (up 5%). As one of only five Trask River subbasins to exhibit even marginal increases in 2007, Boundary Cr. definitively represents critical spawning and rearing habitat for Coho. Habitat conditions in this 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. Three years of inventory suggest that Boundary Cr. and Edwards Cr. are the two most important tributaries for Coho in the SF Trask sub-basin.

Multiple density peaks were observed in the 1.2 mile mainstem, eventually reaching 1.8 fish/sq.m. at RM 0.8. The Boundary Cr. mainstem was rearing 44% of the total sub-basin Coho population in 2007, down from 62% in 2006. Coho production increased in Headquarters Camp Cr. when compared to the previous year. Summer parr estimates increased by 25% there to reach 1,470 (expanded) and average 1.3 Coho/sq.m. The large wood jam at the beginning of Headquarters Camp Cr., which ended distribution in 2005, was passed by adults during the following two years. The beaver ponds just above this jam, near the mouth of Stretch Cr., exhibited some of the highest rearing densities of the 2006 and 2007 surveys (up to 2.3 Coho/sq.m. in 2007). 2 active beaver dams in all were noted for the sub-basin at this site.

Expanded estimates for Coho in Stretch Cr. have climbed consistently from 0 (2005) to 535 (2006) to 1,190 (2007) since the ephemeral wood jam has shifted. Distribution extended 0.4 miles in 2007 and averaged 1.4 fish/sq.m. Together with Headquarters Camp, these two streams accounted for 66% of Boundary Cr. Coho during the summer of 2007. This was the only year of the inventory when rearing levels were not higher in the Boundary Cr. mainstem.
Stream flow was actually higher in Headquarters Camp Cr. at its junction with Boundary Cr.

Rearing capacity for Coho in this sub-basin appears greater than the levels achieved during this three year inventory. Adult escapement the probable primary limitation. Decreasing numbers of Steelhead, Cutthroat, and 0+trout have been observed here over the last three years. The Headquarters Camp culvert near the mouth of Stretch Cr. was blocked with sediment and wood and appeared impassable. Anadromous potential upstream of this culvert was minimal although eventual road failure at this site is possible. 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
2007	4,780	1.0	375	30	170

- 20% visual bias not included

Small Tributaries

For the 10 small tributaries of 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 summer of 2006 and again in the same six in 2007. Signs of adult spawning were present in Trib. D both years and to a lesser degree in Blue Bus and Rock Cr. in 2007. Small upstream migrations of 125(expanded) juvenile Coho or less were observed in Miller (0.2 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 observed in Steampot and a moderate spawning potential was present.

The 2007 expanded estimate for summer parr in Rock Cr was 285. There was a 4 ft. falls at RM 0.4. It was apparent that a spawning event had occurred directly below this falls. A rearing density of 1.7 fish/sq.m.was observed there. This was the site of an ODF paired stream study project (Rock / Trib D) and additional data is available for this location from that inventory. A stream gauging station was also present at the Rock Cr. mouth. For potential comparison to the ODF paired study project, the RBA inventory produced final summer Coho parr estimates of 342 and 1,938 for the paired streams of (Rock / Trib D). These numbers include ODFW's 20% snorkel bias associated with the methodology.

Expanded estimates for Coho reached 275 summer parr in Blue Bus in 2007. It is likely that adult spawning occurred here in a short 0.2 mile reach where Blue Bus meanders through the East Fork floodplain. Pool complexities were high there, riparian vegetation was abundant, and fine spawning gravels were present. It is likely that adult spawning consistently occurs in this zone because of the complex channel morphology that exists at the mouth of Blue Bus Cr. Anadromous distribution effectively ended where the stream channel entered its own canyon and an enormous wood jam had collected. This may not be a permanent barrier.

Habitats in Trib. D provided the greatest potential for supporting Coho. No summer parr were observed here in 2005. An expanded estimate of 1,220 summer parr were present during the 2006 survey and 1,615 summer parr in 2007. This 32% increase was the largest of the 5 streams in the basin to exhibit an increase in Coho in 2007. Distribution extended 0.7 miles in this small stream before pool habitats diminished. High rearing densities were maintained the entire length both years, averaging 3.2 fish/sq.m. in 2007. A perfect spawning peak is visible in the 2007 density profile for this stream, reaching 4.8 fish/sq.m. at RM 0.4. All pools were well stocked and rearing capacity may have been approached in 2007. Similar to Boundary Cr., Trib. D was one of the lowest gradient tributaries to the EF Trask. Numerous log structures were present which are still just beginning to be incorporated into the stream channel. An aquatic habitat inventory was in progress in 2007 and two juvenile traps were in place. Data for comparison can be obtained through ODF. One active beaver dam was also noted.

1+Steelhead were present in low numbers in Miller, Rock, Steampot, and Trib. D intermittently throughout this three year inventory. No culvert problems were observed within the range of Coho distribution. No Knotweed was found in these reaches.

Wilson River Basin

Two consecutive years of significant increases in Coho production were documented in the Wilson basin. An increase was also observed in the Kilchis basin and for the combined Tillamook Bay complex of streams. Two consecutive increases in adult escapement for the 2005 and 2006 winter broods was the primary driver for increasing summer rearing populations. The Wilson was the largest and most productive basin in the Watershed for all species of salmonids for all three years of the Rapid Bio-Assessment inventory. The Wilson River drainage encompassed roughly 105 miles of Coho distribution in 2007, which resulted in an expanded estimate of 256, 590 Coho summer parr (not including 20% visual bias). This represented an increase of 20% over the 2006 population, which was about 135% larger than

the 2005 population. The Wilson's 2007 juvenile Coho population accounted for 45% of all Coho in the Tillamook Bay complex of streams. The Wilson basin contained two of the most productive sub-basins for Coho in the entire inventory – the Little North Fork (61,360 expanded) and Jordan Cr. (39,375 expanded). Together, these two streams accounted for 39% of all Coho in the Wilson basin. The summer rearing population in Jordan Cr. in 2007 was approximately 153% larger than in 2006. This was the most significant inter annual increase for Coho in the basin. The second largest increase was observed in Rogers Cr. on the West Fork North Fork (up 136%). Three sub-basins within the Wilson exhibited declines in Coho production during the 2007 surveys, including the Devils Lake Fork (down 36%), the South Fork (down 19%), and the Little North Fork (down 5%). The Devils Lake Fork and the South Fork represent the uppermost and final two forks of the Wilson River.

Adult escapement in the Wilson for Coho was estimated by Bio-Surveys at 2,566 – 2,916 for the 2006 winter brood (a back-calculation from summer parr abundance). Most Wilson basin summer rearing Coho in 2007 were found in the Little North Fork (24%), the North Fork (19%), Jordan Cr. (15%), and the Wilson mainstem (12%). The highest average rearing densities for Coho in the Wilson were observed in Trib. A of the Devils Lake Fork (6.9 fish/sq.m.), Trib. A of Ben Smith Cr. (3.7 fish/sq.m.), Trib. A of the South Fork (3.5 fish/sq.m.), the South Fork of Jordan Cr. (3.4 fish/sq.m.), Berry Cr. of the Little North Fork (2.4 fish/sq.m.), Rogers Cr. of the West Fork North Fork (2.2 fish/sq.m.), and Trib. C of Cedar Cr. (2.0 fish/sq.m.). A short 2.6 mile distribution in Rogers Cr. produced an impressive 10,905 (expanded) summer parr in 2007, while an even shorter 1.6 mile distribution in Trib. C of Cedar Cr. produced 6,165 (expanded) summer parr. Coho production in the 6.6 mile Cedar Cr. sub-basin was large and totaled 20,175 (expanded) summer parr. The highest average rearing densities among the larger mainstem habitats were found in the West Fork North Fork (1.8 fish/sq.m.), the Little North Fork (1.7 fish/sq.m.), and the Jordan mainstem (1.6 fish/sq.m.). The streams listed above were the most highly frequented destinations for adult spawners during all three years of this inventory. These represent important anchor habitats for Coho in the Wilson basin. Coho seeding in these reaches was probably very close to their summer rearing capacity during the 2007 inventory. Significant Coho production was also observed in 2006 in the Devils Lake Fork (13.5 miles) when expanded estimates reached 37,525 summer parr (18% of the basin-wide total).

A minor 9% decline in pool-rearing 1+Steelhead abundance was observed in the Wilson basin during the 2006 survey, mostly occurring in the Devils Lake Fork (down 58%) and Jordan Cr. (down 43%). The mainstem Wilson abundance also declined by 17%. These decreases were then followed by a much more dramatic 61% decline in 2007. Almost all stream segments in the Wilson basin experienced significant declines in 1+Steelhead, Cutthroat, and 0+trout during the summer surveys of 2007. Similar findings were observed in the Trask basin. Survey timing in the Wilson basin for 2007 was nearly identical to the summer 2006 inventory and it is likely that the observed decline will be an indicator of future reductions in adult escapement.

The largest losses in 1+Steelhead in the Wilson were observed in all the largest producers - the mainstem (down 56%, or 5,570 SH expanded), the Little North Fork (down 76%, or 3,110 SH), the North Fork (down 85%, or 1,025 SH), the South Fork (down 74%, or 915 SH), the West Fork North Fork (down 74%, or 800 SH), and the Devils Lake Fork (down 61%, or 470 SH). The remaining Wilson basin population was found mostly in the mainstem (51%), the Little North Fork (11%), Jordan Cr. (11%), and Cedar Cr. (9%). Jordan Cr. represented the only stream to indicate no change in Steelhead abundance between 2006 and 2007.

Most 1+ Steelhead summer rear in riffle and rapid habitats, which were not a part of this survey. Therefore, a significant portion of the total 1+Steelhead population was not included in the total estimates above. These data are for trend analysis only. These data can not be used as an indicator of population size.

Cutthroat abundance decreased somewhat less drastically by 24% basin-wide in 2007, although losses in several streams were severe. The most notable losses for this species occurred in the South Fork (down 38%), the North Fork (down 35%), and the Little North Fork (down 31%).

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 stream 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 summer 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 Gamehog, 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 escapements and higher summer rearing densities. 13 beaver dams were documented in the Wilson basin, all in the Devils Lake Fork. 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 2007 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Mainstem Wilson	31,850*	12.4	24,885*	35.2	4,455*	50.9	2,220*	31.8
-Beaver	645		150		-		55	
-Ben Smith	5,015	2.0	285		35		115	1.6
-Cedar	20,175*	7.9	2,460	3.5	780*	8.9	805*	11.5
-Elk	9,770	3.8	1,730	2.4	155	1.8	210	3.0
-Fox	635		1,370	1.9	75		110	1.6
-Jones	1,705		125		40		60	
-Jordan	39,375*	15.3	13,715*	19.4	950*	10.9	395*	5.7
-South Wolf	-		50		-		-	
-Stanley	-		45		-		5	
-Wolf	-		110		5		15	
-Trib. B	40		45		-		15	
-Trib. C	440		125		-		20	
Devils Lake Fork	13,475	5.3	2,625	3.7	235	2.7	325*	4.7
-Deyoe	1,260		65		-		55	
-Drift	290		125		-		10	
-Elliot	2,795	1.1	135		35		135	1.9
-Idiot	1,745		180		20		5	
-Trib. A	3,160	1.2	295		-		65	
-Trib. C	390		-		-		5	
-Trib. D	545		-		-		-	
-Trib. G	510		10		-		-	
Little North Fork	54,620*	21.3	9,210*	13.0	890*	10.2	895*	12.8
-Berry	2,780	1.1	440		50		130	1.9
-White	3,175	1.2	785	1.1	55		90	1.3
North Fork	18,740*	7.3	3,065*	4.3	180	2.1	270	3.9
-WF North Fork	17,930	7.0	3,430*	4.9	280*	3.2	205	2.9

--Rogers	10,905	4.2	1,385	2.0	140	1.6	170	2.4
South Fork	9,140	3.6	1,750	2.5	220	2.5	175	2.5
-Trib. A	2,250		310		55		45	
-Trib. B	370		205		30		40	
-Trib. C	1,085		225		10		120	1.7
Basin Total	**254,815**	**99.3**	**69,335**	**98.1**	**8,695**	**99.4**	**6,765**	**96.9**

* 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%)
2007	31,850	24,885	4,455	2,220
	(12%)	(35%)	(51%)	(32%)

- 20% visual bias not included

The Wilson mainstem extended from the head of tide to the junction of the Devils Lake Fork and the South Fork. Two years of substantial increases in summer rearing Coho populations have been observed in the Wilson mainstem. An increase of 31% was documented in 2006 followed by a larger gain of 39% in 2007. These were expected responses following two years of increases in adult Coho escapement but was contrary to the two years of decline observed in the Trask mainstem. The Wilson mainstem was the third largest producer of Coho for the basin in 2007 behind the Little North Fork and the Jordan Cr. sub-basin. Expanded estimates in the 32 mile Wilson mainstem were roughly equal to expanded estimates in the 6.8 mile Jordan mainstem, where Coho production more than doubled in 2007. Coho rearing densities in the Wilson mainstem remained at an extremely low average of 0.13 fish/sq.m. The highest individual pool counts for Coho (not expanded) were observed at RM 4.2 (635 summer parr) and RM 22.7 (680 summer parr). The second peak count was observed in one of the healthiest and most stable reaches of mainstem habitat that extended, roughly, from Jordan Cr. upstream to Cedar Cr. A conspicuous zone of low to zero counts for Coho and almost all other species has been documented for the last two years between RM 13 and RM 15 (just downstream of Fall Cr.). Frequent bedrock exposure, high solar 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, Jones, and Tribs. B and C.

Much of the mainstem channel displayed low floodplain terraces and abundant boulder/bedrock glide habitat. Pools were large and deep with very limited 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 Fork the channel began 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 frequent observations of Stickleback.

Wilson mainstem habitats in general are ideal for 1+Steelhead production. Long rapids, excellent pool formation, high stream flow, and cobble substrates are available in high abundance. The Wilson mainstem abundance of Steelhead during all three survey years was the largest observed anywhere in the Tillamook Bay Complex. This population segment was equal to 70% of the entire Trask basin population for 2006 and 85% for 2007. A decline in abundance for this species is apparent over three years of surveys in the Wilson mainstem, falling first by 17% in 2006 and then again by 56% in 2007. This stream segment accounted for about one-half of all pool-rearing 1+Steelhead in the basin in 2007. The basin-wide decline in 1+Steelhead was even more severe (61%), similar to the 63% decline observed in the Trask basin. Significant two-year losses (2006 / 2007) in pool-rearing 1+Steelhead estimates were observed in the Kilchis and Miami basins also. The reasons for such wide-spread drops in 1+Steelhead abundance are not clear but likely will result in reductions in future wild steelhead adult escapement. The decline in 1+ Steelhead abundance was preceded by a clear 63% decline in 0+trout estimates from the Wilson mainstem during the previous summer of 2006. 0+ trout estimates in the Wilson mainstem improved dramatically in 2007 (+100%). In 2007, 1+Steelhead in the Wilson mainstem were mainly in the lower one-half of the survey, decreasing from RM 1 where the highest pool count was observed (116-not expanded). A second, smaller peak in numbers was observed at RM 22.7 (76-not expanded). Counts were very low above RM 24, in contrast to the past two years of survey.

Cutthroat numbers in the mainstem have remained similar during all three inventoried years. Cutthroat densities in 2007 generally decreased as the survey progressed upstream, similar to the pattern observed for 1+Steelhead. The highest count (69-not expanded) was observed in the first pool at the head of tide. Chinook summer parr were present throughout 28.3 miles of the mainstem survey in a similarly decreasing density profile. Expanded estimates for this species decreased 16% in 2007 and totaled 25,890. This population segment represented about 97% of all juvenile Chinook observed in the basin.

Knotweed infestation was high for the first 11 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.

