

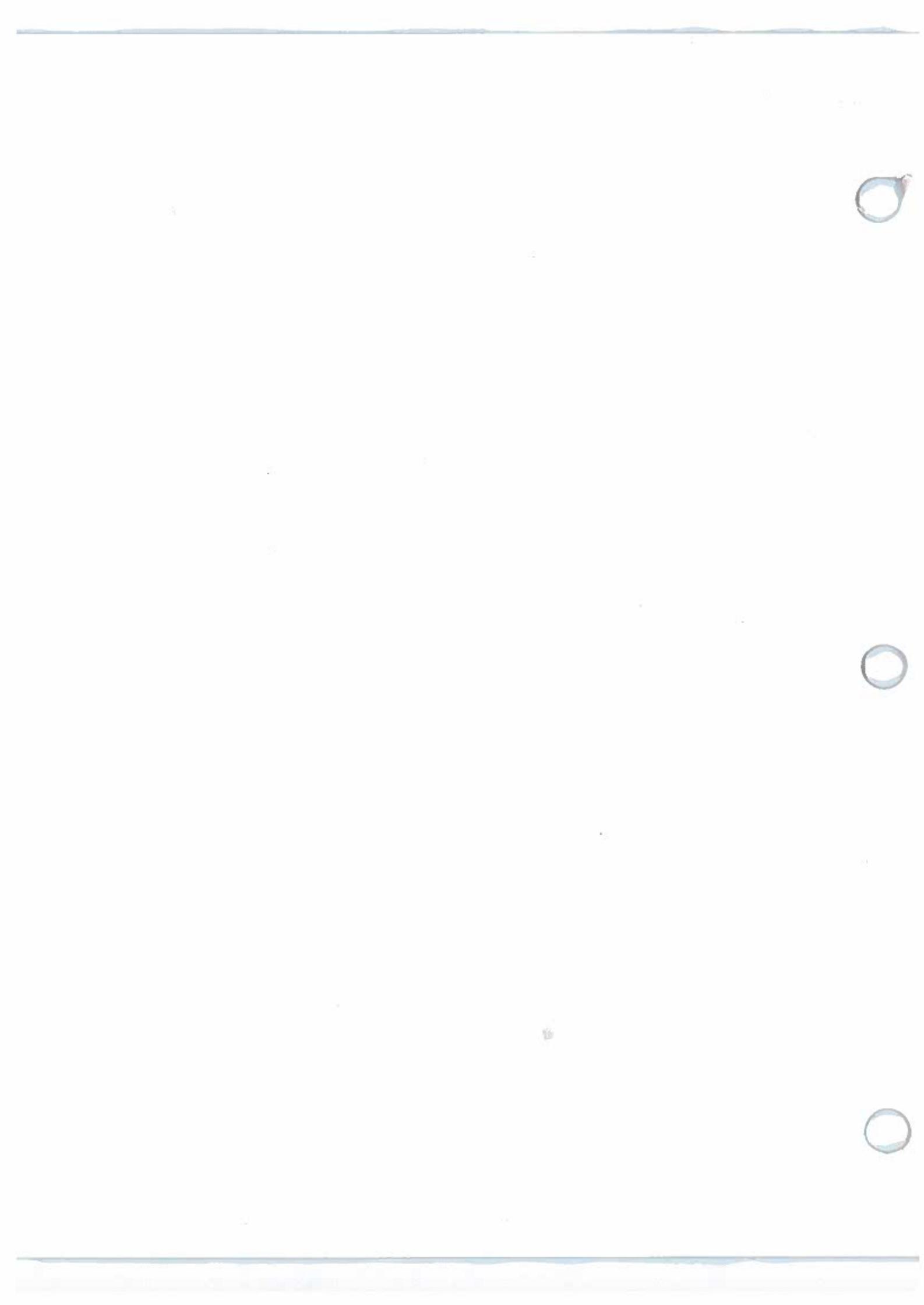
Big Horn County  
Fremont County  
Hot Springs County  
Johnson County  
Park County  
Sheridan County  
Washakie County



# Cody Interagency Dispatch Zone Fire Danger Rating Operating Plan

April 2013 - Version 1.0

Cody Interagency Dispatch Zone  
Coordinating Group



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## I. Introduction

This Fire Danger Rating Operating Plan (FDROP) documents the establishment and management of the Cody Interagency Dispatch Center Zone Coordinating Group (CDC Zone) fire weather system and incorporates NFDRS fire danger modeling into fire management decisions. Direction for development of a Fire Danger Rating Operating Plan can be found in various agency manuals. This plan provides a framework for decisions while providing guidance for decision-makers. Furthermore, this plan provides the direction necessary to convey fire danger awareness of escalating fire potential to fire management personnel. This awareness is critical when wildland fire danger levels are at severe thresholds which may significantly compromise safety and control.

## II. Roles and Responsibilities

### A. Fire Danger Technical Group

The CDC Zone Operations Committee will assign a task group (Fire Danger Rating Technical Group) to maintain, review, and update this plan. Members of the Fire Danger Rating Technical Group will monitor NFDRS to ensure validity, coordinate/communicate any problems identified, review plan implementation, coordinate plan revisions, present the plan, and be available for NFDRS technical consultation. Some specific elements to monitor and coordinate are ensuring observations are selected appropriately (time, SOW, wet flag, consistent), station management in WIMS (herb state, catalog), station maintenance (instrument errors, transmit times), station site locations (eliminate redundant/inappropriate, propose new sites where appropriate).

The Fire Danger Technical Group is comprised of representatives from the following agencies or offices:

- Bighorn National Forest – Forest Service
- Bighorn Basin/Wind River District – Bureau of Land Management
- Cody Interagency Dispatch Center
- Shoshone National Forest – Forest Service
- Wind River Agency – Bureau of Indian Affairs

### B. Fire Weather Station Owners and Managers

There are sixteen weather stations that have been identified to forecast fire danger ratings and provide outputs for other fire management decisions for the CDC Zone. These stations were selected for quantity, quality and consistency of data. There are other stations available on adjacent lands that may provide additional weather and fire danger information on an as needed basis or for future management of the CDC Zone.

Table 1 - Station Owners

Station Number	Station Name	Agency	Station Owner	Co-owner	Station Manager
480213	Crandall	FS-SHF	Cathy Hutton	Clint Dawson	Clint Dawson
480214	Eagle	FS-SHF	Cathy Hutton	Clint Dawson	Clint Dawson
481410	Elkhorn	FS-SHF	Cathy Hutton	Clint Dawson	Clint Dawson
481903	Anderson Ridge	BLM	Scott Russell	Frank Keeler	Richard Putnam
481411	Wind River	BIA	Cathy Hutton	Bob Jones	Cal Anacker
480212	Rattlesnake	BLM	Cathy Hutton	Chuck Russell	Rance Neighbors
480804	Grass Creek	BLM	Cathy Hutton	Chuck Russell	Rance Neighbors
482010	Camp Creek	BLM	Cathy Hutton	Chuck Russell	Rance Neighbors
480904	Split Rock	BLM	Cathy Hutton	Chuck Russell	Rance Neighbors

<b>Station Number</b>	<b>Station Name</b>	<b>Agency</b>	<b>Station Owner</b>	<b>Co-owner</b>	<b>Station Manager</b>
480307	Hyatt High	BLM	Cathy Hutton	Chuck Russell	Rance Neighbors
480306	Mill Creek	FS-BHF	Cathy Hutton	Jon Warder	Todd Legler
480403	Burgess	FS-BHF	Cathy Hutton	Jon Warder	Kevin Hillard
480906	Leigh Creek	FS-BHF	Cathy Hutton	Jon Warder	Curtis Rasmuson
480404	Boyd Ridge	FS-BHF	Cathy Hutton	Jon Warder	Todd Legler
481002	School House	FS-BHF	Cathy Hutton	Jon Warder	Curtis Rasmuson
245609	Hillsboro	FS-BHF	Cathy Hutton	Mack McFarland	Grand Teton NP

Above identifies the owner, co-owner and manager of each RAWS. The duties and responsibilities for each position are outlined in below.

**Station Owner**

- Monitors stations daily for operational problems and data errors and takes action to correct minor problems in a timely manner to ensure minimal breaks in data stream during established operating seasons.
- The station owner or co-owner is the initial contact for all issues regarding station management in WIMS and station maintenance for stations under their control. The station owner/co-owner will assure that identified problems with a weather station are corrected by contacting the station manager responsible for the maintenance and repair of the station.
- Ensures responsible individuals at the zone or geographic area level are notified of station problems in timely manner.
- Responsible for initiating station start-up date as indicated in the FDRA operation plan.
- Responsible for initiating station green-up as indicated in the FDRA operation.
- Responsible for setting freeze date of station by coordinating with co-owner
- Responsible for closing stations down by completing station frozen date in WIMS, 12/1.
- Reviews station data collected at the end of each season and works with station co-owner to resolve issues regarding missing or incorrect data.
- Has edit access to CDC zone owned stations in WIMS.

**Station Co-owner**

- Performs station owner duties and responsibilities when station owner is absent.
- Monitors stations daily for operational problems and data errors and takes action to correct minor problems.
- Monitors freeze dates of stations to provide input to owner on freeze date entry in WIMS.
- Edits station catalog card in WIMS including updates to fire danger rating fire business decision points in WIMS as indicated in the CDC Zone FDRA Operating Plan.
- Assists Station Owner with resolving issues regarding missing or correcting data.

**Station Manager**

- Responsible for maintenance and repairs of assigned stations.

- Notifies station owners and fire managers of operational issues, including periods when a station is expected to be out of service.

### **C. Dispatch/Communications**

Personnel from the Cody Dispatch Center (CDC) are responsible for entering daily observations into WIMS and updating the Fire Danger. CDC disseminates daily forecasts, watches, warnings and fire danger forecasts to field personnel and unit offices. Both weather forecasts and fire danger are available on the CDC web page. Fire danger signs are managed by the individual agencies.

### **D. Field Operations Managers**

Unit fire managers (Zone FMOs, FOSs and CDC Center Manager) and their assistants will assure that their personnel understand NFDRS outputs and how they are to be used. Unit fire managers are responsible for implementing this plan, and ensuring decisions are made consistent with the intent of the plan. Unit fire managers will also provide maintenance support for those stations that cover their zones and will assist CDC with daily observations update when necessary.

### **E. Program Managers**

The Unit Program FMOs and agency administrator will use this Fire Danger Operating Plan and NFDRS outputs as a tool to coordinate and to make informed fire related decisions. The program managers/agency administrators are ultimately responsible for ensuring this plan is maintained, utilized, and communicated.

## **III. Fire Danger Rating Inventory**

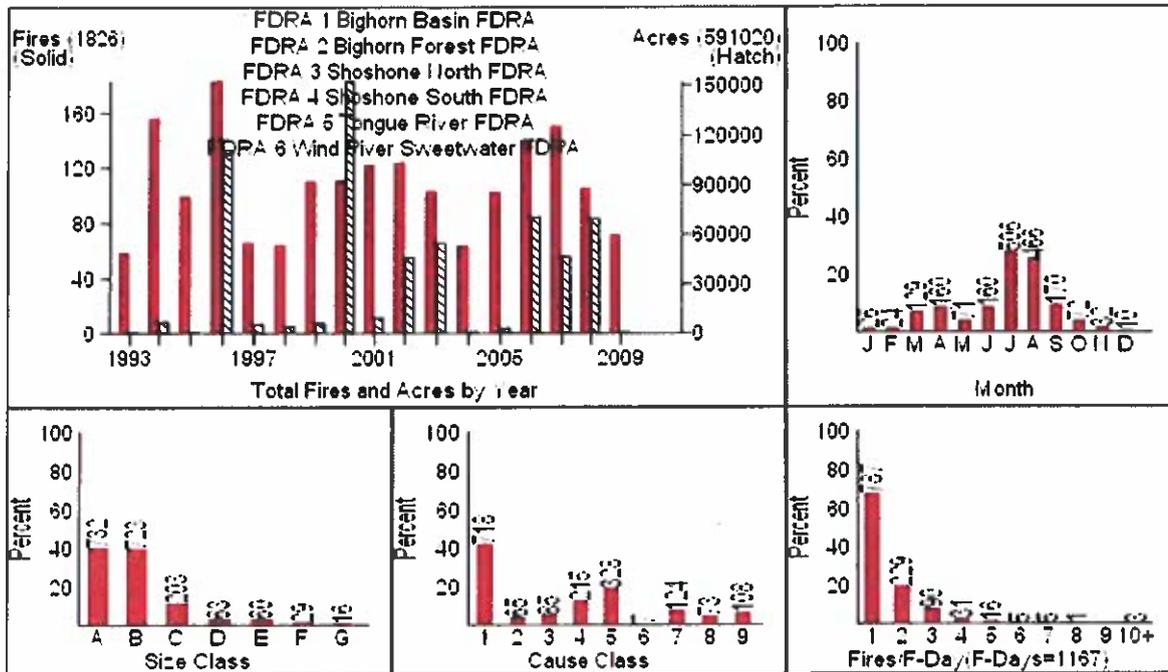
### **A. The Administrative Unit**

The Cody Interagency Dispatch Zone (CDC Zone) is situated in the northwest quadrant of Wyoming. The CDC Zone is 15,238,113 acres and roughly covers 190 miles north to south and 140 miles east to west. The western part of CDC Zone reaches parts of the continental divide on the leeward side of the Absaroka's, Beartooth and Wind River Mountains. The southern end of the CDC Zone extends from South Pass into the edges of the Great Divide Basin. The eastern edge extends up from the Rattlesnake Mountains and across the foothills of the Bighorn Mountains. The central to northern portions of the CDC Zone make up the Bighorn Basin which is bounded by all of the mountain ranges mentioned along with the Owl Creek Mountains. Population centers are concentrated along main river and transportation corridors. Industry in the area is agricultural, petroleum, tourism, and recreation based. Within this whole area, several federal, state, county cooperators highlighted below make up the Fire Danger Rating Technical Group of fire land managers in the CDC Zone.

During the 1993 to 2009 period selected for the FDROP analysis, the CDC Zone has averaged 107 wildfires and 34,766 acres annually. For the ten year period (2000-2009), fire occurrence on the CDC Zone has averaged 109 fires per year. The average annual area burned by wildfire during that period is approximately 45,428 acres. The ten year average in the CDC Zone has an acreage increase seen throughout the CDC Zone from the result of type 2 and type 3 incidents increasing within a period of drought. The main fire season runs June through September. July and August is the peak part of the season. The CDC Zone fire season begins in March and runs through October. Eighty percent of the fires are A and B size class and 40% of ignitions are lightning caused with debris burning second at 18%. Campfires and arson together make up another 18% of the fire total. The fire statistics reviewed may be underreporting the wildfire occurrence and acreage burned due to the amount of fires not reported on private lands that are protected by local fire departments.

Figure 1 shows the CDC Zone fire summary.

Figure 1 - CDC Zone Fire Summary (1993-2009)



### 1. Bighorn National Forest - USFS

The Bighorn National Forest is located in Forest Service Region 2 in north central Wyoming's Big Horn Mountain range. The gross area within the proclaimed Forest boundary contains 1,115,161 acres which includes 7,491 acres of State and private land. The Forest is located approximately midway between Yellowstone and Mount Rushmore National Parks. The BHF extends more than 70 miles from the Montana state-line to remote areas east of Tensleep and west of I25. The Great Plains border the Forest on the east and on the west the Bighorn Basin borders the Forest. It is bordered by the BLM on the west, the Crow River Indian Reservation and private lands on the north, by private, state, BLM lands on the south and east. Bighorn, Johnson, Sheridan, and Washakie counties are part of the Forest. Wildland urban interface is present in particular with some new subdivisions outside of the Forest and permitted businesses on the Forest. Adjacent large industry to the forest would involve tourism, recreation, oil, and agriculture.

The Bighorn National Forest has about 728,000 acres of forested land, amounting to approximately 65% of the Forest. Principle species include lodgepole pine, Engelmann spruce and subalpine fir. Ponderosa pine, limber pine and Douglas-fir are found at the lower elevations. Non-forested lands include grassy meadows, shrub lands, alpine tundra, and rocky areas.

During the 1993 to 2009 period selected for the FDROP analysis, the Forest has averaged 17 wildfires and 1,916 acres annually. For the ten year period (2000-2009), fire occurrence on the BHF has averaged 15 fires per year. The average annual area burned by wildfire during that period is approximately 2,731 acres. The main fire season runs June through September. August is the peak of the season. Eighty eight percent of the fires are A and B size class and 68% of ignitions are lightning caused with campfires second at 21%. Fires of recent significance have started in narrow steep canyons by human activity under windy conditions to produce some larger trends. Appendix B3/B4 shows the fire history summary for 1993-2009.

Insect activity is beginning to impact the fuels from low to high elevation along the transportation corridors. The type of wind driven fires coming out of the narrow canyons may become more common and larger as the beetle kill damage continues.

## **2. Bighorn National Recreation Area - NPS**

The Recreation Area is managed by the National Park Service and is composed of 120,000+ acres, which straddles northern Wyoming and southern Montana. There are two visitor centers and other developed facilities in Fort Smith, Montana and near Lovell, Wyoming. The Bighorn Canyon NRA is located in the north central part of Big Horn County. The Bighorn Lake extends approximately 71 miles through Wyoming and Montana, 55 miles of which are held within spectacular Bighorn Canyon. The Bighorn Mountains come into the recreation area from the east and the intermountain desert and high plains border the western edge of the Bighorn Canyon NRA. The site is very arid. Recreation is the primary use of unit. The Bighorn NF provides fire protection and management to the unit by agreement. The unit is managed from Grand Teton National Park.

During the 1993 to 2009 period selected for the FDROP analysis, the Bighorn Canyon NRA has averaged 4 wildfires and 55 acres annually. For the ten year period (2000-2009), fire occurrence on the Bighorn Canyon NRA has averaged 2 fires per year. The average annual area burned by wildfire during that period is approximately 46 acres. The main fire season runs July through September. July is the peak of the season. April has a large portion of the fire season which is due to agricultural burning and machinery. Seventy-three percent of the fires are A and B size class and 33% of ignitions are lightning caused and equipment, debris burning, and smoking account for 33% of ignitions. Class C fires make up 20% of the ten year average. Appendix B2 shows the fire history summary for 1993-2009.

## **3. Wind River/Bighorn Basin District – BLM**

The BLM administers approximately 5.8 million acres in Northwest and Central Wyoming. The heart of the District is surrounded by the Wind River, Absaroka, Beartooth and Bighorn Mountains. Units working this land base are BLM Cody Field Office, BLM Lander Field Office, and BLM Worland Field Offices. There are BOR lands managed for fire administration in the CDC Zone. Big Horn, Fremont, Hot Springs, Park, Washakie, and parts of Carbon and Natrona County are the counties encompassing this land base. Mining, cattle, agriculture, are very prevalent on BLM lands. The District also consists of several Wilderness Study Areas (WSA) and Areas of Critical Environmental Concern (ACEC) areas scattered throughout. There are also several prominent landmarks throughout the unit related to frontier and pioneer history that are historic.

During the 1993 to 2009 period selected for the FDROP analysis, the BLM has averaged 46 wildfires and 16,716 acres annually. For the ten year period (2000-2009), fire occurrence on the BLM has averaged 24 fires per year. The average annual area burned by wildfire during that period is approximately 2,892 acres. The main fire season runs July through August. July is the peak of the season. Sixty one percent of the fires are A and B size class and 61% of ignitions are lightning caused and equipment and debris burning account for only 11% of ignitions and arson at 5%. Class C and D fires make up 21% of the ten year average. Appendix B1/B2 shows the fire history summary for 1993-2009.

## **4. Wind River Agency – BIA**

The Wind River Indian Reservation (WRIR) is part of the BIA's Rocky Mountain Region which covers Montana and Wyoming. The WRIR consists of approximately 2,268,000 acres, of which about 1,888,500 is tribal trust and allotted lands and the remainder are fee (private) lands. The WRIR is in the western part of the Wind River Basin surrounded by the Wind River Mountains on the south and southwest, the Absaroka Mountains on the northwest, the Owl Creek and Bridger Mountains on the north and Beaver Divide and other highlands to the south and east. There are many reservoirs on the WRIR which are used mainly to provide irrigation water for

agriculture. Forest land on the WRIR encompasses approximately 750,000 acres and is divided into three management areas, Owl Creek, Absaroka and Wind River Roadless Area. The remainder of the lower level lands, cover an area of over 1,500,000 acres, where most of the reservation population lives. In this area, there are several towns and small communities, significant areas of farmland and vast areas of rangeland used for livestock grazing. The WRIR is within Fremont County and Hot Springs County. Federal agencies bordering WRIR are BLM and USFS from within the CDC Zone.

During the 1993 to 2009 period selected for the FDROP analysis, the Reservation has averaged 40 wildfires and 10,459 acres annually. For the ten year period (2000-2009), fire occurrence on the WRIR has averaged 32 fires per year. The average annual area burned by wildfire during that period is approximately 16,487 acres. The average figure is somewhat misleading since it includes one fire which burned over 137,000 acres in 2000 (Kate's Basin Complex). Without this fire, the acreage per year drops to about 2,900 acres, which may more accurately reflect the current trend.

The fire season on the WRIR generally has two peak occurrence periods. One is in the spring, after temperatures have begun to warm up, but prior to vegetation green-up in the lower elevations. The other period runs from early July into October. This period corresponds with the warming and drying that occurs in the summer and is extended by the curing of vegetation in the late summer and fall. Ninety-five percent of the fires on the WRIR are a result of human activity. Appendix B2/B8 shows the fire history summary for 1993-2009.

## **5. Wyoming State Forestry Division**

The Wyoming State Forestry Division is within the CDC Zone is managed under the Wyoming Office of State Lands and Investments. Statewide the program is charged with managing the State trust lands and providing assistance forestry. Within the CDC Zone the Division manages the forestry, fire and conservation programs on State trust lands. The Division works throughout the CDC Zone with private landholders in these programs, forestry contracts, fuels abatement, prescribed fire, and suppression. Acreage managed under this division for forestry products are generally adjacent to or within the National Forests. Approximate acreage of trust lands within the CDC Zone is 728,125.

Fires on the state lands reflect the occurrence of the zone fire activity and classes. Data to conduct fire analyses is not readily available yet. Management options focus on quick initial attack and suppression to protect the residential values, timber, range, petroleum, and winter forage for wildlife. Beetle kill is also impacting the forested holdings and changing land use patterns from ranch to residential involves this division in more community protection planning for the emerging urban interface.

## **6. Counties**

The counties within the CDC Zone contain several portions of the cooperating agency lands. The Forest Service, BLM and BIA own most of the acreage in the CDC Zone area.

Big Horn County is located in the north central portion of the CDC Zone. The County is approximately 7,335,040 acres in size. The BHF, BLM, BICA, and the State trust lands make up over 90% of the land base. Typically the forested areas are situated in the upper elevations and foothills of the County and private lands are bordering BLM and State trust lands. Fires in the lower elevations are related more closely to human activities while the fires in the upper elevations are primarily from lightning and on forest lands. The western half of the BHF is in this County along with ½ of the Bighorn Canyon. The BLM is the largest land manager in the County. The County lies within the CDC Zone.

Sheridan County is located on the eastern edge of the CDC Zone with the town of Sheridan at its center. The County is approximately 1,614,720 acres in size. The private and State Trust Lands border the BHF on the eastern slope in the lower elevations. The northeast portion of the

BHF is in this County. Most of the known fire history occurs on the BHF as the reporting system captures those events. The Tongue FDRA in this County has little fire data to draw conclusions for fire danger decisions. The fires on the BHF Tongue district in this County are primarily lightning or campfire caused. State trust lands include some important winter range. Private lands are primarily range or agriculture. The Tongue and Bighorn FDRAs are in this County and make up about 40% of the County land base.

Johnson County is located on the eastern edge of the CDC Zone with the town of Buffalo at its center. The County is approximately 2,666,240 acres in size. The County has a large amount of private lands on the eastern slope in the lower elevations. The southeast portion of the BHF is in this County. State trust lands in the County are widely dispersed between private lands. BLM lands are in this County, but primarily outside of the CDC Zone. The Bighorn FDRA makes up about 15% of this County. Cattle, oil, tourism are main industries in the County. Wildfires are primarily lightning caused in the mountains and in the lower elevations industry/human caused.

Park County is located in the northwest corner of the CDC Zone. Park County is approximately 4,443,520 acres in size. The higher elevations of the County in the Beartooth and Absaroka Mountains are primarily Yellowstone NP and Shoshone NF lands. Lower portions of the County are private lands mixed state and BLM lands. Approximately 80% of the land base is federal or state land. Park County makes up about 60% of the Shoshone North FDRA. The Shoshone North FDRA Fires in the County are also tied to debris burning in the lower elevations while the larger project fires are generally initiated by lightning on SHF or YNP lands.

Fremont County is located in the south central and southwest portion of the CDC Zone. The County is approximately 5,877,120 acres in size. The BHF, BLM, BICA, and the State trust lands make up over 90% of the land base. The Wind River Indian Reservation is the largest land base in the County. The entire County is within the CDC Zone area. The Owl Creek Mountains on the north end and the Wind River Mountains on the south end trap most of the moisture that enters the County. The majority of the County is in agricultural use on state, BLM, private and trust lands. Human caused fires from debris burning are the main cause of fire in the County along with arson.

Sweetwater County borders Fremont County on the south end of the CDC Zone. It is the most remote and sparsely populated County in the FDRA. The Sweetwater County lands within the CDC Zone are minimal, less than 1%, and all BLM acres. These lands are primarily for grazing, energy, and recreation.

At the center of the CDC Zone, lies Hot Springs County. Approximately, 1,282,560 acres in size, this County is about a 50/50 split of private and federal/state trust lands. This County lies within the CDC Zone. Thermopolis is the main population center. Oil, tourism, and agriculture are again primary industries. Fires reported are mostly lightning caused. Campfires, arson, and debris burning contribute to the fire load.

Washakie County makes up the southeast corner of the CDC Zone with Worland and Ten Sleep being the primary communities. Ownership is primarily BLM on the western part. Private, BHF, and State trust lands in the eastern part of the County blend together. The whole County lies within the CDC Zone. Oil, tourism, mining and agriculture are primary industries. Fires reported are mostly lightning caused. Campfires, arson, and debris burning contribute to the fire load.

## **7. Shoshone National Forest**

The Shoshone National Forest is part of the Forest Service's Region 2 Rocky Mountain Region. The Forest is located in the Rocky Mountains of northwest Wyoming and is approximately 2,466,580 acres. The Shoshone extends more than 180 miles from the Montana state-line to South Pass near Lander, WY. It is bordered by the Custer and Gallatin National Forests (FS Region 1) to the north, Yellowstone National Park and Bridger-Teton National Forest (FS Region 4) to the west and southwest, and the Wind River Indian Reservation, Lander & Worland

BLM, private and State trust lands to the east. The federally owned lands, with the exception of the BLM lands, are commonly referred to as part of the Greater Yellowstone Area. Portions of the Forest are found in Park, Hot Springs, Teton and Fremont counties. The Forest is subdivided into five ranger districts; the Clarks Fork, Greybull, and Wapiti Ranger Districts are informally known as the north zone, and the Washakie and Wind River Ranger Districts are known as the south zone. Primary land use on the Forest is from resorts, permittees, outfitters, sportspersons, recreationists, timber, and livestock. Wildland Urban Interface is present in particular with some new subdivisions and permitted businesses. Adjacent large industry to the Forest would involve tourism, recreation, oil, and agriculture.

