Section VII. W.

Old Growth/Riparian Management Emphasis Network

Network Development Process
Wall Ecosystem Analysis

Kathryn M. Boula, Wildlife Biologist
David Crabtree, Fisheries Biologist

September 1995

I. Background:

The Federal Guide for Watershed Analysis includes guidance for the delineation and management of old growth and riparian habitat "reserves". PACFISH includes general standards for protection of aquatic/riparian resources in eastern Oregon. Conservation of old growth and riparian habitats was addressed at the "landscape" scale for the entire Wall drainage, including all 15 subwatersheds within National Forest lands. At this scale, we sought to integrate existing Forest Plan and Regional direction with current understanding of ecosystem function and the habitat needs of riparian and old growth-associated animals and plants. The rationale and process used to develop a proposed old growth/riparian habitat network in the Wall drainage are outlined below.

II. Network Goal and Objectives:

The goal of this process was to develop a network of habitats that could contribute both now and in the future to the long-term viability of old growth and riparian habitats and the local populations of species dependent on those habitats. These species in turn contribute to the continued function of the forest ecosystem, and to the overall biological diversity of aquatic and terrestrial communities. The boundaries of the individual units within the network are viewed as permeable, both spatially and temporally, recognizing that old growth plant and animal communities have and will shift over time and space. The network should reflect and encompass this dynamic process. (See map, Figure 1)

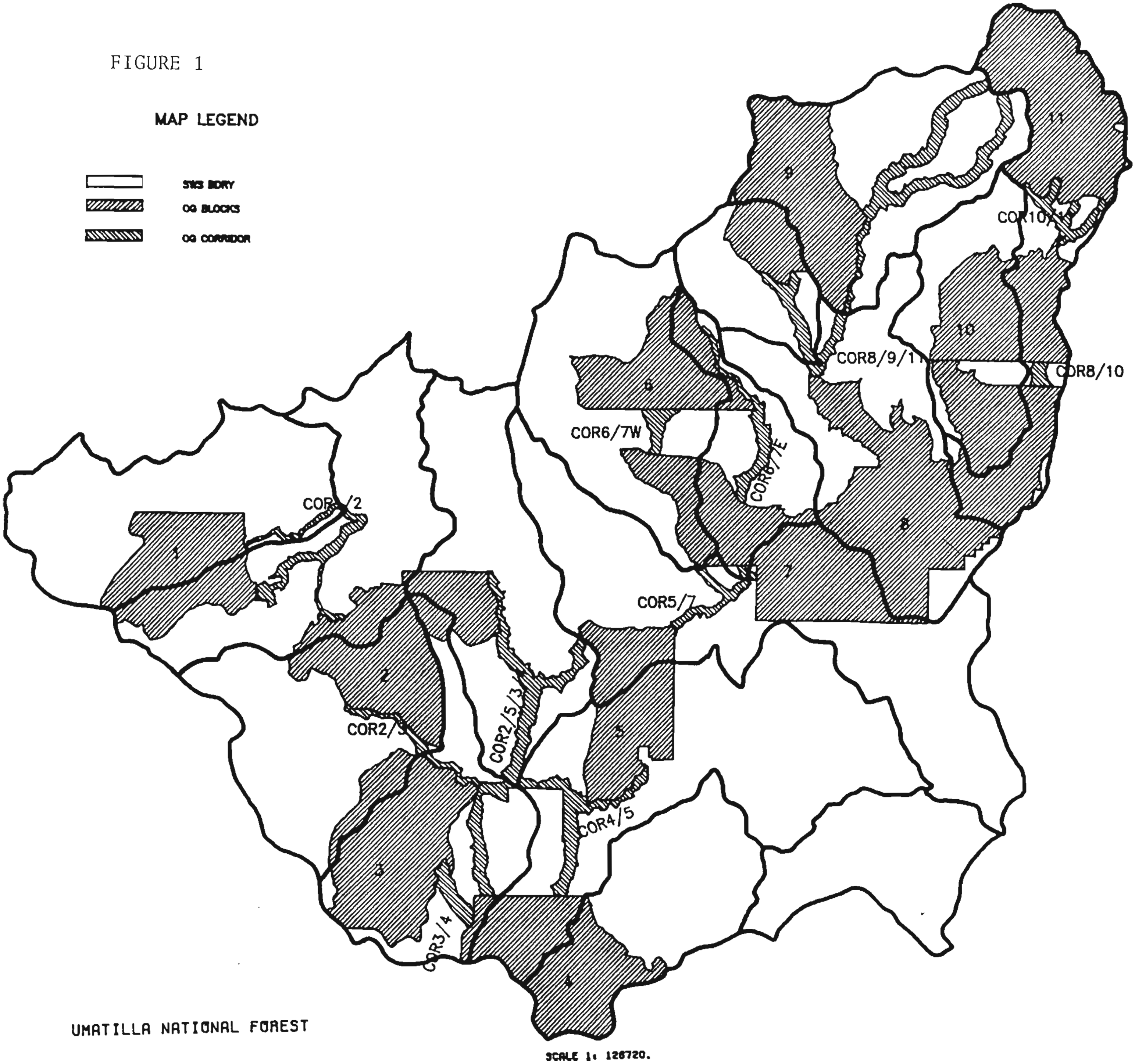
The objective of this effort was to identify, map, and draft management proposals for a combined network of Riparian Habitat Conservation Areas (RHCAs) and old growth forest habitats. The ultimate products of this exercise include spatially-displayed management opportunity areas within the network blocks, along with suggested management plans. Restoration needs are prioritized, and in some cases area-specific management prescriptions are offered.

