WYOMING

Forest Action Plan

WYOMING STATEWIDE FOREST RESOURCE ASSESSMENT AND FOREST RESOURCE STRATEGY

Wyoming State Forestry Division
Office of State Lands and Investments
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Introduction

Wyoming State Forestry Division (WSFD), part of the Office of State Lands and Investments, is charged with conserving, protecting, and enhancing the forest resources of Wyoming. The Division is comprised of three major areas: operations and trust lands, fire management, and cooperative forestry. Operations & trust lands includes the management of over 263,000 acres of forested State Trust Lands, conservation crews, and trust land improvement. Fire Management provides suppression and fire management on 3.6 million acres of State Trust Land (forest and rangelands), helitack, and support for fire suppression in the state with a fire fabrication and maintenance facility, as well as federal excess property (FEPP). This also entails offering support statewide with fire training, grants, and utilizing the FEPP/FFP program to supply counties with cost-effective firefighting equipment. Cooperative forestry is responsible for community and urban forestry, forest health, rural forestry assistance, best management practices (BMPs), wood utilization, fuels management, and forest resource planning. These cooperative programs offer assistance for the citizens of Wyoming in many forms, including technical and financial, and reaches beyond boundaries of ownership.

Wyoming's forest resources play an important role in the state historically and as well as today. From providing timbers for mining and railroad ties to lumber and heating, the islands of forest that are found around the state also provide vital habitat for wildlife and water. Much like the forest around the country and world, Wyoming forests face many challenges including pressure from insects and disease, drought, and wildfire. Since the 1900s, sawmills have come and gone with upwards of 194 active mills in 1948 to under 30 more recently. Bark beetles have ebbed and flowed over the decades leaving standing dead trees that are often not utilized for forest products. New technologies and techniques may lead to better utilization of the forest products in the future. The WSFD utilizes a variety of tools such as the Good Neighbor Authority (GNA) and Shared Stewardship programs to ensure more work is done on the ground to improve forest health and management, reduce wildfire risk, and collaborate with partners across jurisdictions.

The Forest Action Plan is a guiding document intended for WSFD, conservation partners, and those with an interest in forestry in the state. The document examines the most current forest resources in the state to show trends, threats, priorities, opportunities, and strategies. The Forest Action Plan is a requirement for state agencies to be eligible for federal, state, and private forestry funding via the federal Cooperative Forestry Assistance Act (Title 16 U.S. Code, Chapter 41).

Wyoming Forest Resources

Geology and Topography

Wyoming has a land area of over 62.6 million acres (97,812 square miles). Elevations range from a low of 3,099 ft on the Belle Fourche River in Crook County in the northeastern corner to 13,804 ft on Gannett Peak in Fremont County. The forested areas of Wyoming are in the western and central portions of the state, part of the ecoregion province referred to as the Southern Rocky Mountain (Bailey, 1995). The Rocky Mountains are rugged glaciated mountains as high as 14,000 feet with local relief between 3,000 feet and 7,000 feet. An isolated area of forest land exists in the northeast portion of the state where ponderosa pine forests have found an ecological niche in the Black Hills. This province is referred to as the Black Hills Coniferous Forest Province (Bailey, 1995). Wyoming's forest land often consists of "island forests" surrounded by

the non-forested lands of the high plains and basins. Examples include the forests of the Big Horn Mountains, Black Hills, Laramie Mountains, the Sierra Madre, and the Medicine Bow Mountains. The land between the forests in Wyoming falls between two ecoregion provinces, on the eastern side of the state the Great Plains—Palouse Dry Steppe Province and the more central and southwest fall into the Intermountain Semi-Desert Province (Bailey, 1995). The forests in the northwest portion of Wyoming are more contiguous. A network of riparian forests occurs along the major river systems and tributaries providing a valuable habitat component and interconnection between other forested areas.

Of the total land area in Wyoming, 15.6% is considered forest land (approximately 9,715,000 acres). Of that forest land, 55% (5,381,000 acres) are timberland, 33% (3,302,000 acres) are reserved, and 11% (1,069,000 acres) are considered other. In addition, 7% (742,000 acres) are considered woodland. Timberlands consist of forested land that produces or has the potential to produce 20 cubic feet per acre per year and "…not withdrawn from timber utilization by statute or administrative regulation" (DeRose et al., 2018). Timberlands tend to be at higher elevations where moisture regimes are greater, which is also generally correlated with federal ownership. Other lands are considered forest land, which are incapable of producing 20 cubic feet per acre of industrial wood under natural conditions because of adverse site conditions. Woodlands are composed of woody species that have not traditionally been used by industry but are important for other reasons.

Wyoming's mountains and hills have helped to shape the state's climate, vegetation, natural resources, industries, and people. Major physiographic regions include the High Great Plains which is primarily in the northeastern quarter of the state, the Semi-Desert region located in central and south-central Wyoming, the Southern Rockies consisting of the northwest portion of the state, the north-central portion, as well as parts of the southeastern portion of Wyoming, and finally, the Black Hills located in the northeastern corner of the state (Bailey, 1995; Wyoming State Forestry Division & U.S. Department of Agriculture, 2001). Every known type of geological feature can be found within the boundaries of Wyoming. Forested areas are generally associated with elevation and moisture conditions closely associated with mountain ranges and the Black Hills.

Weather and Climate

As previously noted, Wyoming's landscape includes both the High Plains and mountainous areas. This topographic variation influences the weather and climatology throughout the state. As a result, there are a variety of micro-climates within Wyoming. The mountain ranges generally are located in a north-south pattern, which is perpendicular to the westerlies. Areas with a higher elevation may have more of a swing in temperatures and precipitation in comparison to areas with a lower elevation. Subsequently, there can be a significant difference in temperature and precipitation patterns throughout Wyoming (Hansen et al., 2015).

Overall, Wyoming has a cool climate due to elevation. Areas that are 6,000 feet in elevation or higher infrequently reach 100° Fahrenheit in the summer. The mean maximum temperature is between 85° and 95° Fahrenheit, with slightly lower mean maximum temperatures going up in elevation. As noted by the Wyoming State Climate Office, the winters in Wyoming vary

frequently from mild to cold conditions. The coldest month is January but overall, the winters are generally long and cold.

Wyoming experiences an array of severe and hazardous weather including blizzards, tornadoes, flash floods, and hailstorms. Tornadoes occur less frequently in Wyoming in comparison to the Midwest. As noted by the Wyoming State Climate Office, this is a result of the low population and development, as well as the vast amount of rangeland. Hailstorms tend to be one of the most damaging types of hazardous weather throughout Wyoming, impacting crops and property annually (Wyoming State Climate Office). Wyoming is also quite windy and during the winter months, the wind can gust over 50 mph.

The average annual precipitation ranges from 6 inches in the lower-elevation regions to 95 inches within the higher elevations. Specifically, the mountainous regions provide a boundary that allows moisture from the Pacific Ocean to fall on the western slopes (Wyoming State Climate Office). Areas west of the mountains including Yellowstone and Grand Teton National Parks receive the majority of their annual precipitation in the form of snowfall. East of the mountain ranges, the climate tends to be semiarid and influenced by the Continental Divide. These areas are within the rain shadows of the mountain ranges and as a result, receive minimal precipitation. In general, most of the precipitation falls from spring through early summer across the state. The Wyoming Average Annual Precipitation (1981-2010) map displays the average annual precipitation in further detail. The data originated from the PRISM Climate Group at Oregon State University. It should be noted that precipitation limits the distribution of forests in Wyoming and is a key factor limiting tree growth.

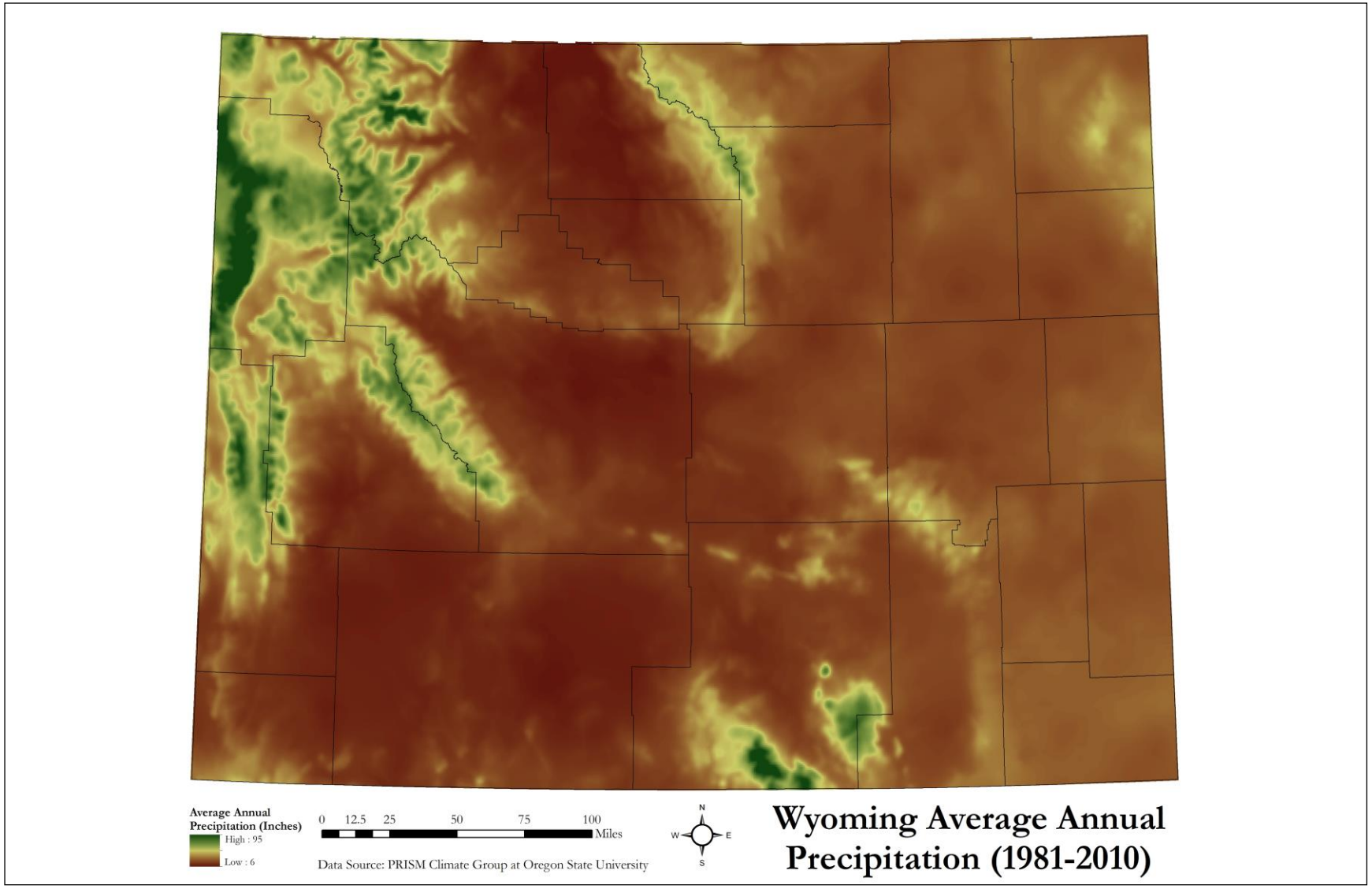


Figure 1. Wyoming Average Annual Precipitation from 1981-2010.

Forest Cover Types

Forest type, largely adapted from Bailey (1995) as well as Wyoming State Forestry Division and U.S. Department of Agriculture (2001), is one indicator of forest diversity and refers to the predominant tree species in a stand based on tree stocking. Approximately 17% (10.5 million acres) are forest and other woodlands. The spruce-fir is the most abundant forest type in Wyoming, covering 27.8% (2.9 million acres) of Wyoming's forest land. Second, in abundance is the lodgepole pine type which covers 24% (2.5 million acres). Pinyon/juniper is the third abundance forest type in Wyoming covering 10.3% (approximately 1.1 million acres). The fourth abundant forest type is nonstocked forest land which accounts for 8.2% (0.86 million acres). Moreover, the ponderosa pine accounts for 8% (0.8 million acres) and douglas-fir accounts for an additional 7.75 (0.8 million acres) (DeRose et al., 2018). The remaining forested land in Wyoming includes western softwoods forest type, which covers 6% of the state and hardwoods including aspen/birch and oak/hickory make up the balance at 7.8%.

The Wyoming Forest Type map displays the major forest types throughout the state and illustrates the evident and predictable nature of vegetation zones in relation to mountainous topographic features. The Wyoming Forest Type data came from the U.S. Department of Agriculture Forest Service Rocky Mountain Research Station and the base layer featuring the topographic relief originated from the Environmental Systems Research Institute (ESRI). Moreover, the Wyoming forest type information was adapted from the Wyoming Forest Legacy *Assessment of Need* (2009) and written by The Conservation Fund in cooperation with WSFD.

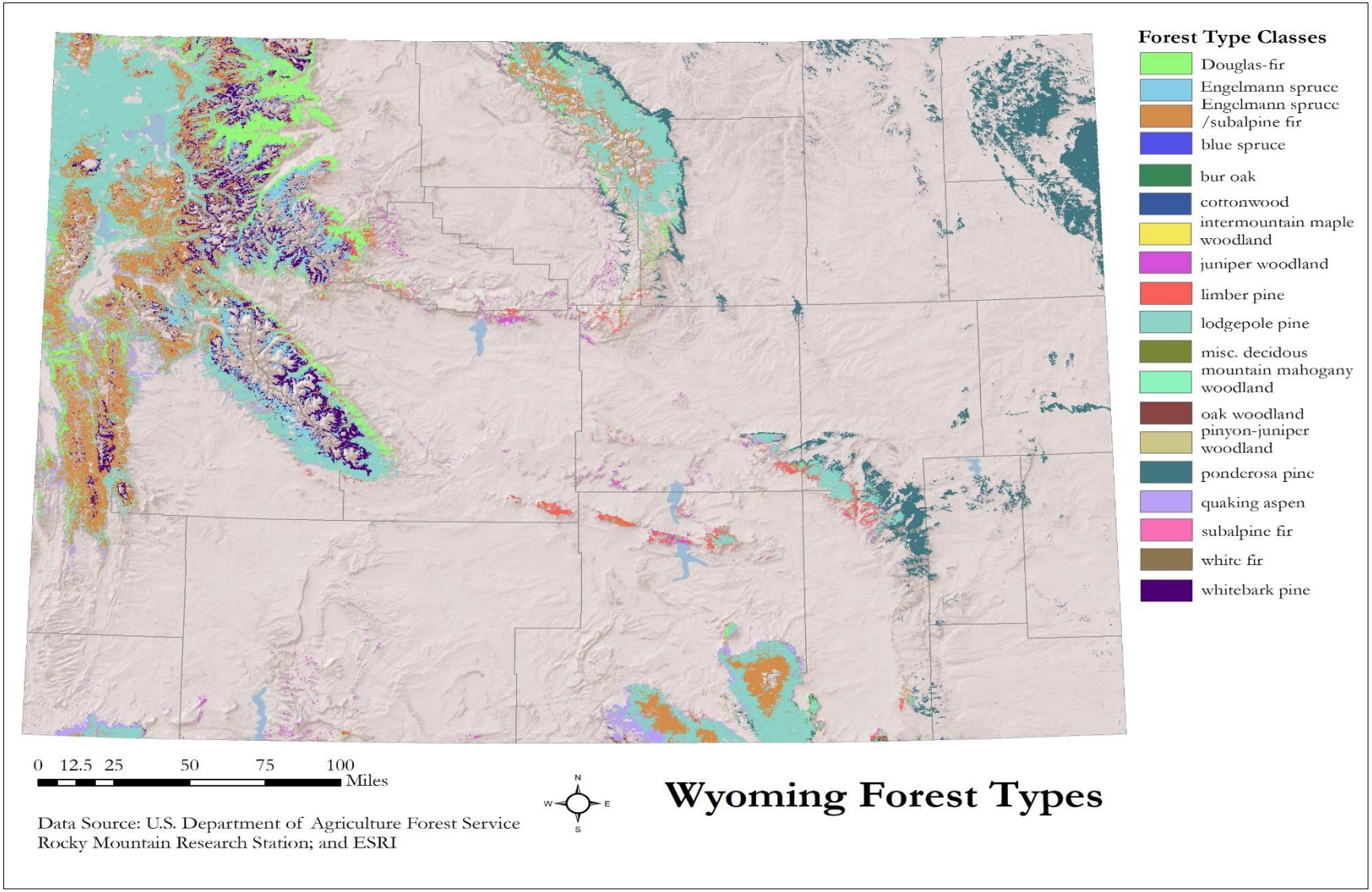


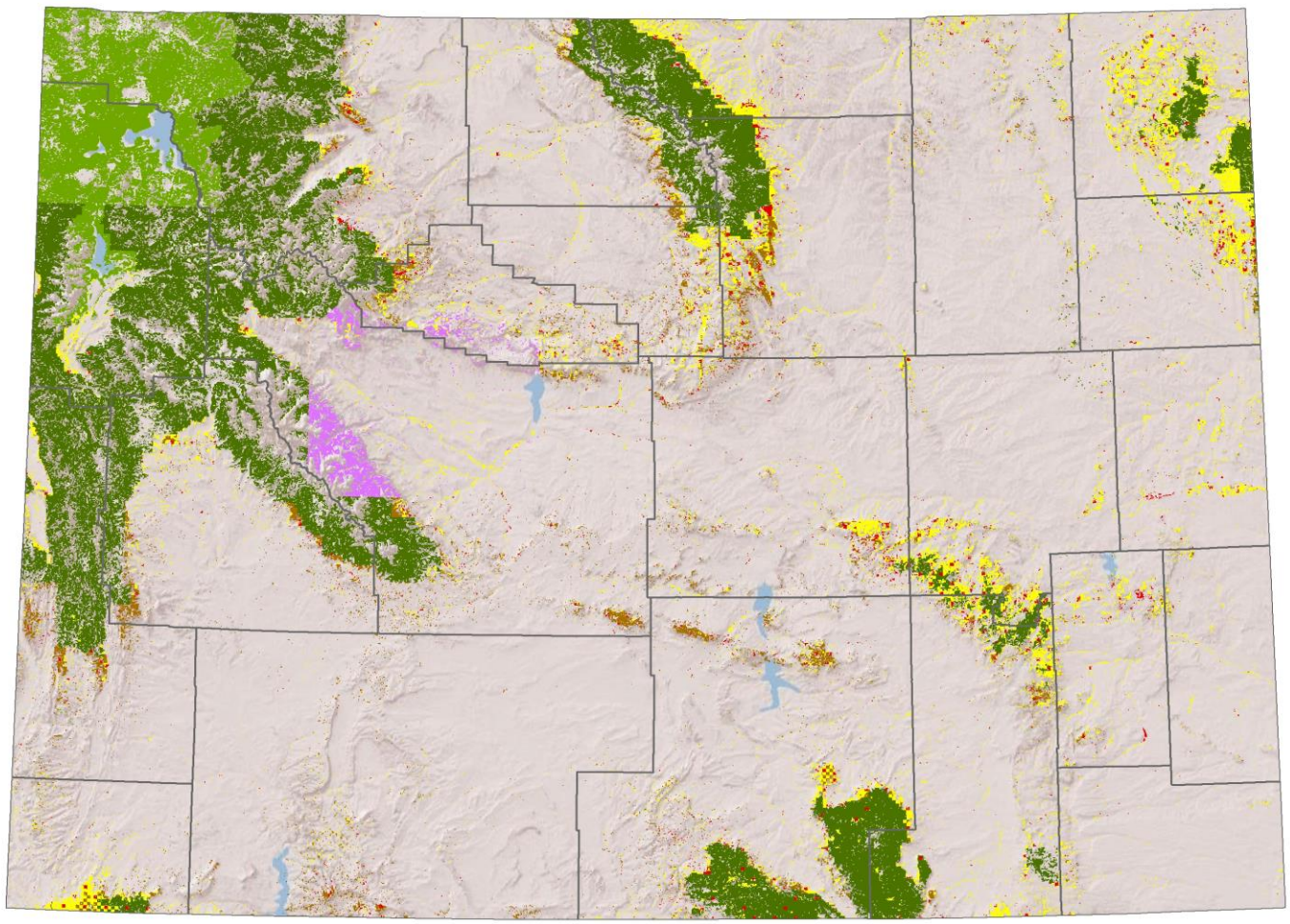
Figure 2. Wyoming Forest Types.

Forest Ownership

In Wyoming, forest land (including some woodlands) is predominantly administered by the U.S. Department of Agriculture National Forest System. Total Federal forest land in Wyoming is 8.1 million acres which specifically includes 5.8 million acres of National Forest, which is 56% of the total forest land. Privately-owned forest land encompasses 1.9 million acres. While, 6% (668,000 acres) is administered by the Bureau of Land Management (BLM), and the remaining Federal acres (1.6 million) are administered by other agencies such as the National Park Service, Department of Defense, and Fish and Wildlife Service. 3.4% (359,000 acres) is owned by the state, county, and municipal government.

Land ownership in Wyoming is often a checkerboard pattern with considerable intermixing of federal, state, and private lands. The pattern can complicate management and create challenges in accessing land for management activities. For example, before managing State Trust Lands, WSFD must locate the boundaries of the parcel and secure access to the parcel as an agency or in some instances, leave it up to the contractors to secure access to state lands. Given that the largest block of forested State Trust Land is about 4,500 acres out of 263,000 forested acres, that process happens many times each year. Other land management agencies can face similar issues. Many private land parcels face development/subdivision pressure. There is also a lot of ownership turnover which makes it challenging to have consistent management over multiple land ownerships. In order to get more forest management work done on the ground, new federal provisions such as the Good Neighbor Authority, are used as a guiding tool to increase capacity, get more projects done across boundaries and meet objectives across jurisdictions.

The Wyoming Ownership of Forest Land map provides spatial detail about the land ownership/management pattern within Wyoming. The ownership of forest land data was obtained from LANDFIRE and the U.S. Department of the Interior (DOI) Geological Survey (USGS) and information provided for the map was adapted from Wyoming's Forest Legacy *Assessment of Need* which was written by The Conservation Fund in cooperation with WSFD.



Ownership of Forest Land

- Bureau of Indian Affairs
- U.S. Forest Service
- State
- Private
- National Park Service
- Bureau of Land Management

0 12.5 25 50 75 100 Miles

N W E S

Wyoming Ownership of Forest Land

Data Source: LANDFIRE: Existing Vegetation Type layer. (2016). U.S. Department of the Interior, Geological Survey. [Online]. Available: https://www.landfire.gov/version_comparison.php [2019, April 20]; Wyoming's Forest Legacy Assessment of Need

Surface Management

Reserved forest land is known as land that is unavailable for wood utilization through administrative proclamation or legislation (DeRose et al., 2018). Examples include National Forest Wilderness areas as well as National Parks and Monuments. Approximately 32% of Wyoming's forest land is designated as reserved forest land (Forest Resources of the United States, 2017). The result of these designated non-timber values within the federal land management systems is that the importance of private forest land has been elevated further. Moreover, 3% of Wyoming's are located in Wilderness Areas, encompassing 3 million acres. Wilderness Areas may include forest and other land cover and per the Wilderness Act of 1064; undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed to preserve its natural conditions.

Unreserved forest land represents 66% of the forest lands in Wyoming, which is approximately 7.1 million acres. Approximately 18% (1.93 million acres) are estimated to be private forest lands. Timberland is defined as forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation (Forest Resources of the United States, 2017). Wyoming's timberlands are roughly 5.5 million acres, composed of national forest (71%), private (18%), other federal (7%), and state (4%) lands (Forest Resources of the United States, 2017). The average net volume per acre of live trees on unreserved timberlands in Wyoming is 1,628 cubic feet per acre (cf/ac.). Private lands account for 1,034 cf/ac, while national forests account for 1,556 cf/ac. The average net sawtimber volume on unreserved timberlands is 1,098 cf/ac. Private lands account for approximately 658 cf/ac of sawtimber volume, while national forest lands have 1,263 cf/ac of sawtimber volume. Sawlog volume in sawtimber trees on private lands is approximately 3,365 board feet per acre (U.S. Department of Agriculture Forest Service, Forest Inventory and Analysis Program, 2020).

Timber product removals originate from either growing-stock, dead trees, or other non-growing stock sources during harvest time (DeRose et al., 2018). In 2016, total tree removals in Wyoming equated to 13 million cubic feet (Forest Resources of the United States, 2017). The source of trees for the timber industry has made a dramatic shift. Privately owned forest land has become critical to the survival of this industry. In 1976, 78% of forest products were derived from public lands with only 22% derived from private lands. By the year 2000, the volume of materials harvested in Wyoming had declined by 78%, but most significantly 73% of those materials came from private forests. There has also been a shift in which forest types are most important to the timber industry. Up until 2014, Ponderosa Pine was the dominant species composition of Wyoming's timber harvest. Since 2014, Lodgepole pine has succeeded as the dominant species (McIver et al., 2016).

Private forest ownership timber stocking accounts for 21% of annual gross growth, whereas national forest timberland removals account for 8% of gross growth (DeRose et al., 2018). Moreover, the total volume of growing stock within Wyoming is around 8.73 million cubic feet (0.15% of the growing stock). Timber from private lands is an important link in the supply chain of raw material to forest product companies in and near Wyoming. However, despite the difficulties of contract administration and timber availability on federal lands, all forested lands in Wyoming are important to the forest product industry and companies.

The number of Wyoming mills has declined over the years, but the industry has improved in overall efficiency and utilization. There has been an expansion of new forest product sectors such as biochar, cellulosic ethanol, house logs, manufactured log homes, and log furniture. Additionally, there have been significant investments into improvements at existing sawmills along with the additional stud mill in Northern Colorado that utilizes timber from Wyoming and using a HewSaw that allows for increased recovery from harvested trees.

While the amount of harvest from Federal land can at times be limited in reserved areas and emphasis on non-timber harvest uses such as preservation. Forest Management activities often can help conserve forest resources for the long-term and enhance access for recreational opportunities among other benefits. Utilizing authorities such as Categorical Exclusions and Good Neighbor Authority (GNA) has assisted with increased forest utilization and fuels reduction in many areas including roadless areas.

Wyoming's forest product industry is a significant component of Wyoming's economic and employment picture and is inextricably linked to the forest industries of neighboring states. Net annual growth of softwood timber in 2017 was a decline of -157,668 thousand cubic feet from all ownerships, and hardwood timber was 1,194. Removals for all species was 12,983 thousand cubic feet, and mortality was 328,119 thousand cubic feet (Oswalt et al., 2019). The Surface Management map displays the ownership status of land across Wyoming. For example, Bankhead Jones land is managed by the U.S. Forest Service and Bureau of Land Management and displayed as the color black throughout the map. The surface management data was adapted from Wyoming's Forest Legacy *Assessment of Need* which was written by The Conservation Fund in cooperation with WSFD. It is important to note that for the GIS analysis, roadless areas were not considered reserved land.

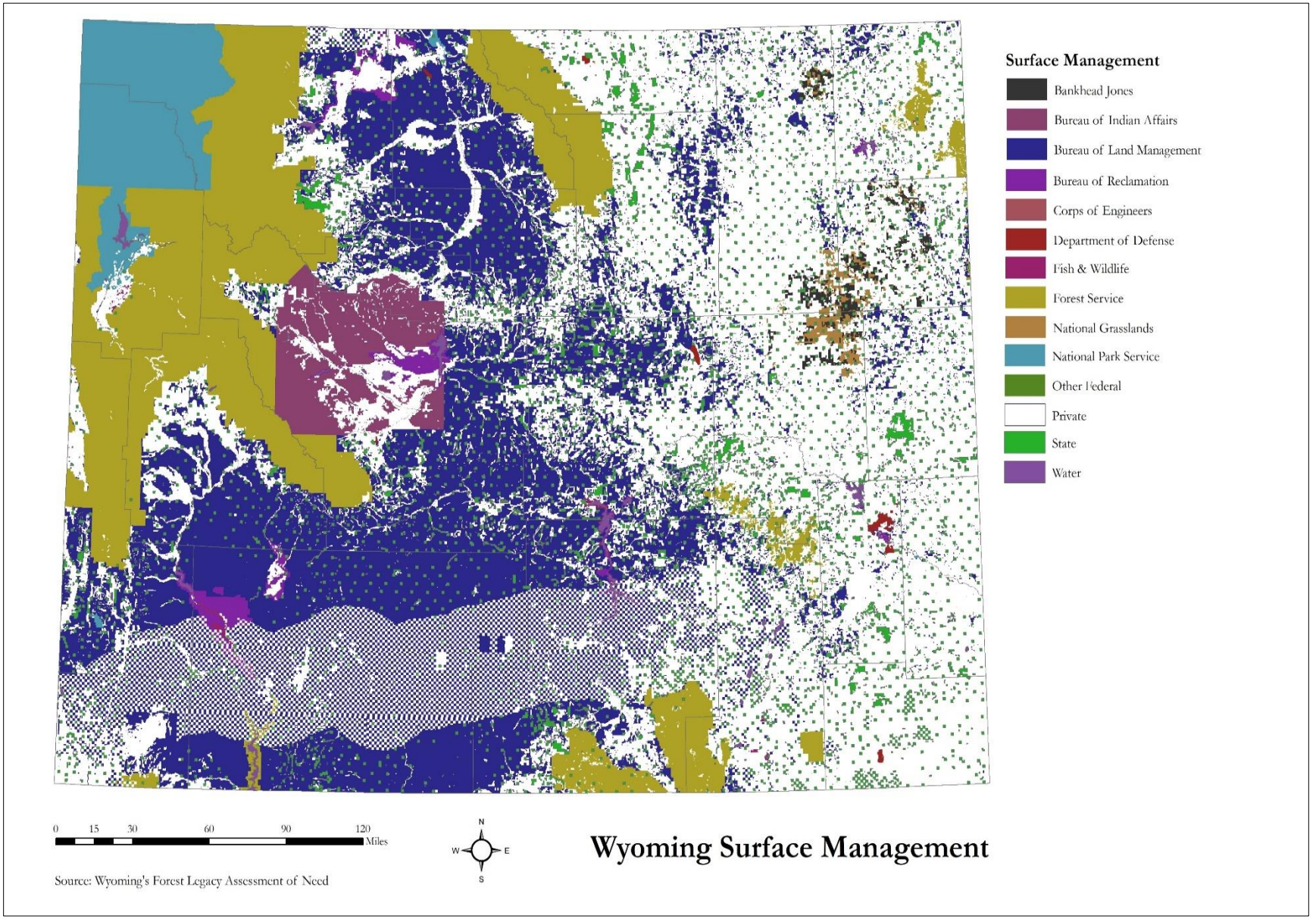


Figure 4. Wyoming Surface Management

Riparian Forests

Riparian forests are a highly valuable component of Wyoming's landscape. They exist where there is an adequate amount of moisture, typically along creeks, rivers, and areas with human influence, along with irrigation ditches. These forests can be as narrow as the shore along a river to several miles wide most often depending upon hydrology. In higher elevation settings, they are flanked by coniferous and aspen forests, while in lower elevations they typically border sagebrush steppe and grassland habitat types.

Compositionally, riparian forests vary greatly throughout Wyoming with elevation and hydrology as the primary factors determining species occurrence and distribution. At higher altitudes, spruce, fir, alder, willow, and birch are common components, transitioning to Douglas-fir, maple, chokecherry, hawthorn, mountain ash, plum, and serviceberry in lower elevation mountain forests. In Wyoming, aspen is the most common deciduous component of upland riparian sites. Cottonwood, boxelder, and willow predominate in the plains. Some eastern hardwoods such as American elm, bur oak, hackberry, and hophornbeam at the western edge of their ranges are significant components of riparian forests in the lower elevations of eastern Wyoming. Non-native species such as Russian olive and saltcedar have extensively invaded some riparian areas, outcompeting native species, significantly reducing the quality of wildlife habitat and contributing to diminishing stream flows.

Less than one percent of the Intermountain West is classified as riparian forest, yet an estimated 80% of wildlife depends on this limited area for food, water, shelter, and migration routes during a portion of their life cycle. Consequently, riparian habitats are biologically rich, providing the greatest species diversity within Wyoming. Just as importantly, wildlife uses of Wyoming's riparian forests and associated riparian lands as migration corridors as these forests connect tracts of forested lands, and the structure of these forests provides cover and shelter for virtually every species of wildlife within Wyoming.

The wildlife uses of Wyoming's riparian forests and associated riparian lands are essential migration corridors, connected with consecutive tracts of forests that provide the uninterrupted structure, shelter, and canopy cover for nearly every species of wildlife within Wyoming. Riparian forests and associated riparian habitats are particularly important for bird species. Over 60% of the Neotropical migratory bird species in the western United States use riparian areas at some point during the year. Breeding diversity of birds is higher in riparian habitat than all other western habitats combined. Therefore, it is critical to protect this valuable type of land and consider long-term management decisions and planning.

Riparian forests and associated riparian habitats are particularly important for bird species. Over 60% of the Neotropical migratory bird species in the western United States use riparian areas at some point during the year. Breeding diversity of birds is higher in riparian habitat than all other western habitats combined.

Riparian zones at the bottom of V-shaped valleys incised in bedrock are generally stable. However, riparian zones on the alluvial soils of broad floodplains common across Wyoming can change rapidly. A complex and shifting mosaic develops based on spring floods that overflow banks and relocate channels. Periodic spring floods create new channels and soft alluvial soils

are eroded as the river seeks shorter passage downstream. Banks are cut on the outside of turns and point bars of sand and gravel are formed on the insides of turns, creating a new habitat for the succession of riparian forest species. Oxbows are created in former river channels, creating wetlands and over time, fertile ground for the establishment of cottonwood and other tree seedlings. Riparian forests also play a key role in filtering sediments and nutrients and storing water in the spring in alluvial zones to sustain streamflow during drier months.

Wildfire also influences riparian forest ecology, despite higher moisture conditions than other forest types. Improved moisture conditions typically result in increased herbaceous and woody biomass. Seasonal curing of fine fuels makes wildfires common occurrences from late summer through early spring in many riparian forest habitats. These fires are often characterized as less intense with a corresponding reduction in destructive capacity. Drought and the buildup of dead woody fuels can lead to more intense fire behavior with stand replacement capabilities. Both types of fire activity should be considered typical for riparian forests though frequency rates differ. Some species such as aspen are highly dependent on fire disturbance to maintain population vigor.

Cottonwood forests provide much-needed shelter, stock water, and shade for human settlement and livestock operations across Wyoming’s high plains landscape. Human settlement has altered some aspects of forest ecology. Flood control through the construction of dams and dikes has had a significant impact on riparian forest health in many parts of the state. Cottonwood trees need flushing flows and the creation of point bars for the establishment of seedlings. Cottonwood re-establishment requires naturally occurring seasonal flushing flows and the creation of point bars. With regeneration significantly diminished, cottonwood woodlands appear to be declining in many areas of the state. The beaver populations play a significant role in influencing riverine and riparian hydrology and in creating important habitat for fish, wildlife, and livestock. Although, their prevalence is still significantly diminished from past levels.

The productivity of riparian sites has resulted in the extensive conversion of riparian forest to other uses such as agriculture. Much of Wyoming's most productive agricultural lands are within or adjacent to riparian areas. Proximity to water has made riparian areas valuable for urban, industrial, and recreational development. At lower elevations, aging tree populations combined with a general lack of successful regeneration due to altered water flows, drought, agricultural and industrial uses, and urban development have resulted in the rapid decline of riparian forests in recent years.

Aspen, the most common deciduous component of Wyoming forests, has been a growing focus of concern within the Rocky Mountain Region. Approximately two-thirds of aspen forests are disturbance dependent and the combination of fire suppression plus a reduction in forest management - including less harvest of more shade-tolerant conifers - has contributed significantly to the decline of aspen populations. However, the apparent decline of aspen could be a decline from higher amounts of aspen that resulted from large disturbances about 100 years ago with natural forest succession replacing aspen pending the next disturbance by harvest or fire. Nonetheless, stands are showing significant decline due to fire exclusion/suppression, reduced regeneration, succession to conifers, and browsing pressure from ungulate populations

and domestic livestock. Aspen mortality appears to be prevalent in lower elevations and drier sites. If climate conditions warm, aspen forests may experience higher mortality.

Water Resources

Water is a crucial natural resource in Wyoming that supports its population and forested landscape. The availability of water resources is contingent upon spatial and temporal factors such as topography and climate throughout the state (Hansen et al., 2015). Wyoming is known as a headwaters state, with four major river basins encompassing it including the Missouri-Mississippi, Green-Colorado, Snake-Columbia, as well as the Great Salt Lake.

Forests can help protect water resources, including drinking water, and when managed effectively and efficiently the protection can be increased. In particular, forests help filter and maintain the flow of rainwater to streams, rivers, and groundwater aquifers. Unmanaged forests can be more susceptible to a variety of issues that can impact water quality. Insect and disease issues can lead to tree mortality, increasing fuel loads, and risk of wildland fires. Depending on mortality rates, erosion issues can increase leading to sedimentation of waterways, lakes, and reservoirs. Wildland fire, depending on several factors including intensity and duration, can lead not only to erosion but additional sediment with ash and other debris. The cost of removing sedimentation can prove to be a very difficult and costly issue which not only can impact drinking water but wildlife and the ecosystem.

Many Americans receive their drinking water from surface water or groundwater located on forest land. Subsequently, it is crucial that forests are managed in a sustainable and healthy manner. Poor forest health has the potential to influence the amount of water traveling through forests. State and Private Forestry provides assistance and planning for forest health and Forest Legacy projects within target watersheds, helping protect drinking water. As noted by the National Association of State Foresters (2019), “states should prioritize service delivery to these identified Target Watersheds in order to help protect drinking water supplies, and to help demonstrate the value of federal investment in state programs”.

To provide further insight into Wyoming’s water resources and more specifically target watersheds, the National Association of State Forester’s Drinking Water Performance Measure data was utilized. This includes information on target watersheds, population by watershed, as well as surface water and groundwater targets. Overall, there are 67,140,570.72 acres of watersheds in Wyoming or those intersecting a watershed. The smallest watershed in Wyoming is the Quarter Corner Pond which encompasses 3,056.81 acres. The largest is the Big Thumb Creek-Yellowstone Lake which is 210,614 acres. The Garden Creek-North Platte River has the largest population within its boundaries.

The target watershed data includes Forest to Faucets index values >30. There are several target watersheds throughout Wyoming and many of these overlap with forested land throughout the state. As seen in the Wyoming Target Watersheds map a significant portion of western and northwestern Wyoming have target watersheds. This is also true for portions of southeastern Wyoming, Laramie Range, as well as north-central Wyoming. However, this is not to say that there are not target watersheds located in other portions of the state too. As seen in the map, there are also other crucial target watersheds located throughout the state. As a result, it is imperative

that forest management focuses on the importance of watersheds across Wyoming and maintaining them for municipal use as well as supporting forests across the landscape.

The Wyoming Total Population by Watershed map's data also stems from the National Association of State Forester's Drinking Water Performance Measure dataset. The total population is a combination of the population served from municipal groundwater supply and the modeled population served by municipal surface water. Moreover, both the groundwater population and surface water population were adjusted by the service delivery footprint. As seen in the Wyoming Total Population by Watershed map, the largest populations by watershed are located within portions of Park County, overlapping into Montana and Natrona County, including the city of Casper. Other areas with the largest population by watershed including portions of Lincoln and Sweetwater counties, as well as Carbon, Albany, and Laramie counties.

Groundwater in Wyoming is mainly a result of alluvial and bedrock aquifers (Wyoming State Geological Survey, 2020). It is recharged as a result of rain and snowmelt within the mountainous portions of Wyoming. In the semi-arid portions of the state, there is oftentimes less precipitation, a decrease in soil permeability, and the likelihood of evaporation is greater. As a result, there is less groundwater recharge in these areas (Wyoming State Geological Survey, 2020). The Wyoming Groundwater Targets map provides insight into crucial groundwater targets throughout the state. The data for this map originated from the National Association of State Forester's Drinking Water Performance Measure dataset. In this instance, groundwater targets appear to be sprinkled throughout Wyoming on the map.

Even though the mean annual precipitation for Wyoming is 16 inches of precipitation, 17 million acre-feet of total annual flow are produced within the state under normal conditions (Hansen et al., 2015). A majority of Wyoming's surface water originates from high-elevation snowpack, helping maintain rivers, streams, and reservoirs (Hansen et al., 2015). There are a few rivers that bring water into Wyoming including the Laramie and North Platte Rivers, Blacks Fork, Henry's Fork, Bear Rivers, as well as the Clarks Fork River. The Wyoming Surface Water Targets map brings awareness to important surface water targets throughout the state. The data used for this map is from the National Association of State Forester's Drinking Water Performance Measure dataset. In this instance, there are clusters of surface water targets primarily through the western portion of the state, southwestern, central, north-central, and southeastern portions.

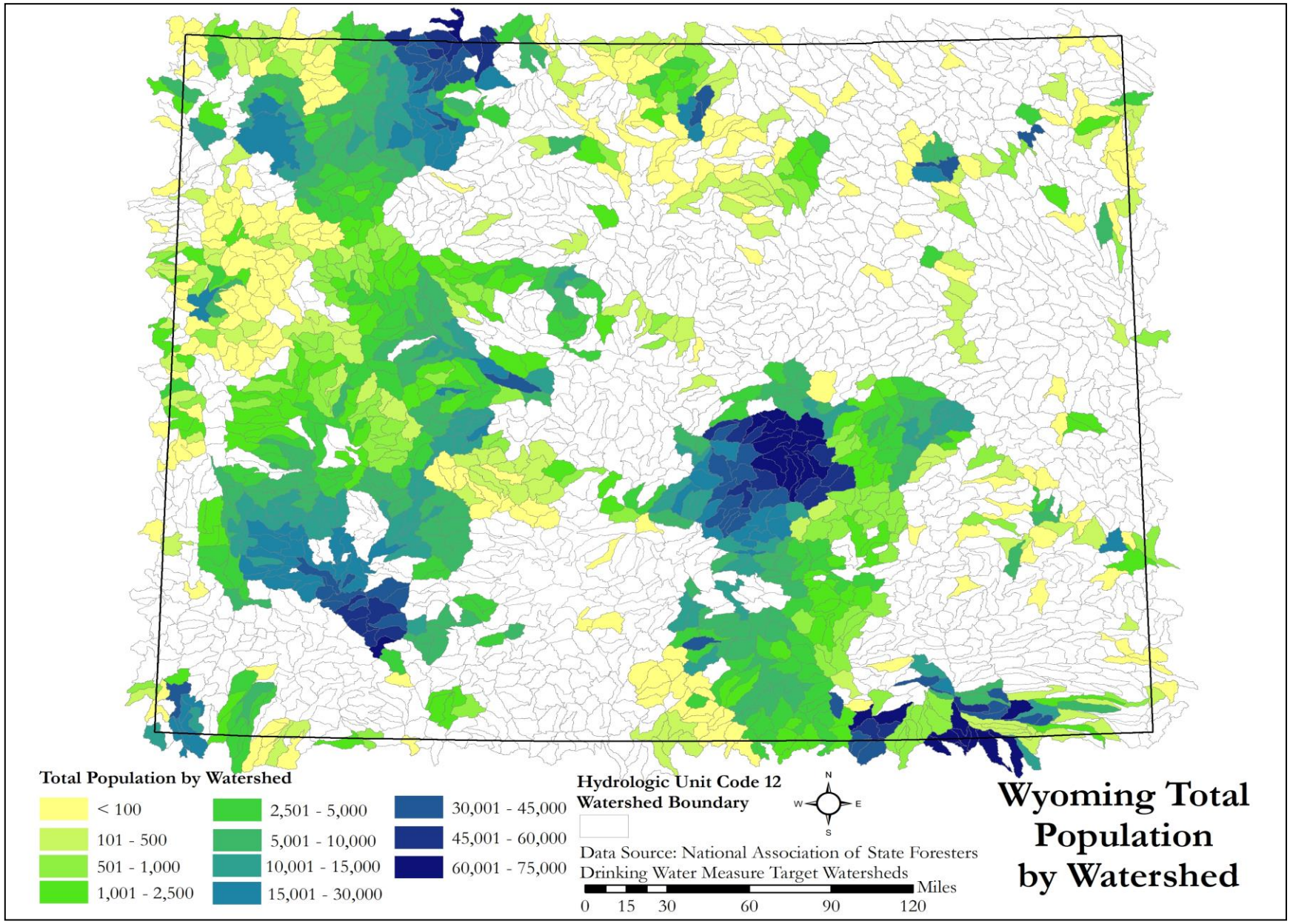


Figure 5. Wyoming Total Population by Watershed.

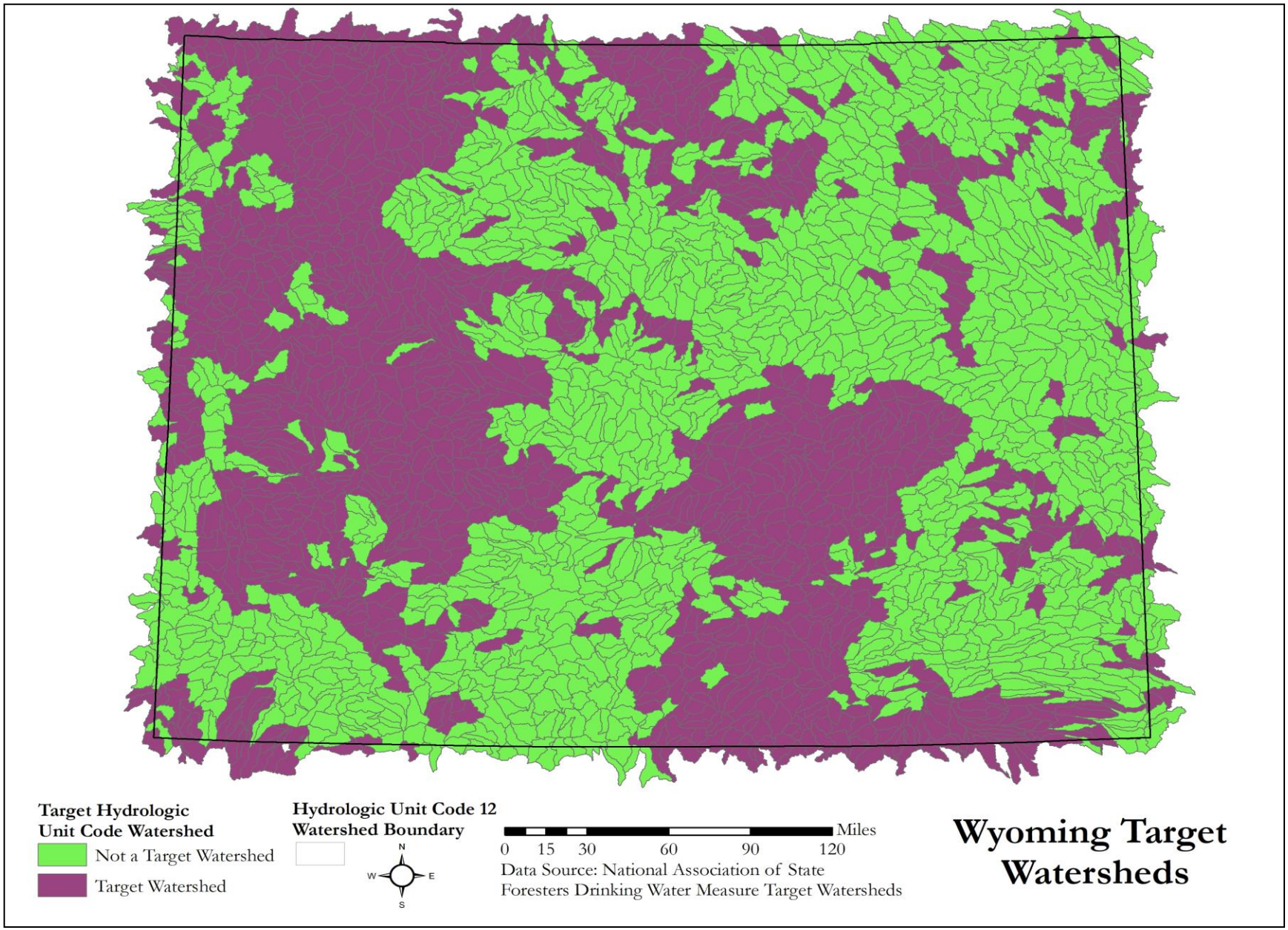


Figure 6. Wyoming Target Watersheds.

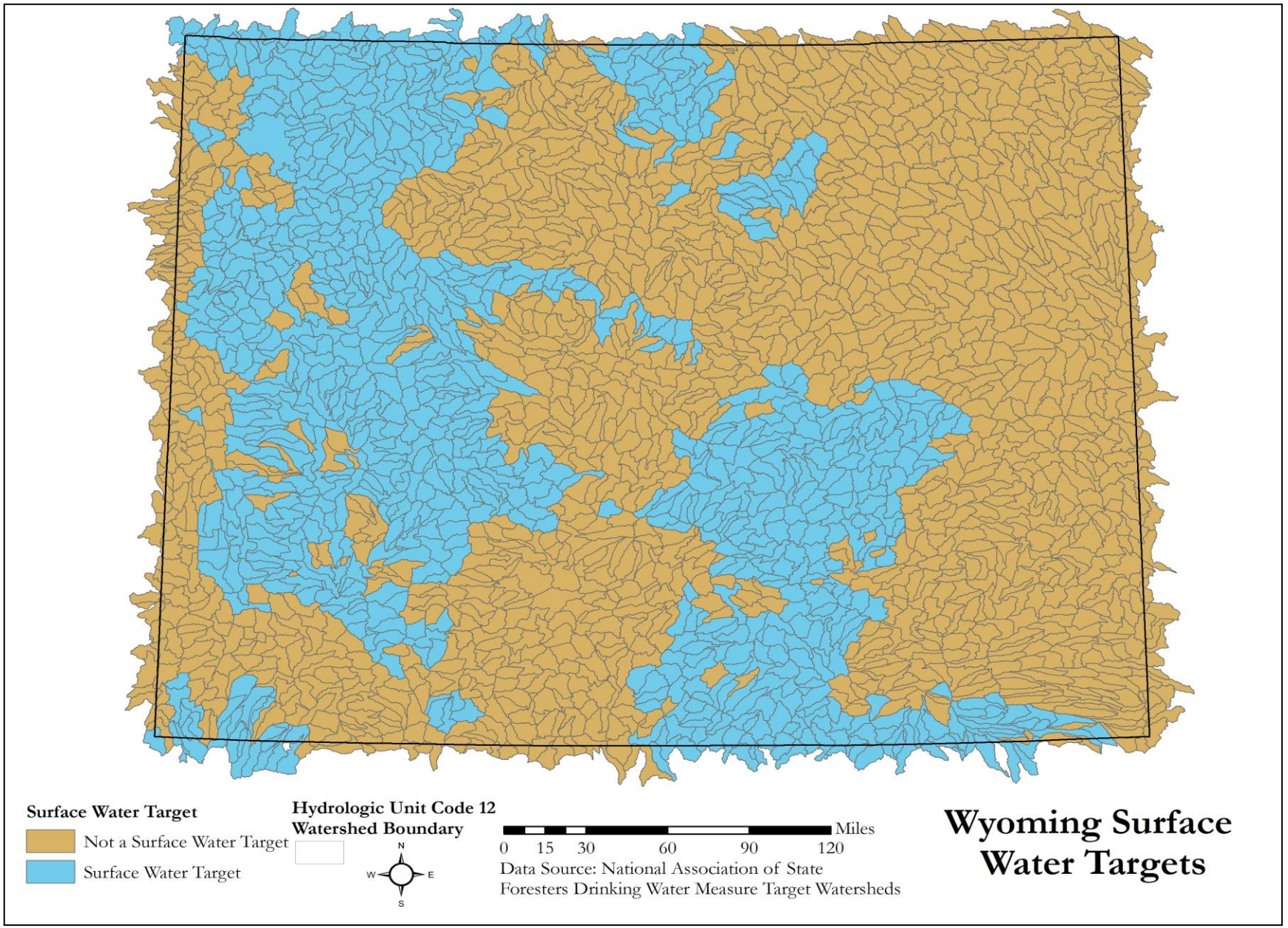


Figure 7. Wyoming Surface Water Targets.

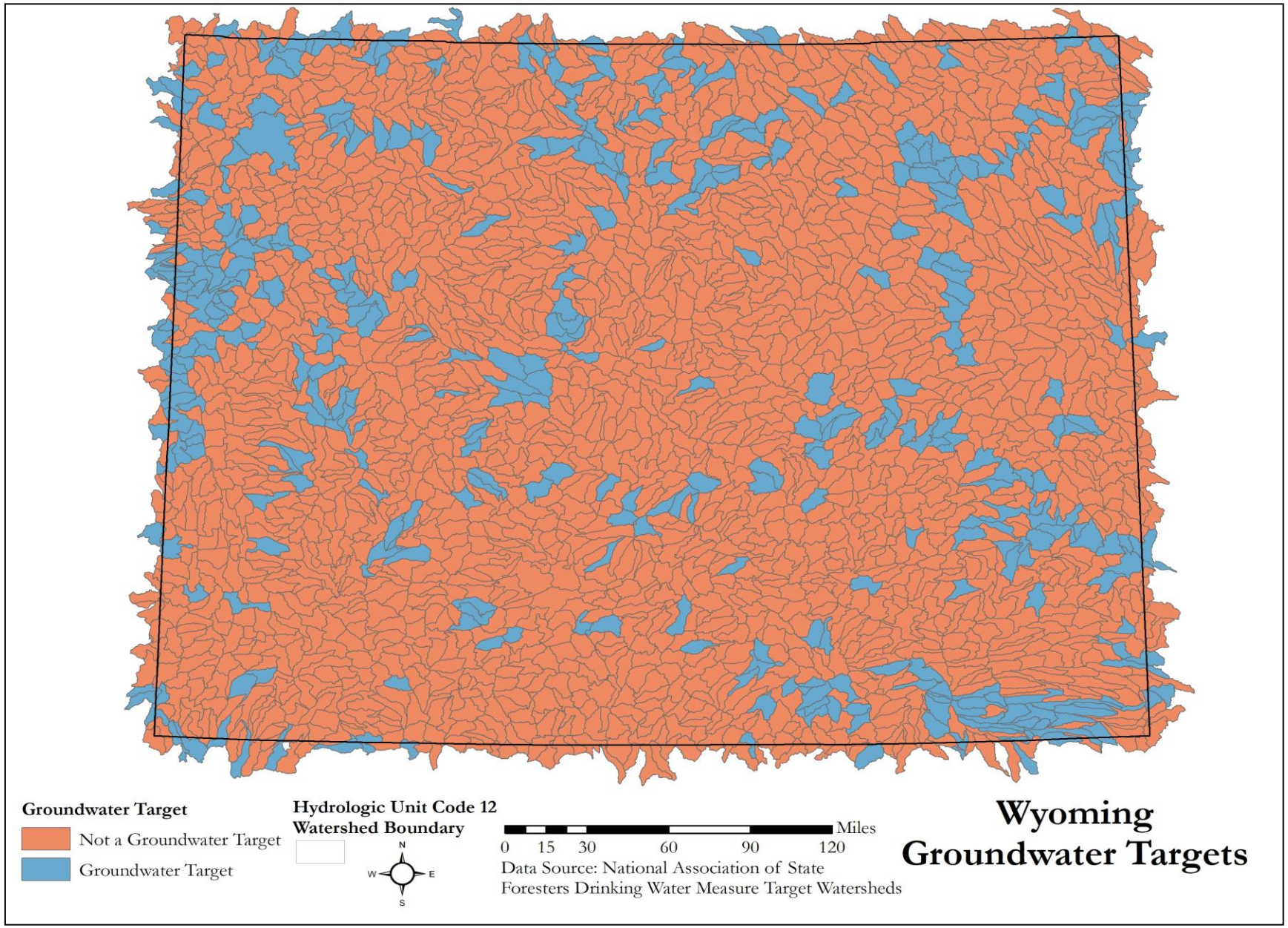


Figure 8. Wyoming Groundwater Targets

Urban and Community Forestry

Wyoming's community forests are an important resource for residents and tourists alike. Wyoming leads the nation with one of the highest percentages of Tree City USA recognized communities, averaging around 40%. Additionally, Wyoming has two higher education campuses recognized as a Tree Campus USA. These recognitions must be applied for and renewed each year by the community.

The community forest consists of all trees, vegetation, and landscaping located in and around developed spaces, trees, and other associated vegetation in and around cities, towns, and developments. Community forests serve many of the same functions as other forests. They affect natural systems, like the water cycle and the nutrient cycle. Community trees are important for reducing storm-water runoff by intercepting water and lowering the urban heat-island effect by shading and lowering temperatures. Trees contribute to a sense of community by characterizing the setting. They reduce urban noise, pollution, and provide places to rest and socialize through aesthetics. Community trees increase property values and play an important role in the economic vitality of Wyoming's communities. The community forest canopy is a distinctive feature of the landscape that provides residents protection from the elements and forms a living connection to earlier generations that planted and tended these trees.

Research on the costs and benefits of Wyoming's community forests concluded that for every $1 spent on public trees the residents receive $2.09 in benefits. Additional research revealed that Wyoming's community forests store 436,484 tons ($8,138,006 value) of carbon and annually sequester 14,162 tons of carbon valued at $259,951 per year. Defining the boundaries of the community forest is difficult because the change between urban and rural land use is gradual in many parts of the state. Wyoming cities and towns have about 194,000 acres of land within their incorporated boundaries. It is estimated that over 2 million trees exist within these boundaries. Small acreage tracts surrounding towns such as Casper, Cheyenne, Jackson, and others contain hundreds of thousands of additional trees that are essentially part of the community forest ecosystem.

Funding for tree management at the local level continues to increase. As local governments gain a better understanding of the benefits of community trees, they allocate more staff and funding to care for their community forests. The WSFD's Community Forestry Partnership Cost-Share Grants require a local cash match for tree planting projects or in-kind match for program development projects which in turn has been a catalyst for cities to create budget line items for community forestry management. WSFD Community Forestry program offers around $100,000 annually in financial support for tree planting, program development, and training projects and programs. By requiring a match component to the grants WSFD effectively leverages almost $200,000 in program and project development annually.

Tree health in community forests continues to be a concern, due to native forest health threats and abiotic factors. In addition, emerging exotic pests such as emerald ash borer (EAB) and gypsy moth threaten Wyoming's urban trees. WSFD Forest Health program leads to annual invasive pest monitoring, trapping, and data collection through cooperation with USDA APHIS and USDA USFS. These federal partnerships offer guidance for prioritizing emerging invasive pests, such as EAB and gypsy moth. With increased diversity of non-native tree species in our community tree

canopies versus our native forests, invasive pest issues also increase. Thus, providing the need for current community forest inventories and management plans.

Comprehensive tree inventories on publicly owned land have been completed in over 40 cities and towns. These inventories have revealed a lack of species diversity in most communities with green ash, cottonwood, spruce, and Siberian elm making up a large percentage of the species. Private trees - those located in yards - have much greater species diversity than public trees. The elevation of Wyoming towns varies from just over 3,800 feet to over 9,000 feet with lower elevation communities having greater potential for species diversity and faster growth rates for planted trees.

During the years 2013-2016, six new arboreta were established, and one historic arboretum was enhanced and improved in communities across the state. The goals of these arboreta are to demonstrate tough trees that can survive in various regions of Wyoming based on climate and elevation. Additionally, education is a primary objective for the arboreta by introducing and highlighting species that perform well to improve species richness and diversity.

Non-Forested Lands

The WSFD through Assistance Forestry also addresses non-forested lands and has a direct and cooperative fire management responsibility on millions of acres of non-forested land. Through technical assistance and cost-share funding, WSFD has contributed to thousands of acres of tree planting on non-forested residential and agricultural lands for snow control along highways and in communities that are not part of a traditional forest. Therefore, any state forest resource assessment for Wyoming must also address non-forested lands.

Other Critical Forest and Fire Management Plans and Initiatives

Several partnering agencies across Wyoming have established their own critical forest and fire management plans and initiatives over the years. These plans and initiatives serve as additional guidance and overview regarding Wyoming's natural resources. Several of these documents and protocols overlap with the Forest Action Plan, aiming to further address areas of opportunity and threats. The following provides insight into these specific plans from our state and federal partners.

Wyoming Wildlife Action Plan

The Wyoming State Comprehensive Wildlife Conservation Strategy (CWCS) was produced to provide a long-range conservation plan to conserve Wyoming's Species of Greatest Conservation Need (SGCN) and meet the requirements of the congressionally authorized State Wildlife Grants (SWG) Program. The Wyoming Game and Fish Department (WGFD) served as the lead agency in the development of this strategy, but many other partners and major stakeholders were invited to participate. The CWCS identifies 279 SGCN in Wyoming, along with key habitats for these species. Of these species, 44 have been included because of specific known conservation needs. The remaining 235 have been included primarily due to a lack of key data necessary to assess their conservation status. Key habitats for these species have been identified. Threats or challenges are identified, and the proposed actions to conserve the SGCN and their associated habitats are addressed. Monitoring measures are also identified.

National guidance for statewide assessments of forest resources and the 2008 Farm Bill requires that commonalities between state assessments and state wildlife action plans be addressed. The WSFD consulted the WGFD for input regarding the data for the fish and wildlife habitat analysis and maps. WGFD also reviewed the draft Assessment regarding wildlife issues. The recommendation from WGFD was to utilize their data for priority habitat for aquatic and terrestrial species plus priority habitat for non-game species. Sage grouse core habitat areas were also included which was decided by WSFD. WSFD believes that the inclusion of the priority habitat layers and the review by WGFD effectively incorporates the state wildlife action plan into the Wyoming Statewide Forest Resource Assessment.

National Forest Land and Resource Management Plans
Multi-resource management plans are developed for the national forest system (NFS) lands according to the National Forest Management Act direction. WSFD has been an active partner in the plan revision process and therefore has a good working knowledge of the latest land and resource management plans. Those plans provide direction for the management of NFS lands. Threats and priorities identified by the Assessment, and direction provided by the resource strategy, can be addressed/implemented only to the extent allowed by the management plans.

Bureau of Land Management Plans
The Bureau of Land Management (BLM) also develops multi-resource management plans for the lands it administers. WSFD and the Office of State Lands & Investments (OSLI) also have a working knowledge of BLM RMP Resource Management Plans (RMP). Those plans provide direction for the management of BLM lands. Threats and priorities identified by the Assessment, and direction provided by the resource strategy, can be addressed/implemented only to the extent allowed by the management plans.

Private Forest Management Plans
Of the approximately 1.9 million acres of private forest lands in Wyoming, 23% (430,218 acres) have management plans developed through the Rural Forestry Assistance Program. Those management plans have been developed as a guide for landowners to help them achieve their stated management goals and objectives. The information gathered through this effort has contributed to the development of the State Forest Resource Assessment.

Fuels Mitigation
Community Wildfire Protection Plans (CWPP) have been developed at the county level. There are 24 up to date CWPPs throughout the state, providing direction on wildfire and hazardous fuels management. The CWPPs identify priority areas for wildfire mitigation/fuel reduction projects and make recommendations for how projects should be implemented. The CWPPs also define the boundaries of at-risk communities including all land ownership and have been an important source of information for land managers.

The Fuels Mitigation Program with WSFD provides the opportunity for landowners to participate in the NFP program and oftentimes generate CAFA projects on private and state lands. In some instances, this land is adjacent to U.S. Forest Service land. Fuels mitigation projects aim to reduce wildfire risk through defensible space, fuels treatments, as well as fuels breaks.

Forest Legacy Program

In 2005, Wyoming Governor Dave Freudenthal designated the Wyoming State Forestry Division as the lead agency for the USDA's Forest Legacy Program (FLP) in Wyoming. The purpose of the Forest Legacy Program is to identify and protect environmentally important forest areas that are threatened by conversion to nonforest uses and to promote forestland protection and other conservation opportunities. Desired outcomes include the protection of important scenic, cultural, fish, wildlife, and recreational resources, riparian areas, and other ecological values. Traditional forest uses, including timber management, as well as hunting, fishing, hiking, and similar recreational uses are consistent with purposes of the FLP. The FLP acquires and accepts donations of perpetual conservation easements that permanently limit property interests and uses to protect forest values. The FLP also purchases and accepts donations of forestland in full fee. The FLP only works with willing sellers or donors.

The Forest Legacy *Assessment of Need* for Wyoming was developed to document the need for a Forest Legacy Program in Wyoming, identify priority areas, and provide program direction. The Assessment of Need was reviewed and approved by the USDA in 2009 and along with the USDA Forest Legacy Program Implementation Guidelines are the guiding documents for the implementation and delivery of the Forest Legacy Program in Wyoming. The Assessment of Need (2009) and Program Implementation Guidelines (2017) are hereby incorporated into this document by reference. The data and analysis provided in the *Assessment of Need* contributed significantly to this document.

State Trust Land Management Plans

State trust land management plans are typically written at the project level. Development of a statewide management plan for forested lands, including an updated inventory, is in progress with data collection underway. WSFD preserves excellent knowledge of the priorities identified and management recommendations made by trust land management plans.

Governor's Task Force on Forests

Over the years, Wyoming's forests have experienced an array of challenges such as insect infestations, wildfires, as well as droughts. The Governor's Task Force on Forests aimed to assess and offer recommendations on how to actively and passively manage Wyoming's forests. Moreover, the final report and initiative provide resource management guidance as well as economic opportunities and innovation recommendations. As a result of the final report and study, there have been several recommendations and studies. For example, there have been several watershed studies conducted throughout the state to better understand the risks associated. Another recommendation as a result of this initiative was the 2016 Wyoming Forest Biomass Conference, which provided the opportunity to share information, data, resources, as well as expand the forest biomass industry within Wyoming.

GIS Analysis and Assessment of Wyoming's State Forest Resources and Priority Landscapes

Data Layers

National direction suggests that state forest resource assessments should be built upon previous analysis and utilize existing data when possible. The Wyoming State Forest Resource Assessment partially follows the Spatial Analysis Project (SAP) methodology. WSFD selected

ten layers for the GIS analysis. In some instances, the data had to be adapted for use in this assessment. WSFD made every attempt to use the data correctly and without bias. The reader should use caution when interpreting or reaching conclusions based on the content of any data layer. While the data layers generally depict conditions in the state accurately, in some instances, if taken out of context, the data could be or appear misleading. Further detail on each of the state forest resources and maps follow. It is important to note that the data layers and maps from this statewide assessment are not intended to be used for detailed analysis at large or project-level analysis. Please use caution if attempting to use or interpret data from this assessment. The national direction for state assessments suggested using at least one data layer to represent each strategic objective from the three national themes.

One reason for the exclusion of those strategic objectives from the GIS portion of the Wyoming Statewide Forest Resource Assessment is that layers are already included. Additional layers reduce the impact of all of the layers in the assessment. WSFD believes that the strategic objectives that are most important to Wyoming are included in the GIS analysis. Objectives such as connecting people to trees and forests and global climate change are addressed in other ways throughout the Wyoming Statewide Forest Resource Assessment. The national direction encourages regional and multi-state analyses to delineate multi-state priority landscape areas. In the West, states are independently developing state assessments that are appropriate for their unique circumstances. Because there is no west-wide assessment, states will need to work together to identify priority landscapes across state boundaries after the individual state assessments are completed.

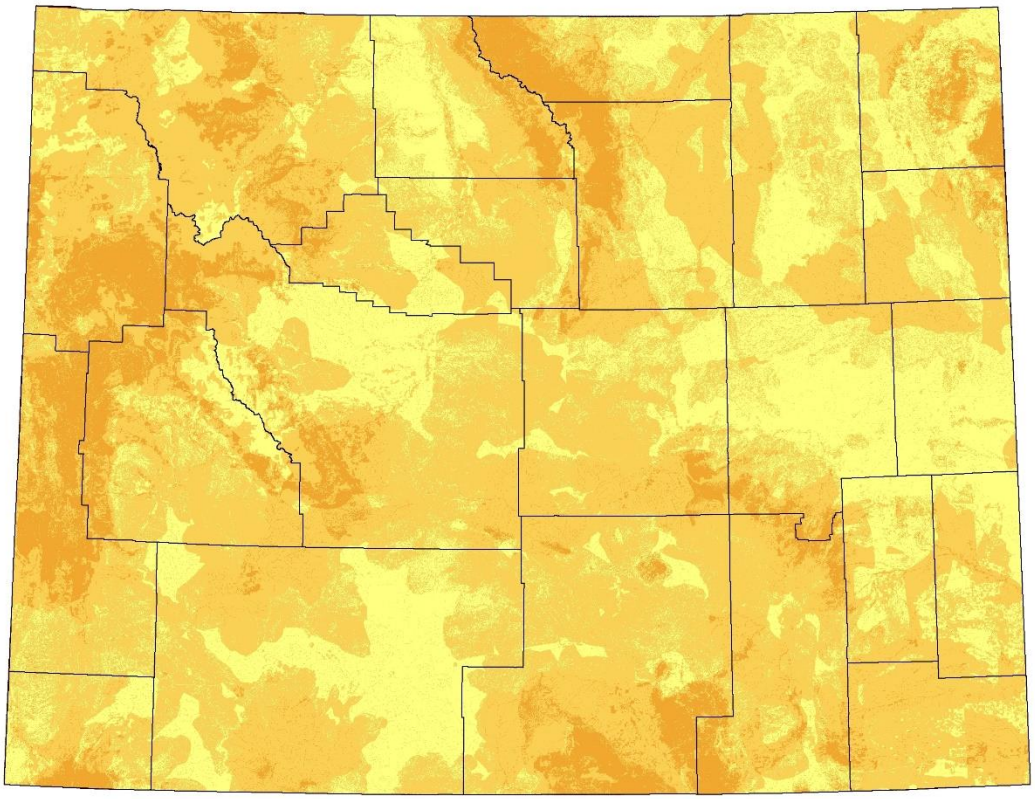
National direction also indicated that a state's geospatial assessment can include one or more weighted overlay analyses to identify priority landscapes. Wyoming's forest resource assessment results in the composite dataset that is the final geospatial output of the Wyoming Statewide Forest Resource Assessment.

