

Rock outcrop:

Asplenium septentrionale
Pellaea andromedaefolia
Polystichum californicum

Rocky slopes, scree:

Aster gormanii
Arnica viscosa
Campanula scabrella
Lewisia columbiana var. *columbiana*
Romanzoffia thompsonii

Riparian zones:

Botrychium minganense
Botrychium montanum
Calamagrostis breweri
Cimcifuga elata
Huperzia occidentalis
Poa laxiflora

Aquatic habitat in small lakes and ponds:

Montia howellii
Utricularia minor
Wolfia columbiana

Survey and Manage, C-3 Species

The Standards and Guidelines in the *Record of Decision* (1994) specify that agencies survey and manage for species specified in Table C-3 of that document. No surveys for these species have been conducted in the study area and occurrence of these species here is unknown. The types of habitat preferred are known in general terms for many of the species, however. This information is summarized in Appendix J2 to the FS EIS (USDA and USDI, 1994). Many of these species are associated with late-successional forests which have been harvested over most of the watershed.

Appendix List BOT4 in the South Fork McKenzie Watershed Analysis (1994) groups these species into "guilds" according to their preferred habitats. Since that watershed is adjacent to the study area its environment is similar. However the study area does not include alpine and subalpine areas associated with the highest elevations of the South Fork McKenzie. Nevertheless, that appendix can be used to suggest where C-3 species may be found in the study area.

WILDLIFE

Reference Conditions

Species historically found in the Quartz Creek watershed evolved with the landscape in response to a range of environmental variability. Changes in the size, type and frequency of disturbance have altered the historic range of environmental variability. As a result, forest stands may not provide, prior to harvest, the structural and compositional features necessary for the long term viability of many late-successional species. No appropriate analogs are available for comparison.

Current Conditions

Twenty-two species listed as either (Record of Decision) C-3, state listed critical, state listed vulnerable or Federally listed (including R6 sensitive) are known to occur in the Quartz Creek watershed. (Table VI). The highly fragmented condition of the Quartz Creek watershed does not currently provide large expanses of multi-storied canopy old-growth habitat necessary for the long term viability of many of these species. Forest fragmentation is a landscape level process that progressively subdivides forest stands into smaller and more isolated tracts and can result both from human activity or natural processes. A highly fragmented landscape departs from the historic range of variability in the forested landscape and can negatively influence the integrity of ecological processes. In general, forest fragmentation increases the amount of forest edge and decreases the amount of interior habitat, leading to long term changes in forest structure, microclimate, habitat availability, and prey density. These changes can ultimately result in changes to species population health and distribution. Future land management strategies focus on recruitment and maintenance of a series of interconnected late-successional forest habitats.

The development of late-successional reserves will enhance the quality of habitat features for late-successional associate species. Many species in the Quartz Creek watershed, however, are associated with early seral habitats. These species include deer, elk, songbirds (including neotropical migrants) and small mammals. An unpublished study conducted in nearby watersheds documented 70 species utilizing early seral Douglas-fir stands, 61 of which were neotropical migrants or non-migratory passerines (E, Arnett, pers. comm.). The other 9 species were raptors, shorebirds, game birds or waterfowl species. Swainson's thrush, hermit warbler, winter wren, MacGillivray's warbler, and black throated gray warbler were the most common species detected. Published studies have previously associated these species, except MacGillivray's warbler, to be late seral associates.

The availability and distribution of early seral habitat types is expected to decrease in areas managed for late successional reserves such as west of Quartz Creek and around Elk Creek. As early seral habitat transitions into mid and late seral conditions, these species can be expected to shift part or all of their home ranges away from late-successional reserves and toward matrix or private land areas that could provide essential early seral characteristics important for foraging or cover. Increased animal damage complaints from private landowners are possible assuming private land serves as a source of early seral habitat.

Table W-1. Species of concern known or with potential to occur in the watershed.

Table C-3 species	State listed -critical	Federally listed (including R6 sensitive species)	State listed -vulnerable
Red tree vole	Oregon spotted frog	Red legged frog	American marten
	Western pond turtle	Western pond turtle	Fringed myotis
	Ferruginous hawk	Ferruginous hawk	Pallid bat
	Northern goshawk	Northern bald eagle*	Pileated woodpecker
	Common nighthawk	Peregrine falcon*	Olive-sided flycatcher
	Townsend's big-eared bat	Townsend's big-eared bat	Willow flycatcher
	Fisher	Harlequin duck	Western bluebird
		Northern spotted owl*	
		White footed vole	
		California wolverine	

* federal threatened or endangered species

Species of Concern

Of the 408 total ROD C-3 species; 234 (57%) are fungi, 81 (20%) are lichens, 23 (6%) are bryophytes, 43 (10%) are mollusks, 17 (4%) are vascular plants, 4 (1%) are arthropod groups, 5 (1%) are amphibians and 1 (0.2%) are mammals. Because the location and potential distribution of many Fungi, lichen, bryophite, mollusk and arthropod ROD C-3 species is unknown, Standards and Guidelines mandates the implementation of extensive surveys and the management of known sites.

Red Tree Vole (*Phenacomys longicaudus*)

The only ROD C-3 wildlife species that potentially occurs in the watershed based on it's home range and habitat requirements is the red tree vole. The red tree vole is found in dense, mesic coniferous forests that contain large Douglas-fir trees. Their diet consists almost exclusively of Douglas-fir needles. This species builds nests of Douglas-fir needles from 50-150 feet off the ground. Because they are arboreal and nocturnal they are rarely observed. They are a major prey item for the northern spotted owl. The ROD Standards and Guidelines can be expected to protect existing habitat and provide the recruitment of long term habitat for the red tree vole through maintenance of late

successional reserves (LSRs) west of Quartz Creek and around Elk Creek and improved riparian corridors necessary for dispersal.

Northern Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles are associated with rivers, marshes, coasts and lakes. They also require large trees for nesting. Although no known nesting sites occur in the watershed area, bald eagles are occasionally seen perched along the banks of the Mckenzie River. The continued maintenance of the Mckenzie River riparian area and the corresponding recruitment of late-successional habitat near the river will continue to provide quality bald eagle habitat.

American Peregrine Falcon (*Falco peregrinus anatum*)

Suitable nesting habitat (usually cliffs) is the most common limiting factor for the peregrine falcon. Peregrines are not well suited to forest interior conditions. Nesting habitat surveys have not recorded peregrine falcon use in the watershed area. Although it is unclear what effects the ROD Standards and Guidelines will have on potential future peregrine falcon populations, deleterious effects are not expected.

