

**Oregon Plan Coho Assessment Part 4J:  
Land Use and Land Cover Characteristics  
In the Coastal Coho ESU**

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**Part 4D PECE Criteria Papers**

Morgan J. 2005. *Certainty that the conservation effort will be implemented: Forest Practices Act. Oregon Plan Assessment Part 4D, ODF A1.*

<http://nrimp.dfw.state.or.us/OregonPlan/>

Lee B. 2005. *Certainty that the conservation effort will be implemented:: State Forests Program Oregon Plan Assessment Part 4D, ODF A2.*

<http://nrimp.dfw.state.or.us/OregonPlan/>

Dent L. 2005. *Certainty that the conservation effort will be effective: Riparian Areas. Oregon Plan Assessment Part 4D ODF B1.* <http://nrimp.dfw.state.or.us/OregonPlan/>

Dent L. 2005. *Certainty that the Conservation Effort Will Be Effective: Fish Passage, Roads, and Landslides Oregon Plan Assessment Part 4D, ODF B2.*

<http://nrimp.dfw.state.or.us/OregonPlan/>

**Part 4J Technical Reports**

Mills K., L. Dent L., J. Paul , B. Riggors. 2005. *Reducing Effects of Roads on Salmonids under the Oregon Plan. Oregon Plan Assessment Part 4J, Technical Report 1.*

<http://nrimp.dfw.state.or.us/OregonPlan/>

Dent L., A. Herstrom, E. Gilbert. 2005. *A Spatial Evaluation of Habitat Access Conditions and Oregon Plan Fish Passage Improvement Projects in the Coastal Coho ESU Oregon Plan Assessment Part 4J, OP Technical Report 2.*

<http://nrimp.dfw.state.or.us/OregonPlan/> 18 pp.

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## Land Use and Land Cover Characteristics In the Coastal Coho ESU

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### **Introduction**

This purpose of this paper is to characterize in a very general sense the land use and land cover patterns of the coastal coho ESU. Specifically, we characterize forest cover characteristics throughout the ESU and the land use and cover in riparian areas. This information was generated to support other aspects of the State of Oregon's Coho and Oregon Plan Assessment. For detailed discussions of topics such as riparian function and process, land use practices, aquatic habitat, water quality, fish hatcheries and many others please refer to the entire Oregon plan and coho assessment project (<http://nrmp.dfw.state.or.us/OregonPlan/>)

### **Upland Forest Characteristics**

Over the centuries, small and large disturbances in combination with forest succession created diverse forests. Disturbances range from infrequent to frequent, simple to complex, and very large to very small. In forests, large-scale disturbances generally favor colonizing species such as Douglas fir. Small-scale disturbances can create gaps where shade-tolerant understory species and herbaceous plants flourish, and also increase the supply of snags and large woody material in the forest. The landscape was never homogeneous, and only part of the forest was old growth at any one time (Agee, 1993). Wimberly et al. (2000) estimated that old-growth forest coverage in the Oregon Coast Range varied from 25-75% during the past 3000 years.

However, even without disturbance events, forests change significantly over time. Through forest succession, biomass accumulates canopies close and open, and understory and over story vegetation changes. Forests accumulate organic material (nutrients and energy as carbon) through photosynthesis, transpiration and subsequent plant tissue growth. Accumulation rates vary over time and space and by species. For coniferous forests, the rate of accumulation increases for approximately 80 to 120 years after stand initiation, after which it declines as the stand further matures.

Forest succession dynamics have been greatly influenced by extensive logging of old growth forests, intensive forest management, and recent decades of fire suppression. The growing and harvesting of forest tree species was not practicable until forest fires could be more effectively controlled so the current forest conditions reflect a combination of harvesting and fire suppression.

On federal lands, the management approaches are established by Congress under the National Forest Management Act or the Federal Land Policy and Management Act (for BLM lands). Under this set of approaches, the vast majority of federal lands in the ESU are managed under a "reserve" strategy with a relatively small portion managed under multi-resource strategies.

On state-owned forestlands, the majority of lands are managed under a multi-resource strategy that combines landscape and site-specific strategies to achieve goals for riparian and aquatic conditions. Reserve strategies are substantial near riparian and other special areas. State Parks are managed under a reserve emphasis approach.

Tribal lands are generally managed under a multi-resource strategy. While these lands are currently limited in scope, a number of factors may result in increases in this ownership over time.

On private lands, management is based upon a range of investment strategies and objectives. Most private industrial lands are managed under a wood production strategy, while the non-industrial lands are generally managed under wood production or residential value emphases. Most industrial forestlands in the ESU participate in a voluntary certification program under the Sustainable Forestry Initiative. Under this program, a qualified independent third party must certify that the land or participants is managed in conformance with the SFI Standard. One principle requires that landowners meet all applicable regulatory requirements.

A range of voluntary actions occurs on forestlands. Some forestlands within the ESU are covered by Habitat Conservation Plans and many private landowners choose to exceed the standards of the Oregon Forest Practices Act for a range of operational and management reasons, including Oregon Plan Non-regulatory measures (Morgan 2005).

