RAPID BIO - ASSESSMENT 2008
COASTAL ESU
OCEAN TRIBUTARIES
FINAL REPORT

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INTRODUCTION

A total of 25 small coastal streams were inventoried during the 2008 Ocean Tributaries Inventory, comprising 154.3 miles of survey. Rapid Bio-Assessment Survey effort for these streams was suspended in 2007. However, this summary includes a review of multiple years of replicate effort. 2008 RBA inventories marked the third survey year for most streams, the fifth survey year for Rock Cr. / Devils Lake, the sixth survey year for Sand Lake and the Neskowin Basin, and the ninth survey year for the Yachats Basin. All of these streams were direct tributaries to the ocean and were not associated with any major Oregon Coast Range river system. All of the inventoried streams have been classified as containing only dependent Coho populations. The inventory ranged from Ecola Cr. in Cannon Beach to Sutton Cr. in Florence. The goal of this inventory was to assess historical, present and future coho production potential in the complex of small order HUC's of the North, Mid, and South Coast within the Coastal ESU.

Many of these streams have limited historical coho abundance data and most are not included in any regular monitoring program. There is currently significant effort being expended to assess the biological criteria for developing a recovery strategy for coho within the Coastal coho ESU and this inventory attempts to provide a baseline of abundance and distribution data for some of the potentially unique demes that exist within the greater independent populations of the ESU.

1+Steelhead and Cutthroat abundance and distribution data was also collected in this inventory. However, the primary objective was coho and the RBA methodology is not well suited for developing actual estimates of abundance for these other species.

Where available, data from historical juvenile inventories was included in tables for individual stream discussions. This historical data base was strong in the Mid-Coast and the Sand Lake/Neskowin complex.

METHODS

The basins and sub-basins surveyed were pre-selected and prioritized by a consortium of managers and advisors involved in the Coastal Coho TRT and the Coastal Coho Stakeholders process. Survey crews were concentrated temporally within each 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. As a result, the Coho distributions observed should be considered a snapshot of a very dynamic distribution pattern that has the potential of exhibiting extensive seasonal variation. Land owner contacts were made for all of the private, industrial and public ownerships that existed on at least one side of every stream reach surveyed.

Most surveys were initiated by randomly selecting any one of the first five pools encountered. The protocol however was altered for small tributaries (2^{nd} order) where Coho presence or absence was undetermined, in these tributaries, the first pool above the confluence was selected as unit number one. This alteration in protocol was adopted to identify minor upstream temperature dependant migrations that may not have extended more than a few hundred feet. The identification of this type of migratory pattern in

juvenile salmonids is critical for understanding potential limiting factors within the basin (temperature, passage, etc.)

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 distribution pattern.

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 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 survey to develop a calibration factor for each surveyor's estimate of distance. Total distances represented in the database are consistently greater than map wheeled distances using USGS 1:24,000 series maps. This is related to the level of sinuosity within the floodplain that is not incorporated in mapping. If you are attempting to overlay this database on existing stream layer information there would be a need to justify lineal distances with known tributary junctions (these can be found in the comments column of the Access 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 have less of their initial avoidance behavior.

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 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 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

There was also commentary recorded within each of the surveyed reaches that included information on temperature, tributary junctions, the abundance of other species and adjacent land use.

GENERAL OBSERVATIONS

Table (1) Expanded Estimates for the 2008 Ocean Tributaries Inventory in the Oregon Coastal ESU

Stream (north to south)	Coho	1+Steelhead	Cutthroat
NORTH COAST			
Ecola	7,363	50	540
Arch Cape	681	190	360
Short Sand	-	-	785
Watseco	-	-	30
Netarts Bay	600	-	110
Sand Lake	4,819	70	855
Neskowin	10,431	455	2,095
MID-COAST			
Rock / Devils Lake	9,469	15	910
Spencer	1,994	-	170
Wade	-	-	-
Coal	-	-	20
Moolack	-	-	15
Big	5,250	20	515
Vingie	-	-	190
Starr	269	-	155
Yachats	54,756	1,920	5,125
Cummins	6,850	730	1,690
Bob	5,213	420	1,240
Tenmile	13,631	1,585	4,570
Rock	119	135	660
Big South	5,281	900	2,355
Cape	4,438	705	1,895
SOUTH COAST			
Berry	319	-	95
Sutton	8,881	150	1,410
Total	**140,364**	**7,345**	**25,790**

* Juvenile coho estimates expanded with 20% visual bias added

Ocean Tributaries surveyed during the 2008 Coastal ESU project year ranged in size from small half-mile surveys with no Coho to 40 mile long river systems such as the Yachats. When comparing the production estimates above it is useful to consult the site-specific discussions below to determine the relative size of each particular basin. In general, some level of Coho production potential exists in all inventoried streams regardless of the current presence or absence of coho parr.

A total expanded estimate of 140,364 coho summer parr including a 20% expansion for visual bias is represented in this inventory. These results exhibit a 22.3% decline in abundance compared to the 2006 inventory total (180,759 summer parr), the survey was not conducted in 2007. Increases in juvenile abundance during 2008 were observed in most of the larger basins and ranged from 21% in the Big Cr. (north) basin to 504% in Bob Cr. Production estimates in the Ecola and Neskowin Basins exhibited no change between cohort years (2005 and 2008). Declines in abundance for this cohort

were observed in Arch Cape (-20%), Rock/Devils Lake (-45%), Rock (-84%), Cape (-23%), Berry (-79%), and Sutton (-18%).

Two basins, Netarts and Starr, exhibited low level Coho production in 2008 that exhibited no coho production from the parent brood in 2005. The total juvenile Coho estimate for the 2008 Ocean Tributaries Inventory represents an adult escapement of 1,123-1,276 Coho for these dependent populations during the 2007 brood year (details on the figures used for this back-calculation are included in the Yachats and Neskowin discussions).

Many of these small ocean tributaries are now lumped into a North Coast and Mid-Coast Dependent category of miscellaneous streams by ODFW in their annual assessments of wild spawner abundance. This makes individual comparisons difficult between basins. The combined total adult escapement estimate from ODFW for the 2007 dependent populations was 937 adult OCN coho. This included 376 for all North Coast streams and 561 for dependent Mid-Coast streams. A high level of agreement between ODFW adult spawner estimates and RBA (back-calculated) adult estimates exists for the 2007 dependent population. This comparison has been highly variable in other survey years. The miscellaneous ODFW groupings appear to have significantly over-estimated adult spawner abundance for this group of streams for the 2004 brood year. ODFW generated individual adult estimates for the Sand Lake / Neskowin complex, Devils Lake / Beaver Cr, and the Yachats that year. Estimated adult Coho escapement (back-calculated from 2005 RBA juvenile estimates) for the small Ocean Tributaries excluding Sand Lake, Neskowin, Rock, and Yachats was 500 adults for the 2004 winter brood (54,983 summer parr). The 2004 ODFW estimate for this same group of streams was 4,364.

Not surprisingly, the top seven most productive coastal tributary basins for Coho production were also the largest in size:

1) Yachats
2) Tenmile
3) Neskowin
4) Rock Cr / Devils Lake
5) Sutton
6) Ecola

These standings have changed little since 2005 aside from the steady climb of Cummins Cr. and the decline of Cape Cr.

Exceptional improvements in juvenile abundance were observed between the related cohorts of 2005 and 2008 (2004 / 2007 adult cohort) in Bob (+504%), Big South (+117%), Cummins (+99%), Spencer (+85%), Tenmile (+89%), Yachats (+31%), Big (+21%), and Sand Lake (+23%). Most of these systems exhibited extremely low average rearing densities for Coho which indicates that carrying capacity and full smolt production potential was not achieved with the adult escapement observed for the 2007 winter brood. Adult escapement continues to limit the production potential of these small coastal streams.

Keller Cr. in the Yachats Basin exhibited the only average rearing density (2.0 Coho/sq.m.) in 2008 which surpassed the accepted carrying capacity for Coho summer parr (1.7 Coho/sq.m.).

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 as well as changes in total abundance.

Expanded estimates for pool rearing 1+Steelhead were similar for the combined streams of the Ocean Tributaries Inventory between 2006 (6,350) and 2008 (7,345). However, a severely declining trend remains evident in most basins with more than three years of survey data. The top five largest steelhead populations in 2008 were all observed between Yachats and Heceta Head – Yachats River, Tenmile, Big South, Cummins, and Cape. Cutthroat expanded estimates stream by stream have shown considerably less long term decline over the last 3-9 years. In addition, recent metrics exhibit a significant 93% increase (inventory-wide) in the pool rearing component of the cutthroat population between 2006 (13,345) and 2008 (25,790).

Distribution profiles

The distribution of juveniles and the trend in rearing density for each surveyed stream provides 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 surveyed. Trend analysis will be an important aspect of this review for surveys with year to year replicates of RBA inventories.

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 data base 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.

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. Replicate surveys conducted in these same reaches in subsequent years can describe a portion of the improvement or decline in Coho production without the complexity and uncertainty of predicting juvenile production from adult escapement. 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 waterfalls or large debris jams. 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 mainstem.

Precautions

The specific location of spawning sites does not infer that the highest quality spawning gravels were targeted 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. It may however, be a significant indicator of the channel morphology that provides the appropriate attributes for the deposition and sorting of spawning gravels. This argument is strengthened by successive years of inventory that repeatedly identify the same juvenile distribution patterns.

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, survey start point, number of units sampled within the reach, surveyor variability, etc. The range of variability for at least one of these variables was documented in the final review of the 1998 Rapid Bio-Assessment. To facilitate the proper utilization of 2008 inventory data these 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. The table below contains this comparison exhibiting the variation in average density based on the selection of different starting points.

(Table 2)

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
(Arranged from North to South)

Ecola

Two years of low Coho production and one of moderate have been observed for the 3 years inventoried in the Ecola Basin. Low expanded estimates from 2008 mirror those from the 2005 cohort year, while results from 2006 appear to be almost twice as high. Drastic declines in Cutthroat and Steelhead abundance were observed in 2008. Summer RBA surveys scheduled for 2009 will reflect the results of a strong brood year (2006) arriving as smolts to a productive ocean with high ocean survival rates. The results of the 2009 inventory may reveal levels of coho production closer to Ecola Creeks current carrying capacity.

Average rearing densities from 2006 (below 0.4 Coho/sq.m. for all reaches) and visual observations of high quality habitats suggest that potential production rates for Coho in Ecola could be as much as four times higher than observed in 2006. The total summer rearing estimate for the 2006 year of high abundance would have required an escapement of 114-130 adults during the 2005 winter brood. This appears to be the most important stream for Coho between the Nehalem and the Necanicum Rivers. Excellent spawning and rearing habitat for all anadromous species exists in the Ecola Basin.

Basin-wide distribution for Coho has remained between 8.2-9.6 miles during the last three surveyed years. Steep gradients and large waterfalls at the end of each of the three mainstem reaches terminate anadromous distribution (a 13 ft. falls in the mainstem, a 7ft. falls in the West Fork, and a 7 ft. falls in Tolovana / trib. to the West Fork). The longest lineal distribution for Coho was observed in 2008 when Coho summer parr extended 2.9 miles in the mainstem (from the head of tide to the falls), 3.5 miles in the West Fork, 0.4 miles in Tolovana, 2 miles in Trib. B, and 0.8 miles in Trib. D. Low average rearing densities for coho (peaking at 0.3 fish/sq.m. in the West Fork) were observed in all mainstem reaches within the basin. Adult escapement currently appears to be the primary limiting factor in Ecola Cr.

Most coho production has been observed in the West Fork during the last three surveyed years. In 2008 the basin-wide percentage of contribution from this reach peaked at 67% compared to 18% from the Ecola mainstem and 8% from Trib. B. Evidence of low level adult spawning was also present in Trib. D in 2008 - 363 summer parr (including visual bias) was the highest average rearing density for a reach in the basin (1 coho /sq.m.). Average rearing density reached 0.3 Coho/sq.m. in Trib. B. The main spawning peaks, based on three years of rearing density profiles, have occurred in the Ecola mainstem between RM 1.3 and RM 1.9 (RM calculated from the head of tide), in the West Fork around RM 0.7, and in Trib. B near RM 1.2. These zones exhibit prime stream gradients and the highest abundances of well sorted, clean spawning gravels in the basin.

1+Steelhead and Cutthroat have been present during all three survey years in a steadily declining trend. Significant declines in abundance for these two species were observed in 2008 in both age classes (0+ and 1+). Decreased adult escapement is the

most likely reason for these declines. No chinook parr have been observed in the surveys above the head of tide but low numbers may have been present in the estuary.

Low stream gradients and high levels of channel sinuosity were reported throughout much of the basin downstream of the waterfalls. Abundant reserves of fine spawning gravels were present in this system along with relatively high wood complexities. Additional inter-tidal mainstem habitat and extensive wetland habitats (salt and fresh water) were present downstream of the survey's start point (confluence of Trib A). The presence of this high quality winter refuge is a very significant component of salmonid life histories within the Ecola basin. This zone may also be providing additional summer production unquantified in this inventory because of the tannins that terminated visibility for the chosen sampling methodology (snorkel). Estuary habitat like this, associated with a direct ocean tributary, was rare within the ESU wide inventory. Continued annual assessment is strongly recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	7,556	1,195	550	905
2006	14,269	1,510	335	835
2008	7,363	745	50	540

* 20% visual bias added for Coho

Arch Cape

This was the largest and southern-most stream on the Arch Cape beach. Spawning and rearing conditions appeared good for both Coho and Steelhead. High summer flow volumes and deep pools were present along with fine spawning gravels for the first 0.5 miles of the survey. The stream gets steep and bouldery by RM 1 and presents limited anadromous potential beyond that point. A 20 ft. falls at RM 1.2 represents a permanent barrier to anadromous migration. The Highway 101 bridge was the only road crossing encountered.

