Natural Resources, Forest Management,
and Fire Protection Plan

Renehan Subdivision
5740 Burgess Rd,
Colorado Springs, CO 80908

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Project #: 196624000
EPC Project #: MS238

Prepared: November 30, 2023

Kimley»Horn

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Natural Resources, Forestry Management, and Fire Protection Plan

GENERAL PROJECT DESCRPIPTION

The purpose of this project is to subdivide the existing property, tax ID #: 6213000050, located at 5740 Burgess Road, Colorado Springs, CO 80908, into three individual lots. The existing property is approximately 34.37 acres in size. The property shall be subdivided so that Lot 1 (southern region of the property) is 8.62 acres, Lot 2 (central/northeast region of the property) is 17.06 acres, and Lot 3 (Northwestern region of the property) is 8.69 acres. The Site is currently zoned as RR-5, allowing for 5 acre lots. Proposed wildlife protection is to be included in the plat as a wildlife protection, no-build area. A 50' access easement for the anticipated private shared driveway is also included within this project.

SITE CHARACTERISTICS

The Project Site is 34.37 acres in size. The Project involves the division of property into three single family lots ranging in size: 8.62 acres, 17.06 acres, and 8.69 acres, respectively. The existing site is vacant and undeveloped land, with an unmaintained driveway/trail providing access from Burgess Road. The Site is heavily wooded with pine trees covering about 80% of the Site. Black Forest Colorado is classified as a part of the Pine-Oak Woodlands ecoregion.

The existing Project Site generally slopes from east to west & south to north, towards Kettle Creek, which meanders just north of the property. Elevations vary from 7088 to 7258. Slopes vary from 2% - 25% in grade, forming numerous on-site and off-site drainage basins facilitating flows towards Kettle Creek. All soils on-site are Kettle Gravelly Loam Sand, hydrologic soil Type B. See NRCS Soil Resource Report (Appendix B)

PROPOSED SITE

The proposed subdivided lots are to be used for single family residential. Three single-family homes are anticipated, all accessible from the shared driveway. See a proposed site plan in Appendix A. The shared driveway is compliant with Black Forest Fire/Rescue Protection District – Guidance Document for Firefighting Access and Roads criteria (Appendix F). The proposed shared driveway is proposed to be approximately 1300 linear feet. The shared driveway will be considered as a fire access road and will designed with a 26-foot width all weather surface material and will include a turnaround (modified hammerhead) at 750 feet and a cul-de-sac with a 50-foot radius at the terminus (consistent with LDC Section 6.3.3.C.3.J). There are plans to install a gate on the shared driveway. As per the Black Forest Fire/Rescue Protection District – Guidance Document for Firefighting Access and Roads, the gate width will be two feet wider than the driveway. The gate will be a swinging gate, swinging inward. Coordination with the fire department will determine if a knox box will be required for access to the gate.

FLOOD HAZARD

Flood hazard maps and flood insurance maps (FIRM) from the Federal Emergency Management Agency (FEMA) were reviewed to determine the potential for flood hazard at the site. The site is not located in a flood hazard zone, and thus flood risk is deemed by FEMA to be 'minimal'. Reference Appendix C.

WETLAND AND WILDLIFE COMMUNITIES

No wetland communities are present within the Site. The northwest corner of the Site is identified by El Paso County as a potential moderate quality habitat for various riparian wildlife due to the proximity to the FEMA 100-year Floodplain. Protected wildlife species with the potential to occur include the Preble's meadow jumping mouse (Zapus hudsonius preblei), a small rodent species listed as threatened by the U.S. Fish and Wildlife Service (USFWS). Additionally, this species is listed by Colorado Parks and Wildlife (CPW) as a threatened, Tier 1, Species of Greatest Conservation Need. The most important wetland types occupied by Preble's meadow jumping mice include riparian areas and adjacent wet meadows. Because a portion of the site falls within the 300' buffer of the 100-year FEMA Floodplain, which is classified as potential habitat, a wildlife protection zone (no-build area) is proposed at the northwestern extents of the site. See Appendix A, the proposed Site Plan, for the location of the no-build zone. As a result of this voluntary preservation action, it is anticipated that no further coordination with the USFWS or CPW regarding listed species will be required for this project. No other listed species involvement is anticipated for this project.

