TUMALO CREEK WATERSHED ANALYSIS

Deschutes National Forest
Bend/Ft. Rock Ranger District

September 28, 2007

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An Update to the 1998 Bend Watershed Analysis

Tumalo Creek Watershed Analysis Team

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There were 13 exhibits in the original document, many of which are still relevant – such as fish distribution, Riparian Reserves, and topographical view. The new exhibits listed above either update the original document or represent new information.

New Exhibits 1-10 are found within the body of the document and New Exhibits 11-19 are found in the Appendices.

TUMALO CREEK WATERSHED ANALYSIS
LIST OF TABLES

Some of the tables from the original 1998 document were not updated or were only updated "narratively". Also included below are several new tables.

CHAPTER I

CHARACTERIZATION OF THE WATERSHED

Tumalo Creek Watershed Analysis
Chapter I - Characterization of the Watershed

Chapter I-1. INTRODUCTION

The Tumalo Creek Watershed Assessment is an update to the original Bend Watershed Analysis, completed September 30, 1998. This document is not a re-write of the 1998 document, but instead appends the document with new information. The biggest change in the watershed since 1998 is the change in drainage boundaries and associated names. The original analysis included the Bull 6th field subwatershed, which was outside of the 5th field watershed the rest of the analysis was based on. This 6th field Bull subwatershed was dropped in this updated analysis to confine the analysis area to just one 5th field subwatershed, which will allow analysis of effects, including cumulative, to the 5th field scale. In addition, in 2003 a region-wide effort was implemented to refine drainage boundaries, resulting in changes within the Tumalo Creek watershed. This resulted in slight changes in the physical boundaries within the 5th field watershed. See discussion below on watershed changes below under Characterization of the Watershed.

Forest management in the watershed has been limited in the 9 years that have passed. The original 5th field watershed was 61,660 acres and was composed of 4 sub-watersheds. Presently, the Tumalo Creek Watershed is composed of (2) 6th field sub-watersheds and totals 37,770 acres. Information contained in the 1998 analysis is considered valid unless addressed in this document. Effort was made to update most exhibits and recalculate most tables, but in some cases updates were done narratively.

Much of the information in the 1998 document is still relative. The assumption can be made that the information is still relevant unless documented in the edits made in this document. The paragraph references are to the ***page*** paragraph, rather than the topical paragraph.

Chapter I-1. CHARACTERIZATION OF THE WATERSHED

Paragraph 1. Bull Spring and Bearwallow Butte are no longer in the watershed because of the change in boundaries.

Paragraph 3. The 5th field Tumalo Creek watershed is now 37, 713 acres. There are now 6748 acres of private land within the watershed (portion within FS boundary).

Paragraph 4. The watershed is now composed of (2) 6th field subwatersheds, Upper Tumalo (20,745 acres) and Lower Tumalo (16,968 acres). Upper Tumalo closely resembles the former Forks and Bridge subwatersheds, and is a Tier 2 Key Watershed. Lower Tumalo Creek subwatershed closely resembles the former Tumalo Creek subwatershed. The geographic area occupied by the former Bull sub-watershed (26,219 acres) was essentially dropped with the change in boundaries (See exhibits 11,12).

Chapter I-2. Paragraph 2. Wilderness and Roadless areas are now in the Upper Tumalo Creek subwatershed.

Chapter I-2. LANDSCAPE AREAS AND FLOWS

Chapter I-2. Paragraph 5. Landscape Areas designations were not changed by the team, but the geographic areas changed with the change in the watershed boundary. While the Cold/Forest/Unroaded and Bridge Watershed remained nearly unchanged, the Wilderness was reduced approximately 10%, the Front Country/Transition was reduced approximately 40%, the Dry Forest was reduced approximately 23 %, and the Private/Dry Forest was reduced approximately 75%. See Exhibit 12.

WATER RESOURCES

Water Quantity

Chapter I-3. Paragraph 2. The drainage basin (5th field watershed) is 59 square miles.

Water Quality

Chapter I-3. Paragraph 3. Hillsides adjacent to Bridge Creek continue to become more vegetated with time, providing more ground cover to trap sediments and reduce overland flow of sediments that would lead to turbidity increases.

Despite the cold water temperatures driven by springs and snowmelt, Tumalo Creek from river mile 0 to 12.5 (near Skyliner Bridge) was listed on the 2004-2006 Oregon Department of Environmental Quality (ODEQ) list of water quality impaired waterbodies (303)(d) list) because of elevated water temperatures. The criteria is salmonid rearing and migration

Diversions

Chapter I-3. Paragraph 4. The Columbia Southern Canal has not been used since 1998, as water is withdrawn downstream off-forest at approximately river mile 11, allowing the water to remain instream an additional 8 miles during the irrigation season. Tumalo Creek is no longer on the 303(d) list for flow modification and habitat modification. These were de-listed in 2002, and not considered a pollutant.

SOIL RESOURCE

Chapter I-4. Paragraph 1. The inherent productivity of the soils is now moderate 50% (18,942 acres), low 27% (10,225 acres), high 22% (8209 acres), and barren 1% (353 acres), with differences due to the change in the watershed analysis boundary.

AQUATIC SPECIES

Chapter I-4. Paragraph 3. Genetic analysis of redband/rainbow tissue samples referred to in the original watershed analysis was never completed. New tissue samples of redband/rainbow trout were collected within the watershed at 3 locations in 2006/2007 and the U.S. Fish and Wildlife Service will be analyzing during the winter of 2007/2008.

Habitat Conditions

Chapter I-5. Paragraph 2. The Bridge to Bridge Restoration Project was implemented during 2004-2006 on 2.8 miles of Tumalo Creek within the Bridge Creek Fire area, restoring channel stability, riparian vegetation, pool habitat, and large woody debris instream and on the floodplain.

Chapter I-5. Paragraph 3. Irrigation water has not been withdrawn from the Columbia Southern Canal since 1998 with the operation of the canal located at approximately river mile 3 below Shevlin Park.

VEGETATION

Plant Association Group (PAG)

Chapter I-6. Paragraph 4. Under Plant Association Group (PAG) add the word “nearly” 95%.

Insects and Pathogens

Chapter I-7. Paragraph 1. First line change “past 2 decades” to “past 3 decades”.

TERRESTRIAL WILDLIFE SPECIES

Habitat

Chapter I-7. Paragraph 2. Delete “These areas continue to support wildlife requiring even the most pristine of habitats”. Add ‘wildfires” as a factor to dramatically altering areas.

Species Diversity

Chapter I-8. Paragraph 2. Add sensitive species to threatened and endangered species for TES. The peregrine falcon is a sensitive species.

Chapter I-8. Paragraph 3. Surveys for TES species (Northern Spotted Owl) were completed in 2007. Delete lynx as a possible occupant.

Chapter I-8. Paragraph 4. Replace suitable NRF with “designated”. Replace 1,126 acres NRF with 2559 acres. NRF was reassessed forest-wide since the last analysis was completed, increasing the acreage. The mountain pine beetle infestation has affected NRF – 80% of NRF within the watershed has been affected. Dispersal habitat was not recalculated.

FIRE/FUELS

Chapter I-9. Paragraph 1. Slopes have continued to re-vegetate in the last decade and have become more stable.

RECREATION

Chapter I-9. Paragraph 1. The Three Creeks Road from Sisters is road #16. The recreation area is known as the Tumalo/Skyliner recreation area.

Chapter I-9. Paragraph 4. The Farewell Trail and trailhead near Tumalo Falls has been added to the trail system.

CHAPTER II

ISSUES AND KEY QUESTIONS

Tumalo Creek Watershed Analysis
Chapter II – Issues and Key Questions

Issue 1. Sustaining Water Quality and Riparian Health

A large-scale stream and riparian restoration project was completed during the years of 2004-2006 on Tumalo Creek within the Bridge Creek Fire area, a reach of 2.8 miles (approximately river mile 12.7 to 15.5). Channel stability, streambank stability, fish and wildlife habitat, and riparian vegetation were restored. With reduced streambank and channel erosion, turbidity and sedimentation will be reduced, improving water quality.

Tumalo Creek is no longer included on the Oregon Department of Environmental Quality (ODEQ) 303(d) list of water quality limited waterbodies for flow modification and habitat modification, being de-listed in 2002. These parameters are not considered to be pollutants. However, Tumalo Creek from the mouth to river mile 12.5 is now on the 2004-2006 303(d) list for water temperature. Irrigation water has not been diverted into the Columbia Southern Canal since 1998. The new diversion, located at approximately river mile 3 and nearly 8 miles downstream of the old diversion, has been used since that time.

Key Questions

1. What is the status of water quality within the Bend Municipal Watershed and what level of use in current activities is appropriate in order to maintain high water quality in the long term?

There are now few stream crossings that do not have boardwalks or bridge crossings. Water bar installation and trail maintenance has occurred on the Bridge Creek Trail system in recent years.

2. Key Question #2 is no longer relevant considering the stream underwent restoration. The stream now meets Proper Functioning Condition. A long term monitoring plan (10 years +) will continue to evaluate the success of the restoration work in meeting the project objectives.

3. Key Question #3 is no longer relevant considering this reach of Tumalo Creek is no longer included on the ODEQ 303(d) list for flow modification and habitat modification.

4. What fire risks exist due to present fuel loadings?

No changes to original document.

Issue 2. Protecting Resource Values While Maintaining A Quality Recreation Experience With Appropriate Use Levels And Access.

Background:

Portions of the South Fork Trail have been re-routed to address the issue of sediment delivery to streams. Delete the reference to the North Fork Trail. Roadwork has been undertaken on road 370 to address drainage problems.

Key Questions:

1. How do we maintain water quality as upland recreation activities increase the chance of water quality degradation via sedimentation?

Since the original analysis was completed, trail work to improve drainage and reduce sedimentation to streams has been undertaken on South Fork Trail and trails within the Bend Municipal Watershed. Mountain bike trail use on the North Fork Trail was restricted to uphill only to reduce detrimental impacts.

2. What management actions are necessary to minimize the risk for detrimental impacts from Road 370, Road 4601, and continued recreation use and development of trail systems?

Work was completed on Road 370. Road 4603 to Tumalo Falls has been realigned, including resurfacing and replacement of multiple culverts. No work has been completed on Road 4601, which is still in poor condition.

3. What kinds of recreation use conflicts between users or with resources need to be prevented or resolved?

Downhill mountain biking has been restricted on the North Fork Trail. The Farewell Trail has been constructed to allow downhill mountain biking access as a replacement. Include deterioration of drainage structures as a resource impact from recreation use.

4. What limits to recreation use would protect wildlife habitat?

ISSUE 3. SUSTAINABILITY OF FOREST CONDITIONS WHERE RESILIENCY IS BEING LOST

Background

The background is still relevant, with an update of few stand management treatments have been implemented in the past **30** years (paragraph 2).

Key Question #1. The mountain pine beetle infestation has reduced the health of many stands within the watershed, increasing mortality and fuel loading. Insect and disease has affected 36% of the watershed.

New Issue added:

ISSUE 4. PROTECTION OF WILDLAND URBAN INTERFACE WITH INCREASING FUEL LOADS AND FIRE RISK.

Key Questions

1. How do we implement Hazardous Fuel Reductions (HFR) within the Greater Bend Community Wildfire Protection Plan (CWPP) boundary along Skyliner Road to protect private land inholdings while maintaining other forest resources including wildlife habitat, water quality, soil resources, and recreational activities?

The Greater Bend Community Wildfire Protection Plan (CWPP)
The Greater Bend CWPP (See Map below) was signed in May 2006 with the following purpose:

- Protect lives and property from wildland fires;
- Instill a sense of personal responsibility for taking preventive actions regarding wildland fire;
- Increase public understanding of living in a fire-adapted ecosystem;
- Increase the community's ability to prepare for, respond to and recover from wildland fires;
- Restore fire-adapted ecosystems; and
- Improve the fire resilience of the landscape while protecting other social, economic and ecological values.

Skyliners, with a size of 257 acres, 46 structures, and a population of 39, was identified in the plan as a Community at Risk and an Area of Special Concern (See Map below).

To rank the 10 Communities at Risk in the Greater Bend Community Wildfire Protection Plan, two risk assessment methodologies were utilized: the Oregon Department of Forestry Assessment of Risk Factors and a combined risk assessment that considers Fire Regime - Condition Class, Fire Starts & Large Fire History. A composite rating using the two methodologies ranked Skyliners as number six, placing it in the second of three priority categories.

As an Area of Special Concern, the CWPP described the need for Skyliners to develop an additional safe ingress/egress route and a "shelter in place" area should emergency egress be cut off.

The CWPP also included the Bend Municipal Watershed within the WUI boundary, and as an Area of Special Concern, because approximately half of Bend's water comes from this area. A wildland fire occurring in or near this watershed could severely affect water quality in the Bridge Creek watershed. The CWPP encouraged treatment for hazardous fuels as identified in this plan to prevent damage from catastrophic wildland fires to the watershed.

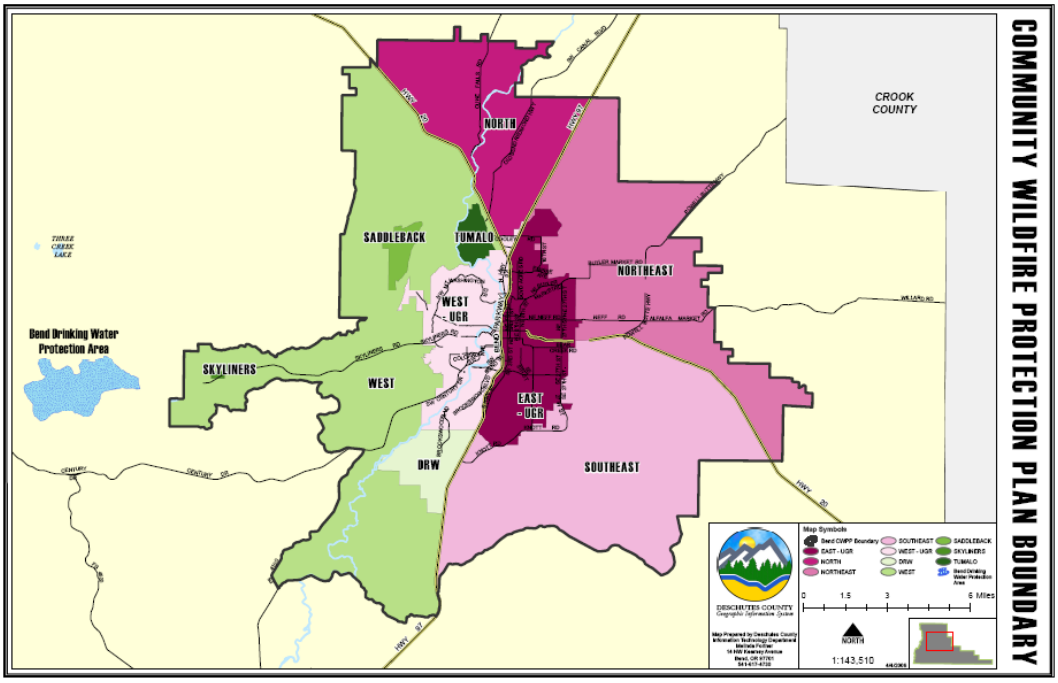

Exhibit 1. Greater Bend Community Wildfire Protection Plan boundary.

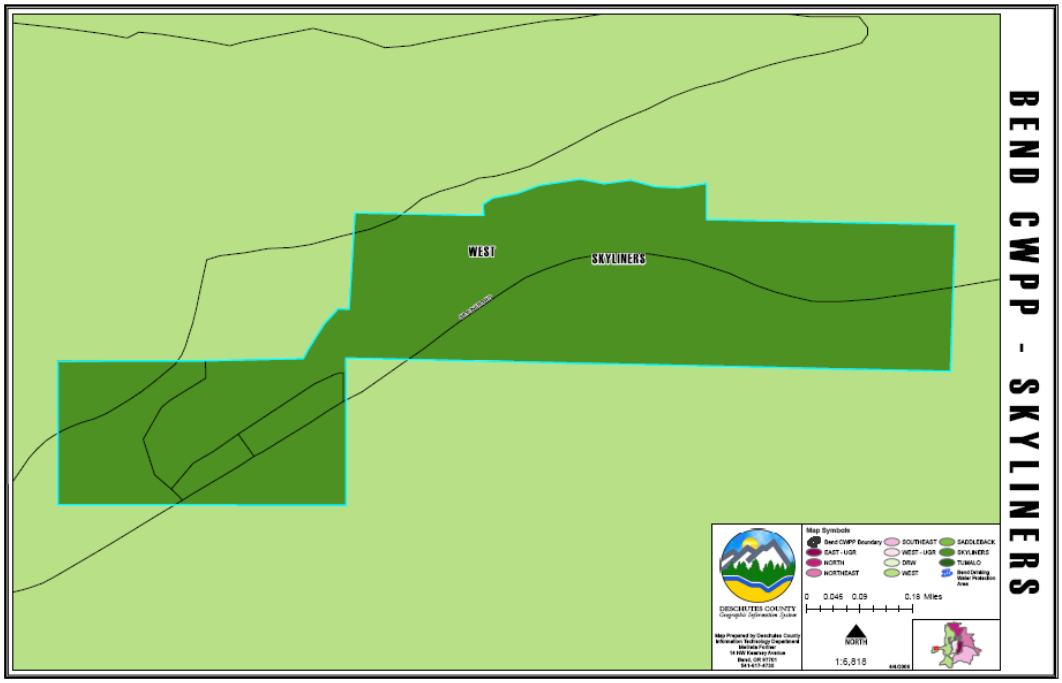

Exhibit 2. Skyliners Community at Risk.

Hazardous Fuels Reduction

The ability to conduct hazardous fuel reduction in the Tumalo Creek watershed is challenging because of the proximity to Skyliners, the Cascade Science School at Skyliners Lodge, the Skyliners Sno-park, the Bend Municipal watershed, Spotted Owl habitat, heavy, dense fuels, steep topography, and the Tumalo Creek riparian area.

Strategic Placement of Treatments (SPOT)

The SPOT process allows resource managers, the public, and partners to participate and collaborate in NEPA planning. Key components of the process include: 1) definition of the analysis area, 2) identification of assets and protection targets, 3) definition of the "Problem Fire", 4) design of treatment patterns to mitigate a problem fire and meet a range of objectives, 5) test treatment patterns with FlamMap, then adjust and re-test, 6) display the trade-offs, and 7) follow-up with monitoring/adaptive management.

FlamMap is a fire behavior mapping and analysis program that computes potential fire behavior characteristics (spread rate, flame length, fireline intensity, etc.) over a landscape for constant weather and fuel moisture conditions.

It is recommended that the SPOT process and FlamMap be utilized to evaluate potential treatment locations once the Preferred Alternative is determined.

2. What kinds of treatments can be implemented in the CWPP boundary and how do we evaluate their potential effectiveness?

Treatment Options

Opportunities for treatment are limited to thinning, mowing, and underburning. Steep topography and the proximity to private land and Tumalo Creek limit treatment options. Project planning will use authorities from the Healthy Forests Restoration Act.

Evaluation of Effectiveness

Treatment units within the watershed will be monitored as part of the Central Oregon Fire Management Service monitoring program, using the FireMon protocol, which meets national standards.

The Greater Bend CWPP also identifies a process for monitoring and evaluation:

After fire season – late Fall

- Identify and assess new or treated risks.
- Evaluate and track progress toward goals, and update maps.
- Adopt new and/or revised priorities, with specific projects.
- Identify specific fuels treatment projects.
- Discuss grant opportunities and determine which communities at risk will seek funding for identified projects.
- Review grant opportunities, write grants.

Spring

- Identify appropriate projects to decrease structural vulnerability, address issues with evacuation routes, condition of roads and water supply.
- Identify appropriate projects to address educational needs.
- Review grant opportunities, write grants.

CHAPTER III,IV

HISTORIC AND CURRENT CONDITIONS

Tumalo Creek Watershed Analysis
Chapters III and IV - Historic and Current Conditions

Chapter III, IV -1. HYDROLOGY

Chapter III, IV -1. Paragraph 1. Forks and Bridge subwatersheds essentially became the Upper Tumalo subwatershed, which is still a Tier 2 Key Watershed.

Chapter III, IV-1. Paragraph 2. Bull Springs is no longer within the Tumalo Creek watershed with the boundary change.

Chapter III, IV -1. Paragraph 4. Irrigation water withdrawal from the diversion at river mile 3 rather than river mile 11(Columbia Southern Canal) has reduced instream impacts for approximately 8 miles.

Chapter III, IV-1. HISTORIC CONDITIONS

Chapter III, IV-2. Paragraph 2. Again, Tumalo Irrigation District Water is withdrawn downstream at river mile 3 rather than at river mile 11.