Based on juvenile estimates and the relative isolation of this basin, it appears that adult spawning for all anadromous species has occurred in Arch Cape during all three surveyed years. The strongest juvenile population of the 3 inventoried years (2005) declined in abundance by about 20% from its parent cohort. Only a few streams in the 2008 inventory experienced declines for this cohort – Rock/Devils Lake, Rock (south), Cape, Berry, and Sutton. The back-calculated adult escapement for the 2004 winter adult brood that produced the 2005 juvenile abundance suggests the escapement of 7-8 adults. Stock replacement was not achieved for the 2007 adult brood and Arch Cape probably consistently relies on supplemental straying from adjacent independent populations. The 2006/2009 juvenile cohort appears to be about 50% weaker in Arch Cape based on summer parr estimates from 2006. Average rearing densities for summer parr have remained below 0.2 Coho/sq.m. during all three survey years. Production levels could be much higher in this stream with increased adult escarpment. Steelhead abundance appears to be steadily declining in Arch Cape along with most small ocean tributaries in this inventory. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	856	490	625	185

2006	394	760	280	100
2008	681	650	190	360

* 20% visual bias added for Coho

Short Sands

Significant Coho and Steelhead potential is present in Short Sands. Coho distribution ended in 2005 at a series of debris jams lodged tightly into a bedrock gorge about 0.4 miles up from the beach. Much of the wood in these jams was large and old and it looked like passage has historically been difficult at this site. No juvenile coho were present in Short Sands during the 2006 or 2008 survey. It appears that no smolts from the 2005 level of production (a single spawning pair) survived to return as adults to the system. Stray adults from adjacent independent populations in the Necanicum or the Nehalem Rivers are probably the main source of salmonid production for this small coastal tributary. Steelhead abundance has consistently declined during each year of survey in Short Sands. A low level of cutthroat abundance was observed during each surveyed year with a significant oscillation in abundance.

Habitat conditions were excellent in the basin. Well sorted spawning gravels were present along with a wide variety of substrate sizes including several small bedrock steps. Pool scours were abundant and diverse and wood complexities high. The old growth conifer forest provided an intact canopy, excellent wood recruitment potential, and cool summer water temperatures. Stream gradients were high in general. A degraded fish ladder at RM 1.2 with several broken stairs and associated debris jams appeared to be a barrier for juveniles and adults (currently the series of ephemeral debris jams at RM 0.4 are the primary barrier). Coho spawning and rearing potential in the Necarney tributary appears minimal due to increased stream gradients, abundant bedrock, and a lack of fine gravels. 1+Steelhead and Cutthroat have been observed in Necarney. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	81	320	170	170
2006	-	175	85	45
2008	-	215	-	530

* 20% visual bias added for Coho

Watseco

Production potential for Coho and Steelhead appears high in Watseco. No Coho have been observed here during the last three surveyed years. 1+Steelhead were present in 2005 and 2006, indicating that adult passage was possible at that time. Cutthroat were present in low numbers during all surveys. A series of long slow marshy pools winds through low sand dunes and beaver ponds at the start of Watseco, leading 0.3 miles to the Highway 101 cement box culvert (good condition). Potential winter rearing refuge looked excellent through this reach. A tight matrix of driftwood at the mouth looked to be the most significant barrier to adult escapement.

Upstream of the Highway 101 crossing, habitat conditions rapidly transitioned into steeper gradients, good gravels, and larger cobbles. Pool formation and abundance

was excellent for the next 0.5 miles where most of the 1+Steelhead and Cutthroat have been observed. This is also where the best spawning habitats for Coho were observed. A small tributary (Rock Cr.) from the south feeds in just upstream of Highway 101 through an extensive wetland bog and sewage treatment site. No anadromous potential was present in this tributary.

A gravel road bridge marked the end of significant anadromous use in the mainstem of Watseco just below RM 0.74. Boulders and bedrock outcroppings began to be encountered at this point. A large tributary to the right just upstream of this bridge contributed much of the flow and displayed a 5 ft. boulder falls at the mouth that looked impassable for anadromous adults. The mainstem presented a 5 ft. cement dam just upstream of this tributary with a large accumulation of bedload (gravel and rock) behind it. Potential anadromous productivity in this system appears very high. Poor adult access appears to currently limit Coho production. The driftwood jam at the mouth definitively complicates access. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	-	65	55	150
2006	-	45	15	65
2008	-	20	-	30

* 20% visual bias added for Coho

Netarts Bay Streams

Only two streams in the Netarts Bay complex of streams have been identified over the last three survey years as having significant anadromous production potential – Whiskey and Jackson. An expanded estimate of 494 (including 20% visual bias) summer parr were documented in Whiskey Cr. during the 2006 survey. No Coho were observed in any other Netarts Bay tributary in 2006. This number of juvenile Coho indicated the escapement of about 4 adult Coho to Whiskey Cr. during the previous winter. Because of the previous assessment that significant anadromous production potential exists only in these two tributaries, they were the only two streams included in the 2008 RBA inventory. Coho parr were observed in both tributaries inventoried in 2008. Juvenile abundance was 25% lower in Whiskey during the 2008 survey (369 Coho including 20% visual bias) and an expanded estimate of 231 Coho (including 20% visual bias) were documented in Jackson Cr this same year. The basin-wide expanded estimate of 600 coho for 2008 indicates the escapement of about 6 adult Coho for the 2007 winter brood. The presence of juvenile Coho in Jackson during 2008 is a significant finding since no coho were present in the basin during the 2005 juvenile cohort year. The adults from the 2007 winter brood are likely strays from adjacent independent populations of coho.

Large coho runs have been reported historically at the mouth of the Netarts Bay. The extensive wetland rearing capacity of the Netarts Bay contributes significantly to the production potential of these fresh water streams and is a rare element among small ocean tributaries.

Whiskey Cr. exhibits excellent potential for both coho and steelhead. A total of 1.2 miles of coho distribution was observed in both 2006 and 2008. Rearing densities averaged a low 0.4 Coho/sq.m. in 2006 and 0.2 Coho/sq.m. in 2008. These low summer

rearing densities suggest that significant additional production potential exists. Steelhead presence has declined during each year of survey. Low Cutthroat abundance has exhibited little change within the 3 surveyed years. Good gravels and numerous well scoured pools provided conditions suitable for all anadromous species. Whiskey exhibits the greatest potential in the Netarts Bay drainage for Coho production and represents the highest priority for continued annual assessment.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	-	50	120	35
2006	494	260	10	75
2008	369	225	-	45

* 20% visual bias added for Coho

Jackson Cr. is the southern-most feeder stream to enter the Netarts Bay. This stream's primary channel currently flows out of a steep basaltic headland within the Cape Lookout State Park Campground directly into the ocean over a steep slope of rocky riffles. A secondary channel, dug to improve oyster cultivation in the Netarts Bay, empties through a long straight trench into wide braided tidal channels in the Netarts Bay salt marsh. Both channels have been surveyed. No coho were observed until 2008 when summer parr were observed in the first pool of the engineered channel (just upstream of the tidal marsh) and a short segment of the natural channel 0.3 miles upstream of the ocean beach. Based on the estimated juvenile abundance from that year, it is likely that a single adult spawning event occurred in Jackson Cr during the previous winter.

Adult escapement probably occurred through Netarts Bay and the engineered channel since the natural river mouth to the south is steep, rocky, and shallow due to the diversion in stream flow. Adult escapement from the beach would require a more perfect timing of high tides and high stream flows. Unfortunately very little spawning habitat is present in the straight, over-simplified, engineered channel. Pool frequencies are low and gravel sorting is poor due to steep channel entrenchment. Only 0.1 miles of natural stream habitat exists between the divergence of this channel from the Jackson mainstem and a rapid increase in stream gradients upstream of the mainstem culvert at RM 0.6.

The highest quality spawning gravels and pool complexities were observed downstream of the channel diversion, between the beach and RM 0.5. Well scoured pools, fine gravels, and old growth conifer canopies were present in this stream reach. Riparian vegetation was abundant and diverse and channel sinuosity was high.

Coho production potential in general appears low in Jackson Cr. due to the rapid increase in stream gradient and average substrate size at the main road crossing near RM 0.6. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	-	555	5	45
2006	-	385	5	160
2008	231	40	-	65

* 20% visual bias added for Coho

Sand Lake

(Table 3)
Expanded Sand Lake (5th field) Estimates of Juvenile Salmonid Production

Survey Year	Coho	0+	Sthd	Cut
2002	3,675	2,345	155	1,335
2003	2,606	1,215	195	725
2004	6,338	1,005	425	1,260
2005	3,919	1,865	190	1,375
2006	3,325	1,295	70	765
2008	4,819	1,020	70	855

*(20% visual bias added for Coho)

(Table 4)

Neskowin / Sand Lake / Combined Coho

Adult Survey Year	ODFW Adult Estimate	Adult Escapement Based on RBA Summer Parr Abundance	Summer Parr	Juvenile Survey Year
2001	71	107 – 123	13,431	2002
2002	16	128 – 144	15,875	2003
2003	0	124 – 141	15,469	2004
2004	0	114 – 130	14,281	2005
2005	N/A	158 – 179	19,731	2006
2007	N/A	122 – 139	15,250	2008

- This combined table is included because the ODFW SRS adult spawning escapement data was summarized with the two basins combined until 2004. These basins have now been combined into the larger North Coast Dependent adult estimate with lower site specific resolution
- 20% visual bias was added for summer parr

Six years of RBA inventories conducted in the Sand Lake basin have quantified the abundance of juvenile salmonids in approximately 8.6 miles of available rearing habitat. Summer rearing coho parr distribution has ranged between 5.5 miles in 2002 to 8.4 miles in 2006. Back-calculation from the 2008 summer parr estimate suggests an adult escapement of between 39-44 Coho for the Sand Lake basin. Back-calculation from the highest juvenile abundance year of 2004 portrayed an adult escapement of between 51-58 Coho for the 2003 winter brood. A consistently positive trend appears for Coho when juvenile cohort cycles are examined. The 2002/2005/2008 juvenile cohort increased by 6.6% for the first cohort cycle and by 23% for the second cohort cycle. The 2006 summer rearing Coho population also exhibited a 27.6% increase in abundance relative to its 2003 parent cohort. This record is significant considering the highly variable ocean survival rates reported during the last 8 years. Unfortunately surveys were not conducted

in 2007 when survival rates for the strongest Sand Lake juvenile cohort (2004/2007) would have been observed.

A similar pattern can be seen in the combined Neskowin/Sand Lake juvenile abundance between related years. The 2002/2005/2008 combined juvenile cohort exhibits consecutive increases of 6.3% and 6.8% while the strongest 2003/2006 cohort exhibits a 24% increase between years. Cohort trends in abundance are similar when examining the Neskowin Basin separately, except for the fact that almost no change was observed between the 2005 and 2008 basin wide population. In general, Coho production in the Neskowin Basin has remained between two and three times higher than in Sand Lake during the past six surveyed years.

Many of the similarities between the inter annual trends in the Neskowin and Sand Lake population of coho may be linked to similar ocean survival rates and the possibility of similar genealogies. Trends in abundance do not seem to track with adjacent populations classified as independent (Tillamook or Nestucca). This information establishes excellent rationale for pursuing an advanced monitoring strategy designed to test the hypothesis that the Sand Lake and/or Neskowin Basin Coho may exhibit genetic characteristics that make them unique from local independent populations. If unique genetic characteristics exist, then the preservation, recovery and enhancement of this potential population becomes extremely significant. DNA analysis protocols would be the appropriate tool for testing this hypothesis.

The estimates used in the above back-calculations and in the Combined Neskowin/Sand Lake Table are based on equations calculated by Nickelson and Lawson (1998). These equations back-calculate adult escapement using survival rates calculated for each life history stage including an average of 2,500 eggs per female, an egg-to-fry survival rate of 8.8% - 10%, and an assumed 1:1 male to female ratio for returning adults. Ocean survival rates have been highly variable in the last decade with recent double digit values and these adult numbers are only meant to develop a conservative scenario that more accurately represents adult escapement for these small watersheds.

Adult sampling methodologies use the random selection of a few individual reaches to extrapolate trends for the entire basin. Juvenile estimates are based on a 20% sample of all pools within every stream mile of the basin. The relatively small sample size used in expanding adult estimates tends to be more accurate for large basins, like the Nestucca. The small sample size becomes problematic in smaller and less productive basins. In the case of the Sand Lake and Neskowin basins there are very few productive reaches and the odds of missing these reaches in a random selection process are very good. The more likely selection of a non-productive reach would have the effect of under-estimating basin-wide production while the less likely selection of a highly productive reach might greatly over-estimate basin-wide production. Juvenile estimates are less time consuming and develop a more accurate assessment of escapement for small watersheds.

