Initial Assessment: Year 2001 Wildfire Situation in the Western United States

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Executive Summary

Reducing the treat of wildfire in the wildland-rural/urban interface and preparing communities to effectively withstand fires is a widely recognized need. Much media attention in the past has focused on forest fires burning in and around our National Forests. However, to create policies and programs for reducing wildfire risk, policy makers need objective information on the distribution of wildfires by ownership and vegetation type. With this information, policy makers can determine whether large-scale actions across federal lands or efforts localized around at-risk communities would be most effective at reducing the losses associated with wildland fire.

In this study, we document the condition of the landscapes burned in wildfires in the western United States. This information can be critical to the development of national policies related to management of wildfires. This assessment is the second in a series of assessments by Pacific Biodiversity Institute of the ownership, current condition and landscape history of areas burned by wildfires in the United States.

This study provides insight into the following questions:

- How does this wildfire season compare to the past?
- Are most of the wildfires in the western United States burning in our National Forests – or are other ownerships involved?
- Are wildfires usually synonymous with forest fires – or are other vegetation types commonly involved?
- Where wildfires burn through forests, what is the natural fire regime of these forests?
- What role does past land management activity play in fire spread and severity?
- Are the National Forest lands that are burning suitable for intensive forest management activities?
- Where are most of the homes threatened by wildfires located?

The results of our nationwide analysis demonstrate that wildfires this year have burned a total area that is slightly less than the average over the last ten years. This year's fires have burned less than half of the area burned last year at this time and only one fifth of the average for the last century.

As of August 27, 2001 only 14.3 percent of the land burned nationwide is in National Forests. Only 13.4 percent of the total number of fires started on National Forest land. The vast majority of fires have started and burned on tribal, private and state lands. Significant wildfire burn area is also found on Bureau of Land Management (BLM) land.

Our analysis of federal wildfire statistics indicates that this year is not atypical. Over the last five years, only 14.2 percent of the nationwide burn area at this time in the summer was on National Forest land. Over the period from 1997 to 2000, only 18.7 percent of the nationwide burn area was on National Forest land at years-end. For two years in a row (1997 and 1998) the year-end burn area on National Forest land was less than ten percent of the nationwide total.

These simple statistics suggest that the current political focus on reducing risk from wildfires through changes in National Forest management may be somewhat misplaced when the vast majority of the fires are occurring on other ownerships. National policies and priorities need to address the reality of where wildfires actually occur.

In addition to an analysis of nationwide wildfire statistics, we analyzed fourteen of the largest and most significant fires in detail and conducted a preliminary analysis of seven additional large fires. The fires we studied included:

Fire Name	Area (acres)	State	Type of Analysis
Lakeview Complex	127,000	Oregon	Detailed
Buffalo Complex	91,000	Nevada	Detailed
Virginia Lake Complex	79,723	Washington	Detailed
Spaulding	75,137	Nevada	Detailed
Observation	67,700	California	Detailed
Sheepshead	51,452	Oregon	Detailed
Rex Creek Complex	47,843	Washington	Detailed
Elk Mountain Complex	26,800	South Dakota/Wyoming	Detailed
Trough	24,970	California	Detailed
Thirtymile	9,300	Washington	Detailed
Icicle Complex	7,697	Washington	Detailed
Quartz	6,170	Oregon	Detailed
Green Knoll	4,470	Wyoming	Detailed
Libby South	3,830	Washington	Detailed
Sheep	82,000	Nevada	Preliminary
Jackie's Butte	73,450	Oregon	Preliminary
Clear Creek	53,097	Nevada	Preliminary
Upper Willow	41,830	Nevada	Preliminary
Fort Ranch	40,000	Utah	Preliminary
Blue Complex	37,950	California	Preliminary
Stag	20,000	Nevada	Preliminary

All of the largest fires (over 50,000 acres in size) have burned primarily on BLM, tribal and private land. These fires burned primarily in grasslands, shrublands, or other non-forested areas. The majority of the smaller fires we studied burned primarily on National Forest land, but a significant portion of the area burned in most of these smaller fires was not forested. Our detailed analysis of twelve major fires indicates that one structure was lost in a grassland fire, 54

structures were lost in fires burning in shrublands, open woodlands and open forests; whereas fires in denser forest environments burned two structures.

As our study demonstrates, most wildfires do not burn in National Forests. Yet, national wildfire management policies put a primary focus on these very lands and often fail to adequately address the larger issue of fire on tribal, state and private lands. Wildfire management on tribal, state and private land is often more important to homeowners and rural communities than wildfire management on National Forest land. These lands often experience more wildfire activity than National Forest land and more homes and communities are located on or adjacent to this part of the landscape. On the federal portion of the landscape, more area usually burns on Bureau of Land Management land than on the National Forests. National policies and priorities need to address these realities.

The public, and even some wildfire experts, often tend to equate wildfires with forest fires. This common misconception is disproved by a more careful examination of the landscape conditions under which most wildfires burn. Our study demonstrated that most of the area burned this year in the western continental United States consisted of grasslands, shrublands and sparsely forested areas. Fire management and land management policies need to reflect this reality. A national fire policy that puts a major focus on thinning and prescribed burns in our National Forests will not address this main issue.

Wildfires are a natural process and serve an important, irreplaceable ecological function in many ecosystems. Fires burning in remote, high elevation forests (usually in National Forests or Parks) help maintain ecosystem function and diversity. In these remote, high elevation ecosystems, intensive management activities cannot effectively replace the role of fire.

This study and a similar study conducted by Pacific Biodiversity Institute last year both show many cases where intensive forest management activities promoted wildfire spread and severity. Studies by other scientists show similar results. Current evidence does not support the idea that activities resembling current logging practices will create fire-safe forests or fire-safe communities. Forest management activities such as prescribed burning and thinning may play an important role in improving forest stand condition and reducing wildfire risks in some situations, but considerably more research is needed to understand the complexities of fire behavior in forest ecosystems and how management activities can influence this behavior.

Most of the areas that have burned on National Forest lands in this year's wildfires are on steep slopes. Road building and intensive forest management activities would be close to impossible in much of this rugged terrain. Even if forest-thinning activities could reliably create more fire-safe forest stands, the cost would be immense in many of the areas that burned this year – due to the difficulty of building roads across cliffs, canyons and other steep and rugged terrain.

The majority of homes that were destroyed in this summer's wildfires were far removed from National Forest land. They burned in fires that also started far from the National Forests. Many of the homes were primarily surrounded by grassland, pastures, shrublands and other non-forest vegetation. The results of our initial assessment indicate that homeowners in all environments that may experience wildfire need to take actions to make their homes fire-safe. Reliance on federal programs directed toward changes in National Forest management would be a mistake.

The study points to four key recommendations:

- From a national policy perspective, much more emphasis needs to be placed on providing funding to tribal, state and local governments, as well as private individuals, to help create fire-safe communities. Traditionally, a majority of Congressional appropriations for wildfire prevention and suppression activities have been allocated to the US Forest Service. A sizeable portion of the most recent appropriation is targeted to support experimental forest thinning projects in fairly remote areas. Since most of the wildfire activity is not on National Forest land and most of the homes at risk are substantially removed from the National Forests, it is unlikely that channeling huge sums of money to the US Forest Service is the most cost effective method of reducing wildfire risk to communities in the western United States. We recommend that the federal government channel much of the massive federal funding devoted to wildfire preparation and prevention directly into local communities.

- The best way to effectively prepare for wildfire is to insure that individual homes and communities are prepared to prevent and then withstand a fire. Many people in the western United States live in high-hazard fire environments. In these situations, "the human-built environment becomes an important factor in predicting the loss of life and property. Untreated wood shake and shingle roofs, narrow roads, limited access, lack of fire-wise landscaping, inadequate water supplies and poorly planned subdivisions are examples of increased risk to people living with the threat of wildfire" (Pacific Northwest Wildfire Coordinating Group 2001). A series of simple, inexpensive actions can be taken to reduce wildfire risk – wherever wildfires burn – be it grasslands, deserts, suburbs or forests.

- For the homeowner, the first place to start in creating a fire-safe house is the roof – which is the most vulnerable part of the house. Roofs in fire country should be made of metal or some other class C or better fire resistant roofing. It is also important to enclose the undersides of balconies and aboveground decks with fire resistant materials. A variety of other simple construction considerations make the difference whether a home survives a wildfire. Creation of a defensible space around the home is also important. Homes in high-hazard fire environments should be surrounded by a buffer of at least 100 feet of relatively fuel free terrain (Pacific Northwest Wildfire Coordinating Group 2001).

- Local fire departments and community organizations can also play an important role in preparing a community for wildfire – and these organizations need to be adequately funded.

With an effort focused on creating fire-safe homes we can, within a few years, create fire-adapted communities that can withstand the periodic fires that have swept the western US on a regular basis for thousands of years.

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Introduction

Wildfires during the summer of 2000 heightened the national debate over wildfire management policies in the United States. There is a widely recognized need to reduce the threat of wildfire in the wildland-rural/urban interface and to better prepare communities to withstand fires that are a natural part of the environment. Much media attention in the past has focused on forest fires burning in and around our National Forests. But to create policies and programs for reducing wildfire risk, objective information is needed on the distribution of wildfires by ownership and land cover (vegetation) type. With this information it can be determined whether large-scale actions across federal lands or efforts localized around at-risk communities would be most effective at reducing the losses associated with wildland fire.

Our objective in this initial assessment is to document the condition of the landscapes burning in wildfires in the western United States. This information can be critical to the development of national policies related to management of wildfires and wildfire risk. This assessment is the second in a series of assessments by Pacific Biodiversity Institute of the ownership, current condition and landscape history of areas burned by wildfires in the United States (See Morrison et al. 2000).

In this study, we focus on the following questions:

- How does this wildfire season compare to the past?
- Are most of the wildfires in the western United States burning in our National Forests – or are other ownerships involved?
- Are wildfires usually synonymous with forest fires – or are other vegetation types commonly involved?
- Where wildfires burn through forests, what is the natural fire regime of these forests?
- What role does past land management activity play in fire spread and severity?
- Are the National Forest lands that are burning suitable for intensive forest management activities?
- Where are most of the homes threatened by wildfires located?

Methods

To gain a better understanding of the current wildfire situation in the United States, we undertook a two-part assessment of fires that have burned this year (2001). In the first part, we reviewed readily available data on the number and extent of all wildfires so far this year in relation to historic fire trends, geographic distribution, land ownership, and management history. Our primary sources for this data were the National Interagency Fire Center and the National Interagency Coordination Center in Boise, Idaho. These federal government agencies maintain an Internet web site that posts updated fire information on a daily basis (www.nifc.gov). Our analysis of the overall national situation is based on statistics compiled by these agencies that span nearly a century of wildfire activity.

In the second part of our assessment, we conducted a more detailed review and landscape analysis of eight of the largest fires that have burned this summer to gain insight into the overall fire situation (Table 1). We also studied four smaller fires (less than 10,000 acres in size) that garnered significant media attention. We chose this set of wildfires based on the overall area burned, wildfire-containment costs, media attention and availability of data. Together, these twelve fires are representative of the breadth of conditions found in this year's fire episode in the western continental United States (Figure 1).

Pacific Biodiversity Institute has also done a preliminary assessment of nine additional fires which started later in the season (Table 1). The total burn-area thus far for all the individual fires included in our detailed and preliminary assessments amounts to nearly one million acres. This represents over 50 percent of the fire extent area in the western Continental US. This is a very good sample of the fire activity affecting this part of the country this year. It also includes nearly all of the larger fires.

Table 1. Individual Fires Studied in Initial Assessment By Size, State and Primary Ownership

Major Fires Studied in Detail

Fire Name	Area (acres)	State	Primary Ownership
Lakeview Complex	127,552	Oregon	BLM
Buffalo Complex	91,000	Nevada	BLM
Virginia Lake Complex	79,723	Washington	Colville Confederated Tribes
Spaulding	75,137	Nevada	BLM
Observation	67,700	California	BLM
Sheepshead	51,452	Oregon	BLM
Rex Creek Complex	47,843	Washington	National Forest
Elk Mountain Complex	26,800	South Dakota/Wyoming	National Forest and Private
Thirtymile	9,300	Washington	National Forest
Icicle Complex	7,697	Washington	National Forest
Green Knoll	4,470	Wyoming	National Forest
Libby South	3,830	Washington	National Forest

Major Fires with Preliminary Assessment Completed

Fire Name	Area (acres)	State	Primary Ownership
Sheep	82,000	Nevada	BLM
Jackie's Butte	73,450	Oregon	BLM
Clear Creek	53,097	Nevada	BLM
Upper Willow	41,830	Nevada	National Forest
Fort Ranch	40,000	Utah	BLM
Blue Complex	37,950	California	National Forest
Trough	24,970	California	National Forest
Stag	20,000	Nevada	BLM
Quartz	6,170	Oregon	Private, State, National Forest
TOTAL ACRES	**971,971**		

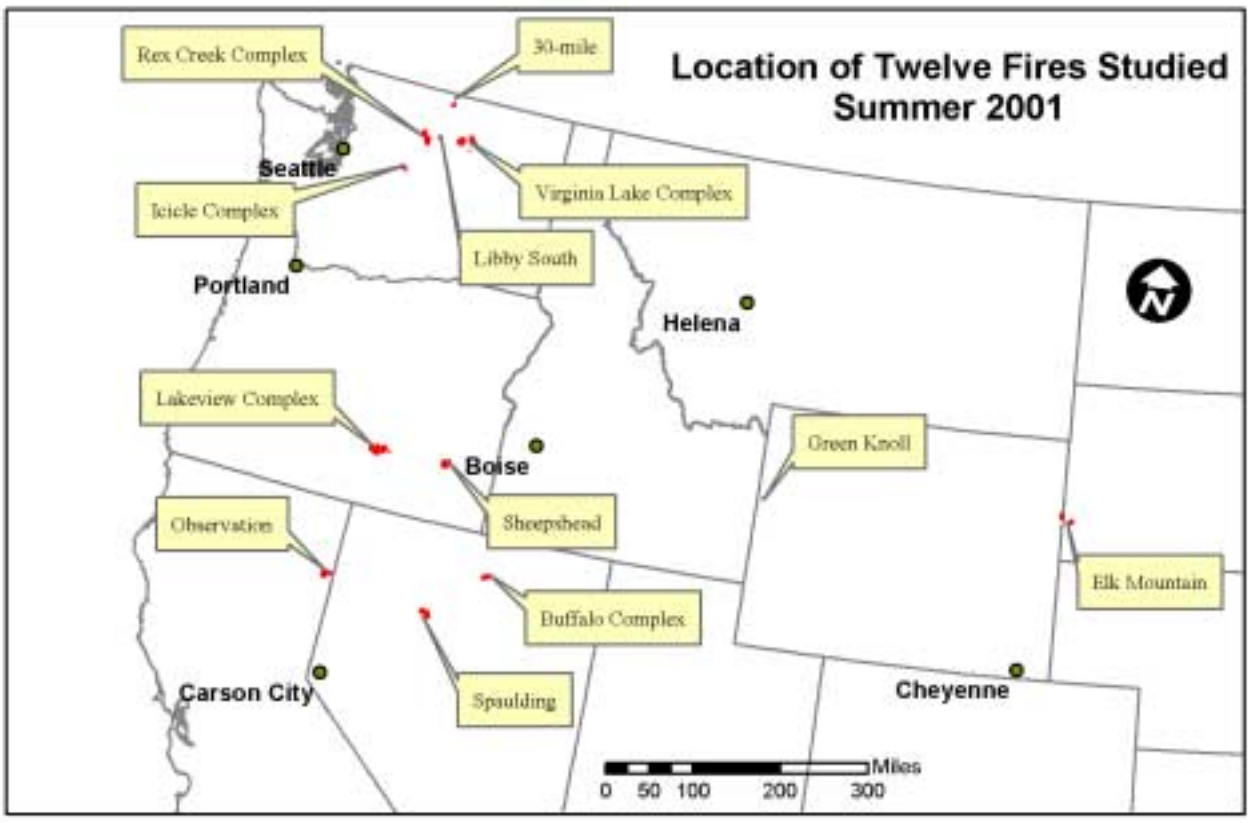


Figure 1. Location of twelve fires studied in detail.

For each fire we conducted an assessment of the land ownership of the area that burned and the pre-burn land cover or vegetation type of the area. We relied on the best readily available land ownership data for each area. These land ownership databases included data from individual National Forests, the Washington Department of Natural Resources, and Pacific Biodiversity Institute's Enhanced Protected Area Database for the United States (Pacific Biodiversity Institute, in prep.). For land cover and vegetation type we relied on the recent National Land Cover Database (Vogelmann et al. 2001) and vegetation data from the North Cascades Grizzly Bear Habitat Assessment Project (Almack et al. 1993). In addition to these data sources, we used recent Landsat Thematic Mapper satellite imagery and/or digital orthophotography to evaluate the landscape condition and vegetation cover of the fire areas.

For our preliminary assessment of nine additional fires we conducted a rapid analysis of the same information described above and compiled descriptive information and photographs available on individual web sites and national fire situation reports.

Results

Initial Assessment of National Wildfire Situation

Current Situation

Although many predicted that the current drought in the western United States would result in a severe wildfire season, fire activity (both in total acres and number of fires) has been in line with the average for the last ten years. Both the total number of wildfires and their extent is significantly lower than last year. At this point in the 2001 summer wildfire season, fires have burned a total area of approximately 2,832,000 acres nationwide. Currently the wildfire burn area is just below the ten-year average for area burned nationwide (96.9% of ten-year average, Figure 2).

This year's total area-to-date is less than half (44.5%) of the area burned last year. The year-to-date burn area is only 20% of the year-end century long average area burned nationwide (13.9 million acres). These results are based on data from the National Interagency Coordination Center's Incident Management Situation Report for August 27, 2001 (www.nifc.gov/news/nicc.html), and other historical information provided from the National Interagency Fire Center.

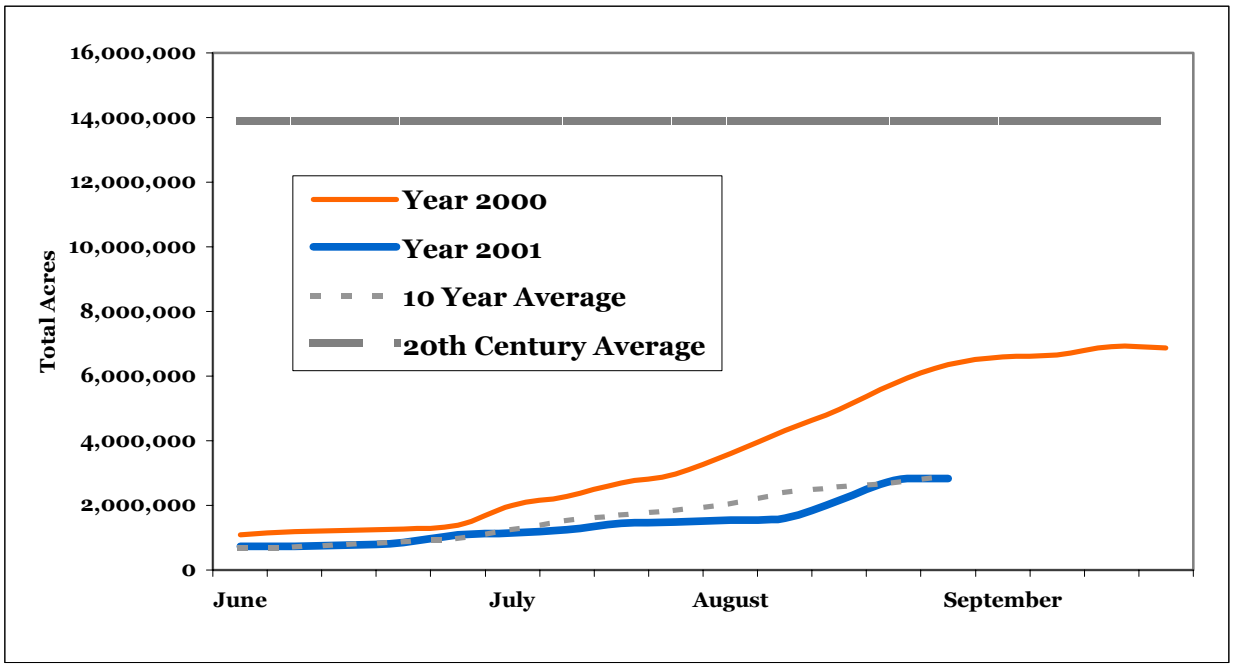


Figure 2. Historical comparison of cumulative area burned by wildfire in the United States. Data from National Interagency Coordination Center (http://www.nifc.gov/news/nicc.html).

This year eastern Oregon, Nevada, northeastern California and eastern Washington experienced the majority of the wildfire activity. This is a sharp contrast to last year, when most of the landscape burned by wildfires was in Idaho and Montana.

As of August 27, 2001 only 14.3 percent of the land burned was in National Forests (Figure 3) and only 13.4 percent of the total number of fires had started on National Forest land (Figure 4). Thus far, over 48 percent of the area burned nationwide has been on tribal, state and private land (Figure 3). In addition, the vast majority (78.9%) of individual fires burning this year have started on private, state and tribal lands (Figure 4). Only 21.1 percent of the fires started on federal land (BLM, Forest Service, US Fish and Wildlife Service and National Park Service). Most of the large fires are burning in the deserts, grasslands and shrublands of Nevada, northeastern California, eastern Oregon and eastern Washington.

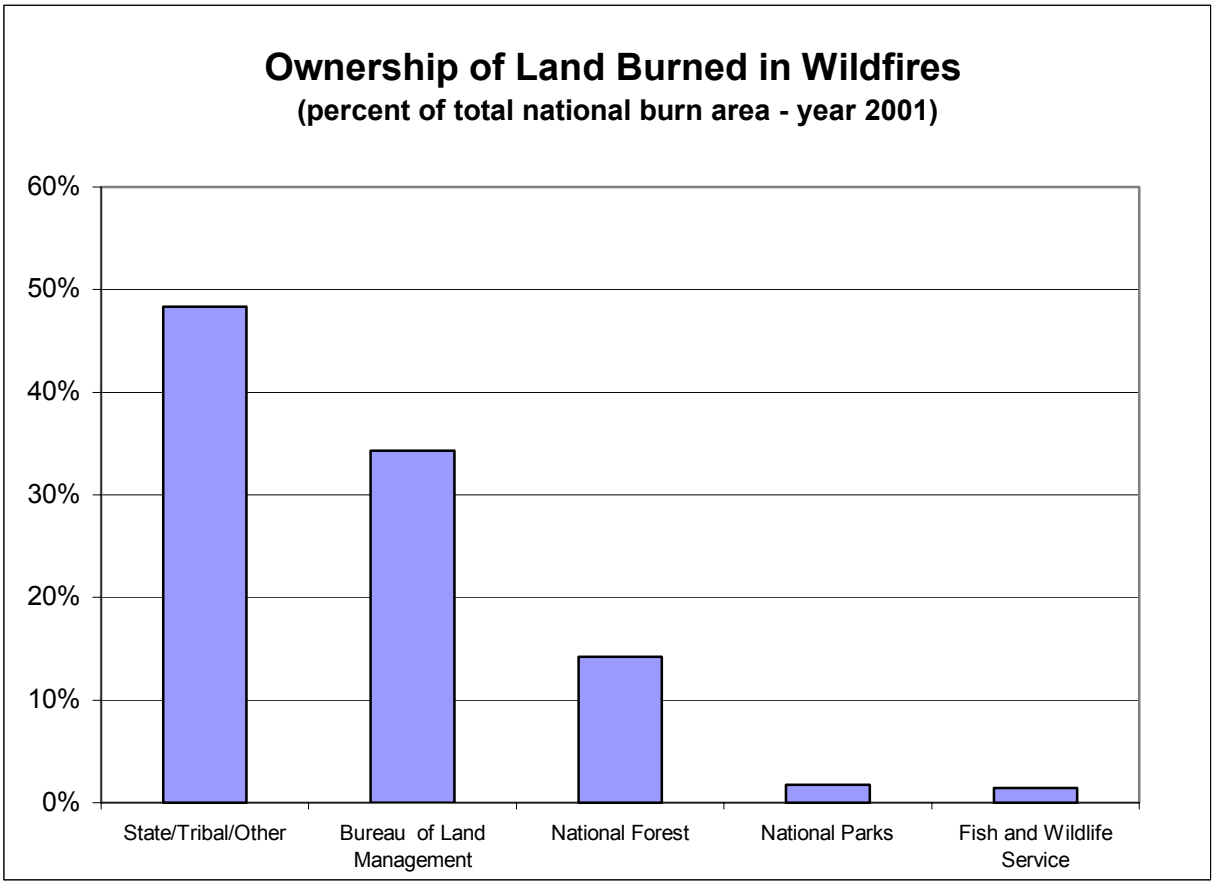


Figure 3. Comparison of percent of total national burn area in various ownership categories as of August 27, 2001. Data from National Interagency Coordination Center (http://www.nifc.gov/news/nicc.html).

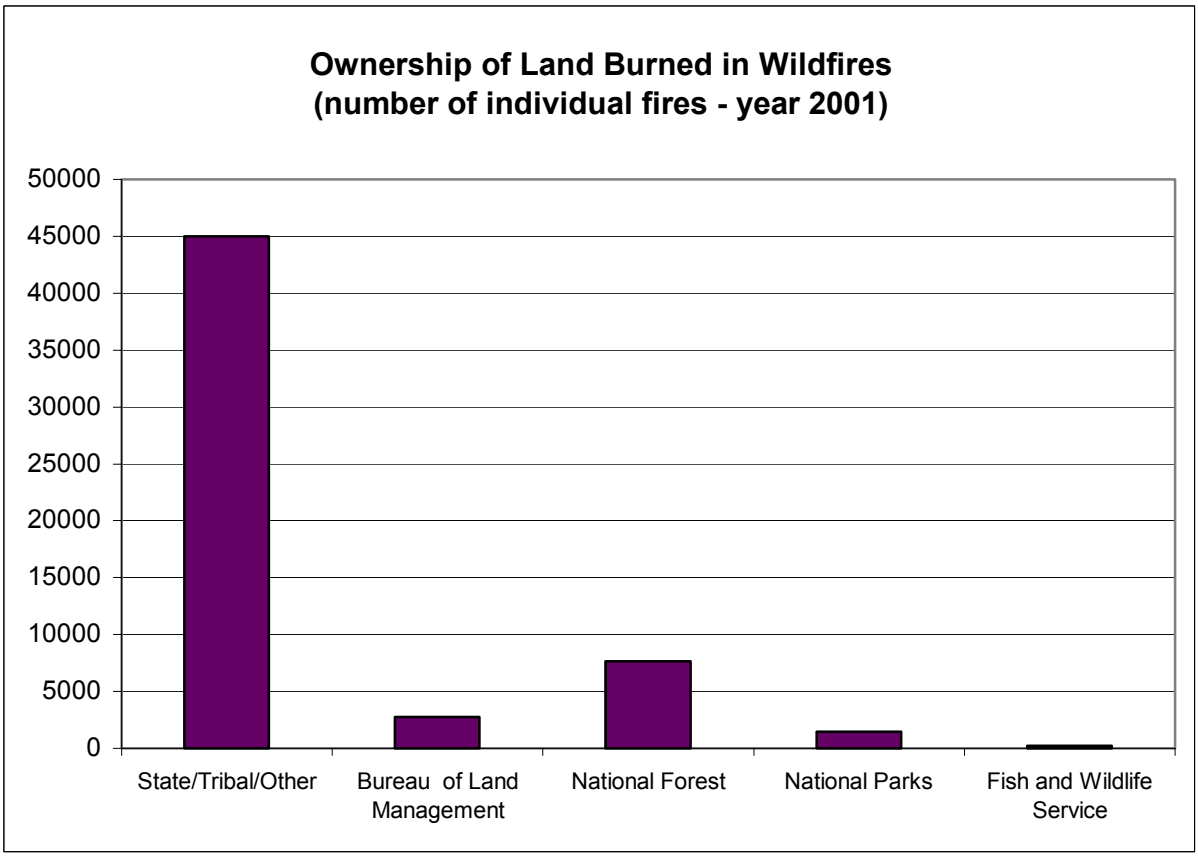


Figure 4. Comparison of total number of individual fires in various ownership categories as of August 27, 2001. Data from National Interagency Coordination Center (http://www.nifc.gov/news/nicc.html).

A review of federal wildfire statistics indicates that the percentage of wildfire area in National Forests this year is near equal to the average for the last five years (Table 2). The year-end average over 1997-2000 is slightly higher (18.7%). But these short-term averages are heavily biased by the relatively high percentage burned in National Forest land in 2000. Year 2000 appears to be somewhat of an anomaly as far as the amount of wildfire activity occurring in National Forests. In the year 2000, 31.6% of the year-end fire acreage was on National Forests, whereas in1997, only 5.4% was on National Forests, and in 1998 only 9.1% was on National Forest.

Table 2. Burn-area on National Forest land in comparison with national total burn-area. Data from National Interagency Coordination Center (http://www.nifc.gov/news/nicc.html).

	Year End				Each Year as of August 27		
Year	National Forest	Total Burn Area	Percent in National Forest	Year	National Forest	Total Burn Area	Percent in National Forest
2001	NA	NA	NA	**2001**	403,496	2,831,986	14.2%
2000	2,333,672	7,393,493	31.6%	**2000**	1,789,558	6,157,012	29.1%
1999	717,679	5,661,976	12.7%	**1999**	131,748	4,130,460	3.2%
1998	212,328	2,329,704	9.1%	**1998**	131,422	1,899,596	6.9%
1997	153,792	2,856,959	5.4%	**1997**	153,304	2,683,340	5.7%
Average			**18.7%**	**Average**			**14.7%**

Prognosis for the Remainder of the 2001 Wildfire Season

The combination of moderating temperatures and recent precipitation has calmed wildfire activity in much of the western United States. Drought conditions still persist (Figure 5) and the possibility for additional wildfires remains at normal or above-normal levels across most of the western states (Figure 6). But a dramatic change in the national fire situation at this point in time is unlikely. The historical record bears out this conclusion (Table 2). Late season wildfire activity is usually concentrated in southern California and other southwestern states. In the Pacific Northwest and Rocky Mountains dramatically declining temperatures and increased precipitation usually bring wildfire activity to a halt in September. It is possible that after the year is over, the percentage of wildfires burning on National Forest land will be even less than it is at the date of this report. Very unusual weather conditions or a rash of human-caused fires could change this prediction.

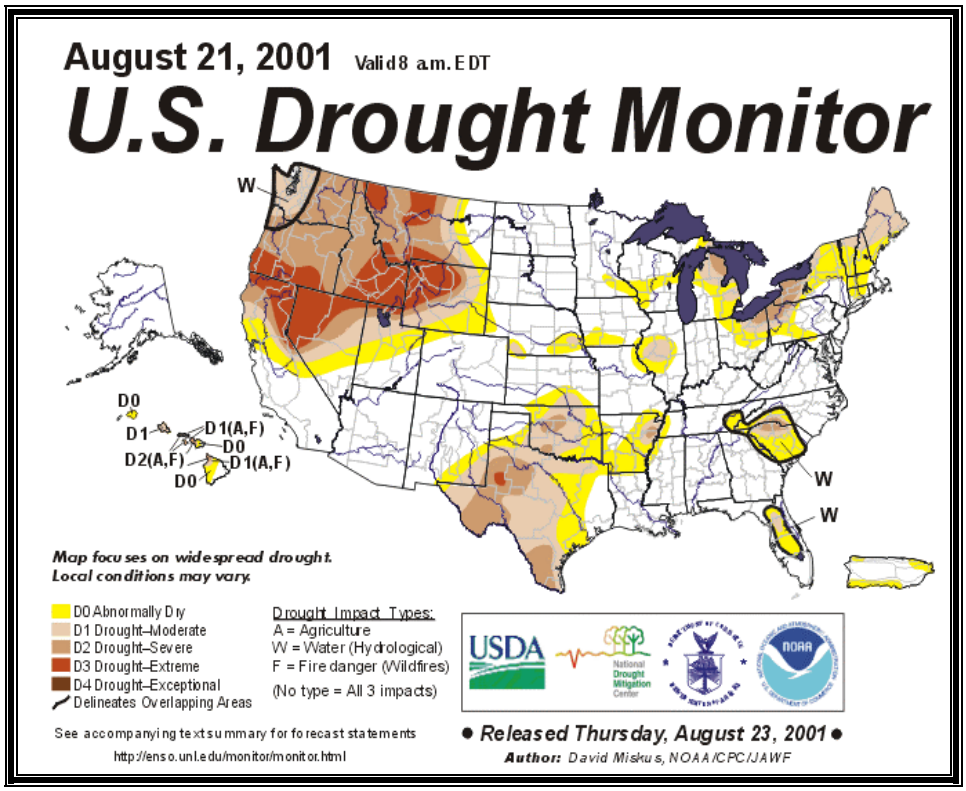


Figure 5. US drought monitor map from National Drought Mitigation Center (http://enso.unl.edu/monitor/monitor.html).

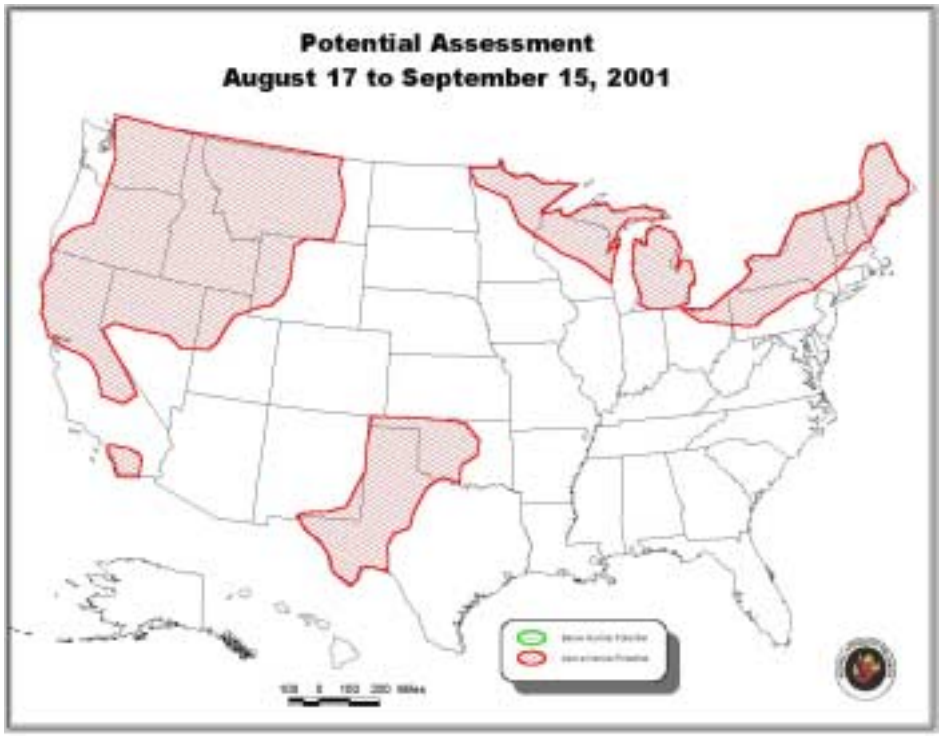


Figure 6. US wildfire potential map from National Interagency Fire Center describing the wildland fire potential for areas throughout the country. Red shaded areas indicate above-normal fire potential. Data source National Interagency Fire Committee (http://www.nifc.gov/fireinfo/potentmap.html).

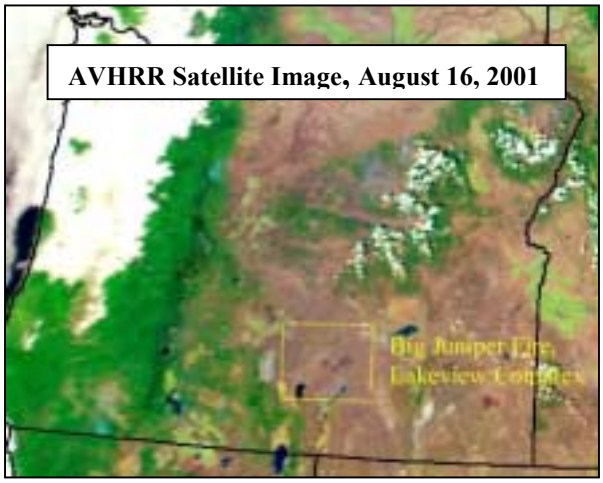
Assessment of Individual Major Fires

Our more detailed assessment of twelve major fires further confirm conclusions made from our analysis of nationwide wildfire statistics. All of the largest fires (over 50,000 acres in size) have burned primarily on Bureau of Land Management (BLM) and tribal and private land. These fires burned primarily in grasslands, shrublands, or other non-forested areas. The majority of the smaller fires we studied burned primarily on National Forest land, but a significant portion of the area burned in most of these fires was not forested. One structure was lost in a grassland fire, 54 structures were lost in fires burning in shrublands, open woodlands and open forests; whereas only two structures were burned in forest fires. Detailed analyses of each fire are given below.

1. Lakeview Complex - Big Juniper Fire

Summary

The Big Juniper Fire, the largest fire in the Lakeview complex, is an example of a fire that is burning in dry grasslands, shrublands, juniper woodlands and desert country. Although this fire was initially reported by the National Interagency Coordination Center to be burning in the Fremont National Forest, the majority of the acreage burned was in BLM land.



Location and History

The Lakeview Complex fires resulted from lightning ignitions. These fires burned on BLM lands, the Fremont National Forest, and privately owned land. The largest fire, the Big Juniper Fire, covered 118,119 acres of mostly BLM managed land. The entire Lakeview Complex covered 127,552 acres.

Lakeview Complex Statistics as of August 18, 2001	
Fires Started	August 8, 2001
Cause	Lightning
Acres in Lakeview Complex	127,552
Acres in Big Juniper Fire	118,119
Containment	100%
Cost	$5 Million
Structures lost	0

Land Cover

The Lakeview Complex fires burned through desert landscapes, sagebrush and juniper forests. The Big Juniper fire burned in a desert landscape. Limited amounts of dry forest were involved.