Northern Spotted Owl (*Stix occidentalis caurina*)

Northern spotted owls have been documented in at least three areas of the analysis area. Owls are known to occur in the sub-watersheds of Lytle Creek, Elk Creek, and Mill Creek (R. Seitz and L. Lyons, pers. comm.). Much of the earlier survey information had come from timber sale planning surveys up to the late 1980's. Thereafter, the Oregon Cooperative Wildlife Research Unit began surveys of specific sites and of suitable habitat to determine occupancy and reproductive status of owls (J. Thraikill, pers. comm.). Currently the Elk Creek and Mill Creek sub-watersheds are being surveyed on an annual basis. As of 1988 a limited survey effort, covering about 10 % of suitable habitat, revealed that the Hagan Late-Successional Reserve (LSR) contained four owl activity centers and supported two pairs. Owl survey results since 1988 for the Hagan LSR are shown in Table W-2. The current goal for the Hagan LSR is to support 5 owl pairs. Based on the current habitat condition of the LSR, and reported scattered night responses, it is believed that additional surveys could reveal additional owl pair locations.

The ROD Standards and Guidelines can be expected to benefit spotted owl populations within the late-successional reserves through increased growth of late-successional habitat and through enhanced connectivity between late successional reserves via management of riparian zones and matrix lands.

Some portions of the matrix lands in Quartz Creek are not meeting the current standards of adequate owl dispersal habitat. The current standard, often called the "50-11-40" measure, seeks to maintain, on at least 50 % of capable lands within a quarter township, stands with stems of at least 11-inches diameter at breast height and at least 40 % canopy closure. Currently, only 37 % of capable lands meet the dispersal standard in northeast quarter of township 18

south and range 4 east. Only 44 % of capable lands meet the dispersal standard in the southeast quarter of the same township.

The dispersal between the Fall Creek LSR and the Hagan LSR to the north may depend on management of critical “stepping stones” that could link the two areas. These stepping stone consist of suitable dispersal habitat in the Long-term Ecosystem Productivity (LTEP) site of Deer Creek, the privately owned Ennis Creek drainage, the Adaptive Management Area just north of Ennis Creek and the private lands just to the north of Finn Rock.

Table W-2. Total northern spotted owls survey results through 1994 in the Hagan LSR, Quartz Creek Watershed, Blue River District, Oregon.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Singles	0	0	1	1	1	2	0	1	1	1
Pairs, non-nesting or unknown	0	2	1	0	1	0	0	0	1	0
Pairs, reproductive	1	0	0	0	0	0	0	0	0	0
Number of known young	2	0	0	0	0	0	0	0	0	0

Table W-3. Additional state listed critical and R6 sensitive species that occur or potentially could occur within the watershed including type of listing, habitat type, current status and expected status of species under standard and guidelines management strategies with a transition toward increased late-successional habitat.

Species	Listing type	Habitat type	Current status	Future Status ⁴
Oregon spotted frog	SC	Aquatic sites w/variety of vegetation. From grassland – forests.	Possible presence	No change ¹
Western pond turtle	SC, R6S	Quiet water in small streams, lakes and marshes. Needs basking structures.	Possible presence ₂	Positive change
Ferruginous hawk	SC, R6S	Requires ledges, cliffs, isolated trees or riparian woodland for nesting.	Possible presence	Positive change
Northern goshawk	SC	Late seral coniferous forest.	Possible presence	Positive change
Common nighthawk	SC	Forage over almost all Oregon habitats, nest in open areas.	Present	No change
Townsend's big-eared bat	SC, R6S	Depends on suitable roost sites. Roosts in buildings, caves, mines and bridges.	Present	Positive change ³
Fisher	SC	Late seral coniferous forest, with deciduous component, riparian corridors.	Present	Positive change
Red legged frog	R6S	Meadows, woodlands, forests. Near ponds, marshes and streams.	Present	Positive change
Harlequin duck	R6S	Low gradient stretches of mountain streams in forested areas.	Present	Positive change
White footed vole	R6S	Riparian portions of forested areas, may also depend on small clearings.	Present	Positive change
California wolverine	R6S	Alpine open forests, late seral associate, avoids dense regenerating forests.	Possible presence	Positive change ²
American marten	SV	Late seral mesic coniferous forests. Dependent on coarse woody debris.	Present	Positive change
Fringed myotis	SV	Forested and riparian areas primarily	Possible	Positive

Species	Listing type	Habitat type	Current status	Future Status ⁴
		west of the Cascade Mountains.	presence	change ²
Pallid bat	SV	Arid habitats, also in open forest types. Roosts in cliffs, caves, mines, buildings	Possible presence	Positive change ²
Pileated woodpecker	SV	Late seral coniferous forests.	Present	Positive change
Olive-sided flycatcher	SV	Multi-story coniferous forests.	Present	Positive change
Willow flycatcher	SV	Riparian willows, forest edges around water	present	No change
Western bluebird	SV	Forest openings with nest holes, riparian woodlands, clear-cuts w/snags.	Present	No change

SC=State-critical, R6S=R6-sensitive, SV=State-vulnerable

¹ Species decline attributed to introduction of bullfrog

² Western pond turtle documented within 1 mile of watershed

³ Species are intolerant of disturbance or human contact that would expect to decrease in LSR settings

⁴ Future condition is defined as the expected general trend of population presence and viability as a result of future land management activity

Little information exists about many of the species listed by the state, Forest Service or Region 6 that are known to exist or potentially could exist in the Quartz Creek Watershed. Forest Service management indicator species American marten and pileated woodpecker for example are both known to occur but no survey information is available. Similarly, the western pond turtle has been observed within 1 mile of the watershed and is listed by the state as critical and Region 6 as sensitive, yet no survey work has been attempted to date. In addition to the 408 ROD table C-3 species about which little is know in the Quartz Creek Watershed, the California wolverine, harlequin duck, Townsend's big eared bat, fisher, Oregon spotted frog, red legged frog and northern goshawk should all be included in future survey strategies that would allow some indication of the effectiveness of ROD Strategies and Guidelines in maintaining and enhancing biodiversity across the landscape.

Elk and Habitat

HEIwest Analysis

The following discussion about elk was derived from personal communication with Bill Castillo, ODFW District Biologist at the Springfield office, the documents Ecology and Management of Roosevelt Elk in Oregon (Harper, 1987), and the South Fork McKenzie River Watershed Analysis (1994).