During the 1993 to 2009 period selected for the FDRP analysis, the Forest has averaged 24 wildfires and 12,533 acres annually. Large fire years such as 1988 were not in the analysis; however the acreage amount burned in that year, 414,847 acres, demonstrates the potential project level fire environment possible on the Forest. In the past 10 years, annual acres burned have increased dramatically. The 20 (1990-2009) year annual average acres burned is approximately 10,655 acres. The ten-year annual average (2000-2009) is over 21,100 acres and the annual average for the 2005-2009, five year period is approximately 29,318 acres burned. The main fire season runs June through September. August is the peak of the season. Ninety one percent of the fires are A and B size class and 50% of ignitions are lightning caused with campfires second at 28%. Appendix B5 and B7 shows the fire history summary for 1993-2009.

The Forest is currently experiencing an insect epidemic in which over 800,000 acres of forest have been attacked. The epidemic is expected to continue for the next few years. Historic fire suppression policies, persistent drought and widespread insect epidemics have increased continuous dead fuel loadings across the Forest. These increased fuel loadings in combination with changes in fire management philosophy are likely the cause of the dramatic increases in annual fire acreage mentioned above.

## **B. Fire Danger Rating Area**

The Fire Danger Rating Areas were delineated by referencing overlapping layers of vegetation, weather forecast zones, precipitation data, and topography. Delineation also considered fire occurrence, local fire managers' knowledge as well as existing fire management unit descriptions used in fire program analysis. Overlaying these features displayed geographic similarities which were very closely correlated to existing fire weather forecast zones. After evaluating all these factors six FDRAs were identified (Map 1 and Table 2). However, one of the delineated FDRAs (Tongue FDRA) does not have any fire occurrence data associated with it nor does it have a RAWS that adequately represents historical weather. Although fire records are scarce for the FDRA, local knowledge indicates that fire occurrence is low. The Tongue FDRA characteristics will be described in this document, but there will be no analysis for determining fire danger rating and business decision points.

## **C. FDRA Characteristics**

The vegetation, topography, and precipitation components were put into GIS layers for analysis as seen in Appendices C1-C3. The components were represented on the landscape to aid in the formulation and establishment of the FDRA. The large scale representation of those factors aided the Fire Danger Rating Technical Group in refining the boundaries of the FDRAs. For example the Shoshone FDRA combined portions of the BLM FMUs to include forest fuel types as part of those FDRAs and the Bighorn Forest FDRA included portions of the Owl Creek Mountains into that FDRA based on fuels and precipitation

National Weather Service Fire Weather Forecast Zone boundaries were obtained from the national weather service and are based on topographic & climatologic influences on weather (Forecast Zone Map, Appendix D).

Map 1 - CDC Zone Fire Danger Rating Areas

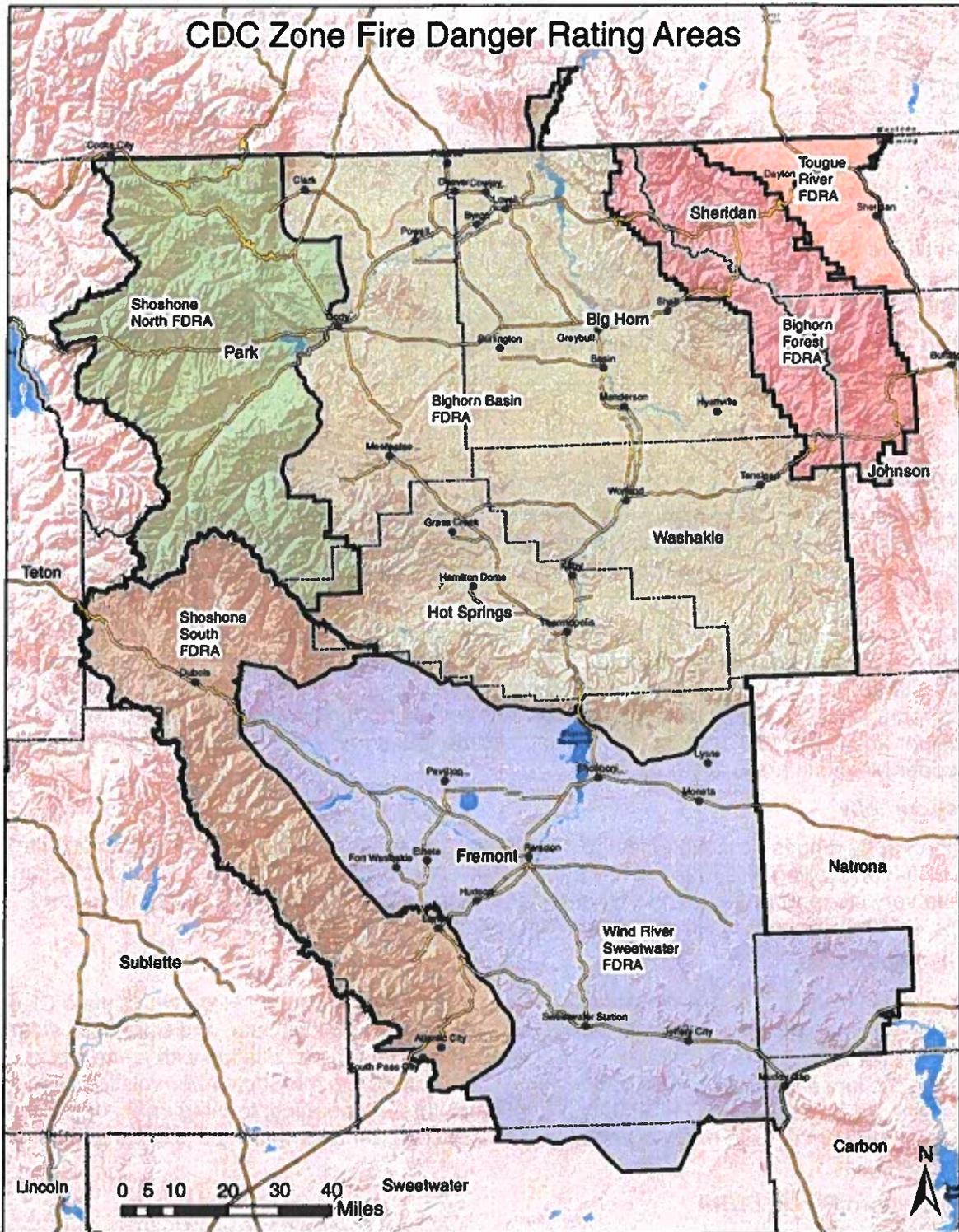


Table 2 – FDRA Characteristics

FDRA Name	FDRA Characteristics			
	Vegetation	Topography	Weather Forecast Zone	Acres
Big Horn Basin	Sage-Grass Agriculture	Foothills Plains	275 & 282	5,843,111
Bighorn Forest	Forest Sage-Grass	Mountains Foothills	284	1,113,829
Shoshone North	Forest Sage-Grass	Mountains Foothills	286	1,947,824
Shoshone South	Forest Sage-Grass	Mountains Foothills	286 & 288	1,7457,39
Tongue River	Sage-Grass	Foothills Plains	274	371,476
Wind River/Sweetwater	Sage-Grass Forest	Foothills Rolling plains	283 & 289	4,216,132

## 1. Big Horn Basin FDRA

### **Vegetation**

Vegetation can vary with: high desert grasses, Wyoming big sagebrush, mountain big sagebrush, rabbit brush, perennials, annuals, lodge pole pine, ponderosa pine, juniper and Douglas fir, limber pine, aspen, piñon-juniper, mixed conifer, and some scattered bitterbrush and mountain mahogany.

NFDRS fuel models A, C, F, G, H, L, S, and T are present throughout the rating area. Fuels can range from consistent to very sparse. Continuous forest stands can be found in the areas of the Grass and Owl Creek Mountains or along drainage systems and north slopes capable of supporting stands. Areas with sparse fuels and vegetation ranging from dense stands of Juniper and Sagebrush with intermixed grasses are found in the areas of Beaver Rim, the Copper Mountain area, and Nowater.

### **Topography**

Topography ranges from 4,000 feet to 11,500 feet in elevation. Areas range in description from fairly flat and rolling hills to extremely steep, rocky, and inaccessible terrain. Topography can have very steep slopes along rivers, grass and sagebrush plateaus, vast, barren rill scarred hills, and/or large rock walls and cliffs. Slopes can range from 20 to 60%.

### **Climate/Weather**

Most of the Wind River/Big Horn Basin FDRA is in Climate Class one. However Climate Class two has historically been used for Grass Creek, Hyatt High, Rattlesnake, and Split Rock stations due to their elevation and locations. May is the key month for precipitation with some inputs during the late summer monsoon outflow in August and during the September solstice period. Winters are very dry with a large portion of the moisture evaporating, forming drifts, or melting away. Parts of the area may only receive 6 to 10 inches annually making this an arid to semi desert region.

## 2. Bighorn Forest FDRA

### **Vegetation**

The Bighorn National Forest is characterized by dense stands of lodgepole pine and spruce/fir interspersed with open parks vegetated with grass and sagebrush. The Bighorn National Forest

has about 728,000 acres of forested land, amounting to approximately 65% of the Forest. Principle species include lodgepole pine, Engelmann spruce and subalpine fir. Ponderosa pine, limber pine and Douglas-fir are found at the lower elevations. Non-forested lands include grassy meadows, shrub lands, alpine tundra, and rocky areas. The drier sites and mid to lower elevations support stands of ponderosa pine, Douglas fir, and juniper, although ponderosa pine is largely limited to the fringes of the Forest. Much of the Cloud Peak Wilderness Area which comprises over 100,000 acres of the Forest is predominantly rock, exposed soil, and wet meadows.

### ***Topography***

The Big Horn Mountains are an isolated range rising from rolling plains country which is approximately 4,000 feet in elevation. The mountains rise to an elevation of 13,175 feet above sea level at the summit of Cloud Peak. The ruggedly glaciated, barren granite peaks slope off to the more gently rolling, timbered ridges and drainages that constitute the bulk of the Big Horn Mountains. Here the terrain is almost plateau-like, ranging in elevation from approximately 7,000 to 9,000 feet. At the Forest boundary, the terrain drops off suddenly to the surrounding plains and rolling foothills.

All of the watersheds originating on the Forest drain into the Yellowstone River through the Big Horn, Tongue, and Powder Rivers. The Yellowstone is part of the Missouri River Basin system.

### ***Climate/Weather***

The precipitation patterns of the Big Horn Mountains are similar to those throughout the Rocky Mountains. The growing season is from mid-May through August. Five to six inches of precipitation falls during this season, most of it as showers at the beginning of the growing season or as snow at the end of the growing season. The average frost-free period is from about June 15 to August 20. Winters are long and cold and last from October 15 through April. At elevations above 9,000 feet, however, snowstorms and frost can occur at any time during the summer months. Portions of the area are in climate class two on the upper slopes and east slopes, while the western slopes may be class one.

## **3. Shoshone North and South FDRA's**

### ***Vegetation***

Vegetation within the Forest is classified into five broad communities: alpine, coniferous forest, montane meadow-parkland, sage-grass, and riparian. Of the Shoshone's 2.4 million acres, 1.3 million are forested. Coniferous forests are the primary fire concern and are best represented by NFDPS fuel model G; dense conifer stands with heavy accumulation of litter and downed woody material. In the past 10 years insect infestations have become epidemic on much of the Forest, and fuel model characteristics are changing with increasing dead fuel loadings in all size classes. Vegetation on the Forest is primarily represented by fire regimes III, IV and V. Average annual number of fire ignitions is modest; however, large fires that result in mixed to replacement severity have been occurring every one to three years for the past ten years.

### ***Topography***

The Forest is located in the central Rocky Mountains on the east side of the continental divide. The mountainous areas north/south trending ranges that drain to the east. The drainage alignment in conjunction with the predominant west to southwest wind patterns promotes large fire growth from west to east, which is visible in historic burn patterns. Most of the Shoshone is within the upper Missouri River Basin, subdivided by the Wind/Big Horn and Clarks Fork River basins. The southern tip of the Shoshone is in the Sweetwater drainage, which flows into the Platte River system. Principal rivers within the Shoshone boundary are the Clarks Fork of the Yellowstone, North and South Forks of the Shoshone, Wind, Wind/Big Horn, and Popo Agie Rivers.

The Shoshone provides a diverse landscape—from lush grasslands to alpine meadows, crystal-clear lakes to glacial carved valleys, and rolling hills to sheer mountain walls. The terrain varies widely from sagebrush flats to rugged mountains due to the Shoshone's location between the western edge of the Great Plains and the eastern edge of the continental divide on the leeward side of the Absaroka, Beartooth, and Wind River Mountains. Elevations range from 4,600 feet at the mouth of Clarks Fork Canyon to 13,804' on Gannett Peak, Wyoming's highest point. The higher elevations are snow-clad most of the year with immense areas of exposed rock interspersed with meadows and forests exposed for only a short time in the summer months.

#### ***Climate/Weather***

Typically, moisture is brought into the area from storms tracking west to east. As the storms are forced up and over the continental divide, moisture is leached from the storm system at the upper elevations which receive average annual precipitation of 75 inches while the lowest elevations average only 10" (Precipitation Zone Map, Appendix X). Approximately 40% of precipitation occurs in the spring, summer thunderstorms provide 30% and the remaining 30% is distributed throughout the fall and winter seasons. Summer temperatures also vary with elevation; with average highs ranging from 78-82 degrees between 6,500'-8500' and average lows from 49 to 59 degrees. A typical summer sees numerous thunderstorms and 23 cold front passages during the established fire season.

#### **4. Tongue River FDRA**

##### ***Vegetation***

The area is characterized by bisecting creek drainages typically mixed with cottonwoods, willows, wild plum, chokecherry and other riparian vegetation. Agricultural fields border the Tongue River, Little Bighorn River and other creeks in the area. The majority of the area is a mix of Great Plains short grass and tall grass species. Sage and grass vegetation may be found in the lower to mid elevations. Wooded portions can be a mix of grass/juniper or ponderosa pine/grassland. Upper elevations may even be a mix of lodgepole and ponderosa pine with some aspen clone stands. Fuel models, one, two, three, five, and nine, would be found throughout the area.

##### ***Topography***

The area is made up of rolling plains, lowland flats, and abrupt slopes that border the Bighorn Mountains. Slopes would be in the 10 to 50% range through most of the area.

##### ***Climate/Weather***

The area is in climate class two. The slopes are on the lee side of the winter storm patterns and the area receives moisture during the summer months from weather patterns coming up the Great Plains or patterns coming west to east across the Rockies.

#### **5. Wind River-Sweetwater FDRA**

##### ***Vegetation***

Vegetation varies from desert salt brush communities to coniferous forests with lush grass meadow, grassy hillsides and grass/sagebrush bottomlands in between. Perennial streams drain almost every major canyon and flow into the Wind River. NFDRS fuel model G; dense conifer stands with heavy accumulation of litter and downed woody material, best represent forested areas on the WRIR with Douglas fir, lodgepole pine and Engelmann spruce occurring at mid to upper elevations or on more northerly facing slopes. This fuel model covers approximately 100,000 to 110,000 acres. NFDRS fuel models H and S are found at the higher elevations and consist of limber pine, whitebark pine and alpine tundra. These fuel models occur on approximately 450,000 to 500,000 acres. The remaining acres on the WRIR are best represented by NFDRS fuel models L (which represent western grasslands vegetated by

perennial grasses) and T (which represent the sagebrush-grass types of the Great Basin and the Intermountain West).

### **Topography**

Topography consists of high mountain peaks and plateaus, glacial canyons and cirques, glacial lakes, canyons and badlands, terraced stream valleys and low lying flats. Elevations range from 4,200 feet Mean Sea Level (MSL) to over 13,000' MSL along the Continental Divide in the Wind River Mountains.

### **Climate/Weather**

The mean annual temperature for the WRIR is between 42 - 45 degrees Fahrenheit except being somewhat cooler in the mountains. Mean precipitation varies from around 7-8 inches per year in the lower elevations to 15+ inches in the foothills and up to 40 inches in the highest elevations of the Wind River Range. Winds throughout the year are most generally from the west or southwest. Typical variations from normal include cold northerly winds in winter and occasionally easterly winds in the spring.

Spring begins dry, but precipitation usually shows an increase by late April. May and June are normally the wettest months of the year. Summers are usually short with hot days and pleasantly cool nights. Precipitation tapers off after early July and normally results from thundershowers and storms rather than frontal activity. Late summer and early fall usually bring a transition to cooler and somewhat wetter weather. By late November and early December winter has usually arrived with outbreaks of arctic air.

### **D. Inventory of Fire Weather Stations**

There are 16 NFDRS Remote Automated Weather Stations (RAWS) used by the CDC Zone (Map 2), 14 of which CDC Zone fire managers are responsible for the operation and maintenance. Hillsboro is maintained by the BLM in Montana and the Anderson Ridge is maintained by the BLM from the High Desert District. The Hillsboro station has been operating for only 6 years and at this time is not being used for fire business decisions, except for prevention signing for the Bighorn National Recreation Area. Cody Dispatch Center (CDC) manages data input and station startup for all stations. All stations are currently running year round. Tables 3 - 7 display the weather stations that have been associated with each fire danger rating area and the composition of the SIGS.

Table 3 - Big Horn Basin FDRA Weather Stations

<b>SIG</b>	<b>Station Name</b>	<b>Station # NESDIS #</b>	<b>Weather Data Years Available</b>	<b>WIMS Observation Period</b>	<b>Location</b>	<b>Elev. (feet)</b>
Big Horn Basin	Hyatt High	480307 3264D47A	1993 - 2009	3/1 - 10/31	44.3000° -107.5161°	5,720
	Split Rock	480904 3278B79E	1993 - 2009	3/1 - 10/31	43.9166° -107.6667°	6,000
	Grass Creek	480804 3264C70C	1993 - 2009	3/1 - 10/31	43.8936° -108.8556°	7,100
	Rattlesnake	480212 52117480	1993 - 2009	4/1 - 10/31	44.5739° -109.2614°	8,426
	Hillsboro <sup>1</sup>	245609 FA643096	2003 - 2009	3/1 - 10/31	45.1038° -108.2188°	3,986

<sup>1</sup> Not included in fire danger rating analysis.

Table 4 - Bighorn Forest FDRA Weather Stations

<b>SIG</b>	<b>Station Name</b>	<b>Station # NESDIS #</b>	<b>Weather Data Years Available</b>	<b>WIMS Observation Period</b>	<b>Location</b>	<b>Elev. (feet)</b>
Bighorn Forest	Boyd Ridge	480404 3249760A	1999 - 2009	5/1 -10/31	44.9413° -107.7088°	7,710
	Burgess	480403 32304060	1990 - 2009	5/1 -10/31	44.7861° -107.5358°	7,795
	Mill Creek	480306 323A0238	1990 - 2009	5/1 -10/31	44.4558° -107.4494°	8898
	Leigh Creek	480906 32829234	1999 - 2009	5/1 -10/31	44.1066° -107.2238°	8,202
	School House Park	481002 3239F5B2	1990 - 2009	5/1 -10/31	44.3063° -108.9819°	8,069

Table 5 - Shoshone North FDRA Weather Stations

<b>SIG</b>	<b>Station Name</b>	<b>Station # NESDIS #</b>	<b>Weather Data Years Available</b>	<b>WIMS Observation Period</b>	<b>Location</b>	<b>Elev. (feet)</b>
Shoshone North	Crandall	480213 32353130	1993 - 2009	4/1 -10/31	44.8503° -109.6114°	6,612
	Eagle	480214 326FA142	1999 - 2009	4/1 -10/31	44.4856° -109.8964°	7,500

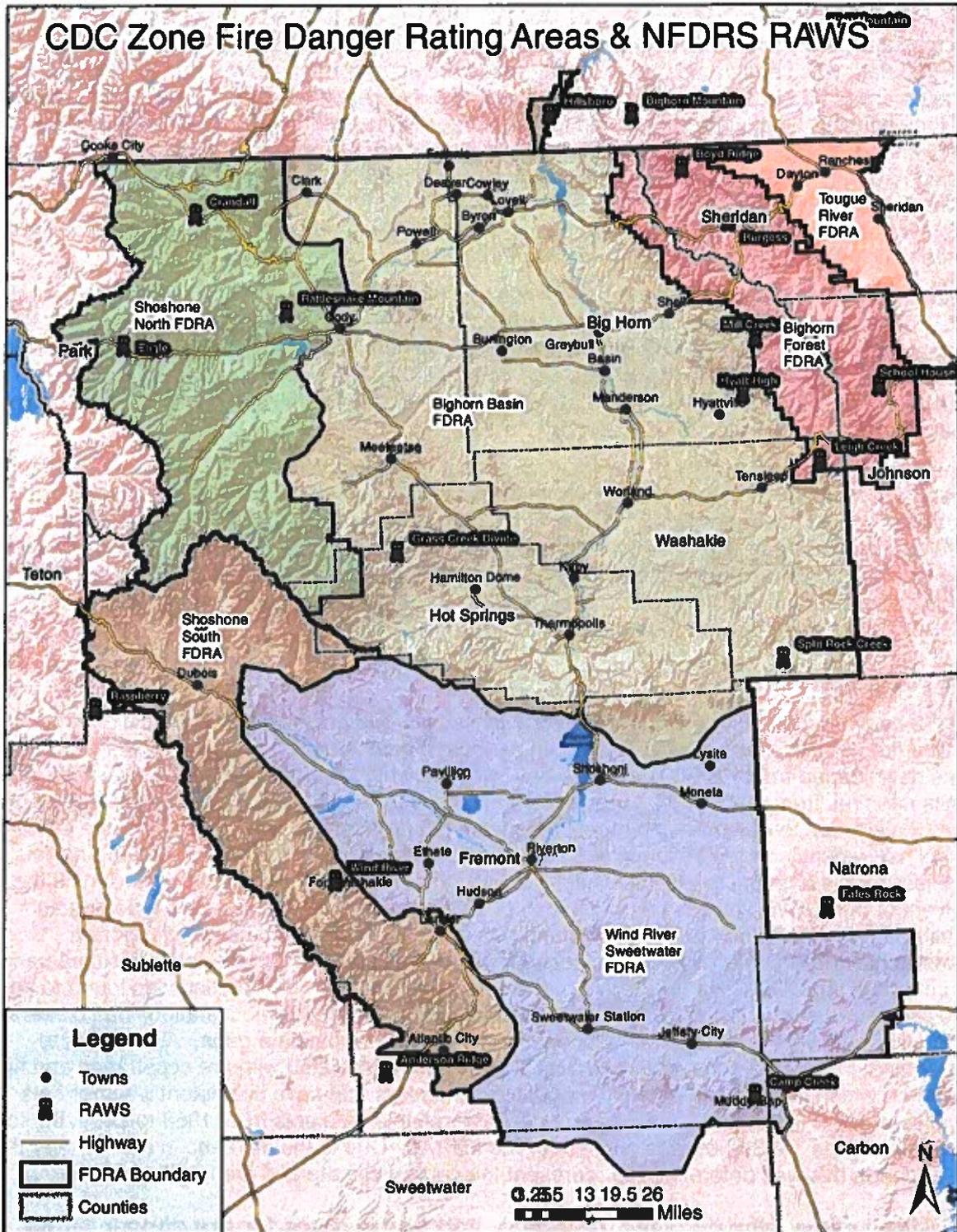
Table 6 - Shoshone South FDRA Weather Stations

<b>SIG</b>	<b>Station Name</b>	<b>Station # NESDIS #</b>	<b>Weather Data Years Available</b>	<b>WIMS Observation Period</b>	<b>Location</b>	<b>Elev. (feet)</b>
Shoshone South	Elkhorn	481410 323A114E	1992 - 2009	4/1 -10/31	43.6794° -109.6111°	8,085
	Anderson Ridge	481903 32787280	1992 - 2009	4/1 -10/31	42.4372° -108.9456°	8,120

Table 7 - Wind River/Sweetwater FDRA Weather Stations

<b>SIG</b>	<b>Station Name</b>	<b>Station # NESDIS #</b>	<b>Weather Data Years Available</b>	<b>WIMS Observation Period</b>	<b>Location</b>	<b>Elev. (feet)</b>
Wind River/ Sweetwater	Camp Creek	482010 3278546C	1992 - 2009	3/1 -10/31	42.3404° -107.5729°	7,380
	Wind River	481411 52117480	1992 - 2009	4/1 -10/31	42.9779° -109.1221°	9,120
	Split Rock	480904 3278B79E	1992 - 2009	3/1 - 10/31	43.9166° -107.6666°	6,000

Map 2 – CDC Zone Fire Danger Rating Areas & RAWS Site Locations



## IV. Fire Danger and Fire Business Analysis

### A. Weather data

Across the CDC Zone all agency data had been retrieved from WRCC. The quality of the WRCC data was variable. Some units had made previous corrections to data from WRCC to ensure errors had been corrected in the system. In all cases, each agency had made .mdb files of their best data that were assembled to make a zone wide .mdb fire weather file. All data was reevaluated at the beginning of this FDRP project for extra quality control of the final .mdb file using FireFamily Plus 4.0 version. The maximum and minimum values of temperature, relative humidity, and precipitation of each station were checked on an annual basis to detect outliers in tabular and graph form. Outliers were examined and validated or corrected. Station catalogs were checked and verified using FireFamily Plus.

The Shoshone North and South Zone stations had been corrected in WRCC up to 2009 and the BLM data had similarly been corrected in WRCC to 2008 because those units created FDRPs in those years. The BHF, BIA and BIP weather data still need to be corrected in the WRCC data base. The errors present in those data sets from WRCC were not transferred into the final FDRP .mdb file constructed. The State does not have any RAWS stations or manual stations that were evaluated or in the CDC Zone.

The weather data available varied widely for each unit. Some WRCC data contained records of manual stations extant, functioning manual fire weather stations and RAWS stations with a range of 5 to 20 years of operation. The Fire Danger Rating Technical Group selected the RAWS station data as the weather data to be used for consistency of daily weather data. For the whole CDC Zone it was noted that 1993 represented the first year within the CDC Zone at which time all of the RAWS stations had the most complete data to begin analysis for the FDRP. The data used for the analysis was from 1993 to 2009.

