

WATERSHED MANAGEMENT APPROACHES TO IMPLEMENTING SOLUTION

Long-term and short-term management for sustainable resources will restore and maintain a healthy ecosystem for vertebrae species and all other Wallowa County residents. However, to restore this ecosystem, we must understand the parameters of its components and practices that are compatible with it. To develop a successful plan, cumulative effects of practices must be considered, as well as long-term goals and short-term requirements.

The resource-based aspects of Wallowa County's economy, ranching, timber harvest, farming, and recreation, all have much to gain by modifying some practices or establishing new parameters so that sustainable timber harvest, grazing, and irrigated crop production can continue in Wallowa County for future generations. Sustainable practices are already utilized by a substantial portion of Wallowa County resource managers.

GENERAL APPROACH

Overall Action

The general public should be educated about overall vertebrae species habitat requirements and reasons for the actions taken and then be allowed to comment.

The effectiveness of all actions taken to benefit vertebrae species should be monitored and modified or terminated if not necessary or effective.

Privately Held Lands

Landowners should be educated about beneficial and detrimental effects of land use on vertebrae species.

Information about governmental and private funding sources to help correct habitat problems and implement solutions suggested in the recovery plan should be provided to landowners.

If funding is limited, funds should be directed first toward correcting high priority problems.

Cost share (and possibly other) incentives for landowners should be provided to those who maintain and enhance watershed conditions and overall environmental quality. See appendix C for cost-share funding sources.

Publicly Held Lands

A coordinated and cooperative effort among agencies should be the focus to make sure efforts at implementing solutions are not duplicated or left out.

Adequate funding for implementation of solutions necessary for watershed enhancement needs to be assured.

Public agencies need to work with adjoining private landowners and other agencies to provide continuity between ownerships in management and monitoring.

Management Tables

The tables in this discussion show general approaches for the management of specific resources or activities. A single management approach can potentially address several interrelated habitat problems. For example, a livestock management approach that encourages buffer strips adjacent to streams would in effect help to (1) manage livestock to enhance fisheries habitat, (2) protect vegetative cover, (3) maintain healthy riparian plant communities, (4) increase riparian shading to preserve cool water temperatures, etc. Solutions to specific problems have been categorized and are listed by identifying number in Appendix B.

Each table consists of a list of management approaches in the first column and the solutions that would be addressed by that approach in the second column. Numbers in the second column identify the solutions listed in Appendix B.

WATER

The availability of clean, high quality water is a key component of good salmon habitat. Salmon have evolved and adapted to the natural flow conditions of the area which are generally (1) high flows in March through July (depending on elevation) due to melting snowpack and (2) moderate to low flows at other times. The lower natural flows are good for salmon spawning, incubation, and rearing. Higher flows are needed to assist migration and remove fine sediment buildup from streams.

On some reaches of streams in the County, irrigation and stock water diversions during low flow times remove enough water to eliminate rearing habitat and make passage impossible for migrating salmon.

The goal for water management is to cooperate with water-right holders and governmental water conservation/management agencies (e.g. Natural Resources Conservation Service (NRCS), Soil and Water Conservation Districts (SWCDs), Oregon Water Resources Division (OWRD), and the Bureau of Reclamation (BOR)) to find ways to supply water needed for salmon habitat. Some ways of potentially finding water to supplement low flows include irrigation conservation measures, adding irrigation impoundments to replace stream diversions during low flow, and leasing water rights during late season flow (i.e., after the second cutting of hay). Additional water during

low flow times may be made available through improved forest management and control of tree densities.

Table 3 summarizes the suggested approaches for water management and the solutions that would be addressed.