Historically, elk populations in Oregon have gone through dramatic cycles of decline and regrowth as a result of human activities. Early pioneers described elk as being very abundant. There was no early management or protection of elk and, as western Oregon became populated with settlers, overharvest began to occur. Mostly due to unregulated commercial exploitation, the elk herds in Oregon were reduced to remnant populations in remote areas by the 1890s to 1900s. The first management actions were taken in 1872, when the state legislature prohibited elk hunting for meat, hides, and antlers. All hunting was

eventually prohibited in 1899. By 1917, the Game Commission reported that it would not be possible to re-establish elk in Oregon. Never-the-less, transplanting programs introduced Rocky Mountain elk originally from Yellowstone Park into western Oregon that presumably mixed with the remnant Roosevelt herds. By 1938, elk populations were recovering and a limited bull hunt was allowed in Clatsop County. Within a few years, hunting was resumed in the McKenzie area.

Knowledge of the exact herd sizes in the analysis area is not available. Surveys by the ODFW began first as informal trend counts by car in limited areas on Forest Service land. Eventually surveys developed into aerial surveys performed during the month of February. The focus is to examine herd composition on the winter ranges; the ODFW management objective is to maintain 10 bulls to 100 cows. Currently elk are close to the ODFW management objective of 4500 elk in the McKenzie Management Unit--an area that is bounded by a line between Springfield and Lebanon on the west, by highways 20 and 58 on the north and south, respectively, and by the crest of the Cascades on the east.

During the 1970s several elk transplants occurred in the Blue River and McKenzie Bridge areas to enhance the population. These introductions are considered to have contributed to the herd sizes today. One historic wintering area was the South Fork of the McKenzie River. After the construction of the dam, the herd is thought to have begun using the Quartz Creek basin to a greater degree. This herd is not likely limited to only the Quartz Creek watershed. Over the season, elk generally migrate upslope during the spring, following the phenology of vegetation and downslope in the fall as frosts kill herbaceous growth. They can travel long distances and will avoid human activity and roads with vehicular traffic. Elk are expected to be in Quartz Creek at any time of the year due to their coming and going and now are considered to be as widely distributed as deer.

Management by ODFW consists of two different approaches. The objective of management in the western, mostly private lands of the McKenzie Management Unit is to stabilize elk populations and prevent increased growth. Management is mostly by regulated hunting in this western portion. Historically, winter elk herds were large and concentrated in few localized areas. Largely through management of hunting seasons, the ODFW have changed elk herds into smaller herds, typically less than 20 elk, that are dispersed over greater areas. The purpose of dispersing elk is to minimize winter damage on private agricultural and industrial forest lands where large herds may congregate. In contrast to the private lands management, the objective in the eastern, mostly Forest Service lands is to maintain a productive herd with surplus to meet recreational harvest objectives. Here management objectives are achieved largely through habitat management. An important component of the habitat management is through cooperation and negotiation with the Forest Service about activities on federal lands.

All land within the Willamette National Forest has been designated according to a big game emphasis areas. These areas are assigned a rating of high, moderate, or low. The effects of projects are evaluated using a numeric model (Wisdom et al. 1986) that calculates indices of "habitat effectiveness" based largely on vegetation cover types and road density.

The Quartz Creek and Minor Tributaries watersheds have been mapped as mostly low with lesser amounts of moderate emphasis. An area of high emphasis in the Mill Creek drainage occurs in the Mill Creek watershed, however this was not included in the model analysis because the model is unable to handle the smaller sized vegetation polygons in Mill Creek. Much of the analysis area is also designated as winter range, being below 3500 feet elevation.

Table W-4 shows the results of the HEIwest elk habitat analysis model and the resultant habitat indices for the various emphasis areas. In most cases, the habitat quality assayed by the model exceeds the minimum limits given in the Forest Plan standards and guidelines. In the moderate emphasis designation, the standards and guidelines require that habitat conditions shall provide "good quality" cover and forage. The intent is to increase or maintain the indices for overall condition (HEI), cover quality (HE_c), forage quality (HE_f), road density (HE_r), and size and spacing of cover and forage area (HE_s); all indices should be at least 0.4. In the low emphasis area, the indices may be low for all four variables; all variables should be at least 0.2. The model produced an index of 0.30 for roads in the Quartz Creek moderate area; this is below the standard of 0.40 for roads. Open roads were measured to be 40 miles in the approximately 10 square miles of moderate area in Quartz Creek. Road lengths were determined by map wheel of the open roads from the 1990 McKenzie and Blue River Ranger District map. Road 340 was assumed closed due to damage; all other were assumed open and are generally well traveled by hunters and recreationalists (G. Flint, pers. comm.). Research has suggested that human activity on roads alters distribution of Roosevelt elk habitat use and that stress caused by human use of roads can lead to adverse biological effects.

Table W-4: Results of the HEIwest elk habitat model analysis.

Emphasis area	HEs size and spacing	HEr Roads	HEc cover	HEf Forage	HEI Overall index
Quartz Creek low	0.22	0.42	0.69	0.75	0.47
Quartz Creek moderate	0.45	0.30	0.70	0.57	0.48
Minor Tributaries low	0.49	0.56	0.73	0.50	0.56

Any decreases in the rate of forest harvest due to the Northwest Forest Plan is not expected to have a negative effect on elk populations in Quartz Creek. The main value of habitat in Quartz Creek is in the winter cover provided for and winter thermal cover is likely to increase over time with the development of the late-successional reserves elk (B. Castillo, pers. comm.).

RECREATION

Historical Use

Past and current human uses of the Quartz Creek and McKenzie Minor Tributaries Watersheds have been related to the abundant natural resources of the area. Accounts of prehistory in the area suggest that this region of the Cascades was used by indigenous people who were ancestors of the Mollala tribe. Early historical accounts document settlers in the 1860's who arrived after gold was discovered in Blue River. Following this, Belknap Springs resort was developed in the 1870's and began to draw visitors through the McKenzie Valley (Upper McKenzie Watershed Analysis 1995). In the early 1900's, forestry became an important economic activity, with 9 mills operating in the McKenzie Valley in the 1930's. Changes in the timber industry which continue into the present resulted in the closure of those mills, with current timber harvests being shipped out of this area for processing (Committee for Economic Development of the McKenzie River Valley, 1986). Although tourism also declined at different times (especially during the depression), it has always been an important economic activity in the area (Upper McKenzie Watershed Analysis 1995). McKenzie District Ranger John Allen noted that in 1925, there was an identified need for a campground near McKenzie Bridge. The number of visitors at that time was close to 40,000: 8,000 were guests of resorts or hotels, 3,900 were picnickers, 100 were summer home residents, and the rest were doing some type of camping or short-term visits. "Rangers at the time noted that the area was already heavily committed to recreation and that recreation values here would become thoroughly entrenched over time" (Allen, 1997). Recreational activities have included boating (rafting, kayaking, and canoeing), fishing (salmon, steelhead, and trout), hunting, collection of bear grass, cones, boughs, mushrooms, and berries, rock climbing, hiking, mining, swimming, camping, and nature study.