Within urban growth boundaries, forestland is generally managed on private lands under a residential value emphasis. A new survey conducted by the Oregon Department of Forestry's Urban and Community Forestry Assistance Plan has found increased emphasis on tree protection. Of 240 cities in the state polled, 37 percent said they have tree-planting or tree-care programs. This is up by 26 percent from 1992, when ODF conducted a similar survey. Cities also say the benefits of urban forests help explain why more cities are spending more money – \$7.8 million in 2003 compared with \$1.2 million in 1992 – on planting and caring for trees.

### **Riparian Management Approaches**

Riparian areas provide important functions and processes for aquatic communities. Examples include shade over streams that prevent streams from warming, large wood recruitment, and nutrient inputs to streams (although coastal streams are generally light-limited rather than nutrient limited). Some riparian areas, typically in lower gradient systems, have wetland characteristics and delay or retain water during runoff as well as provide off channel habitat. Riparian stand structure is an important component affecting flood-plane channel interactions.

Today, each land use employs a set of riparian management, regulatory and voluntary approaches unique to the specific land base. All forestlands (federal, state and private) outside urban growth boundaries must be managed to "meet or exceed the requirements of the Oregon Forest Practices Act." All forestlands must be used in a manner that is consistent and compatible with the land use zones and zoning ordinances of local government's land use plans approved by the Land Conservation and Development Commission. Under the forest practices act, riparian areas are established on all fish-bearing streams with variable buffer widths of 50, 70, or 100 feet. The riparian area is managed to mimic mature forest conditions across the landscape and over time. For state-owned forest land, riparian management zones range from 100- 170 feet on each side of the stream and are also managed for mature forest condition. For federally owned forest land, riparian areas are typically treated as 300 foot reserve areas on each side of the stream.

The approach is different for riparian areas in agricultural areas. In 1993, the Oregon Legislature passed an Agricultural Water Quality Management Act (SB 1010), Oregon Revised Statute (ORS)

568.900 to 933. This statute directed ODA to address water pollution from agricultural activities and rural lands. SB 1010 authorized ODA to develop and carry out an Agricultural Water Quality Management Area Plan (Area Plan) and to enforce associated Area Rules for agricultural or rural lands when a water quality management plan is required by state or federal law. Important components of the approach are Confined Animal Feeding Operations in which the state's policy is to protect the water quality by preventing animal wastes from discharging into waters of the state. While no riparian buffers are established with a formal width, activities are governed and success judged in terms of meeting water quality goals.

### **Purpose**

The purpose of this paper is to

1. Characterize current upland forest characteristics and
2. Characterize land use and land cover in riparian areas.

Characterizing upland forest conditions was done to provide a backdrop of forest conditions in the coastal coho ESU. Riparian management practices vary greatly depending on ownership as described above. These management practices can result in different riparian structures and associated functions. Information on riparian structure and function through out the ESU is somewhat limited (Dent 2005a). Characterizing ownership within riparian areas was done to provide an additional indicator of the types of management expected to occur in the near-stream area and begin to identify where restoration opportunities might be targeted to best address coho concerns.

### **Methods and Data Sources**

#### **Forest Cover Descriptions**

Forest cover was classified as hardwood, coniferous, or mixed using the USGS NLCD data described below. A description of the NLCD can be found at:

<http://landcover.usgs.gov/natl/landcover.asp>. The accuracy of the NLCD data can be found at: <http://landcover.usgs.gov/accuracy/index.asp>. The date of the imagery is 1992 and we performed no additional imagery processing on the data.

As per the documentation from the USGS web site mentioned above, the three forest types are classified as follows:

- ✓ Hardwood was defined as areas dominated by more than 75% of trees species that shed foliage in response to seasonal change.
- ✓ Coniferous was defined as areas dominated by more than 75% of tree species that maintain their foliage all year.
- ✓ Mixed forest cover was defined as areas where neither hardwood nor softwood species represent more than 75% of the cover.

Forest size was put into three diameter-at-breast height (DBH) classes using data from the Oregon Forest Industries Council (OFIC). These data were derived using satellite image processing techniques on Landsat Thematic Mapper data and 1994 imagery. These data are proprietary to the OFIC and are not in the public domain. The image processing was completed by Pacific Meridian Resources, Inc (currently Sanborn Map Company). No accuracy assessment was conducted for the size class analyses due to budget constraints. Sizes were classed:

- ✓ Small: DBH < 25cm

- ✓ Medium: DBH 25-50cm
- ✓ Large: DBH >50cm

### Land Use and Land Cover in the Near Stream Area

We defined the near stream area as the land base within 200 feet of each side of the stream. The use of 200 feet was selected based on professional opinion regarding the distance within which most riparian function is captured. To identify the riparian area around each stream a buffer (proximity zone) was generated that extends upslope on both sides of each side of the stream for 200 feet. These buffers were generated using a geographic information system (GIS) running Arc/INFO version 8.3.