Beaver

Low level Coho spawning was observed in this small lower mainstem tributary during all three survey years. Expanded estimates increased consecutively for each of the last two years. Average rearing density increased to near carrying capacity in 2007. The survey did not encompass approximately 0.4 miles of habitat between the north bank road crossing and the mainstem Wilson. 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 in 2006 and 2007 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 relatively constant.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	140	0.5	40	-	75
2006	575	1.1	45	55	75
2007	645	1.9	150	-	55

- 20% visual bias not included

Ben Smith

This sub-basin contained high quality spawning habitat for Coho that was nearly seeded to capacity during the 2007 survey. Coho production in this low gradient tributary has increased the last two years of survey, +34% in 2006 and +75% in 2007. An already strong average rearing density of 1.7 fish/sq.m. in the mainstem increased to 2.0 fish/sq.m. in 2007. Some streams in the Wilson basin averaged 3.4 fish/sq.m. (SF Jordan, Trib. A to SF Wilson) and even 6.9 fish/sq.m. (Trib. A to Devils Lake Fork) during the 2007 inventory. Trib. A to Ben Smith, in fact, reached an average rearing density of 3.7 fish/sq.m. in 2007 and reared an expanded estimate of 2,125 Coho summer parr over its 0.8 mile distribution. This was almost half of the sub-basin population and appeared to be the limit of Coho production potential for Trib. A.

Adult spawning in the mainstem of Ben Smith appeared strongest upstream of the junction with Trib. A near RM 0.8 where rearing densities peaked at 3.2 fish/sq.m. This was the same spawning destination targeted by adult Coho in 2006 also. The site exhibited a high abundance of fine spawning gravels, wood complexity, and low floodplains along with several log-structure sites that appeared to be well placed and highly functional. Large accumulations of woody debris have gathered in this reach and resulted in a broadly braided channel form. A large log jam ended distribution in Ben Smith at RM 1.6. Adult spawning also appeared to take place in Trib. A near RM 0.2 where rearing densities peaked at 5.8 fish/sq.m. Distribution in this small stream ended at a steep, tight bedrock pinch just beyond a small tributary on the right where the main channel enters a narrow canyon.

A steep bouldery entrance off of the mainstem Wilson is a probable obstacle for upstream temperature dependant migrations of juveniles during summer flow regimes. No Culverts were encountered. No Knotweed. Several fresh landslides were noted near the end of the survey.

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
2007	5,015	2.0	285	35	115

- 20% visual bias not included

Cedar

The largest increase in Coho production in the basin was observed in Cedar Cr. during the 2006 inventory. This 500% improvement was followed by another 14% improvement in 2007. An expanded estimate of 20,175 summer parr were observed rearing in the sub-basin during this third survey year. This level of production was the fourth highest in the basin and amounted to about 8% of all Wilson River Coho. Total distribution in the sub-basin for Coho summer parr remained similar at 6.6 miles, including 3.7 miles in the mainstem and 1.6 miles in Trib. C (the largest tributary). Average rearing densities changed little in the mainstem (1.3 fish/sq.m.) or in Trib. B (1.5 fish/sq.m.), but nearly doubled in Trib. C (2.0 fish/sq.m.). An expanded estimate of 6,165 Coho were present in Trib. C, about 31% of the sub-basin total (compared to 15% last year).

The percentage of total sub-basin Coho found in the Cedar Cr. mainstem decreased from 81% (2005 and 2006) to 66% in 2007. This change reflects the impressive 139% increase in Coho production in Trib. C for the same year. As in the mainstem, Coho production rose dramatically in this tributary in 2006 also, by 513%. A very strong and positive two year trend has emerged for Coho in the Cedar Cr. sub-basin during this inventory. The heaviest adult spawning activity appeared to be centered near the junction of Trib. C and the mainstem. Perfect low gradient stream habitat was present there with numerous flood channels, fine gravel bars, and diverse wood complexity. The highest pool count in the mainstem was observed there (410-not expanded) along with the highest peak rearing densities in Trib. C (3.9 fish/sq.m. in pool #1 and 8.1 fish/sq.m. in pool #2). High counts continued in the mainstem up to the steep boulder pile at RM 3.6 where distribution ended and rearing density peaked at 3.5 fish/sq.m. A

second zone of adult spawning in Trib. C was located at RM 1 where rearing density peaked again at 3.1 fish/sq.m. Adult Coho spawning seems to have occurred also in Trib. C1 where a short 0.3 mile distribution amounted to 1,380 summer parr (expanded) and averaged 4.1 fish/sq.m. (peaking at 8.3 fish/sq.m.). Coho distribution ended in both Trib. C and Trib. C1 in steep boulders and wood jams.

3% of Cedar Cr. Coho were documented in Trib. A (530 expanded) and Trib. B (115 expanded). Adult spawning probably occurred only in Trib. A where juvenile distribution extended 0.4 miles and an average rearing density of 1.7 fish/sq.m. was observed. Upstream temperature or density dependent migrations of juveniles were observed in both streams. It is believed that Coho rearing densities in Trib. C reached their carrying capacity during the summer of 2007. Coho production in the Cedar Cr. mainstem, however, could probably be twice as high as the levels observed in 2007. The main habitat limitations there include low pool frequency due to long straight reaches of riffle and rapid habitats, a low abundance of spawning gravel in the lower 2.5 miles probably due to numerous historical flood and debris torrents, and a general absence of winter rearing habitat for the provision of low velocity hiding cover for juveniles.

1+Steelhead abundance dropped significantly in Cedar Cr. along with the rest of the basin in 2007. Steelhead here account for 9% of the basin-wide total. Cutthroat abundance has remained stable throughout three years of inventory. No Culverts. No Knotweed.

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
2007	20,175	1.3	2,460	780	805

- 20% visual bias not included

Elk

4.6 miles of Coho distribution has been observed for three years here, in steep boulders and high flows. Coho production has increased each year significantly with estimates from 2007 appearing roughly four times as high as estimates from 2005. Average rearing density has also increased each year and in 2007 reached a significant level of 1.2 fish/sq.m. This remains below the full potential of this stream which, considering comparable habitats in the basin could be summer rearing closer to 3.0 fish/sq.m. (or a total of 24,000 summer parr). Low adult escapement and a low abundance of fine spawning gravel appear to be the two most limiting factors. Good spawning and rearing habitat was found intermittently throughout the 4 miles of mainstem habitat. Juvenile rearing densities peaked at RM 1.2 (3.2 fish/sq.m.) and RM 2.2 (2.9 fish/sq.m.) where most adult spawning probably took place. A strong upstream juvenile migration out of the Wilson mainstem was noted at the mouth of Elk Cr. Pools were large in mainstem Elk, large boulders were common, and riparian canopy cover (mostly alder) was good. Distribution ended in steep boulder rapids upstream of a small 4-5 ft. falls.

The West Fork of Elk exhibited small upstream migrations of Coho summer parr during the two previous surveys. Average rearing density for Coho reached 1.0 fish/sq.m. here in 2006. In 2007 signs of adult spawning were present as the expanded estimate rose to 995 Coho and average rearing density reached 3.4 fish/sq.m. A spawning peak of 5.4 fish/sq.m. was observed at RM 0.2. Several large boulder falls terminated distribution after just 0.4 miles. This stream appeared heavily torrented and stream flow was dry at the mouth in 2007. Adult passage in this tributary appeared permanently limited beyond 0.5 miles. A small upstream juvenile migration was noted in the first pool of Trib. A. Spawning and rearing potential look good in this stream for the first 0.3 miles before boulder and bedrock gradients increased. No Culverts. No Knotweed. Slides were numerous in this steep canyon.

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
2007	9,770	1.2	1,730	155	210

- 20% visual bias not included

Fall

With the large culvert removal and bridge construction project finally completed, the Fall Cr. sub-basin appears ready for anadromous adults. Disturbance levels were still high at the time of survey in the late summer of 2007 and juvenile counts remained extremely low. No Coho or 1+Steelhead have been detected here in three years of survey. The area of drainage and active channel size are large in the Fall Cr. sub-basin and habitat conditions looked good. Spawning potential upstream appeared moderate, pool formation was excellent and frequent, and stream flow was relatively high. A tall sloped bedrock cascade at the stream mouth is the main barrier to adult and juvenile migration. During summer flows this jump could be as much as 6 - 8 ft., but during the right winter surge it is likely that the Wilson River would rise almost all of that distance. The 2007 winter brood will provide the first opportunities for adult escapement and re-colonization in many years.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	-	-	15	-	75
2006	-	-	25	-	55
2007	-	-	10	-	5

- 20% visual bias not included

Fox

A 3.5 ft. perched culvert (10 ft. cement box) was noted just upstream of the first pool on Fox Cr. A fish ladder was present though in bad shape, containing about one-tenth of the stream flow. Low level Coho spawning occurred upstream of this culvert in 2005 and 2007. No Coho were seen here in 2006. Juvenile distribution in 2005 extended 0.9 miles and in 2007 extended 1.5 miles. Average rearing density remained low both years. Coho production potential appears high in Fox Cr. and probably warrants repair of the culvert perch and fish ladder. The first 1.5 miles of stream provides numerous high quality spawning and rearing pools. High stream flows appear to have led to diverse channel formations including braids, flood channels, and wide, sweeping turns. Wood complexities were moderate as a result of the fairly diverse forest canopy. Stream gradient and substrate size increase substantially above RM 1.5 limiting any further spawning potential. The perched culvert is the greatest limitation to juvenile migration, adult spawning, and anadromous production in Fox Cr. Steelhead abundance in the sub-basin reflects the same three year declining trend observed throughout the basin. Knotweed infestation was heavy surrounding the main highway culvert.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	440	0.3	950	210	180
2006	-	-	245	110	50
2007	635	0.4	1,370	75	110

- 20% visual bias not included

Jones

Coho production continued to climb 85% in this small Wilson River tributary after last year's increase of 156%. These improvements appear to be mainly the result of continued increases in adult escapement. Average rearing density in 2007 indicates a potential for continued increases in production, perhaps by as much as 100%. 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 in 2006 and 2007 near 2.7 fish/sq.m. A steep boulder falls limits distribution beyond 1 mile. Significant cold water refuge from the Wilson mainstem is also provided by Jones. Low levels of 1+Steelhead and Cutthroat were present all years. No culverts. Knotweed was observed at the mouth of Jones.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	360	0.5	230	40	55
2006	920	1.4	130	25	35
2007	1,705	1.5	125	40	60

- 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. It took another 153% year to year increase in 2007 to bring rearing densities up to a healthy average of 1.6 fish/sq.m. in the mainstem and a noteworthy average of 3.4 fish/sq.m. in the South Fork. This represented the largest production increase in the Wilson basin for 2007. Rearing densities indicate that summer production potential was probably achieved in the South Fork, but that potential in the mainstem could be twice as high. The 2007 Coho population here of 39,375 (expanded) summer parr accounted for 15% of the basin-wide total, about twice its percent contribution from 2006 of 7.3%. Considering the strength of these last two year's improvements, it is apparent that this reach exhibits a very high potential for Coho recovery and thus habitat restoration. This is one of the largest tributary sub-basins to the Wilson mainstem and exhibited the second largest Coho population (after the Little North Fork) and third largest pool-rearing 1+Steelhead population (behind the Wilson mainstem and the Little North Fork) for 2007.

The Little North Fork Wilson (61,360 summer parr expanded), Jordan Cr. (39,375 expanded), the North Fork Kilchis (36,660 expanded) and Elkhorn Cr. of the Trask (36,015 expanded) were the largest producers of Coho in the Tillamook Bay Watershed for 2007 and together accounted for 31% of all Coho parr in the 5 combined watersheds. These four sub-basins contained just 10 - 12 miles of Coho distribution each and all were rearing between 1.5 and 2.0 fish/sq.m. in 2007. Some of the largest populations of pool rearing 1+Steelhead were also found in these sub-basins which, together, added up to 16% of the total Tillamook Bay Watershed population. While larger 1+Steelhead abundances were often observed further downstream in larger mainstem habitats, it is likely that their early life histories are intertwined with the spawning beds in smaller, upper-basin streams such as the four listed above. Considering these figures from 2007, along with similar findings during the two previous years of this inventory, it is apparent that these four stream systems represent the most critical habitat in the Watershed for the survival of both Coho and Steelhead.

A major shift in production towards the mainstem was observed in the sub-basin in 2007. This population increased from 57% to 78% of all Jordan Cr. Coho. 6.8 miles of Coho distribution were present with highest densities observed in a strong, even peak of 6.2 fish/sq.m. at RM 6.4. This was about a mile upstream of the density peak from 2006. Mainstem distribution in 2007 ended at a small falls that did not appear to be a definitive anadromous barrier. Another 22% of Jordan Cr. Coho were observed in

very high rearing densities (averaging 3.4 fish/sq.m.) along 2.1 miles of the South Fork. Two main rearing density peaks were detected in the 2007 density profile, the first reaching 5.5 fish/sq.m. near the mouth of the stream, and the second reaching 5.7 fish/sq.m. at RM 1.1. It was thought that most pools in the South Fork had reached their rearing capacity for Coho during the summer of 2006 (when rearing density averaged 2.0 fish/sq.m.). Expanded estimates in the South Fork that year for Coho reached 6,440. These speculations clearly under-estimated the potential of the habitat. Expanded estimates in the South Fork in 2007 totaled 8,505 summer parr. It is believed that, in 2007, habitat in the South Fork was very close to its carrying capacity for juvenile Coho.

Stream gradients were steeper in the South Fork than in mainstem Jordan, and the channel displayed less sinuosity and complexity. In addition, major channel changes appeared to have occurred following the 2006 floods. Debris and boulders had torrented throughout the survey and there seemed to be a net loss in gravel and pool frequency. These effects did not appear to discourage or decrease adult spawning activity. The major legacy log jam just below the forks at RM 2 had blown out and looked passable. However, Coho distribution ended below this site in long boulder rapids.

Steelhead and Cutthroat abundance both declined by roughly 50% in 2006. Cutthroat abundance continued to decline another 45% in 2007 while 1+ Steelhead abundance appeared to remain stable. This was about the only 1+Steelhead population in the basin which did remain stable in 2007 and ranked, along with the Little North Fork (roughly equal at 995 expanded), as the second largest. Three-quarters of Jordan Cr. 1+Steelhead were rearing in the mainstem, mostly at the beginning and end of the survey. Cutthroat were observed mostly in the lower half of the mainstem. Habitat in the Jordan sub-basin appears ideal for Steelhead. Juvenile Chinook were present only up to RM 1.1 in the mainstem, but were also found in low numbers in the South Fork. The total sub-basin estimate for this species dropped from 905 (expanded) summer parr in 2006 to 235 (expanded) summer parr in 2007.

Buck Cr. enters main Jordan in a deep gorge and spills over an impassable 15 ft. falls. Phipps Cr. and Sargeant Cr. exhibited small upstream migrations of juvenile Coho in 2007 (less than 500 ft.) and were both limited by 6 ft. falls. No culverts. No Knotweed.