(Table 5) Reach scale contributions to coho production trends in the Sand Lake Basin. 20% visual bias added to expanded estimates for Coho.

Survey Year	Sand Cr. mainstem	% Total	Andy	% Total	Jewel	% Total	Gurtis	% Total	Trib. B	% Total
2002	1,250	34.0	1,438	39.1	988	26.9	0	-	0	-
2003	1,588	60.9	244	9.4	444	17.0	0	-	325	12.5
2004	3,413	53.8	856	13.5	1,050	16.6	0	-	1,019	16.1
2005	1,650	42.0	800	20.0	1,000	25.5	19	4.8	450	11.5
2006	2,088	62.7	163	4.9	925	27.8	113	3.4	0	-
2008	3,613	75.0	406	8.4	738	15.3	0	-	0	-

The Sand Lake Estuary contains a single primary source of potential salmonid habitat, Sand Creek. This creek is a 4th order stream with three significant tributaries, Jewel, Andy, and Davis. Sand Cr. and tributaries accounted for nearly all of the basin's summer rearing Coho during all years of the inventory. 1.7 miles of habitat in Jewel, 1.6 miles in Andy, and the upper 1.6 miles of the Sand Cr. mainstem represent the most suitable gravel beds for spawning observed in the system. Good habitat was also observed in Reneke Cr. but was lacking in Coho production during all survey years because of culvert issues. Of these, the Sand Cr. mainstem appears to be the most productive (75% of Coho in 2008) followed by Jewell (27.8% of Coho in 2006). Excellent year-round rearing potential exists in the estuary for nomadic coho from these upper reaches. Elevated water temperatures and salinity gradients seem to promote many upstream juvenile migrations in estuary tributaries during the summer.

A 27% increase in Coho production was observed in the mainstem between 2005 and 2006 followed by a substantial 73% increase between 2006 and 2008 (no survey in 2007). Coho production basin-wide was 45% higher in 2008 than in 2006. A higher percentage of Coho production was observed in the Sand Cr. mainstem in 2008 (75%) than during any other year on record along with the lowest percentage for Jewell (15.3%). Average rearing density remained well below capacity in 2008 for all reaches and has been highest, almost every year, in Jewel Cr. (0.5 fish/sq.m. in 2006). Most spawning peaks have occurred in the first 0.5 miles of Jewel (up to 0.7 Coho/sq.m. in 2008) and between RM 1.6 and RM 2 in the Sand Cr. mainstem (up to 1.0 Coho/sq.m. in 2008). The highest average rearing densities for Coho in the basin documented to date were observed in 2004 in lower Trib. B, 0.8 fish/sq.m., and were in response to a salinity or temperature dependent migration. The potential carrying capacity for coho rearing is well above the level of observed abundance for the last six years of inventory. This is primarily due to inadequate adult escapement to seed the available habitat.

The estuary receives extremely high quality fresh water input from four 2nd order streams that enter on the southern end of the bay, Trib. B, Gurtis, Reneke and Beltz. Trib. B and Gurtis have displayed the highest level of Coho rearing during most survey years. A small temperature or salinity dependant migration was observed in Beltz in 2002.

Reneke seems to exhibit the highest quality habitat between these four small streams but escapement has been blocked by a dysfunctional culvert.

1+Steelhead abundance peaked for the surveyed period in 2004 and has remained extremely low since (70-expanded for 2006 and 2008). The most productive reach for Steelhead production appears to be Jewel Cr. where 100% of the 2006 basin-wide population was observed. In 2008, 36% of the basins steelhead parr were observed in the upper Sand Cr. mainstem. Cutthroat abundance has remained low (725-expanded) to moderate (1,375-expanded) during all survey years (855-expanded for 2008). Continued annual assessment is highly recommended in the Sand Lake Basin.

Neskowin

(Table 6)

Expanded Neskowin (5th field) Estimates of Juvenile Salmonid Production

Survey Year	Coho	0+	Sthd	Cut
2002	9,756	7,020	930	2,870
2003	13,269	3,655	1,865	1,705
2004	9,131	3,515	1,240	1,765
2005	10,363	3,300	645	2,075
2006	16,406	2,050	490	1,520
2008	10,431	1,930	455	2,095

* 20% visual bias added for Coho

(Table 7)

Neskowin / Sand Lake / Combined Coho

Adult Survey Year	ODFW Adult Estimate	Adult Escapement Based on RBA Summer Parr Abundance	Summer Parr	Juvenile Survey Year
2001	71	107 – 123	13,431	2002
2002	16	128 – 144	15,875	2003
2003	0	124 – 141	15,469	2004
2004	0	114 – 130	14,281	2005
2005	N/A	158 – 179	19,731	2006
2007	N/A	122 – 139	15,250	2008

- This combined table is included because the SRS adult spawning escapement data was summarized with the two basins combined until 2004. These basins have now been combined into the larger North Coast Dependent adult estimate with lower site specific resolution
- 20% visual bias was added for summer parr

As in Sand Lake, estimates of back calculated adult coho abundance in the Neskowin basin have been significantly different than ODFW's adult escapement estimates. Based on juvenile abundance, adult escapement between Sand Lake and Neskowin has increased from as low as 107 in 2001 to as high as 179 in 2005. The SRS

adult inventory conducted by ODFW has not had an adequate sample size for the basin to develop a reliable adult escapement estimate. The trend in abundance for the strongest cohort (2003 / 2006) suggests a 24% increase. Back-calculation from the 2006 summer parr estimate suggests an escapement of 131-149 adult Coho for the Neskowin basin (2005 winter brood).

Back-calculation from the 2008 juvenile estimate suggests an escapement of 83-95 adult Coho for the Neskowin basin (2007 winter brood). This 2002/2005/2008 cohort has not exhibited significant variation in juvenile abundance. An increase of 6.2% was observed between 2002 and 2005 followed by no change for the 2005 to 2008 cycle. This same cohort in Sand Lake exhibited a 6.6% increase from 2002 to 2005 (same trend as Neskowin) but a significant 23% increase between 2005 and 2008. It is interesting that the cohort declines observed in larger independent populations have not been observed for these two basins. The Neskowin basin contains only 15 miles of anadromous habitat and no significant estuary habitat.

The Neskowin basin continues to exhibit the highest production rates for Coho of all of the North Coast Ocean Tributaries in this inventory. The 2008 summer rearing population of coho in the Neskowin (15 miles) was the third largest within the inventory of small ocean tributaries between Seaside and Florence. The other two coastal tributaries that consistently produce higher abundances of coho were the Yachats River (40 miles) and Tenmile Creek (15 miles).

(Table 8) Contributions to Coho production trends in the Neskowin Basin.
20% visual bias added to expanded estimates for Coho.

YEAR	MAINSTEM	%	FALL	%	HAWK	%	JIM	%	LEWIS	%	PROSPECT	%	SLOAN	%	SUTTON	%	TRIBC	%	TRIBG	%
2002	6,825	70	175	2	1,588	16	69	2	469	5	50	1	138	1	0	-	0	-	163	2
2003	7,269	55	50	-	4,194	32	119	1	331	3	0	-	250	3	700	5	0	-	344	3
2004	5,694	62	19	-	1,688	19	18	2	631	7	0	-	238	3	0	-	0	-	600	7
2005	7,206	70	181	2	1,350	13	94	1	581	6	125	1	244	2	256	3	119	1	194	2
2006	10,606	65	6	-	1,988	12	775	5	1,038	6	13	-	356	2	294	2	63	-	188	1
2008	7,638	73	13	-	1,119	11	338	3	900	9	0	-	344	3	0	-	0	-	69	-

The Neskowin mainstem has remained the largest single component of basin-wide coho production during all inventoried years (between 55% and 73% of total coho). Abundant low gradient spawning gravels are present throughout the lower three miles which remain largely under-utilized. Wood complexities there are very low except for occasional large legacy logs, deeply embedded in the channel bottom. Seven Pink Salmon adults were observed during the summer survey of 2008 downstream of RM 1

(an expansion of the 20% estimate would have resulted in an estimate of 35 adult Pinks). Numerous large sea-run Cutthroat and approximately 30 juvenile Chinook were also observed below RM 1.0 (measured from the approximate head of tide). A short reach of semi-tidal slack-water habitat exists between the survey start point and the Pacific Ocean (about ½ mile). Stream flow is low in this zone and long deep pools dominate the channel. Thick riparian brush and grass crowd the stream bank and provides complex juvenile refugia. It is likely that greater numbers of Pink Salmon, sea-run Cutthroat, and juvenile Chinook were present in the unsurveyed reach below the head of tide.

The upper reaches of the Neskowin mainstem are dominated by larger cobbles and frequent bedrock exposures. Recent flood impacts appear to have stripped much of the finer gravels and large woody debris from this reach. The average rearing density of 0.4 Coho/sq.m. observed in 2008 for the entire length of the mainstem has exhibited little change in six years of survey. A zone of higher rearing densities between the confluences of Jim, Lewis, and Sloan has been observed during most survey years. This reach between RM 2 and RM 5 appears to be the main spawning destination for adults. A peak rearing density of 1.3 Coho/sq.m. occurred at the end of the survey (RM 6) in 2008. Coho distribution has ended about 6 miles above tidal influence at a 7 ft. bedrock falls for all survey years. This falls occurs just downstream of the old Highway 101 bridge. Production potential for coho in the mainstem appears significantly higher than current levels indicate. Over-winter survival is a primary limiting factor here due to the lack of in-stream wood complexity, low sinuosity and channel entrenchment. Adult escapement currently continues to also limit coho production. The Neskowin mainstem functions as the key anchor habitat for most anadromous species in the basin.

The most productive tributary in the basin for all surveyed years continues to be Hawk (including Butte). This 4 mile sub-basin has contributed between 11% and 32% of basin-wide coho production for the past six surveyed years. Average rearing densities have remained well below carrying capacity each year (0.4 Coho/sq.m. in 2008). The most productive zone for adult spawners appears to be centered around RM 1.5 in the Hawk mainstem. Butte Cr. has exhibited upstream juvenile migrations of coho from mainstem Hawk in some but not all years inventoried. Low level adult spawning is also indicated in Butte by current juvenile distribution patterns. Average rearing densities for Coho in 2008 were highest in Jim (1.0 Coho/sq.m.), Sloan (1.0 Coho/sq.m.), and Lewis (0.9 Coho/sq.m.). These streams have exhibited only short juvenile distributions each year (between 0.7 and 1.3 miles) although Coho production in Lewis in 2008 accounted for 9% of the basin-wide total. Trib G also exhibited good rearing densities in 2006 (avg. density of 1.1 Coho/sq.m.). Hawk, Butte, Lewis, Fall, and Sloan represent the only low gradient tributary habitats in the system where the appropriate sized spawning gravels are present for coho and steelhead. Low level coho spawning appears to have occurred in Sloan during all survey years although contributions to basin-wide totals have remained below 3%.

Fall Cr. exhibits significant production potential for all salmonid species. The intact old-growth conifer riparian canopy has resulted in complex channel characteristics. This entire sub-basin has remained unaltered from historical conditions except for the Highway 101 crossing near the stream mouth which currently represents a total barrier to juvenile migration and a partial barrier to adult migration. The extremely long cement box culvert at this location is buried deep beneath the highway under a large road fill.

The degraded sill-log fish ladder leading up to the culvert has degraded leaving large boulders, angled logs, and poor jump pools that complicate passage for anadromous adults. An approach retrofit to the culvert could improve access for adults. Adult coho passage upstream of this culvert, followed by adult spawning, has occurred during two of the past six years of survey based on observed juvenile distributions.

The Neskowin basin contains several steep cold water tributaries which provide high quality temperature maintenance to the mainstem along with opportunities for upstream temperature dependent juvenile migrations. Multiple problem culverts are currently restricting adult and juvenile migrations in several tributaries including Butte, Fall, Sloan, and Trib G. Coho distribution (14.3 miles in 2008) has decreased by 2.3 miles in the basin during the last two survey years (mostly in Fall and Trib. G due to rapidly degrading culvert conditions). Most of the habitat within the Neskowin basin remains under-seeded and primarily limited by adult escapement.

The trend in 1+Steelhead abundance has declined for four consecutive survey years in the basin and are currently at their lowest observed level since 2002. The expanded estimate for 2008 of 455 1+Steelhead represents a decline of 76% from the 2003 expanded estimate of 1,865 (the highest observed during the survey period). Almost all Steelhead have been documented rearing in the Neskowin mainstem during all years (70% in 2008), with the second largest contributions observed in the Hawk Cr. mainstem (13% in 2008). Moderate Cutthroat production in the Neskowin Basin has shown exhibited no change in trend between the survey years of 2002 (2,870 Cutthroat-expanded) and 2008 (2,095 Cutthroat-expanded). Continued annual assessment in the basin is highly recommended.

Rock Cr. / Devils Lake

Rock Cr. was surveyed for the fifth time in 2008. This stream has exhibited large potential for Coho production with adult escapement estimates as high as 160-181 for the 2002 adult brood (back-calculated from 2003 juvenile abundance estimates). Summer parr abundance in 2006 reflected the survival rate for this cohort, which declined by 15%. 2005 adult escapement in the basin (back-calculated from 2006 summer parr) was approximately132-150 Coho. This appears to be the strongest cohort in the basin based on five non-continuous years of survey.