To characterize current land use and cover patterns along streams and throughout the ESU we created a combined land use and land cover data layer. We identified the following seven ownership categories: Federal, State, Private Industrial, Private Non-Industrial, Urban, Agriculture, and Other. Within each of these seven categories we identified the following sub-categories: Forested, Other, Shrubland, Wetlands, and Quarries. This gave 35 possible unique categories. However, there were only 25 categories in the final land use/ land cover data layer because some of the subcategories did not occur within all ownerships. The above classifications could be obtained using the following three publicly available GIS data layers:

- **Land Zoning:** from the Oregon Division of Land Conservation and Development (DLCD) (used to identify agriculture and urban). The Land Zoning data is the only such state-wide data set available in a digital form and is found on the Oregon Geospatial Enterprise Office web site: <http://landcover.usgs.gov/natl/landcover.asp>
- **Land Cover:** from the United States Geological Survey's (USGS) National Land Cover Data (NLCD) (used to identify forest and non-forest). The NLCD data used 30 meter Landsat Thematic Mapper satellite data classed into 21 classes including "deciduous forest", "evergreen forest", and "mixed forest". A description of the NLCD can be found at: <http://landcover.usgs.gov/natl/landcover.asp>. The accuracy of the NLCD data can be found at: <http://landcover.usgs.gov/accuracy/index.asp>
- **Land Ownership:** from the Oregon State Geospatial Enterprise Office (3/15/04). The Ownership data is the official digital ownership data layer found on the Oregon Geospatial Enterprise Office web site: <http://landcover.usgs.gov/natl/landcover.asp>

The above procedure produced the combinations and acreages shown in Table 1. Technically this procedure is a simple and straightforward GIS exercise. The biggest question and the point of greatest discussion was the identification of Urban and Agriculture. When the three data layers were combined, the 'agriculture' and 'urban' from the zoning layer took precedence over the cover and ownership layers. This was decided because we assumed that the influence of agricultural and urban practices on stream resources, allowed under those zoning laws were probably greater than influences under any other use or cover. This assumption is based on

- (a) Research from Pess et al. (2002) that found adult coho abundance in forest-dominated areas were 1.5-3.5 times higher than densities in rural, urban, and agricultural areas. The authors found that relationships between land use habitat characteristics and adult coho

salmon abundance were consistent over time and that these habitat variables explained almost half of the variation in the annual distribution of adult coho salmon.

- (b) Department of Environmental Quality (DEQ) findings from this assessment demonstrate that water quality is higher on forested streams than for other land uses (DEQ 2005)
- (c) Urban and agricultural activities are perpetual (year after year, or permanent) where as forest activities are sporadic (i.e. 40 years or more depending on ownership)
- (d) Even if the area is not currently under urban or agricultural uses, the zoning allows for such activities at any time.

**Table 1. Acreages within each land use/land cover class.**

Land Use/Cover Grouping	Ownership	Use	Cover Type	Acreage
Agriculture	Anything	Agriculture	Anything	939,314
Federal Forests	Federal	Other	Forest	2,593,359
Federal Forests	Federal	Other	Shrubland	6,767
Mining	Federal	Other	Quarries	4
Mining	Private Industrial	Other	Quarries	22
Mining	Private Non-Industrial	Other	Quarries	115
Other	Other	Other	Forest	18,320
Other	Federal	Other	Other	21,036
Other	Other	Other	Other	639
Other	Private Industrial	Other	Other	8,101
Other	Private Non-Industrial	Other	Other	10,793
Other	State	Other	Other	718
Other	Other	Other	Shrubland	3
Private Industrial	Private Industrial	Other	Forest	2,099,497
Private Non-Industrial Forest	Private Non-Industrial	Other	Forest	491,682
Private Non-Industrial Forest	Private Non-Industrial	Other	Shrubland	1,616
State Forest	State	Other	Forest	621,722
State Forest	State	Other	Shrublands	410
Urban	Anything	Urban	Anything	212,565
Wetlands	Federal	Other	Wetlands	1,720
Wetlands	Other	Other	Wetlands	1
Wetlands	Private Industrial	Other	Wetlands	1,019
Wetlands	Private Industrial	Other	Wetlands	5,429
Wetlands	Private Non-Industrial	Other	Wetlands	2,572
Wetlands	State	Other	Wetlands	168
TOTAL				7,037,592

As an example of how this assumption affected the findings of this paper, an area may be classed as "forest cover" from the USGS satellite imagery but could be zoned as urban or agriculture. In such cases an area could be a city or county park or could be a pasture with trees. For this analysis, such examples were classified as urban or agriculture as indicated by the zoning data. This is not to suggest that forest management has no effects on riparian and aquatic resources. These topics are discussed in detail in Dent 2005a, Dent 2005b, Mills et al. 2005, and Dent et al. 2005.

## Stream Network and Coho Habitat Potential

### Stream Layer Model

We used a modeled stream layer provided by Coastal Landscape Analysis and Modeling System (CLAMS) that approximates a densified stream network represented at a 1:24,000 scale (Clarke et al. unpublished manuscript). Streams were modeled from 10 meter DEMs to calculate gradient and valley morphology. The model is limited by the accuracy of the raw data used, in this case, the 10 meter DEMs. It is known that 10 meter DEMs reflect differences in contour line crenulations on the maps from which they were derived. This difference is then expressed in the final digital line network as stream density differences that follow the map quadrangle boundaries of the base data. That is, some quadrangles have a much greater stream density than an adjacent quadrangle. This difference is due only to the contour line crenulations and not to precipitation, soil, or elevation differences. This denser stream network probably has limited influence in depicting anadromous fish streams, particularly coho streams, but likely depicts more resident fish streams.