III. Riparian Habitat Conservation Areas:

One of the major purposes of watershed analysis with regard to fisheries and watershed concerns is to develop site-specific recommendations for the delineation and management of RHCAs at the watershed scale. For this analysis, the general approach to riparian management proposed in the PACFISH EA for the Columbia Basin was fine-tuned to best suit the Wall watershed. This analysis provides some stream- and reach-specific management recommendations for RHCAs, but in general, this fine-scale level of riparian management is best accomplished at the project level. This analysis also provides considerations for setting RHCA boundaries at the project level as well as management recommendations for RHCAs that are generally applicable throughout the Wall watershed.

WALL ANALYSIS AREA – OLD GROWTH NETWORK

FIGURE 1



Riparian management goals and objectives:

Both PACFISH and the Forest Plan define riparian areas as portions of the watershed where riparian-dependent resources, such as fish, wildlife, invertebrates, water, and riparian vegetation, receive primary emphasis. **The primary goal of riparian management is to maintain or restore healthy, natural function and processes of riparian ecosystems.** All activities and projects in riparian areas should be evaluated for their consistency with this goal. More specifically, healthy, natural riparian functions and processes mean maintaining or restoring water quality, stream channel processes, sediment regimes, instream flows, wetland and meadow water tables, riparian vegetation that provide high quality habitat for fish and other riparian-dependent species.

PACFISH, the Umatilla/Malheur national forest technical working group (1993), and the proposed Umatilla Forest Plan amendments (1994) contain objectives for riparian and aquatic habitat features (e.g., pool depth and frequency, large woody debris frequency, channel stability, etc.). While these objectives are useful for evaluating the condition of riparian and aquatic habitat, they should not be considered ends in themselves. Healthy watersheds contain a diversity of habitats and a corresponding range of values for specific habitat features. That diversity and range are not represented by a single value. Secondly, there are insufficient reference reaches in largely unaltered condition with available habitat data representative of streams in the Wall watershed to establish watershed-specific objectives for these features. Until that information is available, the basinwide objectives developed for the Blue Mountains by the technical group (1993) and those contained in PACFISH direction should be used to evaluate habitat conditions and guide management activities. For example, stream survey data may indicate a reach is deficient in large woody debris. However, if we are managing the forest in that reach in a manner that is consistent with natural processes, such as vegetative composition, fire regime, insects, etc., then the system should be moving towards the goal and objective or riparian management for future recruitment of large woody debris and other associated functions (e.g., shade) whether that means the large woody debris component at some later point in time is 50 pieces/mile or 100 pieces/mile for that reach.

The final design of RHCAs should also meet goals presented in the Federal Guide (pg. 45):
-Ensure that all species of concern are adequately protected
-Adequately consider the roles of riparian areas in the overall landscape pattern and function
-Provide flexibility for forest management practices to the degree compatible with the above goals.

The Umatilla Forest Plan includes two allocations of primary importance to fish habitat; C5--Special Riparian, and C7--Anadromous Fish emphasis. Numerous C5 corridors are located along perennial streams in the Wall analysis area. No C7 allocations occur within the watershed.

Riparian corridors serve an even broader function than providing aquatic habitat; they also contribute to a continuum of habitats that connect the aquatic and terrestrial components of a fully-functional ecosystem:

AQUATIC---> AQUATIC-RELATED---> TRANSITIONAL--->
TRAVEL/DISPERSAL---> TERRESTRIAL CONNECTIVITY

Some specific aspects of this continuum that should be considered in the design of RHCAs include:

-habitat needs and distribution of aquatic, riparian-obligate and riparian-associated species
-the role of riparian vegetative structure and composition as habitat for terrestrial vertebrates
-slope, channel and bank stability
-base and peak flow

-the importance of woody debris in aquatic systems, and it's recruitment and transport through the system
-the effect of low-order riparian systems on downstream processes
-travel corridors/migration routes/habitat connectivity for both aquatic and terrestrial animals

Dimensions

PACFISH and the criteria for the Eastside screens define the widths of RHCAs as the following:

1. **Fish bearing streams**: the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet, including both sides of the stream channel), whichever is greatest.

2. **Permanently flowing non-fish-bearing streams**: the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet, including both sides of the stream channel), whichever is greatest.

3. **Ponds, lakes, reservoirs, and wetlands greater than 1 acre**: the body of water or wetland and the area to the outer edges of the riparian vegetation, or to the extent of the seasonally saturated soil, or to the extent of moderately and highly unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond, or lake, whichever is greatest.

4. **Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides, and landslide-prone areas**: includes features with high variability in size and site-specific characteristics. At a minimum it must include:

a. the extent of landslides and landslide-prone areas,

b. the intermittent stream channel and the area to the top of the inner gorge,

c. the intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation, and

d. for Key Watersheds, the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest;

e. for watersheds not identified as Key Watersheds, the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one-half site potential tree, or 50 feet slope distance, whichever is greatest.

In **non-forested rangeland ecosystems**, the interim RHCA width for permanently flowing streams in category 1 and 2 is the extent of the 100-year floodplain.

FEMAT defines inner gorge as a stream reach bounded by steep valley walls that terminate upslope into a more gentle topography.

To date, RHCA boundaries have been determined solely by stream class, ignoring other RHCA definitions that are more ecologically and functionally site-specific. To be successful, RHCAs need to be fitted to the landscape, incorporating considerations for topography (e.g., slope breaks), changes in vegetation, steepness, soils, and other ecological factors, rather than relying strictly on arbitrary linear measurements. This should be accomplished using an interdisciplinary approach integrating the knowledge and experience of fish and wildlife biologists, hydrologists, soil scientists, botanists, and silviculturists as well as resource use specialists (e.g., timber, range, recreation, mining). It should also be recognized that the PACFISH/screen dimensions are specified as **minimums**.