### B. Fire history data

At the beginning of the Fire Danger Rating Technical Group establishment, a table of each unit's online fire data was tabulated with the time periods of data available listed. Fire history data was downloaded from KCFAST and the FAM website which has the PCHA files available. Most units had fires from 1972-2008. The year 2009 fires were added in KCFAST and looked at by the whole group to determine no recent fires were left unreported. The units within the CDC Zone had recently corrected or included fire history data as part of the Fire Program Analysis process that is ongoing to provide a relatively good set of data for the last 20 years. With the advent of the RAWS stations coming into the CDC Zone, improvements in fire reporting and station data were evident in 1988. The analysis of the files showed fires being reported consistently through the shoulder seasons of March/April and late October after this time period. From within the CDC Zone the RAWS station maintenance and fire reporting was found to have the least amount of missing information from 1993-2009. By 1993, most stations had 5 years of operation and were on track with maintenance to eliminate most data gaps. All analysis to determine critical decision points and best fit should be associated with fire occurrence and fire weather, which restricts the useful fire data to those years that have consistent weather data available. With that noted, some units could have reliable data sets from 1988 to 2009, but for consistency the 1993-2009 was chosen for the FDRAs. Due to the increase in activity over the last decade this was determined to represent the current climate and fire trends very well.

### C. Slope class, climate class, green-up, and freeze dates for fire danger rating area stations

**Slope Class:** National Fire Danger Rating System groups slope into five classes: 0-25, 26-40, 41-55, 56-75, and greater than 75%. They are labeled numerically, 1 through 5 (Table 8).

**Climate Class:** The NFDRS uses four Climate Classes, numbered 1 through 4. Class 2 represents the semi-humid climate where summertime moisture is deficient. Class 3 represents the semi-humid climate where summertime precipitation is adequate to sustain plant growth most of the season (typical of the mountain West and the area east of the Mississippi).

**Green-up Date:** Using the 1978 NFDRS fuel models, the NFDRS processor assumes a length of green-up period according to climate class, which is displayed in Table 8 below. Each station will be greened up upon reaching a Live Fuel Index of 50. Table 9 identifies historical timeframes for this as a reminder to begin monitoring LFI by early to mid-May (Table 9).

**Freeze Date:** Freeze dates for station will be entered in the fall when there are 3 consecutive days of the recorded minimum temperature being below 30° F recorded for a station. Table 10 identifies historical timeframes for this as a reminder to begin monitoring freeze dates by early to mid-September (Table 10).

**Frozen Date:** Within the CDC Zone it was noted that 12/1 would be the date set for freezing all of the RAWS stations within WIMS. The station owner will complete the task of making this entry in WIMS annually.

Table 8 – Station Climate Class, Slope Class, and Green-up Length

Station	Slope Class	Climate Class	Green-up length
Crandall	3	3	21
Eagle	4	3	21
Anderson Ridge	1	3	21
Elkhorn	2	3	21
Hyatt High	2	2	14
Split Rock	2	2	14
Rattlesnake	2	2	14
Grass Creek	2	2	14
Mill Creek	3	3	21
Burgess	3	3	21
Leigh Creek	3	3	21
Boyd Ridge	3	3	21
School House	3	3	21
Camp Creek	2	2	14
Wind River	2	3	21

Table 9 - Station Green-up Dates Based on Live Fuel Index of 50

Station	Fuel Model	Start-up Date	Green-up Criteria	Historical Dates LFI ≥ 50		
				Earliest	Ave.	Latest
Crandall	G	April 1	LFI ≥ 50	5/19	5/28	6/14
Eagle	G	April 1	LFI ≥ 50	5/13	5/28	6/17
Anderson Ridge	G	April 1	LFI ≥ 50	5/7	5/28	6/17
Elkhorn	G	April 1	LFI ≥ 50	5/15	6/6	6/29
Hyatt High	G	March 1	LFI ≥ 50	3/22	5/15	6/25
Split Rock	G	March 1	LFI ≥ 50	3/22	5/20	7/2
Rattlesnake	G	March 1	LFI ≥ 50	5/7	5/30	6/27
Grass Creek	G	March 1	LFI ≥ 50	5/5	5/25	6/1
Mill Creek	G	April 1	LFI ≥ 50	5/15	6/15	6/28
Burgess	G	April 1	LFI ≥ 50	5/23	7/3	7/17

Station	Fuel Model	Start-up Date	Green-up Criteria	Historical Dates LFI ≥ 50		
				Earliest	Ave.	Latest
Leigh Creek	G	April 1	LFI ≥ 50	4/27	6/10	7/22
Boyd Ridge	G	April 1	LFI ≥ 50	4/25	5/28	6/20
School House	G	April 1	LFI ≥ 50	5/3	5/31	6/18
Camp Creek	G	March 1	LFI ≥ 50	5/14	6/01	6/20
Wind River	G	March 1	LFI ≥ 50	5/14	5/28	6/25

Table 10 - Station Freeze Dates and Criteria

Station	Fuel Model	Freeze Criteria	Historical Dates			Frozen Date
			Earliest	Ave.	Latest	
Crandall	G	3 days <30°	9/11	9/15	10/20	12/1
Eagle	G	3 days <30°	9/11	9/15	10/21	12/1
Anderson Ridge	G	3 days <30°	9/11	10/10	10/28	12/1
Elkhorn	G	3 days <30°	9/16	10/6	10/28	12/1
Hyatt High	G	3 days <30°	9/19	10/5	10/29	12/1
Split Rock	G	3 days <30°	9/19	10/20	10/28	12/1
Rattlesnake	G	3 days <30°	9/18	10/10	10/28	12/1
Grass Creek	G	3 days <30°	9/17	10/20	10/28	12/1
Mill Creek	G	3 days <30°	9/16	10/5	10/20	12/1
Burgess	G	3 days <30°	8/28	10/5	10/11	12/1
Leigh Creek	G	3 days <30°	9/17	10/10	10/28	12/1
Boyd Ridge	G	3 days <30°	9/15	10/10	10/29	12/1
School House	G	3 days <30°	9/11	10/5	10/20	12/1
Camp Creek	G	3 days <30°	9/12	10/20	11/12	12/1
Anderson Ridge	G	3 days <30°	9/6	10/10	10/27	12/1
Wind River	G	3 days <30°	9/12	10/5	10/28	12/1

### 1. Big Horn Basin FDRA Classification Criteria

The GIS exercise indicated the basin was predominantly slope class 1. Due to higher elevation and location some of the stations such as Grass Creek, Hyatt High, Rattlesnake, and Split Rock, the overall slope class was increase to 2. This correlates with the ignition and location of lightning starts that are less likely to get quickly detected in the foothills and vast plains. (See Slope Map, Appendix C2)

The climate class was determined initially by the NFDRS climate class guide for the weather stations.

The freeze date was derived from looking at the RAWS station data within the FDRA stations and utilizing the average occurrence of three consecutive days below 30 Fahrenheit. The data was verified with local knowledge during plan formulation.

### 2. Bighorn Forest FDRA Classification Criteria

The slope class was determined to be a proportional combination of slope classes 1, 2, and 3 and 4. The majority of the forest fuel types are in slope class 2. However, the slope class of 3 was selected to better evaluate the occurrence of fires on heavily wooded conifer slopes and through canyons that have significant human caused fire occurrence due to the highway system. These areas are likely to have initial and extended attack activity. (See Slope Map, Appendix C2)

The climate class was determined initially by the NFDRS climate class guide for the weather stations. A climate class of 2 is indicated on the NFDRS guide but the local input indicates the forest types and precipitation patterns occurring place the FDRA in climate class 3.

The freeze date was derived from looking at the RAWS station data within the FDRA stations and utilizing the average occurrence of three consecutive days below 30 Fahrenheit. The data was verified with local knowledge during plan formulation.

### **3. Shoshone North FDRA Classification Criteria**

Slope classes in the Shoshone North FDRA range from 1-5 with a high percentage of the area in classes 4 & 5. The Crandall RAWS is located in relatively more gentle terrain as such slope class 2 however slope class 3 was selected to again note the uphill rates of spread timbered slopes. The Rattlesnake station is in slope class 2 and classified as such. The Eagle station is located in continuous steep terrain so slope class 4 represents the station. (See Slope Map, Appendix C2)

Stations in the Shoshone North FDRA are classified as climate class 3 due to the relatively high quantities of summer-time precipitation that results from thunderstorms.

The freeze date was derived from looking at the RAWS station data within the FDRA stations and utilizing the average occurrence of three consecutive days below 30 Fahrenheit. The data was verified with local knowledge during plan formulation.

### **4. Shoshone South FDRA Classification Criteria**

Slope class in the Shoshone South FDRA also ranges from 1-5 however, approximately 50% of the area is in Slope Class 1 which moderates overall average slopes for the rating area. The Anderson Ridge RAWS is in the largest area of Slope Class 1 and is classified as such. The Elkhorn RAWS is located in more varied terrain and is classified as Slope Class 2. (See Slope Map, Appendix C2)

Stations in the Shoshone South FDRA are classified as climate class 2 due to the more moderate summer-time precipitation experienced in this area. (See Precipitation Map, Appendix C3)

The freeze date was derived from looking at the RAWS station data within the FDRA stations and utilizing the average occurrence of three consecutive days below 30 Fahrenheit. The data was verified with local knowledge during plan formulation.

### **5. Tongue FDRA Classification Criteria**

The area was not evaluated due to a lack of fire data in the unit to conduct analyses.

### **6. Wind River/Sweetwater FDRA Classification Criteria**

The slope class through the FDRA is predominantly class 1. The stations representing the FDRA are set at 2 to represent the activity in the foothills and canyons of the area that have transportation corridors and higher fire occurrence. (See Slope Map, Appendix C2)

Climate class three has been selected to represent the heavier fuel types and upper elevations where the larger fires are likely to occur.

The freeze date was derived from looking at the RAWS station data within the FDRA stations and utilizing the average occurrence of three consecutive days below 30 Fahrenheit. The data was verified with local knowledge during plan formulation.

## **D. NFDRS index correlation with fire business**

**Fuel Model Selection:** Past analysis indicated that NFDRS Fuel Model G was the best choice for the FDRAs that are primarily comprised of forest cover types (Bighorn Forest, Shoshone North, and Shoshone South).

NFDRS Fuel Models G and T were tested for goodness of fit for the FDRAs characterized by rangelands (Bighorn Basin and Wind River/Sweetwater). Analysis using Fuel Model G proved to be the best and most consistent representation of large fire and multi-fire day potential. This is also consistent with previous analysis.

**Large Fire:** Fire size of 10 acres was used as the definition of a large fire in the FDRAs that are primarily comprised of forest cover types. This size was selected because fires in the CDC Zone are typically successfully caught during initial attack at 10 acres or less. If initial attack is not successful and the fire moves into extended attack fire size frequently exceeds 1,000 acres.

A fire size of 250 acres was used for the FDRAs that represent rangelands. Approximately 90% of the fires in the Bighorn Basin and Wind River Sweetwater FDRAs are less than 250 acres.

**Multi-Fire Day:** Two fire starts in one day was defined as a multi-fire day. The CDC Zone does not frequently receive multiple fire ignitions in one day so this definition was used to include the largest sample of multi-fire days for analysis.

**Indices Selected:** Energy release component (ERC) and burn index (BI) were evaluated for goodness of fit for the Big Horn Basin and Wind River/Sweetwater FDRAs. ERC showed the best overall correlation with low Chi Square and high R-Squared values for these FDRAs.

ERCs and one hundred hour fuel moisture (100 FM) was evaluated for the Bighorn Forest, Shoshone North and Shoshone South FDRAs. The 100 FM showed the best correlation for both large fire day and multi-fire day. ERC showed good overall correlation with low Chi Square and high R-Squared values as well and in order to achieve consistency with in the Cody Zone, it was selected to represent these FDRAs.

**Decision Points:** Some agency policies recognize the 90th and 97th percentiles as critical thresholds for fire danger ratings. Due to the recent years changes in fire activity these decision points were reevaluated relative to actual fire activity. During this analysis it was determined that these thresholds do not adequately depict the decision points where there is increasing potential for large fires and multi-fire days. New decision points developed using Fire Business Analysis in FireFamily Plus Plus (Charts available in Appendix E) are incorporated in Section V.

Table 11 describes the fuel model, fire size, multi-day fire, and indices for each station used as inputs for the fire business analysis.

Table 11 – Fire Business Analysis Inputs

SIG	Station and Data Years Used	Fuel Model Analyzed	Indices Analyzed	Large Fire Size (acres)	Multi-fire Day (fires)
Big Horn Basin	Hyatt High (1993-2009) Split Rock (1993-2009) Grass Creek (1993-2009) Rattlesnake (1993-2009)	G, T	ERC BI	250	2
Bighorn Forest	Boyd Ridge (1999-2009) Burgess (1990-2009) Mill Creek (1990-2009) Leigh Creek (1999-2009) School House (1990-2009)	G	ERC 100 FM	10	2
Shoshone North	Crandall (1993-2009) Eagle (1999-2009)	G	ERC 100FM	10	2
Shoshone South	Elkhorn (1992-2009) Anderson Ridge (1992-2009)	G	ERC 100 FM	10	2

SIG	Station and Data Years Used	Fuel Model Analyzed	Indices Analyzed	Large Fire Size (acres)	Multi-fire Day (fires)
Wind River/ Sweetwater	Camp Creek (1992-2009) Wind River (1992-2009) Split Rock (1992-2009)	G, T	ERC BI	250	2

## V. Fire Danger Based Decisions

### A. Fire Danger Rating Decision Points for Preparedness and Staffing Levels

Adjective Ratings are a public information description of the relative severity of the current fire danger situation in a general area. The National Fire Danger Rating System helps management agencies determine this level. These adjective ratings will be used for initial attack responses for fire management units as described in each agency's fire management plan. The ratings are also a component of preparedness levels and staffing plans. (ERC Decision Point Chart used is displayed in Appendix E).

The preparedness level is a five-tier (I-V) risk management planning tool that incorporates selected NFDRS indices as well as other fire danger indicators. The selected indices may vary depending upon which ones prove to be the best indicators for fire size and potential for starts. Tables below will display the decision points for each FDRA that will be used along with other factors used to inform each agency's preparedness plan. Specific procedures and guidelines are to be followed regarding preparedness levels are the responsibility of each agency. The decision points for the planning levels below were set using historical analysis of large fire, multi-fire, and fire days and their relationship weather observations from the weather stations and SIGs described in Table 11 above.

Daily staffing level decision points for fire suppression resources for each agency have been established using adjective fire danger ratings. As with preparedness levels each agency is responsible for preparing the specifics regarding their staffing plans. Agency designated climatological break points for the BLM (80<sup>th</sup> and 95<sup>th</sup> percentiles) and Forest Service (90<sup>th</sup> and 97<sup>th</sup> percentiles) are noted in the tables.

Table 12 - Big Horn Basin FDRA Decision Points

SIG	Fuel Model	Decision Point Ranges (March 1 <sup>st</sup> - Oct 31 <sup>st</sup> analysis period)				
		Staffing Level	Prep Level	Adjective Rating	ERC	Percentile
Big Horn Basin	G	1	I	Low	<37	<17th
		2	II	Mod	37-51	17th
		3	III	High	51-63	51th
		4	IV	Very High	63-73 66	75th 80th
		5	V	Extreme	73+ 80	88th 95th

Table 13 - Bighorn Forest FDRA Decision Points

SIG	Fuel Model	Decision Point Ranges (May 1 <sup>st</sup> – Oct 31 <sup>st</sup> analysis period)				
		Staffing Level	Prep Level	Adjective Rating	ERC	Percentile
Bighorn Forest	G	1	I	Low	<35	<38th
		2	II	Mod	35-48	38th
		3	III	High	48-56	66th
		4	IV	Very High	56-63	81th
		5	V	Extreme	63+ 71	90th 97th

Table 14 - Shoshone North FDRA Decision Points

SIG	Fuel Model	Decision Point Ranges (April 1 <sup>st</sup> – Oct 31 <sup>st</sup> analysis period)				
		Staffing Level	Prep Level	Adjective Rating	ERC	Percentile
Shoshone North	G	1	I	Low	<40	<32th
		2	II	Mod	40-52	32th
		3	III	High	53-60	66th
		4	IV	Very High	61-70 67	83th 90th
		5	V	Extreme	71+ 73	94th 97th

Table 15 - Shoshone South FDRA Decision Points

SIG	Fuel Model	Decision Point Ranges (April 1 <sup>st</sup> – Oct 31 <sup>st</sup> analysis period)				
		Staffing Level	Prep Level	Adjective Rating	ERC	Percentile
Shoshone South	G	1	I	Low	<45	<26th
		2	II	Mod	45-55	26th
		3	III	High	55-70	50th
		4	IV	Very High	70-78 77	81th 90th
		5	V	Extreme	78+ 82	92th 97th

Table 16 - Wind River/Sweetwater FDRA

SIG	Fuel Model	Decision Point Ranges (March 1 <sup>st</sup> – Oct 31 <sup>st</sup> analysis period)				
		Staffing Level	Prep Level	Adjective Rating	ERC	Percentile
Wind River/ Sweetwater	G	1	I	Low	<30	<27th
		2	II	Mod	30-45	27th
		3	III	High	45-55	61th
		4	IV	Very High	56-68	80th
		5	V	Extreme	68+	95th

**B. Representative FDRAs for Administrative Units**

Many of the agencies within the CDC Zone have more than one FDRA that apply to their jurisdictions. Table 17 displays each administrative within the zone and the FDRAs that are associated with them.

Table 17 - FDRAs Associated with Administrative Units

Administrative Unit	Fire Danger Rating Area				
	Bighorn Basin	Bighorn Forest	Shoshone North	Shoshone South	Wind River/Sweetwater
Bighorn National Forest		X			
Big Horn National Recreation Area	X				
Shoshone National Forest			X	X	
Wind River Agency				X	X
Wind River/Big Horn Basin District	X		X	X	X
Wyoming State Forestry Division	X	X	X	X	X
Big Horn County	X	X			
Fremont County				X	X
Hot Springs County	X				
Johnson County		X			
Park County	X		X		
Sheridan County		X			
Sweetwater County					X
Washakie County	X				

**C. Prevention and Fire Danger Rating Signing**

Although fire managers within the CDC Zone believe the FDRA designations and associated SIGs used to determine decision points are adequate for staffing and preparedness level planning, they do not believe this is the most accurate way to articulate fire danger to the public. There may be enough variability in conditions within a FDRA at the same time to warrant different signing of fire danger in different areas. Given this possibility, some of the FDRAs have been subdivided into prevention zones (Map 3). In some locations, individual station fire

danger adjective ratings will be used to set the fire danger signs as well as a criterion to emphasize the fire prevention message in a given area (Table 18). The Tongue FDRA is currently assessed by a satellite imagery greenness factor, with fire danger ratings and restriction needs assessed by the County Fire Warden. Fire Managers in some prevention zones are supplementing the rating system with fuel moisture data and averaging a combination of RAWS station indices to match what occurs in a FDRA.

Table 18 - Fire Prevention Zones

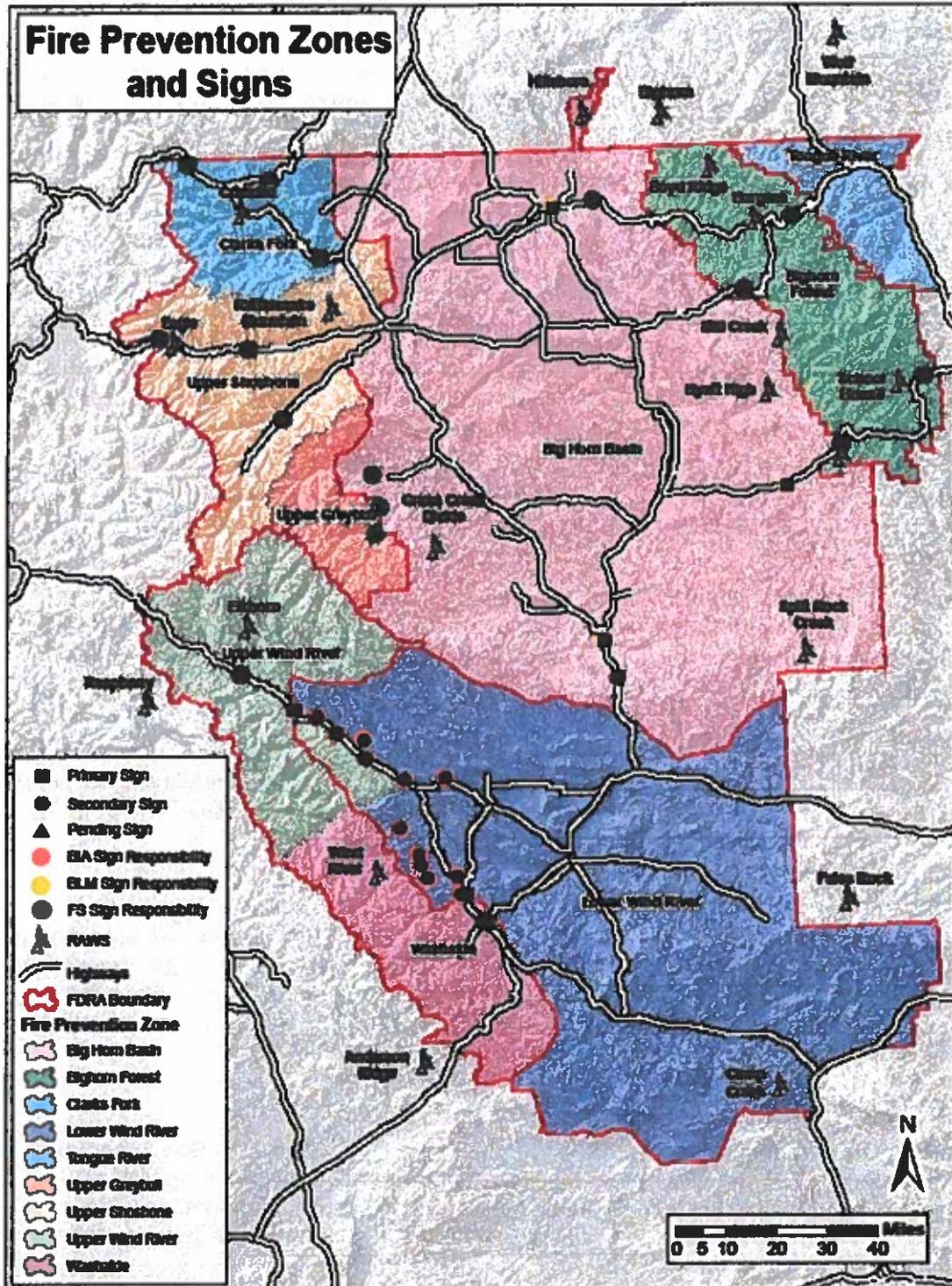
Fire Danger Rating Area	Prevention Zone	Indicator Station or SIG for Signing	Number of Signs in Prevention Zone
Shoshone North	Clarks Fork	Crandall RAWS	3
	Upper Greybull	Eagle/Grass Creek RAWS	1 (+2 in 2012)
	Upper Shoshone	Eagle RAWS	3
Shoshone South	Washakie	Anderson RAWS	1
	Upper Wind River	Elkhorn RAWS	6
Big Horn Basin	Big Horn Basin	Big Horn Basin SIG	3
Bighorn Forest	Bighorn Forest	Bighorn Forest SIG	6
Wind River Sweetwater	Lower Wind River	Sweetwater SIG	10
Tongue River	N/A	NDVI + Fire Warden	0

The Shoshone North FDRA now has been divided into three Fire Prevention Zones, Clarks Fork, Upper Shoshone, and Upper Greybull. The Upper Greybull FPZ may undergo further analysis to determine how well the Grass Creek RAWS represents the fire danger on the lower elevation east slopes. On the upper slopes of the Upper Greybull FPZ the Eagle RAWS will be further evaluated to represent the higher elevation fuel types. These considerations will be further evaluated with two new fire prevention sign installation anticipated during 2012 in the Wood River and Dick Creek areas of the Shoshone NF.

The Shoshone South FDRA now has two prevention zones which are the Upper Wind River Prevention Zone and the Washakie Fire Prevention Zone. The Upper Wind River FPZ signing will be forecasted by Elkhorn RAWS. There are portions of the Wind River Sweetwater FDRA in the signage plan being represented by the outputs of the Elkhorn RAWS. The primary and secondary fire prevention signs on WRA starting north of the Bull River and southwest of highway 26/287 and west to WRA boundary will be represented by Elkhorn RAWS outputs, Map 3. The Shoshone Forest and Wind River Agency will have two primary and four secondary signs to post in this FPZ. Primary signs have the larger prevention format with colors and arrows while the secondary signs may be smaller bulletins on posts with the same information

The Washakie Fire Prevention Zone sign outputs are derived from Anderson Ridge RAWS. The sign at the Washakie Ranger District office represents the fire danger rating outputs of Anderson Ridge RAWS, but it is physically located in an environment that is better represented by the Wind River Sweetwater SIG outputs. The Washakie Ranger District office sign at Lander should have the same signage outputs as the sign at Fort Washakie, so the public does not get confused on the ratings. The Fort Washakie sign 5 miles north of Lander represents the Lower Wind River

Map 3 – Fire Prevention Zones



FPZ. The current signing method can post a moderate at one location and high at another. To articulate fire danger more clearly it is suggested the Forest install a new sign in Sinks Canyon and place another sign at the Louis Lake Road entrance turnout off of highway 28. Until new signs are installed on the Forest, the sign at the Washakie Ranger District Office will continue to serve as the single sign for the Washakie FPZ.

The Wind River Sweetwater FDRA signage is primarily represented by the new Lower Wind River FPZ. The Wind River Sweetwater SIG will forecast the primary and secondary sign outputs for this large area. The eastern portion of the FPZ has no signs in place and maintaining them would be logistically difficult at this time. The BIA has two primary and eight secondary signs to maintain in this zone. The BIA and BLM may look at options to manage the fire danger sign posting in the Wind River Canyon and Thermopolis.

The Bighorn Basin FDRA will be represented by the Bighorn Fire Prevention Zone. The signing displays will be based on the Big Horn Basin SIG outputs. Three signs are in place to represent this area. Near Lovell, the Bighorn Forest and the BLM have two signs close to each other representing different areas. This is another situation where signs that are close together may have different ratings posted. Closer examination may indicate moving one of the signs may be more effective for both agencies. The Bighorn Forest sign is near the Big Horn River but for danger rating in the foothills and mountains to the east in the adjacent Big Horn Forest FPZ.

The Bighorn Forest FDRA is represented by the Bighorn Fire Prevention Zone. The signing displays will be based on the Bighorn Forest SIG outputs. There are six prevention signs in the zone. This zone covers a vast area and it may be feasible to create two zones at a later date for prevention signing.

Evaluating the current location of all of the signs in the CDC Zone will help the working group improve the efficiency of maintaining the signage and point toward new sign locations for consideration or relocation of existing signs. The CDC Zone's key fire prevention signage challenge is distance for logistics and elevation changes affecting fire danger.

