There is a method to the madness in the pages to follow. The method is in the very simplest terms a story of soil and water, the unique landforms and patterns it has created and the sensitivity of these patterns to change

STEP 1: CHARACTERIZATION

Geologic

The Upper Middle Fork Willamette Watershed Analysis area includes the transition from the Western Cascade to High Cascade subprovince of the Cascade Range. The western edge of the Watershed Analysis area lies within the older Western Cascades and is characterized by older volcanics including flows, intrusions and pyroclastics which have been tectonically sheared and hydrothermally altered. This area exhibits gentler slopes and the presence of fine-grained sandy soil and clays. The middle and eastern portions of the Watershed represent the transition from early to late High Cascades ages respectively. This area is dominated by flows and interbeds of pyroclastics, steep sideslopes and sandy soils.

Alpine glaciation has extensively modified the topography of the Upper MFW river watershed. U-shaped valleys with wide, flat bottoms and steep side slopes dominate the landscape in the middle and eastern portions. Hanging valleys, alpine lakes and cirque basins are common features in the upper reaches of the stream channels.

The steep valley sidewalls are prone to debris slides, both naturally occurring and management related (road construction and timber harvest). Debris slides in this area generate frequent pulses of coarse grained soil and woody debris which may or may not be carried to the stream. Debris chutes tend to be oriented nearly perpendicular to main stems which limits the likelihood of continuation of momentum. This is likely to result in deposition of wood and loose soil at these intersections which can be incrementally carried downstream by the larger channel.

Hydrologic

The UMFW Watershed is bisected by the MFW River and drains 177 square miles. The watershed ranges in elevation from a low of 2,000 feet at the mouth to 8,744 feet at Diamond Peak. Ridgelines are predominantly in the 5,000 to 6,000 foot elevation band. Diamond Peak rises to an elevation of 8,744 feet and provides a unique geomorphic setting with radial drainages descending westward forming the headwaters of Swift, Pioneer, Emigrant and Beaver Creeks. Numerous channel segments exhibit alternating surface and subsurface flow. Streams of this nature are present on the flanks of Bear Mountain near Skunk Creek, and south to Beaver Creek. This subsurface flow is interconnected with the numerous cold water springs that surface adjacent to the MFW River, the largest of which are Indigo and Chuckle Springs. Cold subsurface flow also contributes to MFW River directly and the lower portion of Swift Creek. The origin of the cold water is the snow melt from Diamond Peak percolating subsurface and traveling through the numerous cracks within the volcanic flows that form the slopes of Diamond Peak.

The climate of the watershed is typical of the Western Cascades with a Mediterranean weather pattern of hot dry summers and cool wet winters. Over half of the floods occur during the months of December and January, and another one-third during the months of November and February predominantly in response to rain-on-snow events. Similarly, average monthly mean discharges are consistently higher December through May (Lower MFWA, 1995). The largest flood on record was the 1964 flood.

The channel forming flood recurrence interval of 1.5 years is roughly 5,420 cubic feet per second (cfs) for the MFW River. The average annual water yield (AAWY) for the period of record is 287,394 cfs. Due to the higher elevation of the Watershed, the annual water yield is more evenly distributed throughout winter and spring as compared to the lower MFW watershed. Late season snowmelt from

the Cascade peaks helps sustain summer baseflow in the upper elevations where soils are predominantly shallow and free draining.

These values were calculated with data from the USGS Gaging Station (14144800) on the MFW River roughly 7.5 miles downstream from the watershed. The UMFW Watershed represents 69 percent of the gaging station area (USGS, 1964-1994).

There are 478 miles of stream channels, cataloged in GIS, in the watershed. The average density of stream channels is 3.1 miles per square mile, with a high of 3.2 in the older weathered volcanics of the Staley Subwatershed to a low of 1.8 in the young porous volcanics of the Timpanogas Subwatershed.

This natural landscape also exhibits a setting conducive to "High Storm Response". Storm response is calculated as a function of soils, water yield, water availability as determined by the relative accumulation of snow and storm precipitation, aspect, and elevation. See Appendix A for specific characteristics determining Storm Response Categories. Storm response describes the relative speed with which water is translocated to the stream environment. The watershed is predominantly characterized by medium and high Storm Response flow (Figure 2 and 3). This indicates that the majority of the watershed rapidly transports water from snow melt and precipitation to the stream network. Streams respond even quicker where roadside ditches intercept water moving through the soil profile and funnel the water directly to a stream.

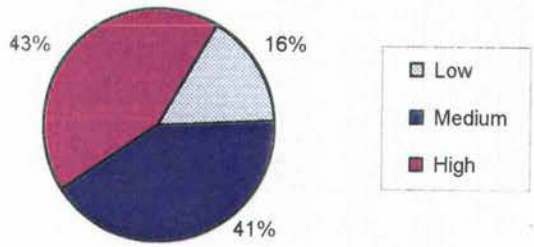


Figure 2. Percent of the UMFWA in High, Medium, and Low Storm Response Categories.