The national direction provides the opportunity for states to complete a separate analysis for individual resource management concerns. For example, if state priorities included forest health, community forestry, and wildfire risk, a state could produce a separate analysis to identify priority landscapes for each. WSFD acknowledges that it could take that approach and identify priority landscapes for many different resource management concerns. However, WSFD questions the value of that approach for Wyoming. Most assistance forestry programs are interrelated, and management activities are planned to address multiple resource objectives. WSFD believes the GIS portion of the Wyoming Statewide Forest Resource Assessment should identify priority landscapes for assistance forestry activities rather than justify certain program areas through individual analyses.

The GIS analysis was conducted at a maximum of 30-meter pixel size. Whenever possible, data layers from previous analyses were utilized. For this assessment document, considerable information was obtained from the Forest Legacy *Assessment of Need*. At the start of the analysis, some layers were given additional weight. Later in the process, WSFD decided, based on input from cooperators, to give equal weight to all layers. The Wyoming Statewide Assessment of Forest Resources—Critical Landscapes map is the composite dataset which delineates priority landscape areas, which can be found later in this assessment.

Wyoming Statewide Assessment of Forest Resources

Critical Landscapes



Data Layers

Development Risk: Areas expected to see increased housing development over the next 30 years.

Fish and Wildlife Habitat: Areas that provide habitat for valued fish and wildlife species.

Forest Fragmentation: Areas becoming fragmented and loose forest connectivity.

Forest Health Risk: Areas where silvicultural treatment can reduce risk of damage.

Community Forestry: Areas where management of the community forest can have positive impacts. Data layer is boundaries of incorporated communities.

Water Quality and Supply: Identify watersheds where forest conservation and management is important.

Wildfire Risk: Areas where planning and management can reduce risk.

Economic Potential: Areas where forests can or do play a major economic role including working forests and mill demand forests.

Statewide Assessment of Forest Resources

High

Low

N W E S

0 15 30 60 90 120

Miles

Data Sources:

Colorado State University, ESRI, Forest Health Technology Enterprise Team, LANDFIRE Program, National Insect and Disease Risk Map, nationalatlast.gov, National Land Cover Dataset, Spatial Analysis Project, PRISM Climate Group-Oregon State University, U.S. Department of Agriculture Forest Service Rocky Mountain Research Station, Wyoming Forest Legacy Assessment of Need, Wyoming Game and Fish Department, Wyoming State Forestry Division, Wyoming's Wildfire Hazard Assessment

Disclaimer:

These data are intended for reference purposes only and the content, accuracy, timeliness, and completeness is not guaranteed. For more information or for the verification of the information contained in these data, please contact the data authors. The State of Wyoming maintains no responsibility and will not be held liable for any damages incurred as a result of the use or misuse of these data.

Figure 9. Wyoming Statewide Assessment of Forest Resources—Critical Landscapes.

Development Risk
The Development Risk map helps "identify, protect, and connect ecologically important forest landscapes, and open space, thus maintaining green infrastructure, particularly around and within areas of population growth and development." Areas developed or likely to be developed were designated with a value of 1 whereas areas not developed or have very limited development were identified as 0. The data and information were obtained from the SAP and research at Colorado State University.

National Theme: Conserve working forest lands.

Strategic Objective: Identify and conserve high priority forest ecosystems and landscapes.

National Direction: Assessments and strategies should attempt to identify, protect, and connect ecologically important forest landscapes, and open space, thus maintaining green infrastructure, particularly around and within areas of population growth and development.

Priority Areas—Development Risk
The analysis shows that significant housing development is expected in many parts of the state over the next 30 years. The population in the West is growing rapidly and Wyoming is no exception. The priority areas map with development risk overlay shows that much of that growth is likely to happen in priority areas. Some of the growth will happen in areas that overlap with forest health issues, wildfire risk issues, green infrastructure issues, and many other state forest resource assessment layers that are likely to be affected. In this case, there may be little that can be done to affect future development. Work in the areas of wildfire risk, forest health risk, economic potential, community forestry, agroforestry, and water quality/supply in advance of the probable development will be important.

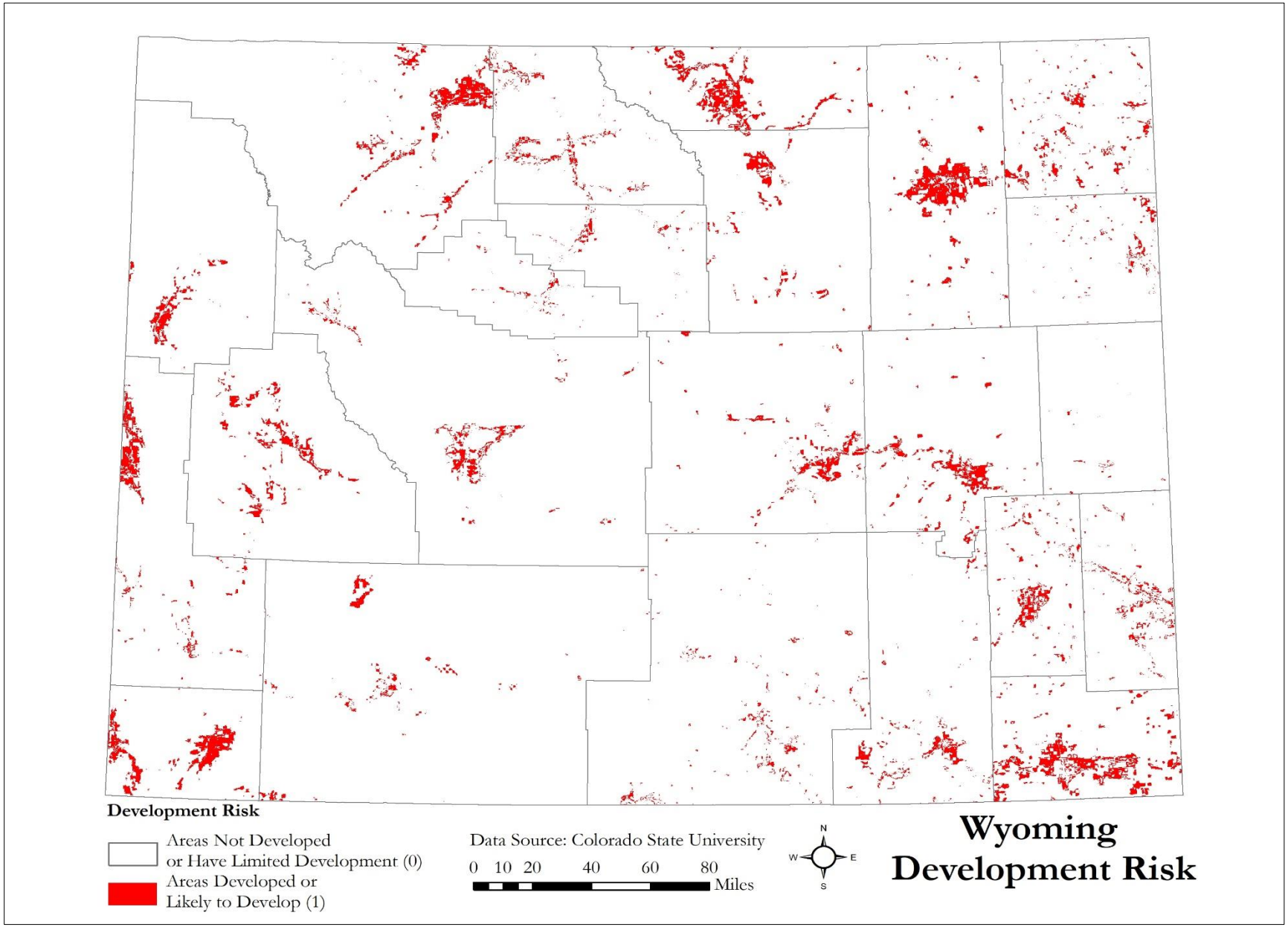


Figure 10. Wyoming Development Risk

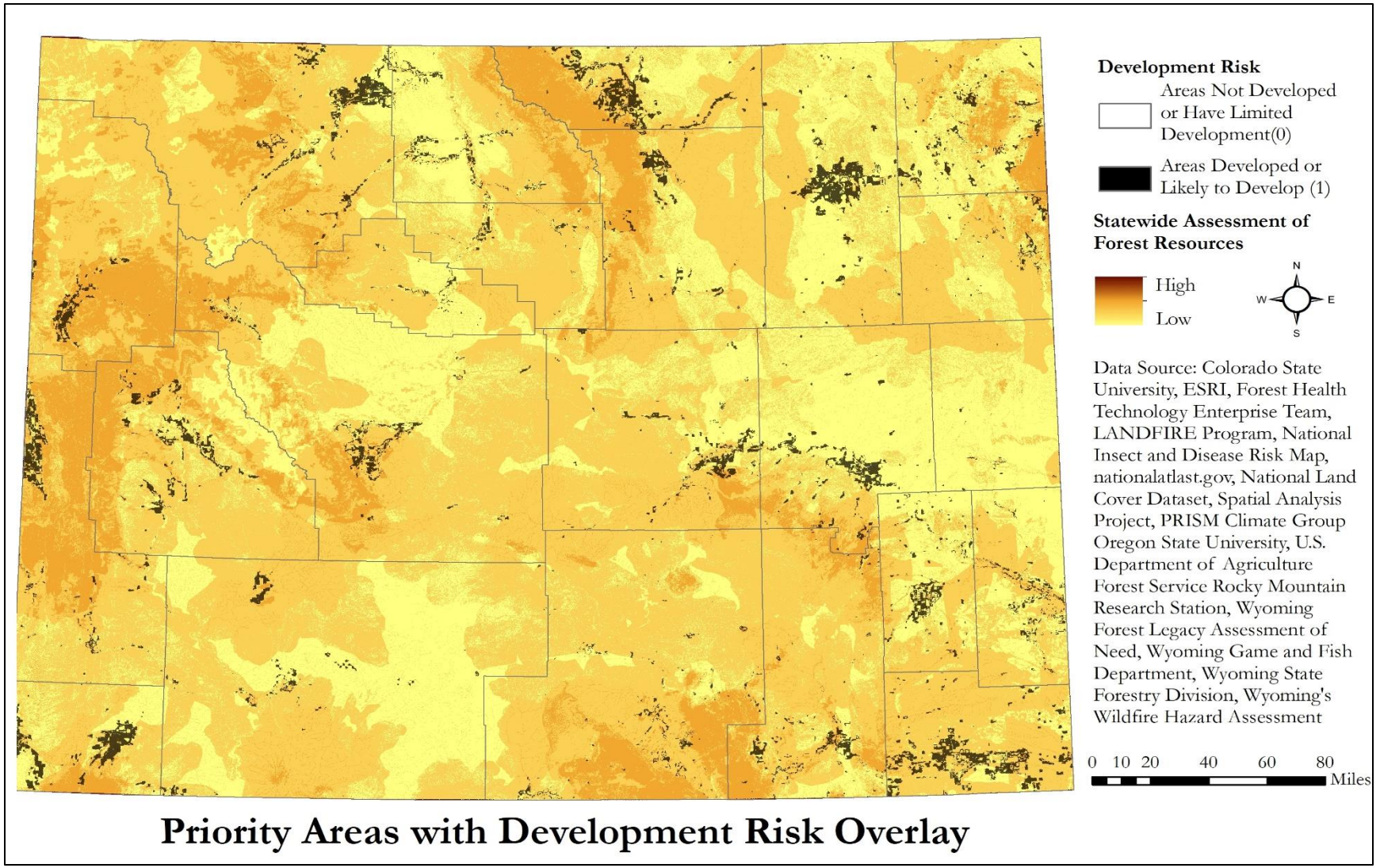


Figure 11. Priority Areas with Development Risk Overlay

Forest Fragmentation
The Forest Fragmentation map displays forest lands on the edge of forested areas that are most susceptible to the development and introduction of damaging agents. The intent of including forest fragmentation is to "identify, protect, and connect ecologically important forest landscapes, and open space, thus maintaining green infrastructure, particularly around and within areas of population growth and development."

The original data included 91 square kilometers around each pixel to determine fragmentation and encompassed all of North America. For analysis, the Wyoming boundary was specifically clipped from the North American dataset. The data was exported to a new raster to reduce 1 km pixels to 30 m pixels. Moreover, the original raster contained values from 0-7, with 0 = water, 1 = edge, 2 = undetermined, 3 = perforated, 4 = interior, 5 = patch, 6 = transitional, and 7 = unlabeled. The following are explanations of the values according to the metadata:

- Water (0): surface water which has no trees;
- Edge (1): most of the surrounding pixels are forested and this pixel appears to be part of the outside edge of a forest patch;
- Undetermined (2): most of the surrounding pixels are forested but this pixel could not be classified as to the type of fragmentation in the surrounding area;
- Perforated (3): Most of the surrounding pixels are forested and this cell appears to be part of an inside edge of a forest patch (near a non-forest inclusion within a forest patch);
- Interior (4): All of the surrounding pixels are forested;
- Patch (5): Most of the surrounding pixels are non-forested and this pixel is part of a forest inclusion or patch of forest in a non-forest background area;
- Transitional (6): About half of the surrounding pixels are forested and this pixel is likely to be part of a patch, edge, or perforation; and
- Unlabeled (7): Generally representative of non-forested areas.

Given those values and detailed explanations, the data had to be reclassified to meet the intent of the forest fragmentation layer in the analysis. The "edge" and "patch" values represented those areas that would be most affected by fragmentation and human activity while "interior" values would be least affected. To make the data useful for this analysis, areas with values of 1 (edge) and 5 (patch) were reclassified to 1 while all other values were reclassified to 0. The data and information were obtained from the National Atlas ("Classification of Forest Fragmentation of North America").

National Theme: Conserve working forest lands.

Strategic Objective: Identify and conserve high priority forest ecosystems and landscapes.

National Direction: Assessments and strategies should attempt to identify, protect, and connect ecologically important forest landscapes, and open space, thus maintaining green infrastructure, particularly around and within areas of population growth and development.

Priority Areas—Forest Fragmentation

This layer was included to emphasize areas where fragmentation and human activity makes a forest more susceptible to risk factors such as insects and disease. The layer shows areas that are potentially affected but it does not have much value for this analysis when considered alone. It should be considered along with development risk, wildfire risk, and forest health risk. The priority areas forest fragmentation map displays the forest fragmentation layer generally around the edges of the national forest boundaries and is sometimes associated with priority areas identified by the Wyoming Statewide Forest Resource Assessment.

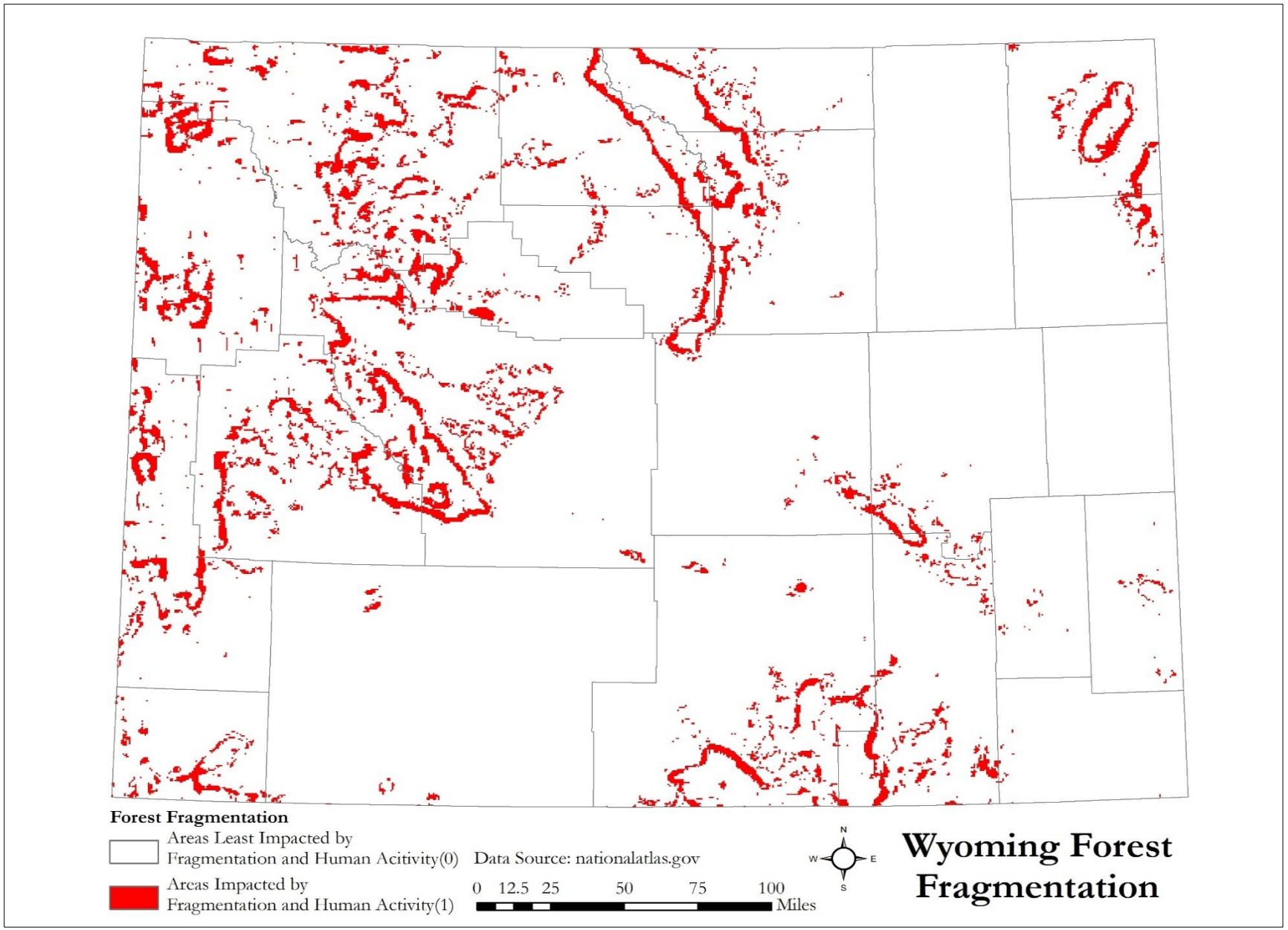


Figure 12. Wyoming Forest Fragmentation.

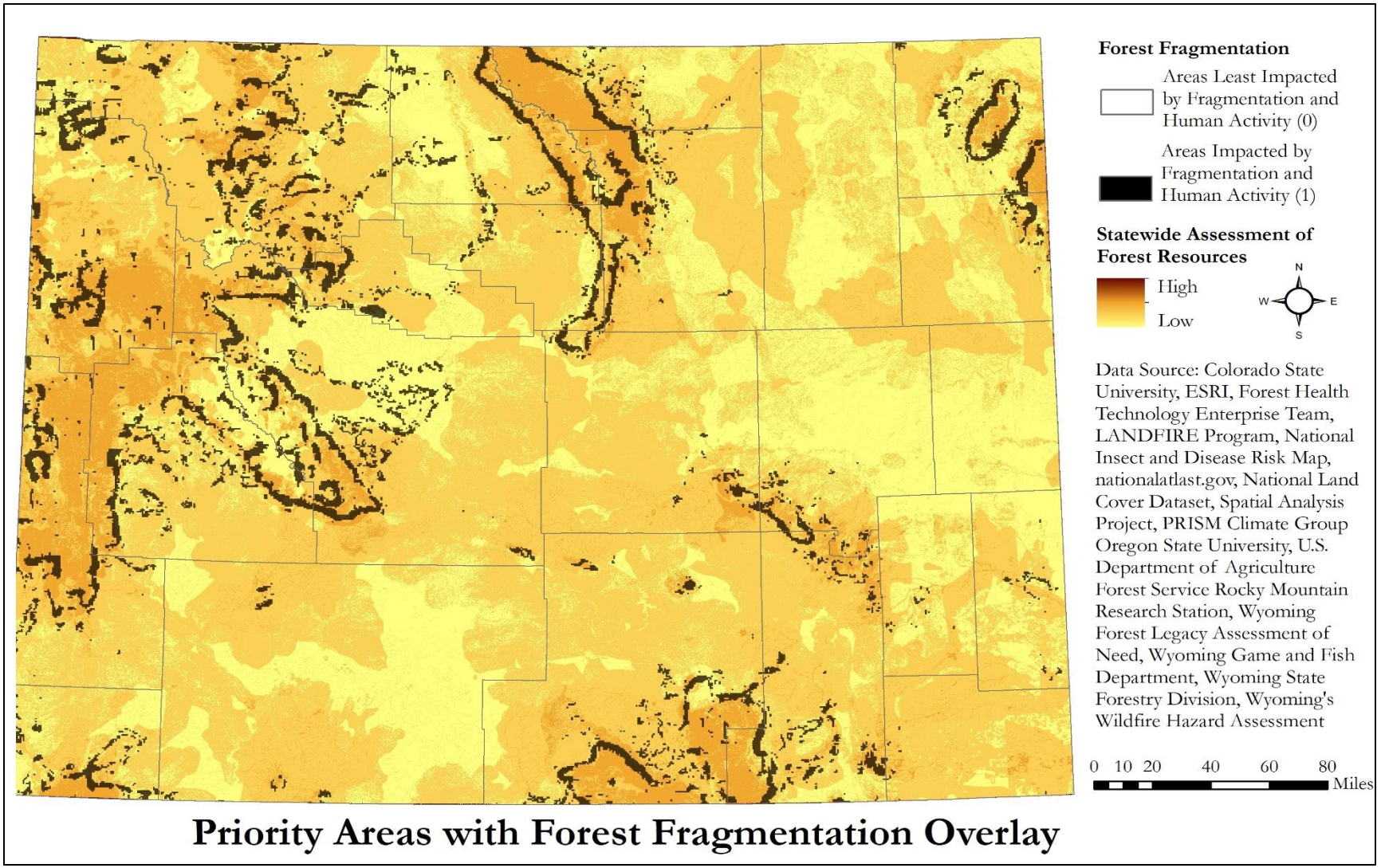


Figure 13. Priority Areas with Forest Fragmentation Overlay.

Wildfire in Wyoming

Wildfires are a common natural hazard in Wyoming, having occurred over the years and continue to frequent the landscape. Overall, the number of acres burned because of wildfires in Wyoming has varied over the years. According to the Wyoming Acres Burned Due to Wildfires from 1992-2019 graph and table, even though there has been quite the variability, there is a slight upward trend to the number of acres burned throughout the state. Moreover, the number of wildfires in Wyoming has increased since 1992, as seen in the Number of Wyoming Wildfires from 1992-2019 graph and table. While the data suggests there has been an increase in the number of wildfires, this should be noted with caution since it may partially be a result of an increase in the efficient and timely reporting of the wildfires. However, it is important to note that Wyoming has experienced several "above average" fire seasons in recent years. Extended drought, extensive areas of beetle-killed trees, aging forest stands, and high fuel loading due to historic fire suppression and reduced active forest management have all contributed to the higher levels of fire activity.

Wildfires can be beneficial and detrimental yet are often both, but it is essential to recognize the risks to natural resources are subsequent. For example, the loss of ecosystem components, such as large trees, is a lost value even in the most remote parts of the state. While the longer fire return interval forest types, such as spruce-fir, some lodgepole pine, and moist Douglas-fir sites may not have missed a fire return yet, the shorter fire return interval types like ponderosa pine, dry Douglas-fir sites, limber pine, juniper, and sagebrush may have missed fire return intervals and stand conditions may be outside of historic norms.

Areas throughout Wyoming that experienced the recently ended bark beetle epidemic could be a long-term problem for fire managers. Fire danger may currently be higher than normal due to standing dead trees. Risk may be increasing as standing dead trees fall, decreasing access for fire suppression efforts, and adding more fuel to the forest floor.

The Wildland Urban Interface (WUI) is expanding in Wyoming, like most of the West, as more homes are built in fire-prone areas. There is little interest in regulation to reduce residential development in the WUI. Efforts have instead focused on homeowner education, fuel reduction, and defensible space development. Notable and proactive acres such as Natrona County, require defensible space prior to building a structure on Casper Mountain.

An important tool for county governments, county fire organizations, communities, and land management agencies is the Community Wildfire Protection Plan (CWPP). A CWPP identifies communities at risk and recommends measures to mitigate the risk across ownership boundaries. Land management agencies have begun to pay close attention to CWPP's and in many cases, projects recommended by a CWPP have become high priorities for land managers. Cooperative projects across ownership boundaries are critical to mitigate fire risk around a community. Such projects are becoming more common in Wyoming.

It is essential to capture the overall wildfire risk throughout the state in varying capacities to provide further guidance for wildfire mitigation and management and one avenue to communicate wildfire risk is through maps. Wildfire risk maps "should identify areas where management can significantly reduce the risk of catastrophic wildfire while enhancing multiple

associated forest values and services" and "identify areas where the effects of fire exclusion can feasibly be mitigated or countered through sound management, particularly where there are opportunities for federal, state, and community partnerships." In order to assess and communicate wildfire risk in Wyoming, a variety of layers and datasets were utilized to provide a robust interpretation including the following: wildfire risk-fire regime condition class vegetation departure potential, wildfire occurrence from 1992-2019, wildfire occurrence density, existing vegetation and canopy cover, housing density, fire behavior fuel models, suppression difficulty index, and wildfire risk.

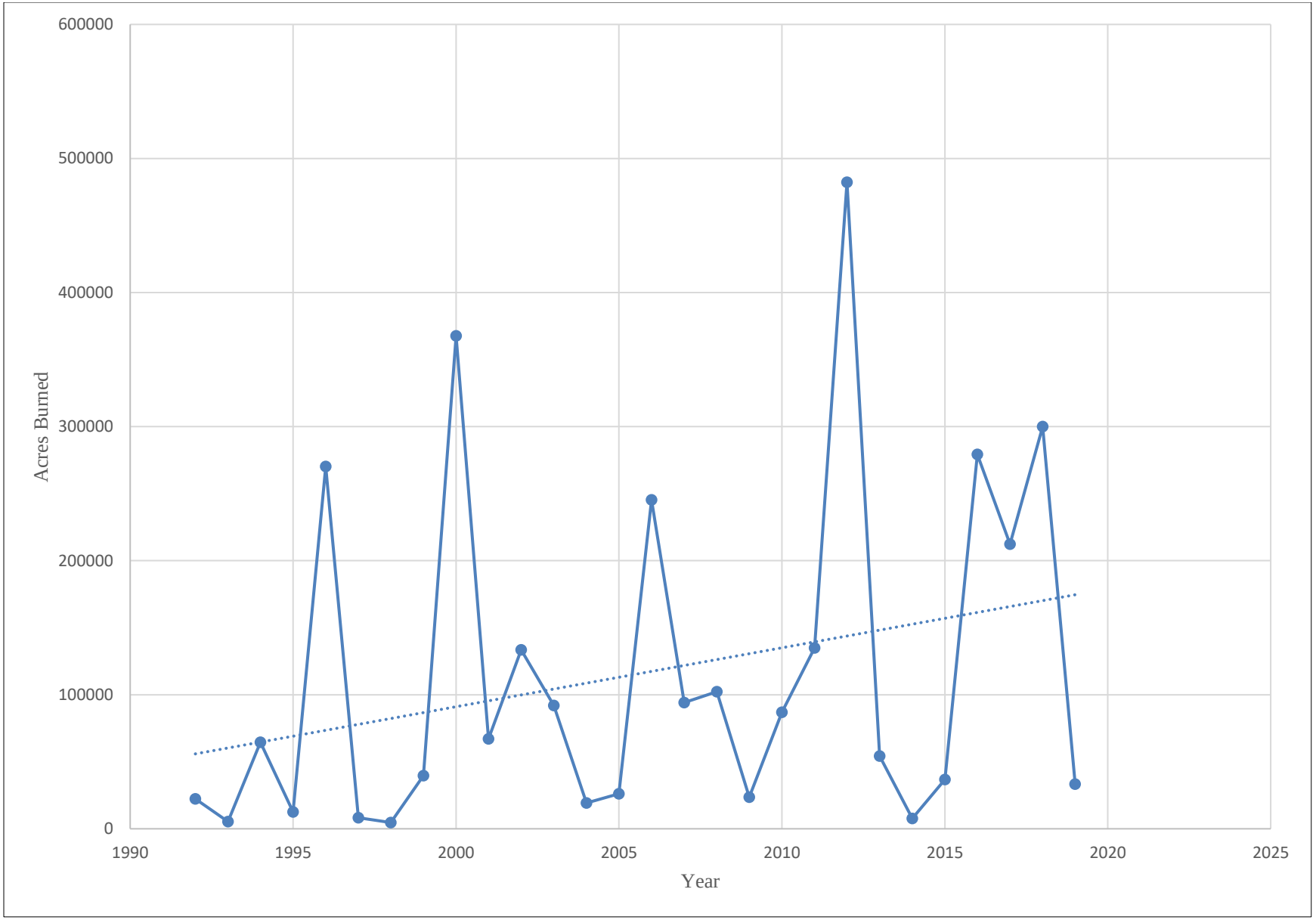


Figure 14. Wyoming Acres Burned Due to Wildfires from 1992-2019.

Table 1. *Wyoming Acres Burned by Wildfires from 1992-2019.*

Year	Acres Burned
1992	22,241.8
1993	5,323.45
1994	64,564.2
1995	12,563.75
1996	270,174.4
1997	8,315.6
1998	4,649.6
1999	39,686.2
2000	367,712.3
2001	66,991
2002	133,557.5
2003	91,966.1
2004	19,246.17
2005	26,183
2006	245,299.1
2007	94,156.9
2008	102,269.1
2009	23,649.14
2010	86,949.44

Table 1 (continued). *Wyoming Acres Burned by Wildfires from 1992-2019*

Years	Acres Burned
2011	134,830.6
2012	482,305.5
2013	54,321.8
2014	7,725.89
2015	36,821.23
2016	279,242.7
2017	212,307
2018	300,000
2019	33,260.09

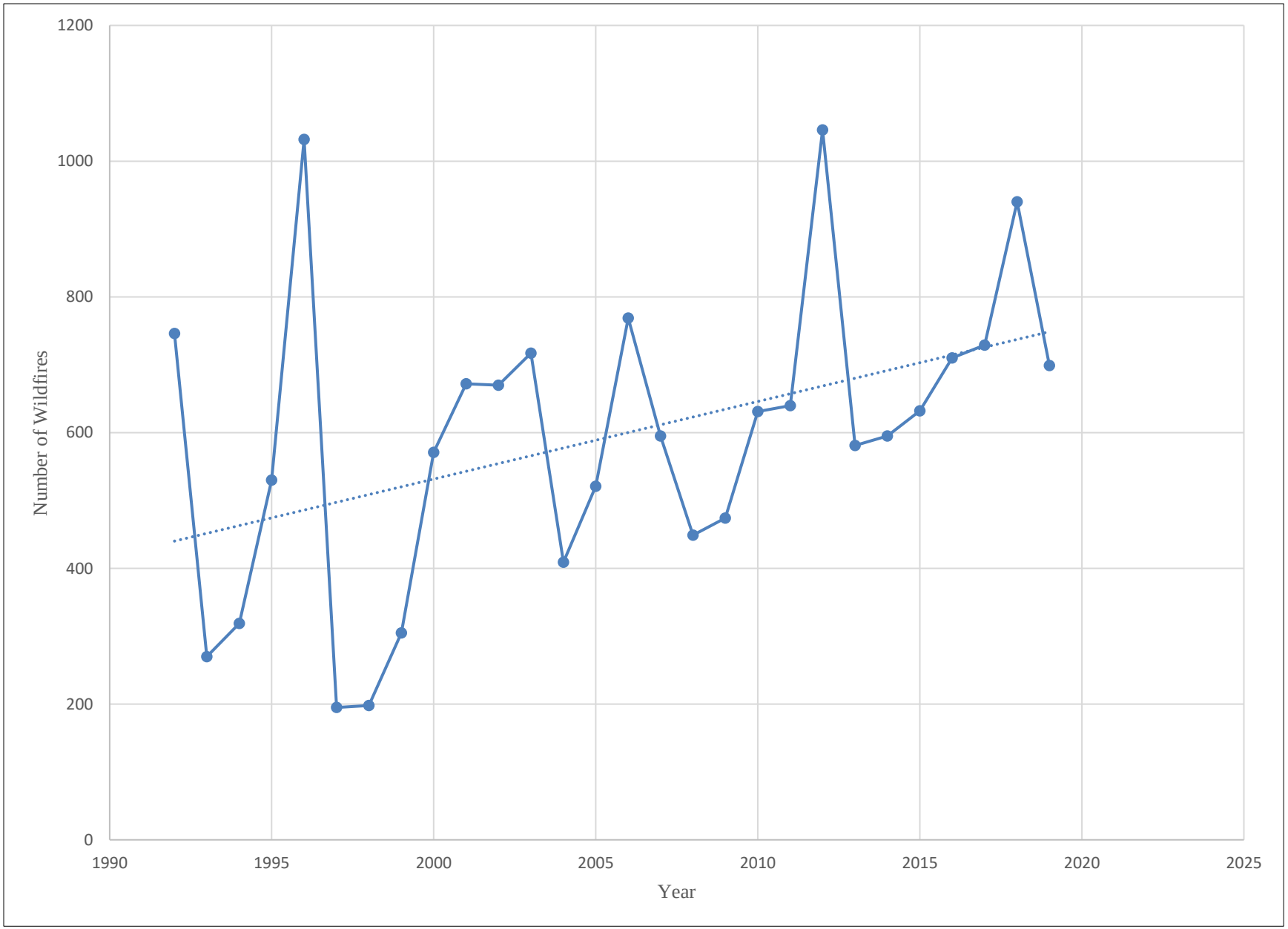


Figure 15. Number of Wyoming Wildfires from 1992-2019.

Table 2. *Number of Wyoming Wildfires from 1992-2019.*

Year	Number of Wildfires
1992	746
1993	270
1994	319
1995	530
1996	1,032
1997	195
1998	198
1999	305
2000	571
2001	672
2002	670
2003	717
2004	406
2005	521
2006	769
2007	595
2008	449
2009	474
2010	631

Table 2 (continued). *Number of Wyoming Wildfires from 1992-2019*

Years	Acres Burned
2011	640
2012	1,046
2013	581
2014	595
2015	632
2016	710
2017	729
2018	940
2019	699

Wildfire Risk-Fire Regime Condition Class Vegetation Departure Potential
One generally accepted measure of the current condition of the different forest types relative to normal fire regimes is the Wildfire Risk-Fire Regime Condition Class Vegetation Departure Potential, often referred simply as Fire Regime Condition Class (FRCC). This is one of the layers in the Wyoming Statewide Forest Resource Assessment. FRCC is a classification of the amount of departure from the normal regime. Three classes as well as condition classes 2 and 3were selected for this analysis. These were selected because they represent areas, where the fire regime is outside of historic ranges and wildfires in those areas, pose the risk of loss of ecosystem components. Additionally, classes 2 and 3 require at least some level of mechanical treatment before a fire can be returned to the system (http://www.nwcg.gov/teams/wfewt/message/FrccDefinitions.pdf). For use in this analysis, areas of condition class 2 and 3 were reclassified to 1 and other areas were reclassified to 0. The data and information used for the Wildfire Risk-Fire Regime Condition Class Vegetation Departure Potential map originated from the LANDFIRE program.

According to the GIS analysis, Wyoming has over 37 million acres of FRCC Class 2 and Class 3 lands. In some cases, those lands would benefit from treatment prior to returning fire to the system to avoid the loss of ecosystem components. While FRCC is an accepted method of evaluating fire, fuels, and the risk of catastrophic fire, the WUI requires a different analysis. Fire suppression in the WUI is a high priority due to the risk to public and firefighter safety and other values at risk. WUI fires also tend to be expensive because of the level of effort given to the suppression of those fires.

National Theme: Protect forests from harm. Enhance public benefits from trees and forests.

Strategic Objective: Restore fire-adapted lands and reduce the risk of wildfire impacts. Assist communities in planning for and reducing wildfire risks.

National Direction: Assessments should identify areas where management can significantly reduce the risk of catastrophic wildfire while enhancing multiple associated forest values and risks. Assessments should identify areas where the effects of fire exclusion can feasibly be mitigated or countered through sound management, particularly where there are opportunities for federal, state, and community partnerships. Assessments should incorporate existing CWPP's and identify communities in especially vulnerable areas that need a CWPP.

Additional Wildfire Risk Analysis
To provide further insight into wildfire risk within Wyoming, additional GIS analysis and maps were collected and created. Specifically, the following layers were created to provide a more holistic approach towards understanding wildfire risk within the state including wildfire occurrences (1992-2019), existing vegetation and canopy cover, housing density, fire behavior fuel models, suppression difficulty index, and wildfire occurrence density. It should be noted though that while each of these maps provided further insight into wildfire risk within the state, they should be used and interpreted with caution.

The Wyoming Wildfire Occurrences map provides a visual representation of reported wildfires within the state from 1992-2019. As seen on the map, it is evident that wildfires have frequented

across the landscape over the last 28+ years. Moreover, every county within Wyoming has experienced wildfires to some extent. This further reiterates that communities and decision-makers must be better prepared for wildfires given they are a relatively common occurrence on the landscape. The wildfire occurrence data originated from two different sources including the Colorado Forest Service Research Data Archive and WSFD. This data was then utilized to further understand wildfire occurrence density per square mile within Wyoming utilizing the Kernel Density tool in ArcGIS. As seen in the map, the density per square mile is higher in Fremont, Sweetwater, Washakie, Park, Laramie, Natrona, Campbell, Teton, as well as portions of Albany, Platte, and Converse counties.

Additionally, the Wyoming Existing Vegetation and Canopy Cover map was added to the collection of wildfire risk-related maps in the FAP, providing further insight into the different types of land cover that may influence wildfire risk. In this instance, the data was reclassified into 11 different categories, noting that a large majority of the state's canopy cover is shrub and herb cover, followed by tree cover. The vegetation and canopy cover data are from the U.S. Forest Service.

To coincide with the vegetation and canopy cover map, a Wyoming Fire Behavior Fuels map was also created. This showcases the Anderson fire behavior fuel models across the state and non-burnable classes. It is evident that fire behavior fuel model two dominates the landscape in Wyoming, which suggests that fire could predominantly spread through fine herbaceous fuels either curing or dead. However, this is not the only fire behavior fuel model that fits the state, rather all but two of the thirteen Anderson fuel models are applicable to Wyoming's landscape. The fire behavior and fuel model data originated from LANDFIRE.

The Wyoming Suppression Difficulty Index (SDI) map provides a quantitative assessment of the difficulty for firefighters to conduct fire control work. The data originated from the U.S. Forest Service and includes factors such as fuels, anticipated fire behavior during severe weather, topography, accessibility, as well as firefighter line production rates. Generally, the SDI index ranges from 1-10, with 10 being the highest. For Wyoming, the SDI is not very high (maximum as 1.94) across the landscape. However, there is some subtle variability across the state and this is not to discredit that there is some suppression difficulty.

Oftentimes, fire hazard and risk maps focus primarily on just fuels and fire occurrences for a given area. However, it is just as important to include anthropogenic factors such as housing density, providing an empirical-based map. In this instance, a map displaying housing density in units per square mile of Wyoming is included. The housing data originated from the 2010 U.S. Census Bureau and on the block scale. Overall, the housing density for the state is quite low, which is expected given Wyoming is the least populated state. Although, it is still crucial to highlight the main populated areas across the state given they are at the root of the WUI, the interface between urbanization and vegetation.

Five layers were utilized to create an all-encompassing wildfire risk map for Wyoming including the following: existing vegetation and canopy cover, housing density, fire behavior fuel models, wildfire occurrences, and suppression difficulty index. This includes data from the 2010 U.S. Decennial Census, Colorado Forest Service Research Data Archive, U.S. Forest Service, and

WSFD. Since some of the layers were shapefiles whereas others were rasters, none of the layers could be reclassified until they were all in the same format. Thus, the polygon to raster and the point to raster tools were utilized to convert the housing density and fire occurrence data from shapefiles to raters. Once all of the layers were in raster format, each was reclassified numerically. Subsequently, the cell statistics tool was then utilized to calculate the sum of the rasters, providing insight into the overall wildfire risk within Wyoming. As seen in the Wyoming Wildfire Risk map, a large majority of the state has a moderate wildfire risk. This can be attributed to the fine, flashy fuels that are prominent across a portion of the landscape. There are portions with higher wildfire risk within the northwestern and western portions of the state including areas near the Bridger-Teton National Forest, Shoshone National Forest, and Grand Teton National Forest. Moreover, portions of the Laramie Range, Medicine Bow National Forest, Big Horn National Forest, and Black Hills of Wyoming also indicate the potential for higher wildfire risk. However, even though these areas are classified as having moderate to higher wildfire risk, this is not to say that other areas do not experience wildfires. Rather, the likelihood is not as high but should not be ruled out. Wildfire risk is prevalent in Wyoming and will continue to be so in the years to come.

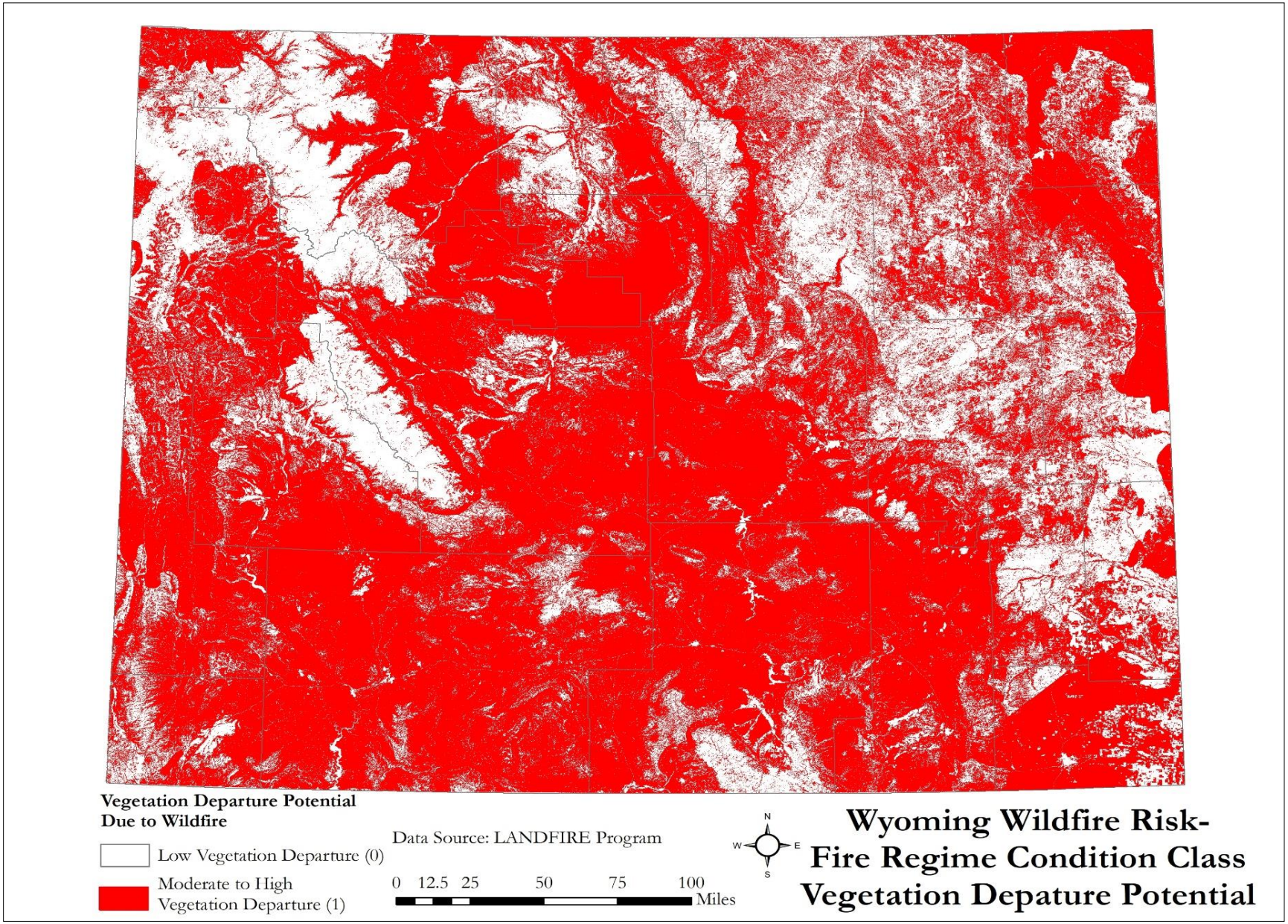


Figure 16. Wyoming Wildfire Risk—Fire Regime Condition Class Vegetation Departure Potential.

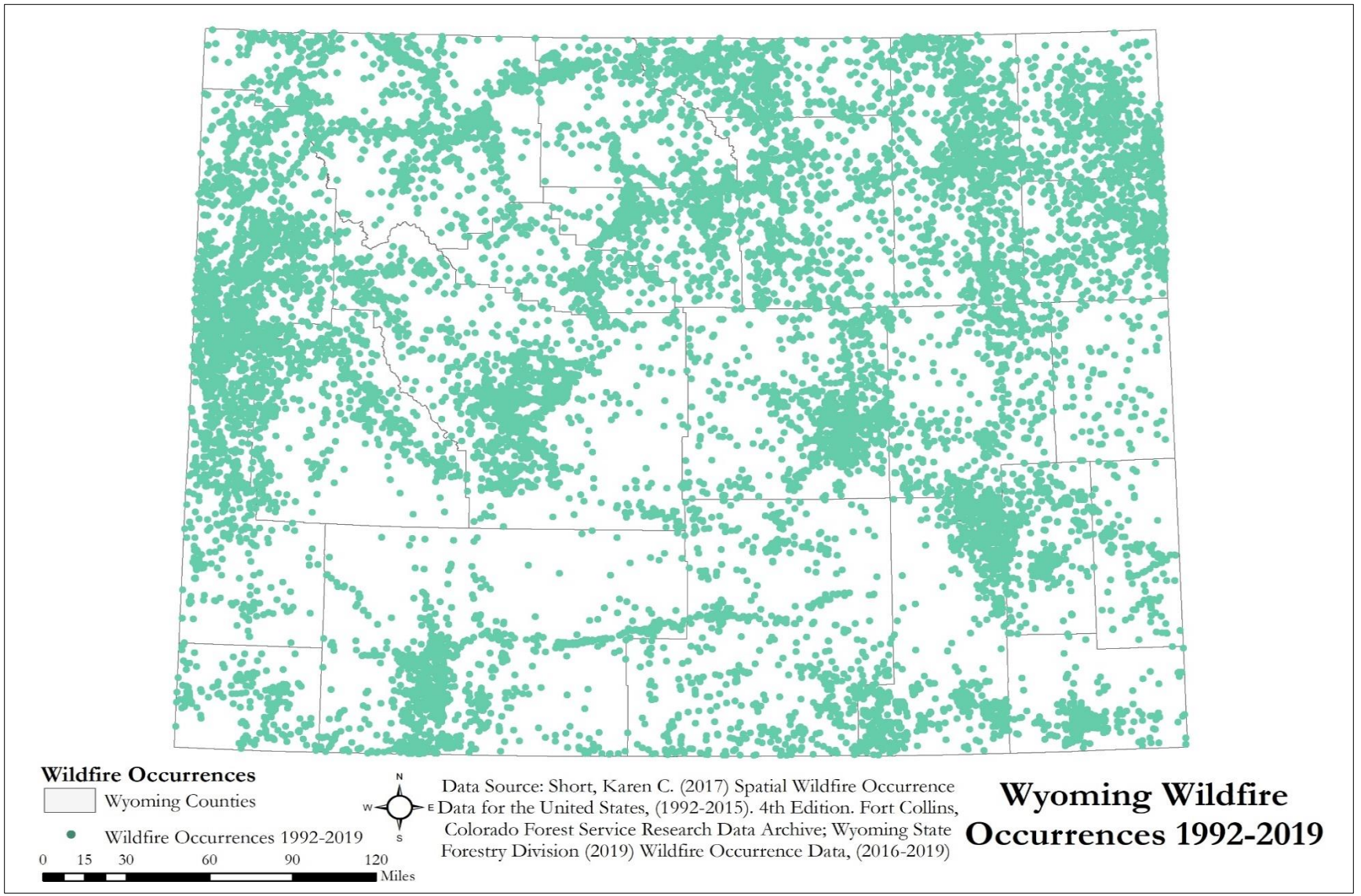


Figure 17. Wyoming Wildfire Occurrences from 1992-2019.

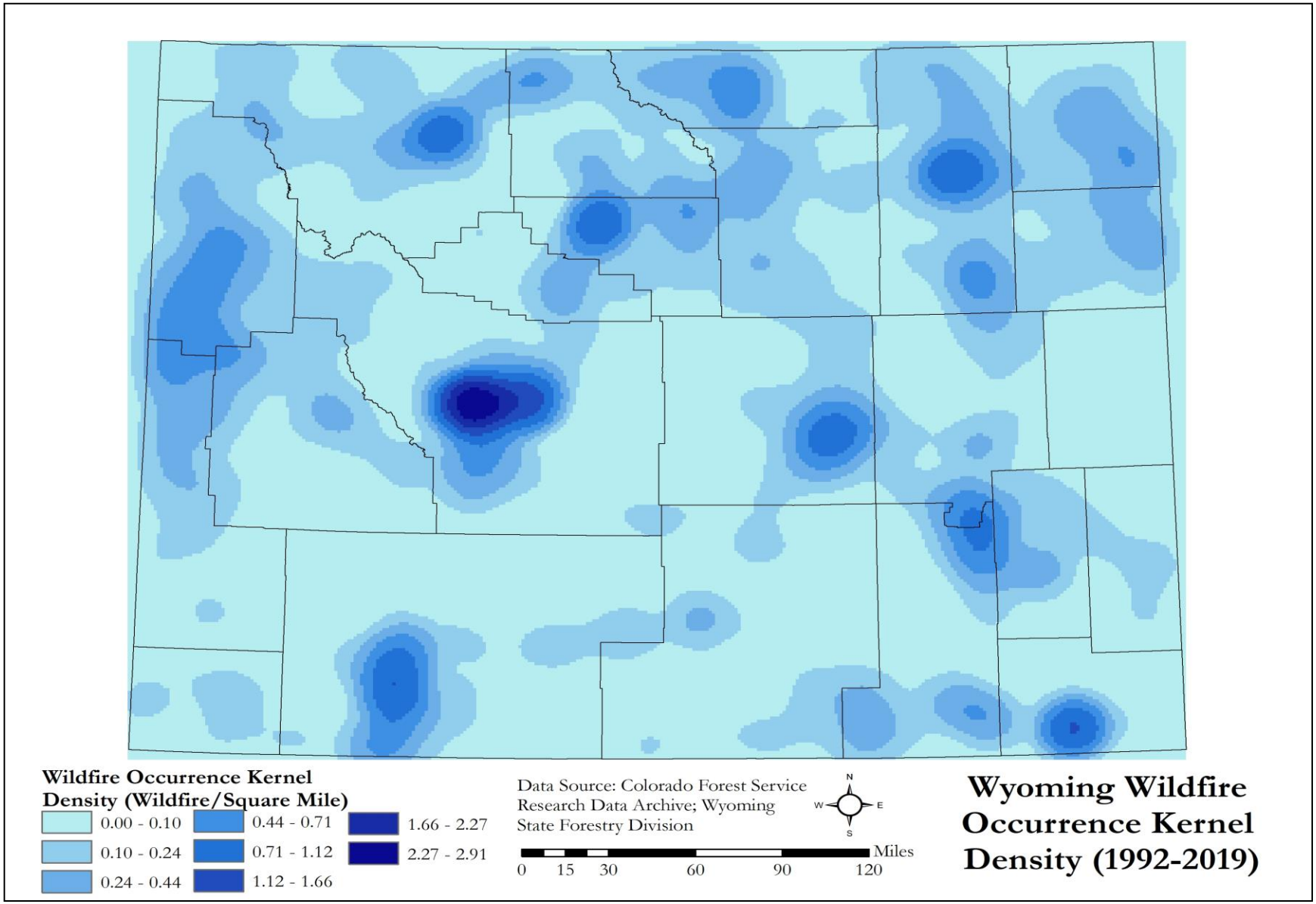


Figure 18. Wyoming Wildfire Occurrence Density from 1992-2019.

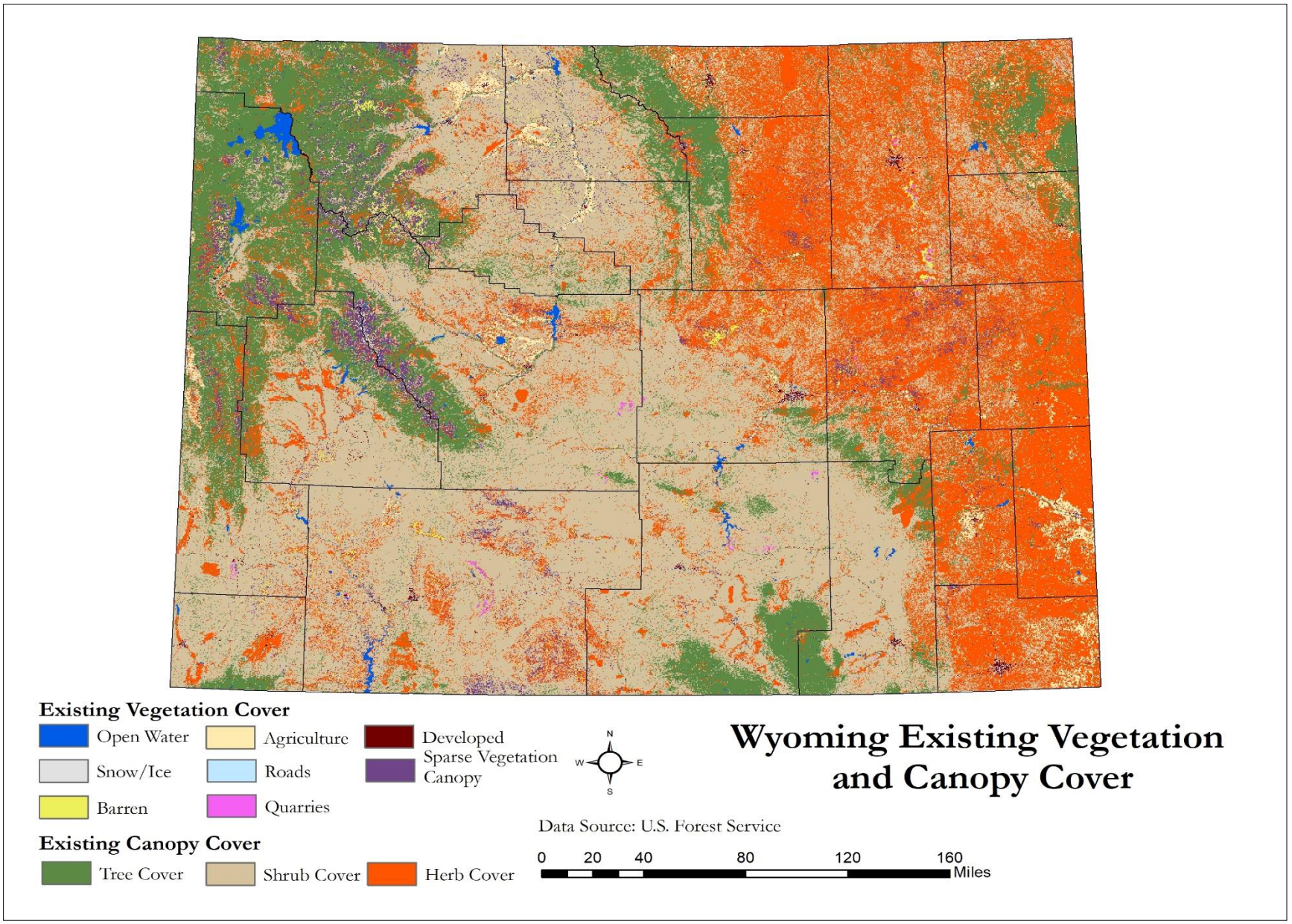


Figure 19. Wyoming Existing Vegetation and Canopy Cover.

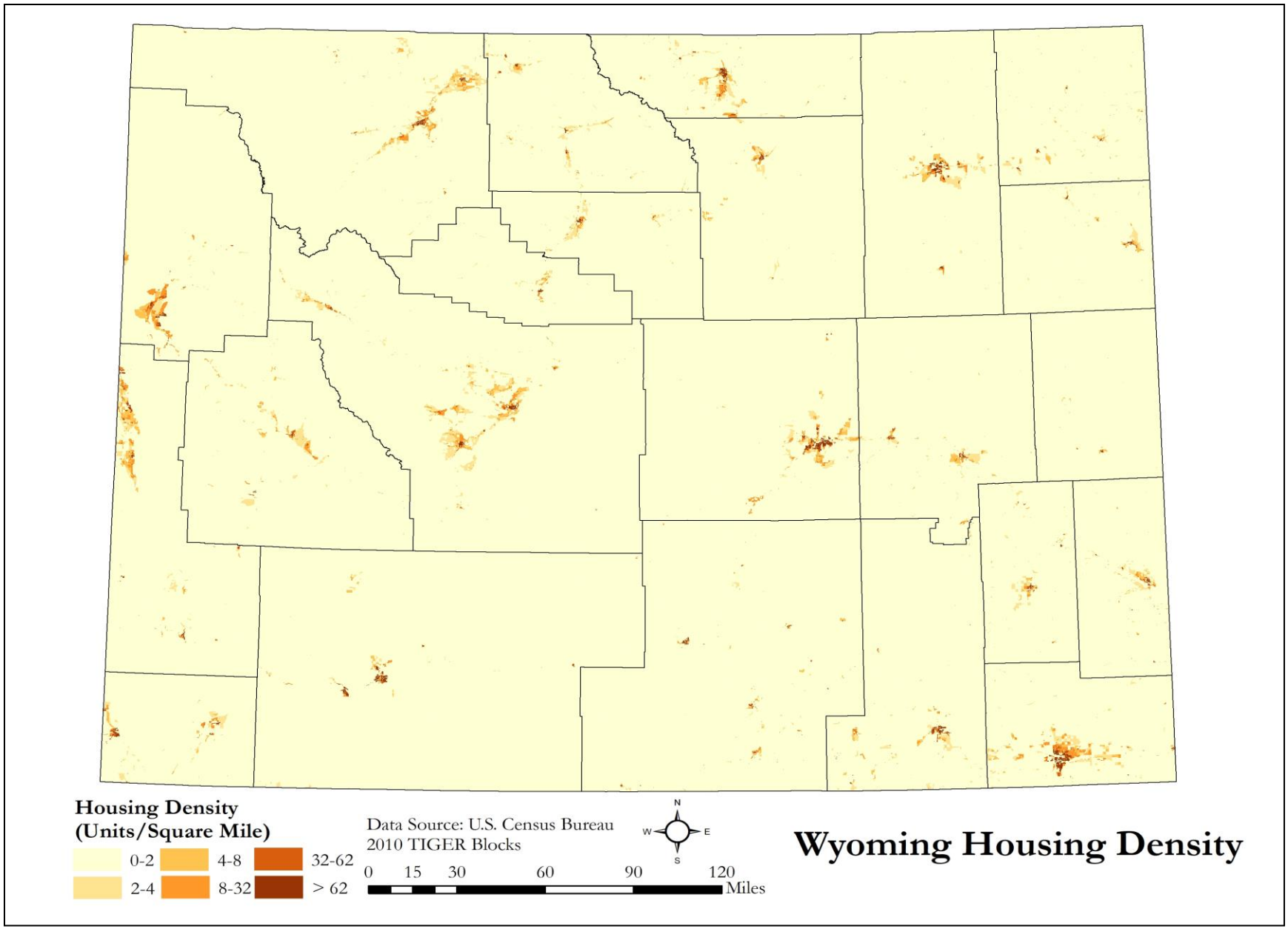


Figure 20. Wyoming Housing Density.

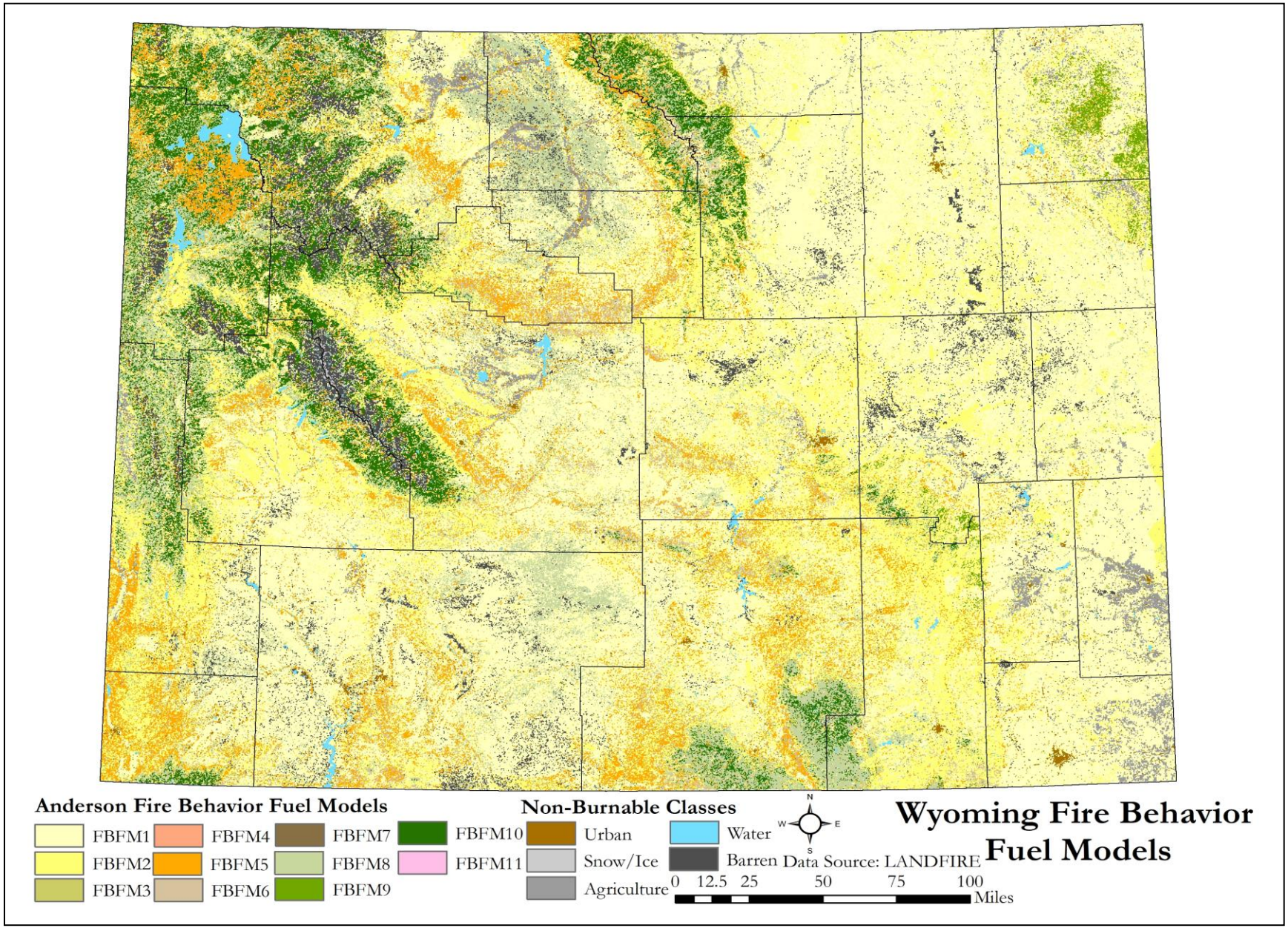


Figure 21. Wyoming Fire Behavior Fuel Models.

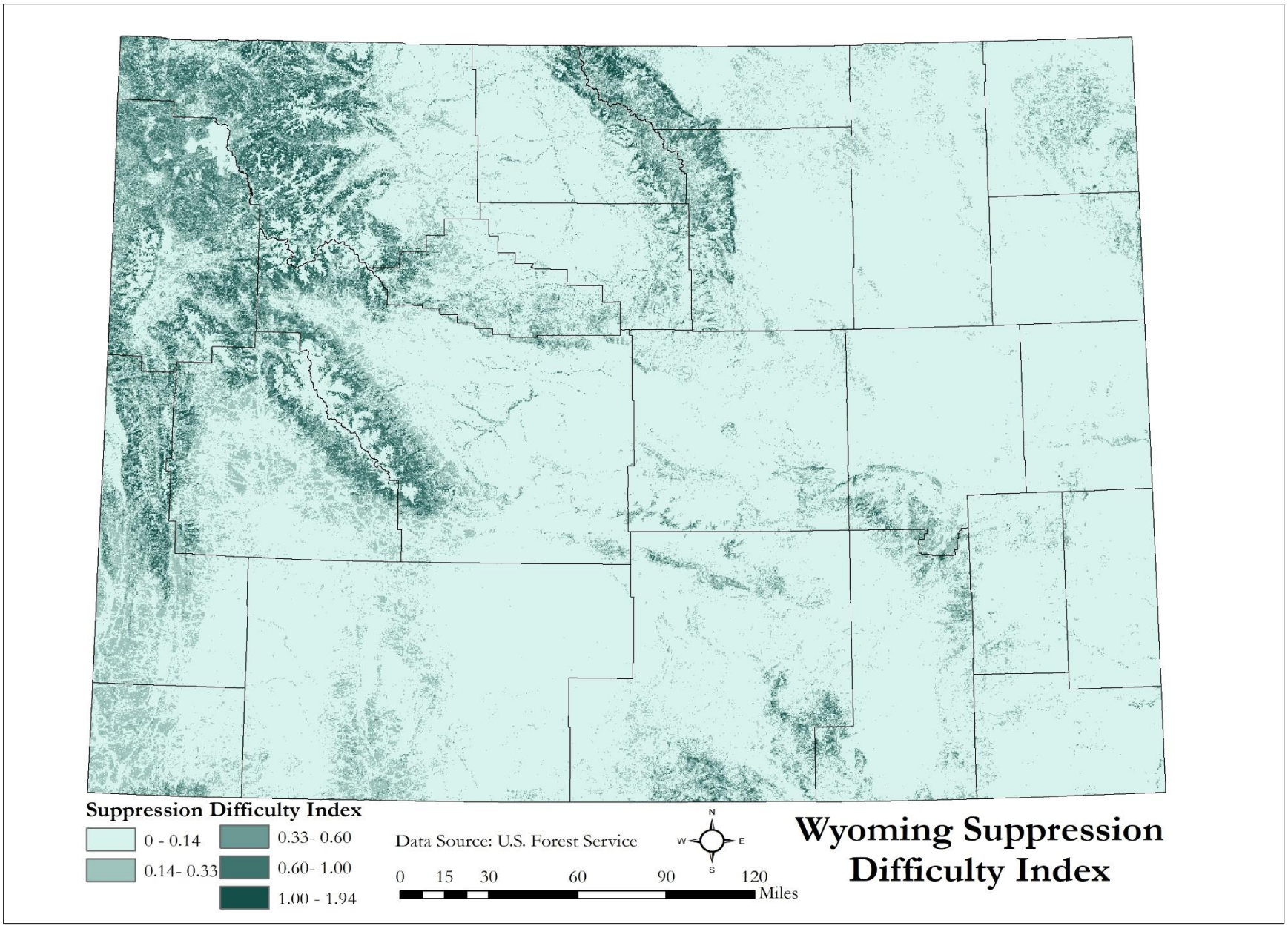


Figure 22. Wyoming Suppression Difficulty Index.

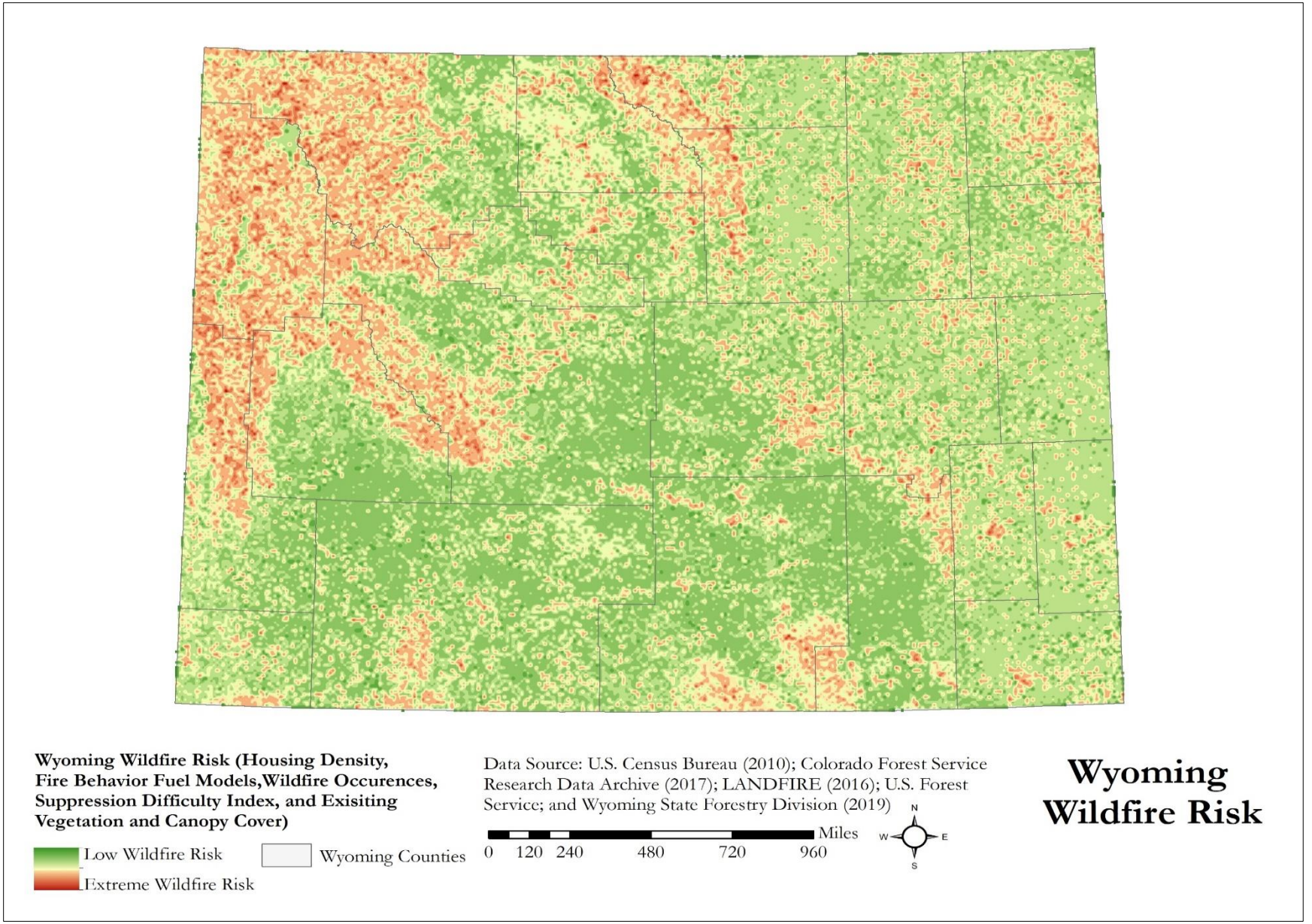


Figure 23. Wyoming Wildfire Risk.