Land Cover	**Percent of total area burned**
Evergreen Forest	1 %
Shrubland	80 %
Herbaceous	19 %
Other (Rock, water)	trace

Landscape near Lakeview fires. August 11, 2001

Ownership and Management

The majority of the Big Juniper fire is on BLM land. Since a small portion of one of the other fires in the Lakeview Complex was on Forest Service land, the entire acreage for this fire was assigned to the Forest Service category in the national status reports. Due to the size of this burn, this error distorted the actual percentages of fires burning by ownership nationwide. This problem has since been rectified.

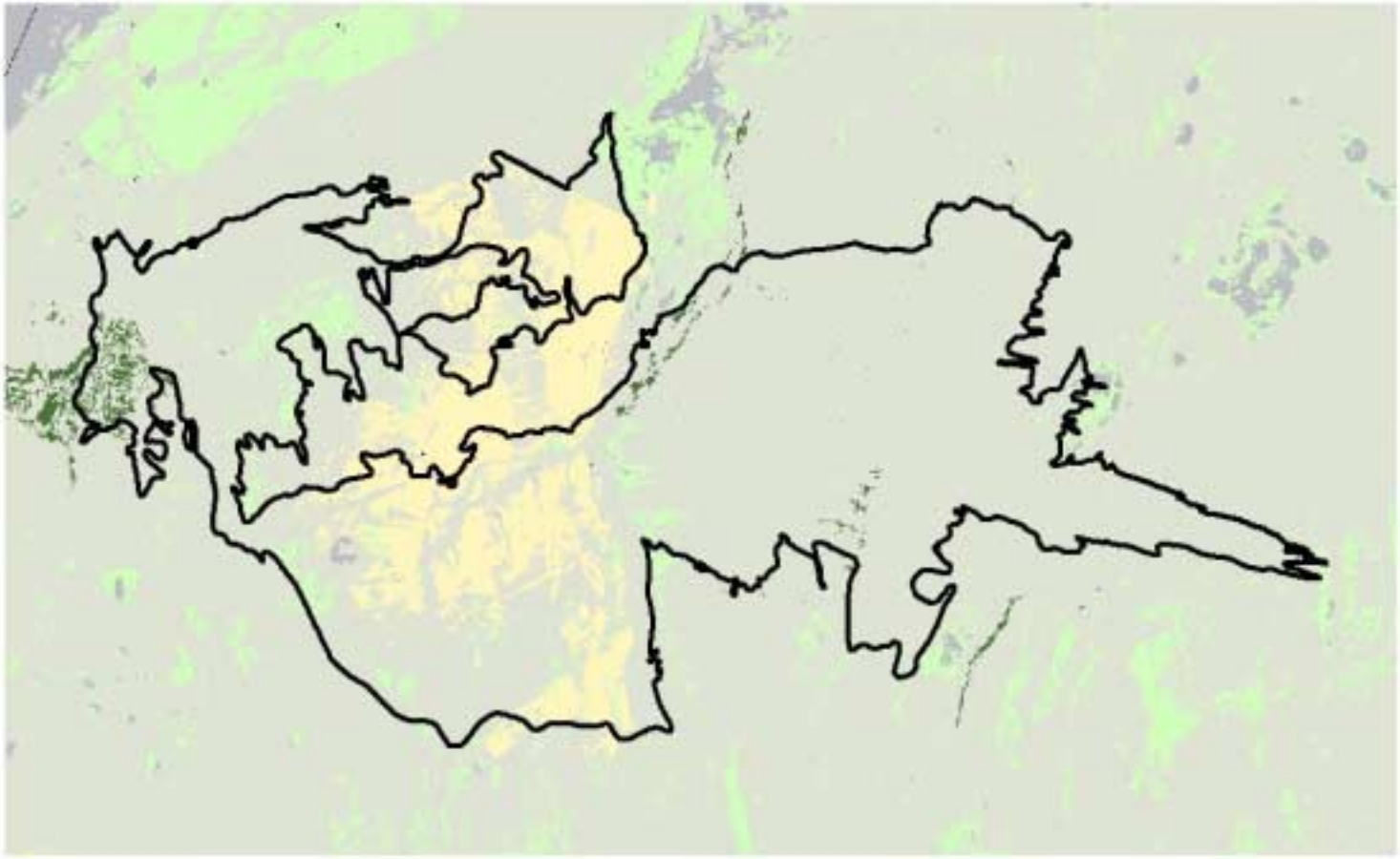
Land Owner	Percent of total area burned
BLM	98 %
Private	2 %

Information Sources

General Information: Lakeview District, BLM- (541) 947-2177
GIS Information: Jim Thompson

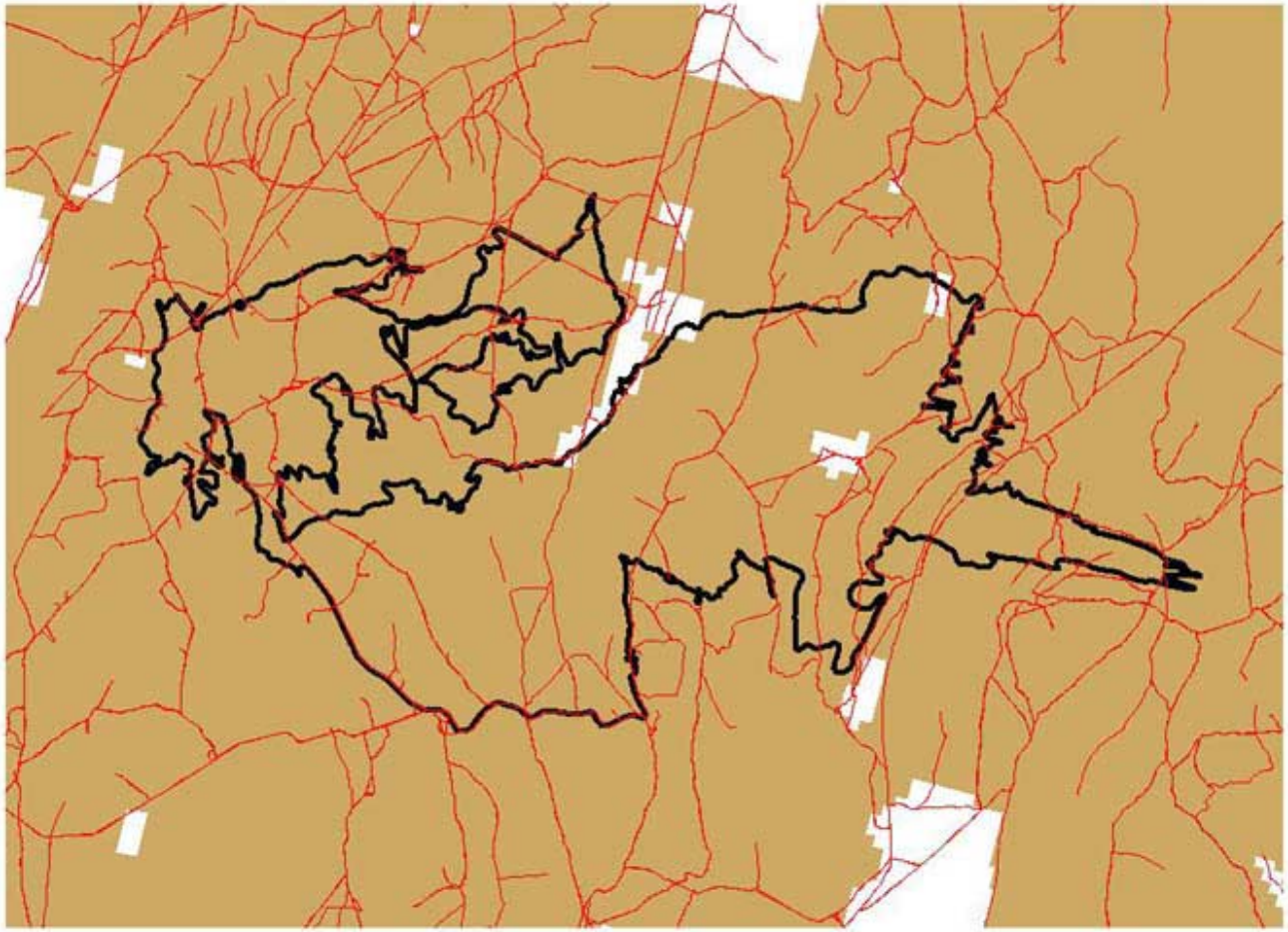
Land Cover

Big Juniper Fire, Lakeview Complex,Oregon, August 16 2001



Ownership and Roads

Big Juniper Fire, Lakeview Complex, Oregon, August 16 2001



Roads
Fire Perimeter
Ownership
Bureau of Land Management
Private

3 0 3 6 Miles

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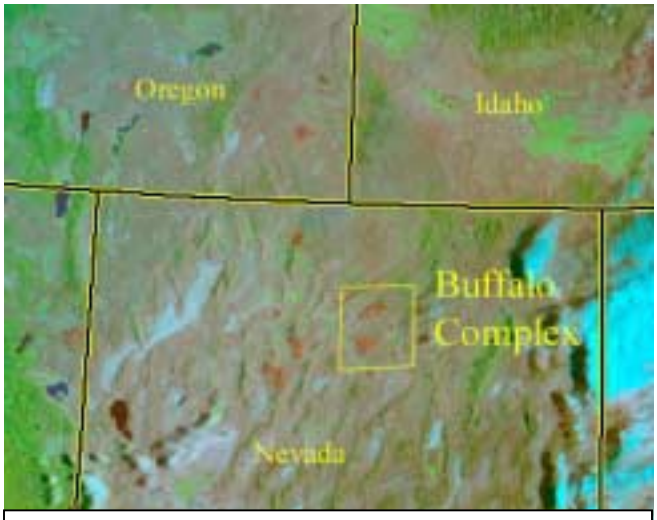
Data sources:
Ownership from Conservation Biology Institute, updated by PBI
Fire Perimeter from www.geomac.usgs.gov

2. Buffalo Fire Complex

Summary

The Buffalo Complex fires in north central Nevada burned across a desert landscape of grass and shrubs. The burnt land is either privately owned or managed by the BLM.

"At first, firefighters weren't sure what there was to save, as they traveled through parched range land and alongside the treeless Snowstorm Mountains and over drying creeks. This wasn't at all like the tall timber fires of the Pacific Northwest, where flames leap across trees and shoot 100 feet into the air. Here they saw fire sweeping across a desert floor that from a distance didn't even appear flammable." (LA Times 8/17/01)



AVHRR Satellite Image: August 18, 2001

Location and History

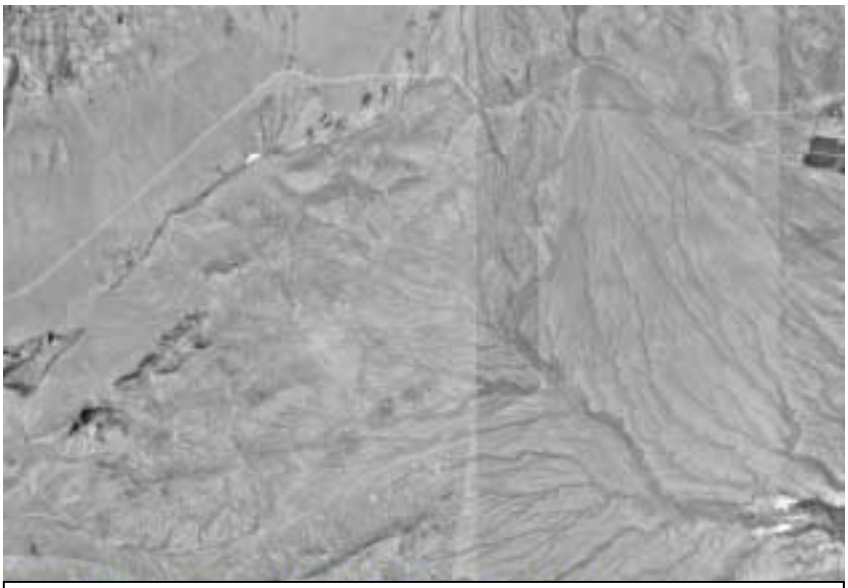
The Buffalo Complex fires consisted of the Buffalo Fire and Hot Lake Fire, both located about two miles south of Midas, Nevada. These fires have been the largest in the state this season, covering 93,092 acres. Eight-hundred firefighters received military assistance in battling this fire.

Statistics as of August 18, 2001	
Fire Started	8/12/01
Cause	Lightning
Acres in Fire Perimeter	93,092
Containment	100%
Cost	$1.7 Million
Structures lost	0

Land Cover

The vegetation in this area is grasslands and shrublands.

Land Cover	Percent of total area burned
Evergreen Forest	trace
Shrubland	96 %
Herbaceous	4 %



Landscape south of Midas, Nevada. USGS 1994.

Ownership and Management
This area is owned and managed by the BLM with some areas privately owned.

Land Owner	Percent of total area burned
BLM	93 %
Private	7 %

Information Sources
General Information and GIS:
Elko Field Office: BLM: (775) 753-0200
Jim Wilkins, Fire Information Officer: (909) 938-7251

3. Virginia Lake Complex

Summary

The Virginia Lake fires are burning entirely on land owned and managed by the Colville Confederated Tribes. The vegetation in this area is mostly shrub-steppe and open grazing lands with some scattered ponderosa pine forests. This is the largest fire in Washington State, with over 73,000 acres burned to date and 39 structures lost. The majority of the ponderosa pine forests that have burned by this fire have survived and benefited from a medium-intensity underburn.

AVHRR Satellite Image of Virginia Lake fires and smoke cloud. August 19, 2001.

Location and History

The Virginia Lake Complex fires were ignited by lightning on August 13, 2001 and spread rapidly across land on the Colville Reservation, southeast of Okanogan, WA. The complex consists of the Virginia Lake fire and the smaller Goose Lake, Mission Creek and Saint Mary's fires. The fires encompass a total of 73,123 acres, making this the largest fire complex in the state. Nine residences were burned in the first several days of the Virginia Lake fire, as well as thirty outbuildings and several vehicles. Residents are now being allowed back to their homes. The Virginia Lake fire is nearly completely contained while the other fires are continue to smolder in some areas. The fires are burning entirely on land owned and managed by the Colville Confederated Tribes.

Statistics as of August 22, 2001	
Fire Started	August 13, 2001
Cause	Lightning
Acres in Fire Perimeter	73,123
Containment	30%
Cost	$4.8 Million
Structures lost	39

Land Cover

The Virginia Lake fire (close to Okanogan) burned mostly, through shrub-steppe communities consisting of sagebrush, rabbitbrush and bitterbrush, and also through ponderosa pine forests. The Saint Mary's fire (along Highway 155) burned through similar shrub communities as well as through ponderosa pine forests. The pine forests burned in these fires include second growth forests which have been recently thinned, second growth forests that have not been thinned, and young, dense pine plantations.

Land Cover*	Percent of total area burned
Evergreen Forest	21 %
Deciduous Forest	trace
Mixed Forest	trace
Shrubland	45 %
Herbaceous	30 %
Other(Rock, water)	4 %

*These numbers do not account for changes in vegetation due to recent harvest activities

The fires spread across the landscape in a mosaic and burn severity varied greatly between different areas of the forests and within the differently managed pine forests. Medium-intensity fire burned through the underbrush in much of the forest, with stand-replacement intensity fires burning only in some areas. Ecologically, the Virginia Lake fires will be beneficial to this ecosystem, which is adapted to a 15-30 year fire-return interval.

A house burned in the Virginia Lake fire. Note that the house is in an open, sparsely vegetated area. Photo by Peter Morrison, August 23, 2001.

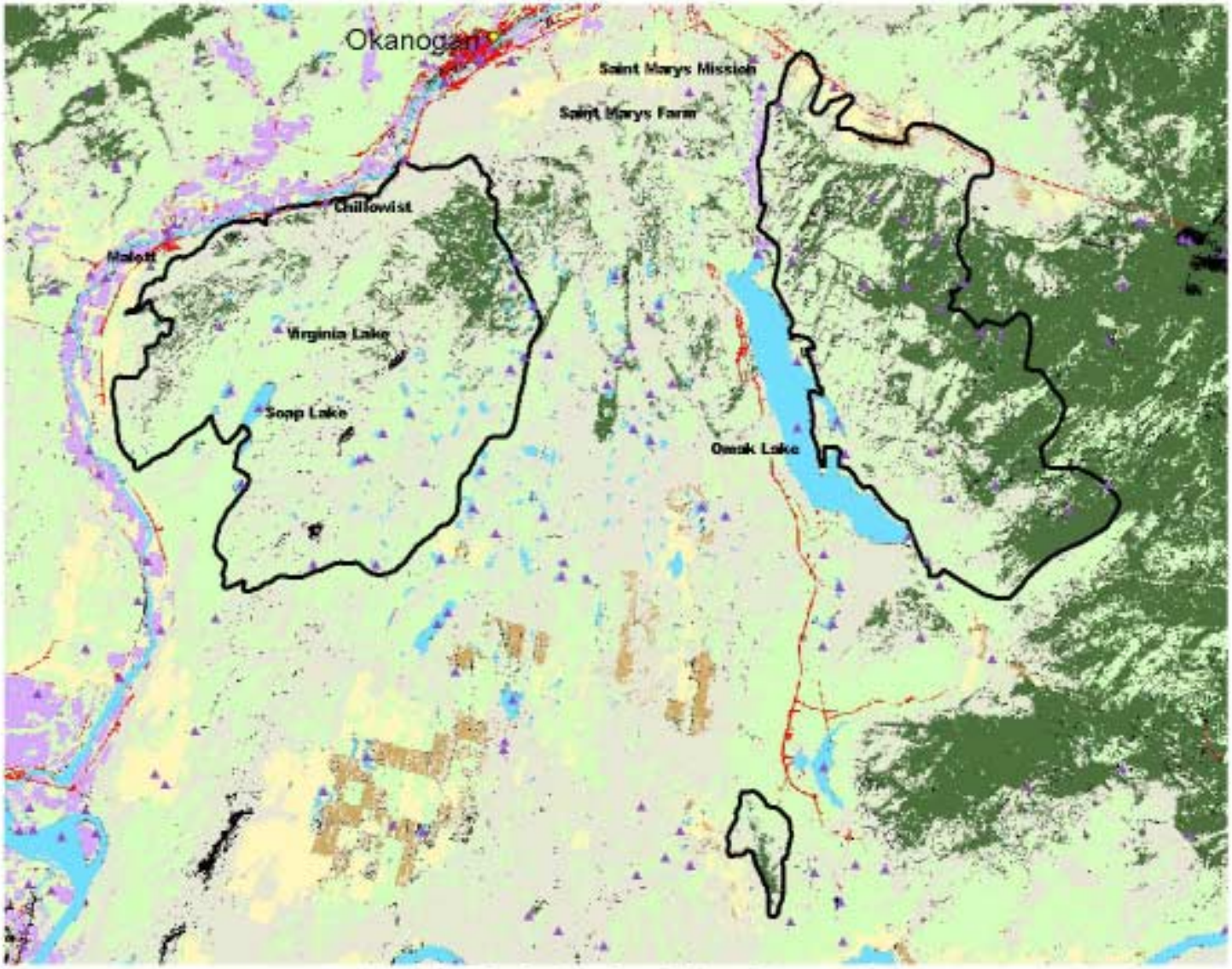
Ownership and Management

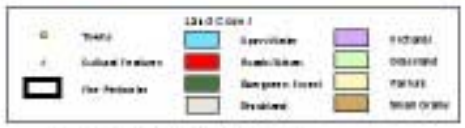
The land burned in the Virginia Lake fires is owned and managed entirely by the Colville Confederated Tribes. The land is managed for residential and community use, grazing and pasture, and timber harvest. Roads are dispersed throughout the burn area.

Land Owner	Percent of total area burned
Colville Confederated Tribes	100%

Information Sources

Virginia Lakes Fire Information- (509) 422-9729



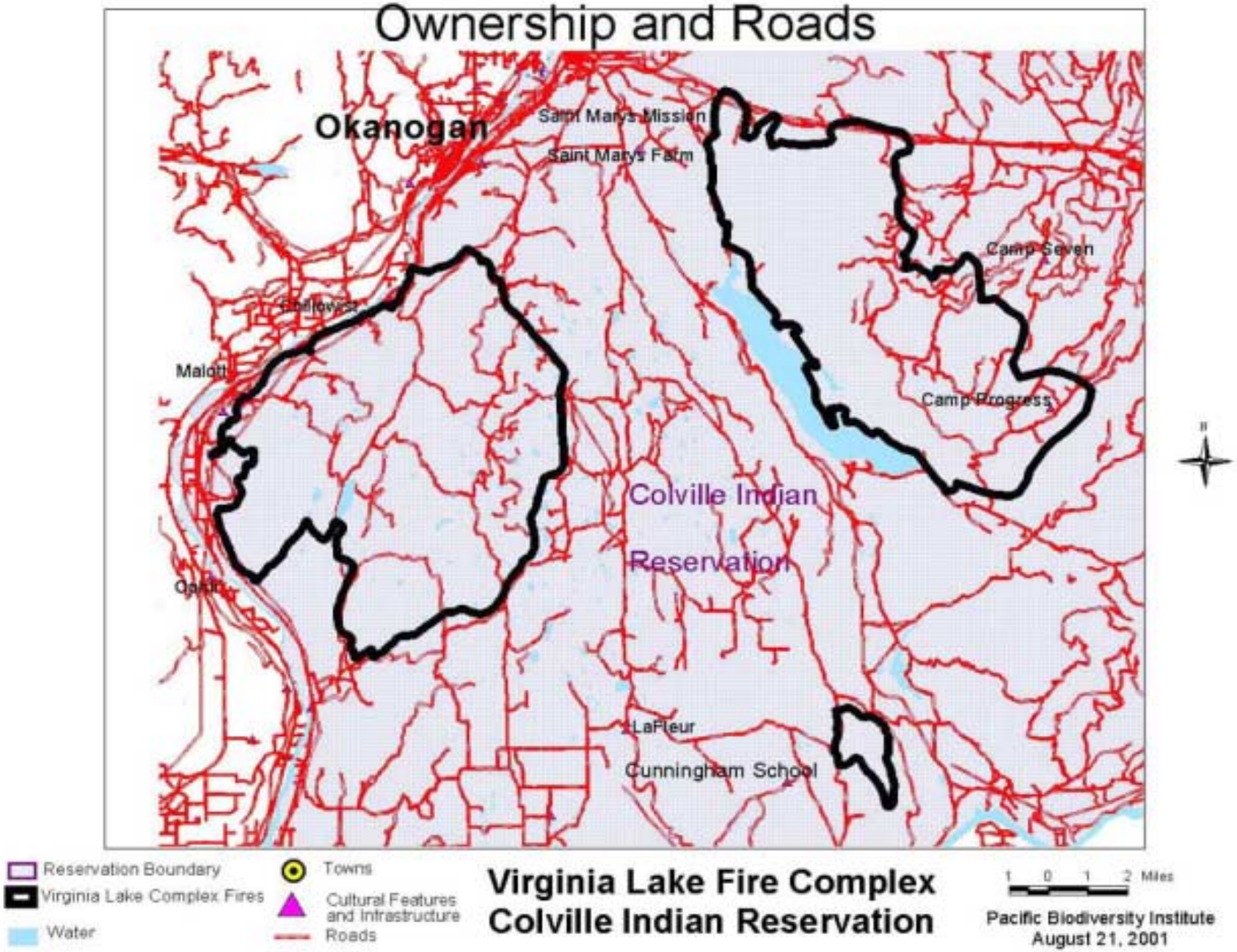


Land cover data from USGS

Virginia Lake Fire Complex
Colville Indian Reservation
Land Cover

2 0 2 4 Miles

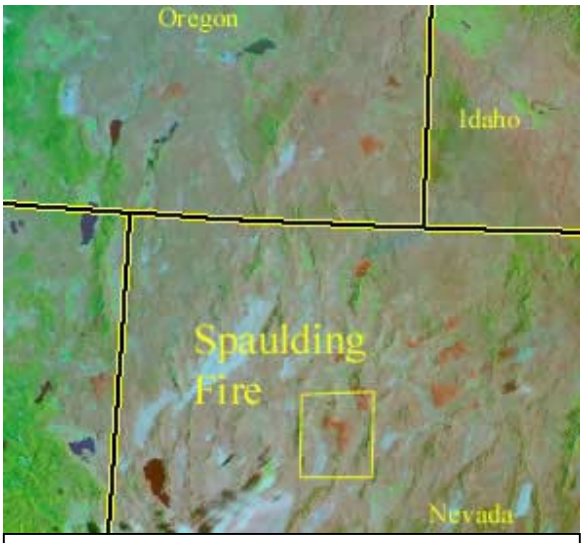
Pacific Biodiversity Institute
August 21, 2001


Ownership and Roads
Okanogan
Saint Marys Mission
Saint Marys Farm
Camp Seven
Camp Progress
Malott
Colville Indian
Reservation
LaFleur
Cunningham School
Reservation Boundary
Virginia Lake Complex Fires
Water
Towns
Cultural Features and Infrastructure
Roads
Virginia Lake Fire Complex
Colville Indian Reservation
1 0 1 2 Miles
Pacific Biodiversity Institute
August 21, 2001

4. Spaulding Fire

Summary

The Spaulding fire burned mostly in open desert country dominated by shrubs and grasslands with some evergreen forests involved. The majority of the fire was on BLM land with a significant portion on private land. National Forest land was not involved in this fire.



AVHRR Satellite Image. August 18, 2001

Location and History

The Spaulding fire was located thirty miles southwest of Winnemucca Nevada, near the Clear Creek Fire. The Spaulding Fire burned through desert country with cheat grass, sagebrush and juniper. Small patches of forest, about 12% of the area inside the fire perimeter burned at higher elevations. The fire has burned in BLM and private land.

Statistics as of August 21, 2001	
Fire Started	August 12
Cause	Lightning
Acres in Fire Perimeter	75,137
Containment	100%
Cost	$1.6 Million
Structures lost	1

Land Cover

The Spaulding Fire burned through desert country covered with cheat grass, sagebrush and juniper.

Land Cover	Percent of total area burned
Evergreen	13 %
Shrubland	86 %
Herbaceous	1 %

Ownership and Management

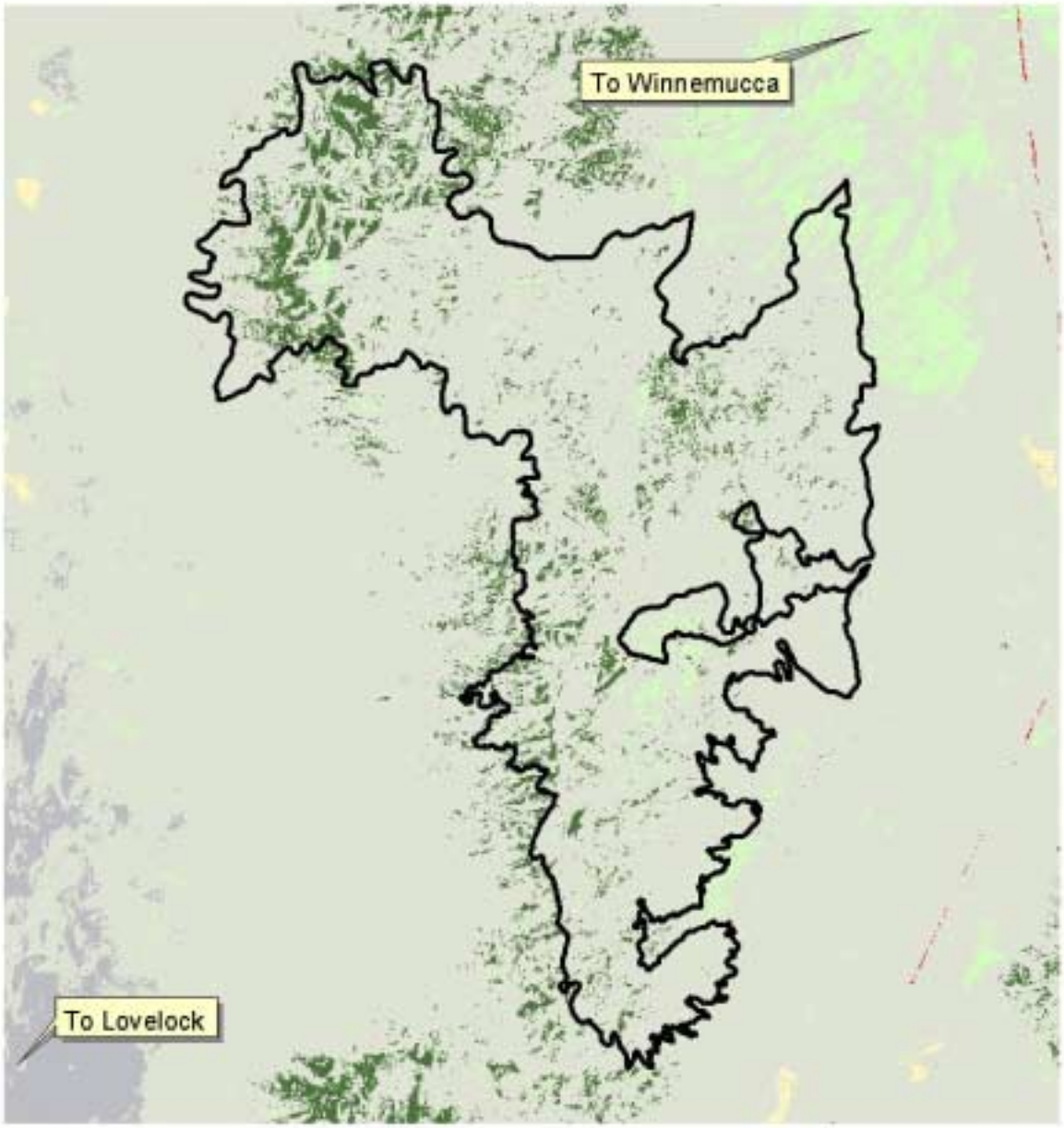
Fifty-nine percent of the land burned in the Spaulding fire is managed by the BLM, and 41% is privately owned.

Land Owner	Percent of total area burned
BLM	74 %
Private	26 %

Information Sources

General Information: Winnemucca Field Office, BLM - (775) 623-1500
GIS: Mike Wallin

Spaulding Fire, Nevada, August 21, 2001
Land Cover Map



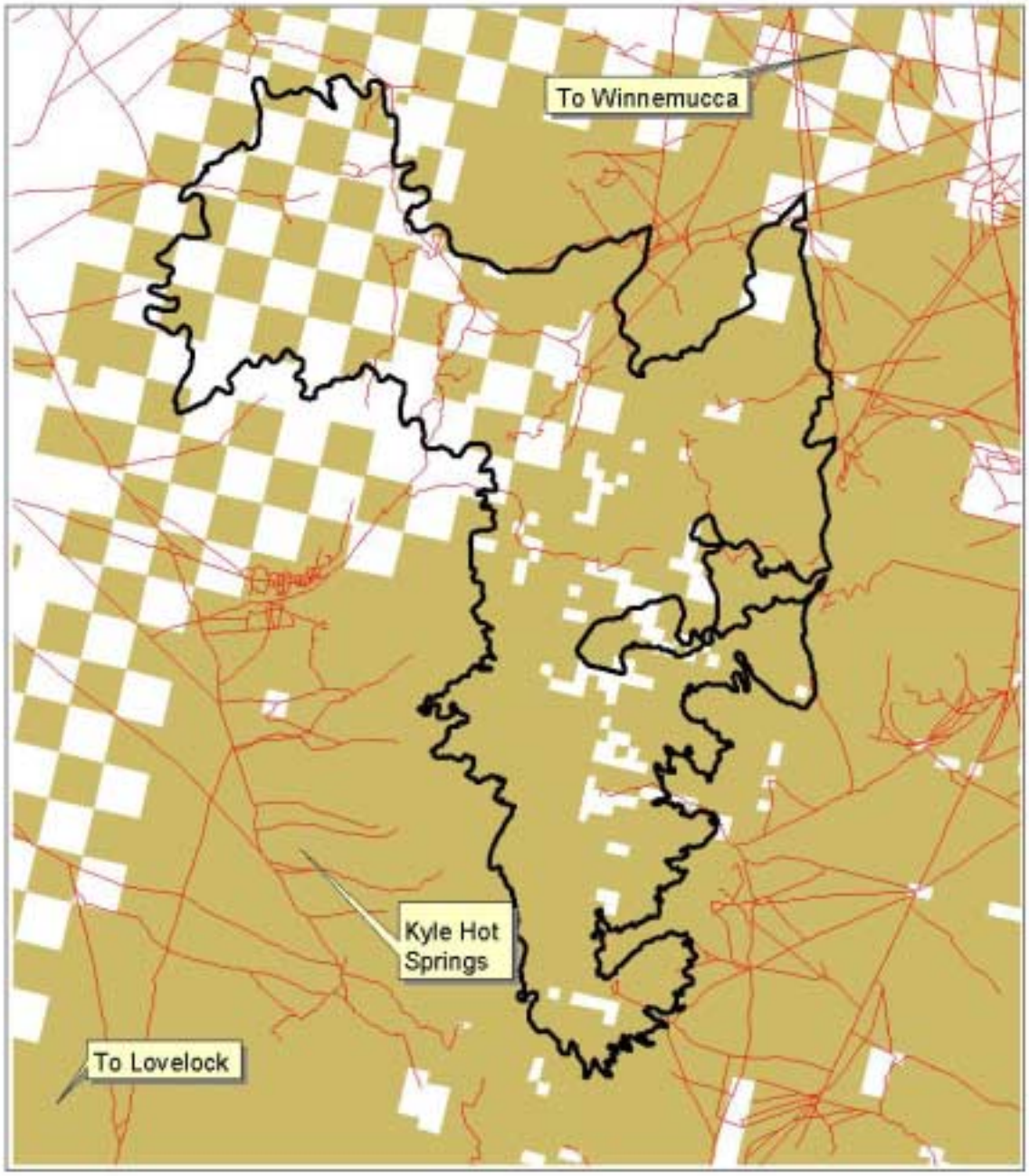
Data sources:
Land cover from USGS
Fire Perimeter from
www.geomac.usgs.gov

Fire Perimeter
Land Cover
Shrubland
Evergreen Forest
Grassland

3 0 3 Miles

Pacific Biodiversity Institute, 2001
www.pacificbio.org

Spaulding Fire, Nevada, August 21, 2001
Ownership and Roads



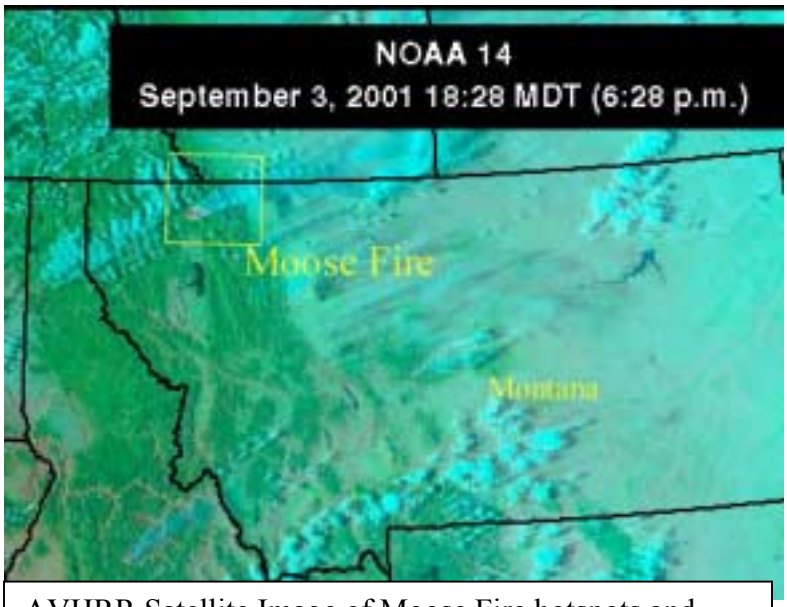
Populated Places
Roads
Fire Perimeter
Ownership
Bureau of Land Management
Private

1 0 1 2 Miles

Data sources:
Ownership from Conservation Biology Institute, updated by PBI
Fire Perimeter from www.geomac.usgs.gov

Pacific Biodiversity Institute, 2001
www.pacificbio.org

5. Moose Fire - Montana



AVHRR Satellite Image of Moose Fire hotspots and smoke plume. September 3, 2001.

Summary

Roads and clearcuts characterize the landscape where this fire spread and gained intensity. Despite the fact that most of the area where the fire initially burned is accessible from the dense network of logging roads, neither road access nor thinned forests prevented this fire from growing into a large fire.

"*There was adequate access by ground and by helicopter for the initial attack resources. Initial attack fire engines drove right to the fire.*"
Moose Fire webpage

Location and History

The Moose Fire ignited by lightning on August 15, 2001 and burned through portions of the Flathead National Forest in northern Montana. Extreme fire behavior began on August 30, when the fire doubled in size and began to expand into Glacier National Park. The Moose Fire was the largest fire in the Flathead National Forest since 1929.

Statistics – As of October 6, 2001	
Fire Started	August 14, 2001
Cause	Lightning
Acres in Fire Perimeter	71,000
Containment	100%
Cost	$19.3 Million
Structures lost	3

This photo was taken near the ignition point of the Moose fire after the fire was contained. The bulldozer lines in the clearcuts are firelines. Photo courtesy of Glacier national Park.

Ownership and Management
The Moose Fire began in a heavily clearcut and thinned portion of the Flathead National Forest. It later spread into private and state land, and into Glacier National Park.

Land Owner	Percent of total area burned
National Park Service	34 %
U.S. Forest Service	53 %
Private/State	13 %

Land Cover
Subalpine and montane forests characterize the landscape where the Moose Fire is burning. Vegetation in these forests includes subalpine fir, whitebark pine, lodgepole pine, Douglas-fir and larch, as well as shrubs and grasses that have grown in old clearcuts and thinned forests.

Land cover*	Percent of total area burned
Evergreen Forest	92 %
Deciduous Forest	2 %
Shrubland	0.2 %
Herbaceous	0.8 %
Other (Rock, water)	5 %

*These numbers do not account for vegetation altered due to recent harvest activity

Fire History
Almost two thirds of the land burned in the Moose Fire burned in a fire in 1910, and another section burned in 1967. The lodgepole pine forest that regenerated from the 1910 fire was within its fire return interval when it burned this year. A section of land adjacent to the Moose Fire, but not within its perimeter, burned in 1999. Overall, the area has a history of large, high severity fires and the extent and severity of the Moose fire is not unusual.