A positive trend was observed between the related 1999 and 2005 juvenile cohorts over two generations (data not available for 2002). This 37% increase in abundance was measured from the lowest historical adult coho escapement for Midcoast basins (1998). This abundance of this cohort decreased substantially (- 45%) between 2005 and 2008. Summer parr estimates for 2008 were the lowest observed for the survey period and suggest an adult escapement of 76-86 Coho for the 2007 winter brood. Declines in the 2005/2008 juvenile cohort were also detected in Arch Cape, Rock Cr. (south), Cape Cr., Berry Cr., and Sutton Cr..

In 2006, juvenile Coho estimates in Rock Cr. were almost identical to the Neskowin basin estimate in less than half the stream miles (6 miles) which reflects the highly productive habitat that it provides for Coho. Rock Cr. was second only to the Yachats in total Coho production for the entire 2005 and 2006 Ocean Tributary

inventories. Historically, Rock Cr. appears to be a significant and unique anchor habitat for coastal Coho despite the emerging negative trend in production. This trend appears to be related mostly to reductions in adult escapement and the resultant lower seeding levels.

Rock Cr. and its primary tributary Seid Cr. both meet in an extensive wetland marsh just above Devil's Lake in Lincoln City. This fresh water marsh, along with Devil's Lake, serve as important winter habitat for juvenile salmonids. The Rock Cr. and Seid Cr. channels have been mechanically manipulated and pushed to opposite sides of the marsh against the hill slopes in order to convert the highest percentage of lowland to pasture. Currently this wetland has been enhanced by the East Devils Lake road crossing that has caused the deposition of mobile sediments and aggraded the channel above the road crossing. A resultant expansion of wetland connectivity has occurred. The East Devils Lake road crossing is currently the target of a maintenance design to reduce flooding of the road prism during winter flows. There is a high probability of reducing the current level of wetland function without consideration of this historical context.

The Rock Cr. basin continues climbing to the north and east for 5.1 miles before reaching an impassable 25 foot cascade falls on a 25 % slope. The stream leaves the marsh and enters forest habitat around RM 1.2 just below the junction with Trib. A at RM 1.8. Above here spawning gravels and wood complexity become abundant. Several habitat improvement structures have been placed in the stream channel throughout the remaining 3 miles which have helped to create additional pools. Adjacent clear cuts begin above RM 2.7 where a 4 ft water intake dam and a 6 ft waterfall, which were passed by adult coho during most surveyed years, present low flow barriers to migration.

The highest average rearing density for Coho in Rock Cr., (1.2 Coho/sq.m.), was observed in 2006. This observation indicates that additional rearing capacity was still present in the basin. In 2008 rearing density averaged 0.9 Coho/sq.m. Total Coho distribution in Rock Cr. (not including Seid Cr.) has remained between 6.4 miles (2003) and 4.4 miles (1999) and measured 5.1 miles in 2008 (RM estimates begin at the East Devils Lake Rd crossing). The highest peaks in rearing density for 2008, usually resulting from the heaviest spawning activity, were observed at RM 0.9 (2.1 Coho/sq.m.) and RM 2.3 (2.4 Coho/sq.m.). Coho production in the upper tributaries is limited by low flows, wood jams, and small waterfalls to less than 0.5 miles each. 2005 Coho production in Trib. C (644 Coho-expanded with 20% visual bias) was the highest tributary estimate (excluding Seid Cr.) in five years of surveys.

Seid Cr. is a short stream dominated by sand and clay in an entrenched pasture channel. A small 0.6 mile reach offers the only gravels in the tributary as flows retreat to sub-surface upstream where large beaver impoundments dominate the valley. Seid Cr. was not surveyed in 1999. 725 (expanded with 20% visual bias) juvenile Coho were found here at an average rearing density of 1.0 Coho/sq. meter in 2003. 1,231 (expanded with 20% visual bias) juvenile Coho were found here in 2005 at an average rearing density of 1.4 fish/sq.m. and a total distribution distance of 1.1 miles. Seid Cr appeared to be nearly seeded to capacity in 2004. 894 (expanded with 20% visual bias) juvenile Coho were observed in 2008 with an average rearing density of 0.8 Coho/sq.m. over a distribution of 0.7 miles.

1+Steelhead production in the Basin has been consistently low and has exhibited continuous decline during each survey year. The marginal presence observed in 2006 and

2008 suggests that this species is on the verge of disappearing from the system. Spawning potential for Steelhead in Rock Cr. may be limited by the abundance of fine substrates and heavy siltation rates. Rock Cr and it underlying geomorphology are not conducive for optimizing steelhead production. Moderate Cutthroat production in Rock Cr. has fluctuated substantially during the last five surveys but exhibits little change between expanded estimates from 1999 (955) and 2008 (820). Continued annual assessment is highly recommended for the Rock Cr. Basin. The summary table below for Rock Cr. production does not include Seid Cr. estimates since there is no data available from 1999.

Year	**Coho**	**0+**	**Sthd**	**Cut**
1999	11,319	700	295	955
2003	19,206	540	205	750
2005	15,488	775	180	1,280
2006	16,250	270	10	405
2008	8,575	735	15	820

* Totals do not include Seid Cr.
* 20% visual bias added for Coho

Depoe Bay

Only NF Depoe was surveyed in 2008. The survey extended only 0.6 miles and observed expanded estimates of only 5 coho, 75 0+ and 140 cutthroat. Because the remainder of the basin was not surveyed, a basin scale comparison between years is not available. The following text summarizes the finding from the period 2001 – 2006 only.

The system supports Coho and Cutthroat. The three major reaches in the basin include North Depoe, Depoe, and South Depoe. The low head dam at the start of the South Depoe survey has impounded a ¼ mile of water which represents the best summer and winter rearing habitat available in the Basin. The large surface area and poor visibility encountered in this reservoir has prevented snorkeling. A large portion of the South Depoe Coho and Cutthroat population probably rears in this location and were not quantified in any of the surveys. The largest expanded estimate to date for basin wide Coho production was observed in 2001 and would have resulted from an adult escapement of approximately 9-10 adults. A gradual decline in abundance has been observed during the past four years with a moderate spike in production noted for 2003. The lowest abundance yet for Coho was found in 2006 which represented an 83% decline relative to its parent cohort of 2003. Almost all of the Coho production appears to take place in South Depoe although small numbers have been observed in North Depoe in 2002, 2003, and 2006. A reservoir impoundment on North Depoe truncates available habitat and limits future production potential.

Approximately 3.3 miles of habitat in South Depoe (including 0.5 miles on the Depoe Cr. tributary) provides the only significant spawning potential for Coho in the basin. This reach was low gradient, highly sinuous, and exhibited high densities of wood. Fine gravels were in moderate abundance although siltation rates were high. Conditions appeared poor for Steelhead due to low flows and small gravel sizes. Continually low rearing densities for Coho indicate that habitat limitations may be present. Continued annual assessment is recommended.

The basin has had a history of STEP Coho releases and Coho presence may have been significantly influenced by this program.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2001	1,075	240	10	395
2002	450	215	10	300
2003	975	40	5	95
2005	788	270	0	415
2006	169	135	0	160

* 20% visual bias added for Coho

Spencer Cr.

Mainstem Spencer is low gradient and exhibits heavy tannins and poor visibility. Cutthroat were common throughout. Coho have been observed in the basin during all six years of surveys in low numbers. The 2003 inventory observed the highest abundances of juvenile Coho which represented an adult escapement of 19-21 adults. The strong 2003 juvenile cohort declined by 59% in 2006 inventories. The 2002 - 05- 08 juvenile cohort exhibited no change between 2002 and 2005 but increased 85% between 2005 and 2008. Back-calculation from the juvenile estimate for 2008 indicates an adult escapement of 16-18 Coho for the 2007 winter brood.

There are indications of extensive silt loading in the mainstem and the resultant poor visibility leads to reduced confidence in surveyor efficiency. Spencer Cr. has very high levels of pool complexity due to the abundance of legacy wood retained in the system. The upper North Fork basin below the falls also exhibits high wood complexity and a healthy riparian canopy. Gravel resources improve higher in the North Fork sub-basin, while little change is noted in gradient or gravel resource in three miles of mainstem survey (mainstem becomes South Fork at confluence of North Fork). Unimpeded passage is maintained for 1.4 miles in the North Fork to an impassable waterfall at the quarry just above the bridge. The North Fork appears to represent the best spawning habitat for Coho in the Basin.

Coho distribution in 2008 in mainstem Spencer Cr. extended 2.4 miles. Average rearing densities for Coho in this reach have remained below 0.2 Coho/sq.m. during all six surveyed years. An expanded estimate of 294 (including 20% visual bias) summer parr were present in this reach. Most production (85%) was observed in the North Fork where average rearing densities measured 0.7 Coho/sq.m. and peaked at 1.3 Coho/sq.m. near RM 0.4. Low numbers of 1+Steelhead were observed in 2003 only when 25 (expanded) were found rearing in the North Fork. Low level Cutthroat production peaked also in 2003 (475 expanded).

Expanded estimates in Spencer definitively under-estimate actual abundance for all species due to poor visibilities. Low adult escapement and heavy depositions of silt on spawning gravels are likely to limit egg to fry survival rates. Production potential for Coho here is significant and continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**

2001	88	0	0	190
2002	1,044	300	0	360
2003	2,306	305	25	475
2005	1,075	50	0	295
2006	938	90	0	90
2008	1,994	120	0	170

* 20% visual bias added for Coho

Wade Cr.

Wade Cr. is low gradient and dominated by marsh habitat above its intersection with Hwy 101. It exhibits poor visibility, heavy logging activity and some slope failure. A water diversion dam at RM 1.8 is a potential anadromous barrier. The active channel is completely silt dominated up to the dam with some low quality opportunities above the dam for spawning. Adults could potentially make it around the dam during very high flows, but not over it. Lamprey were observed in the best gravel. Only 19 Coho parr (in 2002) have been observed here in six years of inventory. These juveniles were in the first pool only – about 335 feet from the beach. Potential Coho spawning habitat extends about 1.5 miles. Cutthroat and 0+trout were observed in most pools with some habitats vacant. Visibility has degraded in the system for unknown reasons since early inventories and rendered the surveys in 2006 and 2008 ineffective at estimating juvenile salmonid abundance or distribution. This condition has likely resulted in the data for these two years under estimating salmonid production. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2001	0	45	0	55
2002	19	10	0	25
2003	0	15	0	50
2005	0	20	0	5
2006	0	0	0	0
2008	0	0	0	0

* 20% visual bias added for Coho

Coal Cr.

This stream exhibits heavy tannins with sandy substrates and some gravel. Most of the channel consists of an extensive beaver marsh with pasture trench pools, and has poor visibility. No Coho have been found here during the six year inventory and no fish at all were reported in the 2005 survey. Poor visibility conditions have complicated surveys during all inventoried years and may have also underestimated salmonid production. Coal Cr. has the potential for Coho re-colonization with habitat conditions very similar to adjacent Wade Cr. and Moolack Cr. Stream flows and tides need to be high to facilitate passage into these streams since their spillways onto the beach are diffuse and shallow and the driftwood gates that block their entrances are often clogged with debris. Potentially productive anadromous habitat totals about 1 mile in Coal. Cutthroat and 0+trout have been observed in low numbers. Continued annual assessment is recommended.

Year	Coho	0+	Sthd	Cut
2001	0	15	0	60
2002	0	15	0	45
2003	0	10	0	55
2005	0	0	0	0
2006	0	10	0	0
2008	0	15	0	20

Moolack Cr.

Historically supporting Steelhead and Cutthroat populations, Moolack appears to have all of the habitat requirements for Coho as well. Ocean access is good, 101 passage is good, though driftwood frequently complicates the approach to the culvert. The riparian zone maintains an open spruce canopy and the substrates are dominated by mud and silt low in the system. Visibilities here are poor and reported abundances are probably underestimated. Substrates shift to gravel at approximately RM 0.5 and visibility improves. Further upstream, bedrock dominates the substrate. With signs of past and present beaver activity, sufficient gravel, and abundant wood, Moolack Cr. exhibits potential for the recolonization of Coho. Continued annual assessment is recommended.

Year	Coho	0+	Sthd	Cut
2001	0	15	35	130
2002	0	40	0	40
2003	0	15	0	30
2005	0	35	0	55
2006	0	15	0	5
2008	0	20	0	15

Big Creek

For clarification, this Big Cr. exists between Waldport and Yachats. The highest juvenile Coho abundance for the basin for the six surveyed years was observed in 2003 (10,425-expanded with 20% visual bias) and would have required an escapement of 84-95 adults. The abundance of this cohort declined in 2006 by 34%. The juvenile data also indicates a substantial decline of 39% between the related 2002 and 2005 cohort. This same cohort appears has increased by 21% since 2005 based on juvenile abundances observed in 2008. Expanded estimates from 2008, however, still suggest that the habitat is under seeded. Back-calculating from the 2008 juvenile estimate (5,250-expanded with 20% visual bias) indicates an adult escapement of 42-48 Coho for the basin during the 2007 winter brood.