### Coho Over-Winter Habitat: Intrinsic Potential Model

To evaluate the influence on coho habitat we utilized a modeled habitat stream layer from CLAMS (Burnett et al. unpublished manuscript). The model predicts the *potential* for streams to provide high quality *winter* habitat for coho. The prediction is based on stream gradient, stream flow, and channel constraint. Gradient and constraint are calculated with a 10-meter digital elevation model and flow is estimated using ODF's average annual stream flow equation (Lorenson et al. 1994).

Intrinsic winter habitat potential is calculated for coho salmon at a reach scale. The reaches are defined as areas with homogenous channel constraint, flow, and gradient. Reach length is proportional to stream width. The smallest stream reach is approximately 50 meters long.

Using approaches discussed by Van Horne and Wiens (1991), gradient, channel constraint, and average annual stream flow were related to intrinsic potential through habitat suitability index curves specific to over-winter coho habitat. Reach-scale estimates for the three stream attributes were modeled in conjunction with the digital stream network. The strength of association between a stream attribute and fish-use is based on published literature (Sandercock 1991, Rosenfeld et al. 2000, Hicks 1990, Bradford et al. 1997, Reeves et al. 1998, Burnett 2001, Sharma and Hilborn 2001, Schwartz 1990, Nickelson 1998). Intrinsic potential in each reach is then expressed as the geometric mean of the valley constraint, mean annual stream flow, and gradient. Calculated intrinsic potential ranges from zero to one (or zero – 100%) with higher values indicating a greater potential to provide high quality rearing habitat.

Simply put, high quality winter habitat is provided by streams with low channel gradients (Schwartz 1990, Nickelson 1998, Rosenfeld et al. 2000), high interaction with flood plains (low valley constraint) (Hicks 1990, Bradford et al. 1997, Reeves et al. 1998, Burnett 2001, Sharma and Hilborn 2001), and small tributaries to mid-sized rivers (Sandercock 1991, and Rosenfeld 2000). The rating provides a measure of "intrinsic potential". Intrinsic potential clearly does not account for other habitat factors that relate to complexity such as large wood and cover or that would need to be considered when prioritizing restoration (e.g. is it highly urbanized?). Intrinsic potential does provide an index by which to evaluate the potential for a stream reach to have high quality winter habitat.



We classified streams and report our findings by three habitat types:

1. *All streams*: These streams approximate a densified version of the stream network found on a 1:24 thousand-scale, USGS map. Streams were modeled by CLAMS as described above.
2. *Coho streams*: Streams with a maximum gradient less than 7%, and no known downstream natural barriers.
3. *High Intrinsic Potential (High IP)*: Coho streams with a modeled IP rating greater than or equal to 80%.

## **Results**

### **ESU: Upland Forest Characteristics**

The percentages of the forested ESU in conifer and hardwood diameter classes are shown in Figure 8. Conifers are more common than hardwood or mixed stands comprising approximately 74% of the ESU. Mixed stands comprise about 16% and deciduous stands about 10% of the ESU. Small and medium diameter trees are the most common (50% and 36% respectively) totaling 86% of the ESU. Large diameter hardwoods comprise less than 1% of the forested stands and large diameter conifers about 13%. Large-diameter mixed stands comprise about 1%. This trend is consistent by monitoring unit as well.

The land use and cover categories in Table 1 were further reduced into seven categories: Agriculture, Private forest, Federal Forest, State Forested, Urban, Wetland and Other. There are approximately 7 million acres within the Coastal Coho ESU. The majority falls into two classifications: federal (37%) and private (37%) forested ownership (Table 2 and Figure 2).

### **ESU: Land Use and Land Cover for Riparian Areas**

The trend in land use and land cover is similar for riparian areas (land base within 200 feet on each side of a stream) along all stream types as it is for the ESU uplands (Table 3). Again, the majority of land use and land cover is classified as Federal (35%) and private forest (38%). However, the trends are different in riparian areas along streams classified as containing coho or having high intrinsic potential for coho habitat (streams with inherently the greatest potential for high quality coho habitat referred to as HIP coho streams).

Along coho streams and HIP coho streams federal forest land use and cover drop to the third most common classification with 19% and 8% respectively (Table 3). Private forest ownership remains constant with about 39% (most common) of riparian land use and cover along coho streams while agricultural use and cover increases to 25%, the second most common. Private forest and agricultural classification are the most common along HIP streams with about 39% and 37% respectively (Figures 3 and 4).

**Table 2. ESU land use and land cover summaries.**

Land use/Land Cover Class	Total Acres	Percent
Federal Forest	2,600,126	37%
Private Forest	2,592,795	37%
Agriculture	939,314	13%
State Forest	622,132	9%
Urban	212,565	3%
Other	59,751	1%
Wetlands	10,909	<1%
Grand Total	7,037,592	100%

**Table 3. Percent of riparian areas by habitat classification in given land use land cover classes.**

Land use/Land Cover Class	All Streams	Coho	HIP
Private Forest	38%	39%	39%
Agriculture	13%	25%	37%
Urban	2%	7%	10%
Federal Forest	35%	19%	8%
State Forest	10%	8%	4%
Other	1%	2%	2%
Wetlands	0%	0%	1%
	100%	100%	100%

**Monitoring Units: Land Use and Land Cover for Riparian Areas**

The trends observed in riparian areas at the ESU scale are similar for Monitoring Units with exceptions as noted below. In general Federal Forest ownership is highest along all streams and declines along coho and even more along HIP coho streams. Conversely, agricultural land use/land cover classification is lowest along all streams and increases along coho and then again along HIP coho streams (Figures 5, 6, 7, and 8). Private forested riparian areas remain fairly consistent through stream habitat types and across monitoring areas, with the exception of the Umpqua.