Burn Extent
On August 31 the fire had not burned all areas within the burn perimeter. The managed landscape, covered by clearcuts and roads, burned during the first week of the fire. Some forested patches within the fire perimeter did not burn. A satellite image taken August 31 (see below) shows pink patches within the fire perimeter which indicate burned clearcuts. A satellite image taken September 9 (see below) shows large forested patches within the burn perimeter which did not burn.

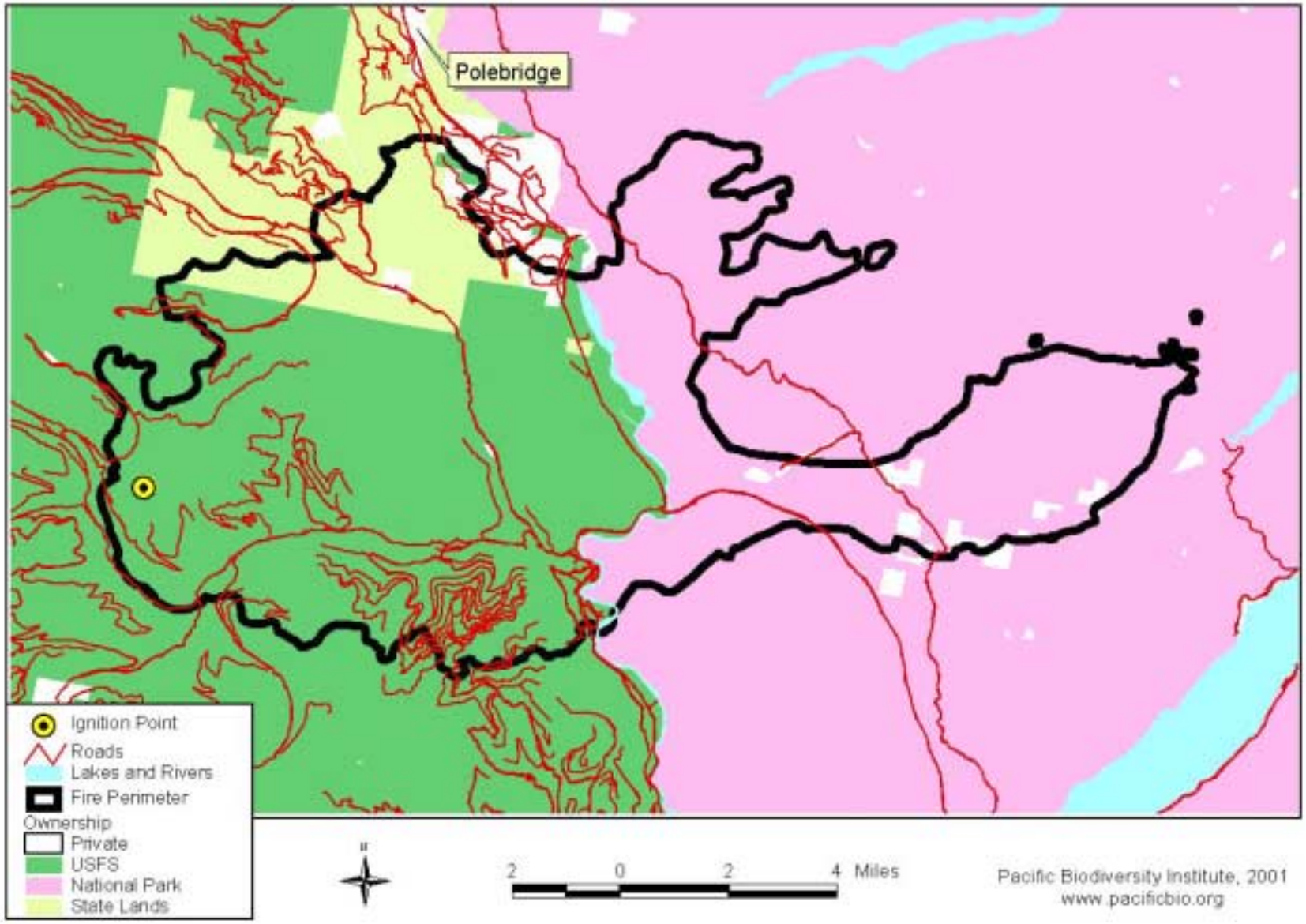
Fire Effects
A preliminary assessment of the Moose Fire indicates mixed severity burns within the fire perimeters. In the managed portion of the landscape, the fire burned actively through a great number of old timber harvest units, while some units did not burn as hot. There were some areas where the ground fire was hot enough to scorch the ladder fuels and overstory larch, but not

catch them on fire. The larch may likely green up next spring while the ladder fuels will die out. Most surveys of creeks within the Moose fire perimeter had no dead fish. Only one low-volume creek exhibited high fish mortality.

Information Sources
General Information: Flathead National Forest Supervisor's Office: (406) 758-5200,
http://www.fs.fed.us/r1/flathead/fire/new/fire_index.htm
Public Affairs Officer Alan Rowley: (406)758-5252
GIS Information:

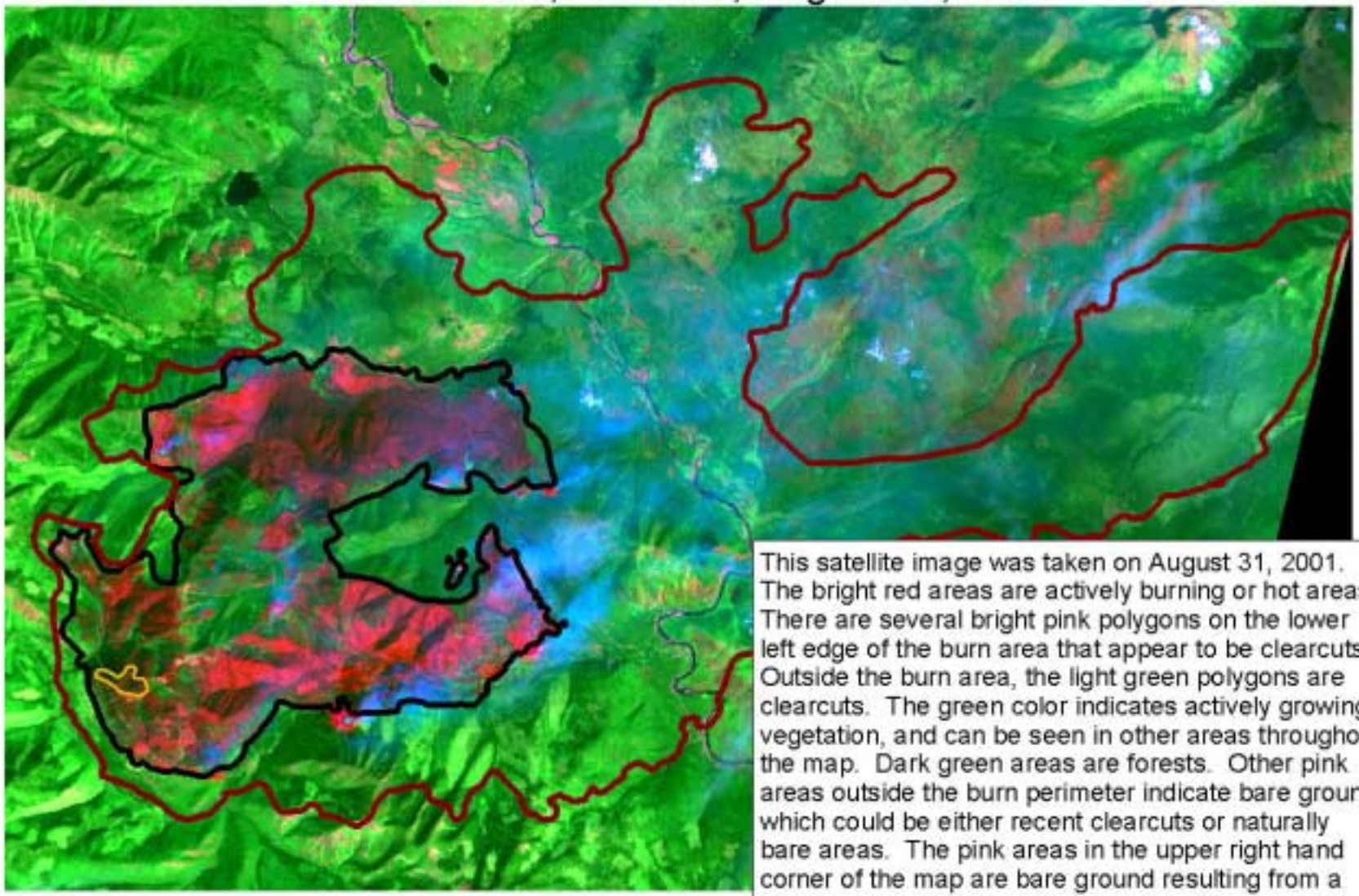
Ownership and Roads

Moose Fire, Montana, September 4, 2001



Satellite Image

Moose Fire, Montana, August 31, 2001

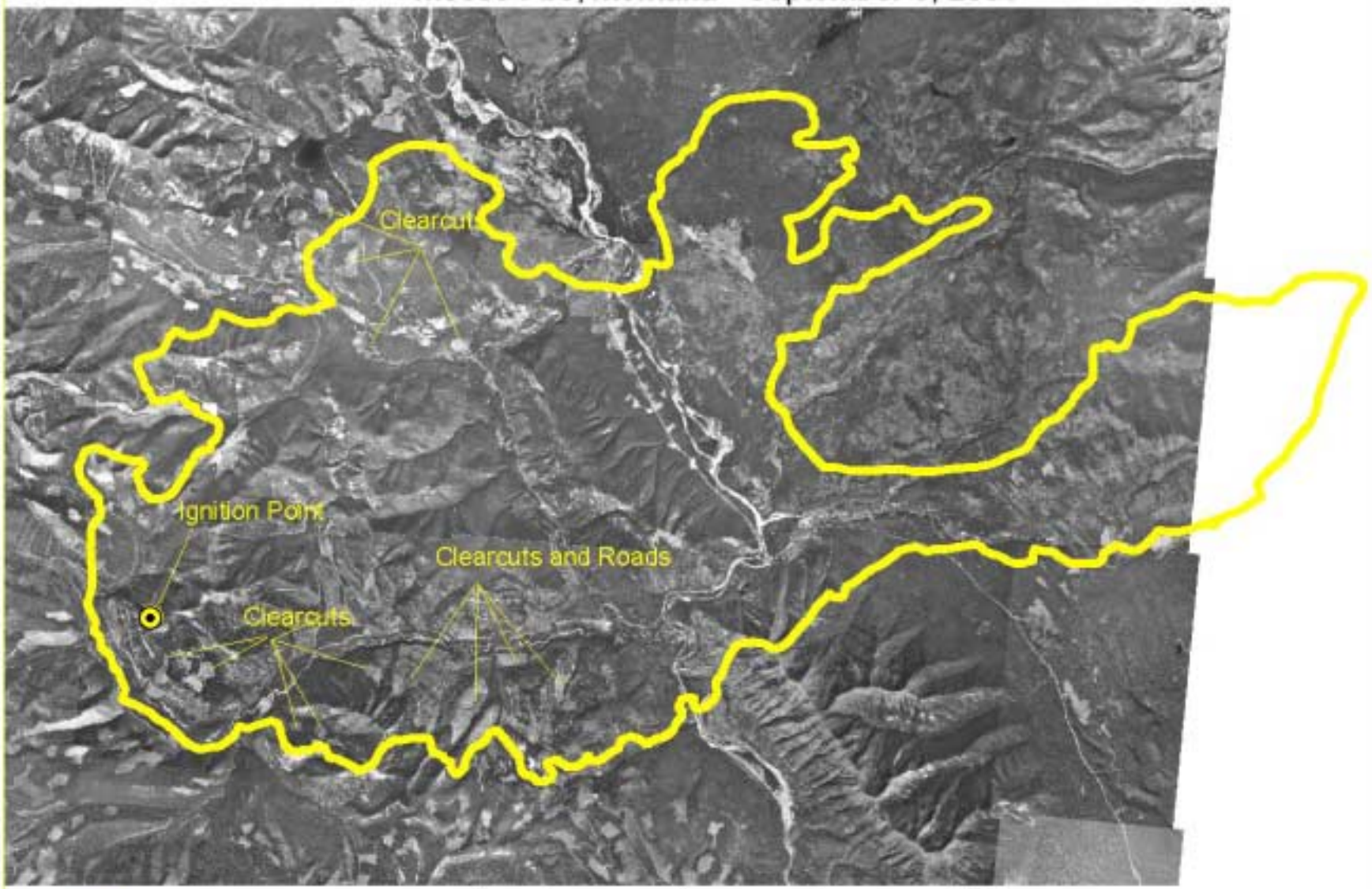


This satellite image was taken on August 31, 2001. The bright red areas are actively burning or hot areas. There are several bright pink polygons on the lower left edge of the burn area that appear to be clearcuts. Outside the burn area, the light green polygons are clearcuts. The green color indicates actively growing vegetation, and can be seen in other areas throughout the map. Dark green areas are forests. Other pink areas outside the burn perimeter indicate bare ground, which could be either recent clearcuts or naturally bare areas. The pink areas in the upper right hand corner of the map are bare ground resulting from a previous fire. Blue is smoke from the fire.

Pacific Biodiversity Institute, 2001
www.pacificbio.org

Aerial Photograph

Moose Fire, Montana - September 6, 2001



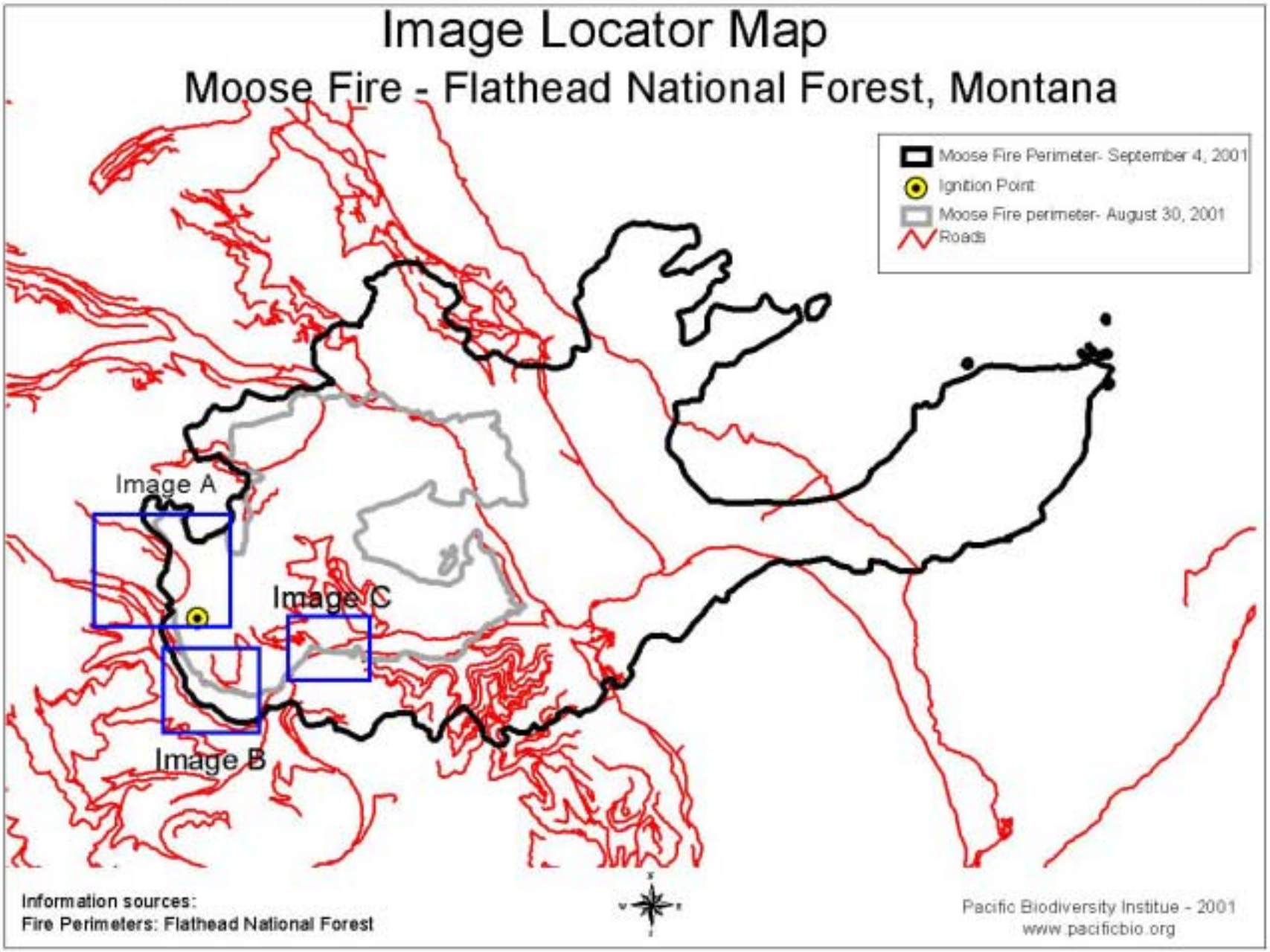


Image Locator Map
Moose Fire - Flathead National Forest, Montana
Moose Fire Perimeter- September 4, 2001
Ignition Point
Moose Fire perimeter- August 30, 2001
Roads
Image A
Image C
Image B
Information sources:
Fire Perimeters: Flathead National Forest
Pacific Biodiversity Institue - 2001
www.pacificbio.org

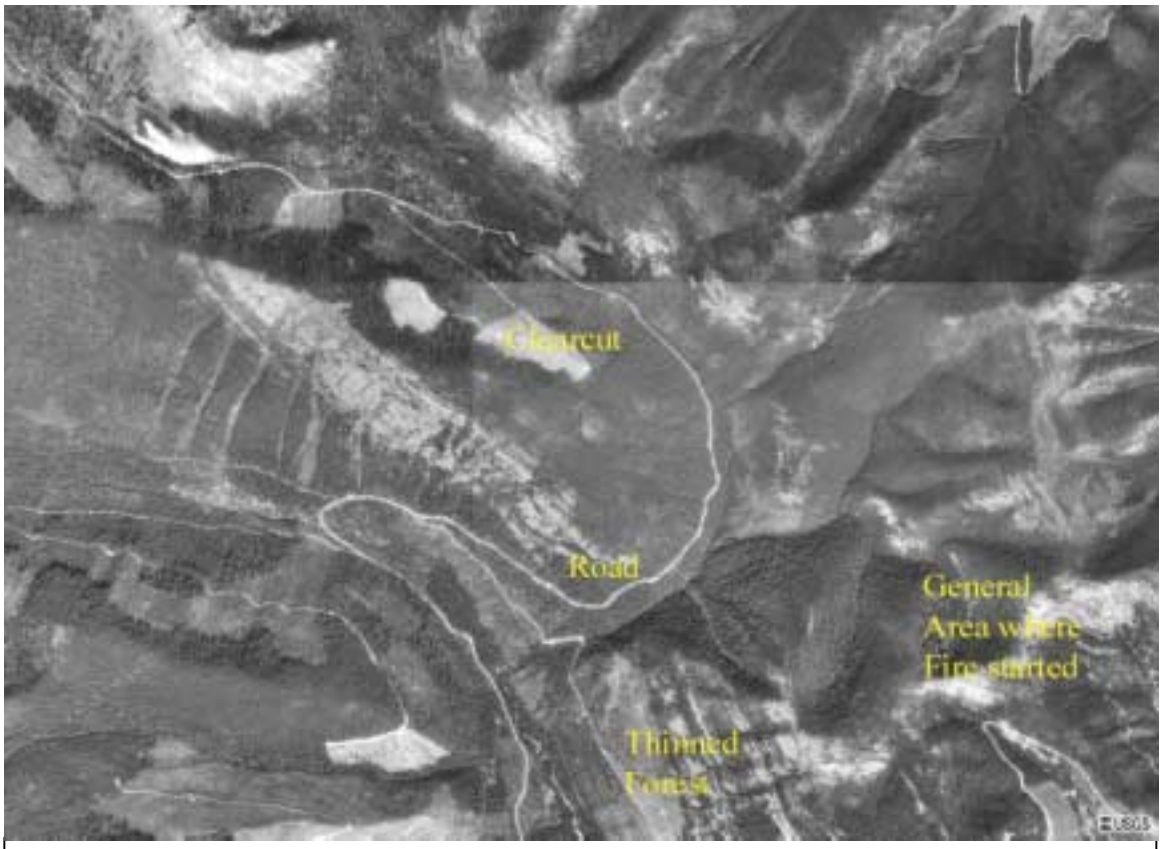


Image A: Landscape condition near ignition point of Moose Fire. Aerial photo from USGS, 1991.

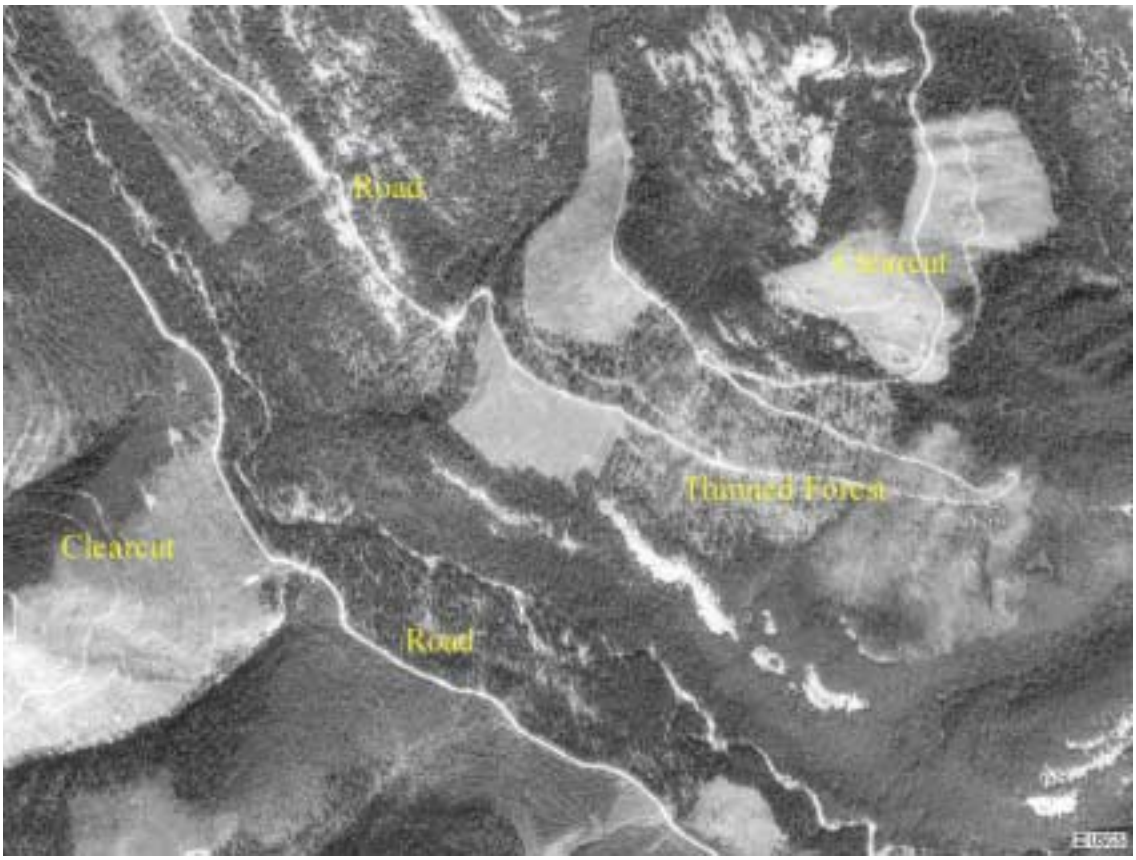


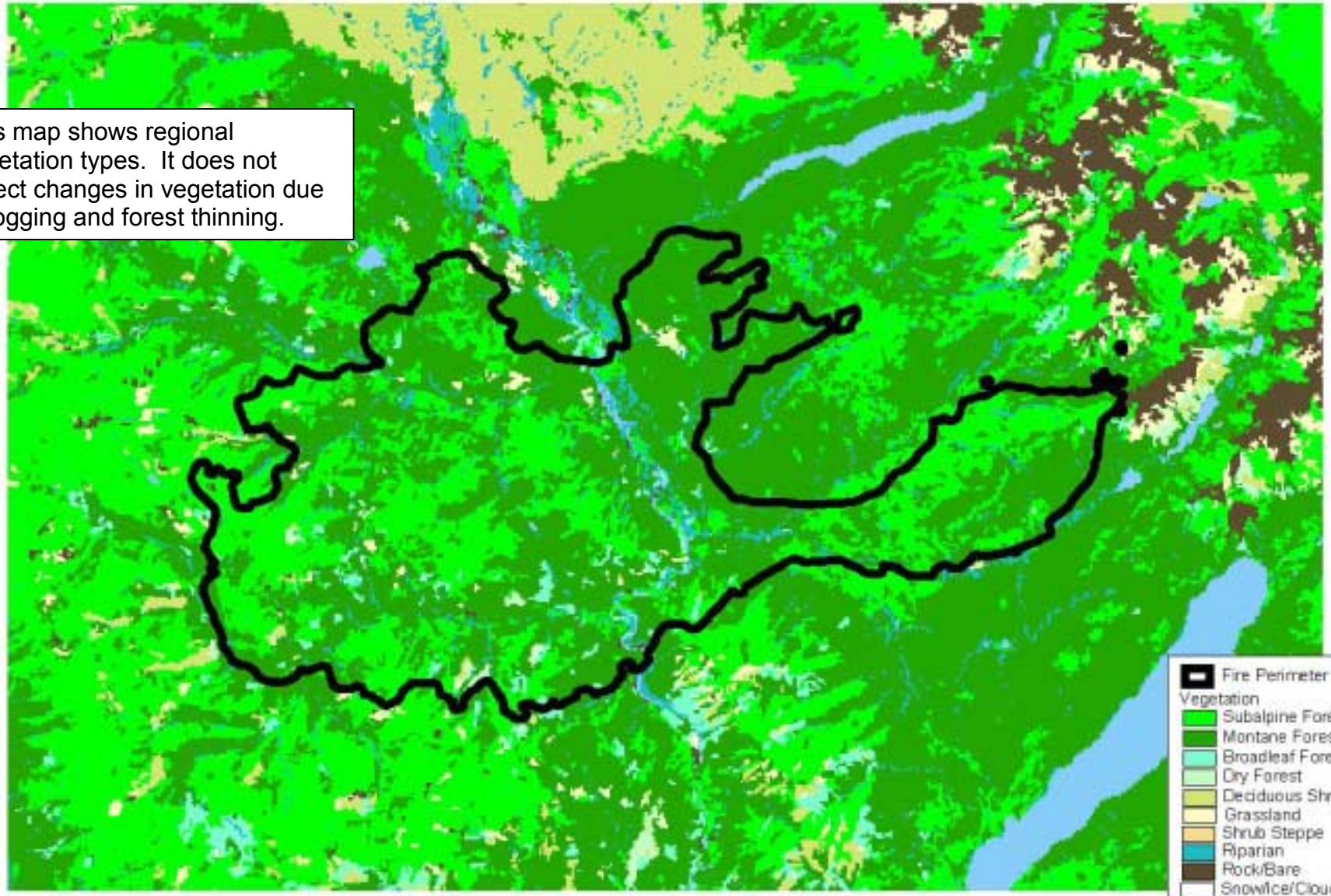
Image B: Landscape condition on the southern perimeter of the Moose Fire. Aerial Photo fromUSGS. 1991.

Image C: Landscape condition on south-east edge of Moose Fire. Aerial photo from USGS, 1991.

Vegetation

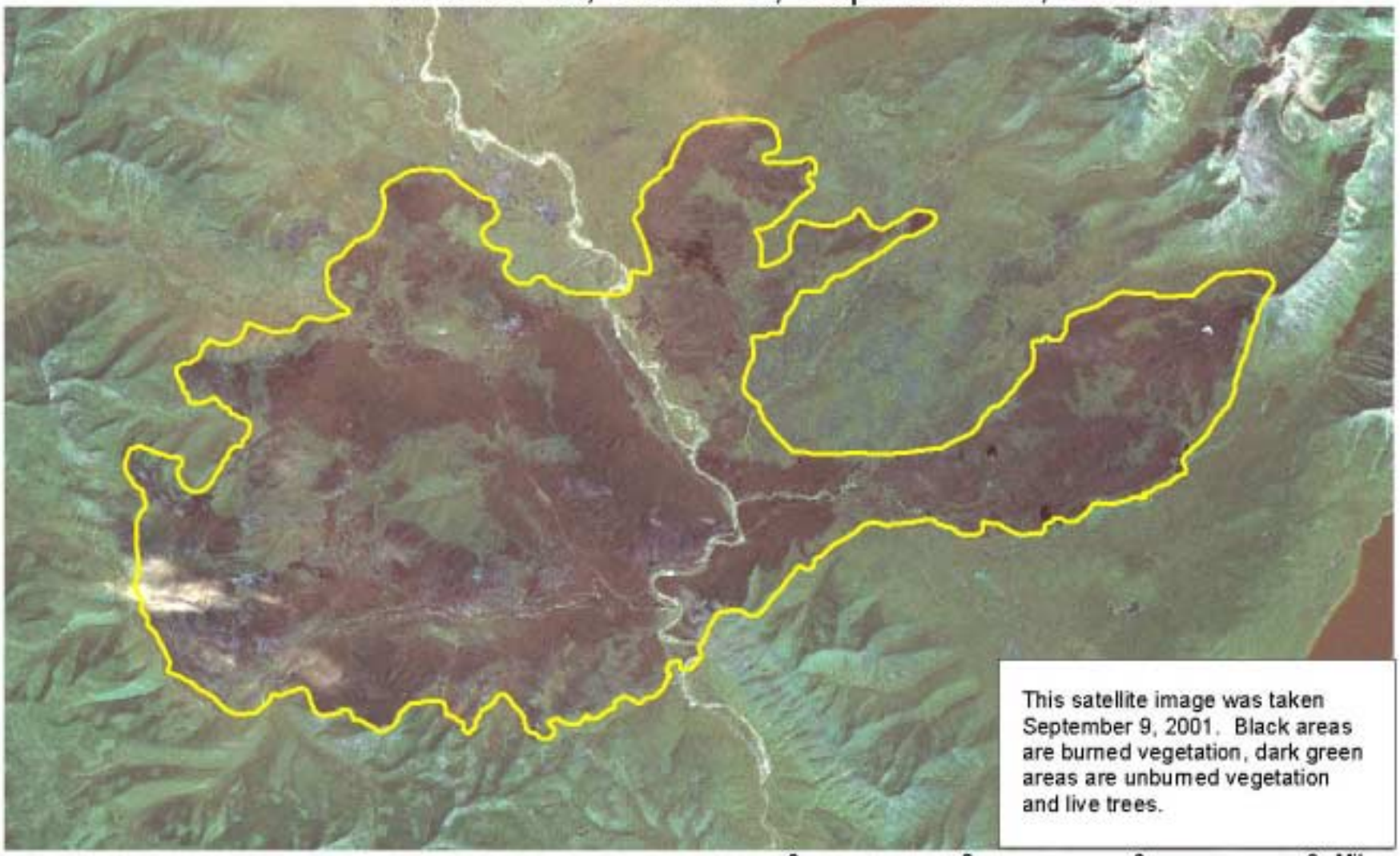
Moose Fire, Montana, September 4, 2001

This map shows regional vegetation types. It does not reflect changes in vegetation due to logging and forest thinning.



Satellite Image

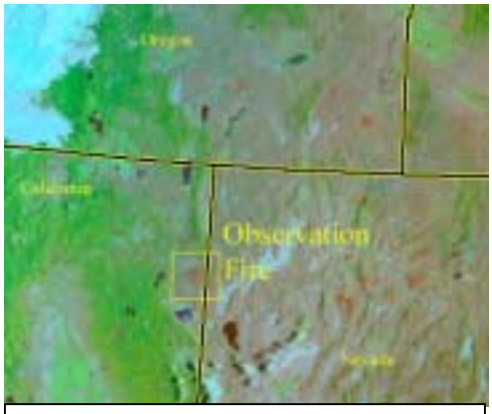
Moose Fire, Montana, September 9, 2001



6. Observation Fire

Summary

The Observation fire has been the largest fire in California this fire season. It burned in open desert country dominated by shrubs and grass with some evergreen forests affected. Most of the fire was on BLM land, with the rest on private property. No National Forest land was involved in this fire.



AVHRR Satellite Image, August 20, 2001

Location and History

The Observation fire was ignited by lightning on August 10, 2001, in lands south of Ravendale, California. Winds and hot, dry weather fueled the blaze as it grew to 67,700 acres, making it the largest fire in California. The fire was 100% contained by August 16, 2001.

Statistics as of September 20, 2001	
Fire Started	August 10, 2001
Cause	Lightning
Acres in Fire Perimeter	67,700
Containment	100%
Cost	$3.15 Million
Structures lost	0

Land Cover

The Observation fire burned across open shrubland and evergreen forests. The rapid growth of this fire is typical of rangeland fires.

Land Cover	Percent of area burned
Evergreen Forest	6 %
Shrubland	92 %
Grassland/Pasture	2 %
Other (bare, rock)	1 %

Ownership

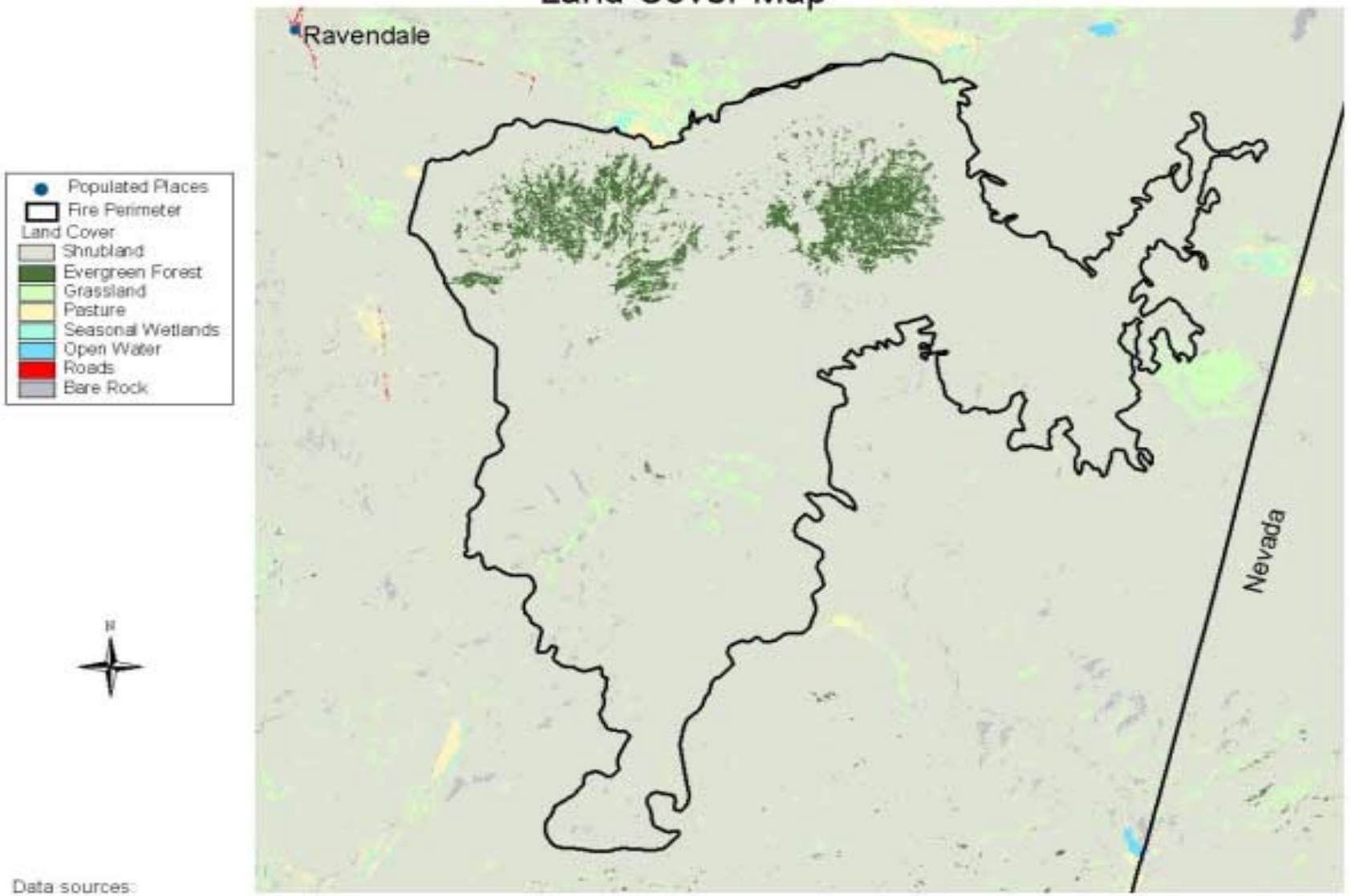
Sixteen percent of the Observation Fire was on private land, and the remainder on BLM land.