#### **D. Dispatch Preparedness Level**

Fire danger adjective ratings are used as one of the inputs for determining the CDC Zone preparedness levels. The complete list of criteria for determining the CDC Zone preparedness level is located in the CDC Mobilization Guide.

#### **E. Seasonal Risk Analysis**

A Seasonal Risk Analysis (SRA) requires fire managers to review current and predicted weather and fuels information, compare this information with historic weather and fuels records, and predict the upcoming fire season's severity and duration for any given area. Each agency will be responsible for preparing seasonal risk analysis for their units. These analyses will be shared with other agencies when prepared.

#### **F. Fire Danger Pocket Cards**

Pocket cards were updated in 2012 and are used for a two year period. See Appendix G for the most current FDROP pocket cards. The pocket cards were developed from historical examples units had prepared. When updated in 2012, it should be noted that differences in pocket cards may require training and attention by users to note that a change in a pocket card has occurred.

Program Needs

## **VI. Program Needs**

### **A. Weather Data**

The weather station data will need to undergo an evaluation and correction process at some point to correct existing problems and to ensure new data is valid. The CDC Zone Fire Danger Technical Group will be tasked with identifying errors and needed corrections. A current copy of the CDC Zone mdb weather file will be maintained by the Group leader. In early 2013, the last three seasons of weather and fire files need to be imported into the database for the zone.

Current problems to note are that the freeze date analysis performed for Anderson Ridge minimums indicate the data should be evaluated in the future. In Fire Family, under the fire associations, CDC is listed as an agency, and when evaluating fires to that agency it was noted the fire names associated with the dates are missing. The fire names need to be imported into the fires associated with the CDC "Agency" so the fire weather variables can be linked to those in CDC incidents. On a unit to unit basis this did not occur, therefore the fire names can be retrieved at this point from each agency association. Some fires were duplicated in the data set and the duplications need to be deleted from the mdb.

### **B. Weather Station Status and Needs**

The analysis conducted in 2010 indicated that the Boyd weather station in the Bighorn FDRA may not be needed in the fire management unit or FDRA for fire business. This consideration was evaluated to reduce some station maintenance and cost needs or point to utilizing another station such as the Bighorn RAWS as a replacement. The Boyd station at this time will remain in place. The Tongue FDRA does not have an assigned station or SIG within the FDRA and at a later date it may be feasible to assign a station or SIG to that FDRA. The current analysis of the fire danger in that unit is based on NDVI greenness and WFAS data.

Although the Wind River RAWS was included in the Wind River Sweetwater SIG, it did not improve the statistical outputs of the group. The statistical correlations were actually better without the station. The Wind River RAWS was also tested for the Shoshone South FDRA and provided no added value and was not included in the Shoshone South SIG. The Wind River RAWS was left in the Wind River Sweetwater SIG to provide representation for the west side of the FDRA where the Wind River Indian Reservation is located. The BIA WRA has a large fire load in the valley that is human caused. The Wind River station is located near Little Washakie Park at over 9,100 feet and is not a good indicator for the Wind River valley and surrounding lower elevations.

The WRA evaluated moving Wind River RAWS and after consulting with their Regional and National Office, the decision was made to leave the station at its current location and to purchase and place a new RAWS at a lower elevation with the location yet to be determined. Due to current budget constraints, a new RAWS is not planned for 2013.

Anderson Ridge RAWS is part of the Shoshone South SIG. This station is part of the Rawlins dispatch zone and managed by owners within that zone. In 2011 due to some lapses of personnel, Anderson Ridge was not properly managed to NFDRS standards resulting in inaccurate indices. The working group is working with the station owners to manage that station to standard for 2013. The BLM owns the station and it was evaluated for elimination in 2012, but is currently an active station. The Shoshone N.F. is interested in maintaining and owning the station if it gets cut from the BLM's program in the High Desert District.

### **C. Additional Analysis**

This Plan will need to be reviewed and updated periodically. Initially, this is planned to occur on an annual basis to facilitate the decommissioning and/or addition of weather stations; complete additional analysis; maintain and improve quality of data; improve coordination of fire danger

signing; and pursue the development of additional indicators and tools for fire managers to use for staffing and preparedness planning. The working group will be further evaluating the prevention zones and signage planning.

## **VII. List of Appendices**

### **Appendix A – Maps of Fire Danger Rating Areas**

- Appendix A1 – Big Horn Basin FDRA Map
- Appendix A2 – Bighorn Forest and Tongue River FDRA Map
- Appendix A3 – Shoshone North FDRA Map
- Appendix A4 – Shoshone South FDRA Map
- Appendix A5 – Wind River-Sweetwater FDRA Map
- Appendix A6 – Big Horn County Map
- Appendix A7 – Fremont County Map
- Appendix A8 – Hot Springs County Map
- Appendix A9 – Sheridan County Map
- Appendix A10 – Washakie County Map
- Appendix A11 – Park County Map

### **Appendix B – Fire History Summary of Fire Danger Rating Areas**

- Appendix B1 – Big Horn Basin FDRA Fires 1993 – 2009
- Appendix B2 – Map of Big Horn Basin FDRA Fires 1993 – 2009
- Appendix B3 – Bighorn Forest FDRA Fires 1993 – 2009
- Appendix B4 – Map of Bighorn Forest and Tongue River FDRA Fires 1993 – 2009
- Appendix B5 – Shoshone North FDRA Fires 1993 – 2009
- Appendix B6 – Map of Shoshone North FDRA Fires 1993 – 2009
- Appendix B7 – Shoshone South FDRA Fires 1993 – 2009
- Appendix B8 – Map of Shoshone South FDRA Fires 1993 – 2009
- Appendix B9 – Wind River-Sweetwater FDRA Fires 1993 – 2009
- Appendix B10 – Map of Wind River-Sweetwater FDRA Fires 1993 – 2009

### **Appendix C – Characteristics Used to Determine Fire Danger Rating Areas**

- Appendix C1 – CDC Zone Vegetation Map
- Appendix C2 – CDC Zone Topography Map
- Appendix C3 – CDC Zone Precipitation and Weather Forecast Zones Map
- Appendix C4 – CDC Zone Fire Management Units Map

### **Appendix D – Statistical Analysis for Correlating NFDRS Index with Fire Business Decisions**

These appendices are excel spreadsheets posted on the electronic web link site and within the DVD copy of this plan for reference. The spread sheets are summaries of the

FireFamily Plus values showing the statistical correlations utilized to make fire business decisions. Due to the volume of data and print size limitations the information in the spreadsheets is not printed with this paper copy of the plan.

#### **Appendix E – Fire Business Decisions for Fire Danger Rating Areas**

- Appendix E1 – Big Horn Basin FDRA Fire Business Decision Graphs for ERC
- Appendix E2 – Bighorn Forest Fire Business Decision Graphs for ERC
- Appendix E3 – Shoshone North FDRA Fire Business Graphs for ERC
- Appendix E4 – Shoshone South FDRA Fire Business Graphs for ERC
- Appendix – Wind River-Sweetwater FDRA Fire Business Graphs for ERC

#### **Appendix F – Fire Danger Rating Signing and Prevention Zones**

Map 3 represents the current fire prevention zones and signs in the CDC FDROP and is referenced as appendices F1 and appendices F2 is a large wall map version of the same map. Appendices F1 and F2 are included in the DVD copy of the plan and are posted on the electronic web link to this plan.

Appendix F1 – CDC FDROP Fire Prevention Zones and Signs (DVD/internet 8.5" x 11" copy)

Appendix F2 – CDC FDROP Fire Prevention Zones and Signs (DVD/internet wall map copy)

#### **Appendix G – Fire Danger Rating Area Pocket Cards**

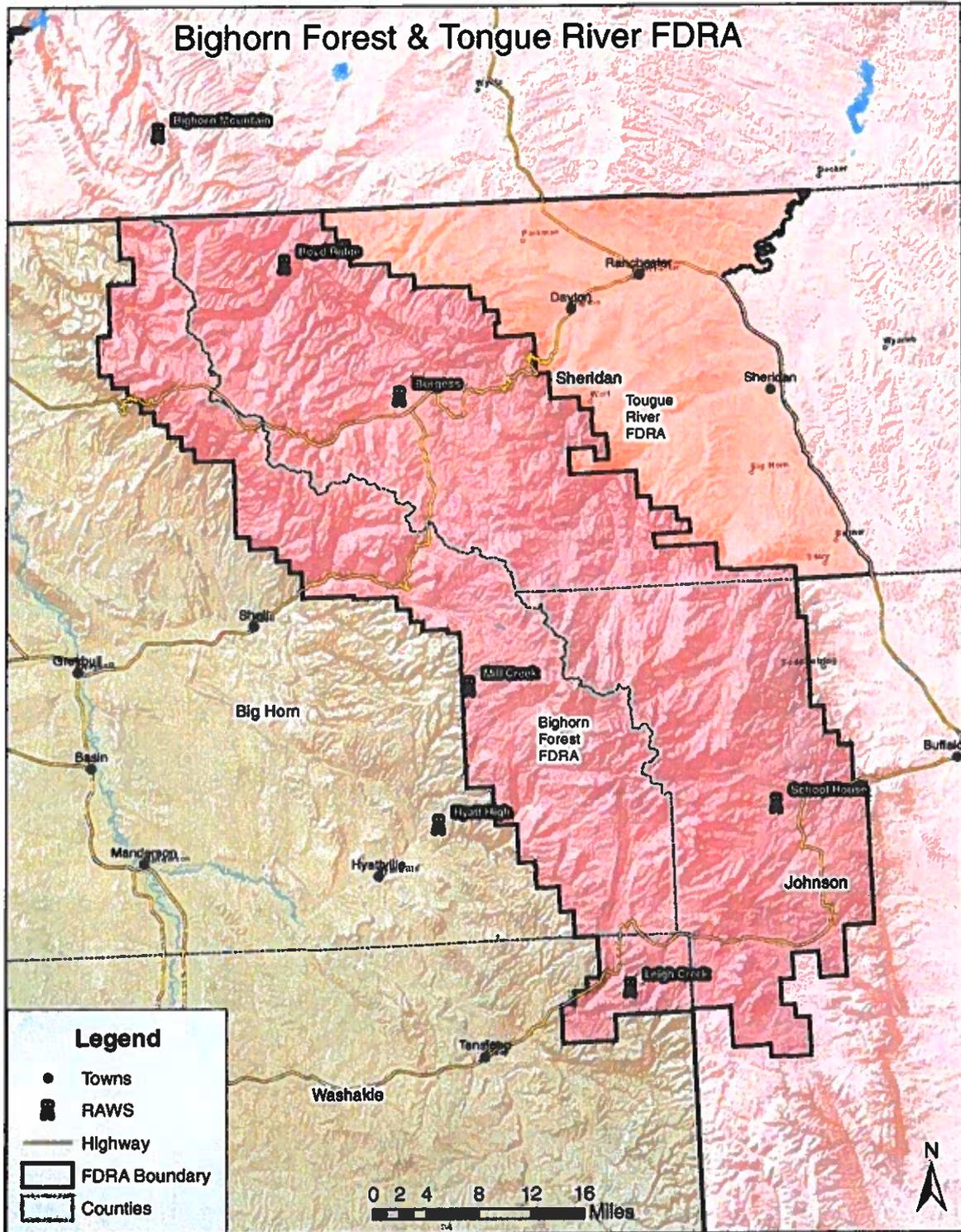
- Appendix G1 – Big Horn Basin FDRA Pocket Card
- Appendix G2 – Bighorn Forest FDRA Pocket Card
- Appendix G3 – Shoshone North FDRA Pocket Card
- Appendix G4.1 – Shoshone South FDRA Washakie Pocket Card
- Appendix G4.2 – Shoshone South FDRA Upper Wind River Pocket Card
- Appendix G5 – Wind River-Sweetwater FDRA Lower Wind River Pocket Card

## **Appendix A – Maps of Fire Danger Rating Areas**

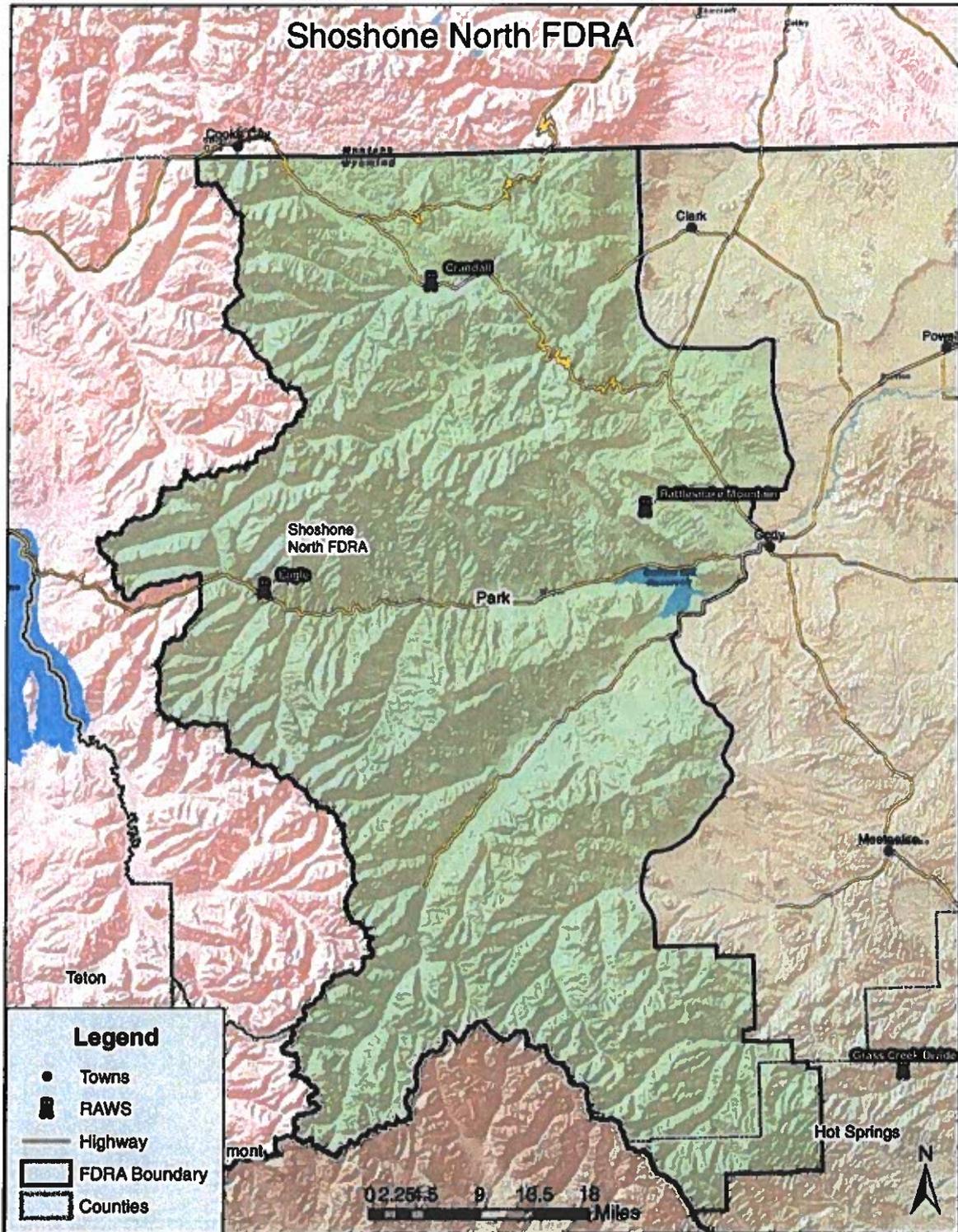
- Appendix A1 – Big Horn Basin FDRA Map
- Appendix A2 – Bighorn Forest and Tongue River FDRA Map
- Appendix A3 – Shoshone North FDRA Map
- Appendix A4 – Shoshone South FDRA Map
- Appendix A5 – Wind River-Sweetwater FDRA Map
- Appendix A6 – Big Horn County Map
- Appendix A7 – Fremont County Map
- Appendix A8 – Hot Springs County Map
- Appendix A9 – Sheridan County Map
- Appendix A10 – Washakie County Map
- Appendix A11 – Park County Map



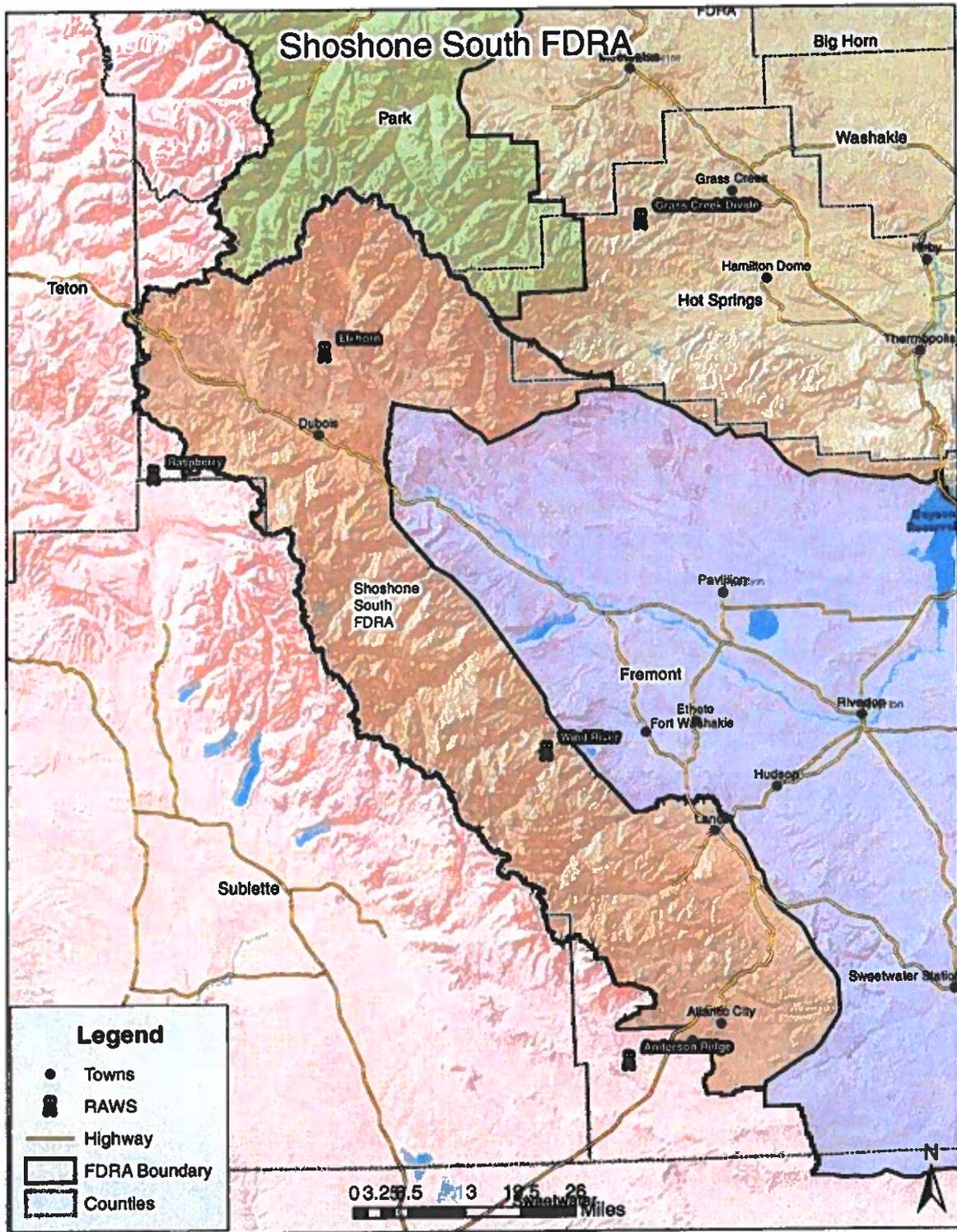
**Appendix A2 – Bighorn Forest & Tongue River FDRA Map**



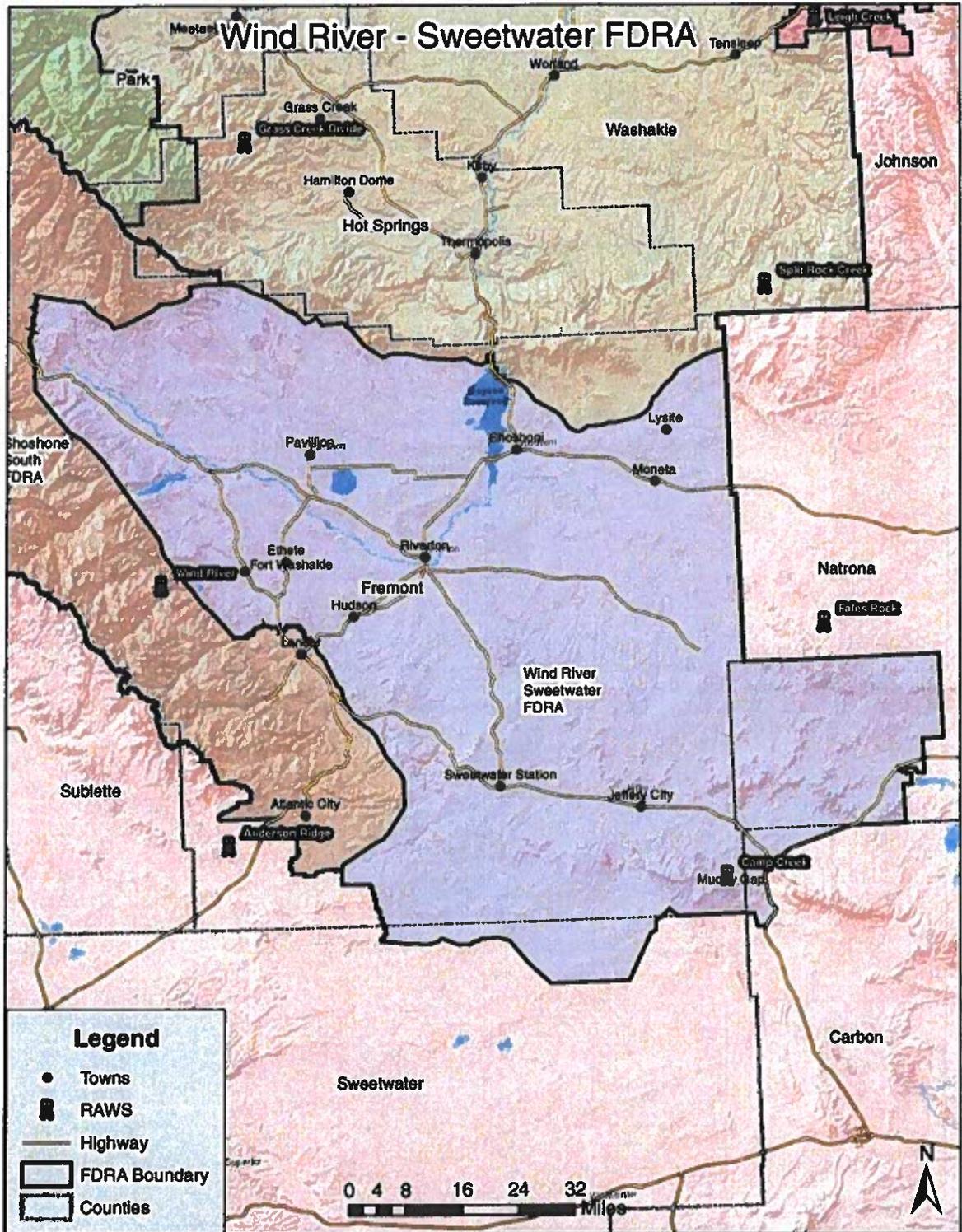
**Appendix A3 – Shoshone North FDRA Map**



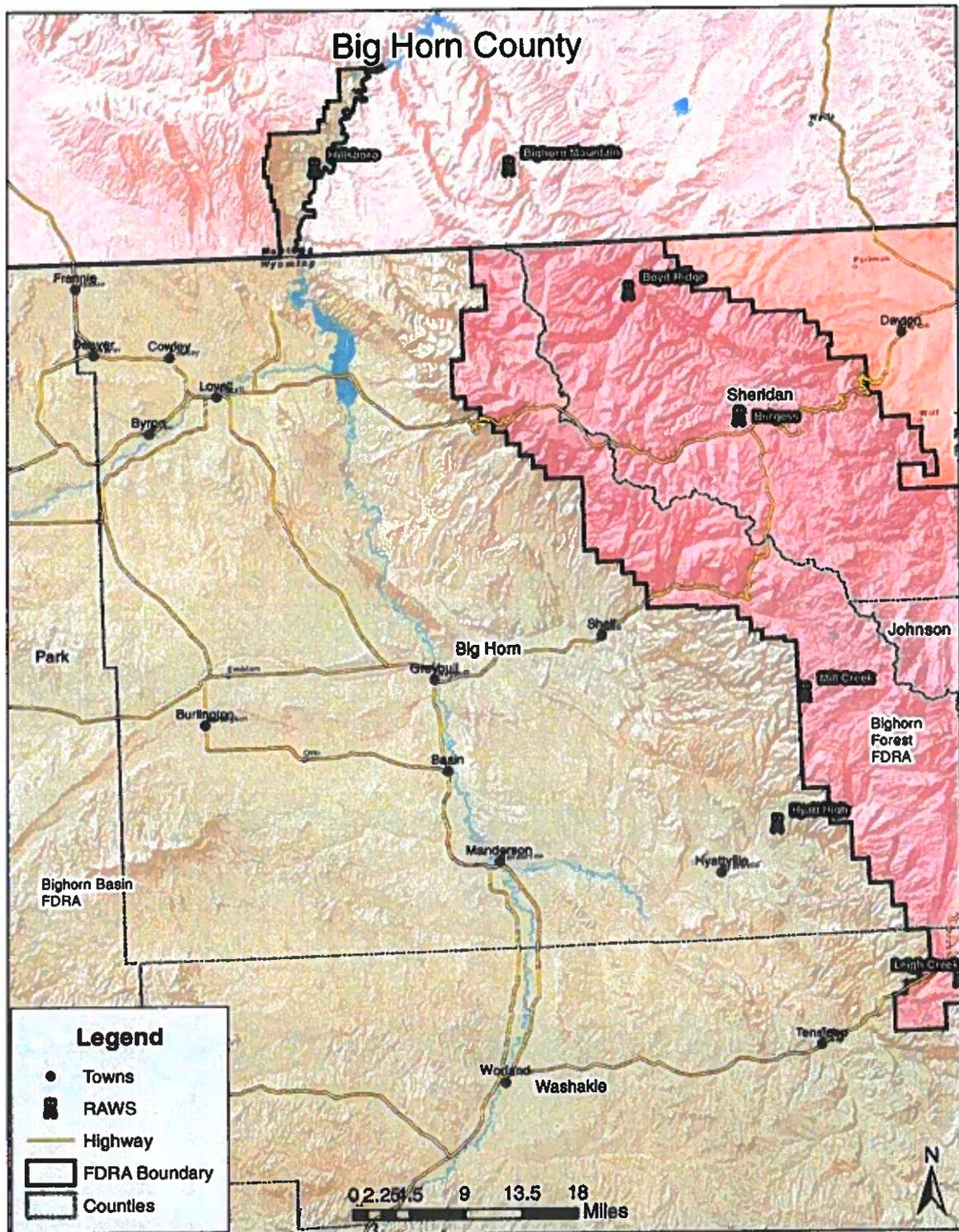
**Appendix A4 – Shoshone South FDRA Map**