Current Recreational Use

The majority of recreation and tourism activities in these watersheds occur near the main stem of the McKenzie River due to easy access and abundant opportunities. This area is within easy driving distance of Eugene metropolitan area, and is on a major travel route to the Cascades and central Oregon. Table R1 shows the average daily traffic volumes for the last 4 years on Highway 126 through this area (Oregon Department of Transportation, 1997). The designation of State Highway 126 just east of this area as a National Scenic Byway has coincided with a 20 % increase in visits to the McKenzie Ranger Station on weekends (P. Raab, pers. comm.), meaning that an increasing number of travelers are likely to be passing through the Minor Tributaries Watershed as well.

Table R1: Average Daily Traffic Volumes on Highway 126.

Mile Post	Location	1993	1994	1995	1996
36.00	.9 mile east of Nimrod	3400	3600	3700	3600
40.70	on Blue River Bridge	3500	3700	3800	3700
45.38	.01 mile W of Cougar Res. Rd.	2900	3100	3300	3200
49.79	.01 mile E. of road to McKenzie Bridge Rec. Area	2600	2800	2700	2600

There are no overall recreation use data available for these two watersheds, nor are there any traffic counts on Forest Service roads which might be used to estimate recreation use. Visitor numbers are available for some developed sites and commercial river use (see below), but not for dispersed recreation use.

Forest Service personnel familiar with the area state that there is very little recreation use outside of the McKenzie River corridor. There is a well-developed road following Quartz Creek that affords access to the Creek at multiple bridges and pull-outs on Rosboro Lumber Company land. However, there is little evidence of Creek use or campsites in this area. The first 5 miles of Quartz Creek provide whitewater rafting or kayaking opportunities during high water. Recent floods have opened up the mouth of the river, and there is very little woody debris in the river to impede progress or pose safety hazards.

Recent logging operations are readily visible from the road through private land, detracting from its value as a scenic drive. Hunting is allowed on the private Rosboro land where it doesn't conflict with forest management activities. Otherwise, private land is generally gated and recreation access is by permit.

The National Forest Boundary begins about 9 miles up the Quartz Creek road, and there appears to be very little use of this area. There are no developed campgrounds in this part of the watershed, and few trails. Forest Service personnel report that most users are hunters and berry and mushroom pickers.

In the Minor Tributaries area, outside of the mainstem of the McKenzie, there is also little recreation use. The Elk Creek area is gated, which deters recreation use. The road to the south of the main stem, sometimes called Powerline Road, is used by hunters and mountain bikers, as well as those driving for pleasure. There are a few dispersed camping sites along this road, as well as signs of depreciative behavior such as illegal dumping. This area contains a 125 acre wetland, called Cottonwood Swamp, which attracts a wide variety of wildlife and has potential for development as a wildlife viewing area (Community Planning Workshop, 1992). This area is a potential site for side channel habitat maintenance and possible restoration.

Future Outlook for Overall Recreation Use

Recreation use in these watersheds is likely to increase in the future for a number of reasons. Between 1980 and 1989, recreation visitor days (RVD's) on the Willamette National Forest increased at an average annual rate of 2.2%, and

RVD's at developed sites grew even faster at 2.4% (see Table R2). Table R3 shows that statewide projections for recreation use indicate that all types of recreation use found in this area are expected to experience significant growth through the year 2000 (Community Planning Workshop, 1992).

Table R2: Willamette National Forest Recreation Use, 1980-89.

Activity	Ave. Annual Growth Rate (%)
Camping	2.8
Driving/sightseeing	2.1
Hiking	1.2
Picnicking	1.8
Horseback riding	2.8
Organization camping	-1.1
Hunting	2.3
Fishing	10.1

Table R3: Recreation Use Projections for Region 8*.

Activity	Ave. Annual Growth Rate (%)
Camping, RV	4.7
Camping, tent with vehicle	2.9
Sightseeing	2.9
Day hiking on trails	6.3
Big game hunting	1.9
Fishing, freshwater boat	3.3
Fishing, freshwater bank	2.3
Boating, river non-motor	2.8
Nature, wildlife observation	4.5

*Region 8 includes Lane, Linn, Benton, Marion, Polk, and Yamhill Counties

An analysis of the Delta Showcase area (Community Planning Workshop, 1992), which includes part of the Minor Tributaries watershed to the south of the McKenzie River, predicts that demand for recreation activities in this area will increase due to demographic factors. They point out that the population of Lane County is growing more quickly than that of the state, is employed at a slightly higher rate, and earns a higher per capita income than the state average. These factors lead to a larger pool of potential visitors with the discretionary income to participate in outdoor recreation activities. Table R4 shows that residents of Lane and Linn Counties use the Willamette National Forest extensively for the types of activities found in these two watersheds.

Table R4: Percent of Lane and Linn County Residents who Visit the Willamette National Forest at Least Once per Year: Top Five Activities.

Activity	Percent
Day hiking	76
Camping	73
View/photograph wildlife	71
Fishing	60
Berry/mushroom picking	42

While the above figures suggest that overall recreation use in the McKenzie Valley will continue to grow, there is no guarantee that the lands in these two

watersheds will experience similar recreation use increases. If the Forest Service develops more opportunities (e.g., trails, campgrounds), or increases the marketing of this area (e.g., interpretive brochures), use will probably increase. However, if supply and marketing remain the same, use levels might not increase significantly until surrounding areas become crowded.

Developed Recreation Sites

Developed recreation sites in these two watersheds include a campground, trails, boat launches, a lookout cabin, and Forest Service recreation residences (see Map 21) Delta Campground is the only developed campground in this area and currently has an occupancy rate of 13 % (Mikkelson 1997). Table R5 shows that use was fairly steady from 1994-96, but dropped off in 1997. An earlier study (Community Planning Workshop, 1992) showed that there were 3,165 campground users in 1991, so use has dropped significantly since then. The main flow of the McKenzie has shifted away from the campground area over time, and fish are no longer stocked in this area. Both of those factors may have contributed to the decline in camping use at Delta. By contrast, campground use in the nearby McKenzie District has increased 2-4 % per year.