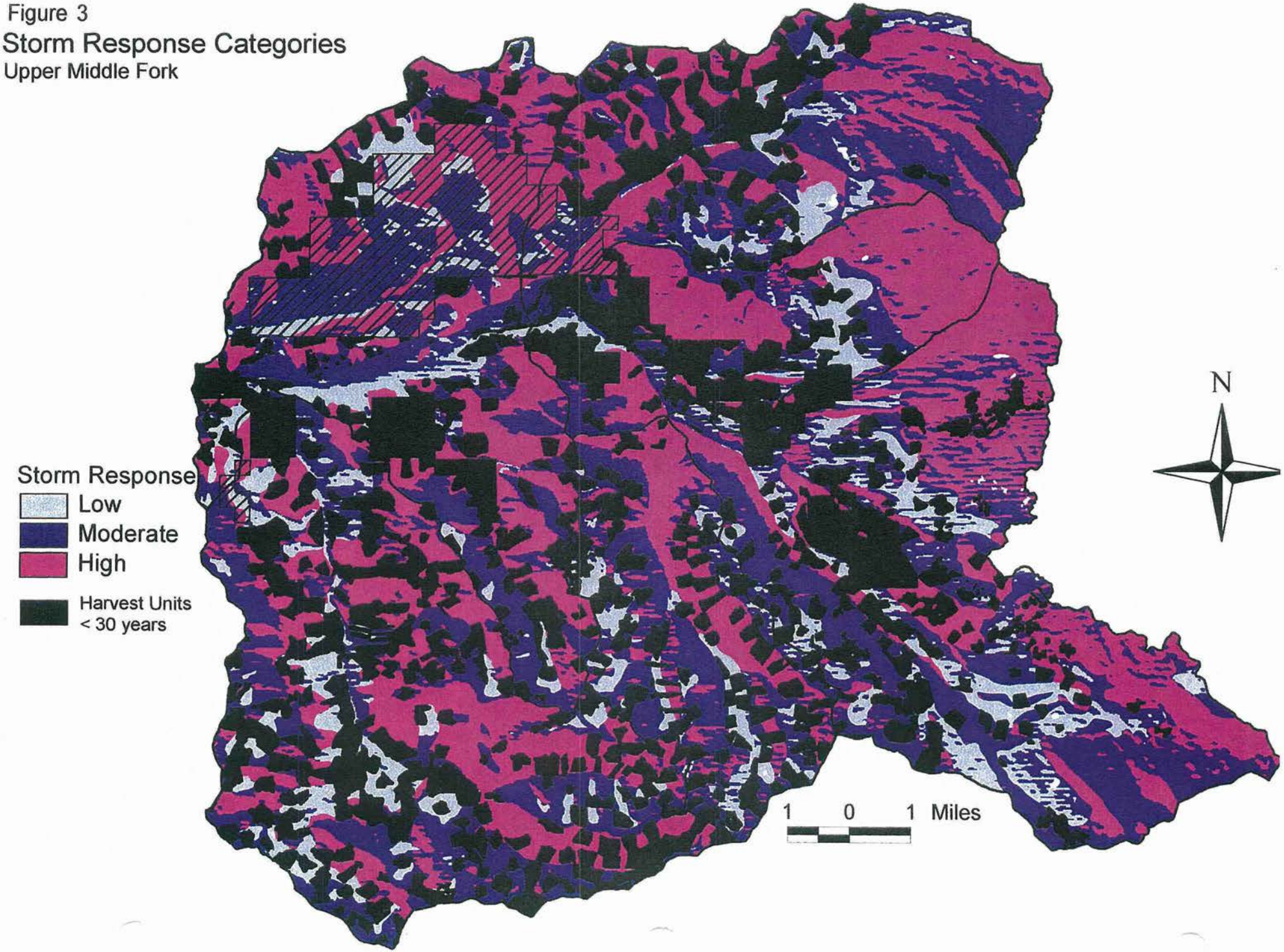
Fluvial

The stream channel segments in the watershed are characterized as Source, Transport and Response based on their gradient, confinement and valley form (Montgomery and Buffington, 1993). Source segments generally occur high in the drainage network and on steep side slopes. They represent the initial formation of the fluvial system and act as sources of water, sediment, and other materials to segments downstream. Fluvial processes are weakly developed and hillslope processes such as mass wasting strongly influence these segments. The dominant disturbance regime in this part of the system is one of relatively high intensity, low frequency events, such as debris flows. They are the primary component of intermittent stream channels. Source channel segments comprises about 55 percent of the total channel network.

Transport segments function as a link between source and response portions of the system and they often occur in middle reaches of the network. They are affected by a combination of hillslope and fluvial processes. Transport segments comprises about a 33 percent of the channel network.

Response segments are generally found in the lower portions of the drainage network where fluvial processes such as floodplain development and pool and bar formation dominate. The disturbance regime in this part of the system is a combination of high frequency, low intensity events, i.e. bankfull flows and high intensity, low frequency events, i.e. major floods. This complex regime produces ongoing interacting channel responses. Most of the fish bearing stream miles occur in response segments. Response segments comprise 12 percent of total network length.

Figure 3
Storm Response Categories
Upper Middle Fork



Channel Types

Stream channels can be characterized by their gradient, confinement and valley form into a number of relatively distinct types. A combination of existing classification methods was used to characterize stream channels which occur in the UMF watershed.

Table 1 displays the results of a map-based classification of the stream network into 28 channel types. Each alphanumeric code represents a unique combination of valley and channel characteristics. Definitions of each code are given in the appendix. For the purpose of general characterization, the different channel types are grouped based on gradient and confinement, two factors which dominate fluvial processes. These groups are further consolidated into three primary categories which reflect broad scale differences in the overall fluvial system.

Table 1. Matrix combining channel types into three geomorphic process categories.

Matrix Combining 27 Channel Types into Three Geomorphic Process Categories						
	Gradient					
Confinement	< 1%	1 - 2%	2 - 4%	4 - 8%	8 - 12%	> 12%
VW > 4x CW	U1DA F6DA	F3C F5D F6B F6D **U1C**	U1A V4D			not likely to occur
VW 2x < CW < 4x VW		M2B	F4B V4B U2B			
VW < 2x CW	not likely to occur		M1A M1B U2A U3A U3B	V1A V1B V2A V3A	H1A H1B H2A H2B	H3A
	Bold = types analyzed for sensitivity in Channel Condition chapter					
		response		transport		source

VW = valley width, CW = channel width

Frequency Distribution of Channel Types

Figure 4. displays a frequency distribution of the 14 most common channel types in the UMF watershed Source segments account for over one third of the total network length. Four transport channel types together make up another third of the network The remaining third includes all response channel types plus additional transport types.

Subwatershed Distribution of Process Types By Stream Class

Figure 5 displays a similar distribution by Subwatershed to allow comparison with the watershed pattern. Some differences are apparent, again reflecting the primary geologic controls on geomorphic forms and processes in the UMF watershed. For example, in the Staley Subwatershed, about 75% of fishbearing miles occur in response channel types which have developed in the more weathered material of the Western Cascades province. The Tumblebug Subwatershed, in the thin soils and steep topography of the High Cascades province, has almost no stream miles in response channel types. The Timpanogas Subwatershed has the greatest proportion of intermittent miles in response types, due to the porous soils commonly found in flat wide glacial valleys. Figure 6 provides a spatial distribution of these geomorphic processes in the watershed.