Land Owner	**Percent of area burned**
BLM	84 %
Private	16 %

Information Sources

General Information: Susanville BLM: (530) 257-5381
GIS Information: Dawn Bush, Susanville BLM

Observation Fire, California, August 13, 2001
Land Cover Map

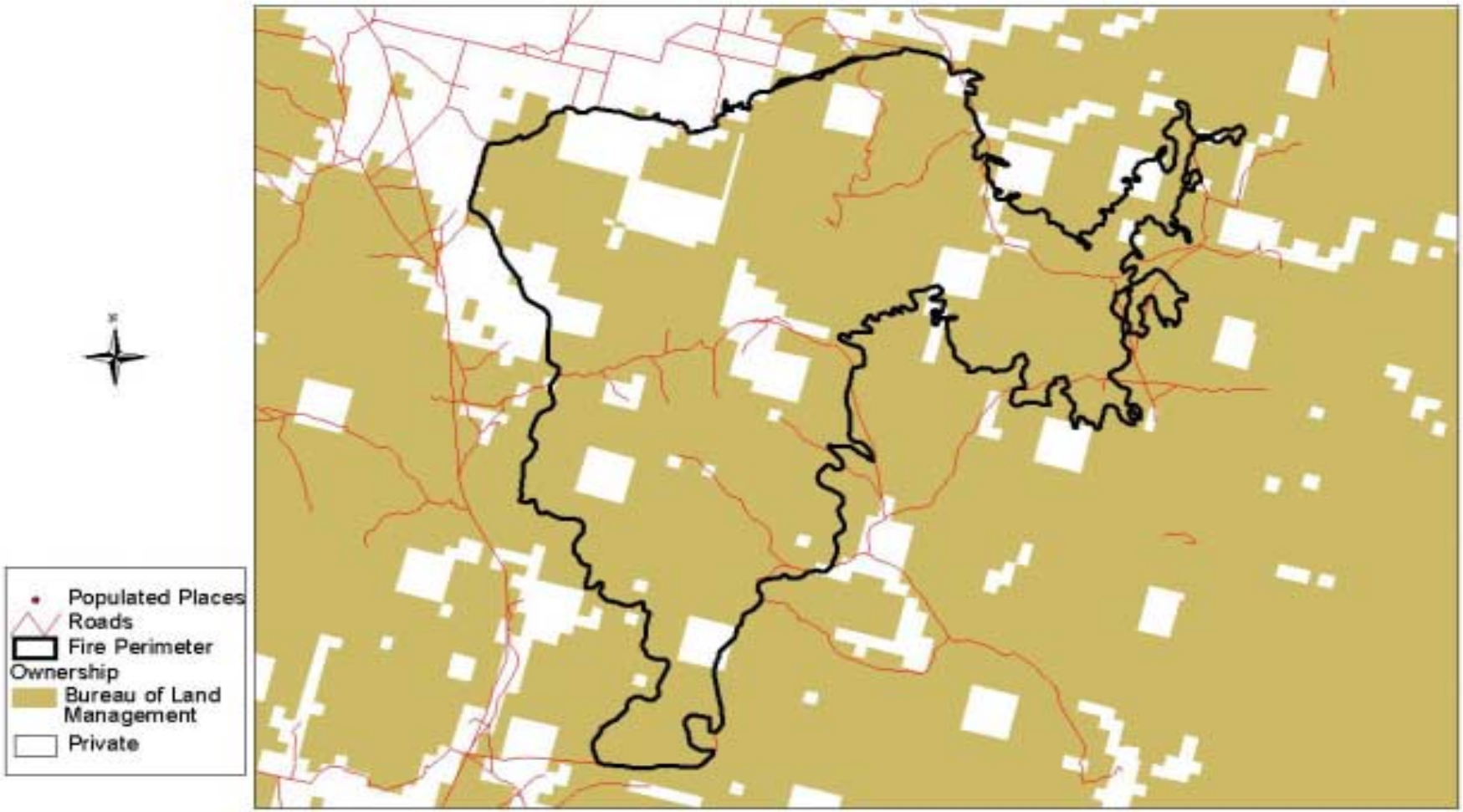


Data sources:
Land cover from USGS
Fire Perimeter from www.geomac.usgs.gov

Pacific Biodiversity Institute, 2001
www.pacificbio.org

Ownership and Roads

Observation Fire, California, August 16, 2001



Data sources:
Ownership from Conservation Biology Institute, updated by Pacific Biodiversity Institute
Fire Perimeter from www.geomac.usgs.gov

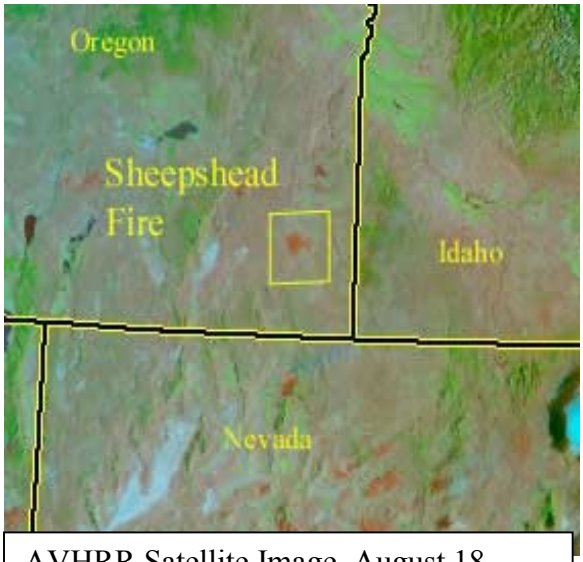
3 0 3 Miles

Pacific Biodiversity Institute, 2001
www.pacificbio.org

7. Sheepshead Fire

Summary

The Sheepshead fire burned almost entirely in open desert country dominated by grass and shrubs. Most of the fire was on BLM land and the rest was on private land. No National Forest land was involved in this fire and very little forest burned.



AVHRR Satellite Image, August 18, 2001. Red spot inside yellow box is the Sheepshead burn area

Location and History

The Sheepshead fire was located in southeast Oregon, 75 miles southeast of Burns. The fire was ignited by lightning on August 9, 2001, and spread rapidly in the open shrub and grassland area to more than 10,000 acres by August 11. Passing thunderstorms, gusty winds and multiple new fires are impeding containment efforts. The fire perimeter includes over 43,000 acres and is 100% contained.

Land Cover

The Sheepshead Fire burned through shrubland and grassland.

Land Cover	Percent in burn area
Evergreen Forest	trace
Shrubland	93 %
Herbaceous	7 %

Statistics as of August 24, 2001	
Fire Started	August 9, 2001
Cause	Lightning
Acres in Fire Perimeter	51,452
Containment	100%
Cost	$3.2 Million

Ownership and Management

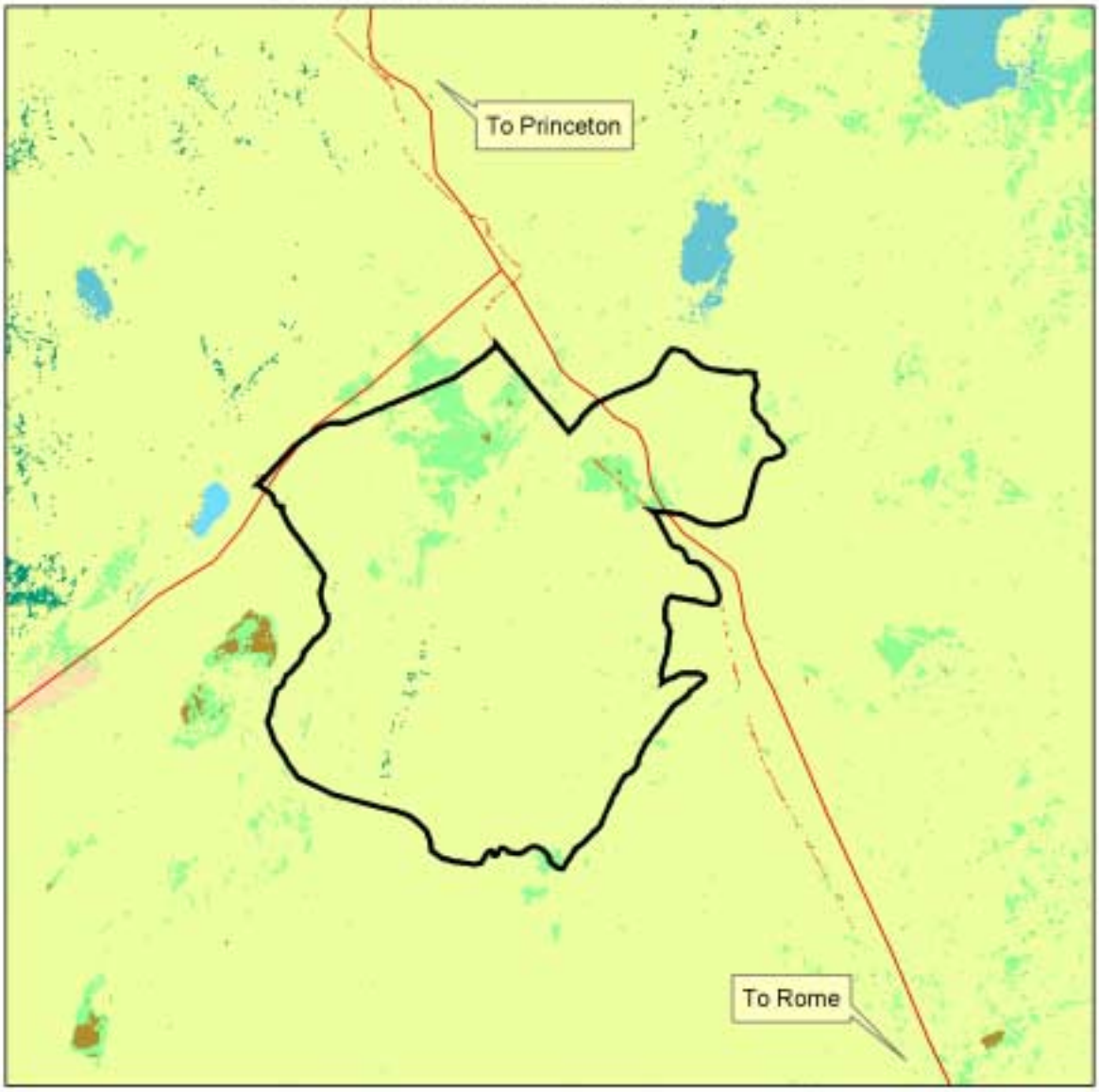
Eighty-two percent of the area burning in the Sheepshead fire is on BLM land and 18% is on private land.

Land Owner	Percent of total area burned
BLM	82 %
Private	18 %

Information Sources

General Information: Burns District BLM (541) 573-4400

Land Cover Map
Sheepshead Fire, Oregon, August 13



Legend

- Fire Perimeter, August 13
- Major Roads

Land Cover

- Shrubland
- Open Water
- Roads
- Bare Rock
- Evergreen Forest
- Grassland
- Pasture/Hay
- Seasonal Wetlands

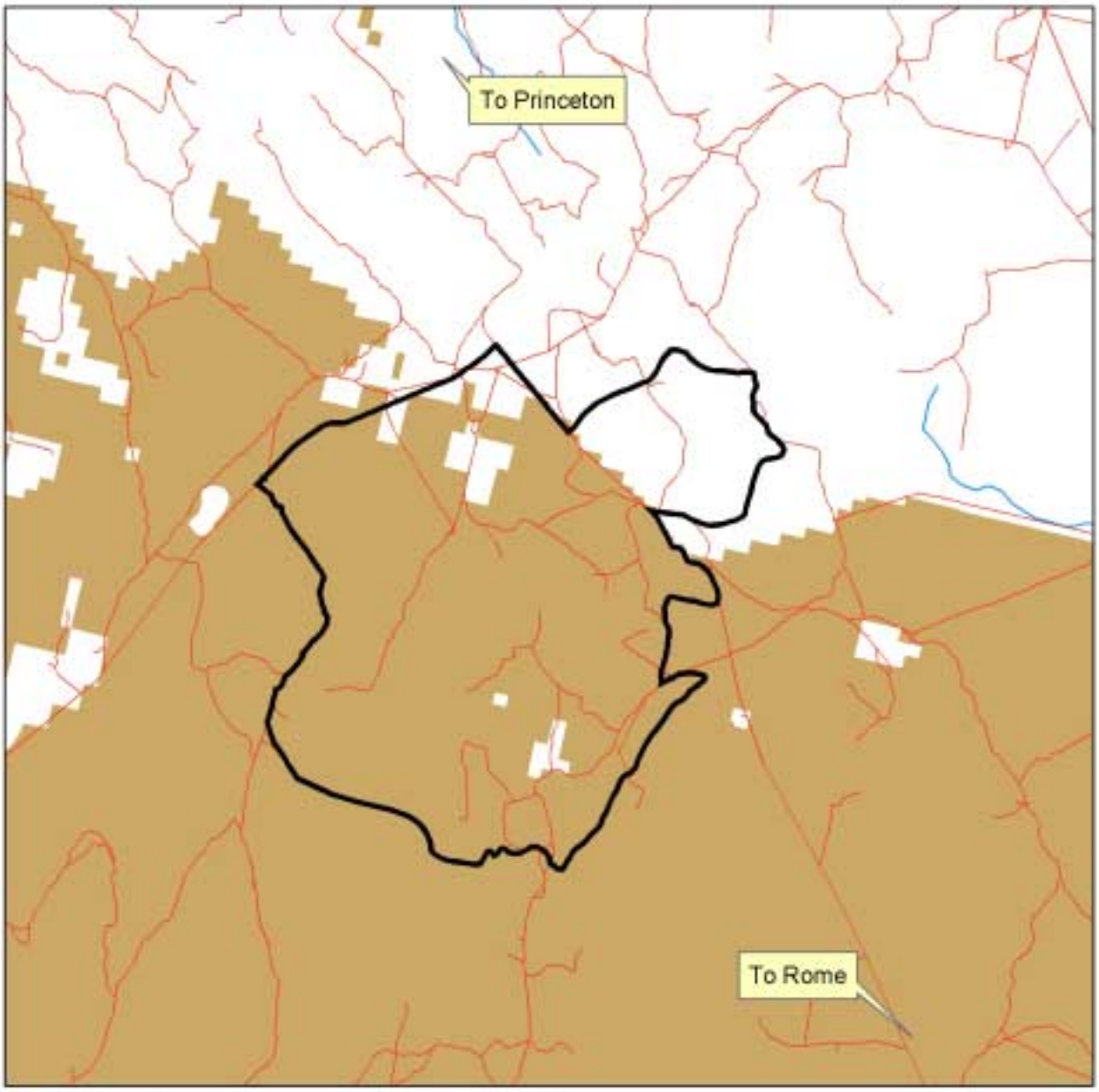
N

Data sources:
Land Cover Data from USGS
Fire Perimeter from Oregon BLM

0 1 2 4 6 Miles

Map by Pacific Biodiversity Institute, 2001
www.pacificbio.org

Ownership and Roads
Sheepshead Fire, Oregon, August 13, 2001



Legend

- Fire Perimeter, August 13
- Bureau of Land Management
- Roads
- Rivers

N

0 1 2 4 6 Miles

Data sources:
Ownership Data from Conservation Biology Institute, updated by PBI.
Fire Perimeter from Oregon BLM

Pacific Biodiversity Institute, 2001
www.pacificbio.org

8. Rex Creek Complex

Summary

The Rex Creek Complex of fires burned almost entirely in Wilderness and Roadless areas. The topography in this region is very steep. The steep and rugged topography limited firefighter's ability to control this fire. Initial reports indicate that most of the trees are surviving the fires and that many ecological benefits will result from these fires. Only a few remote private inholdings within the Wilderness that contain a few summer cabins and homes have been threatened by the fire and only one home has been lost. No communities have been threatened by this Wilderness fire.

AVHRR Satellite Image of Rex Creek Fires and smoke cloud. September 12, 2001.

Location and History

The Rex Creek Complex consisted of five fires located on the north side of Lake Chelan, 34 miles northwest of the town of Chelan, WA. The Rex Creek fire, the largest fire, extended from a few miles south of Stehekin to Safety Harbor Creek. The majority of the fires were in the Lake Chelan-Sawtooth Wilderness and in a roadless area to the south of the Wilderness.

Statistics as of September 24, 2001	
Fire Started	August 12
Cause	Lightning
Acres in Fire Perimeter	54,298
Containment	100%
Cost	$11 Million
Structures lost	2

The complex nearly doubled in size on Saturday, August 18, due to strong winds. The fires to date cover an area of 50,000 acres. The fires are one-hundred percent contained, largely by natural perimeters including Lake Chelan and the rocky peaks of the Sawtooth Range. Fire-fighting efforts were initially limited to protecting thirty cabins along Lake Chelan.

Burn Area, August 24, 2001. Photo from Wenatchee National Forest, Rex Creek website.

Land Cover

Since the topography is so steep in this area, the vegetation varies greatly between high and low elevations. Near lake level, the vegetation is largely ponderosa pine forest and shrub-steppe communities. At mid-elevations, vegetation consists of mixed conifer forests. In the higher country, subalpine fir and lodgepole pine forests are interspersed with subalpine meadows. The fires are burning out as they reach the moist subalpine meadows, cliffs and rocky slopes. Overall, about 66% of the land in the fire perimeter is forested.

Land Cover	Percent of total area burned
Evergreen Forest	62 %
Deciduous Forest	3 %
Shrubland	14 %
Herbaceous	13 %
Other(Rock, water)	8 %

Ownership and Management

Land Owner	Percent of total area burned
U.S. Forest Service	98 %
Private	2 %

Topography

The majority of the land in the Rex Creek burn is "steep," which is defined as slopes ranging from 30 to 70 percent. Substantial portions of the area are "extremely steep," which have slopes greater than 70 percent.

Fire History

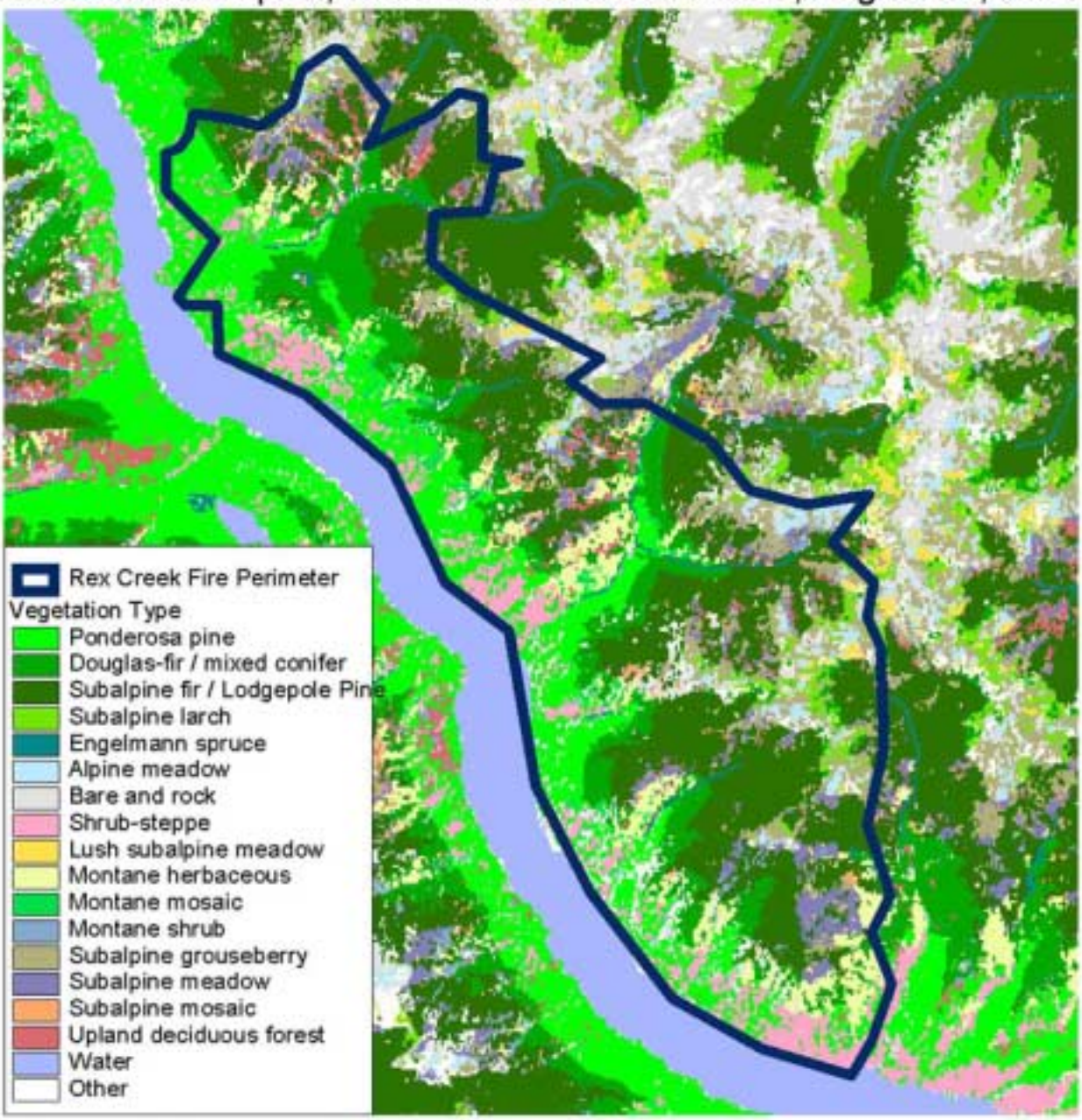
The Rex Creek fire is burning into an area burned in the 1970s. It is also burning in a forest that has been affected by large fires in the 1950s, 1970s and in 1994.

Information Sources

General Information: Chelan Ranger District- (509) 682-2576

Land Cover

Rex Creek Complex, Wenatchee National Forest, August 20, 2001



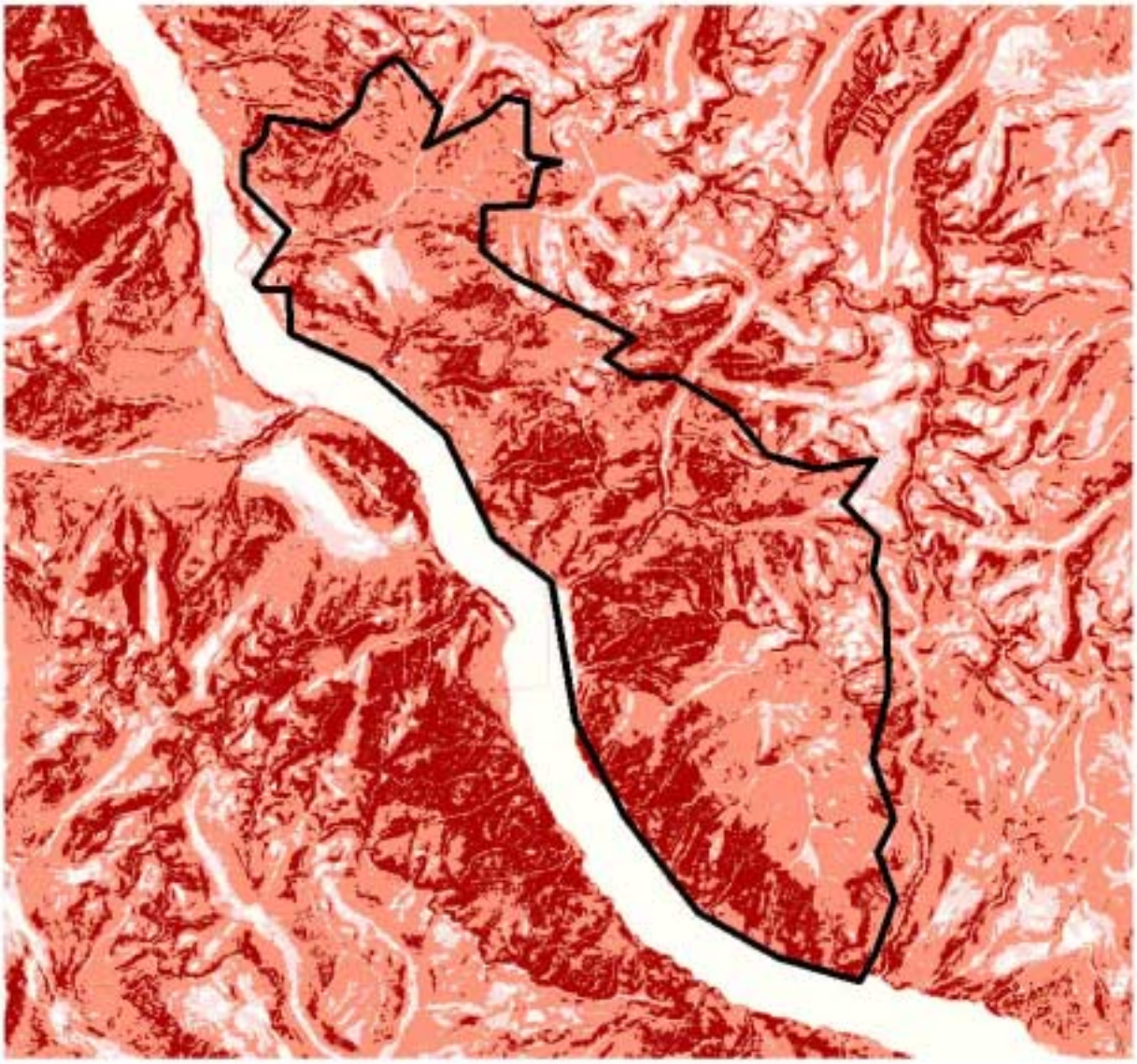
2 0 2 4 Miles

Sources:
Fire Perimeter: Wenatchee National Forest
Vegetation: Peter Morrison

Pacific Biodiversity Institute, 2001
www.pacificbio.org

Slope

Rex Creek Fire, Wenatchee National Forest, August 20, 2001



Fire Perimeter
Slope Classes
Flat
Moderate
Steep
Very Steep; cliffs
No Data

N

Fire Perimeter from Wenatchee National Forest

2 0 2 4 Miles

Pacific Biodiversity Institute, 2001
www.pacificbio.org

Fire History Wenatchee National Forest

9. Elk Mountain Complex

Summary

The Elk Mountain Complex consisted of two fires, the Elk Moutain II and Roger's Shack fires, that burned in southwestern South Dakota and eastern Wyoming, west of Custer, SD. The Elk Mountain II fire burned mostly on private land covered by grasslands and shrubs, and partially in open ponderosa pine forests. The Roger's Shack Fire, the smaller of the two Elk Mountain Complex fires, was largely on National Forest land covered by sparse ponderosa pine forests. Both fires burned in roaded and managed landscapes.

Location and History

Lightning ignited both fires in the Elk Mountain Complex during a storm on July 30, 2001. These fires grew rapidly in a roaded landscape and burned a total of 26,800 acres in seven days. The Roger's Shack fire burned almost entirely within a roaded portion of the Black Hills National Forest, and the Elk Mountain II fire burned mostly on privately owned land. The Roger's Shack fire burned only a few miles south of the perimeter of the Jasper fire, a 83,000 acre fire which burned a heavily roaded portion of the Black Hills National Forest in 2000.

Statistics as of September 21, 2001	
Date fire started	July 30, 2001
Cause (presumed)	Lightning
Acres within fire perimeter	26,800
Containment	100%
Fire-fighting cost	$5.2 Million
People-days*	5,538
Equipment and Resources	38 Engines; 11 helicopters; 357,000 gallons of fire retardant
Structures lost	15
*People-days are defined as the sum of the number of people working each day multiplied by the number of working days	

The Interagency Fire Center designated the Elk Mountain Complex fires as a national priority. Of the two fires, the smaller Roger's Shack fire was of higher priority due to homes and structures scattered on private inholdings in the National Forest. Two cabins and seven outbuildings were burned in the fire. As of August 4, the fires were both 100% contained.

Fire Progression

The Elk Mountain fire began in three different spots outside of the Black Hills National Forest and later spread east into that forest, and north onto privately owned land.

Land sparsely vegetated with ponderosa pines burning in Elk Mountain II fire. July 31, 2001. Photo by Don Luhrsen, Black Hills National Forest.

Ownership and Management

Sixty-three percent of the Elk Mountain Complex burned on National Forest, and 36% burned on private land (Figure 20). The Roger's Shack fire was almost entirely within the Black Hills National Forest while the Elk Mountain II fire predominantly burned privately owned land in Wyoming. Both fire areas are in roaded landscapes.

Land Owner	Percent of total area burned
U.S. Forest Service	63 %
Private	22 %
BLM	15 %

Sparsely vegetated land burning in Elk Mountain II fire. July 31, 2001. Photos by Don Luhrsen, Black Hills National Forest.

Land Cover

The area burned by the Roger's Shack fire was in the Black Hills National forest and the area was 89% forested by sparse ponderosa pines. The Elk Mountain II fire burned partially on the Black Hills National Forest and mostly on grassland. The overall area was 68% forested.

Land Cover in Elk Mountain Complex	Percent of total area burned
Evergreen Forest	68 %
Shrubland	2%
Herbaceous	30 %

Information Sources

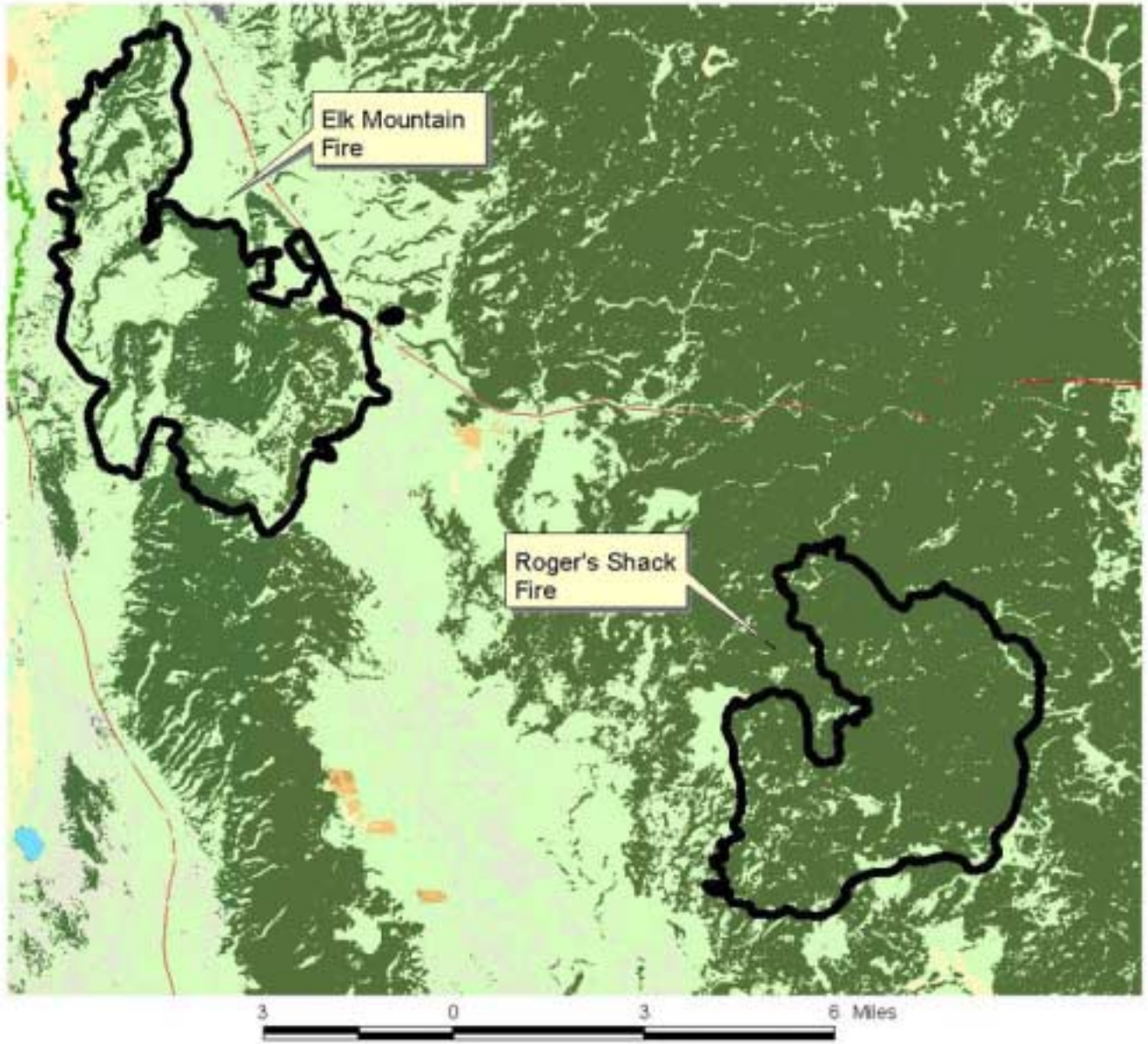
General Information: Black Hills National Forest, Supervisor's Office: (605) 673-9200
http://www.fs.fed.us/r2/blackhills/elkmtn/
GIS: ftp://www.fs.fed.us/incoming/r2/bhnf/Core_Coverages/ris99.zip

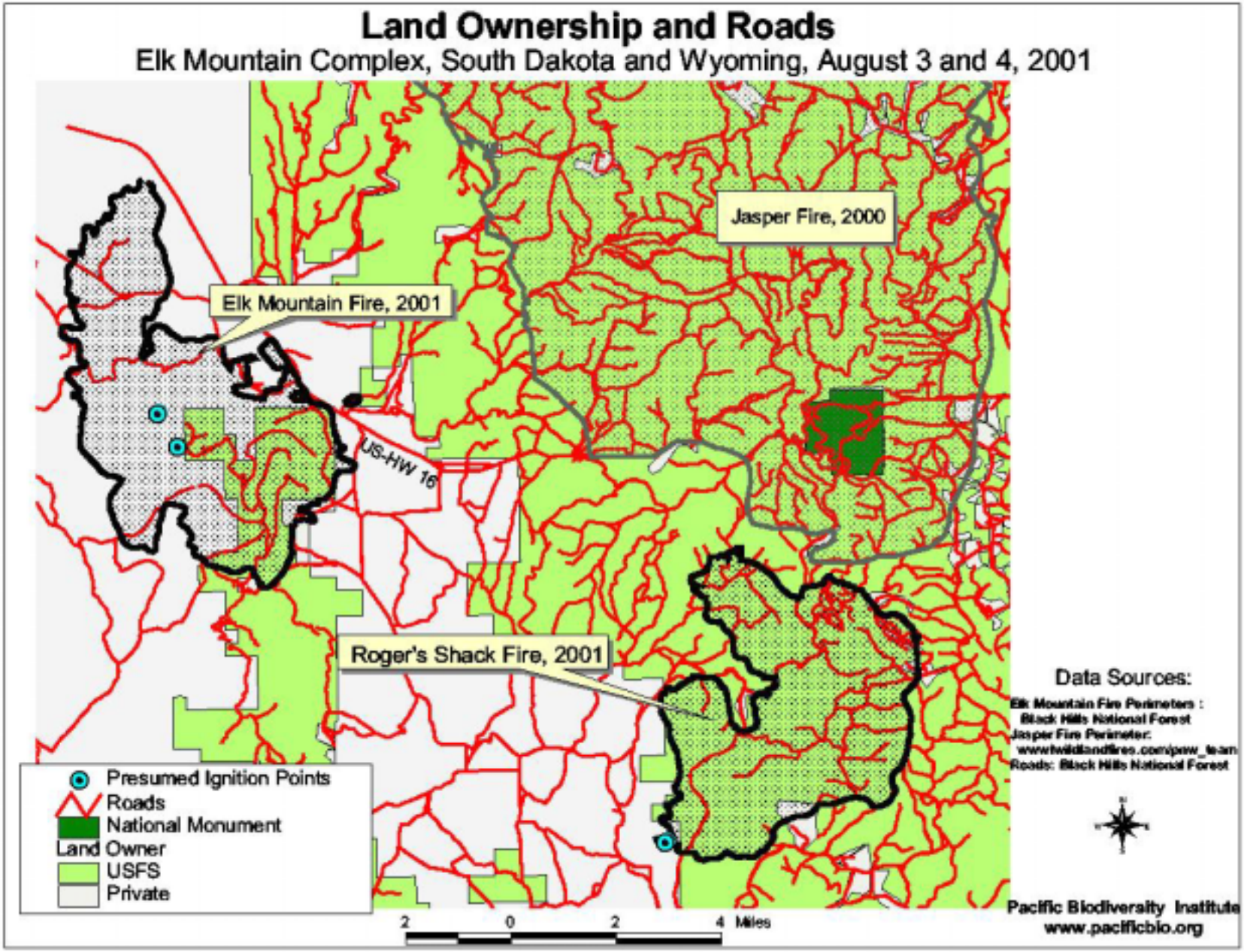
Land Cover

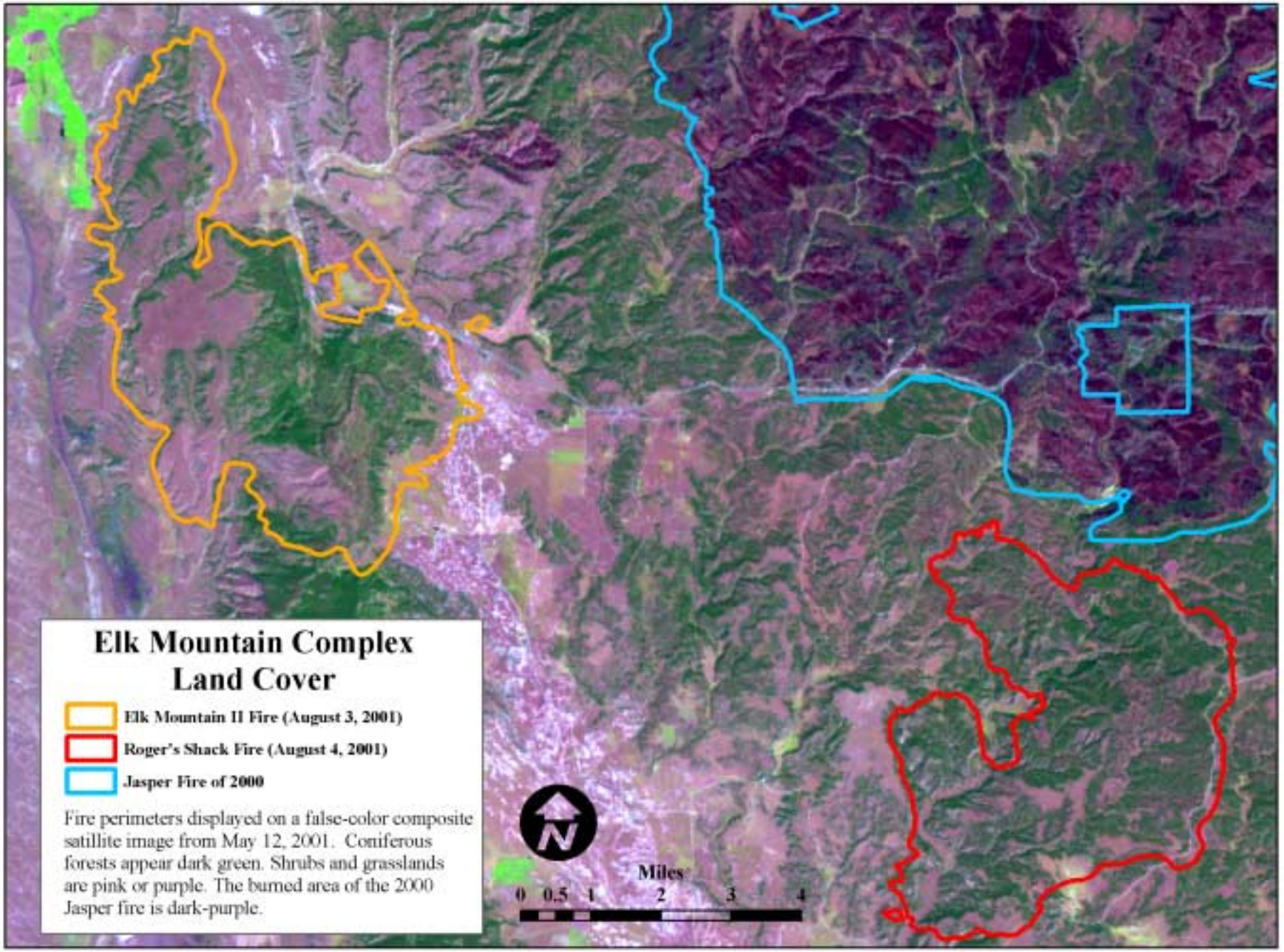
Land Cover data from USGS
Fire perimeters from Black Hills National Forest

Pacific Biodiversity Institute, 2001
www.pacificbio.org

Elk Mountain complex, South Dakota and Wyoming, August 4, 2001




Land Ownership and Roads
Elk Mountain Complex, South Dakota and Wyoming, August 3 and 4, 2001
Jasper Fire, 2000
Elk Mountain Fire, 2001
US-HW 16
Roger's Shack Fire, 2001
Presumed Ignition Points
Roads
National Monument
Land Owner
USFS
Private
2 0 2 4 Miles
Data Sources:
Elk Mountain Fire Perimeters :
Black Hills National Forest
Jasper Fire Perimeter:
www.wildlandfires.com/pnw_team
Roads: Black Hills National Forest
Pacific Biodiversity Institute
www.pacificbio.org


Elk Mountain Complex
Land Cover
Elk Mountain II Fire (August 3, 2001)
Roger's Shack Fire (August 4, 2001)
Jasper Fire of 2000
Fire perimeters displayed on a false-color composite satillite image from May 12, 2001. Coniferous forests appear dark green. Shrubs and grasslands are pink or purple. The burned area of the 2000 Jasper fire is dark-purple.
N
Miles
0 0.5 1 2 3 4

10. Fridley Fire - Montana

Summary
The fire's ignition point was located in an area with a history of logging and thinning. It grew quickly in this landscape, burned into a roadless area and later back into a managed landscape.