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
2007	39,375	1.6	13,715	950	395

- 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
2007	-	-	25	15	55

- 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
2007	-	-	50	-	25

- 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 or 2007. 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
2007	-	-	15	5	-

- 20% visual bias not included

South Wolf

Small upstream migrations of Coho summer parr were observed in South Wolf during the 2005 and 2006 surveys. No Coho were observed here in 2007. 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
2007	-	-	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
2007	-	-	45	-	5

- 20% visual bias not included

Wolf

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
2007	-	-	110	5	15

- 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
2007	-	-	10	5	15

- 20% visual bias not included

Unnamed Tributaries

Trib. B showed signs of a significant upstream migration of Coho summer parr during all three inventory years. 140 (expanded) Coho were present in 2005 over 0.6 miles of distribution, 315 (expanded) Coho were present in 2006 over 0.5 miles of distribution, and 40 (expanded) Coho were present in 2007 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. It is likely that Trib. B represents a minor temperature refuge at its junction 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 was badly slumped in the center and nearly buried in mud. 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. C exhibited signs of adult Coho spawning during the 2005 and 2007 surveys. Expanded estimates reached 225 summer parr in 2005 and 440 summer parr in 2007. Distribution distance totaled 0.7 miles for each year and ended in dry channel conditions where the stream left the lower pasture habitats and began to climb uphill into its own canyon. A small culvert with no flow was present near this location which had scoured a deep pool containing numerous stranded juveniles. Most of the rearing habitat in this low flow stream consisted of shallow pools winding through deep pasture trenches with heavy blackberry infestation. Stagnant water conditions were common. Numerous cattle crossings were noted and siltation was heavy. Moderate supplies of fine gravels were present along with short stretches of thick riparian vegetation. The 2007 summer rearing Coho population had probably reached the rearing

capacity for this stream and exhibited an average density of 1.8 fish/sq.m. Temperature refuge from the mainstem Wilson at the mouth of Trib. C was observed.

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. An enormous debris jam was encountered at the mouth of Trib. E in 2007, completely blocking the fish ladder and all adult access to this stream. 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 found. Cutthroat were present. No Knotweed.

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 highest during the 2005 winter brood leading up to the summer surveys of 2006. The 2007 expanded estimate for the entire Devils Lake sub-basin of 24,190 summer parr was 36% lower than the expanded estimate from 2006 (37,525 summer parr). Both 2006 / 2007 summer Coho abundance remained substantially higher than the expanded estimate from 2005 of 16,180 summer parr. The observed decline in 2007 was likely the result of a decrease in adult escapement within the Devils Lake sub-basin which was contrary to the stronger escapement noted for most other Wilson River stream segments. The 2007 Devils Lake Fork Coho production was ranked fifth largest for the Wilson basin, the lowest of all the main forks in basin and lower than the Wilson mainstem. Percent contribution to basin-wide Coho production fell from 18% to 9%.

2007 surveys totaled 13.5 miles in the Devils Lake sub-basin which included the tributaries of Deyoe (1.6 miles), Drift (0.3 miles), Elliot (1.5 miles), Idiot (0.8 miles), and Tribs. A, C, D, and G. 56% of the sub-basin Coho total was observed rearing in the 7.8 mile mainstem. A short but significant zone of spawning and summer rearing activity appeared in the mainstem at RM 1.7 surrounding the mouth of Trib. A (Gamehog Cr) where Coho counts and rearing densities reached their highest levels of the survey. Trib. A and Elliot were the two most productive tributaries (13% and 12%, respectively, of total sub-basin Coho). Coho estimates in Trib. A and Idiot Cr. actually continued to increase in 2007, 42% and 12%,

respectively. All tributaries besides Deyoe and Drift continued to display moderate to very high average rearing densities in 2007, up to 6.9 fish/sq.m. in Trib. A and up to 1.6 fish/sq.m. in Tribs. C, D, and G. Average rearing densities in Trib. A in 2007 were the highest anywhere in the Tillamook Bay Watershed, although distribution extended only 0.4 miles.

1+Steelhead production has plummeted over three years of surveys in the Devils Lake Fork. A total decline of 58% in 2006 was followed by another 61% decline in 2007. This precisely mimicked the 61% basin wide decline in pool-rearing 1+Steelhead summarized for 2007. This successive rate of decline is alarming and wide-spread throughout the Watershed. This entire subbasin accounted for just 3% of basin-wide totals. Following distribution patterns from the previous two years, 77% of all Devils Lake sub-basin 1+Steelhead were observed in the lower 4 miles of the mainstem. 1+Steelhead production in this sub-basin was significant in 2005 and ranked as the third highest in the basin that year.

Devils Lake Fork Cutthroat abundance has remained relatively stable, oscillating between expanded estimates of 755, 390, and 605 over the last three years. Only 54% of the 2007 Cutthroat population were observed in the mainstem. 13 beaver dams were counted in the Devils Lake sub-basin, the only beaver dams noted for the whole entire Wilson basin in 2007. Five of them were abandoned and in-active.

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%)
2007	13,475	2,625	235	325
	(5%)	(4%)	(3%)	(5%)

- 20% visual bias not included

Only 56% of the sub-basin's Coho were found in the mainstem despite the fact that the mainstem contained 8 of the sub-basin's 13.5 miles of occupied habitat. Expanded estimates for Coho fell 42% here in 2007, along with most of the Devils Lake subbasin. This unexpected decline was the largest decline of Coho in the basin. The only other sub-basins to experience declines in Coho production in 2007 were the South Fork (down 19%) and the Little North Fork (down 5%). Lower adult escapement in these sub-basins is likely the reason for decline. Coho distribution in the mainstem during all survey years has extended 8 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 zones for Coho in the Devils Lake Fork are found at RM 1.7 (near the mouth of Trib. A) and between RM 3 and RM 6 (upstream of Elliot Cr.). Excellent spawning gravels and wide channel braids were encountered in these two locations, each immediately upstream of a tight bedrock pinch in the canyon responsible for the development of broad deposition plains. Much of the finer sediments in these reaches appear to have been supplied by Trib. A and Elliot Cr. The majority of mainstem Coho were observed in the upper zone during the surveys of 2005 and 2006. Production appeared to shift more into the lower zone in 2007 observed by peak pool counts (396 not expanded) and peak densities (4.2 fish/sq.m.) at RM 1.7. Pool surface areas in this reach were large. Because of this, rearing capacity in the Devils Lake mainstem appears practically unlimited, at least twice as high as 2006

production levels. Adult escapement and limited gravel supplies appear to be the main limiting factors. Roughly half of the mainstems 8 miles were dominated by long stretches of boulders, angular rock, and high stream gradients. Extensive beaver marsh habitats dominated the other half, beginning upstream of Deyoe Cr.. Many Coho in the upper half appeared to be very late emergents (small average size).

77% of 1+Steelhead in the sub-basin were observed in the mainstem in 2007 (no change from 2006). A two year declining trend has been observed in this species in the mainstem. -63% in 2006 then another -61% in 2007. 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 Devils Lake mainstem accounted for just 3% of basin-wide 1+Steelhead production in 2007. Almost all of the mainstem Steelhead during all survey years have been found within the first 3 miles of the survey where stream gradients were highest. Many adipose clipped residual hatchery steelhead have been observed rearing in this reach. Declines here mimic Steelhead declines across the basin. 0+trout estimates of abundance were again low in 2007.

Mainstem Cutthroat accounted for 54% of the sub-basin total (no change from 2006) and displayed a relatively even distribution throughout the survey. 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 is currently being seeded by these fresh sites where small plants can be easily swept downstream to colonize disturbed gravel bars. Removal of the Knot weed from this stream segment should be of the highest priority. 4 active beaver dams were noted within the surveyed portion of the mainstem.

Deyoe

Coho spawning has occurred in this small tributary during all three survey years. Strong adult escapement during the 2005 winter brood appeared to seed Deyoe Cr. to capacity for Coho. A peak density of 6.0 fish/sq.m. was reported at RM 0.3 that year. It appeared that adult escapement of Coho decreased in general throughout the Devils Lake sub-basin during the 2006 winter brood leading to lower summer rearing estimates in most streams for 2007. A peak rearing density of 2.9 fish/sq.m. was observed in 2007 at RM 0.2. Coho distribution has extended between 0.8 miles and 1.6 miles during all three years of the inventory. This stream accounted for 3% of the sub-basin population estimate in 2005, 7% in 2006, and 5% in 2007. 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. 4 beaver dams were noted in 2007. 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
2007	1,260	0.9	65	-	55

- 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. The 2.4 fish/sq.m. rearing density observed for Coho that year suggests that Drift Cr. had reached its probable carrying capacity. Density profiles from the summers of 2005 and 2007 suggest that upstream migrations of juveniles were the main source of

summer occupants. Stream gradients in Drift Cr. were very high and substrates consisted mostly of boulders and bedrock. Water temperatures coming out of the steep Drift Cr. canyon were significantly lower than in the Devils Lake mainstem. Anadromous production potential in this stream is mainly limited by the short length of habitat open to adult passage. This short reach represents important temperature refugia for all juvenile salmonids. No culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	185	0.3	220	-	10
2006	1,090	2.4	165	10	-
2007	290	0.8	125	-	10

- 20% visual bias not included

Elliot

Elliot Cr. had been the largest producer of Coho among the Devils Lake Fork tributaries for two consecutive years until 2007 when Coho estimates in Trib. A (Gamehog Cr) surpassed it. Expanded estimates declined 26% in Elliot and increased 42% in Trib. A. Percent contribution to Devils Lake Coho production totals has increased each year in Elliot. 9% of all summer parr in the sub-basin were observed here in 2005, 10% in 2006, and 12% in 2007. The average rearing density for Coho in Elliot doubled during the 2006 survey and approached rearing capacity for the stream. Most adult spawning has focused on RM 1 throughout this three year inventory. A peak rearing density of 2.7 fish/sq.m. was observed there in 2007. Coho distribution terminated all years at the impassable University Falls at RM 1.5. Upstream migrations of juvenile Coho have been observed in Trib. A for less than 0.2 miles during all three surveys. Low stream gradients in Elliot and abundant supplies of fine gravels suggest this reach maintains the potential for high Coho production. 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
2007	2,795	1.3	135	35	135

- 20% visual bias not included

Idiot

This sub-basin exhibited similar production levels for Coho in 2006 and 2007 during a period when overall Coho production for the Devils Lake Fork decreased by 36%. About 7% of all sub-basin Coho were rearing here in 2007. The average rearing density increased to 1.5 fish/sq.m. while distribution (0.8 miles) remained the same. The main spawning peak (2.2 fish/sq.m.) was observed at RM 0.3. 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 this three year inventory. No culverts. No Knotweed. A high frequency of land slides were also observed in this short reach.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,065	0.6	365	85	85
2006	1,555	1.3	375	45	25
2007	1,745	1.5	180	20	5

- 20% visual bias not included

Unnamed tributaries

High rearing densities for Coho were observed in Tribs. A, C, D, and G. 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.

The most productive for Coho over three survey years was Trib. A (Gamehog Cr). Expanded estimates for Coho have increased from 485 to 2,220 to 3,160 summer parr between 2005 and 2007. Trib. A and Idiot Cr. supported the only two increases in Coho anywhere in the Devils Lake Fork for 2007. The population in Trib. A represented 13% of all Devils Lake Fork Coho. Rearing densities were unusually high. An average of 6.9 fish/sq.m. was reached in 2007, an increase from what was thought to be a carrying capacity level of 4.1 fish/sq.m. in 2006. These levels were among the highest in the Tillamook Bay Watershed and appeared to be a result of a strong upstream migration of juveniles mixed with multiple adult spawning events. One of the best spawning zones on the Devils Lake mainstem occurred at the mouth of Trib. A (also known as Gamehog Cr.) where the mainstem canyon opened up and a wide floodplain full of fine gravel and sediments was found. Several interactive channel braids were present along with diverse woody debris jams. Unfortunately, because of the unusually wide channel here, coupled with the expansive gravel bars and flood channels also present, solar exposure, as well as predator exposure, was very high. This reach displayed excellent conditions for adult spawning but offered little cover or complexity for juvenile rearing. The few debris jams within the active summer-flow stream channel of the mainstem were completely packed with summer parr (the highest count and density of the entire mainstem survey was observed under one of these edge oriented wood jams: 396 Coho rearing at 4.2 fish/sq.m.).

The combination of elevated mainstem temperatures and possibly lack of cover to avoid predation has resulted in upstream migrations into Idiot and Gamehog Cr that both enter this highly productive mainstem deposition plain. A high rearing density of 7.1 fish/sq.m. was observed in the first pool of Trib. A in 2007. This climbed to an incredible 13.9 fish/sq.m. just below a large sill log (RM 0.2) which appeared to be a juvenile barrier, ending any upstream migrations of Devils Lake Fork mainstem summer parr. A smaller peak of 5.9 fish/sq.m. was found at RM 0.3, upstream of the sill log, which appeared to be a result of in-stream adult spawning. A 10 ft. falls ended distribution at RM 0.4. It is believed that this 2007 Coho population represented the carrying capacity of Trib. A.

Harvest related activities within the Gamehog Cr subbasin have resulted in severe habitat degradation that may influence the capacity of this key refugia to function to this level during future salmonid cycles. A stream bottom road and adjacent slope undermined by road construction have failed into the stream channel and deposited many cubic yards of sediment. Over zealous upslope thinning prescriptions over exposed the fragile riparian alder stand and most of it has blown down. Increased future risk to the summer temperature profile of the aquatic corridor is the resultant condition that cannot be mitigated for. The cumulative impacts of this kind of treatment on high functioning tributaries (ample shade to protect cold summer flows from solar exposure) could severely impact the capacity of the mainstem Wilson to summer rear salmonids at the currently observed levels in the future.

No Steelhead. No culverts. Knotweed was reported at the mouth of Trib. A .

Evidence of Coho spawning has been observed all three years also in Trib. C. The expanded estimate for Coho increased from 245 to 1,195 in 2006, then back to 390 in 2007. Average rearing density reached 2.6 fish/sq.m. in 2006, probably the carrying capacity of this small, low flow stream. This average fell to 1.6 fish/sq.m. in 2007. Peak density in 2007 (2.4 fish/sq.m.) was noted in the first pool of the survey indicating the presence of a minor temperature refuge from the mainstem of the Devils Lake Fork. Distribution appears limited by low flows to 0.4 miles in Trib. C. 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. The highest count for Coho was observed in the first pool of the survey

indicating the presence of an upstream temperature dependant migration. The abundance of upstream migrants was less in 2007, than observed in 2006. Juvenile Coho were present both years upstream of the culvert indicating the presence of in-stream adult spawning. No Coho were found here in 2005. Expanded estimates in Trib. D for Coho, the only species present, declined from 1,230 summer parr in 2006 to 545 summer parr in 2007. Average rearing density concurrently declined from 4.6 fish/sq.m. to 1.6 fish/sq.m.. Total distribution both years extended only 0.3 miles. This habitat appeared to have represented its rearing capacity for Coho in 2006. Numerous beaver ponds encountered in Trib. D (5 dams total) all appeared to be abandoned. No Knotweed.

Trib. G supported a small population of juvenile Coho during the 2006 and 2007 surveys. Expanded estimates were similar - 645 (2006) and 510 (2007). Rearing density averaged 1.6 fish/sq.m. in 2007. Distribution both years extended just 0.3 miles and appeared to result from a mix of upstream juvenile migration and in-stream adult spawning. Anadromous potential in Trib. G was minimal due to low flows and a narrow channel. High quality cold water was noted here, along with many Cottids. An exceptionally wide riparian buffer should be maintained on Trib. G to protect this cold water asset. Cutthroat were present in 2006. No Steelhead. No Culverts. No Knotweed.

Little North Fork

This sub-basin played an extremely important role in the basin-wide production of Coho and Steelhead during all three inventory years. The 2006 increase in Coho production of 153% in the Little North Fork produced 64,515 (expanded) summer parr. This was the single largest gain in expanded estimates seen in the whole Tillamook Bay Watershed. The Coho summer parr population in the Little North Fork has been the largest in the Watershed through three consecutive inventories. A minor 5% decline in Coho production was observed here in 2007 as expanded estimates totaled 61,360 for the sub-basin. The Little North Fork Coho population accounted for an amazing 24% of the total Wilson basin population in 2007 and 11% of the total Tillamook complex population. 2007 Coho production in Jordan Cr., the next closest in size, accounted for 15% of the Wilson basin total and 7% of the Watershed total. The Little North Fork was the most productive stream segment among the top Coho producers for the Tillamook Bay Watershed in 2007, which included Jordan Cr., the North Fork Kilchis, and Elkhorn Cr.. Together these four sub-basins produced 31% of all Coho in the 2007 inventory and represent the most important habitat in the Watershed for the long term persistence of the population. These four sub-basins appeared equally critical to Steelhead production throughout the Watershed, and it is likely that many of the Coho and Steelhead juveniles observed throughout these inventories in the larger mainstem habitats downstream were the result of production occurring in these higher elevation habitats.