Table 3.--Water Management	
Approach	Solutions Addressed¹
<ul style="list-style-type: none"> • Inventory all water withdrawals and irrigation return flows. 	16, 32, 20
<ul style="list-style-type: none"> • Support OWRD monitoring of water withdrawals to ensure that users remain within their legal water appropriations. (This may also benefit junior water-right holders during times their water rights are curtailed due to lack of water.) 	16
<ul style="list-style-type: none"> • Within existing law, purchase water during low flow times. (Private water right-holders are allowed to sell, lease, or donate water rights to be converted into instream purposes. The Endangered Species Act also allows purchase of water.) 	15, 22
<ul style="list-style-type: none"> • Water may be obtained through water that is "conserved" by development projects upstream, e.g.; impoundments, sprinkler systems, and pipelines 	16, 17
<ul style="list-style-type: none"> • Preserve shaded, iced snowpack (no large clearcut or overcutting) to avoid early melt and runoff (control tree densities and study to determine which tree densities provide the largest quantity and longest duration of snowpack) 	12, 13, 31
<ul style="list-style-type: none"> • Promote the installation of more efficient irrigation systems. 	16, 17

¹See Appendix B

FORESTS

The forest canopy intercepts precipitation. As much as 15 to 40 percent of precipitation remains in the forest canopy for some period of time. Precipitation intercepted by trees is subject to evaporation and transpiration, and this is recycled back into atmospheric water and possible future precipitation, rather than contributing immediately to ground water and streamflow.

Small forest openings may be beneficial to stream hydrology and salmonid ecology because they store more snowpack, increase groundwater supply, and release more groundwater to streams. Large clearcuts (greater than 40 acres) have detrimental effects which include early melting and release of water to streams which may result in higher peak or floodflows in the spring and lower flows later in the year. Lower flows can create high temperatures and other stress problems for fish, and less water for irrigation. Flow and environmental problems resulting from large clearcuts persist for 25 to 50 years.

Forest practices that produce roads and compaction may have negative impacts on salmonid ecology. On a healthy forest floor there is almost no overland flow. However, in roads and skid trails that have been devegetated and/or compacted, water

does not penetrate the ground as easily. The result is overland flow that may carry significant fine sediment and occasionally coarser sediment into streams.

Compaction from roads can also intercept movement of water through soil creating bogs and increasing pore pressure up-slope from the compacted strip. Where slopes are steep, and where fills are present and culverts small or plugged, failure of the road, fill, or slope, and the sudden, major input of sediments to a stream may occur. Subsoilers and rippers may eliminate the compaction problem but generally create additional sedimentation. The roadway can be seeded to grass with a range drill. This seeds and stabilizes the road, allowing road use for fire management or timber harvest.

Table 4 summarizes the forest management approaches related to tree density and fuel loads. Some of the approaches listed in tables of other management categories, e.g., roads, livestock, and campgrounds, also apply to forest management.

Table 4.--Forest Management	
Approach	Solutions Addressed
Tree Density	
<ul style="list-style-type: none"> Maintain appropriate average density of trees, e.g., 50-110 square feet basal area on south facing slopes and ridges 90-160 square feet basal area on north facing slopes 	2, 3, 10, 12, 13, 24
<ul style="list-style-type: none"> Promote early precommercial thinning. 	1, 2, 24
<ul style="list-style-type: none"> Emphasize selective logging practices where appropriate. 	10, 12, 13, 24
<ul style="list-style-type: none"> Encourage the orientation of created openings according to aspect, slope, alignment, and shape, to maximize shaded snow pack. 	10, 12, 13, 24, 2b, 2d
<ul style="list-style-type: none"> Encourage 40-50 percent shading (winter sun) at noon on 50 percent of the forested watershed outside riparian areas. 	10, 11, 13, 24, 2a, 2b, 2d.
<ul style="list-style-type: none"> Encourage species diversity. 	10, 24, 2d
<ul style="list-style-type: none"> Encourage development of management plans for private landowners, e.g., Assistance from Oregon State Forestry Department Assistance from forestry consultants. Assistance from Oregon State Extension/Master Woodland Managers. 	Can address many solutions in plan
<ul style="list-style-type: none"> Shelter wood seed cut, shelter wood removal cut, irregular shelter wood, single tree selection, group selection, and clearcut. 	2a, 2c, 2d, 2e
<ul style="list-style-type: none"> Mechanical under thinning. 	1a