Location and History
Lightning ignited the Fridley fire on August 19 near Fridley Creek in the Gallatin National
Forest. This fire doubled in size on August 22 and displayed "extreme" behavior on August 23 when high winds caused it to double in size again. On Wednesday, August 29, the fire threatened a privately owned cabin southwest of Emigrant on the fire's southeast edge. The cabin was on a ridge top, making it difficult to protect.

Statistics – As of September 13, 2001	
Fire Started	August 19, 2001
Cause	Lightning
Acres in Fire Perimeter	26,373
Containment	100 %
Cost	$11.4 Million
Structures lost	0

Ownership and Management
The fire started in a checkerboard ownership of National Forest and private lands. This area is roaded and has a history of logging and thinning. The fire spread from this landscape into a roadless area and from there onto private land. The Ownership map (see below) shows the progression of the fire compared to ownership and management.

Fireball rages through a clearcut and into a second growth forest. Photo from the *Livingston Enterprise,* August 23, 2001.

Land Owner

Land Owner	Percent of total area burned
U.S. Forest Service	60.3 %
Private	39.6 %
BLM	0.1 %

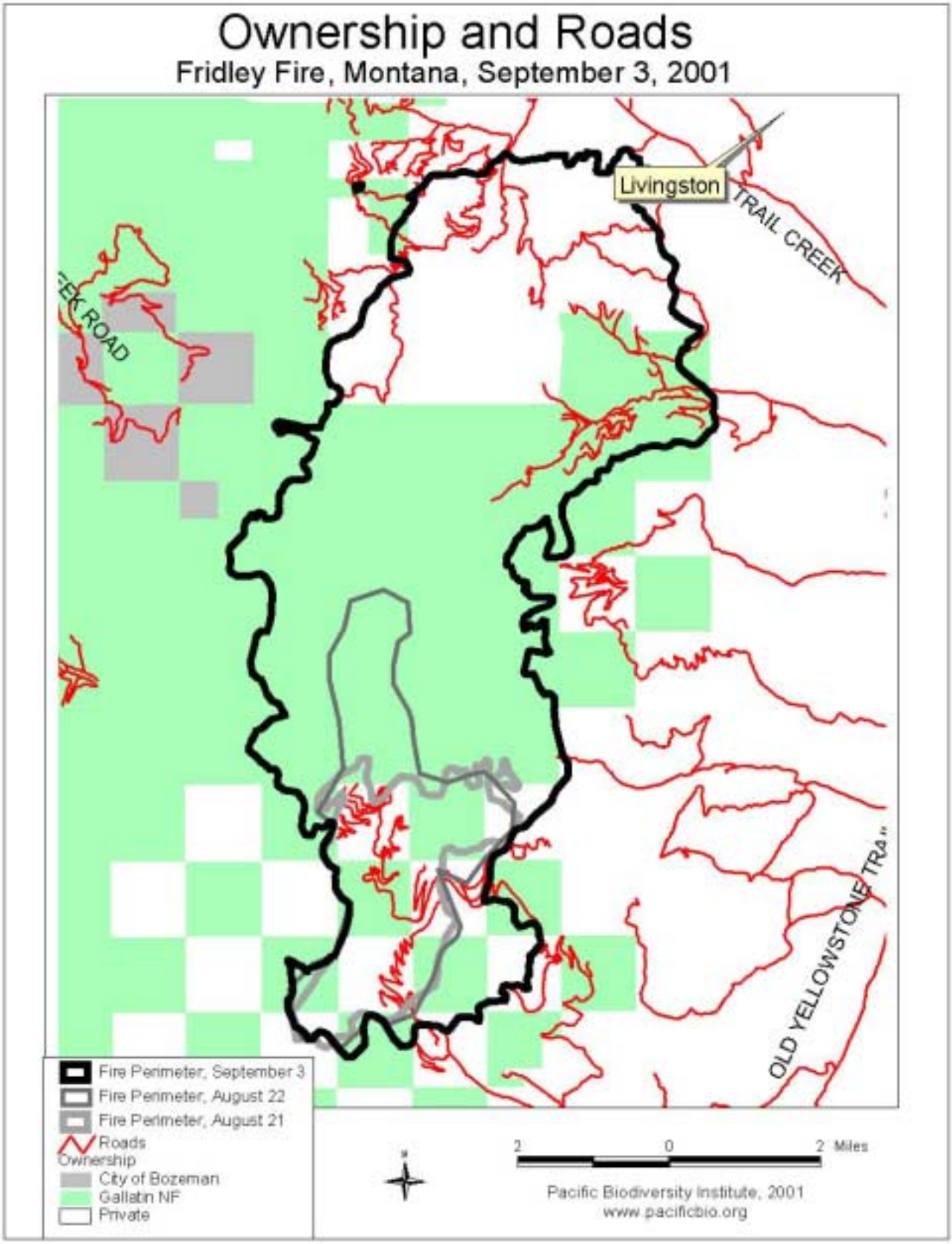
Land Cover

Land Cover	Percent of total area burned
Evergreen Forest	84.9 %
Deciduous Forest	1.3 %
Shrubland	4.6 %
Herbaceous	7.9 %
Other (Rock, water)	1.3 %

Information Sources

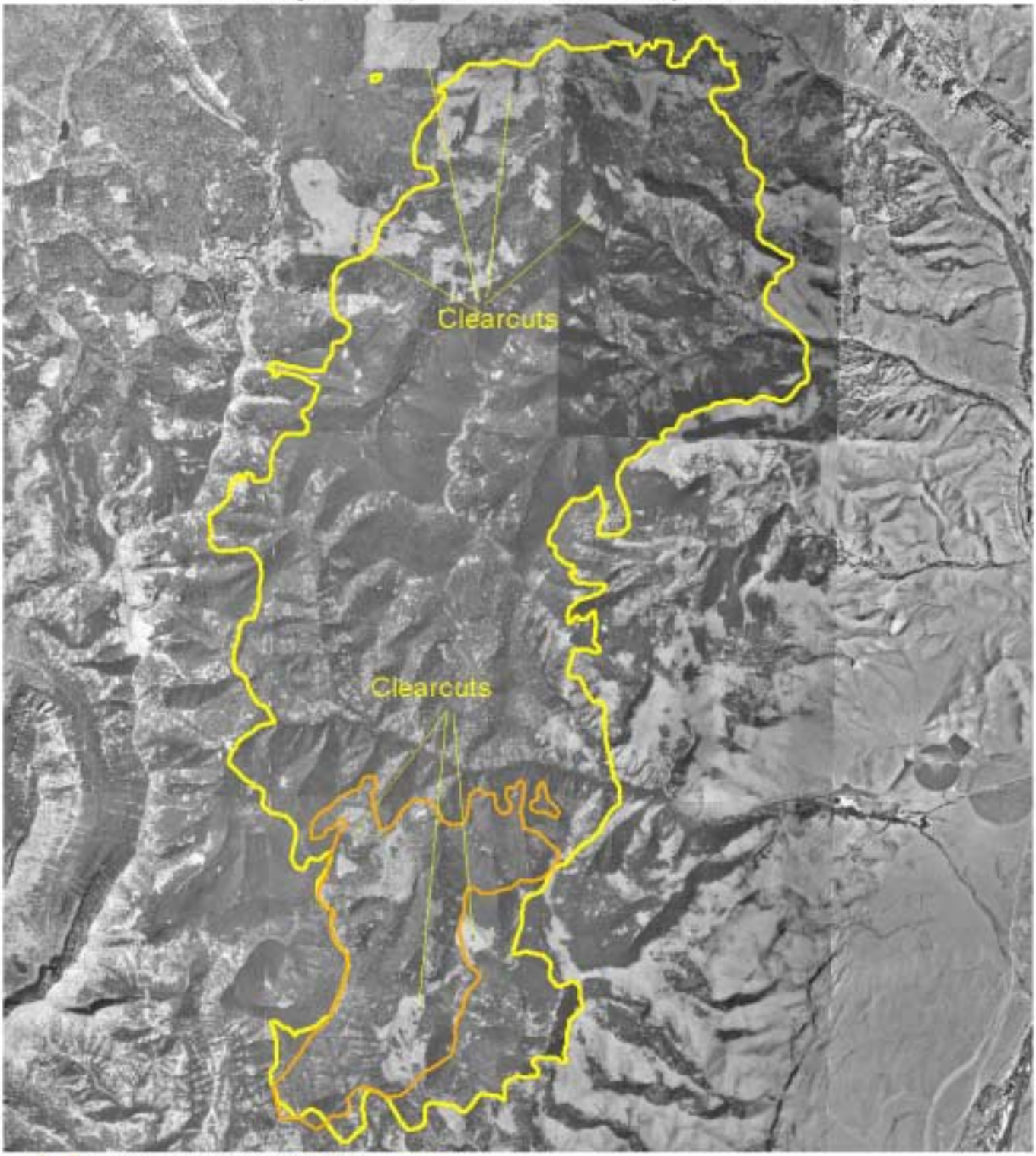
General: Gallatin National Forest, Supervisor's Office: 406-587-6701
Livingston Ranger District- (406) 222-1892,
http://www.fs.fed.us/r1/gallatin/fire/active/fires/fridley/incident_summary.htm

GIS: Gallatin National Forest GIS coordinator


Ownership and Roads
Fridley Fire, Montana, September 3, 2001
Livingston
TRAIL CREEK
EK ROAD
OLD YELLOWSTONE TRA
Fire Perimeter, September 3
Fire Perimeter, August 22
Fire Perimeter, August 21
Roads
Ownership
City of Bozeman
Gallatin NF
Private
2 0 2 Miles
Pacific Biodiversity Institute, 2001
www.pacificbio.org

Aerial Photo

Fridley Fire , Montana - September 3, 2001



Fire Perimeter August 21, 2001
Fire perimeter - September 3, 2001

Aerial photo from USGS, 1994 and 1995

Pacific Biodiversity Institute
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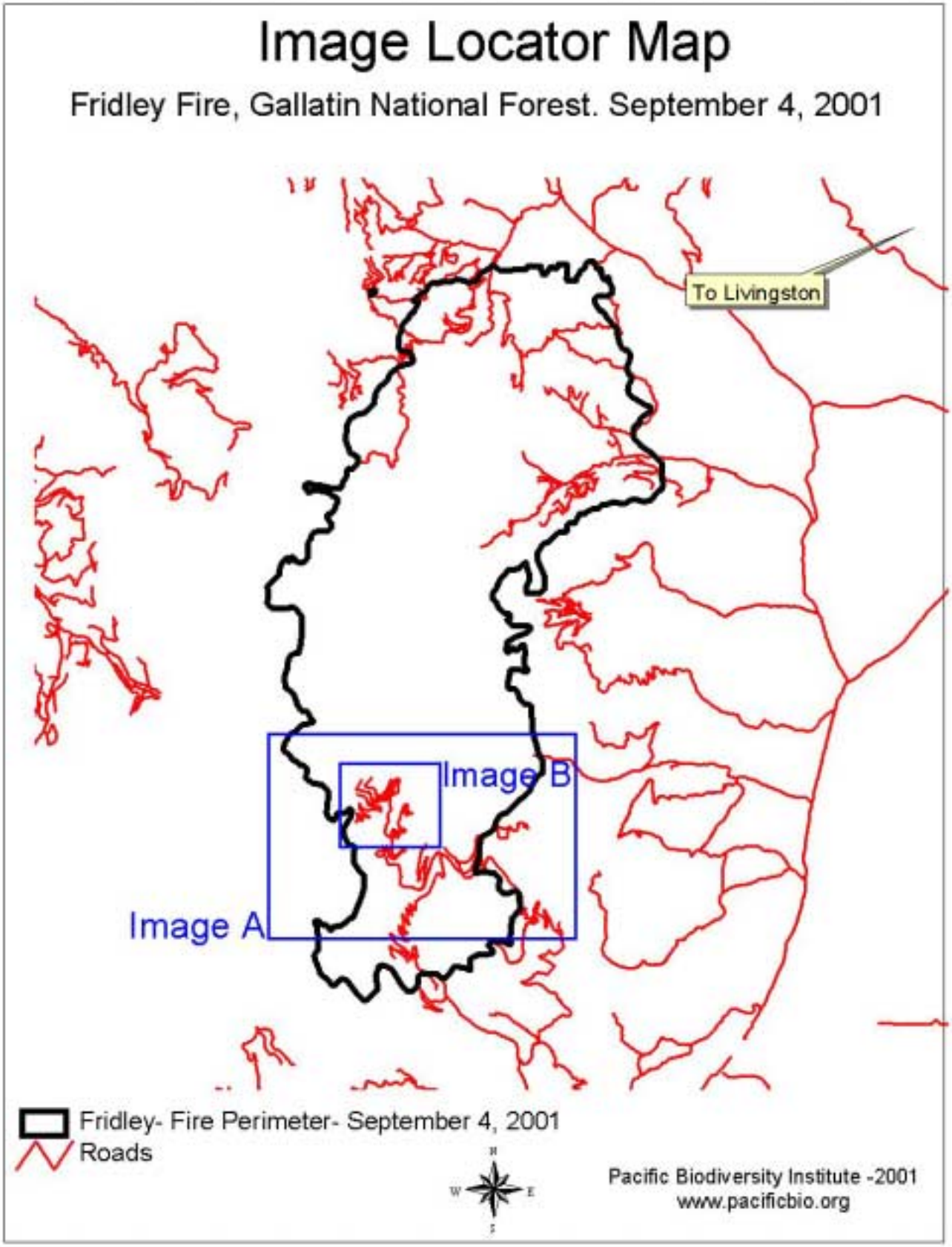


Image Locator Map
Fridley Fire, Gallatin National Forest. September 4, 2001
To Livingston
Image B
Image A
Fridley- Fire Perimeter- September 4, 2001
Roads
Pacific Biodiversity Institute -2001
www.pacificbio.org

Image A: Pre-burn landscape condition on southern portion of Fridley Fire. Aerial photo from USGS, 1998.

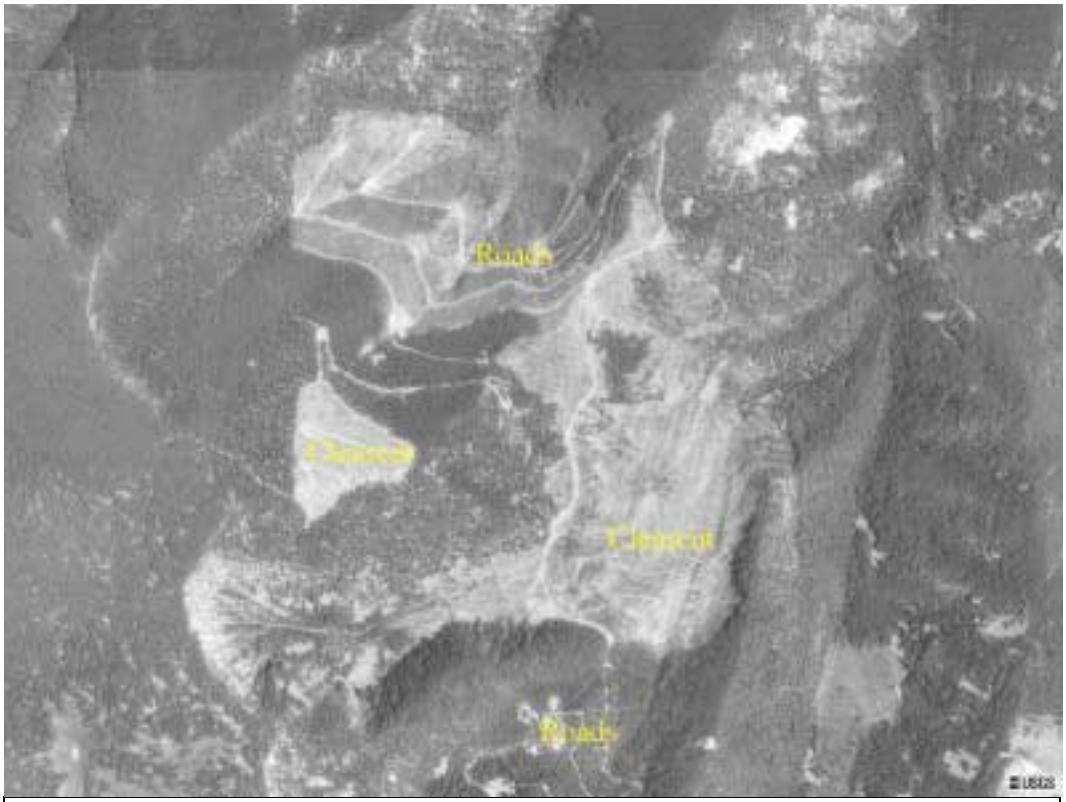
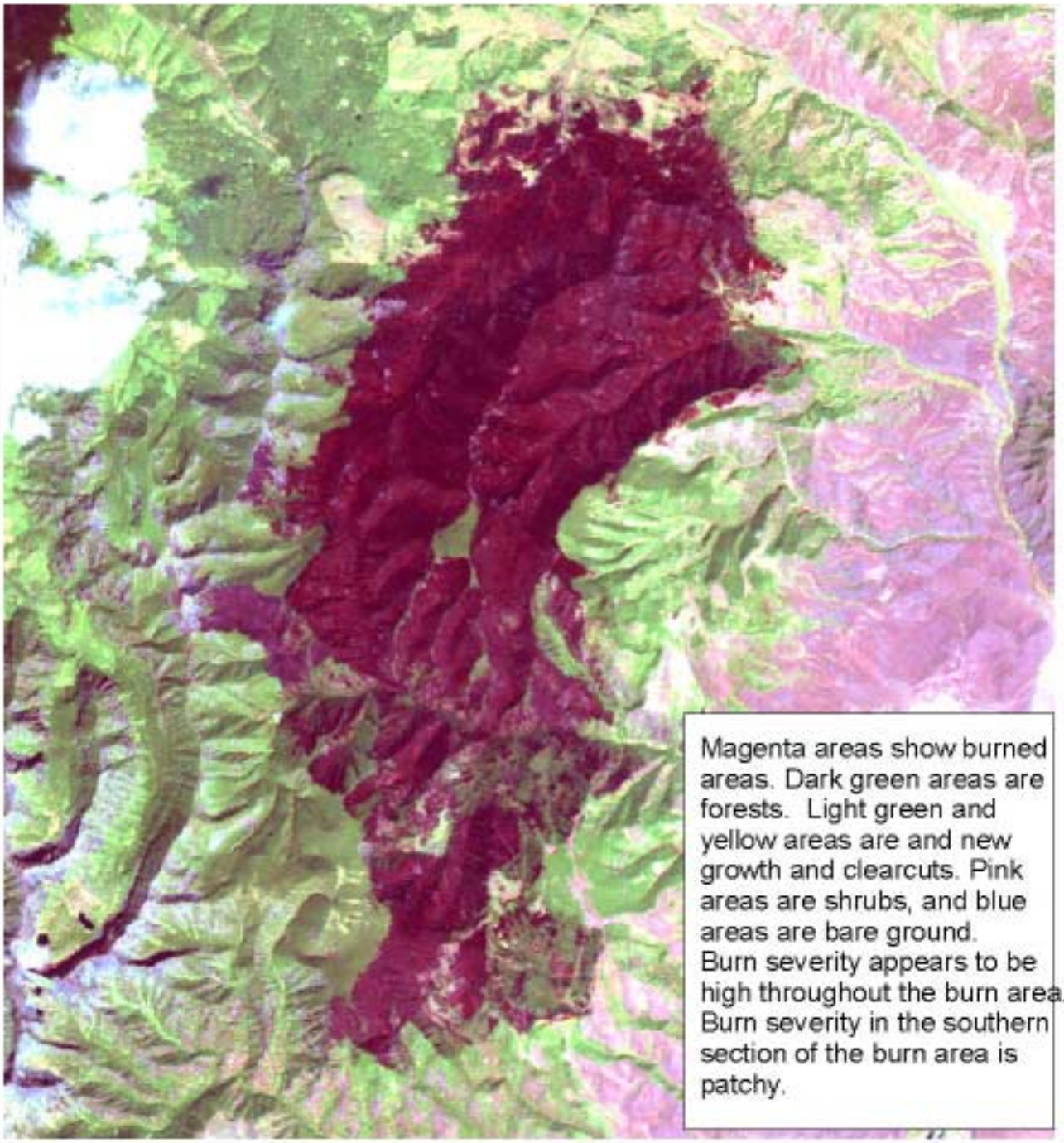


Image B: Pre-burn Landscape condition near fire ignition point. Aerial photo from USGS, 1997.

Post Burn Satellite Image

Fridley Fire, Gallatin National Forest - September 4, 2001



Magenta areas show burned areas. Dark green areas are forests. Light green and yellow areas are and new growth and clearcuts. Pink areas are shrubs, and blue areas are bare ground. Burn severity appears to be high throughout the burn area. Burn severity in the southern section of the burn area is patchy.

Image: TM satellite image taken September 4, 2001.

N

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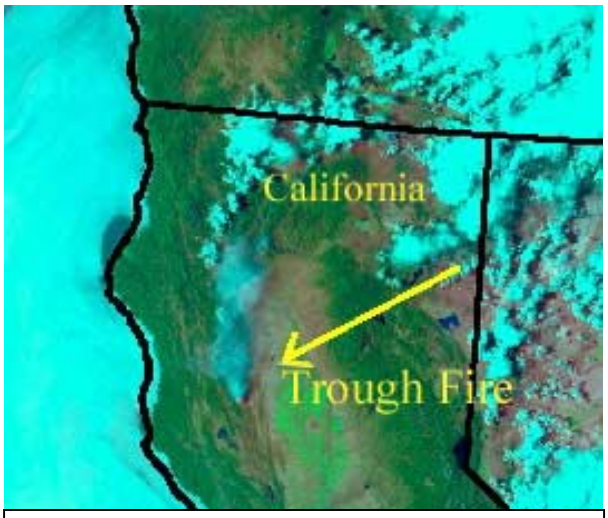
11. Trough Fire- California

Summary

This human-caused fire began along a road in a densely roaded area of the Mendocino National Forest and burned into Snow Mountain Wilderness. The vegetation in the area where the fire started and initially burned was largely grass and shrublands. Fire containment efforts focused on the Wilderness Area. At the time of containment, over $12 million had been spent on this fire despite burning mostly in Wilderness.



AVHRR Satellite Image. August 9, 2001. Smoke plume is from Trough Fire

Location and History

The Trough Fire began in chaparral brush, grasses and oak woodland. The area of ignition was a sparsely habited area four miles west of the community of Stonyford, California. Several days subsequent to ignition the fire burned into the Snow Mountain Wilderness while continuing to spread through the Mendocino National Forest. A total of approximately 25,000 acres of land burned across a wilderness landscape consisting mostly of steep terrain and dense vegetation. Ten residences, mostly cabins on private inholdings in the National Forest, and 20 outbuildings were lost. The fire was human caused, but is still under investigation.

Statistics as of September 21, 2001	
Fire Started	August 8, 2001
Cause	Human, undetermined
Acres in Fire Perimeter	24,970
Containment	100%
Cost	$13 Million
Structures lost	30

Ownership and Management

The Trough Fire initially burned in the Mendocino National Forest and then burned into the Snow Mountain Wilderness. The burned portion of the Mendocino National Forest is densely roaded.

Land Ownership	Percent of total area burned
U.S. Forest Service	**95.7 %**
Private	**4.3 %**

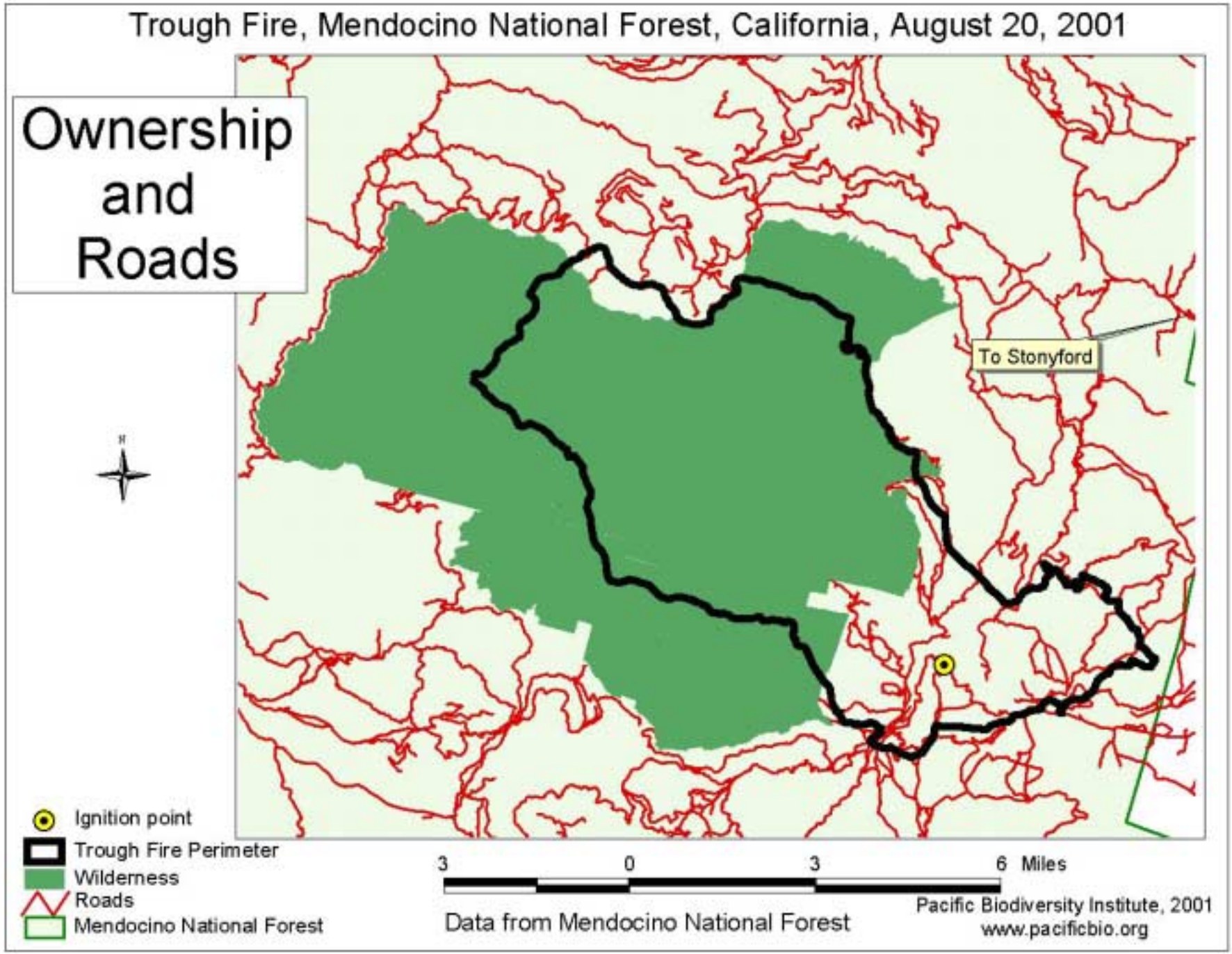
Trough Fire: August, 2001. Image from Trough fire website.

Land Cover
The fire began in an area covered by chaparral brush, grasses and oak woodlands. As the fire gained intensity it burned into mountains vegetated by evergreen forests and shrubs. Overall, only 45% of the area is covered by evergreen forest.

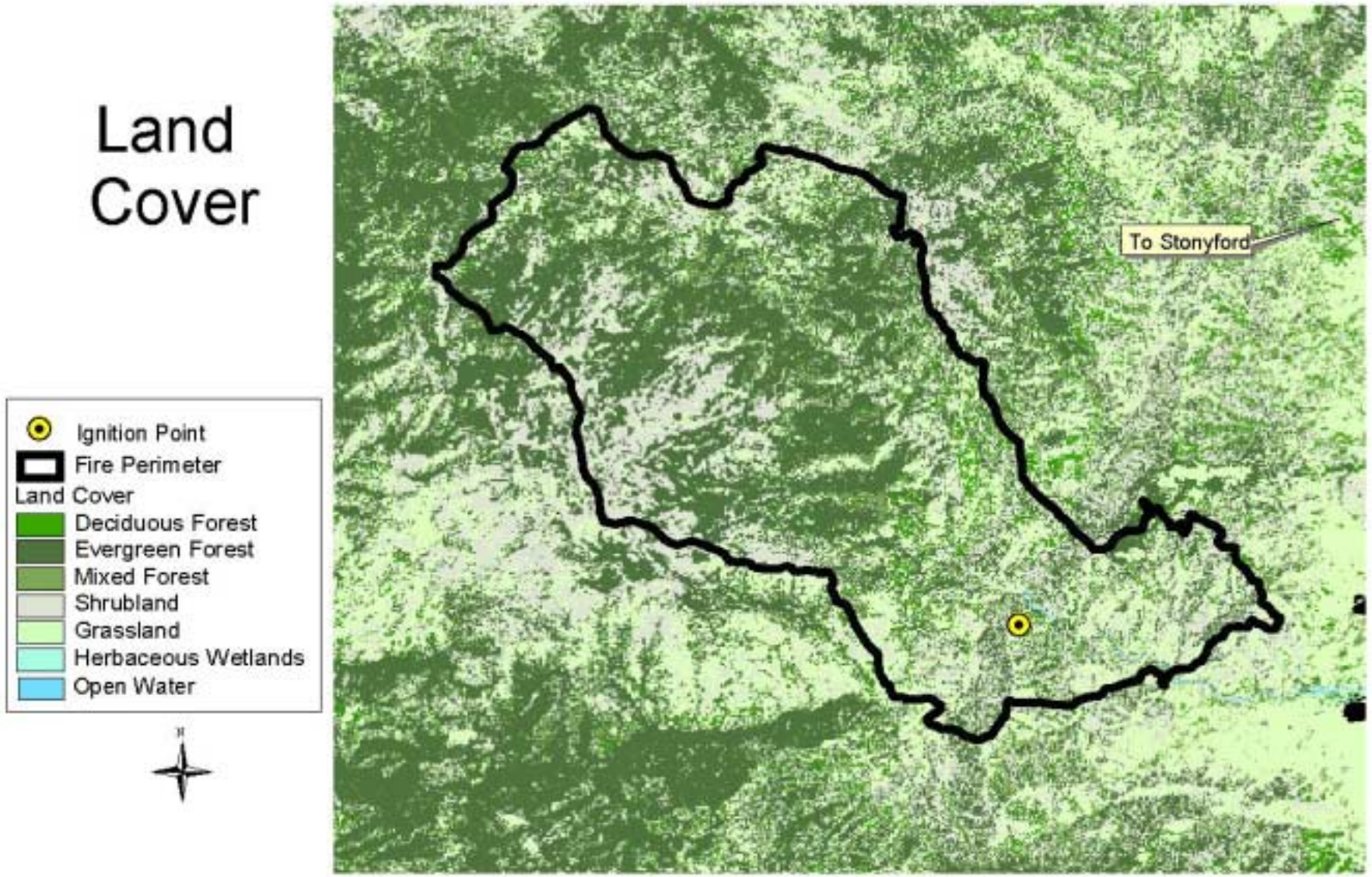
Land cover	Percent of total area burned
Evergreen Forest	44.8 %
Deciduous Forest	4.5 %
Mixed Forest	5.5 %
Shrubland	28.9 %
Herbaceous	16.2%
Other(Rock, water)	0.1 %

Trough Fire: August 2001. Image from Trough fire website.

Information Sources
General Information:
GIS Information:


Trough Fire, Mendocino National Forest, California, August 20, 2001
Ownership and Roads
To Stonyford
N
Ignition point
Trough Fire Perimeter
Wilderness
Roads
Mendocino National Forest
3 0 3 6 Miles
Data from Mendocino National Forest
Pacific Biodiversity Institute, 2001
www.pacificbio.org

Trough Fire, Mendocino National Forest, California, August 20, 2001

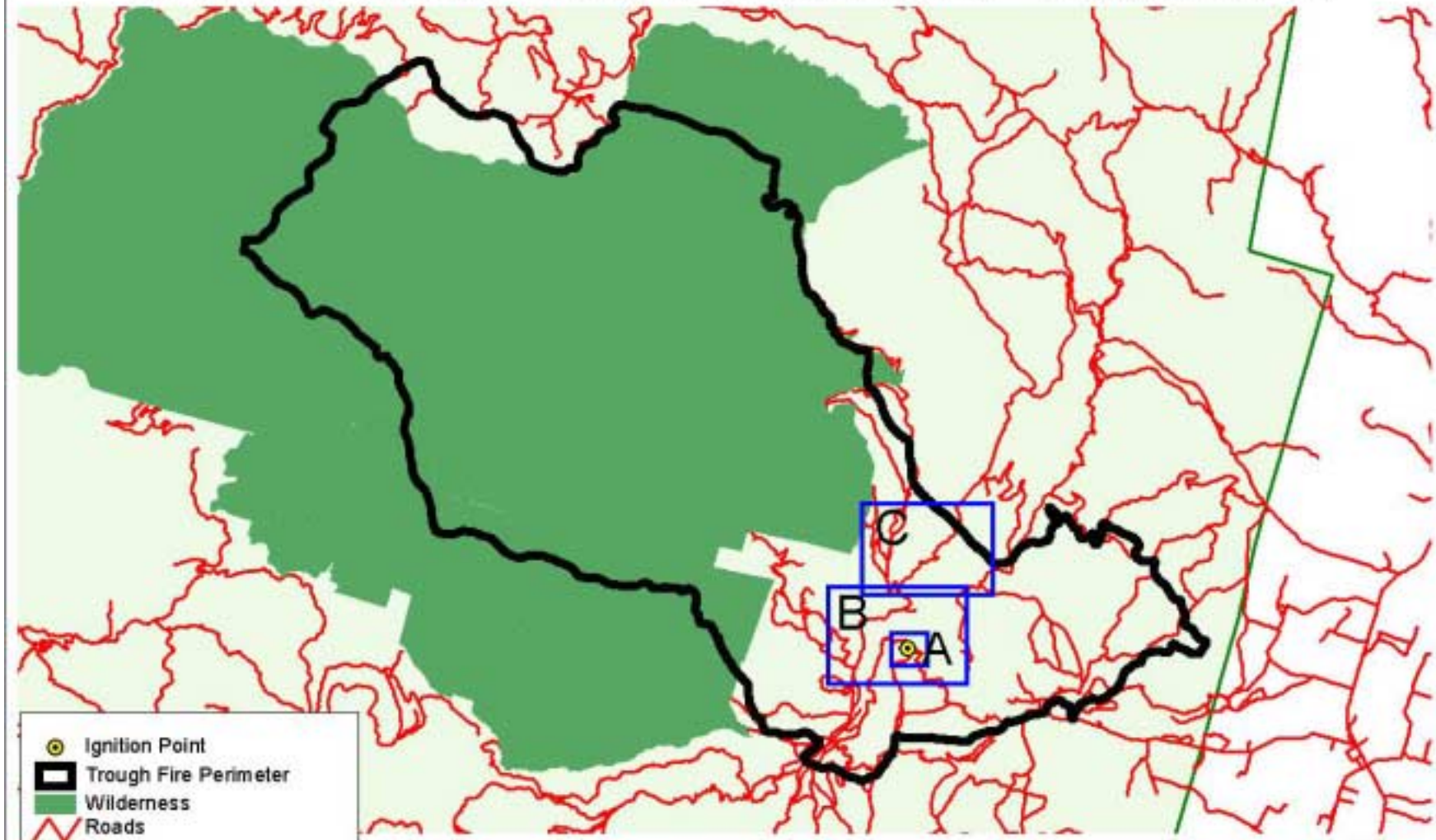


Fire Perimeter from Mendocino National Forest
Land cover data from USGS

Pacific Biodiversity Institute, 2001
www.pacificbio.org

Image Locator Map

Trough Fire, Mendocino National Forest, California - August 20, 2001



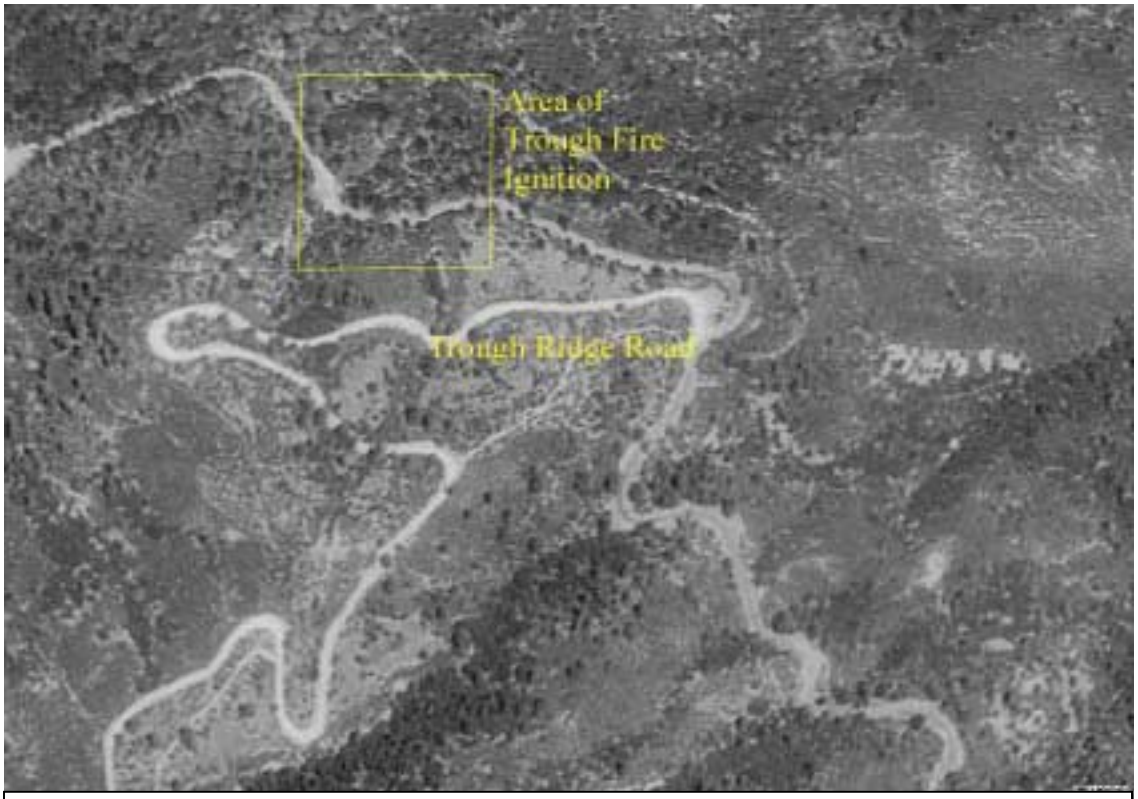


Image A: Aerial photograph of landscape conditions near ignition point. Vegetation is brush and oak woodlands. Photo from USGS, 1996.