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.

The 2007 summer rearing Coho population in the Little North Fork (11.1 miles) was about twice as large as the Wilson mainstem population (32 miles). 89% of the Little North Fork population was observed in the 8.9 mile mainstem. This percentage has not changed since 2006. An average rearing density of 1.7 fish/sq.m. was maintained throughout this reach. This represents a significant improvement from the 2005 average density of 0.42 fish/sq.m. Most spawning activity in 2005 and 2006 was focused 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 that year. Several high counts (up to 740 summer parr) were found in this reach during the 2007 survey, but peak rearing density for Coho (6.6 fish/sq.m.) was

observed further upstream at RM 8.2. The 2007 density profile displayed a continuous and even climb toward this peak indicating that most adult spawning had probably occurred there. This same profile suggests that much of upper mainstem was seeded to capacity. Significantly higher production rates, however, appear possible in the mainstems 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.

Expanded estimates for 1+Steelhead showed little change in 2006, but fell sharply (76%) in 2007 along with 0+trout (down 32%) and Cutthroat (down 31%). The Little North Fork was one of the few reaches in the basin where 1+Steelhead abundance did not decline in 2006. However, the stream followed the strong basin-wide trend (down 61%) in 2007. Decreases were similar in the Trask basin. Survey timing in the Wilson basin changed very little over the three years of inventory. It is possible, in both these basins, that significant flood events during the fall of 2006 negatively impacted over-wintering Steelhead (and Coho) juveniles.

This sub-basin remained the single most productive for Steelhead among the Wilson River tributaries during all three inventories. This stream is clearly a key player in the basin's overall Steelhead production and in 2007 accounted for 11% of the total. 56% of Little North Fork 1+Steelhead were found rearing in the mainstem between RM 3.5 and RM 6.5, as in 2006 (57%), and 2005 (65%). This reach occurs roughly between the mouths of White Cr. and Blowout Cr. and coincides with the exceptional spawning and rearing habitat that Coho have keyed in on over the last three survey years. Fine gravels were abundant in this zone as well as long, deep pool scours. There is an interactive floodplain here and the stream channel has been allowed to meander through wide turns to a greater extent than the more confined canyon in the lower and upper reaches of the mainstem.

Cutthroat distribution in the mainstem was variable between years. Highest counts in 2007 were observed in the first mile of survey, while highest counts in 2006 focused on the survey's midpoint. Expanded estimates for Chinook summer parr have fallen successively from 2,980 (Aug. 3, 2005) to 1,360 (July 27, 2006) to 695 (Aug. 16, 2007). Chinook were present in the mainstem up to approximately RM 5 during each year. 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.

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
2007	61,360	1.7	10,840	995	1,160

-20% visual bias not included
-includes all tributaries

Berry

After a 119% increase in Coho production in 2006 it was believed that Berry Cr. was seeded to capacity. Rearing densities continued to increase in 2007 as production increased an additional 37% in this short 0.5 mile reach. Adult Coho spawning has occurred here during all three survey years within the first 1,300 ft. of stream where 2007 rearing densities peaked at 4.4 fish/sq.m.. These represent exceptional rearing densities for the Coho species. Upstream juvenile migrations contributed to these high levels. 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.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	925	0.5	870	65	400

2006	2,030	1.9	505	265	100
2007	2,780	2.4	440	50	130

- 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%. It appears that some combination of low level spawning and upstream juvenile migration was responsible for the high average rearing density observed during the second survey. Peak rearing density, near the mouth, reached 4.5 fish/sq.m. that year. This habitat was very near its seeding capacity in 2006. Distribution that year extended beyond several enormous wood jams and ended in low flows and small pools. The large flood event of 2006 left an incredible and impassable log jam at the mouth of Blowout, terminating 2007 survey efforts. 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
2007	-	-	-	-	-

- 20% visual bias not included

White

White Cr. was the most productive for Coho among the Little North Fork tributaries during the last two survey years. Signs of in-stream spawning were non-existent here during the 2005 survey, but adult escapement occurred for the 2005 and 2006 adult broods. One mile of distribution for Coho in 2006 exhibited consistently high rearing densities which peaked at 5.6 fish/sq.m.. These figures suggested that White Cr., along with the rest of the Little North Fork tributaries, may have reached full summer rearing capacity for Coho in 2006. 1.2 miles of distribution in 2007 averaged a significantly lower rearing density and exhibited a 10% decline in population size. This appears to have been due mainly to an overall reduction in adult escapement in the Little North Fork sub-basin during the 2006 winter brood. The most significant spawning peak in 2007 reached 1.8 fish/sq.m. near the end of the survey (RM 0.9). A series of 4 ft. boulder falls near RM 0.4 that stopped juvenile Coho migrations during the summer of 2005 was passed by adults during the winter broods of 2005 and 2006. Flat stream gradients and ample spawning gravels were present upstream of the falls until a second, steeper boulder gorge terminated all anadromous passage at RM 1.2. 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
2007	3,175	1.3	785	55	90

- 20% visual bias not included

Unnamed Tributaries

Trib. A exhibited a minor upstream migration of 5 (expanded) Coho before steep stream gradients and bedrock falls terminated distribution. 1+Steelhead were present in 2006. Cutthroat were observed all three years. No culverts. Heavy Knotweed infestation was present at the mouth. This Tributary is a good reference for locating the start of the Knotweed 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 Knotweed 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 Knotweed infestation may exist at a local quarry site.

Trib. B supported what appeared to be a large upstream migration of 610 (expanded) Coho summer parr. 97% of this population was found in the first pool of the survey. Distribution ended at a 7 ft. debris jam after 300 ft. of survey. Steep stream gradients limit production potential beyond 700 ft. in this stream. Cutthroat were also present. No culverts. No Knotweed.

Trib. C supported 170 (expanded) Coho in what looked like a strong upstream migration of juveniles. Peak rearing density of 3.1 fish/sq.m. was observed at RM 0.2 which might support the possibility of adult spawning. Rearing density averaged 1.0 fish/sq.m. and distribution extended 0.5 miles. This stream exhibited excellent habitat potential and looked capable of supporting low level adult spawning. 1+Steelhead were present in 2006. Cutthroat were observed all three years. No culverts. No Knotweed.

North Fork Wilson

Coho production has surged in the North Fork sub-basin since 2005, increasing by 195% in 2006 and again by 73% in 2007. Increases in adult escapement for the 2005 and 2006 brood were likely the driver of this abundance. The 2006 winter brood was the strongest of the three cohorts observed in this three year inventory and a result itself of the strong parent brood of 2003 (14,584). Expanded estimates for Coho were 48,545 summer parr in 2007 which represented 19% of the total Wilson basin population. This was the second largest contribution to basin-wide totals after the Little North Fork (61,360 expanded). Coho production in the NF mainstem (18,740 expanded) was equal to that of the WFNF mainstem (18,100 expanded), each fork representing about 38% of the NF sub-basin Coho total. The second largest increase in Coho production in the basin for 2007 was observed in Rogers Cr. where the expanded estimate rose 136% to 10,905 summer parr. This accounted for another 22% of the NF sub-basin Coho total. The average rearing densities for Coho reached 2.2 fish/sq.m. in Rogers Cr. and 1.8 fish/sq.m. in the WFNF.

Healthy mixed species riparian canopies were encountered throughout much of the system as well as ample summer flows. 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. Three years of inventory have identified the most productive spawning beds in the sub-basin between RM 3 and RM 5 in the NF mainstem, surrounding RM 2 in the WFNF mainstem, and at RM 0.6 and RM 1.7 in Rogers Cr.. Numerous large pools in the WFNF and NF mainstems appear to provide abundant adjacent summer rearing habitat for these spawning sites. Unfortunately, the wide winter-flow channel observed in these reaches lends itself to high solar exposure and avian predator impacts.

Stream habitats in the North Fork appeared ideally suited to Steelhead production and had exhibited some of the largest expanded estimates in the basin in 2005 and 2006. 2007 estimates for both Steelhead and Cutthroat declined dramatically throughout the basin. Pool-rearing 1+Steelhead were almost non-existent in the NF mainstem and WFNF mainstem when compared to estimates from 2006 for the same stream segment. Pool-rearing estimates for this species fell 85% in the NF mainstem, 74% in the WFNF mainstem, and 56% in Rogers Cr.. The largest portion of the 2007 population was observed in the WFNF (46%).

Cutthroat abundance in the NF sub-basin has declined just as dramatically over the last three years, from 1,460 (expanded) in 2005 to just 690 (expanded) in 2007. 39% of this population was observed rearing in the NF mainstem, mostly in the middle portion of the survey. No Knotweed was reported in the NF sub-basin.

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%)
2007	18,740	3,065	180	270
	(7%)	(4%)	(2%)	(4%)

- 20% visual bias not included

Coho production in the NF mainstem has increased over the three inventoried years. The 0.3 fish/sq.m. average rearing density observed for Coho in 2005 has increased for two consecutive years to 1.1 fish/sq.m. in 2007. Expanded production estimates have increased by 248% in 2006, then by 58% in 2007. The production levels observed in 2007 do not represent full capacity. This stream segment accounted for 39% of the total sub-basin Coho population. Distribution in the mainstem has remained between 6.4 miles (2005) and 8.2 miles (2006) throughout this three year inventory (6.8 miles in 2007).

Spawning peaks have changed location from year to year and have included RM 3, RM 4.5, and RM 6.8. The strongest, at RM 4.5 in 2007, reached 4.8 fish/sq.m. Pool counts for Coho also peaked in the same area, about 1,400 ft. downstream, indicating that a majority of the population was probably still rearing near the site of emergence. This reach occurred between Tribs B and C (upstream of the West Fork) and displayed several stretches of dry channel conditions which could have contributed to these high rearing densities. Very low densities for Coho, 1+Steelhead, and Cutthroat were reported throughout the first mile of the survey.

Substrates throughout the NF mainstem 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 is terminated by an 18 ft. falls at RM 8.2 that ends all anadromous potential.

A huge decrease in pool-rearing 1+Steelhead was observed in 2007 in the NF mainstem. These declines tracked with the basin-wide trend for this species, which exhibited a decline of 61%. In the NF mainstem, 1+Steelhead estimates declined 85%, 0+trout estimates declined 20%, and Cutthroat estimates declined 35%. Two consecutive years of decline have been noted here for Cutthroat. High displacement or mortality rates as a result of the November 2006 flood could be related to these widespread declines. Most 1+Steelhead and Cutthroat during the summer of 2007 were observed in the middle of the NF mainstem survey, with several zero counts from pools in the first mile and last two miles. Most 1+Steelhead in the sub-basin were found in the West Fork mainstem. This was the fourth largest 1+Steelhead tributary population in the basin during the 2006 inventory. No culverts. No Knotweed.

Coho were present in three small tributaries to the NF mainstem during the 2007 survey. Low level adult spawning was responsible for the population in Trib. A (635, expanded). The 0.9 mile distribution in Trib. A averaged 0.8 fish/sq.m. with a spawning peak of 1.2 fish/sq.m. at RM 0.4. The culvert at the mouth of Trib. A, which is perched by 2 ft., was passed by adults, but had restricted upstream juvenile migration from the NF mainstem. A small spike in rearing density was observed in the pool just below this culvert. This stream was the largest of the unnamed tributaries to the NF mainstem and exhibited substantial spawning and rearing potential for anadromous fish. Culvert repair here is warranted. The 0.4 mile distribution in Trib. C supported just 60 Coho summer parr (expanded) and was probably due to an upstream migration of North Fork mainstem juveniles. Large boulders and low summer flows limit productivity and summer rearing potential in this stream. Trib. D supported an

upstream migration of 105 Coho summer parr over a total distance of 0.1 mile. A 6 ft. falls terminates and anadromous passage.

West Fork North Fork

Expanded estimates of Coho production have been nearly identical in the WFNF mainstem and in the NF mainstem for three years in a row. Higher rearing densities in the WFNF mainstem reflect the shorter 4 mile distribution (only about one-half the NF mainstem). After two years of consecutive and significant improvements in Coho production, measuring 195% (2006) and 79% (2007), the summer rearing population here in 2007 averaged 1.8 fish/sq.m. Total distribution of 4 miles exhibited little change over three survey years and the upper limit was delineated by a significant increase in stream gradient and a series of bedrock cascades. In 2007, rearing densities and pool counts for all species peaked at RM 2, just downstream from the mouth of Rogers Cr.. A rearing density of 3.9 fish/sq.m. was observed there for Coho, which probably represented a combination of in-stream WFNF spawning production and downstream density-driven juvenile migrations out of Rogers Cr.. 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 observed in Trib. A of the WFNF during the 2006 and 2007 surveys. 610 (expanded) summer parr were present in 2006 and the average rearing density was high at 5.1 fish/sq.m.. Only 170 (expanded) summer parr were observed in 2007 in an average rearing density of 2.6 fish/sq.m.. These individuals appeared to be a result of upstream juvenile migration. Only 0.2 miles of distribution was observed both years. 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.

Strong Steelhead production in the WFNF in 2006 was followed by a decline of the species in 2007, despite very little change in 0+trout abundance over three years. Large declines in 1+Steelhead were reported basin-wide in 2007. Cutthroat estimates in the WFNF have dropped two years in a row. Most 1+Steelhead and Cutthroat were observed in the first two miles of the survey. No Steelhead were observed upstream of RM 2.6 in 2007. No culverts. No Knotweed.

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
2007	18,100	1.8	3,505	280	215

- 20% visual bias not included

Rogers

2007 Coho production in this tributary was extremely high considering the short 2.6 miles of distribution. More Coho were observed here than in any other comparable distribution in the basin, including: 2.1 miles in SF Jordan (8,505 expanded), 2.4 miles in Ben Smith Cr. (5,015 expanded), even 4.6 miles in Elk Cr. (9,770 expanded). Expanded estimates increased 81% in Rogers Cr. in 2006 followed by an even stronger increase of 136% in 2007. This was the second largest increase in abundance for the basin in 2007 after Jordan Cr.. A very strong positive trend has emerged in Rogers Cr. for Coho during this three year inventory. Continued increases in adult escapement appear to be driving this increase in juvenile abundance.

An expanded estimate of 10,905 Coho summer parr were observed in Rogers Cr. in 2007, in an average rearing density of 2.2 fish/sq.m.. This represented 22% of the total North Fork sub-basin population. The strong spawning peak observed during the previous two surveys at RM 1.7 appeared again in the 2007 density profile and reached 3.8 fish/sq.m.. 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. B was the most productive tributary for Coho with 435 summer parr (expanded). A high average rearing density of 3.3 fish/sq.m. was observed over 0.3 mile. Adult spawning appeared to have occurred there. A small 0.3 mile upstream migration of 115 juvenile Coho was observed in Trib. A before a log jam terminated distribution. Trib. C appeared too steep for anadromous use.

Steelhead, Cutthroat, and 0+trout abundance in Rogers Cr. has declined notably over three years of survey. Losses in Steelhead appear to be the heaviest (66%). Similar trends have been noted throughout the Watershed. No culverts. No Knotweed.

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
2007	10,905	2.2	1,385	140	170

- 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 5.3 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 3.6 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 declined 19% from the previous year, following trends in the Devils Lake Fork (down 36%), but contrary with the observed basin scale increase.

