Glossary

Age Class - An interval, usually 10 to 20 years, into which the age ranges of vegetation are divided for classification or use.

Anadromous - Going up rivers to spawn.

Baseflow - Baseflow is separated from stormflow for some analysis purposes. Stormflow is direct runoff from the ftorm event. for the MFW River at Sandprairie Campground, baseflow has been determined as 3,500 cfs.

Biological Diversity - Term used in the Forest Plan to provide goals and direction for evaluating the significance of old-growth stands, minimizing fragmentation of existing old-growth forests, and maintaining many of the structural components of unmanaged stands in managed stands.

Breccia - Fragmental rock whose components are angular and therefore, as distinguished form conglomerates, are not waterworn.

Canopy - The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Clearcutting - The cutting method that describes the silviculture system in which the old crop is cleared over a considerable area at one time.

Climax - The culminating stage in plant succession for a given site where the vegetation has reached a highly stable condition.

Climax Species - Those species that dominate a climax stand in either numbers per unit area or biomass.

Colloids - Substances in a state of fine subdivision having peculiar properties because of their extremely high surface area. Fine-grained materials that are held in suspension.

Colluvium landtype - A landtype of loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity.

Commerical Thinning - Any type of tree thinning that produces merchantable material at least equal in value to the direct costs of harvesting.

Commodities - A transportable resource with commercial value; all resource products that are articles of commerce.

Dendritic drainage pattern - A drainage pattern characterized by irregular branching in all directions with the tributaries joining the main stream at all angles.

Early Forest Succession - The early stage or condition of a plant community that occurs during its development from bare ground to climax.

Ecosystem - An interacting system of organisms considered together with their environment.

Ecological Site Productivity - In this document relates to the function of large woody material.

Earthflow rates -

Element Occurrence Number - A unique number given to a rate plant population by the Oregon Natural Hertiage Database which tracks populations statewide to determine endangerment.

Endemic - Prevalent in or restricted to a particular nation, region, locality, or group; native.

Evapotranspire - The portion of the precipitation returned to the air through direct evaporation or by transpiratin of vegetation, no attempt being made to distinguish between the two.

Even-aged management - The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together.

Flow regime - Generally describes the pattern of monthly variation in the volume of water discharged from a stream or river.

Fluvial species - Plant or animal species that live in the water.

Forested Land - Land at least 10 percent occupied by forest trees or formerly having had such tree cover and not currently developed for nonforest use.

Fuel Management - The practice of planning and executing the treatment or control of living or dead vegetative material in accordance with fire management direction.

Fuel Treatment - The rearrangement or disposal of natural or management generated activity fuels.

Fuels - Combustible wildland vegetative materials.

Geometric mean - The mean of the four Habitat Effectiveness Indices (size and spacing index value; road density index value; cover index value; and forage quality index value).

Geomorphic - Of, or pertaining ot, the figure of the earth or the form of its surface; resembling the earth.

Green Tree Retention - A stand management practice in which live trees as well as snags and large down wood are left as biological legacies within harvest units to provide habitat components over the next management cycle.

Habitat - The area where a plant or animal lives and grows under natural conditions. Habitat consists of living and non-living attributes, and provides all requirements for food and shelter.

Habitat Diversity - The number of differenet types of habitat found within a given area.

Land Use Allocation - The commitment of a given area of land or a resource to one or more specific uses.

Large Woody Material - Portion of a tree that has ballen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter.

Management Area - An area with a similar management objective and a common management prescription.

Mature Forest - In the WNF, areas containing trees whose average age is 120 - - 200 years old. There is significantly less diversity of plant species and structure than in an old-growth forest.

Migration Corridor - The portion of the landscape serving as a routine passageway for fish or wildlife species as they move from one habitat to another, often on a seasonal basis.

Morphology - The obervation of the form of lands.

Natural Regeneration - Reforestation of a site by natural seeding for the surrounding trees.

Non-forested Land - Lands that never have had or that are incapable of having 10 percent or more of the area occupied by forest trees; or lands previously having such cover and currently developed for non-forest use.

Old-Growth - A forest comprised of many large trees, large snags, and numberous large down logs; having a multi-layered canopy composed of several species of trees; the last stage in forest succession. In the WNF, forests begin to show some old-growth characteristics at 175--200 years.

Over-mature Timber - The stage at which a tree declines in vigor and soundness; past the period of rapid height growth.

Overstory - That portion of the trees forming the upper or uppermost canopy.

Plinkers - A person that shoots at targets selected at whim, for practice or amusement.

Pole/sapling - A successional stage in which trees between five and nine inches in diameter are the dominant vegetation.

Precommerical Thinning - Removal of some trees in a stand before they attain merchantable size so the remaining trees will grow more quickly.

Probable Sale Quantity - Describes the allowable harvest levels for various alternatives that could maintained wihtout decline over the long term if the schedule of harvests and regeneration were followed.

PUM - Piled unmerchantable material; generally unusable woody material less than 8 inches x 10 feet remaining after timber harvest.

Reforestation - The natural or artificial restocking of an area with forest trees.

Regeneration - The renewal of a tree crop, whether by natural or artificial means. Also, the young crop itself.

Rehabilitation - The process of restoring a site to a former state or desired condition.

Release - Freeing trees from competition for light, water, and nutrients by removing or reducing the vegetation growth that is overtopping or closely surrounding them.

Removal Cut (final cut, regeneration cut) - The removal of the last seed bearers or shelter trees after regeneratino is established under a shelterwood method.

Riparian - Pertaining to areas of land directly influenced by water or influencing water. Riparian areas usually have visible vegetative or physcial characteristics reflecting this water influence. Stream sides, lake borders, or marshes are typical riparian areas.

Salvage - The cutting of trees that are dead, dyingm, or deteriorating (before they are "overmature", or materially damaged by fire, wind, insects, fungi or other injurious agencies) before they lose their commercial timber value.

Seral - A biotic community which is a developmental, transitory stage in an ecologic succession.

Seven day peak period - The warnest consecutive 7 day periodof the year used to deterime compliance with temperature standards.

Silviculture - The art and science of controlling the establishment, composition, and growth of forests.

Slash - Residue (leaves, bark, twigs, roots, etc) left on the ground after logging.

Snag - A standing dead tree usually greater that 5 feet high and 6 inches diameter at breast height. Its interior may be sound or rotted.

Stand - An aggregation of trees or other vegetation occupying a specific area and sufficiently uniform in species composition, age arrangement, and condition as to be distinguishable from the forest or other vegetation or land cover on adjoining areas.

Stand Diversity - Any attribute that makes one timber stand biologically or physcially different from other stands.