We are not aware of any scientific basis for setting different RHCA dimensions for fish-bearing vs. Non-fish-bearing streams. To the contrary, we believe there is strong rationale for treating perennial streams similarly, regardless of their fisheries status, particularly where stream temperatures are of concern (see the Eastside Scientific Panel Report 1994). The basis for the two-tree-height or 300 ft. dimension for fish-bearing streams was based on the need for one tree height (150 ft.) for woody debris recruitment, shading, nutrient input, other direct riparian influences on streams plus an additional tree height (150 ft.) as a buffer to maintain riparian microclimate conditions (FEMAT 1993). Thus, if two tree-height RHCAs are needed to maintain riparian functions and conditions, this should hold true for all perennial streams regardless of the presence of fish. This also recognizes the importance of riparian areas for all riparian-associated species, not just fish.

A recommended change from PACFISH/screen RHCA definitions is the inclusion of springs, seeps, and wet areas, which should be protected with a RHCA of 1 site-potential tree height or a minimum of 100 ft. from the wet area. These can be important cold water sources and moist habitats in a watershed that is characterized by high stream temperatures and relatively dry conditions.

IV. Old Growth Habitat Emphasis Areas

The availability of old growth habitat within the Wall drainage has declined dramatically since the turn of the century, particularly in the ponderosa pine plant association group (PAG). The overall percentage of stands dominated by firs has increased: however, in the northeastern portion of the analysis area, older stands in the fir PAGs have experienced serious levels of insect infestation, with some stands having almost complete mortality among the grand and Douglas-firs. Under the Forest Plan C1 network, very little active management would actually have been feasible, given the comparatively small and widely dispersed acreage of the reserved areas. Management emphasis was on retaining the remaining stands of old growth, but with little or no provision for the movement of individual old growth stands in and out of the forest landscape over time. While areas "capable" of supporting old growth forest were delineated, no site-specific management plans have been implemented to begin to move these areas toward functional old growth. Given the current scarcity of viable habitat, the limited management opportunities available under the current network, and the growing number of old growth associated species on the Sensitive species list, the objectives for a revised old growth network were to:

-identify all known old growth stands within the drainage
-delineate a network that included as much of the remaining old growth as possible, so as to retain the maximum degree of flexibility and the most options for both connectivity and management

-determine the status of each old growth stand in terms of current old growth quality, stand structure, incidence of spruce budworm, and mortality levels
-integrate the resultant old growth network and it's management with identified RHCA corridors
-minimize, where possible (given the overall goals) conflicts with existing Forest Plan allocations

Process:

The delineation of old growth emphasis areas involved a stepwise approach. Our first questions were "where should habitat blocks be placed?", closely followed by "how large should blocks be, and how far apart?" to achieve the long-term goal of viable habitats and viable animal populations. An ideal approach to these questions would have been to use species guilds to help model our network (Mellen et al. 1994). However, at the time of this analysis, guild information was not available. As a proxy for guild analysis, the network was modeled largely on the habitat needs of the pileated woodpecker, a Management Indicator Species for the Umatilla NF. The pileated woodpecker was chosen for several reasons: it's status as an MIS, it's dependence on old growth forests and large home range size, it's recent inclusion on the **draft** Region 6 Sensitive Species list, and because there are recent, well-documented research findings for this species in the Blue Mountains. Two other old growth-associated species, the goshawk and the marten, also occur within the Wall drainage. Both species have reported home ranges even larger than that of the pileated woodpecker, but unlike the woodpecker, little local information for either species is available on which to base a network. Available information about goshawks and martens, in terms of territory size and preferred habitat types, was incorporated into the network design as much as possible (see Section VII. V. for description of goshawk and marten habitats).

A. Location and size of Old Growth Emphasis Areas:

Each Old Growth Emphasis Area was centered on a cluster of three potential pileated woodpecker home ranges, as described by Bull and Holthausen (1993). All areas formerly identified in the C1 grid were initially included in the new clusters.

1. First, all areas of old growth and mature forest from GIS "existing condition" layers, within a 2-mile radius of a selected C1 were identified. These areas became the building blocks of the old growth network, as well as the centers of potential pileated woodpecker "nest blocks". We then identified an additional area of the most mature forest available immediately outside the nest block. The resulting area (target acreage was 900 acres) comprised one pileated woodpecker management area, based on the home range estimates and recommendations of Bull and Holthausen. When delineating nest blocks and home ranges, we attempted to maximize the degree of habitat connectivity and minimize the degree of habitat fragmentation within the blocks.

2. The next step was to identify two additional 900-acre home ranges close to the initial block described above. To avoid loss of habitat effectiveness due to excessive overlap, the three home ranges should be 1 to 1 1/3 miles apart, but no closer than 3/4 miles. The resulting cluster of three potential home ranges should be as "blocky" in shape as possible. Long, linear segments of habitat, such as riparian buffers, will not provide nesting habitat for pileated woodpeckers unless they are very wide (>900 feet total width), and not fragmented by harvest units (FEMAT Report 1993, Table VE-1). Buffers may, however, provide foraging habitat for pileateds and nesting habitat for smaller woodpeckers, if they include interior habitat.

3. Grand fir and mixed conifer plant communities were the first priority for selection of nest blocks in the southern and eastern portion of the drainage, where these plant associations are consistent with NRV. In the northern and western portions of the drainage, particularly in the Lane and Fivemile Creek watersheds, many stands historically dominated by ponderosa pine are now predominantly fir. In these areas, we concentrated on inclusion of stands with the best old growth structural components, regardless of current PAG.

