Processes and Trends

Processes and Trends

"Ever stop to think and forget to start again?"

There are many processes at work in this watershed. Flood, insects, disease, and wind storms are normal processes found throughout the Western Cascades. They operate here as well and in ways that are typical. However, in this watershed, their influence tends to be localized and is overshadowed by the following key processes. More detailed discussions of these processes can be found in pertinent individual reports. In this and following chapters answers to key questions will be noted by referencing the number of that key question after the pertinent statement (e.g. SC1).

Fire

Fire is the dominant disturbance process that has affected the current conditions of the South Santiam watershed. It is more helpful to discuss human-caused and lightening-caused fire than natural and historic fire because this watershed has been occupied by humans for at least 8,000 years. Humans have used fire intentionally and accidently throughout that time.

Lightening-caused fires in the eastern headwaters and higher elevations of the watershed were often associated with precipitation, tended to stay small and leave behind elements of the pre-fire forest structure. Stand replacement fires were less frequent than underburns. In the western and lower elevation areas of the watershed, large blocks experienced catastrophic stand-replacement fire events, particularly the Moose, Menagerie and Sevenmile subwatersheds. These fires seem to have occurred during drought conditions that led to large, high intensity fires because of timing and available fuels and were lightening and/or human-caused. The geographic characteristics of the main canyon consist of an strong East-West orientation and a steep 'V' shape. This geography creates a chimney effect that intensifies normal fire season winds and has probably contributed to higher intensities and rapid spread over larger areas once fires ignited. The lack of residual large wood in the stream channels and channelbanks, where it would have been predicted to survive the known fire events of the last 100 years, suggests that repeated large fires affected these areas even before European humans settled the area.

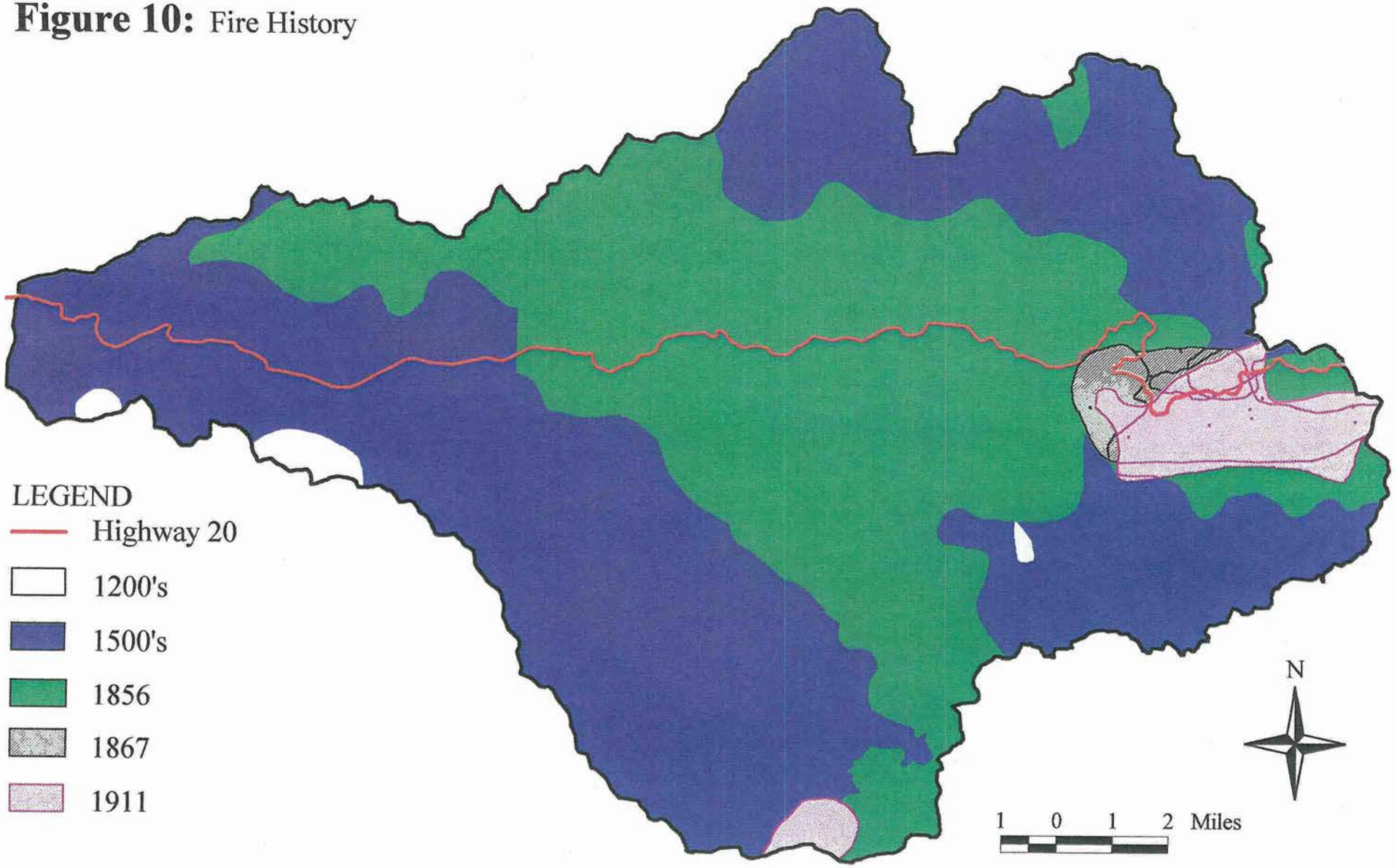
The lack of a well-developed duff layer on some north-facing slopes in these 3 subwatersheds also suggests that fire intensities were high and/or frequent for a period of time. In a more typical Western Cascades situation, the moister climate of north-facing slopes results in more duff accumulation as compared to south-facing slopes in an particular area. A probable scenario is that a stand replacement type fire burned through an area creating lots of snags and, over time, a large amount of fuels on the forest floor. Several years or decades later, a second fire came through that was carried by these heavy fuel loads and burned up snags and down wood and the duff layer even more thoroughly than the first fire.