Chapter III, IV-2. CURRENT CONDITIONS

Chapter III, IV-3. Bridge Watershed Landscape Area

Chapter III, IV-3. Paragraph 4. The City of Bend withdraws up to 13.6 million gallons/day (21 cubic feet/second) from Bridge Creek (City of Bend, 2006).

Chapter III, IV-3. Paragraph 6. Overland flow of sediments from hillslopes during storm events is becoming less severe as the vegetation and ground cover continue to increase.

Chapter III, IV-4. Front Country/Transition Landscape Area

Chapter III, IV-4. Paragraph 4. Bull Springs is no longer in the Tumalo Creek watershed with the boundary change.

Chapter III, IV-4. Paragraph 5,6. The streambank erosion, decreased channel stability, and lateral channel migration occurring in Tumalo Creek were addressed in the restoration project. Stream restoration design was based on established principles, using past and present aerial photography and data collected on reference reaches, which are undamaged areas of Tumalo Creek and other nearby streams. The channel was designed to decrease channel gradient, make the channel narrower and deeper, and increase the channel sinuosity (meandering) and length. Restoration was accomplished through the physical reshaping of sections of the channel, placing boulder and log jam structures, forming gravel bars, and creating side channels and small ponds. The number of trees within the channel was increased from about 19 pieces/mile prior to the project to nearly

200 pieces/mile post-project, providing increased fish habitat, including that of the sensitive species redband trout. Additional large wood was used in bar formations, streambank construction, off-channel habitats, and for floodplain roughness. In all, over 2100 whole trees were used in the project. Pool habitat has been increased to approximately 25%. Over 70,000 native riparian shrubs and trees were planted along the stream to re-establish bank stability and provide future shade and large trees instream. A post-project stream survey will be completed in 2008 to assess post-project habitat and channel conditions.

Chapter III, IV-5. Dry Forest Landscape Area

Chapter III, IV-5. Paragraph 4. Columbia Southern Canal has not been used since 1998 with the creation of the diversion lower in the drainage, allowing discharge to remain instream an additional 8 miles. Tumalo Creek within this landscape area is no longer on the ODEQ 303(d) list for flow modification or habitat modification. These were de-listed in 2002. The stream from the mouth to river mile 12.5 is on the 2004-2006 303(d) list for water temperature.

Chapter III, IV-5. Private/Dry Forest Landscape Area

Chapter III, IV-5, Paragraph 6. Bull Springs is no longer within the watershed because of the change in watershed boundaries. The Tumalo Irrigation District diversion is located at river mile 3 below Shevlin Park. Streamflow may decrease to just a few cfs during the summer irrigation season from this point downstream to the confluence with the Deschutes River.

Chapter III, IV – 6. SOIL RESOURCE AND EROSIONAL PROCESSES

The following table summarizes the soil stratum profiles within the Tumalo Creek Watershed.

Chapter III-IV - 6. Substitute the following table:

Table 1. Soil stratum/landtypes of the Tumalo Creek Watershed

Landtype	SRI landtype #'s	acres	percent
alpine meadows	4	2,724	7%
wet meadows	5	632	2%
juniper scab flats	53	45	0.05%
lodgepole frost pockets	7, 15	127	0.05%
ash/paleosol/cinders	80, 81, 82, 83	358	0.1%
ash/paleosol/lavas	72, 73, 84, 8A,HM, MV	2,579	7%
riparian or ephemeral drainages	2, 8, 10	2,536	7%
barren lands **	3, 6, 9, 13, 18, HB and HJ	2,043	5%

ash/till	16, 19, 21, 22, 24, 25, 26, 32, GB, GF, GH, GJ, GK, HG, MC, MG, MK	19,329	51%
ash/outwash	36, 37, GP, XD	3,070	8%
ash/residuum or colluvium	50, 56, 58, 59, 64, 66, 67, 68, 69, 76, 8T, LG	4,286	11%

* NOTE: The landtype groups were stratified primarily by parent material and underlying geology using groupings of the Deschutes Soil Resource Inventory (SRI) landtype mapping units. The stratification of landtypes was slightly altered for this update and was expanded to break out lower elevation wet meadow areas from alpine meadow areas. Changes in percentages of landtypes from the original stratification also reflect the changes in the subwatershed boundaries identified for the 2007 watershed update process.

Chapter III-IV - 7. Substitute the following table:

Table 2. Inherent productivity of soils in the Tumalo Creek Watershed

productivity class	acres	percent
high	8,209	22%
moderate	18,942	50%
low	10,225	27%
barren (SRI #3 only)	353	1%
water	10	0.1%

* NOTE: the acres of landtypes considered unsuited for timber production were excluded from this table as a distinct productivity class for the 2007 update. Acres of SRI landtype #36 identified in the 1998 watershed analysis as unsuited are included in the acres of low productivity represented by cubic foot site class 6 or 7. Changes in the percentage of productivity classes within the subwatersheds reflect this inclusion and the watershed boundary changes for the 2007 watershed analysis update. In addition, landtype units from the NRCS Upper Deschutes Soil Survey that are mapped on private lands in the Lower Tumalo Creek subwatershed to the east of the Deschutes National Forest boundary were correlated as best as possible with SRI landtypes in order to determine their productivity class for this summary.

Chapter III-IV - 9: * NOTE: the Bull subwatershed is not included in the newly defined Upper and Lower Tumalo Creek subwatersheds. Documented management activities in the Forks, Bridge and Lower Tumalo subwatersheds include approximately 447 acres of commercial thinning associated with the Feline, Katalo and Kit timber sales within the Lower Tumalo subwatershed since 1998, and approximately 320 acres of private forestland in the Upper Tumalo subwatershed. Change the 1,344 acres harvested in the Forks subwatershed (former) in the past 30 years to “40” years.

Chapter III-IV - 10. Substitute the following table:

Table 3. Acres of documented past management activities within each subwatershed since 1970.

Subwatershed	Total acres	Acres of activity	% of watershed	Acres of activity since 1998
Upper Tumalo	20,754	2,073	10%	0 / 320
Lower Tumalo	16,975	1,915 / 5332 *	11% / 31%	447 / 0

* NOTE: Table 3 reflects the watershed analysis boundaries of the Upper and Lower sixth field subwatersheds of Tumalo Creek for this update. Acres of activity was substituted as a column title for acres impacted from the original watershed analysis to better represent the acres reported on which management activities have occurred.
***** acres of activity includes those on federal land / private land in the subwatershed. Impacts on federal acres do not reflect railroad era logging, which are estimated to have covered 30% of the land currently under federal jurisdiction in the Tumalo subwatershed. Private land acres impacted reflects primarily railroad era logging impacts and cumulative selective harvest entries in the past twenty years. Approximately 447 acres of documented management activities have occurred within the Lower Tumalo subwatershed since 1998, including commercial thinning associated with the Feline, Kitty, Electra, Katalo and Kit timber sales. Approximately 320 acres of private forestland were harvested within the Upper Tumalo subwatershed in 1998 and 1999.

Chapter III, IV – 10. Condition Classes

Chapter III-IV - 11. Substitute the following table:

Table 4. Existing condition classes within each subwatershed

Subwatershed	Class A (ac./%)	Class B (ac./%)	Class C (ac./%)	Class D (ac./%)
Upper Tumalo	18,291 (88%)	511 (2%)	1,913 (9%)	39 (<1%)
Lower Tumalo	1,205 (7%)	10,447 (62%)	5,138 (30%)	164 (1%)

* NOTE: Due to the change in subwatershed boundaries approximately 880 acres of the Bridge Creek Fire salvage area were added to the Upper Tumalo sixth field subwatershed from the Tumalo sixth field subwatershed designated in the 1998 analysis. These acres were added to the Class C condition class for Upper Tumalo and subtracted from the same condition class for Lower Tumalo for this summary. Additionally, approximately 320 acres of private land in the Upper Tumalo subwatershed (T18S R10E Sec 16) were heavily harvested during the summers of 1998 and 1999 using ground based equipment without any subsoiling rehabilitation and were converted from Class B to Class C in this table. There have been no documented timber management activities on federal lands within the Upper Tumalo subwatershed since 1998.

The 447 acres of documented management activities associated with the Feline, Katalo and Kit timber sales within the Lower Tumalo subwatershed since 1998 are primarily commercial thinning of black bark ponderosa stands that were railroad harvested in the early 1930's and 40's. Impacts in these activity areas were minimized through the use of designated harvest systems and/or winter logging and included subsoiling to ameliorate compaction incurred on primary skid trails and landings. The condition class of these acres likely was upper class B or lower class C prior to entry and is considered to be class B following these activities. The class acres were not changed in this table as a result.

Chapter III, IV – 11. Erosional Processes

Chapter III-IV - 12 – Paragraphs 1 & 2. The discussion of sediment contribution related to litter and duff levels on the forest floor as a result of fire suppression needs to be distinguished between plant association groupings (PAGs). While areas within the Mt. Hemlock zone have thick and relatively impermeable mats of litter and duff that contribute to overland flows during high intensity rainfall events, increased litter and duff layers in drier Ponderosa and Mixed Conifer PAGs tend to reduce raindrop impacts and slow overland flow accumulations and energies. A decade of growth within the Bridge Creek fire area has provided additional ground cover from tree and shrub leaf litter within primarily Ponderosa and Mixed Conifer PAG types. The succession of vegetation over time also affects the amount and type of organic input on the soil surface and varies noticeably by aspect within the fire area. North and gentler east aspects are beginning to lose shrub cover as tree canopies begin to close, while south aspects remain quite full with shrub cover as tree densities, heights and canopies are somewhat reduced compared to the north and east aspects. No additional changes to litter or vegetative cover within the Tumalo fifth field watershed as a result of fire disturbances have occurred over the past ten years.

Chapter III-IV - 12. Paragraph 4. The private ground that was harvested in 1998 and 1999 within T18S, R10E, Section 16 approximates 320 acres within the Upper Tumalo subwatershed and is accounted for in Table 4. Approximately 25 acres associated with this activity were harvested within the Lava Island Falls subwatershed.

Chapter III-IV - 13. Paragraph 1. Commercial thinning of middle aged, second growth Ponderosa stands has begun to occur on federal lands in recent years. Activity areas since the 1998 watershed analysis include the Katalo, Kit, Kitty, Electra, and Feline timber sales mentioned below Tables 3 and 4.

Chapter III-IV - 13. Soils Needs Assessment, bullet #4 and #5. Trail additions, reconstruction, and management use decisions have been implemented within the Upper Tumalo subwatershed since the 1998 analysis, including the following. The South Fork trail in the Upper Tumalo subwatershed has had grade and location changes implemented; the Farewell trail has been constructed; and uphill only mountain bike traffic has been implemented on the North Fork trail. Anecdotal monitoring of these trail corridors by the soils resource specialist while riding these trails includes the following

observations: Actions on the South Fork have improved function for mountain bike use by reducing skidding damage and moving some trail locations capable of directly contributing sediment and runoff further away from the stream. Construction of the Farewell trail with grades and locations sufficient to minimize impacts from mountain bikes has allowed for the implementation of uphill only mountain bike traffic on the North Fork trail, further reducing erosive impacts and potential sediment contribution to Tumalo Creek.

Chapter III-IV -13. Soils Needs Assessment, bullet #8. Actions have been implemented to address this need.

Chapter III-IV -14. Soils Needs Assessment, bullet #9. The Mrazek trail has been re-routed in places to address ownership and resource issues.

Chapter III-IV -14. Soils Needs Assessment, bullet #10. Roads 370 and 4601 are currently managed at level 2 maintenance levels. Road 370 has had culvert and surface improvements since the 1998 analysis intended to reduce sediment contribution to stream drainages.

Chapter III-IV - 14. Soils Needs Assessment, bullet #11. The grade and roadbed of road 4601 remains unchanged since 1998. Direct contribution of sediment and overland flow to Tumalo Creek is not apparent, although erosion from water movement is occurring. Alternatives to the 1998 recommendation for relocating the roadbed where grades were estimated to exceed 10% include installation of drivable waterbars or paving the surface. The road segment with these grades was acquired by the Forest Service as a part of the Crown Land Exchange, although the entire road remains a share cost road with the Crown Pacific Holding Company and would need concurrence for all proposed actions.

Chapter III, IV. AQUATIC SPECIES

HISTORIC CONDITIONS

Composition and Distribution

Chapter III, IV-14. Paragraph 2. The stream restoration project within the Bridge Creek Fire area has increased habitat for bull trout. Recent electrofishing surveys within the restoration area (2004-2007) have not discovered any bull trout.

Habitat Conditions

Chapter III, IV-15. Paragraph 5. The restoration project within the Bridge Creek Fire area restored habitat conditions to approximate those of pre-fire conditions. The streamside forest canopy will take decades to approximate those of pre-fire conditions.

CURRENT CONDITIONS

Composition and Distribution

Chapter III, IV-16. Paragraph 1. Redband genetic samples collected in 1994 were never processed. New samples were collected in 2006-2007 from above Tumalo Falls, within the restoration area, and downstream of the restoration area. Analysis revealed there has been little hatchery fish introgression (Matala, et al 2007).

Habitat Conditions

Chapter III, IV-17. Paragraph 3. The riparian area of Tumalo Creek within the Bridge Creek Fire area was improved with the planting of 70,000 trees and shrubs during 2004-2007.

Front County/Transition Landscape Area

Chapter III, IV-18. Paragraph 2. The stream restoration project reduced the bankfull width, increased pool habitat to 20-25%, improved shade and bank stability, and added over 2100 trees instream and to the floodplain. Improved channel and bank stability will decrease the intergravel fine sediment volume.

Dry Forest Landscape Area

Chapter III, IV-18. Paragraph 5. The stream from Shevlin Park Market Road (river mile 3.4) upstream to Skyliner Bridge (river mile 12.7) was surveyed per regional protocols in 1999. The stream survey is available in the district files.

Chapter III, IV-18. Paragraph 6. As discussed previously, the Columbia Southern Canal has not been operated since 1998.

VEGETATION

The following table replaces **Table 5** in the original document:

Table 5. Plant Association Groups by Subwatershed

Major PAG	% of Total Landscape	Dominant tree Species coverage	Upper Tumalo	Lower Tumalo
PPD/W	28%	Ponderosa pine	0%	66%
MCD	13%	Ponderosa pine	13%	14%
MCW	17%	White fir	20%	13%
LPD/W	11%	Lodgepole pine	15%	6%
MHD	24%	Mt. hemlock	40%	0%
MDW/RIP	4%	Mdw/riparian	7%	0%
ROCK/ALP	3%	Rock/alpine shrub	5%	1%
TOTALS	100%		100%	100%

Chapter III and IV-20. Paragraph 3. **Structural Stage Classification:** Add "The early structural stage (SS1) is less than 30 years old. The mid structural stage (SS2, 3, 4, 5) is between 30 and 130 years old. The late structural stage (SS6 and 7) is more than 130 years old."

Chapter III and IV-20. **Table 6 - Historic Structural Stages by Plant Association Groups.** Historic structural stage was not re-calculated for the 2007 update. The 1998 historic structural stage determination was based on a larger area and the historic structural stages developed in 1998 are assumed to remain valid for the smaller 2007 analysis area.

Chapter III and IV-23. Paragraph1. The mountain pine beetle continues to be the most significant agent of mortality.

Chapter III and IV-26

Replace Table 8 with the following:

Table 8. Existing Forest Structural Stages by Plant Association Group (Percentage)

Major PAG	% of Total Landscape	Dominant Tree Species Coverage	Open Areas	Early Structure	Mid Structure	Late Structure
PPD/W	14%	Ponderosa Pine Dry/Wet	5%	1%	62%	33%
MCD	14%	Mixed Conifer Dry	0%	20%	60%	20%
MCW	20%	Mixed Conifer Wet	1%	37%	49%	13%
LPD/W	13%	Lodgepole Pine Dry/Wet	1%	2%	47%	50%
MHD	29%	Mountain Hemlock Dry	6%	6%	48%	40%
MDW/RIP	1%	Mesic/Wet Shrublands	46%	5%	31%	17%
ROCK/CINDER	3%	Rock	100%	0%	0%	0%
Landscape Totals	100%		10%	13%	48%	29%

Chapter III, IV-26. Paragraph 4. Under Landscape Area 3, change “about 20 years ago” to about 30years ago.

Chapter III, IV-27 Insert the following immediately prior to “**Stand Density Classes:**”

Insect and Disease (I&D) Since 1998

Since the previous analysis done in 1998, insect and disease activity has continued to increase in the analysis area. Since 1998, insect and disease activity has affected 21% of the total acres in Upper Tumalo Creek (9391 acres) and 49% of the total acres in Lower Tumalo Creek (2907acres) subwatersheds (12, 293 acres - 36% overall). An obvious cause for the higher percentage of insect and disease activity in Upper Tumalo Creek is that fewer density management activities have occurred in this higher elevation, more inaccessible area. Much of the Upper Tumalo Creek subwatershed is wilderness or unroaded area. With the increased stress on the trees caused by drier conditions in the past decade, these denser, older structural stage stands in Upper Tumalo Creek are also more susceptible to insect and disease caused mortality. In Lower Tumalo Creek, all PAGS are at continued risk of insect and disease caused mortality; mortality is heaviest in the MCW and LPD/W PAGs. **Note:** A minimum of only 1 tree/4acres triggers the determination that an area has been affected by I&D.

Chapter III, IV-27. Paragraph 4. Stand Density Classes: Stands gained higher densities in many areas but mountain pine beetles have reduced densities on other large areas.

Chapter III, IV-28. Tables 10 and 11 were not updated. The landscape ‘zones” described in the original document were not re-analyzed in this present analysis. The descriptive information is still valid on pages III, IV-29 through 33.

TERRESTRIAL WILDLIFE SPECIES

HISTORIC AND CURRENT CONDITIONS

Chapter III, IV-34. The numbers for structural stage and road densities discussed on this page have changed, largely due to the change in the watershed boundary, but the overall discussion themes are still relevant. Information on structural stage and road density is included in Tables 8 and 20.

Chapter III, IV-35. Replace Tables 13a. and 13b.with the following:

Table 13. Wildlife species considered in this document. Selected species in **bold** received further consideration *

Species	Status	Habitat	Presence
Canada lynx	Federal Threatened	Subalpine fir with lodgepole pine	No Habitat in the watershed.
Northern spotted owl	Federal Threatened, MIS	Old growth mixed conifer forests. Late successional structure (LOS) management indicator species (MIS)	Designated nesting/roosting/foraging habitat is in the watershed.
Oregon spotted frog	Federal Candidate, Regional Forester Sensitive	Stream, marsh	Potential habitat in the watershed but limited to Tumalo Creek.
Pacific fisher	Federal Candidate, Regional Forester Sensitive	Mixed conifer forest, complex forest structure. LOS MIS.	Potential habitat in the watershed.
American peregrine falcon	Regional Forester Sensitive, BCC	Riparian, cliffs	Potential nesting and foraging habitats in the watershed.
Northern bald eagle	Regional Forester Sensitive, MIS	Lakeside or riverside with large trees	No nesting use documented in the watershed but some minor potential, plus foraging.
Bufflehead	Regional Forester Sensitive, MIS	Lakes, snags	No Habitat in the watershed.
Harlequin duck	Regional Forester Sensitive, MIS	Rapid streams, large trees	Potential habitat in the watershed.
Horned grebe	Regional Forester Sensitive	Lakes	No Habitat in the watershed.
Red-necked grebe	Regional Forester Sensitive	Lakes	No Habitat in the watershed.
Tricolored blackbird	Regional Forester Sensitive, BCC	Lakeside, bullrush	No Habitat in the watershed.
Yellow rail	Regional Forester Sensitive, BCC	Marsh	No Habitat in the watershed.
Greater sage-grouse	Regional Forester Sensitive, BBC	Sagebrush flats	No Habitat in the watershed.
Pygmy rabbit	Regional Forester Sensitive	Sagebrush flats	No Habitat in the watershed.
California wolverine	Regional Forester Sensitive	Mixed conifer habitat, high elevation	No Habitat in the watershed. Wide-ranging, may travel through.
Northern goshawk	MIS	Mature and old-growth forests; especially high canopy closure and large trees. LOS MIS	Habitat in the watershed.
Cooper's hawk	MIS	Similar to goshawk, can also use mature forests with high canopy closure/tree density	Potential habitat in the watershed.
Sharp-shinned hawk	MIS	Similar to goshawk in addition to young, dense, even-aged stands	Potential habitat in the watershed.
Great gray owl	MIS, S&M	Mature and old growth forests associated with openings and meadows. LOS MIS	Potential habitat in the watershed.
Great blue heron	MIS	Riparian edge habitats including lakes, streams, marshes and estuaries	Potential habitat in the watershed.
Golden eagle	MIS, BCC	Large open areas with cliffs and rock outcrops	Habitat in the watershed.
Red-tailed hawk	MIS	Large snags, open country interspersed with forests	Habitat in the watershed.
Osprey	MIS	Large snags associated with fish bearing water bodies	Potential habitat in the watershed.
Townsend's big-eared bat	MIS	Caves and old dwellings	No Habitat in the watershed.
Preble's shrew	Regional Forester Sensitive	Usually near permanent or intermittent streams in semi-arid grass/forb habitats.	Potential habitat in the watershed.
Elk	MIS	Mixed habitats	Habitat in the watershed.