Shifting patterns of adult escapement (2006 winter brood) within this three year inventory likely led to decreased spawning activity in these uppermost two forks of the Wilson River. Coho production in nearby Elk Cr. increased 82%. Decreases in Devils Lake Fork and South Fork Coho abundance were the only observed interannual declines in the Wilson basin for 2007. South Fork Coho accounted for 5% of the 2007 Wilson basin summer rearing population.

Habitat conditions were similar to most upper Wilson tributaries including long rapids, frequent bedrock exposures, and patchy spawning gravels. The mainstem channel passed through several narrow gorges and interactive floodplains were in general absent. An overall lack of finer sediments was observed. Maximum winter flow rates appeared substantially lower here than in the North Fork or the Devils Lake Fork. 71% of sub-basin Coho were observed rearing in the mainstem and 18% in Trib. A, the most productive tributary. A low average rearing density of 0.6 fish/sq.m. was observed for Coho in the mainstem with a main spawning peak (1.4 fish/sq.m.) at RM 1.5. Production levels for Coho in this reach could be three times higher than 2006 levels with increased adult escapement.

1+Steelhead production decreased slightly by 18% in 2006 before plummeting an additional 74% in 2007. Widespread declines in pool-rearing abundance for this species were noted in most of the basin in 2007. This reduced population still represented the fourth largest tributary population of 1+Steelhead in the basin for 2007. Large numbers of residualized hatchery Steelhead were present (fin clips) during each survey year. Only 70% of the 2007 South Fork population was observed in the mainstem compared to 93% in 2006. Most of these were observed in the lower half of the survey. Cutthroat densities have remained low in the sub-basin during all three years of survey but declined 38% in 2007 to their lowest observed abundance. No culverts or Knotweed sites were located on the SF mainstem.

Trib. A traversed the South Fork Prison Camp and exhibited 0.9 miles of Coho distribution during each survey year. Expanded estimates here continued to increase in 2007 and have exhibited continuous increases since 2005, from 480 summer parr (2005) to 1,690 (2006) to 2,250 in 2007. Average rearing densities were high, 3.5 fish/sq.m., and a spawning peak with densities of 6.1 fish/sq.m. was observed at RM 0.3. These levels suggest that the habitat here had probably reached full rearing capacity for Coho (although this same assertion was made in 2006 when rearing densities averaged 3.0 fish/sq.m.). Signs of upstream juvenile migration were observed in the first pool of the survey where rearing density

spiked at 5.6 fish/sq.m.. Water temperatures in this high flow tributary were very cool. 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. These were rare habitat types in the South Fork Wilson. Coho distribution ended in steep gradients. Steelhead and Cutthroat were present in low numbers. No culverts. No Knotweed.

Trib. B supported low level Coho spawning in 2005 and 2007. An upstream juvenile migration was observed in 2006. 370 (expanded) summer parr were present during the 2007 survey in an average rearing density of 0.8 fish/sq.m. over 0.4 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 and 2007 surveys. Expanded estimates in 2007 were highest - 1,085 summer parr rearing at an average density of 2.3 fish/sq.m.. A spawning peak of 3.1 fish/sq.m. was observed in the middle of the survey. Distribution extended 0.5 miles and was limited by low flows, steep bedrock, and log jams. Spawning and rearing habitat in Trib. C looked good for Coho. 1+Steelhead and Cutthroat were also present in low numbers. No culverts. No Knotweed. Trib. C1 (new culvert looked well positioned) showed no Coho either year due to steep, impassable log jams just upstream of the culvert.

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
2007	12,845	0.6	2,490	315	385

- 20% visual bias not included

Kilchis River

Three years of inventory in the Kilchis basin have consistently exhibited the third highest estimates for Coho summer parr out of the five major basins in the Watershed. Expanded estimates in 2007 of 105,395 summer parr (not including 20% visual bias) from 50 miles of stream in the Kilchis was similar to the production levels observed from 76 miles in the Trask (111,775). Some of the highest density summer rearing levels for Coho in the entire Tillamook Bay complex of streams were observed in the North Fork Kilchis mainstem. In 2007 this sub-basin equaled Coho production levels from Elkhorn Cr. on the NF Trask (36,015 expanded) and surpassed estimates from the Wilson mainstem (31,850 expanded). Juvenile Coho abundance has increased significantly for two years in a row in the Kilchis basin. This is believed to be mainly due to continued increases in adult escapement. Adult escapement for the basin during the 2006 winter brood appeared to be the highest during this three year inventory. Expanded estimates for juvenile Coho more than doubled in 2006, then increased again by 32% in 2007. The significance of these contributions of Coho production to the Tillamook Bay complex has increased over the last three years from 13% (2005) to 16% (2006) to 19% (2007). 50 miles of total distribution for Coho summer parr in the Kilchis basin was up approximately 3 miles since 2005. The 2007 distribution is a good representation of the current limit of adult escapement for this species.

The primary anchor habitats for Coho in the Kilchis basin, considering all three survey years, appear to be the 16 mile Kilchis mainstem, the 7 mile North Fork mainstem, and the 6.7 mile Little South Fork sub-basin (including the highly productive, 2.3 mile Sam Downs Cr.). Summer production in these reaches accounted for 29%, 27%, and 20%, respectively, of the basin total. Two consecutive years of increased Coho production were experienced in all three of these habitats. The largest increases in production in 2007 were observed in Sam Downs Cr. (+ 103%), the NF mainstem (+ 70%), and its main tributary, Schroeder Cr. (+ 85%). Minor increases were noted in the Kilchis mainstem (+ 10%) and the Little South in (+ 17%). Summer rearing Coho populations exhibiting the highest average rearing densities were observed in small tributaries such as Company Cr. on the SF Kilchis (2.7 fish/sq.m.), Trib.

A of the Kilchis (2.6 fish/sq.m.), French Cr. on Schroeder Cr. (2.3 fish/sq.m.), Sam Downs Cr. (1.9 fish/sq.m.), and in the comparably large pool-habitat of the NF Kilchis mainstem (2.0 fish/sq.m.). Exceptionally high density rearing in the NF Kilchis mainstem reached peak levels of 5.9 and 8.0 Coho/sq.m.. These observed rearing densities and similar ones from 2006, match peak rearing densities observed in the Little North Fork Wilson, Jordan Cr./Wilson, Rogers Cr./WFNF Wilson, and Elkhorn Cr./Trask, and surpass published norms of full seeding for the Oregon Coastal ESU.

Expanded estimates of 4,815 1+Steelhead for the Kilchis basin in 2007 represent a significant decline of abundance (- 40%) when compared to expanded estimates from 2006. This was the second year of decline for this species in the Kilchis basin after a minor decline of 6% in 2006. These declines mimic the decline (- 53%) observed in pool-rearing 1+Steelhead abundance for the combined habitats of the Tillamook Bay complex in 2007. Kilchis basin 1+Steelhead estimates in 2007 were again the third highest in the Watershed after the Wilson (8,750 expanded) and the Trask (5,245 expanded). The largest portions of the Kilchis population were observed in the Kilchis mainstem (44%), the NF mainstem (16%), and the Little South Fork mainstem (12%). The 1+ Steelhead in the Kilchis accounted for 21% of all 1+Steelhead in the 2007 Tillamook Bay complex of streams. Cutthroat estimates in the Kilchis in contrast remained very stable through the 3 year inventory from 3,115 (2005) to 3,425 (2006) to 3,550 (2007).

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. All 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. Indications are 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). Many hunting families of this species and heavy scat signs were observed.

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. Abundance levels for all four species of salmonid juveniles remained moderate into inter-tidal habitats during all three survey years on the Kilchis mainstem. This pattern was observed also in the Miami mainstem, but is not a common occurrence in many larger Oregon Coastal rivers. These observations 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 three consecutive years (this is the only major basin without Knotweed in the Tillamook Bay complex of streams). This was also the only major basin in the inventory to show no signs of recent beaver activity (within the range of Coho distribution). 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 2007 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Mainstem	30,065*	28.5	6,345*	29.6	2,135*	44.3	705*	19.9
-Clear	4,485	4.3	1,915*	8.9	370*	7.7	135	3.8
-Coal	820		85		5		75	2.1
-Little South Fork	11,245*	10.7	1,400*	6.5	590*	12.3	335*	9.4
--Sam Downs	9,725*	9.2	2,355*	11.0	205	4.3	440*	12.4
-Murphy	920		115		20		60	1.7
-Myrtle	285		65		40		210*	5.9
-South Fork	5,945*	5.6	1,400*	6.5	310*	6.4	175	4.9

--Company	2,030	1.9	170		40		70	2.0
-Vaughn	5		100		-		95	2.7
-Trib. A	1,615	1.5	180		-		125	3.5
-Trib. B	45		50		-		25	
-Trib. E	545		125		35		80	2.3
-Trib. J	260		95		-		60	1.7
North Fork Mainstem	27,935*	26.5	4,600*	21.5	765*	15.9	225*	6.3
-Fossil	405		85		20		10	
-Schroeder	5,705	5.4	1,320	6.2	220	4.6	145	4.1
--French	800		150		10		15	
-Triangulation	495		65		5		20	
-Trib. A	285		100		-		20	
-Trib. D	230		60		-		15	
-Trib. E	315		25		-		15	
-Trib. F	140		25		-		5	
-Western	295		95		-		10	
Basin Total	104,595	99.2	20,925	97.6	4,770	99.1	3,070	86.5

* 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%)
2007	30,065	6,345	2,135	705
	(29%)	(30%)	(44%)	(20%)

- 20% visual bias not included

The Kilchis mainstem survey stretched about 16 miles from the inter tidal wetlands just above Hwy 101 to a series of narrow bedrock chutes and steps at the junction of the North and South Forks. This reach was highly productive for Coho relative to the rest of the Watershed for every year of the inventory. In 2006, estimates for summer rearing Coho were higher here than in the Wilson mainstem (32 miles) or the Trask mainstem (14.1 miles). Estimates here for Coho in 2007 were slightly lower than in the Wilson mainstem (31,850), but remained the sixth highest of any stream reach in the Tillamook complex of streams. The mainstem reach of the Kilchis River represented critical rearing habitat for 29% of all Coho and 44% of all 1+Steelhead in the Kilchis basin during the 2007 survey. The largest populations of all fish species in the basin have been found in the mainstem Kilchis during all three inventoried years. This river segment appears to be the most important component of summer fish production in the basin. The North Fork Kilchis mainstem was close behind in 2007 with an expanded estimate of 27,935 Coho summer parr (only 765 1+Steelhead, expanded).

In response to increased adult escapement, expanded estimates for Coho in the mainstem have increased for two years in a row, up 93% in 2006, and another 10% in 2007. Average rearing densities for Coho, however, has remained extremely low (between 0.1 and 0.2 fish/sq.m.). Minor density peaks appeared to be randomly scattered over the last three survey years (0.7 fish/sq.m. at RM 7.2 and 0.8 fish/sq.m. at RM 15.6 for 2007), though highest individual pool counts were upstream of RM 10 for each year (up to 766, not expanded, at RM 12 for 2007). 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 downstream of the North and South Fork convergence.

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 numbers for all species of juvenile salmonids.

2007 mainstem estimates for pool-rearing 1+Steelhead continued to decline by 30% after the 2006 decline of 45%. This represents a definitive back to back 2 year reduction in 1+ Steelhead abundance which may continue based on similarly decreasing abundances of the 0+ trout age class. Declines here followed basin and Watershed wide trends (down 40% and 53%). 1+Steelhead estimates from the mainstem Kilchis represented about one-half of the basin-wide population for the last three survey years (44% in 2007).

Cutthroat abundance does not appear to be following the same trend. A decline of only 13% has been observed in this species between 2005 and 2007. 1+Steelhead and Cutthroat densities in the mainstem decreased as the survey progressed upstream for each year of the inventory. The highest individual pool counts for both species were observed in the first 3 to 5 miles of the survey with occasional peaks up to RM 7. Densities then dropped off sharply. Juvenile Chinook were present all the way through the Kilchis mainstem in 2007 with an expanded estimate of 9,650. No culverts were present. No Knotweed was observed in any part of the mainstem during these three years of survey.

Clear

Coho production continued to rise in Clear Cr. in 2007, increasing by 23%. Total distribution of 2.2 miles has remained stable for the three survey years. The current end of distribution appears ephemeral at a tight pinch in the canyon which has trapped boulders and old wood and created a small 4 ft falls. A larger debris jam however, was observed about 1000 ft. further upstream in 2007. Average rearing density for Coho increased slightly during the third year of survey, but remained at least 50% lower than the stream's potential carrying capacity. A spawning peak near RM 0.8 has been observed during all three survey years, and reached 1.3 fish/sq.m. in 2007. The main spawning activity appeared closer to RM 1.7 in 2007 where densities reached 1.4 fish/sq.m.. An upstream migration of juveniles was observed at the mouth of Clear Cr. in 2007 where rearing densities increased to 1.3 fish/sq.m. (this was not noted in 2006). This has consistently been one of the smaller Coho population segments in the basin throughout the inventory, representing between 4-5% of basin-wide production each year. Indications are that Clear Cr. could support much higher levels of production with increased adult escapement.

1+Steelhead production has declined in Clear Cr. following the basin trend. 0+trout estimates however, improved in 2007 in contrast to the basin trend which indicated an over all decline from the previous year. Cutthroat abundance has vacillated with no definitive trend associated with observed abundances. Distribution for 1+Steelhead was relatively even throughout the survey while Cutthroat numbers were highest at the start and end. No Coho were documented in Tribs. A or B. No culverts. No Knotweed. Numerous slides were reported along Clear Cr. in 2006, indicating steep unstable upslope conditions.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,115	0.4	710	540	185
2006	3,635	0.7	595	400	430
2007	4,485	0.8	1,915	370	135

- 20% visual bias not included

Coal

Coho production nearly tripled in Coal Cr. in 2006, then declined 20% in 2007. This was one of the only streams in the basin to exhibit a decline in Coho for 2007. In-stream spawning is believed to have occurred in Coal Cr. during each year of this inventory. Adult escapement during the 2005 winter brood appeared to be the strongest for this sub-basin. Juvenile distribution extended 1.3 miles for Coho in 2007 with the highest rearing densities reaching 2.1 fish/sq.m. near RM 0.6. A 10 ft. bedrock falls at RM 1.4 ends anadromous potential. It is believed that production potential for Coho in Coal Cr. remains higher than the level reached here in 2006. Adult escapement seems to be the primary limitation.

1+Steelhead estimates declined to nearly zero in 2007 in Coal Cr.. Only a single pool-rearing juvenile was observed (expanded to 5 by the methodology). Two consecutive years of decline have been observed for this species. Cutthroat and 0+trout estimates appeared more stable. 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
2007	820	0.7	85	5	75

- 20% visual bias not included

Little South Fork

The Little South Fork (6.7 miles) and the North Fork (12.3 miles) have been the two most productive sub-basins in the Kilchis for Coho for the last three years. Coho production estimates have increased considerably since 2005 in the Little South Fork, up 486% in 2006 and another 17% in 2007, for an expanded estimate of 21,440 summer parr. This included 9,725 (expanded) summer parr from Sam Downs Cr. (2.3 miles), which accounted for 45% of the sub-basin total. Still, North Fork Coho estimates remained about 71% higher in 2007 and represented 35% of the basin-wide total, while Little South Fork estimates accounted for 20%. Coho production declined in 2007 in the mainstem component of the Little South Fork by 17% while rising 103% in Sam Downs.