Table R5: Delta Campground Use: April 15-Sept. 15.

Year	Users
1997	2336
1996	2522
1995	2550
1994	2512

There are three established trails within these watersheds, and two more which lie right along the border. Indian Ridge Trail, in the southeast part of the Quartz Creek watershed is used by hunters, berry pickers, and bear grass pickers. Estimates of use on this trail are not available, but District personnel suggest that use is light. Indian Ridge is also a communications site, with three buildings and 8 different groups using the site.

King-Castle Trail starts off of King Road No. 2639 and is located in the Minor Tributaries watershed. This joins up with the Castle Rock Trail and affords a great view of the McKenzie Valley and the Three Sisters. This trail is relatively new and use figures are not available. Delta Old Growth Trail is a short interpretive trail that starts from the Delta campground area. District personnel estimate a minimum of 2,000 users per year, based upon self-registration at the trailhead. Three new bridges on this trail are currently being constructed, and this might facilitate greater use in the future. There is a short "unofficial" trail that users have established to Slate Rock, a popular climbing site off of Road 2618-350. District personnel estimate about 50 people per year use this site.

There are two additional trails that lie right along the border of the watershed, and which might be impacted by management actions within the watershed. One is the trail to HeHe Mountain on the southwest border of the Quartz Creek

watershed. The other is a trail on the edge of the Hagan Block Research Natural Area on the northwest border of the Minor Tributaries Watershed. Mt. Hagan is also the site of two communications towers and four buildings which service the communications site.

There are a number of boat launches open to the public within the Minor Tributaries watershed (see Table R6). These sites are administered by a variety of agencies and private landowners. There is at least one private landing, at Rainbow Bridge, that is not open to public use. Boating use is discussed in the next section.

Table R6: Boater Access on the McKenzie River.

River Mile	Name
47.9	Rosboro Bridge Landing
49.2	Sheppard Slide
49.8	McMullin Slide
50.8	Finn Rock Landing
55.5	Forest Glen Landing
56.1	Hamlin Landing
58.9	Bruckhart Bridge Landing

Source: Casali and Diness, 1988

There is one lookout cabin on the Quartz Creek watershed, Indian Ridge Lookout, that is rented out on a nightly basis to recreationists. This is very popular and is rented every night from July 4 through the end of September. District personnel report that reservations for the entire season fill up in the first few hours of telephone registration.

There are 23 Forest Service recreation residences within the Minor Tributaries Watershed. These are administered by the McKenzie Ranger District, and they estimate that these residences account for 2,258 visits, or 2,898 RVD's (Raab, pers. comm.). The leases on these recreational residences date back to when summer home tracts were platted in 1934, and are currently up for review. The current annual fee ranges from \$447 to \$1,149 (McKenzie River Reflections, 1997).

Conflicts

Given the low use levels for most developed sites within the analysis area, there are likely to be few conflicts between recreationists, although no data are available which measure conflicts or crowding for non-river users. There is the potential for ecological impacts, however, since many of the developed sites are within the riparian area of the McKenzie River. Delta Campground and Old Growth Trail, boat launches, and recreation residences are all within the riparian area. Ecological impacts from roads, sanitation facilities, and bank modification are probably of most concern. Many of the recreation residences are built close to the river (before setback regulations were in place) and have septic systems that can impact water quality. Ecological impacts can lead to conflicts between recreationists and those people interested in ecosystem health. A 1996 survey

found that 80% of respondents agreed that "the river banks and vegetation close to the banks should be protected" (Community Planning Workshop, 1996).

Future Outlook for Developed Sites

There are relatively few developed recreation sites within the two watersheds. Delta Campground and Old Growth Trail, King-Castle Trail, boat launches, and the recreation residences are within the high use McKenzie River corridor. The previous information presented for overall recreation use showed that camping on the Willamette National Forest grew 2.8% between 1980 and 1990, and campgrounds on the McKenzie Ranger District have shown similar growth in recent years. However, use of Delta Campground appears to be declining. As other campgrounds in the area reach capacity (especially during peak periods), use at Delta should begin to increase. However, factors causing the recent decline in use should be investigated further.

King-Castle Trail and Delta Old Growth Trail should experience increased use in the future as they are readily accessible from Highway 126. They represent two ends of the trail spectrum, as one is very short, accessible for people with disabilities, and interpreted, and the other is moderately long and difficult. Indian Ridge Trail is much less accessible from the main highway, and will probably experience only modest increases in use. The Indian Ridge Shelter will continue to be extremely popular, as there are only a limited number of these opportunities available in Oregon's forests.

The recreation assessment for the Delta Showcase area (Community Planning Workshop, 1992) suggested that the development of wildlife observation trails in the Cottonwood Swamp would draw more hikers to the area. Their public participation efforts (Community Planning Workshop, 1993) indicated a preference towards a combined education/interpretive and wildlife management/watchable wildlife emphasis for the Delta Showcase, which would be consistent with a trail through the Cottonwood Swamp. However, further analysis of the ecological impacts of this type of trail would be necessary.

Future use at developed sites within these watersheds will be somewhat dependent on marketing efforts made by the Forest Service. Improvements in road signs, brochures, or other types of advertisements would lead to increases in use beyond what would occur naturally.

River Recreation Use

The McKenzie River that passes through the Minor Tributaries Watershed is used for boating and fishing (bank and boat). Commercial guides that use the river between Olallie Boat Launch and Hamlin Landing are required to have a permit from the McKenzie Ranger District, and this allows the District to track annual commercial use of the river. Table R7 shows how commercial use through the analysis area has increased, especially in the last three years.

Table R7: Permitted Commercial Use on the McKenzie River.

Year	Raft	Driftboat	Kayak	Total
1987	1265	62	0	1327
1988	2067	77	0	2144
1989	1686	134	0	1820
1990	1379	144	0	1523
1991	1885	184	0	2069
1992	1734	187	5	1926
1993	Data Unavailable			
1994	2321	230	0	2551
1995	2679	271	0	2950
1996	3392	296	8	3696

Source: Raab, pers. comm.