Forest Health Risk

Many forest stands in Wyoming are mature to overmature and overly dense. This combined with a current lack of forest stand heterogeneity at the landscape level contributes to increased risk of insect caused tree mortality. On State Trust Lands, stands are identified by size class rather than age. Across all species and all acres, much of the forested State Trust lands are in the largest size class, which roughly correlates with trees over 100 years old. The pattern continues across the state, although reliable stand-level private land data is unavailable.

Most communities in Wyoming were developed on prairie landscapes. The early source of plant materials was generally confined to cottonwoods growing naturally along rivers and streams. Although fast-growing, cottonwoods are not long-lived and these over mature trees are rapidly declining in many communities. Many were planted as street trees and are not being replaced with more diverse species or are not being replaced at all. However, there are several community programs, like Rooted in Cheyenne and Rooted in Laramie, whose goal is to increase urban tree diversity and urban tree cover.

There are potential long-term impacts of climate change on Wyoming's forests. Under a long-term reduced precipitation scenario, forest health impacts could be significant. Distribution of tree species could be altered as species better able to tolerate warmer and drier conditions expand their distribution. The timing and duration of wildfire seasons could change. Warmer climates are predicted to favor faster adapting insects over slower adapting tree species. Models predict warmer temperatures will lead to higher insect populations during outbreaks and range expansion/higher amounts of damage observed in areas than seen historically.

Invasive plant and insect species are major forest health threats. Native plant communities that did not evolve with invasive plants or insects are often unable to handle the stresses brought on by exotic introductions. With increased competition for resources and inadequate defense mechanisms, invasive plants can overtime replace native vegetation. Changes in plant compositions have the potential to alter fire regimes, increase erosion, and decrease wildlife habitat quality.

The Forest Health Risk map displays areas at risk of basal area loss due to insects and disease and where silviculture may help mitigate that risk if management plans and regulations allow. Moreover, the purpose of including the Forest Health Risk map is to "identify high-value forest landscape areas that are especially vulnerable to existing or potential forest health risk factors where forest management practices are most likely to prevent and mitigate impacts." The National Insect and Disease Risk Map (NIDRM) data were obtained from the Forest Health Technology Enterprise Team (FHTET) website. NIDRM data was clipped to the state of Wyoming. The data source for this layer is the National Insect and Disease Risk Map (FHTET)

National Theme: Protect forests from harm.

Strategic Objective: Identify, manage, and reduce threats to forest and ecosystem health.

National Direction: Assessments should identify high-value forest landscape areas that are especially vulnerable to existing or potential forest health risk factors where management

practices are most likely to prevent and mitigate impacts. Assessments should also identify areas where management could successfully restore impacted forests.

Priority Areas—Forest Health

The mountain pine beetle and spruce beetle have damaged more forested areas than any other pests in Wyoming, killing over 4 million acres over the past 20 years. Mountain pine beetle populations are currently at endemic levels with observed damage steadily decreasing since its peak in 2009. Forest health aerial detection survey flights revealed relatively little present mortality from mountain pine beetle. Spruce beetle continues to affect areas across the western side of the state. Western spruce budworm presently causes the most insect-related damage to forested acres across Wyoming.

The lack of age class diversity and overall susceptibility to insect attack has been observed throughout the state. Since 2000, Bark beetle-caused tree mortality significantly affected the Black Hills National Forest, Medicine Bow National Forest, Shoshone National Forest, Uinta-Wasatch-Cache National Forest, and Bridger-Teton National Forest in addition to surrounding state and private lands. Other areas, such as the Bighorn National Forest and surrounding state and private lands also experienced some tree mortality caused by bark beetles but to a lesser degree, Mountain pine beetle susceptible hosts as small as five inches in diameter were attacked and killed. Forest stand conditions combined with favorable weather conditions allowed mountain pine beetle populations to increase in both southern Wyoming and northern Colorado.

There was previous speculation that the mountain pine beetle epidemic would result in increased aspen regeneration in many parts of the state as competition from conifers was reduced due to mortality. That increase has not been observed. There would be many positive impacts from increased aspen, including diversity, more forage production, and the more fire-resistant nature of aspen stands. Aspen is generally considered a disturbance-dependent species. Over time, more shade-tolerant conifers would be expected to reoccupy the sites where they previously existed. Management continues to determine whether conifer species or aspen should occupy a given site for the long-term. Maintaining the increased aspen on the landscape without continued disturbance will prove difficult.

Limber pine and white bark pine stands statewide have been killed by or by a combination of white pine blister rust and mountain pine beetle. Tree mortality spread within these higher elevation forest types, particularly in the Big Horn Mountains, Gros Ventre Range, Wind River Range, and in the southern Laramie Range. Mountain pine beetle populations survived at higher elevations than they have in the past. Whitebark pine and limber pine on the Shoshone National Forest and Bridger-Teton National Forest were killed by a mountain pine beetle epidemic in northwest Wyoming

Defoliation from western spruce budworm has been observed in most areas containing Douglas-fir and true fir species. Dense multi-storied single species stands are at the highest risk of maintaining high western spruce budworm populations. Defoliation of sapling and pole sized understory trees is frequent in these areas and often leads to mortality. Complete defoliation of mature overstory trees occurs during periods of the highest western spruce budworm

populations. Mature trees completely defoliated over 3 years or more often die and outbreaks can be continuous, long-lasting, or intermittent in nature.

Subalpine fir decline primarily affects high elevation spruce-fir forests in Wyoming. Subalpine fir decline is thought to be a combination of western balsam bark beetle, fir engraver beetle, armillaria fungi, annosus fungi, and climatic induced stressors. Drought conditions have led to the decline of shallow-rooted mature spruce and infestations of spruce ips beetle and other detrimental insects in communities around the state.

Exotic and invasive plants in Wyoming have the most significant impact on open canopy systems and riparian areas. Open-canopy systems are impacted by the increase of invasive annual grasses: ventenata, medusahead, cheatgrass, and jointed goatgrass. Increased competition in the understory negatively impacts native species growth, regeneration, and decreases their available soil moisture and sunlight. Invasive annual grass establishment creates dense continuous fine fuel loads across large areas resulting in reduced fire return intervals. After wildfires, invasive annual grasses out-compete native species perpetuating the problem. Open canopy systems in Wyoming include sagebrush, pinyon-juniper, and ponderosa pine forests.

Riparian areas are primarily affected by the establishment of exotic species Russian olive and saltcedar. Russian olive-dominated riparian areas are less diverse in terms of habitat structure and plant community composition. Despite the use of the fruits by many animals, this reduced habitat diversity can negatively impact other wildlife, including cavity-nesting and insect-eating birds. Russian olive are aggressive competitors for light, water, and spatial resources often out-competing the native vegetation.

Saltcedar aggressively replaces willows, cottonwoods and other native vegetation in riparian areas. Wildlife, insect, and plant diversity drastically decreases with the establishment of saltcedar. Saltcedar lowers the ground water table, drying up springs and marshy areas reducing overall water yield. Dense roots slow down river flow and increase sediment deposition along the riverbank. This leads to increased colonization further into the floodplain, widening the riparian zone. Wider riparian zones cause streamflow reductions and rechanneling, often resulting in flooding.

Other damaging agents impacting Wyoming's forests, whether traditional, riparian, or community are listed below. Brief descriptions of the current and potential threats follow:

- Dwarf mistletoe in lodgepole, Douglas-fir, and ponderosa pine forests is common on National Forest lands in Wyoming.
- Douglas-fir beetle can affect scattered stands that have been stressed by drought, wildfire, root rot, defoliation by western spruce budworm, or windfall.
- Balsam wooly adelgid is an invasive insect currently found in southwestern Idaho and northern Utah. It has not been positively identified in Wyoming. Balsam wooly adelgid effects all true fir species.
- Saltcedar and Russian olive are exotic plants that are replacing native willow and cottonwood forests that play a significant ecological role in Wyoming.
- Emerald ash borer has been found in Colorado, Nebraska, and South Dakota, and threatens ash trees across Wyoming. Gypsy Moth is an invasive insect representing a

- threat to over 500 different plant species.
- Past prolonged droughts continue to affect forest vegetation until moisture levels are average or above average for a sufficient period of time allowing forest vegetation to completely recover from the effects of drought.
- Dalmatian toadflax, Canada thistle, common burdock, and houndstongue are invasive plants found in high elevation closed-canopy forested systems of spruce/fir and lodgepole pine.
- Pine wilt disease represents a threat to exotic pines commonly planted in urban communities.

The Priority Areas with Forest Health Overlay map displays the Wyoming Statewide Forest Resource Assessment final map with forest health risk as an overlay. Forest health risk is a significant contributor to many of the priority areas. Efforts to address the forest health risk would be beneficial to the priority areas.

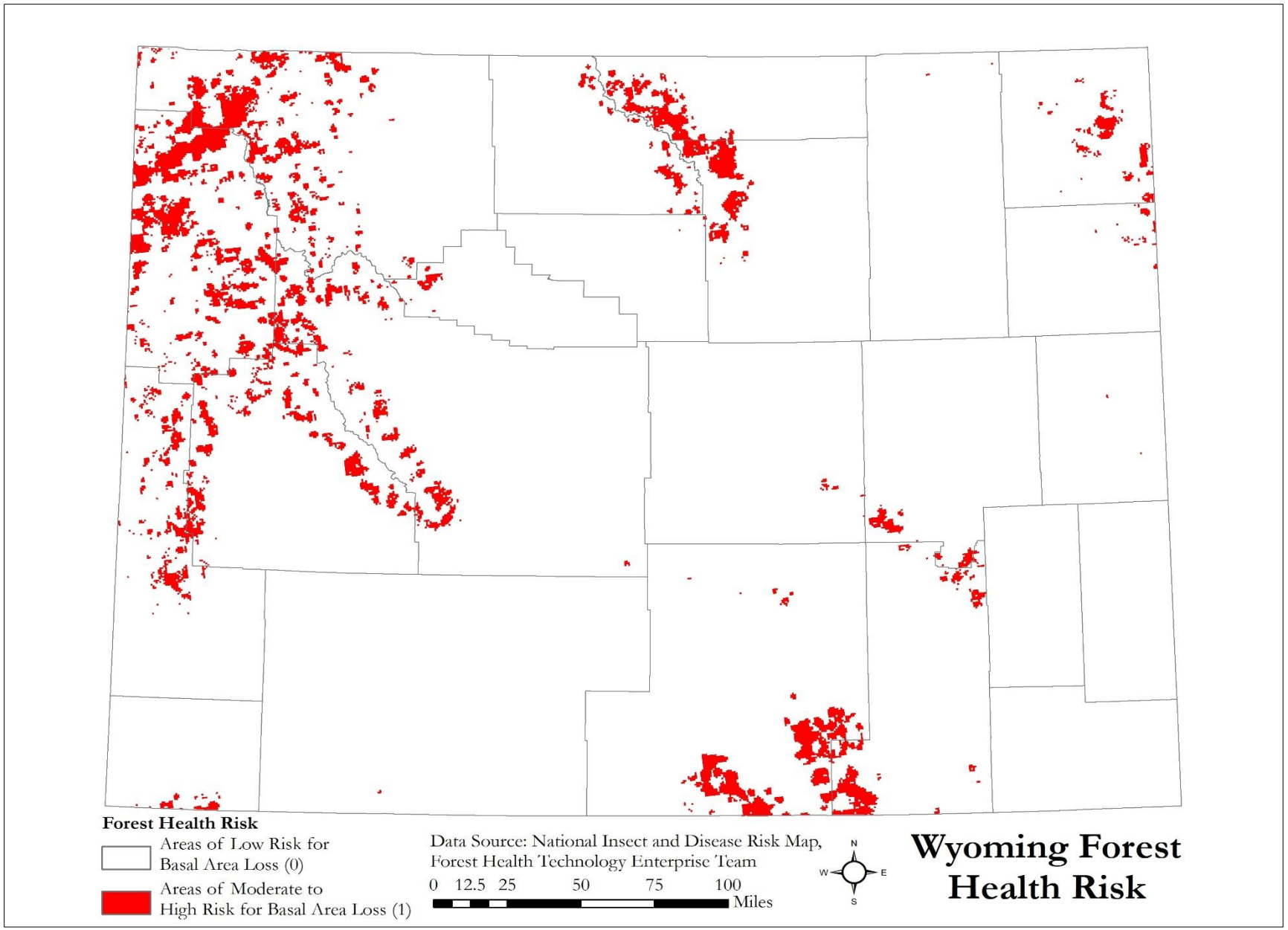


Figure 24. Wyoming Forest Health Risk.

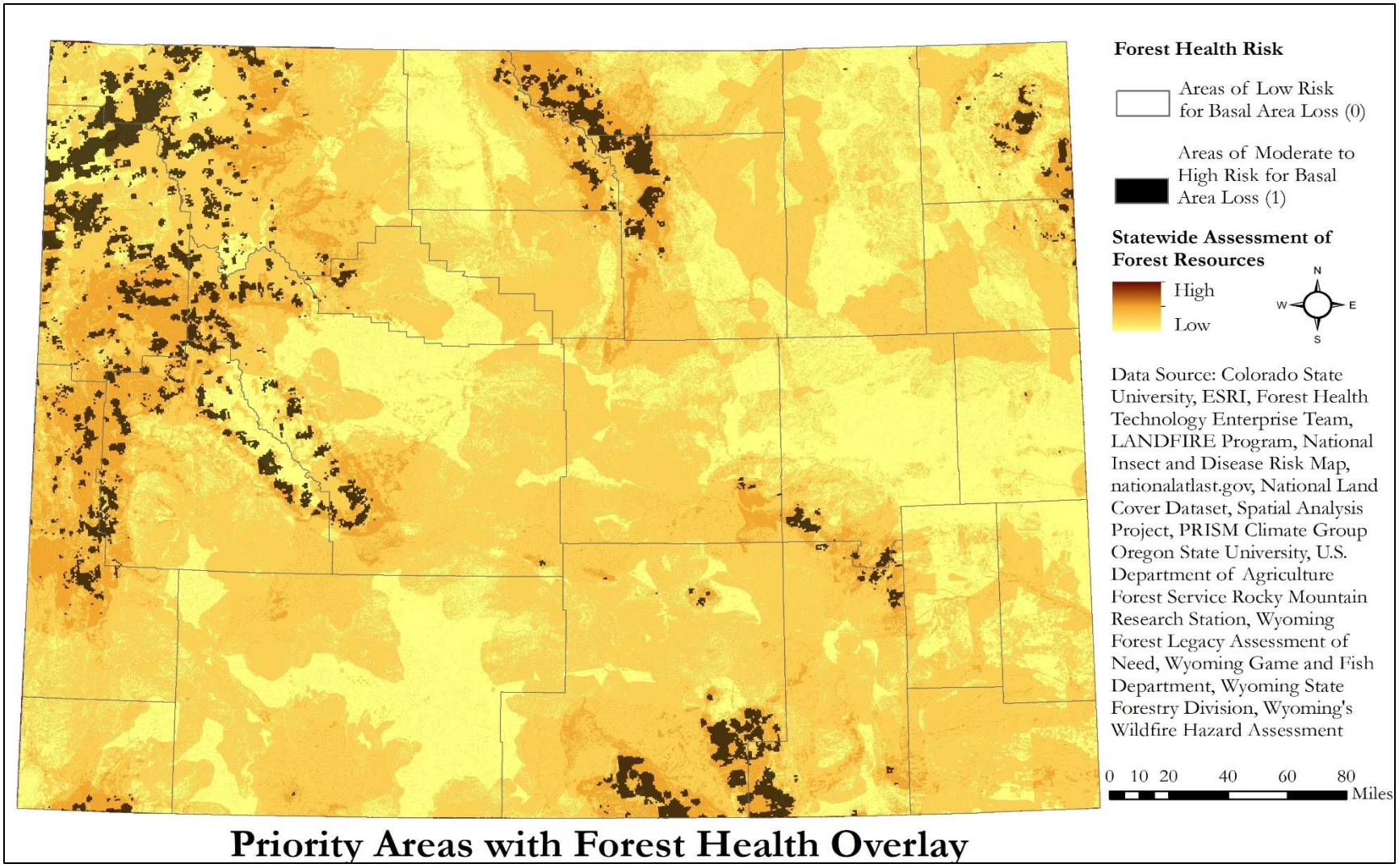


Figure 25. Priority Areas with Forest Health Overlay.

Fish and Wildlife Habitat—Terrestrial Habitat
Wildlife is a valuable resource in Wyoming, important to the economy through hunting and other recreation, and a tradition embraced by many Wyoming. Maintaining quality habitat is a top priority for wildlife managers. The Wyoming Game and Fish Department (WGFD) has a State Wildlife Action Plan that provides an overview strategy to ensure the health and diversity of wildlife are maintained throughout Wyoming. The latest version of the State Wildlife Action Plan can be found at https://wgfd.wyo.gov/Habitat/Habitat-Plans/Wyoming-State-Wildlife-Action-Plan.

In addition to the State Wildlife Action Plan, the WGFD also has a strategic habitat plan in place. Habitat considerations influence most natural resource management decisions in the state to some degree. WGFD has focused on collaborating with stakeholders and the public to create a plan that helps conserve ungulate migration corridors, known as the Migration Corridor Strategy. The Strategy provides specific proactive guidelines to help conserve migration routes, assessing probable threats, and provides the opportunity for a thorough review and comments on projects. Moreover, it is important to note that WGFD has been working on the Wyoming Mule Deer Initiative, which is an attempt to increase mule deer habitat across Wyoming, a component of migration corridor risk reduction. Wyoming State Forestry Division will work with the appropriate agencies to ensure all Trust Land Preservation and Enhancement (TP&E) will be protected.

The Fish and Wildlife Habitat—Terrestrial Habitat layer includes priority terrestrial habitat data from the WGFD, and sage grouse core habitat areas were used to emphasize important terrestrial wildlife habitat. The purpose of this layer is to "identify forest landscapes that represent or contribute to viable wildlife habitats, contain high species richness, endemism, and/or that represent core habitat for focal conservation species." Moreover, due to former Secretary of the Interior Jewell's Secretarial Order 3336—Rangeland Fire Prevention Management and Restoration Plan (signed 01/05/2015), the Sage Grouse Initiative lead by the NRCS in partnership with private landowners and Former Governor Mead's Executive Order for habitat preservation/conservation, the bird was not deemed appropriate for listing by the Fish and Wildlife Service in September 2015. However, due to the ongoing conservation effort in Wyoming, sage grouse core areas were included in the fish and wildlife habitat layer.

The priority terrestrial habitat, priority non-game habitat, and sage grouse core areas were combined into one polygon layer using the Union tool and then converted to a raster and reclassified to values of 0 and 1. The terrestrial habitat layer was given a weight of 2 due to importance. The WGFD recommended that their data for priority habitat be utilized in the analysis. This includes priority habitat for aquatic species, terrestrial species, and non-game species. These are often the types of habitat that limit game populations and distribution. This data was obtained via ftp download from WGFD and used to create a layer that is relevant to the analysis for the Wyoming Statewide Forest Resource Assessment.

National Theme: Enhance public benefits from trees and forests.

Strategic Objective: Protect, conserve, and enhance wildlife and fish habitat.

National Direction: Assessments should identify forest landscapes that represent or contribute to viable wildlife habitats, contain high species richness, and/or represent core habitat for focal conservation species. Assessments should incorporate state wildlife action plans.

Priority- Fish and Wildlife Habitat—Terrestrial Habitat
Among the current issues in Wyoming is the decline of aspen. Aspen decline is attributed to unsuccessful regeneration and/or competition from conifers. The lack of successful regeneration can have several causes, including drought, herbivory, and the lack of disturbance and/or harvesting of aspen stands. Planned projects by land management agencies address retaining or increasing aspen.

The impacts of bark beetle epidemics in Wyoming have caused significant changes to forest stand structure and composition. Bark beetle mortality of mature overstory trees has resulted in a decrease of forest cover and increases in coarse woody debris on the forest floor. These changes can impact forage abundance, thermal cover, and locomotive costs for large ungulates. With over 4 million acres across Wyoming affected by bark beetle mortality, the distribution of mature forests may be limited for decades.

The priority area map displays the Wyoming Statewide Forest Resource Assessment final map with priority terrestrial habitat as an overlay. Priority terrestrial habitat is a significant contributor to many of the priority areas and efforts to address it would be beneficial to the priority areas.

Fish and Wildlife Habitat—Aquatic Habitat
This layer represents priority aquatic habitat data from the Wyoming Game and Fish Department and was used to emphasize important aquatic wildlife habitat. The priority aquatic habitat layer was converted to a raster and reclassified to values of 0 and1. The aquatic layer was given a weight of 1 because it is often a duplicate of the “Water Quality and Supply” layer which already has a weight of 2.

The WGFD recommended that their data for priority habitat be utilized in the analysis. This includes priority habitat for aquatic species, terrestrial species, and non-game species. These are often the types of habitat that limit game populations and distribution. This data was obtained via ftp download from WGFD and used to create a layer that is relevant to the analysis for the Wyoming Statewide Forest Resource Assessment. Additionally, due to the ongoing conservation effort in Wyoming, sage grouse core areas were included in the fish and wildlife habitat layer.

National Theme: Enhance public benefits from trees and forests.

Strategic Objective: Protect, conserve, and enhance wildlife and fish habitat.

National Direction: Assessments should identify forest landscapes that represent or contribute to viable wildlife habitats, contain high species richness, and/or represent core habitat for focal conservation species. Assessments should incorporate state wildlife action plans.

Priority—Fish and Wildlife Habitat—Aquatic Habitat
This layer is closely tied to the water quality and supply layer but is also important because it represents a habitat for important aquatic species.

The map shows that priority aquatic habitat sometimes corresponds with priority areas identified by the Wyoming Statewide Forest Resource Assessment. Management that maintains priority aquatic habitat is likely to benefit the priority areas.

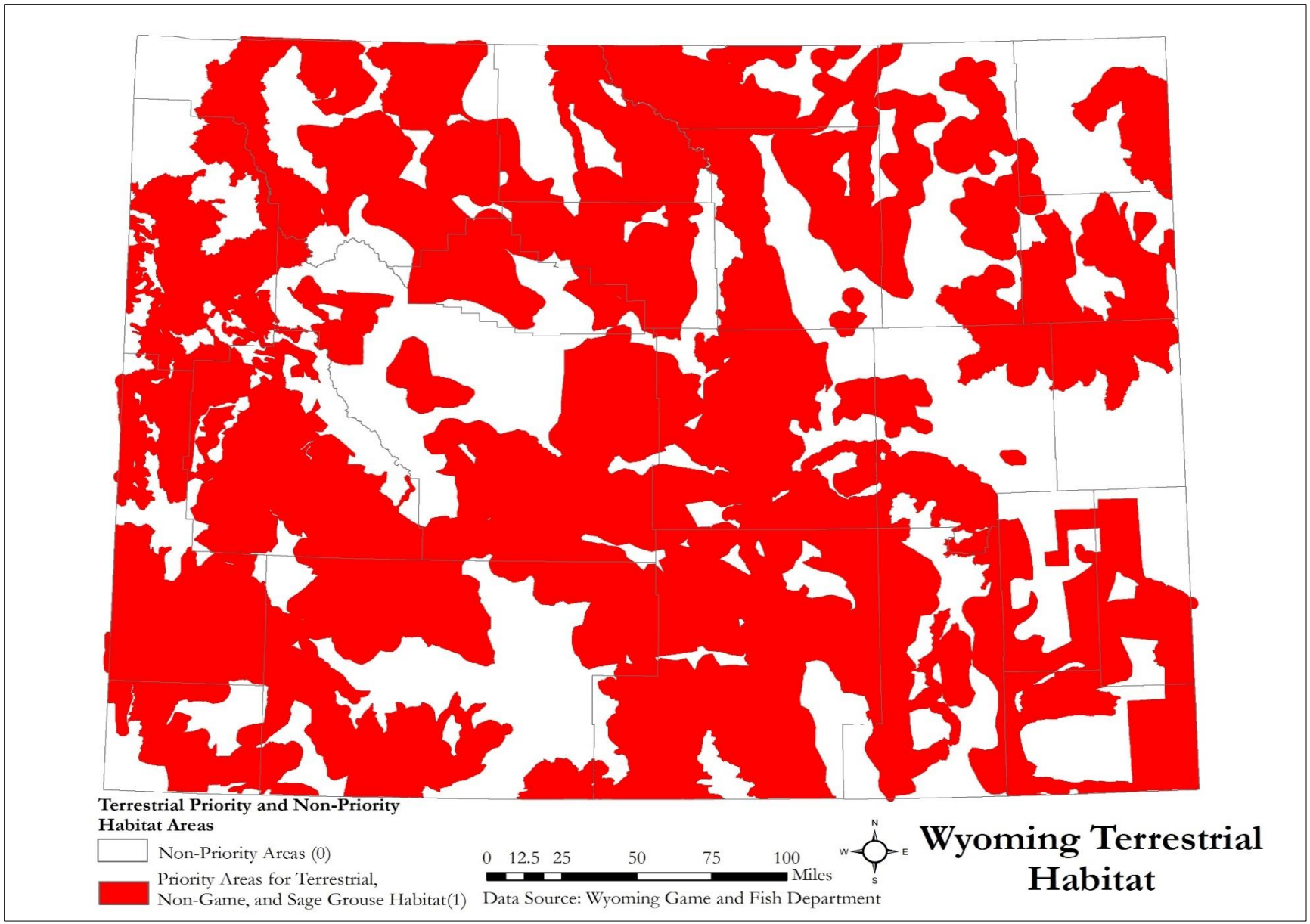


Figure 26. Wyoming Terrestrial Habitat.

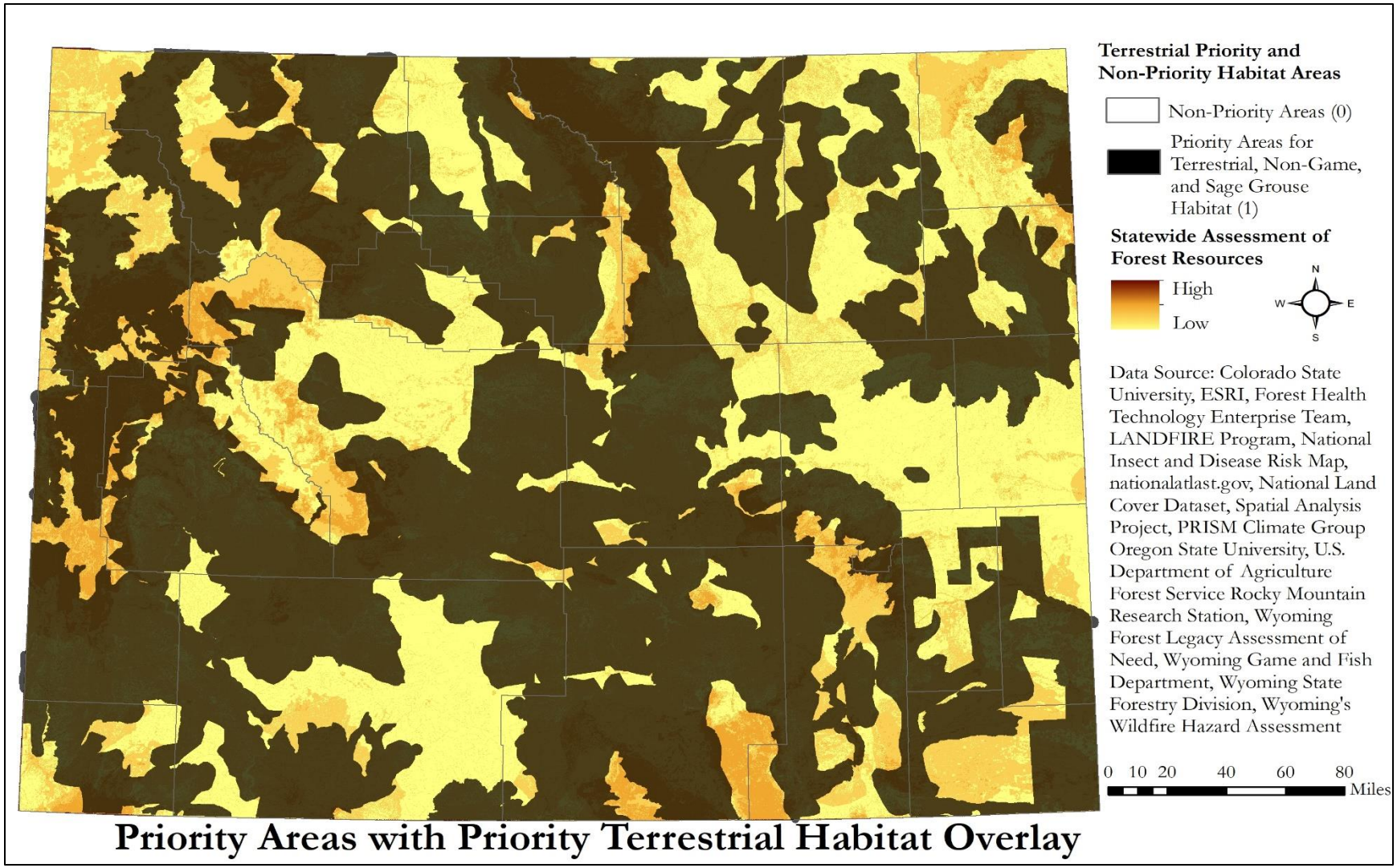


Figure 27. Priority Areas with Priority Terrestrial Habitat Overlay.

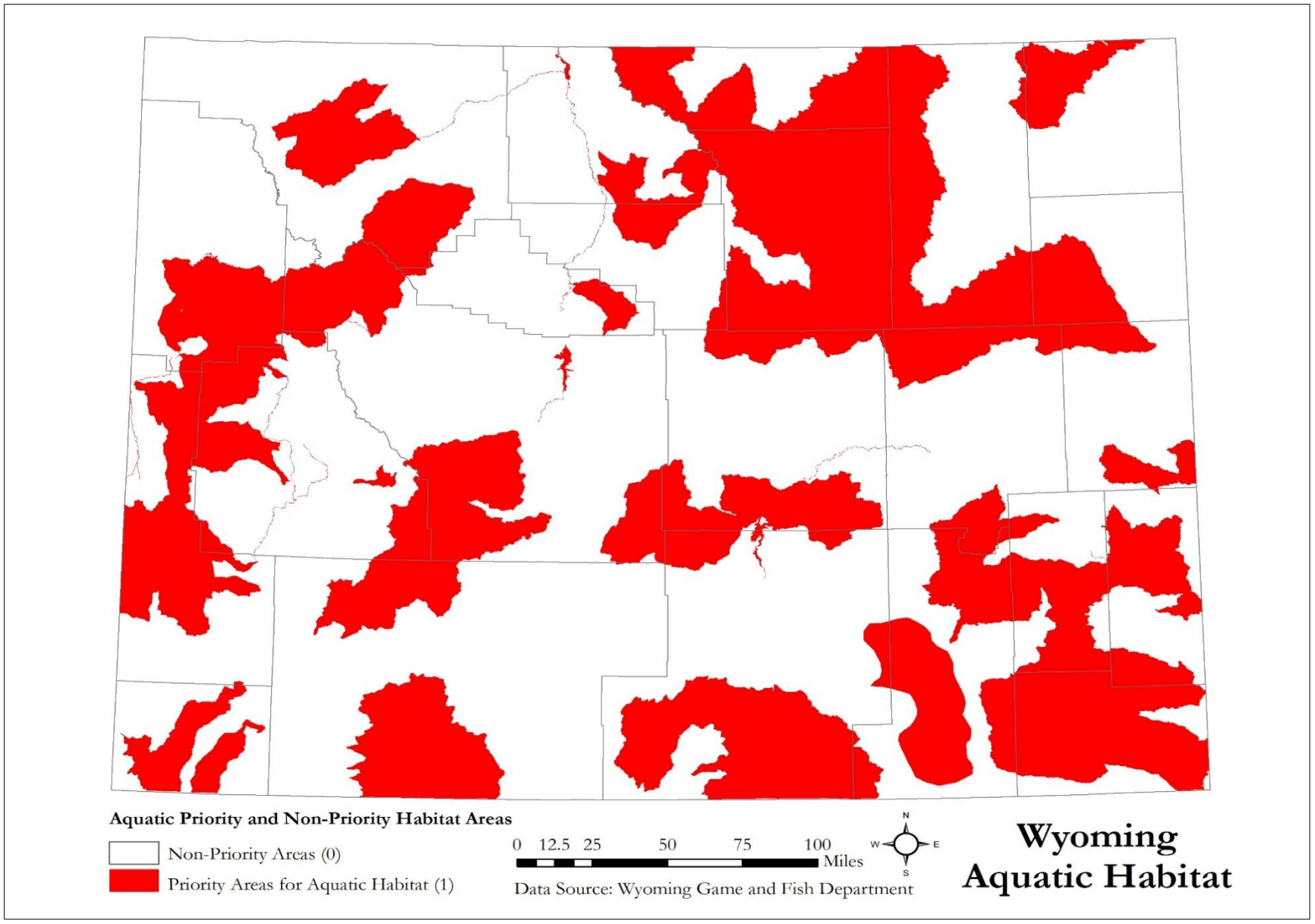


Figure 28. Wyoming Aquatic Habitat.

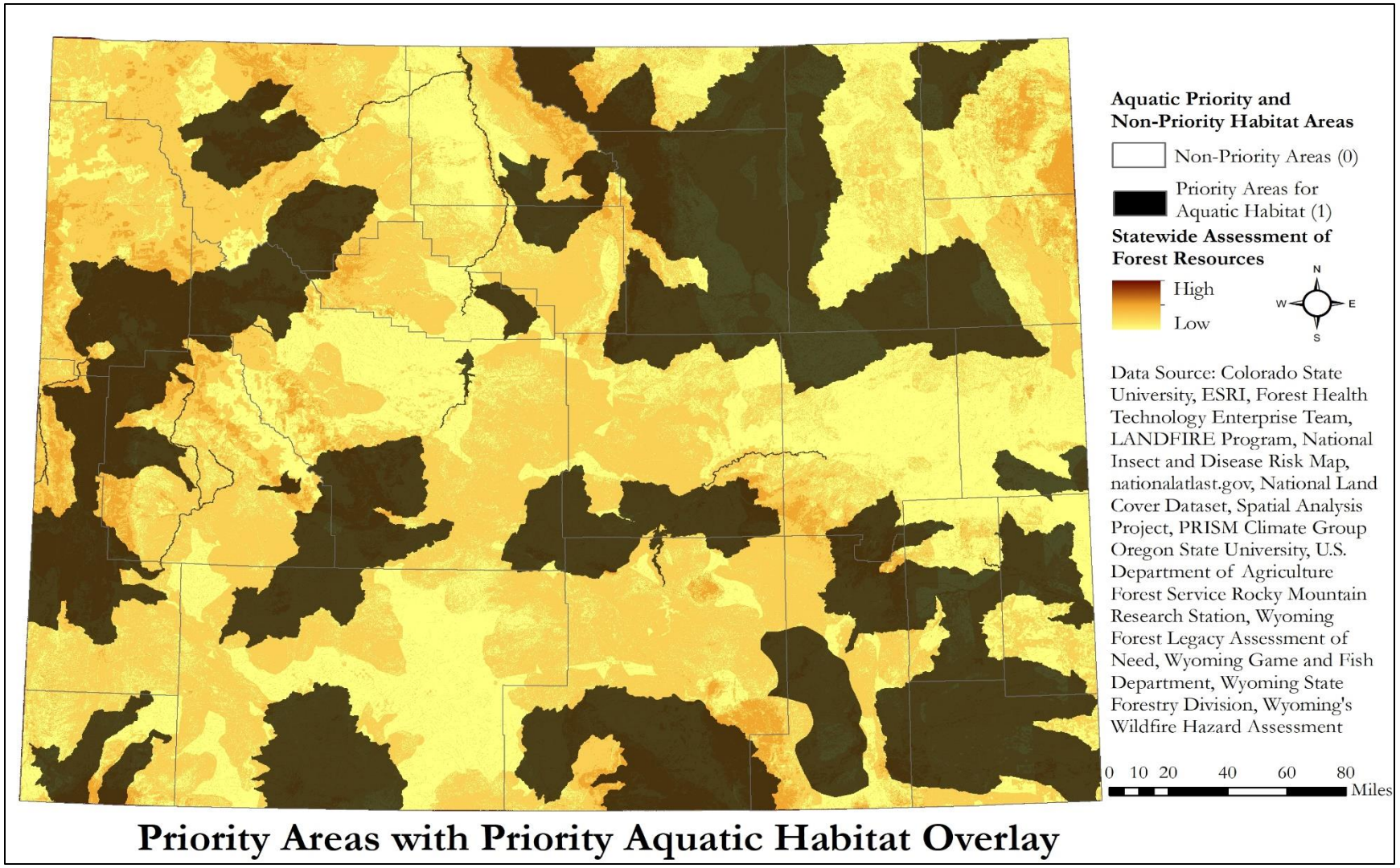


Figure 29. Priority Areas with Priority Aquatic Habitat Overlay.

Water Quality and Supply
This layer intends to emphasize the areas where there is sufficient precipitation to provide excess water which travels downstream for use elsewhere and areas where forest management can influence water quality and quantity.

The purpose of this layer is to "identify key watersheds necessary to maximize the forest benefits and where restoration or protection activities are particularly critical to water quality." This layer includes all areas receiving greater than 20 inches of annual precipitation (areas where water quantity can potentially be enhanced) and streamside management zones as a 50-foot buffer on all streams (areas where forestry practices can impact water quality). Any pixel in one or both of those areas was reclassified to "1" while other areas received a "0". This data layer was created by WSFD using all areas receiving more than 20 inches of annual precipitation combined with a streamside management zone layer

National Theme: Enhance public benefits from trees and forests.

Strategic Objective: Protect and enhance water quality and quantity.

National Direction: Assessments should identify watersheds where continued forest conservation and management is important to the future supply of clean municipal drinking water, or where restoration or protection activities will improve or restore a critical water source.

Priority Areas—Water Quality and Supply
In the arid West, water quality and supply has always been a critical issue for people, wildlife, industry, and agriculture. Long-term drought increases the focus on the issue. Pressure on the available water can be intense due to competing demands. Recall that a majority of Wyoming's water originates from snowmelt within the mountains. Experimental projects are underway to evaluate cloud seeding as a means to increase snowfall. Management actions that can increase water yield while protecting water quality could be helpful.

The large-scale insect epidemic that occurred in southern Wyoming contributed to increased water yield within the area. However, the dead trees now are fuel for a wildfire, increasing the risk of a large wildfire with the potential for negative effects on water quality. The watersheds throughout Wyoming need to be protected and have proper forestry practices done such as ensuring invasive species are removed and fuels reduction is conducted.

Climate change could impact water quality and supply. Should climate change produce a long-term reduced precipitation scenario, water quality would be reduced. The amount and timing of runoff and peak flows could be altered. Increased wildfire activity during a warmer/drier period could negatively impact water quality as larger, hotter fires affect vegetative cover and soils.

Wyoming has a voluntary mechanism in place to protect water quality. Wyoming's Silviculture Best Management Practices (BMPs) are a cooperative effort between WSFD, the Department of Environmental Quality, the forest products industry, forest landowners, and land management agencies. A system of logger/landowner/land manager education and audits of timber sales exists to help maintain clean water and avoid impacts to streams. The ongoing audits have shown high

implementation and effectiveness of the BMP's and provided the information needed to focus on training as problems arise.

Moreover, the Wyoming Water Development Office has funded and provided support for Municipal Watershed Wildfire Hazard Mitigation Assessments within the State of Wyoming to further support objects in the Governor's Task Force on Forests. In particular, these studies helped establish watershed management plans that highlight forest management treatments that have the potential to reduce the impact of wildfires on municipal watersheds in portions of Wyoming such as Cheyenne and Buffalo.

The priority area map displays the Wyoming Statewide Forest Resource Assessment final map with water quality and supply as an overlay. Water quality and supply is a significant contributor to many of the priority areas and efforts to address water quality and supply would be beneficial to the priority areas.

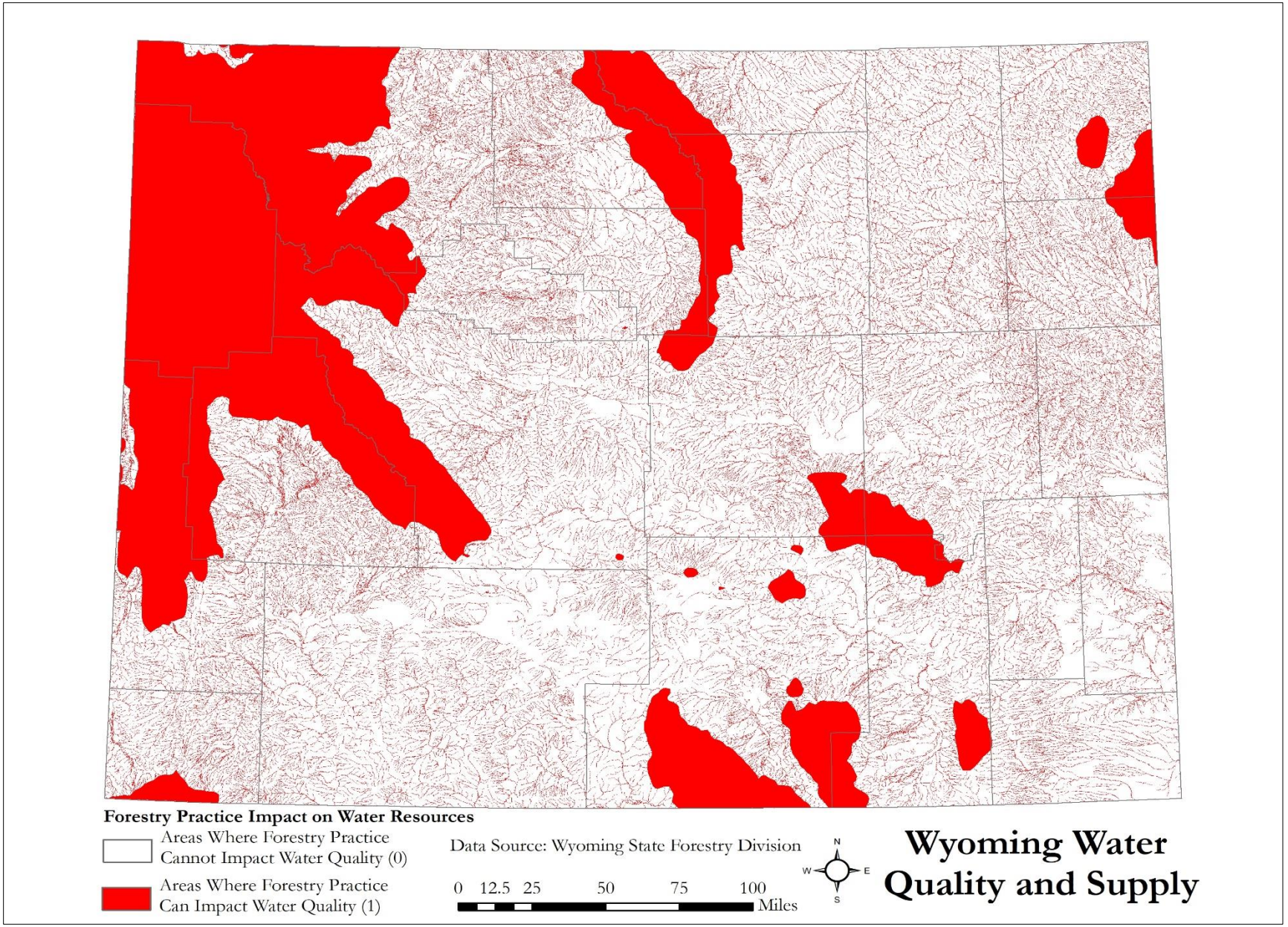


Figure 30. Wyoming Water Quality and Supply.

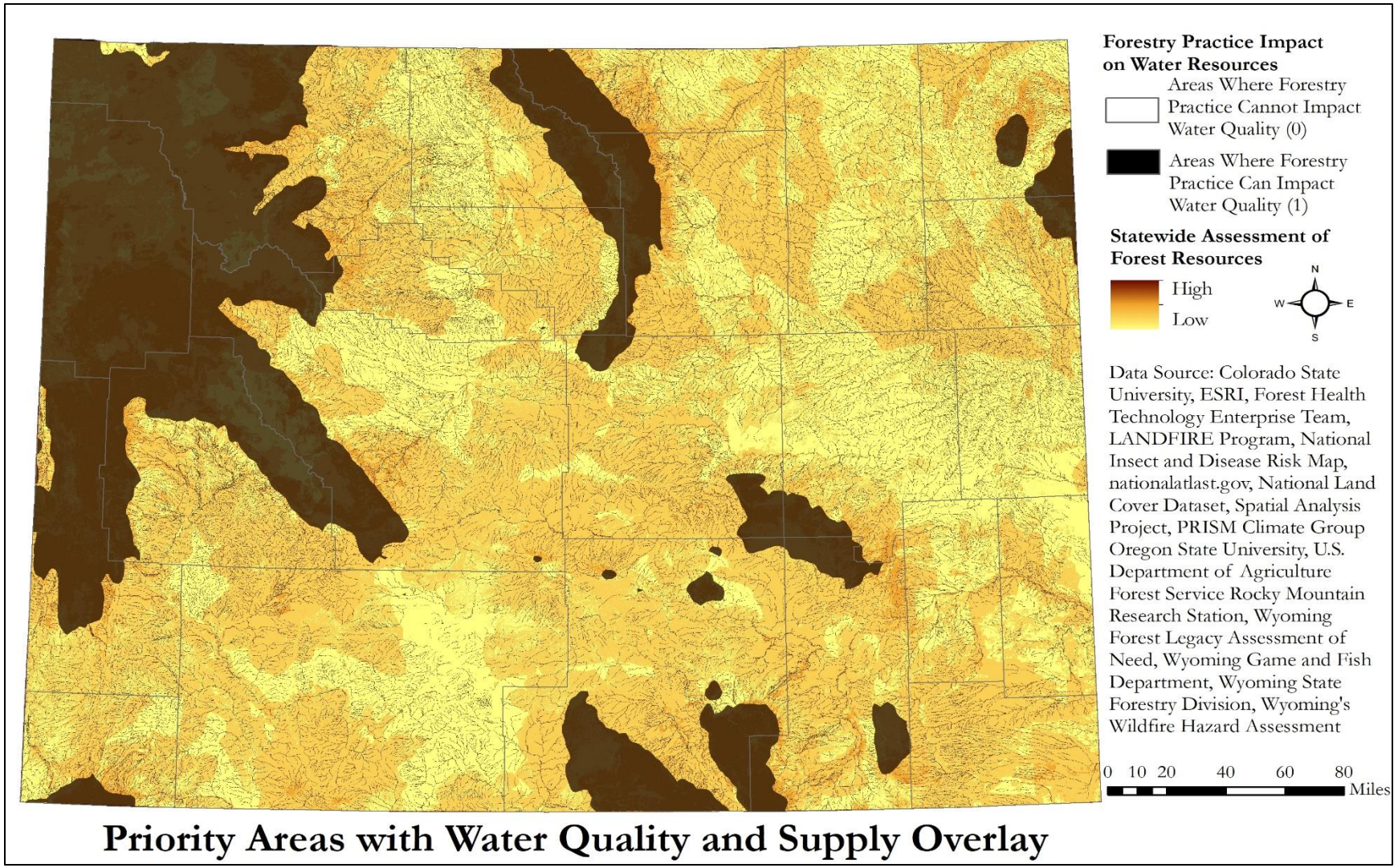


Figure 31. Priority Areas with Water Quality and Supply Overlay.

Economic Potential—Working Forests
This layer represents non-reserved forests of any species on less than 50% slope with a site index of 50 or greater (base 100). Harvesting in steeper slopes areas must be done appropriately, ensuring BMP guidelines are followed, and it is economically viable. It is intended to "identify forest landscape areas where there is a real, near term potential to access and supply traditional, non-timber, and/or emerging markets such as those for biomass or ecosystem services." For Wyoming, this layer has added importance as the state struggles to retain existing traditional forest products industry capacity and looks for opportunities for alternative forest product industry capacity. The traditional forest products industry capacity is especially important both for forest management needs and for developing alternative uses for biomass.

Wyoming chose to use two layers to address economic potential. The first layer is working forests, which addresses all forested lands with the potential to be productive forests (traditional forest products, biomass, or ecosystem services) based on several factors. The other is mill demand forests**,** which addresses the forested lands that are important for producing the raw materials necessary to help retain existing forest products industry infrastructure. Note that the term "working forest" is not restricted to productive timberlands. Riparian and community forests are also included in this layer. This separates the working forest layer from the mill demand forests layer. The working forest data originated from the National Land Cover Dataset (NLCD) limited to the above criteria by a model produced by WSFD. The intent is to represent all working forests – traditional, riparian, and community.

Site Index
A layer for site index data is not available for all lands in Wyoming, thus a new one was created based upon three factors—precipitation, elevation, and aspect. The site index layer was then reclassified.

- The precipitation layer was reclassified with less than 15" = 0, 15 – 20" = 2, 20 – 25" = 4, and 25"+ = 6.
- The elevation layer was reclassified with < 4,000' = 0, 4,000 – 8,000' = 2, 8,000 – 9,500' = 1, 9,500 – 10,000' = 0, and > 10,000' = -1.
- Aspect was created from a 30-meter DEM and reclassified based on azimuth so that 0 – 45 and 315 – 360 = 2, 225 – 315 and 45 – 135 = 1, and 135 – 225 = 0.

Final outputs ranged from 0–10, which were assigned to site indices of 20–90 throughout the state. For the final reclassification of this layer, site index values 50 and greater were classified as 1 with all other lands classified 0, under the assumption that site index values less than 50 do not represent commercially important lands.

Slope
A 30-meter digital elevation model (DEM) for Wyoming was utilized for the slope layer, which was calculated using the Spatial Analyst tool and then reclassified. Areas with a slope less than or equal to 50% were classified as "1" and other areas were classified as "0". 50% was used because although that is often considered too steep for typical ground-based systems, there are other areas with a greater slope that could be harvested using cable systems not often used in Wyoming. In order to account for some of the steeper terrain, the maximum slope was raised to include more acres of forest land.

Forest Cover
The National Land Cover Database (NLCD) was used to create the forested land layer. The values 31-33, 41-43, and 91 were used to create it. Subsequently, the forested areas were reclassified to "1" and non-forested areas were reclassified to "0".

Non-Reserved Land
The purpose of the non-reserved land was to remove wilderness, national parks, and research natural areas from the analysis. While those areas provide other values, for this analysis working forest lands cannot be within those designated areas. Reserved lands were classified as "0" and non-reserved classified "1". Moreover, roadless areas were not considered reserved land because they have been withdrawn from active management as a result of USFS management decisions, not as a result of any legal requirement in effect in Wyoming at this time.

Overview of Working Forest Layer
A weighted sum analysis was conducted on the four layers mentioned above. Briefly, the four layers made up of "1" and "0" data were stacked on top of one another and the pixel values summed using equal weights. Any pixel within the resulting layer could have a value from 0-4. In order to be considered a "working forest", a pixel needed to have a resulting value of 4, meaning it met the requirements in all 4 layers. The resulting data was reclassified so that values of 4 became 1 and all other values became 0.

National Theme: Enhance public benefits from trees and forests. Conserve working forest lands.

Strategic Objective: Maintain and enhance the economic benefits and values of trees and forests. Actively and sustainably manage forests.

National Direction: Assessments should identify forest landscape areas where there is a real, near term potential to access and supply traditional, non-timber, and/or emerging markets such as those for biomass or ecosystem services. Assessments and strategies can identify viable and high potential working forest landscapes where landowner assistance programs…can be targeted to yield the most benefit in terms of economic opportunities and ecosystem services. Assessments and strategies can also identify opportunities for multi-landowner landscape-scale planning and landowner aggregation for access to emerging ecosystem service markets.

Economic Potential—Mill Demand Forests
This layer represents working forests (coniferous only) within current mill working circles as defined by WSFD.

In order to depict the forest products industry demand for timber, locations for major mills were selected from a mill location data layer. Major mill locations were buffered based on observed (subjective) haul distances for sales purchased by each mill. The individual buffers were then combined into one raster dataset and reclassified to "1" for within a demand area and "0" outside of demand areas. Mill working circles were then combined with the working forests layer via overlay analysis and reclassification to produce a data layer called Mill Demand Forests. That layer represents the working forests within mill working circles.
National Theme: Enhance public benefits from trees and forests. Conserve working forest lands.

Strategic Objective: Maintain and enhance the economic benefits and values of trees and forests. Actively and sustainably manage forests.

National Direction: Assessments should identify forest landscape areas where there is a real, near term potential to access and supply traditional, non-timber, and/or emerging markets such as those for biomass or ecosystem services. Assessments and strategies can identify viable and high potential working forest landscapes where landowner assistance programs…can be targeted to yield the most benefit in terms of economic opportunities and ecosystem services. Assessments and strategies can also identify opportunities for multi-landowner landscape-scale planning and landowner aggregation for access to emerging ecosystem service markets.

Priority Areas—Economic Potential

Wyoming's forests have always played an important economic role. Historic uses included timber harvesting for railroad ties and lumber, livestock grazing, mining, hunting, and fishing. Small sawmills existed in many locations around the state. Old timber harvesting practices have been replaced by modern, efficient practices. The small sawmills have decreased in number while larger more efficient operations have emerged. Livestock grazing remains an important use of the forests.

About 64% of unreserved timberland in Wyoming is the National Forest System (NFS) federal land managed by the U.S. Forest Service (McIver et al., 2016). Moreover, 67% of the 2018 harvest came from NFS lands, while 27% came from tribal and private landowners and approximately 6%from other public landowners including the State and Bureau of Land Management (Marcille et al., *in prep*). In 2018, Wyoming's timber harvest was 81.6 million board feet (MMBF), representing a 21% increase over 2014 (Marcille et al., *in prep*; McIver et al., 2016). While harvest levels were down in both private (3% decrease) and other public land (49% decrease), timber harvest on NFS land was up 55% in 2018 relative to 2014 (Marcille et al., *in prep*).

The forest products industry in the state faces many challenges. The availability of wood for harvest is a limiting factor in the industry. National and international economic factors and the nature of the forest products industry at large create difficulties for Wyoming's industry. High fuel prices have impacted the shipping of products from the forest to the mill to the market, although those prices are currently decreasing. Mills must obtain logs from much longer distances (300 miles and more) than in the past.

The number of mills Wyoming has varied over the years from 107 in 1957, 23 in 2000, and 21 in 2005. In 2010, there were 29 active primary forest product manufacturers, and 28 in 2014 (McIver et al., 2016). As of 2018, Wyoming had 30 active primary forest product manufacturers, producing lumber, post and poles, log homes, wood pellets, as well as animal bedding, firewood, and log furniture (Marcille et al., *in prep*). Although there has been a variation in the number of manufacturers, there has been a steady increase in the industry's capacity to process timber (McIver et al., 2016). In particular, this was a result of the Saratoga mill opening under new ownership, along with additional manufacturers throughout the southeastern portion of the state.

Without the forest products industry, forest management on a meaningful scale becomes difficult to accomplish. There is an opportunity to use forest management projects to produce the raw materials to sustain the industry while addressing the problems described elsewhere in this document, such as forest health and wildfire risk.

There is interest in a new type of forest products industry to utilize small-diameter material, dead trees, and mill residue, which are among the materials generally described as biomass. Using biomass to heat schools, produce wood pellets, and generate electricity have all been explored. Federal and state governments have provided technical assistance and funding to promote new markets. Economic factors, such as the cost to transport materials to a processing facility have made the establishment of these new markets difficult. Economic factors will probably dictate that new markets would be most successful if located near a traditional mill to allow the higher value products to offset the transportation costs for the biomass.

Of course, there is non-commodity economic potential related to Wyoming's forests, such as recreation, tourism, clean air, clean water, and habitat value. There is also another commodity-related economic potential, such as oil and gas development. These are all important economic issues and the intent of this assessment is not to minimize them. However, the direction for this assessment is clear that economic potential refers to "…areas where there is a real, near-term potential to access and supply traditional, non-timber, and/or emerging markets such as those for biomass or ecosystem services."

Ecosystem services is another topic of interest, particularly with potential markets for carbon offsets and the role that forests can play through carbon sequestration as a method of mitigating climate change. Forests can sequester significant carbon. According to a University of Wyoming (UW) study in cooperation with WSFD, the most densely stocked forests, even with relatively small diameter trees, contain the most stored carbon. Thinned stands and younger, faster-growing stands sequester carbon at a faster rate as they grow. The issue with relying on densely stocked stands to sequester carbon is that they may not be sustainable for the long term due to the risk of loss to insects, disease, and wildfire.

Markets for carbon offsets have been slow to develop for Wyoming landowners. WSFD explored a sale of carbon offsets but one climate exchange was unwilling to allow state governments to participate. Should a "cap and trade" system be implemented in the United States then markets for forest carbon may begin to develop more rapidly.

The map displays the overall Wyoming Statewide Forest Resource Assessment with economic potential layers as an overlay. Economic potential is a significant contributor to many of the priority areas and efforts to address economic potential would be beneficial to the priority areas.

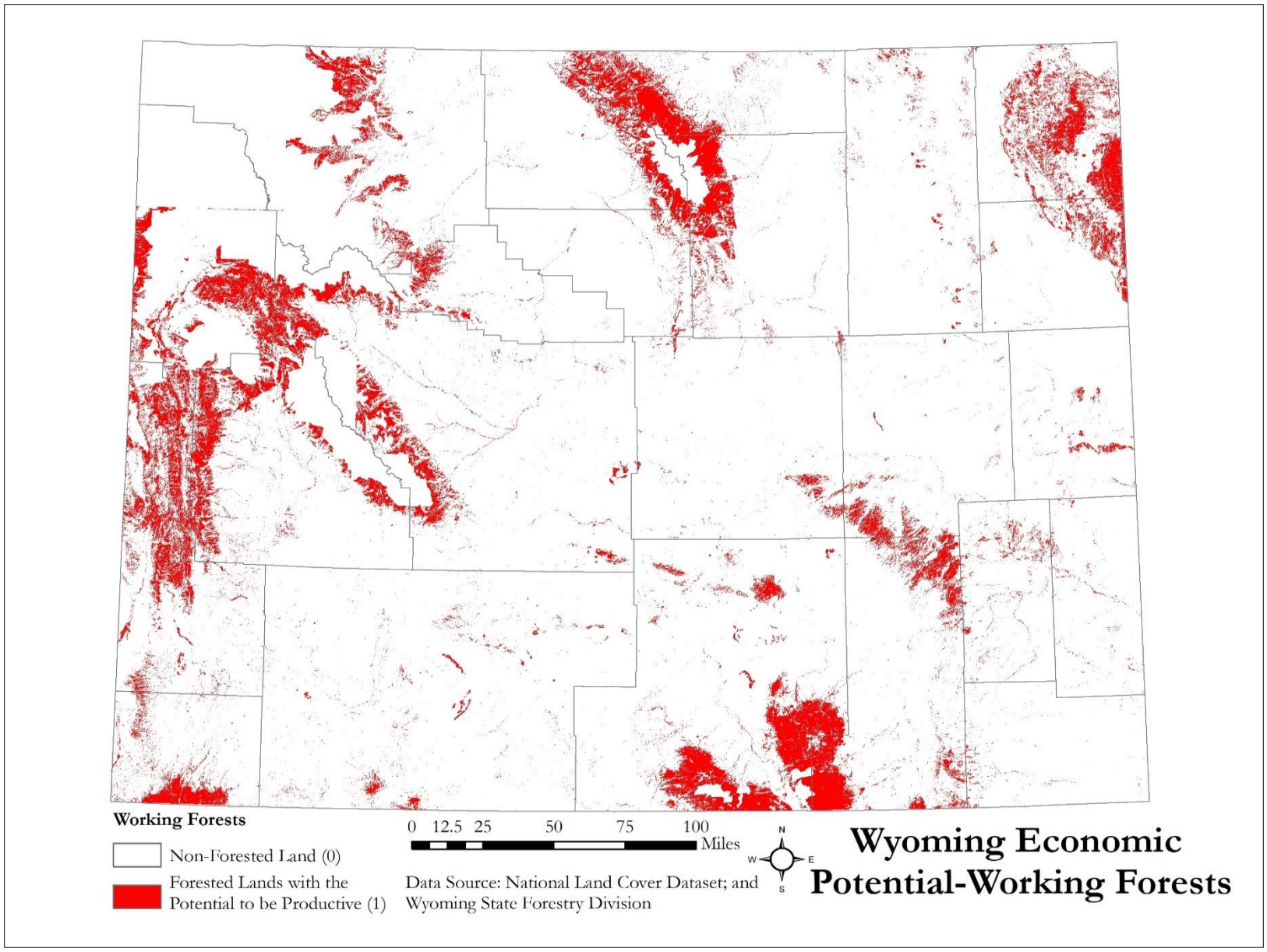


Figure 32. Wyoming Economic Potential—Working Forests.

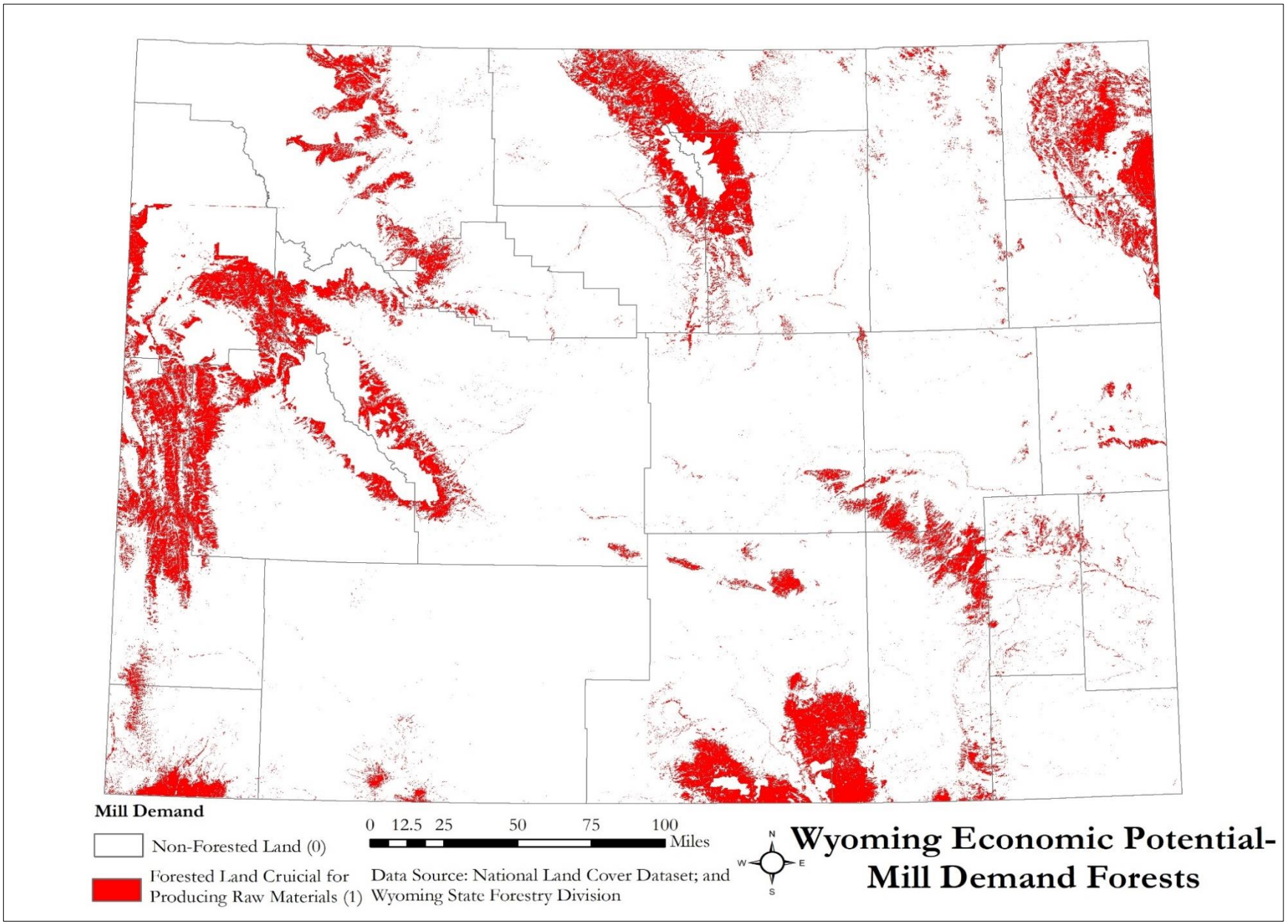


Figure 33. Wyoming Economic Potential—Mill Demand Forests.

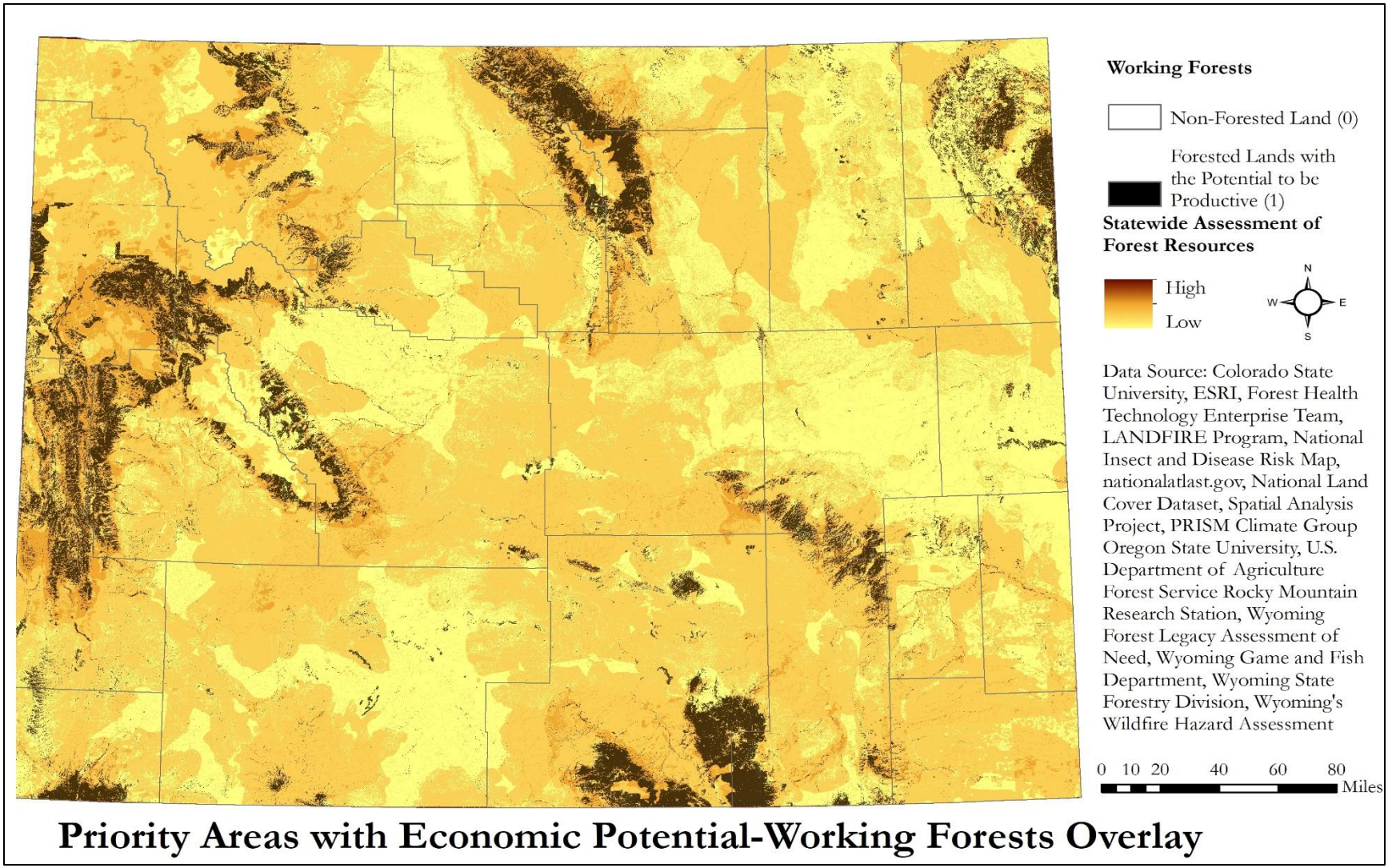


Figure 34. Priority Areas with Economic Potential—Working Forests Overlay.

