Chapter 6 - Landscape Objectives and Management Recommendations

One goal of ecosystem management is to understand natural ecological processes operating in an area, such as a watershed, so that resources can be managed to maintain the health, diversity and productivity of the ecosystem. A second goal is to meet human needs.

This chapter presents the integration of ecological processes and human uses in the Indian/Deadwood watershed and the subsequent development of management recommendations for federal lands. Some of the recommendations are also applicable to non-federal lands, where aquatic habitat restoration may be desired.

LANDSCAPE OBJECTIVES

The watershed analysis team identified the dominant natural processes and cultural influences in the watershed. These were used to guide development of landscape level objectives and patterns consistent with the Northwest Forest Plan. A synthesis of the natural processes and current conditions in the watershed led to identification of unique areas and areas of similar characteristics. These were delineated as Landscape Blocks with boundaries often following subwatershed boundaries (see Map 6.1). The team then identified some management strategies that could be used to reach the long-term objectives of the Landscape Blocks, given their current conditions.

Because the Forest has limited funds and time to apply to management of the Indian/Deadwood watershed, the Landscape Blocks were prioritized into three categories (low, medium, high) in terms of their importance for meeting the terrestrial and aquatic resource goals (priorities are shown on Map 6.1). In addition, a list of recommended management activities or projects was identified for each Landscape Block. These activities have been broken into two time periods (years 1-3 and years 4-10) to further help prioritize the work. The recommended management activities are listed in Appendix M.

This section summarizes the aquatic management assumptions and principles of conservation biology that were used to select landscape objectives and management strategies for the watershed. It then outlines the factors that drove the design strategies for each Landscape Block..

The main aquatic landscape objectives focus on protecting the highest concentrations of the best remaining aquatic habitat, especially anadromous salmonid habitat, and those areas that could provide good habitat quickly after improvements are conducted. These areas will tend to act as refugia where the habitat would be somewhat more resilient to disturbance than areas outside the refugia, and still be able to support fairly healthy runs of anadromous salmonids through times of disturbance. The areas outside the refugia have more long-term objectives of improving the stream function through management.

Conservation biology integrates the elements of distribution, number, size, configuration and connectivity to understand the function of habitat and species responses to habitat (USDA/USDI 1990). Five key concepts used are:

- Species that are well-distributed across their range are more secure over time than species confined to smaller portions of their range.

- Large blocks of habitat, containing potentially interacting multiple pairs of any species, are superior to small blocks of habitat with fewer individuals.

- Blocks of habitat that are closer together are better than blocks far apart.

- Habitat that occurs in less fragmented blocks (in contiguous blocks) is better than habitat that is more fragmented.

- Habitat between habitat blocks functions better for dispersal/genetic exchange, the more nearly it resembles suitable habitat for the species in question.

None of the above five concepts have been specifically tested on the Siuslaw National Forest, however, they represent concepts developed from numerous studies throughout the world and are believed to apply to species and habitats found in the Coast Range of Oregon.

Identification of the Landscape Blocks was based on the following:

Landscape Blocks A, B, and C - currently contain the highest proportions of mature conifer habitat and least fragmented mature conifer (Appendix L, Tables 2 and 3). These areas also contain some of the highest proportions of federal land (Appendix L, Table 1). All federal lands in Block A and C and most of the land in Block B is allocated to Late-Successional Reserve (LSR) under the NFP (Map 2.2). In the short-term, these areas offer the best opportunity to consolidate and enlarge the remaining best habitat in the watershed. In addition, Blocks A and B are part of a larger wildlife security block identified in the Federal Lands Assessment as a place to restore some low open-road density, isolated habitat for wildlife that are adversely affected by human access into secure areas.

Blocks A and C contain the highest concentration of functioning rearing habitat for anadromous salmonids in the watershed. Securing these blocks through road stabilization as quickly as possible will provide the best protection in the short term. These two blocks also have the greatest potential for responding quickly to habitat improvement activities. Blocks A and C are to be regarded as refugia where good production of salmonids from a functioning system can occur and remain relatively constant and more resilient to climatic events. Other creeks are still in the early stages of recovery.

The upper portion of Upper Indian Creek, in Landscape Block B, has the highest production potential in Upper Indian Creek. The ability to meet Block B objectives will be dependent on private landowners that own the majority of land along Upper Indian Creek.

Section 318 Timber Sale Units: Landscape Blocks A and B contain several Sect. 318 units (Mister Rogers units 1-4, Maria Skyline units 1-6 and Indian Hook units 1-5). These units are all within the high priority area for maintaining and enlarging the best existing mature conifer habitat in the watershed. Also, about half of these units are within the Key Watershed.

If these units are harvested, about 500 acres of mature vegetation will be lost, including 236 acres of late-successional seral stage vegetation (Appendix L, Table 2). There appear to be

good replacement volume opportunities in other parts of the watershed, e.g., in the Matrix portions of Landscape Block E and in the upper portion of Landscape Block H4.

Landscape Block D - currently contains the largest patch of interior forest and some of the highest proportions of mature conifer. All the federal land is allocated to LSR. It is important as an adjacent area to Block C to the north to improve (enlarge) the size of mature conifer patches. The connectivity to Block C, however, is interrupted by private lands, many of which are managed as industrial forests. Good connectivity between the two blocks is needed on the northeast edge across the federal lands.

Block D provides a good opportunity to expand the aquatic refugia from Block C. The objectives for Elk and Buck Creeks are to improve productive reaches within the stream and work with private owners who may own the most productive areas of the drainages.