Since permits are not issued for non-commercial use on the McKenzie River, there are no reliable data available for use rates. McKenzie Ranger District personnel estimated that there were approximately 5,250 non-commercial visits within the analysis area in 1996 (Raab, pers. comm.). A 1990 study by Moran estimated 4500 boaters along the stretch between Olallie and Blue River during the summer months, 44 % of whom were with guides. A 1991 EWEB study of McKenzie River use from Blue River to Walterville estimated that 13 % of trips were commercial, while Hall and Shelby's 1996 study showed that 23 % of the use from Olallie Campground to Leaburg Lake was commercial (guides or clients of paid guides). None of the studies coincide exactly with the analysis area, so it isn't possible to accurately estimate the percentage of commercial versus non-commercial boaters in this area. Given the varying percentages of the studies, the Ranger District's estimate of 5,250 non-commercial visits seems reasonable. This would result in a total of 8,946 river users in the analysis area in 1996. In the most recent study (Hall and Shelby, 1996), 64% of the users were rafters, 24 % drift boaters, and 12 % kayakers.

The Shelby and Hall study found little evidence that the section of the McKenzie through the analysis area is too crowded at this time. They did not find the waiting time at put-ins to be an issue, which is consistent with the results of another survey in which only 8 % of respondents said that there were an inadequate number of boat landings in the corridor (Community Planning Workshop, 1996). The number of encounters with other boaters was not high and was not of concern to many boaters. They note that the upper McKenzie is among the least crowded of rivers they have studied, while the lower McKenzie ranks close to the Deschutes, among the most crowded. On the upper river, boaters say fishing, scenery, and camping are better than on other rivers, while on the lower river, boaters say these things are inferior to other rivers. The analysis area encompasses the lower part of the middle section studied, and the upper part of the lower section.

Fishing is clearly an important use of the river in the analysis area. In recent years, ODFW has stopped stocking above Blue River, and fishing for all native fish in the McKenzie River is catch and release. There are some anglers who prefer this type of policy, and others who would prefer to fish for, and keep,

hatchery fish. One of the strategies in the 1996 strategic plan for the McKenzie River (Community Planning Workshop, 1996) is to “maintain a catch and release policy for native trout and salmon, until native fish populations are replenished. Only 39 % of those surveyed during the planning process felt that “the current level of fishing in the corridor is sustainable.”

Conflicts

While there don’t appear to be overall issues of too many boaters, there are some conflicts that can occur in specific locations. Personnel from the McKenzie Ranger District noted that the river at the old scale ramp can get up to 40 kayakers at one time playing in the reddsides rapid. There is also evidence of environmental impacts which occur from boating use. Hall and Shelby found that litter and vandalism were the most noticed and most objectionable environmental impacts. Seventy percent of boaters said they noticed vegetation loss and erosion along the river, and just over 50 % of those who noticed said it detracted from their experience. These impacts detracted for more people than did social conflicts.

Clearcuts that can be seen from the river are also of concern to boaters. Seventy-four percent said that clearcuts detracted from their experience on the McKenzie River (Hall and Shelby 1996). Two of the top three motives for boating the McKenzie are “enjoy the natural environment” and “see the scenery,” so boaters are clearly aware of the surrounding environment. Table R8 shows how boaters on different segments of the river evaluated clearcuts.

Table R8: Effect of Visible Clearcuts on Boating Experience.

River Section	Detracts	No Effect	Adds	not noticed
Upper	54%	46%	0%	30%
Mid	75%	23%	2%	14%
Lower	77%	21%	2%	6%

Source: Hall and Shelby, 1996

Upper river: Olallie campground to McKenzie Bridge campground

Mid river: McKenzie Bridge campground to Finn Rock

Lower river: Finn Rock to Ike’s

Future Outlook for River Recreation Use

Statewide projections for non-motorized river boating are for growth of 2.8 % per year. This, combined with the demographics of the nearby Eugene metropolitan area, suggest that river use of the McKenzie will continue to grow. Current use does not appear to have major social impacts, although at peak use times in certain locations there can be conflicts between recreationists. Increased growth, however, can lead to future conflicts, such as those currently experienced on the lower reaches of the McKenzie River.

Fishing use is also projected to increase for a number of reasons. Statewide projections are for growth between 2.3-3.3 % per year, and the quality of the McKenzie fishery should generate similar growth numbers. The elimination of

stocking above Blue River should lead to improved health of native fish, and draw anglers looking for this type of fishing experience. Many of those anglers will employ local guides, leading to increases in commercial use of the river. The only potential downside risk to fishing is from a severe change in regulations (or complete closure) designed to protect threatened or endangered species.

Visual Quality

Because of the heavy use along Highway 126 and the mainstem of the McKenzie, scenic quality of the surrounding hillsides has been a major issue. Clearcuts on both private and public land can detract from boating and traveling experiences. As noted above, 74 % of boaters on the McKenzie said that clearcuts detracted from their recreation experience. The Forest Service can only control visual quality on their own lands, although they may be able to provide visual buffers between the main recreation areas and clearcuts on private land.

The Willamette National Forest Land Management Plan has assigned visual quality objectives (VQO's) for each management area on the forest (Upper McKenzie Watershed Analysis). The Quartz Creek and Minor Tributaries watersheds include areas designated as "11c: Scenic - Partial retention middleground," "11d: Scenic - Partial retention foreground," "11e: Scenic - Retention middleground," and "11f: Scenic - Retention foreground." Table R9 shows the acres allocated to each of these designations and the maximum disturbed condition that is allowed within each. Following the methods used in the Upper McKenzie Watershed Analysis, it was assumed that it would take all stands 20 years to recover from any harvest activities (i.e., move out of the "disturbed condition"). The percent of acres in each designated area that are less than 20 years old is also shown in Table R9. Currently, only management area 11f slightly exceeds the percent of disturbed condition targeted in the Plan.

Table R9: Existing Visual Conditions in Viewsheds.

Management Area	Acres	Max. Disturbed Condition	Existing Disturbed Condition
11a	1,801.36	24%	7.4%
11c	3,832.52	20%	9.5%
11d	.07	14%	13%
11e	953.81	14%	1%
11f	1,168.78	10%	11%

While the above analysis shows that VQO's are generally being met, there still could be particular clearcuts that are highly visible from major recreation sites. A more detailed analysis of individual harvest units and their topographical relationship to major recreation sites would have to be conducted to determine if there were problems in this regard.

Air Quality

It appears likely that air quality in these watersheds is currently better than historical conditions. Historical air quality in this area was affected by natural fires, and fires set by early inhabitants. The District Archeologist reports that many early fires were started by both Indians and sheepherders (Bergland 1998). Fire lookout records indicate that the Cascades would have been very smoky every fall, lasting probably up through the 1950's. Watershed analyses done for Weyerhaeuser note that journals from early pioneers from the 1860's documented downed, burned snags from Walterville up the valley for 15 miles (Weyerhaeuser 1994). They also state, "in 1855 and again in 1895, fire consumed a large portion of the forest in the Gate Creek watershed" (Weyerhaeuser 1994, p.5). An overview of historic and current air quality in this area is included in the Upper McKenzie Watershed Analysis (1996).