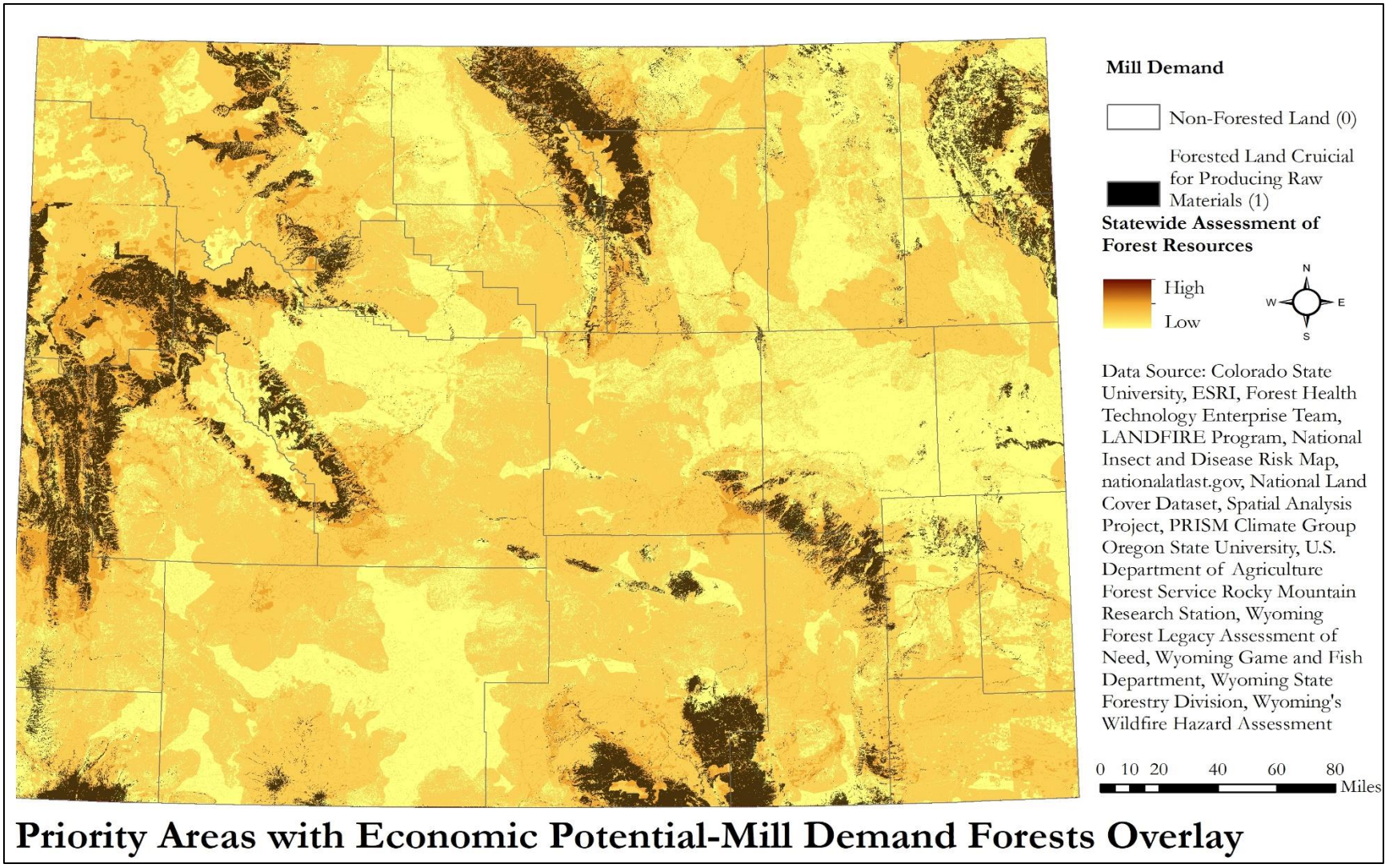


Figure 35. Priority Areas with Economic Potential—Mill demand Forests Overlay.

Green Infrastructure

Green infrastructure encompasses all the vegetation in a developed area that assists with managing the urban environment by providing ecosystem services. Within Wyoming and the western portion of the United States, green infrastructure is referenced as a set of practices that assist with managing the urban environment and further supports urban and community forestry. This entails practices such as managing storm water runoff and utilizing urban forests throughout our communities. By encouraging and supporting green infrastructure, it can decrease temperatures of impervious surfaces through increased urban tree canopy, improve aesthetics within the community, increase property values, enhance outdoor recreational opportunities, as well as create a further sense of community and wellbeing.

By discussing this in the terms of 'infrastructure', it suggests that urban forests and trees are a crucial component of our earth-system science and just as important as other infrastructure resources such as water, transportation, as well as electricity (Council of Western State Foresters, 2017). By prioritizing green infrastructure within an urban landscape, decision-makers have the opportunity to address the importance of connecting nature and society. As a result, this could lead to increased budgets dedicated to program development and infrastructure improvements.

National Theme: Conserve working forest lands.

Strategic Objective: Identify and conserve high priority forest ecosystems and landscapes.

National Direction: Assessments and strategies should attempt to identify, protect, and connect ecologically important forest landscapes and open space, thus maintaining green infrastructure, particularly around and within areas of population growth and development.

Community Forestry
Community forestry is a high priority in Wyoming because growing trees in Wyoming communities is difficult and requires commitment, expertise, and funding. Many communities lack expertise or funding and depend on WSFD for assistance. Rather than use a complex analysis to prioritize Wyoming's small number of communities, WSFD chose to use the boundaries of the incorporated communities as a layer in this analysis.

The purpose of this layer is to "identify, protect, and connect ecologically important forest landscapes, and open space, thus maintaining a green infrastructure, particularly around and within areas of population growth and development" and "identify areas where management or restoration of the urban or exurban forest canopy will have significantly positive and measurable impacts on air quality and produce substantial energy savings." Polygon data was obtained for the boundaries of Wyoming's cities and towns. The polygon data was converted to a raster and reclassified to values of 1 for communities and 0 for all other lands. This layer is an attempt to include communities as part of this analysis since they were not included in the national direction.

National Theme: Conserve working forest lands. Enhance public benefits from trees and forests.

Strategic Objective: Identify and conserve high priority forest ecosystems and landscapes. Actively and sustainably manage forests. Improve air quality and conserve energy.

National Direction: Assessments should attempt to identify, protect, and connect ecologically important forest landscapes and open space, thus maintaining green infrastructure, particularly around and within areas of population growth and development. Identify areas where management of the urban or exurban forest will have a positive and measurable impact on air quality and produce substantial energy savings.

Priority Areas—Community Forestry
The Wyoming Community Forestry priority area map shows the Wyoming Statewide Forest Resource Assessment final map with communities as an overlay. Communities are often within the priority areas and efforts to address the community forests would be beneficial to the priority areas.

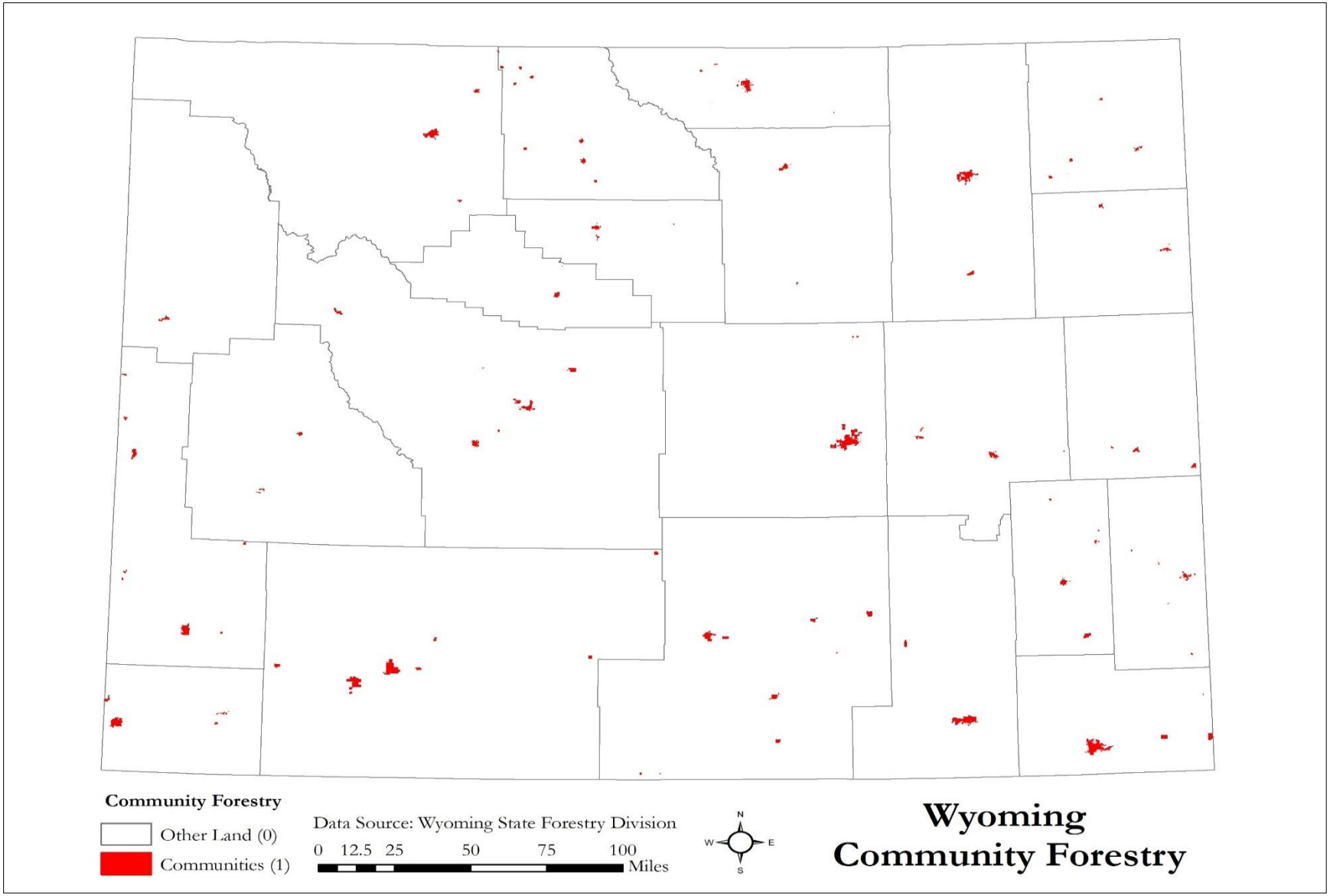


Figure 36. Wyoming Community Forestry.

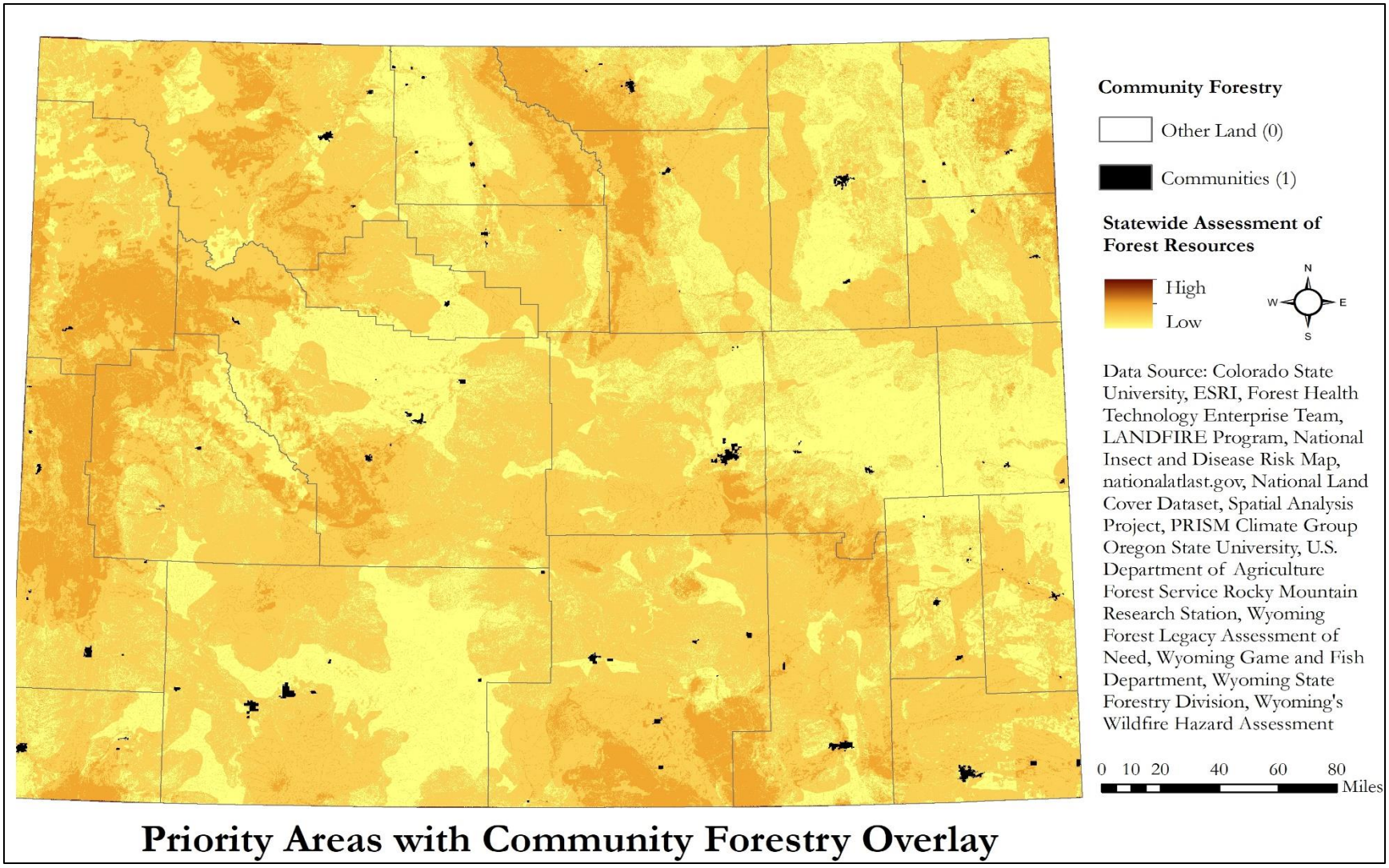


Figure 37. Priority Areas with Community Overlay.

Rural Forestry Assistance Potential
Approximately 17% of Wyoming's forest lands are privately owned, these lands provide about 73% of the forest products harvested in the State. Providing technical and management planning assistance to forest landowners is a key component of WSFD's mission.

The source for this data layer is the Gap Analysis Project (GAP) National Land Cover Dataset for Wyoming. The dataset was developed using multi-season satellite imagery (Landsat ETM+) from 1999-2001 in conjunction with digital elevation model (DEM) derived datasets (e.g. elevation, landform) to model natural and semi-natural vegetation. Vegetation classes were drawn from NatureServe's Ecological System Classification (Comer et al. 2003). Additionally, the project included land-use classes that were employed to describe areas where natural vegetation has been altered. In many areas of the country, these classes were derived from the National Land Cover Dataset (NLCD). The final output layer is a compilation of forest and woodland cover types. Areas of privately owned forest were classified as 1 with other areas classified as 0

National Theme: Conserve working forest lands.

Strategic Objective: Identify and conserve high priority forest ecosystems and landscapes. Actively and sustainably manage forests.

National Direction: Assessments should identify forest landscape areas where there is a real, near term potential to access and supply traditional, non-timber, and/or emerging markets such as those for biomass or ecosystem services. Assessments can identify viable and high potential working forest landscapes where landowner assistance programs can be targeted.

WSFD provides a broad range of outreach and technical assistance to private landowners; ranging from workshops and field days, to on the ground technical assistance and cost-share, to the development of multi-resource management plans. Assistance is available to all landowners and tailored to address their individual management goals and objectives and site-specific resource needs, to protect and enhance the environment while providing a range of economic and resource benefits. Program guidance is provided by the USDA Forest Service Forest Stewardship Program and management plans are developed in compliance with Stewardship Program Guidelines. The Rural Forestry Assistance Program seeks to integrate all Cooperative Forestry Programs and promote healthy, diverse, vigorous forests with enhanced resilience to wildfire, insects, and disease; while providing for a sustainable and reliable supply of forest products.

Rural Forestry Assistance also promotes the integration of trees and shrubs with livestock and crops, which provides significant biological, economic, and social benefits, facilitating the retention, enhancement, and restoration of biological diversity and agroecosystem resilience at the field, farm, watershed, and landscape levels. This integrated approach is known as Agroforestry.

Agroforestry practices are site adapted and are applicable to a wide range of locations in Wyoming. Practices broadly fall into three categories: silvopasture, riparian buffer strips, and windbreaks. Most forested land, riparian areas, and agricultural lands are suitable for one or more agroforestry practice with limitations set by precipitation, elevation, and soils. Silvopasture is probably the most common agroforestry practice in the state; incorporating forage production with traditional forest management to enhance forest health and diversity, reduce fuel loading and the impact of wildfire, and improve product quality and revenues. Riparian buffer strips maintain and enhance water quality; filtering sediments and non-point source pollutants, stabilize stream banks and retain, enhance, and restore aquatic and terrestrial habitats. Windbreaks moderate wind speed, reducing soil erosion, provide protection to livestock and crops, alter snow drift patterns, and provide habitat diversity. Often these practices can be assisted technically and financially by the Natural Resource Conservation Service and Wyoming Conservation Districts. Wyoming has a successful Living Snow Fence Program which installs windbreak plantings for the specific purpose of controlling snow drift on state highways, which significantly contributes to public safety and reduces snow control costs. Currently, program demand exceeds resource availability.

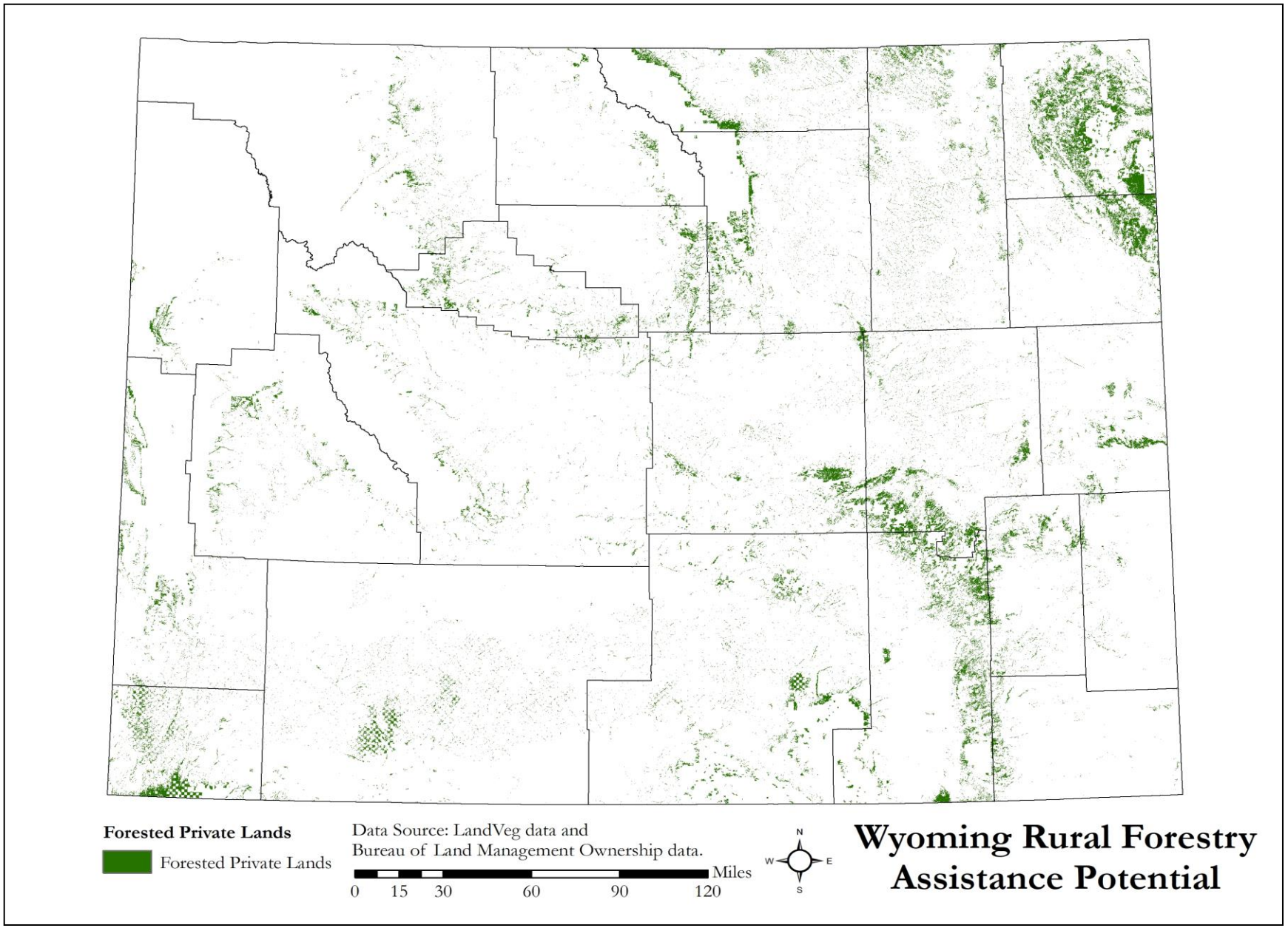


Figure 38. Wyoming Rural Forestry Assistance Potential.

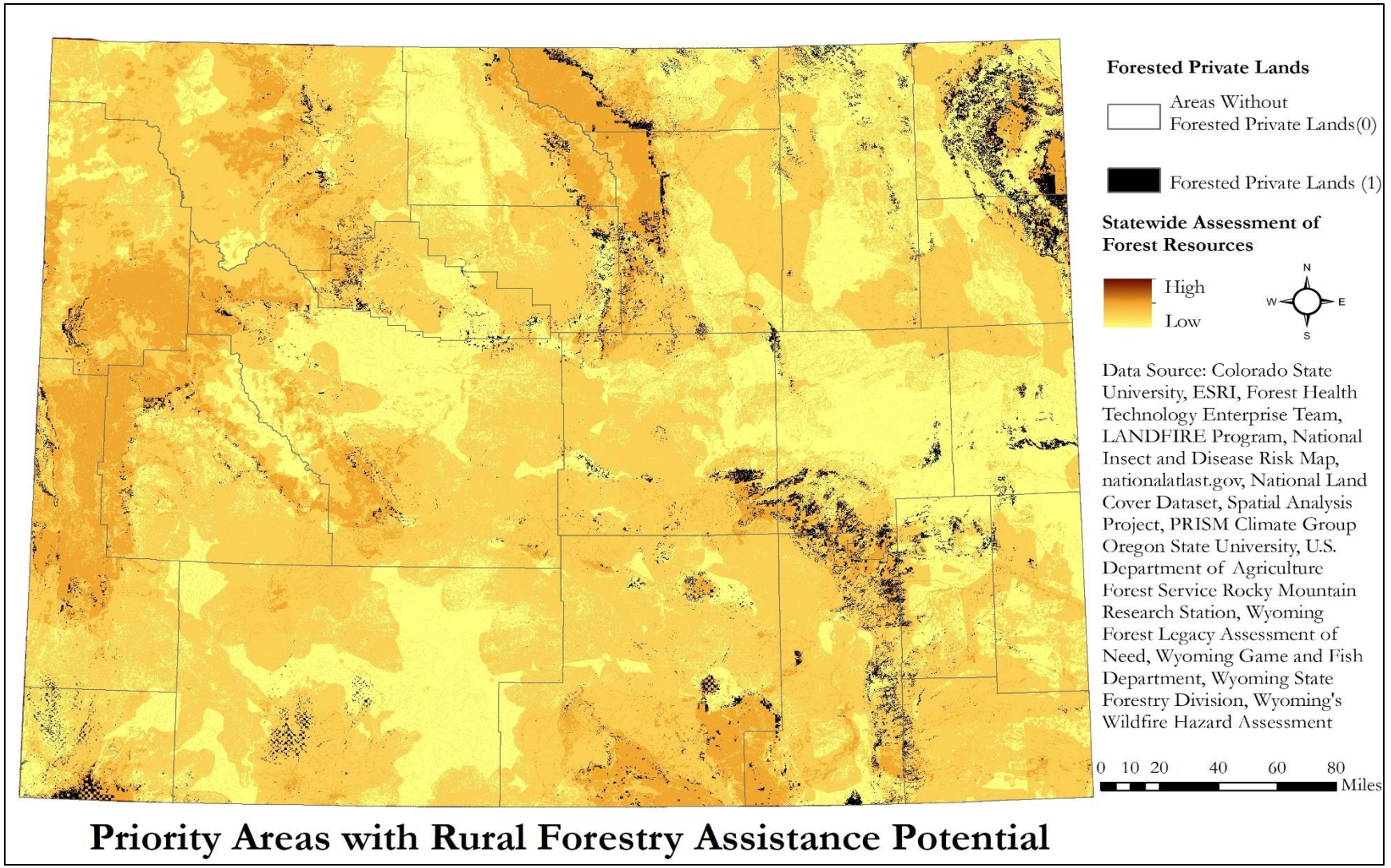


Figure 39.Priority Areas with Wyoming Rural Forestry Assistance Potential.

Climate Change

According to the Wyoming State Climatologist's Office, "climate change is likely to be one of the most important issues facing Wyoming and the western United States over the next century." Thus, it is imperative to continue to protect, manage, and conserve Wyoming's forests, which aligns with the objectives of S&PF.

Wyoming's climate is dynamic and over the last century, the state has seen an increase in temperatures and droughts which have resulted in tree mortality, increased wildfire risk, as well as insect outbreaks (United States Environmental Protection Agency, 2016). Wyoming is considered highly sensitive to climate change due to several factors, including a naturally dry climate and dependence on mountain snow for surface water. Predictions seem to indicate that the western portion of the United States will experience warmer temperatures in the future. Future precipitation is uncertain, with forecasts of above and below historic normal precipitation levels. Precipitation could shift from snow to rain with impacts on the amount and timing of runoff and groundwater supply. There may be impacts on the length and severity of the fire season, contingent upon precipitation patterns, temperatures, and fuel loading.

Increased atmospheric carbon dioxide levels are believed to be one of the causes of climate change. Forests and wood products offset about 20% of carbon emissions resulting from the burning of fossil fuels. Forest management practices that maintain healthy forests and reduce the risk of stand-replacing fire could help forests to sequester additional carbon in living trees and wood products. At this point, there is no financial incentive for forest managers to focus on carbon sequestration. Markets for carbon credits have excluded the public and state lands and looked more favorably upon reforestation and afforestation than traditional forest management. Changes in national policies related to climate change and carbon sequestration could impact forest management in Wyoming in the future.

Connecting People to Forests

Recall that State and Private Forestry is centered on three objectives—conserve, enhance, and protect. Moreover, it focuses on connecting individuals across boundaries to trees and forests, ideally engaging them in stewardship activity. It was not included as a data layer in the GIS portion of the Wyoming Statewide Forest Resource Assessment. The suggested data layers for this strategic objective were Census data, recreation and trail networks, hunting and fishing areas, and cultural and heritage site data.

Wyoming is a sparsely populated state consisting mostly of rural areas and small communities. Land ownership is about 49% of public lands managed by federal agencies, plus about 5 percent of State Trust Lands, with the remaining 46% privately owned. There are abundant opportunities for outdoor recreation throughout Wyoming, including hunting, fishing, hiking, and all other means of connecting with nature. Recreational opportunities are close-by in most Wyoming communities. Moreover, farming, ranching, and other agricultural practices are of great importance to the economy and the residents of the state. Timber harvesting has been a part of the culture of the state since the days of the tie hacks.

There are educational programs in place that provide information on forests and forest management to children and adults. WSFD staff members frequently provide presentations to school-aged children and civic groups regarding forestry issues. Reconnecting people, particularly children, with nature is an emphasis area for the U.S. Forest Service. Numerous initiatives, such as "Kids in the Woods"

strive to reconnect people with forests. In Wyoming, Teton Science Schools offers outdoor education programs for children and adults. The National Outdoor Leadership School offers wilderness and leadership education programs to older children and adults. Wyoming Project Learning Tree provides natural resource education and promotes good stewardship of natural resources for both children and adults.

From the farms to the ranches to the rivers to the forests and public lands, Wyoming residents are cognizant of agriculture, forestry, and recreation within the state. While the concept of maintaining a green infrastructure to connect people to forests has merit in many states, and in communities within Wyoming, and while conservation education is an important function of WSFD, this strategic objective does not fit as a GIS layer in the Wyoming Statewide Forest Resource Assessment.

Priority Forest Landscapes

National direction indicates that state forest resource assessments shall "…identify, describe, and spatially define forest landscape areas where forestry program outreach and activity will be emphasized and coordinated." This assessment identifies priority forest landscapes on a map, describes the analysis used to determine the priority landscapes, and provides written information describing the current forest conditions in Wyoming. The analysis was conducted and priority landscapes were identified across all ownerships. It is important to remember that in some cases, such as stewardship, forestry program outreach is restricted to private lands.

Wyoming's priority forest landscapes can generally be found on manageable (not administratively withdrawn) federal lands, on the surrounding state and private lands, in areas defined as important for water quality and supply and/or terrestrial habitat, and in and around communities. Administratively withdrawn areas, such as wilderness and national parks, are often lower priority landscapes as defined by this analysis. This analysis emphasizes landscapes where active resource management can play an important role. While wilderness areas and parks have significant resource values that are managed and in some cases actively managed-through prescribed fire, for example, there is a clear preservation mandate for those areas. Forestry program outreach would be less effective in such areas.

The Wyoming Statewide Assessment of Forest Resources—Critical Landscapes map shows the priority landscapes with the highest priorities designated as dark brown. The darker brown hue indicates that more of the analysis layers were counted in those areas. These areas are priorities for active management in some cases, and in other cases may be important areas for certain resources with or without management.

The display scale of the map also affects the appearance. When looking at the full map within this document, the areas of dark brown may appear more widespread and contiguous than they actually are. When zoomed in on a portion of the state, the color pattern becomes more complex than it appears on the full map in this document.

Wyoming has been described as a state of "island forests" due to the distribution of most of the forested lands around the state's mountain ranges. The distribution of the forested lands had a significant impact on this assessment and the identified priority landscapes. There are priority landscapes outside of the major forested parts of the state, such as riparian forests and non-forested areas, but most of the priority landscapes are associated with the state's forested mountain ranges. The Wyoming Statewide Assessment of Forest Resources—Critical Landscapes map could give the

impression that the priority landscapes are mostly within the national forest system boundaries. Clearly, there are significant priority landscapes within the national forest system and national forest management is critical to the state. However, a closer look at the map shows significant priority landscapes outside of the national forest system boundaries on private, state, and Bureau of Land Management (BLM) lands as well. As stated in the "General Management" section, forests on non-federal lands have become increasingly important as a source of raw materials for the forest products industry. Development pressure on those lands can be intense. Therefore, the non-federal priority landscapes may be most important to the national theme "Conserve Working Forest Lands" in Wyoming.

The dark brown hues are the priority landscapes for the Assistance Forestry program and for the investment of State and Private Forestry funds as defined by this analysis. However, an area that is not dark brown on the map could still be a high priority for management for any number of reasons.

Threats to Priority Forest Landscapes

As a result of this assessment, several threats and/or challenges to achieving the three national themes and the strategic objectives have been identified. In some cases, an identified threat may be an opportunity for management to improve the situation. The following list describes many of those threats/opportunities:

Forest health issues continue to affect many areas across the state. Further details about forest health issues in Wyoming are described in the "Forest Health" section of the Wyoming Statewide Forest Resource Assessment. The Bark beetle epidemic, defoliator, and disease pressure combined with detrimental forest stand conditions increased the risk of widespread tree mortality. Forest stand conditions are a result of inadequate active forest management plus effective fire suppression, and climatic factors such as drought and climate change. Many forests across the landscape lack age, structure, and tree species diversity leaving them susceptible to future insect, disease, and wildfire-related disturbance.

The threat of fire in the WUI is significant and expanding. This impacts fire suppression strategies, tactics, and costs, and also impacts firefighter and public safety. Private property rights are important in Wyoming, and regulations to address building in the WUI are often not practical. Lands in the WUI are often desirable for housing development, often due to the presence of forests, which in turn present a hazard to the housing development.

Wildfires in areas outside of the WUI are also a threat. Conditions on some landscapes are no longer within normal fire regimes or fire return intervals, the result of effective fire suppression, limited forest management, and climatic factors. For example, ponderosa pine stands often burn in an intense, stand-replacing manner, rather than the lower intensity fires of the past. With more intense fires there is the risk of the loss of ecosystem components, such as large trees, plus the risk of damage to other resources, such as water quality. For some landscapes, before fire can safely be returned, if desired, mechanical treatment would be necessary to reduce fuels to help control fire intensity.

A viable forest products industry is essential to enable effective forest management on a meaningful scale. The forest products industry is a partner in forest management, and without it, proposed management projects become quite expensive. The forest products industry in Wyoming has been shrinking for some time in terms of the number of mills. Mill capacity was significantly reduced with the closure of the Saratoga mill in 2003. Mills also closed in Sheridan, Cody, and Laramie

permanently. The current historically low lumber market is a threat to the remaining mills. The Saratoga mill re-opened in 2009, which is encouraging. A predictable, dependable supply of forest products is critical to retaining the forest products industry infrastructure in the state. The development of non-traditional markets, such as those for biomass, could become important to the state, particularly when located with existing mills to minimize biomass transportation costs.

Wyoming's low elevation riparian forests are in decline. Aging tree populations combined with a general lack of successful regeneration has resulted in the rapid decline of riparian forests in recent years. Invasive non-native species such as Russian olive and saltcedar have extensively invaded some riparian areas, outcompeting native species, significantly reducing the quality of wildlife habitat, and contributing to diminishing stream flows.

Aspen is a focus of concern within the Rocky Mountain Region. Some stands are declining because of low reproduction, succession to conifers, and browsing pressure from wildlife and domestic livestock. Because aspen is generally a disturbance-dependent species, the combination of fire suppression plus a reduction in forest can contribute significantly to the decline of aspen populations.

There are numerous challenges to maintaining healthy community forests in Wyoming. Community forests often lack age class diversity with most of the mature trees planted early in a particular community's history and having originated from planting stock available nearby. Community forests also often lack species diversity. In small communities, a lack of community forestry expertise is sometimes a problem. Limited funding for maintenance, planting, and removals can impact the development of community forestry programs.

In an arid state like Wyoming, water quality and quantity will always be important issues. Forest management activities, or the lack thereof, can have a positive or negative impact on water resources. Compliance with Wyoming's Silviculture Best Management Practices (BMP) is critical to protecting water quality during forest management activities. In areas of ample precipitation, forest management can increase water yield. Bark beetle epidemics may contribute to increased water yield from forested watersheds because of a broad-scale reduction in live trees. However, the resulting increased fuel loading and the potential for large, intense wildfires in the future pose a significant risk to water quality.

Terrestrial habitat is under pressure in Wyoming. There are numerous resource demands on public, state, and private lands, including energy development, housing development, agricultural uses, resource management, recreational uses, and wildlife habitat. The other resource demands have the potential to negatively impact wildlife habitat in some circumstances. In addition, natural processes such as bark beetles and wildfires can impact wildlife habitat. Poor aspen stand health and riparian forest decline can be detrimental to wildlife habitat.

Fragmentation of land ownership is likely to adversely affect natural resource management in Wyoming. Large blocks of private land have historically been important for issues such as open space, commodity production, agriculture, and wildlife habitat. As large blocks of private land are subdivided resource management becomes more difficult. Forest health issues are more difficult to address and fire management becomes more complex. Small parcels can be difficult to manage for agriculture and/or commodity production. There is an economy of scale in forest management, and the management of small parcels can become economically unfeasible. Access for management is becoming more complicated. Additional small parcels owned by more landowners can make parcels

to be managed more isolated. Easements for roads across multiple landowners or construction of roads can be difficult to obtain. Statutes and rules related to easements can make obtaining an easement expensive and difficult.

Management guidance for private lands is increasingly important. Private lands are providing a large portion of the commodities available for harvest despite being a small portion of the commercially productive forest lands. Private lands provide numerous non-commodity resource values. Science-based management recommendations would help to ensure that the management of private lands is done sustainably.

In some areas, older forests were converted to young forests due to the bark beetle epidemic that occurred throughout the mid-2000s. As a result, there has been a new generation of even-aged stands at the landscape scale. Ultimately the cycle will repeat in the future. There must be an increased focus on density management in young stands in the future. Mature, overmature, and old-growth stands will occupy much less area on the landscape. In many cases, management may be needed to keep remaining older stands healthy. Management may also be needed to accelerate the growth of younger stands into stands with some late-successional or old-growth characteristics.

Wyoming is considered highly sensitive to climate change due to several factors including a naturally dry climate and dependence on mountain snow for surface water. There may be impacts on the amount and timing of water runoff and the length and severity of fire seasons. Under a long-term, reduced precipitation scenario forest health could be negatively impacted.

Invasive species, both insects and plants, pose a threat to forested lands. Exotic insects can be very destructive in forest systems that did not evolve with the insects. Invasive plants can supplant native vegetation and can alter fire regimes within and around forested lands.

Multi-State Priority Areas

Many of the states in the west are facing similar natural resource management issues as Wyoming. Each state will address its threats and priorities in the Wyoming Statewide Forest Resource Assessment and Resource Strategy documents of the Forest Action Plan. In order to be most effective, however, bordering states should work collaboratively across boundaries on similar issues.

Wyoming is unique in that it shares a border with six other western and midwestern states. Many of the threats that Wyoming faces are cross-boundary issues that other states share as well. It is reasonable to expect that, for example, threats and priorities in the Black Hills in Wyoming are similar to those in the Black Hills in South Dakota.

As part of the implementation and monitoring of the Wyoming Statewide Forest Resource Assessment and Resource Strategy, Wyoming will work collaboratively with its six neighboring states to address common issues on priority landscapes as identified by each state’s Statewide Assessment of Forest Resources.

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WYOMING STATEWIDE FOREST RESOURCE STRATEGY

Providing Long-Term Strategies to Manage Priority Landscapes

WYOMING STATE FORESTRY DIVISION
OFFICE OF STATE LANDS AND INVESTMENTS

JUNE 2020

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Background

Statewide Forest Resource Strategy Requirements:

Following the completion of the Wyoming Statewide Forest Resource Assessment, states are to complete a Statewide Forest Resource Strategy to detail how priority forest landscapes will be addressed and how State and Private Forestry funds can contribute to that effort. A state's Forest Resource Strategy will provide a long-term, comprehensive, coordinated strategy for investing state, federal, and leveraged partner resources to address the management and landscape priorities identified in its assessment. The resource strategy should incorporate existing statewide forest and resource management plans and provide the basis for future program, agency, and partner coordination. Direction for the Statewide Forest Resource Strategy was provided by the 2008 Farm Bill, which states:

SEC. 2A. STATE-WIDE ASSESSMENT AND STRATEGIES FOR FOREST RESOURCES.

''(a) ASSESSMENT AND STRATEGIES FOR FOREST RESOURCES.— For a State to be eligible to receive funds under the authorities of this Act, the State forester of that State or equivalent State official shall develop and submit to the Secretary, not later than two years after the date of enactment of the Food, Conservation, and Energy Act of 2008, the following:

- ''(1) A State-wide assessment of forest resource conditions, including—
    - ''(A) the conditions and trends of forest resources in that State;
    - ''(B) the threats to forest lands and resources in that State consistent with the national priorities specified in section 2(c);
    - ''(C) any areas or regions of that State that are a priority; and
    - ''(D) any multi-State areas that are a regional priority.
- ''(2) A long-term State-wide forest resource strategy, including—
    - ''(A) strategies for addressing threats to forest resources in the State outlined in the assessment required by paragraph (1); and
    - ''(B) a description of the resources necessary for the State forester or equivalent State official from all sources to address the State-wide strategy.

The 2008 Farm Bill can be reviewed in its entirety at the following link:

http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_public_laws&docid=f:publ246.pdf

Wyoming's Statewide Resource Strategy
Addressing Priority Landscapes and National Objectives:
The Wyoming Statewide Forest Resource Assessment data layers were developed to depict national objectives, which are representative of the three national themes including conserve, protect, and enhance. Analysis of the data layers produced priority landscapes and threats to those landscapes. The Resource Strategy is intended to address the threats while moving the priority landscapes towards the desired conditions as described by the three national themes.

Analysis of the Wyoming Statewide Forest Resource Assessment identified several threats and priorities related to forest management in Wyoming. Information to briefly explain the Assessment and caution the reader concerning the interpretation of it is provided given below.

It is important to understand how the Assessment delineates priority landscapes and how the Assessment should and should not be interpreted. The Assessment is a continuum of pixel values without distinct boundaries that would result in particular areas being "in" or "out" of priority areas. Most resource management threats/priorities do not follow distinct boundaries. The Assessment is intended to depict generalized areas where a greater number of forest resource values/threats/priorities exist. Forest managers can interpret the data to help them make decisions about management practices in any given area.

It was completed at the statewide level across all ownerships. Caution should be utilized when "zooming in" on a statewide analysis and making any management decisions for any particular place on the ground. It is a high-level analysis not intended for detailed project planning purposes.

The Wyoming Statewide Forest Resource Assessment is not a prescriptive document- it does not direct specific actions based on values on the map. It would not be suitable for a statewide analysis to prescribe specific activities intended to meet specific progress targets in any priority landscape. That is best left to detailed project planning by local resource managers using site-specific data.

Areas shown in darker hues on the final analysis map in the Wyoming Statewide Forest Resource Assessment might indicate priority areas needing immediate action, or areas of high importance based on resource values without the need for intensive management actions. Local resource managers must evaluate what the Wyoming Statewide Forest Resource Assessment indicates for any particular part of a priority landscape.

The priority areas identified by the Statewide Assessment differ from priority areas identified by other analyses such as the Forest Stewardship Important Resource Areas. Statewide Assessment priority areas may include other priority areas which in turn informed the analysis for the Statewide Assessment. The use of priority areas for program delivery and accomplishment reporting will be determined at the national level.

The Assessment and the data layers included when interpreted by WSFD and our cooperators, show certain threats to the priority landscapes. Those threats are broad and strategic in nature, such as Wyoming's unprecedented forest health issues. The threats are not detailed and local. Often the data layers from which the Assessment was developed are broader by design, making it difficult to use them to identify specific local threats and priorities.

The data layers used in the Assessment had different levels of influence in various parts of the state. In the traditional forest areas (conifer-dominated landscapes), the layers that had the greatest impact on the location of the priority landscapes were wildfire risk, forest health risk, fish and wildlife habitat, water quality and supply, economic potential, and stewardship potential.

In community forest areas, the layers that were most important to the location of priority landscapes were community forestry, economic potential, wildfire risk, development risk, and fish and wildlife habitat.

In riparian forest areas, the most important layers to the location of priority landscapes were agroforestry, stewardship potential, fish and wildlife habitat, water quality & supply, economic potential, and development risk.

In the non-forested parts of the state, the layers having the most impact on the location of priority landscapes were development risk, wildfire risk, fish and wildlife habitat, and agroforestry.

The strategies identified in the Resource Strategy are typically "big picture" ideas regarding how to address the threats and priorities identified by the Assessment. The strategies generally avoid specific on-the-ground recommendations that are better left to local resource managers. The strategies also usually avoid assigning time or accomplishment targets because different landowners/managers operate under different timelines, priorities, and rules. Specific management recommendations, targets, and timelines belong in management plans developed by local resource managers. The Resource Strategy provides strategic guidance, not site-specific management recommendations. In some cases, the strategies may not be within the scope of some land management agencies, though the strategies may still be desirable goals for the state as a whole. Moreover, each threat and resource can be addressed by a variety of partners and

stakeholders such as local, state, and federal agencies, non-governmental organizations, private businesses, as well as landowners and other members of the lay public.

Threats and Opportunities:
The Wyoming Statewide Forest Resource Assessment described specific threats to the state's forest resources. Included in the Assessment was a detailed map depicting priority areas throughout the state. Forest management should generally focus on the priority areas while recognizing that similar issues will occur outside of priority areas and those other areas may also require attention.

The design of the Resource Strategy will allow state, federal, and other entities the flexibility to manage the resources in ways that best suit budget and staff limitations while still effectively addressing the threats and opportunities described later on. The Resource Strategy document will not pinpoint specific locations throughout the state, but rather will focus on trends and issues common to certain regions or vegetation types. Some specific examples may be provided to more effectively identify particular threats that the state is facing. Each of the threats described in this document is intertwined to some degree, but several of the threats are so intertwined that it would be incorrect to address them as single issues.

Threat 1:
Wyoming continues facing formidable insect and disease issues. Increased defoliation from western spruce budworm resulting in reduced tree vigor or mortality across susceptible forested stands. Bark beetles are affecting pine, true fir, and spruce stands throughout the state. White pine blister rust, various root rots, and other diseases decrease tree resistance to biotic and abiotic factors or cause tree mortality.

Threat 2:
Forest stand conditions resulting from too little active forest management plus effective fire suppression, and climatic factors such as drought and climate change contributed to the observed bark beetle mortality over the past 20 years. In many areas, age class, stand structure, and species diversity is still lacking, leaving large parts of forests susceptible to a particularly damaging agent at the same time. Increased age class diversity and species diversity, where practical, would result in a more resilient, sustainable forest.

Threat 3:
A viable forest products industry is essential to enable effective forest management on a meaningful scale. The forest products industry is a partner in forest management, and without it, proposed management projects become quite expensive. The forest products industry in Wyoming has varied in the number of manufacturers over the years but there has been an increase in regards to the capacity to process timber. The Saratoga mill reopened, helping contribute to the increase in development processing capacity. A predictable, dependable supply of forest products is critical to retaining the forest products industry infrastructure in the state. The development of non-traditional markets and funding for the most advanced research in wood technology, such as those for biomass, could become important to the industry, particularly when located with existing mills to minimize biomass transportation costs. The promotion of woody biomass and other forest products produced in Wyoming has the potential to assist in energy production.

Threat 4:
In some areas, older forests were converted to young forests due to bark beetle epidemics. The result is a new generation of even-aged stands at the landscape scale. Ultimately the cycle will repeat in the future. There must be an increased focus on density management in young stands in the future. Mature, overmature, and old-growth stands will occupy much less area on the landscape. Management may also be needed to accelerate the growth of younger stands into stands with some late-successional or old-growth characteristics.

Strategy:

- Increase age class, structural, and species diversity on lands non-reserved for forest management. Management should be directed towards achieving desired future conditions (DFC).
    - Promote active forest management on suitable lands across all ownerships to achieve an appropriate age class and structural stage distribution following established silvicultural science.
    - Promote salvage operations on suitable lands across all ownerships to recover merchantable products and accelerate recovery and regeneration of forest stands such as after a major disturbance such as a wildfire or insect/disease outbreaks.
    - Promote species diversity on lands capable of growing multiple tree species. As sites regenerate after the bark beetle epidemics, evaluate them to determine the appropriate long-term species composition
    - . Maintain productive conifer sites in coniferous forest types to ensure long-term growth and yield of forest products.
    - Determine management strategies to avoid the development of another generation of large-scale, old, even-aged stands.
    - Management of residual stands of larger trees should be carefully planned to keep those stands healthy. Active management may be needed to achieve overall forest health objectives in those stands.
    - Monitor a lack of regeneration and loss of productive forested acres to insects, disease, or fire. Where practical, use artificial regeneration where natural regeneration has failed.
- Use fire as a tool on lands when appropriate to achieve species and age class diversity goals.
    - Apply prescribed fire to maintain or restore fire-adapted lands.

- In consultation with appropriate fire authorities and with a fire use plan approved by all affected landowners/managers, utilize natural fires when within approved burning conditions to accomplish resource objectives.

- Agencies and landowners must work collaboratively to facilitate the cross-boundary implementation of prescribed fire, including the use of "Good Neighbor" or Wyden Act where appropriate.

- Ensure a predictable, dependable supply of forest products to help sustain a viable forest products industry.
  - Actively manage suitable lands to achieve structurally diverse, healthy forests capable of maximizing growth and yield of forest products while meeting long-term habitat goals at the landscape level.

  - Advocate management plans and budgets that result in a consistent supply of forest products.

  - Provide management planning assistance to private landowners to encourage active forest management to enhance the long-term productivity of forest resources.

  - Provide a consistent flow of projects to maintain a stable contractor and consultant infrastructure to augment private forestry assistance and carry out on the ground management activities.

  - Encourage large-scale collaboration between federal, state, and private lands on forest product sales

  - Continue the statewide Wyoming Interagency Forest Industry Meeting to provide training and development opportunities for both timber and service contractors.
  - Examine policies and regulations that inhibit active forest management.

  - Ensure definitions of "renewable biomass" include all ownerships.

- Advocate research and encourage development funding to create additional forest products markets from wood fiber, including those generally described as "biomass."
  - Ensure a predictable, dependable supply of forest products to aid in the development of these non-traditional markets.

  - Provide technical assistance to potential biomass industries, communities, and local entities.
  -
    Adjust slash disposal requirements, utilization standards, and harvest design to accommodate any developing biomass utilization opportunities.

    - Ensure proper valuation of "biomass" products that reflect final product values and transportation costs.
- Strive to retain whitebark, aspen, and limber pine forest types.
    - Seek ways to manage existing stands to improve health and resilience.
    - Better dissemination of information on the status and distribution of whitebark pine.
- Mitigate the threat of falling trees in campgrounds, roads, trails, administrative sites, ski areas, and near power lines.
    - Prioritize areas based on hazard and public safety concerns.
    - Utilize commercial sale opportunities within vegetative wherever possible.
- Track on the ground management activities, insect and disease outbreaks, and wildfires as they occur.
    - Track forest management actions via geographic information systems (GIS) technology and predict future forest management activities to communicate with the public and stakeholders the accomplishments and opportunities for future management needs.

Existing Resources/Resource Needs:

- **Resources:**
    - Federal and State land management agencies have existing staff dedicated to the management of our forest resources.
    - Assistance to private landowners and other entities is provided by WSFD staff, Wyoming Game and Fish Department, and consulting foresters.
    - Good Neighbor Authority as a tool to get more work done on the ground implementing forest management objectives and reducing barriers to access for agencies
    - Other resources such as the Natural Resources Conservation Service also provide assistance.
    - Forest Products Industry
- **Needs:**
    - Budget constraints and capacity often limit the ability of agencies to meet management targets.
    - Increase forest products industry is essential to achieve forest management objectives.

- Explore new products and markets, and funding for biomass industries
- Better information and education on the costs and benefits of prescribed and natural fires.
- Improve private forest resource inventory. Federal and state land inventories exist, but no private land inventories exist. A private lands forest inventory will allow resource managers to more accurately assess potential management options.
- Continued consistent funding for forest management and state and private forestry programs.
- Develop assessment tools, guidelines, benchmarks for determining what constitutes a healthy or desirable condition.

Threat 5:
The threat of wildfire in the Wildland Urban Interface (WUI) is significant and expanding. This impacts fire suppression strategies, tactics, and costs, and also impacts firefighter and public safety. Private property rights are important in Wyoming, and regulations to address building in the WUI are often not practical. Lands in the WUI are often desirable for housing development, often due to the presence of forests, which in turn present a hazard to the housing development.

Threat 6:
Wildfires in areas outside of the WUI are also a threat. Conditions on some landscapes are no longer within normal fire regimes or fire return intervals, the result of effective fire suppression, limited forest management, and climatic factors. For example, ponderosa pine stands often burn in an intense, stand-replacing manner, rather than the lower intensity fires of the past. With more intense fires there is the risk of the loss of ecosystem components, such as large trees, plus the risk of damage to other resources, such as water quality. For some landscapes, before fire can safely be returned, if desired, mechanical treatment would be necessary to reduce fuels to help control fire intensity.

Strategy:

- Mitigate the risk of catastrophic fires in WUI areas.
  - Reduce fuels by coordinating defensible space and fuel break projects across all land ownerships for maximum landscape effect and resource benefit.
  - Complete, update, and implement Community Wildfire Protection Plans (CWPP).
  - Expand capabilities and programs of communities (i.e., FIREWISE, Fire safe councils).
  - Increase public awareness of wildfire prevention and risks in the WUI through information and education through the utilization of prevention teams, Public Service Announcements (PSA), and non-traditional media outlets.
  - Increase wildfire awareness in non-WUI areas such as prairie/grasslands.

    - Engage/re-engage the insurance industry.
- Increase the training and capacity of the state's local fire resources.
    - Continue the use of Federal Excess Personal Property (FEPP) equipment. Acquire and utilize equipment through the Firefighter (FFP) program.
    - Increased advanced level National Wildfire Coordinating Group (NWCG) S-course (300 level and above) training for firefighters, as well as continued support for basic (100 and 200 level) firefighter training.
    - Expand local capabilities for managing emerging incidents and assist in the Type III incident management team development.
    - Continue to seek other opportunities for wildland equipment and training such as grants or exchange programs.
- Actively manage suitable non-reserved lands to achieve structurally diverse, healthy forests to develop more resilient forest landscapes.
- Utilize prescribed fire where practical on lands that cannot be managed using other forest management activities
    - Utilize mechanical pretreatment in preparation for prescribed fire.
    - Implement the Prescribed Fire Council largely run by non-governmental organizations (NGO).
    - Acquire funding for more contract prescribed burns on state and private lands. Agencies should work cooperatively to utilize prescribed fires to accomplish landscape management goals.
    - Increase qualifications to develop prescribed burn programs.
    - Utilize fire departments and other cooperators for prescribed burns as training opportunities.
    - Explore options of the utilization of Southwest Fire Use Academy (FUTA) for prescribed burn assistance.
    - Explore options for addressing liability issues that have hampered prescribed fire programs.
- Utilize natural fires to accomplish resource objectives and minimize the risk of catastrophic wildfires while focusing on lands that cannot be managed using other means.
    - Develop or identify areas where naturally caused fires are allowed to burn to achieve management objectives and coordinate with landowners, managers, and local governments.

        - Develop control/confine/monitor strategies for suppression actions based on expected fire behavior, values at risk, and resource management goals.
        - Implement a large-scale education program to provide information to the public, media, and elected officials regarding the use of natural fires to accomplish objectives.
    - Enhance and continue cooperation between agencies to increase capacity throughout the state.
        - Encourage Incident Management Team participation to the extent that agency staffing and budgets allow.
        - Encourage Interagency training opportunities.
        - Continue CWPP development and revisions/updates.
- Track wildfires, prescribed fires, and fire use as incidents and projects occur.
        - Use GIS technology to track management actions and predict future forest management activities to communicate with the public and stakeholder accomplishments and opportunities for future management needs

Existing Resources/Resource Needs:

- **Resources:**
    - Federal and state land management agencies and local fire entities have existing staff dedicated to fire management.
    - Assistance to private landowners and other entities is provided by WSFD staff, consulting foresters, local fire districts, and mitigation project coordinators.
    - A streamlined process for working across boundaries/ownerships, such as the Good Neighbor Authority.
- **Needs:**
    - Budget constraints often limit the ability of federal agencies to meet management targets.
    - Increased forest products industry is essential to achieve forest management objectives.
    - Better information and education on the costs/benefits/hazards/risks of prescribed and natural fires.
    - Increased budgets and training for prescribed fire.
    - Statewide coordination of fire prevention education, information, and training.
    - Increase partnerships and exchanges between natural resource agencies.

- Continued consistent funding for forest management and state and private forestry programs.

Threat 7:
Wyoming's low elevation riparian forests are in decline. Aging tree populations combined with a general lack of successful regeneration has resulted in the rapid decline of riparian forests in recent years. Invasive non-native species such as Russian olive and saltcedar have extensively invaded some riparian areas, outcompeting native species, significantly reducing the quality of wildlife habitat, and contributing to diminishing stream flows.

Strategy:

- Increase stream flow rates in riparian areas.
  - Remove Russian olive and saltcedar and increase the public awareness of the threats associated with these species.
  - Remove noxious weeds in or around riparian areas.
  - Reintroduce native vegetation or introduce desired non-native species for riparian rehabilitation based on local management expertise.
  - Implement cottonwood and willow planting plug program in conjunction with the Wyoming Department of Game and Fish and Conservation Districts.
  - Monitor and re-treat/re-seed/re-plant treated areas as needed.
- Manage ungulate populations to control herbivory.
  - Manage domestic and wildlife ungulate numbers at herd objectives.
  - Encourage and provide cost-share for water development projects that lessen pressure on riparian areas.
- Manage upstream forests to increase runoff for a watershed.
  - Actively manage suitable lands using established silvicultural science to achieve structurally diverse, healthy forests while following Best Management Practices (BMP). Encourage coordination/cooperation between ownerships.
  - Manage forest composition and densities to maintain desirable levels given the forest management direction for the area.
  - Promote healthy aspen stands on true aspen sites by removing conifers/sagebrush and invigorating clones by cutting/prescribed fire.
- Conduct forest management activities in riparian areas to increase forest health, improve species diversity, and increase residual tree vigor.
  - Conduct demonstration projects to provide examples and evaluate the results of different restoration tactics.

    - Promote partnerships with Weed and Pest, research (G&F, UW, chemical companies), sportsman's groups, NGO's, natural resource agencies, communities, private landowners.
    - Conduct research to determine the best techniques to regenerate native riparian forests.
    - Where necessary, conduct streambank stabilization and in-stream engineering projects to reduce erosion/sloughing.
- Increase the public's understanding of the decline in our low elevation riparian forests and why it is important.
    - Form a statewide committee to devise a promotional/educational campaign.
    - Create a clearinghouse (website) for all projects, research, and contacts statewide.
    - Coordinate this effort with a wide range of partners.

Existing Resources/Resource Needs:

- **Resources:**
    - Federal and state land management agencies have existing staff dedicated to the management of our forest resources.
    - State and federal wildlife agencies provide direction, funding, and expertise regarding statewide habitat needs to land management agencies and landowners.
    - Assistance to private landowners and other entities is provided by WSFD staff and consulting foresters.
    - Other resources such as Natural Resources Conservation Service also provide assistance.
- **Needs:**
    - Better information on the benefits of riparian forests.
    - Improved private forest resource inventory. Federal and state land inventories exist, but no private land inventories.
    - Coordination between state and federal agencies, private landowners, Conservation Districts, and the Natural Resources Conservation Service.
    - Develop assessment tools, guidelines, benchmarks for determining what constitutes a healthy or desirable condition.
    - Continued consistent funding for forest management and state and private forestry programs.

Threat 8:
Aspen is a growing focus of concern within the Rocky Mountain region. Some stands have declined because of diminished reproduction, succession to conifers, and browsing pressure from wildlife and domestic livestock. Because aspen is generally a disturbance-dependent species, the combination of fire suppression and reduced forest management - including less harvest of more shade-tolerant conifers – has contributed significantly to the decline of aspen populations.

Strategy:

- Increase the regeneration of aspen stands through the use of forest management activities.
    - Use prescribed and natural fires to increase disturbance on aspen sites.
    - Promote active forest management, including aspen harvest and the removal of conifers on true aspen sites, to encourage healthier aspen clones and multiple age classes.
    - Implement large-scale aspen enhance projects across the landscape to reduce impacts of overbrowsing and increase chances of project success.
- Carefully analyze current and potential aspen sites for suitability and probability of success.
    - Monitor regeneration of beetle-killed forests and where practical direct stand development towards the appropriate species for the site. As the beetle-killed forests begin to regenerate, many acres that are not traditionally aspen sites will begin to regenerate in aspen. Some of these stands should be maintained as aspen, but many of them should return to coniferous forest types to maintain long term yield of forest products.
    - Analyze historical vegetation, site productivity, and management goals to determine the best sites to focus on aspen restoration/retention efforts.
- Manage ungulate populations to control herbivory. Manage domestic and wildlife ungulate numbers at herd objectives.
- Coordinate and collaborate with Wyoming Department of Game and Fish and federal agencies on aspen enhancement and wildlife habitat priorities across ownerships
- Track aspen management activities as they occur.
    - Track forest management actions via geographic information systems (GIS) technology and predict future forest management activities

Resources:

- Federal and state land management agencies have existing staff dedicated to the management of our forest resources.
- State and federal wildlife agencies provide direction, funding, and expertise regarding statewide habitat needs to land management agencies and landowners.

- Assistance to private landowners and other entities is provided by WSFD staff and consulting foresters.
- Other resources such as the Natural Resources Conservation Service also provide assistance.
- Wyoming Wildlife and Natural Resource Trust (WWNRT), Rocky Mountain Elk Foundation (RME), and other sportsmen/conservation groups.

Needs:

- Budget constraints often limit the ability of federal agencies to meet management targets.
- Collaboration and coordination among state and federal agencies on the priorities and implementation of aspen enhancement projects.
- Better information and education on the costs and benefits of prescribed and natural fires.
- A streamlined process for working across boundaries/ownerships, such as the Good Neighbor Authority.
- Continued consistent funding for forest management and state and private forestry programs.
- Better dissemination of information on the status and distribution of aspen.
- The development of markets for aspen would offset the costs of treatment.
- Develop assessment tools, guidelines, benchmarks for determining what constitutes healthy or desirable conditions, and desirable sites for aspen.
- A better understanding of aspen decline causes, including Cytospora and sooty bark cankers as well as stand age and site conditions.
- A synthesis of information and expertise to provide technical guidance to land managers.

Threat 9:
There are numerous challenges to maintaining healthy community forests in Wyoming. Community forests often lack age class diversity with most of the mature trees planted early in a particular community's history and having originated from planting stock available nearby. Community forests also often lack species diversity. In small communities, a lack of community forestry expertise is sometimes a problem. Limited funding for maintenance, planting, and removals can impact the development of community forestry programs.

Strategy:

- Enhance species and age diversity.
    - Provide technical expertise.
    - Provide information to communities on appropriate spacing, planting sites, and suitable species.
    - Encourage the proper care of young and middle-aged trees.
    - Encourage the development of local tree species guides.
    - Assist with developing local arboreta.
    - Emphasize the need for tree inventories and utilize GIS technology to gauge the composition and health of the community forests.
    - Assist in devising management plans to address the needs found in the inventory.
- Increase community forest resilience from native and invasive pests of concern
    - Provide expertise, community outreach, and educational opportunities and resources
    - Provide guidance for the development of municipal response/action plans
- Increase local community forestry expertise
    - Provide local training opportunities such as arboriculture, municipal forestry, and forest health workshops, as well as the Northern Rockies Tree School within the state of Wyoming.
    - Provide scholarships to attend municipal workshops and trainings, locally, regionally, and nationally.
    - Provide the opportunity to highlight Tree City USA communities, information sharing, education, and networking for city, county, and state employees responsible for managing local community foresters through the Community Tree Managers Focus Group,
    - Encourage ISA Certified Arborist Certification.
    - Improve the knowledge and diversity of tree board membership.
    - Encourage the involvement of natural resource professionals such as the United States Forest Service (USFS) employees, Weed, and Pest managers and Natural Resources Conservation Service (NRCS) staff through program development and partnerships.
    - Provide modern training tools and resources to support local workshops such as the Project Learning Tree (PLT) curriculum.
- Enhance funding and build capacity within the communities.
    - Provide funding to communities through WSFD Community Forestry grants and evaluate the potential for competitive grants for specific needs.
    - Make funding contingent on long-term plans for planting and maintenance.

    - Encourage communities to increase their own funding sources.
    - Help communities to realize the value of trees, tree inventories, and the cost of not funding the community forest.
    - Encourage communities to think of innovative ways to find/create new funding sources.
    - Encourage communities to build partnerships with local businesses, non-profits, and other governmental organizations.
    - Explore the carbon sequestration and marketing potential of community forests.
    - Encourage communities to build their capacity by increasing staffing.
    - Become less reliant on federal funds by building support for greater state funding to WSFD.
- Measure progress within communities.
    - Tree City USA provides a baseline indicator of success and community commitment
    - Develop performance measures for different sized communities. For example, a large city should have at least a City Forestry Division, medium-sized cities should employ city staff with arborist certification, and small towns should have an active tree board with training opportunities.
    - Emphasize the use and importance of tree inventory software programs and provide support for updating and maintaining the inventory and encourage in-house management.
- Build green infrastructure.
    - Suggest communities adopt landscape ordinances for commercial and residential development.
    - Highlight the benefits of including tree plantings in streetscape projects.
    - Encourage communities to work towards increasing canopy cover percentages through tree planting and proper tree management.
    - Show the economic and social benefits of building with trees.
    - Encourage communities to adopt tree preservation ordinances.
    - Provide training for engineers, public works directors, city planners, etc.

Existing Resources/Resource Needs:

- **Resources:**
    - Utilizing state and federal funds, WSFD provides technical assistance through staff that includes a Community Forestry Coordinator, a Cooperative Resource Forester, as well as District Foresters and Assistant District Foresters.
    - Portions of the federal funds received for community forestry are passed through to the communities in the form of community forestry grants. Grant funds can be used to increase the capacity and education level within the community as well as to provide planting and maintenance of the community's trees.
    - Providing educational opportunities through the Northern Rockies Tree School and the Community Tree Managers Focus Group.
    - Program guidance is provided by the Community Tree Managers Focus Group and the Forest Stewardship Steering Committee
    - At least 7 communities have city foresters/arborists, 13 communities have maintenance and park staff, and 39 communities utilize tree boards to guide the community forestry resource.
    - Tree Campus USA and Tree Campus USA recognized communities and campuses range from 35-41 and 2 campuses, these numbers can fluctuate from year to year.
    - There are six arboreta across Wyoming located in Cheyenne, Newcastle, Powell, Sheridan, Rock Springs, and Riverton that are important for education and advancement in tree species diversity.
    - The historic High Plains Arboretum, near Cheyenne, provides living examples of trees adapted to Wyoming's harsh climate.
- **Needs:**
    - Increased federal and state funds will increase the money leveraged from the communities. On average each dollar granted leverages two dollars within the community.
    - Continued consistent funding for forest management and state and private forestry programs.
    - Build partnerships with private entities to supplement existing funding.

- Provide and expand science-based information explaining the benefits of community forests to the public and elected officials.
- Continued emphasis on a "Train the Trainer" approach.
- Promotion of species diversity at the High Plains Arboretum and local arboreta.

Threat 10

In an arid state like Wyoming, water quality and quantity will always be important issues. Forest management activities, or the lack thereof, can have a positive or negative impact on water resources. Compliance with Wyoming's Silviculture BMP's is critical to protecting water quality during forest management activities. In areas of ample precipitation, forest management can increase water yield. The bark beetle epidemic may have influenced increased water yield from forested watersheds due to a major reduction in live trees on the landscape. However, the resulting increased fuel loading and the potential for large, intense wildfires in the future pose a significant risk to water quality.

Strategy:

- Continue compliance with Wyoming's Silviculture BMP's during forest management and road building and maintenance activities.
  - Continue BMP audits across all ownerships using an interdisciplinary committee.
  - Encourage and provide BMP training to loggers and landowners.
  - Reduce fuels using salvage timber harvesting operations when possible while following Best Management Practices.
- Look for opportunities to complete forest management activities to increase water quality and quantity where practical.
  - Design management activities, including potential demonstration projects, according to the best available science to maximize benefit.
  - Implement forest management activities on a landscape-scale and other meaningful scales to increase the likelihood that those activities would have a positive impact on water quality.
  - Quantify the cost of no action such as the impacts of large wildfires on streams, reservoirs, and public water systems.
  - Create a more resilient forested landscape to disturbance by increasing age, species, and structural diversity across watersheds.
- Emphasize riparian forest restoration and the improvement of riparian habitats.
  - Manage the fuel loading in Streamside Management Zones (SMZ) to minimize the effects of future fires on soils and water.
  - Enhancing aspen to decrease conifer fuel loading.
  - Reintroduction of beavers in proper locations.

    - Utilize contracts for services, stewardship contracts, and stewardship agreements as needed to reduce fuels mechanically.
    - Utilize prescribed fire during approved burning conditions to treat fuels in remote areas.
    - Following any fire that may have affected soils, utilize erosion control methods to limit sediment delivery to water.
    - Where practical replant trees and other vegetation to accelerate soil stabilization and decrease sedimentation.
    - Monitor stream flow rates to measure actual increases in water yield following the beetle epidemic.
- Reduce runoff from urban areas into watersheds.
    - Educate community leaders about the benefits of trees for reducing stormwater runoff.
    - Encourage communities to view trees as capital assets.
    - Encourage tree plantings to break-up non-pervious surfaces such as in medians, parking lots, and along streets.
- Utilize aerial photography to evaluate community tree canopies to determine where tree plantings should be focused on.
- Track on the ground management activities, insect and disease outbreaks, and wildfires as they occur.
    - Track management actions via geographic information systems (GIS) technology and predict future forest management activities to communicate with the public and stakeholder's accomplishments and opportunities for future management needs.

Existing Resources/Resource Needs:

- **Resources:**
    - Federal and State land management agencies have existing staff dedicated to the management of our forest resources.
    - Assistance to private landowners and other entities is provided by WSFD staff and consulting foresters.
    - A streamlined process for working across boundaries/ownerships, such as the Good Neighbor Authority and Wyden Amendment.
    - Three municipal watershed wildfire hazard mitigation assessments completed within the state of Wyoming.

- Other resources such as the Natural Resources Conservation Service and Conservation Districts also provide assistance.

Needs:

- Better information and education on the costs and benefits of prescribed and natural fires.
- Municipal watershed wildfire hazard mitigation assessments for every community that has their municipal water dependent on large amounts of forested lands.
- Budget constraints often limit the ability of federal agencies to meet management targets.
- Utilize the Good Neighbor Authority to implement forest management projects and reduce barriers to access for agencies.
- Continued consistent funding for forest management and state and private forestry programs.
- Increased funding for BMP education and monitoring.
- Continued participation in BMP planning and compliance from land management agencies, academia, and the forest products industry.
- Increased forest products industry is essential to achieve forest management objectives.
- Accumulate local water yield data.

Threat 11:
Terrestrial habitat is under pressure in Wyoming. There are numerous resource demands on the public, state, and private lands, including energy development, housing development, agricultural uses, resource management, recreational uses, and wildlife habitat. The other resource demands have the potential to negatively impact wildlife habitat in some circumstances. In addition, natural processes such as bark beetles and wildfires can impact wildlife habitat, either positively or negatively. Other forestry issues, such as aspen decline and riparian forest decline, can be detrimental to wildlife habitat.

Strategy:

- Encourage land managers to undertake landscape-level planning to maintain or enhance forest and woodland communities (Adapted from the State Wildlife Action Plan).
    - Broaden the scale and integration of management planning and treatments. Move from “spot treatments” to a larger scale, connected activities.

    - Pursue conservation easements and other land stewardship agreements to conserve migration corridors, functioning diverse ecosystems, open spaces, and other crucial habitats.
- Increase capacity for providing management information to landowners, resource managers, and industry.
    - Provide direct access to or links to literature, studies, and resource guides.
    - Develop informational resources when unavailable.
    - Develop websites as an educational tool.
- Maintain continuity across ownerships and programs and integrate programs to provide holistic management tools to all landowners.
- While considering the silvicultural requirements of the forest resource, mimic natural disturbance regimes using fire or mechanical treatments to provide an ecological balance and vegetative landscape mosaic to enhance fire-dependent vegetation and wildlife (Adapted from the State Wildlife Action Plan).
- Track on the ground management activities, insect and disease outbreaks, and wildfires as they occur.
    - Use GIS technology to track management actions and predict future forest management activities.