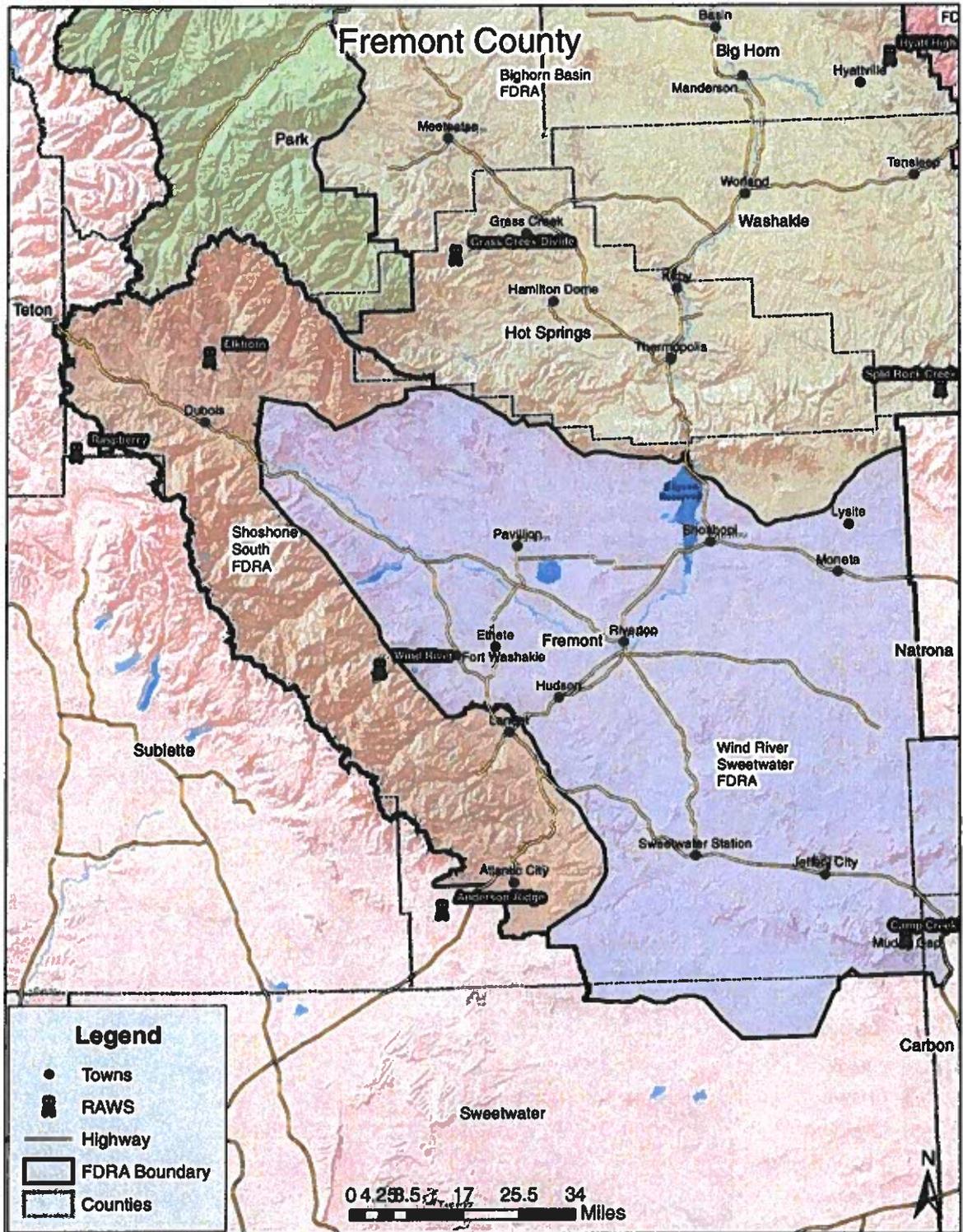
**Appendix A5 – Wind River-Sweetwater FDRA Map**



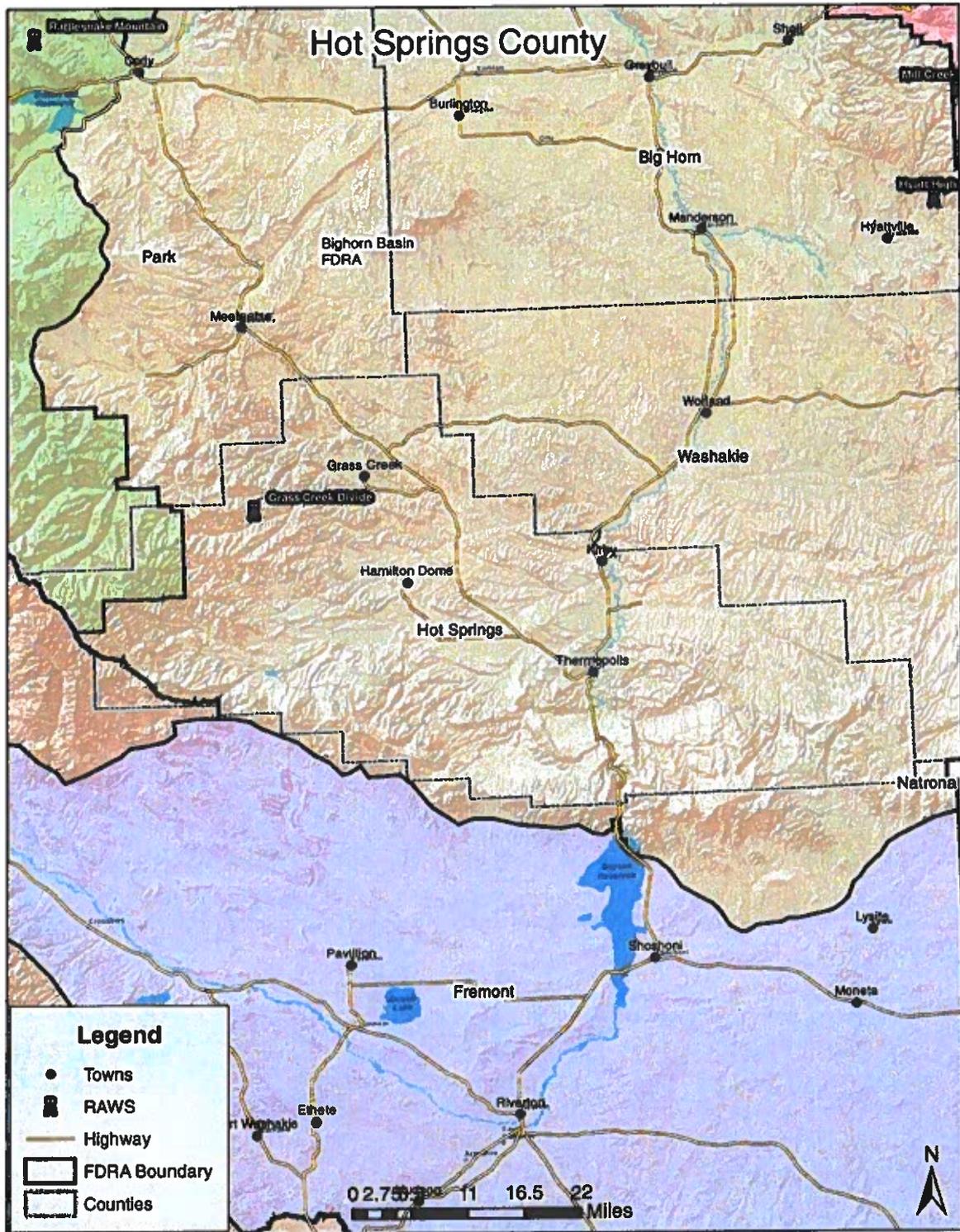
**Appendix A6 – Big Horn County Map**



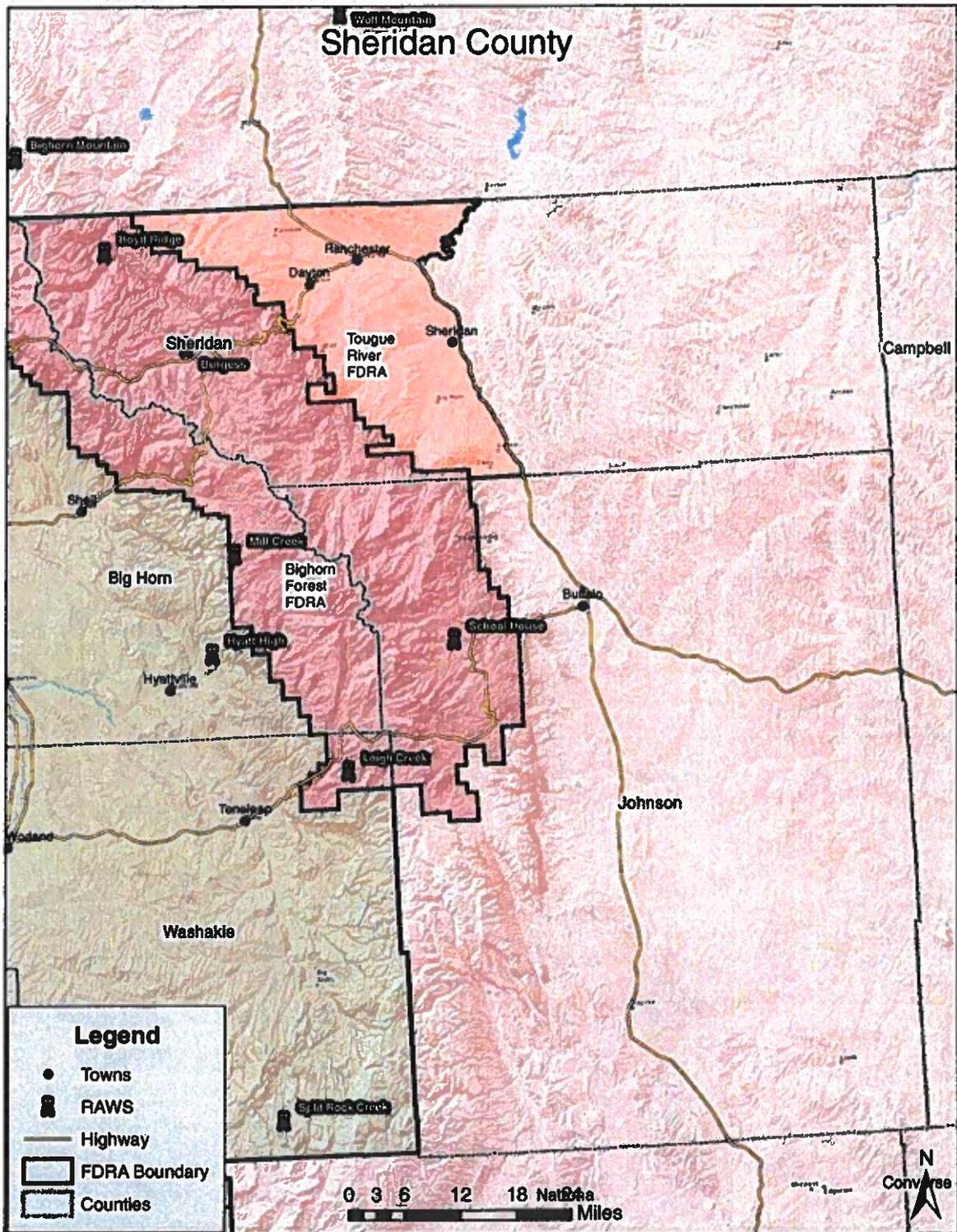
**Appendix A7 – Fremont County Map**



**Appendix A8 – Hot Springs County Map**

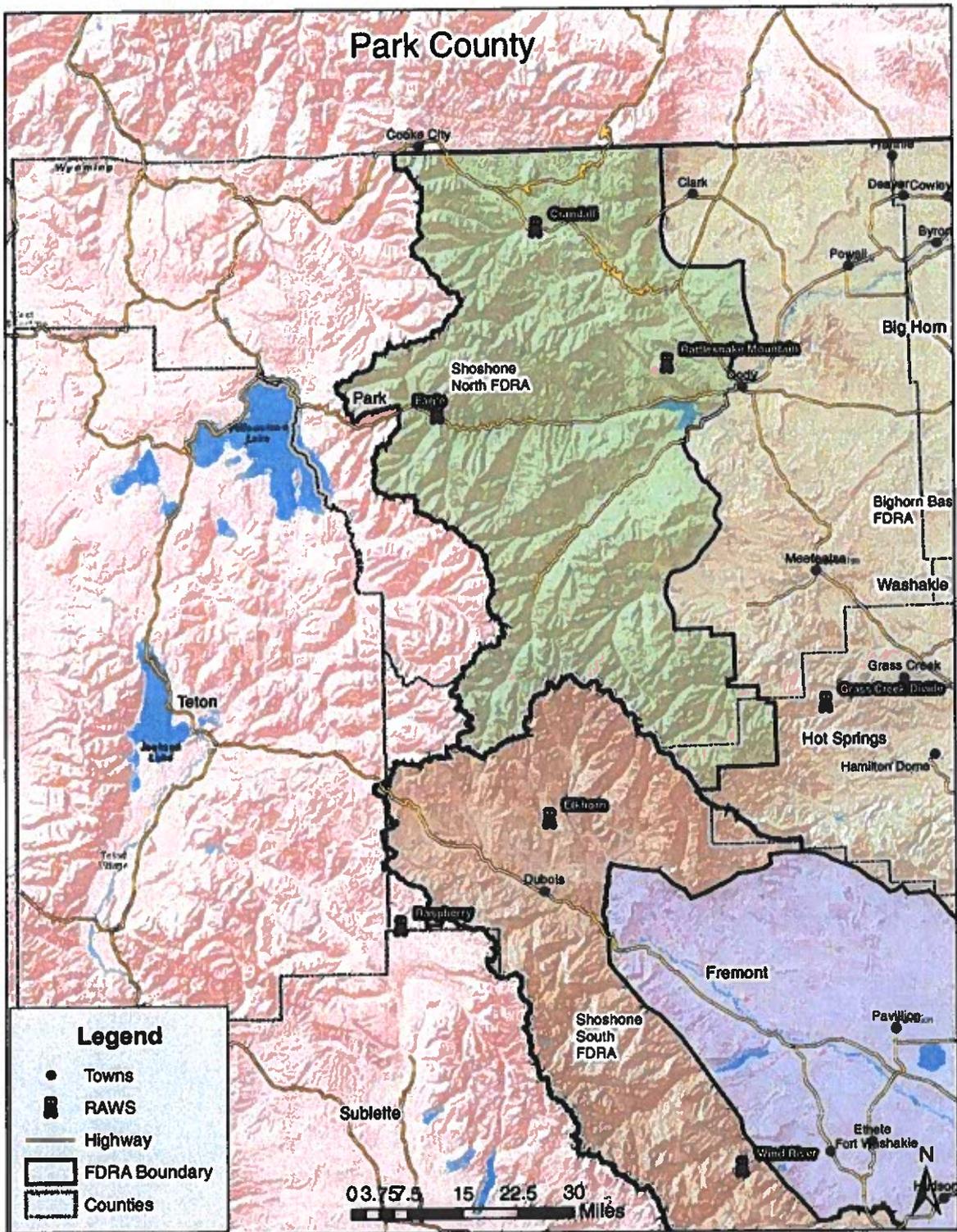


**Appendix A9 – Sheridan County Map**





**Appendix A11 – Park County Map**



## **Appendix B – Fire History Summary of Fire Danger Rating Areas**

Appendix B1 – Big Horn Basin FDRA Fires 1993 – 2009

Appendix B2 – Map of Big Horn Basin FDRA Fires 1993 – 2009

Appendix B3 – Bighorn Forest FDRA Fires 1993 – 2009

Appendix B4 – Map of Bighorn Forest and Tongue River FDRA Fires 1993 – 2009

Appendix B5 – Shoshone North FDRA Fires 1993 – 2009

Appendix B6 – Map of Shoshone North FDRA Fires 1993 – 2009

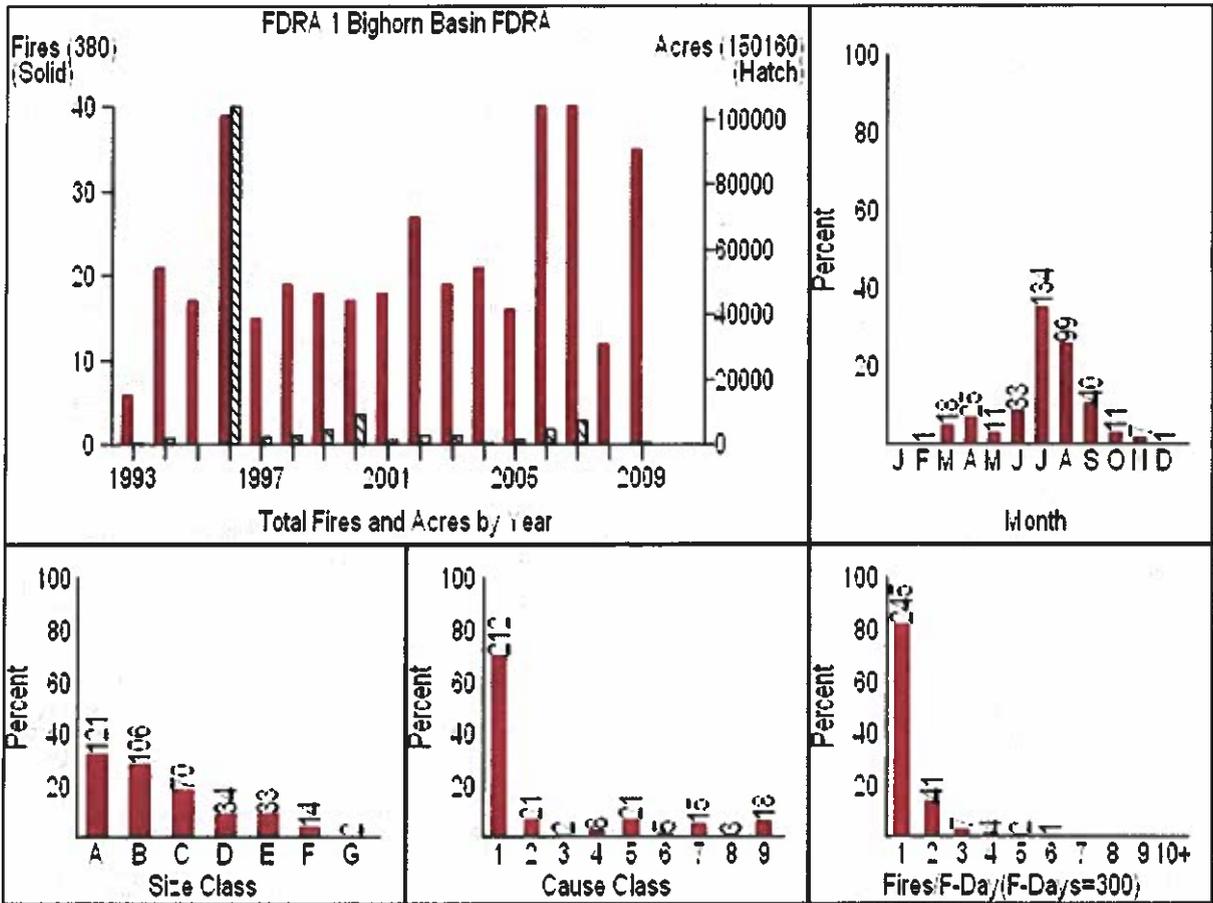
Appendix B7 – Shoshone South FDRA Fires 1993 – 2009

Appendix B8 – Map of Shoshone South FDRA Fires 1993 – 2009

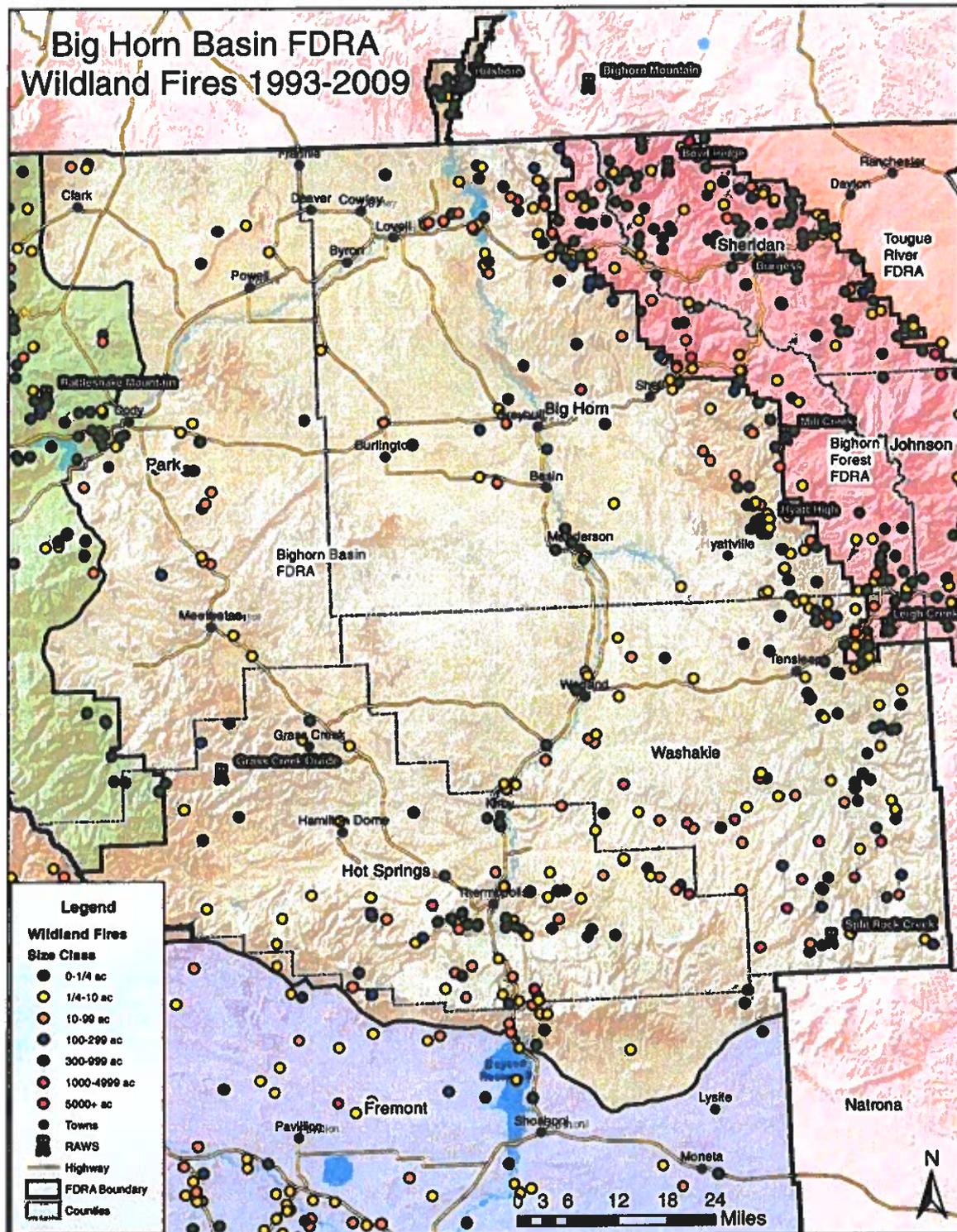
Appendix B9 – Wind River-Sweetwater FDRA Fires 1993 – 2009

Appendix B10 – Map of Wind River-Sweetwater FDRA Fires 1993 – 2009

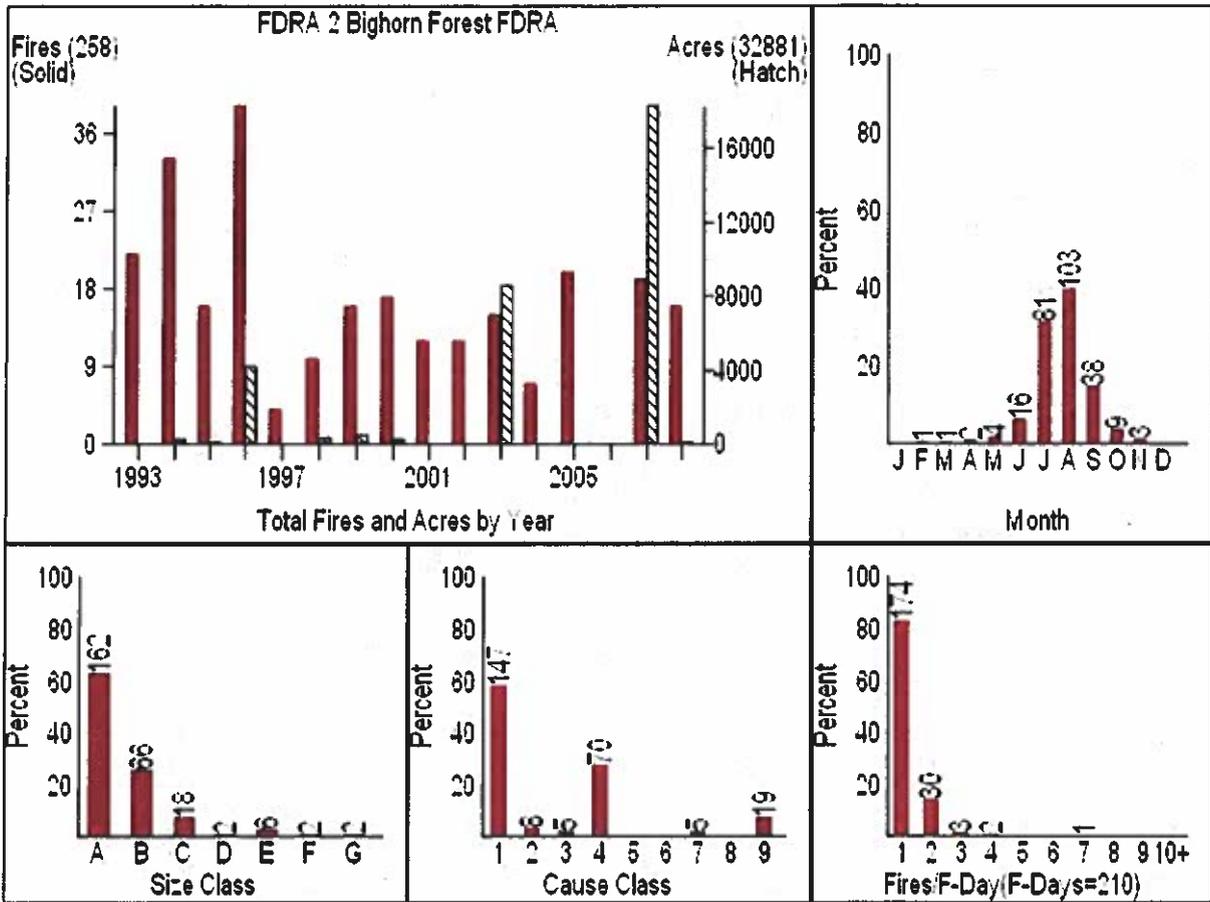
**Appendix B1 – Big Horn Basin FDRA Wildland Fires 1993-2009**