Approximately 6.5 miles of Coho distribution were observed in the Big Cr. Basin in 2008. Most of the best spawning habitat and highest production rates have been observed in Dick's Fork's 2.7 miles. Peak conditions occur in conjunction with an increase in gradient and the resultant well sorted gravels above RM 1.6. The highest average rearing densities for Coho in the basin observed to date were in Dick's Fork in 2006 (0.9 fish/sq.m.) when a strong spawning peak (6.3 fish/sq.m.) was observed at RM 2.1. Approximately 70% of basin-wide Coho production occurred in Dick's Fork in 2008 when rearing density averaged 0.6 Coho/sq.m.. Spawning peaks were observed at RM 0.8 (1.1 Coho/sq.m.) and RM 2.3 (1.2 Coho/sq.m.). An expanded estimate of 20 1+Steelhead were also present, the most 1+Steelhead observed in the basin since 2002. This accounted for all 1+Steelhead in the basin in 2008. 51% of all Cutthroat in the basin in 2008 were also found in Dick's Fork.

Lower rearing densities occur in mainstem Big Cr. which ends at RM 1.9 at an impassable 25 ft. falls. Spawning and rearing conditions in this reach are excellent. The highest average rearing density for Coho to date in mainstem Big Cr. has been 0.5 Coho/sq.m. (2003, 2006). Rearing density averaged 0.4 Coho/sq.m. in 2008 and exhibited a main spawning peak of 1.8 Coho/sq.m. at RM 1.5. This reach accounted for 21% of basin-wide Coho production in 2008. Most of the basin's 1+Steelhead have been observed in this reach in continually declining abundance over the past six years of survey. None were documented here in 2008.

The lower South Fork of Big Creek appears to be gravel limited with vast surface areas of marsh and wetland habitat. Most of this reach was tannic and visibility was poor. This condition improves eventually where the stream climbs through a section of heavy slash from a clearcut on the right and into a short one mile reach of higher gradient habitats with spawning gravel present. Forest canopies here provide adequate shade, pools become more frequent, and rock and gravel begin to replace sand and mud. This reach ends quickly where the stream's already low flow is divided in two just above a 5 foot waterfall near RM 2. Coho production in the South Fork has accounted for between 10 and 20 percent of basin-wide totals. Highest average rearing densities for Coho here were observed in 2003 and 2008 (0.5 fish/sq.m.). Reynolds Creek exhibits no potential for Coho due to the absence of spawning substrate.

Relatively low Coho rearing densities in Dick's Fork and the Big Cr. mainstem, despite highly favorable habitat conditions, indicate a strong potential for higher production rates. The abundance of high quality spawning gravel severely limits the production potential of the basin. A limiting factors analysis was recently developed for the Big Cr. basin by the Midcoast Watersheds Council. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2001	4,013	325	90	605
2002	7,125	270	345	465
2003	10,425	280	10	615
2005	4,344	240	5	420
2006	6,863	170	0	300
2008	5,250	335	20	515

* 20% visual bias added for Coho

Vingie Cr.

This stream has a broad floodplain, up to 250' wide, above the Hwy 101 crossing, which is periodically flooded due to beaver activity. Vingie exhibits complex aquatic habitat with many side channels, sufficient gravels, high levels of beaver activity, and good wood densities. Low level adult spawning occurred here during the 2002 winter brood and resultant 2003 summer parr distribution extended for one mile above the beach. Low level Cutthroat production has been observed each year (low estimates in 2005 and 2006 were the result of shorter survey distances). There is excellent potential for Coho and steelhead colonization in this system. The 2001 survey extended for 2.5 miles before gravel resources began to diminish. Adult escapement is the main limiting factor. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2001	0	65	0	190
2002	0	115	0	120
2003	144	125	0	125
2005	0	45	0	65
2006	0	65	0	20
2008	0	105	0	190

* 20% visual bias added for Coho

Starr Cr.

Starr begins with a tight log-jam on top of a bedrock spillway onto a sand beach that may frustrate anadromous migrants (this is an ephemeral barrier). After a series of historical beaver pond impoundments (providing intermittent high quality habitat) is a large cement dam (1.2 miles up) with a 5' spillway at the City of Yachats water diversion structure. This structure terminates anadromous migration and results in low summer flows at peak withdrawal that is probably detrimental to resident and anadromous salmonids.

No Coho or Steelhead were observed in Starr until 2008 when an expanded estimate of 269 (including 20% visual bias) juvenile Coho were identified. This population exhibited a low average rearing density of 0.3 Coho/sq.m. and extended upstream to RM 1.1. A weak spawning peak (0.6 Coho/sq.m.) was observed at RM 0.8. These juveniles were probably the result of a single spawning event during the 2007 winter brood.

Habitat conditions in Starr appear to be capable of supporting significantly higher production rates for Coho and Steelhead. Spawning gravels were present and pools were well scoured. Low fish numbers in 2005 and 2006 are mainly due to shorter survey distances. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2001	0	135	0	490
2002	0	135	0	105
2003	0	115	0	725
2005	0	15	0	60
2006	0	110	0	35

2008	269	115	0	155

* 20% visual bias added for Coho

Yachats Basin

The Yachats is the only watershed in the current Rapid Bio-Assessment database that exhibits nine years of basin wide inventory for the years between 1998 and 2008. Six of these years were consecutive with 2004 and 2007 representing the only missing years of data. 39.1 miles of Coho distribution were surveyed here in 2008 (45.8 in 2006). Access to upper Stump Cr., (tributary of Keller), was denied in 2008. A summary of this long term data set for trend analysis is represented below. These are some of the assumptions associated with the development of this table:

- The sample size for calculating egg to summer parr survival (8.8-10 percent) was very small (5 tributaries w/1 redd).
- Ocean survival rates have been highly variable during the last ten years ranging between estimates of 3% to 12%.

(Table 9)

Yachats Basin Population comparison between years (1998-2008)

Expanded Snorkel Counts (estimates include only pool dwelling portions of the population, and excludes portions of the population rearing in the estuary, in addition, only the upper limit of Coho and Chinook distribution is included in this expansion, additional production exists for Cut, Sthd, and 0+ above the upper limit of Coho). (Note: no data from summer 2004 or 2007)

Year	**Coho**	**0+**	**Sthd**	**Cut**	**Chin**
1998	17,110	7,430	1,815	2,645	305
1999	11,300	14,440	1,905	3,750	815
2000	19,338	17,270	5,180	4,290	2,665
2001	45,306	14,560	7,070	4,620	2,955
2002	61,919	20,760	2,070	5,715	3,155
2003	63,919	16,110	3,285	5,395	5,975
2005	41,825	8,075	1,665	4,140	410
2006	80,531	10,985	1,325	3,885	805
2008	54,756	8,020	1,920	5,125	335

- 20% visual bias added for Coho

Table (10)
Adult escapement predicted from back calculation of summer parr based on an 8.8 to 10 percent egg to parr survival rate (generated from sub-basins with only 1 adult spawning pair in the year 2000). 2.5 redds/female ~ 1,000 eggs/redd. A 1:1 male/female ratio. (Note: no data from summer 2004 or 2007)

Survey Year	Coho Summer parr	Back-Calculated Adult Escapement	ODFW Adult Estimate	Winter Brood Year
1998	17,110	137-156	99	1997
1999	11,300	90-102	102	1998
2000	19,338	155-176	150	1999
2001	45,306	362-412	76	2000
2002	61,919	495-562	52	2001
2003	63,919	511-582	1,121	2002
2004	no data	-	1,597	2003
2005	41,825	335-380	641	2004
2006	80,531	644-732	N/A	2005
2007	no data	-	N/A	2006
2008	54,756	438-498	N/A	2007

* ODFW adult estimates for Yachats have been grouped into the larger Mid-Coast Dependent estimate since 2005

There are several observations to be made from a review of this trend data.

- Coho production in the Yachats Basin has been, by far, the highest in the entire Ocean Tributaries Inventory (Cannon Beach to Florence) for all survey years.

- The largest juvenile Coho estimate yet recorded for the Yachats Basin occurred during the summer of 2006. This marked the second generation of improvement for this cohort (00/03/06). Production increases between the summers of 2000 and 2003 measured +231% and between 2003 and 2006, +26%. This is currently the strongest cohort in the Yachats Basin (1999, 2002, 2005 adults).

- The only declines in juvenile Coho abundance in six survey years were observed in the same related cohort (2005 / 2008). The 2004 winter brood responsible for the 2005 juvenile estimate represented the second generation of the depressed 1998 adult cohort (lowest recorded abundance for the ESU). A decline in adult escapement (60%) was also observed in the ODFW estimate for the 2004 brood. A 32% decline in abundance was documented for this cohort based on juvenile

abundances between 2002 and 2005. Marine survival rates declined during these years. This cohort has responded to recent improvements in marine survival with a 31% increase in abundance between the 2005 and 2008 juvenile estimates.

- Despite conflicting estimates of adult abundance (between juvenile RBA and adult SRS), a strong production cycle has emerged for the Yachats. The last six years of juvenile surveys have observed significantly higher basin scale populations than the first three. Even the relatively weak 99/02/05/08 juvenile cohort is currently 385% more robust than first documented in 1999 summer inventories. Unfortunately the data missing from the unsurveyed years of 2004 and 2007 prohibits long term trend analysis for this cohort.

- Significant increases in older age class Steelhead production had been observed in the basin until 2002 when summer rearing populations declined 71% from the previous year. This decline had been predicted from falling 0+trout numbers during the 2001 surveys. 2008 marks the fifth year of an overall declining trend in older age class steelhead with the most current observations of abundance being comparable to the low estimates observed in 1998 and 1999. 0+trout estimates are presently at their lowest recorded level since 1998.

- Cutthroat abundance have exhibited slow and steady growth over the nine years of surveys. Abundance levels in 2008 ranked as the third highest in the data set behind 2002 and 2003 and were about twice as high as estimates from 1998 (the lowest in the data set).

- A large swing in juvenile Chinook abundance is exhibited in Table 9, above. Estimates from the last 3 surveyed years (2005, 2006, and 2008) were the lowest since 1998 and dramatically higher production was observed for this species between 2000 and 2003. Much of this pattern, however, can likely be attributed to survey timing and the significant shifts in the summer rearing distribution of chinook that trend toward the estuary as summer progresses. The later date of survey for the basin in 2005 and 2006 (the end of August) and 2008 (the end of September) relative to previous years suggests that the comparison in abundance is inappropriate. Later inventory dates would expect lower mainstem abundances as juvenile Chinook migrated downstream below the head of tide.

Stream Comparisons

Inventories on the mainstem Yachats (which include the SF Yachats) in 2000 indicated that Coho distribution had increased from the poor conditions observed in 1999 (1.5 miles of mainstem occupied) to 4.8 miles of mainstem exhibiting low levels of juvenile Coho rearing. A radical transition has been observed since, where the entire mainstem of the Yachats (between 12 and 15 miles) has been observed rearing high numbers of juvenile Coho. This distribution has extended into and throughout the estuary.

The estuary has not been a part of this inventory and represents a component of the basin's summer standing crop that has not been quantified. The mainstem Yachats has consistently reared between 20 and 40 percent of the basin's total Coho population (29% in 2008).

Highest rearing densities for Coho in the mainstem have occurred above Grass Cr. between RM 10.5 and RM 14.5. This reach of prime stream gradients, fine spawning gravel, and excellent riparian condition represent the main anchor habitat for Coho spawning in the Yachats mainstem. The highest densities were observed in 2006 when an average of 1.7 Coho/sq.m. was maintained between RM 12 and RM 14.5. This short reach appeared to be seeded to capacity for Coho that year. The zone of heaviest spawning activity moved downstream slightly in 2008 when two main peaks were observed at RM 10.7 (2.1 Coho/sq.m.) and RM 11.9 (3.3 Coho/sq.m.). An average of 1.3 Coho/sq.m. was maintained this year between RM 10.7 and RM 12.3, indicating that rearing capacity had not been met.

In general, high counts have not been observed below RM 7 with the exception of large pools near tidewater with high wood complexities and undercut bank habitats (where the highest count of the entire 2003 survey was noted). This high count in 2003 may suggest the presence of a significant population below the head of tide. The stream-wide average rearing density in 2008 was 0.5 Coho/sq.m.. The highest stream-wide average rearing density in 2006 was 0.7 Coho/sq. meter. This data suggests that Coho production in these 15 miles could be at least twice as high as observed in 2006. Adult escapement appears to be the main limiting factor.

The North Fork Yachats, and its tributaries, accounted for 39% of basin-wide Coho production in 2006 and 28% in 2005 and 2008. As many juvenile Coho were rearing in this sub-basin in 2008 (9.8 miles) as in the Yachats mainstem (12.8 miles). The total expanded estimate for the North Fork sub-basin in 2008 was 15,481 (including 20% visual bias). Coho production here was high during the strong 2003/2006 juvenile cohort which exhibited expanded estimates of 28,719 and 31,344 (+9%), including 20% visual bias, for the sub-basin. A considerably weaker 2005/2008 cohort exhibited expanded estimates of 14,406 and 15,481 each, including 20% visual bias.

77% of total Coho production in the North Fork sub-basin in 2008 occurred in 5.3 miles of mainstem distribution (compared to 63% in 2006 and 64% in 2005). Average rearing densities for Coho in the NF mainstem have ranged between 0.2 Coho/sq.m. (2005) and 0.9 Coho/sq.m. (2006) and measured 0.6 Coho/sq.m. in 2008. The main spawning peaks appeared at RM 3.7 (1.5 Coho/sq.m.) and RM 4.7 (1.4 Coho/sq.m.). Coho production in the mainstem could be almost three times as high as estimates from 2008 with increased adult escapement.