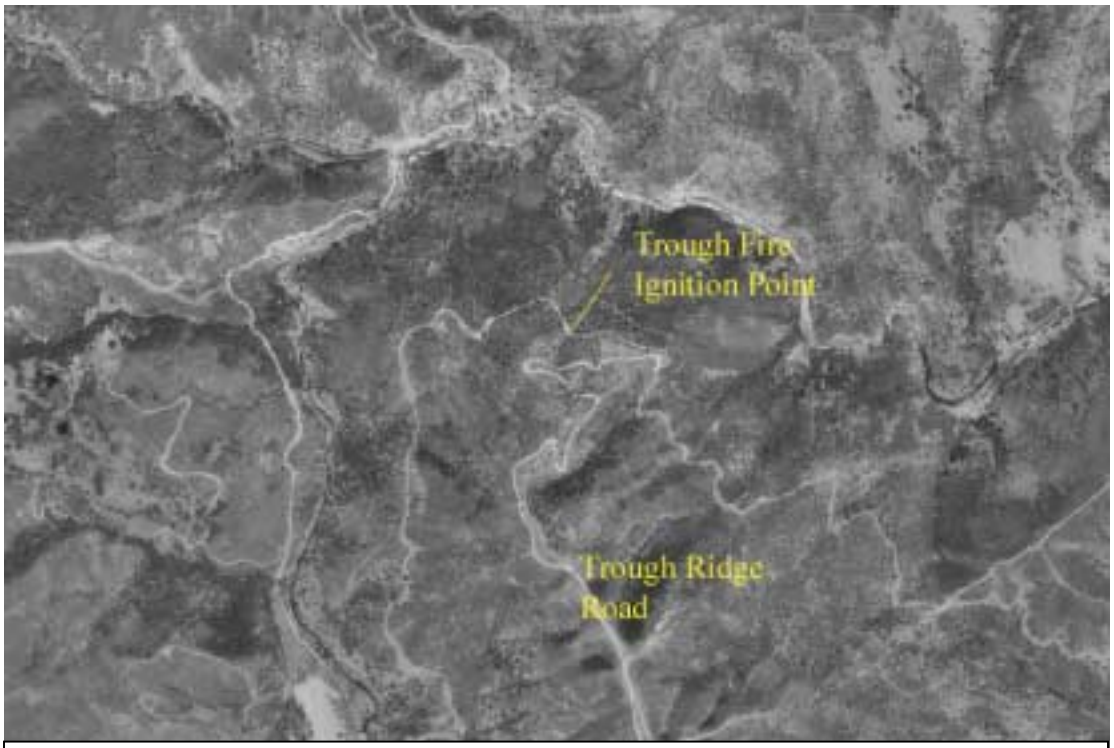


Image B: Aerial photograph of the landscape conditions near ignition point. Note network of roads and sparse vegetation. Photo from USGS, 1996.

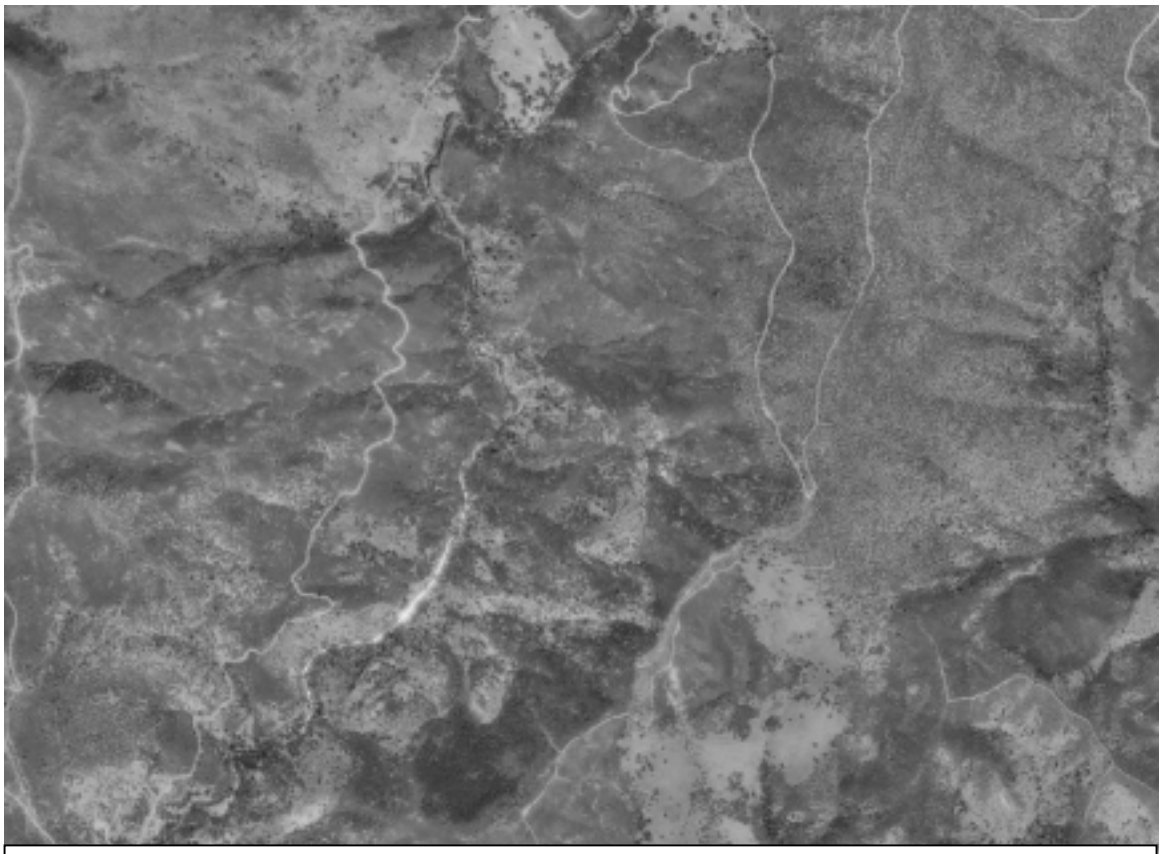
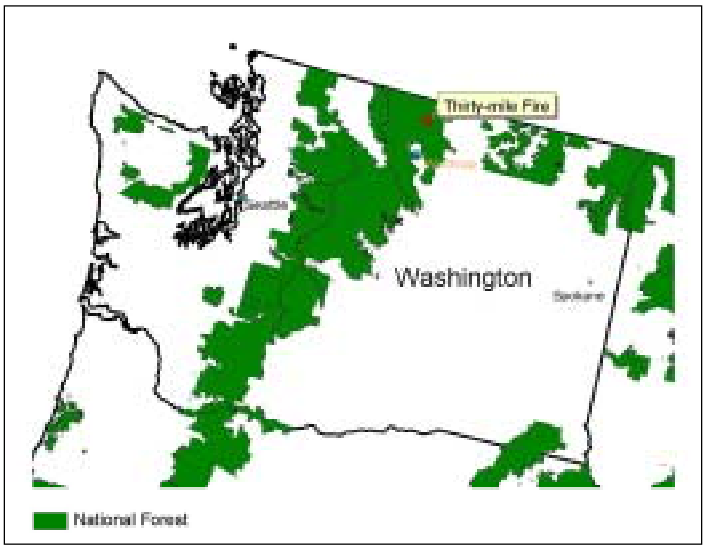


Image C: Pre-burn aerial photograph of landscape burned in Trough fire. From USGS, 1996.

12. Thirtymile Fire

Summary

Road access is directly implicated in the cause of the fire – a human left an unattended campfire next to a well-used road. This fire started on a major road that penetrates deep into remote country up the Chewuch River. Although firefighters had immediate road access to the location of the fire this did not prevent the fire from growing to over 9,300 acres, killing four firefighters and injuring several others.



When the fire blew up from the initial blaze, it swept up the slopes of an extremely steep canyon. There are no roads on these canyon walls because they are exceedingly steep and roads would be nearly impossible to build in much of this country. In this situation, good road access to the fire initiation site did not prevent a great tragedy or help bring what started as a small blaze under control.

Location and History

The Thirtymile fire, which burned in the Okanogan National Forest and Pasayten Wilderness, was first noticed on Monday, July 9, 2001. Forest Service investigators believe an unattended camp fire set in a poorly constructed campfire ring caused the fire as early as Saturday July 7, 2001.

Statistics as of July 27, 2001	
Date fire started	July 9, 2001
Cause (presumed)	unattended campfire
Acres within final fire perimeter	9,300
Containment	100%
Fire-fighting costs	$4,634,900
People-days*	8,648
Maximum Equipment	10 Engines / 9 Helicopters
Structures lost	0
*People-days are defined as the sum of the number of people working each day multiplied by the number of working days	

The Thirtymile fire began near a road along the Chewuch River and then spread mainly through Roadless Areas and Wilderness. No homes or structures were threatened. While initially only a few acres in size, the Thirtymile fire spread to over 2,200 acres on July 10 in a period of two-and-a-half hours. The final area of the burn was 9,300 acres. It was 100% contained by July 24, 2001. Four firefighters were killed in the initial attempts to fight this fire. Several other people were injured.

Ownership and Management

The fire burned entirely within US Forest Service land with 37% of the fire area in the Pasayten Wilderness. The fire also burned in the Chewuch Research Natural Area and within the Lynx Management Zone.

Land Owner	Percent of total area burned
U.S. Forest Service	100%

The Thirtymile Fire began near a road and proceeded to spread through Roadless Areas and Wilderness. Other than the road near where the fire started, there are no other roads in the burn area. Road construction would have been difficult to impossible in this area due to the steep topography.

Land Cover

The Thirtymile fire burned mostly through subalpine fir and lodgepole-pine forests. There were dense stands of lodgepole pine immediately around the ignition point. Engelmann spruce and aspen lined the river channel. The steeper slopes consisted of a mixture of sparse ponderosa pine, Douglas-fir, shrubs and herbaceous vegetation on rock talus. The area within the burn perimeter was 92% forest.

Land Cover	Percent of total area burned
Evergreen Forest	92 %
Shrubland	2 %
Herbaceous	4 %
Other(Rock, water)	2 %

Topography

The fire started in the Chewuch River valley and proceeded to burn up steep talus slopes on the northwest side of the valley and steep forested slopes on the southeast side of the valley. These slopes range from 15 to 45 percent and up to 75 percent in some areas. The fire mainly followed the river valley as it progressed.

Regional Fire History

Several major fires have burned in this region within the last 100 years. Most of the major fires occurred during or before the 1930s. The majority of the fires occurring in this region after 1990 were less than 10 acres and were ignited by lightening. The Thirtymile fire burned into the western portion of the 1994 Thunder Mountain Fire.

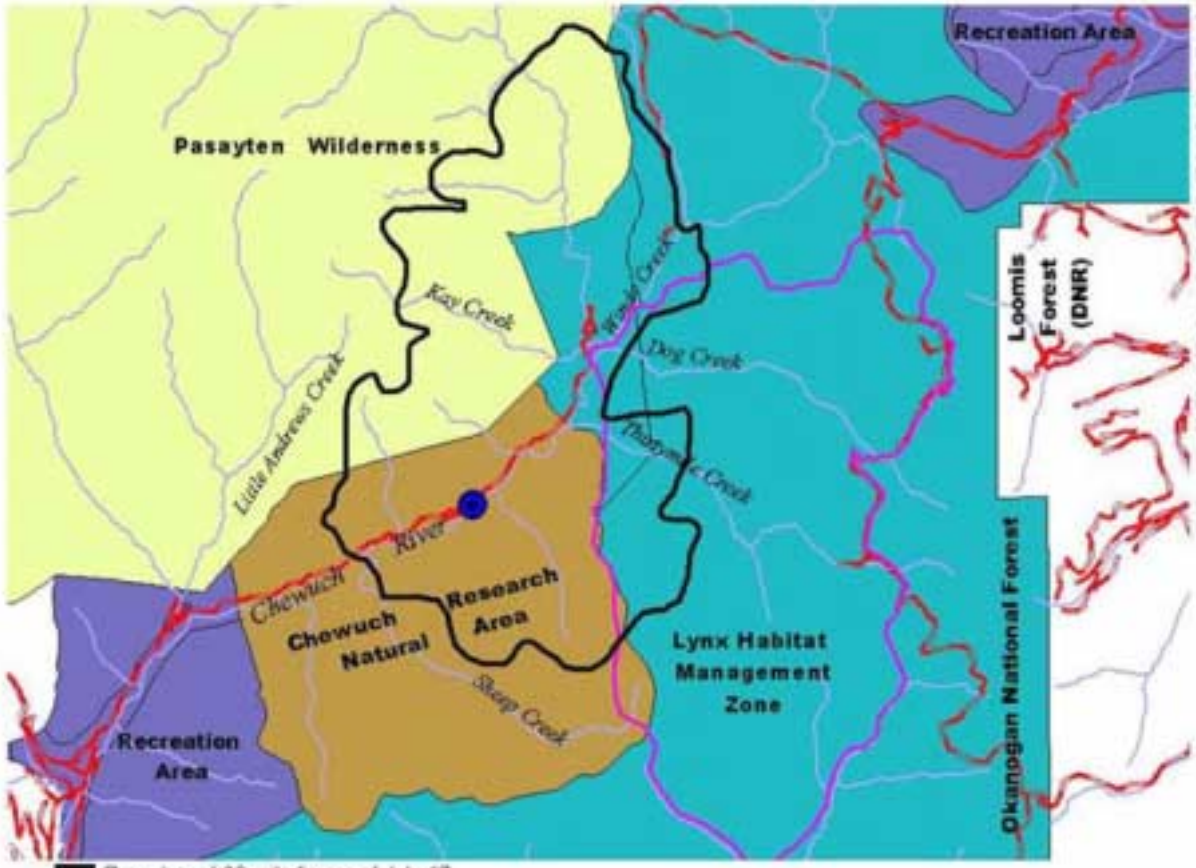
Conclusions

The Thirtymile Fire began near a road and proceeded to burn into Roadless Area and Wilderness. This fire burned through National Forest lands remote from human settlement and would not have started in that area if it had not been for the road access. Most of the vegetation that burned was lodgepole pine and other trees with low commercial value. The extremely steep slopes and inaccessible terrain of much of the burned region make it unsuitable for logging or road construction. As it would be very difficult to construct roads in this region, road construction for fire suppression would have been difficult.

Information Sources

General Informaion: www.thirtymilefire.com,
Okanogan National Forest Winthrop Work Station (509) 996-2215

30-Mile Fire, Okanogan National Forest, Washington State as of July 17, 2001, 9:00 am

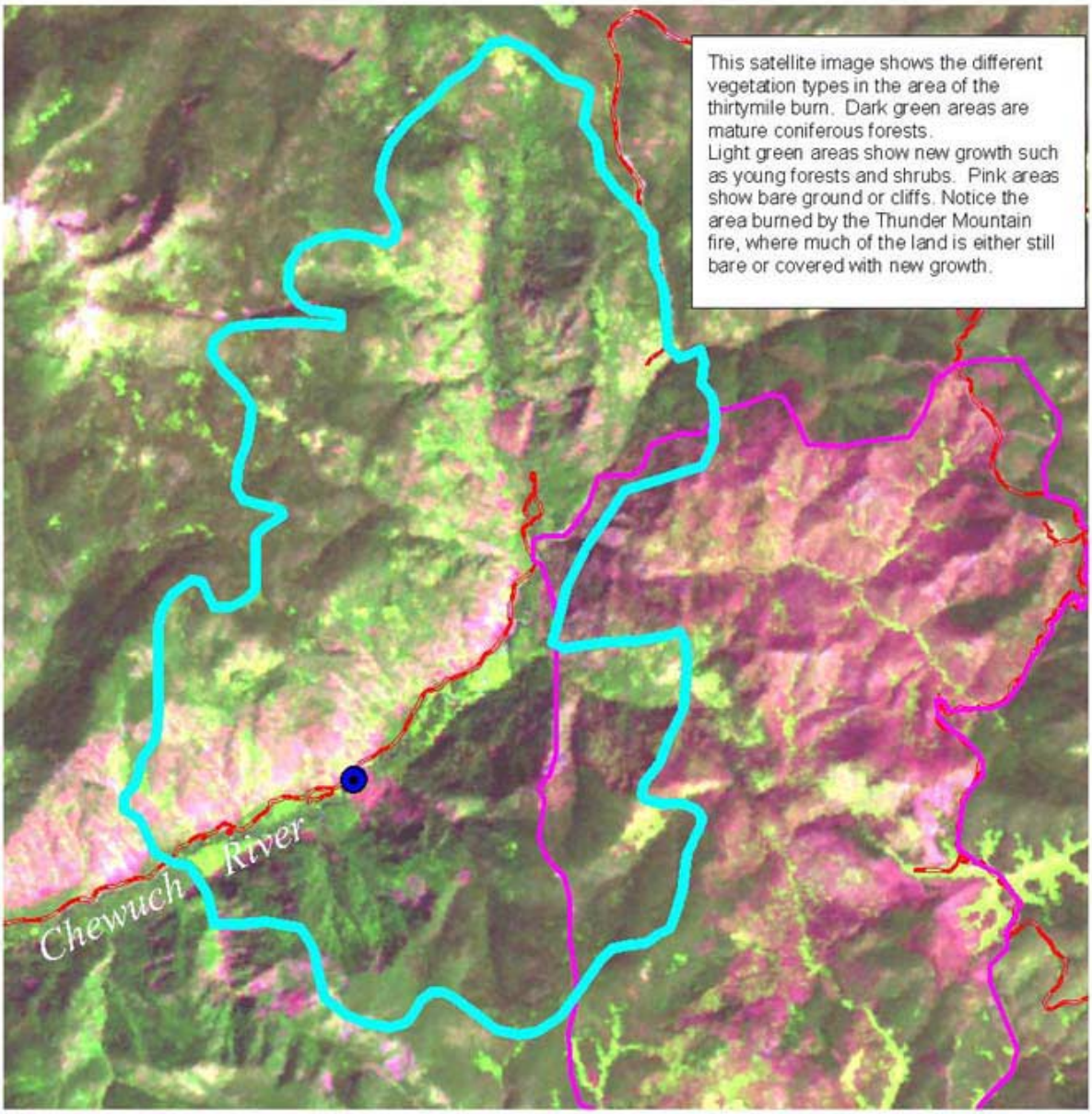


The 30-Mile Fire, located about 25 miles north of Winthrop, Washington was discovered on the evening of Monday, July 9. On Tuesday afternoon, the fire exploded from around 10 acres to over 2500 acres in 2 1/2 hours, taking with it the lives of four firefighters and injuring others. The area that is burning is mostly lodgepole pine forests with cliffs and extremely steep terrain. As of 9 am on July 17, 2001, the fire was burning around 10,500 acres. The fire started in the Chewuch Research Natural Area and has moved into the Pasayten Wilderness and the Lynx Habitat Management Area of the Okanogan National Forest.

Pacific Biodiversity Institute
www.pacificbio.org
map by Alena Wolkowski, Isaac Standen and Peter Morrison

Pre-Fire Satellite Image

30-Mile Fire, Okanogan National Forest, Washington State
as of July 17, 2001, 9:00 am



Information Sources:
Fire Perimeter: Okanogan National Forest
Satellite Image: 1998 Landsat TM

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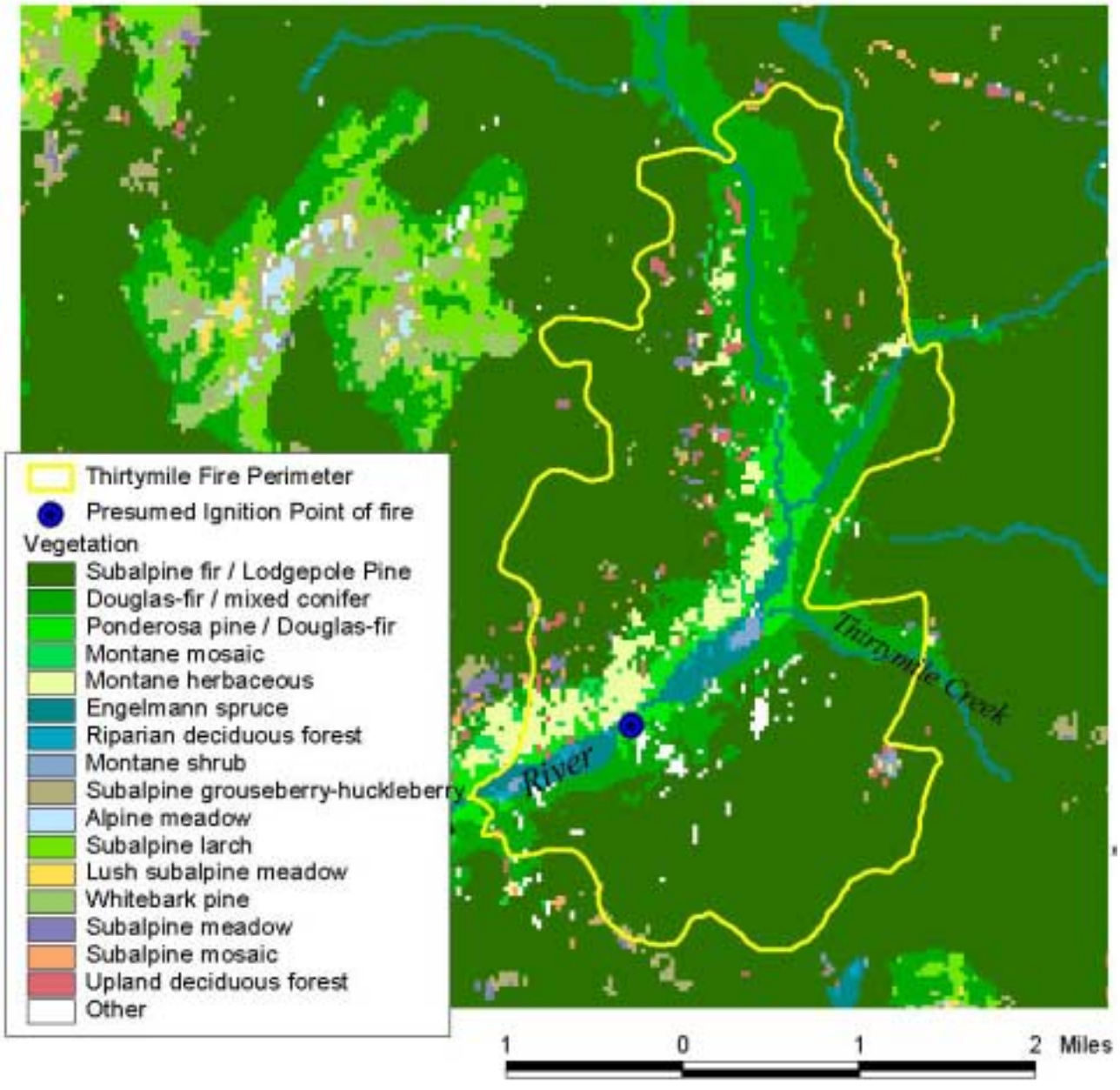
Land Cover

Thirtymile Fire, Okanogan National Forest, Washington State, July 17, 2001



Information Sources
Fire Perimeter: Okanogan National Forest
Vegetation: Almack et al., 1993

Pacific Biodiversity Institute
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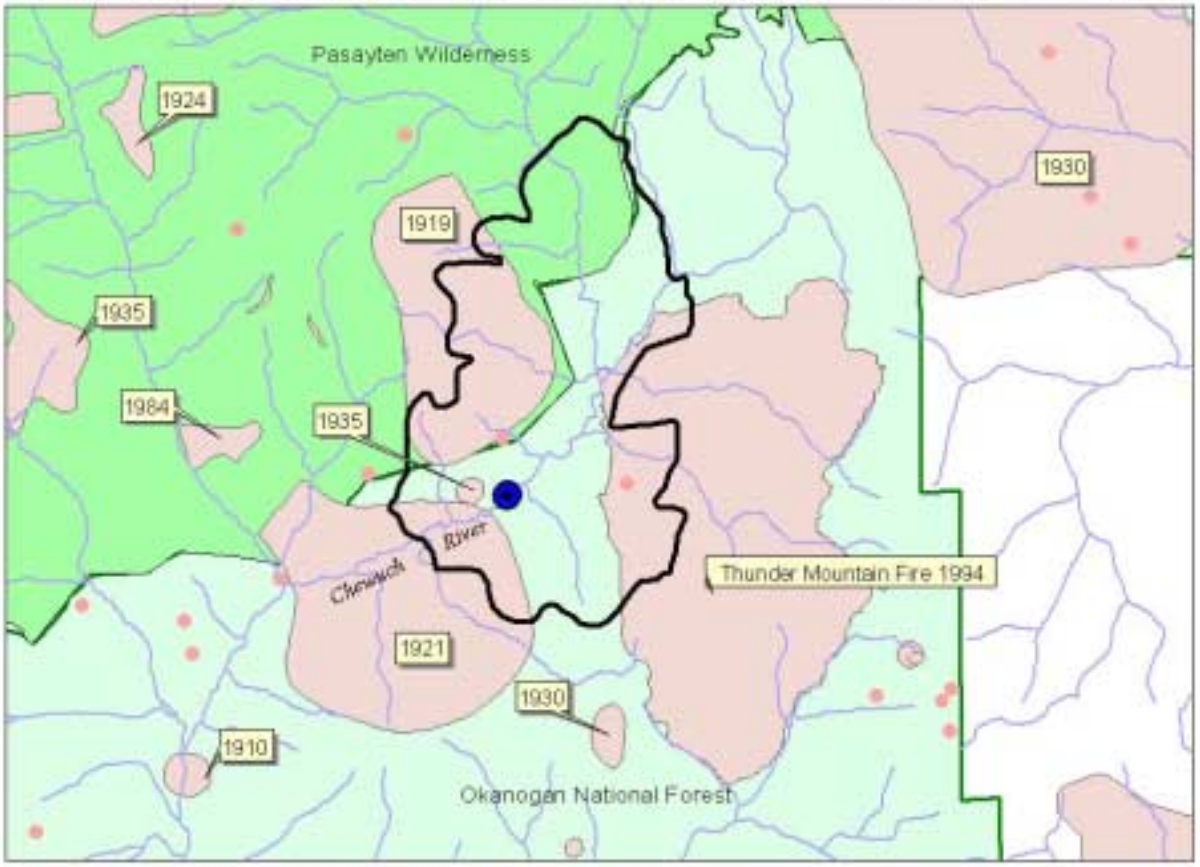
Regional Fire History

Thirty Mile Fire, Okanogan National Forest, Washington, July 17, 2001



Boundary of 30-mile Fire as of July 17
Presumed Ignition Point of 30 mile fire
Ignition Points for fires under 10 acres 1990 - present
Rivers and Streams
Fires 1900 - present
Wilderness
USFS

1 0 1 2 3 Miles

Data from the Okanogan National Forest

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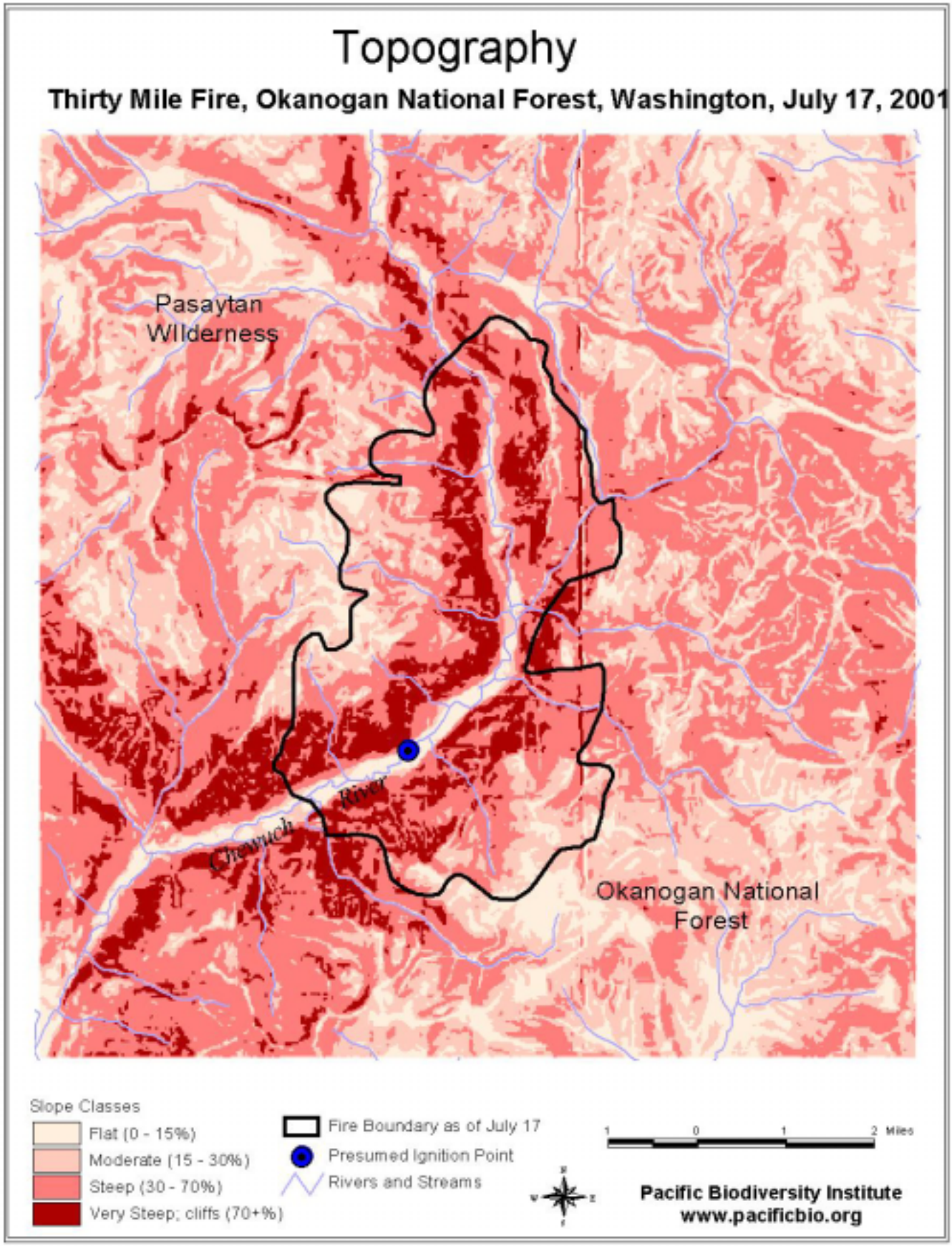
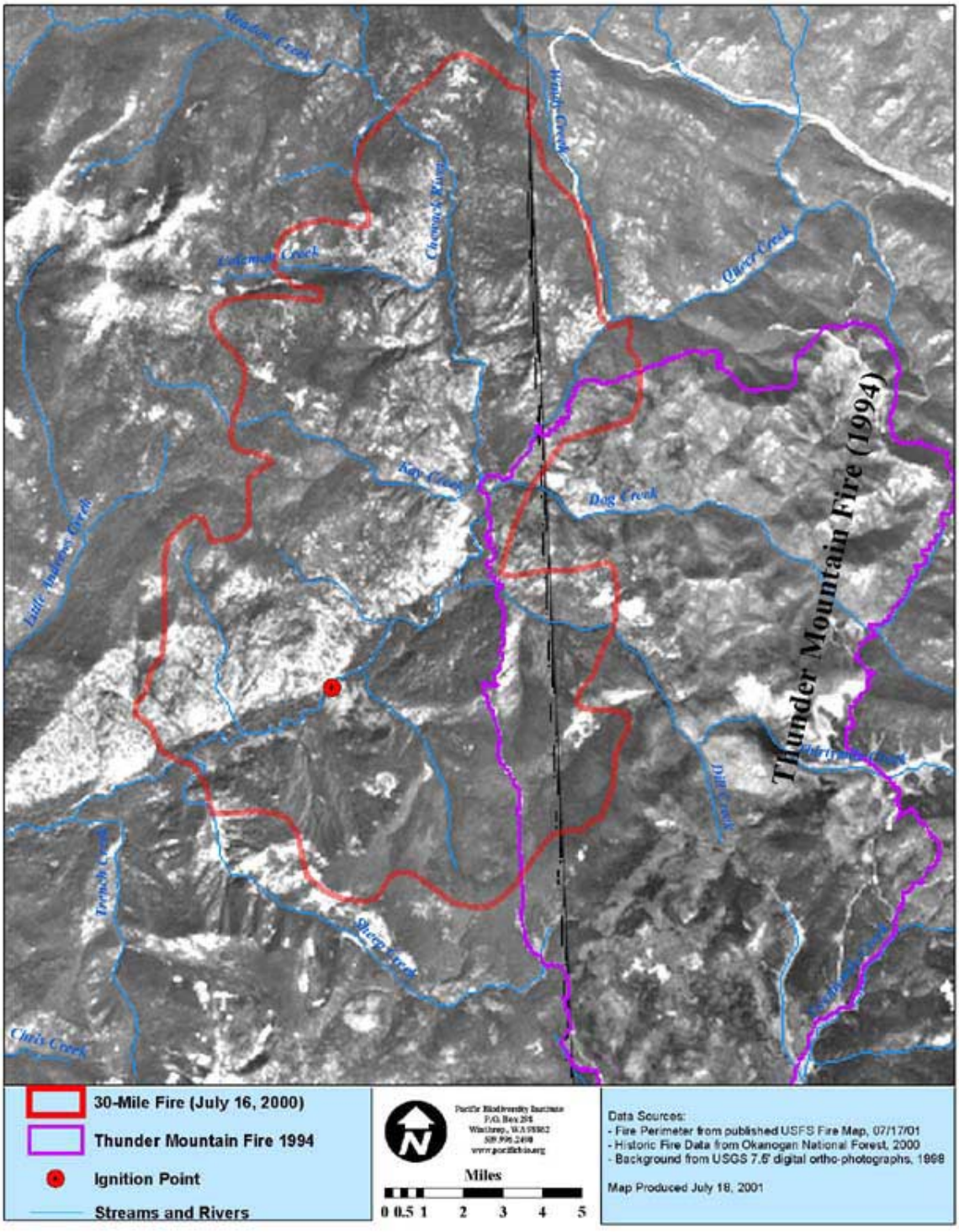

Topography
Thirty Mile Fire, Okanogan National Forest, Washington, July 17, 2001
Pasaytan
Wilderness
Chewuch
River
Okanogan National
Forest
Slope Classes
Flat (0 - 15%)
Moderate (15 - 30%)
Steep (30 - 70%)
Very Steep; cliffs (70+%)
Fire Boundary as of July 17
Presumed Ignition Point
Rivers and Streams
1 0 1 2 Miles
Pacific Biodiversity Institute
www.pacificbio.org

30-Mile #102 Fire as of July 16, 2001



14. Icicle Creek Complex

Summary

The Icicle Complex fires burned through steep mountain terrain that is Roadless or Wilderness. Although the fires have burned into some private inholdings and near summer cabins outside of Leavenworth, they are mostly in roadless areas and Wilderness. The area where the fires burned is a famous rock climbing area, known for its extremely steep terrain. This steep and rugged terrain made firefighting more difficult. Road construction in this type of terrain would be impossible or extremely expensive.