The mainstem reach of the Little South Fork was under seeded for all fish species during the 2005 survey. The most significant improvement in the 2006 Kilchis basin inventory was then documented in this reach where expanded estimates for Coho increased 731%. 2007 Coho production estimates were 17% lower in this stream segment than the previous year. Enormous production potential for all anadromous fish is present throughout this 3.7 mile stretch of stream habitat. Well stocked coniferous riparians are present here and play a significant role in maintaining habitat quality. Stream sinuosity and channel diversity was high, substrates of all sizes were present and appeared well sorted, and summer stream flows were significant. There were numerous large pools in this reach where spawning and rearing conditions appeared to be optimum. Adult escapement seems to be the only limiting factor for the mainstem Little South Fork. Average rearing density for Coho in 2006 (0.8 fish/sq.m.) was the highest of the 3 year inventory and suggested that additional production capacity (as much as 100%) was still present in the reach. The main spawning peak observed in 2007 at RM 2.5 (1.1 fish/sq.m.) was observed in the same location in 2006. A 10 ft. debris torrent jam terminated Coho distribution at RM 3.6. No

1+Steelhead were observed upstream of this jam between 2005 and 2007 and it currently functions as a barrier to anadromous migration.

1+Steelhead production in this sub-basin has been significant (825, expanded, in 2007) for the Kilchis basin (17%). Declines for this species in 2007 were - 65% in the sub-basin and - 69% in the mainstem. This was the lowest abundance for the mainstem for pool-rearing 1+Steelhead, in three years of survey. Most 1+Steelhead in the sub-basin (72%) were rearing in the LSF mainstem. Cutthroat and 0+trout estimates also decreased in 2007 though they remained higher than in 2005. No Chinook juveniles were found in 2007. The mainstem exhibited ideal spawning substrates for both Steelhead and Coho. Significant numbers of 1+Steelhead rearing in extensive rapid habitats were not documented in this inventory.

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. Trib. C has supported the largest summer rearing populations of Coho, in 2006 (250 expanded) and 2007 (470 expanded). One or two spawning pair were responsible for the seeding that occurred in this small stream during the 2006 winter brood, leading to 0.7 miles of juvenile distribution in 2007 at an average rearing density 1.2 fish/sq.m.. The high summer flows and cold temperatures that were observed in the Little South Fork mainstem between 2005 and 2007 depended largely on water contributions from numerous 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.

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
2007	11,245	0.7	1,400	590	335

-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 in this 2.3 mile reach has increased significantly over the last three years of survey. Average rearing densities for Coho have doubled two years in a row following increases of 220% and 103% in expanded estimates. Distribution has increased from 1.2 miles in 2005 to 1.8 miles in 2006 to 2.3 miles in 2007. The population here in 2007 accounted for 45% of all Little South Fork Coho and 9% of all Kilchis basin Coho. This was the 4th largest contribution to Coho production in the basin and exhibited the 4th highest average rearing density. Based on these observations and similar contribution percentages in 2005 and 2006, it is apparent that spawning grounds in Sam Downs are some of the most important and frequently targeted habitats in the basin for adult Coho. The highest counts for Coho in 2007 were observed at RM 0.8, near the first site of significant spawning activity, where summer rearing densities peaked at 4.1 fish/sq.m.. A second, stronger peak of 4.4 fish/sq.m. was observed at RM 1.5. An average rearing density of 1.9 fish/sq.m. for this stream in 2007 suggests that the habitat was fully functional for spawning and summer rearing. Adult Coho in the 2006 winter brood appear to have passed an enormous log jam, near the end of juvenile distribution, which occurred at the junction of a steep tributary on the right-hand side of the stream. A wrecked excavator in the stream at the mouth of this tributary had fallen 200 ft. or so down the sheer walls of the canyon from a clear-cut above.

1+Steelhead abundance in 2007 was just under the level reported in 2005, while Cutthroat and 0+abundance increased dramatically after a year of little change in 2006. Steelhead sightings were mostly in the lower half of the survey while Cutthroat were evenly distributed. Tribs. A and B to Sam Downs showed evidence of minor upstream migrations of juvenile Coho during the last three survey years that were terminated by a 12 ft. falls and an 8 ft. falls in each after about 600 ft. of distribution. A 30

ft. falls in Trib. C prevented anadromous use. 35 (expanded) juvenile Chinook were present in 2006, none were documented in 2005 or 2007. No Culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,500	0.4	865	245	255
2006	4,795	0.8	875	460	255
2007	9,725	1.9	2,355	205	440

- 20% visual bias not included

Murphy

A combination of in-stream Coho spawning and upstream juvenile migration was observed in Murphy Cr. during all three survey years. Coho production increased 222% here in 2006 then indicated no change in 2007. Extremely high rearing densities, up to 4.1 fish/sq.m., were again 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. A second peak in rearing density at RM 0.7 reached 1.1 fish/sq.m., which probably represented the presence of an adult spawning event.

Approximately 1,200 ft. of lower Murphy that paralleled the roadside was heavily enshrouded in blackberry and could not be surveyed any of the three years. These pools were most likely supporting very high Coho rearing densities. It was estimated in 2006, 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 not surveyed during any of the three years of this inventory, so comparisons between years are accurate.

Distribution appeared limited beyond 1.3 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 and 2007 surveys. Production potential beyond the estimate given above 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
2007	920	1.3	115	20	60

- 20% visual bias not included

South Fork

Coho production varied little here between 2005 and 2006 preceding the radical jump of 216% observed in 2007. A large increase in adult escapement is believed to have been associated with this observed increase. A series of 6-8 ft. falls on the mainstem near RM 1 appeared to restrict adult passage only during the 2005 winter brood, since Coho juveniles were observed upstream of that point during the summer surveys of 2005 and 2007 where none were present in 2006. 1+Steelhead were seen above this gorge all years. Most of the mainstem is unavailable 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 the mainstem where production potential for Coho appeared relatively low. An excellent stretch of fine spawning gravels and sinuous pools is present above the gorge with near-perfect conditions

that extend to RM 4 where huge bedrock outcroppings and a 4 ft. falls restrict passage. Average rearing density has remained very low over the last three years which indicates a large unutilized potential in this reach for increased Coho production. It would seem that the habitat here could support a juvenile Coho population 3 - 5 times that documented in 2007. The only spawning peak visible in the 2007 density profile appeared at RM 1.8.

In 2006, expanded estimates for Coho increased 90% for the sub-basin as a whole, almost all in Company Cr.. In 2007, this trend reversed, as sub-basin Coho totals continued to climb by 71%, almost all in the mainstem, Company Cr. estimates declined by 27%. Three-quarters of all sub-basin Coho in 2007 were rearing in the mainstem with the additional one-quarter in the only major tributary, Company Cr. (which surpassed mainstem production in 2006). The South Fork sub-basin accounted for 8% of all Coho in the Kilchis basin in 2007, 23% more than Schroeder Cr. and 18% less than Sam Downs.

1+Steelhead production has remained stable in the mainstem throughout the 3 year inventory. Cutthroat and 0+trout estimates have also remained relatively stable. Basin-wide declines for these species were considerably more severe in other stream reaches. 1+Steelhead and Cutthroat were present throughout the entire length of the 2007 survey (2.9 miles). 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
2007	5,945	0.3	1,400	310	175

-20% visual bias not included

-not including Company Cr.

Company

The mouth of Company Cr. is just downstream from the steep boulder gorge in the SF Kilchis and probably attracts many of the adults deterred by that barrier. In 2007, 25% of the SF sub-basin summer parr population was rearing in Company Cr. at a high average rearing density of 2.7 fish/sq.m. and a distribution totaling 1.4 miles. Expanded estimates for Coho dropped by 27% in 2007 after a significant 186% increase in 2006. Better adult passage at the SF Kilchis falls during the 2006 winter brood probably led to decreased spawning pressure in Company Cr. An obvious spawning peak was visible in the 2007 density profile, at 4.2 fish/sq.m. at RM 0.7, very close to the previous year's peak at RM 0.9 (4.3 fish/sq.m.). This stream has exhibited the highest average rearing density for Coho in the Kilchis basin during all three years of this inventory. Spawning habitat in Company, Sam Downs (1.9 fish/sq.m.), and the NF Kilchis (2.0 fish/sq.m.) appeared to be the most heavily used by adult Coho in the basin throughout this inventory. These represent key anchor habitats for the persistence of the deme

Stream habitats and upslope forest integrity was classified as excellent throughout the Company Cr. survey. Coho distribution ended at a log jam in long, steep boulder rapids which exhibited limited additional potential for spawning. Only minor interannual variations in Steelhead, Cutthroat and 0+ trout were observed in the 3 years of inventory. No culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	970	1.0	245	40	110
2006	2,775	2.5	320	140	105
2007	2,030	2.7	170	40	70

- 20% visual bias not included

Vaughn

This stream exhibited largely un-utilized spawning and rearing potential during each year of the inventory. 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 two 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 has declined substantially in Vaughn since the 2005 survey. Only one single summer parr was observed in 2007 rearing in a shaded reach in the middle of the golf course. The total extent of the 2007 survey was 1.4 miles and extended beyond the problematic culverts and into healthy looking forest/stream habitat. The worst problem culvert (a 3 ft. cement box culvert perched by 2 ft. over rip-rap and packed with debris) at RM 1 looked impassable for 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 in 2005 as the highest priority for replacement within Vaughn Cr.. Temperature limitations also become a factor in the agricultural section of the stream below the golf course later in the summer. The Cutthroat population appears stable. 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
2007	5	0.3	100	-	95

- 20% visual bias not included

Small Tributaries

Tribs. A, E, and J, along with Myrtle Cr. exhibited evidence of in-stream Coho spawning in 2007. Tribs. A and E have also exhibited adult spawning during every year of this three year inventory. Expanded estimates in Trib. A have been the highest. An increase of 425% in Coho production in 2006 (1,050 expanded) was followed by a second increase of 54% in 2007 (1,615 expanded). The second highest average rearing density in the basin (2.6 fish/sq.m.) was observed in this small stream which exhibited 1.4 miles of Coho distribution in 2007. Extremely high rearing densities were observed in the narrow pasture-trench channel through the first ½ mile of the survey, peaking at 8.6 fish/sq.m. at RM 0.4. A good spawning zone was located just above the pasture habitat where the stream entered the forest and regained its natural channel characteristics. Potential for restoration is 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 observed here, in low numbers, between 2005 and 2007.

Coho distribution in Trib. E has extended to RM 0.7 for three consecutive years. Expanded estimates of 825 summer parr in 2006 were the highest (545 in 2007). Steep stream gradients and lack of well sorted gravels limit spawning potential for Coho in this tributary. Rearing density averaged 1.3 fish/sq.m. in 2006 with two spawning peaks present. Average rearing density in 2007 decreased to 0.7 fish/sq.m.. A small upstream migration of Coho summer parr was noted in the first pool of Trib. E2. Cutthroat and 1+Steelhead were present in low numbers each year. No culverts. No Knotweed.

Coho production in Trib. J (260 expanded) and Myrtle Cr. (285 expanded) was minimal in 2007, though appeared to be the result of at least one spawning pair. Distribution in each totaled 0.3 miles. A spawning peak near the end of the survey in Trib. J was identified by a 2.2 fish/sq.m. spike. A perched culvert in Myrtle indicated that adults had passed during the previous winter. Almost all of the Coho in

Myrtle were found in the plunge pool below the main 5 ft. steel pipe culvert which was perched by 2 ft. above the summer water level. A stretch of dry channel was present between this pool and the large cobble fan at the stream's junction with the Kilchis mainstem. Juvenile Coho (only 10 expanded) were also present upstream of this culvert. Spawning potential looked good in this stream and adult passage was probably still sufficient at the time of the 2007 survey. It seems that repair of the culvert perch would still leave a juvenile barrier at the cobble fan at the mouth of the stream. A 5 ft. boulder falls at RM 0.3 also limits anadromous production potential in this stream. 1+Steelhead, Cutthroat, and juvenile Chinook were all present in the large plunge pool.

Mapes, Sharp, and Tribs. B, G all displayed short upstream migrations of juvenile Coho. The largest of these, 145 (expanded) summer parr over 0.3 miles, was observed in Sharp. The undersized and half-submerged 3 ft. pipe culvert on Mapes could be restricting adults. The average stream width there appeared larger than the culvert was capable of handling. Spawning potential in Mapes appeared low. A 4 ft. culvert on Trib. G was perched by 2 ft., representing a juvenile barrier. Spawning and rearing potential there appeared minimal due to low flows and steep gradients. No Knotweed was found.

School, Washout, and Tribs. C, D, F, and H. 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

Three years of inventory have identified the NF Kilchis as one of the most important anchor habitats for Coho in the Tillamook Bay complex of streams. The North Fork was consistently the largest and most productive sub-basin in the Kilchis for Coho, accounting for 25% (2005), 27% (2006), and 35% (2007) of all summer parr in the basin. The North Fork contains 12.3 miles of high gradient stream habitat. The 2006 winter brood appeared to be the strongest in the inventory throughout the Kilchis basin. Rearing densities for Coho in the upper NF mainstem in 2006 and 2007 were among the highest in the Tillamook Bay Complex of streams. Reaching an average of 2.0 Coho/sq.m. in 2007, the large pools of the NF mainstem may have been rearing close to their full capacity. Expanded estimates for Coho in the North Fork sub-basin continued to increase in 2007 by 73% producing 36,660 summer parr. This matched estimates from the Elkhorn sub-basin (11 miles) in the NF Trask and surpassed estimates for the Kilchis mainstem (16 miles) and the Wilson mainstem (32 miles). The 2007 summer rearing Coho population in the North Fork Kilchis ranked as the third largest in the Tillamook Bay Inventory after the Little North Fork Wilson (61,360 expanded) and Jordan Cr./Wilson (39,375 expanded).

Between the summers of 2005 and 2007, the sub-basin Coho population was divided mostly between the NF mainstem (76-78%) and its main tributary, Schroeder Cr. (17-19%). Significantly higher production for Coho appears possible in the Schroeder Cr. mainstem than any cohort achieved during this three year inventory. The last three survey years have also included the tributaries Fossil, Shaw, Triangulation, Western, and Tribs. A, C, D, E, and F. Low level adult spawning was detected in Fossil, Triangulation, and Tribs. A and E. Upstream juvenile migrations were observed in the rest. Significant contributions of cold flows were provided by all these steep drainages.

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. Rearing conditions appeared perfect for juvenile Steelhead. High 1+Steelhead estimates were expected during the 2005 survey, based on the aquatic habitat conditions observed, though only 385 (expanded) 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 that year (4.5% of the basin total). A large 296% increase in abundance was observed for this species during the 2006 survey (up to 1,525 expanded). Again, almost all were rearing 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 that displaced population.

In 2007, estimates for this species declined 30% in the Kilchis mainstem, 33% in the NF Kilchis sub-basin, and 40% in the Kilchis basin, mimicking the drastic and widespread 53% decline in pool-rearing 1+Steelhead abundance observed throughout the Tillamook Bay Watershed. The North Fork population ranked as the second largest in the Kilchis this year (1,025 expanded) after the Kilchis mainstem (2,135 expanded), and accounted for 21% of the basin-wide total (three-quarters from the NF mainstem). Sub-basin 0+trout estimates remained relatively stable through the course of the 3 year inventory and Cutthroat abundances remained relatively small.

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%)
2007	27,935	4,600	765	225
	(27%)	(21%)	(16%)	(6%)

- 20% visual bias not included

The North Fork mainstem appeared to be the primary destination for adult Coho spawners in the Kilchis basin for the last three years. Expanded estimates for Coho have increased consecutively by 169% and 70% since 2005 and each year have represented the largest segment of the basin-wide population after the Kilchis mainstem. Average rearing density for the 6.9 mile segment was 1.8 fish/sq.m. in 2006 and 2.0 fish/sq.m. in 2007. These levels are impressive considering the vast pool surface areas available for rearing in the mainstem. As in 2006, the highest rearing densities in 2007 (8.0 fish/sq.m.) appeared near the end of the survey (RM 6.4), where pools decreased in size. Peak rearing densities in 2006 reached 10.8 fish/sq.m. at RM 7.2. Unlike the 2006 juvenile Coho distribution, roughly 62% of the 2007 mainstem population was rearing downstream of RM 2.7. A significant spawning peak located at RM 0.9, probably led to the high local densities of 5.9 fish/sq.m. observed.