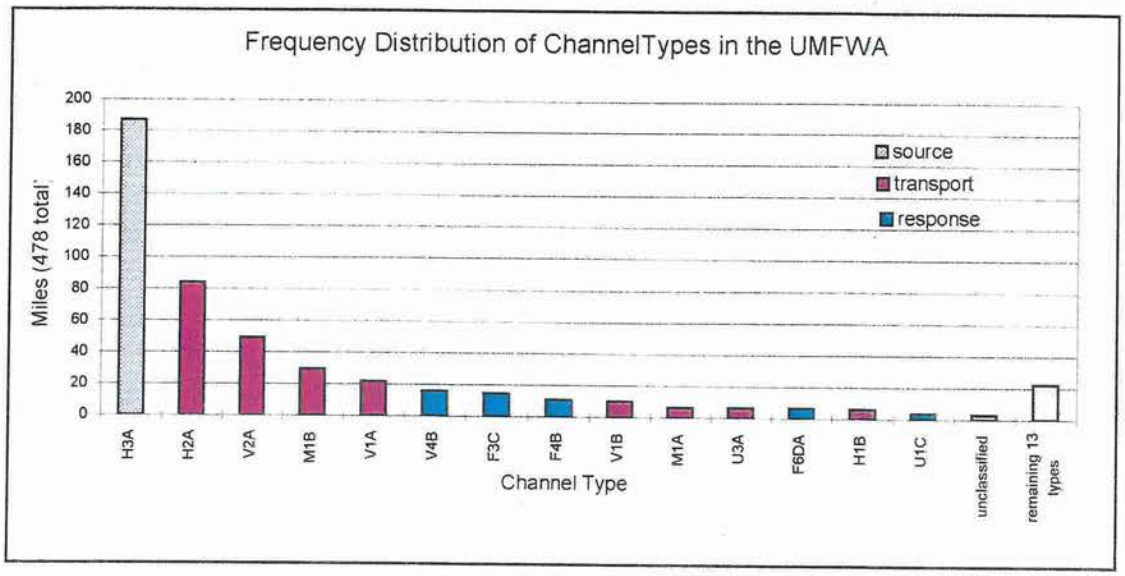


Figure 4. Frequency distribution of channel types (segments) in the UMFWA.

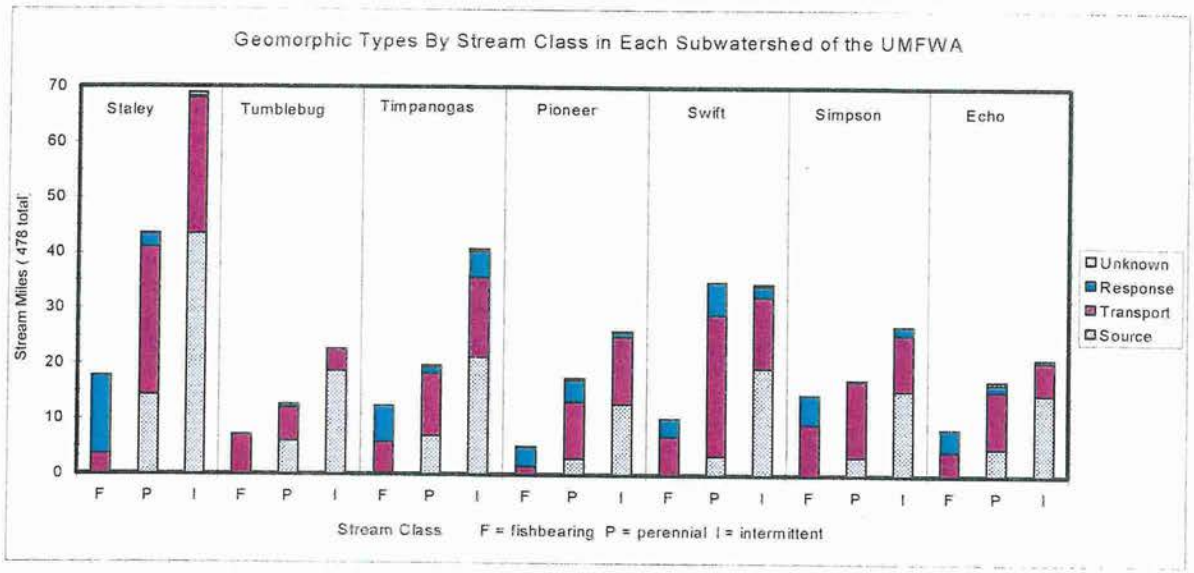
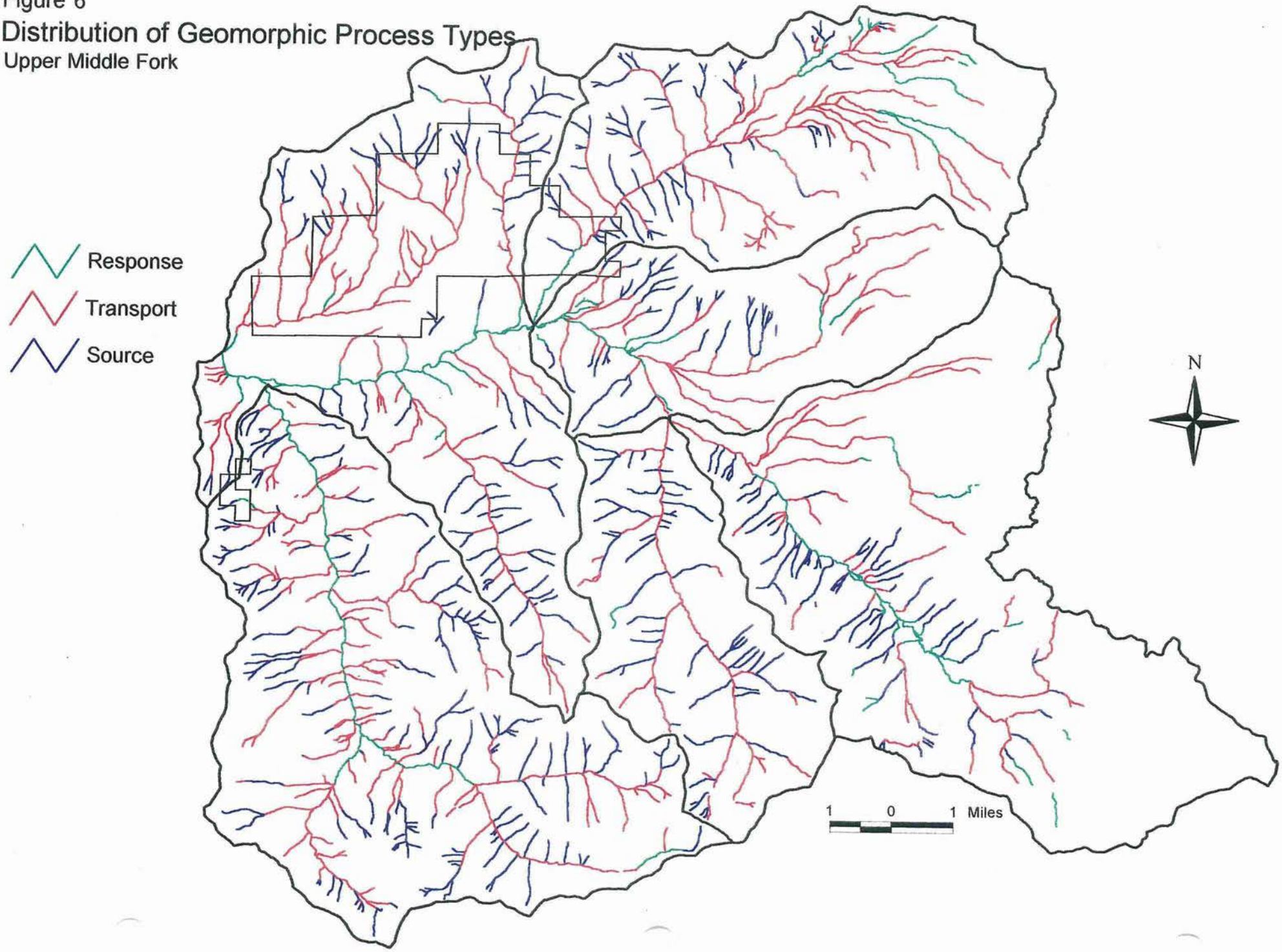