**North Coast**

*All Streams.* Of all the monitoring areas, state forested riparian areas are by far the most common in the North Coast monitoring areas. State and private forested riparian areas are most common along the all-stream classification (40% and 39% respectively). Federal forested riparian areas are the third most common, but still only account for about 13% of all streams with decreasing prevalence along coho streams. Riparian areas with agricultural cover and use only account for about 4% of all streams.

*Coho Streams.* Private forested riparian areas remain prevalent and, unlike the ESU as a whole, are more common than other land use/land cover classes along coho and HIP coho streams (to 47% along both stream habitat classes). However, the prevalence of state forested land decreases along coho streams (28%) and then again along HIP coho streams (12%).

Agricultural cover and use accounts for about 25% of the riparian acres along HIP coho streams, the second most land use and cover. Urban areas comprise about 14% of riparian areas along HIP coho streams. The other land use and cover classes are fairly uncommon along coho streams (1-8%).

#### Mid South Coast

*All Streams.* Federal and private forested riparian areas are the most prevalent along all streams (23% and 57%). Agricultural cover and use in riparian areas is the next most common with about 10% of the acreage.

*Coho Streams.* Agricultural and private forested riparian areas are the most prevalent along coho streams with about 23% and 48% respectively. Federal ownership accounts for about 12% of riparian acreage along coho streams. The prevalence of agricultural ownership and cover increases along HIP coho streams. Approximately 38% of riparian areas along HIP coho streams were classified as agricultural use or cover and 36% as private forested. All others account for less than 10%.

#### Umpqua

*All Streams.* Of all the monitoring areas, the Umpqua has the greatest percentage of federal and agricultural ownership along all streams. About 47% of riparian areas are classified as federal forests along all streams. The second most common is private forested (26%) followed by agricultural (22%).

*Coho Streams.* This monitoring area has the greatest percentage of agricultural ownership along coho streams than any other monitoring unit. Agricultural cover and use was the most common classification along coho and HIP coho streams, 45% and 62% respectively. Federal and private ownership are the second most prevalent along coho streams comprising about 24% and 21%, respectively. Private forested riparian areas comprise about 18% of HIP coho streams, second most common after Agricultural.

#### Mid-South

*All Streams.* Private and federal forested riparian areas are the more common (44% and 45%) than other land uses and covers in the all-streams habitat type. All other cover and use types comprise less than 10%.

*Coho Streams.* Federal and Private forested riparian areas comprise 30% and 50% respectively of coho streams, while Agricultural ownership is the third most common with only 10%. Private forest ownership is the most common for HIP coho streams in this monitoring area (51% of riparian acres) with agricultural and federal riparian areas comprising 22% and 16% respectively.

### ***Discussion and Conclusions***

Upslope vegetation patterns are primarily a function of frequency, size, shape and distribution of harvest activities which in turn reflect policies and ownership. Ownership and vegetative cover patterns demonstrate a reduction in mature forest conditions outside an expected natural range. We estimate that forest cover in the ESU is primarily small (33%) and medium (28%) coniferous (74%) forest. Old-growth forests are currently estimated to be at low levels relative to historical times. Researchers have estimated that old growth forests probably accounted for 25-75 percent of the total forested land base prior to European settlement Wimberley et al. (2000). Today old growth forests are estimated at about 6% of the coastal landscape with another 30% in late successional stage (Spies et al 2002). We estimate that 13% of the forested ESU is covered with large conifers. These older forests are concentrated on federal and state ownership while younger forests (0 to 40 years old) occur on private forestland. These younger forests exclude growth of understory or shrubs and lack other key habitat elements such as snags and downed wood.

We explored current land use and land cover in the near stream area and estimate that nearly 35% and 38%, respectively, of riparian areas are within federal and private forest cover and use. However, the percent federal ownership drops dramatically along coho streams (19%) and in particular High IP streams (8%). Conversely the agricultural cover and use increases along coho streams (25%) and High IP streams (37%). These ownership patterns are important because riparian management strategies vary by ownership and have evolved over time.

For forested uses, leaving riparian buffers along streams is now a common approach to protecting aquatic habitat. However, the practice is generally less than 20 years old. Prior to the early 1970's there were no regulatory requirements for the retention of riparian vegetation. With the implementation of the Oregon Forest Practices Act in 1972, minimal buffers were required on forestland streams "important for fish." By the mid-1980's more substantial buffers that required retention of some conifers were in place for streams "important for fish" on forestland. It was not until 1994 that riparian management areas requiring substantial conifer retention were in place for "all fish-bearing streams." Requiring riparian management areas along "all fish-bearing streams" versus just streams "important for fish" likely increased streams receiving riparian protection on private forestlands by 30 percent. As discussed in the introduction, riparian management under federal and state forest plans is even more restrictive. These changes occurred even more recently (within the last 10 years).