Landscape Blocks E and G - include lands primarily around the mainstems of Indian and Deadwood Creeks and Lower Lake Creek. The mainstems are dominated by private rural residences, small farms and private woodlots. The land functions as low-gradient mainstem aquatic environments and, therefore, has the best potential for high-quality fish spawning and rearing habitat if these areas could be returned to historial condition.

The main objectives in the mainstems are to work with landowners to develop challenge cost share agreements to improve habitat conditions and to concentrate that work if possible in those areas where the most gains can be made.

A large southern portion of federal lands in Block E is allocated to Matrix. This includes land west of privately owned bottomlands along Indian Creek. The area may offer an opportunity to seek wood commodity production, because it is not in a Key Watershed and does not appear to be an important area for connectivity between LSR lands. Management for wood production will allow this area to provide pockets of early seral vegetation.

One bald eagle management area (MA) is located along Indian Creek (in Block E), surrounded mostly by federal lands allocated to LSR. The adjacent LSR lands could be managed to enhance future nesting opportunities for bald eagles.

Most of the federal land in Block G is allocated to LSR, except the southern portion encompassing Lower Lake Creek. One bald eagle MA is near Lake Creek and is surrounded by Matrix. The lands within the bald eagle MA are administratively withdrawn from timber management.

Landscape Block F - contains a high proportion of natural stands, though mostly of younger seral stage vegetation. This is probably due to recent fires in the area. The Block is dissected by private land along the main tributary stream, Bear Creek.. All the federal land is allocated to LSR and is relatively important as a connectivity corridor between the fragmented LSR lands to the east of the watershed and the more consolidated LSR land within and north of the watershed.

BLM administers a large portion of the Bear Creek subwatershed, but most of the lands along the mainstem of Bear Creek are in private lownership. BLM could develop cooperative programs with interested landowners to improve fish habitat in the Bear Creek drainage.

Landscape Block H - is in the middle of the watershed, containing the ridges and slopes that separate Indian and Deadwood drainages. The landscape is dominated by rugged steep slopes with few valleys suitable for human settlement, so most of the land is in federal ownership. The forests have been intensively managed and few areas of mature conifer habitat can be found today (Appendix L, Table 2). Some of the most fragmented natural stands are found in this block, limiting travel opportunities (connectivity to other natural stands) for terrestrial species (See Appendix L, Table 4). Because this area has been so intensively managed, it provides an opportunity for designing large-scale (landscape scale) management treatments to promote late-successional condition, while producing a steady supply of wood commodities.

Block H was divided into 6 separate blocks to distinguish different aquatic strategies. Each is identified in Appendix M and on the Landscape Block maps.

Block H2 (Failor) and H5 (West Fork Deadwood) were rated as high priority areas for aquatic habitat restoration. H2 is a rare subwatershed without a road up the riparian area and offers good opportunities for riparian restoration. In addition, the entire subwatershed could be monitored for effectiveness of watershed restoration techniques. H5 is a large subwatershed that would provide an opportunity to expand the refugia from Block C into this potentially very productive subwatershed. H1 (Velvet and Green Creeks) and H4 (Gibson, Taylor, Herman, and part of N. Indian) are rated as moderate priority for aquatic restoration. Initial objectives for Blocks H1 and H4 are to improve large wood supplies through stand manipulation primarily, although site specific improvements to maintain productive areas may be done. Blocks H3 (Misery) and H6 (Panther) are rated as low priority areas due to the large amount of riparian areas that are in private ownership and the lack of identified partnerships in these subwatersheds. Improvements, if made, will be conducted in the upper headwaters of each subwatershed. Development of partnerships is the main objective here and would make these watersheds a higher priority for treatments.

Table 6.3 summarizes the management objectives and terrestrial, aquatic and social management strategies selected for Landscape Block.

MANAGEMENT OPPORTUNITIES

The Landscape Block management strategies were used to select appropriate management treatments and project opportunities. These are listed in Appendix M, "Priority Management Recommendations by Landscape Block". A general discussion of the management recommendations is provided below.

Management for Streams and Riparian Areas

The Indian/Deadwood watershed is largely riparian. The recovery strategy includes natural recovery augmented with anadromous fish habitat restoration. Restoration activities are focused to: 1) protect the best habitat by reducing the risk of further degrading existing conditions, 2) remove barriers to natural recovery and 3) work on areas with the highest likelihood of accelerating development of desired conditions.

Analysis of each of the subwatersheds in Indian/Deadwood provides the basis for selection of aquatic objectives and management recommendations outlined in Table 6.3 and Appendix N. Ten criteria

were considered to characterize natural and managed conditions, and potential to influence those conditions:

Subwatershed condition criteria are a combination of inherent characteristics and management legacies:

- Current aquatic habitat condition
- Presence or absence of CWD in stream affected by management practices (buffered clearcuts with and without stream cleanout)
- Riparian condition
- Potential aquatic habitat in moderately confined and unconfined low gradient stream reaches on federal lands
- Percent natural stands in the subwatershed
- Number, condition and location of roads under county and Forest Service management

Ability to influence conditions criteria include:

- Percent federal lands in the subwatershed
- NFP Key Watershed guidelines
- Potential for private landowner cooperation
- Potential for influencing riparian vegetation by thinning/planting

Descriptions of the criteria and ratings for each subwatershed are provided in Appendix N. Five categories of projects were identified and prioritized for each subwatershed which aim to restore watershed processes, riparian vegetation and in-stream conditions. Map 6.2 shows the priorities by subwatershed. Results will be best when all types of watershed projects are implemented.