Existing Resources/Resource Needs:

- **Resources:**
    - Forest Legacy and other conservation programs.
    - Federal and State land management agencies have existing staff dedicated to the management of our forest resources.
    - Assistance to private landowners and other entities is provided by WSFD staff and consulting foresters.
    - Other resources such as the Natural Resources Conservation Service and Conservation Districts also provide assistance.
- **Needs:**
    - A streamlined process for working across boundaries/ownerships, such as the Good Neighbor Authority.
    - Budget constraints often limit the ability of federal agencies to meet management targets.

- Continued consistent funding for forest management and state and private forestry programs.

Threat 12:
Fragmentation of land ownership is likely to adversely affect natural resource management in Wyoming. Large blocks of private land have historically been important for issues such as open space, commodity production, agriculture, and wildlife habitat. As large blocks of private land are subdivided resource management becomes more difficult. Forest health issues are more difficult to address and fire management becomes more complex. Small parcels can be difficult to manage for agriculture and/or commodity production. There is an economy of scale in forest management, and the management of small parcels can become economically unfeasible.

Threat 13:
Access for management is becoming more complicated. More small parcels owned by more landowners can make parcels to be managed more isolated. Easements for use of roads across multiple landowners or construction of roads can be difficult to obtain. Statutes and rules related to easements can make obtaining an easement expensive and difficult.

Strategy for 12 and 13

- Cross-boundary collaboration such as the "Good Neighbor Authority" will be essential for the forest, wildlife, and wildland fire management.
- Attempt to manage subdivisions as one land unit.
    - Encourage landowners to work together instead of working as single entities.
    - Develop subdivision level management plans rather than for individual entities.
    - Develop management plans as part of subdivision development.
- Complete comprehensive landscape-level travel management plans.
    - Maintain road infrastructure sufficient to actively manage forest resources and provide adequate access.
    - Close unnecessary roads to reduce maintenance costs and relocate roads to reduce long-term maintenance needs.
- Provide incentives to conserve working forest lands.
    - The Forest Legacy Program helps maintain working forests and management access by preventing fragmentation and parcelization of lands through conservation easements or the strategic purchases of land.
    - Develop means to acquire and hold easements.
- Provide education to private landowners on options to keep forest lands together as it is passed on to the next generation

- Keep forestry practices financially viable.
    - Strive to develop and maintain a forest products industry infrastructure to provide consistent markets for forest products.
    - Strive to develop alternative forest products markets, such as biomass.
    - Encourage predictable, sustainable harvest levels on public lands to help sustain the infrastructure necessary to manage private lands.
- Track accomplishments as they occur.
    - Use GIS technology to track management actions and predict future forest management activities.

Existing Resources/Resource Needs:

- **Resources:**
    - Forest Legacy and other conservation programs.
    - Non-governmental Organizations
    - Federal and State land management agencies have existing staff dedicated to the management of our forest resources.
    - A streamlined process for working across boundaries/ownerships, such as the Good Neighbor Authority.
- **Needs:**
    - Ensure cost-share program guidelines are revised to meet the current needs of landowners and forest resources.
    - Target homeowner associations and subdivisions as a whole to conduct workshops and other informative events.
    - Continued consistent funding for forest management and state and private forestry programs.
    - Maintaining working forest lands requires sustainable forest and agricultural products markets.
    - Streamline the process of obtaining road easements and road use agreements.

Threat 14:
Management guidance for private lands is increasingly important. Private lands are providing a large portion of the commodities available for harvest despite being a small portion of the commercially productive forest lands. Private lands provide numerous non-commodity resource values. Science-based management recommendations would help to ensure that the management of private lands is done sustainably.

Strategy:

- Emphasize stewardship plan development.
    - Capture and track the progress of forest stewardship plans.
    - Require development and implementation of stewardship plans in order to be eligible for cost-share programs.
- Provide information and education to private landowners on the benefits of forest management.
    - Reach out to absentee landowners and continue to implement Landowner Field Day events to educate private forested landowners on the importance of forest management.
    - Develop assessment tools for landowners.
    - Train landowners on basic data collection techniques and basic forest management strategies.
    - Provide landowners with information about the responsibilities of forest ownership.
    - Use local media to reach out to landowners.
- Obtain better inventory information on private lands.
    - Encourage implementation of Forest Inventory and Analysis (FIA) in Wyoming to capture information about private forest lands.
- Establish/maintain a local contractor base and provide landowner education.
    - Ensure stable funding for forest management and road maintenance projects to provide a consistent flow of projects.
    - Empower private landowners to safely and effectively conduct forest management activities.
- Provide financial incentives for management through the use of cost-share programs.
- Develop and implement certification programs for landowners.
    - American Tree Farm System
    - Stewardship Forest

Existing Resources/Resource Needs:

- **Resources:**
    - Assistance to private landowners and other entities is provided by WSFD staff and consulting foresters.

- The Forest Products industry, the Natural Resources Conservation Service, Conservation Districts, Weed and Pest, and the University of Wyoming/County Extension have professionals to provide assistance to private landowners.
- The American Tree Farm System—Statewide Tree Farm Committee, the Forest Stewardship Program (FSP).

- **Needs:**
  - Continued WSFD Staff availability to provide the current level of service.
  - Continued consistent funding for forest management and state and private forestry programs.
  - Collect private land inventory information and distribute it in a useful format.

Threat 15:
Wyoming will be on the leading edge of the impacts of climate change. Wyoming is considered highly sensitive to climate change due to several factors, including a naturally dry climate and dependence on mountain snow for surface water. There may be impacts on the amount and timing of water runoff and the length and severity of fire seasons. Under the long term, reduced precipitation scenario forest health would be negatively impacted.

Strategy:

- Explore the carbon sequestration potential of forests.
  - Carbon markets may provide a financial incentive for sound forest management.
  - Encourage private landowners to manage their forests and keep them informed of how they may benefit from the carbon market.
  - Forest carbon storage may be used to offset the impacts of other activities.
- Implement forest management activities at a landscape scale to reduce forest mortality resulting from insects, disease, and wildfire as a means to reduce contributions of carbon from forests in Wyoming
- Forest management under a changing climate.
  - Focus on management for current healthy diverse forests that are naturally resilient to many threats including climate change.
  - Adapt forest management tactics to mitigate impacts resulting from changes in the climate.
  - Use adaptive management strategies to account for species adaptation, changes in length and severity of fire seasons, increase/decrease in insect and disease outbreaks, etc.

- Adapt water management to accommodate changes in flow and timing as a result of climate change.
    - Manage at a large landscape level to increase snow capture and retention as well as to reduce the risk of flooding and excessive runoff.
    - Manage canopy closure to influence snow accumulation.
    - In created openings, maintain sufficient surface roughness to allow snow capture and retention.
    - On current drier sites, manage for species with the greatest tolerance for dry conditions.
    - Adjust residual stocking levels to promote healthy forest conditions and promote water yield.
    - Adjust slash disposal requirements, utilization standards, and harvest design to accommodate any developing biomass utilization opportunities.

Existing Resources/Resource Needs:

- **Resources:**
    - Federal and State land management agencies have existing staff dedicated to the management of our forest resources.
    - Assistance to private landowners and other entities is provided by WSFD staff and consulting foresters.
    - Other resources such as the Natural Resources Conservation Service and Conservation Districts also provide assistance.
- **Needs:**
    - Research the effects of climate change on our forests.
        - The potential effects of a long-term warming trend on forest structure, composition, growth and yield, and threats such as fire and insects.
        - The potential effects of a short- or long-term cooling trend on forest structure, composition, growth and yield, and threats such as fire and insects.
    - Develop management strategies under changing climate scenarios.
    - Continued consistent funding for forest management and state and private forestry programs.

Threat 16:

Invasive species, both insects and plants, pose a threat to forested lands. Exotic insects can be very destructive in forest systems that did not evolve with the insects. Invasive plants can supplant native vegetation and can alter fire regimes within and around forested lands.

Strategy:

- Monitor invasive insects, pathogens, and plants within the state as well as in neighboring states.
    - Use GIS technology to track the detection and infestation of invasive species.
- Continue to develop Early Detection and Rapid Response (EDRR) guidelines.
    - Develop maps of priority ecosystems and habitats placed at risk by invasive species.
    - Working with partners, develop rapid response incident teams that cross jurisdictional lines, and respond quickly to any invasive species outbreak.
- Build awareness of invasive species and their threat at all levels and jurisdictions.
    - Educate the public about the dangers of transporting exotic or invasive species into the state on forest products such as firewood and Christmas trees.
- Focus efforts on the control and management of invasive species.
    - Focus resources on priority species control in priority areas as identified through risk assessments.
    - Monitor long-term invasive species population trends and the effectiveness of treatments. Make this information readily available to all stakeholders, public and private.
- Develop rehabilitation and restoration strategies for using native or desired nonnative species for restoration and rehabilitation.
    - Prioritize and develop native plant stock that is resistant to invasive insects and pathogens.
    - Develop and promote strategies and techniques to promote natural regeneration of native plant communities and the collection of native seed and plant stock for use when artificial means of regeneration are necessary.
- Encourage forest and fire management techniques that do not promote the spread of invasive species.
    - Cleaning forestry equipment prior to moving into new management areas.
    - Careful prescribed fire planning to avoid increasing invasive species such as cheatgrass.

    - Increase public education about the risks of interstate and intrastate transport of firewood.

- Manage forests and rangelands to promote a healthy landscape more resistant to invasive populations.
    - Promote active forest management on suitable lands across all ownerships to achieve an appropriate age class and structural stage distribution by species.

Existing Resources/Resource Needs:

- **Resources:**
    - State and federal agencies, Weed and Pest, Natural Resources Conservation Service, Conservation Districts, and private landowners.
    - GIS technology can be used in the detection, rate of spread, and predicted outcomes of invasive species outbreaks.
- **Needs:**
    - Improve the capacity of federal and state agencies to identify and control invasive species.
    - Continued consistent funding for forest management and state and private forestry programs.

Monitoring and Revision

The factors that occur on priority landscapes are ongoing, long term issues, such as wildfire risk, economic potential, water quality & supply, and fish & wildlife habitat, for example. It will be difficult to measure progress in those areas and others over a short term reporting period. For example, measuring changes in water quantity or quality as a result of management actions would require many years of scientifically valid measurements.

Measuring the impacts of forest and fire management practices on age class diversity and stand structure is similarly complex. Annual progress could be measured in this case, but a goal or target in the Assessment or Resource Strategy is not binding upon all landowners/managers, making a measurement of real progress difficult.

Annual or periodic "monitoring" of the high-level strategies and tactics described in the Resource Strategy and intended to address the threats/priorities identified by the Assessment would be difficult. The Assessment and Resource Strategy were developed for all lands within the state. However, not all lands are subject to the same ownership, management priorities, regulations, or management processes. In some cases, such as private forest land management, no regulatory or reporting mechanism exists in Wyoming, meaning the only available information is anecdotal. Management practices can usually be applied more quickly on private and state lands than on federally managed lands. To accomplish "monitoring" in the sense that it currently exists for some land managers would be problematic without uniform standards and uniform data collection.

Except where otherwise noted, the process of monitoring our progress by addressing each of the threats will be a continuous process. Our approach for addressing each of the threats above will be subject to federal program review, federal reporting processes, legislative oversight, and internal review.

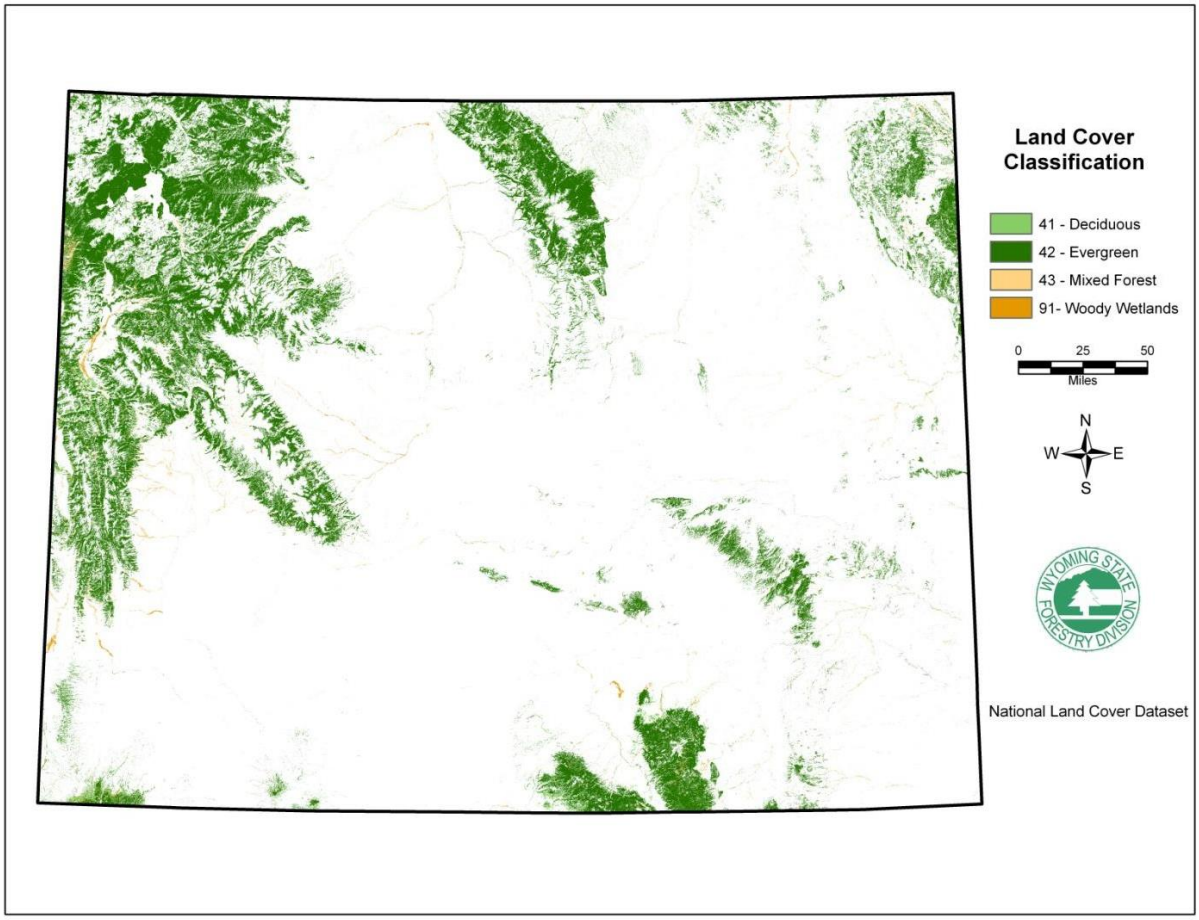
Internally, WSFD will continually evaluate programs for effectiveness as the Division strives to implement an adaptive approach to addressing threats and priorities on Wyoming's priority forest landscapes. Efforts that are working will receive increased emphasis, while less effective efforts will be de-emphasized, with the understanding that it will take time to evaluate effectiveness. As new information becomes available, the Division will work to improve program tactics and delivery to better meet the needs of our constituents and the resources.

Inter-State Collaboration

Many of the states in the west are facing similar forest management and wildfire issues as Wyoming. Each state will address its threats and priorities in the Wyoming Statewide Forest Resource Assessment and Resource Strategy documents. In order to be most effective, however, bordering states must work collaboratively to tackle similar issues. Wyoming is unique in that it shares a border with six other western and midwestern states including Colorado, Montana, Nebraska, South Dakota, Utah, and Idaho. As part of the implementation and monitoring of the Resource Strategy document, Wyoming will work collaboratively with its six neighboring states to address the following issues on priority landscapes as identified by each state's Statewide Assessment of Forest Resources: (1) forest health concerns; (2) wildfire; (3) WUI; (4) viable forest products industry; (5) aspen; (6) forest conversion; (7) water quality and quantity; (8) invasive species; (9) low elevation riparian forests; as well as (10) management guidance for private lands.

Appendix

Forest Legacy Program
Assessment of Need for the State of Wyoming



July, 2009

WYOMING STATE FORESTRY DIVISION

THE CONSERVATION FUND

America's Partner in Conservation

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I. INTRODUCTION

Purpose of the Forest Legacy Program

While the majority of Wyoming's productive forest lands are in public ownership (83%), private forested lands are playing an increasingly important role in providing timber products, wildlife habitat, and other publicly-important values to Wyoming's people.

Approximately 17% of Wyoming's forested lands are privately owned (including individuals, families, trusts, investment partnerships, mining interests, and forest products companies). These lands provide 73% of the timber harvest volume in the State. As documented in this report, private timber landowners are facing increased incentives to convert their forest lands to other uses, particularly recreational residential development. Furthermore, stand age and size classes are old, large and uniform enough to be vulnerable to disease and insect outbreaks.

As human population density increases in some areas of Wyoming, demands on forest land increase. The results include growing pressures on private lands to provide a wider variety of products and services, including subdivision lots, forests that are healthy and aesthetically pleasing, protection from wildfire risk, and active insect and disease control. Other economically important demands include fish and wildlife habitat, and recreational opportunities. Competing demands on forest uses are resulting in forest fragmentation, unhealthy forest land, and difficult fire management at the forest-urban interface.

Thoughtful protection of forest lands is important to maintain the balance and potential of Wyoming's forests. Good stewardship of these privately held forest lands requires a long-term commitment to sustainable forest management that can be fostered through a partnership of Federal, State, and local government efforts.

In the 1990 Farm Bill, the Forest Legacy Program (FLP) was one of several programs established to promote the long-term integrity and sustainable management of forestlands. The Secretary of Agriculture was directed to establish a Forest Legacy Program administered by the USDA Forest Service (USFS) in cooperation with State, regional, and other units of government. In carrying out this mandate, the Secretary has been authorized to provide funding for states to acquire interests in lands through conservation easements in perpetuity for inclusion in the Forest Legacy Program. The primary goal of the Forest Legacy Program is to identify and protect environmentally important forests from conversion to nonforest uses. Landowner participation in the Forest Legacy Program, including the sale of conservation easements, is entirely voluntary. For the proposed Wyoming program, timber harvesting is allowed on properties conserved through the Forest Legacy Program but must be done in compliance with a State Forest Stewardship Plan and Wyoming State Forestry's Best Management Practices for road construction and timber harvesting (BMPs).

Conservation Easements

The Forest Legacy Program allows for the acquisition of conservation easements from willing sellers. A conservation easement is a legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land in order to protect its conservation values (such as its forest cover, ecological function, or scenic benefits). The conservation easement allows the landowner to continue to own the property and to use it for forestry and recreation, but restricts development and subdivision. The terms of the conservation easement are tailored to the characteristics of the property, the goals of the State of Wyoming in acquiring the conservation easement, and the objectives of the landowner. Under the Forest Legacy Program public access is not required; forest management activities are permitted as described in a Forest Stewardship Plan and consistent with the state BMPs. Hunting, fishing, hiking, and similar recreational activities are permitted if those activities are consistent with the goals for acquisition of the property. Activities that are not consistent with protection and conservation of the forest attributes of a property are generally not allowed. For example, mining that would disturb the surface of the property is not allowed, so landowners must identify the potential for surface mining and the condition of the split estate to be eligible for the program. The conservation easement is a permanent encumbrance on the property and future owners will be bound by the easement's terms. For these reasons, it is imperative that the Wyoming State Forestry Division (WSFD) and Wyoming State Forestry Stewardship Coordinating Committee (WSFSCC) adequately explain the implications of the proposed conservation easement to the interested participant. The landowner will draft the conservation easement with the WSFD and should seek legal counsel. The holder of the easement is responsible for making sure the conservation easement's terms are followed and can take action to restore damages to the property if there has been a violation of the easement.

Fee Simple Interest

The acquisition of a fee simple interest in forested properties can also be undertaken with the Forest Legacy Program. In the case of fee simple interest, the parcel and all rights are purchased outright. Fee simple purchase is typically a more expensive option and will only be considered in cases of outstanding merit.

State Grant Option

Wyoming has selected the State Grant option of the FLP. All FLP acquisitions shall be transacted by the State with title vested in the State or a unit of State or local government. In the case of donations, title may also be vested in a land trust or the Federal Government. The State may also request the Forest Service acquire tracts with title vested in the Federal Government. Wyoming statute prohibits the Board of Land Commissioners from accepting conservation easements, though the Board is able to acquire fee simple interest in forested properties. Conservation easements may be held by other units of State government. The holder may not sell or otherwise dispose of land or interests in properties it has acquired using FLP funds without reimbursing the USFS or substituting lands of equal value and conservation benefit.

Enabling Legislation

The Cooperative Forestry Assistance Act of 1978, as amended (16 U.S.C. 2101), provides authority for the U.S. Secretary of Agriculture to provide financial, technical, educational, and related assistance to States, communities, and private forest landowners. Section 1217 of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (P.L. 101-624, 104 stat. 3528), also referred to as the 1990 Farm Bill, amended the Cooperative Forestry Assistance Act and allows the Secretary to establish the Forest Legacy Program to protect environmentally important forest areas that are threatened by conversion to non-forest uses. This authority continues indefinitely. If the authority is revoked or the program ceases to be funded, existing Forest Legacy projects are not affected but no new projects will be solicited. Appropriations are provided on an annual basis at Congressional discretion. The FY 2009 program funding was $51.6 million for 27 projects nationwide.

Through the 1996 Farm Bill (Federal Agricultural Improvement and Reform Act of 1996; Public Law 104-127; Title III - Conservation; Subtitle G - Forestry; Section 374, Optional State Grants for Forest Legacy Program), the Secretary is authorized, at the request of a participating State, to make a grant to the State to carry out the Forest Legacy Program in the State, including the acquisition by the State of lands and interests in lands. Wyoming has requested the State Grant Option.

WSFD is the lead agency for the Forest Legacy Program in Wyoming as designated by Governor Freudenthal in 2005 (Appendix I). The Cooperative Forestry Assistance Act directs the Secretary to establish eligibility criteria for the designation of Forest Legacy Areas, in consultation with the WSFSCC (Appendix B). These eligibility criteria are developed based upon the Assessment of Need (AON) for establishing a State Forest Legacy Program.

The Wyoming Uniform Conservation Easement Act, Sections 34-1-201 through 34-1-207 of the Statutes of Wyoming, was signed into law in 2006 and enables the use of conservation easements. In addition, the qualifications of conservation easement holders and the public benefit requirements necessary for easement donations to be eligible for income tax deductions are defined in Section 501(c)(3) and 170(h) of the Internal Revenue Code of 1985.

Purposes of the Assessment of Need

The Assessment of Need (AON) documents (1) the need for the Forest Legacy Program in Wyoming by describing the land use changes affecting forests and (2) how the program will be implemented by describing eligible areas and priorities. The required purposes of the AON are:

1. To document the need for a Forest Legacy Program in Wyoming;
2. To identify and delineate the boundaries of forest areas meeting the eligibility requirements for designation as Forest Legacy Areas; and
3. To recommend areas to the FS/Secretary for inclusion in the Forest Legacy Program.

This document meets those goals by identifying and assessing:

1. The condition and importance of Wyoming's forest resources, paying particular attention to those characteristics that will help guide implementation of the FLP (Section II);
2. The major threats of conversion to the forest resources and forest uses (Section III);
3. The most important areas for the implementation of the FLP and the eligibility criteria that were used to identify them (Sections V and VI); and,
4. The evaluation criteria that should be used for the selection of projects (Section VII).
5. This document also addresses some threats that are not effectively addressed through FLP (e.g. forest health impacts) but are important to consider in the overall context of forest management and conservation in Wyoming.

Preparation of the Assessment of Need

The AON is being prepared by the WSFD, in consultation with the WSFSCC, for submission to the USDA Forest Service (USFS). A contract was issued to The Conservation Fund to produce the AON for the WSFD. The Conservation Fund has assembled a team to implement the contract, as shown below. The team members, primary roles, and key personnel are:

- The Conservation Fund – Project management, coordination with WSFD and WSFSCC, public participation, preparation of final mapping products.
    - Luke Lynch, Wyoming Field Representative, Project Leader
    - Evan Smith, Director of Forestry Projects, Forestry Consulting and analysis
    - Tom Segerstrom, Research, Drafting, Biological Consulting
- Wyoming Geographic Information Science Center: Shawn Lanning, GIS Research Scientist
- Greenwood Mapping
    - Rich Greenwood, mapping analysis and oversight
    - Angie Rudolph, map production

The AON was developed on the basis of existing published data, much of which is available on the Internet, as well as considerable Wyoming-based knowledge. We have attempted to document all relevant sources, but have not, in the interests of readability, used as many citations as one might find in a professional paper. We hope the resulting synthesis is a useful way to view Wyoming's privately owned forests, along with the opportunities and challenges facing the people who own and manage these forests.

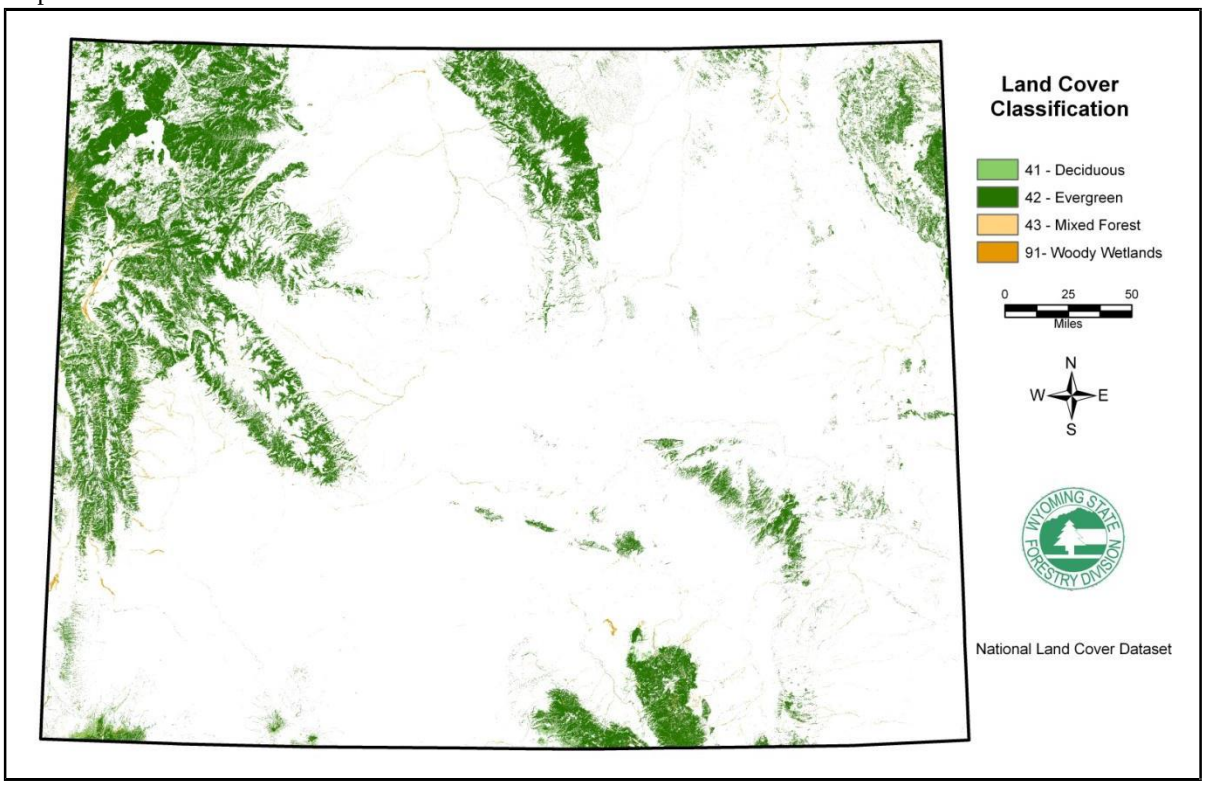
The AON must be approved by the USFS prior to the release of project funds. Once approved by the USFS, the AON may be amended by WSFD, with approval by the WSFSCC and USFS, to reflect new information or priorities.

II. WYOMING'S FOREST RESOURCE – CONDITIONS, TRENDS AND THREATS

Setting

This section is a broad overview of the conditions in Wyoming that will influence the character of the Wyoming Forest Legacy Plan. Wyoming has a land area of over 62.6 million acres (97,812 square miles). Elevations range from a low of 3,099 ft on the Belle Fourche River in Crook County in the northeastern corner of the State to 13,804 ft on Gannett Peak in Fremont County. The forested areas of Wyoming located in the western and central portions of the State are part of two provinces (Map 1, Ecoregion province descriptions are found in the Appendix C) referred to as the Southern Rocky Mountain Steppe and Middle Rocky Mountain Steppe (Bailey 1978). The Rocky Mountains are rugged glaciated mountains as high as 14,000 feet with local relief between 3,000 feet and 7,000 feet. Most of the forest land in Wyoming is concentrated in the northwest region of the State (Map 1). An isolated area of forest land exists in the northeast area of the State where ponderosa pine forests have found an ecological niche in the higher elevations of the plains and foothills of the Black Hills. This province is referred to as the Black Hills Coniferous Forest Province (Bailey 1978).

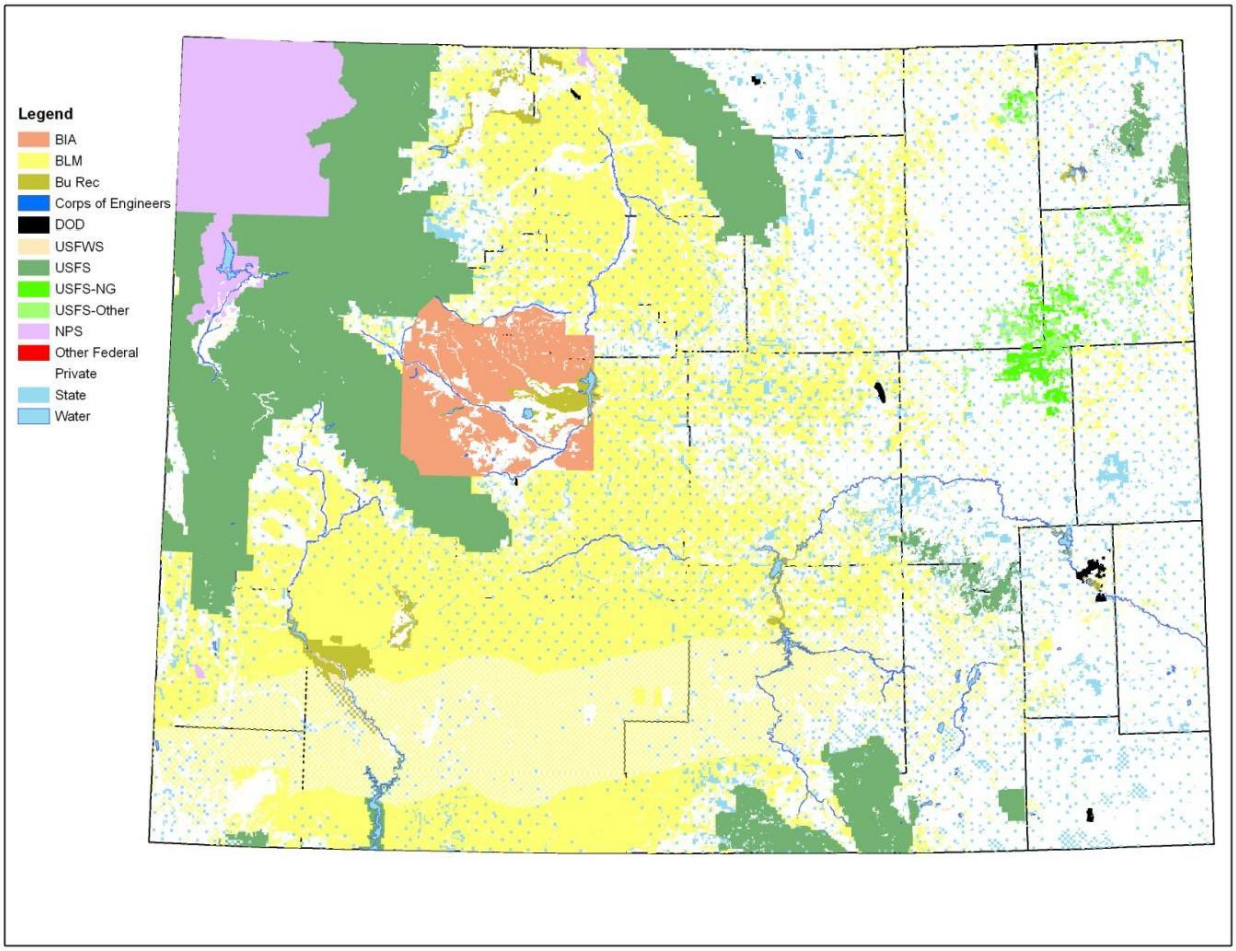
Map 1. Land Cover Classification.



Approximately 17 percent of the land area, or about 11 million acres, is classified as Timberland and 2 percent is classified as Woodlands, which together total forest lands in Wyoming (Figures 1 and 2). Timberlands are composed of tree species traditionally used in the forest products industry. Woodlands are composed of woody species that have not traditionally been used by industry, but are important for several other reasons. Timberlands tend to be at higher elevations where moisture regimes are higher, which is also correlated with federal ownership.

Fifty-three percent of the forest land is administered by the USDA Forest Service, and 17 percent is privately-owned, which includes Indian Trust land (Indian Trust land is not eligible for this program). Fifteen percent is administered by the National Park Service, 11 percent is administered by the USDI Bureau of Land Management (BLM), and the remaining 4 percent is owned by State, county, and miscellaneous Federal agencies. Map 2 spatially illustrates the location of the major owner groups in Wyoming.

Map 2. Wyoming Land Ownership



About one-third of the total forest area is in what the USDA Forest Service Interior West Forest Inventory and Analysis (IW-FIA) designated as a "reserved" status based upon industrial availability, and thus timber derived economic values, without extensive environmental analysis. These lands are segregated in current IW-FIA analysis by the following parameters: forest land in designated "roadless" areas, greater than one mile from a maintained road, on a greater than 40% slope and/or less than 10% the area supporting live trees. The result of these designated non-timber values within the federal land management systems relative to the Forest Legacy Program is that the importance of private forest land has been elevated further.

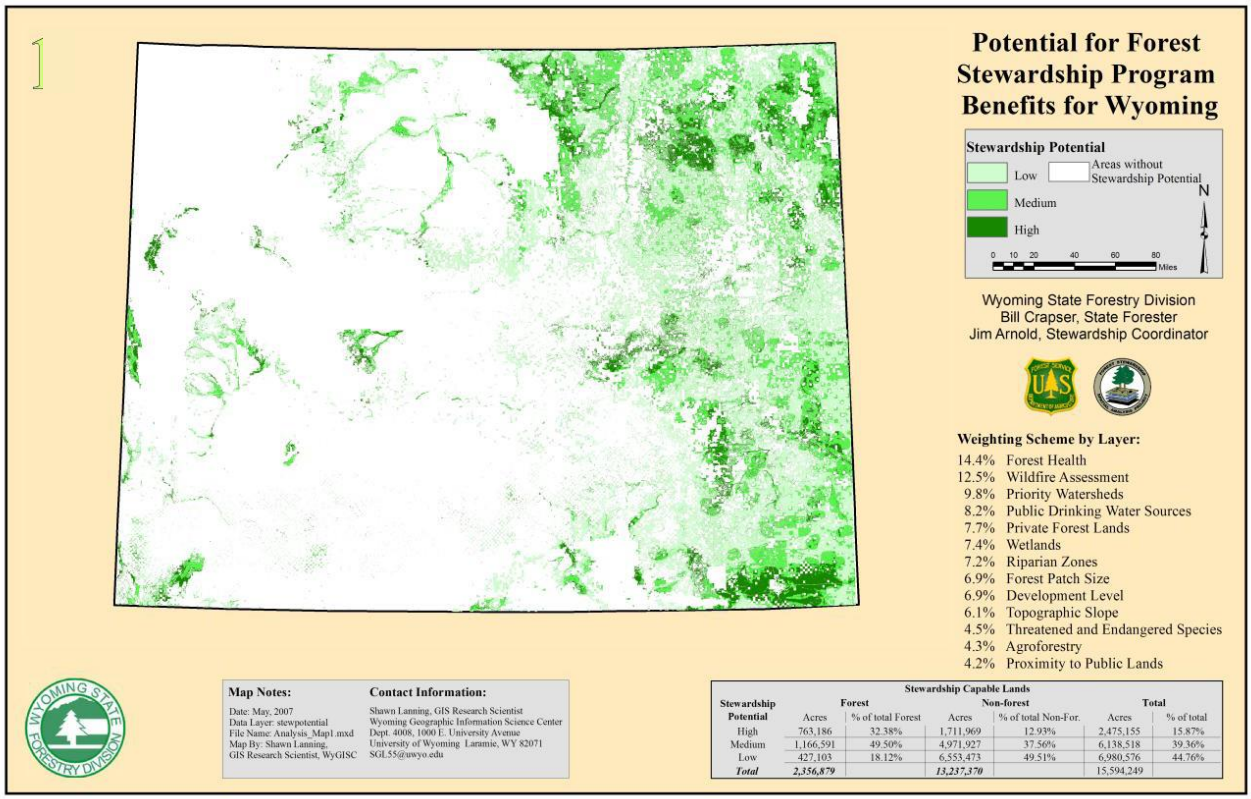
Wyoming's mountains and hills have helped to shape the state's climate, vegetation, natural resources, industries, and people. Major physiographic regions include the Great Plains

primarily in the northeastern quarter of the State, The Semi Desert region located in Central and South-Central Wyoming, The Southern Rockies consisting of the northwest portion of the state, the north-central portion and part of the southeastern portion. The Black Hills in the Northeastern corner of Wyoming. Every known type of geological feature can be found within the boundaries of the State of Wyoming. Forested areas are generally associated with elevation and moisture conditions closely associated with mountain ranges and the Black Hills.

Wyoming State Forestry Division recently completed the Spatial Analysis Project for Wyoming's private forest land. This report analyzes the stewardship capability and potential for Wyoming's forested lands using a weighted criteria scheme based on forest health, wildfire assessment, priority watersheds, public drinking water sources, wetlands, riparian zones and other factors, all of which provide important information on private lands forest quality. The Spatial Analysis Project summary is attached as Appendix D and numerous maps are used in this AON from that report.

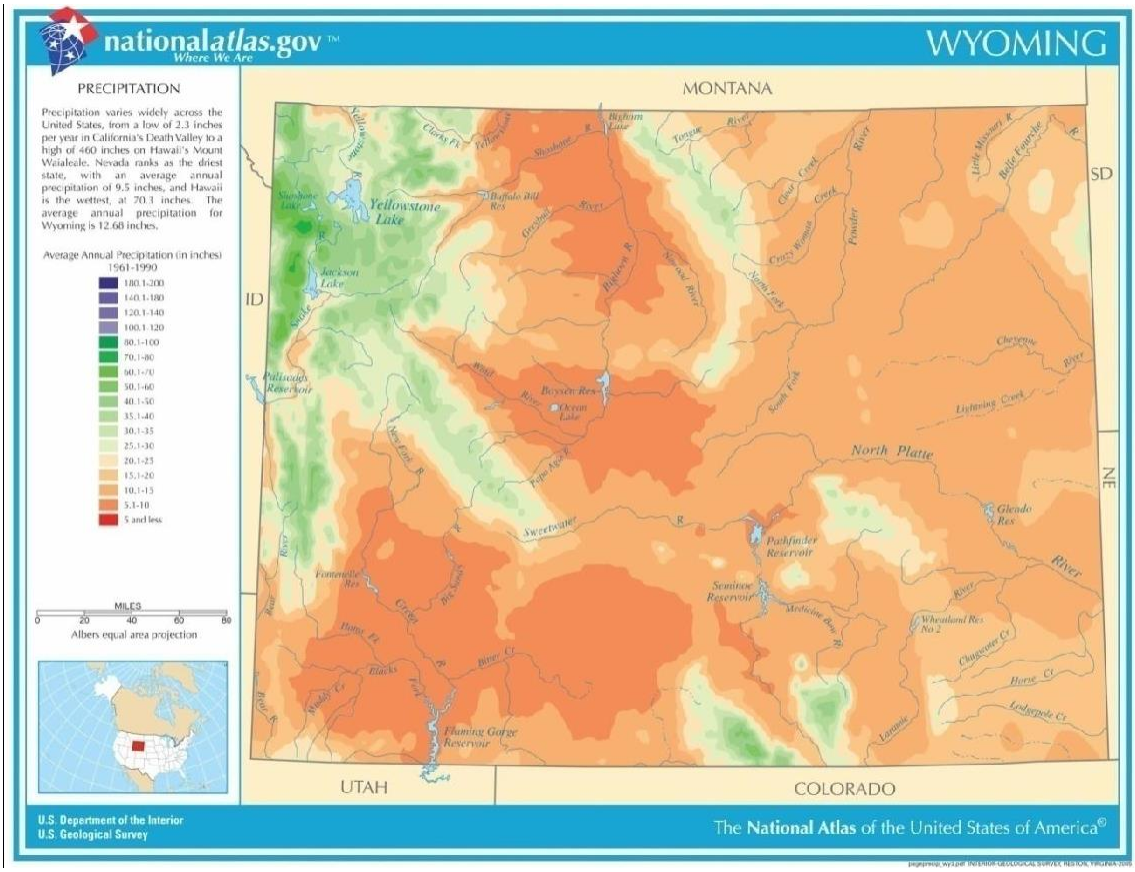
The Forest Stewardship plans indicate relatively high levels of timber management in an area, and consequently indicate productive private land forestry areas. Map 3 below shows several areas with high concentrations of WSFD stewardship planning. The areas can be described as Northeast Wyoming (Black Hills), Southeast Wyoming (Laramie, Medicine Bow, and Sierra Madre Range), and more scattered areas in north central Wyoming and western Wyoming. It is important to note that Map 3 includes non-forested areas as well as forested areas and only the forested areas are eligible for the FLP.

Map 3. Potential for Forest Stewardship



The Rocky Mountains and the Continental Divide influence Wyoming's climate, as areas west of the mountains receive 80-90 inches of precipitation annually with the majority coming as snow in the higher elevations of Yellowstone and Grand Teton National Parks. The areas east of the various mountain ranges tend to be basins influenced by the continental divide, which are in the rain shadows of the mountain ranges, and therefore receive less than 5 inches of precipitation. The average annual precipitation for Wyoming is 13.07 inches (Map 4).

Map 4. Wyoming Annual Precipitation Map (USGS, 2005)



Forest Characteristics

Forest Type (Largely adapted from WSFD, USDA, 2001, Wyoming Forest Health Report and USDA-RMRS, 2005) is considered an indicator of forest diversity, and refers to the predominant tree species in a stand based on tree stocking. The lodgepole pine type is the most abundant forest type in Wyoming, covering over 2.6 million acres (23%) of Forest land. Second in abundance, the spruce-fir type covers 1.8 million acres (16%) of the State's forest land. Third, ponderosa pine totals 1.1 million acres (9%) of forest area. Douglas-fir and Engelmann spruce each make up 8% of the area; juniper, 8%; aspen, 6%; whitebark pine 5%, and limber pine 4%. Non-stocked forest land accounts for 10 percent of total forest land in Wyoming. Non-stocked forest land includes sparsely stocked woodland, recently cut and burned areas, and other areas that fall below a 10-percent stocking threshold of live trees. Figures 1 and 2 illustrate the distribution of forest type on timberland and woodland. Lodgepole pine predominates on timberland, whereas juniper is the most abundant forest type on woodland.

Figure 1. Area of Timberland by Forest Type. (USDA-RMRS, 2005)

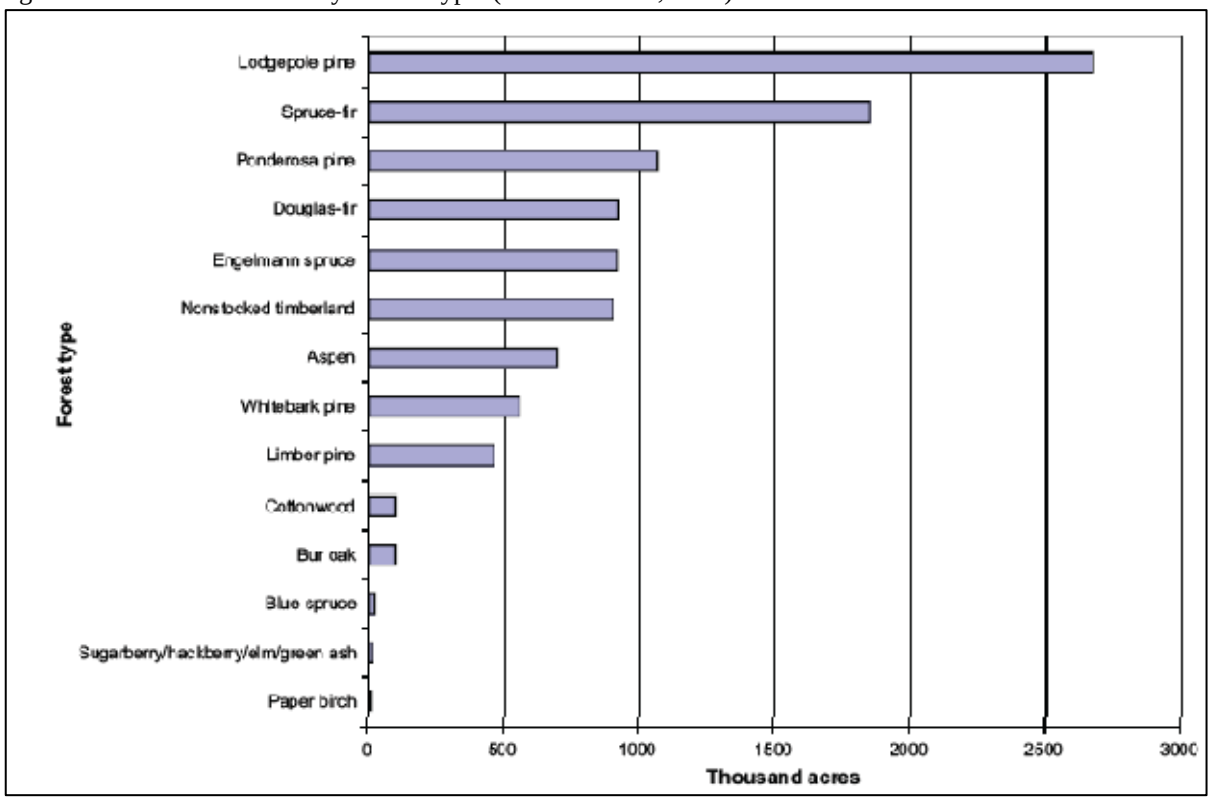
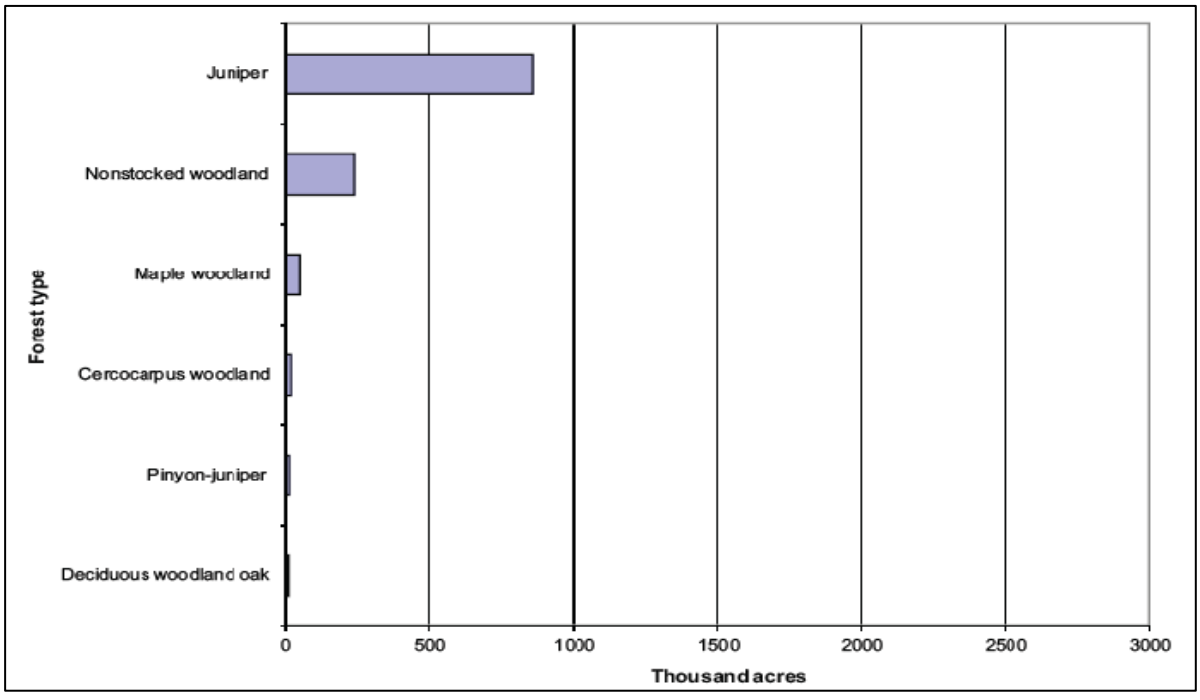
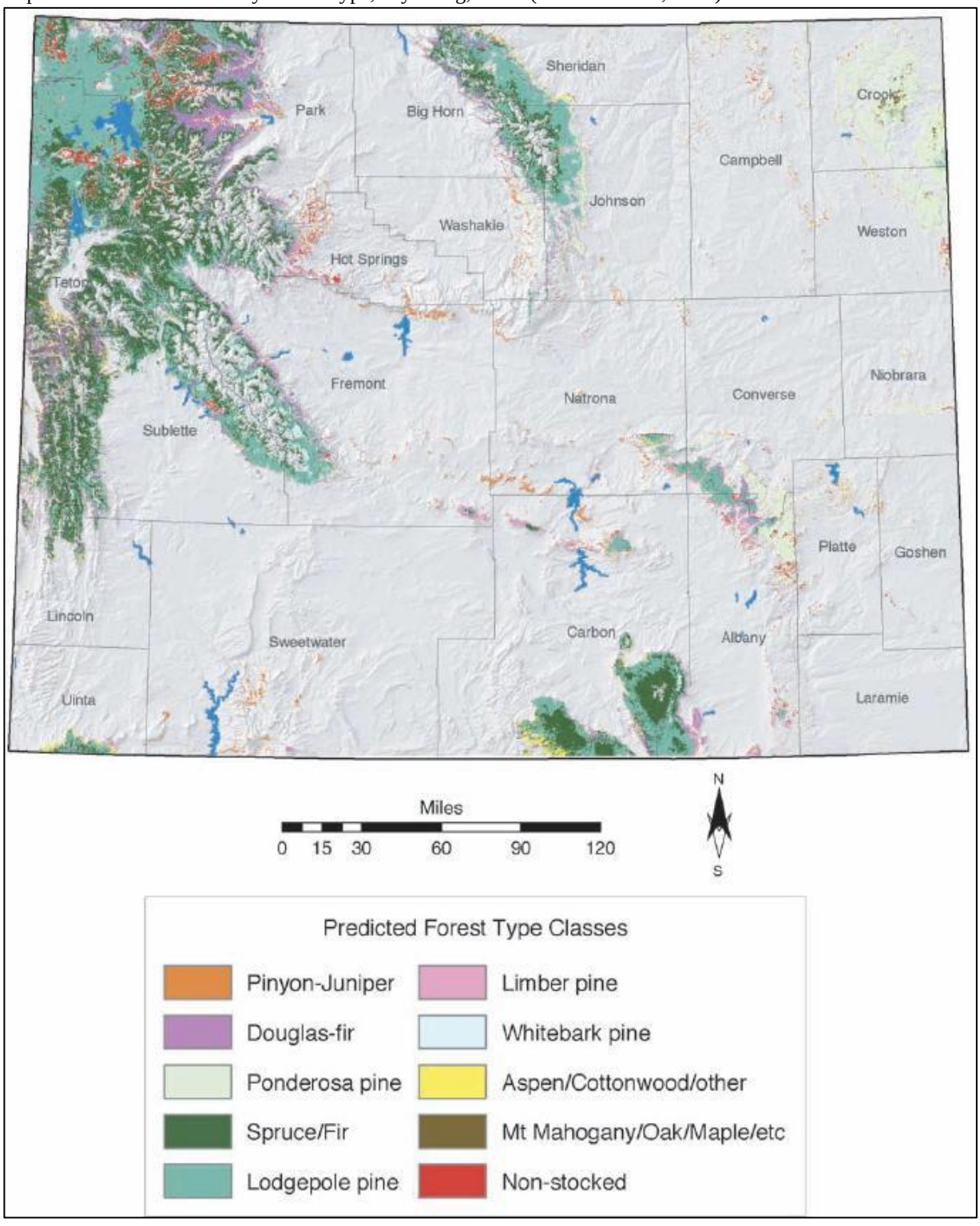


Figure 2. Area of Woodland by Forest Type. (USDA-RMRS, 2005)



Map 5 displays the major forest types and forest type groups overlayed with a shaded relief map layer in Wyoming. This illustrates the very evident and somewhat predictable nature of vegetation zones in relation to mountainous topographic features. Vegetational zonation in the Southern Rocky Mountain Steppe is controlled by a combination of elevation, latitude, direction of prevailing winds, and slope exposure. The uppermost (alpine) zone is characterized by alpine tundra and the absence of trees. Directly below is the subalpine zone dominated by Engelmann spruce and subalpine fir. Below the montane zone is the foothill zone where mountain-mahogany and several species of oak are present. Lodgepole pine is heavily concentrated in the northwest region where Yellowstone National Park is located. This area is part of the Middle Rocky Mountain province characterized by basins and ranges.

Map 5. Area of Forest Land by Forest Type, Wyoming, 2002. (USDA-RMRS, 2005)



The spruce-fir types indicate an elliptical pattern surrounding the harsh, exposed environment of the alpine zone. Douglas-fir follows the east-facing coves at the higher elevations. Ponderosa pine is heavily concentrated in the northeast region where the Black Hills National Forest is located. Below this area lies the montane zone, characterized by ponderosa pine and Douglas-fir, depending on aspect. Ponderosa pine favors drier, exposed slopes, whereas Douglas-fir prefers higher, moist, sheltered areas.

Riparian Forests

Riparian forests are a highly valuable component of Wyoming's landscape. Riparian forests exist where there is adequate moisture, typically along creeks, rivers, and with human influence, along irrigation ditches. These forests can be as narrow as the shore along a river to several miles wide most often depending upon hydrology. In higher elevation settings, they are flanked by coniferous and aspen forests, while in lower elevations they typically border sagebrush steppe and grassland habitat types.

Compositionally, riparian forests vary greatly throughout the state with elevation and hydrology primary factors determining species occurrence and distribution. At higher altitudes spruce, fir, alder, willow and birch are common components, transitioning to Douglas fir, maple, chokecherry, hawthorn, mountain ash, plum and serviceberry in lower elevation mountain forests. Aspen is the most common deciduous component of upland riparian sites. Cottonwood, boxelder and willow predominate in the plains. Some eastern hardwoods such as American elm, bur oak, hackberry and hophornbeam at the western edge of their ranges are significant components of riparian forests in the lower elevations of eastern Wyoming. Non-native species such as Russian olive and saltcedar (Tamarix sp.) have extensively invaded some riparian areas; outcompeting native species, significantly reducing the quality of wildlife habitat and contributing to diminishing stream flows.

Less than 1% of the intermountain west is classified as riparian, yet an estimated 80% of wildlife depends on this limited area for food, water, shelter, and migration routes during some part of their life cycle. Consequently, riparian habitats are biologically rich, providing the greatest species diversity within the state. Just as importantly, wildlife uses Wyoming's riparian forests and associated riparian lands as migration corridors as these forests connect tracts of forested lands, and the structure of these forests provides cover and shelter for virtually every species of wildlife in the State of Wyoming. Riparian forests and associated riparian habitats are particularly important for bird species. Over 60% of the neotropical migratory bird species in the western United States use riparian areas at some point during the year. Breeding diversity of birds is higher in riparian habitat than all other western habitats combined.

Riparian zones at the bottom of V-shaped valleys incised in bedrock are generally stable. However, riparian zones on the alluvial soils of broad floodplains common across Wyoming can change rapidly. A complex and shifting mosaic develops based on spring floods that overflow banks and relocate channels. Periodic spring floods create new channels and soft alluvial soils are eroded as the river seeks shorter passage downstream. Banks are cut on the outside of turns, and point bars of sand and gravel are formed on the insides of turns, creating new habitat for succession of riparian forest species. Oxbows are created in former river channels, creating wetlands and over time, fertile ground for the establishment of cottonwood and other tree seedlings. Riparian forests also play a key role in filtering sediments and nutrients and storing water in the spring in alluvial zones to sustain stream flow during drier months.

Wildfire also influences riparian forest ecology, despite higher moisture conditions than other forest types. Improved moisture conditions typically result in increased herbaceous and woody biomass. Seasonal curing of fine fuels makes wildfires common occurrences from late summer through early spring in many riparian forest habitats. These fires are often characterized as less intense with a corresponding reduction in destructive capacity. Drought and the buildup of dead woody fuels can lead to more intense fire behavior with stand replacement capabilities. Both types of fire activity should be considered typical for riparian forests though frequency rates differ. Some species such as aspen are highly dependent on fire disturbance to maintain population vigor.

A growing focus of concern within the Rocky Mountain Region is the decline in aspen stand vitality and a subsequent reduction in range. Stands are showing significant decline, through diminished reproduction and increased mortality resulting from drought, conifer encroachment, and browsing pressure from ungulate populations and domestic livestock. A disturbance dependent species, extensive wildfire suppression combined with a reduction in forest management has altered plant succession and contributed significantly to the decline of aspen populations. The current mountain pine beetle epidemic and the loss of many pine stands should act as a release mechanism for suppressed aspen stands and reverse the decline in areas hard hit by the beetle.

Cottonwood forests provide much-needed shelter, stock water, and shade for human settlement and livestock operations across Wyoming's high plains landscape. Human settlement has altered some aspects of forest ecology, however. Flood control through the construction of dams and dikes has had a significant impact on riparian forest health in many parts of the state. Cottonwood trees need flushing flows and the creation of point bars for the establishment of cottonwood seedlings. Regeneration significantly diminished, cottonwood woodlands appear to be declining in many areas of the state. Beaver also play a significant role in influencing riverine and riparian hydrology and in creating important habitat for fish, wildlife, and livestock, although their prevalence is still significantly diminished from pre- European settlement times.

The productivity of riparian sites has resulted in the extensive conversion of riparian forest to other uses such as agriculture. Much of the state's most productive agricultural lands are within or adjacent to riparian areas. Proximity to water has made riparian areas valuable, for urban, industrial and recreational development. Legacy projects which feature riparian forest sites have the potential to be an important program focus.

Wood Product Resources

Non-reserved timber lands represent 57 percent of the forest lands in Wyoming. An estimated twenty-three percent (1.9 million acres) are private lands that may be eligible for inclusion in Wyoming's FLP. The average net volume per acre in the non-reserved timber lands is 1,780 cubic feet per acre (cf/ac.). Private lands produce 1,044 cf/ac., yielding 3,220 board feet of saw timber per acre.

Forested lands in Wyoming have been evaluated in a manner that differs from the AON's of some other states in order to provide more realistic understanding of the forest resources that are likely to be eligible for the FLP. USDA criteria were used to categorize Wyoming forest lands. Timberlands are forested areas where the primary species are currently suitable for use in the wood products industry and woodlands are composed of species not typically used for wood products. Forest lands are further subdivided into two subcategories, reserved and non-reserved. Reserved

forest lands are not available for the harvest of wood products due to administrative or management limitations such as wilderness and roadless designations set by Congress or the administrating agency. Non-reserved forest lands are those lands where the ability to harvest wood products has not been removed as a management option. All private forest land in Wyoming is currently designated as non-reserved. Data concerning private timberlands is presented with some comparisons to other land ownership classes to provide a clearer understanding of its importance to the local wood products industry.

Private timberland stocking represents approximately half of the growing stock volume per acre measurements derived on Forest Service land in Wyoming. However, the administrative complexities of Forest Service removals offsets this difference in the market place, as private lands can be managed with more flexibility and are therefore more important to timber harvest in the Intermountain West Region. Most importantly, the volumes available on eligible FLP lands contribute substantially to the current regional and national timber markets, as well as to the employment of people in Wyoming and neighboring states (see Wyoming's Forest Products Industry below).

In the year 2000, not including trees removed for land clearing or land use conversions, tree removals in Wyoming equaled 15.4 million cubic feet (mcf) of which 74 percent were derived from private timber forest lands. Nearly ninety-four percent of the trees removed were used to produce wood products with 66.7 million board feet (mbf). Approximately 6 percent remained on the land as logging residue and 1 percent was used as fuel wood.

Wyoming's Forest Product Industry

Most Wyomingites are employed by, and economically dependent upon, the production and exportation of basic raw resources to other states. As noted in the Land Ownership section, the statistics presented for Wyoming must be evaluated in light of Wyoming's low population relative to any other state, with approximately 500,000 people.

In the year 2000, there were 55 active forest product processors and manufacturers utilizing products from timberlands in Wyoming and neighboring states. The types of industries active in Wyoming include:

- Sawmills that produced milled lumber and by-products such as fiber,
- Mills that produce house logs for building log homes,
- Manufacturers that produce and sell pre-constructed log homes or log furniture, as well as producers of wood pellets and fire wood.
- Facilities for the production of cellulose based fuel grade bio-ethanol.

Of the materials received at Wyoming mills (13,449 mcf), 85.5% was used to produce lumber, 7.9% became post and pole products, 2.4% was used for log homes and 4.2% became other products.

Wyoming's sawmill sector has become more efficient. The number of mills in the State declined from 107 in 1957 to 23 in 2000 and yet produced 7 times more lumber (376 mmbf) than in 1957. As illustrated in the previous section, the standing inventory or available stocking substantially

exceeds the current harvest of forest products. In 2000, the capacity to process materials at Wyoming's mills and manufacturers is estimated to be 114 mmbf (USDA, 2002), generating about $47 million in sales. The percent of capacity being utilized declined by 15% between 1986 and 2000, and another 17% by 2002 (See Threats to Wyoming Forests). Current mill production is at less than 40% capacity utilization.

The log home sector has expanded since 1976 to 11 firms by the year 2000 producing 830,000 linear feet of house logs generating $7.1 million in sales (USDA, 2002). There are also 11 firms manufacturing log furniture in Wyoming using primarily lodgepole pine forest products less than or equal to 7" dbh, and generating $1.1 million in sales in the year 2000. Thirteen firms produced post and pole, firewood and fuel pellets in Wyoming during 2000. In January of 2008 a cellulosic ethanol plant started production in Upton, Wyoming, the first facility of its kind in the country. A second facility, also to be located in Wyoming is currently under consideration.

The estimated sales value of Wyoming's primary forest products was nearly $80.4 million free on board the producing mill in 2000. Eighty-six percent of these products were exported to other locations in the Rocky Mountain Region, the North Central Region and the Southern Region (Figure 3). Wyoming consumers purchased 10% of the forest products and in particular, 64% of the log home sales were purchased in Wyoming or neighboring Rocky Mountain States and 76% of the other forest products were sold in the Rocky Mountain Region, including Wyoming. These sales contribute to the economies of the region and create or augment other local economies external to the forest harvest and products industry.

Figure 3. Market Areas for Wyoming Forest Products (USDA, 2002).
(1) North Central, (2) Rockies, (3) South, (4) Wyoming, (5) Northeast, (6) Far West.

The source of trees for the timber industry has made a dramatic shift, which makes the FLP particularly important for Wyoming. Privately owned forest land has become critical to the survival of this industry. In 1976, 78% of forest products were derived from public lands with only 22% derived from private lands. By the year 2000, the volume of materials harvested had declined by 78%, but most significantly 73% of those materials came from private forests. Wyoming's timber industry is now dependent on private forest lands as the primary source of raw materials for production. Wyoming's private timber supplies are often associated with multi-function ranches and affected by the price of timber relative to other ranch products and services such as the price of beef.

There has also been a significant shift in which forest types are most important to the timber industry. Sixty-six percent of the saw log harvest was composed of ponderosa pine in 2000 with lodgepole pine contributing only 21.3%. This underscores the importance of maintaining these private forests and facilitating forest management planning and practices. In particular, private lands in the north east corner of the State are producing 78% of the harvest volume (Table 1).

Table 1. Wyoming's 2000 Timber Harvest by County (USDA, 2002).

County	Volume	Percentage of total
	MBF *	
Albany	6,052	9
Big Horn	618	1
Campbell	801	1
Carbon	3,115	4
Converse	936	1
Crook	31,975	45
Fremont	435	1
Goshen	-	0
Hot Springs	-	0
Johnson	3,864	5
Laramie	-	0
Lincoln	1,100	2
Natrona	-	0
Niobrara	-	0
Park	2,352	3
Platte	1,332	2
Sheridan	3,364	5
Sublette	3,400	5
Sweetwater	-	0
Teton	-	0
Uinta	6,416	9
Washakie	2,454	3
Weston	2,280	3
Total	70,494	100

* Harvest volume expressed in thousand board feet (MBF) Scribner.

In direct relation to the approved Forest Legacy Plans for the neighboring states of Montana, Colorado, and Idaho, Wyoming's net flows may appear relatively small, but this masks the complexity and magnitude of the total flow. Several of Wyoming's timber producing regions border timber producing regions in Idaho, Montana, South Dakota, Colorado, and to a lesser extent, Utah. Wyoming was a net importer of 42.6 mmbf from surrounding states and exported 22.4 mmbf in 2000. In 2000, more than 87 mmbf crossed Wyoming's borders, which represents 124% of the State timber harvest and 71% of the volume processed in the State during the year (USDA, 2002). South Dakota was the origin of the largest volume of timber imported, followed by Colorado and Montana. About 32% of Wyoming's timber harvest in 2000 was exported to Idaho, Montana, and South Dakota. South Dakota received more than 80% of the exported timber, with Idaho and Montana receiving the remainder.

Timber harvested and processed within Wyoming generally did not move long distances. In 2000, 67% of the timber harvested and processed in Wyoming was processed in the County where the timber was harvested; another 25% was processed in adjacent Wyoming Counties. Likewise, most non-Wyoming timber processed in Wyoming mills came from adjacent, although

out-of-State, counties (USDA, 2002). For all of the forest product sectors, the levels of timber processed differs from the import and export rates for the State. Mills rely upon out-of-state timber with 75% of their supply originating out-of-state, and though only 68% of Wyoming's timber harvest was processed within the State. The importance of private lands eligible for the FLP is once again accentuated by the fact that private timberlands contributed 54% (61.5 mmbf) of the 113.7 mmbf of timber processed in Wyoming mills in 2000. About 43% (26.3 mmbf) of private timber received by Wyoming mills came from outside the State (USDA, 2002). The proposed FLP may help maintain private timber harvest within Wyoming.

To summarize the Forest Product Industry section, there has been a shift in importance from publicly owned lands and lodgepole pine to private forest lands and ponderosa pine for the necessary raw materials to supply industry. The number of Wyoming mills has declined, but the industry has improved overall in efficiency and utilization of milling by-products. Wyoming's mills are currently operating at approximately 40% of their capacity. There has been an expansion of new forest product sectors such as cellulosic ethanol, house logs, manufactured log homes, and log furniture. Future harvest from forests on Federal lands is likely to continue to be limited, because of an increased public policy emphasis on non-timber harvest forest uses, such as recreation and preservation. Only 34% of Wyoming's forested acres are likely to be utilized in the near future, although forest growth exceeds mortality by nearly 150%. Wyoming's forest product industry is a significant component of Wyoming's economic and employment picture and is inextricably linked to the forest industries of neighboring states.

Forest Health

The effects of forest health issues from multiple sources are a major concern in Western Wyoming. A prerequisite for the most effective management activities is to maintain forest integrity and resilience. Decreasing forest fragmentation through the Forest Legacy Program is a good step in the right direction.

General indicators of forest health are biological diversity, productive capacity, ecosystem resilience and vitality, the integrity of the soil resource, the character of water resources, and global cycles (Stolte, 1997). As with any living population, there is always change and fluctuation; including mortality, disorder and regeneration. Such occurrences are often cyclical, following expected patterns under specific environmental conditions and are ecologically pertinent. However, there are situations where disruptions in forest systems limits the ability of the forest to sustain itself or its character and meet the current and future needs of people over time. These disruptions can be in the form of insects and disease (endemic and exotic), climatic such as drought, natural events of unusual magnitude such as wildfire or high winds or management actions that fail to respect natural systems. In most instances, poor forest conditions are not due to a single factor but are attributable to a combination of factors coming together to produce disorder.

Healthy forests are typically diverse forests where plant populations do not exceed the carrying capacity of the site. Diversity within forests may be linked to species diversity, but is just as frequently a function of structure and age. Homogenous populations whether of species, structure or age are more susceptible to disruption. Diversity provides a natural buffering capacity to limit the scope and influence of forest ailments. A significant factor in overall forest health is plant

vigor which is determined by site capacity and population density. Many of Wyoming's forests currently exceed healthy population densities predisposing them to a wide range of problems.

Some of these factors can be ameliorated by management activities; others cannot. In regard to the FLP, the majority of our effective and available management tools require the economy of scale. In other words, having large enough forested tracts will facilitate the implementation of management prescriptions that are efficient either in their ecological outcome, or their financial feasibility. Private land forest protection through the FLP preserves the opportunity to implement our more effective management practices. The program may also serve to reduce fire related problems in the Wildland Urban Interface, where residential developments are threatened by historically occurring wild land fires.

The several disease and insect "agents of change" at work in Wyoming forests have long been known to forest managers, but landscape-scale and even global trends in the passage of time have made the effects of those agents very noticeable to private landowners and the public in recent years. The demand for solutions often ends with the realization that the economics or feasibility of our available management actions requires larger forested tracts and ownership without a substantial density of homes or structures. This issue of residential development and "parcelization" is described within the Ownership Trends section and it represents a significant threat to healthy forests in Wyoming. The same generalization can be made for energy development within forests where once again access and the implementation of forest management actions may become limited.