Economic Importance

The towns in the vicinity of these watersheds appear to be highly dependent on tourism. McKenzie Bridge and Blue River have numerous lodging, restaurant, and retail stores that serve tourists. There are also guiding services and an acclaimed golf course (Tokatee). A study of the area in the late 1970's (Wile, 1978) contained a list of businesses taken from the 1977 Blue River phone book. Table R10 compares that list with the businesses listed in the 1995/96 Blue River phone book (the last time that Blue River had a separate phone book). While the number of restaurants and lodging facilities hasn't changed greatly, the economy has certainly diversified, especially in the construction-related industries, probably reflecting the increased home-building in this area.

Table R10: Businesses Listed in Blue River Phone Book, 1977 and 1996.

Business	1977	1996
Lodging	17	15
Eating and Drinking	7	9
Government Offices	7	12
Gas/Automotive	6	6
Mobile home/Trailer Park	3	4
Forestry-related	3	3
Ranches	2	2
Churches	1	4
Real Estate	1	2
Heating Oil	1	1
Services	3	4
Grocery Stores	5	5
Golf Courses	1	2
Retail, non-grocery		3
Recreation Services		3
Construction-related		6
Newspaper		1
Camps		2
Nurseries		2
Water Bottling Company		1

Recreationists visiting this area produce economic impacts when they spend money in the local economy, which then gets re-spent on labor and inputs through a multiplier effect. Since the economies in this area are so small, the multiplier effects would also be small, concentrated mostly in payments to local labor. In order to estimate the economic impacts of recreation in this area, an estimate of overall use would be necessary. At this time, there are only estimates of river use, and use at Delta Campground and Old Growth Trail.

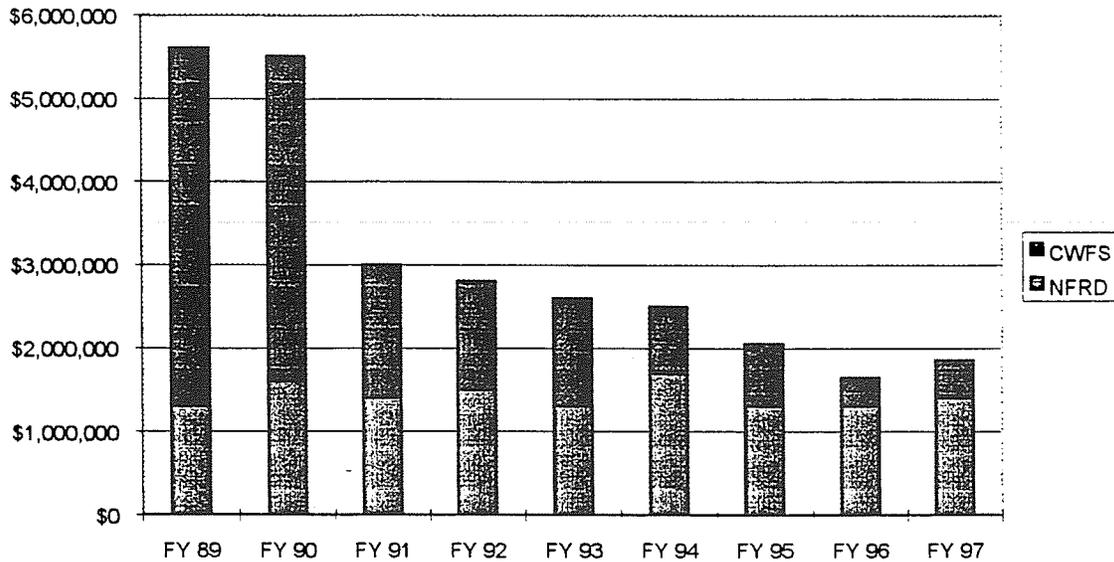
A study of the economic impacts of outdoor recreation in Oregon (Johnson et al. 1995) showed that visitors engaged in water recreation spent an average of \$27.47 (in 1996 dollars) per day. In 1996, there were an estimated 8,946 river user days in the analysis area. Using these estimates, boaters would have spent \$245,747 in the local economy in 1996. Since the "average expenditure" statewide does not accurately reflect guided use on the McKenzie, this is probably an underestimate of the direct impact of boaters.

The daily expenditure estimate for campers from the statewide study is \$17.32. There is not a separate expenditure estimate for hikers, so the "general day use" estimate of \$40.26 can be used. Combining this information with the use estimates for Delta Campground (2522 in 1996) and Old Growth Trail (2,000) results in an additional direct impact of \$124,201. These are just a part of the economic impacts generated by recreation in this area, which also includes hiking on other trails, hunting, and other activities. (Note that since many of the recreationists in the analysis area also recreate in the surrounding areas, it would not be accurate to add their impacts to a similar analysis done for the surrounding areas.)

Roads

Roads within the analysis area provide access for both forestry activities and recreational use. With the recent declines in timber harvests, there has been an accompanying decline in the need for roads, as well as the funds to construct and maintain roads. Figure R2 shows how the Willamette National Forest funding level for roads has declined over recent years. The dramatic decline in funding is due to fewer dollars from timber sale dollars (CWFS), while funding from budget allocations (NFRD) has remained fairly steady. There has been an influx of "flood money" to respond to the damage caused by floods in the past two years, but that funding will not continue into the future. Personnel from the Blue River Ranger District report that they have been able to maintain most roads to their standards, but some roads will have to be maintained to a lower standard in the future, and some may have to be closed (White, 1997; see Geology and Geomorphology section for additional information on road funding).

Figure R1: Road Program Funding Levels



Recreational users that will be impacted the most by road closures in the analysis area are hunters. There are also recreationists and others who drive Road 2618 along Quartz Creek all the way over to Oakridge. It is unlikely that this road would be closed in the future, although spur roads off of it, especially into the Late Successional Reserve area in the Quartz Creek watershed, are good candidates for closure. Previous experience on the McKenzie Ranger District showed that public reaction to road closures can be quite negative at first, with many gates and locks destroyed. However, over time they have found that people have gotten used to the closures and those behaviors have disappeared.