1. Road Treatments: The existing road network poses the greatest threat to the aquatic ecosystem. Road treatments aim to reduce the risk of resource damage through projects that include waterbarring, subsoiling, culvert removal/replacement, and road obliteration. Road treatments vary dependent on resource conditions (proximity to high quality fish habitat, age and construction method, culvert condition, etc.) and management objectives. At a minimum, road treatments should modify the road prism to be self draining with little to no reliance on structural drainage features that require frequent or expensive maintenance. By eliminating the need for road maintenance on non-ATM roads, limited road maintenance funds can be more effectively utilized on preventative expenditures on the ATM road system.

2. Riparian Vegetation: Reestablishing vegetation, particularly conifers, in degraded riparian areas is the most effective way to restore stream function and to create high quality fish habitat over the long-term. Projects include establishment of woody riparian vegetation, release of existing conifers in riparian areas, thinning existing stands in or near riparian areas to enhance tree size. Healthy riparian areas are self-sustaining. They provide a continuing source of large woody debris, maintain cool stream temperatures, and promote good quality water to support fish and aquatic life. The benefits of shade and streambank stabilization will occur relatively soon while the benefits of large woody debris in streams resulting from riparian vegetation management will be realized in 50 to 100 years.

3. In-stream Structures: In-steam structural improvements, such as placing logs and rocks and excavating side channels, are an effective way to improve fish habitat in many situations. These treatments are particularly effective where an immediate increase in fish habitat is needed or where

the stream system needs a "jump start" to help promote natural recovery processes. Habitat complexity is lacking in many areas throughout the Indian/Deadwood stream network.

4. Upland Thinning: The location within the watershed and proximity to streams was used to identify plantations most likely to benefit the aquatic resource from vegetation manipulation (thinning). The objective of thinning in these plantations would be to increase tree growth within the stream influence zone (one-site tree distance in steep, confined streams; somewhat wider as the valley becomes less confined). This long-term strategy would increase tree growth both along streams with fish habitat (individual recruitment) and in source areas for inputs of large wood into intermittent channels which would eventually supply mainstems below.

5. Develop Partnerships: State and private landowners will have a large part in determining the future condition of fish habitat in Indian and Deadwood Creeks. Working cooperatively with other agencies (ODFW, County Road Management, ODF), landowners (private and industrial) and interested groups is critical for sharing information, research techniques and to develop adaptive management practices on all lands. Creating working partnerships with other agencies and interested groups has benefits beyond its effect on the streams.

Management for Late-Successional Forests

According to the Northwest Forest Plan, the intent of management in LSRs is to "maintain natural ecosystem processes, such as gap dynamics, natural regeneration, pathogenic fungal activity, insect herbivory, and low-intensity fire" (USDA/USDI 1994, p. B-1). The use of silvicultural practices to accelerate the development of overstocked young plantations into stands with late successional characteristics and to reduce the risk from severe impacts resulting from large-scale disturbances is encouraged.

Silvicultural treatments, including thinning of forest stands, underplanting with deciduous and late-successional species such as western hemlock and western redcedar, and leaving as much down large wood as feasible, is recommended for most, but not all, of the plantations. Some (perhaps 20-25%) of the plantations should be left unmanaged across a variety of PAGs to serve as comparison sites for the treated stands. None of the existing natural stands are recommended for treatment, though an occassional exception may be justified where a densely-stocked natural stand of young or immature trees would benefit from thinning, i.e., by gaining increased understory diversity. In general, however, the natural stands are assumed to be currently providing the best diversity of habitats for terrestrial species.

This watershed analysis recommends varying the silvicultural treatments to reflect the Landscape Block objectives and PAGs. In general, where the objective is to accelerate growth of plantations into late-successional conditions, heavier thinnings and underplanting extensively with western hemlock and western redcedar is recommended. In the moister environments, red alder should be allowed to occur as a natural stand component. Where the objective is not to accelerate development of late-succession, less emphasis should be given to underplanting with hemlock and western redcedar. Table 6.1 provides a complete summary of the guidelines for silvicultural treatments in Indian/Deadwood.

Table 6.1. Guidelines For Silvicultural Treatments

	LANDSCAPE BLOCKS		
	A-D	F,H	E,G
Objectives	Accelerate plantations toward late-succession condition.	Allow for natural succession toward mid-seral conditions, preceding late-seral condition.	Establish woody vegetation along stream mainstems.
Plant Association			
Wet environment: Western hemlock/ salmonberry (TSHE/RUSP)	Manage overstory to allow 2 or more understories to develop early. Underplant with western hemlock & western red cedar on most of area. Consider underplanting with spruce in some riparian areas, esp. Indian Cr. drainage. Allow for red alder as a natural stand component. In root rot pockets, replace diseased trees with alder, maple and cedar	Manage overstory to allow 2 or more understories to develop. Allow hemlock and cedar to become established by natural regeneration on smaller portion of area. Consider underplanting Douglas-fir in some riparian areas if conditions favorable. Allow for alder to be a large component of stands.	Plant deciduous species along with scattered conifer in riparian zones. Treat upslope areas same as F, H.
Moist environment: Western hemlock/ swordfern (TSHE/POMU)	Manage overstory to allow 2 or more understories with shade tolerants or maple to develop. Underplant with hemlock, cedar and maple. Allow for alder as a natural stand component. In root rot pockets, replace diseased trees with cedar and hardwoods.	Manage for forest mosaic of multi-storied stands and stands with a single dense Douglas-fir layer. Underplant a few areas with hemlock and fewer with cedar. In root rot pockets, replace diseased trees with cedar.	Plant deciduous species along with scattered conifer in riparian zones. Treat upslope areas same as F, H.
Dry environment: Western hemlock/ salal (TSHE/GASH)	Maintain dense Douglas-fir overstory. Underplant with hemlock and cedar on some of area. In root rot pockets, replace diseased trees with cedar; maple in larger openings.	Manage for dense Douglas-fir overstory. Underplant a few acres with hemlock and fewer with cedar. In root rot pockets, replace diseased trees with cedar..	Not applicable.