Species	Status	Habitat	Presence
Mule deer	MIS	Mixed habitats	Habitat in the watershed.
American marten	MIS	Mixed conifer or high elevation late-successional forests with abundant down woody material	Habitat in the watershed.
Snags and Downed Wood associated species and habitat	MIS	Snags and down woody material	Habitat in the watershed.
Pygmy nuthatch	Landbird focal species	Mature ponderosa pine forests and snags	Potential habitat in the watershed.
Chipping sparrow	Landbird focal species	Open understory ponderosa pine forests with regeneration	Potential habitat in the watershed.
Brown creeper	Landbird focal species	Large trees in mixed conifer forests	Potential habitat in the watershed.
Flammulated owl	Landbird focal species, BCC	Interspersed grassy openings and dense thickets in mixed conifer forests	Habitat in the watershed.
Hermit thrush	Landbird focal species	Multi-layered/dense canopy in mixed conifer forests	Potential habitat in the watershed.
Olive-sided flycatcher	Landbird focal species	Edges and openings created by wildfire in mixed conifer forests	Potential habitat in the watershed.
Waterfowl Species:			
Common loon	MIS	Edges of remote freshwater ponds and lakes	No Habitat in the watershed.
Pied-billed grebe	MIS	Edge of open water in freshwater lakes, ponds, sluggish rivers and marshes	No Habitat in the watershed.
Horned grebe	MIS	Open water with emergent vegetation	No Habitat in the watershed.
Red-necked grebe	MIS	Lakes and ponds in forested areas	No Habitat in the watershed.
Eared grebe	MIS	Open water with emergent vegetation	No Habitat in the watershed.
Western grebe	MIS	Marches with open water and lakes and reservoirs with emergent vegetation	No Habitat in the watershed.
Canada goose	MIS	Variety of habitat: shores of lakes, rivers, and reservoirs especially with cattails and bulrushes	Potential habitat in the watershed.
Wood duck	MIS	Cavity nester, streams, ponds	Potential habitat in the watershed.
Gadwall	MIS	Concealed clumps of grasses in meadows and tall grasslands	No Habitat in the watershed.
American widgeon	MIS	Clumps of grasses in meadows or tall grasslands	No Habitat in the watershed.
Mallard	MIS	Open water with emergent vegetation	Habitat in the watershed.
Blue-winged teal	MIS	Marshes, lakes, ponds, slow-moving streams	No Habitat in the watershed.
Cinnamon teal	MIS	Cover of vegetation near shoreline	No Habitat in the watershed.
Northern shoveler	MIS	Grassy areas near water	No Habitat in the watershed.
Northern pintail	MIS	Open areas near water	No Habitat in the watershed.
Green-winged teal	MIS	Freshwater marshes with emergent vegetation	No Habitat in the watershed.
Canvasback	MIS	Emergent vegetation	No Habitat in the watershed.

Species	Status	Habitat	Presence
Redhead	MIS	Freshwater marshes and lakes concealed in vegetation	No Habitat in the watershed.
Ring-necked duck	MIS	Thick emergent vegetation on shorelines	No Habitat in the watershed.
Lesser scaup	MIS	Dry grassy areas near lakes at least 10 ft. deep	No Habitat in the watershed.
Common goldeneye	MIS	Cavity nester	No Habitat in the watershed.
Barrow's goldeneye	MIS	Cavity nester	No Habitat in the watershed.
Hooded merganser	MIS	Cavity nester	No Habitat in the watershed.
Common merganser	MIS	Cavity nester, streams.	Potential habitat in the watershed.
Ruddy duck	MIS	Freshwater marshes, lakes, ponds in dense vegetation	No Habitat in the watershed.
Woodpecker Species			
Lewis' woodpecker	MIS, Landbird focal species, BCC	Ponderosa pine forests, burned forests	Potential habitat in the watershed.
Williamson's sapsucker	MIS, Landbird Focal species, BCC	Mature or old growth conifer forests with open canopy cover; weak excavator	Potential habitat in the watershed.
Red-naped sapsucker	MIS	Riparian hardwood forests	Potential habitat in the watershed.
Downy woodpecker	MIS	Riparian hardwood forest	Potential habitat in the watershed.
Hairy woodpecker	MIS	Mixed conifer and ponderosa pine forests	Potential habitat in the watershed.
White-headed woodpecker	MIS, Landbird focal species, BCC	Mature ponderosa pine forests; weak excavator. LOS MIS	Potential habitat in the watershed.
Three-toed woodpecker	MIS	High elevation and lodgepole pine forests	Habitat in the watershed.
Black-backed woodpecker	MIS, Landbird focal species	Lodgepole pine forests, burned forests	Potential habitat in the watershed.
Northern flicker	MIS	Variety of forest types but more associated with forest edges	Habitat in the watershed.
Pileated woodpecker	MIS	Mature to old-growth mixed conifer forests. LOS MIS.	Potential habitat in the watershed.
Species	**Status**	**Habitat**	**Presence**
Swainson's hawk	BCC	Open country	No Habitat in the watershed.
Ferruginous hawk	BCC	Open sagebrush flats; open country	No Habitat in the watershed.
Prairie falcon	BCC	Rimrock, cliffs in open country	Potential habitat in the watershed.
American golden plover	BCC, Shorebird	Upland tundra, rare in OR in dry mudflats, fields and pastures	No Habitat in the watershed.
Snowy plover	BCC, Shorebird	Sandy beaches	No Habitat in the watershed.
American avocet	BCC	Shallow water	No Habitat in the watershed.
Solitary sandpiper	BCC, Shorebird	Small, freshwater mudflats	No Habitat in the watershed.
Whimbrel	BCC, Shorebirds	Grassy marshes and tidal flats	No Habitat in the watershed.

Species	Status	Habitat	Presence
Long-billed curlew	BCC, Shorebird	Dry grasslands	No Habitat in the watershed.
Marbled godwit	BCC	Expansive mudflats and sandflats on beaches	No Habitat in the watershed.
Sanderling	BCC, Shorebird	Sandy beaches with wave action	No Habitat in the watershed.
Wilson's phalarope	BCC, Shorebird	Shallow ponds within grassy marshes	No Habitat in the watershed.
Yellow-billed cuckoo	BCC	Riparian hardwoods	No Habitat in the watershed.
Burrowing owl	BCC	Open grassland or agricultural land	No Habitat in the watershed.
Black swift	BCC	Damp coastal cliffs	Habitat in the watershed (Tumalo Falls sighting).
Loggerhead shrike	BCC	Open habitat with scattered trees and shrubs	No Habitat in the watershed.
Gray vireo	BCC	Rocky, dry hillsides with scattered trees	No Habitat in the watershed.
Virginia's warbler	BCC	Mountain mahogany	No Habitat in the watershed.
Brewer's sparrow	BCC	Sagebrush habitats	No Habitat in the watershed.
Sage sparrow	BCC	Sagebrush habitats	No Habitat in the watershed.
Piping plover	Shorebird	Rare in OR on sandy beaches	No Habitat in the watershed.
Mountain plover	Shorebird	Shortgrass prairies	No Habitat in the watershed.
Buff-breasted sandpiper	Shorebird	Nests in tundra, forages on shortgrass prairie	No Habitat in the watershed.
Black oystercatcher	Shorebird	Coastal rocks	No Habitat in the watershed.
Upland sandpiper	Shorebird	Grassy fields (4-8" tall) with open patches	No Habitat in the watershed.
Bristle-thighed curlew	Shorebird	Rare in OR in marshes or beaches. Nests in Alaska tundra	No Habitat in the watershed.
Hudsonian godwit	Shorebird	Mudflats and shallow water; nests around spruce woods	No Habitat in the watershed.
Marbled godwit	Shorebird	Prairie ponds, mudflats and sandflats	No Habitat in the watershed.
Black turnstone	Shorebird	Tundra, winters on rocky, coastal shores	No Habitat in the watershed.
Surfbird	Shorebird	Nests on barren gravel hilltops, winters on rocky shorelines	No Habitat in the watershed.
Western sandpiper	Shorebird	Mudflats and sandy beaches	No Habitat in the watershed.
Rock sandpiper	Shorebird	Rocky shorelines	No Habitat in the watershed.
Short-billed dowitcher	Shorebird	Mudflats and shallow muddy ponds along coast	No Habitat in the watershed.
American woodcock	Shorebird	Damp, brushy woods	No Habitat in the watershed.
Wilson's plover	Shorebird	Rare in OR on sandy beaches, sandflats or mudflats away from shoreline	No Habitat in the watershed.
American oystercatcher	Shorebird	Rare in OR on rocky coasts	No Habitat in the watershed.

Species	Status	Habitat	Presence
Bar-tailed godwit	Shorebird	Low tundra in western Alaska	No Habitat in the watershed.
Ruddy turnstone	Shorebird	Rocky and sandy shorelines	No Habitat in the watershed.
Red Knot	Shorebird	Sandy beaches	No Habitat in the watershed.
Dunlin	Shorebird	Sandy beaches and mudflats	No Habitat in the watershed.
Neotropical Migrant Birds	Variable but many are declining	Wide variety	Variable by species. Refer to preceding individual species
Cascade frog	Amphibian, declining and reduced distribution	Aquatic, seasonal and permanent streams and lakes. Marshes, swamps, etc. at relatively high elevations in the mountains.	Habitat in the watershed

*Federally listed and Regional Forester Sensitive species come from the Region 6 Threatened, Endangered, and Sensitive species list for the Deschutes National Forest; Landbird focal species come from the Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington (Altman 2000); Management Indicator Species come from the Deschutes National Forest Land and Resource Plan (LRMP)[1990]; Birds of Conservation Concern (BCC) come from the US Fish and Wildlife Service Birds of Conservation Concern – BCR 9 (Great Basin) [2002]; and Shorebirds come from the 2004 US Fish and Wildlife Service U. S. Shorebird Conservation Plan. Species with "Habitat" are known to occur in the watershed. Those with "Potential Habitat" are likely to occur but no surveys have been conducted to confirm their presence.

Species Not Considered

The following provides the rationale and clarification to Table XX. In this section conclusions are made as to the presence or absence of the species based on habitat availability and suitability. Those species that have suitable habitat within or in the vicinity of the watershed will be further described (those in bold in Table XX) in the following sections.

In a letter to all District Wildlife Biologists on the Deschutes and Ochoco National Forest[s] and the Crooked River National Grassland (File code 2670; June 18, 2003) from Shane Jeffries and Dave Zalunardo, Forest Wildlife Biologists for the Deschutes and Ochoco National Forest (respectively), a determination was made that no Canada lynx habitat or self-maintaining populations are present on these three administrative units. The rationale included using the best available science and guidance, that was often more recent than the literature referred to in the comment, and field surveys conducted on these units in 1999, 2000, and 2001. The authors of the letter relied upon the Lynx Biology Team's definitions of habitat and definitions that are part of the Lynx Conservation Assessment and Strategy. The US Fish and Wildlife Service was an integral part of both the Biology Team and the Conservation Assessment and Strategy. Due to lack of habitat, there are no lynx in the watershed.

The horned grebe is a rare breeder east of the Cascades, they favor semi-permanent ponds (Marshall et al. 2003). There are no ponds within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Red-necked grebe breeding habitat consists of extensive clear, deep-water marshy lakes and ponds in timbered regions (Johnsgard 1987, Watkins 1988). This type of habitat does not exist within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The tri-colored blackbird, in Oregon, is restricted to breeding in southern Oregon. This blackbird prefers to breed in freshwater marshes with emergent vegetation (cattails) or in thickets of willows or other shrubs (Csuti et al. 2001). Due to the distance from known habitats and the lack of marshes in the watershed it is highly unlikely that this species is in the watershed.

The yellow rail inhabits freshwater marshes and wet meadows with a growth of sedges, and often with standing water up to a foot deep during the breeding season (Csuti et al. 2001). This type of habitat does not exist within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Greater sage-grouse are sagebrush obligates (i.e. require sagebrush) found on sagebrush-dominated areas east of the Cascades (Aldrich 1963). They rely on sagebrush for food and cover throughout the year (Jenny K. Barnett in Marshall et al. 2003). There are no sagebrush-dominated areas within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The pygmy rabbit are closely associated with areas supporting tall, dense clumps of Great Basin or big sagebrush (Artemisia tridentata) (Csuti et al. 2001). This species is also restricted to the northern parts of the Great Basin, and are thus not found in this area of the Bend-Ft. Rock District. A lack of habitat assumes a lack of presence in the watershed.

The following species are waterfowl that rely heavily on habitat adjacent to an actual body of water (often a marsh or lake) as shown in Table XX: Canada goose, gadwall, American widgeon, blue-winged teal, cinnamon teal, northern shoveler, northern pintail, green-winged teal, canvasback, redhead, ring-necked duck, lesser scaup, common goldeneye, Barrow's goldeneye, hooded merganser, bufflehead, and ruddy duck. There are no large lakes or reservoirs within the watershed that would provide the types of habitats required by these species. A lack of habitat assumes a lack of presence in the watershed.

Habitat for Lewis's woodpeckers is not present within the watershed. This species utilizes dead wood (large snags) in open forests (ponderosa pine and in some cases riparian) that may have been logged or burned (Winkler, et. al. 1995; Natureserve, 2006; Saab et. al. 2002). Marshall, et. al. (2003) reports that this species is associated with open woodland habitat near water. It primarily breeds in Oregon white oak, ponderosa

pine, and riparian cottonwood communities. Important components of breeding habitat include an open woodland canopy and large-diameter dead or dying trees. The open habitat and large snags utilized by this species is lacking in the watershed as are the large trees it requires. This species is more commonly seen on the more eastern portions, forest fringe of the Ft. Rock side of the Bend-Ft. Rock Ranger District.
The Swainson's hawk prefers open country (mostly bunchgrass prairies or irrigated farmland) with very few trees, for they forage extensively while in flight and may include only the nest tree in their home range (Janes 1985b). There are no large expanses of open bunchgrass prairies within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The ferruginous hawk is the largest of Oregon's hawks. They are sensitive to human disturbance and tend to reside in remote areas. This species is at home in the sagebrush plains of the high desert as well as the bunchgrass prairies along the northern foothills of the Blue Mountains. They forage over treeless grasslands and sagebrush plains. They occupy habitat with the lowest tree densities and areas of relatively shallow soils (Cottrell 1981, Janes 1985a, 1985b). There are no sagebrush plains or bunchgrass prairies within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The American golden plover is found on dry or damp upland areas, mudflats, or beaches. They are locally rare in eastern Oregon (Littlefield 1990). This type of habitat is not found in the watershed. A lack of habitat assumes a lack of presence in the watershed.

The snowy plover is found in alkaline playas that may be sparsely vegetated with alkali saltgrass, typically in association with spring, seeps, or lake edges (Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The American avocet's preferred breeding habitats in Oregon include alkaline lakes, marshes, and freshwater sites. Nest sites are along shorelines and in adjacent upland areas with sparse or no vegetation (Robinson et al. 1997). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The solitary sandpiper is uncommon to rare in Oregon. Nesting may occur in high elevation bogs or wet meadows surrounded by mixed conifer forests (Sawyer 1981, Lundsten 1996). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The whimbrel may occur in fields and mud flats around lakes or ponds (Gilligan et al. 1994). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Long-billed curlew nesting occurs primarily in short-grass or mixed-prairie habitat with flat to rolling topography; will nest in agricultural fields including short dry cereal grain

fields, wheat stubble, and fallow fields (Pampush 1981). There are no fields within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Most inland sanderlings are found on wet edges of alkali playas or on muddy lakeshores, with a few along the muddy shores of the largest rivers (Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The Wilson's phalarope nests are placed in bulrushes or dense grass in wet meadows, croplands, and grazed or idle pastures in the vicinity of lakes or ponds, on islands, marshes, sloughs, or even roadside ditches. It also utilizes seasonal, semi-permanent and permanent wetlands (Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The yellow-billed cuckoo is currently, a rare, irregular visitor east of the Cascades (Marshall et al. 2003). Most reports of this bird in eastern Oregon are from riparian areas dominated by willows (Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The burrowing owl relies on open grasslands and shrub-steppe including rangelands, pastures, golf courses, and airports in eastern Oregon (Gabrielson and Jewett 1940). There are no open grasslands or shrub-steppe within the watershed. Also, it has never occurred within this part of Central Oregon. A lack of habitat assumes a lack of presence in the watershed.

The loggerhead shrike breeds in open habitats east of the Cascades. Primary vegetation communities in Oregon include big sagebrush, low sagebrush with scattered juniper, black greasewood, and cold desert shrub communities (Wiens and Rotenberry 1981, Holmes and Geupel 1998, Aaron Holmes in Marshall et al. 2003). It needs open grassy areas for hunting, and scattered shrubs or small trees for nesting. The watershed does not contain open plant communities dominated by sagebrush with scattered trees. A lack of habitat assumes a lack of presence in the watershed.

The gray vireo breeds in arid thorn scrub, chaparral, pinyon-juniper, and oak juniper woodland (Ehrlich et al. 1988). The watershed does not contain arid thorn scrub, chaparral, pinyon-juniper or oak juniper woodlands. A lack of habitat assumes a lack of presence in the watershed.

Virginia's warbler breeds in dry montane woodlands, rocky canyons with scrub oak, chaparral, and pinyon-juniper brushland (Ehrlich et al. 1988). Breeding has not yet been verified in Oregon. The watershed does not contain dry woodlands, rocky canyons with scrub oak, chaparral, or pinyon-juniper brushland. A lack of habitat assumes a lack of presence in the watershed.

The Brewer's sparrow principally breeds in shrublands where the average canopy height is less than 5 feet (Wiens and Rotenberry 1981). The primary plant association used by

the Brewer's sparrow is big sagebrush. The watershed does not contain plant associations dominated by sagebrush or other shrub types. A lack of habitat assumes a lack of presence in the watershed.

In Oregon, the sage sparrow is most commonly associated with big sagebrush communities, sometimes including a mix of other shrubs, or among western juniper (Marshall et al. 2003). The watershed does not contain plant associations dominated by big sagebrush, other shrub types or juniper. A lack of habitat assumes a lack of presence in the watershed.

Piping plovers are more likely found around the Greta Lakes and north Atlantic coast. The only record of a piping plover in Oregon was near Tillamook in 1986 (Marshall et al. 2003). A lack of habitat assumes a lack of presence in the watershed.

There have been 8 records of mountain plovers in Oregon, in counties close to the coast. Although this bird breeds in the Rocky Mts., it is casual in the rest of the West (Marshall et al. 2003). A lack of habitat assumes a lack of presence in the watershed.

Buff-breasted sandpipers are a rare but regular fall migrant on the Oregon coast, with one rare record of a migrant at the sewage ponds in Redmond, OR. Generally the species can be found foraging in grassy habitats (lawns, golf courses, plowed fields) especially near the coast. This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Black oystercatchers are found along the Oregon coast on rocky shores and sand/gravel beaches (Marshall et al. 2003). This type of habitat is not found within in the watershed. A lack of habitat assumes a lack of presence in the watershed.

Upland sandpipers are associated with montane meadows of grasses and forbs surrounded by lodgepole pine and sometimes ponderosa pine forests at relatively high elevation (3,400-5,00 ft; Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Bristle-thighed curlews are very rare in Oregon, often migrating between Alaska and Hawaii completely over the ocean (Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Hudsonian godwits are rare in Oregon, most often migrating between Alaska and South America by way of the Atlantic coast. (Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Marbled godwits prefer coastal mudflats, sandy ocean beaches, wet margins of large reservoirs or brackish lakes, and sewage ponds (Marshall et al. 2003). This type of

habitat is not found in the watershed. A lack of habitat assumes a lack of presence in the watershed.