Figure 5. Geomorphic types by stream class in each Subwatershed of the UMFWA.

Figure 6

Distribution of Geomorphic Process Types

Upper Middle Fork



Terrestrial Patterns & Processes

Landscape Patterns

Fire Processes

Periodic fire has been a normal and recurring disturbance in the ecosystem since the retreat of the last glacier, and has been the principal natural disturbance regime shaping a number of vegetative landscape qualities including patch dynamics and stand characteristics. Diverse topography, forest types, precipitation patterns and fuel conditions within the watershed result in a variety of fire patterns which contribute to the diversity of vegetation patterns within the MFW watershed.

Fire patterns are more thoroughly discussed in upland forest patterns, page 54.

Historical records from the 1940's show two distinct periods of high fire activity, one early in the 20th century, and one mid-19th century. 19th century fires were larger (150 acres to over 500), occurred predominantly in high elevation habitats, and were less numerous than fires of the early 20th century. 20th century fires were smaller (mostly in the 100-150 acre size), more numerous, and occurred throughout the watershed.

Fire suppression efforts were initiated in the 1910s, and has resulted in a substantial decrease in fire event size. There have been over four hundred lightning-caused fires documented since 1949 in this watershed.

Habitat Types

For purpose of this analysis, habitat has been categorized into broad **habitat types** based on topographic position and dominant vegetation types. Four habitat types occur within the Upper Middle Fork of the Willamette watershed:

1) High-elevation Upland Forest

This habitat type is dominated by mountain hemlock, pacific silver fir, and noble fir, usually occurring above approximately 4,000 feet. A number of species, such as the gray jay and the American marten, are closely tied to this habitat type. In addition, this habitat is used during summer by many wildlife species which winter at the lower elevation habitat type. High elevation habitat, occupying approximately 55 percent of the watershed, surrounds the watershed on three sides:

The **crest of the Cascade Mountains** is located at the eastern edge of the watershed and separates east and west Cascade habitats. This area is the highest elevation within the watershed, and receives the greatest amount of snow.

- **Vegetation**: This area supports the largest contiguous block of high elevation forest, interspersed with many natural openings such as wind-throw gaps and alpine meadows. Diamond Peak is a biological island of alpine habitat, and a cluster of rare and unusual plant associations occur along the base of the peak. Windthrow is an important disturbance in this area caused by occasional strong east winds blowing through crest saddles resulting in a concentration of wind-throw gaps at the toe of the crest. These east winds may also serve as an entry vector for noxious weed species currently invading from the eastern Cascades.
- **Wildlife**: Saddles along the Cascade Crest provide an east/west avenue of dispersal. High elevation forest provides habitat and north/south connectivity for species such as American marten, great grey owls, and boreal owls.
- **Fire**: The high elevation forest is the most frequently burned area in the watershed, with a mixture of human and lightning caused fires. Fires are predominantly localized burns with small patches of crown removal. Large fires are infrequent, but when they do occur, are late-season, stand replacement fires.

- **Roads**: This area is the least roaded of the watershed due to the large portion covered by wilderness and Oregon Cascades Recreation Area (OCRA).

The **Calapooya Ridge** is one of the largest east-west ridges in the Cascade range, forms the southern boundary of the watershed and causes a rain-shadow effect on the southern two-thirds of the watershed. In addition to providing a major westward extension of high elevation habitats, this ridge separates the Umpqua River basin from the Willamette basin and contributes to the transition from drier southern Cascades to mesic northern Cascades.