4. Upon review in the field, it is likely that NONE of the nest blocks identified in this exercise will meet all of Bull and Holthausen's recommendations. There simply are few remaining blocks of old growth large enough to encompass an entire 900-acre territory. In situations where we could not identify 900-acre blocks having at least 40 percent old growth and the remainder in at least mature forest, we delineated all the available acres of suitable habitat within a 2.2 mile radius of the area, and added acres of capable habitat (to be managed towards a suitable state) to meet the 900-acre objective.

The resulting habitat clusters met minimum criteria of 2,700 acres in size, with each cluster encompassed within a 2.2 mile radius of the area center, and a maximum edge to edge distance of 5 miles (in order to facilitate juvenile dispersal and genetic diversity). Total acres included in the proposed network are listed by Forest Plan Allocation in Table 1. Figure 2 illustrates differences in total acres and structural composition between the current and proposed networks.

Table 1. Total acres, by Forest Plan allocation, included in Old Growth Management Emphasis Network (including connective corridors).

FP Allocation	Total Acres	% of OG/RHCA Network
A3	229	0.5
A4	547	1.0
A6	97	0.2
C1	1,897	4.1
C2	83	0.2
C3	10,218	22.0
C4	5,970	12.8
C5	2,509	5.4
C8	5,246	11.3
E1	18,271	39.3
E2	1,421	3.1

Comparison of Forest Structural Stages and Proposed Old Growth Network

Structural Stage	% of Forested NF Acres in Wall Anls Area	Struc Stage % w/n Network
Late/Old	28%	34%
Middle	50%	44%
Early/Middle	11%	10%
Early	1%	1%
Very Early	9%	11%
Wall Anl Area	99%	100%

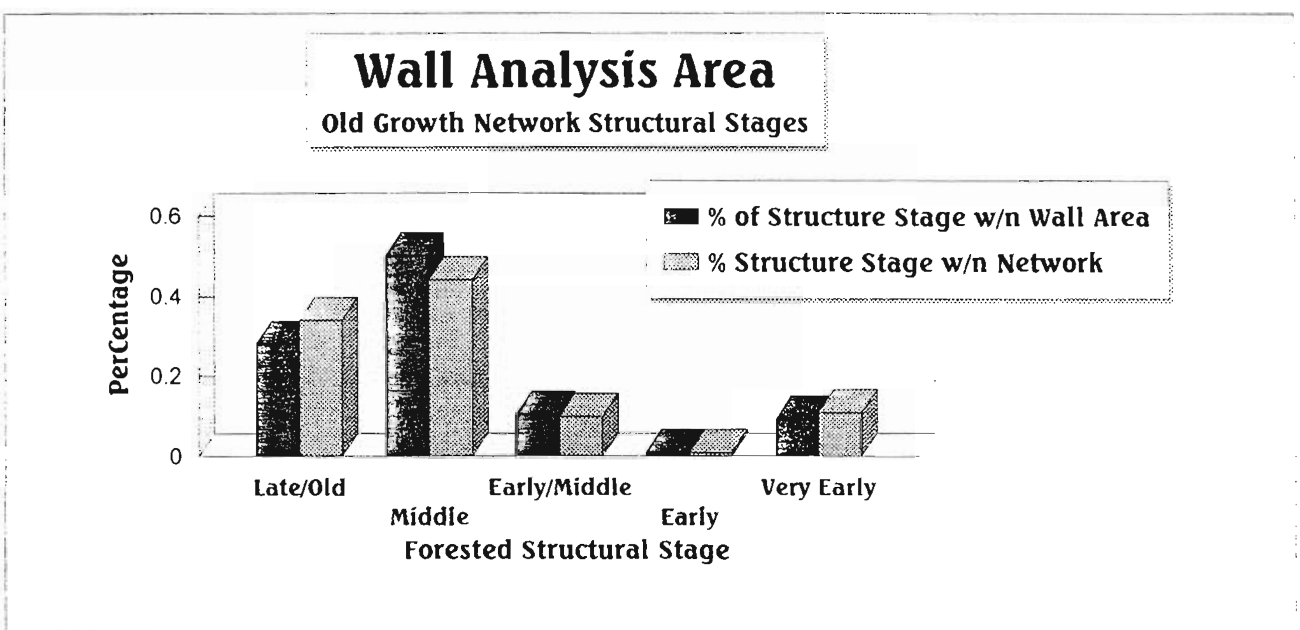


Table 2. Comparison of existing and proposed Old Growth Networks

Structural Stage	Currently Forested NF Acres	% of Current Forested NF Acres	Forest Plan Acres of C1/C2 (%)[2]		Acres Within Proposed Network (%)[3]		% of Ac. Network by Struct. Class
A	B	C	D	E	F	G	H
L/O	23,519	28.1%	1,693	(7.2)	15,318 [4]	(65.1)	34%
M	42,754	50.1%	1,889	(4.4)	19,972	(46.7)	44%
E/M	8,863	10.6%	57	(0.6)	4,780	(53.9)	10%
E	882	1.0%	21	(2.4)	547	(62.0)	1%
VE [1]	7,814	9.3%	58	(0.7)	4,955	(63.4)	11%
Total [5]	76,018	100%			45,592	54.4	

1 VE total WS acres may be over-estimated by 10-15%, these acres are not included in "currently forested" estimates.
2 Column D/B - within the proposed old growth/RHCA network
3 Column G - percent of forested acres by structural class within network
4 Note that only 20% of the currently forested NF acres are late/old structure located within the proposed old growth network. Also, little or no late old structure is believed to exist in the watershed on non-NF lands. The amount of L/O structure within the proposed network is only 11.7% of the total landscape.
5 Total "forested" acreage does not include VE acres.
(%)=% of total currently forested NF acres in Wall Analysis Area

Rationale/Justification:

The large blocks of habitat and relatively wide connective corridors delineated in this proposal were intended to begin to move the drainage back towards historic proportions of structural stages and plant association groups. Moreover, by delineating large blocks, more options are retained for active management that can speed the development of old growth structure in "capable" areas. Larger blocks lend themselves to more of a landscape approach, and allow managers to move away from "managing at the minimum" for single species: a concept that has proven ineffective and inordinately expensive. Where Roadless areas coincided with effective block location (block 8, Skookum Roadless Area), all or most of the Roadless area was included in the block. This resulted in an exceptionally large block, however, management direction for network blocks and Roadless areas was seen as closely compatible.