Table 4.--Forest Management (Cont.)	
Approach	Solutions Addressed
Fuel Loads	
<ul style="list-style-type: none"> Encourage land managers to maintain riparian fuel loads at not more than 35 tons/acre average. Some acres may have higher loads, and some may have lower loads depending on the intensity of fuel management. 	1, 2, 39, 42, 43, 58, 85, 87, 94, 97, 130
<ul style="list-style-type: none"> Encourage land managers to maintain upland fuel loads at an average of 25 tons/acre or less. Some acres may have higher or lower loads, depending on the intensity of fuel management. 	1, 2, 39, 130
<ul style="list-style-type: none"> Encourage land managers to harvest salvage as rapidly as possible while meeting environmental concerns such as adequate woody material recruitment for stream and riparian needs. 	1, 2, 39, 42, 43, 58
<ul style="list-style-type: none"> Encourage land managers to analyze fuels and fire potential ladder. Fuels and dense crowns contribute to crown fires. 	1, 2, 39
<ul style="list-style-type: none"> Encourage land managers to develop fire control corridors if time and resources are not available to treat the entire area. 	1, 2, 39, 59
<ul style="list-style-type: none"> Encourage land managers to select and place appropriate woody Material in upland areas, riparian area, and streams to benefit stream structure, replenish soil inventories, reduce soil movement, and reduce fire risks. 	58, 85, 86, 87, 108

RIPARIAN AREAS

Riparian areas, about 5 percent of Wallowa County's forested areas, are the most fragile and yet the most productive parts of a watershed. About 70 percent of the wildlife in a watershed either lives in or frequents the riparian zone. The intent of timber harvest in riparian zones should be to enhance watershed conditions.

A healthy stream is a stream with little bank exposed. Even during high water, the effect of riparian vegetation is to protect streambanks from erosion by floods and ice and to slow floodwaters and allow fine sediments to settle out, building soil fertility and thickness. The fine soils of the floodplain store water.

Establishment and preservation of woody vegetation along floodplains and in riparian zones is essential to a healthy stream system. Woody debris in the stream

provides hiding cover for small fish and nutrients for invertebrates that fish eat. Past practices removed woody debris from the streams. Approaches for riparian management are summarized in table 5.

Table 5.--Riparian Management	
Approach	Solutions Addressed
<ul style="list-style-type: none"> Encourage the design of riparian management to be site specific 	10, 20A, 20B, 28, 68, 89, 91, 108
<ul style="list-style-type: none"> Encourage relocation design of roads, trails, and campgrounds whenever possible. <ul style="list-style-type: none"> -Revegetate roads and trails with native grass species and/or non-native desirables. 	6, 7, 8, 11, 25, 36, 37, 38, 45, 47, 68, 115
<ul style="list-style-type: none"> Encourage hardened fords and bridges for crossing and watering points for livestock. 	25, 51, 92
<ul style="list-style-type: none"> Encourage fencing, electronic tagging, and creation of natural barriers to large animal use of critical spawning and rearing reaches. <ul style="list-style-type: none"> e.g., Develop and encourage alternatives to instream watering. 	8, 10, 25, 49, 50, 54, 68, 108
<ul style="list-style-type: none"> Provide shade for riparian areas to maintain optimum water temperature for salmon on a site specific basis: <ul style="list-style-type: none"> Good=60 percent and above Fair=40 percent to 60 percent Poor=40 percent and below 	10, 20A, 20B, 25, 28, 30, 85, 94, 108, 130
<ul style="list-style-type: none"> Encourage retention of snags and trees for future large woody debris. 	28, 94
<ul style="list-style-type: none"> Encourage revegetation and protection of existing vegetation on non-forested riparian areas with woody material. <ul style="list-style-type: none"> e.g., Educate land owners on value of streamside woody plants. 	10, 20A, 28, 30, 38, 49, 68, 85, 94, 108
<ul style="list-style-type: none"> Establish carrying capacities for campgrounds and trails. 	77, 25, 44, 46
<ul style="list-style-type: none"> Education by signing and brochures to fishermen and campers about use of riparian zone. 	48, 71, 130
<ul style="list-style-type: none"> Encourage design, implementation, and evaluation of grazing management systems. <ul style="list-style-type: none"> e.g., Manage late summer/fall use in riparian pastures. 	8, 10, 25, 28, 50, 68, 108
<ul style="list-style-type: none"> Limit future development in riparian zones, <ul style="list-style-type: none"> e.g., Avoid building on floodplains. 	26, 74, 90
<ul style="list-style-type: none"> Utilize Oregon Forest Practices Act for minimum protection standards. (The current FPA is in the process of being updated.) 	10, 28, 30, 39, 68, 94, 108
<ul style="list-style-type: none"> Encourage minimal impact methods for noxious weed control in riparian zone. <ul style="list-style-type: none"> e.g., Spot-spraying, pull by hand, biological control. Revegetate with thrifty competitive native species 	63, 64, 65
<ul style="list-style-type: none"> Use filter strips as appropriate. 	38, 54