The second largest producer of Coho in the North Fork sub-basin was Williamson Creek (12.7% of sub-basin total). 25% of North Fork Coho production occurred here in 2005 and 2006. Average rearing densities here have ranged between 0.5 Coho/sq.m. in 2005 to 1.2 Coho/sq.m. in 2006 and measured 0.6 Coho/sq.m. in 2008. Potential Coho distribution extends 2.9 miles. Coho production in this excellent stream habitat could be substantially higher (up to 200% higher) than observed in 2008. Fish Cr. and Glines Cr. each contributed 4% to total North Fork Coho production with average rearing densities of 0.8 Coho/sq.m. and distributions of roughly one mile each. Earley Cr. and Depew Cr. also exhibited low level summer rearing Coho abundances resulting either from singular

spawning events or upstream juvenile migrations (each less than 0.4 miles of distribution).

Stump Cr., Grass Cr., and School Fork were the largest tributary producers of Coho in the basin in 2008 and consistently have exhibited the highest average rearing densities. All three of these sub-basins are tributaries of the upper mainstem Yachats and combined with the upper mainstem, constitute the bulk of the current production. These stream segments are high quality habitats for successful Coho production and include abundant well sorted gravels, low interactive floodplains, high channel sinuosity, and balanced pool/riffle ratios. Large wood complexity has been the consistent limiting factor. Access was denied in 2008 to upper Stump Cr. (beyond the confluence of Keller Cr.). Average rearing density in Keller measured 2.0 Coho/sq.m. and was the highest in the basin in 2008. This habitat exhibited an average of 2.2 Coho/sq.m. in 2006 which may have represented a fully seeded condition. Distribution totaled 2.4 miles in Keller and only 0.4 miles of Stump Creeks historical distribution (2.6 miles in 2006) was inventoried.

12.6 % of basin-wide Coho were documented in the School Fork in an average rearing density of 1.0 Coho/sq.m. over 3.1 miles of stream. This stream exhibited the third highest average rearing density in the basin for 2008. Grass Cr. exhibited the second highest average rearing density in the basin for 2008, 1.3 Coho/sq.m., and accounted for 9% of basin-wide Coho over 3.5 miles of distribution. Only small portions of these three sub-basins reached peak carrying capacity even during the high Coho abundances of summer 2006. Most habitat in the basin is in good shape and improving with recent large scale restoration projects. Adult escapement is currently still the primary limiting factor for Coho production in the Yachats. Continued annual assessment here is highly recommended.

Most pool rearing 1+Steelhead in 2008 were observed in the relatively short, 6 mile reach of the Yachats mainstem downstream of the confluence of the NF Yachats. 41% of the basin-wide total for this species was observed here in 2008 compared to 32% further upstream in the 6.8 mile South Fork. Contributions from the North Fork sub-basin have remained lower than 23% (2006) for all survey years and declined to 17.7% in 2008. Mainstem rearing preferences for this species have shifted considerably from year to year between the lower reaches and the upper reaches with some years exhibiting a relatively even distribution over the whole stream. Dramatic reductions in the abundance of juveniles of this species over the last five years is a strong indicator of collapsing adult escapement. Most Cutthroat in the basin in 2008 were observed in the same three habitats segments, 27.5% in the South Fork, 18.9% in the North Fork, and 12.1% in the lower Yachats mainstem. The School Fork and Grass Cr. exhibited the highest tributary contributions to basin scale estimates (8.5% and 7%, respectively).

Table (11) 2008 Yachats Inventory

Stream	**Coho**	% Total	**0+**	% Total	**Sthd**	% Total	**Cut**	% Total
Mainstem	2,944	5.4	1,040*	13.0	790*	41.1	615*	12.0
Axtel	200		-		-		35	
Beamer	706	1.3	100	1.2	-		105	2.0
Carson	963	1.8	30		-		230	4.5
Depew	213		75		-		75	1.5
Earley	138		15		-		10	
Fish	638	1.2	90	1.1	-		80	1.6
Glines	681	1.2	115	1.4	-		55	1.1
Grass	4,900*	8.9	395	4.9	35*	1.8	355*	6.9
Helms	919	1.7	165	2.1	-		110	2.1
North Fork	11,844*	21.6	1,610*	20.1	340*	17.7	965*	18.8
Stump	7,900*	14.4	415*	5.2	110*	5.7	275	5.4
School Fork	6,906*	12.6	680*	8.5	30	1.6	435*	8.5
South Fork	13,044*	23.8	2,815*	35.1	615*	32.0	1,405*	27.4
Williamson	1,969	3.6	355	4.4	-		225	4.4
Basin Total	**53,965**	**98.6**	**7,900**	**98.5**	**1,920**	**100**	**4,975**	**97.1**

- Percent totals given only for those streams which contributed over 1 %
- 20 % visual bias has been added for Coho
- * Highlighted estimates represent the top five producers

Cummins

Almost six miles of pristine spawning and rearing habitat is available for anadromous use in the Cummins Cr basin. An additional mile of steeper and slightly less productive habitat is provided via a short fish ladder in Little Cummins. Large pools, abundant gravel reserves, and an old growth spruce/hemlock/cedar riparian canopy describe the stream. High wood complexity in several pools has created wide turns and braids in the stream channel, deep excavations into opposing hill slopes, and high levels of floodplain interaction. The basin is surrounded by the Cummins / Rock Creek Wilderness Area and provides an excellent reference of a fully functional coast range system. The main limiting factor in this diverse ecosystem for Coho is the consistent low escapement of adults. Excellent unutilized production potential currently exists in Cummins Creek.

A strong positive trend has been developing for Coho in Cummins since 1999 the only year when no summer parr were found. Four survey years of steadily increasing abundance have followed. The 2008 juvenile estimate suggests an adult escapement of 55-62 adults during the 2007 winter brood which is the largest estimate yet produced for the 13 years of available data. Coho production increased by 57% between 2006 and 2008 and the 2005/2008 juvenile cohort appears to have doubled in size. An impressive re-colonization of coho in a small ocean tributary is occurring in this basin. The observable recovery of the 1999/2002/2005/2008 juvenile cohort along with the 2000/2003/2006 juvenile cohort has been dramatic considering the severely depressed

population estimates from 1999 and 2000. Adult escapement for these two lowest abundance years fell to somewhere between 0-2 Coho.

Coho summer parr were observed in a low average rearing density of 0.3 Coho/sq.m. over 5.9 miles of distribution in 2008. The highest peak density for Coho reached 0.7 Coho/sq.m. near RM 4.1. Production levels for Coho in this system could be several times higher than the level observed in 2008 with increased adult escapement. The trend in 1+Steelhead abundance declined by 54% in 2006 and remained low in 2008. This low abundance remained the fourth highest in the 2008 Ocean Tributaries Inventory. Excellent cobble and boulder rapids throughout this system appear to provide ideal rearing conditions for this species. Cutthroat estimates exhibited little change between 2005 and 2006 and then increased by 225% in 2008. No barriers to anadromous migration were noted.

The junction between Cummins and Little Cummins has been diverted off of the beach and now flows through a man-made fish ladder dug out of the bedrock just east of Highway 101. Passage here appears possible at high flows and/or high tides and upstream habitat is suitable for Coho, though favors Steelhead production. Habitat consists mainly of larger cobble and steeper gradients. Pools are frequent and well scoured and flows are well maintained through the summer. A six foot waterfall above RM 1 is a probable barrier and a series of higher falls near RM 2 are definite barriers to anadromous migration. 1+Steelhead were observed here in 2001 and 2005.

Cummins Creek provides important base-line data for the restoration of several streams in the area and has served, most notably, as the control site for the long term monitoring conducted by ODFW in the Tenmile Cr. watershed. Continued annual assessment here is highly recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
1991	1292	*	*	*
1992	1316	*	*	*
1993	1079	*	*	*
1994	1015	*	*	*
1995	913	*	*	*
1996	1074	*	*	*
1997	1646	*	*	*
1998	863	*	*	*
1999	0	*	*	*
2000	209	*	*	*
2005	3,444	2,030	1,625	620
2006	4,375	2,235	755	520
2008	6,850	1,610	730	1,690

* ODFW data utilizing different sampling strategy not comparable to RBA 2005/2006 (20% visual bias added for Coho)

Bob Cr.

Bob Cr. enters the ocean over a large gravel and cobble fan (an indication of significant bedload migration). Good populations of Steelhead and Cutthroat have been observed here during all years. Limited Coho production has been observed since 2002. In 2008 Coho production increased by 189%. This was by far the largest estimate yet in

six survey years. The 2005/2008 juvenile cohort has exhibited an excellent 504% increase in abundance. The 2003/2006 juvenile cohort exhibited little change. Back-calculation from the 2008 juvenile estimate suggests an adult escapement of 42-47 Coho in Bob Cr. for the 2007 winter brood.

The Bob Creek basin shares many of the same reference attributes observed in Cummins Cr., including an old growth riparian canopy, low upslope impacts, significant summer flows, cool temperatures, complex pools, and clean, well sorted gravels. Production potential here is similarly high.

Coho distribution has ranged from 0 miles in 2001 to 4.8 miles in 2005 and 2006 (4.1 miles in 2008). Average rearing density was highest in 2008 at 0.6 Coho/sq.m. with a main spawning peak of 1.5 Coho/sq.m. at RM 2.6. Spawning conditions in Bob Cr. appear adequate for Coho, but not optimum. Most of the highest quality spawning gravels occur within the first 1.5 miles of low gradient habitat. Large, volcanic cobble and boulders dominate and describe habitat attributes better suited to Steelhead production. Steelhead counts have declined since 2001 and exhibited no change in abundance between 2006 and 2008. Cutthroat estimates exhibited little change for the first five survey years and then increased dramatically in 2008 to the highest levels observed within the inventoried years. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2001	0	1,420	1,195	660
2002	381	1,485	225	870
2003	1,938	675	580	290
2005	863	460	305	650
2006	1,813	995	420	355
2008	5,213	1,080	420	1,240

* 20% visual bias added for Coho

Tenmile Cr.

2003 was the first year of RBA inventory in Tenmile Creek. This basin has been the site of a long term restoration monitoring project conducted by ODFW and the USFS. Restoration efforts began in 1996 and have included land acquisition, 12 miles of road, culvert, and fill removal, tree planting, hardwood tree thinning, and helicopter log placement – including 240 trees measuring between 15m and 35m by 75cm at 35 different sites. Monitoring efforts began in 1991 in order to evaluate the effectiveness of the proposed activities. The main focus has been to compare salmonid production and channel morphologies before and after project work and have included juvenile snorkeling inventories, electro-fishing calibration, smolt trapping, and aquatic habitat inventories. These monitoring efforts have been duplicated on nearby Cummins Cr., which was chosen as the control site for the project. Most emphasis has focused on Steelhead and Cutthroat populations and methodologies have differed somewhat from the RBA protocol – mainly in the sampling of riffles and glides (in addition to pools) where most Steelhead are found.

The Tenmile Cr. watershed was chosen for these studies as a representative model for salmonid recovery in a small ocean tributary. It sits between two of the only wilderness areas on the Midcoast and shares in the unique geology and anadromous fish runs of a very limited number of streams running through the Yachats Basalt rock

formation – a large mass of steep lava cliffs and ridges stretching between Cape Perpetua and Heceta Head. This zone is comprised of many separate small watersheds all of which exhibit steep gradients and lack any significant estuary habitats. In 2008, this block of streams exhibited the two highest Coho estimates in the Ocean Tributaries Inventory (Yachats and Tenmile) and the five highest 1+Steelhead estimates (Yachats, Tenmile, Big South, Cummins, and Cape). Tenmile Cr. encompasses about 15,000 acres with almost 17 miles of accessible stream habitat. Homesteading, logging, and historically unrestrained harvest has had a large impact here, especially on the Coho population, and the opportunity for habitat restoration and population recovery is great.

Since 2003, RBA inventories have been centered on Coho and have sampled pools only. Coho distribution extended over 14.8 miles of habitat in 2003 and increased to 16.9 miles by 2006. Total coho distribution declined to 15 miles in 2008. Expanded estimates in 2003 for juvenile Coho were significant (13,156 - including 20% visual bias) since ODFW estimates had not been over 5,000 since 1993 when an unusually high 30,663 summer parr were reported. The 2003 population estimate exhibited substantial improvement, more than doubling the size of its parent cohort from 2000 (4,580 - including 20% visual bias). This cohort subsequently declined by 39% based on expanded estimates from 2006 (7,975 – including 20% visual bias). Coho production in Tenmile exhibited a 71% increase between 2006 and 2008 (unrelated cohort) and reached its highest level, an expanded estimate of 13,631 – including 20% visual bias, since 1993. This 2005/2008 juvenile cohort has improved in abundance by 89% since 2005 and suggests an adult escapement of 109-124 Coho for the basin during the 2007 winter brood. No data from 2002 is available for this juvenile cohort.