Based on review of the 1937 map, approximately 75 percent of the Wall drainage was covered with mature or old growth forests after the turn of the century. The proposed network includes approximately 46,890 acres (including riparian connective corridors); 61 percent of the approximately 76,018 **currently forested** acres in the drainage, and roughly 37 percent of the entire drainage acreage. (NOTE: the approximately 7,815 acres of "very early" structural stage in the watershed were not included in calculations of "currently forested" acres, since they do not function as forested habitats). Only about 15,000 acres (31%) of the proposed network acres are currently in the late/old structural stage. A breakdown of acres by structural stage for the proposed network is found in Table 3.

Table 3. Old Growth/Riparian Network Composition

Block No.	Total Acres	L/O Ac. (%)	M Ac. (%)	E-M Ac. (%)	E Ac. (%)	VE Ac. (%)
01	2,783	1,801 (65)	491 (18)	144 (5)	17 (.6)	330 (12)
02	4,105	1,765 (43)	1,988 (48)	135 (3)	0	216 (5)
03	3,866	1,990 (51)	1,664 (43)	91 (2)	0	121 (3)
04	3,482	1,535 (44)	1,688 (48)	173 (5)	0	86 (2)
05	2,518	994 (39)	1,147 (46)	251 (10)	0	126 (5)
06	2,412	171 (7)	1,035 (43)	256 (11)	2 (.1)	951 (39)
07	4,292	1,511 (35)	913 (21)	1,294 (30)	236 (5)	347 (8)
08	6,972	1,100 (16)	2,801 (40)	1,673 (24)	95 (1)	1,303 (19)
09	3,965	1,747 (44)	1,950 (49)	57 (1)	8 (.2)	203 (5)
10	2,585	167 (6)	1,446 (56)	506 (16)	12 (.5)	455 (18)
11	3,805	1,358 (36)	1,644 (43)	57 (1)	121 (3)	625 (16)

Connectivity between old growth blocks was addressed primarily through the delineation of wide riparian buffers. While these corridors should provide adequate habitat for movement of most species from one block of old growth to another, few of them are wide enough to provide suitable reproductive habitat for old growth-associated species, due either to the high degree of edge, or the high level of fragmentation from streamside roads, harvest units, and/or natural openings. Where roads were present on both sides of a stream, corridor width was increased in an effort to lessen the impacts of vehicular disturbance and edge. Corridor widths beyond the minimums were delineated in stream "reference reaches" (upper Skookum and lower Wilson Creeks) and in stream reaches with especially serious temperature or erosion problems. Riparian corridors which receive known heavy use as movement/migration corridors by elk were also considered for wider corridor protection.

V. Integration of Old Growth and Riparian Networks

Old growth and RHCA "layers" resulting from the above processes were overlaid in GIS to arrive at a combined old growth/riparian network, and the entire network reviewed relative to the habitat continuum described in Section III above.

Recommendations and Example Prescriptions

Overall Management Objective: Within the network, manage riparian areas to achieve riparian and PACFISH objectives and manage forested areas to achieve and maintain at least 50 percent of its structure as late/old at any point in time. The network areas will be large enough to provide for management opportunities that incorporate the natural changes in structural stages that occur over time.

Riparian Management

PACFISH contains standards and guidelines for management of RHCAs. The following recommendations are suggested modifications and additions to those standards that best achieve the riparian goals and objectives for the Wall watershed.

General Recommendations

In terms of aquatic resource concerns, RHCAs can be divided into two zones: the inner zone of approximately one tree height (150 ft.) that directly affects stream habitat and an outer zone of one tree height that maintains riparian conditions, such as reducing desiccation from edge effects and maintaining moist soil conditions for riparian vegetation. Thus different management strategies to achieve different objectives for those two zones may be appropriate. The risk of potential adverse effects of management activities on stream habitat will likely be greater within the inner zone. Consequently, management within that area should be more conservative.

Riparian management consists of protection (i.e., maintaining natural processes and riparian habitat features and avoiding alteration of those processes) and restoration, where natural processes and riparian conditions have been altered by management. Most of the riparian habitat in the Wall watershed has been altered in some way (e.g., timber harvest, grazing, roads, fire suppression), and riparian restoration is greatly needed. Some restoration techniques, such as fixing or obliterating roads in riparian areas, are fairly straight-forward. Other restoration approaches, such as vegetation manipulation, are more uncertain, particularly in riparian areas.

Timber

PACFISH S&G's call for no timber harvest or firewood cutting in RHCAs except for salvage from catastrophic events, for example the spruce budworm infestation that has occurred in some riparian areas in the NE portion of the Wall watershed. The key criteria for the appropriateness of salvage and silvicultural activities in RHCAs is to be consistent with meeting riparian management goals, to be undertaken in areas where risks of effects that are counter to achieving riparian management goals are minimal, to have clear advantages over other alternatives (i.e., riparian recovery through natural processes), and to be treated as experimental until there is evidence to support their effectiveness. An experimental approach requires that activities be carefully designed and monitored, and that they be undertaken on a small scale until their effectiveness can be determined. It should also be acknowledged that so-called "catastrophic events", such as fire, insect outbreaks, and blowdown from windthrow, are natural processes that have beneficial ecological functions (e.g., creating snags, input of large woody debris to streams).