- **Vegetation**: This ridge provides an extended distribution of high elevation Pacific silver fir and mountain hemlock associations. There is a higher density of rare and unique plant associations in this area. The transition from north to south Cascades is reflected in the presence of several species, such as knobcone pine, at the northern extent of their range. In addition, the high-elevation peaks mimic east-side conditions, providing habitat which could serve as refugia or dispersal corridors during episodes of global climatic change.
- **Wildlife**: The ridge provides habitat for high-elevation species and facilitates dispersal. In addition, the ridge serves as summer habitat for elevationally migratory species. The ridge also hinders dispersal of riparian-dependent species from the Umpqua River drainage to the Willamette River drainage.
- **Fire**: The deeply dissected north slopes of the Calapooya Ridge have some of the greatest concentrations of lightning strikes in the watershed. Fires tend to burn in a mosaic pattern., and tend to have more and larger patches of stand-replacement burn.
- **Roads**: High road density contributes to disturbance of wildlife species, contributes to fragmentation, and affects habitat use and hunting pressure.

Juniper Ridge extends westward from the Cascade ridge along the northern edge of the watershed, providing a second westward extension of high-elevation habitat.

- **Vegetation**: Stands on south-facing slopes of Warner Mountain contain a particularly diverse community of conifers, characterized by large transition zones between timber types.
- **Wildlife**: This area plays an important role in the east/west dispersal of high elevation habitat associates and provides summer habitat.
- **Fire**: Fires in this area are a mixture of human- and lightning-caused events. Fires burn more intensely and are potentially large in scale.
- **Roads**: High road density contributes to disturbance of wildlife species, contributes to fragmentation, and affects habitat use and hunting pressure.

2. Low & Mid-elevation Upland Forest

This habitat type is dominated by western hemlock and Douglas fir; Ponderosa pine often occurs as a co- or sub-dominant overstory species in the Simpson Creek and lower Staley Creek drainages. This habitat type is utilized by a wide array of wildlife species, most notably the spotted owl. The ponderosa pine provides a northern range extension on the westside of the Cascades for pine-associated species such as the flamulated owl. This habitat type also provides important wintering grounds for many wildlife species.

This type of habitat is found predominantly in the valley basin associated with the upper portions of **the Middle Fork Willamette River basin** bisects the watershed landscape.

- **Vegetation**: Due to the rain shadow effect of the Calapooya in the lower part of this glaciated valley, dry-site associations and species (i.e. ponderosa and sugar pine, incense cedar, tall Oregon grape) occur at frequencies more representative of the Southern Cascades.

- **Wildlife**: The low- and mid-elevation habitats provide important wintering ground for numerous elevationally migratory wildlife species. The Willamette River and its major tributaries provide riparian connectivity with areas outside the watershed.
- **Fire**: Human-caused fires are predominant, with fires starting in the basin and running in stringers up ridges. Due to the lack of snowpack, fires in this area are evenly distributed throughout the fire season and are high intensity due to vegetation types and dry season use by humans.
- **Roads**: The main arterial Road 21 provides primary access to the watershed, and parallels the Middle Fork Willamette River. Traffic associated with the high road density in low-elevation winter range and birthing areas can cause disturbances to wildlife.

3. Rare and Non-Forested Special Habitats

Non-forested special habitats cover approximately 2% of the watershed, but their distribution across the landscape is important for biodiversity of plant and animal species. Eighty-five percent of flowering plants in the central western Cascades are found in non-forested areas such as rock outcrops and meadows (Hickman 1976), and all documented sensitive species locations within this watershed are in non-forested special habitats. Many of the special habitats identified in the Special Habitat Management Guide (WNF 1992) are present within the watershed. However, inventory and mapping of special habitats in the watershed is well below 50% complete, so patterns of distribution cannot be accurately discussed.

In addition to the broad upland forest categories, this watershed has stands which have been classified in the Special Habitat Management Guide (WNF 1992) as rare forested plant associations and unusual. These stands contribute to the watershed's diversity of community types, may reflect unusual environmental conditions, or may represent the outlying extent of that community. These communities are concentrated in two locations: one group occurs at the base of Diamond Peak, and the other occurs on the Calapooya Ridge.

4. Riparian

Riparian habitats serve a vital landscape function of connectivity allowing for dispersal and genetic interchange of both riparian and many upland species. Riparian stands are characterized by a larger hardwood component which contributes greatly to the diversity of wildlife species utilizing the riparian habitats.

Habitat classified in GIS as Riparian Reserve occupies approximately 15% of the watershed. However, many Class IV streams are not included in this figure, so this figure substantially under-represents potential Riparian Reserve lands in this watershed.

Habitat Patterns

Condition of habitat can be described in terms of the patterns in which it occurs. Fragmentation, interior forest habitat, and habitat connectivity are landscape patterns strongly affecting plant and wildlife species. Useable habitat must occur in patterns which not only provide patches of sufficient size to sustain viable populations, but also provide connectivity for survival into the future. When landscape vegetation patterns change, there is often an accompanying shift in species composition, distribution, abundance and interchange of population genetics.

Interior forest habitat plays a critical part in maintaining healthy populations for many animal species (Forman & Godron, 1986, Bunnell, 1995). Interior forest is any seral stage which occurs in a patch of sufficient size that there is some area which is not influenced by edge effect. Along edges of strongly contrasted habitats (i.e. old growth adjacent to stand initiation), edge effects could extend up to 400m in the Central Cascades, so any patch less than 64 ha contains no interior habitat (Chen et al, 1995). Large blocks of interior habitat provide for sustainability of a larger number of species.

There are several noteworthy blocks of interior forest habitat which are larger than 1000 acres. A large block of private land occurs in the Simpson creek drainage, predominantly composed of early seral stands, with a few patches of mid-seral stage interspersed. Large, unfragmented mature high-elevation

habitat remains in the Diamond Peak Wilderness and the Oregon Cascades Recreation Area. Particularly important are three blocks of mid-elevation old growth, interior forest habitat found on the south slopes of Bear Mountain, the base of Tumblebug Gorge, and land in the vicinity of Lighthouse Rock. A fourth area, the west slope of Staley ridge is similar mid-elevation mature habitat and is contiguous with mature habitat on the west slope of Staley Ridge addressed in the Lower Middle Fork of the Willamette watershed analysis.