The Regional Ecosystem Assessment Project (REAP) assessed three fire history studies done on the adjacent Blue River Ranger District of the Willamette National Forest (Morrison and Swanson 1990, Teensma 1987, and Connelly and Kertis 1992). REAP constructed a range of natural variability for the two major tree series present in this watershed. This coarse filter assessment indicated a wide range of natural variability for these tree series. Evidence indicates that portions of the watershed

experienced a more severe fire history (larger patch size, with hotter burns) than the areas sampled by the Blue River fire studies. About 25% of the watershed along the main river canyon is characterized by these conditions. Fire patterns in the remainder of the watershed seem similar to those in the Blue River fire studies.

There is one area, the Three Creeks Research Natural Area, that has not experienced a stand replacement fire in the last 800 years. This seems to be a consequence of geographic location, landform, weather patterns, and random chance. The evidence a large landscape scale fire occurring in the watershed 400-500 years ago comes from a preponderance of old growth trees in this age range. Major fires also occurred in 1856 and 1911. See Figure 10 for a map of the fire history.

Figure 10: Fire History



The Major Consequences

A. There is a general lack of snags and large down wood in the uplands, in riparian areas and in the stream channels.

B. The resulting seral stage pattern heavily influenced the harvest patterns and associated road building pattern throughout the watershed. (FD1)

C. There are soils in several areas that are younger, colluvial soils with a minimal duff layer. The distribution of duff development does not correlate well with the seral stage pattern.

The Effects of these Major Consequences

The following discussion includes observations that are generally true for this watershed. As in most things, exceptions can be found to any of these consequences somewhere in the watershed.

A. There is a general lack of snags and large down wood in the uplands, in riparian areas and in the stream channels.

- All seral stages are lacking snags and down wood structural components.
  - There is less habitat for those wildlife species that depend on these 2 structural components to support their life cycle than the distribution of seral stages would indicate.
  - The stands in many areas are just starting to develop new snags.
  - The suppression of wet-lightening-storm-caused fires has impeded the development of small snag patches that would have normally resulted from these small, low intensity fires.
- The effects of natural soil instability was not moderated by trapping of slope failure sediments by large down wood.
  - This put more sediment in the stream channels but because of lack of sediment storing structure in the stream channels, this sediment left the watershed, destined to eventually become part of the beaches on the Oregon Coast.
- Lack of down wood slowed the redevelopment of the duff layers which decreased the water and nutrient storage capacity of the soils.
  - There is potential that this has slowed the redevelopment of the mycorrhizal component of these soils.

- There is less habitat for the ground dwelling, duff-dependent wildlife, plant, and fungal species.

- This has lowered productivity in some younger fire regenerated stands by slowing tree growth. This is a very localized effect.

■ The major stream channels (South Santiam River, Moose Creek, Canyon Creek and Soda Fork) are downcut to bedrock along a greater percentage of their length than would occur if there were large wood in those channels. Geologically, the watershed is in a downcutting phase and these channel types would naturally have some reaches that are dominated by bedrock.

- These stream have lost their ability to moderate flood flows.

- The streams became disassociated from their floodplains.

- The gradient of side channels coming into the main channels steepened to the point where these confluences are a barrier to the migration of some aquatic organisms.

  - Less of the watershed is available to anadromous fish now than has been in the past.

- There is a lack of fish habitat (spawning gravels, hiding cover, and winter refugia) in the main channels as well as in some tributaries.