These were among the highest peak rearing densities for Coho in the Kilchis basin, and the NF mainstem average density was the fourth highest. For the last two years, Coho rearing densities in the NF mainstem have been among the highest in the Tillamook Bay Watershed, comparable to streams one-half to one-third its size. In 2007, this population continued to exhibit rearing densities as high as Company Cr., Trib. A of the Kilchis, French Cr., and Sam Downs - all much smaller streams, the size of NF mainstem tributaries (such as French). Coho production has increased significantly in the NF mainstem in relation to the levels observed in 2005 (0.2 fish/sq.m). Three years of surveys verify that this reach represents critical anchor habitat for Coho.

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. 1+Steelhead counts in the NF mainstem have exhibited a less dramatic decline over three years of survey than in other reaches of the Watershed. A large 259% increase in 2006 however, was followed by a 38% decline in 2007. This most recent decline was nearly identical to the basin-wide 40% decline in 1+Steelhead abundance. 67% of the 2007 population was documented rearing downstream of RM 2.7. NF mainstem Steelhead production was the second highest in the Kilchis basin in 2007, after the Kilchis mainstem. Cutthroat

abundance in the NF mainstem has been very low during all survey years and the 0+trout estimates have indicated little variation in abundance. No culverts. No Knotweed.

Fossil

Signs of adult spawning were observed in Fossil during the 2006 and 2007 surveys. These relatively small occurrences of juvenile Coho were likely the result of no more than two spawning pairs. The short 0.5 mile distribution ended at a massive wood jam. Steep stream gradients and multiple large wood jams limit future production potential in this stream. 1+Steelhead were documented in 2007 only. Cutthroat were present all years 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
2007	405	1.2	85	20	10

- 20% visual bias not included

Schroeder

The most significant tributary to the NF Kilchis is Schroeder and its primary tributary, French. Coho production has increased consistently in Schroeder during the last two survey years and evidence of in-stream spawning was observed in French in 2006 and 2007. An expanded estimate of 6,505 summer parr were present between the two in 2007 (88% in Schroeder), accounting for about 6% of the basin-wide total. This represented an 85% improvement in Coho production compared to the summer of 2006 and a 344% improvement compared to the low estimates from 2005. Continued increases in adult escapement appear to be driving these increases in summer parr abundance. The combined population in Schroeder and French has accounted for approximately 18% of the NF sub-basin's Coho production during each of the last three survey years.

Distribution extended 2.4 miles in the mainstem of Schroeder. Coho production has doubled in this reach for the last two years in a row. The stream habitat has not visibly changed at all. Good spawning conditions were noted in Schroeder and average rearing densities have increased significantly to 1.6 fish/sq.m.. In comparison to rearing densities for Coho in comparable habitats around the Watershed, it would appear that continued increases in production (up to 50%) are possible here. The main spawning peak identified during the last two survey years occurred between RM 1.5 – 1.7 and reached 3.3 fish/sq.m. in 2007. A smaller peak in rearing density of 2.4 fish/sq.m. was observed near the mouth of Schroeder indicating an upstream migration of juveniles out of the NF Kilchis. Coho distribution ended at a 4 ft. bedrock falls. A minor upstream juvenile migration of Coho was noted in Trib. A extending only 345 ft., this stream appeared too steep for significant anadromous production. 2007 Expanded Coho estimates for the mainstem of Schroeder were higher than Clear Cr. (4,485) and lower than the SF mainstem (5,945). 1+Steelhead abundance has increased in Schroeder each year since 2005, unlike most reaches in the basin. Cutthroat estimates have remained relatively stable. 0+trout abundance also increased significantly here in 2007. No culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	1,315	0.3	805	25	165
2006	2,545	0.9	595	165	70
2007	5,705	1.6	1,320	220	145

-20% visual bias not included

-Not including French Cr.

French

This stream is the main tributary to Schroeder Creek. Evidence of adult Coho spawning was observed in French during the last two surveys. Juvenile Coho were present up to RM 0.7 where impassable log jams terminated distribution. A strong average rearing density of 2.3 fish/sq.m. was observed in 2007 with a spawning peak of 3.1 fish/sq.m. near the middle of the survey. Signs of frequent debris torrents were observed in the narrow French Cr. canyon. Very little pool structure and poor gravel sorting were noted also. No culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	150	0.5	175	-	-
2006	970	1.6	210	110	50
2007	800	2.3	150	10	15

- 20% visual bias not included

Triangulation

Minor Coho spawning appears to have occurred here during all three surveyed years. Spawning gravels were present in pockets between long stretches of cobble and bedrock. Coho production increased 156% in Triangulation in 2006 and 21% in 2007. A steep bedrock intrusion just upstream from the NF Kilchis seems to be a barrier for upstream juvenile migration into Triangulation. Coho distribution extended just 0.3 miles and ended in steep stream gradients. There appears to be no further Coho spawning or rearing potential beyond RM 0.5. Overall production potential for Coho in Triangulation appears low due to the limited duration of habitat and the lack of well sorted gravels. A single 1+Steelhead was observed in 2007. Low numbers of Cutthroat were present during the last three years of inventory. This stream appears to be most important as a significant source of cold flows for the North Fork mainstem. No culverts. No Knotweed.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	160	0.2	25	-	65
2006	410	1.1	15	-	45
2007	495	1.9	65	5	20

- 20% visual bias not included

Small Tributaries

Small upstream migrations of Coho were observed in Western, and Tribs. C, D, and F that extended less than 1000 ft. and totaled less than 230 (expanded) summer parr. Signs of adult spawning were present in Trib. A (285 expanded) where summer parr were distributed for 0.4 miles upstream of an impassable cobble fan (summer flows) at the stream mouth. Low level adult spawning was also suspected in Trib. E (315 expanded, 1000 ft.). The 4 ft. culvert in Trib. E was in good shape. All these streams were too small and steep for significant Coho spawning 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 temperature profile during summer flow regimes. No culvert problems were identified and no Knotweed was sighted.

Miami Basin

Out of the five basins surveyed in the Tillamook Bay Complex, Coho production and distribution in the Miami remained the lowest during all three inventoried years. Basin-wide expanded estimates for Coho, however, did exhibit two years of improvements between 2005 and 2007, unlike the Tillamook basin (no change in 2006) and the Trask basin (down 23% in 2007). The significant 64% increase in production observed in the Miami basin in 2006 was followed by an 8% increase in 2007. Expanded estimates reached 27,010 summer parr (not including 20% visual bias) in 2007, about 5% of the total Coho production in the Tillamook Bay Watershed that year. Coho production in the Miami remained between 5% - 6% of the Watershed total during each year of this three year inventory. The basin-wide Coho population in the Miami in 2007 was smaller than in any of the major Coho producing sub-basins around the Watershed, including the Little North Fork Wilson (61,360 expanded), Jordan Cr./Wilson (39,375 expanded), the NF Kilchis (36,660 expanded), and Elkhorn Cr./NF Trask (36,015 expanded). It was also less than half the level of Coho production observed for the Tillamook River basin in 2007 (63,155 expanded).

Miami basin Coho distribution for 2007 decreased slightly from 28.8 miles to 26.1 miles. Many stream surveys ended in dry channel conditions in steep stream gradients. This distribution is approximately one-half the lineal distance observed in the Kilchis basin (50 miles). Three years of surveys in the Miami basin have indicated that the 13.3 mile mainstem is a primary location for summer rearing Coho. The percent contribution to the basin from this stream segment was 79% in 2005, 81% in 2006 and 69% in 2007.

Spawning escapement to tributary habitats appeared to increase during the final survey year as Coho estimates increased 245% in the NF Miami, 227% in Peterson, 127% in Illingsworth, 59% in Moss, and 37% in Prouty. The largest tributary populations during all three inventory years have been documented in Moss, Illingsworth, Peterson, and Prouty. The only habitats in the basin which even approached full seeding for Coho during the last three survey years were observed in Illingsworth in 2007 (1.7 fish/sq.m.) and in Trib. G in 2006 and 2007 (1.7 fish/sq.m.). All other reaches remained far below carrying capacity and production potential.

Evidence of high water temperatures in the highly exposed, low gradient reaches of the lower Mainstem and signs of water withdrawals (Moss Cr., Prouty, Trib. E) 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. The largest and most important anchor habitat for Coho was located on the Miami mainstem in this transition zone (RM 7 – 9) between the upper and lower basin. Low gradients and fine gravels were still abundant in this zone, while forest coverage and pool complexity began to increase notably. 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 all the way up to the confluence of the NF Miami. Production potential decreased from that point on as stream gradients increased and substrates became poorly sorted.

The most under-utilized reaches for spawning and rearing during all years of inventory were observed in the low gradient sandstone and clay habitats present in Minich, Peterson, Trib. F, and Prouty. These drainages were all located on the North side of the Miami basin. Fine gravels, low floodplains, and abundant riparian vegetation exhibit significant future production potential for Coho. Substantial production potential was also recognized in Moss Cr. and Trib. E, on the South side of the Miami basin. Substrates in these two sub-basins were dominated by hard basaltic cobble and boulders and stream gradients increased more quickly than on the North side of the Miami basin. Numerous occurrences of well sorted, fine gravels were observed in these streams. The production potential for anadromous fish in Moss and Trib. E appeared significantly higher than the actual levels observed between 2005 and 2007. Dry channel conditions and water withdrawals during summer flow regimes appeared to be the greatest limitation to salmonid production.

1+Steelhead and Cutthroat production has decreased in the Miami basin since this 2005 inventory. Expanded estimates that year for these two populations totaled 7,350 and 3,005, respectively. During the 2006 survey these estimates declined 51% and 44%, respectively. In 2007, 1+Steelhead estimates continued to decline an additional 15%. This was one of the smallest declines however when compared to other 4 major basins during the 2007 inventory. Pool-rearing estimates for this species fell 53% across the Tillamook Bay complex of streams. Expanded estimates for the Miami during this final inventory year were 3,095 1+Steelhead and 1,760 Cutthroat. This number of 1+Steelhead was similar to that observed in the 27.6 mile SF Trask sub-basin (3,120 expanded) and was higher than all other sub-basin totals in 2007. The only stream segment rearing more was the 32 mile Wilson mainstem (4,455 expanded). Miami basin 1+Steelhead production has been uniquely high per mile throughout this three year inventory. For clarification, the portion of the 1+Steelhead population rearing in riffle/rapid habitats was not a part of this inventory. These numbers are not absolute and are intended to identify trends only.

Knotweed infestation was extreme along the lower Miami mainstem and continued up to RM 9 . The absence of riparian vegetation in the lower mainstem is a significant issue for restoring functionality to the ecosystem. 7 active beaver dams were reported in the basin in 2007, primarily in Prouty and Trib. F.

(Table 18) Miami River 2007 Basin Wide Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Mainstem	18,715*	69.3	8,110*	83.3	2,590*	83.7	870*	49.4
Hobson	20		60		10		60	3.4
Illingsworth	1,615*	6.0	105	1.1	165*	5.3	-	
Minich	175		20		-		40	2.3
Moss	2,000*	7.4	125*	1.3	100*	3.2	205*	11.6
NF Miami	950	3.5	430*	4.4	25		30	1.7
Peterson	1,390*	5.1	310*	3.2	30	1.0	200*	11.4
Prouty	970*	3.6	150*	1.5	10		95*	5.4
Struby	-		15		-		10	
Trib. B	-		10		-		-	
Trib. D	-		15		-		10	
Trib. E	-		70		40*	1.3	50	2.8
Trib. F	40		25		-		35	2.0
Trib. G	500	1.9	110	1.1	25		80*	4.5
Trib. H	25		20		25		30	1.7
Trib. I	-		-		-		5	
Trib. J	245		45		10		-	
Trib. K	365	1.4	90		55*	1.8	15	
Basin Total	27,010	100	9,710	99.7	3,085	99.7	1,735	98.6

* 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%)
2007	18,715	8,110	2,590	870
	(69%)	(83%)	(84%)	(49%)

- 20% visual bias not included

The majority of the juvenile salmonid rearing in the Miami basin for the last three inventoried years has occurred within the 13.3 miles of mainstem habitat. The basin-wide trends for each species, therefore, have mirrored the population changes observed within this reach. The only exception to this occurred in 2007 when Coho estimates declined 8% in the mainstem while continuing to increase by 8% basin-wide due to broader spawning escapement to tributary habitats. A 17% decline in 1+Steelhead abundance in the mainstem in 2007 was closely matched by a 15% decline basin-wide. Similarly, a 17% increase in mainstem Cutthroat abundance contributed to a 5% increase in basin-wide abundance. A declining trend in Steelhead and Cutthroat abundance is visible in the mainstem estimates from the last three years. Between 2005 and 2007 the abundance of these two species has continued to decline, 61% and 42%, respectively.

With a mainstem segment similar in length to the Kilchis mainstem, the Miami mainstem produced only 62% as many Coho in 2007 and 21% more 1+Steelhead. The relative importance of the Miami mainstem to total Tillamook Bay Watershed Coho production has also declined from 5% to 4% to 3% over the last three inventoried years. Despite the observed decrease in 2007, the 1+Steelhead population in the Miami mainstem still is a significant and important contributor to Tillamook Bay Watershed totals. This 13.3 miles was the second largest 1+Steelhead producing reach for the entire Tillamook Bay complex of streams in 2005 and 2007 behind the Wilson mainstem (32 miles), and the fourth largest in 2006. The final 2007 Miami mainstem estimate represented 11% of the total Tillamook Bay Watershed estimate (for pool-rearing 1+Steelhead only).

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. A narrow bedrock gorge and an old debris jam further upstream are currently barriers to adult passage. Dry channel conditions were observed at this debris jam in 2007. The average Coho rearing density of 0.5 fish/sq.m. remained low for the mainstem. Most of the summer Coho rearing during the last three inventories has occurred upstream of RM 5. 61% of all mainstem Coho were documented between RM 6.2 - 9.1 in 2006. 43% were observed between RM 7 - 9 in 2007. This zone appears to be the main Coho anchor site for the Miami basin and occurs, roughly, between the mouth of Prouty Cr. and the mouth of Trib. I (near the second to last main road bridge). Wide channel braids in this reach have created numerous backwaters and alcoves resulting in extensive floodplain interaction. In-stream wood complexity was high as a result of a second growth stand of mixed evergreen trees that are actively recruiting to the channel. Fine, well sorted spawning gravels were also highly abundant within this 2-3 mile segment of stream.

Two main spawning peaks for Coho have appeared each year between RM 7.2 - 8.2 and between RM 12.2 - 12.4. Pools surface area was significantly smaller near the upper peak, which was within a mile of the end of Coho distribution. 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. High wood complexities were observed

through most of the upper mainstem and pool scour and diversity appeared excellent. Long boulder rapids and poorly sorted substrates dominated the stream channel upstream of the NF Miami junction.

As in 2005, most 1+Steelhead in 2007 were observed rearing in the first 6 miles of the mainstem, with gradually decreasing densities further upstream. Cutthroat abundance has exhibited a similar distribution. Mainstem 1+Steelhead abundance for 2006, however, was highest between RM 6.2 – 8.9, where 50% of the population was observed. Expanded estimates for juvenile Chinook in the Miami mainstem reached their highest level in three years in 2007. 8,525 were observed this year up to RM 9.2 (1,420 in 2006, and 3,585 in 2005).