Rearing densities in the mainstem have been very low, averaging between 0.1 Coho/sq.m. and 0.3 Coho/sq.meter. 82% of basin-wide Coho production occurred in the mainstem in 2008. Lineal Coho distribution in this reach fell slightly to 10.4 miles in 2008, ending about 0.9 miles upstream of the confluence of Wildcat Creek. A moderate spawning peak was again observed near RM 6.9 (0.9 Coho/sq.m.). No barriers to migration were noted, only increasing rock size and rapid/riffle dominance.

There have been many pools in the lower reaches completely lacking in Coho and Steelhead during the last three years of surveys and several large pools with conspicuously low counts. If there was no wood or debris complexity, fish were generally absent. This is most likely due to avian predation since the canopies and pools in these reaches were typically wide open with ample room for predators to aggregate, stalk and hunt. Large congregations of juvenile Coho have been observed there in close association with 1+ Steelhead and Cutthroat underneath whatever cover was available. The highest individual pool count for Coho from 2008 (150 – including 20% visual bias) was observed at RM 1.6 in this type of situation. In addition, 85% of all mainstem 1+Steelhead were observed downstream of RM 6, with 40% downstream of RM 2. The large pool surface areas and high complexity wood complexes in lower Tenmile appear to be very attractive habitats for many species. There are only a handful of these types of pools in the whole basin and it is likely that they play key roles in the full function of this system. In addition, a massive full spanning log and debris complex just above the head of tidal influence exhibits a large capacity for complex rearing that was not sampled in the 20% snorkel inventory. All juvenile Chinook in the basin (165 – expanded) were also observed in this zone, downstream of RM 2.

The South Fork (13%), Wildcat Cr. (2%), Mill Cr. (1%), and Trib. D (1%) represented the most productive tributaries to Tenmile Cr. for Coho in 2008. The South Fork had the longest distribution, 1.9 miles, which included 0.3 miles in Cullen Cr. and 0.4 miles in Trib. A. The average rearing density in the South Fork mainstem of 1.0 Coho/sq.m. was the highest in the basin for 2008. Coho production in the high potential habitat of Wildcat Cr. has been dropping each year for unknown reasons. It appears that one adult spawning may have occurred there during the 2007 winter brood with additional inputs of upstream juvenile migrations during the summer of 2008. Most other side tributaries were too steep and bouldery to support Coho spawning.

The large and consecutive 47% and 53% reductions in 1+Steelhead abundance in Tenmile between 2003 and 2006 are notable. A significant 59% rebound was observed in 2008. An overall declining trend remains since 2003. 94% of the 2008 population was observed in the mainstem, mostly below RM 6. Cutthroat abundance declined for two years between 2003 and 2006 preceding a strong increase of 362% in 2008 when the expanded estimate reached 4,570. It is not appropriate to compare 0+ trout estimates to past ODFW data due to the weaknesses of the RBA methodology for species other than Coho.

Based on the low average rearing densities and large volumes of vacant pool surface area observed, significant production potential for Coho and Steelhead is currently unrealized. Adult escapement appears to currently limit Coho in the basin. While severely depressed, the 2008 1+Steelhead estimates from the Tenmile Basin remained the second highest in the Ocean Tributaries Inventory behind the Yachats Basin. 2008 Coho production in Tenmile was also the second highest behind the Yachats. These two basins appear to be the most important systems for anadromous fish in the Ocean Tributaries Inventory followed by the Neskowin, Rock Cr./Devils Lake, and Sutton Lake Basins (where production focuses mostly on Coho), and the Big South, Cummins, and Cape Cr. Basins (where production favors Steelhead). Continued annual assessment in Tenmile is highly recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
1991	8,003	*	*	*
1992	7,799	*	*	*
1993	30,663	*	*	*
1994	3,294	*	*	*
1995	4,369	*	*	*
1996	3,783	*	*	*
1997	4,410	*	*	*
1998	2,105	*	*	*
1999	1,198	*	*	*
2000	4,580	*	*	*
2003	13,156	5,990	4,055	1,720
2005	7,194	6,060	2,130	1,435
2006	7,975	3,325	995	990
2008	13,631	5,735	1,585	4,570

* ODFW data utilizing different sampling strategy not comparable to RBA 2003 - 2008 (20% visual bias added for Coho)

Rock

There are extensive indications of channel altering debris torrent activity in Rock Cr. resulting from the high flow events of 96 / 97. Historical USFS survey data describes the presence of a migrating slope in the headwaters of Rock Cr. that may be the source of what appears to be significant recruitment of migratory substrates. This stream supported Coho for three consecutive years until 2006 when estimates dropped to zero. Only a minor presence was detected in 2008. Cohort survival patterns in the basin have fluctuated widely in recent years. Most adult escapement here is probably due to stray adult Coho from adjacent basins.

Coho production in Rock peaked in 2003 and results from 2006 indicate a complete 100% decline in this strongest cohort. Conversely, A strong 138% increase was observed between the 2002/2005 juvenile cohorts. This cohort exhibited an 84% decline in 2008, based on juvenile estimates, and suggests the escapement of only 2 adults (one spawning pair) during the 2007 winter brood. This one spawning event appears to have occurred low in the mainstem since the highest count for summer parr was observed in the first pool of the survey, just up from the beach. Back calculation from previous juvenile surveys suggests Coho escapements of 2-3 adults (2001 brood), 9-10 adults (2002 brood), and 6-7 adults (2004 brood).

5 miles of potential Coho distribution exist along this stream. No barriers to anadromous migration were noted. Excellent habitat conditions similar to Cummins and Bob were also observed in Rock Creek. Production potential for Steelhead is high. Most of the stream runs through the Rock Creek Wilderness Area and is protected from any significant land use impacts.

Rock Cr. exhibits a broad floodplain in the lower reaches with a cobble dominated aquatic corridor. Most tributaries are small and too steep for the provision of significant salmonid habitat. Stream gradient in the mainstem increases at approximately RM 3.0, and a narrow canyon begins at RM 4.0. The absence of high quality gravel substrates are limiting salmonid production above RM 3.0.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2001	0	590	485	895
2002	313	940	595	700
2003	1,094	1,560	815	580
2005	744	355	470	345
2006	0	180	20	65
2008	119	565	135	660

* 20% visual bias added for Coho

Big South

Has supported populations of Coho, Steelhead, and Cutthroat during all six years of survey. The strongest juvenile cohort in the basin (2003/2006) exhibited little change between generations and is back-calculated at 45-51 adults (2005 winter brood), based on 2006 summer parr abundance. The weakest juvenile cohort in the basin (2002/2005/2008) exhibited a 33% decline in abundance between 2002 and 2005 but rebounded in 2008,

increasing in size by 117%. The expanded estimate for summer parr in 2008 (5,281 – including 20% visual bias) was just 6.6% lower than the 2006 estimate (5,656 - the highest for the surveyed years). The lack of survey data from 2004 and 2007 prevents the tracking of the third cohort in the basin which was only sampled in 2001. The 2005 summer rearing Coho population in Big South was the smallest to date out of six survey years and represented an escapement of 19-22 adults for the 2004 adult brood.

Big Cr. has a high quality interactive floodplain, with high levels of wood recruitment. Evidence of debris torrent flows are present in full spanning jams, long stretches of habitat without wood, torrented tributary channels, and large depositions of mobile substrate. Tributaries are typically too steep with barriers for significant levels of Coho production. The exceptions include Panther Cr. and Trib G. As a result of the 1996/1997 torrent, the inner riparian vegetation and channel roughness has been removed from many of the lower reaches of Big South and avian predation has become a significant factor in juvenile survival. Multiple large concentrations (12-15 / flock) of common mergansers have been observed feeding in these broad open canopied reaches. Evidence of large accumulations of scat also indicates the long term presence of these predators. This condition is improving each year with vegetative recovery on torrent deposited gravel bars with new wood contribution. The spread of invasive Knotweed has increased dramatically in lower Big South and has begun to creep upstream taking over gravel bars and stream banks. Riparian vegetative diversity is rapidly decreasing.

Coho distribution in the Big South Basin has ranged between 10 and 12 miles over the last six survey years. 10.1 miles of Coho distribution were observed in 2008, 7.5 of these in the mainstem. 62% of basin-wide Coho and 93% of basin-wide 1+Steelhead were observed in the mainstem in 2008. Extremely low rearing densities for Coho were exhibited (averaging 0.1 Coho/sq.m.) on a steadily increasing gradient of abundance to RM 7 (a peak of 0.7 Coho/sq.m.). Based on these densities it appears that this population is severely depressed currently and that the system is capable of production estimates possibly 10-15 times higher for Coho. 76% of all 1+Steelhead in the mainstem were observed rearing downstream of RM 3, following a summer rearing pattern also observed in the Tenmile and Cape Cr. basins.

Panther Cr. exhibited no rearing Coho in 2001, small upstream migrations of Coho in 2002, 2005, and 2008, and low level spawning activity in 2003 and 2006 (around 360 Coho, expanded, for both years over 0.5 miles). The highest average rearing density for Coho in the basin (1.7 Coho/sq.m.) was recorded here in 2006. Production potential here appears low due to poor gravel sorting, steep stream gradients, and confined stream reaches dominated by bedrock exposures.

Trib. G has exhibited successful Coho escapement during all six survey years, with average rearing densities between 0.3 Coho/sq.m. and 0.6 Coho/sq.m. and a maximum distribution of 2.5 miles in 2005 (including 0.6 miles in Trib. G1). Expanded estimates for Coho in Trib. G have consistently been the highest of all the tributaries in the basin and have accounted for 17% - 45% of basin-wide Coho totals. In 2008 this tributary exhibited just 1.3 miles of Coho distribution and accounted for 37% of basin-wide production. The average rearing densities of 0.6 Coho/sq.m. and 0.9 Coho/sq.m. observed in Tribs. G and G1, respectively, in 2008 were the highest in the basin. Lower stream gradients and a higher abundance of well sorted gravels in Trib. G are more conducive to supporting coho than the channel conditions in the remainder of the Big Cr.

mainstem upstream of the Trib. G confluence. Low average rearing densities throughout the years suggest that a significant potential for higher production rates has remained unrealized in this tributary. Adult escapement appears to be the primary limiting factor.

Steelhead abundance estimates for the last three surveyed years are much lower than during the first three surveyed years. Cutthroat abundance increased 188% between 2006 and 2008 and was the highest abundance observed within the 6 surveyed years. Distribution for this species in 2008 appeared relatively even throughout the mainstem, which exhibited 83% of the basin-wide population.

Big South exhibits one of the highest potentials for both steelhead and coho production on the Mid-Coast between the Yachats and Siuslaw Rivers and is currently limited primarily by low adult escapement. The third highest 1+Steelhead estimate in the 2008 Ocean Tributaries Inventory was observed here. Continued annual assessment is highly recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2001	4,325	2,385	2,125	1,460
2002	3,638	4,340	1,225	2,215
2003	5,400	6,075	1,220	1,485
2005	2,431	1,165	480	765
2006	5,656	3,970	850	820
2008	5,281	3,045	900	2,355

* 20% visual bias added for Coho

Cape Cr.

Exhibits high quality habitat for Coho, Steelhead, and Cutthroat - moderate gradients, small cobbles, and good gravel throughout. The lower mainstem exists within a broad active floodplain with channel braiding and good wood densities interfacing with the aquatic corridor. Cabled log structures were still present in several locations along the lower three miles. The paved road along the stream has recently been removed above RM 2. The upper mainstem appears to be recovering from the torrents of 1996/1997.

Coho production in Cape Cr. dropped 39% in 2008 (relative to 2006). A steadily declining trend in juvenile abundance has emerged for the basin since 2002. All returning cohorts that can be followed have experienced losses based on juvenile abundance estimates. The related 2002/2005/2008 juvenile cohorts experienced declines of 45% and 23%, consecutively, between generations, while the related 2003/2006 juvenile cohorts experienced a decline of 29% between generations.

The trend in coho abundance in Cape Cr opposes that observed farther north but is clustered with other southern ocean tribs (Rock, Berry, and Sutton). Survival rates for the most recent 2007 winter brood (juveniles during the summer of 2005) appear to have been very high for almost all of the streams in the 2008 Ocean Tributaries Inventory (based on juvenile abundances observed in 2008). The only northern ESU coastal tributaries that exhibited declines in abundance for the 2007 adult cohort (2005/2008 juveniles) were Arch Cape and Rock/Devils Lake. The third cohort (2001/2004/2007) cannot be tracked in Cape Cr. due to a lack of survey data from 2004 and 2007. This cohort appeared to be the weakest based on juvenile estimates from 2001.

Adult estimates back-calculated from the highest juvenile abundance year of 2002 reached 84-95 Coho for the 2001 winter brood. Adult estimates back-calculated from the 2008 juvenile abundance estimate have declined to 36-40 Coho for the 2007 winter brood.

Only 6 miles of Coho distribution was observed in the basin in 2008, down from 8.6 miles in 2006, the last year surveyed. 4.9 of these miles were in the mainstem where 92% of basin-wide Coho production was observed. The average rearing density of 0.3 Coho/sq.m. exhibited a primary spawning peak of 1.7 Coho/sq.m. near RM 3.9. Coho distribution in Wapiti extended just 0.6 miles in 2008, compared to 2.2 miles in 2006, and appeared to be the result of upstream juvenile migrations from the Cape Cr. mainstem (an expanded estimate of 300 summer parr, including 20% visual bias). Excellent habitat conditions and significant Coho production have been observed in this tributary during previous surveys. In 2002 and 2003 as many as 1,550 summer parr (including 20% visual bias) were present in Wapiti, over a lineal distribution of 2.4 miles, contributing 19% to basin-wide totals.