Plantations in the LSR can be expected to look more similar to natural stands on similar topographic positions. Plantations in wet environments will have increased tree size and a scattered second story (planted) of western hemlock and western red cedar. It is unknown if within 100 years, underplanting in 30 year old plantations will develop a second story that is distinguishable from the overstory. The understory in fire-regenerated stands did not develop until the overstory was 70 years old.

Plantations treated in moist environments can be expected to have a higher level of understory, than those in wet environments (see specific recommendations for Landscape Management Blocks). Coarse woody debris (CWD) and soil organic matter can be expected to be low relative to natural stand development, especially in wet and moist environments, until stands reach late-successional condition. Some CWD will have been retained during thinning for ecosystem productivity, especially in unthinned pockets used for controls to provide the opportunity to evaluate how well the restoration thinning works.

Dry environments can be expected to have an overstory of dense Douglas-fir with little understory development for many years. Moderate thinning in plantations can be expected to increase the size of the Douglas-fir overstory. Tree density will be such that there will be the possibility of thinning again in dry environments in about 15-20 years with enough trees for snags and logs for CWD and underplanting at that time. However, because of lower conifer stocking, a second thinning at 70 years will be less probable in the wet and moist environments.

Laminated root rot treatment

Treatment of root rot should occur where silvicultural management is applied to meet other landscape objectives. The existence of root rot alone is not reason to manage a stand. Some indirect benefits to Late-Successional Reserves are expected to occur within root rot pockets, i.e., creation of snags and subsequent openings as infected trees fall over. Alder typically seeds into openings and is immune to the disease. Creation of small openings is expected to enhance species diversity in general.

Snags and Coarse Woody Debris

A desired condition of LSRs is to have natural accumulations of large (>20") down logs and snags. In early stages of succession, coarse (large) woody debris (CWD), left from former late-successional stands, holds nutrients and replenishes capital allowing for the rapid growth of microbes that immobilize nutrients and protect them from loss. As plantations move into mid-succession, plants increasingly depend on the nutrient cycle to supply their nutrient needs. Coarse woody debris has importance in the ecological function of all resources because of its role in the food chain. Today, levels of CWD are deficient in most areas of the watershed..

Managing CWD For Ecological Function--Although watershed analysis could provide recommended levels of CWD to leave in managed stands, it may be best at this time to look at the amount of CWD that would occur in these areas if they were developing naturally after a fire and to recognize that CWD in plantations is a mere fraction of what we would expect to see in natural stands of the same age. The figures in Chapter 4 (Figs. 4.3 and 4.4) provide examples of the range of variability expected in natural stands.

In the West and Middle Units one could expect CWD levels remaining from fire input to be about 50 cu. ft/ac. In the East Unit, one could expect levels remaining from fire to be about 50-60 cu. ft/acre based on a smaller pulse. CWD levels remaining after the logging of 10-30 years ago is probably about 0-5 cu. ft/ac.

Coarse woody debris in natural stands in the watershed is currently at a minimum. The CWD will increase considerably over the next 75 years as stands recover from the last fire disturbance. Over time the CWD in the West and Middle Units will be higher than the East Unit. Historically, stands 10-40 years old had about 170 to 275 cu. ft./ acre of CWD. In contrast, managed stands have almost no CWD at the same age. Although the large wood component will not recover for a few more decades, functions associated with woody detritus (organic material) may begin to recover to various levels depending on removal of wood through commercial thinning. The recovery of the woody detritus pool, which is the dominant store of organic matter and carbon, has been shown to be delayed by young stand thinning and salvage by approximately 7 to 12% (Krankina and Harmon, 1995).

In the absence of CWD standards for Riparian Reserve and Late-Successional Reserve allocations, project planning teams should develop prescriptions that meet the intent of CWD needs for the ecosystem described in the ROD. Determination of CWD needs for project sites should be based on the following considerations:

- location and concentration of existing CWD as it relates to position on the slope of the land,
- fire history of the area and fire risk occurrence,
- the needs of wildlife (population and diversity),
- transfer, cycling and retention of nutrients,
- structure and function of CWD in streams,
- existing information, such as ecoplots, VSE and CVS plots,
- land allocation standards that give particular emphasis to the prescriptions.

Management of Matrix Lands

Under the Northwest Forest Plan, Matrix lands are identified as areas that could be managed for commercial production of wood fiber to meet some of the demand for lumber and other wood products. Most of the remaining mature conifer stands on federal land were allocated to the Late-Successional Reserve, but a few patches are found in Matrix. The acres of seral stages found today in these two NFP allocations are shown in Table 6.2. The largest (35%) proportion in the Matrix is younger conifer and conifer-mix stands, while the largest (49%) proportion in LSR is the mid-late seral stages of mature conifer and mature mixes of deciduous and conifer.

The estimated acres of Matrix in the Indian/Deadwood watershed is 8,577. Because of the high density of streams in the watershed, a large portion (92 %) of the federal land is within Riparian Reserves. When these Reserves are withdrawn from the Matrix allocation, about 452 acres remain. About 41% (186 acres) of those lands are managed stands. The remaining 59% (266 acres) is in natural stands, although only about 209 acres are mature conifer stands.

As explained in the Federal Lands Assessment, the Matrix is highly fragmented and occurs as small patches along ridgelines. Few feasible timber harvest sales could be designed for Matrix lands alone, but would need to be combined with adjacent commercial thinning sales and management of riparian reserves.