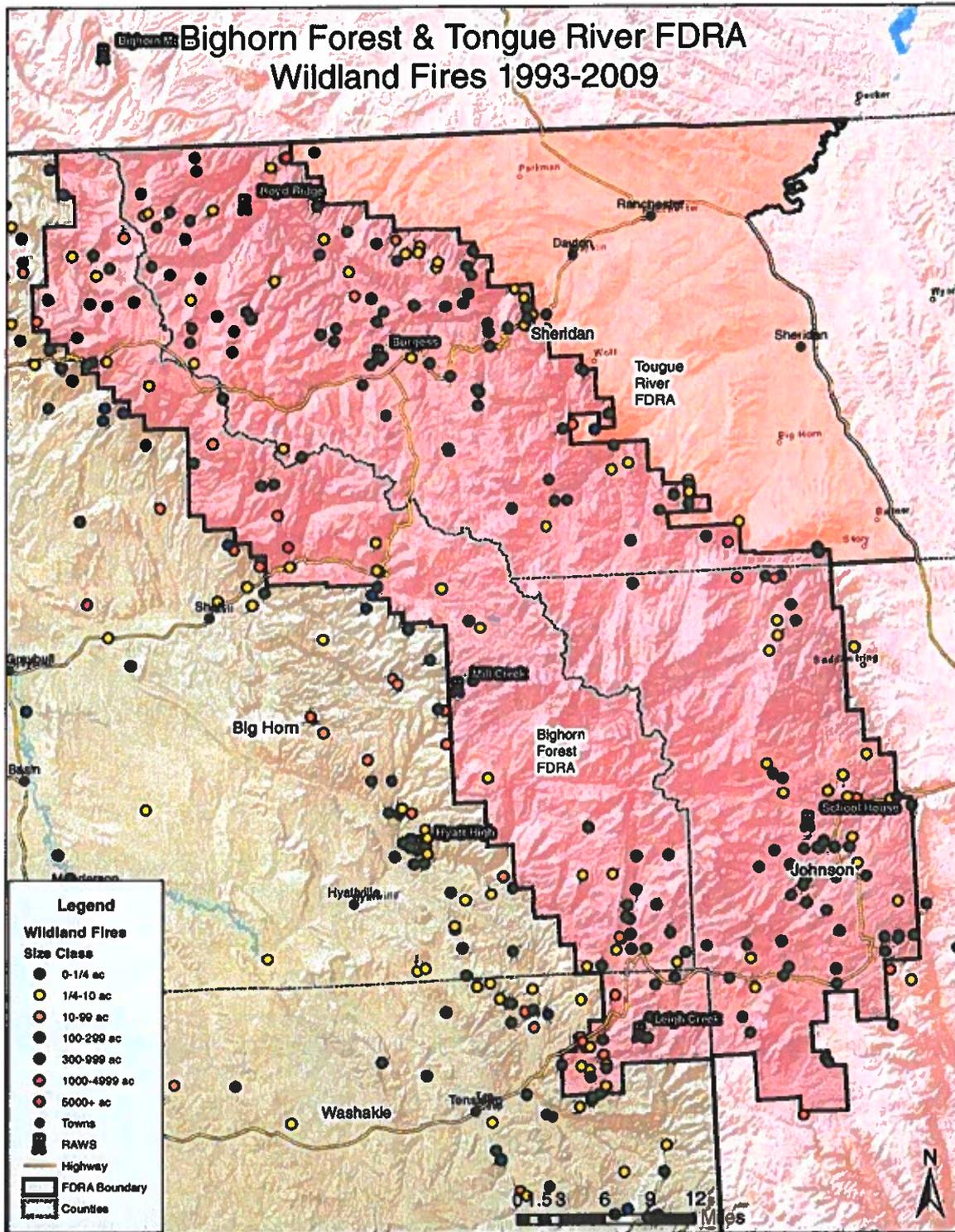
Appendix B2 – Map of Big Horn Basin FDRA Wildland Fires 1993-2009



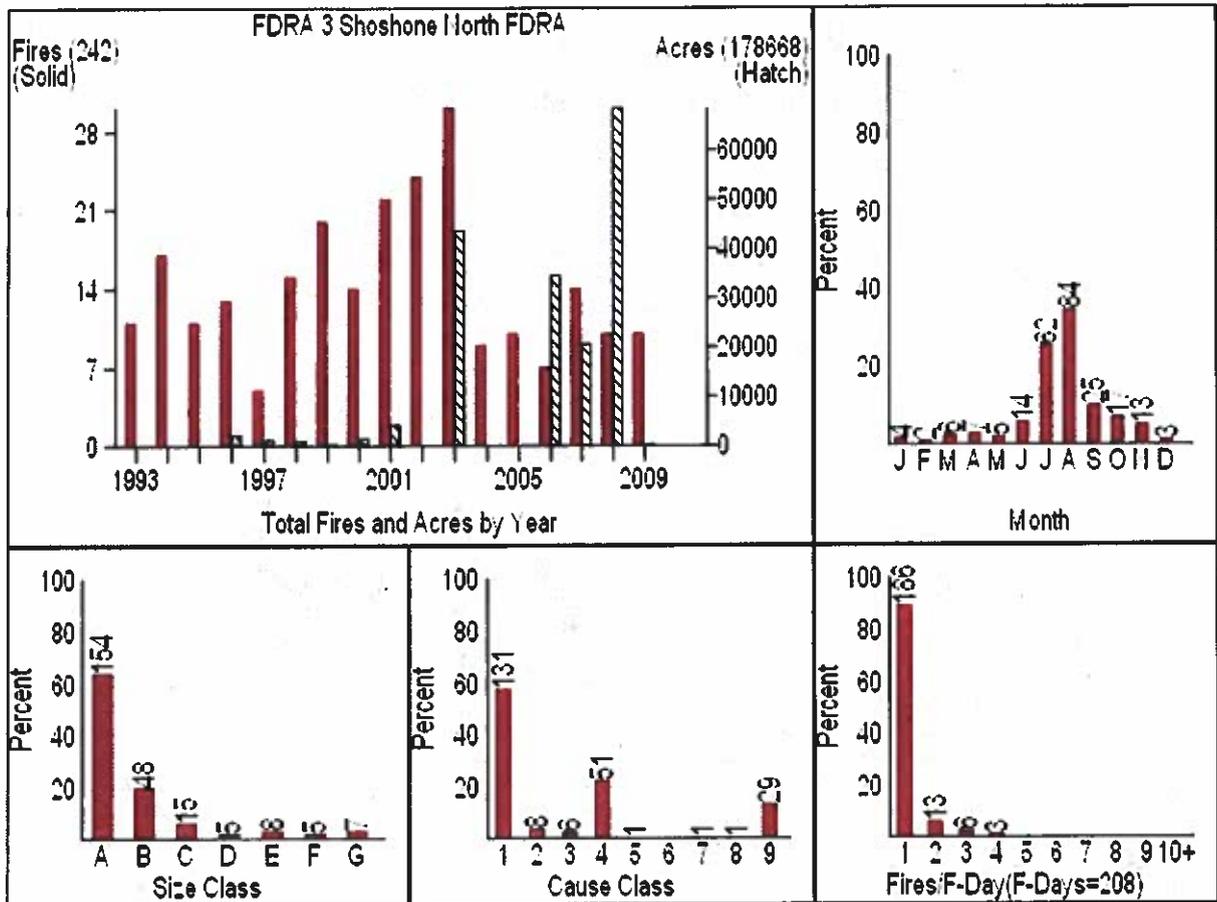
**Appendix B3 – Bighorn Forest FDRA Wildland Fires 1993-2009**



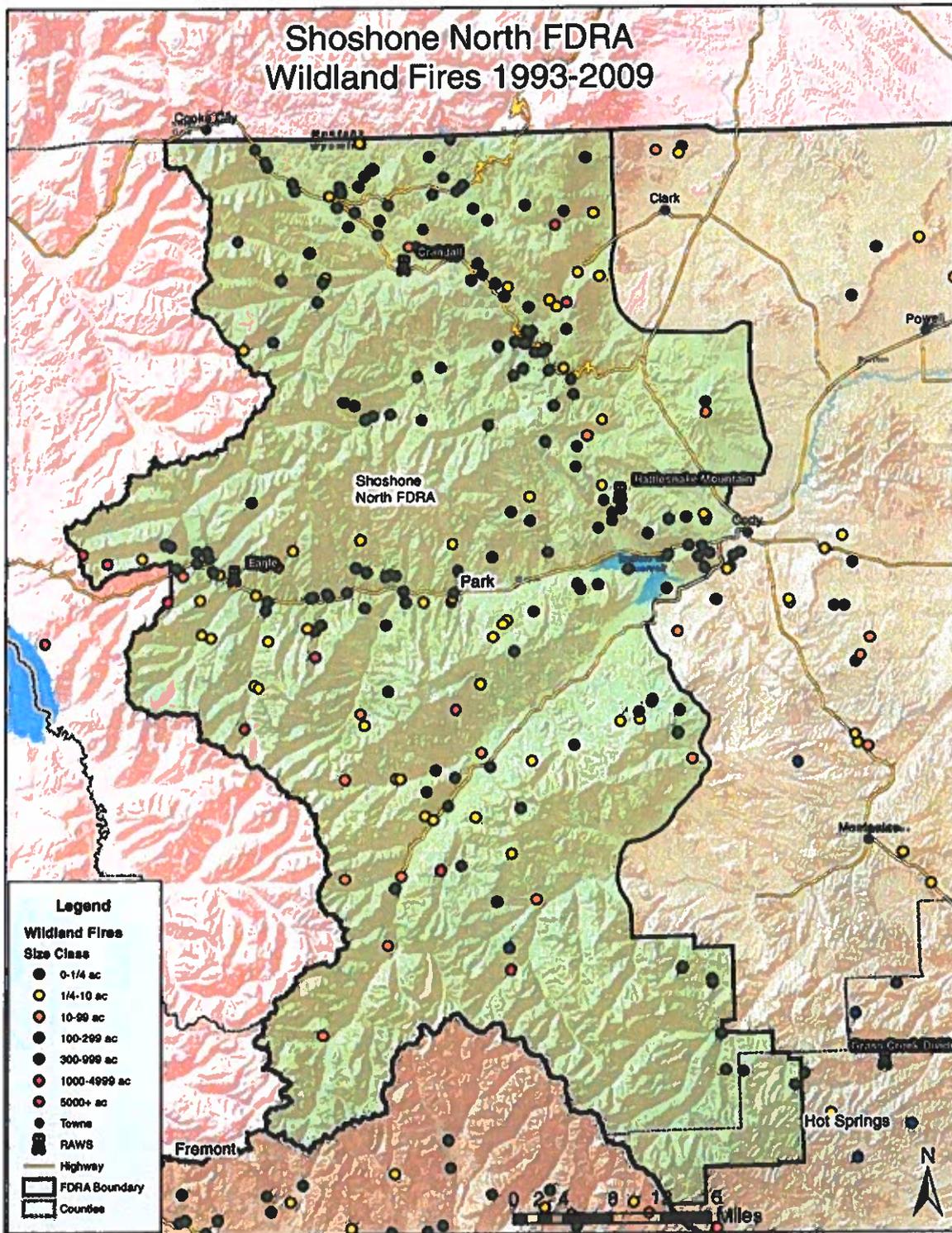
**Appendix B4 – Map of Bighorn Forest & Tongue River FDRA Wildland Fires 1993-2009**



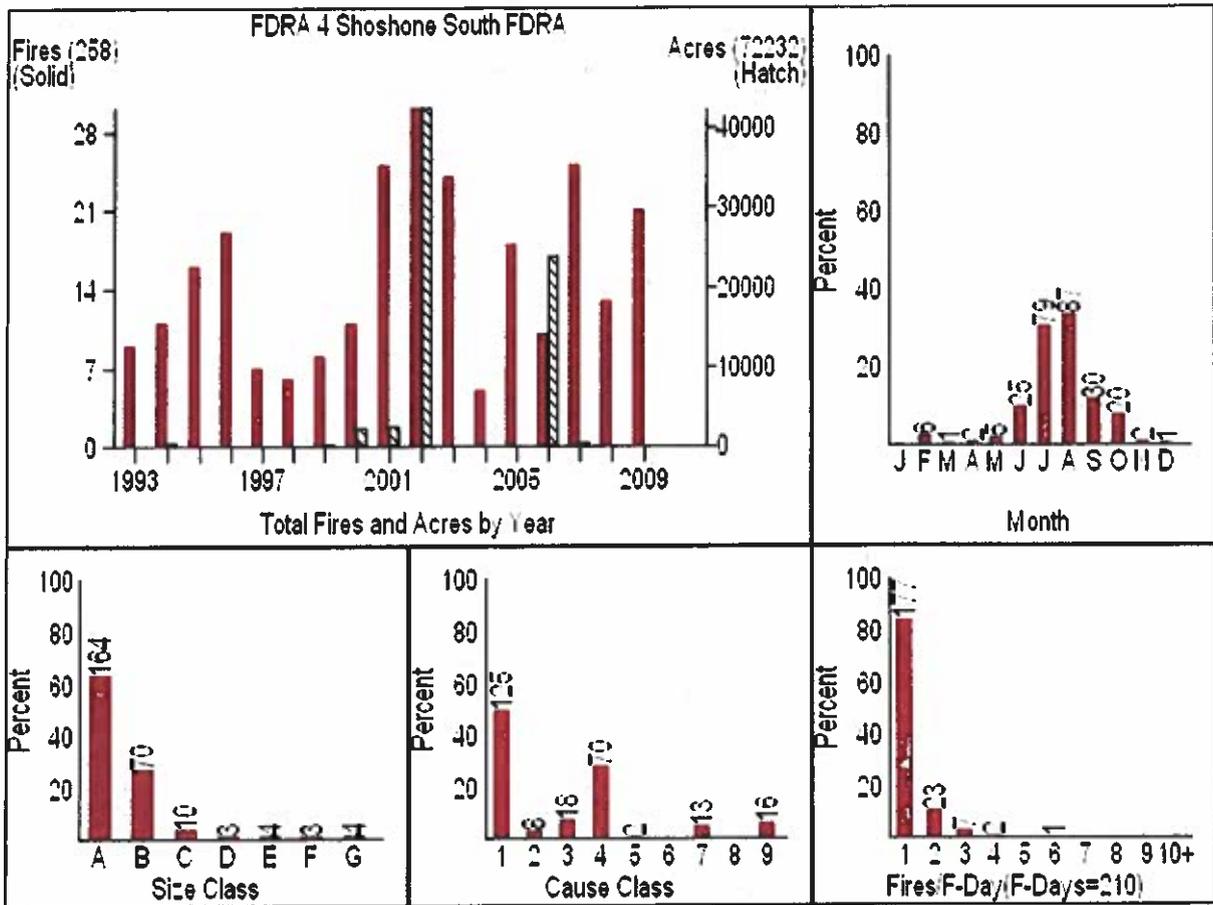
### Appendix B5 – Shoshone North FDRA Wildland Fires 1993-2009



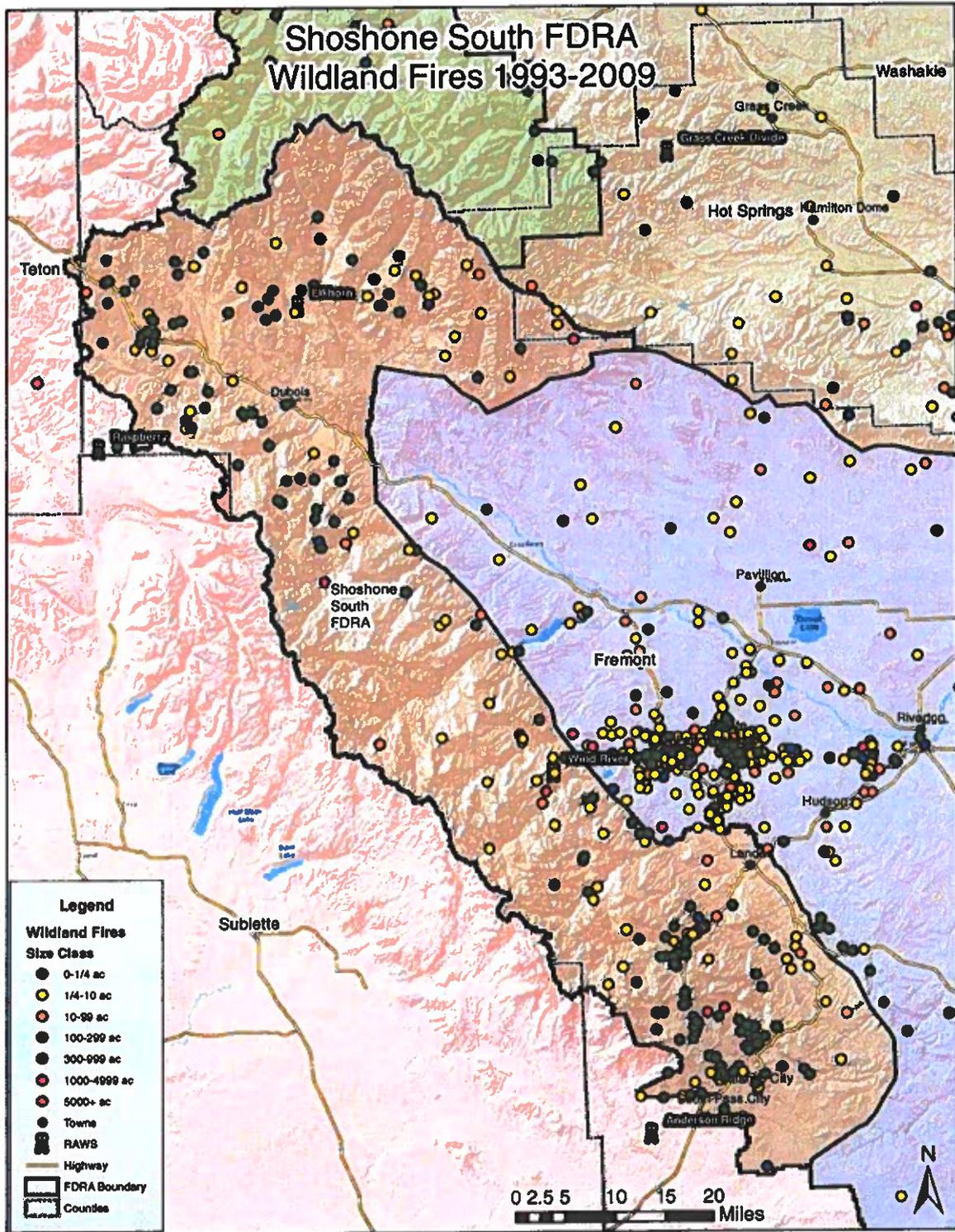
Appendix B6 – Map of Shoshone North FDRA Wildland Fires 1993-2009



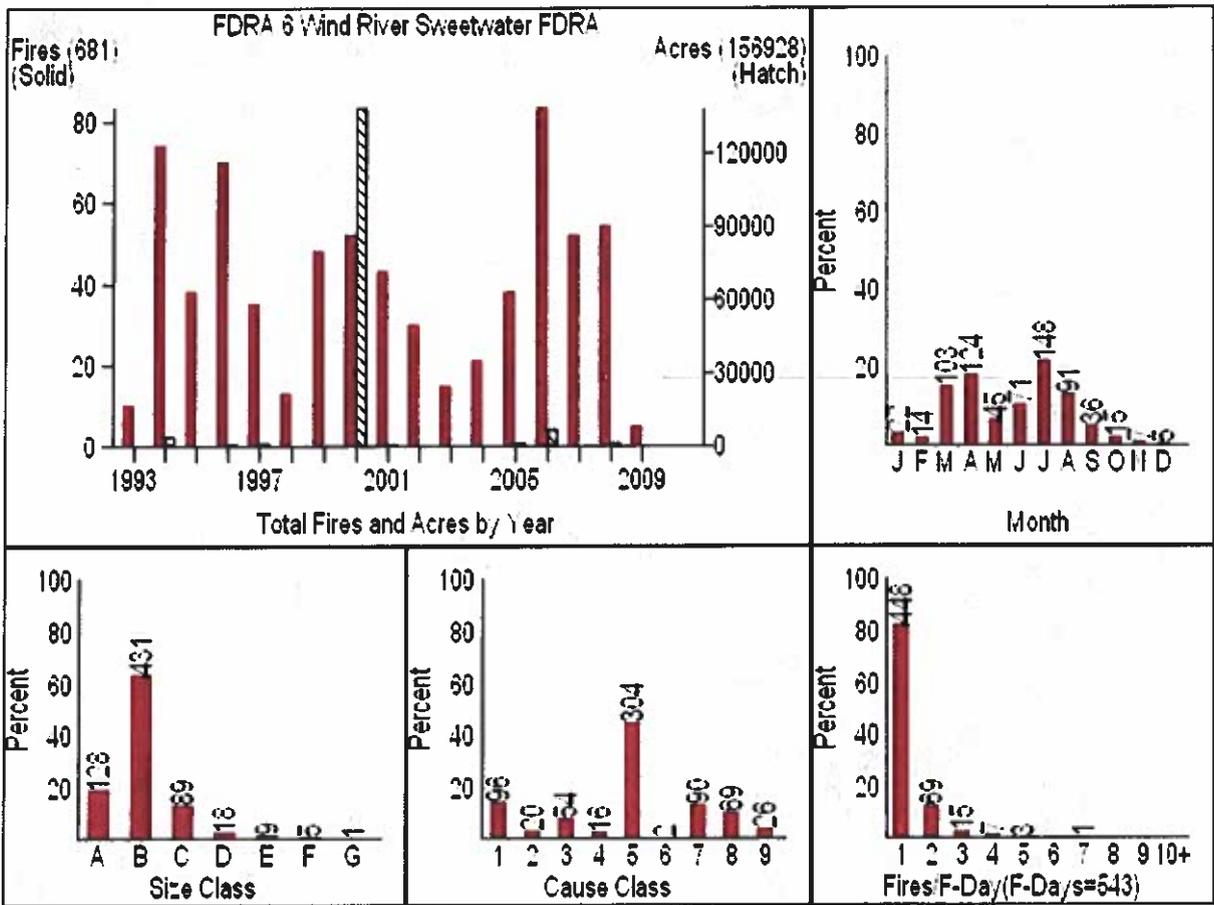
**Appendix B7 – Shoshone South FDRA Wildland Fires 1993-2009**



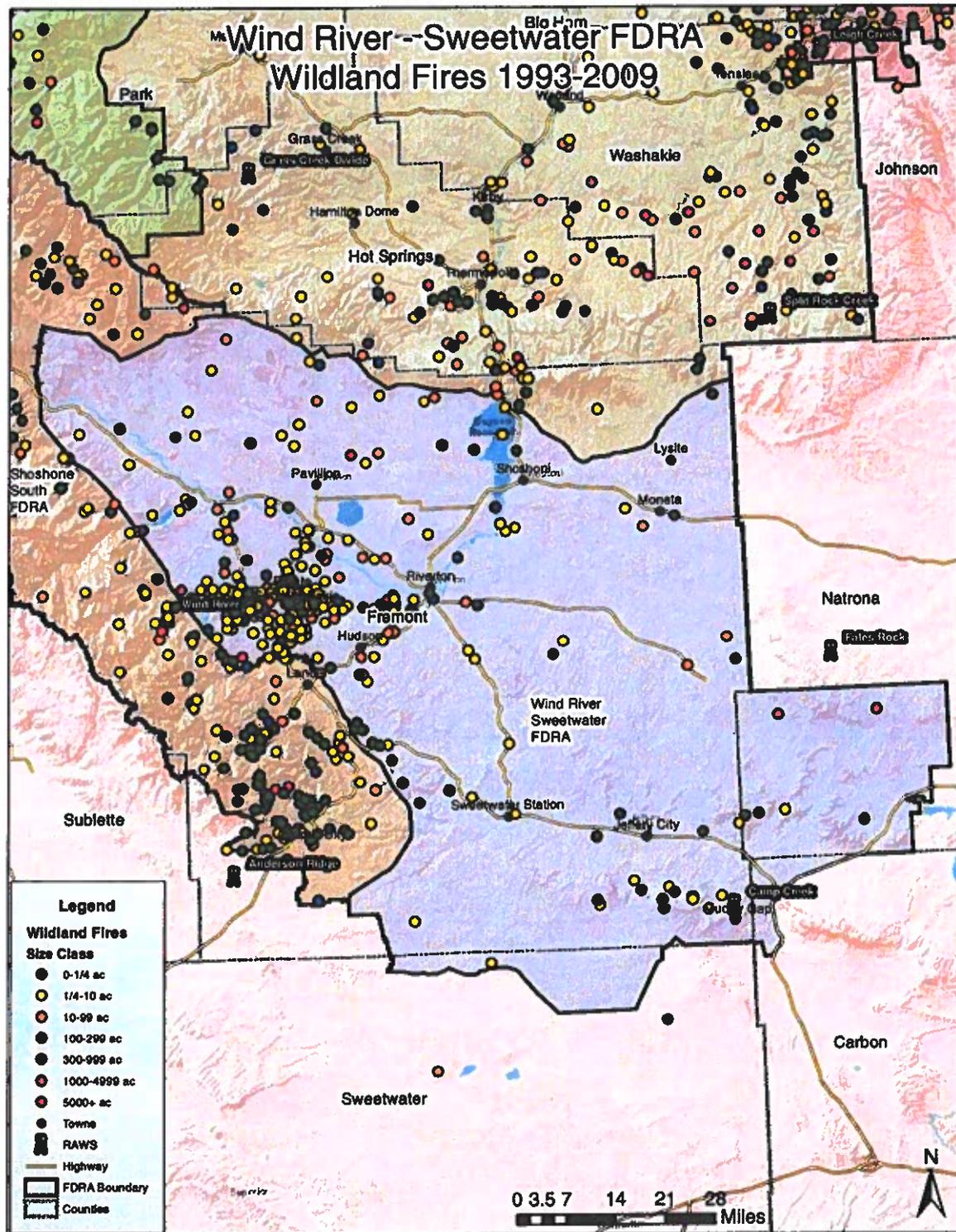
**Appendix B8 – Map of Shoshone South FDRA Wildland Fires 1993-2009**