Natural **fragmentation patterns** vary within the UMFW watershed, but can be grouped into two broad categories: large block and mosaic. Fragmentation patterns within the watershed have been altered by dispersed harvest activities and associated road building. An increase in forest fragmentation often causes a reduction in the amount of useable habitat, loss of species associated with interior forest (Wiens, 1985), and change in species composition. The direct effect of this reduction in habitat is an increase in home range size and energy expenditure of habitat specialists species (i.e. spotted owl), with a secondary effect of decreased species population numbers per area.

Travel corridors and **connectivity** of habitat over the landscape is critical for dispersal and genetic exchange to maintain viable populations (Harris, 1984; Lefkovitch & Fahrig, 1985). Connectivity need not be spatially contiguous nor temporally continuous so long as over time it is arranged in a pattern which allows movement across the landscape. Habitat that effectively provides connectivity across the landscape is that habitat which meets the basic needs for survival such as food, microclimate, and security from predators.

In the MFW watershed, the non-harvest allocations along the Cascade Crest provide north-south high elevation connectivity as well as eastside/westside Cascade connectivity which has not been significantly altered by management activities. Connective corridors which are low elevation, westward extension of high elevation habitat or interdrainage tend to occur in harvest allocation lands, and may be limited in their current connectivity function.

Terrestrial TE&S and Unique Species

Wildlife

Threatened, endangered and sensitive wildlife species found within this watershed are the northern spotted owl, the American Peregrine falcon, the American Wolverine, Townsend's big-eared bat, the Western Pond turtle and the red-legged frog.

Plant

Three species listed on the R6 Sensitive Plant species list have been confirmed present within this watershed; all of these species are represented forestwide by the single, disjunct population located in this watershed.

- Bolander's hawkweed (*Hieraceum bolanderi*), a member of the sunflower family, is associated with moist, open woods and steep rocky slopes from 1,000 to 7,200 feet in elevation; currently, there are 51 documented populations of this species, most of them in the Southern Cascades.
- Columbia Gorge Lewisia (*Lewisia columbiana var. columbiana*) is associated with dry, rocky sites; currently, there are only 18 populations documented state-wide, most of them along the Columbia Gorge and west-slope Cascades in the vicinity of the Gorge.
- Green-flowered Ginger (*Asarum wagneri*) is associated with mesic to dry meadows and open woods. This species is a Mt. McLoughlin endemic, and all other populations are located in the Rogue River drainage, primarily on the Butte Falls Ranger District.

Additionally, two R6 Sensitive Plant species are strongly suspected to occur within the watershed:

- Populations of sticky arnica *(Arnica viscosa)*, a talus-slope associate and cowbane (*Oxypolis occidentalis*), a wet meadow associate, are known to occur just outside (within one mile) of the

watershed. These habitats are present in the watershed, and a number of areas have not been surveyed..

Candystick (*Allotropa virgata*), a species listed in the ROD as a strategy 1 survey and manage species is known to occur within this watershed. Other survey and manage species are suspected to occur within this watershed, but survey information about these species is inadequate to make a final determination of presence or absence. A number of species occur in this watershed which are not listed on the Regional Forester's sensitive species list, but are still listed by the Oregon Native Plant Society of Lane County as unique or rare due to limited distribution or abundance. Although there are no federal mandates protecting these species, these species make an important contribution to the biodiversity of the area.

Terrestrial Non-Native Species

Invasive non-native species are a threat to native species diversity. Non-natives often are present without the host of predators, disease and other control factors which limit their abundance in their native lands, and so are able to displace and outcompete native species. Control and eradication can be difficult, and is most effective when infestation levels are low. Population models for vascular plant species suggest that control efforts must be more than 90% effective to maintain infestations below full biological potential (Sharratt, 1995).

Wildlife

The Barred Owl has become established around Simpson and Staley Creeks, and likely will become established elsewhere over time. This species occupies a wider habitat niche than the Spotted owl and is more aggressive so has been known to displace Spotted owls out of occupied territory.

Botanical

The majority of the invading species are pioneer species, adapted to utilizing disturbed ground commonly associated with timber harvest and associated road building. In addition, the increased light found along roadsides and continued disturbance due to maintenance allows roads to serve as corridors for weed invasion. A few species are well suited for invading forested stands.

Past management practices have included seeding with non-natives for erosion control and forage enhancement. Due to this practice, most meadows include a large component of non-native grass species. Of particular concern are the mat-forming species which spread off the site of application, colonize broad tracts of land, and/or outcompete local native species.