- The water table in the floodplains was lowered which decreased the number and size of wet special habitats that would be expected to be found on the floodplains.

  - This affects the abundance of riparian area species, including those in the survey and manage list (Table C-3, ROD).

B. The resulting seral stage pattern heavily influenced the harvest patterns and associated road building pattern throughout the watershed.

■ When timber harvest and road building began in the 1940's, they were concentrated in those parts of the watershed that were private land or supported large areas of Late-Successional/Old-Growth stands on National Forest lands. (Cascadia, Lower Canyon, Owl and Soda Fork subwatersheds)

- Areas were harvested that hadn't experienced a catastrophic fire or other disturbance event for a long time.

- The salvage of dead trees along the road system has eliminated a source for recruitment of large down wood.

- Many of these first roads are now the main transportation routes in the watershed.

  - Road construction standards from the 1940's to the 1970's included sidecasting of waste material, less compaction of the subgrade, undersized culverts, and culverts that were not placed with fish passage in mind.

    - Undersized culverts increase the velocity of the water passing through which can make them a barrier to the migration of aquatic organisms.

    - Culvert outlets are too high for aquatic species to jump or crawl upstream.

    - There are more road failures and maintenance problems on these roads than those built with more recent construction standards.

    - Roads in the Canyon Creek area created a pulse of sediment in a way that seems to mimic the geologic pattern for this area when viewed over a 500 year period.

  - Most are closely associated with the major stream channels which means they may have interrupted the functioning of the riparian area in those locations.

  - Traffic-generated sediment can be a site-specific problem on some of these roads.

- A combination of the seral stage pattern and ownership pattern along with the associated harvest pattern has had an effect on the connectivity of habitats in the watershed.

  - An estimated 53% of the watershed was in the 2 late seral stages in 1900, with a majority of that in Late-Successional/Old-Growth. Presently, 41% of the watershed is in these 2 stages with a majority in the Understory Reinitiation stage.

  - Cascadia, Soda Fork, Sheep, and Lower Canyon subwatershed harvest patterns seems to mimic historic catastrophic fire patterns that tended to create a boom/bust cycle on a large area for specific seral stages.

  - The pattern of harvest in Owl, and parts of Sevenmile and Moose subwatersheds has created a pattern that consists of smaller scattered patches of seral stages which is not as typical in the Western Cascades as the large fire-generated patch size.

  - Because of the interaction between the seral stage pattern and the harvest history, there is a lower percentage of the habitats that are associated with the Understory

Reinitiation and Late-Successional/Old Growth seral stages than was typical for this part of the Cascades over the last 400 years.

- Soda Fork subwatershed is marginal for the north/south dispersal necessary to preclude genetic isolation for the Northern spotted owl and other species associated with the Late Successional/Old Growth seral stage. North and west of this watershed in the Middle Santiam watershed, the private land ownership pattern, along with its harvest history and expected timber harvest rotation length, makes the Soda Fork subwatershed a critical north/south link between populations of the Northern spotted owl in this province.

- Cascadia is marginal for the east/west dispersal of the Northern Spotted Owl but the current conditions in the Willamette Valley west of Cascadia are the biggest impediment to dispersal. This subwatershed is adequate habitat for many other species.

- The harvest pattern concentrated the effects of different management practices. These sets of management practices tend to mimic particular fire regimes as summarized in Table 3.

C. There are soils in several areas that are younger, colluvial soils with a minimal duff layer. The distribution of duff development does not correlate well with the seral stage pattern.

- Some of these areas are less productive and still subject to surface erosion.

- These soils have a low potential for producing turbidity because they have a very low clay content.

- The minimal duff layer is one factor contributing to a higher frequency of debris chutes on these areas. Lack of large down wood and lower root strengths are other factors that contribute to this effect.

Table 3: Summary of Historic Management Practices

Time Period	Management Practices	Fire Regime	Subwatersheds
1940's to 1950's	Left wood in the stream channels Left lots of large woody debris Left some snags and cull and/or green trees No riparian area buffer Minimal fuels treatment (private and public lands)	Low frequency of high intensity fires, low intensity fires present	Cascadia Falls Lower Canyon Owl Sheep Soda Fork
1960's to mid 80's	Cleaned wood out of stream channels Left very little large woody debris Left very few snags and cull and/or green trees Left some riparian area buffer Fall-type burning conditions with low duff retention on public lands Minimal fuels treatment on private	High frequency of high intensity fires, effects of low intensity fires is masked	Cascadia Owl Lower Canyon Sevenmile Sheep Soda Fork
Mid 1980's to Mid 1990's	Putting wood back in the channels Left some large woody debris Left some snags and cull and/or green trees Left riparian area buffers Spring-type burning conditions with some duff retention requirements	Low frequency of high intensity fires, low intensity fires are present	Moose Sevenmile Upper Canyon

Trends

The following trends are also contributed to by the social processes at work in the watershed.