LIVESTOCK

Properly managed, livestock grazing may be of benefit in riparian management. However, livestock near streams can cause a variety of habitat problems. Major problems are loss of riparian vegetation and water quality degradation.

Riparian vegetation provides shade for streams and protects banks. It is to the long term benefit of the landowner to maintain healthy riparian vegetation because the root systems of the shrubs and forbs in meadow areas and trees in other areas are a protection against bank erosion during high water. In some cases, several acres of ground have been lost to erosion during high water.

Livestock use can reduce water quality by increasing temperature through loss of shade, adding sediment, and adding fecal coliform bacteria. Improving water quality in some stream reaches is important for several reasons in addition to improving salmon habitat. Maintaining water quality is important in avoiding potential health problems for children and adults who use the water downstream for recreation.

The season, timing, frequency, duration and intensity of grazing use should be based on the physical and biological characteristics of the site. This should offer adequate cover (live plants, plant litter, and residue), vigorous plants, and proper root growth to promote infiltration, conserve soil moisture and maintain soil stability.

Approaches to livestock management are listed in table 6. Many of these approaches, while requiring a change in management practices, should benefit landowners over the long term by providing for the continued health and productivity of the land.

Table 6.--Livestock Management	
Approach	Solutions Addressed
General	
<ul style="list-style-type: none"> • Provide alternate water sources in both upland and riparian areas. 	8, 10, 11, 20A, 28, 50
<ul style="list-style-type: none"> • Use upland salting. 	8, 10, 11, 20A, 28, 50
<ul style="list-style-type: none"> • Study and monitor the use of seasonal grazing to enhance riparian conditions. 	8, 10, 11, 20A, 28, 50, 108
<ul style="list-style-type: none"> • Use well planned riparian fencing in spawning areas, e.g., <ul style="list-style-type: none"> -Let down type fencing. -Temporary electric. -Permanent fencing. 	8, 10, 11, 20A, 28, 50, 108