Stand Examination Surveys - Procedures to collect data on Forest stands.

Stocking - A loose term for the amount of anything in a given area, particularly in relation to pre-determined optimum.

Structure - The configuration of elements, parts, or constituents of a habitat, plant, or animal community.

Succession - The progressive development of vegetation from bare ground towards its highest ecological expression, the climax community; the replacement of one plant community by another.

Tuffs - Rocks formed of compacted volcanic fragments, generally smaller than 4 mm in diameter.

Vegetative management - Activities designed primarily to promote the health of the crop forest cover ofr multiple-use purposes.

Water yield Class - Classification based on the water retention properties of soil types. It is an indication of the rate and amount of water yield expected from each soil based on various factors.

YUM - Yarded unmerchantable material; generally unusable woody material less than 8 inches x 10 feet remaining after timber harvest.

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A

Appendix A

Information Sources and Needs

This describes the information used to analyze the Middle Fork Willamette River Downstream Tributaries Watershed and to document the data needs for future analysis.

ISSUE VM Vegetation Manipulation

VM1 Compared to natural conditions, where has the intensity and pattern of vegetation manipulation affected plant and animal habitat diversity, species composition, amount of interior habitat, and habitat connectivity?

Data Needed	Source	Integrity	Future Needs
Vegetation	VEG/VEGIS	Fair	Complete fields for Year of origin, plant association, major/minor species, special habitats, habitat features. Move MOMS database to Vegis
Historical Vegetation	HVEG	Good	
Stream Buffers	SBUF	Fair	Complete and field verify Class IV streams, add names as an item
Lake Buffers	LAKEB	Good	Add lake names as an item
Late Successional Reserves	LSR3, LSRS	Good	
Special Habitats	SHAB	Fair	SHAB layer 40% complete. Complete point, polygon and habitat features.
Stand Description	Ecoplots	High	Connect database to layer
Series Description	Plant Association Guide	High	Get field information and put into GIS
Insect & Disease Data	USFS & ODFW 1994 Survey Warner Creek GIS	High	
Stand Structure	Silvaculture Prescriptions, Slinky, Stonepot, Boulderdash	High	

VM2 Compared to natural conditions, where has the intensity and pattern of vegetation manipulation affected ecological site productivity?

Data Needed	Source	Integrity	Future Needs
Vegetation	VEG/VEGIS	Fair	See VM1
Ecology Plots	ECOP	Good	Connect database to coverage

VM3 Where and to what extent have the changes in spatial and temporal distribution of vegetation influenced water yield, and peak flow? Where have these changes in hydrology affected channel function and habitat conditions?

Data Needed	Source	Integrity	Future Needs
Vegetation	VEG/VEGIS	Fair	See VM1
Water yield	SRI	Good	
Slope	SLO	Good	
Stream flow data	USGS	Very Good	Get updates from USGS

VM4 What are the most important delivery mechanisms for sediment generated by vegetative disturbances in this Watershed? What are relative rates of delivery by land form or slope to stream? Where are the high risk areas for generating, delivering or depositing sediment?

Data Needed	Source	Integrity	Future Needs
Vegetation	VEG/VEGIS	Fair	See VM1
Unstable Soils	SRI	Good	Manuscript and digitize unstable soils identified in EA's
Slope	SLO	Good	
Streams	STR	Good	Field verify Class IV's and add to GIS.

VM5 Where and to what extent has vegetation manipulation affected riparian and aquatic habitat complexity?

Data Needed	Source	Integrity	Future Needs
Vegetation	VEG/VEGIS	Fair	See VM1
Streams	STR	Good	See VM4
Riparian Area affected by Roads	STR,TRAN		Intersect Class IV buffers with tran to get acreage of riparian reserves.
Stream Temperature Date	USGS District Records	Very Good Good	Continuous daily records; locate temperature monitors with GPS

VM6 Given current Forest Plan land allocations, where and how many acres are available for vegetation manipulation?

Data Needed	Source	Integrity	Future Needs
Allocations	LMP	Good	Submit Forest Plan Amendment for developed recreation sites
Vegetation	VEG	Fair	See VM1
Late Successional Reserves	LSRS	Good	
Ownership	ADMN	Good	Propose logical district boundaries

ISSUE NF Exclusion of Natural Fire

NF1 What is the comparison of the fire pattern, fire behavior and burn intensity between the current fuel loading conditions and the conditions before modern day fire suppression activities?

Data Needed	Source	Integrity	Future Needs
Vegetation	VEG/VEGIS	Fair	See VM1
Historical Vegetation	HVEG	Good	
Ecoplots	ECOP	Good	Connect database to coverage
Conditions & Intensity	J.D.Walstad, OSU, 1990	Good	
Fuel loadings & models	Forest-wide Standards & Guides	Good	
Effects	F.E.I.S. Warner Recovery Project	Good	
Fuel models & loadings	Charlie Martin report - TFM	Good	
Fire ecology regimes	Wright, Bailey, 1982	Fair	
Fuel loadings & models	Maxwell, W. Technical Report PNW-105	Good	
Historical	Carol Winkler - anthropology	Fair	Need specific information for MFWDT
Fire History & pattern	Peter H. Morrison, General Reports PNW-GTR-254, 1990	Fair	
Fire Model and Fuel Regimes	Dennis Sullivan, AFMO, Oakridge RD	Fair	

NF2 How has habitat diversity changed with modern day fire suppression?

Data Needed	Source	Integrity	Future Needs
Historical Vegetation	HVEG	Good	
Historical	Carol Winkler - Anthropology	Fair	Need more info for the area.
Historical Fire	Peter Teensma, PhD., 1987	Good	
Fuel Models	Anderson, H.E., General Technical Repors, 1982	Good	

NF3 How have fire pattern and behavior affected Threatened, Endangered and Sensitive species, and fire dependent species?

Data Needed	Source	Integrity	Future Needs
Vegetation	VEG/VEGIS	Fair	See VM1
Sensitive species	Natural & prescribed fire	Fair	Need more information.

ISSUE TR Transportation System

TR1 Where and to what extent has the density and condition of roads influenced natural and management induced disturbances?

Data Needed	Source	Integrity	Future Needs
Roads	TRAN/TMS	Good	
Soils	SRI	Good	
Vegetation	VEG/VEGIS	Fair	See VM1

TR2 What sections of roads are currently introducing or have the potential to introduce excessive amounts of sediment into the stream system? Where and to what extent does the influx of sediment influence channel conditions?