Table 6.2. Acres of Current Seral Stages by NFP Allocation (federal land only)

	Siuslaw NF				BLM	
Seral Stage	**LSR**		**Matrix**		**LSR**	
	Acres	**%**	**Acres**	**%**	**Acres**	**%**
Grass/forb	45		10		1	
Very early seral (< 10 years)	2,738		613		530	
All very early		6%		9%		10%
Early seral conifer (11-25 yrs)	3,561		1,099		52	
Conifer-mix pole	1,417		268		19	
Deciduous-mix pole	207		0		0	
All early seral		12%		19%		1%
Young deciduous-mix (25-40 yrs)	746		107		61	
Young conifer	5,484		1,625		320	
Young conifer-mix	4,369		811		26	
All young seral		23%		35%		7%
Mid-late seral						
Mature conifer (>45 yrs)	12,897		1,206		1,347	
Mature conifer-mix	5,094		271		790	
Mature deciduous-mix	2,777		324		812	
Multi-late	1,502		145		281	
All mid-late seral		49%		27%		59%
Pure deciduous (all ages)	4,394	10%	711	10%	1,272	23%
TOTAL	45,231		7,190		5,511	

Note: Data excludes Lower Lake due to different vegetation typing.

Four blocks of Matrix are found in the watershed. General management recommendations for these are described below:

1. Most of the northern portion of Landscape Block H4 is allocated to Matrix though it is expected to contain several marbled murrelet sites. These Matrix lands cannot be expected to provide much mature timber for commodity use because of harvest constraints to meet murrelet habitat needs and Aquatic Conservation Strategy objectives for lands along N. Fork Indian Creek.

2. The headwater portion of Failor Creek (in Landscape Block H2) is allocated to Matrix. Failor Creek is all in federal landownership and offers one of the best opportunities to manage an entire subwatershed for stream restoration objectives. The Matrix lands should be treated with greatest sensitivity to stream restoration needs, i.e., headwall and upper slope stability will be important to stream recovery.

3. The southwest portion of Landscape Block E (Elk Creek and lower Long Creek) is allocated to Matrix. This area is not within the Key Watershed and it is not a critical area for connectivity between Late-Successional Reserve (LSR) lands. In addition, much of the land to the east, along the mainstem Indian Creek, is in private ownership. There may be opportunities to seek commercial wood fiber production in this area, while meeting the Aquatic Conservation Strategy

objectives for Elk and Long Creek subdrainages. (Note: A small portion of LSR land falls in the middle of the Matrix. This needs to be analyzed to determine if it is a mapping error or if it is intended to serve some habitat needs.)

4. The southern end of Landscape Block G (lower Lake Creek and the lower portion of Green Creek) is allocated to Matrix. These lands do not appear to be important for connectivity between LSR lands. There should be some opportunities for wood fiber production while meeting the Aquatic Conservation Strategy objectives for the tributaries into Lake Creek.

Table 6.3. Landscape Objectives and Management Strategies

I. LANDSCAPE OBJECTIVES for Blocks A, B, C:

- Provide large (>1000 acre) patches of contiguous mature and late-seral wildlife habitat.
- Provide high quality, fully-functioning headwaters for Indian and Deadwood Creeks, to serve as aquatic refugia.
- Reduce human presence over time.

LANDSCAPE BLOCK	DOMINANT ECOLOGICAL PROCESSES	LANDSCAPE FUNCTION (TERRESTRIAL)	LANDSCAPE FUNCTION (AQUATIC)	MANAGEMENT STRATEGY (TERRESTRIAL)
A (Marla, Rogers,Long–upper portion)	FIRE: Infrequent, stand replacing. LANDFORM: Questaform, low relief. ENVIRONMENT: wet to mesic. PAGs: - Predominantly RUSP & POMU. Small occurrence of GASH.	LANDSCAPE STRUCTURE: large areas move through succession in same seral stage. 1-2 seral stages present at any one time. SERAL PATHWAYS:. Alder has larger role than conifer in early seral stages & remains a large component into mature stages. Conifer regeneration sparse due to salmonberry competition. Old growth structure begins to develop at 120 years.	Function as a headwater source of wood, sediment & high-quality water for low/moderate gradient mainstem with good habitat complexity. Highest short-term potential for "functioning" subwatershed in the Indian Cr. drainage.	• Priority for development of late successional structure. Manage with block of mature forest to north, northwest. • Consolidate mature and managed stands to promote development of large contiguous blocks of mature conifer habitat. • Expand areas around existing mature stands ("biodiversity hotspots") by focusing management activities on adjacent plantations. • Accelerate late-successional structure of plantations by thinning to favor late-successional species, thus shortening the time plantations are in mid-seral conditions. • Manage as part of larger wildlife security block ; reduce human presence by conducting desired management early and closing non-ATM roads.