In the Wall watershed, consideration of existing conditions and the above criteria suggest that salvage would be most appropriate in riparian areas where fir has encroached into fire-resistant community types. Additional culture of conifer and perhaps hardwood species may be needed in RHCAs where past timber harvest activities have altered the vegetative composition. Analysis of proximity of harvest units to streams can be used to identify potential areas for possible treatments.

Roads

Because of the substantial adverse impact of roads in riparian areas, PACFISH S&Gs call for minimizing roads and landings in RHCAs. Existing roads in RHCAs should be the highest priorities for obliteration or rehabilitation to reduce sediment delivery, improve fish passage, restore natural hydrologic paths, etc. Analysis of the proximity of roads to streams completed for this assessment should be used to identify potential areas for treatment. No new roads should be planned in RHCAs.

Although some roads in the watershed have been closed because of riparian and watershed concerns, most have been closed to meet forest plan objectives for elk habitat management. Closing or repairing additional roads would be beneficial to watershed conditions (e.g., closing roads with native surface that increase fine sediment delivery to streams during wet conditions). Closing other roads may actually result in increased impacts to streams since those closed roads continue to intercept and alter surface and subsurface flows, and drainage systems of closed roads are not maintained as frequently as open roads, thereby increasing sediment delivery in some cases. Potential road closures should, therefore, be reviewed on a case by case basis. Continuing watershed impacts of some closed roads need to be reduced. Specific recommendations for road closures are included by subwatershed in Chapter 6.

Grazing

Most of the public and private land in the Wall Analysis Area is used for livestock grazing. If riparian management goals and objectives are to be achieved, it is essential that grazing be carefully managed and monitored. This and previous analyses have documented extensive high water temperatures within the drainage. Various studies (e.g., Meehan 1991) have linked livestock grazing in riparian areas to increased stream temperatures through loss of shade and widening and shallowing of channel cross section through bank degradation (i.e., trampling and vegetative changes). Wet meadows are important cool water storage areas, such as the upper Alder, Skookum, and Swale systems, where there are numerous meadows. Many of these meadows have changed over time from wet meadows to dryer sites with diminished water storage capacities, which in turn has contributed to lower summer flows and high summer temperatures. Livestock grazing appears to have contributed to this change. Meadows and lower gradient streams in the upper portions of the watershed, and other cool water sources, such as springs and seeps, and streams with relatively larger summer flow capacities (and, therefore, greater effect on water temperatures) should be subject to continued restoration and protection from grazing impacts.

Grazing of sheep and cattle in the Wall watershed began in the late 1800s. Thus it would be necessary to have data prior to the turn of the century to determine pre-grazing water temperatures. These data do not exist, however, the historic and continued presence of cool water species (steelhead trout) suggests that water temperatures were once cooler than they are today. Whether proposed temperature objectives for steelhead can be achieved watershed-wide is uncertain, however some stream reaches have temperatures close enough to the objectives to make these goals.

Data from utilization surveys and livestock exclosures indicate that hardwood growth and recruitment has been suppressed from grazing by both livestock and big game. While fish and other riparian-dependent species probably co-evolved with populations of deer and elk, present high numbers may be slowing riparian recovery under current degraded conditions, and the combined impacts of large numbers of big game and livestock has been substantial in some locations. Restoration attempts should include monitoring; a relatively simple technique for assessing the relative levels of damage attributable to livestock or wild ungulates would be to place video cameras in unfenced areas adjacent to exclosures.

Much of the riparian habitat restoration accomplished to date in the Wall watershed has been through the use of fenced exclosures. While riparian exclosures have been effective (Beschta et al. 1991), they are expensive to construct and maintain as a sole approach to grazing management in all of the areas where they are needed. Other approaches should also be examined. PACFISH standards call for adjusting grazing practices (e.g., season, numbers) to eliminate impacts inconsistent with riparian objectives. Changes in grazing practices can require considerable planning and are usually accomplished through allotment management plan revision, although they can also be made through changes in annual operating plans, given sufficient notice to the permittees. Limited funding has been available for AMP revisions for the past several years. Biological evaluations have been completed for two of the four AMPs within the analysis area; however, they only address PETS species, such as redband, which have very limited distribution in the watershed, and do not include other riparian-associated species. The specific mitigation measures needed to protect those species may include changes in grazing practices.

Fire and Fuels

Management activities since the 1970s have greatly changed the role of fire in the watershed. As in upland areas, fire suppression and heavy grazing prior to 1930s reduced the frequency of fires and likely increased the density of vegetation. Timber harvest and subsequent site preparation, for replanting, and road construction have also altered natural fuel loading and fire potential in riparian area. Tree mortality from recent insect infestations have also increased fuel loading and the potential for more intense fires in riparian areas, particularly in the Alder, Upper Skookum, and Upper Swale subwatersheds.

The risk of potential impacts to streams from wild fires must be weighed against the risks associated with possible impacts and uncertainties of treatments to reduce fire potential. This situation is complicated by high stream temperatures, the precarious status of some species, and the resulting reduced resiliency of those species and their habitats to buffer the effects of disturbances such as fire. The conclusion of this analysis was that the risk of potential detrimental effects to riparian management objectives of harvest treatment alternatives outweigh the risks of potential intense fire activity impacts to riparian areas.