Data Needed	Source	Integrity	Future Needs
Roads	TRAN/TMS	Good	
Streams	STR	Good	See VM4
Soils	SRI	Good	

TR3 Where and to what extent has the density and configuration of roads affected surface and subsurface hydrology.

Data Needed	Source	Integrity	Future Needs
Roads	TRAN/TMS	Good	
Streams	STR	Good	See VM4

TR4 Where are high risk or high priority road/stream crossings which do not have drainage structures designed to withstand 100 year events?

Data Needed	Source	Integrity	Future Needs
Streams	STR	Good	See VM1
Roads	TRAN/TMS	Good	

TR5 What are the possible resource effects of maintaining system roads at expected funding levels?

Data Needed	Source	Integrity	Future Needs
Miles of road by maintenance level	TMS	Good	
Current & projected RM budget	Program data	Good	

TR6 Where and to what extent have roads affected fish passage and riparian reserves?

Data Needed	Source	Integrity	Future Needs
Stream Buffers	SBUF	Good	See VM1
Lake Buffers	LAKEB	Good	
Roads	TRAN/TMS	Good	
Vegetation	VEG/VEGIS	Fair	See VM1

TR7 Where and to what extent are the road locations and their use affecting wildlife and botanical species and special habitats?

Data Needed	Source	Integrity	Future Needs
Roads	TRAN/TMS	Good	
Special Habitats	SHAB	Fair	See VM1

TR8 Where and to what extent has the condition and use of trails altered earth movement disturbances?

Data Needed	Source	Integrity	Future Needs

TR9 How and to what extent does changed travel access influence potential human caused fire ignitions and suppression response time?

Data Needed	Source	Integrity	Future Needs

TR10 How does changed travel access effect public and administrative use of the forest and local economics?

Data Needed	Source	Integrity	Future Needs

ISSUE NS Introduction And Spread Of Non-Native Species

NS1 Where and to what extent has introduction of non-native species affected native flora and fauna?

Data Needed	Source	Integrity	Future Needs

ISSUE EI Infrastructure

EI1 Where are existing and potential infrastructure land uses?

Data Needed	Source	Integrity	Future Needs
Inventory of structures	FLUR database Case files	Good	Continually update - install into GIS
Mining Claim Location	BLM database	Poor	Get current & complete data.

EI2 Does the presence and use of these facilities affect the Watershed resources?

Data Needed	Source	Integrity	Future Needs

ISSUE HL Hills Creek Dam And Lake

HL1 How has the change from a river system to a lake (reservoir) system affected the aquatic ecosystem? What are the fish and wildlife species that have blocked or disrupted migration patterns?

Data Needed	Source	Integrity	Future Needs
Affected Environment	1979 COE Reservoir EIS	Good	
Affected Environment	Aerial photos 1959	Excellent	

HL2 How has species composition changed with the filling of the lake? what are management opportunities?

Data Needed	Source	Integrity	Future Needs

HL3 What is the affect of the lake drawdown on lake turbidity? What are the restoration opportunities?

Data Needed	Source	Integrity	Future Needs
Rehabilitate History	District files	Excellent	
New Methods	Reservoir Shoreline Revegetation by A.Leiser	Good	
High Tubidity Areas	1990 Aerial photos	Excellent	

HL4 How has the channel downstream of the dam been altered since the construction of the dam? How has this alteration affected the aquatic ecosystem?

Data Needed	Source	Integrity	Future Needs
Storage & Minimum flows	1979 COE Reservoir EIS	Good	

HL5 To what extent has the dam modified the average flows during all times of the year, and the average annual peak flows? How have these modified flows affected flood plain processes, functions, and their associated riparian area habitat?

Data Needed	Source	Integrity	Future Needs
Flows	1979 COE E Reservoir EIS	Good	

HL6 How has the dam affected the sediment distribution and transport capability of the channel downstream of the dam?

Data Needed	Source	Integrity	Future Needs
Sediment Transport	1979 COE Reservoir EIS	Fair	

HL7 How has the cooler water released from the dam in the spring and early summer affected aquatic species? How has the warmer water released from the dam in the late summer and early fall affected aquatic species?

Data Needed	Source	Integrity	Future Needs
Water Temps	1979 COE Reservoir EIS	Good	

HL8 What recreation opportunities are provided by Hills Creek Lake? How can these opportunities be enhanced? What is the affect on local economy?

Data Needed	Source	Integrity	Future Needs
Affects on Economy	1979 COE Reservoir EIS	Fair	

OTHER DATA NEEDS

Data Needed	Source	Integrity	Future Needs
Valley Segments	GIS		Manuscript, digitize, move to ARC INFO
Fire History	Fire Occurrence		Finish manuscripting, digitize, move to ARC INFO. Review Augusta Creek for their techniques
Resource Values	Resource Specialist		Create Access Travel Management Plan
Recreation Opportunity Spectrum	ROS		Manuscript, digitize, move to ARC INFO
Time safety road cutoff	GIS		Need to get into GIS for fire.
Helispots, pump chances, turn arounds, h20 areas for engines	GIS		Need to get all this information into GIS. This manuscripting was done at one time but the manuscripts have since disappeared.
TSHE/RHMA/ OXOR	Botanist, Silviculture		Field identify, input into SHAB layer and VEGIS
Private Lands	Private Landowners		Acquire stand information for GIS
LSR Assessment	District Specialists		Create an LSR Assessment Plan
Thompson's Mistmaiden	Botanist,		Manuscript on SHAB, input into VEGIS
WIN	Hydrologist		Link database to STR layer
Levels of Acceptable Change	Recreation		Link to dispersed site layer
STR	Hydrologist, Fisheries Biologist		Link SMART database to STR layer
White Oak	Botanist		Need field verification of white oak component of stands, input into GIS
Stream Temperautes	Aquatic Biologist, Hydrologist		Need stream temperature information for sites below Hills Creek Dam

B

Appendix B

Team Membership and Other Contributors

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C

Appendix C

Shady Beach Fire Document

SHADY BEACH FIRE

EFFECTS & REHABILITATION EFFORTS

D'Lynn Williams, Biological Technician

1995

Shady Beach Fire occurred in September and October 1988 and was comprised of 9,163 acres. Approximately 3,300 acres of this fire occurred within the Middle Fork Willamette Downstream Tributaries Watershed Analysis area. An Environmental Impact Statement was completed in June, 1989 and is the main reference document for this summary.