Table 6.3. Landscape Objectives and Management Strategies

MANAGEMENT STRATEGY (AQUATIC)	MANAGEMENT STRATEGY (SOCIAL)	SPECIFIC RECOMMENDATIONS	BLOCK PRIORITY
• Key Watershed (tier 1) - highest potential for maintenance and further enhancement of aquatic refugia, in Rogers & Maria subwatersheds. • Maintain refugia by protecting concentrations of existing good habitat, esp. through road stabilization. • Promote connectivity between stream and floodplain with addition of large wood. • Maintain riparian diversity, e.g., keep elderberry thickets. • Increase in-stream habitat complexity and areas of rearing habitat.	• Provide undeveloped recreation opportunity, with limited open-road access. • Work with county to maintain CO. Rd. 5130 and 5134 which are part of ATM system. • Consider removal of FR 5800, given high potential for adverse impacts to resources and high maintenance costs over the long term.	• Maria & Rogers: conduct management activities (road stabilization, in-stream work, riparian veg., & plantation thinnings) during next few years, then stabilize and reduce open road density as projects are completed - to reduce human presence. • W.Fk Indian: Stabilize roads; encourage a partnership with Davidson to assist with stream restoration. • Long Cr.: low potential for short-term restoration. Over long-term, improve riparian vegetation through plantings and release of conifers; stabilize roads.	HIGH - terrestrial HIGH - aquatic

Table 6.3. Cont. Landscape Objectives and Management Strategies

LANDSCAPE BLOCK	DOMINANT ECOLOGICAL PROCESSES	LANDSCAPE FUNCTION (TERRESTRIAL)	LANDSCAPE FUNCTION (AQUATIC)	MANAGEMENT STRATEGY (TERRESTRIAL)
B (Upper Indian, N. Indian– upper portion)	Same as A	Same as A	Headwater source of wood, sediment & high-quality water for low/moderate gradient mainstem with good habitat complexity.	• Priority for development of late successional structure. Link to mature forest to north/northwest. • Aggregate largest intact mature and late seral stands. • Accelerate late-successional condition (same as Block A). • Improve connectivity for terrestrial species between Upper Indian and N. Indian drainages, i.e., within Riparian Reserves.
C (Upper Deadwood, N.Panther)	FIRE: Moderately frequent; patchy. LANDFORM: Slightly longer slopes, backbone ridges, more confined valleys ENVIRONMENT : Dry to moist. PAGs: GASH & POMU widely distributed.	LANDSCAPE STRUCTURE: Mod to large patch size from fire; additional patchiness from root rot. High snag occurrence due to root rot and bark beetle. 2-3 seral stages present at one time. SERAL PATHWAYS: Conifer is predominant component in early seral stand and remains a major component into late seral. Regeneration of dense stands with considerable self-thinning (CWD). Greater conifer regeneration down to riparian zone, compared to Blocks A and B.	Headwater source and transport of wood, sediment and high-quality water to upper mainstem of Deadwood Cr., which is moderately confined, has low/moderate gradients and good habitat complexity.	• Priority for development of late successional structure. Provide connectivity with mature stands to north. • Consolidate mature and managed stands to promote development of large contiguous blocks of mature conifer habitat. • Accelerate late-successional condition (same as Block A). • Expand areas around existing biodiversity "hotspots" by focusing management activities on adjacent plantations. • Treat root rot pockets in managed stands during thinning operations, by replacing trees in and adjacent to disease pockets with nonhost species (cedar or hardwoods as appropriate for PAG.)

Table 6.3. Cont. Landscape Objectives and Management Strategies

MANAGEMENT STRATEGY (AQUATIC)	MANAGEMENT STRATEGY (SOCIAL)	SPECIFIC RECOMMENDATIONS	BLOCK PRIORITY
• Promote long-term large wood development in plantations through thinnings--development of conifer patches on some toeslopes; some willow plantings in floodplain. • Long-term promotion of connectivity between stream and floodplain in N. Indian.	• Maintain FR 3250 and FR 3700 as part of ATM system. • Stabilize FR 2100 (CO. Rd. 5130) and close to thru traffic; use FR 2116 as alternate route. • FR 5800 - same as A.	• In short term: provide slash pile corridors along slope contours of plantation thinning units that connect natural stands. The slash corridors can provide connectivity (hiding and travel corridors) within Riparian Reserves. • N.Indian: stabilize roads; improve riparian vegetation (i.e., with willow plantings, clumpy plantings of conifer and some thinning in plantations), especially along mainstem.	HIGH - terrestrial MOD - aquatic (N.Fk Indian: moderate potential for riparian and upslope wood.) (Upper Indian : low due to private ownership of much of mainstem.)
• Upper Deadwood: highest potential for maintenance and further enhancement of aquatic refugia in Deadwood drainage. • Protect concentrations of existing good habitat. • Promote habitat complexity. • Continue partnerships with private landowners for in-stream structures and riparian vegetation restoration.	• Consider decommissioning either FR 3500 or FR 6300. Both will have high maintenance costs over long term due to proximity to important aquatic resources. (FR 6300 is preferred by residents during winter.)	• Upper Deadwood: Enhance potential fish-rearing habitat. (Watershed currently contains areas of good floodplain connectivity.) Stabilize roads, add in-stream structures, plant riparian veg. and do some thinnings in plantations. • N. Panther: Riparian planting and release to promote large woody debris over the long-term. Provide willow plantings to encourage beaver activity.	HIGH - terrestrial HIGH - aquatic

Table 6.3. Cont. Landscape Objectives and Management Strategies

II. LANDSCAPE OBJECTIVES for Block H (H1 - H6):

- Maintain a large-scale area of relatively similar seral stage vegetation.
- Provide area for continual management of vegetation, designed to promote LSR conditions in the long-term and produce even-flow of wood fiber for several decades.