The Black turnstone is a common winter migrant on the coast, but rare in the eastern portions of Oregon. Most commonly found on rocky shores and sandy beaches, it can also be found in flooded fields (Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Marshall et al. (2003) reports that the Surfbird is strictly a coastal species with no inland records. It is, however, a common migrant along the coast. This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Western sandpipers can found at permanent and seasonal wetlands, occasionally along shorelines of reservoirs, lakes, ponds, and wet meadows during migration (Marshall et al, 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The Rock sandpiper is strictly coastal with no inland records in Oregon (Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Marshall et al 2003 reports that the Short-billed dowitcher is a rare but regular migrant east of the Cascade Mts. They are found primarily in wet mud or shallow water with underlying mud mostly associated with tidal mudflats. This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Natureserve (2006) shows the American woodcock as being a species restricted to the eastern half of the United States. Neither Marshall et al (2003) nor Sibley (2005) contain entries for this species. This species nests within second growth hardwood or deciduous forests, often associated with a wetland or riparian habitat (Natureserve 2006). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Wilson's plover breeds along the Atlantic and Pacific coasts. There has been only record of a sighting of this species in Coos County. A lack of habitat assumes a lack of presence in the watershed.

The American oystercatcher is very rare in western North America, often being found mainly along the coast of the Baja of California or the Atlantic coast (Sibley, 2005). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Bar-tailed godwits are rare in Oregon, with the only records being along the coast (Marshall et al. 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

The Ruddy turnstone is found on rocky shores, jetties, open ocean beaches, and flooded fields. This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Red knots are observed as migrants along the Oregon coast where they forage on tidal flats. They have been observed along the shore of large brackish lakes inland (Malheur and Summer Lakes), but are rarely found on the margins of freshwater lakes or reservoirs (Marshall et al 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Dunlin are associated with wetlands and mudflats found with estuaries, alkali lakes, grass fields, rice fields, and sewage ponds (Marshall et al 2003). This type of habitat is not found within the watershed. A lack of habitat assumes a lack of presence in the watershed.

Species Not Considered in Detail [new section]

The following species have a low probability of occurrence in the watershed, have habitat requirements similar to species discussed in detail (e.g. woodpecker species), or are common generalists using a variety of habitat types. Refer back to Table XXX for habitat information. For example, the olive-sided flycatcher uses the edges of mixed conifer forest created by wildfire or other disturbances. Its habitat matrix is very common in the watershed but the edge/ecotone may not be. As a group, there is no historic information on these species and no current survey data. Inferences can be made as to the amounts of potential habitats using vegetation type and stand structure data, however this level of detail is best addressed at the project-scale.

Harlequin duck (unlikely)
Cooper's hawk (relatively common)
Sharp-shinned hawk (relatively common)
Red-tailed hawk (common)
Great blue heron (common)
Osprey (common)
Pygmy nuthatch (represented via woodpeckers and LOS MIS)
Chipping sparrow (represented by LOS MIS)
Brown creeper (represented by LOS MIS)
Hermit thrush (represented by LOS MIS)
Olive-sided flycatcher (represented by several spp.)
Canada goose (common)
Wood duck (common)
Mallard (common)
Snags and Down Wood associated species and habitats (represented by woodpeckers)
Williamson's sapsucker (represented by other woodpeckers and LOS MIS)
Red-naped sapsucker (represented by other woodpeckers and riparian spp.)
Downy woodpecker (represented by other woodpeckers and riparian spp.)
Hairy woodpecker (represented by other woodpeckers and common)

Northern flicker (represented by other woodpeckers and common)
Prairie falcon (unlikely)
Black swift (very rare)
Common merganser (represented by aquatic/riparian spp. and common_

Northern Bald Eagle

Current Condition

Chapter III, IV-36. Paragraph 3. Replace last sentence with "Deer winter range provides sporadic forage resources to bald eagles from mortality of fawns and older adults, which is generally in late winter or early spring, depending upon winter severity and duration."

Chapter III, IV-37. **Table 14** was not recalculated. This table is similar to Table 6. See discussion for Table 6.

Northern Spotted Owl

Current Condition

Chapter III, IV -37. Paragraph 2. Surveys have been conducted in the watershed in 2007 with no detection and will continue in 2008. NRF habitats have been mapped in the watershed but field surveys to confirm condition/suitability have not been done. There are presently 2559 acres of NRF designated in the watershed. About 80% of these acres have been affected by insect and disease.

Chapter III, IV-38. **Table 15** is similar to Table 8. See Table 8 for updated information.

Chapter III, IV-37. Paragraph 3. Use updated tables to update acreages given in this discussion.

Chapter III, IV-38. Paragraph 3. Last sentence should read "There is no Critical Habitat Unit designated in the watershed, nor any Late Successional Reserves (LSRs). However,"

Chapter II,IV-39. The following Table replaces Table 16 in the former document:
Table 16. Tumalo Creek Watershed – Northwest Forest Plan Allocations

NWFP Allocation	NWFP Acres Within the Watershed	NRF Habitat Acres
Congressionally Withdrawn Lands	4,418	0
Administratively Withdrawn Lands	12,155	2,121
Matrix	7,853	438
Riparian Reserve	5415	--
Other Ownership	1,297	0
Totals	25,723	2,559

Chapter II,IV-39. Paragraph 1. Add the following to **Trends** discussion under Table 16: "Insect and Disease has affected NRF habitat, reducing its effectiveness. Of the 2314 acres of designated NRF in the watershed, only 432 acres remains unaffected.

Canada Lynx

Chapter III, IV-39. Delete the entire section on Canada Lynx.

Northern Goshawk

Chapter III, IV-42. Paragraph 6. Edit first sentence with "Surveys were initiated in 2007 with one detection and will continue in 2008. Additionally, goshawk sightings…."

Great Gray Owl

Current Conditions

Chapter III, IV-44. Edit Last sentence. "…., surveys were conducted in 2007 with no detections and will continue in 2008."

Chapter III, IV-46. Replace **Table 17** with the following table. Note that the historic stand structure was not changed from the original document. See discussion after Table 6.

Table 17. Historic and Current Conditions - Stand Structure by PAG

Structural Stage						
Major PAG	**Early**		**Mid**		**Late/Old**	
	HRV	**Current**	**HRV**	**Current**	**HRV**	**Current**
PPD/W	10%	1%	10%	62%	80%	33%
MCD	10%	20%	20%	60%	70%	20%
MCW	20%	37%	35%	49%	35%	13%
LPD/W	30%	2%	45%	47%	25%	50%
MHD	15%	6%	55%	48%	30%	40%
Landscape Totals	14	13	27	48	54	29

Open areas of the total landscape were estimated at 5% HRV and 10% under existing conditions. See Table 8 for more information.

Chapter III, IV-48. Table 18 "**Deer Seasonal Ranges** and Table 19 "**Deer Cover/Forage Ratios**, were not recalculated. Bridge and Forks are essentially now Upper Tumalo subwatershed and the former Tumalo is similar to present Lower Tumalo, the numbers should still be representative. Bull subwatershed was dropped.

Table 20. Open Road Density

Subwatershed (6th Field HUC)	Road Miles	Subwatershed Square Miles	Road Densities (Miles/square mile)
Upper Tumalo	40.81	32.43	1.26
Lower Tumalo	139.29	26.52	5.25
Watershed Totals	180.1	58.95	3.06

Chapter III, IV-49. Add to end of wildlife section: "The insect and disease (I &D) infestation has affected the Old Growth Management Area (OGMA) and Late or Old Stage (LOS) areas. I&D has affected 100% of OGMA and 81% of LOS in the watershed. I&D have variable effects depending upon the type of organism and the degree of effect. Rarely does it result in 100% tree mortality, but the loss of large trees and/or significant numbers of trees will affect habitat capability for some species (i.e. bad for some and good for others). LOS dependent species such as northern spotted owls would be adversely affected in most cases.

Chapter III, IV – 49. **Add** the following tables (Table 21 and 22):

Table 22. Acres Affected by Insect and Disease

Subwatershed	Watershed Acres	OGMA Acres/ % affected I&D	NRF Acres/ % affected I&D	LOS Acres/ % affected I &D	Total Acres I&D	% of Watershed affected by I&D
Upper Tumalo	20,745	448/100	2314/81	--	9391	45
Lower Tumalo	16,968	0	245/52	--	2902	21
Totals	37,713#	448/0	2559/80	476/81*	12,293	36

= Calculated for 5th field only. Acres unaffected include 81acres SS6 and 9 acres SS7.
= total watershed is 37,713 acres but portion within FS boundary is 34,536. Calculations based on what is within FS boundary.

Table 23. Insect and Disease Infestation by PAG

Subwatershed	Major PAG	Total Acres	I&D	% Infested
Upper	PPD/W	36	17	47
	MCD	2596	1654	64
	MCW	4157	1803	43
	LPD/W	3075	2603	85
	MHD	8114	2950	36
	MDW/RIP	314	127	41
	ROCK/ALP	775	41	5

Lower	PPD/W	9134	1074	12
	MCD	1978	341	17
	MCW	1822	798	44
	LPD/W	703	659	94
	MHD	0	0	0
	MDW/RIP	7	7	100
	ROVK/ALP	10	0	0

FIRE/FUELS

CURRENT CONDITION

Present Day Fires

Chapter III, IV - 50. Paragraph 4. Add "The Greater Bend Community Wildfire Protection Plan (CWPP) was developed in response to the fire environment concerns.

Chapter III, IV – 51. After Ponderosa pine zones, Add:

Fire Regime Condition Class

Historical Fire Regimes, Natural Range of Variability and Fire Regime Condition Class (FRCC) Mapping Methodology**.**

Upper Deschutes Basin Fire Learning Network Technical Team: Amy Waltz, Jeff Campbell, Mike Simpson, Dave Owens, Jen O'Reilly, Glen Ardt, Gregg Riegel, Chris Zanger

Introduction

Fire Regime Condition Class is an ecological index that measures the departure of current stand structure, fire return intervals and fire severity from historic stand structure, fire return intervals and fire severity. Changes in forest structure have occurred since Euro-American settlement due to multiple factors, including fire exclusion, grazing and timber management. In many cases, the changes in forest structure have led to changes in fire behavior resulting in increased fire risk to communities, as well as a decline in or loss of fire-adapted plant and animal species.

This analysis was conducted by the Upper Deschutes Basin Fire Learning Network, a collaborative group of federal and state agencies, local government and community groups and conservation organizations. The mapping and computer analyses were contracted out to Jeff Campbell, of Spatial Solutions. Input data (as described in the document), was assimilated or generated by the UDB FLN technical team (above).

The technical team used the FRCC Mapping Tool, an Arc Extension that was developed by National Interagency Fuels Technology Team (NIFTT), part of the National Interagency Fuels Coordination Group (NIFC). For more information regarding this team and their products go to www.landfire.gov.

FRCC RESULTS for Tumalo Watershed

Biophysical Settings are potential vegetation classes with disturbance, and may represent historical vegetation distribution (Map 3). The Tumalo watershed map is dominated by three Biophysical Settings: ponderosa pine, dry mixed conifer and wet mixed conifer – lodgepole pine.

Table 1 lists the historical and current successional stage distributions for the three most abundant vegetation types in Tumalo Watershed. Changes consistent among these three vegetation types include a significant reduction in the proportion of late-successional classes within each Biophysical Setting and a corresponding increase in mid-successional classes. Within the ponderosa pine Biophysical Setting, there is a significant increase in mid-successional classes with closed canopies (greater than 40% canopy cover).

Table 24. Successional stages

Vegetation Type	Successional Stage	Historic Distribution (%)	Current Distribution (%)
Ponderosa Pine	ES	25	18
	MSC	5	29
	MSO	25	38
	LSO	40	6
	LSC	5	9
Mixed Conifer (dry)	ES	15	9
	MSC	1	17
	MSO	30	54
	LSO	40	11
	LSC	14	8
Mixed Conifer (wet) &Lodgepole pine (wet)	ES	10	20
	MSC	10	17
	MSO	35	49
	LSO	40	7
	LSC	5	7

Table 2 lists stand FRCC (by successional stage) and watershed FRCC (also shown in Map 4) for each Biophysical Setting. Stand departure is the percent departure of the current stands from the historic stands. For example, there is 84% less (-84) late-successional open stand ponderosa pine habitat in the Tumalo Watershed today as compared to modeled historic distributions. (Also see Table 6 in original document and Table 8 in this document – numbers vary depending on methods arriving at data).

There are two components of Fire Regime Condition Class: the Vegetation Class Departure and the Fire Frequency and Severity Departure. These data are based solely on the vegetation class departure and does not include data on missed fire cycles or changes in fire severity. Missed fire cycles are not considered in this calculation due to the uncertainty of fire interval and pattern in the mixed severity fire regime that typifies mixed conifer Biophysical Settings (mixed conifer is considered to be in Fire Regime III, where fires of mixed severity, and often irregular patterns, occur every 35 to 100+ years). Should missed fire cycles be factored in, it can be assumed the FRCC for each of the Biophysical Settings would increase by one class, i.e. FRCC 2 to FRCC 3.
Stand departure is summarized into a stand level FRCC in the following manner:
-100 to 33 departure = stand FRCC 1
33 to 66 departure = stand FRCC 2
66+ departure = stand FRCC 3
Successional stages that are in less abundance today (like late-successional open stands) are summarized as FRCC 1 or similar by FRCC standards. This appears counter-intuitive, as this represents an "out-of-wack" system. These stands should be more appropriated labeled as "conserve" and, this analysis can highlight these stands as important to conserve because of their scarcity on the landscape. Successional Stage Relative Abundance describes the current amount of a vegetation type relative to it's historical condition, i.e. abundant, over represented, trace, similar, or under represented (Map 5).

Table 25. Fire Regime Condition Class

Vegetation Type	Successional Stage	Hist. Dist. (%)	Cur. Dist. (%)	Stand Departure	Stand FRCC	Watershed FRCC (Departure Index)	FRCC
Ponderosa Pine	ES	25	18	-28.09	1	41	2
	MSC	5	29	82.88	3		
	MSO	25	38	34.12	2		
	LSO	40	6	-84.88	1		
	LSC	5	9	43.3	2		
Mixed Conifer (dry)	ES	15	9	-37.23	1	40	2
	MSC	1	17	94.13	3		
	MSO	30	54	44.81	2		
	LSO	40	11	-73.12	1		
	LSC	14	8	-39.75	1		
Mixed Conifer (wet) &Lodgepole pine (wet)	ES	10	20	50.92	2	32.5	1
	MSC	10	17	39.93	2		
	MSO	35	49	27.98	1		
	LSO	40	7	-81.44	1		
	LSC	5	7	28.08	1		

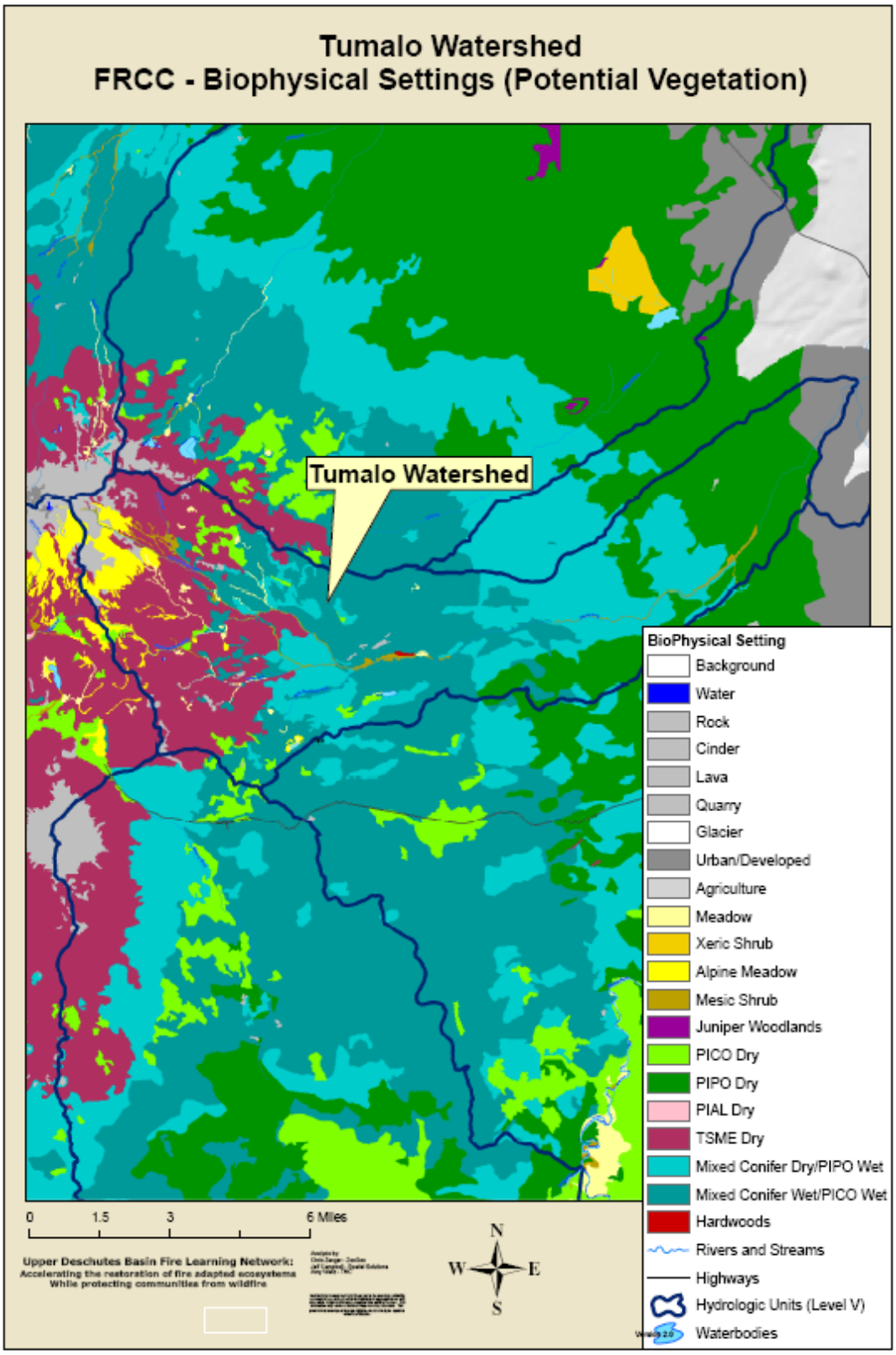

Exhibit 3. FRCC Biophysical Settings (Potential Vegetation)