- Because of the accumulation of fuels probable under the current set of management practices (Table 4), there is a high probability of very high intensity fires occurring some time in the future particularly on the public lands.

- Because of the light flashy fuels being created on private lands, there is a short term high risk of catastrophic fire in the Cascadia subwatershed.

Table 4: Summary of Current Management Practices

Time Period	Management Practices	Fire Regime	Subwatersheds
Mid 1990's into the foreseeable future	Public Lands More wood in the streams Lots of large woody debris, snags, and cull/green trees left Wider riparian area buffers Fuels treatment will consist of more pile burning than broadcast burning	High frequency of low intensity fires	Moose Upper Canyon
	Private Lands Less residual large woody debris, snags, and cull/green trees Some riparian area buffers Minimal fuels treatment because of a lack of large fuels needing treatment 70 year rotation length	High frequency of high intensity fires	Lower Canyon Cascadia

- Fire suppression is allowing the accumulation of some large down wood because fire size has been minimized and there are less underburn type fires.

- It is estimated that natural stands will need to grow to 110 years old to have significant numbers of trees greater that 24" DBH. This means existing Stem Exclusion and Understory Reinitiation stands will need an average of 75 years and 30 years, respectively, to grow into this larger DBH range. Thinning can shorten these times to an average of 45 years and 20 years respectively. (AF4)

- In general, thinning in the Stem Exclusion stage can speed development of large wood on uplands and in Riparian Reserves by 30 or more years as compared to unthinned stands. Fertilization can further shorten timeframes needed to grow large diameter trees. (AF4)

Sediment Production and Transport

There is a continuous high level of production of sediment in this watershed. Large scale upland earthflows and debris chutes are the most visible methods of production. Creep and slough are less obvious but important contributors which have been increased by the effects of the fire history. Stream channels and their upper banks also contribute to the level of sediment produced by the watershed.

Not much turbidity is generally produced because the younger soils in the eastern 2/3 of the watershed are lacking in the finest sediments (clays and colloidals). In the western 1/3 (Cascadia subwatershed) there are more silty clay loams that are much more weathered and create more natural turbidity. This turbidity is evident during storm events.

Geology and the lack of down wood to trap sediments has created high energy stream channels that are highly efficient sediment transport systems. These high energy channels maintain their energy during storm events long enough to carry the finest sediments out of the watershed.

The Major Consequences

A. Sediment does not stay in the system very long because of the stream channel characteristics, one of which is the lack of structure (large down wood) discussed under Fire. It moves out storm event by storm event instead of staying in the watershed for several seasons.

B. Overall water quality is high and the nutrient levels are low because of high stream energies.

C. The mosses and other small aquatic plants have been and are being scoured from the channels because of the amount of sediments being moved downstream and the high stream energies.

D. The current stream system is very resistant to the effects of changes in the amount and timing of water produced by the watershed.

E. The addition of in-stream structures can have an immediate, dramatic influence on the retention of sediment in the system.

F. Rapid movement of the finer particles out of the watershed has created the mud flats at the upper end of Foster Reservoir.

The Effects of These Major Consequences

A. Sediment does not stay in the system very long because of the stream channel characteristics, one of which is the lack of structure (large down wood) discussed under Fire. It moves out storm event by storm event instead of staying in the watershed for several seasons.

- There are riffle and bedrock dominated stream reaches that have a lack of spawning substrates.
    - This has limited the areas suitable for reproduction of anadromous and resident fish in the Moose and Upper South Santiam Areas.

B. Overall water quality is high and the nutrient levels are low because of high stream energies.

- Clarity recovers quickly after storm events.

- Contributes to a lower level of fish production.

C. The mosses and other small aquatic plants have been and are being scoured from the channels because of the amount of sediments being moved downstream and the high stream energies.

- The nutrients normally contributed by these plants are at lower levels in these streams than streams that have a similar geomorphology but are lower energy or carry a lower sediment load.
  - Also contributes to lower fish production levels.
- There is more wetted bank instability than would exist if these plants were established.

D. The current stream system is very resistant to the effects of changes in the amount and timing of water produced by the watershed.

- The stream system's sensitivity to changes in the amount and timing of peak flows will increase as a result of stream restoration projects. These changes in peak flows may be induced by management actions and/or natural processes.

E. The addition of in-stream structures can have an immediate, dramatic influence on the retention of sediment in the system.

- There can be positive effects because the stored sediments create better fish habitat and there may be negative effects on water quality and existing facilities depending on location. These negative effects may include increased instability along the highway and adjacent to the campgrounds and increase in the length of time that turbidity affects water clarity.
- This improves the ability of streams to retain aquatic organisms and utilize organic materials.