Most forest health impacts are best addressed through federal and state programs other than the FLP, but the important role of the Forest Legacy Program lies in the opportunity to work with private landowners through Forest Stewardship Plans and the conservation easements that are developed for selected properties. Each program encourages the best known management practices to sustain forest health, while retaining the flexibility to allow future managers to respond to new science and unforeseen forest stressors that might emerge.
The following are brief descriptions of significant forest health issues and their root causes (USDA, 2001).

Air Pollution – Wyoming's air quality is affected by both global, region, and even local air quality issues. Annual sampling for three acid compounds by the USGS (USGS, Unpublished Progress Report, 2007), documents that concentrations of ammonium nitrate deposition continues to increase while sulfate concentrations are declining. In addition, the occurrence of elevated levels of ozone, nitrous oxide, and volatile organic compounds, has been recently documented within Wyoming's industrialized areas (WDEQ, 2006). In the Bridger Wilderness area, Clair (1993) noted increased levels of lead, zinc and manganese that increased closer to heavily urban and industrial areas. Some of the ecosystem impacts of adding plant nutrients may not be seen immediately as "damage," but they are clearly an agent of ecosystem change. Lichen can indicate changing air quality and Cune (1997), as well as Neit et.al. (1999) observed declines in sensitive species of lichen in the southern portions of Wyoming and increases in more pollution tolerant species of lichens.

Insects and Diseases – These agents of change that are native, contribute significantly to important forest renewal processes, including the recycling of nutrients by decomposing organic matter for the rejuvenation of soils. The insects and diseases that currently represent significant factors at play in Wyoming are listed in the Wyoming Forest Health Report (USDA, 2001) as:

- Comandra (white pine) blister rust, is affecting the distribution and vitality of ecologically important white bark pine stands. Dwarf mistletoe in lodgepole, Douglas fir and ponderosa pine forest is present in 30-60 percent of the National Forest lands east of the Continental Divide and 67 percent of the lodgepole forests, as well as 17 percent of the Douglas fir stands west of the Divide in Wyoming (USDA, 2001).
- Mountain pine beetle is affecting extensive stands of lodgepole pine and ponderosa pine. Under current climate and stand conditions, this insect is affecting up to 50-80% of some stands.
- Douglas fir beetle has affected scattered stands that have been stressed by the now decade-old drought, fire, root rot, defoliation by western spruce budworm, or windfall, with noted increases in the North Fork of the Shoshone River where Johnson and McMillan (2000) observed dramatic increases between 1998 and 1999. This trend has continued since that time.
- Western balsam bark beetle, fir engraver beetle, and Armillaria and Annosus root diseases are the major cause of mortality in subalpine firs in Wyoming and have been observed on four National Forest in Wyoming (USDA, 2001).

Altered Fire Regimes – Fire is a natural component of forest ecosystems. The fire regime or the frequency and intensity of wildfire occurrence in a given location was dependent on a number of factors including long and short range climatic conditions, build up of live and dead fuels, terrain and ignition source. Typically, the shorter the interval between fire events, the lower the expected fire intensity. Fire regimes are believed to have ranged from as short as 5-7 years for grasslands and some forests to in excess of 250 years for some higher elevation forests. Forest management, fire suppression and grazing has altered some fire regimes; particularly those with shorter frequency intervals. Some sites with longer frequency intervals may have altered fire regimes, though the current practices impacting fire occurrence have not been in effect long enough to alter all fire regimes. Altered regimes impact forest ecology, influencing plant succession, regeneration, forest structure and diversity.

Biodiversity – Wyoming has the largest virtually intact ecosystem remaining in the lower 48 States; the greater Yellowstone Ecosystem in the north and western third of the State. This diversity is reflected in the presence of large mammals, including carnivores, but throughout Wyoming large populations of mammals represent a nationally renowned resource that relies upon extensive migrations and movements largely due to the distribution of seasonal ranges. The ability for wildlife to move across Wyoming's expansive wild lands to avoid seasonal resource limitations is the key to the intactness of this ecosystem. Fragmentation including the restriction of migration corridors, diminished habitat complexity and the suppression or regulation of natural processes without compensating management actions, is all contributing to a loss of biodiversity. Declines in biodiversity on genetic, species, and community levels have been documented both regionally and nationally (Langner and Flatter, 1994). Reducing forest fragmentation and maintaining forest community "patch size" and connectivity are among the primary benefits of the FLP.

Exotic Species – As human activity and mobility increase, the greater the potential for the introduction of exotic species into the environment. Many exotics are able to out-compete native species, sometimes radically impacting plant and animal communities and altering natural processes, with unforeseen and often devastating consequences. A current focus for concern is riparian areas where Russian olive and tamarisk have replaced native willow and cottonwood forests and altered stream hydrology. Another exotic species of concern that was noted by the USDA Wyoming Forest Health Report (2001) as a threat to forests is leafy spurge. This noxious and toxic plant tends to form extensive mono-cultures that are very difficult to contain and control, and usually requiring the killing of any forest communities in the chemical control process. This plant is dramatically increasing in Wyoming particularly in the northeastern forests of Wyoming, which currently represent the most commercially valuable forests in the State. The most effective strategy is called "early detection and rapid response," which is a process facilitated by the FLP baseline assessments and Forest Stewardship Plans.

In summary, the challenge to the Forest Legacy Program is to encourage the development of Forest Stewardship Plans and conservation easements that encourage eligible private landowners to improve management techniques and adapt new science in the face of forest health issues.

Wildlife, Fisheries, and Watershed Resources

Forest-based wildlife and fisheries resources include over 663 vertebrate species and support a wildlife-associated recreation industry estimated at over $634 million a year, which in Wyoming distributed among a mere 500,000 Wyoming citizens. Forest Legacy can enhance this resource by protecting areas of high fisheries and wildlife habitat value, habitat connectivity, and continuity.

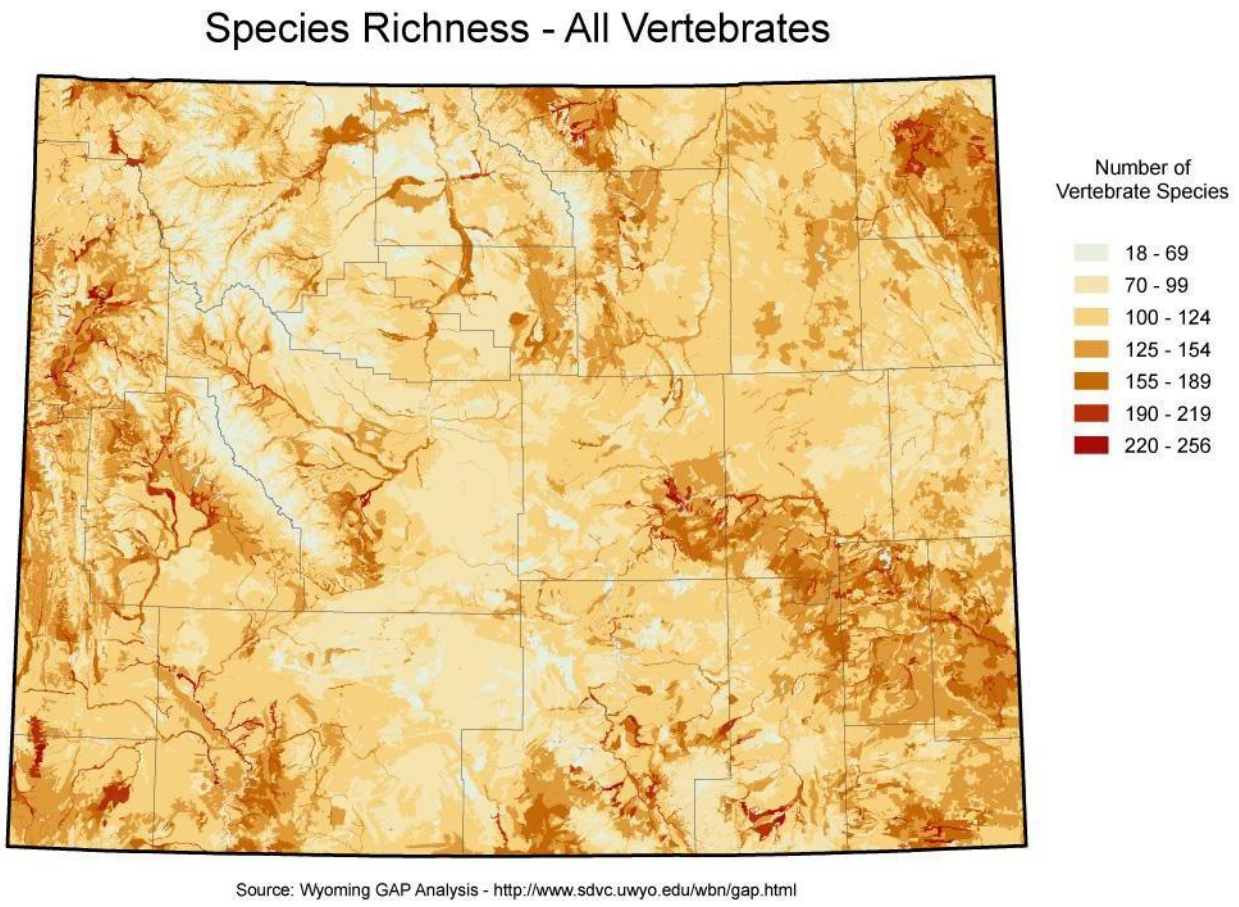
The western third of Wyoming, which is the rockiest, snowiest, and steepest portion of the state, represents a significant portion of the largest, virtually intact ecosystem remaining in the lower 48 States: the Greater Yellowstone Ecosystem. The eastern two-thirds of Wyoming has better soils, longer growing seasons, and is naturally even more productive in many aspects. To most people, the expansive biodiversity of Wyoming's wildlife is reflected in the presence of many species such as moose, elk, bighorn sheep, eagles, coyotes, trout, grizzly bears, wolves, etc. Each of these species has high human associations as well as vast spatial habitat requirement. Along with all of the other wildlife species throughout Wyoming, the Greater Yellowstone Ecosystem wildlife represents a nationally renowned treasure supported by forest lands and forest sustained watersheds.

The people of Wyoming, and indeed the international community, utilize these wildlife resources for priceless human pleasure, but just as importantly, Wyomingites indirectly bring their wildlife resource to the market place, and rely upon it economically. The power of the economic figures generated from the wildlife resource are, once again, accentuated in Wyoming relative to other States because of Wyoming's very low human population size and the scattered distribution of our people. In other words, the per capita revenues and the effects of the other types of benefits are magnified and permeate throughout our many small, rural communities.

In the northern and western regions of the continent, many ecologically and economically significant species of wildlife rely upon extensive migrations and movements largely due to the distribution of seasonal ranges. The ability for wildlife to move across Wyoming's expansive wild lands to avoid season resource "bottlenecks" is the key to the function and health of our ecosystems. Given the nature of wildlife in Wyoming, avoiding forest fragmentation and maintaining habitat connectivity and continuity are mandatory conditions for sustaining the future of Wyoming's wildlife resource. The FLP works to maintain those conditions in the long-term.

Wyoming is known to support over 800 species of wildlife (WGFD, 2005). Specifically, there are 120 species of mammals, 426 species of birds, 12 species of amphibians, 27 species of reptiles, 78 species of fish, arguably several thousand species of invertebrates, and well over 13,305 species of plants (WGFD, 2005, and NRCS Plant Database). Wyoming has 279 species designated as being a category of "greatest conservation need," including 54 mammals, 60 birds, 26 reptiles, 12 amphibians, 40 fishes, 19 crustaceans, and 68 mollusks (Appendix E). Map 6 illustrates the distribution of species rich area where numbers of species can be found within the same location. It is interesting to note the clear relationship of species richness to the lower elevation forested areas of Wyoming, which are often privately owned. Such comparisons can also be made using the distribution of forest types (Map 5). Using these illustrations, the correlations between the areas eligible for the FLP, wildlife, forest character and potential to generate forest products becomes clear.

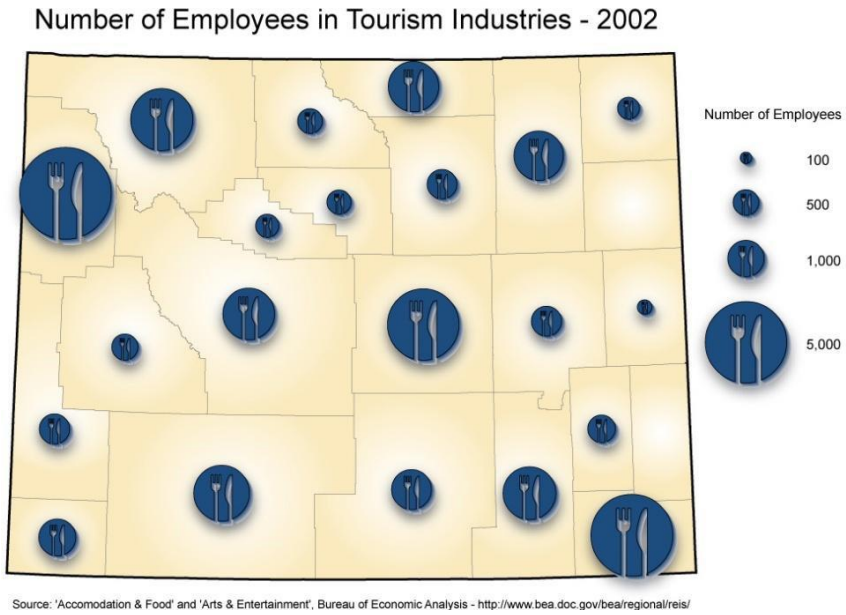
Map 6. The Distribution of Wyoming's Species Richness of All Vertebrates.



In 2001, 662,000 Wyoming residents and nonresidents 16 years old and older fished, hunted, or wildlife watched in Wyoming (USFWS, 2001). Of the total number of participants, 293,000 fished, 133,000 hunted, and 498,000 participated in wildlife-watching activities, including observing, feeding, and photographing wildlife. The sum of anglers, hunters, and wildlife watchers exceeds the total number of participants in wildlife-related recreation because many individuals engaged in more than one wildlife activity. In 2001, state residents and nonresidents spent $634 million on wildlife recreation in Wyoming. The tourism industry provides 30,000 full time jobs across the state (Figure 4).

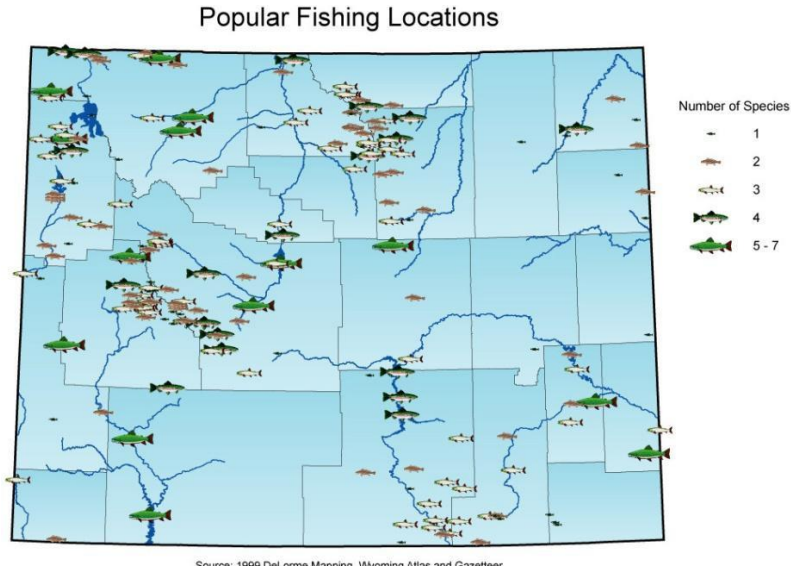
Tourism is Wyoming's second largest industry, and its economic benefits are more diffusely distributed among the general population scattered across the rural landscape. This industry is dependent upon the recreational opportunities and ecological services provided by Wyoming's forests. While public access will not be required on properties conserved through the Forest Legacy Program air, water, wildlife and aesthetic values flow across the landscape to benefit all.

Figure 4. Number of Employees in Tourism Industries - 2002



Wyoming is considered an “arid” state, with much of the state receiving less than 20 inches of precipitation annually. Aquatic habitats are a critical part of Wyoming and they have influenced the state’s history and development. Naturally reproducing trout streams are considered high-value resources, but both cold and warm water fisheries are highly prized as recreational resources (Map 7). Some 414,000 people fished in Wyoming during 2001 spending 4.4 million days enjoying the state’s freshwater resources. Of the total anglers in 2001, some 56 percent were visitors from out of state (USF&WS 2002). The private forest land eligible for the FLP helps sustain these important fisheries.

Map 7. Distribution of Wyoming’s Fishing areas.



Watersheds, Rivers, and Streams

Forest Legacy can enhance Wyoming's rivers by conserving forestland adjoining high quality streams and other high priority water bodies.

Wyoming's watersheds, rivers, and streams form significant portions of the headwaters for the three great rivers of the Western US. Each is fed by the winter snowpack in the forested mountain ranges of the State. Each is sustained and made productive by the rainfall intercepted by Wyoming's forests and forest-protected soils. Surface water from Wyoming forests supplies 35% of Wyoming's residents. Careful management of our forest resources will help ensure a continued supply of clean water.

The Yellowstone, the Bighorn, the Tongue, the Powder, the little Cheyenne and the Platte River flow into the Missouri River and the Mississippi and the Gulf of Mexico. The Green River flows south to the Colorado River and the Gulf of California, and the Snake River flows west to the Columbia River and the Pacific Ocean (Map 8). The Clark's Fork of the Yellowstone River is federally designated as a Wild and Scenic River. The majority of the streams in Wyoming are designated as supporting trout fisheries of regional and national importance (WGFD, 1989). The quality and quantities of Wyoming's water affects the entire western United States, which underscores the need for thoughtful conservation programs such as the FLP in the State.

Map 8. The Rivers of Wyoming.

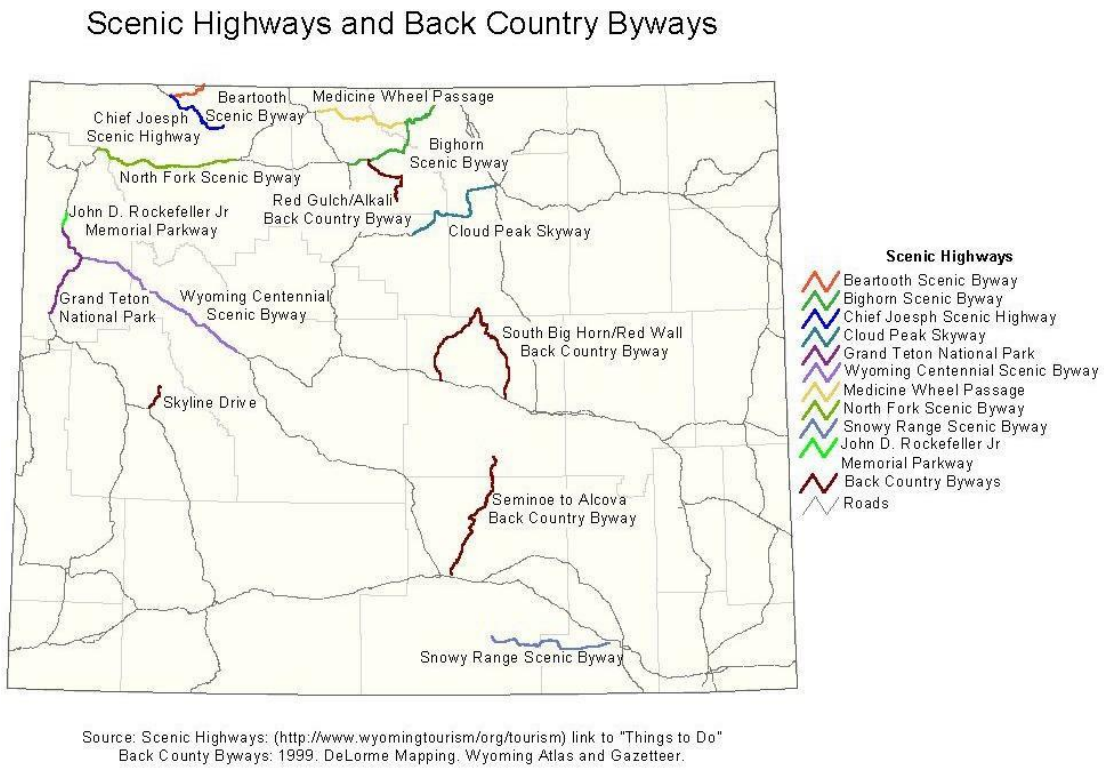
Recreational and Scenic Resources

Visitors to Wyoming spend approximately 2.25 billion dollars per year, and our natural splendor is the major attraction. Maps 9, 10 and 11 show the number and distribution of unique natural areas, designated snowmobile trails, and designated scenic drives in the state. Yellowstone National Park and its famous natural wonders and processes alone attract 3 million visitors per year. Tourist spending levels increased 12 percent in 2005 over the previous year, and local tax receipts from tourism related businesses were up 12.4 percent.

Map 9. Unique Natural Areas in Wyoming.

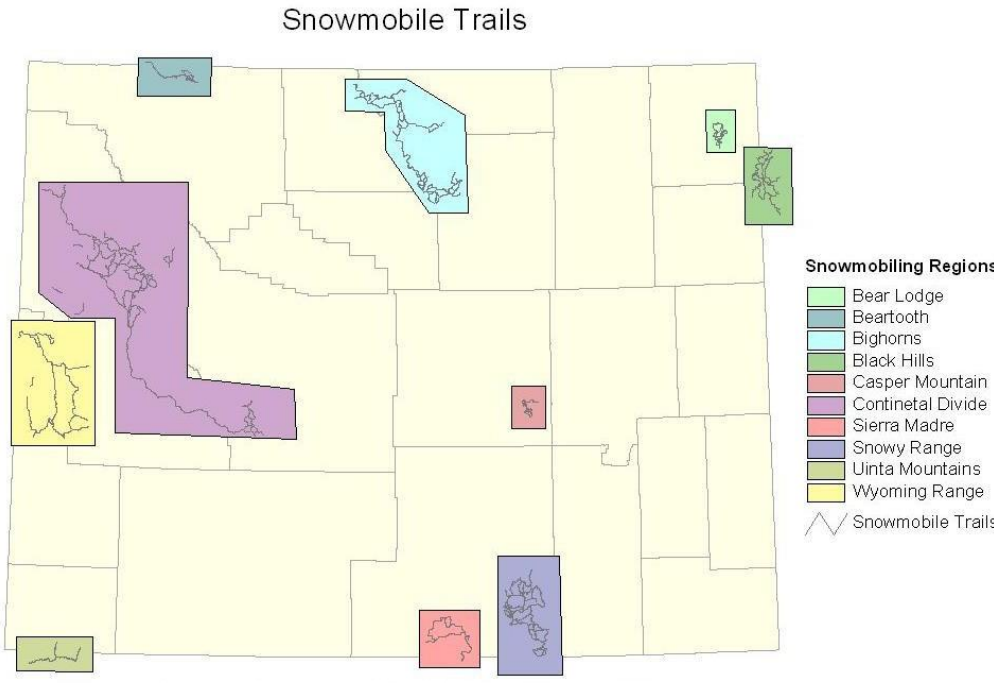
Source: Wyoming Gap Analysis, 1994 (http://www.sdvc.uwyo.edu/wbn/gap.html)

Map 10. Wyoming Scenic Driving Routes.



Source: Scenic Highways: (http://www.wyomingtourism/org/tourism) link to "Things to Do"
Back County Byways: 1999. DeLorme Mapping. Wyoming Atlas and Gazetteer.

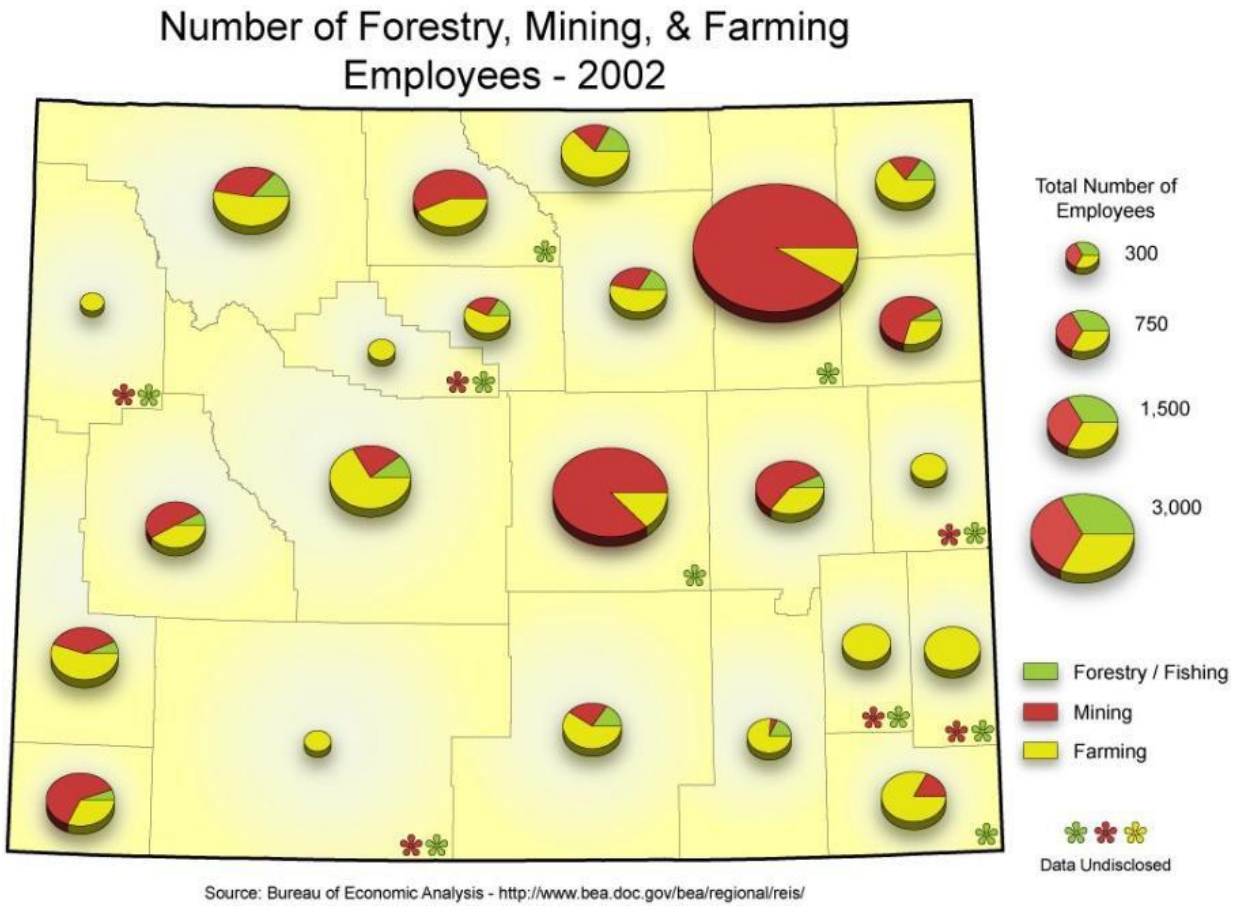
Map 11. Snowmobile Trails Designated by the State of Wyoming.



Source: Wyoming Department of State Parks & Cultural Resources - 2003
122W 25th St. Herschler Bldg. 1FE
Cheyenne, WY 82002
http://commerce.state.wy.us/sphs/snow

All of the statistics presented in this AON must be considered in light of the fact that Wyoming's population is the lowest in the United States. A small number of jobs or revenue relative to those of other states take on much greater significance in Wyoming when examined on a per capita basis. Very little complex manufacturing occurs within the State, and Wyoming's citizens are dependent upon basic, raw natural resources for employment. The vast majority of the people in Wyoming are employed in mining, oil and gas, agriculture, logging, and tourism industries, or the administration of those industries within government agencies (Map 12).

Map 12. Logging, Farming and Mining Employment in Wyoming.



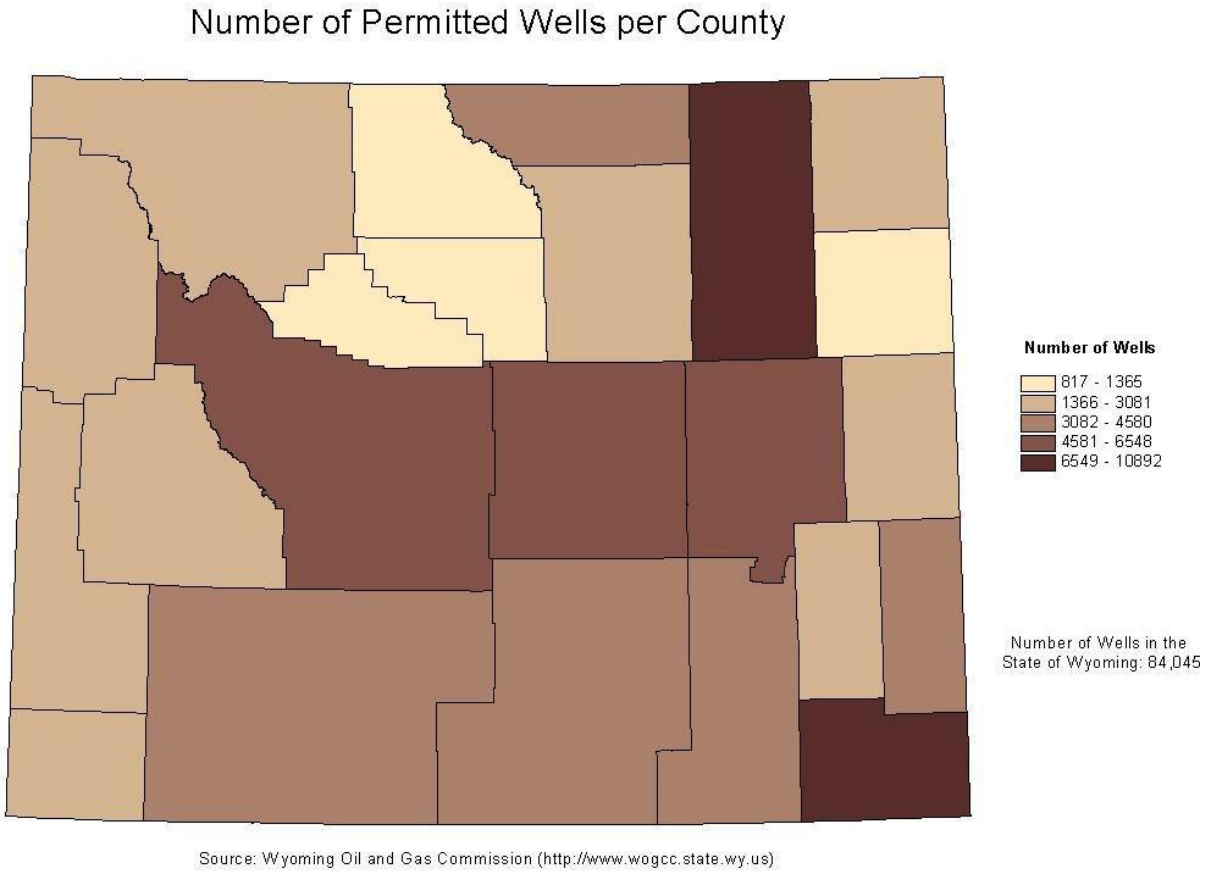
Land Ownership Trends

Most of Wyoming's recent economic and population growth have been spurred in the oil and gas and mining industries. In addition, there is a sector of Wyoming's population that is growing dramatically based on lifestyle or amenity living trends. This growing sector is based upon outside or remote sources of income such as retirement incomes and the sale of amenities and lifestyles to that market (i.e. real estate, recreation, travel, communications and other access to remote markets). This phenomenon has produced a healthy rate of growth centered on much of the forested lands near Yellowstone and Grand Teton National Parks during the past 30 years, which is a significant time frame in economic terms (Sonoran Institute, 2006).

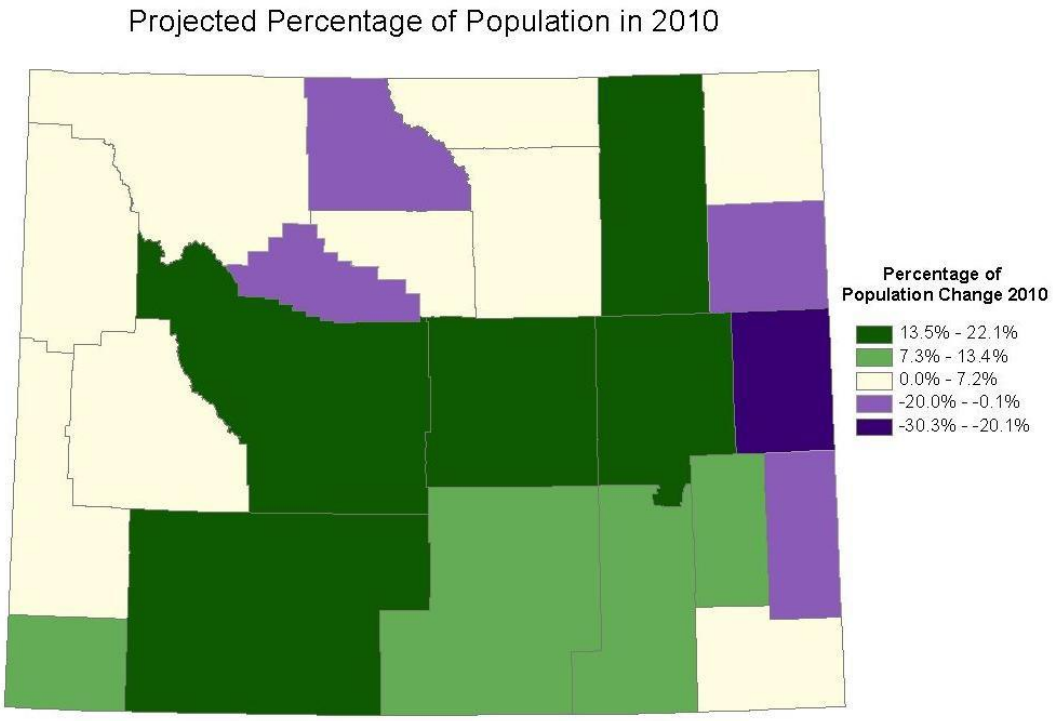
In the short-term, dramatic energy development is creating a land use "gold rush" (Map 13). This

energy development involves coal-bed methane and coal surface mining in the northeastern portion of the state, and natural gas development in the south central, southwestern and the northwestern portions of the state. In the longer-term, forested lands are being broken into small parcels for residential use as well as private recreation and land uses dedicated to energy production such as gas fields, which limit forest product harvest and management. The population growth exceeds the growth rate data available from the U.S. Census bureau for the year 2000 regarding residential and population trends (Maps 14 and 15).

Map 13. Number of Permitted Fossil Fuel Wells by County, Wyoming (WOGCC).

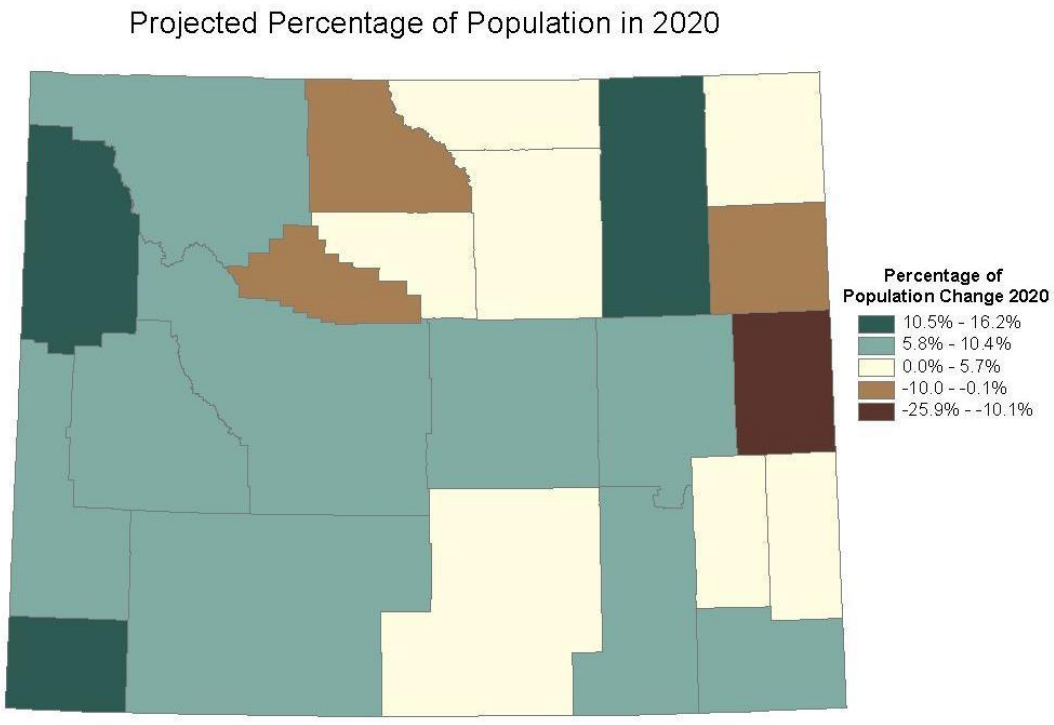


Map 14. Projected Percentage of Population Change from 2000 to 2010.



Source: Dr. William Gribb, 2002

Map 15. Projected Percentage of Population Change from 2010 to 2020.



Source: Dr. William Gribb, 2002

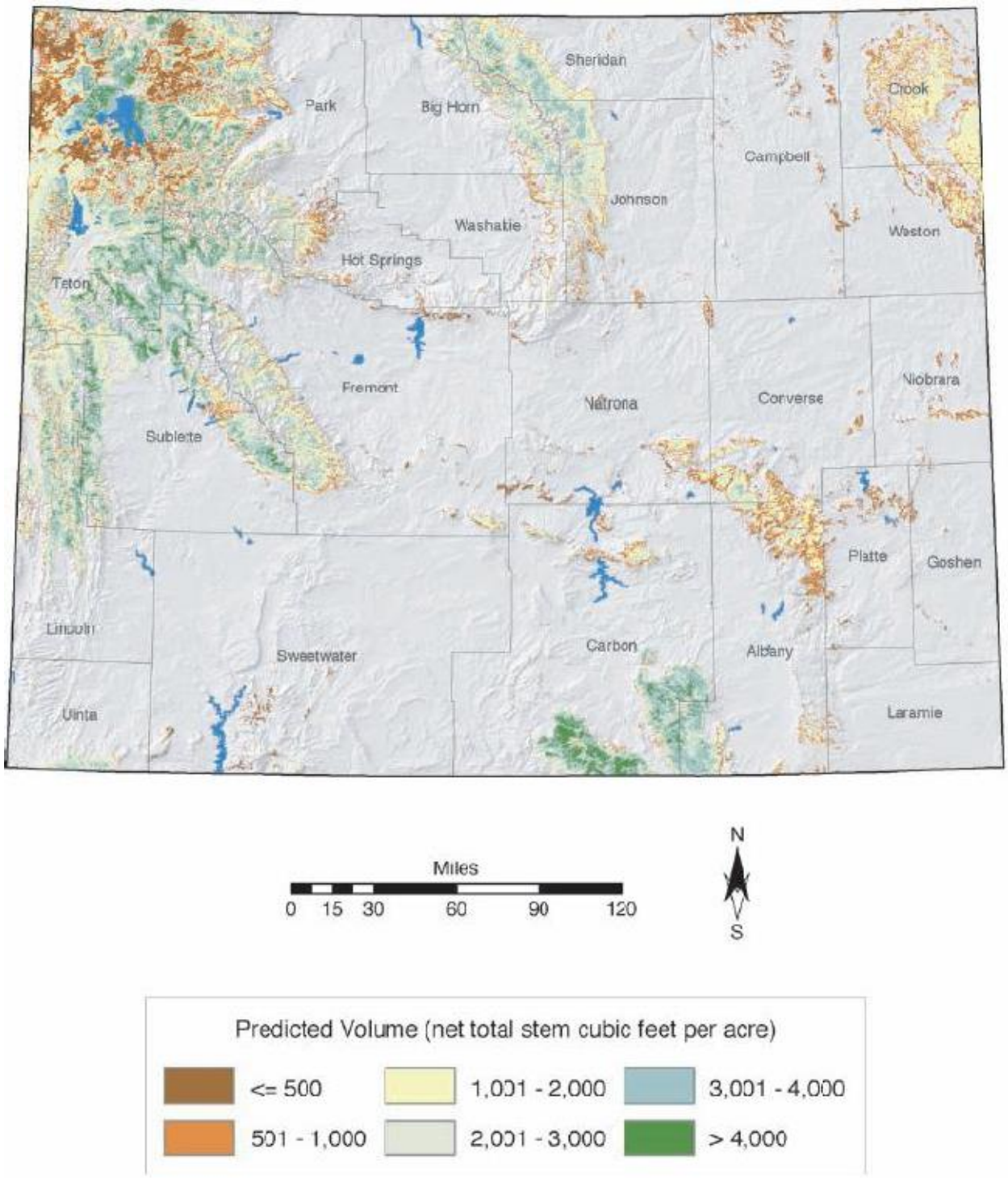
Trends in Forest Characteristics

Forests and the characteristics of tree populations are not static in time. Evaluating how composition is changing at any given time is a critical aspect in determining population status relative to the FLP goals. When all timber producing tree species are combined, the annual forest growth (annual tree growth – mortalities) on non-reserved forest in Wyoming exceeds removals at an 8:1 ratio (USDA-RMRS, 2005). The lowest annual forest growth rate was for ponderosa pines, equaling a positive rate of 2:1. This leads to substantially increasing inventories of trees or "stocking" over time, which means that the volume of marketable timber inventory, and therefore economic importance, will increase in the future on private lands eligible for the FLP. The non-reserved forest stand age classes occur in a classic bell-shaped (normal) curve centered upon the 50-100 year old stand age class. This means that private land forests are relatively young with 95 percent of the stands less than 100 year old. At the current annual forest growth rates relative to mortality, the proportion of trees in the older age classes is increasing.

In contrast, the proportion of older age-class trees is significantly higher on reserved forest lands with 33 percent of the stands 150 years old or older. This older population also has a bimodal age class distribution of stands rather than a normal distribution. The 0-50 year age class is large, but the 50-100 year age class is much reduced relative to that found on the non-reserved land. This reflects the effects of different histories, forest management strategies and capabilities (fire control, etc.) as well as site characteristics (elevations, soils, topography, etc.). These differences comprise part of Wyoming's forest diversity. These statistics are heavily influenced by the recent fires in Yellowstone National Park.

To summarize the trends in the Forest Characteristics section, Wyoming forests are composed a wide variety of forest types. The most important in regards to Wyoming's FLP are the private lands with lower elevation forests along the boundaries of Wyoming's seven national forests, and those in the eastern third of the State.

Map 16. Net cubic foot volume of growing stock trees on forest land in Wyoming, 2002. (USDA-RMRS, 2005).



III. THREATS TO FOREST SUSTAINABILITY

Competing Land Uses

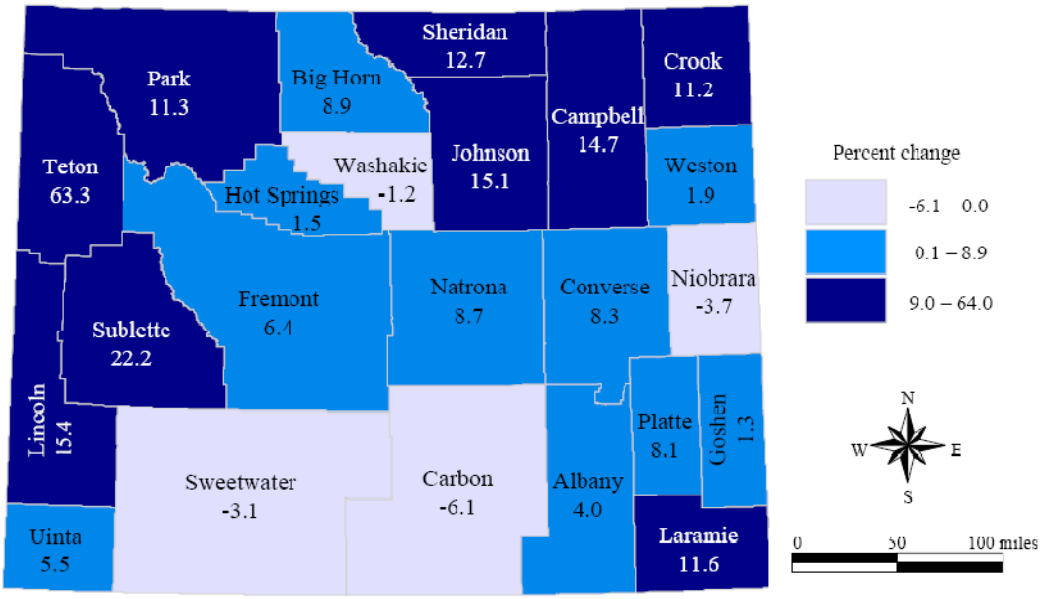
Competing land uses present the largest single long term threat to forest sustainability in Wyoming. Fragmentation or parcelization of forest landscapes degrades the ability of foresters, landowners and other land managers to practice sustainable forest management on a meaningful scale. The primary threats to forest sustainability on private lands come from residential subdivision and impacts from oil & gas and other mineral development.

Residential and Recreational Subdivision

With an abundance of outdoor recreational amenities and the high quality of the outdoor environment, Wyoming is an increasingly popular place to have a temporary or "second home" for recreational use. The name Wyoming has its origins in an Algonquian word meaning "large prairie place," and as described in previous sections, most of Wyoming is not forested. Yet the primary drivers of recreational subdivision include the presence of water, trees, and views, all of which place the most strain on our forested private lands.

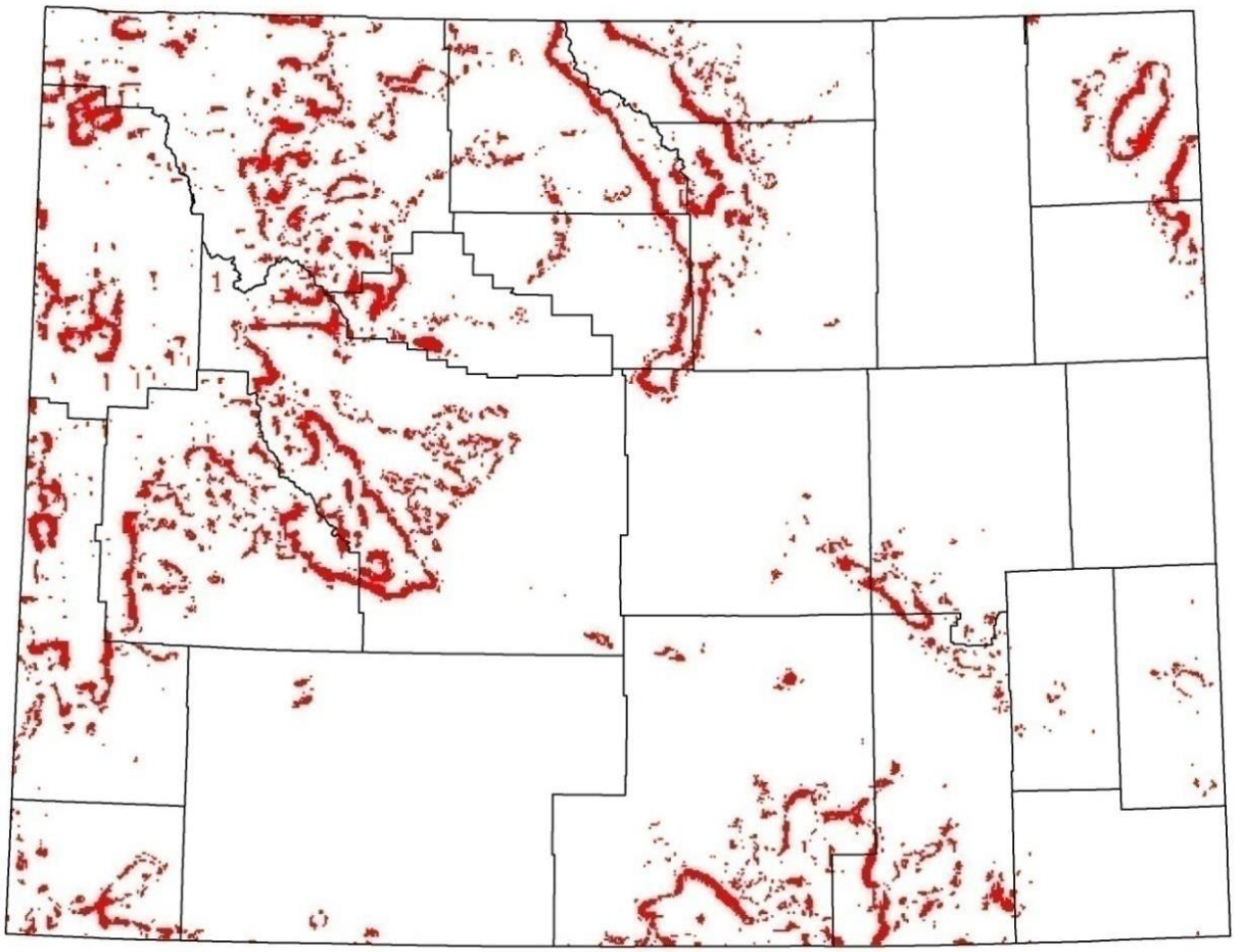
Map 17 below shows population Change in Wyoming's Counties. There may be a correlation between a county's population increase and the presence of timbered land, with population growth concentrated in the forested lands of the northwest portion of Wyoming (Park, Teton, Sublette and Lincoln Counties), the northeast (Sheridan, Johnson, Campbell, and Crook Counties), and including Laramie County in the southeast. A contributing factor to this demographic trend is second home purchasers acquiring forested properties for aesthetic reasons.

Map 17. Population Change in Wyoming's Counties, 1990-2000.



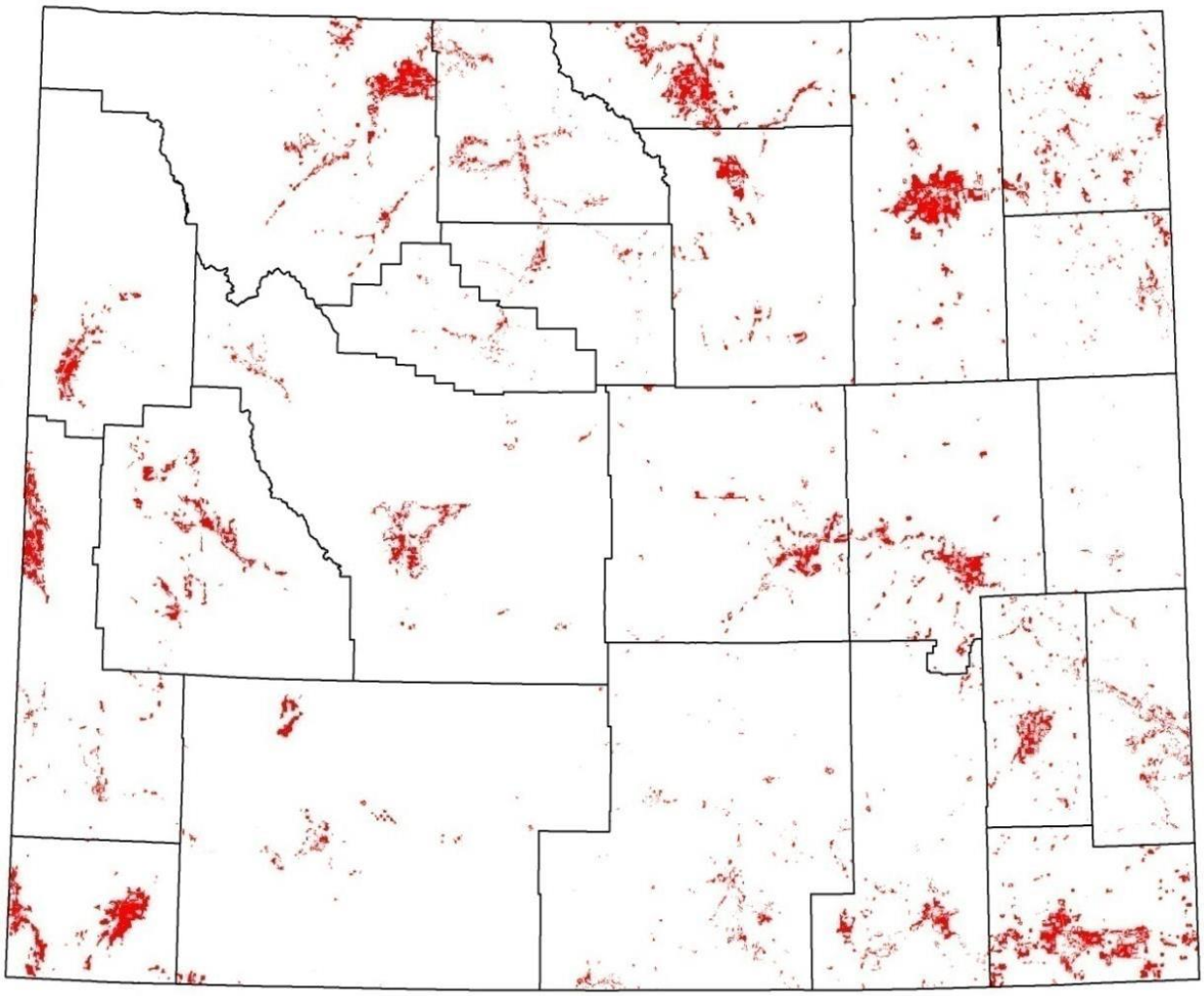
A second and equally important factor in Wyoming's population growth is a robust economy driven in large part by the natural resource and mining sectors. Wyoming led the 17 Western States in job growth in 2006, creating a net of 13,900 new jobs. The Natural Resources & Mining sector have accounted for 29% of these jobs, although related construction (21%) and professional and business services (9%) also contributed significantly to this job growth. Increase in housing permits issued in Wyoming outpaced the West and the U.S. during the period 2003 to 2006, driven largely by the natural resource and mining sector and an increase in second home growth.

Map 18. Forest Fragmentation.



This is a national data layer from NationalAtlas.gov and is included to represent those forest lands on the edge of forested areas that are most susceptible to development and introduction of damaging agents.

Map 19. Development Risk.



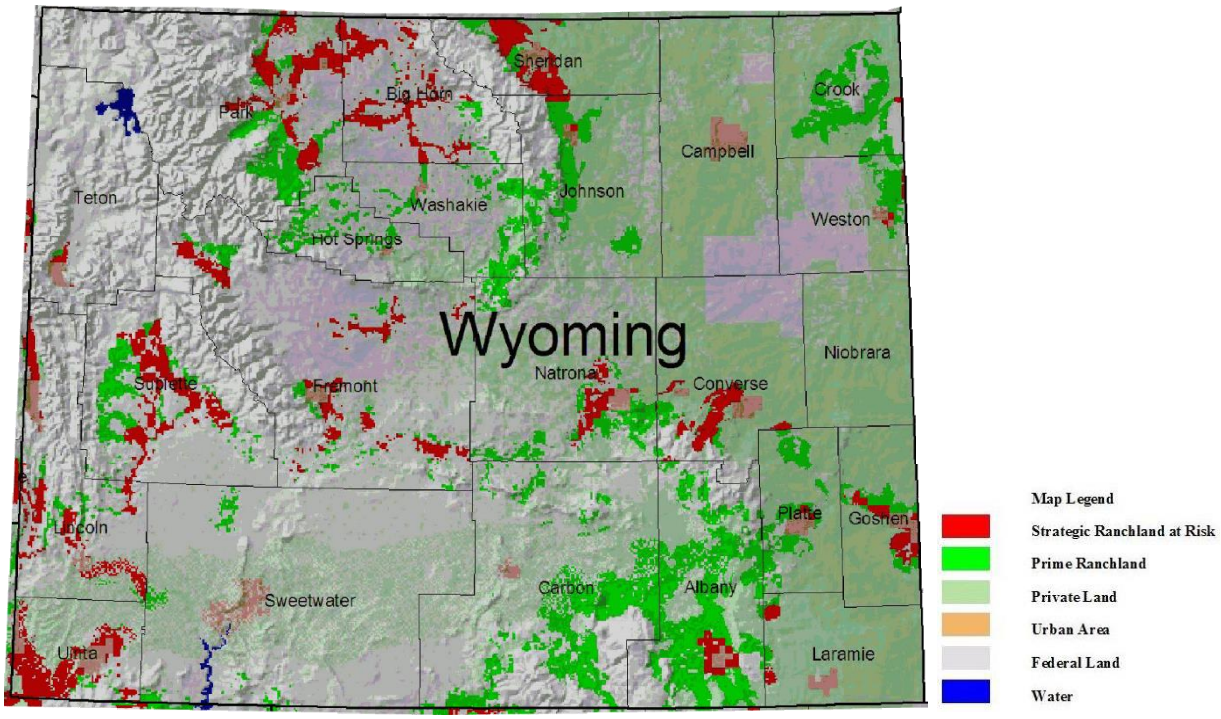
Fragmentation and Parcelization

Fragmentation refers to breaking up the forest cover with other uses such as development so that forested habitats become smaller and more disconnected. Parcelization refers to the process of dividing land up into smaller and smaller ownership parcels. The area may remain in forest, but because of smaller ownerships, the management objectives may change significantly. Each year in the United States, the number of forest ownerships increases by about 150,000. If present trends continue, over 95% of private forest ownerships will be in parcels smaller than 100 acres in the next five years. These parcelized forests are becoming personal green spaces maintained as amenities, rather than working forests dedicated to sustainable forestry and timber production. While there may be exceptions, the general fact is that the size of the forest holding is an important factor in whether the owner uses expert forest information and feels connected to the forestry community. Larger forested tracts provide greater opportunity for sustainable management and improved economic and public benefits.

While population growth and increased human density are pressures that force the parcelization of forest lands, there are other economic pressures at work that can result in the parcelization of Wyoming's forests as well. It is often possible to generate land values that are higher than timber values by breaking the land into smaller units for sale. This is particularly true around recreational assets such as rivers, lakes, and public lands such as national forests. In these places, financial pressure to sell major blocks of forest land may be too great for owners to resist. Whether they are families seeking retirement security or companies seeking profitable returns, the result is the same for future forest management. Conservation easements through the Forest Legacy Program could provide some assistance in these situations for landowners who are interested in conserving sustainable forests and forestry in Wyoming.

There has been relatively little study directed specifically towards changes to Wyoming's private forest lands over time, in large part because of their dispersed nature and their frequent inclusion in agricultural operations. The American Farmland Trust published "Strategic Ranchland in the Rocky Mountain West" in 2002 to document the amount and scope of high quality ranchland threatened by conversion to other uses. Five Wyoming Counties, Sublette, Park, Uinta, Bighorn, and Fremont, ranked in the top 25 for the amount of ranchland threatened. The study also determined that the most threatened ranchland is concentrated in high mountain valleys, which in Wyoming's relatively arid climate, is where we have the largest concentration of private, forested lands. The study identifies over 2.6 million acres that are threatened by low density residential development by 2020.

Map 20. Strategic Ranchlands at Risk (AFT, 2002).

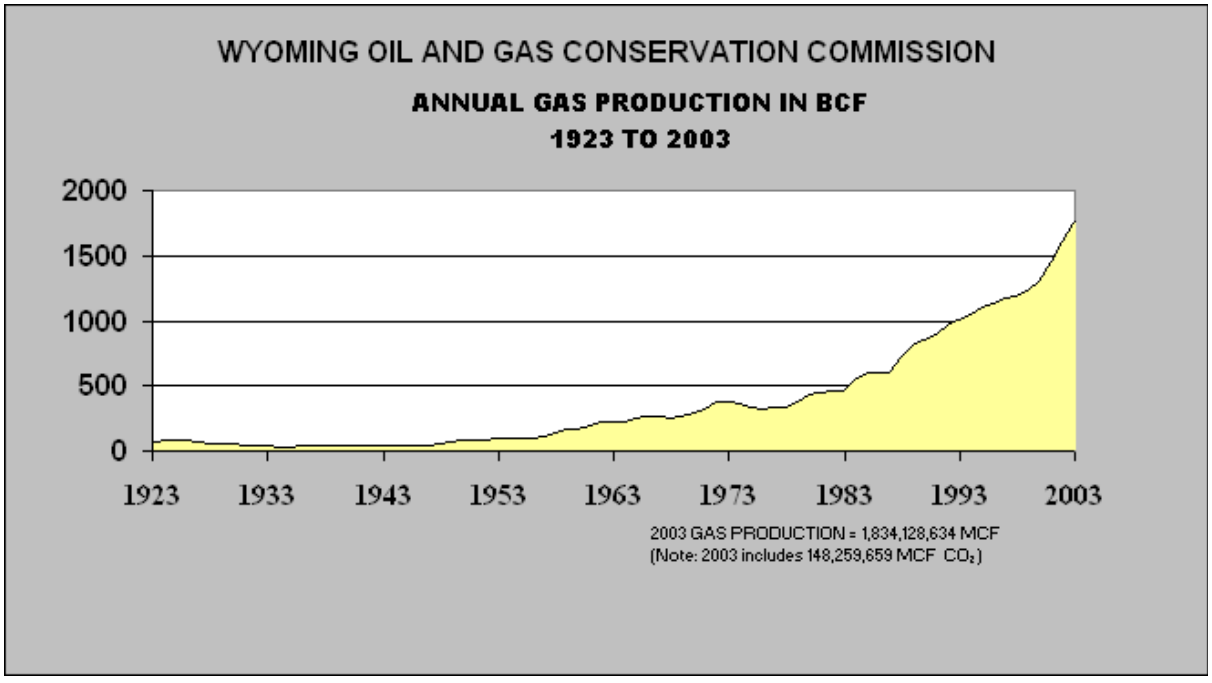


Mineral Development

The development of oil and gas resources in Wyoming has accelerated over the past several years as a result of technological innovations and increased demand for natural gas. For example, the BLM predicts permitting 110,000 wells in the state of Wyoming in the next 10 years, which roughly doubles the total number of wells which have been permitted in Wyoming since 1896. Deep gas drilling in tight sands requires tighter well spacing than traditional oil & gas development. Tighter spacing, in some cases one well site on every 5-10 acres of land, increases fragmentation of the landscape, and in forested areas, could degrade the forest resource and the ability to effectively manage the forested landscape.

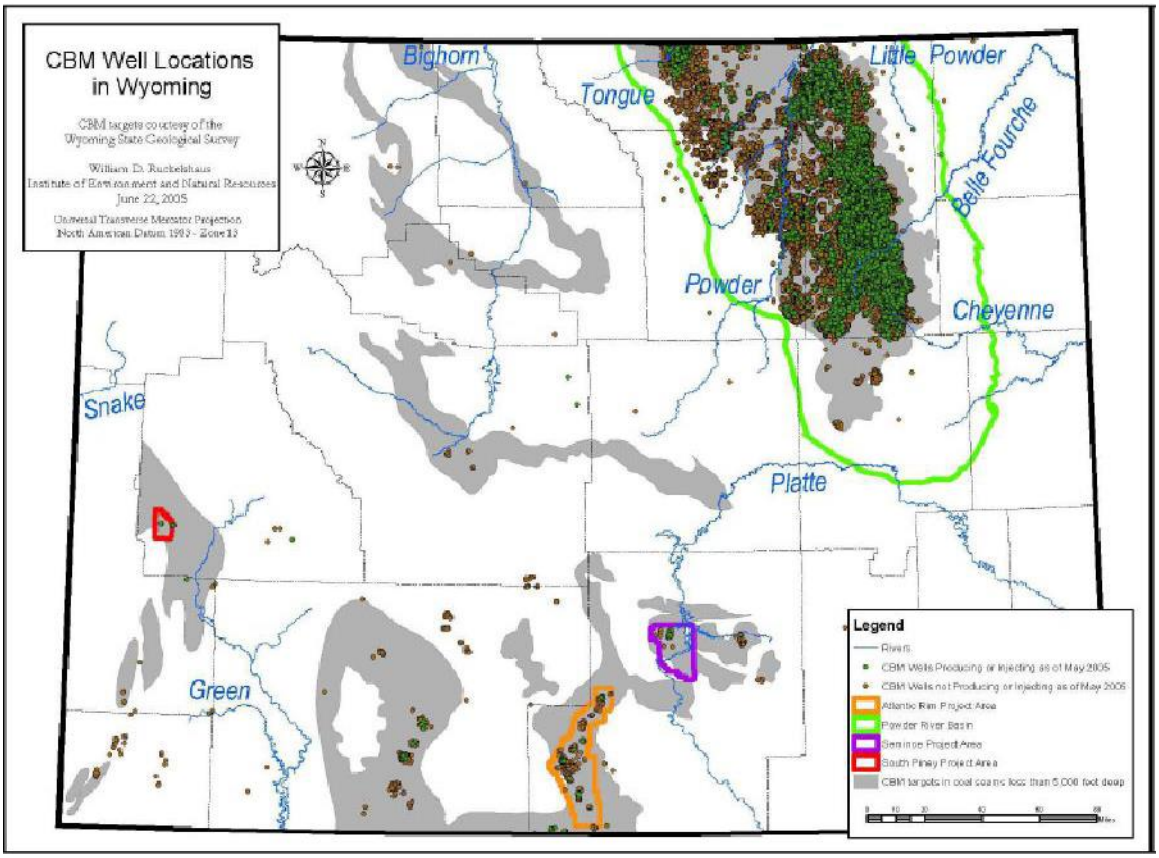
Approximately 48% of all private land in Wyoming (12.9 million acres) is considered "split estate," meaning that the surface landowner does not own the mineral estate beneath their property. Split Estate minerals provide an additional threat to sustainable forest management because the forest landowner is unable to control the timing, magnitude, or type of mineral development on their deeded property. In 2005, the Wyoming State Legislature passed the Surface Owner Accommodation Act, which provides a framework for split estate oil and gas development (but does not prevent a third party from developing minerals on split estate lands).

Figure 5. WOGCC Annual Gas Production.



While all oil & gas development could have a potential impact on forest sustainability, of particular concern is Coal Bed Methane (CBM) development. This form of methane extraction can produce significant quantities of surface water, some of which contains minerals and salts that impact forest health.

Map 21. CBM Well Locations.



Overall, the threats to forest sustainability in Wyoming are based on two basic trends: the increase in demand for rural residential development, and the growth in oil & gas and mineral extraction activities across Wyoming. Both trends are multi-faceted and have a variety of impacts on private land forestry in Wyoming.

IV. EXISTING FOREST RESOURCE CONSERVATION PROGRAMS

Forest Legacy is the most important program available to purchase conservation easements on private forest land.

Conservation of Wyoming's forests has long been a national priority. However, this priority has been placed on federally-owned and managed forests, and not on private forest lands. Unlike many other States, little emphasis has been placed on private land forest conservation in Wyoming. This section will identify federal, state, and non-profit efforts at forest land conservation in the State of Wyoming, to better understand what the need is for the Forest Legacy Program.

Federal Programs

Land and Water Conservation Fund is a designated federal funding source used to acquire land for public recreation through programs administered by both state and federal entities. Over the years, the fund has provided more than $9 billion for federal land acquisition and grants to state and local governments. The federal side of the fund provides for land purchases and associated management costs for conservation, recreation, and wildlife protection through the Forest Service, National Park Service, Fish and Wildlife Service, and Bureau of Land Management. The state side of the fund provides matching grants for developing, planning, and acquiring land and water for recreation opportunities. Each state sets its own priorities and selection criteria. Wyoming has a number of projects partially financed by LWCF matching funds including Washington Park in Buffalo, Optimist Park in Laramie, and the Pine Creek Ski Area in Lincoln County.

Wetlands Reserve Program is a federally-funded volunteer program administered by the Natural Resource Conservation Service to preserve and restore wetlands on private lands through purchase of a conservation easement and cost-share on enhancement projects. This program has potential for some applicability to forested lands.

Grasslands Reserve Program is a federally-funded volunteer program administered by the Natural Resource Conservation Service to protect and restore grasslands on private lands through conservation easements. These conservation easements can be term or perpetual. The program could be used to protect small forested acreages set adjacent to important grasslands.

Farm and Ranchland Protection Program (FRPP) is a federally-funded conservation easement program administered by the Natural Resource Conservation Service through the Commodity Credit Corporation. This voluntary, cost-share program has been used by several non-profit entities described below for the partial funding of perpetual conservation easements on locally-important farmlands.

State Programs

The Wyoming Wildlife and Natural Resource Trust (WWNRT) was created by legislative action in 2005 for the purposes of preserving and enhancing Wyoming's wildlife and natural resources. Among other types of projects, the WWNRT has funded the purchase of conservation easements on important wildlife and natural resource lands in Wyoming. This source of funding could be a potential source of matching funds for FLP projects if enacted in Wyoming.

The Wyoming Game & Fish Department has an active conservation easement acquisition program which is designed to conserve crucial wildlife habitat. The program utilizes several outside funding sources, including the WWNRT and the FRPP described above.

Non-Profit Organizations

The Land Trust Alliance. Land Trusts are key stakeholders in forest conservation programs because of their experience, nationwide and locally, with conservation easements. The Land Trust Alliance, based in Washington DC, is the national organization for the 1,500-plus land trusts. Established in 1982, LTA serves as an educator, advocate, advisor, and leader for land trusts. It promotes voluntary land conservation and strengthens the land trust movement by providing the leadership, information, skills, and resources land trusts need to conserve land for the benefit of communities and natural systems (http://www.lta.org).

The Land Trust Alliance defines a land trust as a "nonprofit organization that, as all or part of its mission, works to conserve land by undertaking or assisting direct land transactions – primarily the purchase or acceptance of donations of land or easements." The Land Trust Alliance lists seven organizations that work in Wyoming. Six of these organizations are principally local organizations, focused solely on specific geographic areas of Wyoming. Active nationwide organizations and staffed land trusts operating in Wyoming are described below:

The Nature Conservancy. The mission of The Nature Conservancy is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. An international organization, the Nature Conservancy has 11 priority sites in Wyoming. Wyoming's oldest operating land trust, The Nature Conservancy holds conservation easements on over 240,000 acres of important wildlife habitat across the State.