A sizeable portion of the Wall Analysis Area has been subject to prescribed underburning over the last decade. Additional underburning is recommended . Fisheries and watershed mitigation requirements for these burns should include case by case assessments of: 1. use of natural fire breaks, roads, and blacklines and avoidance of tractor-created firelines to minimize soil disturbance and sedimentation; 2. limiting underburning in RHCAs to ponderosa pine community types on class 4 streams and the outer zone of the RHCA (i.e., > 150 ft. from the stream) for Class 1-3 streams; and 3. ponds, springs other wet habitats should be protected with no-burn buffers.

Old Growth Management and Restoration

Past manipulation of old growth stands in the Wall drainage has resulted in reduced viability and increased vulnerability to drought, insects, disease and wildfire. The likelihood of intense fire is high in some areas (blocks 9 and 11), while in others, the proportion and distribution of existing old growth is insufficient to provide long-term suitable habitat. In many blocks, current plant community composition is inconsistent with the area's HRV. Restoration needs and opportunities in the old growth blocks should be prioritized based on the following considerations.

A. Restoration Needs Assessment:
For each Old Growth Emphasis Block, determine the following:

1. Plant Association Group (PAG) acres
2. Acres in each structural stage
3. Degree of edge/fragmentation
4. Range of Variability for PAGs and structural stage within the block and subwatershed, determine if and how far above/below HRV
5. Overall stand condition: is this a viable stand?

Consider: -# live trees per acre
-presence/absence of viable canopy layers
-species composition of remaining live trees

6. Availability of snags, large woody debris, and green replacement trees
7. Existing road system density and condition
8. Availability and condition of connective corridors

B. Treatment Priority:
Once blocks have been assessed for treatment need, determine priority for treatment/management:

1. What is the priority for treatment based on current and future habitat condition for upland and riparian animal species in the area?

2. What silvicultural priorities were assigned to stands within the block? (refer to HRV document)

3. Is the area occupied by Sensitive or Management Indicator Species? If so, additional coordination/integration needed.

C. Management Prescription:
Develop prescriptions aimed at restoring/enhancing old growth structure and appropriate species composition. Prescriptions may include combinations of burning, salvaging, thinning, or removal of slash. In many cases, lack of need, time or finances will dictate that no immediate action occur.

D. Additional Considerations: In order to meet the objectives of restoring/maintaining old growth within the management blocks **management prescriptions should meet the snag, down log and green tree replacement levels recommended by Bull and Holthausen (1993).** Overall, management within the network should result in **no net increase in road density.** Riparian road densities should show a net decrease.

When prescribing treatments for blocks, the interaction of old growth blocks, riparian habitat corridors, and other connectivity corridors must also be considered. It may be helpful to develop prescriptions that incorporate all the blocks in the northeastern, central and southwestern portions of the analysis area simultaneously. Once "block" prescriptions are complete for each of these three "subdivisions", review all three together, to ensure connectivity is enhanced/maintained. This analysis showed that the northeast portion of the study area (watershed 26) is the highest priority for restoration treatments at this time. Further review for connectivity to old growth habitats outside the Wall boundaries will also be necessary for a comprehensive landscape approach.

Old Growth Emphasis Block - Treatment Example

The following is an example of how the above considerations could be implemented in the management of the Upper Little Wall Old Growth Block (# 6).

The Upper Little Wall block encompasses 1,472 total forested acres. The ranges of variability for each PAG, by structural stages, are:

Table 4a

	VE	E	EM	M	L/O
PIPO	1-5	5-10	5-10	15-30	40-70
WABGR	1-5	5-10	5-10	15-30	40-70

This translates to the following acreages of "appropriate" PAGs and structural stages for block #6:

Table 4b

	VE	E	EM	M	L/O
PIPO	.5-2	2-3	2-3	5-10	14-24
WABGR	12-58	58-115	58-115	173-345	460-805
TOTAL	12.5-60	60-118	60-118	178-355	474-829

In 1937, essentially **all** the forested acres within the area of block 6 were in mature to old growth condition in ponderosa pine.

The management goal for this area would be to restore or maintain between 474 and 1,500 acres of old growth, a range which incorporates the full spectrum of possible historic old growth percentages. For this example, 750 acres (approximately 50% of the total block) was chosen as the minimum management target.

Existing structural stage distribution was determined by querying the Paradox vegetation database. Results of those queries were:

Existing late/old structure with appropriate species composition:	50 ac
Existing late/old structure with inappropriate species composition:	64 ac
Total late/old structure	114 ac
Existing middle structure with appropriate species composition:	696 ac.
Existing middle structure with inappropriate species composition:	208 ac.
Total middle structure	894 ac.

These results indicate a shortage in late/old acres, compared to HRV (474-829 ac.), 1937 acres (approx. 1500) and the identified objective (750 ac.). Middle structure acres appear to be in excess of HRV (e.g. total existing middle structure acs. (894) - maximum HRV for middle structure (355)=539 acres beyond maximum HRV). Conversion of the 64 late/old acres having inappropriate species composition may be feasible through a combination of traditional silvicultural practices, such as thinning from below and prescribed burning. This would still leave a deficit of approximately 636 acres of late/old structure, even if all the "inappropriate" acres were successfully converted (750-acre target - 114 acs. of now "appropriate" old growth structure). Commercial thinning in the middle structure to reduce density levels and concentrate growth on the remaining trees, could accelerate movement of these stands into late/old structure. By treating the 539 acres of "excess" middle stage, it may be possible to increase the acreage of late/old forest in block 6 to 653 acres within the next 25-50 years, a definite improvement, but still below the 750-acre minimum target, and well below 1937 levels of old growth forests.