F. Rapid movement of the finer particles out of the watershed has created the mud flats at the upper end of Foster Reservoir.

- These mud flats provide the site for the annual Sweet Home Mud Flat Races.
  - Mud-caked vehicles and $1000's spent on vehicle cleaning and repair result from this 2 day event as well as fun and frustration. Some local merchants benefit.

Trends

- This level of sediment production is expected to continue far into the future.

- The transport of sediment out of the watershed will continue if structure is not added to the channels.

Human Interactions with the Watershed

Prior to the 1940's the watershed was used mostly for the subsistence of area residents much like it had been used by the Native Americans that came before them. Major changes in the economy of the local and national economies heavily influenced the harvest history in the watershed for the next 50 years. Today resource management is political. Private land rights is an issue. Tribes are more interested in traditional and ceremonial uses of the watershed. Decline in timber harvest on public lands has decreased the availability of the financial resources needed to maintain the road system. Anadromous fish habitat management is a national issue. There is also expected to be a stable or increasing demand for wood fiber. Diverse recreational use is also expected to increase due to the growing population of the Willamette Valley.

The Major Consequences

A. Foster Dam has had a major impact on fish populations in the watershed.

B. Management of public lands road system is changing due to multiple resource objective needs and current and projected federal road maintenance budget declines.

C. Santiam Wagon Road has influenced the current conditions found in the watershed.

D. Highway 20 is effecting the South Santiam River and other streams in the watershed. It occupies about 5% of the riparian area along the South Santiam River.

E. The ownership pattern is a major influence on the pattern of activities in the watershed.

F. Harvest of timber and other forest products was a major element in the economic development of the local communities.

G. The Falls Creek Hydroelectric project was well designed and is providing electricity in cost effective way with minimal environmental effects on the Falls subwatershed. (this is it, nothing else is added in following section)

H. Humans have been a major factor in the fire history in the watershed. The consequences of this fire history were discussed at the beginning of the chapter. (this is it, nothing else is added in following section)

I. The Highway 20 corridor is an attraction for tourists and local recreationists. The proximity of the river and highway is an important element of the scenic quality of the drive between Sweet Home and Sisters. (this is it, nothing else is added in following section)

The Effects of these Major Consequences

A. Foster Dam has had a major impact on fish populations in the watershed.

- The reservoir created conditions suitable for a recreational warm water fishery (bass, blue gill and crappie) and a kokanee fishery.

- As a result of hatchery management practices, chinook salmon were eliminated from the watershed.

  - Reintroduction of these fall-spawning salmon creates a conflict with the timing of future in-channel restoration projects and other management activities.

- The presence of predators (bass and squawfish) in the reservoir is limiting the survival of juvenile anadromous salmonids during downstream migration.

  - This decreases the ability of the salmonids to reseed the available habitat because there are so few adults returning to spawn.

B. Management of public lands road system is changing due to multiple resource objective needs and current and projected federal road maintenance budget declines.

- The road system represents a large capital investment that needs to be protected by maintenance or storage.

- Roads on public lands will be less accessible due to lack of surface and roadside maintenance and less miles will be available because some roads will be decommissioned. See Figure 11 for a map of the current and predicted transportation system.

  - Traffic on roads with low maintenance standards is likely to create more turbidity than a closed road would create.

  - Less open roads on public lands will further increase the recreational pressure on private industrial lands in the watershed. The owners are putting more restrictions on public use of their lands because of increasing vandalism, fire prevention, and liability concerns.

  - Reductions in open road densities is beneficial to wildlife that are sensitive to disturbance from motorized vehicles.

- The 700+ miles of the road system has substantially increased the drainage network. This is especially evident in Upper Canyon and Owl subwatersheds.

- Habitat for some riparian species has been created in ditchlines that intercept subsurface water and behind partially plugged culverts in a watershed where small wetlands are relatively rare except for on the glacial flats in the headwaters.

- The road drainage system has influenced the timing and magnitude of peak flows but it is difficult to know whether peak flows are increased or decreased.

■ Except for Soda Fork subwatershed, open roads are not disrupting elk use of an area because of low open road densities, increasing hiding cover along existing roads and strategic wildlife road closures (for example, the road into Walton Ranch). See Table 5 for the current road densities of each subwatershed.

■ Construction, maintenance, and use of roads continues to exacerbate the spread of weeds and it is costing ever-increasing amounts of time and money in attempts to control these species.