"In addition to the fire-kill of merchantable timber, the fire had important effects on wildlife habitat, water quality, and long-term site productivity. There were some minor direct fire effects on soils but most of the site productivity effects involve reductions of organic material that affects nutrient supplies to the soil. Mass wasting would be increased on steeper slopes near stream channels where the fire has consumed all slope stabilizing woody material." (p.S-4)

Geology & Soils

"On landslide-prone slopes where forest fires have killed most of the vegetation, pre-existing landslides may be reactivated and new landslides may occur. "(p. III-3) " Soil-erosion potential is aggravated by the rerouting of water associated with road drainage. Roads may intercept ground and surface water, concentrate it, and route it into land areas that may not be able to absorb additional water input without some slope failure. Road placement and construction practices are the most important factors in minimizing the increase in erosion as a result of management activities in the analysis area."(p.III-10)

Water & Fish

"The quality of the water flowing through and coming from the analysis area and in the Hills Creek Reservoir is considered to be good except during high winter flows when turbidity may be high, or during summer low-flow periods when segments of some streams exceed 58 degrees F. Concerns for water quality have centered on turbidity (fine sediment that is suspended in the water), sediment loads (coarser sediments that are moved along a stream channel), peak flow increases, and water temperature. All these characteristics directly affect fish habitat and indirectly affect recreational experiences. In addition, sediment loads can affect downstream improvements such as the Hills Creek Reservoir which will eventually be filled with these fine and coarse

bedload sediments. Other pollutants, such as sewage, hydrocarbons, or other toxic chemicals do not occur in this area." (III-11)

"Nearly all the streams in the analysis area have incised channels as a result of the erodible nature of the soils and parent material....most of the streams are in alluvial or colluvial material. Pieces of large woody debris play an important role in stabilizing alluvial channels. ...Streams within the fire area where this debris was partially or wholly consumed will produce high amounts of sediment during winter peak flows until the stored sediment moves out of the system or until stabilizing debris is replaced."(III-13)

"Stream temperatures have increased over natural levels as a result of management activities such as road construction and timber harvest.... The United States Geological Survey (USGS 1988) has monitored water temperatures at a stream gauge on Hills Creek from 1958 to 1984. These data show that the temperature of Hills Creek exceeds 58 degrees F. for 91 percent of the days recorded in August for the period of record. Temperatures as high as 70 degrees F have been recorded." (III-14 & 15)

"Studies show that the removal of forest cover increases streamflow and flood frequency. The effect is believed to be caused by a reduction in melting and evaporation losses and increased snow accumulations in cutover areas. (III-17)

"High flows from post-fire storms in the fall of 1988 have resulted in some channel erosion. The turbidity levels of the streams appears to have risen. ...Shoreline turbidity caused by summer wind-wave activity produces locally turbid water that extends as much as 200 feet from the shore at exposed headlands". (III-20)

"Fish in both the stream systems and the reservoir are affected by changes in water quality. Stream temperature affects the amount of dissolved oxygen that water can absorb....Sedimentation affects the structure of spawning beds and by suffocating juvenile fish or by trapping them in spawning gravel." (III-21)

Wildlife

"The analysis area provides habitats for a wide variety of animal species that can be considered typical of western Cascade Douglas-fir forests....The analysis area provides winter and summer habitat for Roosevelt elk, black-tail deer, cougar, black bear, coyotes and numerous small mammals....The winter range provided within the analysis area is a particularly important and limited resource. In part, this is due to the loss of about 2,000 acres of valuable winter range that was eliminated with the construction of the Hills Creek Reservoir and in part due to the fact that the site of the City of Oakridge was once part of this low-elevation winter habitat....Road use, whether from logging, recreational

activities, or hunting is the main human activity besides hunting that has the largest effect on these elk herds. Disturbance by road traffic increases stress on the animals by causing them to expend energy and driving them away from forage. (III-32)

Cultural

There are 25 inventoried prehistoric sites in the Shady Beach Fire analysis area. All these sites are estimated to date from prehistoric times to about 2,500 years ago. It is thought that all these sites represent hunting and gathering camps since no indication of any permanent dwellings have been found. Of the 25 sites, 10 are located within the fire area. Of these 10, eight have been disturbed by previous road-building or timber-harvest activities. The undisturbed condition of the remaining two sites is enough to make them eligible for the National Register of Historic Sites. The fire had no effect on these sites. There are no known historic cultural resources located in the analysis area except for the old Central Oregon Military Wagon Road and a homestead site located at the bottom of Hills Creek Reservoir."(III-40)

Rehabilitation Efforts

Aerial seeding and fertilizing was completed in October 1988 to help prevent excessive erosion possibilities. Item 1.8 Bull Creek (244 acres) was fertilized using 12.2 tons of 20-10-15-7 fertilizer and 4880 pounds of Shady Beach seed mix. Item 1.9 Modoc Creek (87 acres) was fertilized using 4.35 tons of 20-10-15-7 fertilizer and 1740 pounds of Shady Beach seed mix. The Shady Beach seed mix consisted of 40% Orchard grass, 50% annual ryegrass, 10% Dutch white clover by weight. The decision to use non-native plant species was made because of the lack of native species' seed available and the prohibitive costs of this seed. Introduction of non-native species and the possibility of noxious weed species is always a concern. The Shady Beach seed mix which was used had been certified by the State.

Additional rehabilitation efforts included: installation of silt fencing and hay bales to catch sediment from surface erosion sites before the runoff entered stream channels; installation of hay bales within stream channels to catch sedimentation; installation of additional catch basins to serve as settling ponds to prevent transportation of sediment; seeding/fertilizing of several miles of firelines within the Watershed Analysis area of the Shady Beach Fire, and large material placement on steep slopes to prevent surface erosion.

Several temporary roads were closed to benefit big game and to help decrease erosion potential. In particular, Road 2302200 and its spurs were considered maintenance problems and closed immediately after logging. The 220 spur of this system failed between construction in 1989 and logging the next spring.

road was built approximately 500 vertical feet above Rd. 2118 which is the east access to Hills Creek Reservoir, so was a major concern of sedimentation directly to the Lake. The Forest Service installed silt fencing and hay bales to stop sedimentation from entering the Lake, and the road was closed for the winter to allow the surface to dry out before use. The road was reconstructed in Spring of 1990 and all timber was cut and hauled that summer. The road was bermed the fall of 1990.

The size of an existing slide on Rd. 2302 at the top of Tufti Mountain was increased by the effects of the Shady Beach Fire. Several road surface/fill failures occurred after the Fire and during/after subsequent salvage logging.

A slide on Rd. 2118 south of the mouth of Modoc Creek has been triggered since the Fire. This slide is several acres in size. The Forest Service is currently studying the area to determine an appropriate rehabilitation method.

Reforestation efforts for the Shady Beach Fire have been a challenge--many of the units have been planted three times and barely meet the NFMA (National Forest Management Act) direction for stocking levels.