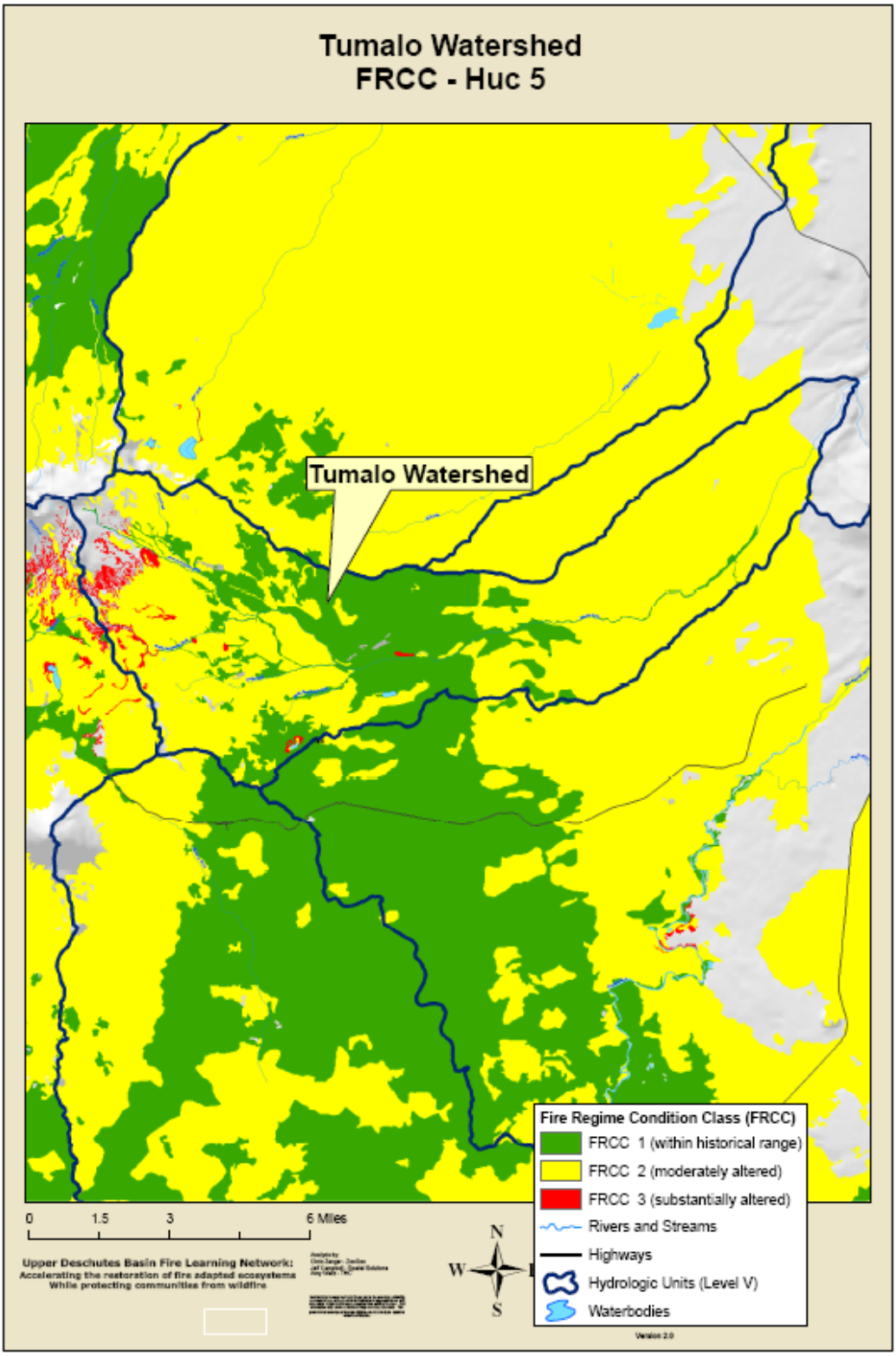

Exhibit 4. Fire Regime Condition Class

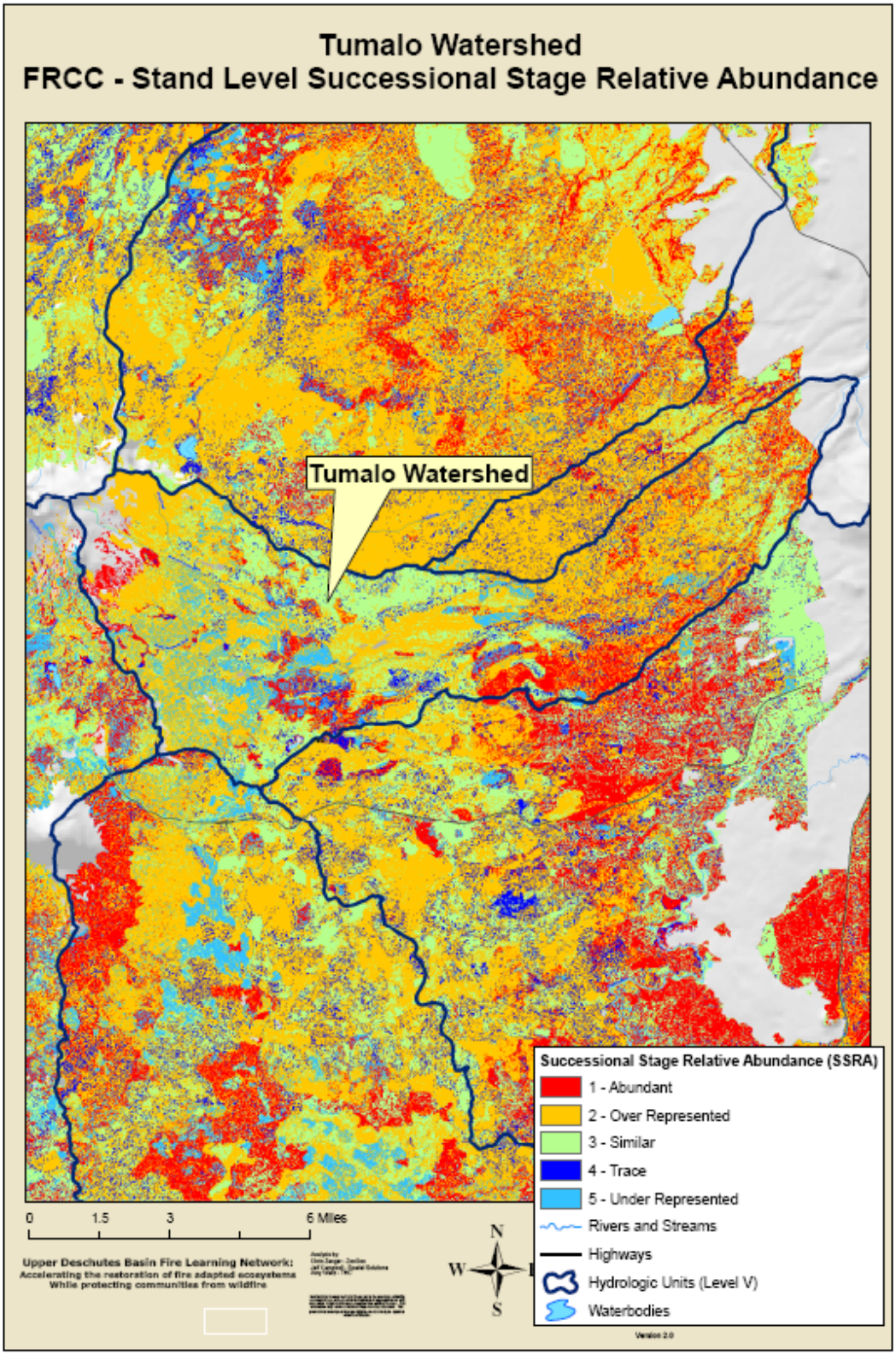

Exhibit 5. Successional Stage Relative Abundance

Chapter III, IV – 52. Paragraph 4. **Delete** the last sentence "Approximately 7 percent of the area is considered high hazard fuels, 26 percent are moderate fuels, and 67 percent are low hazard fuels." **Add:**

Fuel Hazard and Potential Fire Behavior

This report describes the analysis conducted to address potential fire behavior and hazardous fuel conditions within the Tumalo Creek Watershed. Data used to characterize the landscape were developed for the Deschutes National Forest based on 2004 satellite imagery.

Conditions were modeled for a "problem fire", defined here for the Tumalo watershed as a fire driven by a westerly wind, moving down-canyon, and threatening the Bend Municipal Watershed and the wildland-urban interface. For modeling purposes, problem fire conditions are:

Wind direction: 270 degrees
Wind Speed: 25 mph (20 foot wind)
Fuel Moistures (97% percentile): 1 hr: 2%, 10 hr: 3%, 100 hr: 6%,
Live Woody: 55%, Live Herbaceous: 30%, Foliage: 100%

A west wind (270 degrees) at speeds of 25 mph would be a relatively rare event; however it represents the conditions which are the greatest threat to values at risk.

The FlamMap analysis area is significantly larger than the Tumalo Creek Watershed. A large rectangle was selected for the analysis so that adjacent areas are included and edge effects are captured. Where possible, descriptive outputs are reported for the watershed.

Table 3 displays acres by fuel model for the Tumalo Watershed. Fuel models and historic large fires are shown on Map 6.

Table 26. Fuel models

Fuel Model	Acres	Percent of Watershed
1 - Grass	1,210	3
2 – Grass, shrub, litter	2,688	7
6 - Shrub	14,204	38
8 – Short-needle litter	7,249	20
9 – Long-needle litter	4,714	13
10 – Heavy dead & down	4,487	12
97 – bare ground	102	0
98 - water	32	0
99 – bare ground	2,346	6
Total	37,032	99

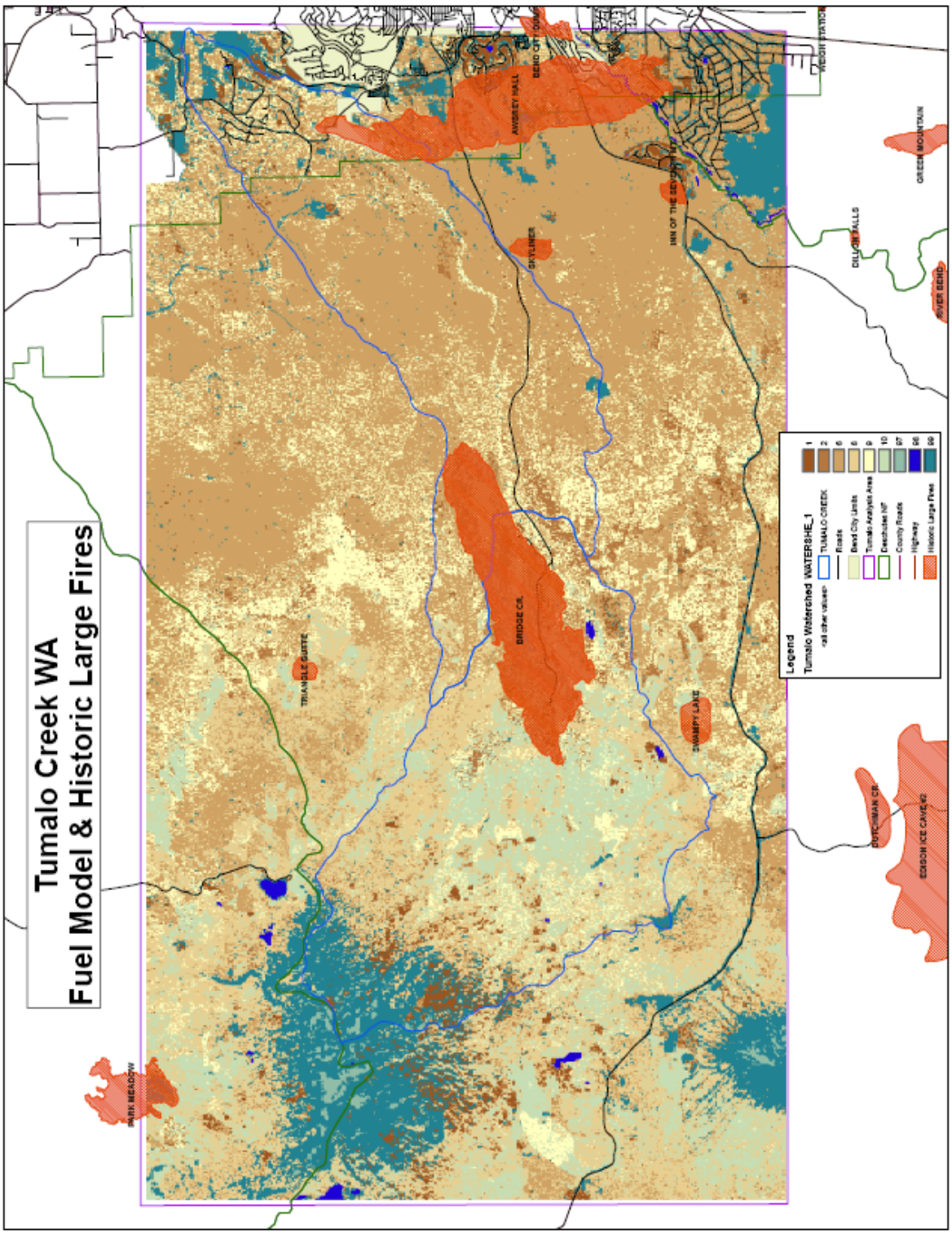

Exhibit 6. Fuel models and historic large fires

The first output from FlamMap is displayed on Map 7. Burn probability is displayed. Burn probability is an output grid from the minimum travel time fire growth model.

This feature produces a single output map that contains the fraction of the number of fires that encountered each node (0.0 to 1.0). The burn probability for the Tumalo Creek Watershed is derived from a random distribution of 3000 fires, with duration of 8 hours.

High burn probabilities are related to the sizes of fires that occur on a given landscape -- for the same conditions, large fires produce higher probabilities than small fires (each burn a larger fraction of the landscape). Since fire size is a function of the gross spread rate and duration of the fire, treatments or conditions that reduce the spread rate will lower the burn probability.

Table 27. Burn Probability, Tumalo Creek Watershed

Burn Probability - Description	Acres	% of Watershed
Very Low	16,585	44
Low	4,890	13
Moderate	3,872	10
High	7,905	21
Very High	3,782	10

The description terms (very low, low etc) are assigned based on a classification of the range of burn probability values into 5 classes. They are relative values, not absolute.

Potential fire behavior was calculated and two values are displayed here: flame length and crown fire. Flame length potential is displayed in Map 8 and crown fire in Map 9.

Table 28. Flame Length Potential

Flame Length (feet)	Acres	% of Watershed
<2	13,342	35
2-4	537	1
4-8	3,657	10
8-11	2,348	6
11+	14,660	39

Table 29. Crown Fire Potential

Fire Type	Acres	% of Watershed
0 – Non-burnable	2,210	6
1 – Surface fire	16,454	44
2 – Torching (Passive Crown Fire)	12,365	33
3 – Active Crown Fire	3,515	9

The table below displays the acres and percent for flame length potential and burn probability outputs from the FlamMap model for the Tumalo Watershed. The two outputs are combined as shown in the table. Map 10 shows the two combined output.

Table 30. Flame length potential and burn probability

Burn Probability	**Flame Length (feet)**					
	0	**2**	**4**	**8**	**11**	**20**
Very Low	na	4,181 (12)	100 (<1)	930 (3)	337 (1)	6,081 (18)
Low	na	934 (3)	201 (<1)	844 (2)	661 (2)	2,523 (7)
Moderate	na	1,075 (3)	165 (<1)	1,588 (5)	908 (3)	4,174 (12)
High	na	220 (1)	71 (<1)	296 (1)	442 (1)	1,812 (5)
Total	6,933 (20)	6,409 (19)	536 (1)	3,657 (11)	2,348 (7)	14,660 (42)

Burn probability is a relative index for the likelihood of a piece of ground burning given the conditions run in the model (97th %-tile weather and fuels, with 20' wind (270 degrees, 25 mph). Burn probability ranges from 0.00 to 0.10156. The range was divided into 4 equal divisions. Categories for burn probability are:

0 – 0.02539 = Very Low
0.02539 – 0.05078 = Low
0.05078 – 0.07617 = Moderate
0.07617 – 0.10156 = High

Flame length potential was divided into categories roughly based on the Hauling Chart. Categories for flame length:

0 – **0**, Non Burnable
.1 – 2: **2**
2.1 – 4: **4**
4.1 – 8: **8**
8.1 – 11: **11**
11.1 +: **20**