LOWER SWALE, BLOCK #8:

The Lower Swale block (#8) includes 7,237 total forested acres, and is the largest of the network blocks, owing to the inclusion of the Skookum Roadless Area. The ranges of variability for each PAG (%), by structural stages, are:

Table 5a

	VE	E	EM	M	L/O
PIPO	1-5	5-10	5-10	15-30	40-70
WABGR	1-5	5-10	5-10	15-30	40-70

This translates to the following acreages for block #8:

Table 5b

	VE	E	EM	M	L/O
PIPO	4-19	19-39	19-39	58-116	154-270
WABGR	24-120	120-240	120-240	360-721	961-1682
TOTAL	28-139	139-279	139-279	418-837	1115-1952

In 1937, approximately 4,300 acres within the area of Block #8, or 76% of the forested acres within the block area were in mature to old growth condition in ponderosa pine.

The goal for management of this area would be to restore or maintain between 1,115 and 4,300 acres of old growth, a range which incorporates the full spectrum of possible historic old growth percentages. For this example, 3618 acres (approximately 50% of the total block) was chosen as the minimum management target.

Existing structural stage distribution was determined by querying the Paradox vegetation database. Results of those queries were:

Existing late/old structure with appropriate species composition: 430 ac.
Existing late/old structure with inappropriate species composition: 243 ac.
Total late/old structure 673 ac.

Existing middle structure with appropriate species composition: 109 ac.
Existing middle structure with inappropriate species composition: 1271 ac.
Total middle structure 1380 ac.

These results indicate a shortage in late/old acres, compared to HRV (1115-1952 ac.), 1937 acres (4300), and the identified objective (3618 ac.). Middle structure acres appear to be in excess of HRV (1380-837=443 acres beyond maximum HRV). Conversion of the 243 late/old acres having inappropriate species composition may be feasible through a combination of traditional silvicultural practices, such as thinning from below (prescribed burning may be difficult, as much of this block is located in the steep canyons along Swale Creek, with most of the old forest concentrated in the riparian corridors). This would still leave a deficit of approximately 2,945 acres of late/old structure, even if all the "inappropriate" acres were successfully converted (3618 acs. target - 673 acres "appropriate"old growth = 2,945 ac.). Commercial thinning in the middle structure to reduce density levels and concentrate growth on the remaining trees could accelerate movement of these stands into late/old structure. By treating the maximum number of acres of "excess" middle stage (443 ac.), the maximum possible increase in late/old forest acreage in block #8 over the next half century would be to approximately 1,116 acres (673 ac. existing old growth + 443 treated middle ac); only one-third of the 50 percent minimum target of 3,618 acres.

UPPER SWALE, BLOCK #10:

The Upper Swale block (#10) includes 2,132 total forested acres. The ranges of variability for each PAG (%), by structural stages, are:

Table 6a

	VE	E	EM	M	L/O
PIPO	1-5	5-10	5-10	15-30	40-70
WABGR	1-5	5-10	5-10	15-30	40-70

This translates to the following acreages for block #10:

Table 6b

	VE	E	EM	M	L/O
PIPO	2-9	9-17	9-17	26-52	69-120
WABGR	18-90	90-180	90-180	270-541	721-1261
TOTAL	20-99	99-197	99-197	296-593	790-1381

In 1937, approximately 2,400 acres within the area of Block #8, more than 100 percent of the **currently** forested acres within the block area were in mature to old growth condition in ponderosa pine. The acreage difference may be an indication of previously forested areas that no longer support stands of trees.

The example goal for management of this area would be to restore or maintain between 790 and 2,400 acres of old growth, a range which incorporates the full spectrum of possible historic old growth percentages. For this example, 1066 acres (approximately 50% of the total existing forested acres within the block) was chosen as the minimum management target.

Existing structural stage distribution was determined by querying the Paradox vegetation database. Results of those queries were:

Existing late/old structure with appropriate species composition:	0 ac.
Existing late/old structure with inappropriate species composition:	163 ac.
Total late/old structure	163 ac.
Total middle structure	1306 ac.

These results indicate an extreme shortage in late/old acres, compared to HRV (790-1381 ac.), 1937 acres (2400), and the identified objective (1066 ac.). Middle structure acres are again in excess of HRV (1306-593=487 acres beyond maximum HRV). Conversion of the 163 late/old acres having inappropriate species composition may be feasible through a combination of traditional silvicultural practices, such as thinning from below. Prescribed burning may not be appropriate (at least in the immediate future) due to high fuel levels. This would still leave a deficit of approximately 900 acres of late/old structure, even if all the "inappropriate" acres were successfully converted. Commercial thinning in the middle structure to reduce density levels and concentrate growth on the remaining trees, could accelerate movement of these stands into late/old structure. By treating the maximum number of acres of "excess" middle stage (1306-296=1010), the maximum possible increase in late/old forest acreage in block #10 would be to approximately 1,173 acres. It appears then that the 50 percent late/old target may actually be attainable in the Upper Swale block.

The above examples can be further refined using UTOOLS to highlight treatment priorities spatially, according to the following steps:

1. Create base map of block, showing acres of "appropriate" old growth, print on paper at largest possible scale
2. Create a series of overlays (on film) of locations of acres of "inappropriate" old growth and middle structure, at the same scale, and overlay on paper map

Areas of "inappropriate" species composition can then be prioritized, while at the same time being able to spatially identify potential areas of conflict (i.e., riparian buffers, steep slopes, etc.)., and more efficiently field validate proposed treatment needs and techniques. This process will be accomplished by District personnel in the Implementation phase.

As with all treatments in the old growth riparian blocks, the actions recommended here should be closely coordinated among fisheries and wildlife biologists and silviculturists. **These Recommendations assume complete field review of each old growth block by the stewardship team early in the planning process.**