The need for snag habitat for future years has been supplemented by partial topping green trees. The purpose of topping these trees is two-fold: reducing windthrow potential, and introducing heartrot into the crown of the trees to provide snags in 20 or 30 years. Snags are an integral part of a "natural" forest.

D

Appendix D

Fire Document

Fire Input

Charlie Rasler, Fire and Fuels Management

1995

Fire History

Because of the importance of fire in shaping vegetation structure, density, and species composition, it was felt that an overall description of the fire history and present risk in the Watershed was appropriate and important part of the analysis of the biological domain.

The information in this document is based on what is know about the fire history of the Middle Fork Willamette Downstream Tributaries Willamette Watershed. Currently, the likelihood of fires that are primarily stand replacement events is not very high. Replacement fires in the modern era are significantly less frequent and smaller than they were between the years 1680 through 1918. This century, fire suppression activities have also repressed low intensity fires. Natural underburns, which are fairly easy to control, have been virtually eliminated.

Between 1949 and 1994 there were 383 fires and the largest of these was a portion of the Shady Beach Fire in 1988. This human caused fire burned approximately 3,300 acres in this watershed----total acres for the fire was 9,987. Below is a list of fires that were 15 acres or bigger, before 1949 records were poor and scattered:

Fire Name	Year	Acres	Cause
Shady Beach Fire	1988	3,300	Human
Packard Fire	1987	255	Human
Salix Fire	1985	15	Human
Bohemia Fire	1980	518	Human
Deadwood Creek Fire	1966	50	Human
Buck Creek Fire	1952	40	Human
Johnson Meadows Fire	1919	420	Lightening

The rest of the fires were under 15 acres - leaving 376 fires. 271 were lightning and 112 were human caused.

The Middle Fork Willamette Downstream Tributaries Willamette Watershed has a relative low risk to moderate risk of significant fire, since this area typically receives a greater amount of moisture. The moisture decreases the likelihood of significant fires. At the same time, the MFWDT Watershed is one of the highest fire areas for Willamette National Forest.

Continued fire suppression will result in increased in mortality, species conversion to plants less resistant to fire, and further accumulation of both horizontal and vertical fuels. Without the reintroduction of fire or other treatments that mimic fire, the likelihood of stand replacement fires will continue to increase, and overall forest health will decline.

"Fire has been an important disturbance process in the western Cascade Mountains landscape," (Teensma,1987 & Morrison and Swanson, 1993). "In temperate forest ecosystems fire influences species composition and distribution, initiates succession, controls the patterns and scale of the vegetation mosaic and governs ecological processes by regulating fuel accumulations. Fire is also important in maintaining wildlife habitat, reducing forest insects and diseases, and influencing ecosystem stability and diversity" (Burke,1979; Teensma,1987; Morrison and Swanson, Swanson, Agee,1993).

Fires of varying intensities and diverse temporal and spatial extent have resulted in an extremely complex mosaic of forest composition and stand age stand age structure. This complexity of forest composition and structure has created a diversity of habitats for biological organisms.

"The maintenance of this rich biological diversity might be achieved by managing the forest landscape more closely along the patterns of natural disturbance. The patterns of historical fire occurrence and extent might be used as "template" for forest management" (Connelly and Kertis,1991).

Fire

Periodic fire has been a normal and recurring component of the Middle Fork Willamette Downstream Tributaries Watershed since the retreat of the last glacier. The forests periodically experience both large and small disturbances that destroy less than an acre, to thousands of acres at a time. New forests regrow through a succession of plant communities and forest structures.

Many fires were probably ignited by lightning, particularly along prominent ridgelines. Fire spread depends on a host of climatic and fuel factors including fuel biomass and moisture content, ambient air temperature, humidity, wind direction, and wind speed. Fires may be localized small events that follow

topographic contours related to parameters of weather and fuels. Conversely, during drought conditions and extreme fire weather, fires may be topographically independent.

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.

FUEL LOADING AND MODELS FOR THE WATERSHED.

A representation of fuel loading and an average site condition was arrived at by Ecosystem Plot --- (a series summary of this watershed), this will be arranged by dead fuels. A average for each fuel size class, the fuel size class will be catagorized by 1,2,3 and 4, 1 being the lowest and 4 being the highest, this will be described in the natural forest residues in common vegetation photo series - (USDA Forest Service General Technical Report Pnw-105 May 1980 - Types OF The Pacific Nothwest) The Residue Descriptive Code in the upper right hand corner will be the fuel class. Also Aids to Determining Fuel Models for Estimating Fire Behavior (General Technical Report Int - 122) April 1982 Hale Anderson will be used as a guide for estimating fire behavior in these types of fuel size class, these will be fuel Model 8 and 10.

Natural stands were categorized as stands with 0-3 inch material less than 5 tons per acre >5t/a or greater than or equal to 20 total tons per acre >=20t/a were given a fuel model 10 (FM10).

Stands with 0-3 inch material less than or equal to 5 tons per acre <=5t/a and less than 20 total tons per acre <20t/a were given a fuel model 8 (FM8).

Fire Behavior for Fuel model 8, Slow burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional jackpot or heavy fuel concentration that can flare up.

Fire Behavior for Fuel Model 10, The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead down fuels include greater quantities of 3 inch or larger limbwood resulting from overmaturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties.

Fuel Loading class and Fuel Models, For the MFWDT Watershed

Fuel Model	Fuel Loading Class			
	1	2	3	4
8	23%	35%	0%	0%
10	0%	0%	26%	16%

FM 8 - Fuel Loading 1@2 total for watershed 55%

FM10 - Fuel Loading 3&4 total for watershed 42%

The fuel models that were used are the most common there could be a mix of fuel models in this Watershed, the other models that would fit most likely would be FM 5 which is a Brush model--(Fires are generally of low intensity as surface fuels loads are light), The other fuel model would be a FM 12---(logging slash or wind, floods), Fire Behavior would be Rapidly spreading fire with high intensities capable of generating firebrands. The amount of the FM 8 will change as time goes by and most likely the fuel model will go up to model 10. conclusion the historic role of fire is an important element of baseline information useful in integrating fire strategies with the larger land management picture. It can be helpful in estimating which species are likely to dominate and Fuel Models the landscape if fire is eliminated as a management tool, and which species will have a relative advantage in the presence of fire.

Fire models and Conclusion.