AVHRR Satellite Image. August 27, 2001

Location and History

The Icicle Creek Complex consisted of thirteen fires along the Icicle River near Leavenworth, Washington. These fires extended from Icicle Road up to the top of the ridge. Parts of the fires burned into the Alpine Lakes Wilderness. The fires burned several outbuildings and a number of structures were threatened but no residences were lost.

Statistics as of August 28, 2001	
Fires Started	August 12, 2001
Cause	Lightning
Acres in Fire Perimeter	7,697
Containment	100%
Cost	$8.1 Million
Structures lost	1

Land Cover

The Icicle Creek fires burned steep slopes vegetated by evergreen forests and grasslands. The land in the higher elevations is rocky and sparsely vegetated. The area within the burn perimeter was only 69% forested.

Land Cover*	Percent of total area burned
Evergreen Forest	69 %
Deciduous Forest	1 %
Shrubland	3 %
Herbaceous	18 %
Other(Rock, water)	9 %

*These numbers do not account for vegetation altered by recent harvest activities

Area near Chatter Creek Fire, Icicle Complex. August 15, 2001. Photo courtesy Icicle Creek website, Wenatchee National Forest.

Ownership and Management

The Icicle Creek fires burned through the Wenatchee National Forest with some private inholdings. Portions of the fires burned in the Alpine Lakes Wilderness. The fires burned in an area that is entirely roadless except for Icicle Creek Road that runs through the center of the Fourth of July Fire.

Land Owner	Percent of total area burned
U.S. Forest Service	71 %
Private	29 %

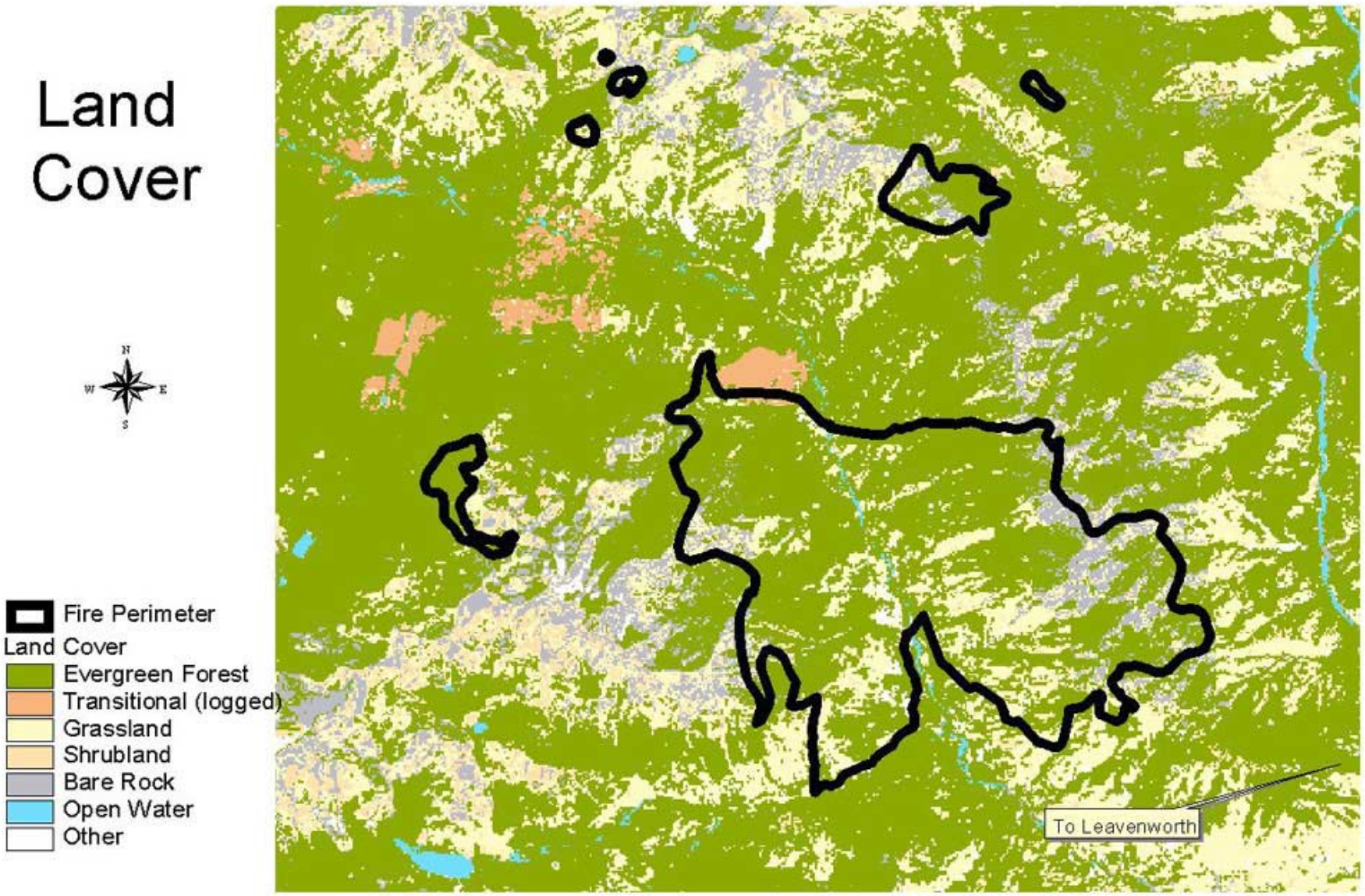
Fire History

Some of the Fourth of July Fire, a fire in the Icicle Creek Complex, is burning into land burned in a 1994 fire. Large fires have burned in the surrounding Wenatchee National Forest in 1994, the 1970s and the 1950s.

Information Sources

General Information: Lake Wenatchee/Leavenworth Ranger Districts: 509-763-3103

Icicle Creek Fires, Wenatchee National Forest, August 20, 2001



Land Cover data from USGS
Fire perimeter from Wenatchee National Forest

1 0 1 2 Miles

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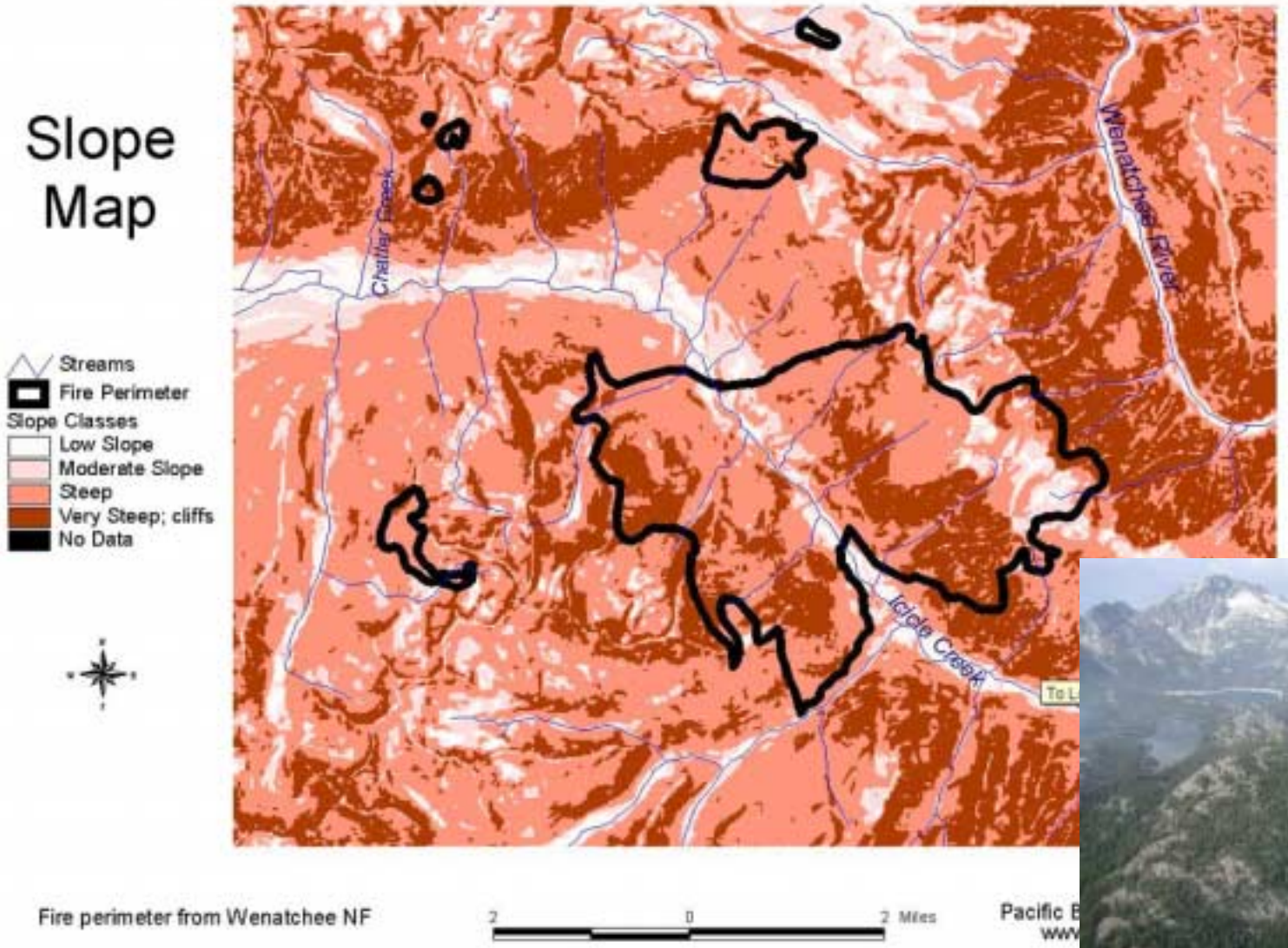
www.pacificbio.org

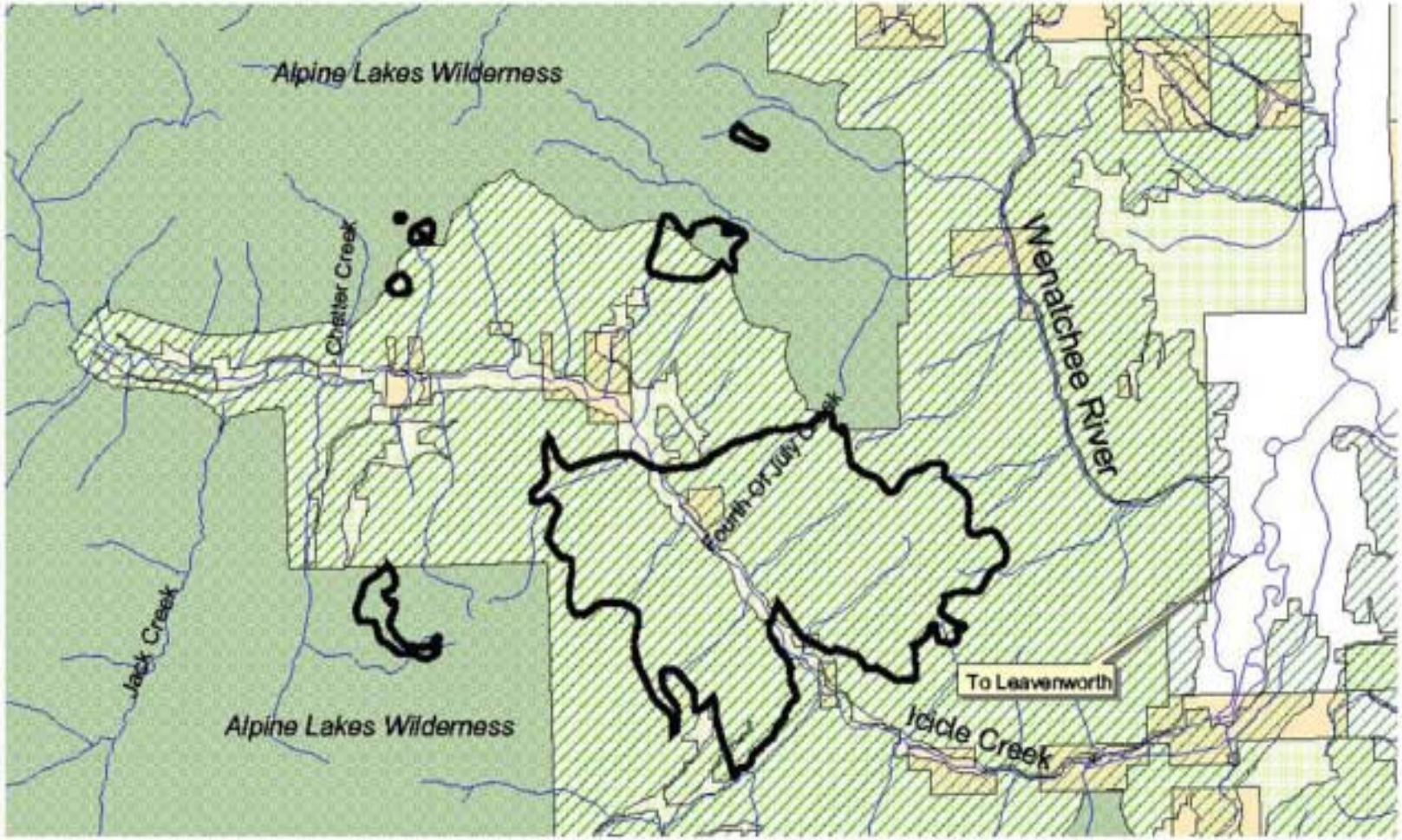
Icicle Creek Fires, Wenatchee National Forest, August 20, 2001



Steep Terrain in area of Icicle Complex fires. Photo courtesy of Icicle Fire Complex website, Wenatchee National Forest

Ownership and Management

Icicle Creek Fires, Wenatchee National Forest, August 20, 2001

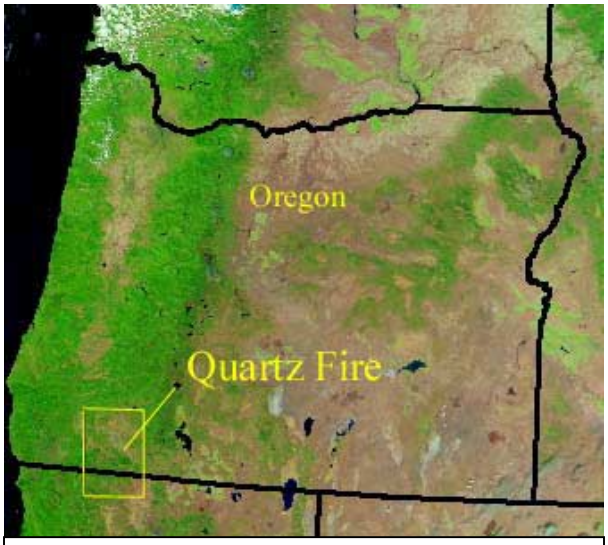


Fire History Wenatchee National Forest

14. Quartz Fire - Oregon

Summary
The Quartz fire burned through a checkerboard ownership of National Forest and private land in southwest Oregon. Much of the area has a dense road network and a long history of past logging. Despite the fact that most of the area is easily accessible from the dense network of logging roads, the fire continued to spread and threaten remote, rural homes. Many areas within the fire perimeter were clearcut, partially cut or thinned in the past 50 years. This fire shows that more roads and more logging are not the solution to preventing and containing wildfires.

Location and History
This lightning caused fire burned through private land and the Rogue River National Forest ten miles south of Medford, Oregon. The fire threatened several homes, making it a high priority to receive fire-fighting funds. The two residences lost in the fire were on remote private inholdings in the public forestland. The fire only grew to 6,170 acres, yet the total expenditure on fire suppression at the time of containment was $9.8 Million, making the Quartz fire one of the most expensive fires this season.



AVHRR Satellite Image. August 19, 2001

Ownership and Management
The Quartz Fire burned through a mosaic of National Forest and privately owned lands. The area is densely roaded.

Owner	Percent of burn area
USFS	56%
Private	29%
BLM	15%

Statistics as of September 25, 2001	
Fire Started	August 10,2001
Cause	Lightning
Acres in Fire Perimeter	6,170
Containment	100%
Cost	$12 Million
Structures lost	11

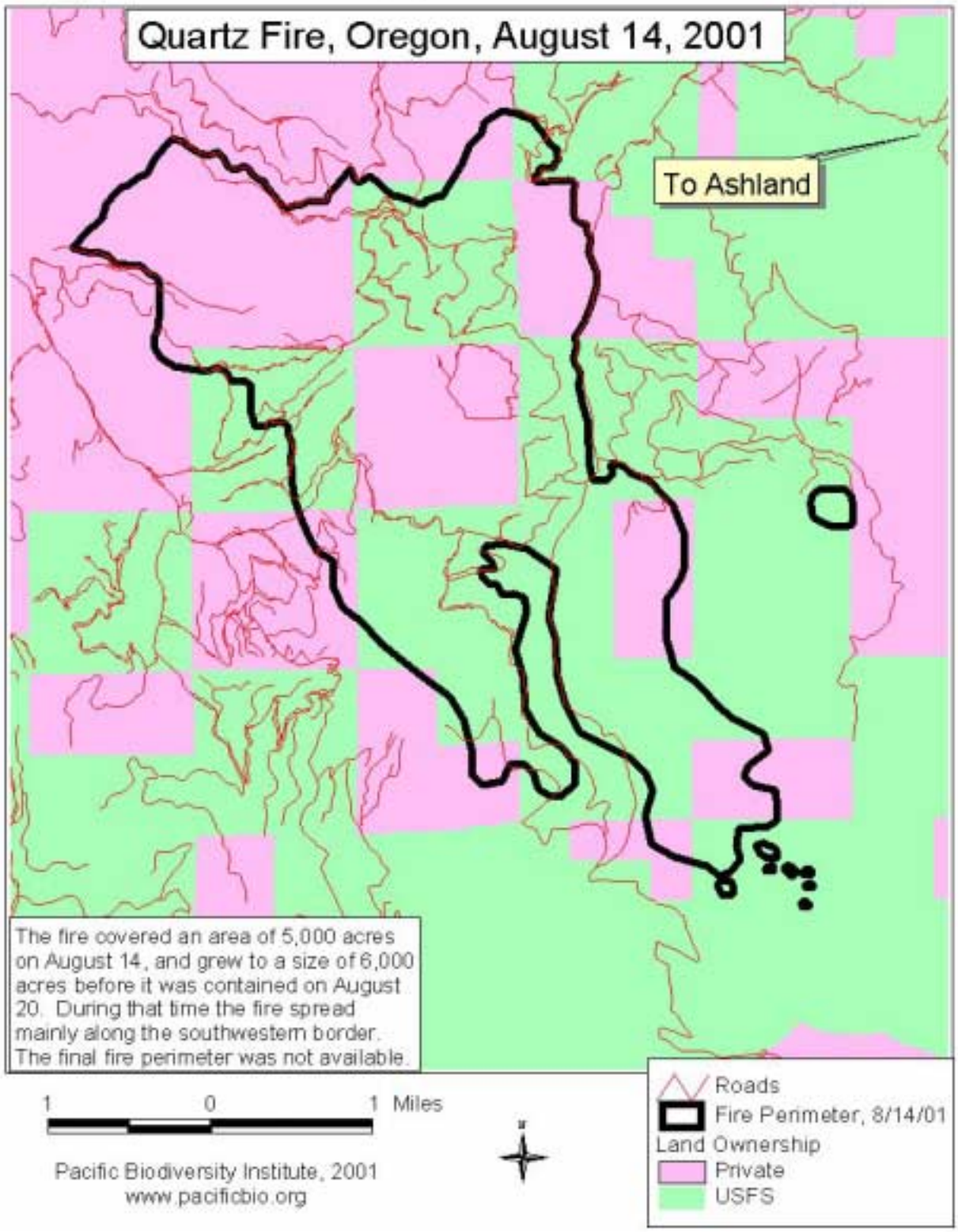
Land Cover
The landscape conditions of the burn areas, as well as the burn intensity, varied throughout the fire's perimeter. Forest ecologist Richard Hart stated; *"We've got the whole palette out there: We've got heavily managed, lightly managed and unmanaged lands on this fire. We can learn a lot from this fire."* (Medford Mail Tribune: August 19, 2001). The fire burned almost all of the vegetation in some sections of the forest, and in other areas swept across the forest floor debris while leaving mature trees untouched.

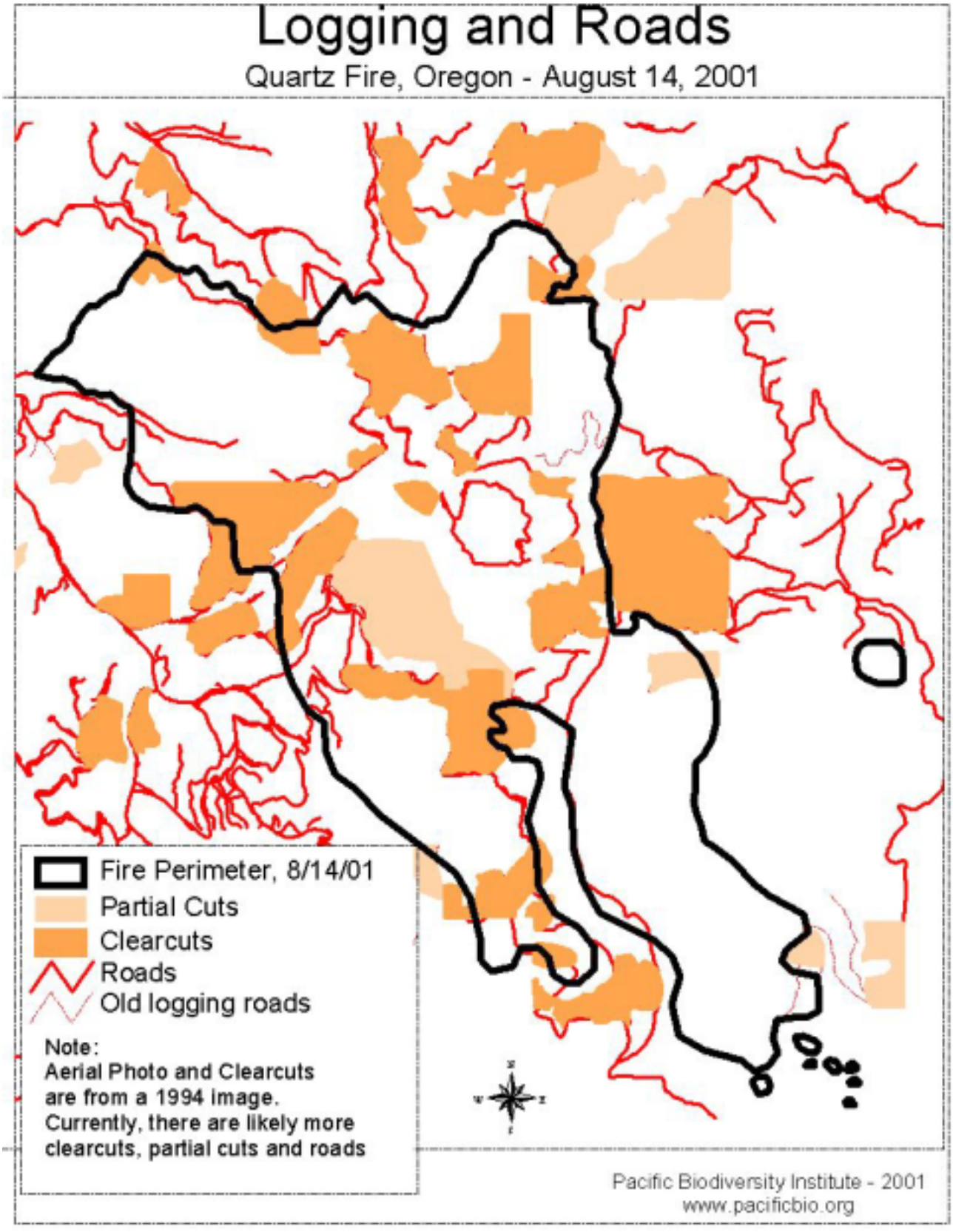
Land cover	**Percent of total area burned**
Evergreen Forest*	81.8 %
Deciduous Forest	2.0 %
Mixed Forest	7.2 %
Shrubland	2.2 %
Herbaceous	6.8 %

*This number does not account for trees lost to recent harvesting.

Information Sources
General Information Sources: Rogue River National Forest: (503) 945-7425

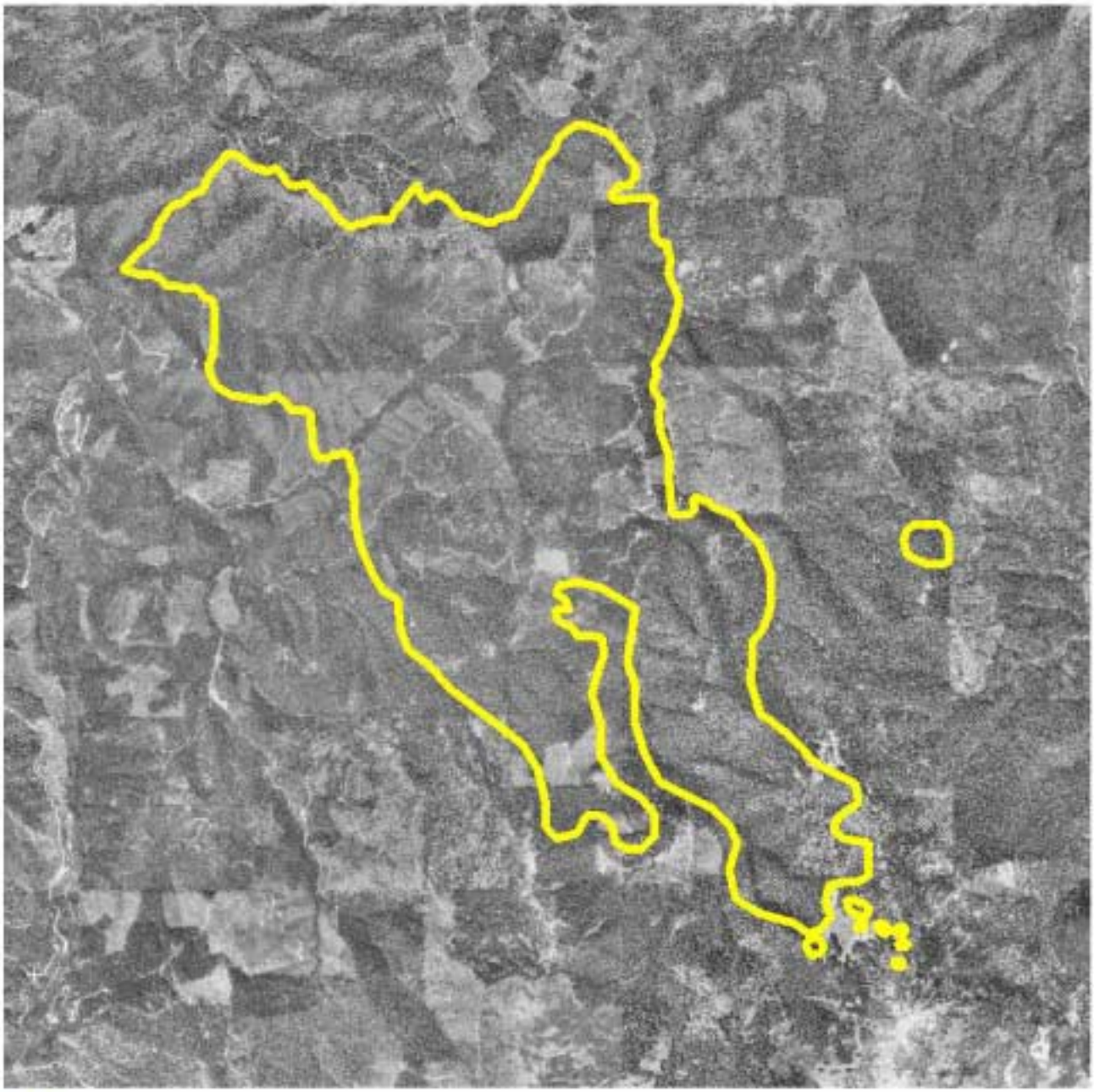
Ownership and Roads




Logging and Roads
Quartz Fire, Oregon - August 14, 2001
Fire Perimeter, 8/14/01
Partial Cuts
Clearcuts
Roads
Old logging roads
Note:
Aerial Photo and Clearcuts
are from a 1994 image.
Currently, there are likely more
clearcuts, partial cuts and roads
Pacific Biodiversity Institute - 2001
www.pacificbio.org

Aerial Photograph

Quartz Fire, Oregon - August 14, 2001



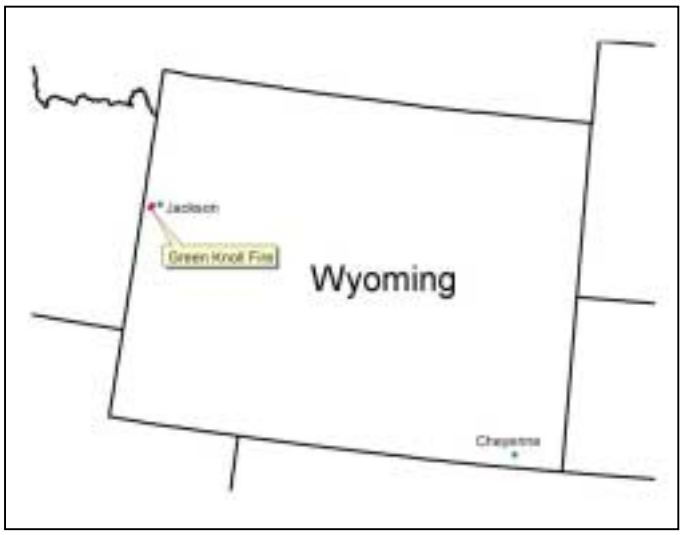
Fire Perimeter, 8/14/01

1994 Aerial Photograph

0.7 0 0.7 Miles

Pacific Biodiversity Institute, 2001
www.pacificbio.org

15. Green Knoll Fire



Summary

The Green Knoll fire is presumed to have been started by an unattended campfire near a road in the Targhee National Forest. It then quickly spread into the Bridger-Teton National Forest. The fire's ignition point was within a heavily logged area with many roads, and it grew quickly in this landscape. Although fire fighters had significant road access to where the fire burned, they were unable to stop the fire from growing to nearly 4,500 acres in eight days. Eventually the fire spread beyond this heavily managed area into the Roadless area designated as the Palisades Wilderness Study Area. The fire threatened homes built on the edge of the forest when it moved into a residential area near Jackson, Wyoming. Most of these homes have flammable, wooden-shingle roofs and can be reached only by narrow, winding roads, limiting the number of fire engines able to reach them. Firefighting efforts intensified to protect these homes making this one of the most expensive fires this season.

Statistics as of September 20, 2001	
Date fire started	July 22, 2001
Cause (presumed)	unattended campfire
Acres within fire perimeter	4,470
Containment	100%
Fire-fighting costs	$11 Million
Equipment and Resources	4,000,000 gallons of water and retardant, 22 Engines
Structures lost	0

Ownership and Management

The fire began within a roaded and logged portion of the Targhee National Forest. It quickly spread into a heavily roaded and logged portion of the Bridger-Teton National Forest. From this region the fire spread into the Palisades Wilderness Study Area management zones. Wilderness Study Areas are unroaded portions of land in National Forests under consideration for greater protection as Wilderness Areas.

Land Owner	Percent of total area burned
U.S. Forest Service	13 %
Private	87 %

Land Cover

Much of the land within the fire perimeter has been clearcut or partially cut. The forest where the fire started and intensified consists of subalpine fir and Englemann spruce. The roadless area where the fire spread to consists of a mix of aspen and Douglas-fir. The forests adjacent to the suburban residences are lodgepole pine. Overall, less than half of the area within the burn perimeter was coved by evergreen trees, and 75% of the area within the burn perimeter was forested. These numbers do not account for trees lost to recent harvesting.

Land Cover*	Percent of total area burned
Evergreen Forest	43 %
Deciduous Forest	25 %
Mixed Forest	7 %
Shrubland	12 %
Herbaceous	12 %
Other(Rock, water)	1 %

*These numbers do not account for vegetation altered by recent harvest activities

Conclusions

At the time of containment, more money was spent on this fire than any fire this summer. The need to protect expensive homes in the wildland-urban interface north of the fire perimeter gave this fire top priority status. While media attention focused on the expensive homes that had to be evacuated, they left out information about the fire itself, including the fact that this fire was human caused, began along a road in a heavily managed area, and burned in an area with a high frequency fire regime.