Rearing capacity in Cape Cr. and Wapiti appears to be much higher than any previous surveys have reported. No barriers have been noted although increasing gradient and substrate size limits production above RM 6 in Cape and above RM 2 in Wapiti. These reaches have historically produced significant numbers of Coho and are currently primarily limited by adult escapement.

A small upstream juvenile migration of Coho was also observed in NF Cape extending 0.4 miles (an expanded estimate of 50 summer parr, including 20% visual bias). High stream gradients and large cobbles limit anadromous spawning and rearing potential in the North Fork.

Steelhead production in Cape Cr. also exhibits an overall declining trend over the last six survey years. This pattern is visible in most of the streams surveyed in the Ocean Tributaries Inventory but is most apparent between Cape Perpetua and Heceta head where Steelhead abundances have historically been the highest. Cutthroat estimates in 2008 increased significantly by 232% from their lowest level in six years of surveys. 0+trout estimates continued a four year decline.

Production potential for Coho and Steelhead appears high in Cape Cr. despite the recently depressed estimates and continued annual assessment in the basin is highly recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2001	3,913	3,205	2,820	1,600
2002	10,494	6,015	2,455	1,955
2003	10,188	5,575	3,225	2,025
2005	5,788	3,780	1,725	1,040
2006	7,219	2,180	535	570
2008	4,438	2,070	705	1,895

* 20% visual bias added for Coho

Berry

This stream flows out of a steep canyon on Cape Mountain down into the wide flat marsh surrounding Lily Lake, just north of Sutton Creek. A long, winding inter-tidal

channel connects Lily Lake to the ocean at Baker Beach. Three years of surveys have been conducted in Berry Cr. between 2005 and 2008 (no survey in 2007). Moderate Coho production was observed in 2005 and 2006 before abundance levels fell sharply by 77% in 2008. These losses represented a 79% decline in juvenile abundance between the 2005 and 2008 cohort years. Declines in this cohort among the ocean tributaries in this inventory were uncommon and only experienced in Berry, Sutton, Cape, Rock/Devils Lake, Rock, and Arch Cape.

Good spawning gravels and high summer flows exist in Berry Cr. in close proximity to complex juvenile habitat within Lily Lake. The best spawning gravels for Coho are found between Lily Lake and Highway 101 where stream gradients are moderate and pool diversity is high. More Coho were likely present in Lily Lake downstream of the survey start-point. Maximum Coho distribution appears limited to less than 1.7 miles (not including Lily Lake) due to steep gradients and boulder drops. Average rearing densities were high in 2005 and 2006 (1.2 Coho/sq.m. and 1.3 Coho/sq.m., respectively) with some pools peaking up to 5.1 fish/sq.m. downstream of the Highway 101 culvert (RM 0.4). Average rearing density in 2008 dropped to 0.4 Coho/sq.m. and peaked at 0.9 Coho/sq.m. near RM 1.3. Based on these rearing densities it appears that Coho production in 2005 and 2006 had approached, but not quite met, the full carrying capacity of the habitat. Adult escapement is probably the main limiting factor in this basin.

The Highway 101 culvert is currently perched by 1.5 ft. and appeared to be a juvenile barrier during the high abundance years of 2005 and 2006, terminating upstream temperature dependant migrations (based on distribution graphics). This was a 6 ft. cement box culvert with steel fish baffles and was buried under deep road-fill. The next 6 ft. steel pipe culvert, about 1000 ft. upstream from the cement box, was in worse shape – perched by 1.5 ft., split in the middle, and badly deformed. The upstream half of this culvert was badly crushed, possible due to heavy traffic on the gravel road leading to a large quarry operation around RM 1. The road here is currently collapsing. Based on juvenile distribution it appears that adult Coho passed both of these culverts during the winters of 2004, 2005, and 2007. This site is a high priority for restoration.

The 2005 summer rearing Coho population is currently the largest observed in the 3 surveyed years and represents an escapement of 12 –14 adults. The 2008 summer rearing Coho population represents an escapement of 2-3 adults. Because of the lake rearing habitat that is associated with this system that could provide large quantities of potential summer and winter rearing habitat, carrying capacity may not be fully realized even though instream habitats appeared to be nearly seeded to capacity in 2005 and 2006. Steelhead potential was also present but of limited significance. Continued annual assessment is recommended.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	1,544	155	10	415
2006	1,413	80	0	160
2008	319	75	0	95

* 20% visual bias added for Coho

Sutton

Production potential for Coho is significant in the Sutton Lake Basin. The fifth largest Coho estimate in the 2006 and 2008 Ocean Tributaries Inventory was observed here between three main reaches, 5 miles on Bailey Cr., 0.9 miles on Levage Cr., and 0.9 miles on Rath Cr. (mileages from 2008). A minor Coho presence was detected in Dahlin Cr. each year (106 summer parr in 2008 - expanded with 20% visual bias). Access was denied to Levage Creek in 2005 which has complicated comparisons between years. Not including Levage, it appears that Coho production in the basin was similar between 2005 and 2006 followed by a more significant decline of 13% between 2006 and 2008 (no survey in 2007).

The total expanded estimate (including 20% visual bias) from 2006, including 1,600 Coho from Levage Cr., reached 11,600 Coho summer parr. This was the largest basin-wide population estimate for the Sutton basin for the 3 surveyed years. Back-calculating from this figure, an estimated 93-105 adults escaped into the Sutton Basin for the 2005 winter brood. Back-calculating from the 2008 total estimate for juvenile Coho (8,881 – expanded with 20% visual bias, including 206 Coho from Levage) suggests an escapement of 71-81 adults for the 2007 winter brood. Additional juvenile rearing is likely occurring in Sutton and Mercer Lakes that was not a part of these estimates. A decline of 18% appears to have occurred between the 2005 and 2008 juvenile cohorts in the Sutton Basin. Declines for this cohort were only observed in Sutton, Berry, Cape, Rock, Rock/Devils Lake, and Arch Cape during the 2008 Ocean Tributaries Inventory.

The Sutton Lake Basin is comprised of four main streams originating on the south slope of Cape Mountain (north of Florence) that feed into a massive wetland complex collectively known as Mercer and Sutton Lakes. Sutton Creek drains out of Sutton Lake and flows 3.6 miles through sand dunes to the ocean. Having good reserves of low gradient spawning gravels in close proximity to the nearly unlimited summer and winter rearing habitat provided by the lakes appears to provide optimum conditions for Coho production.

No Coho were observed in Sutton Creek in 2005. A single juvenile was found during the 2006 survey at RM 0.9, about 2 miles downstream from the first lake in a fine-sand channel winding through high dunes. Two juveniles were observed nearby during the 2008 survey. Visibility was moderate due to tannic water and large amounts of aquatic vegetation and it is possible that other Coho juveniles were also present. The expanded estimate for this reach in 2008, including 20% visual bias, totaled 13 summer parr. There is no potential for spawning in this reach and it is assumed that these juveniles had migrated downstream from one of the four upper lake tributaries. Most of the channel in Sutton Cr. consisted of deep sand and compacted mud with small amounts of rock appearing near the end of the 2.9 mile survey. The few occurrences of gravel and rock were poorly sorted and heavily burdened with sand and silt. It appears that most of the Coho fry produced in the headwater spawning beds are absorbed by the immense rearing potential in the lakes.

The most productive reach for Coho in the basin for all years has been Bailey Creek where rearing density averaged 0.7 Coho/sq.m. for 4.1 miles in 2008. Approximately 89% of basin-wide Coho production occurred in this sub-basin in 2008

(7,888 summer parr – expanded with 20% visual bias). Small upstream juvenile migrations, totaling 0.9 miles in all, were observed in Tribs. A, B, and C. The only 1+Steelhead in the basin have been observed in the Bailey mainstem during all three survey years.

Spawning conditions for Coho were ideal in the Bailey mainstem upstream of the long pasture trench pools at the streams mouth. Production rates could be greatly increased there if floodplain interaction were improved. A very successful USFS log-treatment restoration project was observed just upstream between RM 1.3 and RM 2. Large amounts of woody debris have been collected there creating good cover and deep pool scours. The highest three individual pool counts for Coho in Bailey Cr. were observed in this stream segment in 2008.

Abundant reserves of gravel were present further upstream in a low, sinuous floodplain with moderate wood complexities. Rearing densities peaked there at RM 3.1 (1.6 Coho/sq.m.) where most adult spawning appears to have occurred. Sedimentation rates were high and bedrock exposures were frequent in the upper reaches. Distribution ended in low flows and steep rocky riffles. Low rearing densities suggests that Coho production could be much higher (at least 100% higher) in Bailey with increased adult escapement.

Levage Creek was surveyed for the first time in 2006 when an average rearing density of 1.5 Coho/sq.m. was observed over 1.2 miles of distribution. This was the highest average rearing density for Coho in the basin for 2006 and indicated a fully seeded condition for this species. An expanded estimate, including 20% visual bias, of 1,600 summer parr were present that year (14% of the basin-wide total). Coho production declined 87% in Levage between 2006 and 2008 when just 206 summer parr were observed (expanded with 20% visual bias). This represented 2% of the basin-wide total. An average rearing density of 0.4 Coho/sq.m. was observed in 2008 over a distribution of 0.9 miles.

Habitat conditions in Levage were similar to other tributaries in the basin. The entrenched stream channel originates in an open grassy marsh, gradually transitioning into flat, exposed pasture habitats, and ended in a healthy and interactive floodplain with good canopy coverage and well sorted gravels. Low summer flows, moderate siltation, and low adult escapement appeared to be the main limiting factors.

Rath Creek exhibited the second highest production rates for Coho in the basin in 2008 (669 summer parr, expanded with 20% visual bias). This represented 8% of the basin-wide Coho total (as in 2006) and a decline of 27% since 2006 (919 summer parr). The average rearing density of 1.1 Coho/sq.m. observed in 2008 showed no change from 2006 although total distribution decreased from 1.2 miles to 0.9 miles. This was the highest average rearing density for Coho in the basin in 2008. It was suspected that this reach had reached its summer carrying capacity for Coho during the 2005 survey when average rearing density reached 1.9 Coho/sq.m. and expanded estimates totaled 1,875 summer parr (including 20% visual bias).

Stream habitats in Rath were small due to low flows and long stretches of channel entrenchment in the lower pasture habitats. Spawning gravels were frequently encountered but heavy siltation likely effects their productivity. Above the low gradient pasture reach, Rath quickly transitions into a steep rocky channel with little anadromous

potential beyond RM 1. Most adult spawning appears to focus on RM 0.6 where rearing densities peaked at 2.2 Coho/sq.m. in 2008.

Production potential for Coho in Dahlin appeared low. The stream channel was deeply entrenched in a wide grassy marsh with large amounts of sand and silt. Stream flow was very low and has resulted in a poor sorting of gravels and low pool complexities. Visibility was poor. Low level adult spawning may have occurred here during the winter of 2005 (194 summer parr, expanded, during the 2006 summer survey). An expanded estimate of 106 summer parr were present in 2008 averaging 0.3 Coho/sq.m. over 0.9 miles. It is possible that production rates were higher in Dahlin than they appeared and that some Coho had migrated downstream to the lake before the time of survey.

High levels of Coho production in the dunal lake systems between Florence and Coos Bay is well documented and the Sutton Lake Basin exhibits most of these same characteristics. High sedimentation rates and low adult escapement currently appear to limit production. Continued annual assessment in the basin is highly recommended. Continued assessment in Sutton Creek itself is of low priority.

Year	**Coho**	**0+**	**Sthd**	**Cut**
2005	10,550	850	90	1,180
2006	10,000	735	105	970
2008	8,675	950	150	1,350

* 20% visual bias added for Coho
* Does not include Levage Cr.

Recommendations

Table (12) Lineal Distance for Recommended Future Assessment

Stream (north to south)	Coho Potential	Continued Annual Assessment	Lineal Distance (miles)
Ecola	Yes	High Priority	9.6
Arch Cape	Yes	High Priority	1.0
Short Sand	Yes	High Priority	1.0
Watseco	Yes	High Priority	0.5
Netarts Bay	Yes	High Priority	2.0
Sand Lake	Yes	High Priority	9.0
Neskowin	Yes	High Priority	16.6
Rock / Devils Lake	Yes	High Priority	7.1
Fogarty	Yes	Low Priority	1.0
Depoe Bay	Yes	High Priority	3.1
Spencer	Yes	High Priority	3.5
Wade	Yes	Low Priority	1.0
Coal	Yes	Low Priority	1.0
Moolack	Yes	Low Priority	1.0
Big	Yes	High Priority	6.5
Vingie	Yes	Low Priority	0.5
Star	Yes	Low Priority	0.5
Yachats	Yes	High Priority	43.1
Cummins	Yes	High Priority	5.5
Bob	Yes	High Priority	4.8
Tenmile	Yes	High Priority	16.7
Rock	Yes	High Priority	4.0
Big South	Yes	High Priority	11.7
Cape	Yes	High Priority	9.0
Berry	Yes	Low Priority	1.3
Sutton	Yes	High Priority	7.5
Total Recommended Mileage for 2009:			**168.5**