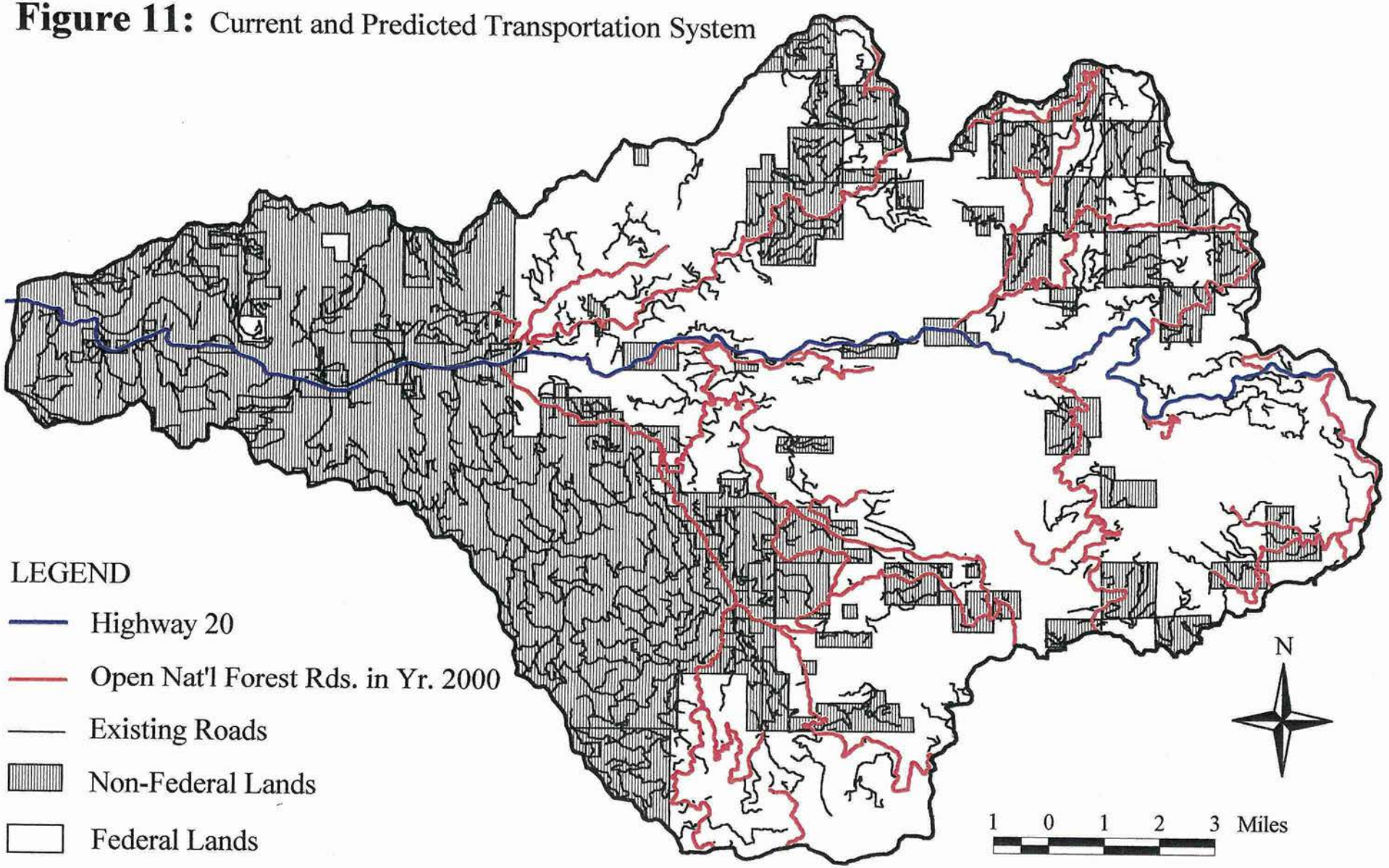
■ There will be a lower density of available four-wheel drive habitat but it will be of higher quality.

- There will be a higher density of aluminum recovery sites along the remaining habitat, providing a source of supplemental income for enterprising individuals.

Table 5: Road Densities

Subwatershed	Road Density
Cascadia	4.06
Lower Canyon	4.90
Menagerie	2.50
Moose	3.57
Owl	5.17
Sevenmile	3.32
Sheep	2.82
Soda Fork	4.50
Upper Canyon	3.04
Watershed	3.71

Figure 11: Current and Predicted Transportation System



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C. Santiam Wagon Road has influenced the current conditions found in the watershed.

- It is highly probable that there is a major highway instead of a forest road in this watershed because of the travel pattern established by the Wagon Road.

- The road has been a conduit for invasion of non-native plant species into the watershed since the 1860's because of its use as a stock driveway.

- The designation of the Santiam Wagon Road as a recreation trail complements east Linn County's Strategic Action Plan's recreation and tourism objectives.

  - This use may increase the probability of human-caused fires.

  - Reconstruction has increased the amount of sediment being produced by the Wagon Road in the Sevenmile and Sheep subwatersheds at least in the short term.