The road along the south side of the McKenzie River, sometimes called Powerline Road, gets occasional recreational traffic, both vehicle and bicycle. Access in this area has led to some problems, including illegal dumping, vandalism, and poaching. While closing this road might solve those problems in this area, it would probably only displace the problems to another area on the forest. Dense concentrations of scotch broom are located along this road. Loss of natural vegetation and wildlife habitat is occurring. In addition, the potential to colonize new areas persists.

Cultural Resources

The Quartz Creek and Minor Tributaries Watersheds have archeological sites that suggest both prehistoric and historic occupation in this area. Members of the Santiam or Central Band of the Mollala tribe used this area at different times of the year, although no more than about 50 people were probably living here at any one time. The unratified treaty negotiations of 1851 show this area ceded from the Santiam Band of the Mollala tribe, but in the later 1855 Dayton Treaty,

this group did not show up on the record. It is believed that members of this tribe instead joined the Confederated Tribes of the Warm Springs, The Confederated Tribes of the Grand Ronde, and the Confederated Tribes of Siletz Indians. The area was no doubt utilized by Willamette Valley Calapooya Indians as well.

The ridge-tops in the southern portion of the Quartz Creek Watershed have evidence of both prehistoric and historic use. These areas were popular as travel routes and as sites for hunting and berry picking (hence the name Indian Ridge in the southeast corner of the Watershed). It is believed that these ridges may represent an ethnic divide, since stone chips associated with tribes to the south have been found along with obsidian tools associated with tribes from the McKenzie drainage.

Prehistoric sites in these watersheds include a very rare obsidian tool cache, probably related to winter encampment. Since the sources for obsidian were not accessible during the winter, it is hypothesized that early tribes would bring obsidian down to this area during the summer for later use, or for trading with other tribes. Other archeological evidence includes lithic sites (stone tool aggregations) at river confluences, and ceremonial sites (piled rock features) that relate to both prehistoric and historic Native American use. Interestingly, there is a complete lack of evidence that clearly relates to fishing as a major activity of early inhabitants of this area. There are also very few artifacts that relate to the late prehistoric time period, even though this type of evidence is abundant in surrounding drainages (e.g., Oakridge area, South Santiam).

In the 1850's and 60's, there is evidence that the Confederated Tribes of the Warm Springs were coming to this area in late summer and fall to forage their horses (and protect them from Paiute raids), hunt, and gather huckleberries. This use continued up into the 1950's, although cars and trucks had replaced horses by this time. Peeled cedar trees in the watersheds, whose bark was used in basket-making, have been increment-bored to show use extending from 1910 to the 1940's.

Elk and Humans

Given the low densities of human use throughout most of these two watersheds, there should be little conflict between human uses and elk populations. Future road closures will reduce interactions even more. There are some reports of elk poaching, in particular along Powerline Road to the south of the McKenzie River, as that location is readily accessible to people. Seasonal road closures may be one way to address this problem.

While ecosystem management is moving parts of these watersheds toward late successional reserves, it is unlikely that this will have a negative impact on elk habitat when viewed from an ecosystem perspective. There are many private forest lands in these watersheds and adjacent watersheds that provide adequate

open areas for foraging. The late-successional reserves, especially if accompanied by road closures, will improve the hiding cover for elk in this area. A more detailed discussion on elk, habitat, and roads is presented in the wildlife section.

Conflicts

Cultural resources really weren't an issue for the Forest Service until the 1970's. By that time, much of the watersheds had already been logged once, and many sites were probably disturbed or destroyed. The basic approach the District currently follows is to avoid any prehistoric and major historic sites.

Nevertheless, District personnel do not expect many conflicts between cultural resources and timber harvesting activities. There is the potential for conflicts between dispersed recreation use and cultural resource sites, since current hunters probably use the same sites that Indian hunters would have used, and surface artifacts probably get taken. Since dispersed use in this area is fairly light, major conflicts would not be expected.

Summary

Overall, the Quartz Creek and Minor Tributaries Watersheds are influenced by many different types of human uses, including forestry activities, recreational use, and residential development. In turn, the resources of these watersheds influence the nearby human communities by providing economic opportunities and quality of life. At this time, it appears that these watersheds, outside of the mainstem of the McKenzie, are not heavily used by recreationists. There is substantial use along the McKenzie River, but major conflicts between users have not yet appeared. However, as population and recreation demand continue to grow in the future, this area may see increased use and conflicts. The areas outside of the McKenzie River corridor can provide increased recreation supply as other areas become more crowded.

Section IV: Synthesis

GEOLOGY/GEOMORPHOLOGY

Interpretation

The relative importance of various land use activities in accelerating sediment production and delivery to stream channels can vary significantly from one area to another, and through time in a single area. Compared to moderately sloped watersheds, steeper basins tend to produce more sediment (through a variety of erosion processes) and to respond to management activities to a greater degree (Swanson et. al 1987). Hard data for both background and management erosion rates and mass movement processes in the Quartz Creek watershed analysis area is lacking.

Observational data from a limited analysis of a series of aerial photos, and from reconnaissance aerial surveys and field reviews conducted immediately following the most recent storm event, suggests that mass soil movement from managed areas is more common today than under undisturbed, reference conditions. Terrain analysis and field reconnaissance performed for this analysis has clearly suggested that the upper Quartz Creek, Deathball Mountain, Ennis Creek, Mt. Hagan, and probably the Elk/Cone Creek land blocks are dominated by mass wasting processes, especially debris torrenting.

Management appears to have influenced the occurrence these processes, especially through road construction on steep inner gorge slopes and steep headwater swales. Mapped torrent channel densities ranging from 2.0 to over 5.0 mi/mi² indicate the high density of channels in several sub-watershed areas. Several of the mapped channels have experienced active debris torrenting within the last 30 years.

The February 1996 floods provided a recent opportunity to evaluate the effects of land use on the response of managed watershed areas. The 1996 event produced record peak discharges in lower elevation watershed of the nearby H.J. Andrews Experimental Forest, and was the first major slide-triggering storm to occur in the McKenzie in over two decades (Swanson et. al. unpublished report (www.fsl.orst.edu)). Roads in the Blue River basin, roads were found to be both a source of accelerated sediment production as well as a trap providing sediment storage for material generated from up slope areas.

Roads in Quartz Creek are both a source of chronic erosion and sediment delivery to the stream system, as well as a threat for larger, more episodic inputs of sediment during infrequent storms. Roads have no natural analog, so their input to the sediment budget of each watershed in the analysis area is above the background natural level of erosion and sedimentation for that watershed. Many roads in the watershed analysis area are old, and were constructed to a