The Conservation Fund. The mission of The Conservation Fund is to forge partnerships to conserve America's legacy of land and water resources. Through land acquisition, sustainable programs and leadership training, the Fund and its partners demonstrate balanced conservation solutions that emphasize the integration of economic and environmental goals. Since its founding in 1985, The Conservation Fund has helped its partners safeguard wildlife habitat, working farms and forests, community greenspace, and historic sites totaling more than 5.5 million acres nationwide. In Wyoming, The Conservation Fund, in concert with its partners, has protected approximately 13,500 acres in Wyoming.

The Rocky Mountain Elk Foundation (RMEF) is dedicated to ensuring the future of elk, other wildlife and their habitat. Founded in 1984, RMEF has protected and enhanced more than 4.9 million acres of wildlife habitat in elk country and funded more than 5,200 stewardship, conservation education and hunting heritage projects in 49 states and eight Canadian provinces. RMEF has helped open nearly half a million acres for public access and hunting. In Wyoming, RMEF has worked with partners on 11 private land conservation projects permanently protecting over 45,000 acres.

The Wyoming Stock Growers Agricultural Land Trust (WSGALT) is dedicated to Wyoming's ranching and farming heritage, and is Wyoming's only state-based agricultural land trust. WSGALT's goal is to provide agriculture landowners with land conservation options to enhance their business planning to remain productive and independent today, and better prepared to pass on their tradition to future generations.

WSGALT was founded by general membership vote of the Wyoming Stock Growers Association in December of 2000. WSGALT's establishment was based on a growing need within the ranching community to provide voluntary, private sector mechanisms that assist landowners in retaining their land in agriculture and in passing it on to succeeding generations. WSGALT accomplishes its objectives through receiving conservation easements, increasing awareness of tools to maintain ranchlands, and assisting in research for new opportunities to conserve working agricultural landscapes. As of March, 2007, WSGALT has protected over 67,000 acres of agricultural lands in eight counties across Wyoming.

Jackson Hole Land Trust. The Jackson Hole Land Trust is a private, nonprofit organization that was established in 1980 to preserve the critical wildlife habitat, magnificent scenic vistas and historic ranching heritage associated with open space in Jackson Hole. By working with the owners of this area's special open lands, the Jackson Hole Land Trust has ensured the permanent protection of over 15,000 acres in and around Jackson Hole. Cattle, horse and dude ranches comprise seventy-four percent of that total.

The Green River Valley Land Trust. The Green River Valley Land Trust (GRVLT) assists landowning families in the conservation of agricultural, ranch and natural lands in order to sustain and protect open spaces, watersheds, wildlife habitat and other ecological values in Wyoming's Green River Valley located in Sublette County, both for today and generations to come. As of April, 2007, the GRVLT has worked with 29 families to protect more than 13,500 acres of private land in Sublette County.

V. THE FOREST LEGACY PROGRAM IN WYOMING

The Need for Forest Legacy in Wyoming

Wyoming's private forests are an increasingly important component of Wyoming's timber industry, provide numerous conservation values, and despite their relatively small size, are an integral part of Wyoming's iconic landscapes.

While forest conservation activities are increasing in both private and public forests nationwide, and existing federal, state and private programs make important contributions toward the protection of forest lands, the threats to the continued health and productivity of Wyoming's forests are growing every year. In large part, Wyoming's private forest land has been overlooked by the conservation community, as efforts have been focused on Wyoming's agricultural lands. The challenges to continued sustainable forestry include competition from other land uses, such as residential development and oil & gas development; fragmentation and parcelization as large forest tracts are subdivided for higher sale values; and a wide range of forest health threats.

The Forest Legacy Program is perhaps the single most important non-regulatory tool to address the forest threats related to conversion of land use and increased parcelization and fragmentation of private forest land. Because of the limited funds available, FLP will not be able to address all or even most instances of forest conversion and fragmentation in Wyoming. However, if selectively directed, Forest Legacy funds can make a difference in preventing fragmentation or degradation of truly key private forested properties in Wyoming.

Goal of the Forest Legacy Program in Wyoming

The Wyoming State Forestry Division recently completed a spatial analysis of private forestlands in Wyoming, which form the basis for the selection of Wyoming's Forest Legacy Areas. Wyoming's private forest lands, as described in previous sections of this report, are located near large blocks of United States Forest Service land. These private forest lands are typically lower elevation and provide greater ecological function. They provide important land type transitional edges, as land cover changes from higher lands with adequate moisture regimes to be forested, to lower grasslands, meadows, and riparian areas.

The goal of the Forest Legacy Program in Wyoming is to work with willing landowners to conserve significant forested properties that contain important environmental values and that also contribute to the working forest economies and local communities.

The program will focus on protecting forest lands from conversion to non-forest uses due to parcelization and fragmentation on large properties in areas that are important for ecological benefits, watershed protection, wildlife habitat, forest products industry, and/or outdoor recreation. The FLP will rely on conservation easements as the primary tool for land protection. Fee interest acquisition will be considered on a case-by-case basis, where public ownership would provide significant public benefits, and where there was local support for such an acquisition.

Forest Legacy Area Eligibility Criteria

National program requirements -- Under FLP Guidelines, Forest Legacy Areas (FLAs) must encompass forest lands with significant environmental and traditional forest use values. FLAs may also include non-forested areas such as farms and towns if they are an integral part of the landscape. Since FLA boundaries may not correspond to property boundaries, tracts located partially within the geographically defined legacy area are eligible for the FLP, upon approval of a boundary adjustment. To be eligible as a Wyoming Forest Legacy Area, the proposed area must meet the following nationally established criteria:

- It must represent an environmentally important forest area that is threatened by conversion to non-forest uses.
- It must contain one or more of the following important public values: scenic resources; public recreation opportunities; riparian areas; fish and wildlife habitat; known threatened and endangered species; known cultural resources; and/or other ecological values.
- It should provide opportunities for the continuation of traditional forest uses, such as timber harvesting, forest management or outdoor recreation.

While most of Wyoming's private lands are not forested, there are still approximately 2.36 million acres that may meet this criteria (WSFD SAP, 2007) The challenge is to identify the highest priority areas to FLP's limited resources most effectively. Where in Wyoming is the Forest Legacy most needed and most likely to have the best effect?

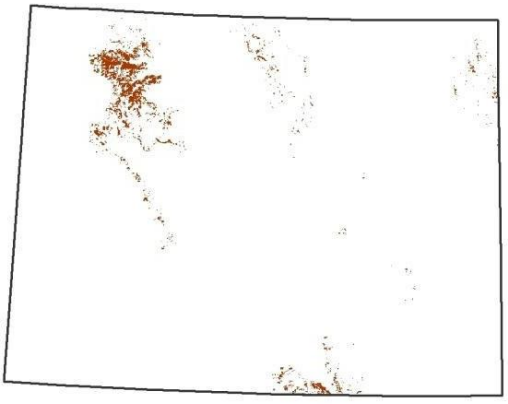
Eligibility criteria -- To prioritize between the many important areas, eligibility criteria was adapted from Wyoming State Forestry Division's 2007 Spatial Analysis Project. The Criteria is represented as 12 GIS data layers which were analyzed using ArcGIS Model Builder.

Not all layers within the analysis are equally important to Legacy Program suitability. Each has a varied degree of influence determined by local resource issues. In Wyoming Forest Health has become the resource issue of highest importance. Conversely, Public Land Proximity is not as influential when determining Legacy suitability within Wyoming. To account for the variance of influence, all data layers were weighted. In effect, the weighting skews the suitability analysis in favor of layers with greater importance. For the sake of simplicity, Wyoming chose to assign different influence percentages to each layer. The percent of influence was determined by the State Forest Stewardship Coordination Committee, the strategic priorities of the agency and resource issues of current importance such as wildfire and the recent bark beetle epidemics. Once the percent of influence for each layer was determined, the layers were multiplied by their corresponding percent of influence and then added together.

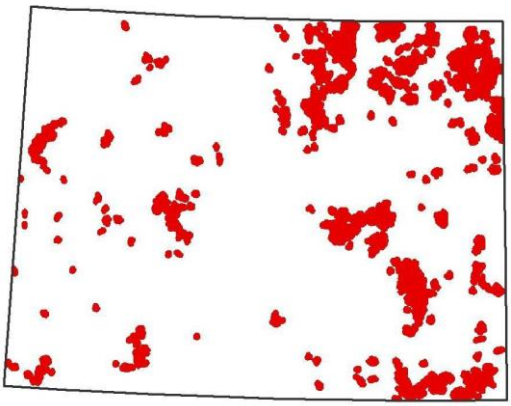
Eligibility Criteria /Datalayer Weights:

Forest Health	15.5%	Wetlands	7.4%
Wildland Fire Assessment	13.5%	Riparian Zones	7.2%
Priority Watersheds	9.8%	Forest Patch Size	6.9%
Development Level	9.0%	Slope	6.1%
Public Drinking Water Sources	8.2%	Threatened and Endangered Species	4.5%
Private Forested Lands	7.7%	Proximity to Public Lands	4.2%

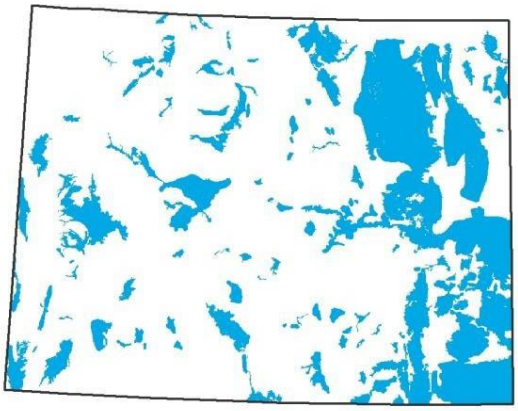
Data Layers



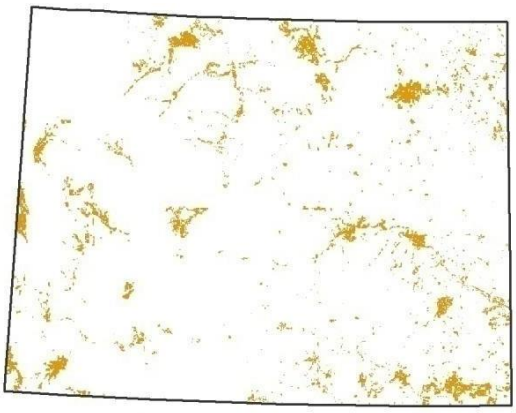
Forest Health



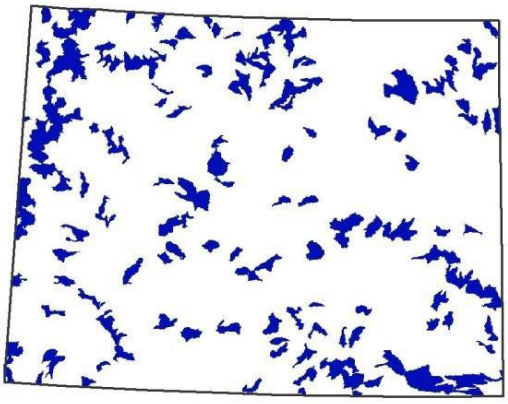
Wildland Fire Assessment



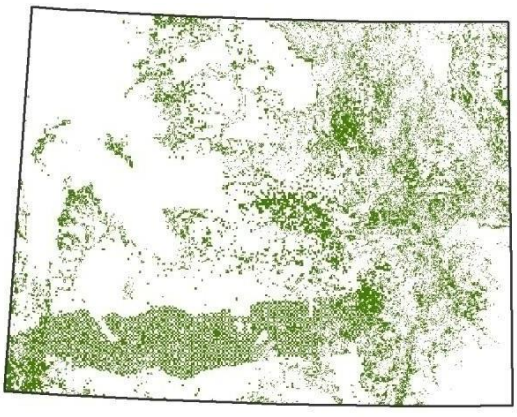
Priority Watershed



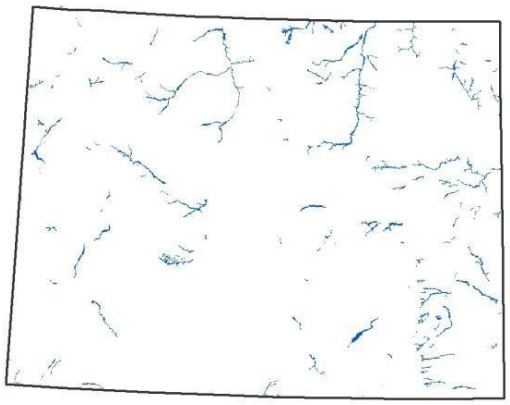
Developing Areas



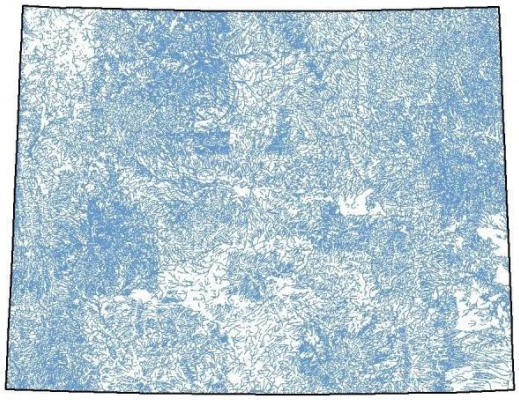
Public Drinking Water



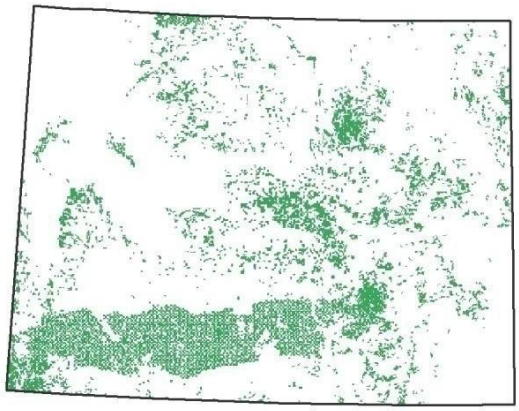
Private Forest Lands



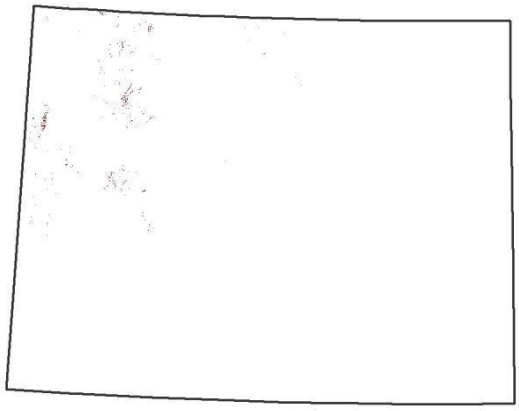
Forest Wetlands



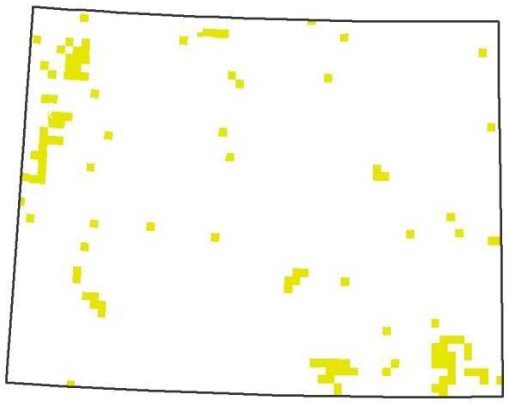
Riparian Zones



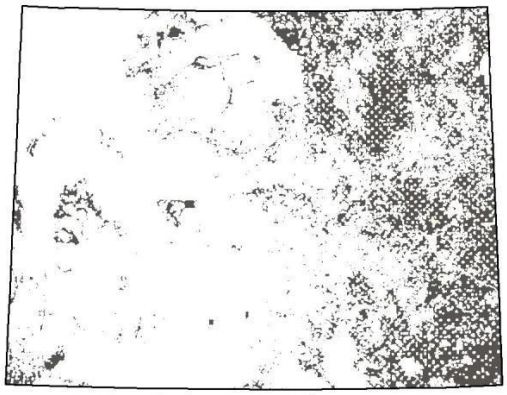
Forest Patch Size



Slope Classification



Threatened and Endangered Species

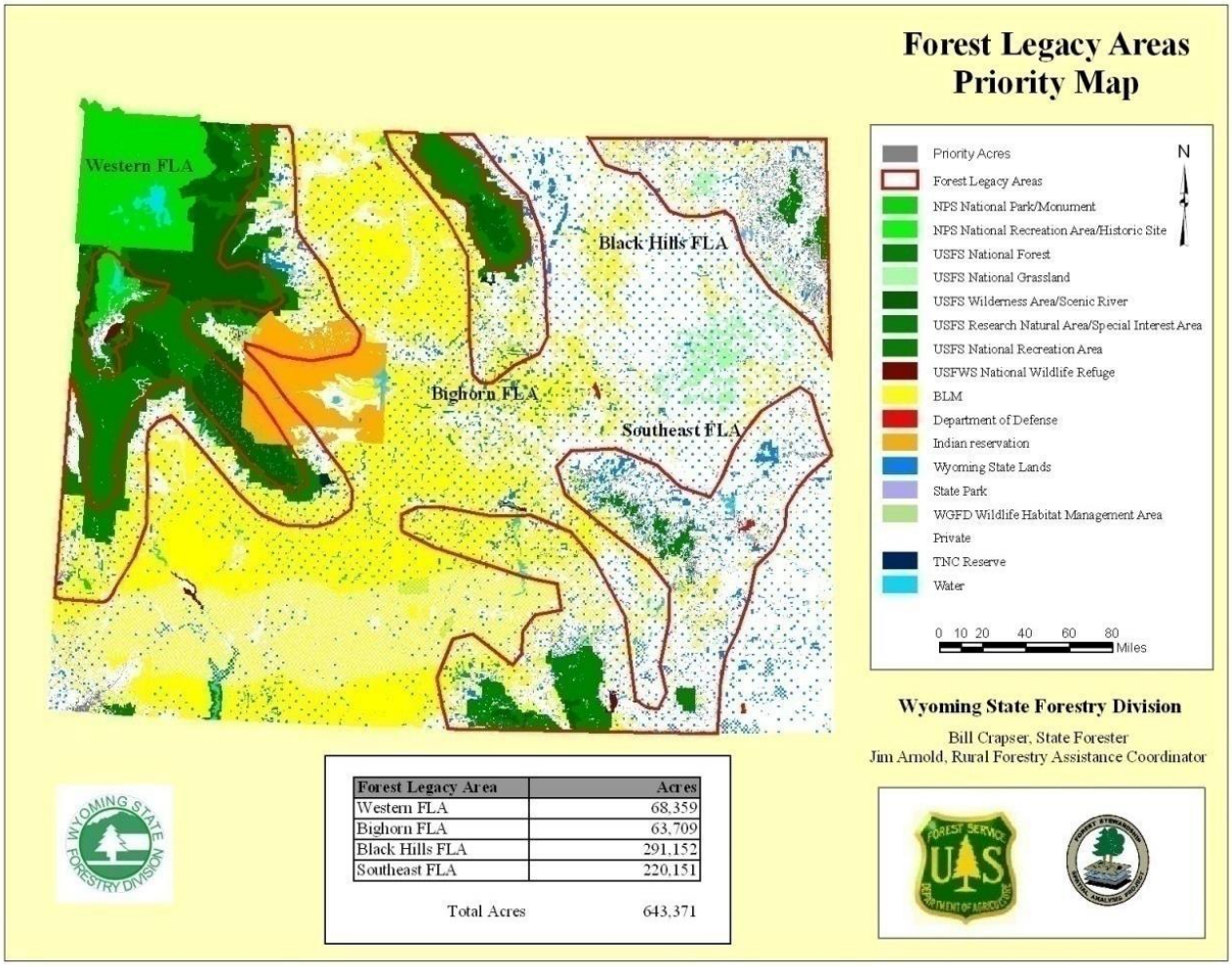


Proximity to Public Lands

VI. FOREST LEGACY AREA DESCRIPTIONS

Utilizing the criteria described above, the Wyoming State Forestry Division is selecting four distinct Forest Legacy Areas. The four areas are Bighorn Mountains, Southeastern, Black Hills, and Western. The boundaries of these areas are shown below, using the base map described in the previous section.

Map 22. Forest Legacy Areas Priority Map.



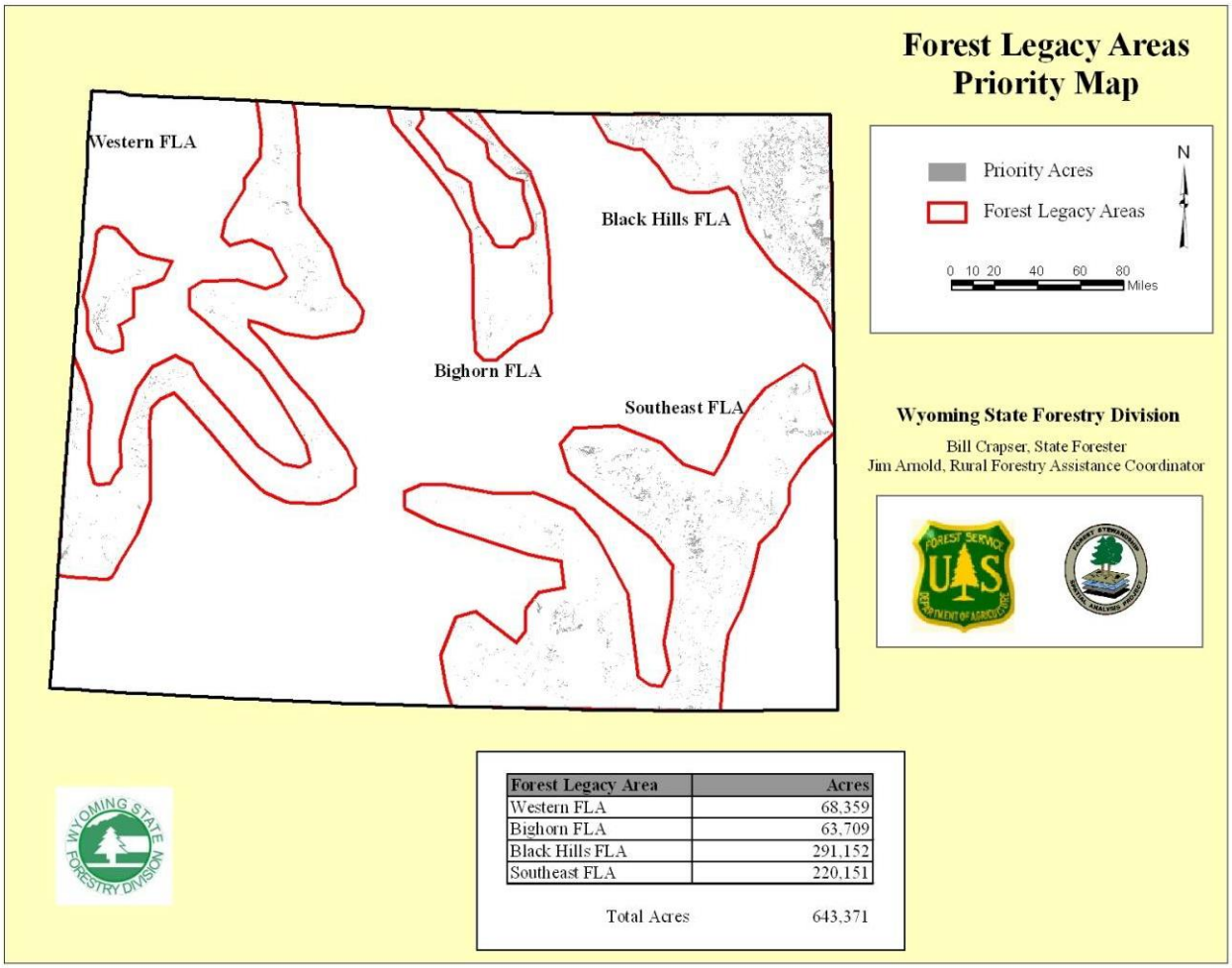
The four Forest Legacy Areas, based on the WSFD SAP analysis, comprise approximately 12.2 million acres of total private lands. These lands represent a mosaic of forested lands, riparian lands, grasslands, and mixed community types. When these 12.2 million acres are limited to lands classified as deciduous, evergreen, mixed forest, or woody wetlands, 3.6 million acres remain as priority lands. This 3.6 million acre figure includes significant acreage buffering forested lands. To assess the very highest priority lands, WSFD has categorized lands based on stewardship potential, threat, and other characteristics as described in the Forest Legacy Area

criteria described in Section V above. When this weighted Spatial Analysis Program is used, the result is approximately 643,000 acres of highest priority lands within the four FLA's:Table 2. Forest Legacy Areas.

Forest Legacy Area	Acres
Western FLA	68,359
Bighorn FLA	63,709
Black Hills FLA	291,152
Southeast FLA	220,151
Total Acres	**643,371**

The four Forest Legacy Areas represent the highest priority private forested lands for conservation within the State of Wyoming. These four areas are described in greater detail below. The map below illustrates the location of the Forest Legacy Area acreages within each of the four Forest Legacy Areas:

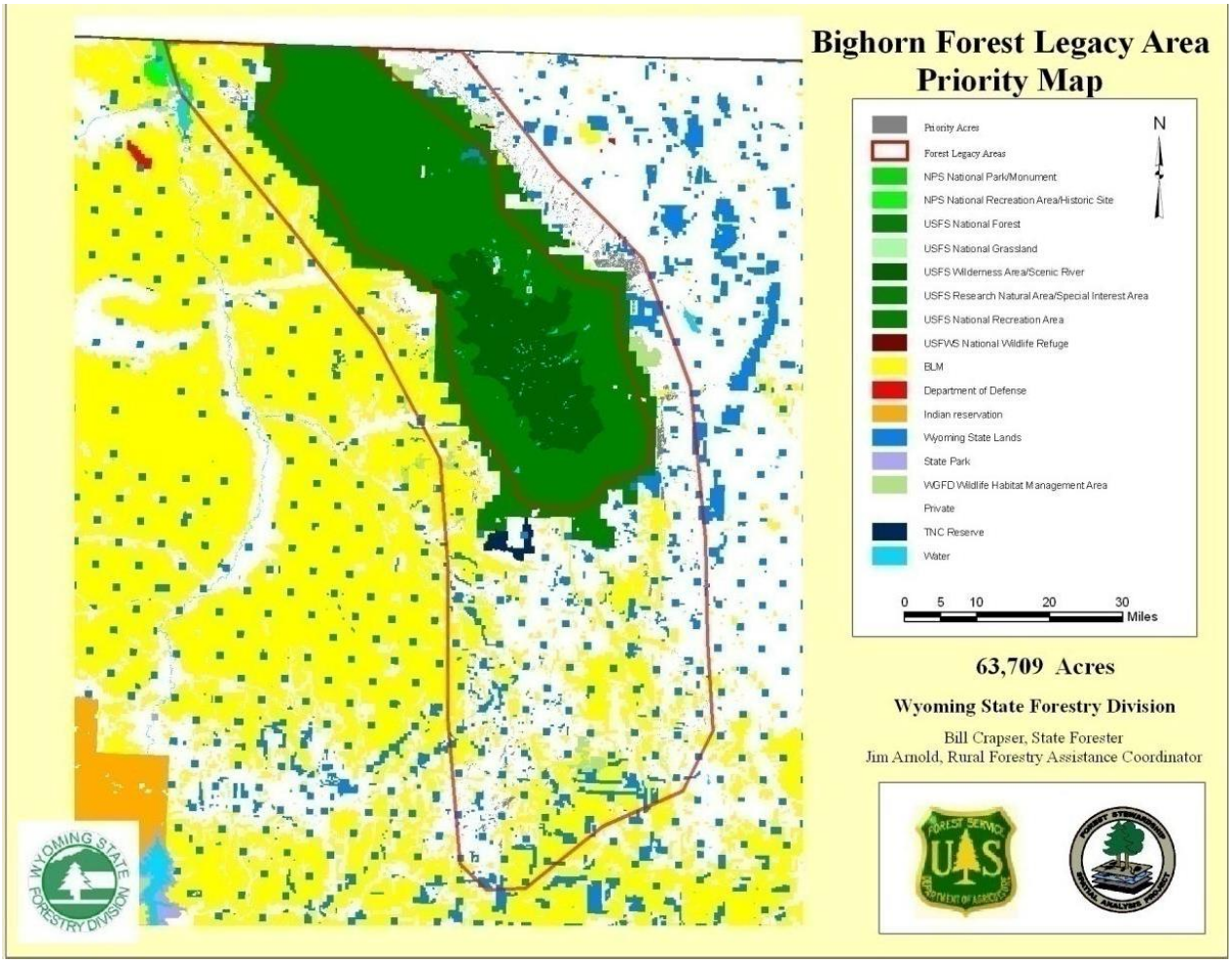
Map 23. Forest Legacy Areas Priority Map 2.



Bighorn Mountains Forest Legacy Area

The Bighorn Mountains Forest Legacy Area includes the private forested lands surrounding the Bighorn Mountains in north central Wyoming. This includes portions of Sheridan, Johnson, Natrona, Washakie, and Big Horn Counties. Private forested land in the Bighorn FLA is limited to relatively small parcels, typically located on the edge of the Bighorn National Forest. The majority of the private forested lands was homesteaded in conjunction with lower elevation grazing lands, and to this day, is frequently owned in conjunction with an agricultural operation. While the private forestlands within the Bighorn FLA are somewhat scattered for viable forest product production on their own, they play a very important role in conjunction with public lands timber harvest, and provide many unique ecological values.

Map 24. Bighorn Forest Legacy Area Priority Map.



The Bighorn Mountains FLA includes 12 active forest product facilities, and accounts for 15% of Wyoming's timber harvest in 2000. The Bighorn Mountains FLA is the smallest FLA by acreage, with approximately 63,709 acres classified as deciduous, evergreen, mixed forest, or woody wetlands in the top priority ranking analysis.

Few mountain ranges in the West span a wider variety of landforms and ecosystems than the Bighorns. Shortgrass prairie and sagebrush lap its eastern slopes, while on its western side badlands descend into cottonwood stands along the Bighorn River. The Bighorns' steep flanks

are carved by streams, leaving spectacular chasms—the canyons of Shell Creek, Tensleep Creek, Crazy Woman Creek and others. The community of Sheridan is experiencing rapid growth based on promising economic development and recreational amenities, while many of the other communities in the Bighorn FLA are struggling to find their niche in an evolving economy.

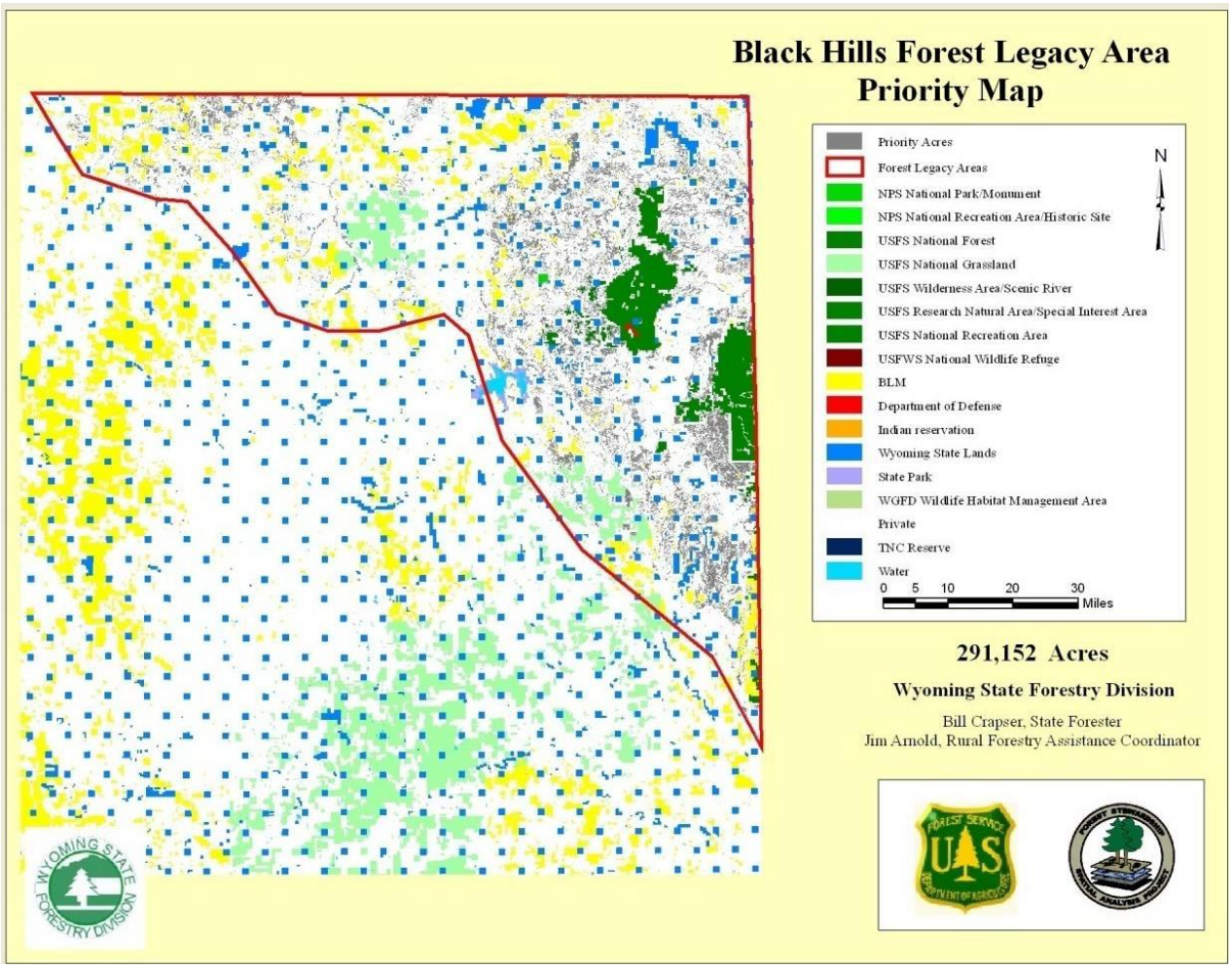
The Bighorns' biodiversity long has appealed to humans. For thousands of years, Native Americans found good hunting here, and settlers later discovered agricultural promise. The Bighorns are also distinct from other Wyoming mountain ranges in terms of geology, including the most extensive area of exposed limestone in the state, providing habitat for many rare plant and animal species. Rare and threatened plants grow here, including a violet-blue flower called Cary's penstemon, Northern Arnica, Soft Aster, Williams' Waterparsnip, Mountain Lady's Slipper, Giant Helleborine, Hall's Fescue, Marsh Muhly, Northern Blackberry and Hapeman's Sullivantia are other rare grasses, plants and wildflowers.

This land is named for the Bighorn sheep that once numbered a million. Large herds of deer and elk now live here, along with moose, waterfowl and upland game birds, but even they face growing threats from development and destructive land management. Bear and mountain lion are prevalent as well. Because the Bighorns are isolated from other mountain regions, much of the wildlife found here is genetically unique. Montane vole, American pika, snowshoe hare and least chipmunks are genetically distinct from the Wind River, Absaroka or Black Hills species by the same name.

Black Hills Forest Legacy Area

The Black Hills Forest Legacy Area (FLA) includes the Black Hills of northeastern Wyoming, including most of Crook County, and portions of Campbell and Weston Counties. The Black Hills are considered the most productive timber source in Wyoming and the region because of the longer, warmer growing season and comparatively high annual precipitation. The Black Hills includes a several county area in South Dakota, which are beyond the scope of this report. Private forested lands within the Wyoming-portion of the Black Hills make up the Black Hills Forest Legacy Area.

Map 25. Black Hills Forest Legacy Area.



The Black Hills is a refuge for plant species that occur in four of the North American biomes: Cordilleran Forest, Grassland, Eastern Deciduous Forest, and Northern Coniferous Forest. This mixture of vegetation is a result of the varied topography, geology, and climates found within the Black Hills. The Black Hills are an isolated mountain range in the Great Plains (Missouri Plateau) of western South Dakota and northeastern Wyoming. Trending roughly northwest–southeast, the uplift is approximately 200 km long and 100 km wide, with an area of more than 2 million acres. Approximately two-thirds of the Black Hills are located in South Dakota (and not

a subject of this report), and about one third is located within Wyoming. Much of the uplift is covered with ponderosa pine forests, particularly at higher elevations. These pine forests combine with ponderosa pine woodlands on warmer, drier sites at high elevations. Pine woodlands are extensive at lower elevations, often with a strong grassland layer. A variety of hardwood types occur in the Black Hills FLA, including both drier riparian stands of aspen, bur oak, and paper birch forests and wetter riparian stands of cottonwood, green ash, American elm, and boxelder forests. Shrublands occupy a variety of habitats, from high-elevation streams to drier non-riparian sites at lower elevations. Grasslands are most extensive at lower elevations, and include mixed- and tall-grass prairie types. High elevation grasslands include the Black Hills montane grassland, a type endemic to the Black Hills. Graminoid-dominated wet meadows and streambanks are common throughout the area. Saline and alkaline wetlands are found at lower elevations.

Since the Custer expedition through the Black Hills in 1874, there have been significant changes to the conditions of the Black Hills FLA. There are now more acres of ponderosa pine and white spruce, and the forest is generally denser. There are fewer acres of aspen, other hardwoods, meadow and grassland because they have been replaced by ponderosa pine and white spruce. Riparian systems are now less dominated by beaver, shrubs, and hardwoods including aspen. Interaction between natural large-scale ecological processes and human-caused processes has altered the Black Hills landscape in many ways. Fire, insect epidemics, wildlife and flooding, as well as related impacts from human activities, all have played a role in shaping current vegetation patterns.

The largest blocks in private ownership are at lower elevations where ranches are common, in areas of historical and current mining, and in many of the high elevation meadows. Timber, mining, agriculture and recreation are the most important land uses.

Forestry is an important component of the Black Hills FLA economy. Crook County reports 25% of its employment directly from forest products, timber, and timber sales. The Neiman Sawmills, Inc. (DBA Devil's Tower Forest Products) is the largest private employer in Crook County, according to the North East Wyoming Economic Development Coalition. Neiman Sawmills increasingly relies on private land forestry to supply its mills. National forests provided approximately 66% of Wyoming's timber harvest in 1986, but by 2000, the National Forest share had fallen to 20% of the harvest. In 2004, fully 40% of Neiman Sawmill's timber supply came from private lands. Industry officials believe that current trends will continue and they will become increasingly dependent on private timberland harvest in future years.

In 2000, Crook County's timber harvest was 31,975 MBF, accounting for a full 45% of all timber harvested in Wyoming. Weston and Campbell Counties accounted for an additional 3% and 1% respectively. Combined, the Black Hills FLA accounts for just under half of the timber harvest in Wyoming, and represents a significant portion of the private timberland harvest in Wyoming.

Fire suppression and relatively old, dense age class forests have contributed to recent high-intensity fires. Frequent low intensity fires, that are more likely with active management, reduce fire and insect hazard. Active selective timber harvest will provide benefits to Aspen and other hardwoods, which are a key viability habitat component for many species. Aspen and other

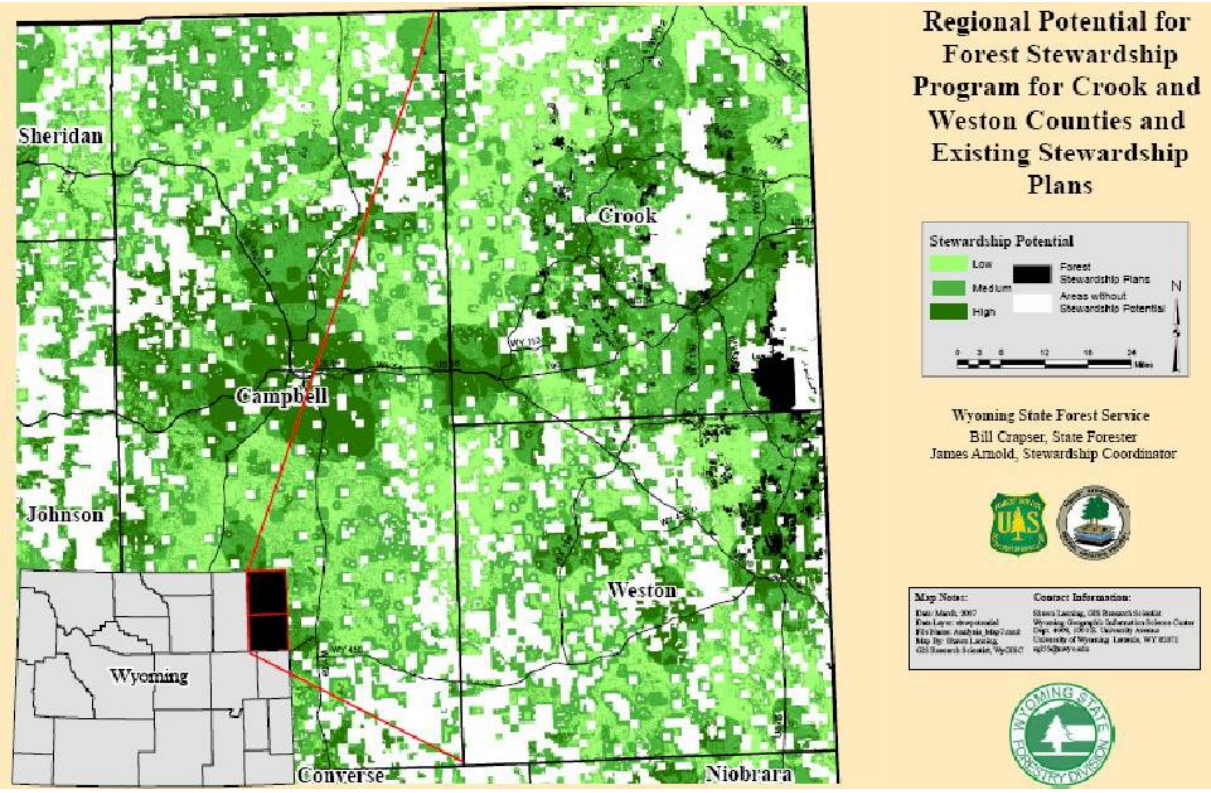
hardwoods, meadow, grassland and restored riparian areas have a low fire hazard rating while ponderosa pine and white spruce have a moderate to very high fire hazard.

According to the Nature Conservancy's 1999 Community Inventory, which studied 68 plant associations in the Black Hills area, 28 are considered globally rare. The global status of five types was not known. Of the globally rare types, at least ten were considered endemic or mostly limited to the Black Hills.

As public lands timber harvests decrease, the Black Hills FLA may provide the most sustainable timber industry potential for Wyoming. Large, relatively contiguous tracts of private forest lands exist in the Black Hills FLA, unlike Wyoming's other FLA's, which are characterized more by scattered timber ownership. WSFD has a particularly strong presence in the Black Hills FLA, which lends itself well to use of the Forest Legacy Program in this area.

The below map of northeast corner of the State, including portions of the Black Hills Forest Legacy Area has been included because it shows the relatively high concentration of existing forest stewardship plans in the area. This high concentration of existing forest stewardship plans exist because of the strong presence and involvement of Wyoming State Forestry Division in this region, and the presence of large tracts of productive private forested lands.

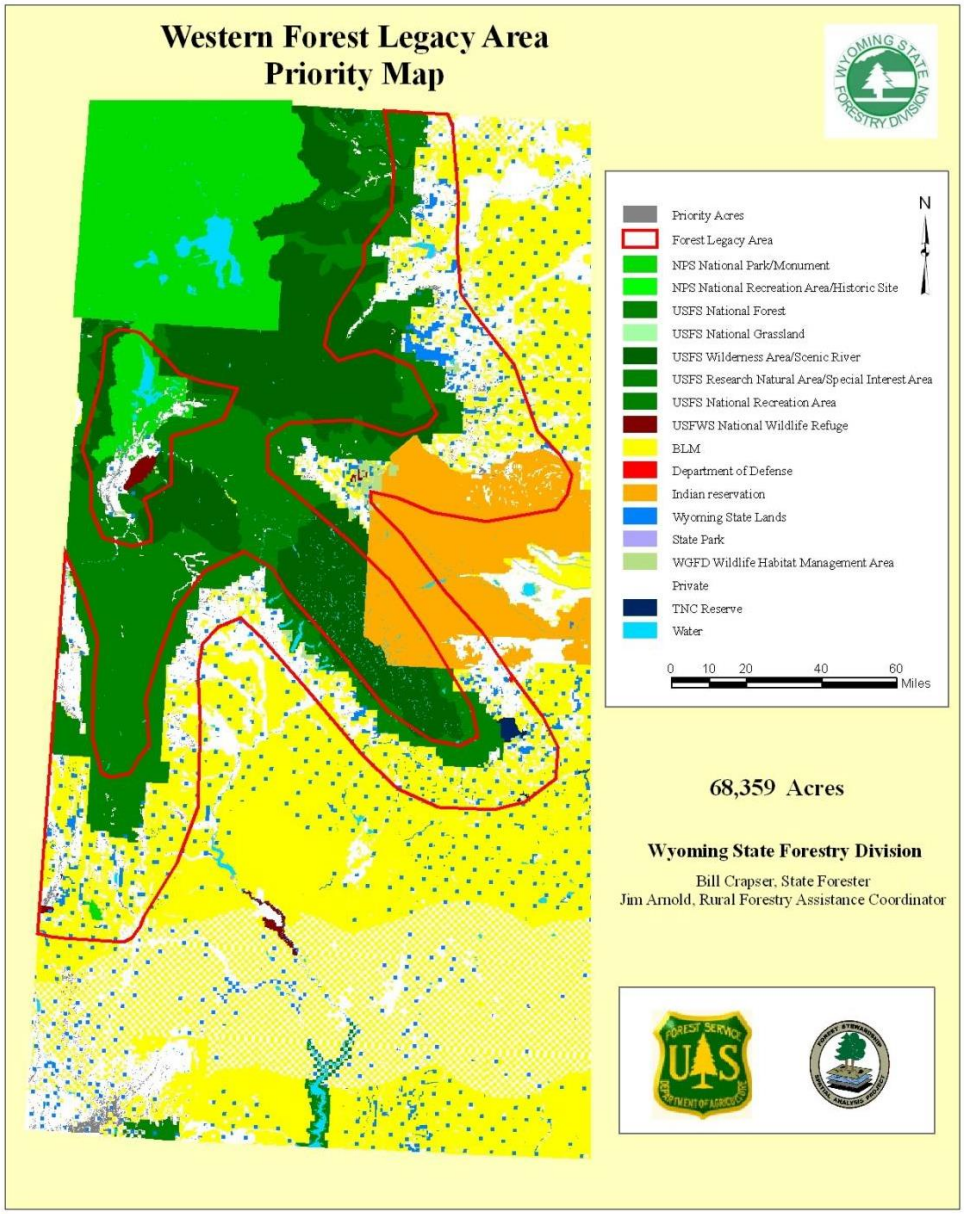
Map 26. Forest Stewardship Potential – Crook and Weston Counties.



Western Forest Legacy Area

The Western Forest Legacy Area includes the forested private lands located on the edge of public lands in Lincoln, Sublette, Fremont, Hot Springs, Teton, and Park Counties. This FLA includes the communities of Afton, Alpine, Cody, Dubois, Jackson, Kemmerer, Lander, Meeteetse, Pinedale, and others. Much of this FLA is under high threat of development, particularly the areas surrounding Alpine, Cody, Dubois, Jackson, and Pinedale, where second home owners are purchasing and developing land, and resort communities are rapidly developing. Oil & gas development is particularly prevalent in the southern portion of this FLA, including the Green River Valley, the Wyoming Range, and the Wind River Front.

Map 27. Western Forest Legacy Area.



The Western Wyoming FLA includes portions of the Greater Yellowstone Ecosystem, one of the largest, relatively intact temperate zone ecosystems left on Earth. The Wyoming portion of the Greater Yellowstone Ecosystem includes Yellowstone and Grand Teton National Parks, and three national forests: the Bridger-Teton, the Shoshone, and the Caribou-Targhee. While much of the region's surrounding forests have been transformed from high plains to agricultural use, Greater Yellowstone still contains nearly all the living organisms present in pre-Columbian times. This FLA includes several significant mountain ranges, including the Wyoming, Wind River, Absaroka, Teton, Gros Ventre, and Owl Creek Mountains.

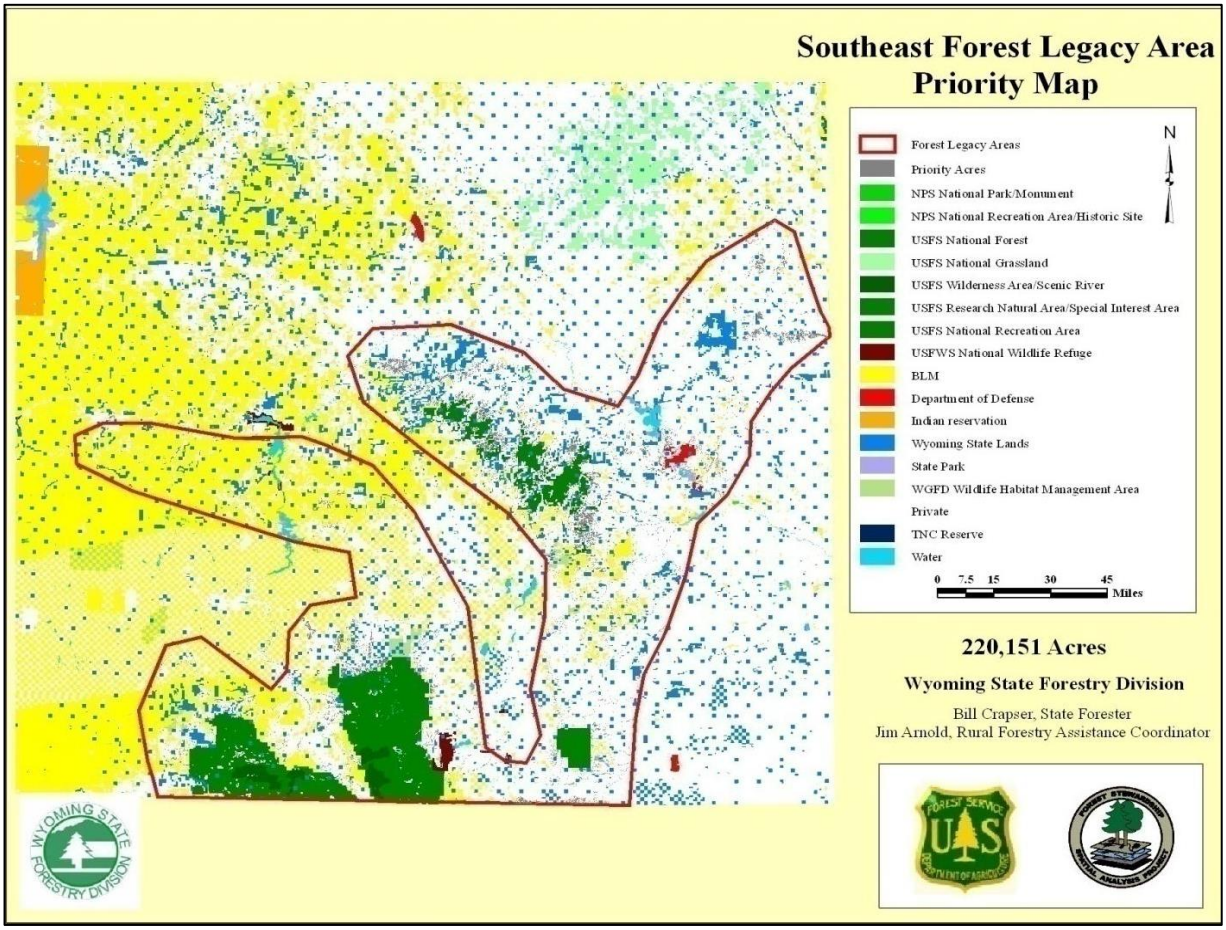
The Western FLA also has a strong forestry tradition. Several of the area's communities supported significant tie hack operations during the railroad boom of the first half of the 20th century. Dubois, for example, was the site of major tie hack operation, which produced over 10 million hand hewn railroad ties between 1914 and 1946. Contemporary forestry operations in the Western FLA are increasingly oriented towards value-added forest products including house log and log furniture production facilities. Although the Western FLA accounts for only 19% of Wyoming's timber production, 55% of Wyoming's primary wood products facilities are located in the seven Western FLA counties (2000). These include 9 log furniture manufacturers and five house log manufacturers. Increasingly, the economies in the Western FLA are focused on services, although oil & gas and mineral development are particularly strong in the southern half of the FLA (particularly Sublette and Lincoln Counties). Like public lands forestry in the rest of Wyoming, forest products producers are increasingly dependent on private lands for timber supply.

Land conservation efforts also have a strong tradition in the Western FLA, due in large part to its fast growing population and proximity to Grand Teton and Yellowstone National Parks. This FLA has particularly good potential for use of the FLP based on a relatively high concentration of skilled land conservation organizations operating in this region.

Southeast Forest Legacy Area

The Southeast Forest Legacy Area includes the Sierra Madre, Medicine Bow, and Laramie Mountain Ranges, as well as several smaller ranges, in Southeastern Wyoming. The Southeast FLA includes portions of Albany, Carbon, Converse, Goshen, Laramie, Natrona, Niobrara, and Platte Counties. Wyoming's three largest communities lie within or adjacent to the FLA and the area is close to the population centers of the Colorado front range. Lodgepole pine, ponderosa pine, and limber pine interspersed with aspen groves dominate the tree species in this landscape.

Map 28. Southeast Forest Legacy Area.



The Laramie Range is the northern most extension of the eastern front of the Rocky Mountains. The range trends northwest from the Colorado border. The Laramie Mountains are bisected by the Laramie River, which cuts a canyon through the mountains roughly due west of Wheatland, and then continues its generally eastward course to join the North Platte River near the town of Fort Laramie. The division marks the southern end of the continuous coniferous forest in the Laramies, and separates the range into two parts. The southern part is generally drier and much more open. The northern range is threatened by residential development at its northernmost end by the City of Casper, Wyoming's second largest metropolitan area. Productive forestland on

Casper Mountain is increasingly being developed for residential use. The 2006 Jackson Canyon Fire burned on the periphery of Casper Mountain's urban interface covered 12,000 acres, destroyed structures and cost $3,940,760 to suppress. This highlights the need for forest management and conservation activities within the urban interface.

The southern end of the Laramie Range is also subject to high development pressure. Sandwiched between Cheyenne and Laramie, Wyoming's largest and third largest communities and within easy reach of the Colorado Front Range, portions of this landscape are being subdivided and developed for residential and second home subdivisions.

The Medicine Bow and Sierra Madre mountain ranges are more rural in nature, but are experiencing growth nonetheless. Growth and threats to this area's private forest lands take the form of rural and second home residential development. This trend is particularly noticeable along the forest edge, and near water bodies.

The area has traditionally had a strong forest products industry, with Federal lands providing the bulk of the feedstock. Lodgepole pine was the primary timber species, with ponderosa pine, Engelmann Spruce and Douglas-fir secondary species of local importance. With the decline in harvest on Federal lands and the corresponding increase in timber harvest on private lands at lower elevations, ponderosa pine is gaining in importance as a regional timber species. The Southeast FLA accounted for 16% of Wyoming's 2000 timber harvest volume.

There is currently one operating sawmill in the Southeast FLA. Bighorn Lumber Company is a family owned operation that employs 65 workers producing 1-inch boards and wood chips at its Laramie facility. There are two other sawmills which are currently not in operation, though efforts are underway to reopen them for production. The former Louisiana-Pacific Corporation lumber mill in Saratoga ceased operations in 2003. The production site, buildings and equipment were sold to Intermountain Resources LLC headquartered in Montrose, CO. The facility has undergone recent upgrades with the hope that it will resume production in 2009. The future of the mill in Encampment is less certain at this time. Currently, the viability of locating a cellulosic ethanol plant within the area is under assessment.

VII. IMPLEMENTING FOREST LEGACY IN WYOMING

Forest Legacy Project Selection Criteria

Projects will be selected competitively on the basis of meeting the criteria outlined below. A Wyoming State Forestry Division staff person will assist landowners with understanding the likelihood of their project, deciding whether or not to apply, and completing the necessary application materials. Each project must demonstrate the following criteria in order to be eligible for the program.

Project Requirements

- **FLA Area Inclusion:** The proposed property boundary must lie, at least in part, within a defined Forest Legacy Area.
- **Willing Landowner**: Written expression of interest must be received from the landowner.
- **Easement Condition:** Conservation easement terms must be clearly consistent with FLP guidelines. Landowner must either own subsurface rights or have formal assurance that major surface disruption is not possible.
- **Forest Stewardship Plan**: The landowner must be committed to compliance with a Forest Stewardship Plan.
- **Financial Leverage:** At least 25% of the project costs must be secured from non-federal cash or in-kind sources.
- **Readiness**: The current status of project development and the preferred time line for transaction completion should be clearly stated.
- **Nonforest Uses**: Nonforest uses are those uses which are inconsistent with maintaining forest cover. If compatible nonforest uses are allowed, they should be less than 25% of the total project area.

Project Evaluation Criteria

In addition, Wyoming State Forestry Division and the Wyoming State Forestry Stewardship Coordinating Committee will evaluate potential projects on the basis of the following evaluation criteria. These criteria will be used to prioritize between competing projects. A draft project evaluation form is included in Appendix F.

- **Appropriate Forest Cover:** Wyoming defines appropriate forest cover as having a minimum of 10% forest canopy cover of a marketable timber species, which include lodgepole pine, ponderosa pine, Douglas fir, and spruce.

- **Timber Productivity:** Preference will be given to properties that have commercially viable standing timber and that contribute to a sustainable forest products industry.

- **Habitat, Water Quality, Recreation Benefits:** Preference will be given to properties that provide important public values, including wildlife habitat (including big game crucial range), protect water quality, or provide recreational benefits.

- **Risk of Development:** Preference will be given to properties that are not immediately in the path of development, but that are at risk of fragmentation and future development. Properties immediately adjacent to municipalities will not be considered for inclusion, or where development of a property is part of a land use plan for a community.

- **Size:** The property size must be of significant enough size to provide meaningful public values. Properties that are contiguous to protected forested lands, such as USFS lands, or are inholdings, could be smaller in size. If not contiguous to other protected lands, a property must be of large enough size to provide ecological and timber values. A minimum parcel size of 320 acres would be ideal.

- **Oil, Gas, Mining:** Selected properties should be in areas without significant threat of intense mineral, oil, or gas development.

Project Selection Process

Project proposals will be identified through a periodic request process. While the details for the project identification and selection process are not yet final, the basic components will include:

- Application by landowner
- Meeting with Wyoming State Forestry Division personnel to evaluate proposal.
- Prioritization of all eligible projects by the State Forest Stewardship Coordinating Committee
- Submittal of prioritized projects by WSFD to USFS
- Review of all projects by the Forest Service and submittal of recommended projects to Congress as part of the President's budget request
- Congressional Appropriations
- Preparation of transaction (agreeing on conservation easement terms and purchase price)
- Completion of transaction (recording of deeds, payment to landowner)

Wyoming State Forestry Division will be responsible for communicating with interested landowners and assisting them in understanding the program (although it is required that landowners seek legal counsel while reviewing conservation easement language). Projects that meet federal requirements for pass-through projects (e.g. projects where a non-profit land trust purchases and holds properties or easements on a temporary basis prior to state acquisition) will be considered under the Wyoming Forest Legacy Program.

Means for Protection

The resource values and goals for the Forest Legacy Program will be achieved through the acquisition of property rights, as detailed below. The terms of each acquisition, will be subject to negotiation and can vary. The framework below is intended as a guide—all acquisitions are subject to approval by the WSFD, USFS, and the landowner.
Acquisition of conservation easements is preferred. Full fee interest acquisition may be appropriate on tracts that are contiguous with tracts of public or state lands or that have exceptionally high conservation values.

1) Acquire development rights on all tracts, especially the rights to subdivide, construct buildings, and utilize the property for non-compatible commercial use (e.g. landfill). Subdivision to correct minor boundary disagreements should be permissible. Reserved home sites may be allowed, and will be evaluated on a case-by-case basis.

2) Harvesting of wood products and forest management activities should be permitted with the following conditions:

    a) Compliance with a Forest Stewardship Plan approved by the WSFD.
    b) Compliance with Wyoming Forestry Best Management Practices (BMP), or the most current WSFD-sponsored BMP guidelines.
    c) Compliance with all applicable laws and regulations.

3) No commercial mining, drilling or mineral development shall be permitted. However, sand, gravel and stone that is reasonably necessary for the construction and maintenance of trails, roads, and other structures which are located on the property and permitted by the terms of the easement may be extracted on site. Borrow pits and roads should not exceed 10% of the area encumbered by a conservation easement.

4) Mining, oil & gas development, and the development of commercial sand and gravel pits shall be prohibited. Forest Legacy Program requirements limit non-forest uses (e.g. borrow pits and roads) to the minimum necessary to complete approved timber harvest. Upon the completion of operations, the land shall be reclaimed as much as practical to its original contour and revegetated. Grazing by livestock, if consistent with forest use, may be permitted. Livestock are defined as cattle, horses, and sheep or other domestic animals historically grazed on the property. Nontraditional livestock such as buffalo may also be permitted.

5) No disposal of waste or hazardous material will be allowed on properties.

6) Prohibit the use of signs and billboards on all properties, except to state the name and address of the property owner, safety concerns, sale of forest products from the property, access restrictions, and/or provide Forest Legacy information.

7) Existing dams or water impoundments or similar structures may be allowed to remain and be maintained.

8) Industrial and commercial activities, except forestry, agricultural and recreational uses are prohibited.

9) Energy development for commercial use is prohibited.

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Appendix A: Wyoming Forestry Division Summary

Wyoming State Forestry Division

The Wyoming State Forestry Division was officially formed in 1952 by the Legislature. Under State Statute the State Forester is mandated to "have direction of all forest interests and all matters pertaining to forestry within the jurisdiction of the State of Wyoming." The Forestry Division fulfills this charge by providing two basic programs to the people of the state; Forest Management and protection of State Trust Lands, and Forestry Assistance.

State Trust Land Management

The Forestry Division is responsible for the management of approximately 250,000 acres of forested trust land scattered around the state. This management includes timber management and harvest, and managing our state lands for long term forest health and productivity. The division is also directly responsible for fire protection and suppression on the 3.6 million surface acres of state trust land.

Assistance Forestry

The Division is also responsible for promotion of good forest management and protection throughout the state on all ownerships. This includes input, advice, and assistance to private landowners, communities, counties, fire districts, elected state leaders, and federal land management agencies. Much of the assistance forestry program is delivered through the partnership and financial support of the USDA Forest Service and their State & Private Programs.

The Wyoming State Forestry Division currently has 48 full time and 4 seasonal employees, along with 70 Department of Corrections inmates, to deliver services to the residents of the State of Wyoming. The Division is headquartered in Cheyenne, and has field offices in Douglas, Newcastle, Casper, Riverton, Buffalo, Pinedale, and Lyman. The Wyoming Conservation Inmate Program has crews based in Newcastle and Riverton. During the summer season the Division also has a seasonal Helitack fire crew based in Casper.

Mission

To utilize science based, professional forestry practices to establish, enhance, protect, and utilize Wyoming's forests, trees, and associated resources to contribute to the socio-economic well being of Wyoming.

Appendix B: WSFD Advisory Committees

Wyoming State Forestry Advisory Committee Members (As of September, 2007):

Bill Crapser-------- State Forester (Chairman)

Senator Gerald E. Geis ---- Chairman, Senate Agriculture Committee

Representative Doug Samuelson--------Chairman, House Agriculture Committee

Bobbie Franks------- Wyoming Association of Conservation Districts

Jim Neiman----- Wyoming Timber Industry Association

John Blaha---- State Fire Advisory Board

Dr. Frank Galey---- Dean, College of Agriculture, UW

Xavier Montoya---- Natural Resources Conservation Service

Jane Darnell --- Bureau of Land Management

Lisa Olson -----Wyoming Community Forestry Council

Tim Pexton ---- Private Forest Landowner

Ryan Lance----Governors Office

Andrea Erickson----The Nature Conservancy in WY

Mary Peterson----- US Forest Service

Vacant------ Landowner

Wyoming State Forest Stewardship Coordinating

Committee (As of September, 2007):

Mr. James Arnold --- Wyoming State Forestry Division

Ms. Kay Hawker --- Farm Service Agency

Mr. Tom Quinn --- Forestry Consultant

Mr. Ryan Amundson --- Pheasants Forever Representative

Mr. Bill Crapser --- Wyoming State Forester

Mr. Dennis Hemmer --- Laramie County Conservation District

Mr. Sam Weaver --- Forest Landowner

Ms. Jane Darnell --- Office of Federal Lands Policy, BLM

Dr. Joseph Kiesecker, Ph.D. --- The Nature Conservancy

Ms. Donna Cuin --- U.W. Cooperative Extension Service

Mr. Buck Peterson --- Forest Industry

Mr. Duane Cook --- Wyoming Association of Conservation Districts

Appendix C: Wyoming Ecoregion Descriptions

Wyoming Ecoregion Descriptions

(Largely taken from WSFD, USDA, 2001, Wyoming Forest Health Report)

The following is a description of forests and forest conditions on all forested lands using non-political, ecological land divisions to gain a more complete picture of forest conditions. Map 2 depicts Forest Health Monitoring plot locations and eco-region delineations for Wyoming. Bailey's (1995) Description of the Ecoregions of the United States is used here as a hierarchical framework for logically delineating ecological regions based on their unique combinations of physiography, soil type, potential vegetation, and climate. Additional information on vegetation types was taken from Knight (1994).

Great Plains-Palouse Dry Steppe Province (Great Plains) This province encompasses the majority of the eastern one-third of the state. Also known as the shortgrass/mixed-grass prairie or American steppe, the Great Plains province elevations range from 3,200 feet near the northeastern border to 6,000 feet at the foot of the Front Range. Rolling hills, badlands, and plains characterize the topography of this province. The lack of forested environments is due mainly to the rain shadow effect of the Rocky Mountains to the west. Evaporation exceeds precipitation during most of the growing season. Average annual precipitation is about 20 inches, mostly coming in the form of winter snow and sporadic spring and summer thunderstorms.

The vegetation of the Great Plains province is composed primarily of grasses and forbs; forests are limited. Common grass and forb species include blue grama, buffalograss, needle-and-thread-grass, pricklypear cactus, and scarlet globemallow. Forested areas include scattered stands of ponderosa pine mixed with juniper and Douglas-fir along the ridges, and ponderosa pine and bur oak along the margins of the Black Hills. Riparian zones in this province are sporadically forested by linearly arranged cottonwood stands. Much of the Great Plains has been altered by agricultural and urban uses, and therefore may not reflect the native plant communities described for this province.

Intermountain Semidesert Province (Semidesert)

The Intermountain Semidesert province covers the largest portion of the state. This province includes valleys, also known as intermontane basins, which range in elevation from 6,000 to 8,000 feet. There is little variation in temperature or precipitation across the Semidesert province. Annual precipitation is about 15 inches per year and is fairly evenly distributed through the seasons. Evaporation rates are high and wind is a nearly constant element. The vegetation of the Semidesert province is composed primarily of sagebrush, greasewood, rabbitbrush, and a variety of bunch grasses. Riparian zones are lined with cottonwoods, shrub-form willows, and sedges. Forests are somewhat scarce. Limber pine and juniper are the most common trees of these high and dry basins, although lodgepole pine, Douglas-fir, and aspen may occupy relatively moist northerly aspects of Semidesert ranges.

Southern Rocky Mountain Steppe-Open Woodland-Coniferous Forest-Alpine Meadow Province (Southern Rockies) This province is composed of the major ranges of the Wyoming portion of the Rocky Mountains. More than surrounding states, the ranges of this province are widely separated by large intermontane basins. The highest peaks top 13,000 feet and the valley floors range from 5,500 to 7,000 feet. Climate is highly variable, depending on local topography. In general, valleys are warmer and drier, with annual precipitation of 15 to 25 inches per year. Higher mountain ranges are typically much cooler and annual precipitation often exceeds 40 inches. Much of the moisture comes as winter snow.

The flora of this region is also highly variable. Due to differences in elevation, aspect, soil types, rainfall, and evaporation rates, mountain vegetation resembles a largescale mosaic of conifers, few hardwoods, and mixed shrubs and grasslands. This province represents the most forested portion of the state. Rocky Mountain forests are often described in terms of vegetation zones; with spruce, subalpine fir, and whitebark pine dominating the highest forested elevations; lodgepole pine, aspen, and Douglas-fir in the middle montane zone; and ponderosa pine, limber pine, and juniper defining the lowest forested zone. There are often exceptions to these zonal rules based on aspect and the occurrence of some less common forest types.