For agricultural areas water quality protection measures occurred even more recently. A water quality management plan guides activities in agricultural areas. The following elements are included in each plan:

- Description of geographical and physical setting
- Identification of water quality concerns in the area and beneficial uses of water that are adversely impacted
- Water quality goals and objectives.
- Measures necessary to achieve goals and objectives.
- Implementation schedule for necessary measures.
- Guidelines for public participation process, including state and local government roles and responsibilities.
- Guidelines for evaluation, review, and update of the plan.

In addition to water quality management plans, ODA provides leadership and technical expertise for weed control programs throughout the state. Next to habitat lost to land development and transformation, invasive species may pose the greatest threat to the survival of native biota in the United States.

The coho assessment concludes habitat complexity, particularly with regard to large wood and over-winter habitat, remains one of the highest risks to coho viability (ODF&W 2005 Part 4C). This paper demonstrates that streams with a high intrinsic potential to provide winter habitat for coho are predominately in private forest and agricultural ownership. Historically there has been a great deal of emphasis on management along forested streams. These results suggest that while that is important, at least for winter coho habitat, riparian management along agricultural streams is equally important. While agricultural practices have recently changed to incorporate practices to address water quality, management activities in the near stream areas are still more restrictive on private forest land than on agricultural land.

If a common goal is to prioritize coho production, the state might consider providing incentives for private forest and agricultural landowners to invest in habitat improvement projects along these streams and to manage streamside areas to provide the range of conditions that are likely to promote high quality coho habitat into the future. These findings are consistent with Burnett et al. (DRAFT 2005). The authors used intrinsic potential habitat models and evaluated land use and cover within 300 feet of the stream. Draft conclusions suggest that widespread recovery of coho salmon depends on habitat improvement in high-intrinsic-potential reaches on private lands. The authors point out that agriculture and development are projected to continue near high-intrinsic potential reaches, increasing the importance of effectively addressing non-point sources pollution from these uses (Burnett et al. Draft 2005). We suggest that while the initial focus might be on the high intrinsic potential streams, it will also be important not to lose sight of watershed processes and the effect that upstream practices have on downstream reaches.

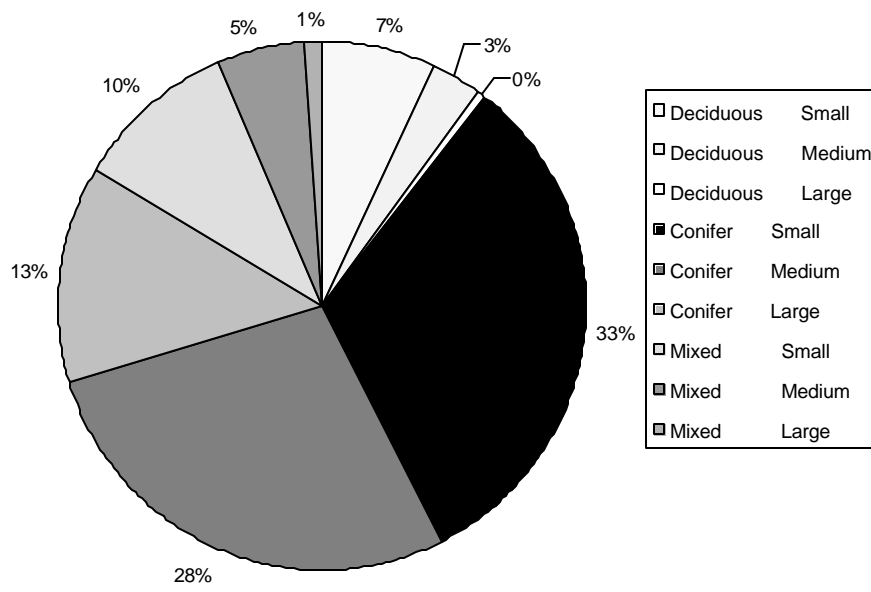


Figure 1. Forest cover characteristics within the coastal coho ESU.

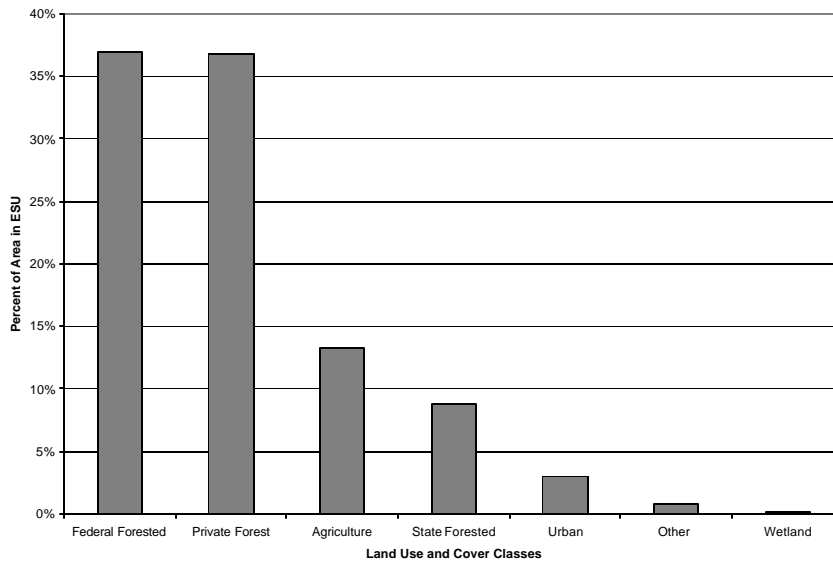


Figure 2. Percent of ESU in given land use/ land cover class.