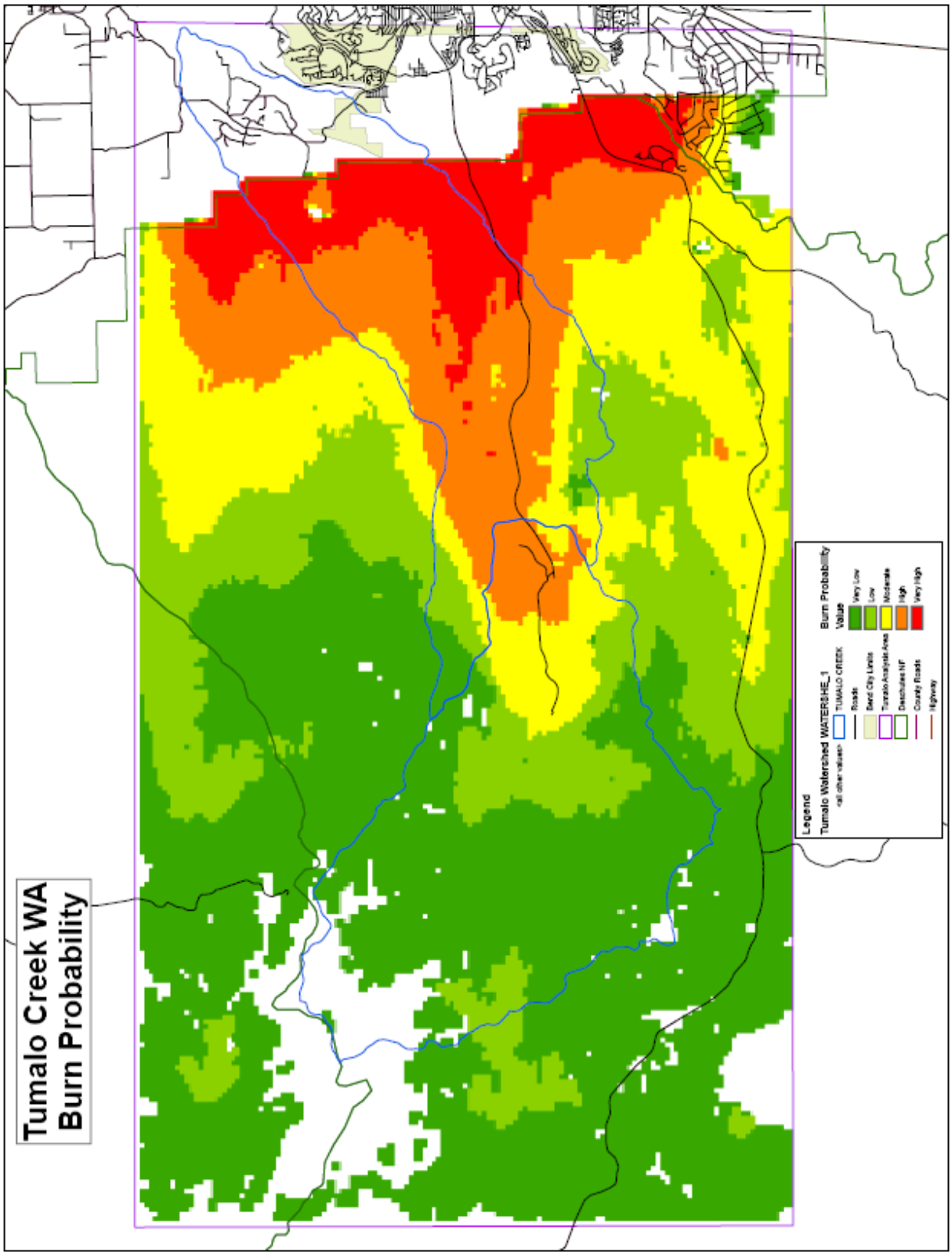

Exhibit 7. Burn probability

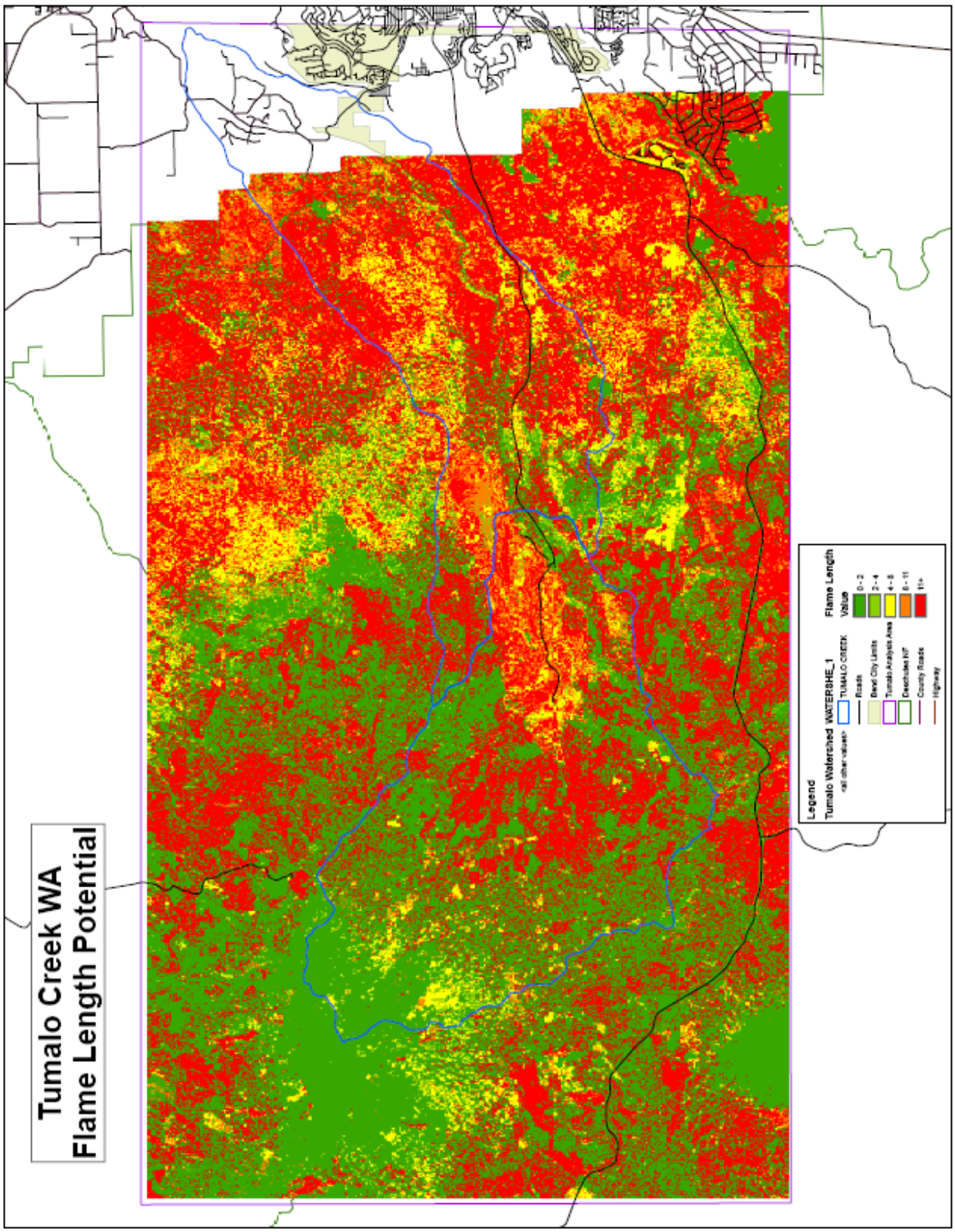

Exhibit 8. Flame length potential

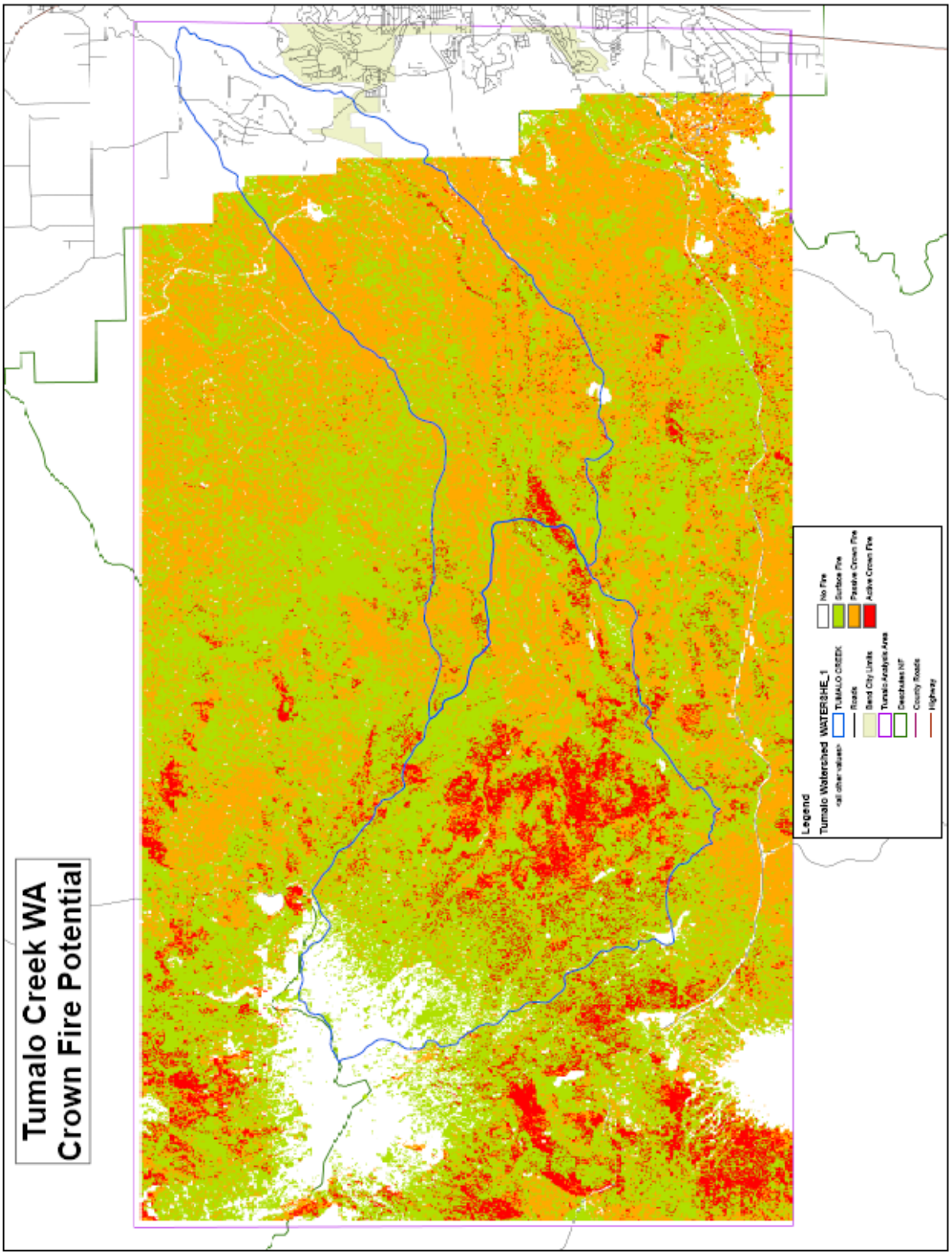

Exhibit 9. Crown fire potential

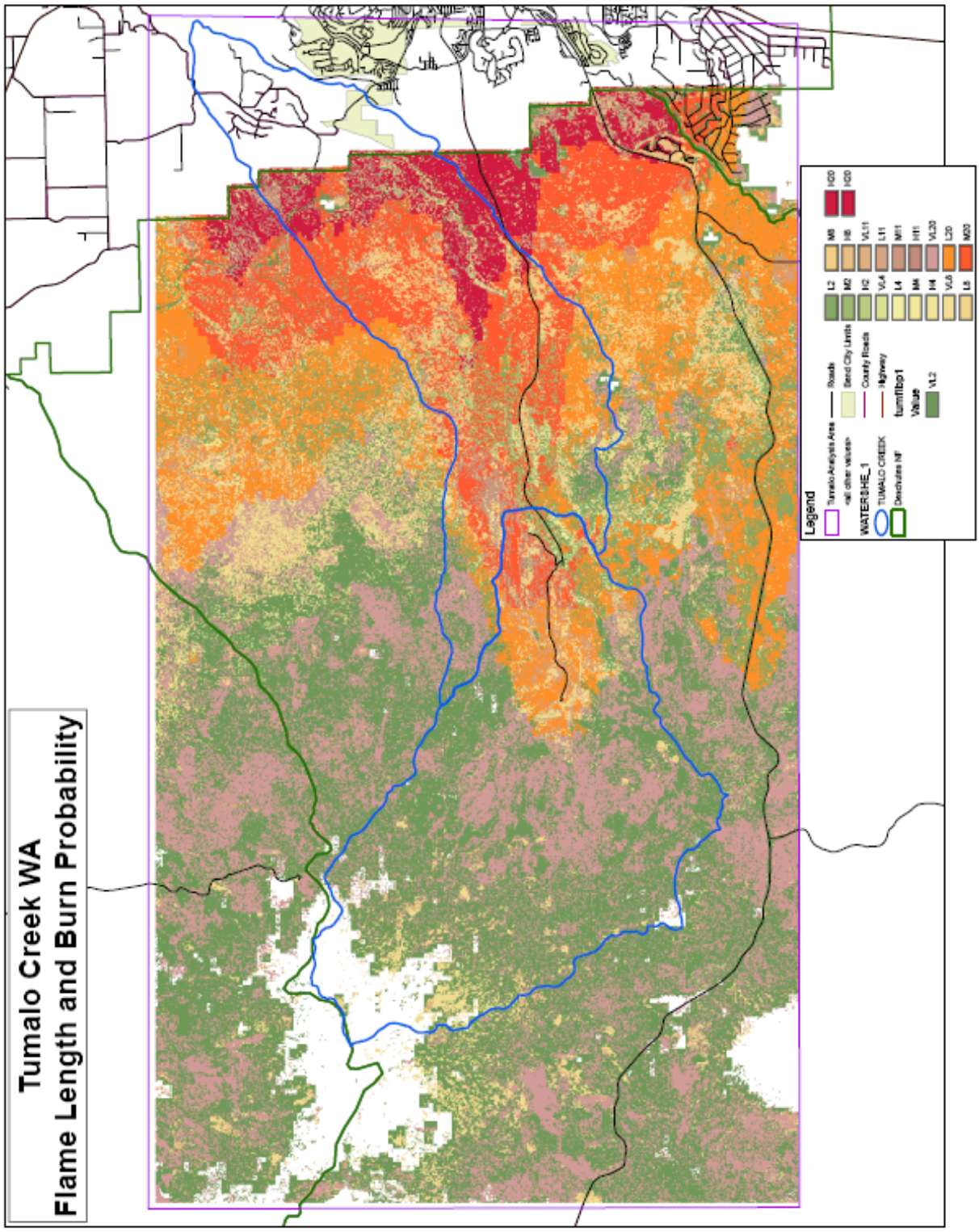

Exhibit 10. Flame length and burn probability

Chapter III, IV-53. Paragraph 3. **Communication: – Delete**. Replace text with "Fires in the Tumalo Watershed should be reported to Central Oregon Interagency Dispatch 416-6800."

Chapter III, IV-53. Paragraph 7. **References:** Add: Greater Bend Community Wildfire Protection Plan, 2006, and Interagency Fire Regime Condition Class Guidebook, 2005, version 1.2.

RECREATION

HISTORIC CONDITION

Wilderness Landscape Area

Chapter III, IV-54. Paragraph 1. Deschutes National Forest established in 1905, not 1906.

Bridge Creek Watershed Landscape Area

Chapter III, IV-55. Add a 4th sentence: "Specific recreation restrictions went into effect in 1990."

CURRENT CONDITION

Wilderness Landscape Area

Chapter III, IV-56. Paragraph 1. 4th sentence: "Use within the Wilderness has doubled from **1992 to 2002**…"

Chapter III, IV-56. Paragraph 2. Last sentence: NOTE: Needs assessment in FY1999 was not done.

Chapter III, IV-56. Paragraph 3. Last sentence: NOTE: Assessments not done although revitalized with the recent Sisters District fires.

Cold Forest/Unroaded Landscape Area

Chapter III, IV-56. Paragraph 1. After 4th sentence, add: "Tumalo Creek (North Fork) is now mandatory uphill only to bikes."

Bridge Watershed Landscape Area

Chapter III, IV-57. Paragraph 1. Replace last sentence with: "In the last 5 years, drainage has been improved."

Front Country/Transition Landscape Area

Chapter III, IV-57. Paragraph 1. The Tumalo Falls Trailhead, including the parking lot, has been reconstructed and a new toilet was installed."

Chapter III, IV-58. Paragraph 1. Replace last sentence with: "**Reconstruction** would be required to bring it to an acceptable standard."

Dry Forest

Trail Conditions

Chapter III, IV-58. Paragraph 1. Add as first sentence: "The Metolius-Windigo horse trail to the Three Creeks Lake area was done in 2003 which moved the trail off of Road 370."

Erosion Processes

Chapter III, IV-58. Paragraph 2. Add at the end of the paragraph: "There are concerns for the area just above Tumalo Falls for ¼ mile where high use and bank erosion have occurred on the trail. A change in the course of the creek has added to the problem.

Human Impacts

Chapter III, IV-59. Paragraph 1. Add at the end: "Significant increase in OHV use has occurred on and off roads in the area. Illegal OHV use occurring on trails, primarily off the 370 road."

THREATENED, ENDANGERED, and SENSITIVE PLANTS, SURVEY AND MANAGE PLANTS, and INVASIVE PLANTS

There was no information about botanical resources in the 1998 Bend Watershed Analysis; therefore, what follows is the state of Threatened, Endangered, and Sensitive plants, Survey and Manage plants, and invasive plants in the watershed in 2007.

Existing Distribution

No Threatened or Endangered plant species, or their habitats, are known to occur within the Bend watershed. There is one Regional Forester's Sensitive plant species within the watershed, described in this document.

A relatively small portion of the Bend watershed has been surveyed for Threatened, Endangered, and Sensitive plants (TES Plants). Surveys for these plants have covered about 10-20% of the watershed, including the Tumalo Creek floodplain.

The following Sensitive species is known within the watershed boundary:

Newberry Gentian (*Gentiana newberryi)*
The Tumalo Creek watershed contains excellent habitat for this species; thirteen populations have been found in the western half of the watershed.

Habitat is found in moist meadows or adjacent to streams and rivers above 4,700 feet. It is likely that more sites are present but have not yet been found, due to the fragmented nature of surveys in the area.

POTENTIAL HABITAT

Potential habitat exists for the following Sensitive plant species; although to date there are no known sites for them within the watershed:

Tall Agoseri (*Agoseris elata*)

Nonforest and openings in ponderosa pine and, rarely, lodgepole pine. Dry edges of moist ecotones adjacent to moist meadows, lakes, stream courses, riverbanks. Nearest known occurrences are on the Sisters Ranger District. Low probability.

Shasta Arnica (*Arnica viscosa*)

Its habitat is alpine or subalpine rocky sites, relatively steep scree and talus slopes above or at treeline, elevation 6,500 feet to 9,200 feet. There are isolated areas of potential habitat in the western quarter of the watershed area.

A population containing several hundred plants exists several miles to the west of the watershed. It is the only known population of this sensitive species, although few surveys have been conducted with the intent of locating more.

Its range extends from Central Oregon to northern California, where it is considered uncommon. Moderate probability.

Gorman's Aster (*Aster gormannii*)

Endemic to Oregon, in nonforest and forest openings, subalpine and alpine, dry exposures, and open rocky slopes. Known from the west side and crest of the Cascade Mountains between 4,000 feet and 6,500 feet. Low probability.

Pumice Grape-fern (*Botrychium pumicola*)

This Central Oregon endemic is known from alpine and montane habitats. It occurs in the pumice soils of lodgepole pine openings and frost pockets, and also at elevations as high as 9,100 feet.

Potential habitat is present in the western fringe of the analysis area but extensive surveys have not been conducted; known sites lie less than a mile to the west. Within the lower-elevation, montane site type, there may be more sites that remain to be found, although in this elevation band there is little habitat present.

Brewer's Reedgrass (*Calamagrostis breweri*)

Moist-dry alpine and subalpine meadows, open slopes, streambanks, and lake margins between 4,600 feet and 6,000 feet. Has not been found on the Deschutes National Forest; nearest sites are west of the Cascade Mountains. Low probability.

Porcupine Sedge (*Carex hystericina*)

Found in wet to moist conditions in riparian zones, and in or along ditches/canals in prairies and wetlands within true fir/Douglas-fir/ponderosa pine forests and also in juniper woodlands at elevations between 3,400 feet to 4,300 feet. Known from a site on the Ochoco National Forest, but not found to date on the Deschutes National Forest. Low probability.

Slender Sedge (*Carex lasiocarpa* var. *americana*)

Known from sites elsewhere on the Bend/Ft. Rock Ranger District, and also from Big Marsh on the Crescent Ranger District. Low probability.

Pale Sedge (*Carex livida*)

Sites with water tables above ground level for the majority of the growing season, peatlands. Known sites are between 2,000 feet and 8,000 feet. Moderate probability.

Green-tinged Paintbrush (*Castilleja chlorotica*)

Many sites for this Central Oregon endemic have been discovered on the Bend/Ft. Rock Ranger District, the closest being about one mile south of the watershed. Typical habitat includes open areas and forested openings in ponderosa pine, lodgepole pine, and mixed conifers, in rocky soils, often with sagebrush or bitterbrush. It has been found at elevations between 4,200 feet and 8,200 feet, although locally the majority of populations have been limited to an elevation band of 4,200 feet to 4,800 feet, in association with bitterbrush. The exceptions locally are two small sites that have been found at elevations of 5,300 and 5,900 feet. Low probability.

Silverskin Lichen (*Dermatocarpon luridum*)

Rocks or bedrock in streams, rivers, or seeps, usually submerged or inundated for most of the year. Associated with Alnus rubra, Pseudotsuga menziesii, Tsuga heterophylla, Acer spp., subalpine or alpine meadow vegetation. Low probability.

Peck's Milkvetch (*Astragalus peckii*)
Most commonly found in shrub-steppe plant associations, but has also been reported from common juniper woodlands, ponderosa pine forest edge and lodgepole pine forest openings. It grows in loose, deep pumice, loamy sand, or sandy soils with flat to gentle slopes. It has often been found in or along dry watercourses, old lakebeds (basins), pumice flats and other natural openings. Most of its preferred habitat lies just outside the watershed, to the northeast. Low probability.

Skin Lichen (*Leptogium cyanescens*)

On trees in humid forests; widely scattered. On mossy trees and rocks or directly on rock when near water. Considered riparian through 2001. Recently documented in upland settings on vine maple, big leaf maple, and in moss on white oak. Associated with Western Hemlock and Pacific Silver Fir Zones in mixed conifer stands, mature big leaf maple and Douglas-fir stands, maple and willow thickets. Low probability.

Water Lobelia (*Lobelia dortmanna*)

In shallow water, up to a depth of 2 meters, at the margins of lakes and ponds. Known mainly from low elevations, but found on the Sisters Ranger District at an elevation of 3,500 feet, which is the only known site in Oregon. Low probability.

Inundated Club-moss (*Lycopodiella inundata*)

Deflation areas in coastal back-dunes; montane bogs, including sphagnum bogs; less often, wet meadows. Known on Deschutes National Forest from the Crescent Ranger District. There may be habitat present at small, high-elevation sites. Moderate probability.

Ground Cedar (*Lycopodium complanatum)*

There are no known sites of this species within the watershed, although a similar species exists in a meadow near Highway 46. It has not been found elsewhere on the Deschutes National Forest.

Potential habitat occurs at the edges of wet meadows within coniferous forest; it has also been found on dry, forested midslopes with low canopy cover. Within the watershed, it may occur elsewhere but its narrow habitat preference may be limiting. Moderate probability.

Adders-tongue (*Ophioglossum pusillum*)

Moist to wet meadows among low shrubs, sedges, and grape-ferns. Found at elevations between 5 feet and 5,000 feet. This species has not been found on the Deschutes National Forest. Low probability.

Fungus (*Ramaria amyloidea*)
Coral-like fungus on moist humus or wood, or under duff. May favor hemlock. Fall species. Associated with Abies spp., Pseudotsuga menziesii and Tsuga heterophylla. There is a known site on the Crescent Ranger District. Moderate probability.

***Rhizomnium nudum* (Moss)**

Its habitat is coniferous forests that include silver fir, western hemlock, mountain hemlock, western red cedar and Engelmann spruce; on the Deschutes National Forest sites (three sites near the Cascade Lakes highway corridor zone), lodgepole pine, Engelmann spruce, mountain hemlock, and western white pine are the primary forest trees. It occurs on humus or mineral soil in seepages, vernally wet depressions or intermittently wet, low-gradient channels. Exposure varies from full sun to full shade. There are likely sites yet to be found within the watershed.

Scheuchzeria (*Scheuchzeria palustris* ssp. *americana*)

Potential habitat is open-canopied bogs, fens, and other wetlands where it is often in shallow water. It is primarily known from west of the Cascade Mountains. This species is known on the Deschutes National Forest from one site near Little Cultus Lake. Moderate probability.

Luminous Moss (***Schistostega pennata)***

On mineral soil in damp caves and crevices and on the soil-bearing root masses of fallen trees. Often near streams or other wet areas. Requires humid, heavily shaded microsites. Most commonly found within silver fir plant series but also common in western hemlock and mountain hemlock series. Also in lodgepole pine stands near water. Stands are typically late seral or old growth. Known sites on the Crescent Ranger District. Moderate probability.

Water Clubrush (*Scirpus subterminalis*)

Generally submerged to emergent in quiet water 2-8 decimeters deep, in peatlands, sedge fens, creeks, ditches, ponds and lakes. Known from the Crescent Ranger District in Big Marsh. Low probability.

Marginate Splashzone Moss (*Scouleria marginata*)

Often forming dark mats on exposed to shaded rocks in streams; seasonally submerged or emergent. Moderate probability.

THREATS TO SENSITIVE PLANT HABITAT QUALITY

The following factors have affected or may affect sensitive plant habitat quality in the watershed:

Driving over it/digging: One of the Newberry's Gentian sites within the watershed lies in a site within the wilderness where someone has been driving into the meadow and digging up small lodgepole trees, presumably for resale to nurseries. This illegal activity is imperiling the plants at this site.

Foot, horse, or bike traffic, or dispersed camping: Elsewhere in the watershed, where as-yet unsurveyed habitat may exist, these activities could be negatively impacting habitat quality for Newberry's Gentian. These same types of activities could also impact the habitat quality for the known Peck's Milkvetch population.

Invasive Plant Species Encroachment: No noxious weeds are known to be in close association with sensitive plant populations in the watershed at this time. However, noxious weeds are present in the watershed and more are found there every year. This trend could eventually threaten sensitive plant habitat and sites, and especially, overall native plant species diversity.