Knotweed infestation was abundant in the lower Miami mainstem where it dominated the stream-bank from the head-of-tide to the mouth of Peterson Cr. (RM 5). Knotweed continued to be present intermittently up to RM 9 (upstream of Prouty Cr.). No culverts were present on the Miami mainstem. One active beaver dam was sighted in the zone of anchor habitat between RM 7 - 9.

Hobson

Low flows and small pools limit production in Hobson. Small upstream migrations of Coho were observed during all survey years. Distribution has remained less than 0.5 miles. Anadromous potential here is minimal as a result of fry originating in Hobson gravels. However, Hobson does contribute fresh water to a historical wetland that has been severely modified by ditching and draining. Restoration of the channel matrix in this wetland surface area would provide high quality summer and winter salmonid habitat utilizing the combined flows of Hobson and Struby to provide a low saline refugia for juvenile salmonids. Knotweed was present near the mouth of Hobson. All culverts appeared passable.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	85	0.3	80	-	40
2006	25	0.5	-	-	20
2007	20	0.4	60	10	60

- 20% visual bias not included

Illingsworth

Low level Coho spawning has been detected here during all three survey years, along with evidence of upstream migrations of summer parr from the lower Miami mainstem. Expanded estimates have increased significantly for two years in a row in Illingsworth, + 168% and + 127%. Two years of increased adult escapement in the Miami basin have improved observations in Illingsworth. Average rearing density for Coho was 1.7 fish/sq.m. in 2007. This was the highest average rearing density observed in the basin for 2007. A spawning peak at RM 0.4 reached 4.2 fish/sq.m. and total distribution extended 1.2 miles. Illingsworth exhibited the second largest abundance of tributary rearing Coho in the Miami basin after Moss Cr. in 2007 and accounted for 6% of basin-wide Coho totals. Three years of surveys in the Miami basin indicate that Illingsworth, Moss, Peterson, and Prouty represent the most important tributary habitats for Coho production.

The lower 0.3 miles of stream between the mouth and the main road culvert (good shape) was predominantly 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 exhibited limited anadromous potential. Recent logging activity near the middle of the survey has resulted in greater solar exposure and locally warmer water temperatures.

1+Steelhead and Cutthroat were also observed. 1+Steelhead estimates have displayed two years of consecutive increase in Illingsworth. The cooler, rocky pools in this stream appear to be attractive to juvenile Steelhead from the lower Miami mainstem. 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
2007	1,615	1.7	105	165	-

- 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 low abundance estimates throughout this three year inventory. Production and distribution potential in Minich was the lowest of the three.

Signs of low level adult spawning were detected here in 2005 and 2007. No Coho were observed 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 limited 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
2007	175	0.7	20	-	40

- 20% visual bias not included

Moss

Despite low expanded estimates, this stream remained the most productive tributary for Coho in the Miami basin during all three survey years. The fact that the highest ranking tributary accounted for just 5-7% of the basin's total Coho (between 2005 and 2007) indicates how unproductive the tributaries of the Miami currently are. Two years of increased production (up 53% then up 59%) were observed here in 2006 and 2007 while distribution has remained relatively the same (between 2.5 and 2.9 miles). A low average rearing density in 2007 of 0.9 fish/sq.m. suggests that production potential for Coho could be at least 100% higher in this habitat. Water withdrawals and dry channel conditions at the mouth and between RM 0.3 – 1.4 (no pools and no flow present) appear to be the most significant limiting factor. Stream flow and Coho counts gradually became more consistent as a spawning peak of 1.1 fish/sq.m. was reached in 2007 at RM 1.4. Distribution ended at a 4 ft. sill log near a major fork in the stream. Habitat conditions appeared good in Moss upstream of the dry channel zone and indicate a significantly higher rearing capacity for Coho. 1+Steelhead abundance has declined by 71% in Moss between the summers of 2005 and 2007. Cutthroat abundance rebounded in 2007 to a level 41% higher than in 2005. All trout were observed upstream of the dry channel conditions.

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 and there are likely significant takes of a listed species occurring here. No culverts were noted. Knotweed was present at the mouth of the stream but did not extend up Moss Cr..

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	825	0.3	455	345	145
2006	1,260	0.6	700	135	45
2007	2,000	0.9	125	100	205

- 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 all three survey years. Expanded estimates for Coho exhibited no change in 2006 despite the large increase in adult escapement throughout the rest of the basin. A significant increase (+ 245%) in Coho abundance was observed here in 2007, while basin-wide production increased just 8%. Total distribution from 2005- 2007 was static at 1.2 miles. Dry channel conditions terminated distribution in 2007. No Coho were present in Trib. A. Trib. B supported a small upstream juvenile migration in the first surveyed pool only. 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
2007	950	0.8	430	25	30

- 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 exhibited by any of the three cohorts in this inventory. An impressive 227% increase in Coho summer parr abundance was observed here during the final survey in 2007. The low average rearing density of 0.7 fish/sq.m. suggests that full seeding has not been approached. The lack of response in Peterson in 2006 to apparently large increases in basin-wide adult escapement was surprising considering the high quality of the available habitat. The high levels of sedimentation observed on the gravel beds in Peterson and its influence on egg / fry survival may have been a factor.

2.2 miles of Coho distribution were observed in the sub-basin in 2007, 1.4 of them in the mainstem. Most spawning activity appeared to occur within the first ½ mile of stream where rearing

densities peaked at 1.7 fish/sq.m.. Approximately 85% of all Coho in the mainstem were observed rearing downstream of RM 0.7. Minor upstream migrations of summer parr were observed in Tribs. B, B1, and C. During the summer survey of 2006, Tribs. B and B1 had re-connected separately to the Peterson mainstem with only about 50 ft. separating the two junctions. Tribs. B and C both exhibited minor spawning potential. About 5% of all Coho summer parr in the Miami basin were observed in the Peterson sub-basin in 2007 (only 2% in 2006 and 3% in 2005). The only culvert at the mouth was in good shape, but was perched by about 4 inches above the summer level of the Miami mainstem. This currently represents only a minor barrier to upstream juvenile migration. There is however concern that further degradation of this placement could occur that limits upstream temperature dependant migrations from the mainstem during pinch period summer low flows. Knotweed infestation was extreme surrounding this culvert.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	435	0.2	275	20	190
2006	425	0.2	465	180	65
2007	1,390	0.7	310	30	200

- 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. Coho abundance has exhibited continual improvement here over three years of survey. Expanded estimates increased by 154% during the 2006 survey and by another 37% during the 2007 survey. The 2007 population represented about 4% of the total Miami basin population, as did the NF Miami, and was the smallest estimate from the four main Miami River tributaries (including Illingsworth, Moss, Peterson, and Prouty).

A mix of adult spawning and upstream juvenile migration was observed. The average rearing density for Coho reached 1.2 fish/sq.m. in 2007 and displayed two main peaks, the first (1.7 fish/sq.m.) was observed near the mouth (an indicator of upstream migration from the mainstem) and the second (1.8 fish/sq.m.) was observed at RM 0.7 (as in 2006) and represented the main zone of adult spawning. Distribution ended most years near RM 1 where stream flow disappeared in a narrow and steep boulder canyon. Based on average rearing density, it is believed that Coho production in Prouty Cr. could be potentially twice as high as the level observed in 2007.

Excellent spawning gravels and low stream gradients were noted in the mainstem and in the beginning of Trib. A (small upstream juvenile migration each year). Summer flows were low and dry channel conditions were encountered intermittently. The main culvert at RM 0.4 (6 ft. steel pipe) exhibited a perch of 6 inches at the time of the 2007 survey and represented a barrier to juvenile migration. There was little sign of disturbance in juvenile distribution that year. Steelhead were observed in low numbers. Cutthroat abundance appeared stable. 3 active beaver dams were encountered in the mainstem of Prouty in 2007. No Knotweed was noted in Prouty until 2007 when a fresh colony was noted at the stream mouth.

Year	**Coho**	**Coho/sq.m.**	**0+**	**Sthd**	**Cut**
2005	280	0.2	120	-	95
2006	710	0.8	105	15	125
2007	970	1.2	150	10	95

- 20% visual bias not included

Struby

Coho were observed here only in 2005, resulting most likely from an upstream migration of juveniles from the Miami mainstem. The minor summer flows of Struby Cr entered a wetland surface historically ditched and drained near the head of tide on the Miami mainstem. The channel upstream of the main road crossing 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
2007	-	-	15	-	10

- 20% visual bias not included

Unnamed Tributaries

Trib. E: A minor upstream migration of 5 juvenile Coho (expanded) was observed here in 2006. Healthy forest conditions and several pockets of spawning gravel were observed in this stream. 1+Steelhead (40 expanded) and Cutthroat (50 expanded) were observed in Trib. E during the 2007 survey and 635 (expanded) juvenile Chinook were also present. It is unusual that Coho production was not higher in this fairly large stream during the last three years of surveys, especially considering the abundance of juvenile Chinook present in 2007. Dry channel conditions were noted at the stream mouth during the summer surveys and water withdrawals may be an issue here. Flows returned to normal at the first bridge crossing upstream of the Miami floodplain. The significant production potential for Coho in this stream was not realized in this three year inventory.

Trib. F: This stream entered the Miami just upstream 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, and 40 (expanded) in 2007. 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 in Trib. F. A failing farm road culvert between the stream mouth and the first bridge appears to have complicated adult and juvenile migrations between 2005 and 2007.

Surveyor access was denied on this reach in 2006 and 2007 and the present condition of this culvert is not known. At the time of the 2005 survey the 5 ft. steel pipe was rusted out badly and bent steeply upward on the upstream end. Debris has accumulated on the upstream lip of the culvert and juvenile passage looked impossible. If that condition persisted through 2007 then the juveniles seen in Trib. F in 2006 and 2007 were probably the result of in-stream spawning by adults that had made it through the culvert. If the culvert has been removed or repaired then the low expanded estimates from 2006 and 2007, and the short 0.3 mile distribution, suggest the presence of an upstream migration of juveniles from the Miami mainstem. Cutthroat were also present in low numbers along with 2 active beaver dams. Knotweed infestation was heavy surrounding the main road bridge on Trib. F.

Trib. G: Coho were observed in this stream each of the three years of survey. Expanded estimates of 115 (2005), 690 (2006) and 500 (2007). The average rearing density in 2006 and 2007 was 1.7 fish/sq.m., near full seeding for Coho. This was the highest average rearing density reported for Coho in the Miami basin for 2007 (similar to Illingsworth). A mix of upstream juvenile migration (2.3 fish/sq.m. at the mouth) and adult spawning (2.1 fish/sq.m. near the end of distribution) resulted in 0.6 miles of high density distribution. Patchy spawning gravel, medium stream gradients, and healthy forest conditions were noted. Expanded estimates of 25 1+Steelhead, 110 0+trout, and 35 Cutthroat were also present in 2007. No culverts. No Knotweed.

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 extended 0.7 miles. This was the largest population observed between 2005 and 2007. Small upstream juvenile migrations were noted in 2005 and 2007. Spawning gravels were present and pool structure was good for the first half-mile of stream before a major tributary junction and a rapid increase in stream gradient were encountered. Production potential for Coho in Trib. H appeared to be much higher than observed in this inventory. 1+Steelhead and Cutthroat were present in low numbers. No culverts. No Knotweed.

Trib. J: No Coho were observed here in 2005. 220 (expanded) Coho summer parr were observed during the 2006 survey and 245 (expanded) in 2007. Density profiles for these two years suggest that these populations were mainly the result of upstream juvenile migrations from the Miami mainstem. Adult spawning looked possible, however, within the first 0.5 miles of Trib. J. Abundant spawning gravels were reported near the mouth of the stream where the channel diverged and braided through the forest and the Miami floodplain. Several log structures were present in this zone. Steep gradients and increasing rock size limit production potential above RM 0.5. 1+Steelhead were present in low numbers. No culverts. No Knotweed.

Trib. K: Expanded estimates for Coho in Trib. K have exhibited two consecutive years of increase. The 2007 abundance was approximately 365 (expanded) summer parr and 0.9 miles of distribution. Rearing density averaged 0.9 fish/sq.m. and peaked at 1.2 fish/sq.m. in the second pool of the survey (the sixth pool of the stream). It is possible that these populations were the result of upstream juvenile migrations out of the Miami mainstem, although large rock and steep stream gradients (as well as the increased population size in 2007) seem to support evidence for in-stream spawning near the mouth of Trib. K. Spawning potential appears much higher in this tributary than observed between 2005 and 2007. Small upstream juvenile migrations of Coho were observed in Trib. K1 during each survey year that extended approximately 500 ft. before a large sill log-falls terminated passage. This did not appear to be a permanent barrier. 1+Steelhead and Cutthroat were present in low numbers. No culverts. No Knotweed.

Tribs. B, D, and I: 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. Preservation of upslope riparian integrity in these drainages should be maintained for the protection of water quality in the Miami mainstem.

Tillamook Bay Tributaries

These seven small streams emptied directly into the Tillamook Bay with little to no affiliation with any of the five major basins. Minimal spawning potential was observed 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 there largest contribution to salmonid production.

Dick

A minor upstream migration of Coho summer parr was observed in Dick Cr. during all three years of inventory. It is possible that low-level adult spawning occurred here in 2007. The culvert was passable for juveniles. High quality spawning gravel was present here and the stream exhibits un-utilized production potential. The stream channel appeared to have been recently torrented and pool development remained limited. This 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. 60 (expanded) juvenile Chinook were also present in 2007. No Knotweed was noted.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	15	30	25	-
2006	30	15	20	15
2007	125	60	-	95

- 20% visual bias not included

Flower Pot

No Coho were observed in Flower Pot during the last three years of survey. Extensive tidal and beaver marsh habitats dominated this stream and represented an enormous winter rearing opportunity for the juvenile salmonids entering 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 observed in Trib. A, which entered on the right just upstream of the mouth. This appeared to be excellent habitat for all estuary species. Cutthroat and 0+trout were present. The culvert was in good shape. No Knotweed.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	-	40	-	5
2006	-	5	-	35
2007	-	-	-	10

- 20% visual bias not included

McCoy Cove

Small upstream migrations of juvenile Coho were observed in McCoy Cove during all three survey years. Distribution totaled 0.2 miles in 2007. No 1+Steelhead were documented. 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
2007	35	25	-	30

- 20% visual bias not included

Patterson

Adult spawning appears to have occurred in Patterson during each survey year. This stream runs directly through downtown Bay City. Average rearing densities remained low, peaking at 0.5 fish/sq.m. in 2007. 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 juvenile Coho observed that year were very large and appeared to be either STEP releases or early spawning hatchery stock. Summer parr production appeared to rebound in Patterson in 2007 (365 expanded) to the level observed in 2005. Abundance in Jacoby dropped to zero. Bad visibility in Jacoby complicates comparisons. Distribution in 2007 extended 0.6 miles in Patterson but did not extend beyond the fish ladder as in 2005 and 2006. The 2007 summer rearing population represents a spawning escapement of two adult pairs.

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 noticeable here during all 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. A large spike in Coho and Cutthroat density was observed in this pool in 2007. 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 in 2005 and 2006. No Coho were seen upstream of the fish ladder in 2007. All three of these juvenile barrier culverts need maintenance or replacement with the highest priority 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
2007	365	0.5	20	-	90

- 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	-	-
2007	-	30	-	25

- 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
2007	-	15	-	5

- 20% visual bias not included

Trib. B

Upstream migrations of juvenile Coho were noted each year between 2005 and 2007. 1+Steelhead and Cutthroat were present in low numbers. 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
2007	25	45	-	35

- 20% visual bias not included

Watershed Recommendations

There are several conclusions based on the last three years of study 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 exhibited the largest populations in the Watershed for all anadromous species during each year of this inventory. 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 of the 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), as well as the upper Trib. E, 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 a 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 throughout this inventory. 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). 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. Three years of data 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.