In general, fire is less prevalent on today's landscapes than in prehistoric times, due to effective fire control policies. Ironically, success in fire suppression has allowed more uniform and increasing fuel loads across the landscape, shifting forest fire effects that were typically of low and moderate severity in historic fires to more severe fire effects today. Fire management objectives must be broader than simply fire suppression if broader goals are to be met. Prescribed fire, and in some cases natural fires, may be useful strategies to integrate with fire suppression to meet land management objectives.

Effects of fire intensity and consumption

The moisture content of a fuel determines if the fuel will ignite readily and how it will burn (Table 22.1). Dry fuels ignite readily and burn efficiently. Fire intensity (in units of Btu per ft per second) is a rate of the amount of heat production at the flaming front of the fire. High intensity, resulting from efficient combustion, indicates high temperatures. Temperature thresholds are critical for killing living tissue (e.g., unwanted vegetation or seed) and chemical reactions (e.g., volatilizing nutrients). Low intensities result from scant fuel loadings or inefficient combustion of moist fuels. Inefficient are too moist to

ignite on their own may dry out as surrounding, drier fuels provide heat to drive off that moisture. How quickly the moist fuels dry controls duration. Tables 22.2 Summarize the influence of fire intensity and duration on consumption and the subsequent effects on resource values.

Fine fuels (smaller than 3 inches in diameter) are the first to ignite during a fire. They act as kindling, burning rapidly because of their low moisture content and high surface-to-volume ratio. Fuel managers prescribe moisture contents of the fine fuels low enough to allow the spread of the fire throughout the area intended to be burned. These low fuel moistures insure nearly complete consumption of the fine fuels (Fig. 22-1)

In general, large fuels (greater than 3 inches in diameter) burn according to their moisture content, provided that the small fuels are dry enough to consume and ignite the larger material. During the flaming stage of the fire, fine fuels are consumed. The heat generated from this consumption serves to ignite and sustain the consumption of larger logs. After the flaming front has passed, large logs continue to smolder until the moisture within them quenches the fire. If fine fuels are dry enough to be totally consumed during the fire, the percent of large fuels consumed is proportional to the moisture content of those large fuels. Hence, reducing the amount of large fuels prior to burning, or burning when their moisture content is high.

Large, decaying logs are usually slow to ignite because of their relatively high moisture content. Consequently, once lit, they burn primarily during the smoldering phase of the fire.

22.1

```
        100 |        :-------------------------        FINE FUELS
            |       :
PERCENT OF  |       :  ________________________________ LARGE FUELS
RESOURCE    |      : :
CONSUMED--->  |     : :  :_______________________        FOREST FLOOR
            |    : : :
         50 |   : : :
            |  : : :
            |  : : :  :_____________________            LIVE SHRUBS
            |  : : :  :
            |  : : :  :
            |  : : :  :     :_____________            LARGE, ROTTEN
            |: : : :     :                            LOGS
            |: : : :     :
         0 |:____:____:____:_______:_________________
SHORT   ---------------------------------------> LONG
WET   <---------------------------------------  DRY
```

Figure 22-1 . Relationship of fire duration and moisture content to the amount of resources consumed.

Table 22-2 Effects of fire intensity and duration on resources

	High Intensity		Low Intensity	
Fuels and Fires	**Long Duration**	**Short duration**	**Long Duration**	**Short Duration**
Consumption of fine fuels	Nearly Complete	Nearly Complete	Incomplete	Incomplete
Consumption of Large Fuels	High consumption; with smoldering	Low consumption little smoldering	consumption varies; occurs mostly as smoldering	little consumption little smoldering
Consumption of forest floor	High consumption; long smoldering	Consumes only dry forest floor	Mostly smoldering consumption	Very little consumption
Mortality and consumption of live shrubs and trees	High mortality; high consumption	High mortality; some consumption	Some mortality; low consumption	Some defoliation
Exposure of mineral soil	High exposure; some damage to chemical and physical properties	Depends on forest moisture	Some exposure	Little exposure

Historic Information

This area is dominated by timber stands averaging 100 to 160 years old, a date which coincides with the cessation of aboriginal burning in the area. General Land Office survey maps from the mid-1800's show that much of this area had been burned over, due to fires that may have been of annual frequency, as had been reported for the Willamette Valley by the exploring expeditions of the have been a Molala winter village, (Baxter,1986), and was maintained as an oak woodland. Prairie landscape into historic times, lends credence to the notion that the Middle Fork drainage was annually intentionally burned off (Winkler,).

Thus it seems likely that both annual firing of the prairies and underburning of the forest were intentionally utilized by native peoples throughout the Willamette Basin to increase the range and abundance of game and edible and useful plants. According to John Minto, an early Oregon settler: "Fire was the agency used by the Calapooia tribes to hold their camas grounds and renew their berry patches and grass-lands for game and the millions of geese, brants, cranes, and swans which wintered in Western Oregon...On the west face of the Cascades the Molallas claimed dominion, and fire was their agency in improving the game range and berry crops (1908).

"Frequent fires swept the forest floor and very little old growth timber exists here as well as elsewhere in the district that does not show fire scar or charred wood at the base of the tree trunks. There fires were either from lightning or from Indian burning of prehistoric days. Early pioneers claim that the forest floor was so open that stock and horses could be driven or ridden through the timber in many places. It is said only in the last twenty years has the present

dense thickets of brush and saplings growth made its appearance. Younger stands are more noticeable which aids the thought of man made-light burning (Breim,1937).

Native American ignitions would, of course, alter the natural range of variability for fires. "There are at least 13 documented reasons for American Indians ecosystem burning. "(Williams 1994). The emerging evidence of extensive burning in the Northwest reinforces the belief that the Native American attitude towards the role of fire in the ecosystem is nearly opposite of the views today. Unfortunately, there is no documentation that specifically records the use of fire by Native Americans.

In his analysis of the developmental history of dry coniferous forests in the central Western Cascades, Means (1980) found, "that dry site stands are burned at intervals averaging 100 years,(and probably less), by fires that destroy only a portion of the canopy, resulting in uneven-aged stand structures which are in striking contrast to the usually much more even-aged structure of Douglas-fir on moister sites. The fact that such periodic, non-catastrophic fires are common on dry sites in the pre-fire suppression period suggests the possibility of intentional underburning by aboriginal peoples." Thus the pre-1850 fire-adapted forest had an open character and greater species diversity than the present closed forest, a result of fire suppression.

Settlers used fire extensively. Ranchers preferred fire to rejuvenate their fields: To kill previously-girdled trees, a rancher set fire on the lee side of ranch buildings and allowed to burn across his field; "no effort whatever was made to prevent it from reaching the neighboring timber. Even his own fences would fall as prey to devouring element, which a high wind soon places beyond his control" Gorman,1899).