Table 6.--Livestock Management (cont.)	
Approach	Solutions Addressed
<ul style="list-style-type: none"> • Use approved educational processes through whatever means available, e.g., NRCS, OSU Department of Forestry and Extension Service. 	130
<ul style="list-style-type: none"> • Keep abreast of and use new technology such as electronic ear tags as it becomes available. 	50, 130
<ul style="list-style-type: none"> • Where beneficial, look at reorganization of pasture rotation as well as resource allocation between livestock and wildlife. 	20A
<ul style="list-style-type: none"> • Document early spring use by wildlife that occurs prior to turnout. 	9
<ul style="list-style-type: none"> • Use temporary fencing along rivers to prevent riparian damage during winter feeding periods. 	50
<ul style="list-style-type: none"> • Use BLM, USFS, SCS, ASCS, OSU Extension, and ODFW to provide coordinated monitoring. 	130
<ul style="list-style-type: none"> • Encourage rangeland revegetation. 	10, 57
<ul style="list-style-type: none"> • Monitor and control noxious weeds. 	63, 64, 65, 77
<ul style="list-style-type: none"> • Develop CRMP with USFS, BLM, NRCS, FSA, SWCD and ODFW. 	
<ul style="list-style-type: none"> • Use filter strips as appropriate. 	
<ul style="list-style-type: none"> • Use appropriate timing frequency, duration and intensity of livestock grazing. 	
Feedlots	
<ul style="list-style-type: none"> • Graze or feed livestock in or near riparian areas during the dormant season or early spring particularly at lower elevations. 	8, 9, 10, 20A, 28, 54, 55, 108
<ul style="list-style-type: none"> • Encourage buffer strips, and in some instances, earth berms adjacent to streams. 	8, 9, 10, 20A, 28, 54, 55, 108
<ul style="list-style-type: none"> • Encourage the planting of vegetation in filter strips, along streambanks and berms. Species selected for these plantings must be appropriate for the purpose or objective chosen. 	30, 108
<ul style="list-style-type: none"> • Encourage locating feedlots away from riparian areas whenever practical. 	8, 9, 10, 20A, 28, 50, 55, 108
<ul style="list-style-type: none"> • Encourage feeding in such a manner that the most decomposed material will be near the stream and the newest material will be farthest from the stream. 	8, 9, 10, 20A, 108
<ul style="list-style-type: none"> • Encourage the planting of shelter belts and the development of water away from streams and riparian areas. 	8, 9, 10, 20A, 28, 50
<ul style="list-style-type: none"> • Encourage livestock producers to consider visual aspects and public perceptions as they design feedlots and livestock handling facilities. 	130
<ul style="list-style-type: none"> • Encourage livestock producers to consider odor control, dust, and noise in relation to neighbors or the public's perceptions. 	130

<ul style="list-style-type: none"> Encourage cooperation with State and Federal agencies through incentive programs designed to improve habitat conditions and research projects that will turn problems into economic benefits. 	130
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WEEDS

A number of noxious, invasive, non-native weeds are spread throughout the county. These weeds can replace native vegetation and destroy ecological diversity. Root systems of many weeds do not provide the soil stability of native vegetation. As a result, an increase of weeds may increase soil erosion in riparian and upland areas.

One way that weeds spread is by seeds entering streams or ditches. Areas where the soil is exposed through logging, fires, and agricultural activities are conducive to infestation by noxious weeds. Reseeding after the Teepee Butte Fire introduced yellowstar thistle (*Centaurea solstitialis*) into that area because of a contaminated seed source. Other problem weeds include Russian knapweed (*Centaurea repens*), diffuse knapweed (*Centaurea diffusa*), spotted knapweed (*Centaurea maculosa*), and leafy spurge (*Euphorbia esula*), among a host of other nonnative plant species in the County.

The noxious weeds need to be aggressively controlled and eradicated if possible. Approaches to weed management are summarized in table 7.

Table 7.--Weed Management	
Approach	Solutions Addressed
<ul style="list-style-type: none"> Identify, map, and manage species on an ongoing basis with Wallowa County Weed Control Supervisor, BLM, USFS, and ODFW. 	66
<ul style="list-style-type: none"> Apply proper herbicides using licensed applicator. 	63
<ul style="list-style-type: none"> Use biological control or hand-pulling in areas where herbicides are inappropriate. 	64, 65
<ul style="list-style-type: none"> Monitoring should be ongoing. 	66
<ul style="list-style-type: none"> Work with Wallowa County weed control officer and committee. 	66
<ul style="list-style-type: none"> Use aggressive educational programs. 	130
<ul style="list-style-type: none"> Use new technology as it becomes available. 	66, 130
<ul style="list-style-type: none"> Replant native and/or desirable non-native vegetation. 	66

ROADS

Roads are an integral part of resource management and have many roles. They are particularly important in forest management where they play a key role as fire breaks and as means of quickly bringing firefighters and equipment to the fire.

Poorly designed, located, and maintained roads are a major source of sedimentation to streams. Other impacts can include loss of riparian shade and channelization due to drawbottom roads, increased surface runoff, decreased groundwater recharge, and potential chemical contamination.