**Appendix B9 – Wind River-Sweetwater FDRA Wildland Fires 1993-2009**



Appendix B10 – Map of Wind River-Sweetwater FDRA Wildland Fires 1993-2009



## **Appendix C – CDC Zone Characteristics Used to Determine Fire Danger Rating Areas**

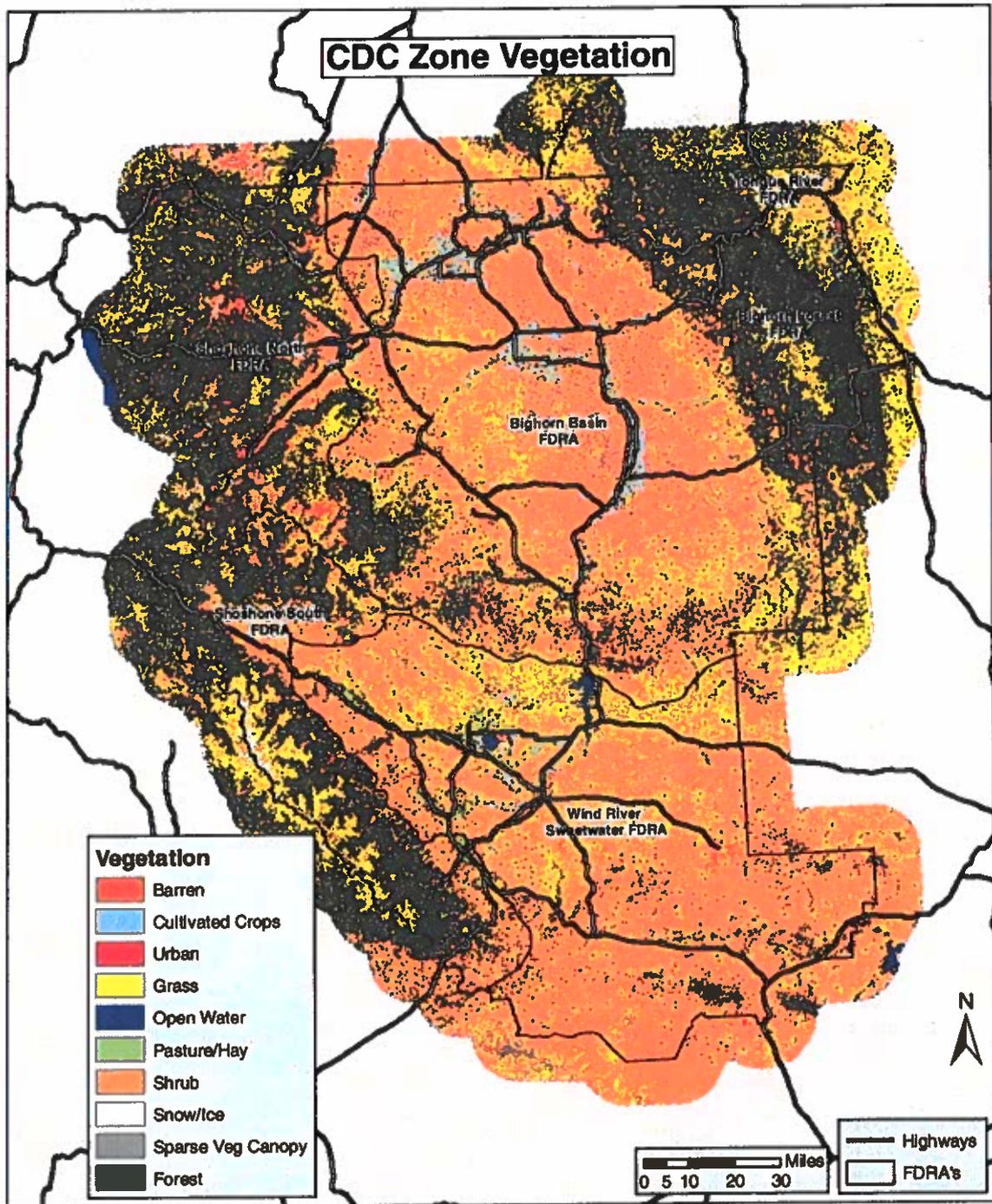
Appendix C1 – CDC Zone Vegetation Map

Appendix C2 – CDC Zone Topography Map

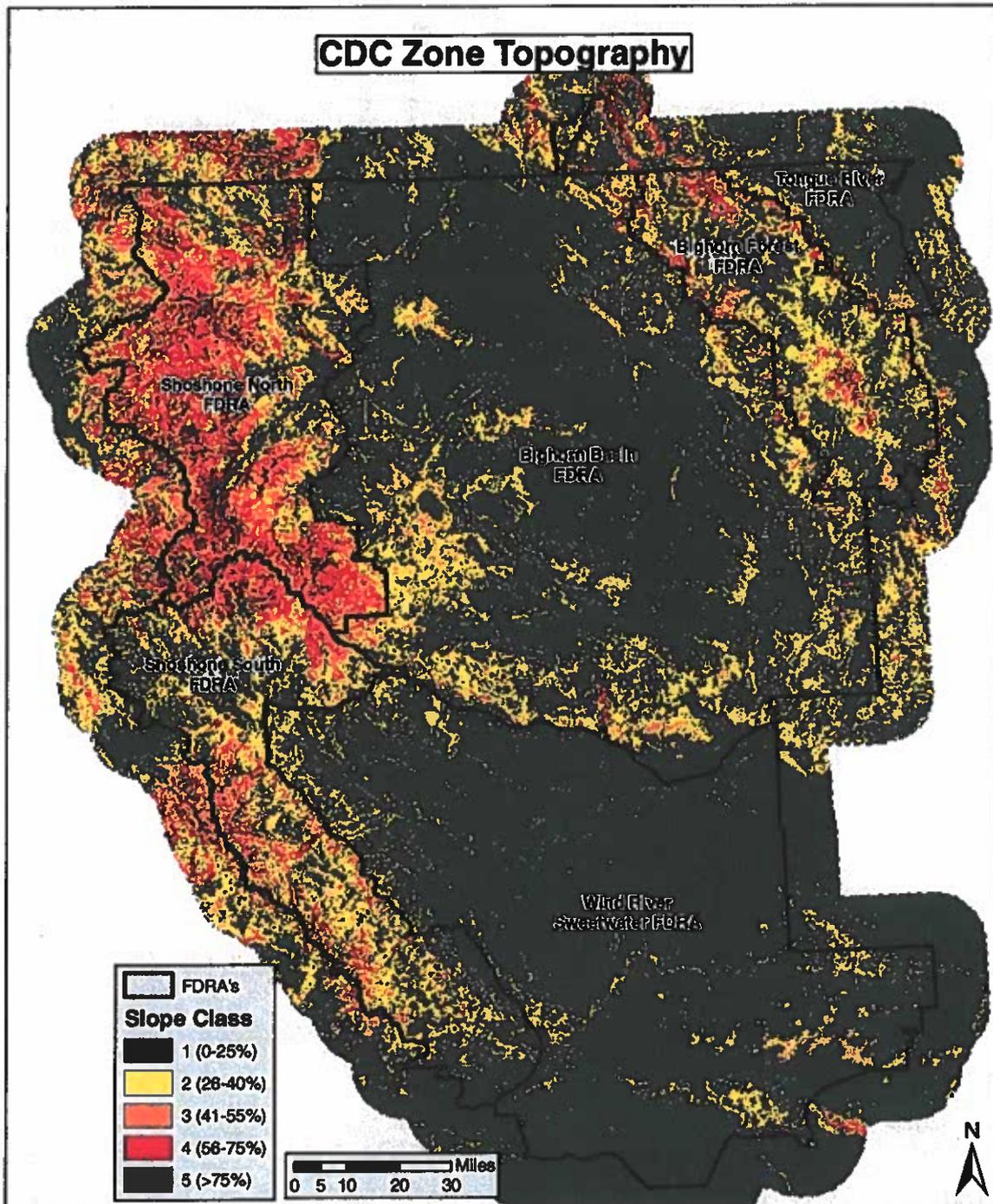
Appendix C3 – CDC Zone Precipitation and Weather Forecast Zone Map

Appendix C4 – CDC Zone Fire Management Unit Map

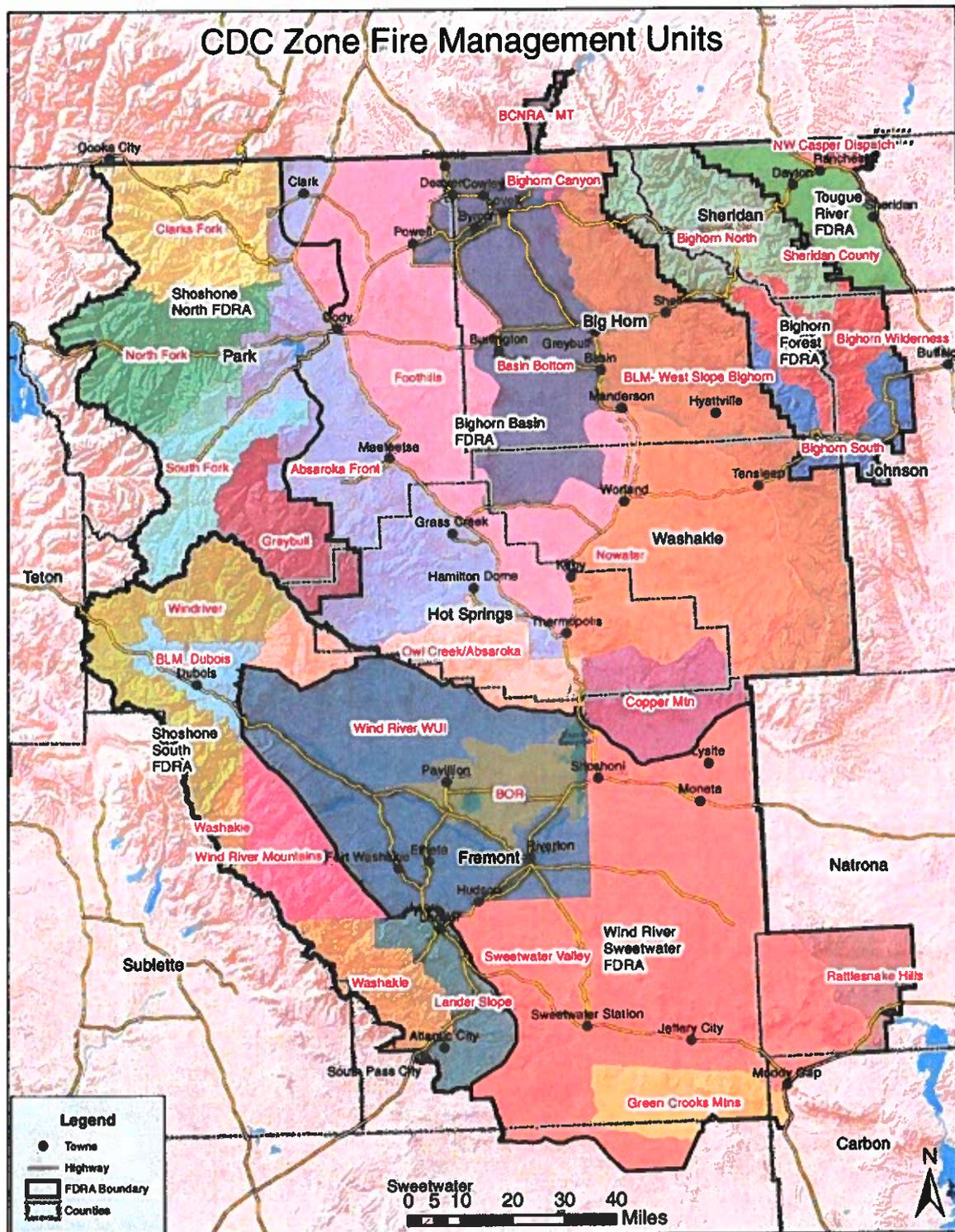
Appendix C1 – CDC Zone Vegetation Map



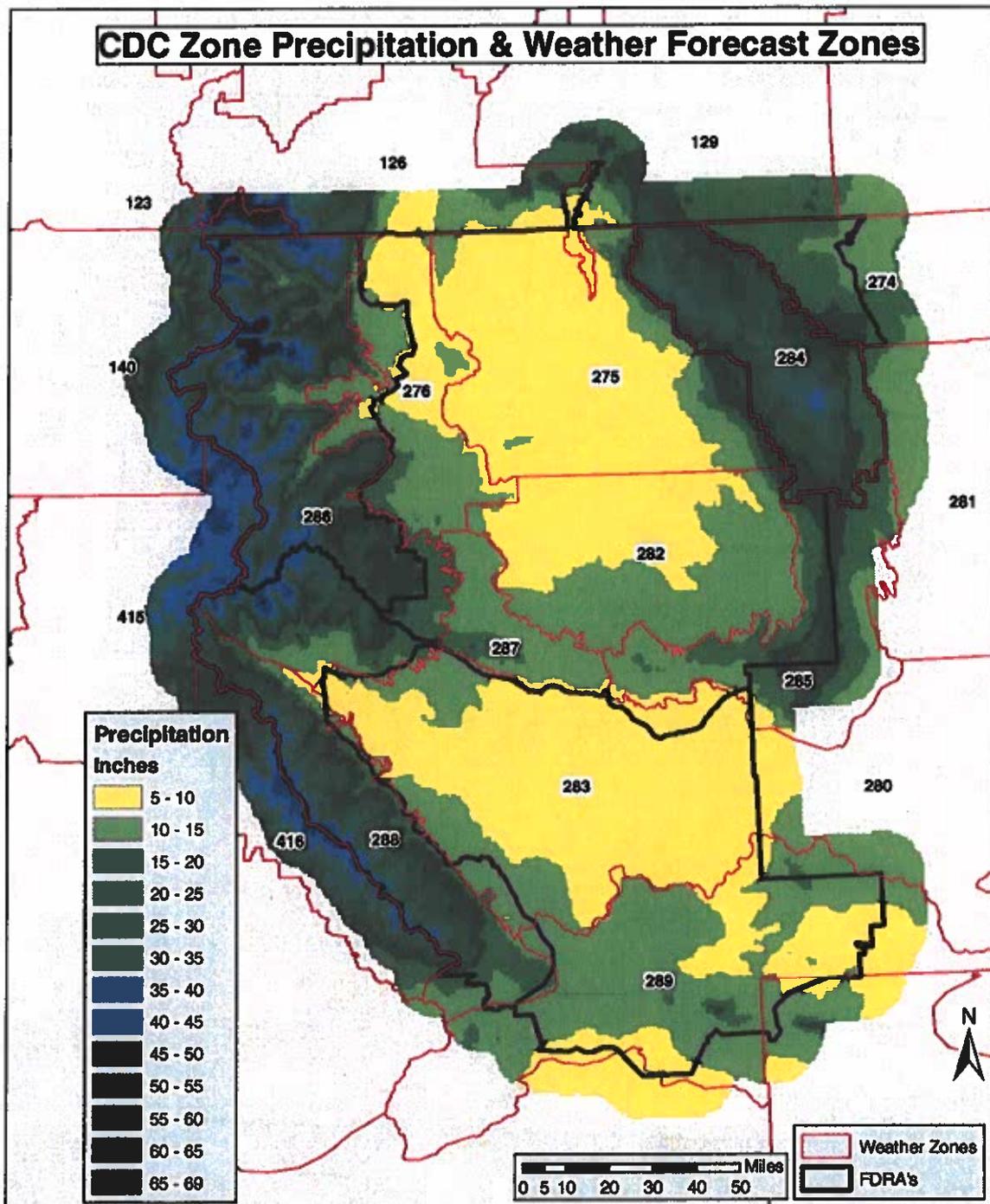
Appendix C2 – CDC Zone Topography Map



Appendix C4 – CDC Zone Fire Management Unit Map



Appendix C3 – CDC Zone Precipitation & Weather Forecast Zone Map





## **Appendix D – Statistical Analysis for Correlating NFDRS Index with Fire Business Decisions**

Data for this analysis is omitted from this document intentionally due to volume of data. This data is posted electronically and can be found on the 2012 DVD.

## **Appendix E - Fire Business Decisions for Fire Danger Rating Areas**

Appendix E1 – Big Horn Basin FDRA Fire Business Decision Graphs for ERC

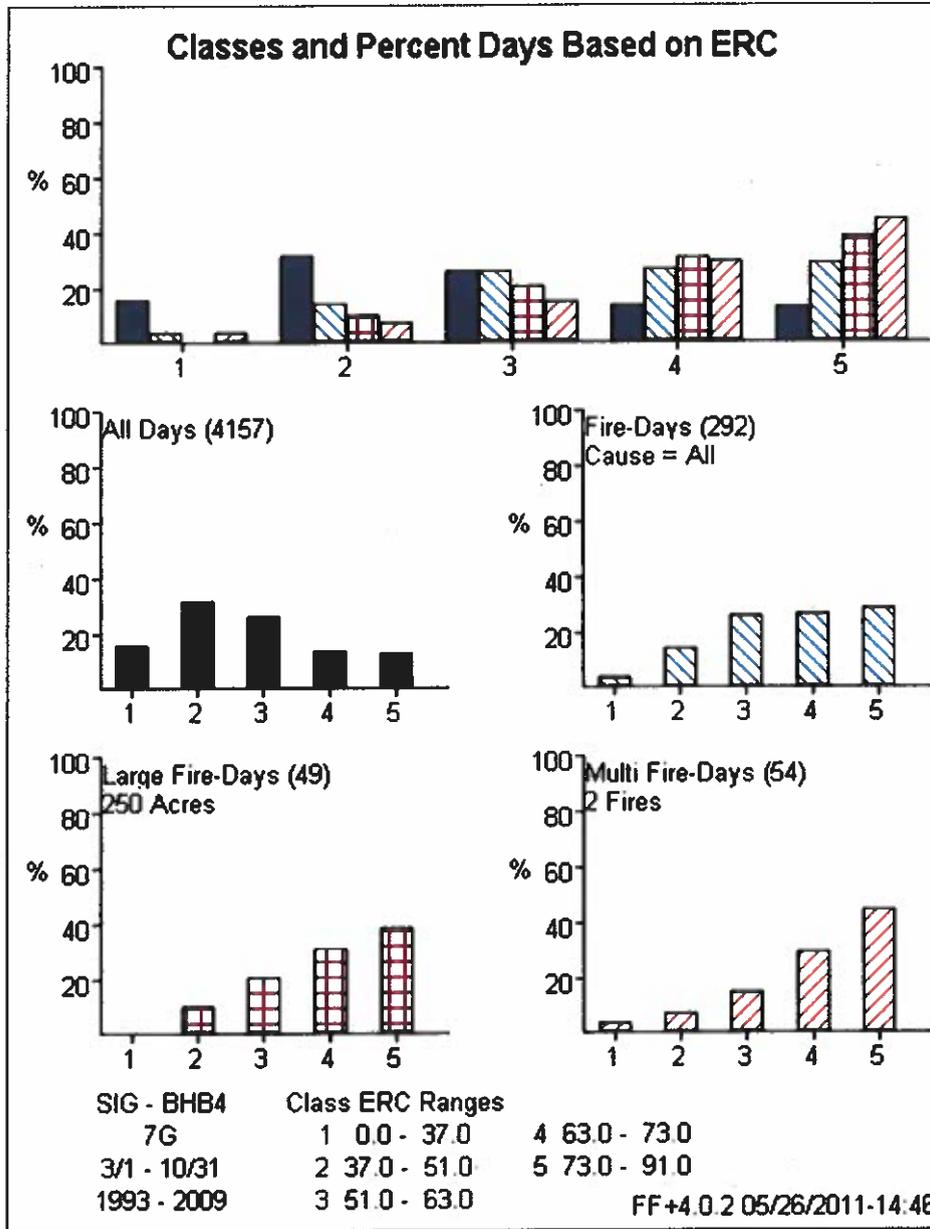
Appendix E2 – Bighorn Forest Fire Business Decision Graphs for ERC

Appendix E3 – Shoshone North FDRA Fire Business Graphs for ERC

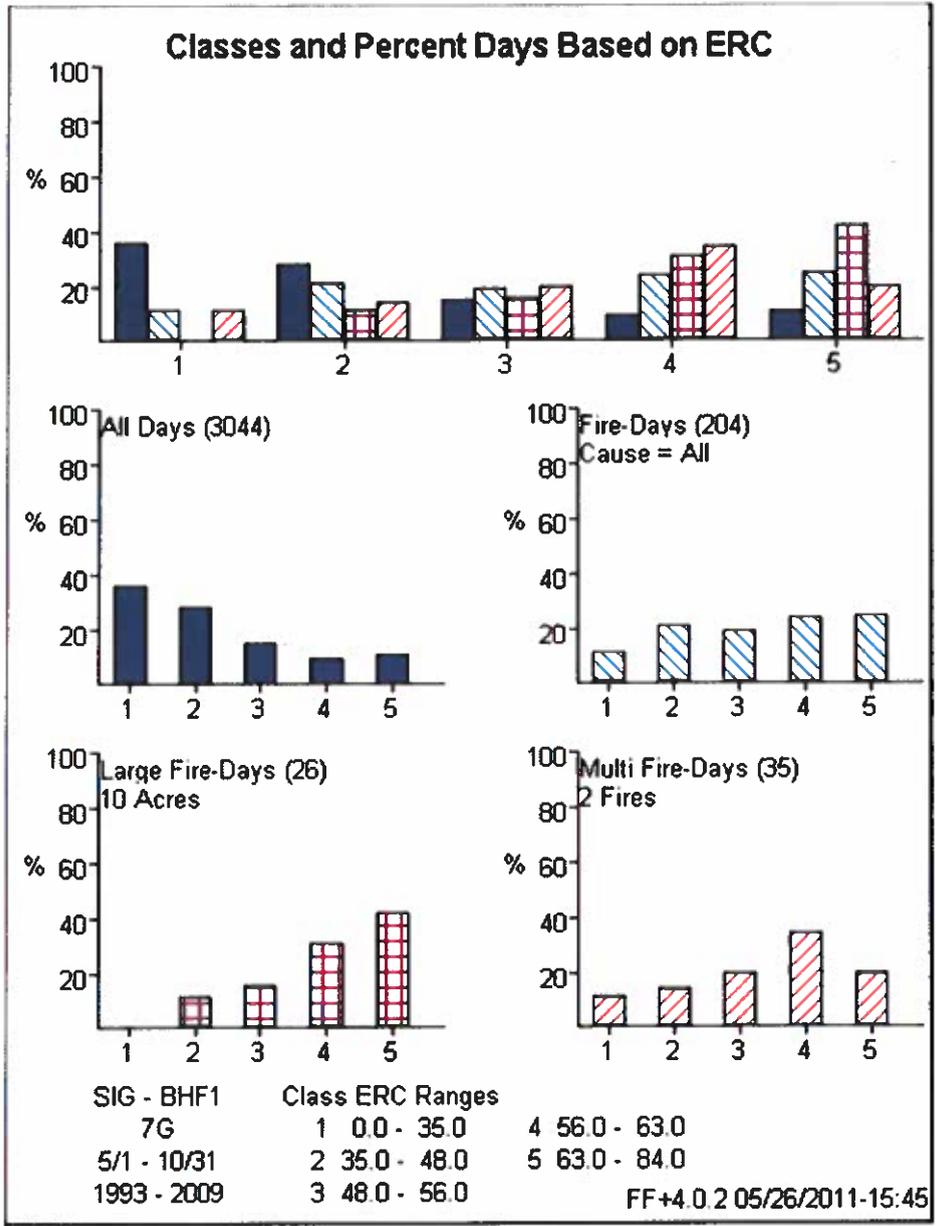
Appendix E4 – Shoshone South FDRA Fire Business Graphs for ERC

Appendix E5 – Wind River-Sweetwater FDRA Fire Business Graphs for ERC

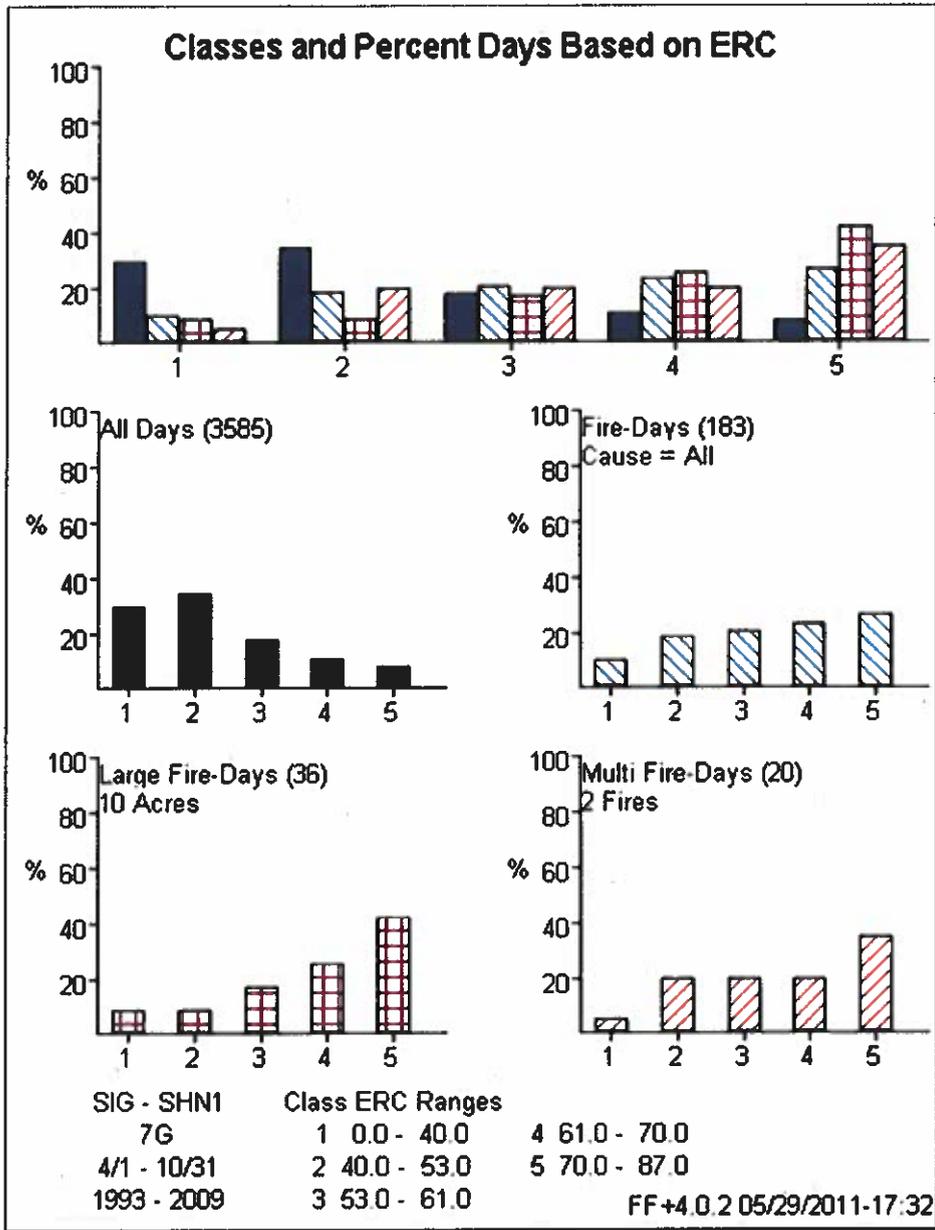
**Appendix E1 – Big Horn Basin FDRA Fire Business Decision Graphs for ERC**