- It supported development of Walton Ranch as a homestead which has been grazed for 130 years.

  - This long term use as a pasture and elk refuge has narrowed the area of riparian vegetation on that side of the South Santiam River.

  - The ranch is an example of the old homesteads along the Santiam Wagon Road that provides opportunity for interpretation and education.

  - This river terrace would have a stand of conifers or alders on it by now except for its grazing history.

D. Highway 20 is effecting the South Santiam River and other streams in the watershed. Facilities within the watershed have added to the high energy nature of the South Santiam. The main facilities that have an effect on the system are Highway 20, forest roads, and campgrounds. Approximately 7% of the riparian area has been influenced by these facilities and the highway accounts for 5% of that 7%.

- The location of the highway has channelized the South Santiam River in the low gradient reaches such as those found by the Trout Creek, Longbow and Fernview campgrounds (where the highway and the river are within spitting distance of each other) because riprap was placed on the riverbank and the highway cut off the meanders that would naturally have occurred in these spots.

  - This creates a stream channel which cannot utilize its flood plain to moderate its energy and hence carries that energy downstream, downcutting the channel as it goes.

- This disassociation with its flood plain has other riparian-dependent species consequences; loss of wetland habitat due to dewatering of site from channel downcutting; loss of tributary connectiveness due to downcutting of main channels; and loss of refugia areas.

- West of Upper Soda, protecting the highway will affect where and how channel restoration projects in the South Santiam River are implemented .

  - Poor placement of structures could cause undercutting of the highway and/or flooding of the roadbed during 10 to 20 year interval storm events.

- The highway interrupts the functioning of the travelway between the river and the uplands for small creatures.

- There is potential for a hazardous material spill that can have grave consequences if the material ends up in the river.

  - Fluids from normal use of vehicles and equipment do not seem to be affecting water quality.

- The cinders used to provide traction on the highway in the winter months is becoming a component of the sediments in some Class II and Class III tributaries in the section between Upper Soda and Tombstone Pass.

  - These non-typical gravels are highly porous and accumulation of them can move flow to subsurface.

    - This may decrease the availability of surface-water aquatic habitat by dewatering sections of the smaller streams.

- Roadside brushing to maintain sight distance and hazard tree removal for safety of highway travelers keeps some riparian vegetation from fully developing.

E. The ownership pattern is a major influence on the pattern of activities in the watershed.

- Because private industrial lands are currently operating on a 70-80 year rotation, Cascadia, Lower Canyon and Owl subwatersheds contain a large contiguous block of the stem exclusion seral stage.

- Cost-share roads reduces the options available to manage the public road system to meet other objectives.

F. Harvest of timber and other forest products was a major element in the economic development of the local communities.

- The communities became dependent on the timber industry for primary and secondary employment.
  - Salvage practices supported a cadre of small family-owned logging businesses.
    - The requirements to retain snags and down wood on National Forest lands has contributed to a decline in the small sales these operators depended on for their business.
- The standard of living was improved because of the financial resources available to develop social, educational and civic structures.
- Most roads in the watershed were built to support timber harvest.
  - These roads made more of the watershed accessible to the general public for recreation use and firewood gathering.
    - Landings have attracted dumping of garden waste, contributing to the spread of non-native plants, especially blackberries.
- Because this harvest happened during a relatively short period of time, it has tended to create large areas that now look like stands created by stand replacement fires of the past. *("50 isn't old if you are a tree.")*
  - Cascadia subwatershed has more tree cover now than it had in 1946. It is a sea of green but is missing the snag component.

Trends

A. The Forest Plan will be a major influence on management of National Forests in the watershed in the future. It sets a broad pattern on the landscape by placement of the Late-Successional Reserve and Matrix. It has established a desired future condition that has both short-term and long-term consequences.

- There is currently a tendency in the Region to interpret the ROD very conservatively and the potential for gridlock is still high. *"We have to know everything before we can do anything."*
- The 1990 Willamette Land and Resource Management Plan created a desired future condition for elk habitat that is in conflict with the desired future conditions set forth in the 1994 Amendment because Late Successional Reserve 215 is in the same place as an high emphasis elk management area.

- Harvest prescriptions will tend away from clearcutting to thinning in natural and managed stands in the short term.

  - Maintenance of the road system to support this type of harvest will be challenging from a financial standpoint.

- The desired future condition is for riparian areas to consist of only the late-successional/old-growth seral stage. The management of Riparian Reserves, especially on Class IV streams, will not mimic fire history in this watershed.

- The pattern of regeneration harvest that will result from the Riparian Reserve pattern in the AMA and Matrix will be on ridgetops only and will not mimic fire-generated patterns which tended to burn across intermittent and small non-fish-bearing permanent streams.