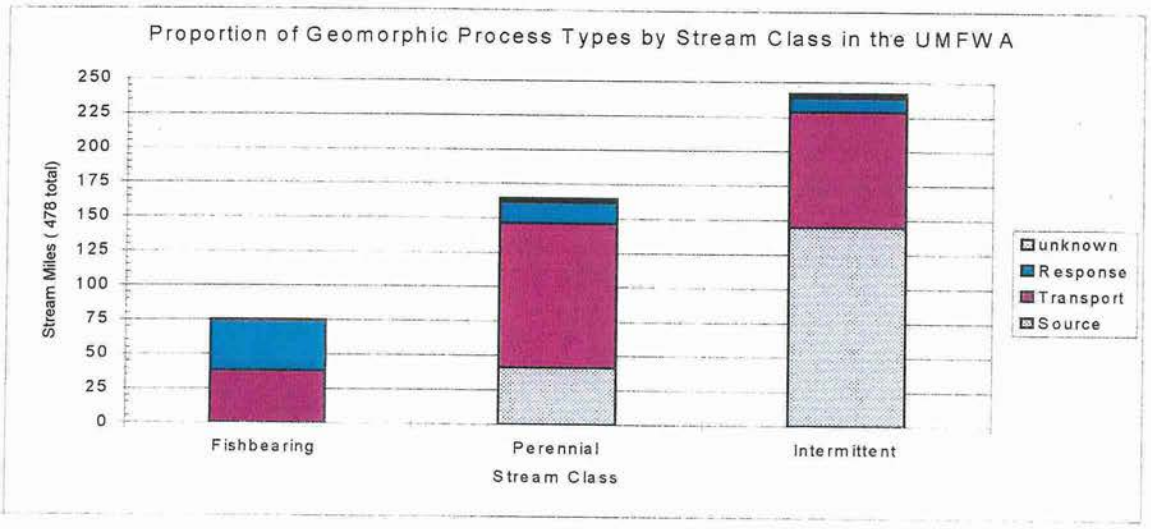
Aquatic Habitats

The high elevation streams which are fed year-round by snowmelt and/or coldwater springs, possess outstanding water quality in terms of temperature. They are the only known locations in the river basin where water temperatures generally remain within the estimated range of 45.5 to 55.4 degrees Fahrenheit (Coast Fork of the Middle Fork Basin Analysis, 1995). This range of temperatures provides potential habitat for rare aquatic species such as Bull Trout. The exceptionally low temperatures found in the headwater streams help moderate the cumulative effects of warmer water inputs from tributaries lower in the watershed as well as direct heat gain in the mainstem MFW River.

The High Cascade geologic processes have directly influenced the distribution of the aquatic species in the Upper Middle Fork Willamette Watershed. Tributaries flowing down from Diamond Peak have limited habitat access, since many stretches have subterranean flows due to highly-porous surface material. The glacially-formed, U-shaped valleys are mostly spring fed, dictating year-round cold temperatures. The colder temperatures limit biological production to species adaptable to these conditions. Water released from the Timpanogas Basin has warmer temperatures due to high solar radiation on the headwater lakes. These temperatures decrease as the water flows through the spring-fed portion of the Watershed at the base of Diamond Peak.

Response channel segments are relatively low gradient and make up 49 percent of fish bearing mileage. The remaining habitat is distributed primarily in transport segments (Figure 7). Waterfalls or other natural barriers generally limit fish distribution in transport reaches. Source segments, which dominate the overall network, are a negligible component of the stream miles inhabited by fish.

Figure 7. Proportion of geomorphic process types by stream class in the UMFWA.



Anadromous Species

Prior to stream cleanouts, logging activities, and the 1960 poisoning effort to eliminate large-scaled fish species during the construction of Hills Creek Dam, bull trout persisted in the cold, spring-fed areas of the Watershed. The fluvial population migrated from the mainstem of the Willamette River to the UMFW River to the headwaters of Swift Creek and other cold water tributaries to spawn.

MFW River bull trout are at the southern fringe of their habitat range. They are considered part of Willamette metapopulation, same genetic structure as McKenzie, Santiam, mainstem Willamette. Bull trout populations in the Pacific Northwest, Idaho, and Montana, are proposed and considered as warranted but precluded for federal listing under the Endangered Species Act. Presently, bull trout are considered "functionally extinct" in the basin. The Draft Bull Trout Conservation Plan, under development, may opt to re-introduce bull trout into the basin as early as 1997.

Before dams were constructed in the Willamette basin, twenty percent of the annual Spring Chinook run returned to the UMFW River (approximately 2,500 fish). Historic surveys show that the salmon used the spring-fed portion of the valley to spawn. Cold upwellings found in large gravel beds provide excellent spawning habitat, protecting the developing eggs and alevin from an influx of sediment deposition. Today the Native Spring Chinook are considered extinct in the basin as a result of blocked passage by three dams. The Oregon Department of Fish and Wildlife, however, has begun replacing the Native population with a Stocked strain from other areas in the Willamette basin. Approximately 100 to 500 stocked Spring Chinook have been added yearly since 1994. The purpose of the reintroduction is to provide a food base for any remnant population of bull trout in the watershed.

Resident Species

Rainbow trout are adapted to warmer stream temperatures than bull trout and generally reside in the lower portions of tributaries and lower portion of the MFW River. Known populations of pauite and torrent sculpin are distributed in the lower reaches of the MFW River and tributaries to upstream migration or food base barriers. Coastal cutthroat trout generally persist in the mid-elevation streams to headwaters of perennial streams. Large-scaled river fish (suckers, whitefish, squawfish) and lamprey are also found in the lower portion of the MFW river. Their upstream distribution has increased with increasing water temperatures.

Aquatic Non-Native Species

Since the advent of hatcheries, early stocking practices introduced several non-native strains of cutthroat, steelhead, and rainbow trout into the MFW river. Often these fish spawned during the same time period in the spring, resulting in hybridization and dilution of the native genetic strains. Current stocking practices use varieties of trout that do not spawn and rarely survive through the winter months.

Eastern brook trout and other exotic fish species were introduced into the high lakes through stocking efforts early in the 1930s and 40s. Stocking efforts increased as roads and access to the wilderness improved. Since then, brook trout have migrated downstream into the headwater tributaries of the MFW and Beaver Creek. Colder water temperatures at the base of Diamond Peak, diffuse the warmer temperatures and presently prevents further downstream expansion.

Human Setting

As a result of the natural setting of the landscape, the historic influences on the watershed, the present allocation of the landbase and changing values of the public, the watershed is used predominantly for timber harvest and recreation.

Recreation

There are two congressionally designated areas within this Watershed: the Diamond Peak Wilderness and the Oregon Cascades Recreation Area (ORCA), including Timpanogas Basin. The portion of the Diamond Peak Wilderness contained in this watershed consists of 13,484 acres. Although this portion of the Diamond Peak Wilderness is located on the Willamette National Forest, the wilderness as a whole is shared administratively between the Deschutes and Willamette National Forests. Wilderness Recreation Spectrum (WRS) allocations include transition, semi-primitive, primitive, and pristine management zones which offers a wilderness experience.

Timpanogas Basin forms the headwaters of the MFW River and consists of 6,270 acres. The basin offers both Semiprimitive Nonmotorized recreation opportunities in the remainder of the area. The Diamond Peak Wilderness and the Oregon Cascades Recreation Area are both high elevation areas which offer different recreational opportunities.

Recreational use occurs over the general area of the watershed, but the major use largely takes place in Riparian Reserves found along the MFW River, it's tributaries, and lakes. High use areas are the MFW River, Diamond Peak Wilderness, and Timpanogas Basin. However, timber harvest, hunting, hiking, mountain biking, driving for pleasure, and similar recreational or economic activities do take place in the remainder of the watershed.