Gorman continues, "Among the principle causes of forest fires may be named sheep herders, campers, hunters, prospectors, miners, trail and road makers, and the settlers. The first named are generally most culpable. Fires were rarely extinguished before the fall rain or until they burn out for lack of material on which to feed."

This information was taken from the Historical Vegetation map of the Watershed. The Forest surveys correspond to county boundaries. Lane County maps postdate 1949 and Douglas county maps predate 1947. The codes used in this map are major vegetation codes which provides data as to dominant tree species and size.

Table Decades of Historical Fires for MFWDT

Age of Stand in Years	Year of Origin Range	Acres	% of MFWDT
300 - 500	1495 - 1695	61,464	56%
140 - 160	1835 - 1855	23,475	23%
80 - 119	1876 - 1915	13,728	11%
Non-forested		6,145	6%
seedling		4,719	4%
Total Acres		109,531	100%

Fire has played a very important part in this Watershed. Past wild fires occurred relatively frequently. The 300 to 500 year old stands have had not just one stand replacement fire over the period of time but have had several fires. Stand replacement fires burned through creating lots of snags and created a large amount of fuels on the forest floor. A second fire came through that was carried by the fuel loads. Some of these areas have been burned four to five times depending on the season and other factors such as temperature, aspect, slope, live fuel moisture, wind, and fuel loadings. This information was gathered from field surveys, fuel photos, ring counts and the vegetation map.

This Watershed has been burned just about throughout the whole area. About seventy-eight percent has had some type of fire in it. The period of time would be from 300 years to 160 years old, 12 percent of the Watershed has burned about 80 years to 119 years ago. Stands that are seedlings and samplings are about 50 years of age represent about 4%, the rest is nonforest 6%, since 1949 there has been 383 fires in the Watershed. 271 were lightning fires and 112 were human caused. Modern fire control policies have been effective at reducing acreage burned by free ranging wildfire. Ironically, success at fire suppression has allowed more uniform and larger fuel loads across this Watershed that could result in more severe fire effects. The objectives of fire management must be broader than simply fire suppression if land management objectives are to be met. Simply fire has been a big part of the disturbance factor for this Watershed.

In 1910 the Forest Service established a fire suppression policy. Steady advances in fire control including the use of telephones quickened the response time of organized fire fighting crews. A primary duty of personnel staffing guard stations was "in case of fire, become acquainted with the trails, springs, campsites, and the presence of horse feed. The Great Depression emergency programs contributed to improvements and fire control, including construction

of roads which increased access to fires in the area. Consequent construction of lookouts and stringing telephone wire reduced detection and reporting time.

The establishment of organized fire fighting crews, smokejumpers, prevention programs, state of the art communication, aerial retardant, helicopters, fire detecting aircraft, sophisticated computerized dispatch, and line resources available all helped to minimize acreage burned by wildfire in the watershed.

Lightning and Human Caused fires in the MFWDT Watershed

Lightning Fires	271
Human Caused	112
Total	383

95% of the human caused fires are along Hills Creek Reservoir and Road 21 to the end of the Watershed --South End--around Campers Flat. The lightning caused fires are evenly dispersed throughout the Watershed. All information was taken from individual fire reports, we have fire records going back to 1949 also have a fire map with individual areas of the fires. From 1949 until the present time we have an average of 8.5 fires a year, but this is just a point in time for the measurement and it could be a lot lower or higher. Fire history - past wildfire occurrence has been relatively frequent in the Watershed area and has played a large part in driving plant succession, creating stand structure and determining the amount of fuels in the Watershed.

Fire Regimes

Fire suppression since the turn of the century has resulted in a disruption of the natural fire cycle, causing a decreasing frequency but increasing intensity of fires (Agee, 1993). The change in fire frequency, management, has changed vegetation and fuel models, therefore changing fire intensity.

Today's high hazard conditions are in those areas that are now overstocked in the understory. Historic insect and disease occurrences were kept in check by a mosaic of fire-regenerated succession stages that limited insect and disease outbreaks to relatively small acreage. Those areas were periodically cleansed by wildfire.

The long term health of the Watershed ecosystems is strongly linked to the public's perception about fire in their forest and fire management strategies that will be constructed and implemented in the future.

Table Relative Fire Resistance of The Most Import Trees of Oregon and Washington in Order of Greatest Resistance

Species	Bark Thickness of Old Trees	Root Habit	Branch Habit	Canopy Cover	Lichen Growth and Color	Foliage Inflammability	Most Common Way of Killing
Western Larch	very thick	deep	high & open	open	light/black	low	most resistant
Douglas-fir	very thick	deep	high&dense	dense	none-heavy/gray	high	crown fires
Ponderosa Pine	thick	deep	moderately high & open	open	light/black	low	crown fires
White/grand fir	moderately thick	shallow	low & dense	dense	none-heavy/gray	medium	root char, crown fire
Western redcedar	thin	shallow	low & dense	dense	none-moderate/gray	high	root char, crown fire, burn down
Mountain Hemlock	medium	medium low	low & dense	dense	none-moderate/gray	high	root char, crown fire
Noble fir	moderately thick	medium thick	high & dense	dense	medium-heavy/gray	high	foliar scorch or crowning, core burn
White pine	medium	medium	high & moderate	dense	moderate/gray & heavy	medium	scorching cambium or crowning
Lodgepole pine	very thin	deep	moderately low & open	open	moderate-heavy/gray, black	medium low	scorching cambium or crowning
Western hemlock	medium	shallow	moderately low & dense	dense	non-heavy/gray	high	root char, crown fire, core burn
Engelmann spruce	very thin	shallow	low & dense	dense	none-heavy/gray, black	very high	root char,scorching cambium, crowning
Sitka spruce	very thick	very shallow	moderately high & dense	dense	none-heavy/gravy, yellow	high	root char, occasional crowning

Tree ring counts, fire scars, historic vegetation maps and aerial photos were used to construct a rough fire history for the Watershed. These observations corroborate fire patterns described by studies done in the Central Cascades (Swanson and Morrison,1990). from these observations it is possible to reconstruct a fire regime in which fires played a large roll in shaping south and westerly aspects, from very high intense fires to low intensity underburns - depending on the time of year and fuel loading, some of these fires that were highly intense on these types of aspects, leaving occasional Douglas-fir survivors to reseed the area.

Brush fields and grasses often grew up in these areas, especially where burned stands re-burn shortly after the initial fire, resulting in a rather slow (perhaps 30 to 60 years) return to canopy forest we see today. The term reburn is used here to describe fires which burn in a fuel bed of snags, brush and grasses created by an earlier fire. Reburns may retard the of closed forest.