The adverse impacts of roads in Wallowa County are not necessarily as severe as those in areas that have heavier rainfall such as western Oregon. Even so, Wallowa County roads need to be evaluated, designed, and maintained to handle the heaviest expected rainfall and runoff without excessive sedimentation.

The approaches outlined in table 8 are to be implemented to mitigate the adverse effects of roads on salmon habitat.

Table 8.--Road Management	
Approach	Solutions Addressed
<ul style="list-style-type: none"> • Develop a comprehensive County transportation plan. <ul style="list-style-type: none"> - Identify and map all existing roads in the County. - Identify non-essential roads and make decision to leave open, close with very limited use or obliterate. - Develop condition index for all existing roads, and bring substandard roads up to "use" standards or close. 	5, 6, 11, 34, 35, 36, 37, 38, 39, 40, 46, 51, 92, 108
<ul style="list-style-type: none"> • Evaluate draw bottom roads. <ul style="list-style-type: none"> -Identify draw bottom roads on County transportation map. -Determine total mileage and percent of total riparian area occupied by draw bottom roads. - Close draw bottom road wherever appropriate. 	5, 6, 11, 34, 35, 36, 37, 38, 39, 46, 52, 92, 108
<ul style="list-style-type: none"> • Temporary road/skid trail construction and maintenance. <ul style="list-style-type: none"> -Build to suit use; do not over build. -In small stream crossings it might cause less damage to the stream if hard ended fords were used instead of installing, then removing culverts. -Cover with slash if the road/trail will be used within 2 years. -Reseed with grass if the road/trail will be used within 2-20 years. - Plant trees or other suitable plant species if the road/trail will be closed for more than 20 years. -Ripping should be avoided unless no other option is available. 	5, 11, 34, 36, 39, 40, 46, 51, 92, 108

Table 8.--Road Management (cont.)

Approach	Solutions Addressed
<ul style="list-style-type: none"> • Criteria for maintenance of closed road. <ul style="list-style-type: none"> -Develop a County-wide definition of a "closed road." -Pull all culverts if a road is closed and not maintained. -Pull all culverts on obliterated roads. -Maintain all seasonally closed roads. -Use structures sufficient to effectively close road. 	38
<ul style="list-style-type: none"> • Road surface criteria <ul style="list-style-type: none"> - Permanent main-haul roads should be paved whenever practical. -Dust should be minimized through application of lignosulfonate, water, etc. -Surface material needed (i.e., pavement, gravel, or soil) would depend on the expected use, length of use, and, if temporary, the length of closure. Pavement would be preferred for high traffic permanent roads. Gravel would be preferred for medium traffic, permanent roads and for temporary roads that would have shorter closure times and would, therefore, not be replanted. Soil would be acceptable for minimum traffic roads that would have longer closure times, and would, therefore, be replanted. Local conditions will necessarily play an important role in choosing a suitable surfacing material. 	35
<ul style="list-style-type: none"> • Criteria for road placement. <ul style="list-style-type: none"> -Wet areas should be avoided. -Minimize erosion during construction. -Do not construct roads during the rainy season where overland flow (perennial or intermittent) is present. -Construct the road to the standard needed for the projected use. 	5, 6, 11, 34, 36, 37, 39, 46, 92, 108
<ul style="list-style-type: none"> • Criteria for road maintenance. <ul style="list-style-type: none"> -A maintenance plan and schedule should be developed for all roads. -Use of gravel and dirt roads would be minimized during the spring thaw, and the use of dirt roads would be minimized during the rainy season. -Draw bottom roads should not be graded toward the stream. -Culverts, water bars, and dips would be regularly inspected and immediately repaired as needed. 	34, 36
<ul style="list-style-type: none"> • Criteria for determining appropriate road grades. <ul style="list-style-type: none"> -Assess associated environmental effects to determine whether a steeper, shorter road might be more appropriate than a longer, lower gradient one. -Take into account slope, aspect, substrate, length, and type of use. 	5, 6, 11, 34, 36, 37, 46, 108