The reach of MFW River from Echo Creek to Timpanogas Lake has been determined to be eligible for nomination as a scenic river for inclusion in the National Wild and Scenic River System. The distance between these points is approximately 16 miles. The outstanding and remarkable values are scenic, recreation, geologic/hydrologic, vegetation and ecology, wildlife, and historic.

Harvest Allocations

The Upper Middle Fork has a total of 46,055 acres in harvest allocations, or 40% of the watershed (Figure 8). Table 2 lists harvest allocation lands in the Upper Middle Fork of the Willamette watershed by management allocation as established by the WNF Forest Plan amended by the ROD. These acres include all scenic (LMP 11) and general forest (LMP 14A) lands, less LSR and RR acres Private lands within this Watershed are owned by Seneca Jones Timber Company and are located as a contiguous block of 7,128 acres within the Simpson and Swift Creek Subwatersheds.

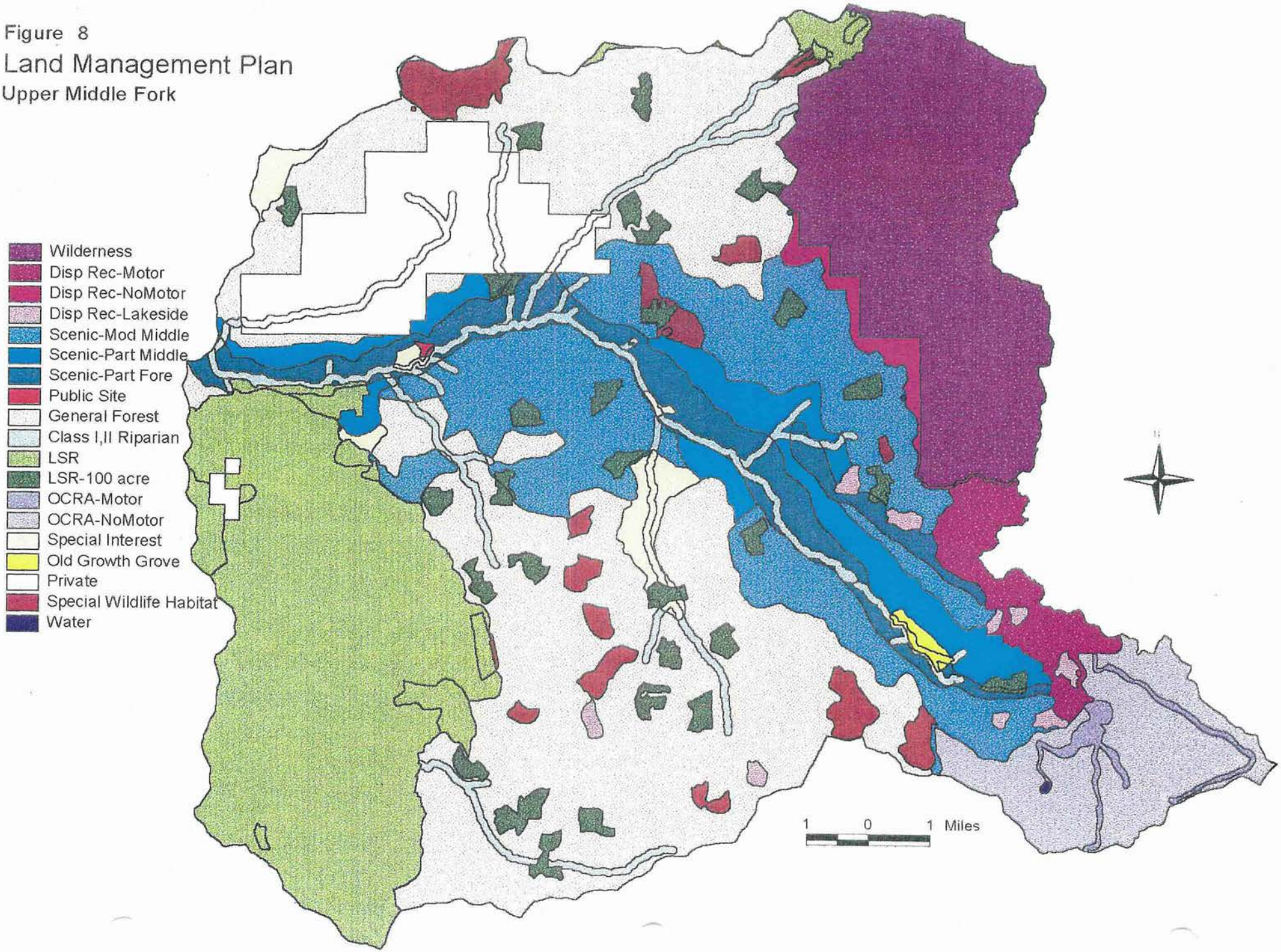
Table 2: Harvest allocation lands in the UMFWA.

Harvest Allocation	Total Acres	SRI Unsuited	Road Prism	Net Harvest
11A: Scenic Mod Middleground	11272	2002	623	8,647
11C: Scenic Partial Retention Middleground	3,081	521	161	2,399
11D: Scenic Partial Retention Foreground	4,018	538	353	3,127
14A: General Forest	27,684	6793	1706	19,185
Total Harvest Allocations	46055	9854	2843	33,358

Timber harvest within these lands will be affected by land suitability for harvest. A generalized picture of lands unsuitable for harvest is included in the table above and is based on SRI type as set by the Forest Plan (Appendix F). Although this information can be used as a starting point, the data is very generalized in nature and is not based on extensive ground survey, setting certain limitations on the conclusions which can be inferred. On-ground, site specific validation is necessary to make a final determination of suitability.

Volume in these harvestable acres will be further reduced by: 1) the 15% green tree retention for harvest units other than thinnings; 2) FW211 lands (see WNF Forest Plan) and 3) buffers for threatened and endangered species, special habitats or other identified resource

Figure 8

Land Management Plan

Upper Middle Fork