LANDSCAPE BLOCK	DOMINANT ECOLOGICAL PROCESSES	LANDSCAPE FUNCTION (TERRESTRIAL)	LANDSCAPE FUNCTION (AQUATIC)	MANAGEMENT STRATEGY (TERRESTRIAL)
H - (Central zone) **H1 - Lower Indian/Green Cr.** **H2 - Fallor** **H3 - Misery** **H4 - Herman (Gibson, Taylor, lower Up.Indian)** **H5 - West Fork Deadwood** **H6 - Panther**	FIRE: Infrequent, stand replacing. LANDFORM: Backbone, spur ridges, short steep slopes. (transition between west & east sides of watershed.) ENVIRONMENT: Variable; transition from moist to dry sites. PAGs: POMU most dominant.	LANDSCAPE STRUCTURE: Large areas move through succession in same seral stage. SERAL PATHWAY: Alder plays a role in early seral stages in some stands. Conifer dominates later seral stages.	Tributary subwatersheds: source, transport and deposition of wood and sediment on a smaller scale. High-quality habitat in most of tributaries to mainstem Deadwood and Indian Creeks.	• Improve wildlife connectivity opportunity between Indian Cr. and Deadwood Cr. drainages by management of plantations to increase structural diversity especially in Riparian Reserves. In short term, provide slash corridors along contours of plantation thinning areas that connect with natural stands. • Aggregate existing mature stands in northernmost portion of Block to provide connecting corridor between E and W portions of larger LSR RO268. • Provide large-scale area of relatively similar seral stage vegetation. Manage plantations on natural successional timeframe, toward mid-seral conditions to precede late-seral stage. • Apply adaptive management to plantations to study various silvicultural treatments.

Table 6.3. Cont. Landscape Objectives and Management Strategies

MANAGEMENT STRATEGY (AQUATIC)	MANAGEMENT STRATEGY (SOCIAL)	SPECIFIC RECOMMENDATIONS	BLOCK PRIORITY
H1 - Long-term restoration of large wood supply; reduce risk from road failures; gradually enhance in-stream habitat complexity. **H2** - Maintain and expand good existing habitat; manage whole subwatershed (upslope to in-stream); subwatershed monitoring potential. **H3** - Develop long-term partnerships or acquire land to restore mainstem; thin plantations and stabilize roads in some upslope areas. **H4** - Expand refugia over time through in-stream wood additions, riparian veg. enhancement, thinnings and road stabilization. **H5** - (Forest key watershed) Potential for maintenance and further enhancement of aquatic refugia and expansion from Landscape Block C. **H6** - Over long term, establish and/or release conifers along hardwood dominated riparian areas.	• Provide a steady flow of wood fiber to local timber industry primarily as a by-product of developing late-successional conditions. • Maintain Gibson old growth trail. • Provide opportunities for research on methods to promote late-successional conditions. • Work with county to maintain CO. Rd. 5130 which is part of ATM system. • Maintain FR 2116 and FR 3278 as part of ATM system. • Consider an alternate connector to replace FR 3259 on the ATM system, based on high repair & future maintenance costs. • Maintain FR 3200 (Indian Ridge Rd.) on ATM system only if monies available to cover high maintenance costs that will be needed to prevent adverse impacts to streams.	**H1** - Lower Indian: reduce impacts from recreation sites; encourage partnerships with pvt. landowners & county road maintenance. Green Ck: stabilize roads, plant riparian veg., incl. willows to encourage beavers; thin plantations; protect 'No Impact' Poa site. Velvet: add in-stream LWD from adjacent slopes. **H2** - Pursue long-term restoration of LWD for input into streams. (No valley bottom road; lots of plantations of similar age.) Take advantage of thinning projects to place in-stream structures. **H3** - Stabilize roads early; thin and riparian plant later. (Limited potential for restoration due to private land along mainstem.) **H4** - N.Fk.Indian (lower) - enhance riparian veg, i.e., willows and clumpy plantings; maintain in-stream structures (needed early). Herman - add in-stream wood; plant clumps of conifers in riparian areas. Gibson - plant clumps of conifers in riparian areas. Taylor - add in-stream wood from upslope. **H5**: Stabilize roads, thin plantations, add in-stream structures and plant willow (needed early). Exlore opportunities for land aquisition; also for partnerships for in-stream work. **H6** : Upper Panther - plant clumps of conifers in riparian areas; release conifers if needed; develop partnerships on lower end of Panther; limited road work and thinning.	**H1** - MOD- terrestrial MOD - aquatic **H2** - HIGH - terrestrial HIGH - aquatic **H3** - MOD - terrestrial LOW - aquatic **H4** - MOD - terrestrial MOD - aquatic **H5** MOD - terrestrial HIGH - aquatic **H6** LOW - terrestrial LOW - aquatic

Table 6.3. Cont. Landscape Objectives and Management Strategies

III. LANDSCAPE OBJECTIVES for Block D:

- Provide large (>1000 acre) contiguous blocks of mature conifer habitat connected to Block C.
- Serve as additional refugia for aquatic resource to expand the refugia to the north.

LANDSCAPE BLOCK	DOMINANT ECOLOGICAL PROCESSES	LANDSCAPE FUNCTION (TERRESTRIAL)	LANDSCAPE FUNCTION (AQUATIC)	MANAGEMENT STRATEGY (TERRESTRIAL)
D (Elk, Buck, Rock3)	FIRE: Moderately frequent, patchy. LANDFORM: Longer slopes, backbone ridges and more confined valleys. ENVIRONMENT: Dry to moist. PAGs: GASH & POMU predominate.	LANDSCAPE STRUCTURE: Moderate to large patch SERAL PATHWAYS: Conifer is a major component in early seral and remains dominant in late seral stages. See Block C.	Small tributary subwatersheds serving as a source of wood, sediment and high-quality water to mainstem Deadwood Cr..	• Priority for development of late successional structure. • Consolidate mature and managed stands to promote development of large contiguous blocks of mature conifer habitat. • Manage plantations around existing mature stands (biodiversity hotspots) to expand area of species and structural diversity. • Accelerate late-successional condition (same as Block A).