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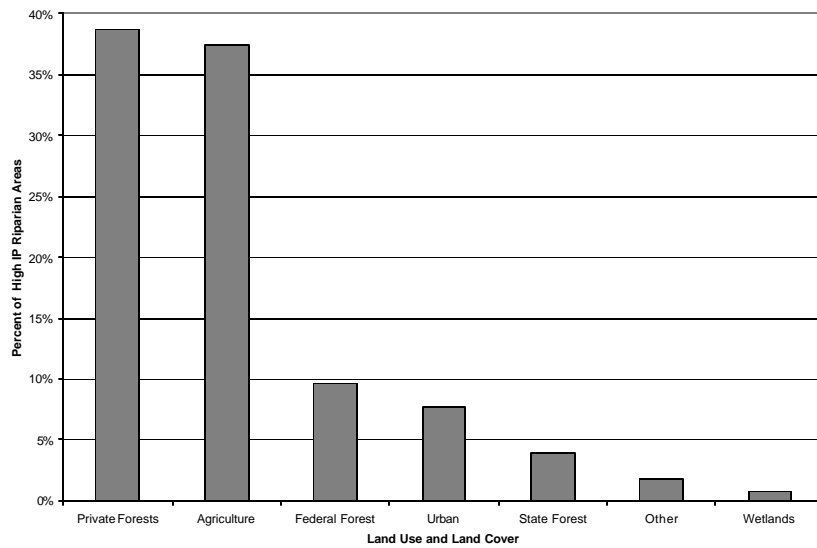
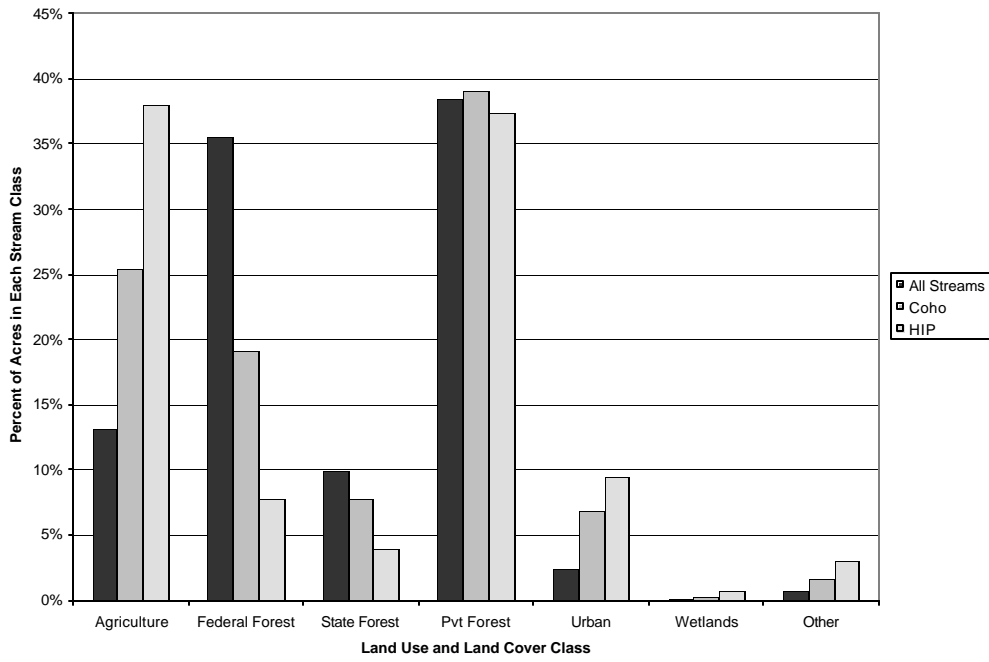


Figure 3. Percent of riparian areas (within 200 feet of each side of the stream) along high intrinsic potential streams in given land use/land cover classes.

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**Figure 4. Percent of acres in habitat classifications for the given land use/land cover classes.**



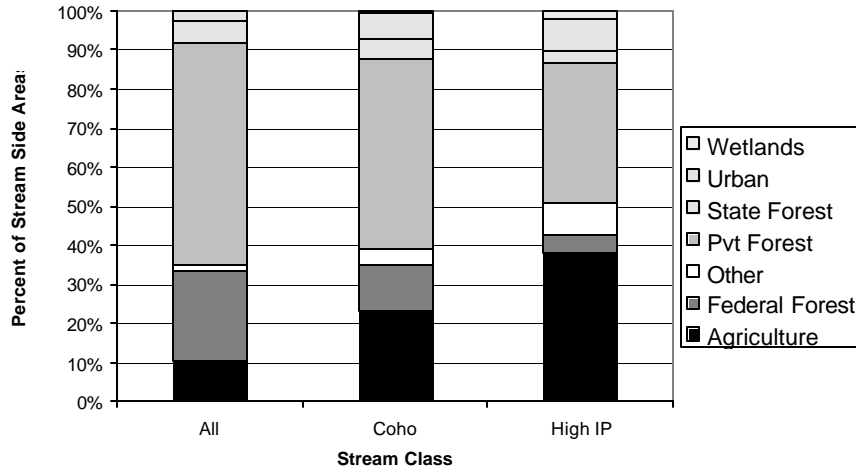


Figure 5. Mid South Coast land use and cover for riparian areas.