On north slopes, flats and in the deeper canyons, fires have been less intense, and may have alternated between low intensity underburning and infrequent stand replacement fires.

On ridge tops and upper side slopes, fires played a role in the maintenance of meadows and restricted tree survival to rocky micro sites, where fuel to carry fires was lacking (Agee,1990).

Fire created snags and coarse woody material have historically existed in large quantities during periods of stand development in all forested series present in the fire area, especially during the early regeneration phase (Scott,1980). In totally killed stands on harsh southerly slopes, such fire remnant snags provide shade and other microclimate moderation for conifer seedlings.

Effects of Fire on Water Quantity and Quality

The effects of fire on the hydrology and water quality of forested watersheds are varied in time and space. Wildfires that destroy overstory forest vegetation will generally increase annual water yields; this increase will decrease with time as regrowth of forest vegetation occurs. Short-term increases in base flow may also occur. Prescribed burning will generally have little impact upon water yields.

Catastrophic wildfires and hot slash burns can cause undesirable impacts to the water quality of forested mountain watersheds. Accelerated erosion represents one of the primary problems associated with these types of burns. Erosional effects become increasingly greater as terrain steepness increases. Where logging slash is machine piled and burned, the piling operation is more likely to

cause accelerated surface erosion than either the burning of scattered slash piles or broadcast burning without piling.

Where low-severity burns occur, much of the organic matter comprising the forest floor may remain following burning. In these situations, the effects of burning are generally insignificant with regard to a wide range of hydrologic and water-quality variables.

In a few studies of small watersheds, increased concentrations of selected ions have been measured for several days following burn or during the first couple of rainfall events after the fire or burns. However , in most studies, either no change or relatively small changes in nutrient export have been found within the first several years following burning. A concurrent increase in water yield due to the loss of overstory vegetation by wildfire or harvesting may limit concentration increases (because of dilution effects of many nutrients.

The MFWDT Watershed is made up of many fuel Models, but as a whole, the main Fuel Models are 8 and 10 and the majority of the Watershed has had some type of historical fire history in it. The unpredictability of many fire effects upon water resources relates, in part, to the wide range of topographic conditions, site differences in soil characteristics and moisture content, variations in fuel moisture and fuel loads, density of vegetation, various microclimates associated with a given slope, aspect and topographic position, and variability in weather patterns before, during, and after the occurrence of a fire. The result is a mosaic of fire severity and effects across a hillside or landscape, even from the "same" fire. In similar fashion, hydrologic processes across the landscape are affected to various degrees.

Although wildfires and/or hot slash fires can affect stream conditions and water quality, research results indicate that prescribed burning, judiciously applied with an awareness of potential onsite and offsite impacts, can be used without causing significant changes to the water quality of streams draining forested ecosystems in the Pacific Northwest---(Natural and Prescribed Fire in Pacific Northwest Forests-Robert L. Beschta 1990). For those advocating prescribed burning as a necessary and important forest management tool, the hydrologic challenge is quite simple. Fire prescriptions should be planned and implemented to prevent the occurrence of severe burns. In doing so, any potentially adverse impacts to the hydrology and water quality of forested watersheds will generally be minimized.

Prescribed Burning

Prescribed burning is a valuable technique in the management of natural resources. Use of this technique involves a systematic series of decisions beginning with the overall philosophy and goals of the organization and

culminating in a thorough evaluation of burns after they are completed. Intermediate steps in this process include reconnaissance of the proposed areas, obtaining permits and resources needed, checking weather and fuel conditions, selecting ignition patterns and tools, conducting the burns, mopping up, and documenting the results of the burns.

The effects of fire on vegetation are still not completely understood, nor are the interactions between fire and of the disturbances such as floods, logging, grazing, and introduced species.

Current trends in fuel accumulation will increase the likelihood of extreme fires in the future. Carefully controlled prescribed fires may be an effective way to reduce fuels and perpetuate desired plant communities in the area.

Compared to historic or modern-day wildfires, prescribed burns are generally much smaller and less intense. This reduces the impacts on other resources.

Acres of fire activities and management on the MFWDT:

BCB	Broadcast Burns	16,542.83 acres
Y.B.	Yarded and Burn (Decks)	2,483.87 acres
BMP	Burn Machine Piles	151.75 acres
M.I.	Manual Ignition	131.71 acres
	Total	19,310.16 acres

Total Acres under some type of management activities	34,869.20
Total acres that were treated with prescribed fire	19,310.16
Total of acres not treated with prescribed fire	15,559.04

Thre was no data on Hand Piling and Burning, Aerial Ignition and Underburning

Uses of Prescribed Burning

1. Site Preparation.
2. Reduces Fuels
3. Favorable seedbed
4. Regulation of stand composition
   Decrease the number of some tree species.
5. Reducing competition
   Competition from shrubs and trees in a developing stand can be reduced by burning
6. Insect and disease reduction
   Fire may be important in reducing insect and disease problems.

7. Fire hazard reduction
   One important use of fire is to reduce or modify fuels to lessen the likelihood of wild fires and ensure that those that do occur will be less damaging and easier to control.
8. Wildlife habitat management
   Prescribed fire is often used to improve wildlife habitat.
9. Range improvement
   Livestock forage is generally improved by fire.

Water Management

Prescribed burning is a tool that can help land managers achieve management objectives. Fire may be used alone or in conjunction with other tools-mechanical, manual, chemical, or biological to achieve desired ends. Prescribed burning is an important tool because of its versatility, usually low cost, and ecological similarity to natural fire in many respects. Prescribed burning may simulate prehistoric fire regimes, or it may be quite distinct from them, depending on the conditions of use. It is the overall short and long term results of prescribed burning that are the measure of its success.

Air Quality

The Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, Volume I, states in chapters 3 & 4 on pages 96-98 that for the selected Alternative 9, PM10 emissions and Total Suspended Particulates (TSP) emissions have dropped and currently exceeds goal of 50 percent reduction of these emissions by the year 2000 for the State of Oregon. This reduction will allow for fire use and will not compromise our ability to reach prescribed burning emissions reduction goals. The production of smoke from wildfires is considered natural and exceptional by air resource managers, so does not influence the regulations of prescribed fire emissions. In the publication A First Approximation of Ecosystem Health on National Forest System Lands, (Pacific Northwest Region, June 1993), an assessment was completed that compared smoke emissions and acres burned annually from presettlement times to current smoke emissions due to wildfire and prescribed fire. For Western Oregon, historic estimates were more that double current estimates of PM10 emissions and acres burned.