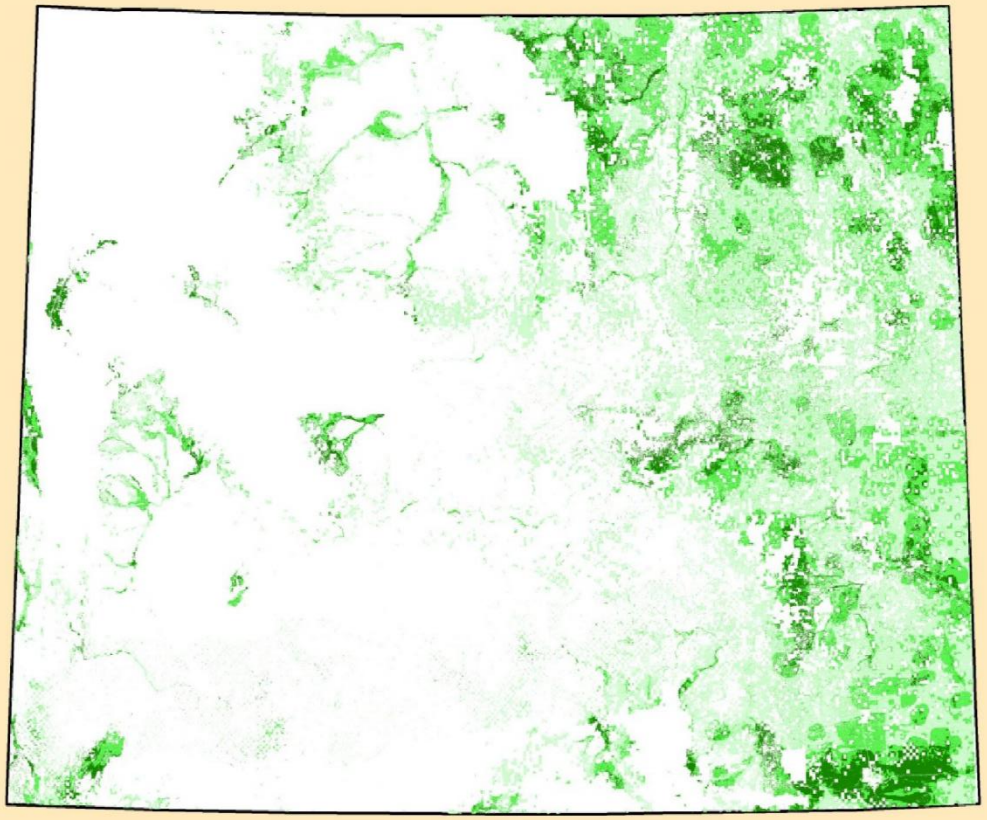
Black Hills Coniferous Forest Province (Black Hills) The Black Hills is a region of relatively low mountains averaging 3,000 to 7,000 feet in elevation. The province is divided by the Wyoming and South Dakota state line. Precipitation ranges from 15 to 26 inches, usually as winter and spring snow. The dominant tree species is ponderosa pine, however, there are limited stands of white spruce and paper birch from the north; green ash, hackberry, American elm, and bur oak from the east; as well as other common western species like aspen and lodgepole pine. Fauna include elk, mule deer, white tail deer.

Percent Forest Type by Ecoregion

	Great Plains	Southern Rockies	Semidesert	Black Hills
Juniper	**20**	**40**	**40**	**--**
Spruce-Fir	**--**	**100**	**--**	**--**
Aspen	**--**	**100**	**--**	**--**
Lodgepole Pine	**--**	**94**	**6**	**--**
Ponderosa Pine	**50**	**20**	**--**	**30**
Oak	**100**	**--**	**--**	**--**
Douglas Fir	**--**	**80**	**20**	**--**
Limber Pine	**--**	**80**	**20**	**--**

Appendix D: WSFD Spatial Analysis Project Maps

1



Potential for Forest Stewardship Program Benefits for Wyoming

Stewardship Potential

- Low
- Areas without Stewardship Potential
- Medium
- High

N

0 10 20 40 60 80 Miles

Wyoming State Forestry Division
Bill Crapser, State Forester
Jim Arnold, Stewardship Coordinator

Weighting Scheme by Layer:

14.4%	Forest Health
12.5%	Wildfire Assessment
9.8%	Priority Watersheds
8.2%	Public Drinking Water Sources
7.7%	Private Forest Lands
7.4%	Wetlands
7.2%	Riparian Zones
6.9%	Forest Patch Size
6.9%	Development Level
6.1%	Topographic Slope
4.5%	Threatened and Endangered Species
4.3%	Agroforestry
4.2%	Proximity to Public Lands

Map Notes:

Date: May, 2007
Data Layer: stewpotential
File Name: Analysis_Map1.mxd
Map By: Shawn Lanning,
GIS Research Scientist, WyGISC

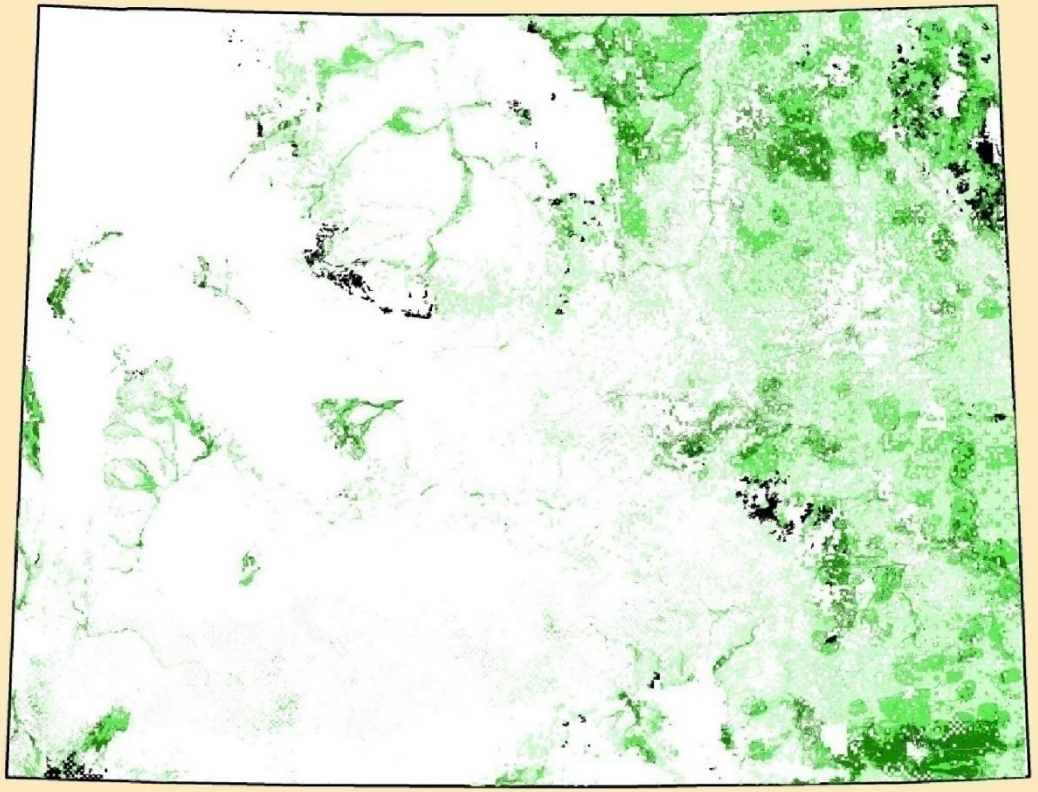
Contact Information:

Shawn Lanning, GIS Research Scientist
Wyoming Geographic Information Science Center
Dept. 4008, 1000 E. University Avenue
University of Wyoming Laramie, WY 82071
SGL55@uwyo.edu

Stewardship Capable Lands

Stewardship Potential	Forest		Non-forest		Total	
	Acres	% of total Forest	Acres	% of total Non-For.	Acres	% of total
High	763,186	32.38%	1,711,969	12.93%	2,475,155	15.87%
Medium	1,166,591	49.50%	4,971,927	37.56%	6,138,518	39.36%
Low	427,103	18.12%	6,553,473	49.51%	6,980,576	44.76%
Total	***2,356,879***		***13,237,370***		15,594,249	

2



Potential for Forest Stewardship Program Benefits for Wyoming and Existing Stewardship Plans

Stewardship Potential

- Low
- Medium
- High
- Areas without Stewardship Potential
- Forest Stewardship Plans

N

0 10 20 40 60 80 Miles

Wyoming State Forestry Division
Bill Crapser, State Forester
Jim Arnold, Stewardship Coordinator

Map Notes:

Date: May, 2007
Data Layer: stewpotential
File Name: Analysis_Map2.mxd
Map By: Shawn Lanning,
GIS Research Scientist, WyGISC

Contact Information:

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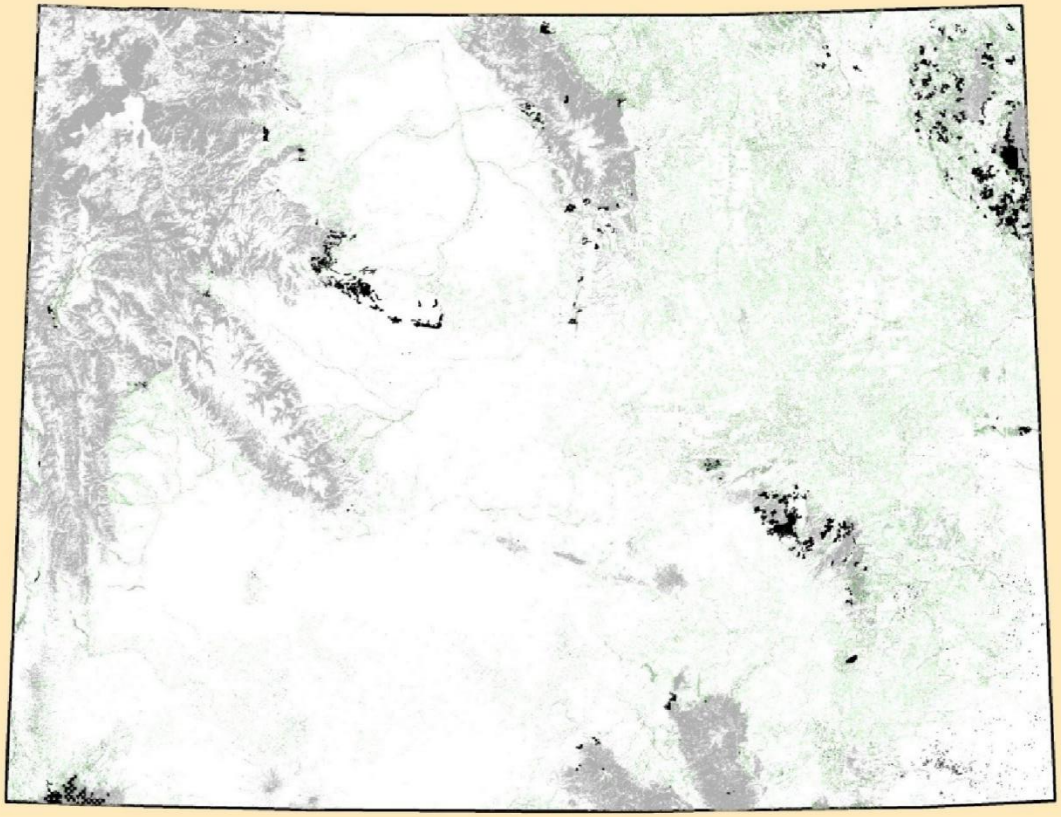
Wyoming Geographic Information Science Center
Dept. 4008, 1000 E. University Avenue
University of Wyoming Laramie, WY 82071
SGL55@uwyo.edu

	Stewardship Potential			*Total*
	Low	**Medium**	**High**	
Acres capable of Stewardship	6,980,576	6,138,518	2,475,155	***15,594,249***
Stewardship Plan (acres)	42,827	64,949	49,768	***157,544***
Stewardship Plan vs. Acres Capable of Stewardship (%)	0.61%	1.06%	2.01%	***1.01%***

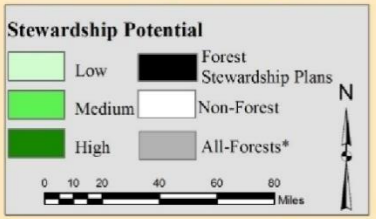
Stewardship Capable Lands

Stewardship Potential	Forest		Non-forest		Total	
	Acres	% of total Forest	Acres	% of total Non-For.	Acres	% of total
High	763,186	32.38%	1,711,969	12.93%	2,475,155	15.87%
Medium	1,166,591	49.50%	4,971,927	37.56%	6,138,518	39.36%
Low	427,103	18.12%	6,553,473	49.51%	6,980,576	44.76%
Total	***2,356,879***		***13,237,370***		15,594,249	

3



Forest Stewardship Potential on Private Forest Lands* and Existing Stewardship Plans for Wyoming



Wyoming State Forestry Division
Bill Crapser, State Forester
Jim Arnold, Stewardship Coordinator

Map Notes:

Date: May, 2007
Data Layer: stewpotandpf
File Name: Analysis_Map3.mxd
Map By: Shawn Lanning,
GIS Research Scientist, WyGISC

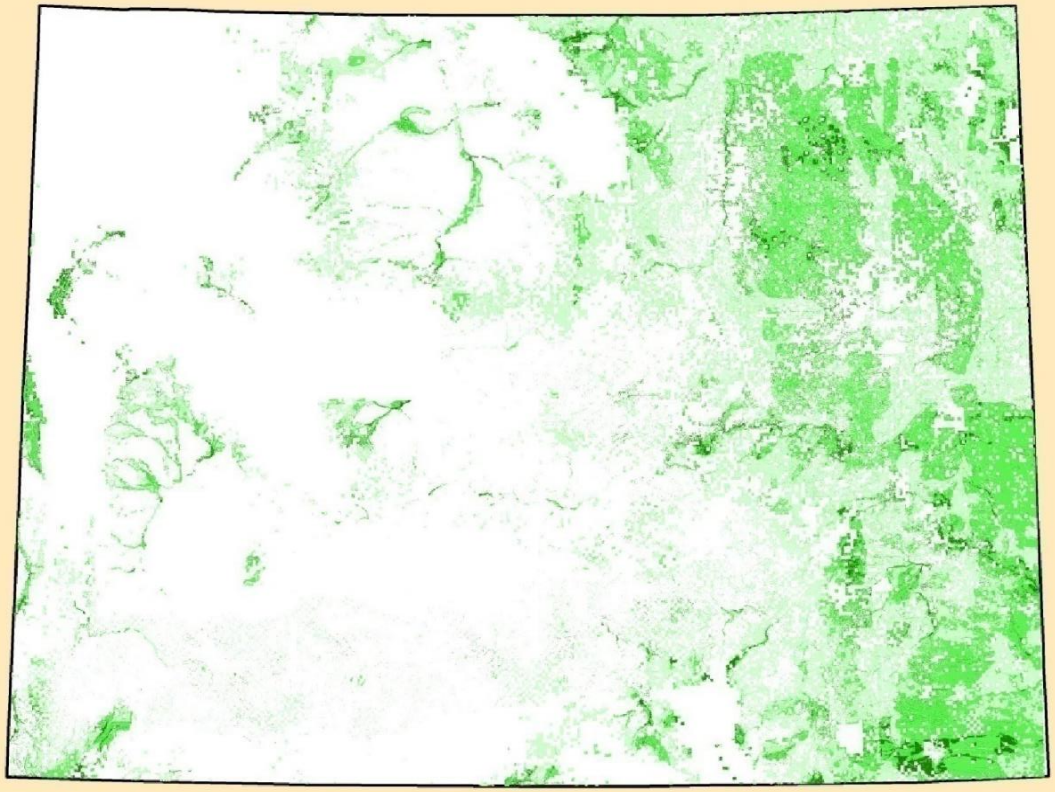
Contact Information:

Shawn Lanning, GIS Research Scientist
Wyoming Geographic Information Science Center
Dept. 4008, 1000 E. University Avenue
University of Wyoming Laramie, WY 82071
SGL55@uwyo.edu

	Private Forest Lands Stewardship Potential			*Total*
	Low	**Medium**	**High**	
Acres capable of Stewardship	427,103	1,166,591	763,186	***2,356,879***
Stewardship Plan acres	18,698	39,693	39,288	***97,679***
Stewardship Plan acres as a percent of acres private forests	4.38%	3.40%	5.15%	***4.14%***

*** Includes Classes of Land Cover (MRLC):**
41 Deciduous
42 Evergreen
43 Mixed Forest
91 Woody Wetlands

4



Resource Richness*
Wyoming

Resource Richness

- Low
- Medium
- High
- Areas without Stewardship Potential
- Non-Mask, Non-Resource

N

0 10 20 40 60 80 Miles

Wyoming State Forestry Division
Bill Crapser, State Forester
Jim Arnold, Stewardship Coordinator

Map Notes:

Date: May, 2007
Data Layer: resource_rich
File Name: Analysis_Map4.mxd
Map By: Shawn Lanning,
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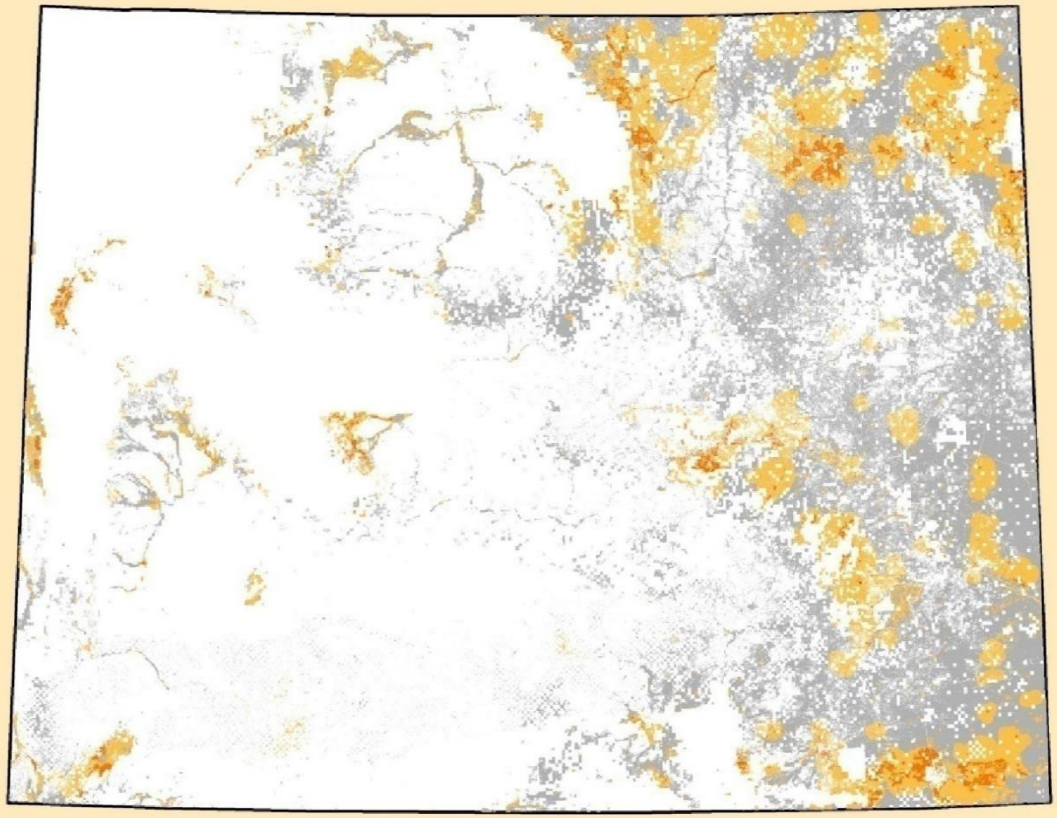
*** Includes Data Themes:**

- **Private Forest Lands**
- **Forest Patches**
- **Proximity to Public/Protected Lands**
- **Forested Wetlands**
- **Riparian Areas**
- **Public Water Supplies**
- **Slope**
- **Priority Watersheds**
- **Threatened and Endangered Species**
- **Agroforestry**

5



Resource Threats*
Wyoming

Resource Threats

- Low
- Medium
- High
- Areas without Stewardship Potential
- Non-Mask, Non-Threat

N

0 10 20 40 60 80 Miles

Wyoming State Forestry Division
Bill Crapser, State Forester
Jim Arnold, Stewardship Coordinator

Map Notes:

Date: May, 2007
Data Layer: resource_thrt
File Name: Analysis_Map5.mxd
Map By: Shawn Lanning,
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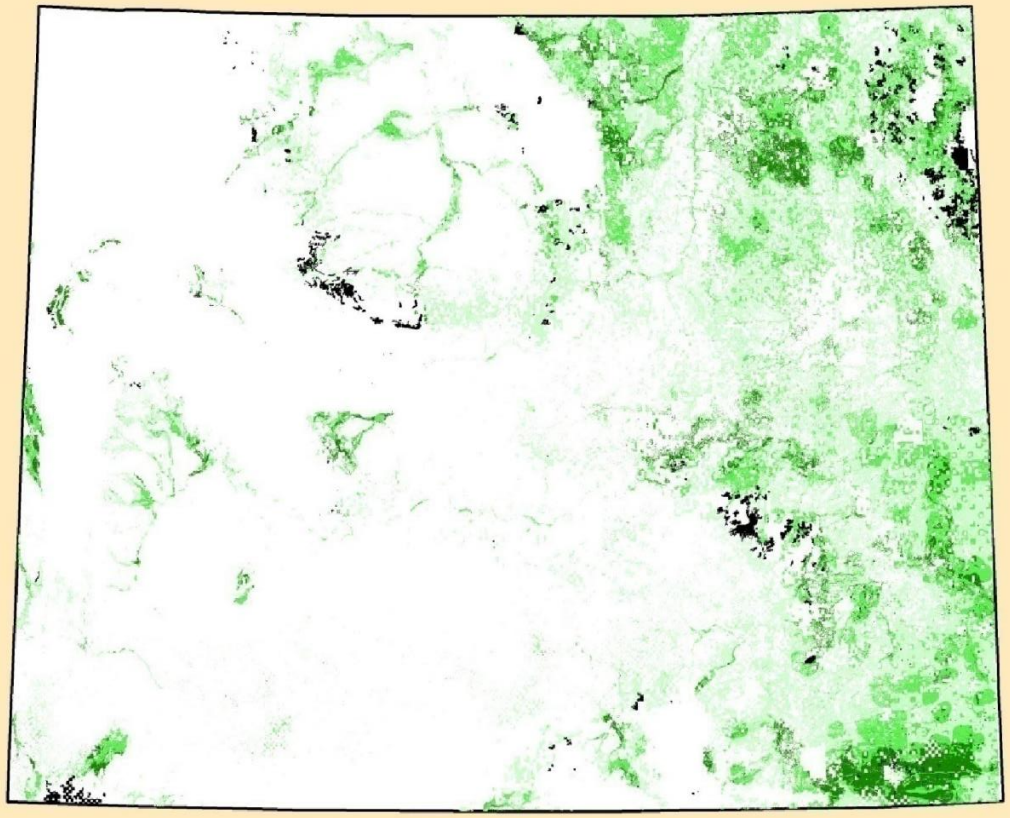
*** Includes Data Themes:**
Wildfire Assessment
Change in Households
Forest Pests

6



Forest Stewardship Potential on Non-Forested - Non-Developed* and Existing Stewardship Plans for Wyoming

Stewardship Potential

- Low
- Medium
- High
- Forest Stewardship Plans
- Areas Without Stewardship Potential
- Private Forest

N

0 10 20 40 60 80 Miles

Wyoming State Forestry Division
Bill Crapser, State Forester
Jim Arnold, Stewardship Coordinator

*** Includes Classes of Land Cover (MRLC):**

- **31 Bare Rock / Sand / Clay**
- **33 Transitional (Barren)**
- **71 Grasslands / Herbaceous**
- **81 Pasture / Hay**
- **82 Row Crops**
- **83 Small Grains**
- **84 Fallow**
- **85 Urban / Recreational Grasses**
- **92 Emergent Herbaceous Wetlands**

Non-forest - Non-developed Lands	Non-forest - Non-developed Land Stewardship Potential			*Total*
	Low	Medium	High	
Acres capable of Stewardship	6,553,473	4,971,927	1,711,969	***13,237,370***
Stewardship Plan acres	23,848	24,910	10,270	***59,028***
Stewardship Plan acres as a percent of acres non-forest - non-developed lands	0.36%	0.50%	0.60%	***0.45%***

Map Notes:

Date: May, 2007
Data Layer: stewpotonnfnd
File Name: Analysis_Map6.mxd
Map By: Shawn Lanning,
GIS Research Scientist, WyGISC

Contact Information:

Shawn Lanning, GIS Research Scientist
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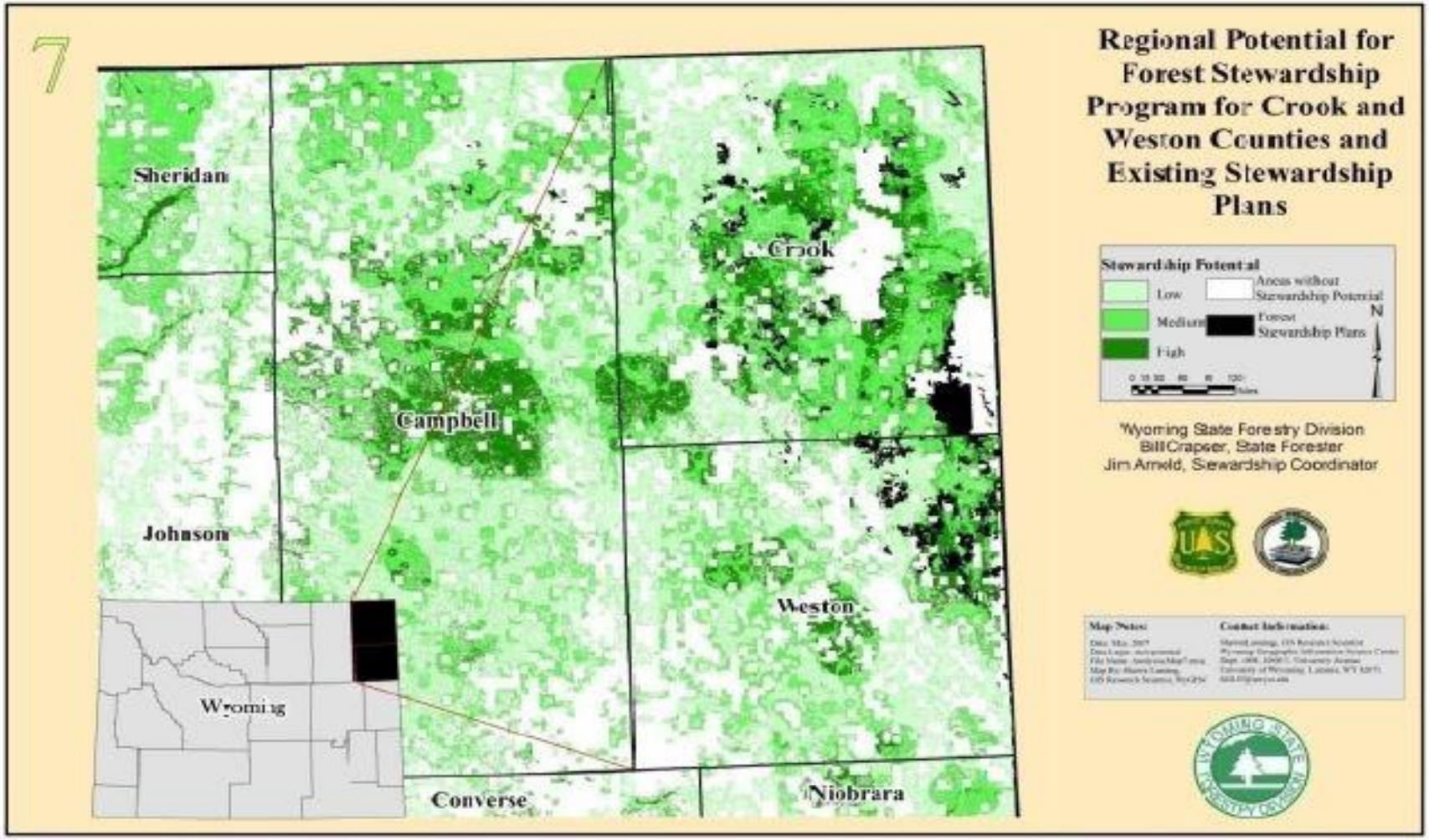
SGL55@uwyo.edu


7
Regional Potential for Forest Stewardship Program for Crook and Weston Counties and Existing Stewardship Plans
Sheridan
Crook
Campbell
Johnson
Weston
Converse
Niobrara
Wyoming
Stewardship Potential
Low
Medium
High
Areas without Stewardship Potential
Forest Stewardship Plans
N
Wyoming State Forestry Division
Bill Crapser, State Forester
Jim Arnold, Stewardship Coordinator
Map Notes:
Contact Information:

Appendix E: WY Species of Greatest Conservation Need

Wyoming Game & Fish Department, updated May 5, 2005

Type	Common Name	Scientific Name
Mammals (54)	Abert's Squirrel	Sciurus aberti
	Big Brown Bat	Eptesicus fuscus
	Bighorn Sheep	Ovis canadensis
	Black-footed Ferret	Mustela nigripes
	Black-tailed Prairie Dog	Cynomys ludovicianus
	Canada Lynx	Lynx canadensis
	Canyon Mouse	Peromyscus crinitus
	Cliff Chipmunk	Tamias dorsalis
	Dwarf Shrew	Sorex nanus
	Fisher	Martes pennanti
	Fringed Myotis	Myotis thysanodes
	Great Basin Pocket Mouse	Perognathus parvus
	Grizzly Bear	Ursus arctos
	Hayden's Shrew	Sorex haydeni
	Hispid Pocket Mouse	Chaetodipus hispidus
	Hoary Bat	Lasiurus cinereus
	Idaho Pocket Gopher	Thomomys idahoensis
	Least Weasel	Mustela nivalis
	Little Brown Myotis	Myotis lucifugus
	Long-eared Myotis	Myotis evotis
	Long-legged Myotis	Myotis volans
	Marten	Martes americana
	Meadow Jumping Mouse	Zapus hudsonius
	Moose	Alces alces
	Northern Flying Squirrel	Glaucomys sabrinus
	Northern Myotis	Myotis septentrionalis
	Olive-backed Pocket Mouse	Perognathus fasciatus
	Pallid Bat	Antrozous pallidus
	Pinyon Mouse	Peromyscus truei
	Plains Harvest Mouse	Reithrodontomys montanus
	Plains Pocket Gopher	Geomys bursarius
	Plains Pocket Mouse	Perognathus flavescens
	Prairie Vole	Microtus ochrogaster
	Preble's Shrew	Sorex preblei
	Pygmy Rabbit	Brachylagus idahoensis
	Pygmy Shrew	Sorex hoyi
	River Otter	Lutra canadensis
	Sagebrush Vole	Lemmiscus curtatus
	Silky Pocket Mouse	Perognathus flavus
	Silver-haired Bat	Lasionycteris noctivagans
	Spotted Bat	Euderma maculatum
	Spotted Ground Squirrel	Spermophilus spilosoma
	Swift Fox	Vulpes velox
	Townsend's Big-eared Bat	Corynorhinus townsendii
	Uinta Ground Squirrel	Spermophilus armatus
	Vagrant Shrew	Sorex vagrans

	Water Shrew	Sorex palustris
	Water Vole	Microtus richardsoni
	Western Heather Vole	Phenacomys intermedius
	Western Small-footed Myotis	Myotis ciliolabrum
	White-tailed Prairie Dog	Cynomys leucurus
	Wolverine	Gulo gulo
	Wyoming Ground Squirrel	Spermophilus elegans
	Wyoming Pocket Gopher	Thomomys clusius
Birds (59)	American Bittern	Botaurus lentiginosus
	American Three-toed Woodpecker	Picoides dorsalis
	American White Pelican	Pelecanus erythrorhynchos
	Ash-throated Flycatcher	Myiarchus cinerascens
	Bald Eagle	Haliaeetus leucocephalus
	Barrow's Goldeneye	Bucephala islandica
	Black Rosy-Finch	Leucosticte atrata
	Black Tern	Chlidonias niger
	Black-backed Woodpecker	Picoides arcticus
	Black-crowned Night-Heron	Nycticorax nycticorax
	Bobolink	Dolichonyx oryzivorus
	Boreal Owl	Aegolius funereus
	Brewer's Sparrow	Spizella breweri
	Brown-capped Rosy Finch	Leucosticte australis
	Burrowing Owl	Athene cunicularia
	Bushtit	Psaltriparus minimus
	Canvasback	Aythya valisineria
	Caspian Tern	Sterna caspia
	Chestnut-collared Longspur	Calcarius ornatus
	Clark's Grebe	Aechmophorus clarkii
	Columbian Sharp-tailed Grouse	Tympanuchus phasianellus
	Common Loon	Gavia immer
	Dickcissel	Spiza americana
	Ferruginous Hawk	Buteo regalis
	Forster's Tern	Sterna forsteri
	Franklin’s Gull	Larus pipixcan
	Grasshopper Sparrow	Ammodramus savannarum
	Great Blue Heron	Ardea herodias
	Great Gray Owl	Strix nebulosa
	Greater Sage-Grouse	Centrocercus urophasianus
	Greater Sandhill Crane	Grus canadensis
	Harlequin Duck	Histrionicus histrionicus
	Juniper Titmouse	Baeolophus ridgwayi
	Lark Bunting	Calamospiza melanocorys
	Lesser Scaup	Aythya affinis
	Lewis' Woodpecker	Melanerpes lewis
	Long-billed Curlew	Numenius americanus
	McCown's Longspur	Calcarius mccownii
	Merlin	Falco columbarius
	Mountain Plover	Charadrius montanus
	Northern Goshawk	Accipiter gentilis

	Northern Pygmy-Owl	Glaucidium gnoma
	Peregrine Falcon	Falco peregrinus
	Pygmy Nuthatch	Sitta pygmaea
	Redhead	Aythya americana
	Sage Sparrow	Amphispiza belli
	Sage Thrasher	Oreoscoptes montanus
	Scott's Oriole	Icterus parisorum
	Short-eared Owl	Asio flammeus
	Snowy Egret	Egretta thula
	Swainson's Hawk	Buteo swainsoni
	Trumpeter Swan	Cygnus buccinator
	Upland Sandpiper	Bartramia longicauda
	Virginia Rail	Rallus limicola
	Western Grebe	Aechmophorus occidentalis
	Western Scrub-Jay	Aphelocoma californica
	White-faced Ibis	Plegadis chihi
	Willow Flycatcher	Empidonax traillii
	Yellow-billed Cuckoo	Coccyzus americanus
Reptiles (26)	Black Hills Redbelly Snake	Storeria occipitomaculata pahasapae
	Bullsnake	Pituophis catenifer sayi
	Cliff Tree Lizard	Urosaurus ornatus wrighti
	Common Garter Snake	Thamnophis sirtalis
	Eastern Yellow-bellied Racer	Coluber constrictor flaviventris
	Great Basin Gophersnake	Pituophis catenifer deserticola
	Great Plains Earless Lizard	Holbrookia maculata
	Greater Short-horned Lizard	Phrynosoma hernandesi hernandesi
	Intermountain Wandering Gartersnake	Thamnophis elegans vagrans
	Many-lined Skink	Eumeces multivirgatus
	Midget Faded Rattlesnake	Crotalus viridis concolor
	Northern Plateau Lizard	Sceloporus undulatus elongatus
	Northern Prairie Lizard	Sceloporus undulatus garmani
	Northern Sagebrush Lizard	Sceloporus graciosus graciosus
	Ornate Box Turtle	Terrapene ornata ornata
	Pale Milksnake	Lampropeltis triangulum multistriata
	Plains Black-headed Snake	Tantilla Nigriceps
	Plains Gartersnake	Thamnophis radix
	Plains Hog-nosed Snake	Heterodon nasicus nasicus
	Prairie Racerunner	Cnemidophorus sexlineatus viridis
	Prairie Rattlesnake	Crotalus viridis viridis
	Red-lipped Plateau Lizard	Sceloporus undulatus erythrocheilus
	Rubber Boa	Charina bottae
	Smooth Green Snake	Opheodrys vernalis
	Western Painted Turtle	Chrysemys picta bellii
	Western Spiny Softshell	Apalone spinifera hartwegi
Amiphibans (12)	American Bullfrog	Rana catesbieana
	Boreal Chorus Frog	Pseudacris maculata
	Boreal Toad	Bufo boreas boreas
	Columbia Spotted Frog	Rana luteiventris
	Great Basin Spadefoot	Spea intermontana

	Great Plains Toad	Bufo cognatus
	Northern Leopard Frog	Rana pipiens
	Plains Spadefoot	Spea bombifrons
	Tiger Salamander	Ambystoma tigrinum
	Wood Frog	Rana sylvatica
	Woodhouse's Toad	Bufo woodhousii
	Wyoming Toad	Bufo baxteri
Fishes (40)	Arctic Grayling	Thymallus arcticus
	Bigmouth Shiner	Notropis dorsalis
	Black Bullhead	Ameiurus melas
	Bluehead Sucker	Catostomus discobolus
	Bonneville Cutthroat	Oncorhynchus clarki utah
	Burbot	Lota lota
	Central Stoneroller	Campostoma anomalum
	Channel Catfish	Ictalurus punctatus
	Colorado River Cutthroat	Oncorhynchus clarki pleuriticus
	Common Shiner	Luxilus cornutus
	Finescale Dace	Phoxinus neogaeus
	Flannelmouth Sucker	Catostomus latipinnis
	Flathead Chub	Platygobio gracilis
	Goldeye	Hiodon alosoides
	Hornyhead Chub	Nocomis biguttatus
	Iowa Darter	Etheostoma exile
	Kendall Warm Springs Dace	Rhinichthys osculus thermalis
	Lake Chub	Couesius plumbeus
	Leatherside Chub	Gila copei
	Mottled Sculpin	Cottus bairdi
	Mountain Sucker	Catostomus platyrhynchus
	Mountain Whitefish	Prosopium williamsoni
	Northern Pearl Dace	Margariscus margarita
	Orangethroat Darter	Etheostoma spectabile
	Paiute Sculpin	Cottus beldingi
	Plains Minnow	Hybognathus placitus
	Plains Topminnow	Fundulus sciadicus
	Quillback	Carpiodes cyprinus
	River Carpsucker	Carpiodes carpio
	Roundtail Chub	Gila robusta
	Sauger	Sander canadensis
	Shorthead Redhorse	Moxostoma macrolepidotum
	Shovelnose Sturgeon	Scaphirhynchus platorynchus
	Snake River Cutthroat	Oncorhynchus clarki ssp.
	Stonecat	Noturus flavus
	Sturgeon Chub	Macrhybopsis gelida
	Suckermouth Minnow	Phenacobius mirabilis
	Western Silvery Minnow	Hybognathus argyritis
	Westslope Cutthroat	Oncorhynchus clarki lewisi
	Yellowstone Cutthroat	Oncorhynchus clarki bouvieri
Crustaceans (19)	Beavertail Fairy Shrimp	Thamnocephalus platyurus
	Circumpolar Fairy Shrimp	Branchinecta paludosa

	Colorado Fairy Shrimp	Branchinecta coloradensis
	Crenatethumb Fairy Shrimp	Streptocephalus mattoxi
	Devil Crayfish	Cambarus diogenes
	Eastern Alkali Fairy Shrimp	Branchinecta redingi
	Ethologist Fairy Shrimp	Eubranchipus serratus
	Gambelii Crayfish	Pacifastacus gambelii
	Giant Fairy Shrimp	Branchinecta gigas
	Greater Plains Fairy Shrimp	Streptocephalus texanus
	Knobbedlip Fairy Shrimp	Eubranchipus bundyi
	Lemon Tadpole Shrimp	Lepidurus lemmoni
	Longtail Tadpole Shrimp	Triops longicaudatus
	Neglectus Crayfish	Orconectes negectus
	New Mexico Fairy Shrimp	Streptocephalus dorothae
	Pocked Pouch Fairy Shrimp	Branchinecta campestris
	Rock Pool Fairy Shrimp	Branchinecta packardi
	San Francisco Brine Shrimp	Artemia franciscana
	Versitle Fairy Shrimp	Branchinecta lindahli
Mollusks (68)	A Land Snail (Hells Canyon)	Oreohelix strigosa ssp. 1
	Abbreviate Pondsnail	Stagnicola apicina
	Ash Gyro	Gyraulus parvus
	Ashy Pebblesnail	Stagnicola traski
	Ashy Physa	Physella integra
	Bear Lake Springsnail	Pyrgulopsis pilsbryana
	Berry's Mountain Snail	Oreohelix strigosa berryi
	California Floater	Anodonta californiensis
	Callused Vertigo Snail	Vertigo arthuri
	Cave Physa	Physella spelunca
	Cloaked Physa	Physa megalochlamys
	Cooper's Rocky Mountain Snail	Oreohelix strigosa cooperi
	Creeping Ancylid	Ferrissia rivularis
	Cylindrical Papershell	Anodontoides ferussacianus
	Disc Gyro	Gyraulus circumstriatus
	Dusky Fossaria	Fossaria dalli
	Fatmucket	Lampsilis siliquoidea
	Fat-whorled Pondsnail	Stagnicola bonnevillensis
	Fragile Ancylid	Ferrissia fragilis
	Giant Floater	Pyganodon grandis
	Glass Physa	Physa skinneri
	Glossy Valvata	Valvata humeralis
	Golden Fossaria	Fossaria obrussa
	Great Basin Rams-horn	Helisoma newberryi
	Green River Pebblesnail	Fluminicola coloradoensis
	Indecisive Vallonia	Vallonia albula
	Jackson Lake Springsnail	Pyrgulopsis robusta
	Keeled Mountain Snail	Oreohelix carinifera
	Lance Aplexa	Aplexa elongata
	Marsh Pondsnail	S. elodes
	Marsh Rams-horn	Planorbella trivolvis
	Meadow Rams-horn	Planorbula campestris

	Mineral Creek Mountain Snail	Oreohelix pilsbryi
	Morgan Creek Mountain Snail	Oreohelix swopei
	Mossy Valvata	V. sincera
	Mountain Marshsnail	Stagnicola montanensis
	Mud Amnicola	Amnicola limosus
	Niobrara Ambersnail	Oxyloma haydeni
	Olive Physa	Physella cooperi
	Pewter Physa	Physella heterostropha
	Plain Pocketbook	Lampsilis cardium
	Protean Physa	Physella virgata
	Pumpkin Physa	Physella ancillaria
	Pygmy Fossaria	Fossaria parva
	Pygmy Mountain Snail	Oreohelix pygmaea
	Ribbed Dagger	Pupoides hordaceus
	Rock Fossaria	Fossaria modicella
	Rocky Mountain Duskysnail	Colligyrus greggi
	Rocky Mountain Physa	Physella propinqua
	Rocky Mountain Snail	Oreohelix strigosa
	Rotund Physa	Physella columbiana
	Rough Rams-horn	Planorbella subcrenata
	Rustic Pondsnail	Stagnicola hinkleyi
	Sharp Sprite	Promenetus exacuous
	Sierra Ambersnail	Catinella stretchiana
	Slope Ambersnail	Catinella wandae
	Star Gyro	Gyraulus crista
	Striate Disc	Discus shimekii
	Tadpole Physa	Physella gyrina
	Two-ridge Rams-horn	Helisoma anceps
	Umbilicate Sprite	Promenetus umbilicatellus
	Utah Physa	Physella utahensis
	Vertigo Paradoxa (A Terrestrial Snail)	Vertigo paradoxa
	Western Pearlshell	Margaritifera falcata
	White Heel Spliter	Lasmigona complanata
	Widelip Pondsnail	S. traski
	Woodland Pondsnail	S. catascopium
	Wrinkled Marshsnail	S. caperata

Appendix F: Application Instructions

APPLICATION INSTRUCTIONS

Thank you for considering the Forest Legacy Program for the conservation of your forested lands. Projects that make it through Wyoming State Forestry Division's evaluation and ranking process will be forwarded to the United States Forest Service and entered into a regional, then national evaluation process. Each year only one or two projects from Wyoming are likely to be funded and become a reality.

Patience is the most important virtue that applicants can possess as their application goes through this administrative process. It is not unusual for a project to take 18 months from the time of being ranked on the state level to the scheduled closing. The more work that is completed ahead of time, the quicker a closing can be expected.

There are many aspects to being selected and ranked high enough to be funded. First off, the property must be within one of the four Wyoming Forest Legacy Areas. One aspect, and probably the most important, is the quality of the forest resources of the tract. The evaluation process investigates the quality of the fish & wildlife habitat, and whether or not conservation of the parcel contributes to water quality. Each of these values is a reflection of the parcel and there is little if anything that a landowner can do to improve the attractiveness of the project based on these criteria.

Other factors are within the property owner's control, such as sale price of the interests acquired. In every case, the landowner is informed of the fair market value of the interests that are being bought/sold. The value is determined by federal appraisal standards. Projects that are available below the established fair market value are given special consideration.

Also considered in the evaluation of a proposed project is the amount of support for the protection of the parcel, as evidenced by written letters from governmental agencies, individuals, or non-profit organizations. Examples would be local, state, or regional land trusts, the county commission and planning department, etc., and state or local representatives and/or congressman. The level of support is also considered. Has the supporter agreed to commit funds for the project, or to have the appraisal, survey, or management plan paid for? Each of these criteria is considered and up to the applicant to provide.

Another aspect given careful consideration is the potential of conversion of the land to non-forest uses. It is up to the property owner, through the answers provided to the questions in the application to establish the threat for the potential conversion.

Most applicants will not be aware of all the organizations, agencies, plans, and strategies that may be applicable to conserving their parcel. That is why it is important to talk to the Forest Legacy Program Coordinator at Wyoming State Forestry to get help with the application. The Forest Legacy Committee will not only evaluate and prioritize potential projects, but also use their expertise and diverse knowledge to add to the quality of the project should it be selected for funding consideration.

So, what makes a good application? Without a doubt it's the amount and quality of the information that you provide about your land, how it fits into local, state, and/or regional land protection strategies, what is the threat of its conversion, who supports its protection, and what is that level of support. Most of this information requires the applicant to do a lot of legwork, talking to local conservation groups, and town officials, and really thinking about the answers posed in the application. Take your time, be thorough, and include as much supporting evidence as you can get your hands on.

Application State of Wyoming
State Forest Stewardship
Coordinating Committee
FOREST LEGACY PROGRAM

Please submit the following information and any additional supporting documentation in support of your application:

1. Name, address (mailing and physical) and phone numbers of applicant landowner.
2. All other owners of record for this tract, and their addresses.
3. Name, address and phone number of authorized agent representing landowner(s) if applicable.
4. Location of the property.
5. Legal description of the property.
6. A copy of the Wyoming State Forestry Division Forest Stewardship Plan for the property.
7. A List or written description of the significant scenic, natural, recreational, wildlife, timber and other resource values contained on the property.
8. Identification of any dumps, mines, oil wells, or other potentially hazardous features of the property.
9. Signed statement giving the Wyoming State Forestry Division and the US Forest Service permission to enter the property for review and appraisal purposes.
10. List any encumbrances or mortgages existing on the property including, but not limited to contracts, leases, or outstanding rights not of record.
11. Copy of plat or survey map of the property. If only a portion of the property is being offered, identify it on a map showing the portion offered in the context of the entire tract.
12. Tract acreage and total number of acres of forests and cleared/open land.
13. List of existing permanent improvements on the tract, including houses, barns, lakes, ponds, dams, wells, roads, and other structures, and total acres occupied by improvements.
14. Please state willingness of the landowner to donate a portion of the value of the property (to conduct a bargain sale).
15. List supporting organizations and government entities and supply letters of support, if available.

Please send application and all supporting documentation to:

Attention: Forest Legacy Program Coordinator
Wyoming State Forestry Division
1100 West 22nd Street
Cheyenne, Wyoming 82002

Appendix G: Public Comment Form

Forest Legacy Program Assessment of Need

Public Input Comment Form

The Forest Legacy Program is a voluntary program funded by the US Forest Service, working through state agencies and with local landowners, initiated to protect environmentally important forests that are threatened with conversion to non-forest uses. The program protects properties within areas designated by the state as important Forest Legacy Areas through conservation easements or fee acquisition with willing landowners. In order for Wyoming to become a participant in the Forest Legacy Program, the Wyoming State Forestry Division must conduct an Assessment of Need. The Assessment of Need will evaluate existing forest resources and condition, identify threats to WY forests, and designate Forest Legacy Areas. The Assessment of Need will be reviewed by the US Forest Service, and once accepted Wyoming will be enrolled in the Forest Legacy Program.

The Conservation Fund is now conducting Public Meetings to present the Draft Assessment of Need and to introduce areas selected as Forest Legacy Areas and to present criteria for project selection. The answers you provide below will be used to help finalize the Draft Assessment of Need for final submittal to the US Forest Service.

You may complete this form and return it at the end of the meeting. Or, you may fax your response to 1-307-733-2365 attention Luke Lynch. You may also make your comments electronically by sending an email to wyomingforest@conservationfund.org.

Name:(Optional)_____

Date:_____/_____/2007

Zip Code: _____

Contact Address (Optional)

Questions and Comments:

1) Do you feel that Wyoming should become a participant in the Forest Legacy Program? Please check yes or no, and explain briefly.

_____Yes Why?

_____No Why?

2. Do you feel that the research (both the breadth and treatment of topics) incorporated in the Draft Assessment of Need was adequate?

_____Yes

_____NO. If no please indicate what information you feel is incorrect or lacking from this Draft.

3) Do you feel that the goals outlined for the Forest Legacy Program are adequate?

_____ Yes

_____ No. Please indicate which goals you disagree with, or which goals you feel should be included.

4) Do you feel that the criteria used to select Forest Legacy Areas were adequate?

_____ Yes

_____ No. Please indicate which criteria you disagree with, or which criteria you feel should be included.

5) Do you agree with the areas outlined as Forest Legacy Areas?

_____ Yes

_____ No. Please indicate what areas you would include or delete, or how you would change selected FLA boundaries.

6) Do you agree with the Project Selection Criteria?

_____ Yes

_____ NO. Please indicate which criteria you do not agree with, or which criteria you think should be included.

Appendix H: Public Meetings and Summary of Public Comments

Public Meetings and Summary of Public Comments

The following public input comment form summarizes public comment responses that used the public comment form provided at the following public meetings:

- Casper, Wyoming: Wednesday, April 25, 2007
- Jackson, Wyoming: Thursday, May 3, 2007
- Cheyenne, Wyoming: Tuesday, June 26, 2007

Invitations to attend these meetings, and a request for comment were sent to the following organizations and government entities:

Farm Service Agency
Green River Valley Land Trust
Jackson Hole Land Trust
Pheasants Forever
Rocky Mountain Elk Foundation
Sheridan Land Trust
The Nature Conservancy
Trout Unlimited
United States Forest Service
University of Wyoming Cooperative Extension Service
University of Wyoming Ruckelshaus Institute
US Fish & Wildlife Service
US Representative Barbara Cubin
US Senator Craig Thomas
US Senator Mike Enzi
USDA Natural Resource Conservation Service
Wyoming Association of Conservation Districts
Wyoming Association of Municipalities
Wyoming Department of Agriculture
Wyoming Game & Fish Department
Wyoming Outdoor Council
Wyoming Sawmills, Inc.
Wyoming State Forestry Division
Wyoming Stock Growers Agricultural Land Trust
Wyoming Stock Growers Association
Wyoming Wool Growers Association

Overall, attendance at the public meetings was low, with every attendee expressing support for establishing the Forest Legacy Program in Wyoming. The following summarizes responses to the public comment forms:

Summary of Public Comments

Forest Legacy Program Assessment of Need

Public Input Comment Form

The Forest Legacy Program is a voluntary program funded by the US Forest Service, working through state agencies and with local landowners, initiated to protect environmentally important forests that are threatened with conversion to non-forest uses. The program protects properties within areas designated by the state as important Forest Legacy Areas through conservation easements or fee acquisition with willing landowners. In order for Wyoming to become a participant in the Forest Legacy Program, the Wyoming State Forestry Division must conduct an Assessment of Need. The Assessment of Need will evaluate existing forest resources and condition, identify threats to WY forests, and designate Forest Legacy Areas. The Assessment of Need will be reviewed by the US Forest Service, and once accepted Wyoming will be enrolled in the Forest Legacy Program.

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You may complete this form and return it at the end of the meeting. Or, you may fax your response to 1-307-733-2365 attention Luke Lynch. You may also make your comments electronically by sending an email to wyomingforest@conservationfund.org.

Name:(Optional)_____

Date:_____/_____/2007

Zip Code: _____

Contact Address (Optional)

Questions and Comments:

2) Do you feel that Wyoming should become a participant in the Forest Legacy Program? Please check yes or no, and explain briefly.

_5_____Yes Why?

"Large tracts of private forest land need to remain intact."

"Another tool to preserve undeveloped land. Let's get it going."

_0_____No Why?

3. Do you feel that the research (both the breadth and treatment of topics) incorporated in the Draft Assessment of Need was adequate?

_5_ Yes

_0_ NO. If no please indicate what information you feel is incorrect or lacking from this Draft.

3) Do you feel that the goals outlined for the Forest Legacy Program are adequate?

_5_ Yes

_0_ No. Please indicate which goals you disagree with, or which goals you feel should be included.

4) Do you feel that the criteria used to select Forest Legacy Areas were adequate?

_5_ Yes

_0_ No. Please indicate which criteria you disagree with, or which criteria you feel should be included.

6) Do you agree with the areas outlined as Forest Legacy Areas?

_4_ Yes

_1_ No. Please indicate what areas you would include or delete, or how you would change selected FLA boundaries.

"Yes, with the changes to the boundaries made as discussed at this meeting"

"The Bighorn Mountain Area should extend further south into northwest Natrona County. Also make sure the Shirley Mountains and Ferris Mountains in Carbon County and Green Mountain in Fremont County"

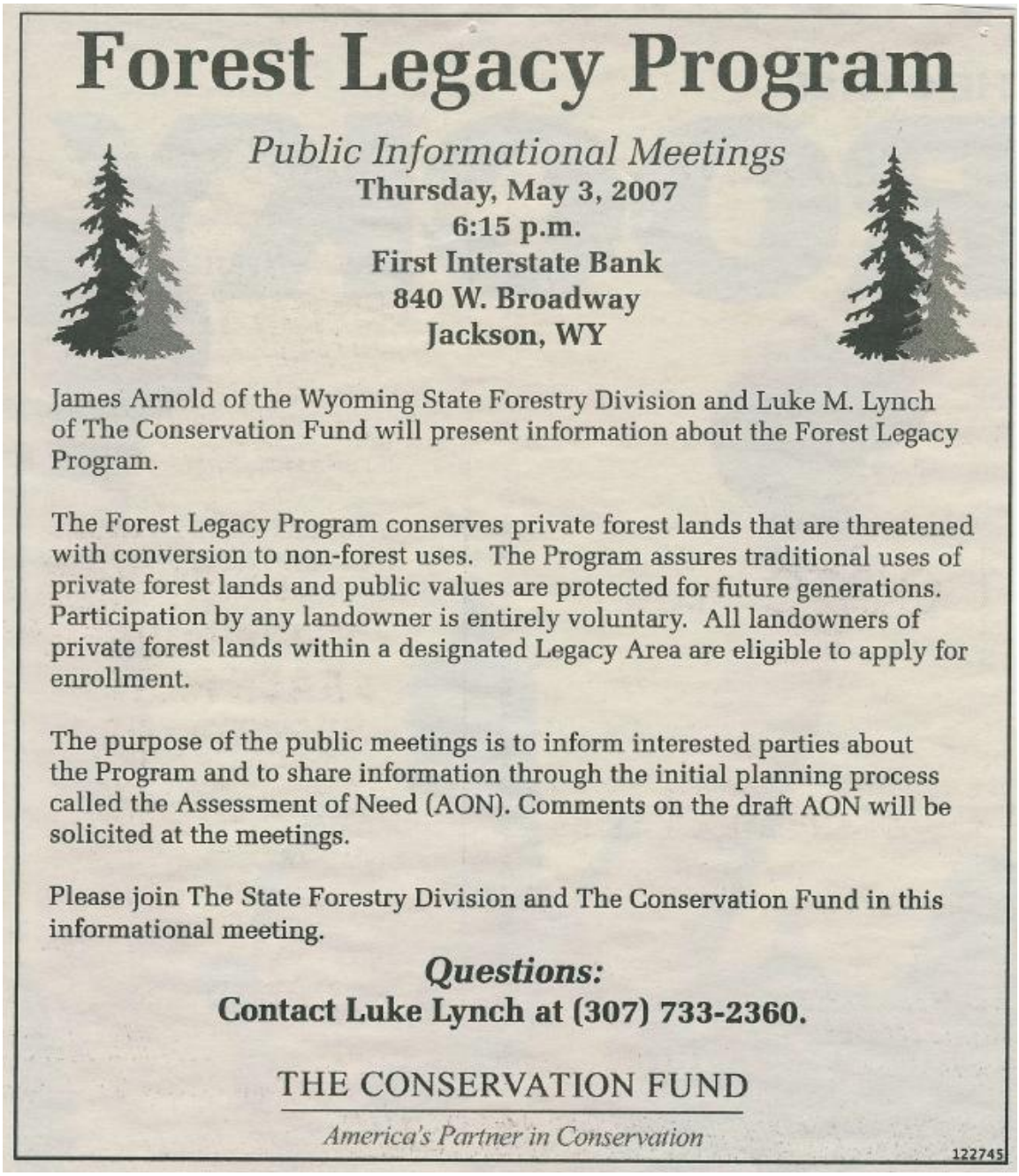
7) Do you agree with the Project Selection Criteria?

_4_ Yes

_1_ NO. Please indicate which criteria you do not agree with, or which criteria you think should be included.

"I think a minimum acreage should be determined and defined in the final draft."

Public Advertisement Sample:



Forest Legacy Program

Public Informational Meetings

Thursday, May 3, 2007
6:15 p.m.
First Interstate Bank
840 W. Broadway
Jackson, WY

James Arnold of the Wyoming State Forestry Division and Luke M. Lynch of The Conservation Fund will present information about the Forest Legacy Program.

The Forest Legacy Program conserves private forest lands that are threatened with conversion to non-forest uses. The Program assures traditional uses of private forest lands and public values are protected for future generations. Participation by any landowner is entirely voluntary. All landowners of private forest lands within a designated Legacy Area are eligible to apply for enrollment.

The purpose of the public meetings is to inform interested parties about the Program and to share information through the initial planning process called the Assessment of Need (AON). Comments on the draft AON will be solicited at the meetings.

Please join The State Forestry Division and The Conservation Fund in this informational meeting.

Questions:
Contact Luke Lynch at (307) 733-2360.

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122745

JACKSON HOLE
LAND TRUST

Mr. Bill Crapser
State Forester
Wyoming State Forestry Division
1100 W. 22nd Street
Cheyenne, WY 82002

Dear Mr. Crapser,

The Jackson Hole Land Trust (JHLT) attended the public meeting in Jackson, Wyoming, presented by The Conservation Fund regarding the proposed Forest Legacy Plan for Wyoming. The purpose of this letter is to state that the goals and objectives of the Forest Legacy Program match the mission of the JHLT.

Currently, the JHLT holds a few conservation easements on protected properties with harvestable forests. We have successfully worked with the owners of those properties and the State Forester to develop Stewardship Plans and implement timber management actions that match the terms of the conservation easements and retain the environmental, aesthetic, and cultural values that our easements seek to maintain.

The Forest Legacy Program, on a statewide basis will be a boon to our state that is so economically dependent upon basic natural resources. Incentives that encourage further conservation of working forests have been lacking in the past.

The JHLT does have one comment regarding a correction in the draft FLP: Page 39 in the last paragraph entitled "**Jackson Hole Land Trust**": as of this date, the JHLT has protected 15,944 acres. More importantly, the second half of the paragraph discusses the work of the Green River Valley Land Trust, which requires a heading entitled with their name.

The JHLT wants to thank The Conservation Fund and the Wyoming State Forestry Department for spearheading this initiative to qualify Wyoming's forest lands for private land protection incentives. Please continue to inform the JHLT regarding the status of this endeavor and do not hesitate to contact the JHLT if you have any questions or opportunities to collaborate with private land owners.

Sincerely yours,

Laurie Andrews
Executive Director

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Appendix I: Letter Designating WSFD Lead Agency for Forest Legacy Program

DAVE FREUDENTHAL
GOVERNOR

THE STATE OF WYOMING

STATE CAPITOL
CHEYENNE, WY 82002

Office of the Governor

November 14, 2005

Dale Bosworth, Chief
U.S. Forest Service
14th and Independence SW
PO Box 96909
Washington, DC 20090-6090

Dear Chief Bosworth:

I hereby designate the Wyoming State Forestry Division as the lead agency for the USDA's Forest Legacy program in Wyoming as authorized under Section 1217 of Title XII of the Food, Agriculture, Conservation, and Trade Act of 1990. Please forward information and other materials concerning the Forest Legacy Program to:

William Crapser, State Forester
Wyoming State Forestry Division
1100 West 22nd Street
Cheyenne, WY 82002

The Wyoming State Forestry Division is the appropriate agency to lead Wyoming's Forest Legacy program as it is charged with providing forest management and protection assistance to private, state, and other government landowners.

We look forward to working with the Forest Service in implementing Forest Legacy in Wyoming.

Best regards,

Dave Freudenthal
Governor

cc: William Crapser, State Forester

TTY: 777-7860 PHONE: (307) 777-7434 FAX: (307) 632-3909

Wyoming Forest Action Plan
National Priorities Report
2015-2020

The 2008 Farm Bill identified three priorities by Congress in that are incorporated throughout the Wyoming Forest Action Plan and include conserving, protecting and enhancing Wyoming's forest resource. The purpose of the National Priorities chapter is to demonstrate effective outcomes that build legislative, policy, and funding support for federal, state, and private forestry programs important to the Wyoming State Forestry Division in accomplishing priorities identified in the Wyoming Forest Action Plan.

Featured below, are some of the highlights that the Wyoming State Forestry Division (WSFD) has compiled since the creation of the Wyoming Forest Action Plan in 2010 and updated to cover 2015-2020. They make very clear the need and importance of the outputs and services provided to the state by Wyoming State Forestry Division.

National Priority #1: Conserve & Manage Working Forest Landscapes for Multiple Values and Uses

Shared Stewardship and Good Neighbor Authority

In 2020, Wyoming entered into a Shared Stewardship Agreement with the U.S. Department of Agriculture's Forest Service. The agreement strengthens the already strong partnerships and furthers conservation efforts across boundaries. One tool WSFD is utilizing is Good Neighbor Authority (GNA) to work closer with our partners. WSFD signed master GNA agreements with USFS and BLM in 2016 to complete work around Wyoming. USFS agreements have led to over 16 projects and 4 co-op positions to assist in completing the work and coordinate GNA projects. 7 projects have been either completed or in process with the BLM around Wyoming. WSFD will have a Supplemental Project Agreement (SPA) with every national forest in the state by the end of 2020. Partnerships extend beyond GNA and include three Participating Agreements which allow the state to conduct landscape scale management on and off the national forest system lands.

Landowner Assistance

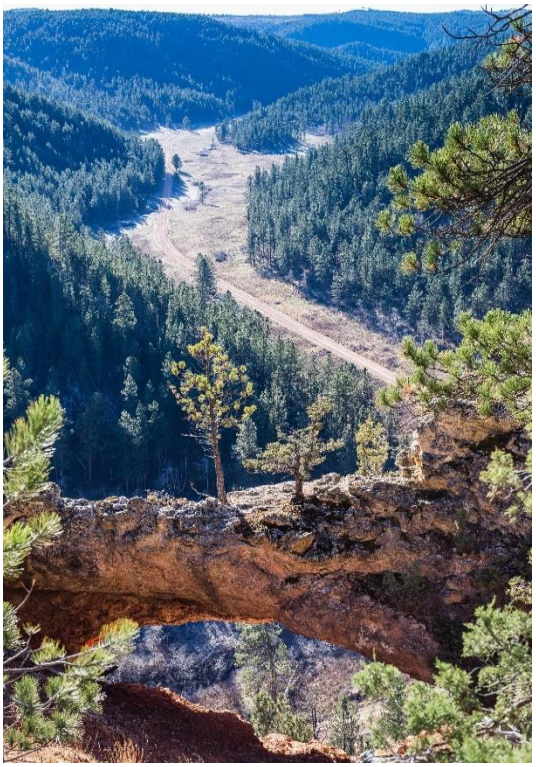
One of the important roles of WSFD is providing assistance to private landowners each year. From 2015 through 2019, WSFD provided technical forestry assistance in some form to 988 private landowners across the state. Workshops and field days were attended by 3,520 landowners. Additionally, over the last 5 years, 78 Forest Stewardship Plans covering 137,032 acres were developed for private landowners. These management plans are critical pieces in conserving and managing a working forest landscape for the future.

State Land Management

Timber harvest continues to be an important tool in managing and recovering Wyoming's forests in the wake of unprecedented mortality from mountain pine beetles, western spruce budworm, and Douglas fir beetle which in total has impacted over 5.2 million acres of forests throughout the state in the past decade. In the 5 year period between 2015 through 2019, harvest levels on Wyoming state trust lands have averaged 1,300 acres and 3.6 million board feet annually, and showed a steady trend.

Additionally, pre-commercial thinning continued to be an important management component on state trust lands, averaging 500 acres annually over the past 5 years. Thinning is important to maintain proper stocking levels and encourage healthy forests; as well as providing sustainable revenues in the future.

Forest Legacy Program



The Grand Canyon of the Black Hills Forest Legacy Project was completed in March 2020. Fee acquisition of the property by the State of Wyoming - Office of State Lands and Investments permanently protects 4,349.51 acres of productive forest lands with significant wildlife and habitat values, provides public access to previously private lands and enhances access to adjoining Federal and State lands. The Forest Legacy Program together with project partners: State of Wyoming - Office of State Lands and Investments, Moskee Land Corporation, Rocky Mountain Elk Foundation and National Wild Turkey Federation contributed $11,525,000.00 for the acquisition.

National Priority #2: Protect Forests from Threats

Insect and Disease

Wyoming forests face considerable threats from bark beetles, defoliating insects, pathogens and invasive organisms. WSFD provides monitoring, expertise, funding, technical assistance and management to combat these threats on both public and private lands throughout the state. In partnership with the USFS, the division conducts annual aerial surveys for insect and disease damage across the state's 10.5 million acres of forested land. Additionally, the WSFD monitors for the detection of invasive species including emerald ash borer and gypsy moth through coordinated trapping programs.

Along with Western Bark Beetle Federal Funding, the WSFD has worked to create the availability of WY State funds to augment the battle against insect and disease threats. In 2019 over 620 acres were treated using Forest Health funds.

Fire Management

WSFD has direct fire protection responsibilities on 3.6 million acres of state trust land and cooperative fire protection responsibilities on an additional 25.5 million acres of land. The division also provides technical assistance relating to all aspects of fire management to Interagency Cooperators and financial assistance to Wyoming's 23 counties, 54 Fire Districts and 147 fire departments through federal grants and state appropriated dollars.

Federal Excess Personal Property (FEPP) & Firefighters Property Program (FFP)

Utilizing FEPP/FFP equipment and parts, WSFD annually obtains, overhauls, and paints ex-military trucks, and builds fire packages for vehicles. These trucks and other equipment are deployed to Wyoming counties and fire districts. Currently there 306 pieces of FEPP equipment valued over $11 million dollars and 308 FFP pieces valued over $2 million dollars. WSFD also provides field service, training, and parts to maintain this fleet of fire suppression equipment.

WSFD absorbs the majority of the Federal Excess Property Program to ensure that the fire departments around the state have the necessary equipment to fight fires. WSFD mechanic shop provides a full- scale overhaul of roughly 4-8 military vehicles and places them in service annually.

Fire Assistance

Twenty-three county-wide Community Wildfire Protection Plans (CWPP) have been completed covering the communities identified as being at risk to wildland fire.

Each year, WSFD supports fire management training classes that provided instruction to roughly 16,373 2015-2020. These trainings are attended by many volunteer firefighters, as well as state and federal employees.

Grants are awarded to volunteer fire departments annually by WSFD via the Volunteer Fire Assistance (VFA) grants. From 2015-2020, 121 departments have received $793,866.02. These grants go to organizing, training, and equipping rural fire departments.

The Fuels Mitigation program is responsible for coordinating the National Fire Plan (NFP), Region 2 and Region 4 Community Assistance Funds Adjacent to National Forest and Grasslands (CAFA), interagency wildland fire prevention, and mitigation programs. Between 2015 and 2020, 85 Projects were funded for Fuels Treatments on 4,001 acres, to create 401 Defensible Spaces, 447 acres of Fuel Breaks, and totaling nearly $5.75 million.

National Priority #3: Enhance Public Benefits from Trees and Forests

Community Forestry

This state program fosters partnerships between government agencies, businesses, and civic organizations to promote and improve community forests throughout the state.

The number of Tree City USA recognized towns annually ranged from 36-42, of the roughly 99 incorporated towns in Wyoming. This represents roughly 40% of all incorporated cities within Wyoming. In 2020 the Arbor Day Foundation waived the fourth standard of holding an Arbor Day event with an official proclamation in light of the global COVID-19 pandemic. However, if communities hosted events they were able to submit materials as usual with their applications.

Pictured above is the group of Wyoming Project Learning Tree Steering Committee and facilitators during the 2019 Annual Facilitators Training Workshop at the Wyoming Game and Fish Whiskey Mountain Conservation Camp near Dubois. In addition to Project Learning Tree, during this training facilitators also become certified facilitators for the other natural resource based Projects including Project Wet, Project Wild, and Project Flying Wild.

WSFD conservation education efforts have annually supported Project Learning Tree, which has also helped to coordinate the annual Wyoming Arbor Day Poster contest. In 2018 Wyoming PLT hosted the Annual International PLT Coordinators' Conference in Cody, WY, in coordination with National PLT. During 2019 and 2020 the Wyoming PLT Steering Committee updated and expanded the Exploring Wyoming's Natural Environments: A supplement to the Project Learning Tree K-8 Environmental Education Activity Guide, including two new activities, further expanding a forest health activity, and adding a new section about creating outdoor classrooms. With financial grant support from WSFD was able to print a new supply of books which will benefit future Wyoming PLT educators.

In 2018 WSFD partnered with the Wyoming Association of Conservation Districts to distribute 17 Tree Trunks with an assortment of educational materials that can be used for forestry workshops and demonstrations. Additionally, in 2020 WSFD again partnered with WACD to create The Forestry Activity Book that is available for educating and engaging kids in the classroom-setting across Wyoming.

Northern Rockies Tree School

This joint partnership between WSFD & Montana DNRC started in 2010, and continues to train representatives from various agencies, private industry, and organizations in community forestry, conservation education, and other tree care issues. From 2015-2019 the school has trained nearly 200 students annually, hosting international keynote speakers, and engaged attendees in community forest management lectures, seminars, and hands-on workshops in Montana and Wyoming! Unfortunately, due to the COVID-19 pandemic in 2020 the event was cancelled.

Mark Hughes speaks about Right Tree Right Place during an outdoor session during the Northern Rockies Tree School in Sheridan, Wyoming in 2016.

Living Snow Fence

In the previous five years, this program planted 59,560 linear feet or 11.28 miles of strategically placed tree rows designed to capture snow and prevent drifting on State highways. Reducing snow drift improves the safety of winter travel, reduces the need for snow removal and weather-related road closures. The Wyoming Department of Transportation contributes $100,000 annually towards these efforts. Conservation Districts install and maintain the plantings.