  - For those wildlife guilds that are associated only with the uplands this vegetation pattern may adversely affect travelways for those species. This affect will be concentrated in the AMA and Matrix and could affect the healthy functioning of this watershed for wildlife species diversity.

- Implementation of watershed restoration as stated in the 1994 Record of Decision creates some conflicts with the processes at work in this watershed.

  - Road decommissioning may preclude access to other more critical restoration projects because decommissioning will tend to occur at a faster rate than other type of projects can be planned and funded.

  - The "Roads are bad" bias can lead to a poor investment strategy. For instance spending dollars to design and install a culvert capable of handling a 100 year flood event versus accepting the risks of culvert failure and putting those dollars towards adding structure to the channels

B. Sediment from road failures will not generally be a significant problem for streams in the watershed because of the sediment production and transport processes described previously. Most road failure sediment is expected to be storm-related and minor compared to the background sediment load coming out of the watershed.

C. On the National Forest, we will be facing year 2000 management needs with the equivalent of the 1950's road system in terms of miles of open roads. It is estimated that 139 miles of National Forest system roads will be managed as open roads by the year 2000 (See Figure 11).

- This has implications for young stand management, fire suppression efforts and the cost and ability to accomplish restoration projects.

- As closed roads revegetate, noxious weed abundance will decrease except for non-native blackberries because they can tolerate shade.

D. Most private industrial lands have a 70-80 year rotation and most have been converted to managed stands. This will generate spikes in the seral stage distribution.

- In the next 10-30 years there will be a sharp decline of the Stand Initiation seral stage in the watershed, possibly to as low as 2-3 percent of the watershed. This is due to existing age distributions and the relatively short time span in the stand initiation stage (30 years) compared to the longer time frames of the other seral stages. As the existing early seral stages move through time there will also be corresponding spikes, well above 25%, for the stem exclusion and understory reinitiation seral stages in the next 20-60 years.

- It is anticipated that this rotation length may limit options for timing and scale of timber harvest activities on the public lands.

- The large down wood left behind during logging in the 1940's and 1950's will decrease because of decay and lack of replacement potential from the stands managed with a 70-80 year rotation.

- Soda Fork subwatershed will always have low connectivity of seral stages because of the checkerboard ownership pattern.

  - Because of the pattern of forage and cover and the potential for meeting Forest Plan requirements, this could be a great place for elk.

  - Soda Fork Creek will continue to be a high energy system with low potential for changing this characteristic if restoration projects are limited to public lands.

  - The Riparian Reserves in this subwatershed will lack the continuity needed to meet the terrestrial wildlife objectives (objectives 3,4,5) of the Aquatic Conservation Strategy.

- Cascadia and Lower Canyon subwatersheds will continue to be dominated by stand initiation and stem exclusion seral stages.

  - There are likely to be more open roads in the cost-share areas (Soda Fork, Upper and Lower Canyon, and Owl) which will have a tendency to concentrate motorized recreation use in these areas.

Summary of the Relevant Trends

Fire

- Because of the accumulation of fuels probable under the current set of management practices, there is a high probability of very high intensity fires occurring some time in the future particularly on the public lands.

- Because of the light flashy fuels being created on private lands, there is a short term high risk of catastrophic fire in the Cascadia subwatershed.

- Fire suppression is allowing the accumulation of some large down wood because fire size has been minimized and there are less underburn type fires.

Table 6: Summary of Current Management Practices

Time Period	Management Practices	Fire Regime	Subwatersheds
Mid 1990's into the foreseeable future	Public Lands More wood in the streams Lots of large woody debris, snags, and cull/green trees left Wider riparian area buffers Fuels treatment will consist of more pile burning than broadcast burning	High frequency of low intensity fires	Moose Upper Canyon
	Private Lands Less residual large woody debris, snags, and cull/green trees Some riparian area buffers Minimal fuels treatment because of a lack of large fuels needing treatment 70 year rotation length	High frequency of high intensity fires	Lower Canyon Cascadia

Sediment Production and Transport

- This level of sediment production is expected to continue far into the future.

- The transport of sediment out of the watershed will continue if structure is not added to the channels.

Human Interactions with the Watersheds

- The Forest Plan will be a major influence on management of National Forests in the watershed in the future. It sets a broad pattern on the landscape by placement of the Late-Successional Reserve and Matrix. It has established a desired future condition that has both short-term and long-term consequences.

- Sediment from road failures will not generally be a significant problem for streams in the watershed because of the sediment production and transport processes described previously. Most road failure sediment is expected to be storm-related and minor compared to the background sediment load coming out of the watershed.

- On the National Forest, we will be facing year 2000 management needs with the equivalent of the 1950's road system in terms of miles of open roads.

- Most private industrial lands have a 70-80 year rotation and most have been converted to managed stands. This will generate spikes in the seral stage distribution.