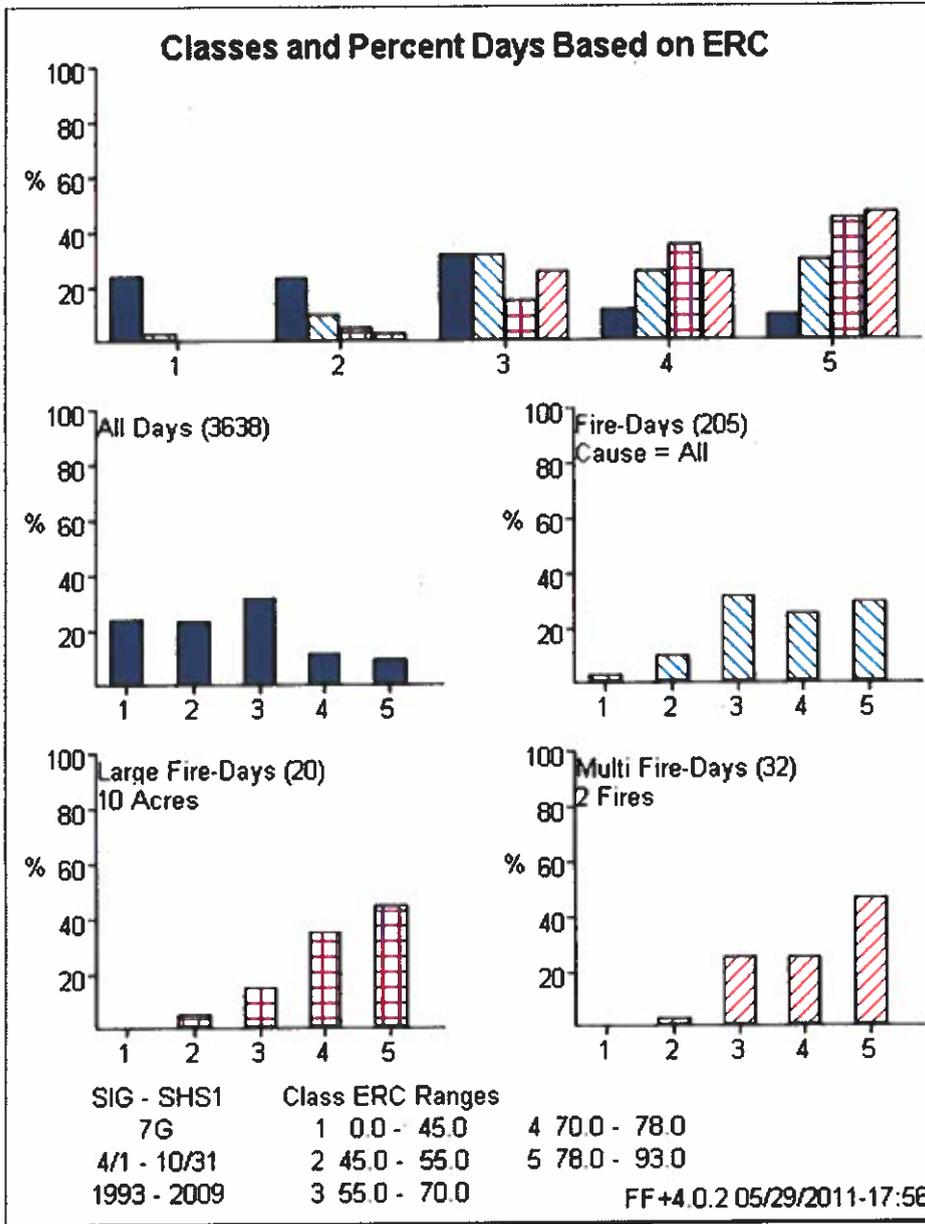
**Appendix E2 – Bighorn Forest Fire Business Decision Graphs for ERC**



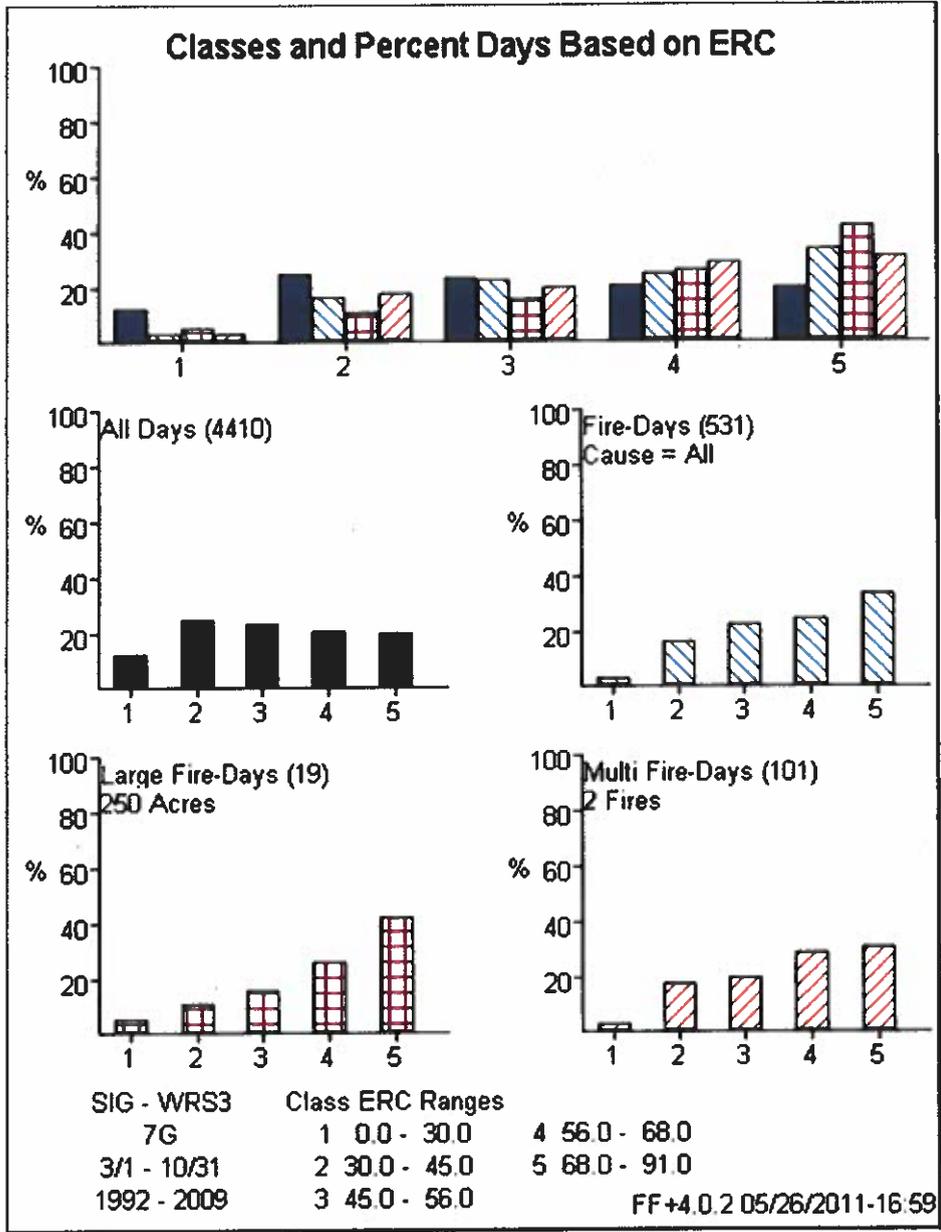
Appendix E3 – Shoshone North FDRA Fire Business Graphs for ERC



Appendix E4 – Shoshone South FDRA Fire Business Graphs for ERC



Appendix E5 – Wind River-Sweetwater FDRA Fire Business Graphs for ERC



## **Appendix F – Fire Danger Rating Signing and Prevention Zones**

See 2012 DVD for current maps

## **Appendix G - Fire Danger Rating Area Pocket Cards**

Appendix G1 – Big Horn Basin FDRA Pocket Card

Appendix G2 – Bighorn Forest FDRA Pocket Card

Appendix G3 – Shoshone North FDRA Pocket Card

Appendix G4.1 – Shoshone South FDRA Washakie Pocket Card

Appendix G4.2 – Shoshone South FDRA Upper Wind River Pocket Card

Appendix G5 – Wind River-Sweetwater FDRA Lower Wind River Pocket Card

Appendix G1 – Big Horn Basin FDRA Pocket Card

**FIRE DANGER -- Big Horn Basin**  
Maximum, Average, and 80th Percentile, based on 17 years data

**Fire Danger Area:**

- ◆ Big Horn Basin
- ◆ FMZ 2758282
- ◆ Big Horn Basin Sig
- ◆ Meets NWCG Wx Station Standards

**Fire Danger Interpretation:**

**EXTREME** -- Use extreme caution  
(Caution) -- Watch for change  
Moderate -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 1995 - 2011  
Average -- shows peak fire season over 17 years (3047 observations)  
**80th Percentile** -- Only 20% of the 3047 days from 1995 - 2011 had an Energy Release Component above 70

**Local Thresholds - Watch out:** Combinations of any of these factors can greatly increase fire behavior:  
20' Wind Speed over 15 mph, RH less than 20%,  
Temperature over 90, 1000-Hour Fuel Moisture less than 15

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**Years to Remember: 2001 2006**

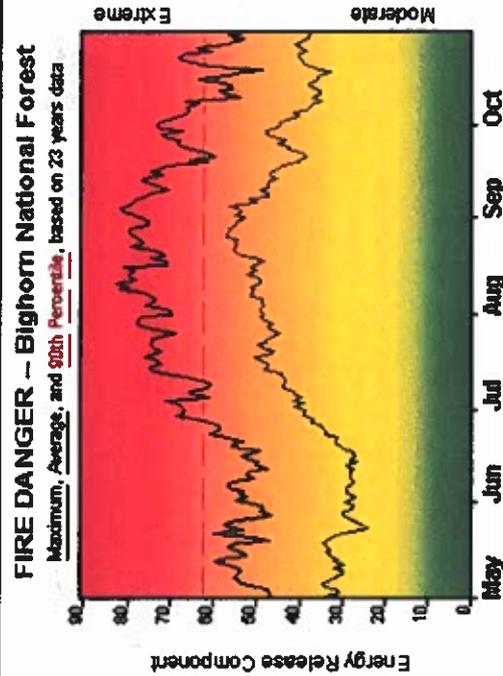
**Remember what Fire Danger tells you:**

- ✓ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- ✓ Wind is NOT part of ERC calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

**Past Experiences:**  
Weather Stations included are Hillsboro, Rattlesnake, Hyatt High, Grass Creek and Spårrock. Rapid rates of spread and control problems can be expected in sagebrush with live fuel moisture below 100%. The area has received large amounts of moisture the previous 2 springs resulting in a higher than normal fuel loading.

Responsible Agency: BLM-Wind River/Big Horn Basin Dist.  
FF-4.0.2 04/28/2012-16:21 (V:\Fuel\Area\Fuel\_Modeling\_basin...12M12 FDROP WBD\_WRS)  
Design by NWCG Fire Danger Working Team

Appendix G2 – Bighorn Forest FDRA Pocket Card



**Fire Danger Area:**

- ◆ Spruce/fir/ridgepole
- ◆ Forecast Zone 294
- ◆ SIG - All BHF Stations
  - Meets NWCG Wx Station Standards

**Fire Danger Interpretation:**



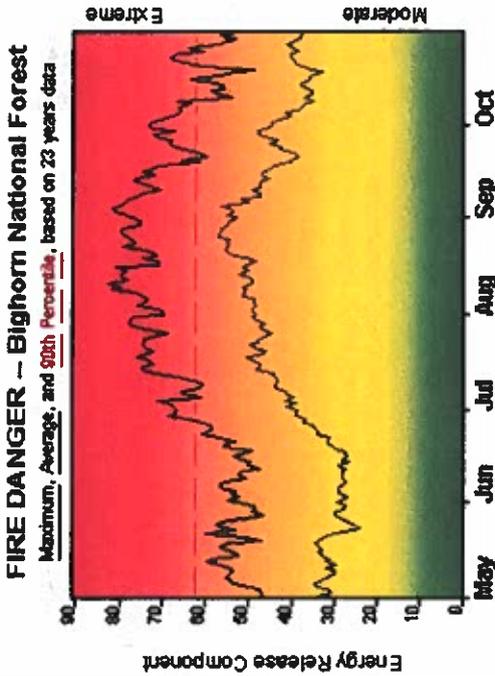
- EXTREME** -- Use extreme caution
- (Caution)** -- Watch for change
- Moderate** -- Lower Potential, but always be aware

**Minimum** -- Highest Energy Release Component by day for 1989 - 2011

**Average** -- shows peak fire season over 23 years (3631 observations)  
**90th Percentile** -- Only 10% of the 3631 days from 1989 - 2011 had an Energy Release Component above 62

**Local Thresholds - Watch out:** Combinations

- of any of these factors can greatly increase fire behavior:
- 20' Wind Speed over 15 mph, RH less than 20%, Temperature over 77, Energy Release Component over 60



**Remember what Fire Danger tells you:**

- ✓ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- ✓ Wind is NOT part of ERC calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography
- ✓ Listen to weather forecasts -- especially WIND.

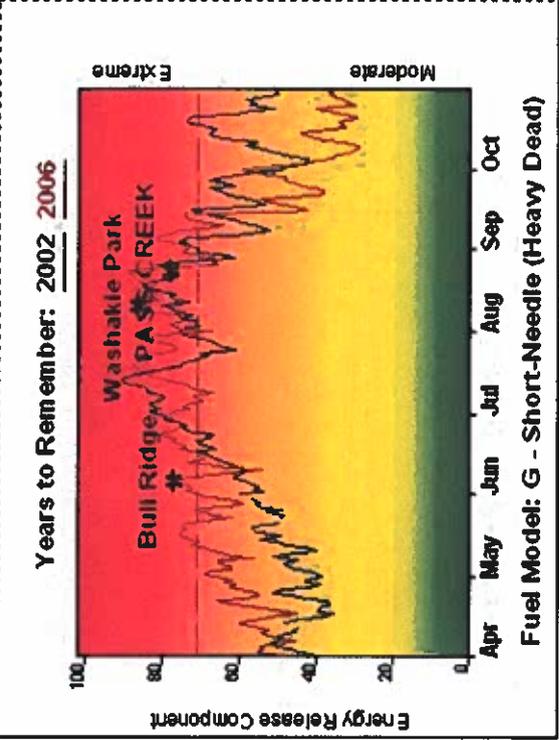
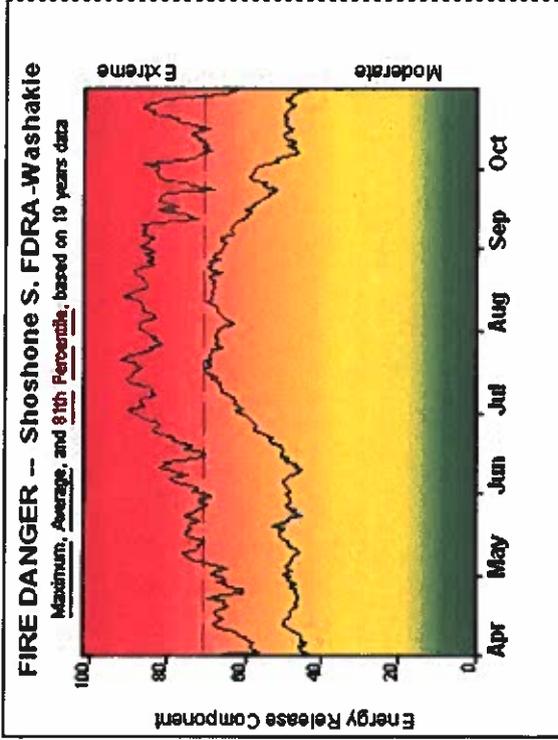
**Past Experience:**

- LCES is critical in all suppression operations, especially at high ERC's.
- With high ERC's, conditions are conducive to development of spot fires which will factor into and increase rate of spread.
- The likelihood of extreme fire behavior greatly increases when 1000 hour fuel moisture is 11% or less.
- Haines Index of 5 or greater is an indicator of possible extreme fire behavior and rapid fire growth.
- Drought greatly influences fire behavior in timber fuel models.
- Wind-throw, insect activity and disease has led to an increase of snags and 1000 hour

Map Responsible Agency: USFS  
 FF-4-0.2 03/27/2012-14:57 (C:\Documents and Settings\Millard\My Documents\Fire\_...\.vml)  
 Design by NWCG Fire Danger Working Team



Appendix G4.1 – Shoshone South FDRA Washakie Pocket Card



**Fire Danger Area:**

- ◆ South Pass to Bull Lake
- ◆ Washakie RD/WFR/Lander FO
- ◆ Elchem/Anderson RIVERS
- \* Meets NWCG 1st Station Standards

**Fire Danger Interpretation:**



**EXTREME** -- Use extreme caution  
*(Caution)* -- Watch for change  
 Moderate -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 1993 - 2011

Average -- shows peak fire season over 19 years (3007 observations)

**81th Percentile** -- Only 19% of the 3007 days from 1993 - 2011 had an Energy Release Component above 71

**Local Thresholds - Watch out:** Combinations of any of these factors can greatly increase fire behavior:  
 20+ Wind Speed over 20 mph, RH less than 17%.  
 Temperature over 80, Energy Release Component over 60



**Remember what Fire Danger tells you:**

- ✓ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- ✓ Wind is NOT part of ERC calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

**Past Experience:**

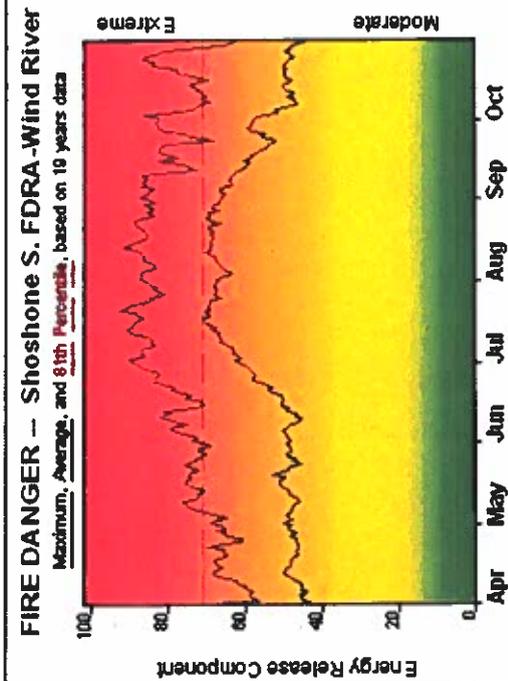
When the following occurs by July 1, ERC greater than 60, 1000 hr. fuels less than 11, KBDI greater than 240, Palmer Drought is -2.0 or greater, then a significant year is signaling.  
 100 hr. fuel moistures less than 10% promotes large fire growth and is a key driver in beetle kill stands. Anticipate drier fuels and increased wind speeds in beetle kill stands. Fire weather zone 288.

Wind River Mts. from Dubois to Lander can have strong downslope winds producing downhill spotting from start locations that spread downhill and then later transition to uphill

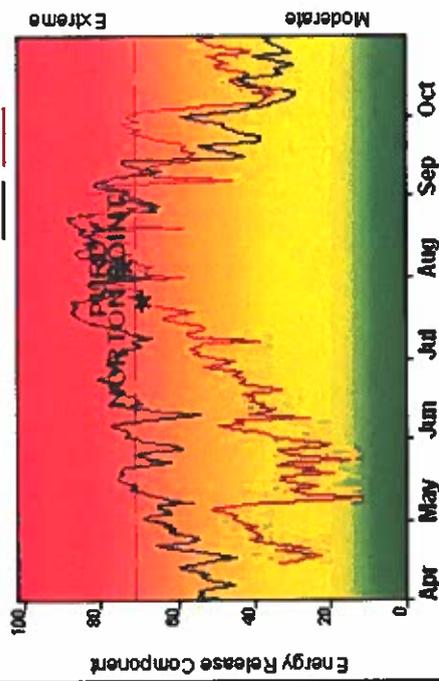
Responsible Agency: USFS - Shoshone N.F.  
 FF-14.0.2 04/27/2012-15:33 (C:\apps\ffas\FireFair\FireFairCDC20M...M026\_CDC\_F00P)

Design by NWCG Fire Danger Working Team

Appendix G4.2 Shoshone South FDRA Wind River Pocket Card



Years to Remember: 2006 2011



Fuel Model: G - Short-Needle (Heavy Dead)

Fire Danger Area:

- ◆ Dubois, Upper Wind River
- ◆ Wind River R.D./WRA
- ◆ Blithem/Anderson RAWS
- ◆ Meets NWCG Wx Station Standards

Fire Danger Interpretation:



**EXTREME** -- Use extreme caution  
(Green) -- Watch for change  
Moderate -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 1993 - 2011  
Average -- shows peak fire season over 19 years (3007 observations)  
81th Percentile -- Only 19% of the 3007 days from 1993 - 2011 had an Energy Release Component above 71

**Local Thresholds - Watch out:** Combinations of any of these factors can greatly increase fire behavior:  
20° Wind Speed over 20 mph, RH less than 17%, Temperature over 80, Energy Release Component over 80



Remember what Fire Danger tells you:

- ✓ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- ✓ Wind is NOT part of ERC calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:

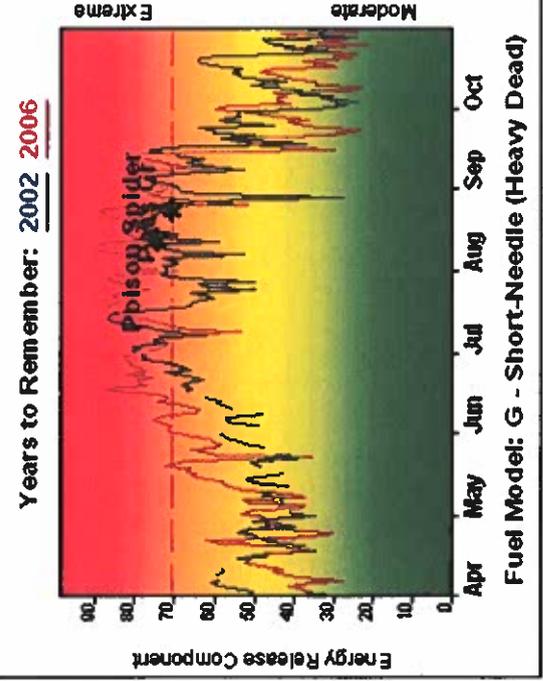
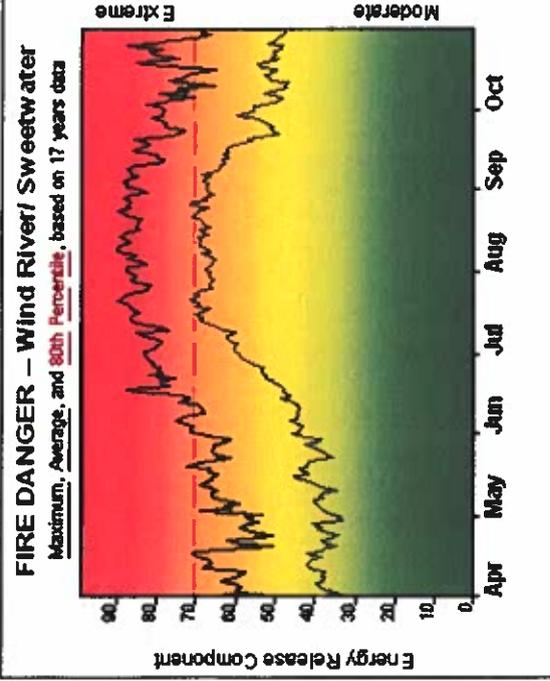
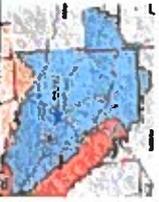
When the following occurs by July 1, ERC greater than 60, 1000 hr. fuels less than 11, KBDI greater than 240, Palmer Drought is <math>-2.0</math> or greater, then a significant year is signing.  
100 hr. fuel moistures less than 10% promotes large fire growth and is a key driver in beetle kill stands. Anticipate dief fuels and increased wind speeds in beetle kill stands. Fire weather zone 288.

Wind River Mts. from Dubois to Lander can have strong downslope winds producing downhill spotting from start locations that spread downhill and then later transition to uphill

Responsible Agency: USFS - Shoshone N.F.  
FF-4.0.2 04272012-16:13 (C:\Vespa\Area\Fire\Fire By Plan\COC20X...10326\_COC\_F00P)

Design by NWCG Fire Danger Working Team

Appendix G5 – Wind River-Sweetwater FDRA Pocket Card

**Fire Danger Area:**

- Wind River/Sweetwater
- FWZ 2756262 Fremont Co.
- Wind River Basin Sig
- Meets NWCG Wk Station Standards

**Fire Danger Interpretation:**

**EXTREME** -- Use extreme caution  
 (Caution) -- Watch for change  
 Moderate -- Lower Potential, but always be aware

**Maximum** -- Highest Energy Release Component by day for 1995 - 2011  
**Average** -- shows peak fire season over 17 years (3218 observations)  
**80th Percentile** -- Only 20% of the 3218 days from 1995 - 2011 had an Energy Release Component above 70

**Local Thresholds - Watch out:** Combinations of any of these factors can greatly increase fire behavior:  
 20' Wind Speed over 15 mph, RH less than 20%, Temperature over 90, 1000-Hour Fuel Moisture less than 15

**Remember what Fire Danger tells you:**

- Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- Wind is NOT part of ERC calculation.
- Watch local conditions and variations across the landscape -- Fuel, Weather, Topography
- Listen to weather forecasts -- especially WIND.

**Past Experience:**

Includes Camp Creek, Wind River and Split Rock stations. Rapid rates of spread and control problems can be expected in sagebrush with five fuel moisture below 100%. Lander front can experience extreme rates of spread down slope and down drainage. The area has received large amounts of moisture the previous two springs resulting in a higher than normal fuel loading.

Responsible Agency: BLM-Wind River/Big Horn Basin Dist.  
 FF-4.0.2 04/28/2012-16:23 (\\file\_team\fuel\_loading\_loadin...12012 FDROP WSD\_WRS)  
 Design by NWCG Fire Danger Working Team