Fire Suppression: Over time, since the era of fire suppression began, the size and number of forest openings has been reduced in the lower portions of the watershed. Openings create important islands for plant diversity and habitat for sensitive species as well. Encroachment of meadows by lodgepole pine is an example of this situation, whereby competition and shading from trees reduce opportunities for native and sensitive plants to flourish.

SURVEY AND MANAGE PLANTS

There is one known Survey and Manage plant species known in the watershed. Surveys have been done in the Bridge Creek and Tumalo Creek floodplain areas, and three populations of *Tritomaria exsectiformis* were found.

While there are no other known Survey and Manage plant species known in the Bend watershed, this is due more to the lack of surveys there than anything else.

The following Survey and Manage plant species where surveys are required may have habitat within the watershed:

Species by Group	**Brief Habitat Description**
Vascular Plants	
Botrychium minganense	Riparian corridor; Engelmann spruce/lodgepole

Botrychium montanum	Wet lodgepole openings; often with
B. minganense	
Cypripedium montanum	Not well defined; in second growth and roadside cut banks in ponderosa pine and mixed conifer

Mosses

Tetraphis geniculata	Large rotten stumps/logs in shaded humid sites

Fungi

Bridgeoporous nobilissimus	Conk on large dead noble firs

Liverworts

Marsupella emarginata var. *aquatica*	Submerged in cold perennial fast-flowing streams
Tritomaria exsectiformis	Damp rotten logs in seeps, springs

INVASIVE PLANTS

By far, the majority of invasive plants within the watershed occur within the Tumalo Creek floodplain. Of special concern is the proliferation of spotted knapweed (*Centaurea maculosa***)**, but Canada thistle (*Circium arvense*) occurs there also. The conduit is Skyliner Road, which leads from Bend, where the knapweed populations are legion. There are sites within the riparian zone throughout the length of the floodplain, as well as along the roadside there. There are also sites higher, adjacent to Bridge Creek at the outflow building and near the caretaker's residence. The sites along the road that occur more than 100' from the creek through Tumalo floodplain are being treated with herbicides, and the remainder are being hand-pulled. Biological control agents (insects that are a plant species' natural enemies) have been released on two Canada thistle sites within the floodplain. The sites along Skyliner are being controlled with herbicides, where they lie adjacent to Forest Service land; there are sites on Skyliner that remain untreated because they occur adjacent to private land.

There are many other invasive plant species that could invade the watershed, such as diffuse knapweed (*Centaurea diffusa*) and yellow starthistle (*Centaurea solstitialis*). Increased weed infestations in the watershed can be expected with increasing recreational use and existing disturbed sites.

CHAPTER V

TRENDS AND INTERPRETATION

Tumalo Creek Watershed Analysis
Chapter V - Trends and Interpretation

Front Country/Transition Landscape Area

Chapter V-5. Trend #1. Trail construction, re-routes and use restrictions within this landscape area have addressed soils and hydrology resource concerns associated with tread erosion, concentrated water flow and sediment contribution to streams.

Chapter V-5. Trend #3. Change trend rating from moderate to moderately-high.

Chapter V-7, Trend #5. This trend was deleted as the stream restoration project implemented 2004-2007 addressed the issues described.

Chapter V-8, Trends #7, #8. These trends were deleted because the Columbia Southern Canal is no longer used. The new diversion at river mile 3 is screened, limiting the capture of fish into the canal system. There is still the possibility of the canal being used for emergencies, resulting in short term fish passage issues.

Add: Increasing trend of OHV use, including illegal use on trails.

Dry Forest Landscape Area

Chapter V-9, Trend #1. This trend was deleted because the Columbia Southern Canal is no longer used and flow modification has been deleted as a water quality parameter by the ODEQ.

Cold Forest/Unroaded Landscape Area

Chapter V pp. 2-3. Trend #3. The road surface of road 370 has had some improvements made since 1998, including small culvert crossings of some intermittent channels and spot surface improvements. The ford of the middle fork of Tumalo creek remains a seasonal source of sediment.

Add: Increasing trend of OHV use, including illegal use on trails.

Bridge Watershed Landscape Area

Chapter V-3,4. **Trend #1.** Replace state DEQ with "Oregon Drinking Water Program". Under **Cause** replace "high biological and chemical…" with "exceptional biological and chemical…". Under **Rationale for Rating** replace 98% with 99%. Replace state DEQ with Oregon Drinking Water Program. Add "usually" to the statement of not drawing water from Bridge Creek when NTU's exceed 2.5.

Front Country/Transition Landscape Area

Chapter V-5. **Trend #1**. Trail construction, re-routes and use restrictions within this landscape area have addressed soils and hydrology resource concerns associated with tread erosion, concentrated water flow and sediment contribution to streams.

Chapter V-7. **Trend #5.** Delete this trend as channel restoration was completed in 2004-2006.

Chapter V-8. **Trend #6.** Under **Rationale for Rating**, last sentence, note that the Crown Land Exchange did occur.

Chapter V-8. **Trends #7 and #8.** Delete these trends as canal not in use.

Chapter V-9. **Add:Trend #10**. Tumalo Creek is included on the 2004-2006 Oregon Department of Environmental Quality 303(d) list of water quality impaired waterbodies for the parameter of water temperature.

Cause: The stream was added to the 303(d) list despite relatively cold water temperatures. However, these temperatures do not meet bull trout requirements. Although no bull trout have ever been documented in Tumalo Creek, they are suspected to have once occupied the stream.

Resources Affected: Fisheries

Trend Rating: Low

Rationale for Rating: No bull trout occupy the stream. Nearest bull trout population is over 20 miles downriver and there are downriver migrational barriers, warm temperatures, and flow diversions to overcome for upstream migration into Tumalo Creek.

Dry Forest Landscape Area

Chapter V-9. **Trend #1.** Delete reference to flow modification and replace with water temperature. See Trend 10 above under Front Country Transition Landscape Area.

Chapter V-10. **Trend #3**. Increase Trend Rating to high from moderate. The Greater Bend CWPP was completed in 2006.

Table 21 was not edited as it is just a summary of information found under Trends.

ECOLOGICAL INTEGRITY RATINGS

Front Country/Transition Landscape Area

Chapter V-12. Under Responsible Conditions, delete reference to Tumalo Creek. Add "Mountain pine beetle infestation has decreased forest health, added fuel loading, and has affected wildlife habitat in NRF, LOS, and OGMA".

Private/Dry Forest Landscape Area

Chapter V-12. **Responsible Conditions:** Delete reference to dewatered Tumalo Creek.

Dry Forest Landscape Area

Chapter V-12. **Responsible Conditions:** Delete reference to decreased flow in Tumalo Creek.

ECOSYSTEM CONDITIONS

Front Country/Transition Landscape Area

Chapter V-15. Under **Current Condition,** delete references to unstable Tumalo Creek and adverse effects from the Columbia Southern Canal. Add reference to Tumalo Creek on DEQ 303(d) list for water temperatures. Add "Mountain pine beetle infestation ahs increased since 1998". Under **Desired Condition,** note that Tumalo Creek within the Bridge Creek Fire was restored, and the canal is no longer used. Under Trends, delete references to instability in Tumalo Creek. Add "Lodgepole pine mortality increasing because of mountain pine beetle infestation".

Private/Dry Forest Landscape Area

Chapter V-17. Under **Desired Conditions**, Tumalo Creek has been removed from DEQ 303(d) list for flow modification but added to list for water temperatures.

CHAPTER VI

MANAGEMENT RECOMMENDATIONS
DATA GAPS AND ANALYSIS LIMITATIONS
MONITORING
AQUATIC CONSERVATION STRATEGY

TUMALO CREEK WATERSHED ANALYSIS
CHAPTER VI – Management Recommendations, Data Gaps, Analysis Limitations, Monitoring, and Aquatic Conservation Strategy

Front Country/Transition Landscape Area

Chapter VI-2. Changes to trends found below:

Trend #1. Completed
Trend #2. No longer applicable.
Trends #3, #4. Mrazek Trail connected Shevlin Park to Skyliner area. Skyliner Trail connected the Skyliner area to the Phil's Trail system.
Trend #5. Over 2,000 Engelmann spruce have been planted in the Bridge Creek Fire area near Tumalo Creek.
Trend #8. While this area is still used for winter recreation, a new play area is being constructed near Mt. Bachelor (Wanoga).
Trend #10. Completed
Trend #11. Day use only allowed along Road 4603 and Tumalo Creek.
Trend #12. No longer applicable.
Add: Implement strategy from the Greater Bend CWPP.

Dry Forest Landscape Area

Chapter VI-3. **Trend #3.** Delete.

DATA GAPS AND ANALYSIS LIMITATIONS

Chapter VI-3. Delete reference to highly disturbed Tumalo Creek as the channel has been restored.

MONITORING

Chapter VI-4. North Fork trail uphill only for mountain bikes. South Fork trail has been relocated in some areas.

AQUATIC CONSERVATION STRATEGY

INTRODUCTION

Chapter VI-4. No changes proposed for the Aquatic Conservation Strategy.
Chapter VI-4. Paragraph 2. Forks and Bridge subwatersheds now combined as Upper Tumalo subwatershed.

Fire/Fuels Management

Chapter VI-6. Fire management strategy for Riparian Reserves has **not** yet been developed.

RECOMMENDED RIPARIAN RESERVE WIDTHS

Chapter VI-7. Paragraph 3. The acreage totals for Riparian Reserves have changed, due to changes in analysis area boundary. Total Riparian Reserves within the 5th field watershed is now 5,415 acres.

REFERENCES

Additional References to add to the original analysis (1998) are found below:

Finney, Mark A., An Overview of FlamMap Fire Modeling Capabilities, 2006. In: Andrews, Patricia L.; Butler, Bret W., comps. 2006. Fuels Management-How to Measure Success: Conference Proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Greater Bend Community Wildfire Protection Plan. 2006. Prepared by Kate Lighthall, Project Wildfire. Bend, OR

Hopkins. 198?. Vegetation mapping on the Deschutes N.F.

Interagency Fire Regime Condition Class Guidebook. 2005. version 1.2.

Upper Deschutes Basin Fire Learning Network Technical Team. 2007. Historical Fire Regimes, Natural Range of Variability and Fire Regime Condition Class (FRCC) Mapping Methodology.