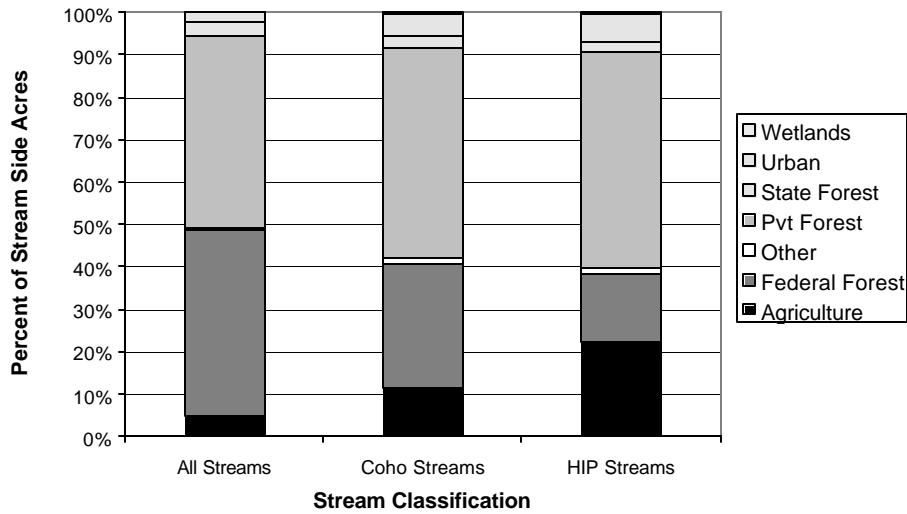


Figure 6. Mid-Coast land use and cover for riparian areas.

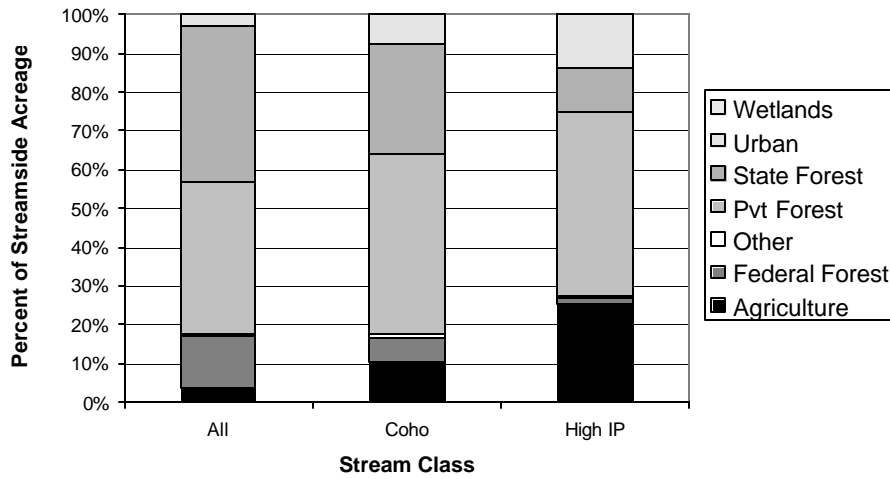


Figure 7. North Coast land use and cover for riparian areas.

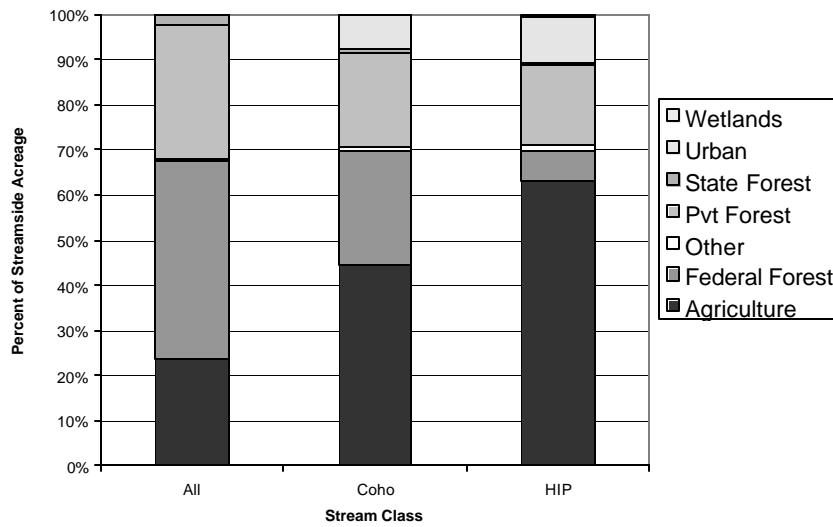


Figure 8. Umpqua land use and cover for riparian areas.

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