IV. LANDSCAPE OBJECTIVES for Block F:

- Allow area to move through mid-seral stages prior to late-seral stage..
- Allow for large patches of natural stands, containing a mosaic of deciduous and conifer species of various age classes.
- Serve as additional refugia for aquatic resources over the long term.

F (Bear)	Same as D.	Same as D.	Same as D.	• Allow natural succession to occur, e.g., no conversion of alder to conifer. • Manage plantations toward mid-seral conditions to precede late-seral stage.

Table 6.3. Cont. Landscape Objectives and Management Strategies

MANAGEMENT STRATEGY (AQUATIC)	MANAGEMENT STRATEGY (SOCIAL)	SPECIFIC RECOMMENDATIONS	BLOCK PRIORITY
• Pursue long-term restoration of large wood supply through riparian planting and release, and thinning upslope plantations. • Reduce risk from road failures. • Gradual enhancement of in-stream structure.	• Provide semi-primitive hiking opportunity to view old growth in Deadwood watershed.	• Plant clumpy patches of conifers in Rock and Buck riparian areas. • Thin plantations to increase tree growth. Obtain LWD for Elk Cr. from adjacent hillslopes. • Develop partnership with Deadwood community group to construct a trail in Elk Cr. watershed to access old growth stands. • Acquire state-owned land in lower portion of Block D to enhance opportunity to manage LSR. (Part of the state property is in Block F also.)	HIGH - terrestrial MOD - aquatic
• Enhance riparian vegetation complexity in lower portion of drainage, which is hardwood dominated.	• Continue existing partnerships; pursue partnership potential for in-stream and riparian vegetation projects. • Provide hiking opportunity on old Schoolhouse Trail; evaluate potential for extension of trail to Windy Peak. • Maintain roads for future access.	• Increase conifer component in riparian zone of lower portion of Block. • Conduct precommercial thinning early. • Continue partnerships in lower portion of drainage to assist with stream restoration.	LOW - terrestrial MOD - aquatic

Table 6.3. Cont. Landscape Objectives and Management Strategies

V. LANDSCAPE OBJECTIVES for Block G and E:

- Function as a low-gradient mainstem aquatic environment with high-quality fish spawning and rearing habitat.
- Lands are predominately private agricultural and rural residential with potential for landowner participation in stream restoration.

LANDSCAPE BLOCK	DOMINANT ECOLOGICAL PROCESSES	LANDSCAPE FUNCTION (TERRESTRIAL)	LANDSCAPE FUNCTION (AQUATIC)	MANAGEMENT STRATEGY (TERRESTRIAL)
G: (mainstem Deadwood Cr., Lower Lake)	FIRE: Transition between Blocks C & H. LANDFORM: Mainstem unconfined valley bottom; Small tributaries from ridges. ENVIRONMENT: Dry to wet. PAGs: GASH & RUSP are widely distributed.	LANDSCAPE STRUCTURE: Mosaic of alder and conifer. 2-3 seral stages present at any one time. SERAL PATHWAYS: Conifer has large role in early seral and remains dominant in late seral. Greater conifer regeneration down to riparian zone, compared to Blocks E.	Areas of complex habitat associated with wood accumulations and high flow side channels & alcoves.	• Provide high-quality bald eagle nesting and roosting habitat near Lake Creek. • Thin plantations around existing mature stands within eagle nesting habitat. • Restore connectivity to natural stands within federal lands, i.e., by improving structural diversity of vegetation through Riparian Reserves. • Manage plantations on natural successional timeframe, toward mid-seral conditions to precede late-seral stage.
E: (mainstem Indian Cr., incl. Elk2, Long-lower, Herman-lower)	FIRE: Infrequent, stand replacing LANDFORM: Mainstem , moderately unconfined valley bottom; Small tributaries from ridges. ENVIRONMENT: Wet. PAGs: High occurrence of RUSP.	LANDSCAPE STRUCTURE: Mosaic of alder and conifer. 1-2 seral stages present at any one time SERAL PATHWAYS: Alder has a larger role than conifer in early seral stages and remains a large component into young and mature stages.	Same as G.	Same as G.

Table 6.3. Cont. Landscape Objectives and Management Strategies

MANAGEMENT STRATEGY (AQUATIC)	MANAGEMENT STRATEGY (SOCIAL)	SPECIFIC RECOMMENDATIONS	BLOCK PRIORITY
• Reduce stream temperatures along stretches of bedrock dominated channel by increasing riparian vegetation. • Pursue or continue development of private partnerships for aquatic restoration projects, e.g., riparian plantings, in-stream structures. Private landowner cooperation is essential to meet goals. • Develop a cooperative relationship with county road maintenance department to seek ways to maintain CO. Road 5140 compatible with stream function.	• Continue involvement with Deadwood CRMP to further stream restoration work on private lands. • Work with county to maintain CO. Rd. 5140 as part of ATM system.	• Participate with Deadwood residents on stream structure projects planned for 1996. • Cooperate with county road maintenance efforts to maintain culverts on tributaries. • Maintain existing Chinook spawning sites. • Work with county on fish passage problems with culverts. • Assist landowners with scattered conifer plantings, willows and other hardwoods.	LOW - terrestrial MOD - aquatic
Same as G, except: • Seek ways to maintain CO. Road. 5130 compatible with stream function.	• Develop partnerships over long-term to assist with stream restoration. • Maintain lower portion of FR 2500 and work with county to maintain CO. Rd. 5130 as part of ATM system.	• Elk Cr. off of mainstem Indian: enhance deep pools through LWD additions; stabilize roads; riparian planting. • Work with county on fish passage problems with culverts. • Maintain existing Chinook spawning sites.	MOD - terrestrial LOW - aquatic