Table 8.--Road Management (cont.)	
Approach	Solutions Addressed
<ul style="list-style-type: none"> • Road drainage requirements. <ul style="list-style-type: none"> -Use an adequate number of relief culverts, water bars, or dips to prevent active erosional features from appearing on the road, and direct the outlet onto a suitable substrate (and/or filter strip) to minimize erosion down slope of the road. -Relief structures are generally needed for every five feet of elevation gain. -Out-sloping of the road may minimize the need for relief structures. 	5, 34, 36
<ul style="list-style-type: none"> • Use filter strips where appropriate 	34

FILTER STRIPS

Filter strips are managed areas of firmly rooted vegetation designed to slow sheet movement of water and intercept the sediment contained in the water. They can improve water quality by reducing movement of excess nutrients and other pollutants as well as sediment into streams. Filter strips can also help recharge the groundwater by intercepting water from roads, allowing the water to percolate into the ground.

Filter strips are effective in stopping or reducing sedimentation from a variety of sources including feedlots, agricultural fields, and roads. They are effective as field borders in reducing sheet erosion from bare, plowed fields. Located below relief culverts and dips on the downhill side of roads, they can be especially effective in reducing sediment movement.

Filter strips, as outlined in table 9, are a management tool that can be applied in resource management.

Table 9.—Filter Strip Management

Approach	Solutions Addressed																																																																																																																																				
<ul style="list-style-type: none"> Suggested minimum filter strip widths (NRCS). Considerations for designing a filter strip include type and quantity of pollutant, slope, soil type, drainage, vegetative species, etc. The chart below shows the width of filter strip in feet, based on slope (vertical drop in feet per 100 feet) and the length of the slope in feet. <p>Slope Length of Slope (feet)</p> <table border="1"> <tr> <td></td> <td>100</td> <td>110</td> <td>120</td> <td>130</td> <td>140</td> <td>150</td> <td>160</td> <td>180</td> <td>200</td> <td>300</td> </tr> <tr> <td>10</td> <td>14</td> <td>14</td> <td>14</td> <td>14</td> <td>14</td> <td>14</td> <td>14</td> <td>14</td> <td>14</td> <td>17</td> </tr> <tr> <td>12</td> <td>14</td> <td>14.5</td> <td>17</td> <td>17</td> <td>17</td> <td>18</td> <td>18</td> <td>19</td> <td>20</td> <td>22</td> </tr> <tr> <td>14</td> <td>14</td> <td>20</td> <td>20</td> <td>21</td> <td>21</td> <td>22</td> <td>22</td> <td>23</td> <td>24</td> <td>27</td> </tr> <tr> <td>16</td> <td>14</td> <td>23</td> <td>24</td> <td>25</td> <td>25</td> <td>26</td> <td>26</td> <td>27</td> <td>28</td> <td>32</td> </tr> <tr> <td>18</td> <td>14</td> <td>27</td> <td>28</td> <td>29</td> <td>30</td> <td>30</td> <td>31</td> <td>32</td> <td>33</td> <td>37</td> </tr> <tr> <td>20</td> <td>14</td> <td>32</td> <td>32</td> <td>33</td> <td>34</td> <td>35</td> <td>36</td> <td>37</td> <td>38</td> <td>43</td> </tr> <tr> <td>23</td> <td>14</td> <td>42</td> <td>43</td> <td>44</td> <td>46</td> <td>47</td> <td>48</td> <td>49</td> <td>51</td> <td>57</td> </tr> <tr> <td>30</td> <td>14</td> <td>54</td> <td>55</td> <td>57</td> <td>58</td> <td>59</td> <td>60</td> <td>62</td> <td>64</td> <td>73</td> </tr> <tr> <td>40</td> <td>14</td> <td>78</td> <td>80</td> <td>82</td> <td>84</td> <td>86</td> <td>88</td> <td>91</td> <td>94</td> <td>106</td> </tr> <tr> <td>50</td> <td>14</td> <td>105</td> <td>108</td> <td>110</td> <td>113</td> <td>115</td> <td>117</td> <td>122</td> <td>125</td> <td>142</td> </tr> <tr> <td>60</td> <td>14</td> <td>133</td> <td>136</td> <td>140</td> <td>143</td> <td>146</td> <td>149</td> <td>154</td> <td>160</td> <td>180</td> </tr> </table>		100	110	120	130	140	150	160	180	200	300	10	14	14	14	14	14	14	14	14	14	17	12	14	14.5	17	17	17	18	18	19	20	22	14	14	20	20	21	21	22	22	23	24	27	16	14	23	24	25	25	26	26	27	28	32	18	14	27	28	29	30	30	31	32	33	37	20	14	32	32	33	34	35	36	37	38	43	23	14	42	43	44	46	47	48	49	51	57	30	14	54	55	57	58	59	60	62	64	73	40	14	78	80	82	84	86	88	91	94	106	50	14	105	108	110	113	115	117	122	125	142	60	14	133	136	140	143	146	149	154	160	180	34, 50, 54
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<ul style="list-style-type: none"> Discourage intensive activities in areas which might need a filter strip that have over 5 percent slope. 	34, 50, 54																																																																																																																																				
<ul style="list-style-type: none"> Design and install settling basins between waste source and filter strip when more than 100-1,000 pound animal units are confined. Clean basin as needed. 	34, 50, 54																																																																																																																																				
<ul style="list-style-type: none"> Grass area filter strips shall be generally on contour and sufficiently wide to pass peak flow at a depth of 0.5 inches or less and provide a minimum of 15 minutes flow-through time. 	34, 50, 54																																																																																																																																				
<ul style="list-style-type: none"> Grass channel filter strips shall be designed to carry the peak flow at a depth of 0.5 feet or less and provide at least 30 minutes of flow-through time. 	34, 50, 54																																																																																																																																				
<ul style="list-style-type: none"> Filter strips on forest land should be at least 25 feet on slopes of less than 1 percent and proportionately up to 65 feet for 30 percent slopes and at least 150 feet for 70 percent slopes. Longer flow lengths should be used as contributing drainage areas increase. 	34, 50, 54																																																																																																																																				
<ul style="list-style-type: none"> Monitor performance and condition of filter strips. Rills and small channels should be minimized to maintain sheet flow through filter area. 	34, 50, 54																																																																																																																																				
<ul style="list-style-type: none"> Grazing in filter strip should be controlled to maintain vegetation in a vigorous condition. 	34, 50 54																																																																																																																																				
<ul style="list-style-type: none"> Installation of filter strips in riparian areas should avoid ground disturbance and removal of trees, stumps, brush, rocks, etc., and consequently may need to be larger than the minimum dimensions. 	34, 54, 108																																																																																																																																				