APPENDICES

Exhibit 11 – Tumalo Creek Watershed Analysis

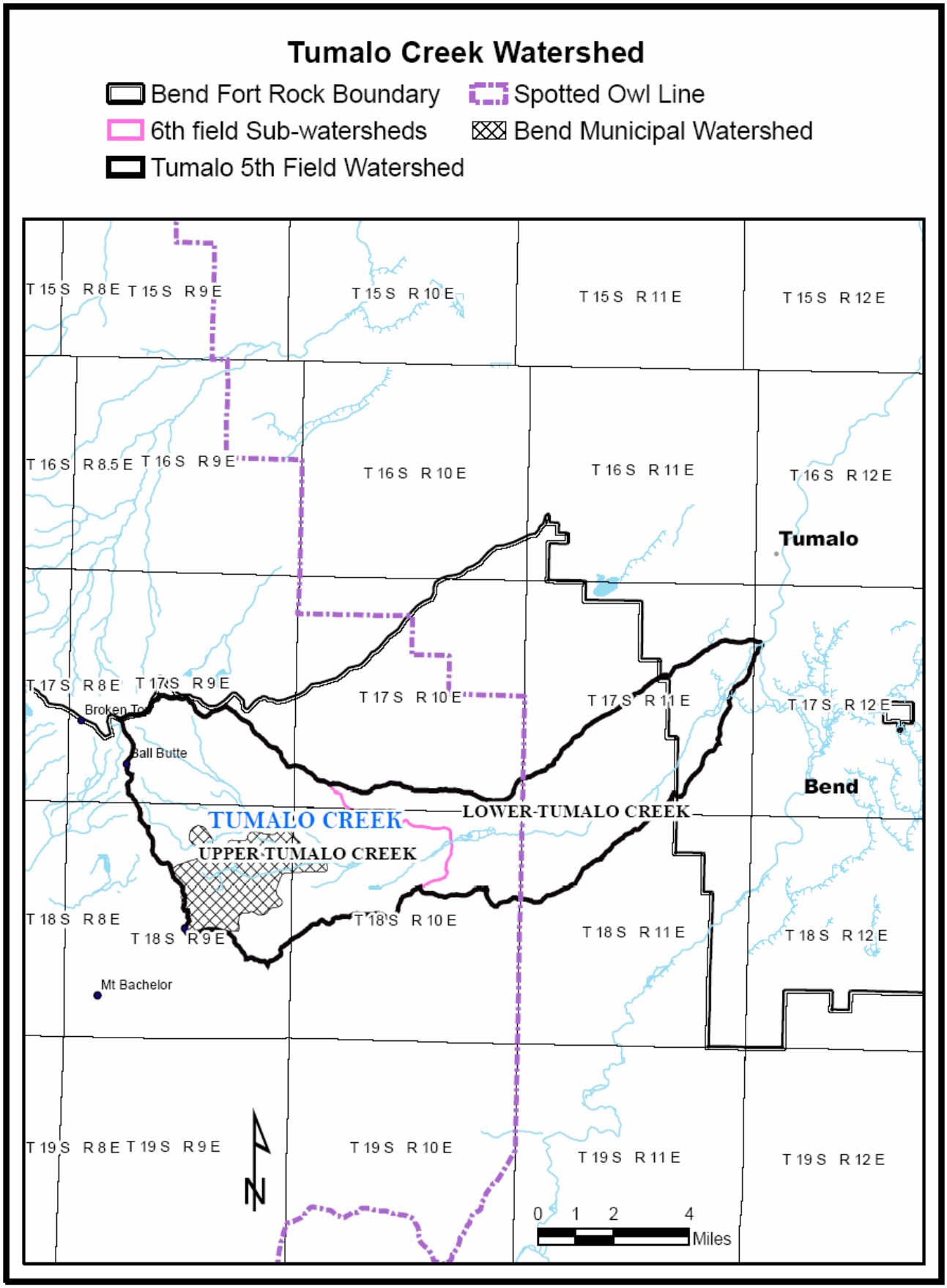

Exhibit 12 – Tumalo Creek Watershed – 1998 Landscape Areas and Boundary

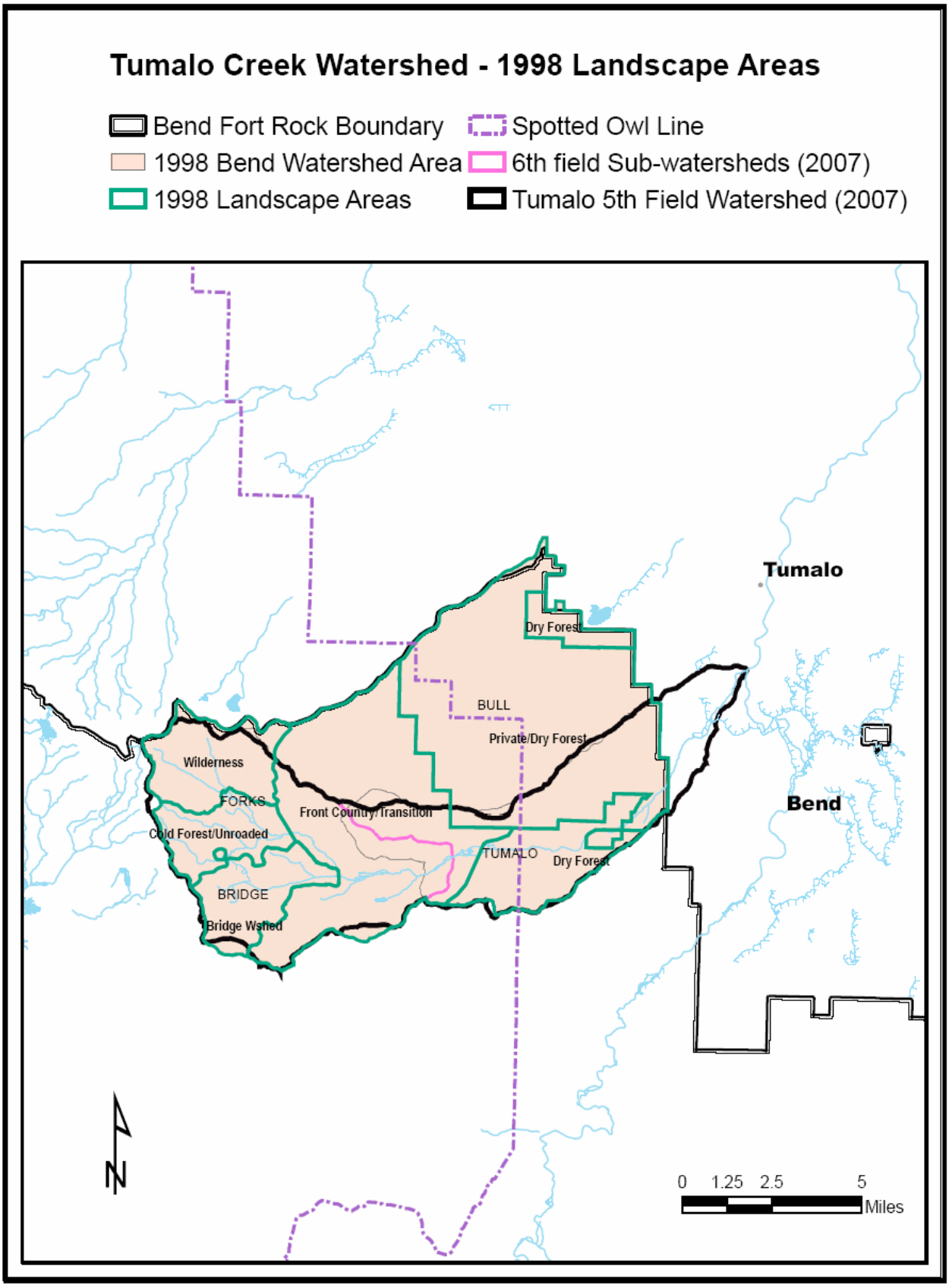

Exhibit 13 – Tumalo Creek Watershed Ownership

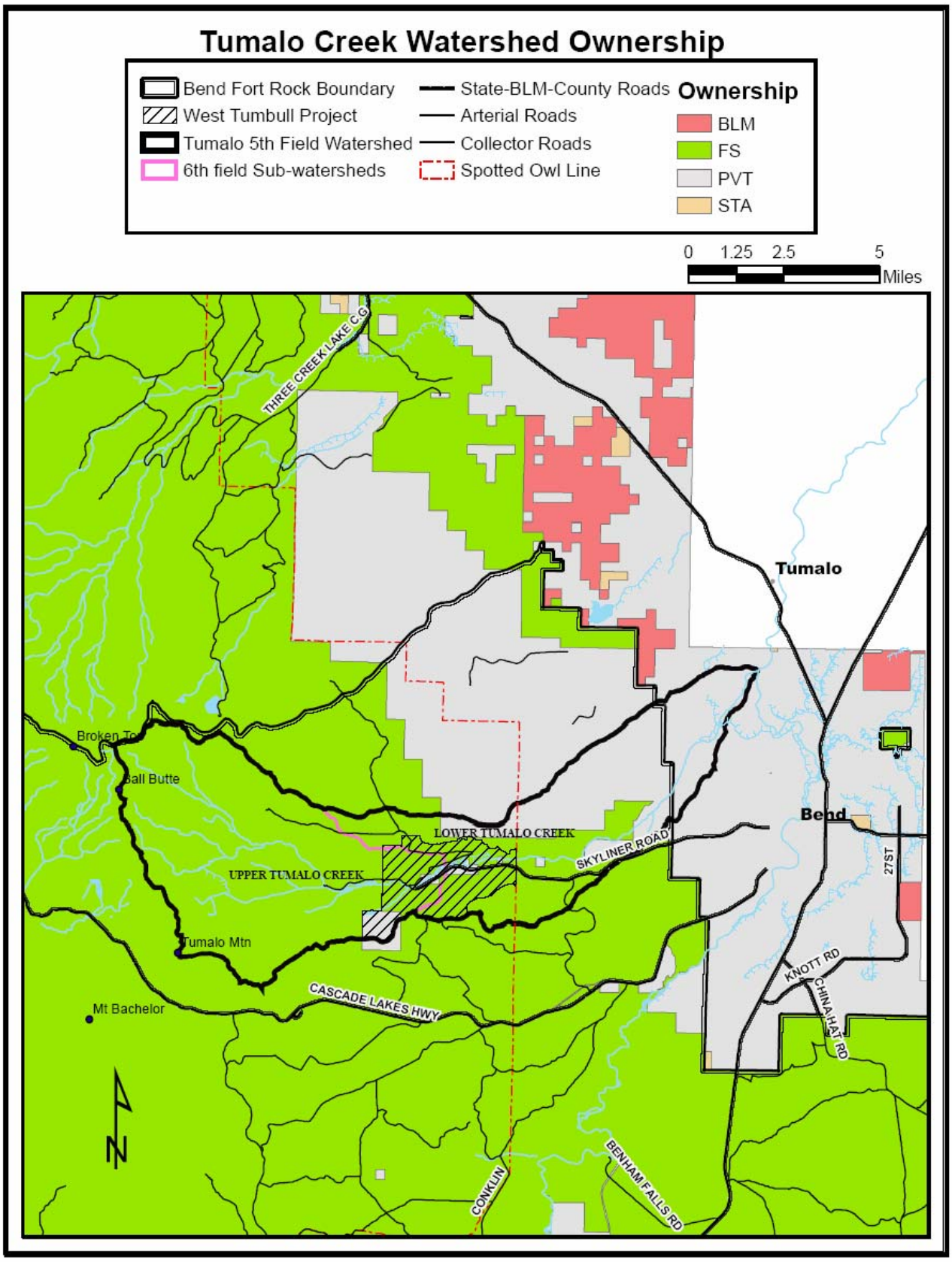

Exhibit 14 – Tumalo Creek Watershed Forest Plan Land Allocations

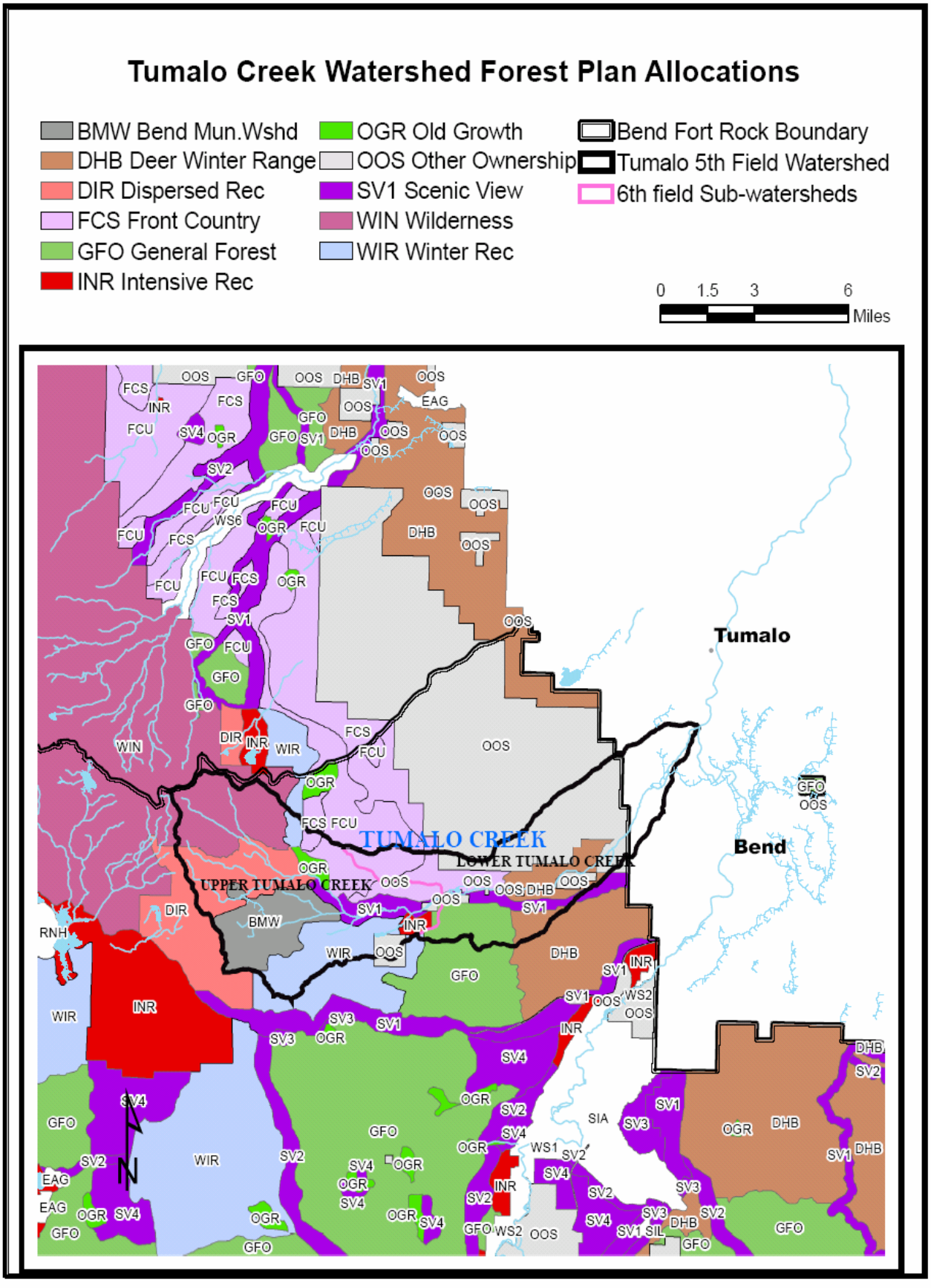

Exhibit 15 – Tumalo Creek Watershed NWFP Land Allocations

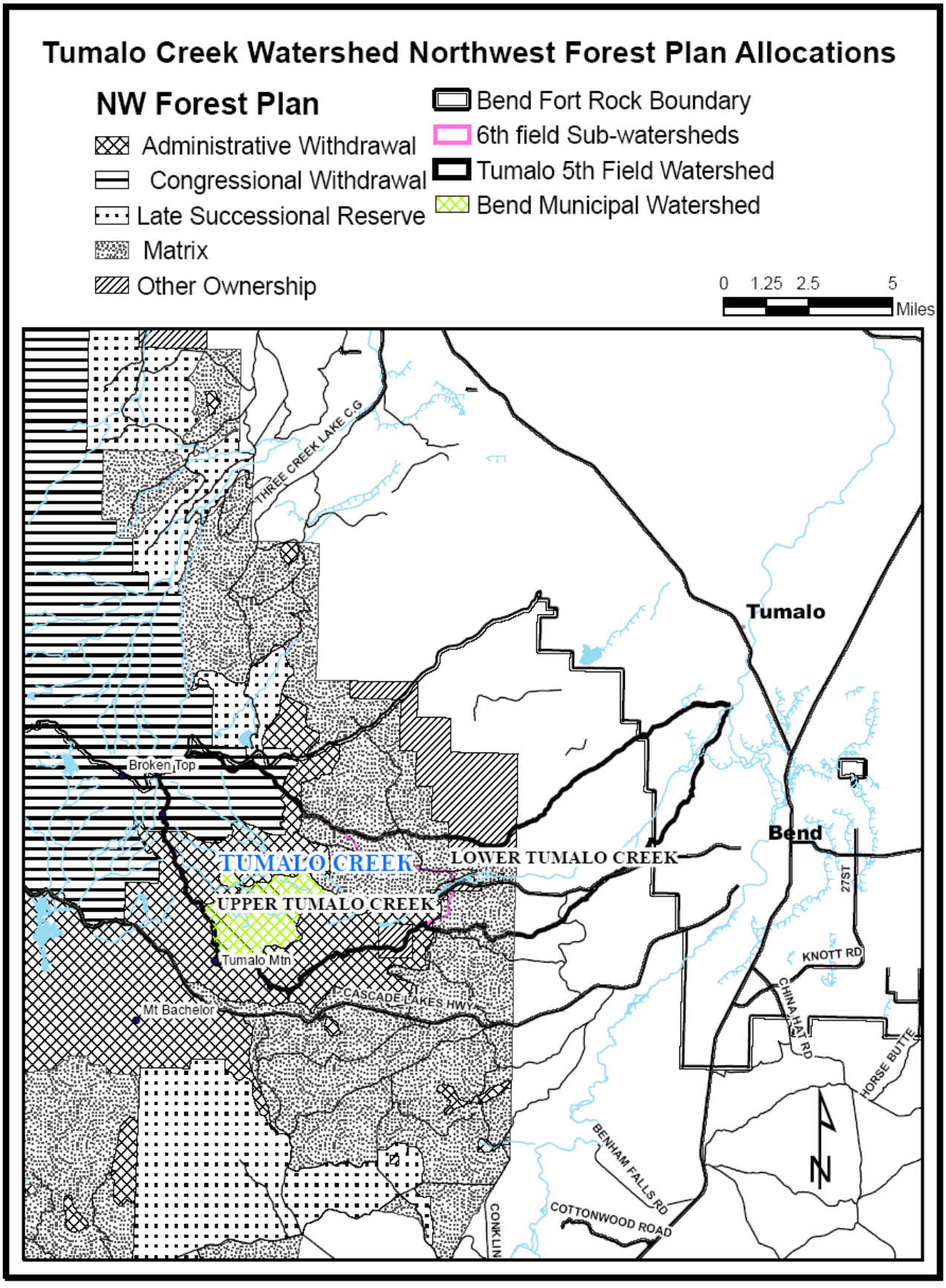

Exhibit 16 – Tumalo Creek Watershed Plant Association Groups

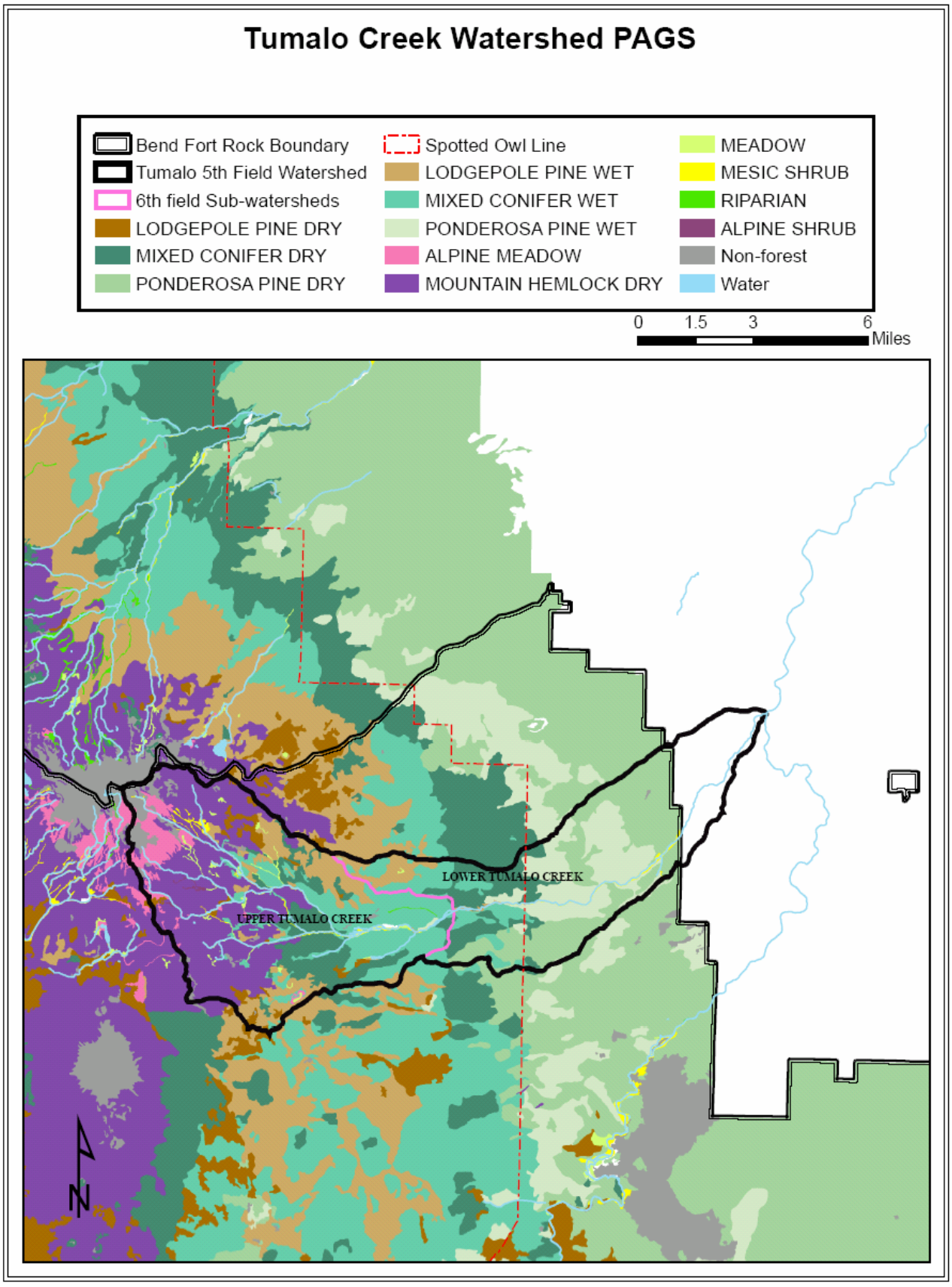

Exhibit 17 – Tumalo Creek Watershed Fire History

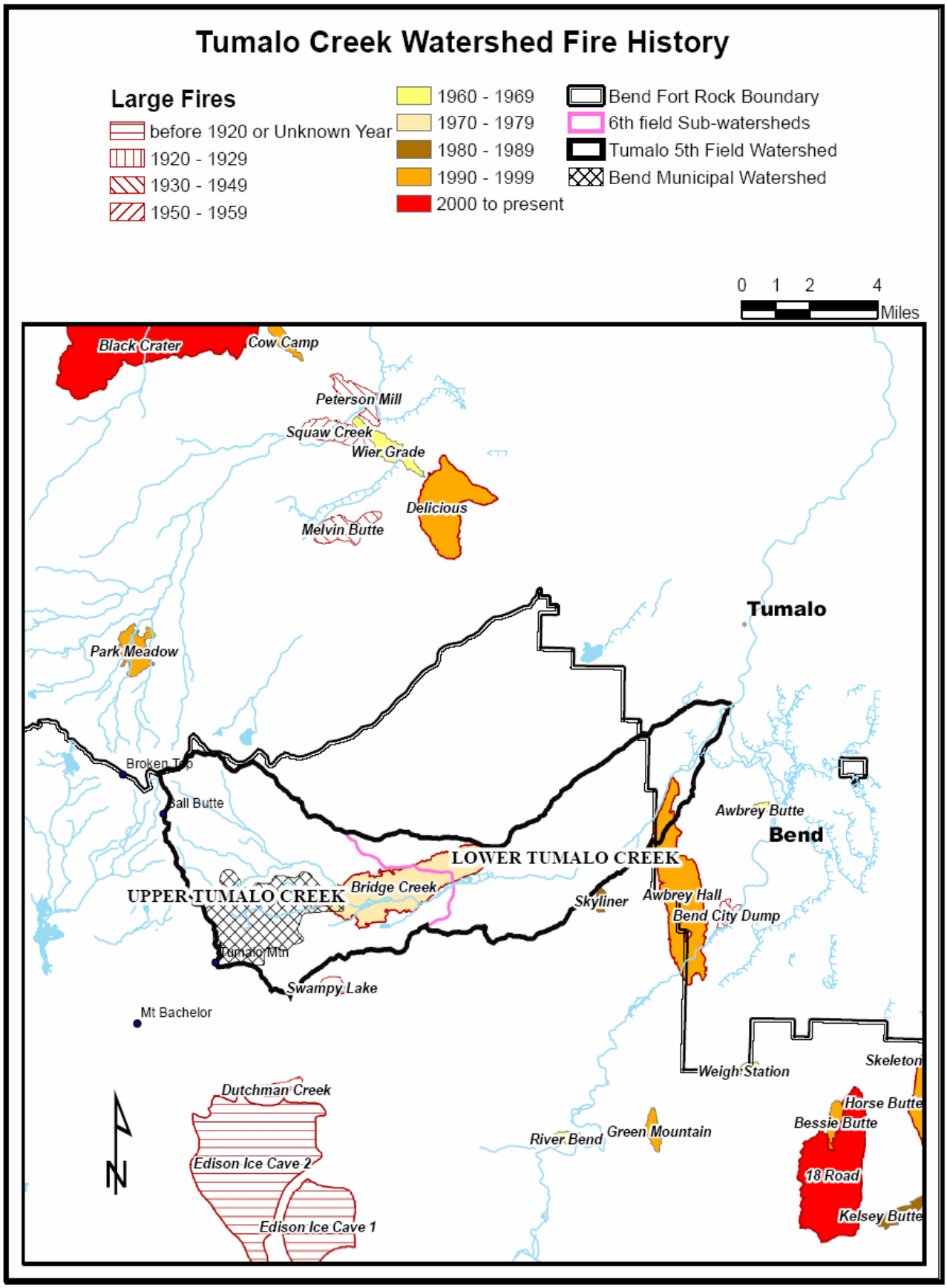

Exhibit 18 – Tumalo Creek Watershed Analysis Insect and Disease

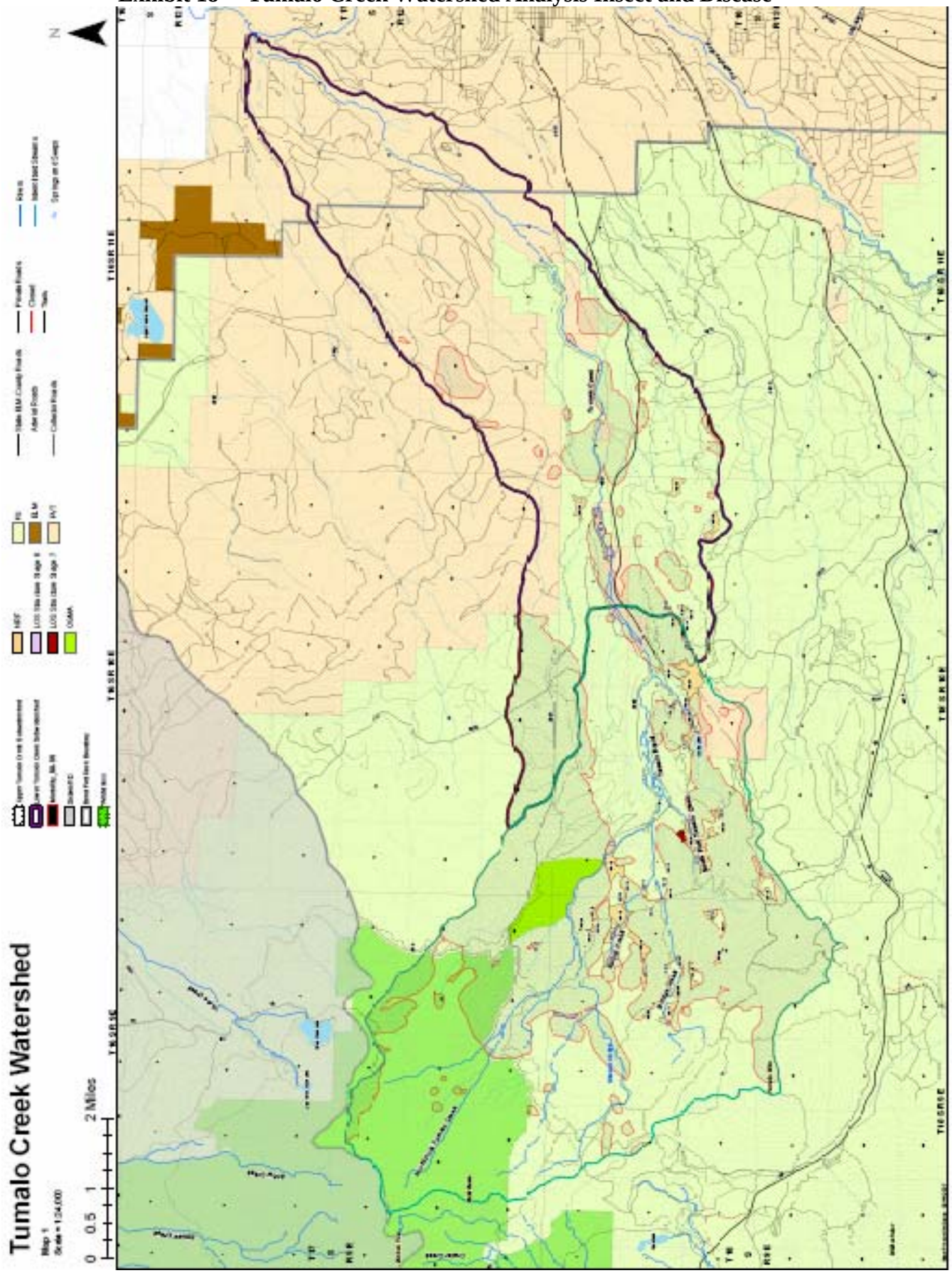

Exhibit 19 – Tumalo Creek Watershed Stand Structure