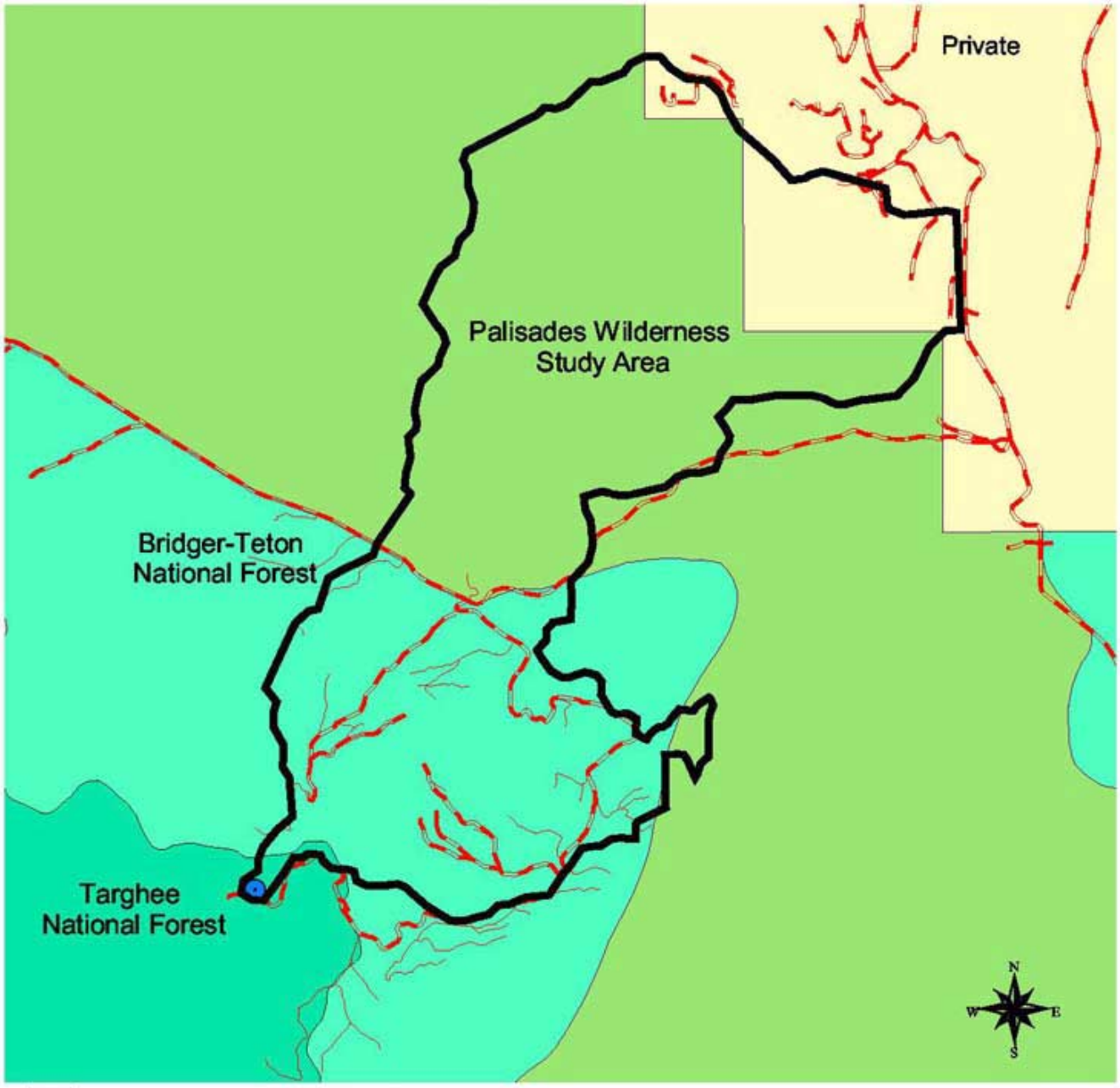
Information Sources

General Information: www.tetonfires.com Teton National Forest: (307) 739-5500

Fire information # (307) 739-5577, Julie Campbell – Fire Manager

Land Management

Green Knoll Fire. Bridger-Teton National Forest
July 29, 2001



Green Knoll Fire Perimeter - July 29, 2001
Presumed Ignition Point
Roads
Old Logging Roads
Wilderness Study Area
Bridger-Teton National Forest
Targhee National Forest
Private

0.5 0 0.5 1 Miles

Information Sources:
Perimeter: Bridger-Teton National Forest
Management Zones: Bridger-Teton National Forest
Logging Activity: USGS 1997 Digital Photographs

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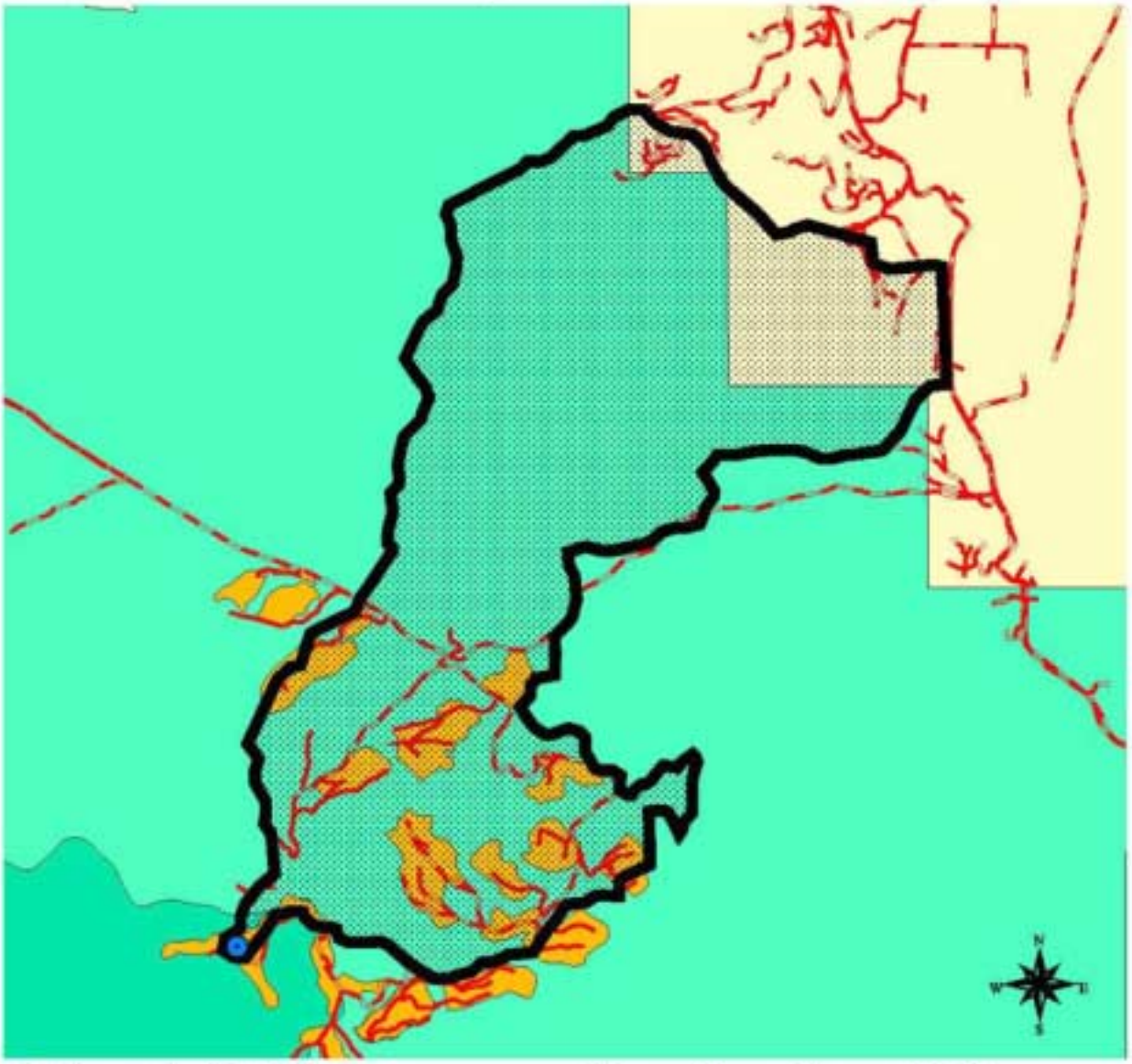
Land Ownership and Management

Green Knoll Fire. Bridger-Teton National Forest
July 29, 2001



Presumed Ignition Point
Green Knoll Fire Perimeter - July 29, 2001
Roads
Old Logging Roads
Clearcuts
Bridger-Teton National Forest
Targhee National Forest
Private

0.5 0 0.5 1 Miles

Information Sources:
Perimeter: Bridger-Teton National Forest
Management Zones: Bridger-Teton National Forest
Logging Activity: USGS 1997 Digital Photographs

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Aerial Photograph

Green Knoll Fire, Bridger-Teton National Forest, Wyoming
July 29, 2001

Green Knoll Fire Perimeter- July 29, 2001

0.5 0 0.5 1 Miles

N
W E
S

Information Sources
Perimeter: Bridger-Teton National Forest
Photograph: Digital Ortho Photographs, March 1997

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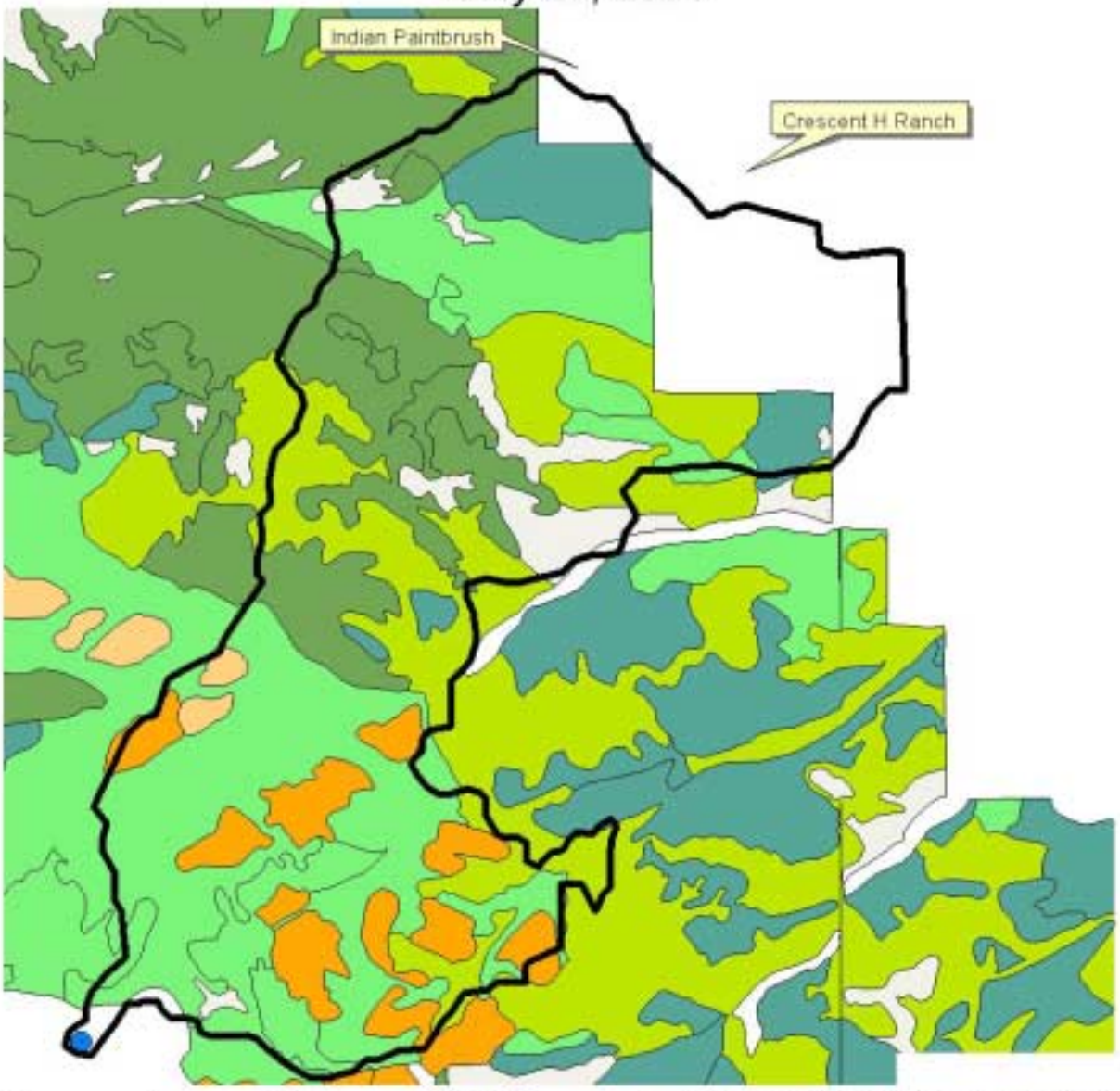
Vegetation and Stand History

Green Knoll Fire. Bridger-Teton National Forest

July 29, 2001



0.6 0 0.6 1.2 Miles

Information Sources:
Perimeter: Bridger-Teton National Forest
Vegetation: Bridger-Teton National Forest

Pacific Biodiversity Institute
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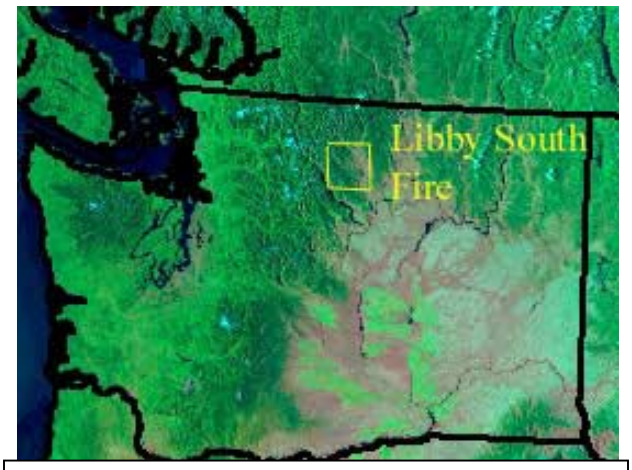
Green Knoll Fire Perimeter - July 29, 2001
Presumed Ignition Point
Vegetation and Stand Activity- 1996
Englemann Spruce/Subalpine Fir
Douglas-Fir
Aspen
Lodgepole Pine
Clearcut
Partial Cuts
Not Forested

16. Libby South Fire

Summary

The Libby South Fire was caused by a Washington Department of Natural Resources employee driving a truck on DNR land. The fire spread from there into an univentoried roadless area on National Forest land. The fire burned mainly through mid-elevation ponderosa pine and Douglas-fir forests.



AVHRR Satellite Image: August 9, 2001

Location and History

According to official reports, the Libby South fire was ignited by sparks from a Washington State Department of Natural Resources truck clearing a road for better fire access on Monday, July 9, 2001. The fire had grown to 1,500 acres on July 10. Fire-fighters contained the fire after it had burned 3,830 acres by July 17, 2001.

Statistics as of July 27, 2001	
Date fire started	July 9, 2001
Cause	sparks from DNR vehicle
Acres within final fire perimeter	3,830
Containment	100%
Fire-fighting costs	$3.6 Million
Human labor hours	115,000
Structures lost	0

Land Cover

The area burned in the Libby South fire, like most of the rest of the west, was very dry given this year's lack of precipitation during both the winter and spring. The fire spread mostly through ponderosa pine and Douglas-fir forest, as well as some bitterbrush and herbaceous shrub-steppe. Overall, only about 62% of the area in the burn perimeter was forested.

Land cover	Percent of total area burned
Evergreen Forest	63 %
Shrubland	8 %
Herbaceous	28 %
Other(Rock, water)	1 %

Fire Fighters on the edge of Libby South Fire

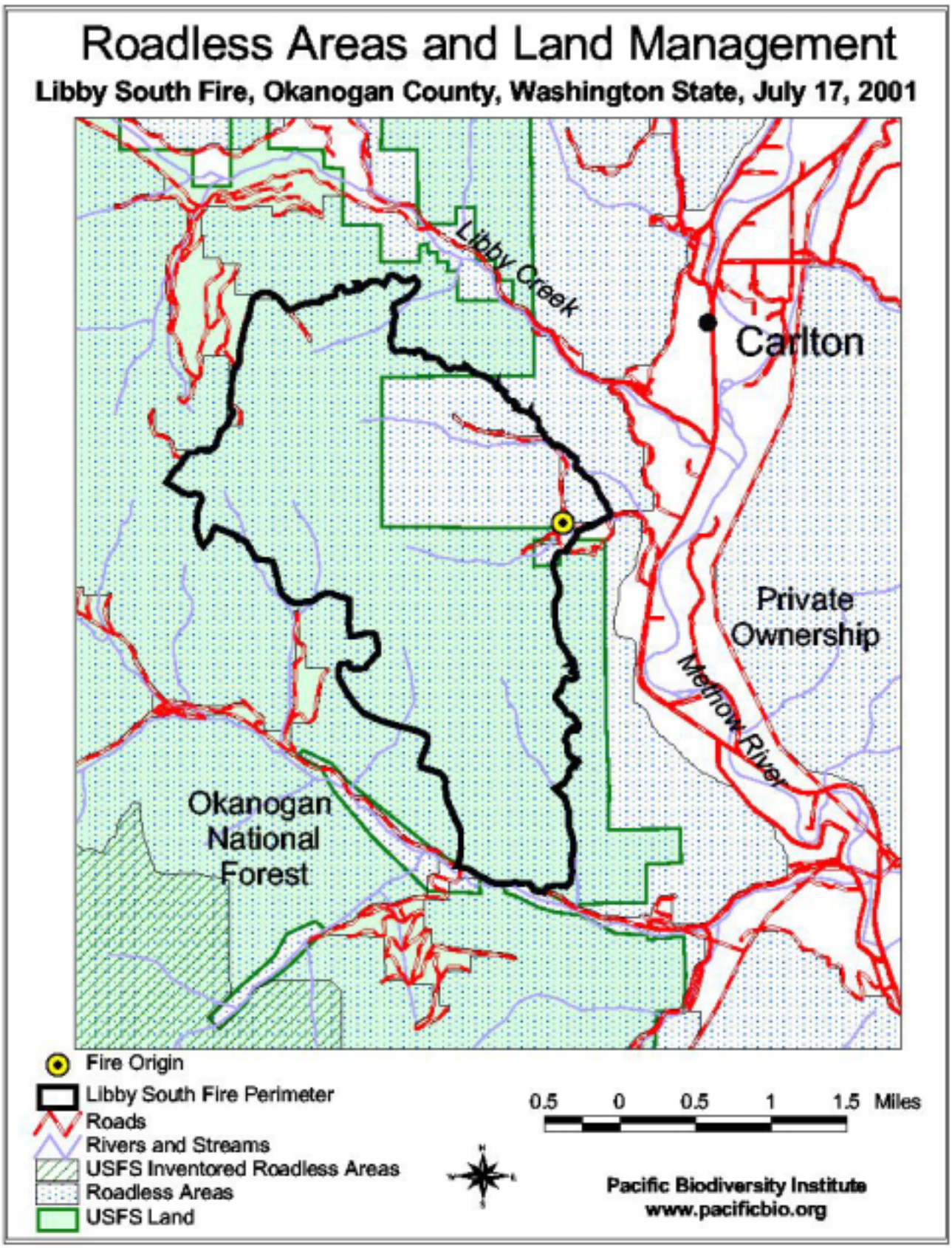
Ownership and Management
The Libby South fire was a human-caused fire that began alongside a road and spread into an uninventoried roadless area on Forest Service land. There has been very little logging activity in this area.

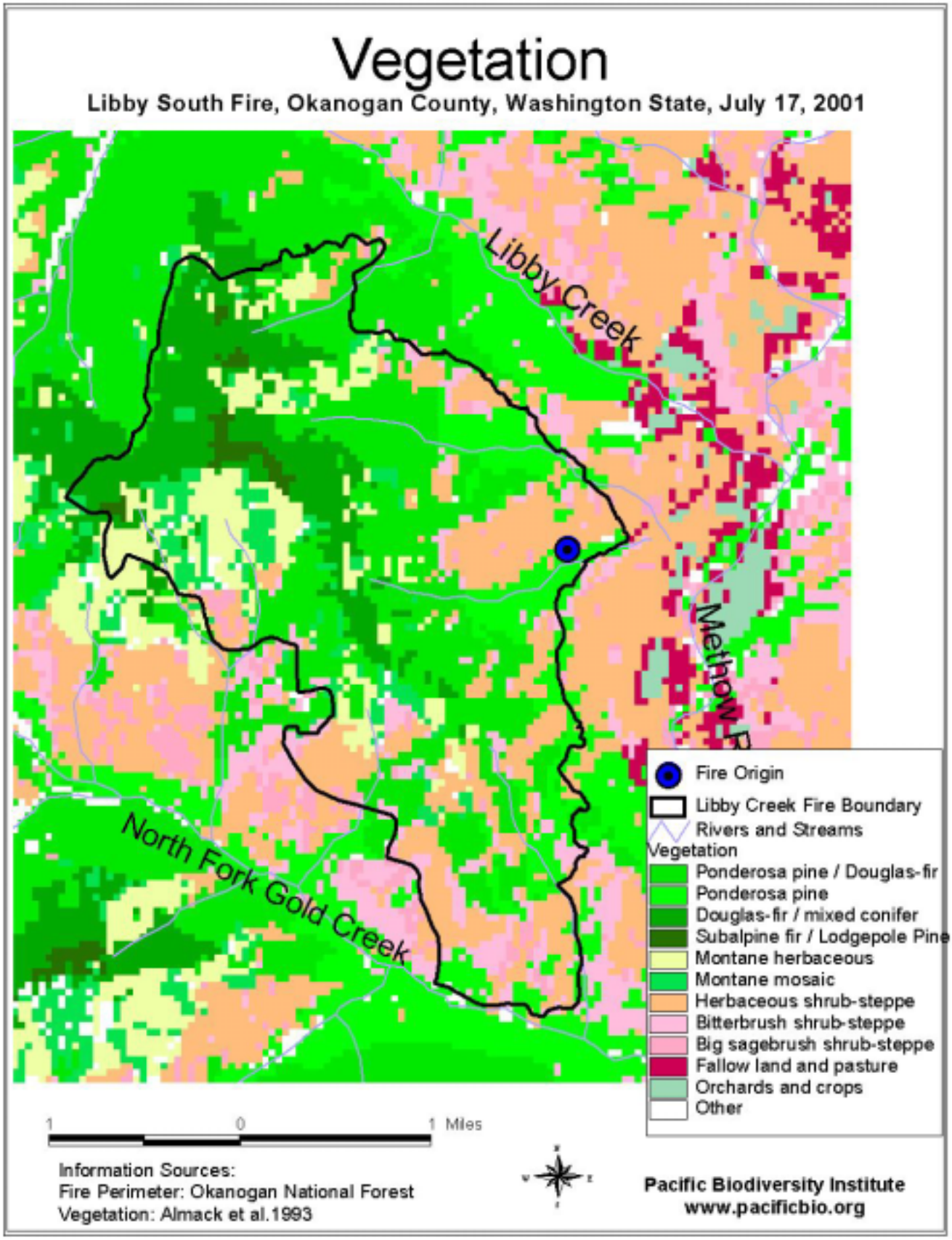
Land Owner	**Percent of total area burned**
U.S. Forest Service	79 %
Washington State	21 %

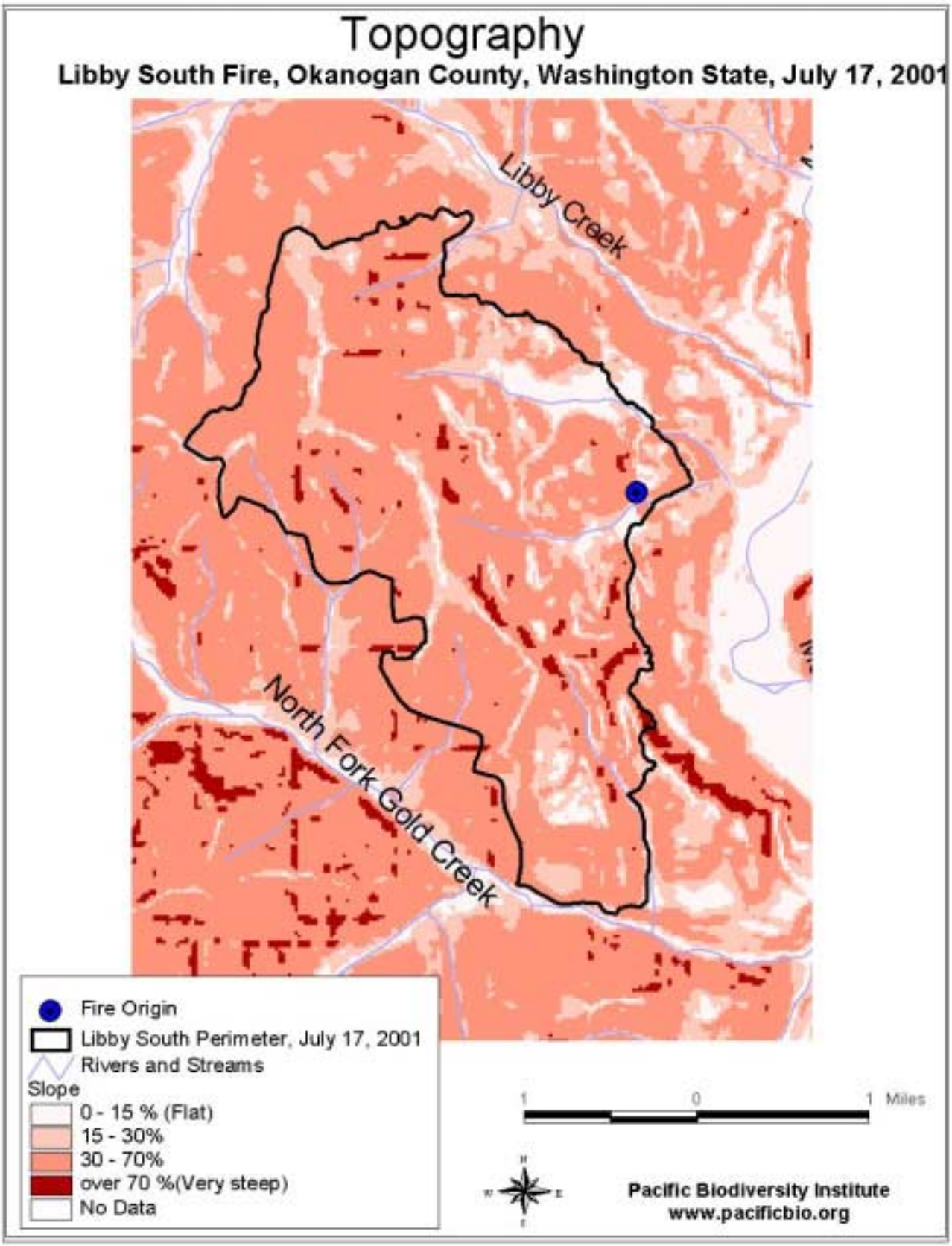
Topography
The Libby South fire largely burned through steep terrain. Nearly the entire burn area was in terrain with 30% to 70% slope.

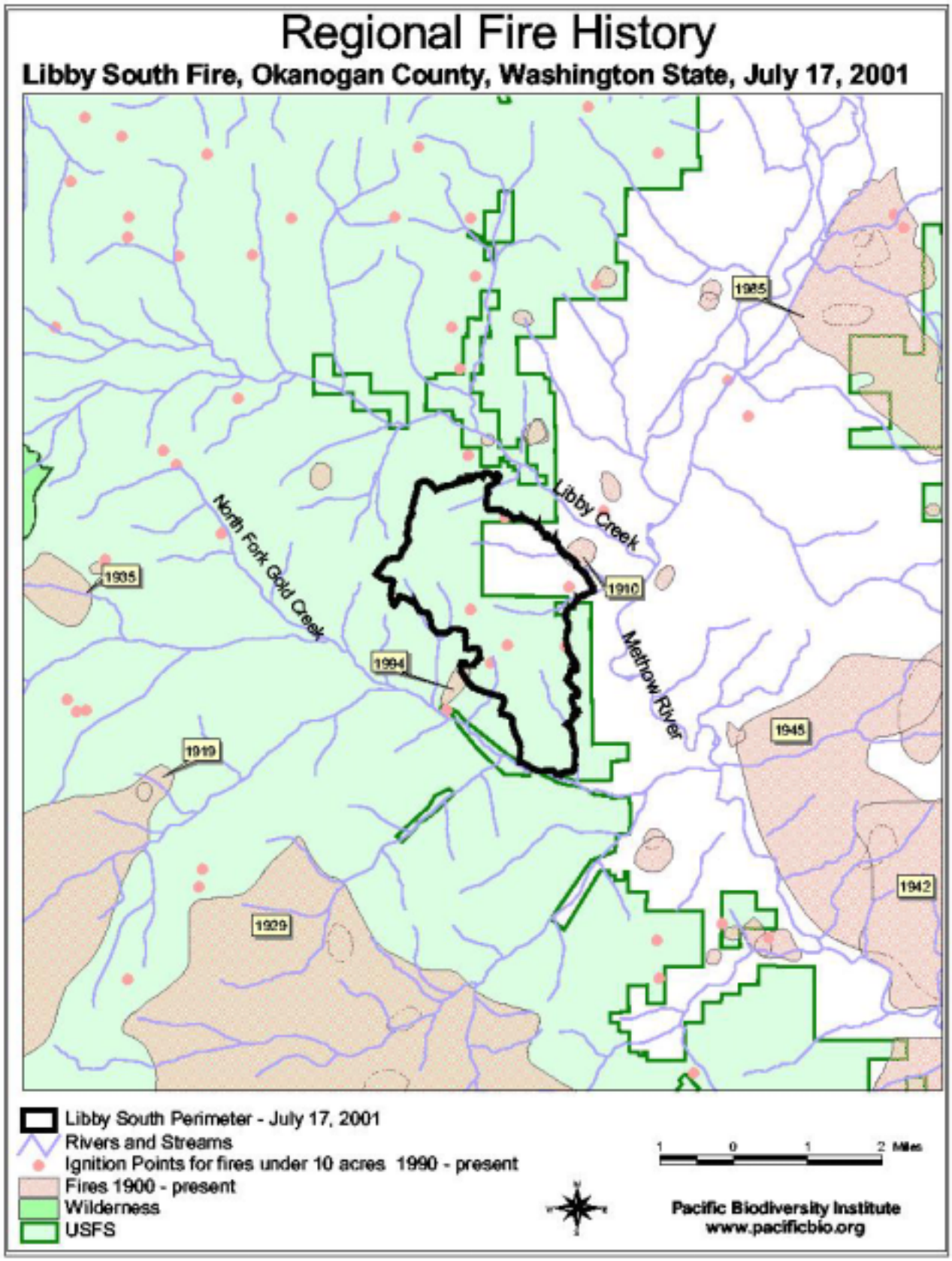
Fire History
Forest Service records from the past 100 years show that there were several other large fires in this area in 1919, 1929, 1942, 1945 and 1982. Several lightning-ignited fires, all less than 10 acres, have burned immediately within the Libby South fire perimeter, but no large stand-replacing fires have burned in this area within the last 100 years.

Information Sources
General Information: Department of Natural Resources: (509) 684-7474
GIS Information:


Roadless Areas and Land Management
Libby South Fire, Okanogan County, Washington State, July 17, 2001
Libby Creek
Carlton
Private Ownership
Methow River
Okanogan National Forest
Fire Origin
Libby South Fire Perimeter
Roads
Rivers and Streams
USFS Inventored Roadless Areas
Roadless Areas
USFS Land
0.5 0 0.5 1 1.5 Miles
Pacific Biodiversity Institute
www.pacificbio.org


Vegetation
Libby South Fire, Okanogan County, Washington State, July 17, 2001
Libby Creek
North Fork Gold Creek
Fire Origin
Libby Creek Fire Boundary
Rivers and Streams
Vegetation
Ponderosa pine / Douglas-fir
Ponderosa pine
Douglas-fir / mixed conifer
Subalpine fir / Lodgepole Pine
Montane herbaceous
Montane mosaic
Herbaceous shrub-steppe
Bitterbrush shrub-steppe
Big sagebrush shrub-steppe
Fallow land and pasture
Orchards and crops
Other
1 0 1 Miles
Information Sources:
Fire Perimeter: Okanogan National Forest
Vegetation: Almack et al.1993
Pacific Biodiversity Institute
www.pacificbio.org


Topography
Libby South Fire, Okanogan County, Washington State, July 17, 2001
Libby Creek
North Fork Gold Creek
Fire Origin
Libby South Perimeter, July 17, 2001
Rivers and Streams
Slope
0 - 15 % (Flat)
15 - 30%
30 - 70%
over 70 %(Very steep)
No Data
1 0 1 Miles
Pacific Biodiversity Institute
www.pacificbio.org


Regional Fire History
Libby South Fire, Okanogan County, Washington State, July 17, 2001
1985
Libby Creek
North Fork Gold Creek
1935
1910
Methow River
1994
1945
1919
1942
1929
Libby South Perimeter - July 17, 2001
Rivers and Streams
Ignition Points for fires under 10 acres 1990 - present
Fires 1900 - present
Wilderness
USFS
1 0 1 2 Miles
Pacific Biodiversity Institute
www.pacificbio.org

Preliminary Assessment of Major Fires Burning in the Western United States

1. Sheep – Nevada

The Sheep fire was named for the landscape in which it is burning, grazing lands for sheep. It was the largest fire to burn in Nevada so far this season, totaling 82,000 acres at containment. The fire was ignited by lightning in a passing storm on August 11, 2001. The vegetation burned included wild rice, cheat grass and sagebrush. This land is managed by the BLM and is used primarily for grazing and forage for domestic stock and wildlife.

2. Jackie's Butte – Oregon

This lightning-caused fire burned grass and sagebrush on BLM land, 10 miles east of Rome, Oregon. The fire burned into wild horse management areas. This was the first large wildfire of the season in Oregon, and burned 73,450 acres by the time of containment on August 13, 2001.

3. Clear Creek Complex – Nevada

The Clear Creek fires burned through shrublands and grasslands south of Winnamucca, Nevada. This dry, desert country is owned by the BLM and used for grazing and wildlife forage. The complex consisted of three lightning-caused fires and burned a total of 53,097 acres by the time they were contained on August 19, 2001.

4. Upper Willow - Nevada

The Upper Willow fire began in old growth sagebrush and heavy cheatgrass on the northern border of Nevada. The fire threatened ranch structures, private and USFS residences, and sage grouse habitat. Portions of the fire burned through steep terrain in the Humbolt-Toiyabe National Forest. The fire perimeter encompassed a total of 41,830 acres at containment on August 24, 2001.

5. Fort Ranch – Utah

The Fort Ranch fire burned intensely and rapidly across grasslands north of the Promontory Mountains in northwest Utah. The land affected was both privately owned and BLM land and was covered with cheat grass and scrub brush. This fire was ignited by lightning on July 13, 2001 and blew up on July 18th , expanding 5,000 acres in one day. The fire-fighters contained the fire after it had reached 40,000 acres, making it the largest fire in Utah this year.

6. Blue Complex - California

Lightning ignited several fires in the Modoc National Forest, 13 miles east of Likely, CA on August 9 and 10, 2001. Three of these fires were grouped together as the Blue Complex (the Blue, Shields and Canyon fires) and grew to a total of 37,950 acres by the time they were contained on August 22. The Blue fire, the largest fire in the complex, spread through a heavily roaded landscape and into the South Warner Wilderness. Expenditure on these fires was 11.9 Million dollars at the time of containment.

Burn area in Blue Fire. Photo from Blue

Figure 4–1. Smokey Bear warns visitors to prevent forest fires in the shrub-steppe environment of the Colville Indian Reservation, Washington.

Discussion

Through this study, we hope to raise awareness on several issues that are often misinterpreted or ignored by firefighting agency press releases and media reports covering wildfires burning in the western United States. Wise public policy regarding land and fire management depends on a sound understanding of the facts that underlie the national wildfire situation.

How does this wildfire season compare to the past?

Although the year is not yet over, year-to-date comparisons indicate that the amount of land burned in this year's wildfires is less than half the total burn area from last year. This year's burn area is also slightly less than the average for the last ten years. The total burn area so far this year is only about one-fifth of the century long year-end average.

From this information, we conclude that this summer's wildfire activity has been normal in comparison with the short-term record and dramatically less than the area that burned in wildfires

during the first half of the 20th century. Even last year's total nationwide burn area was substantially less than the century-long year-end average (Morrison et al. 2000).

Are most of the wildfires in the western United States burning in our National Forests?

Most wildfires that have burned this year are not on National Forest land. Only 13% of the total number of fires started on National Forest land and 14% of the total burn area is on National Forest land. Clearly, our National Forests are not a dominant part of the wildfire picture in the nation. Our review of the last four years indicates that this is not unusual. In 1997, the percentage of burned area on National Forests was as low as 5% of the total national burned area.

As our analysis shows, most wildfires do not burn in our National Forests. Yet, national wildfire management policies put a primary focus on these very lands and often fail to adequately address the larger issue of fire on tribal, state and private lands. Wildfire management on tribal, state and private land is probably more important to homeowners and rural communities than wildfire management on National Forest land. These lands often experience more wildfire activity than National Forest land and significantly more homes and communities are located on or adjacent to this part of the landscape. On the federal portion of the landscape, significantly more area usually burns on Bureau of Land Management land than on the National Forests. National policies and priorities need to address these realities.

Are wildfires usually synonymous with forest fires – or are other vegetation types involved?

The public, and even some wildfire experts, often tend to equate wildfires with forest fires. This common misconception is disproved by a more careful examination of the landscape conditions under which most wildfires burn. So far this year (2001), all of the largest fires (over 50,000 acres) burned primarily in deserts, grasslands and shrublands. A majority of the area burned in many of the smaller fires examined in this study are also non-forested or sparsely forested.

Although wildfires that burn through forests are a significant land management issue, more fires often burn through other vegetation types. Fire management and land management policies need to reflect this reality. A national fire policy that puts a major focus on thinning and prescribed burns in our National Forests will not address this main issue.

Where wildfires burn through forests, what is the natural fire regime of these forests?

Many of the wildfires that occur on National Forest land burn though higher elevation forests that normally have a fairly long fire-return interval. We documented this extensively in our analysis of the wildfires of summer 2000 (Morrison et al. 2000). This year fewer fires actually burned in forested areas – but those that did burn in National Forests followed this same pattern. The Thirtymile fire burned in an area with a natural fire regime characterized by long return-interval, stand-replacing fires. The Rex Creek and Icicle Creek fire complexes also burned significant amounts of high elevation forest with a similar natural fire regime.

These high elevation forests have been controlled by a different fire regime than the low elevation ponderosa pine ecosystems that have been the basis for much of the public discussion about the

need for thinning and prescribed fire. Because of the significant ecological differences between forest types, thinning and prescribed fire programs may not advisable in the high elevation (or high latitude) forests and will not reduce wildfire risk (Gutsell et al. 2001).

What role does past forest management activity play in fire spread and severity?

Over the past two years, numerous fires have started and burned through land that has a long history of intensive forest management. Some of the largest fires of year 2000 occurred in these areas (Morrison et al. 2000). This year, the Green Knoll fire near Jackson, WY started along a road in an area that had a long history of logging and forest management. The fire burned through this intensively managed area and gained considerable momentum before burning into a Wilderness Study Area.

The Virginia Lake Complex fires burned largely in shrub-steppe environments, but also burned through some managed and unmanaged forests. Our field examination of the immediate fire effects on these forests indicates that both thinned and unthinned stands generally survived the fire and that, in most cases, the fire burned the underbrush in the area's ponderosa pine forests. Even though the fire burned during extreme fire weather, dense, unthinned stands survived along with stands that had been recently thinned.

Similar initial reports from the Rex Creek Complex and the Icicle Creek Complex indicate that the lower elevation, unmanaged forests are still capable of carrying underburns during extreme fire weather and that forest canopies can survive such fires. This indicates that the need for forest thinning operations to reduce fuel loads may be somewhat exaggerated.

Current evidence does not support the idea that activities resembling current logging practices will create fire-safe forests or fire-safe communities. Forest management activities such as prescribed burning and thinning may play an important role in improving forest stand condition and reducing wildfire risks in some situations, but considerably more research is needed to understand the complexities of fire behavior in forest ecosystems and how management activities can influence this behavior.

Are the National Forest lands that are burning suitable for intensive forest management activities?

Most of the areas that have burned on National Forest lands in this year's wildfires are on steep slopes. Road building and intensive forest management activities would be close to impossible in much of this rugged terrain. Even if forest-thinning activities could reliably create more fire-safe forest stands, the cost would be immense in many of the areas that burned this year – due to the difficulty of building roads across cliffs, canyons and other steep and rugged terrain.

Where are most of the homes that are threatened by wildfires located?

The majority of homes that were destroyed in this summer's wildfires were far removed from National Forest land. They burned in fires that also started far from the National Forests. Many of the homes were primarily surrounded by grassland, pastures, shrublands and other non-forest vegetation. The results of our initial assessment indicate that homeowners in all environments that

may experience wildfire need to take actions to make their homes fire-safe. Reliance on federal programs directed toward changes in National Forest management would be a mistake.

Homes gutted or destroyed by wildfires that started on private (left) and tribal (right) land. The fires that burned these homes traveled through shrub-steppe vegetation before burning the home.

Recommendations

Our study points to four key recommendations:

- From a national policy perspective, much more emphasis needs to be placed on providing funding to tribal, state and local governments, as well as private individuals, to help create fire-safe communities. Traditionally, a majority of Congressional appropriations for wildfire prevention and suppression activities have been allocated to the US Forest Service. A sizeable portion of the most recent appropriation is targeted to support experimental forest thinning projects in fairly remote areas. Since most of the wildfire activity is not on National Forest land and most of the homes at risk are substantially removed from the National Forests, it is unlikely that channeling huge sums of money to the US Forest Service is the most cost effective method of reducing wildfire risk to communities in the western United States. We recommend that the federal government channel much of the massive federal funding devoted to wildfire preparation and prevention directly into local communities.

- The best way to effectively prepare for wildfire is to insure that individual homes and communities are prepared to prevent and then withstand a fire. Many people in the western United States live in high-hazard fire environments. In these situations, "the human-built environment becomes an important factor in predicting the loss of life and property. Untreated wood shake and shingle roofs, narrow roads, limited access, lack of fire-wise landscaping, inadequate water supplies and poorly planned subdivisions are examples of increased risk to people living with the threat of wildfire" (Pacific Northwest Wildfire Coordinating Group 2001). A series of simple, inexpensive actions can be taken to reduce wildfire risk – wherever wildfires burn – be it grasslands, deserts, suburbs or forests.

- For the homeowner, the first place to start in creating a fire-safe house is the roof – which is the most vulnerable part of the house. Roofs in fire country should be made of metal or some other class C or better fire resistant roofing. It is also important to enclose the undersides of balconies and aboveground decks with fire resistant materials. A variety of other simple construction considerations make the difference whether a home survives a wildfire. Creation of a defensible space around the home is also important. Homes in high-hazard fire environments should be surrounded by a buffer of at least 100 feet of relatively fuel free terrain (Pacific Northwest Wildfire Coordinating Group 2001).

- Local fire departments and community organizations can also play an important role in preparing a community for wildfire – and these organizations need to be adequately funded.

With an effort focused on creating fire-safe homes we can, within a few years, create fire-adapted communities that can withstand the periodic fires that have swept the western US on a regular basis for thousands of years.

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