CAMPGROUNDS

Campgrounds can be areas of high impact to the adjoining lands and streams. Potential impacts include compaction of soils, devegetation of areas, removal of woody material, and removal of shade trees. Severity of impact is often directly related to intensity of use.

Campgrounds immediately adjoining streams are not compatible with the management of healthy riparian areas and are especially incompatible near salmon spawning areas where harassment of salmon can occur. The removal of "hazard" trees in campgrounds reduces stream shading and the availability of large woody debris for stream structure. Approaches to campground management are outlined in table 10.

Table 10.--Campground Management	
Approach	Solutions Addressed
• Move all recreational improvements at least 100 feet from streambanks.	45, 47
• Set barriers to restrict vehicles from the streambank.	36, 46, 47
• Educate through signing, news releases, and visitor contact.	48, 130
• Inventory campground/day use areas, identify problems and solutions.	46, 47
• Seasonal closures of campgrounds where necessary to protect holding and spawning reaches, e.g., dispersed areas, old fire rings.	44
• Develop in land-use plans the location and design of future campgrounds.	45, 46, 47
• Close (with order) dispersed sites within 100 feet of streambank.	45, 47
• Provide dust abatement throughout campground.	35, 36, 46
• Provide noxious weed control.	63, 64, 65
• Restore riparian vegetation.	11, 46, 49
• Establish carrying capacity for recreational areas.	7, 25, 44, 46