WILDFIRE HAZARD

According to the CSFS Colorado Wildfire Risk Map, the site is at low to moderate risk for wildfire. (Appendix D). Also, reference the Wildland Urban Interface (WUI) Worksheet (Appendix E)

BLACK FOREST FIRE DEPARTMENT PROTECTION REPORT

The proposed project is within the boundaries of the Black Forest Fire Protection District. The Fire District consists of 2 stations, 24 career firefighters, 9 volunteer EMS personnel, and command staff. The nearest station to this project is approximately 1.5 miles away (Station 1), located at 11445 Teachout Rd, Colorado Springs, CO 80908. Anticipated travel time to the site from Station 1 is approximately 3 minutes.

Apparatus at Station 1 includes:

- Engine 711 (Type 1, 750 gallons)
- Brush 741 (Type 6)
- Tender 761 (1800 gallons)

- Medic 781 (Ambulance)
- Wildland Type 3
- Reserve Tender
- Reserve Brush
- Reserve Engine
- Command vehicles

Apparatus at Station 2 includes:

- Engine 712 (Type 1, 500 gallons)
- Brush 742 (Type 6)
- Medic 782 (Reserve Ambulance)

Black Forest Fire District has an ISO insurance rating of 5 that will apply to the homeowners' insurance for structures built in this subdivision. In addition to fire response, Black Forest Fire Department provides Advanced Life Support ambulance transport.

Per section 6.3.3.(A)(4) of the LDC of El Paso County, Colorado:

It is the responsibility of the Fire Authority to provide recommendations as to whether a new development meets the applicable fire code standards for the respective area. If a new development does not meet the applicable standards, then the fire authority should provide comments regarding areas of non-compliance and recommendations for achieving compliance.

The proposed subdivision will utilize a well water source and therefore per section 6.3.3. (C)(1)(a):

For areas without municipal-type water systems, NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting, shall be applied.

Per section 6.3.3. (C)(1)(d)(i) Fire Cisterns:

Fire Cisterns Required: Fire cisterns shall be provided in planned building areas which are not served by hydrants, unless the Fire Authority has recommended and the approval authority has approved an alternative fire protection water supply system.

- This project does not propose fire cisterns for the three lots. The homes are planned to have fire suppression systems.

Per section 6.3.3. (C)(3) Non-Road Access:

Emergency Access Provided: Access for emergency responders, ingress, egress, and evacuation shall be provided for all buildings.

- A shared private driveway with a minimum width of 26 feet is provided for access to the three lots.

Driveways Required: Where any point of a building is greater than 150 feet from a road, a driveway meeting these standards shall be provided to within 150 feet of the furthest point on the building.

- The shared driveway extends to the lots to provide access to the homes within 150 feet.

Width of Driveway and Emergency Vehicle Lanes: Where the driveway is greater than 150 feet in length, it shall be not less than 10 feet in unobstructed width. Emergency vehicle lanes providing one-way travel shall be a minimum of 16 feet in width, and fire lanes with two-way travel shall be a minimum of 24 feet in width.

- A proposed shared private driveway with a minimum width of 26 feet is provided for access to the three lots.

Vertical Clearance: At least 13 feet 6 inches of vertical clearance shall be provided and maintained over the full width of an emergency vehicle lane or driveway.

- Adjacent trees will be removed to ensure the vertical clearance is achieved.

Turns: Required driveways shall be designed, constructed, and maintained to accommodate the turning radius of the largest apparatus typically used to respond to that location. A turn in an emergency vehicle lane shall be constructed with a minimum radius of 25 feet at the inside curb line and a minimum radius of 50 feet at the outside curb line.

- The minimum required radii will be met. The current shared private driveway design shows 500 foot centerline radii. Each individual driveway will be required to be constructed with the minimum radii listed

Grades: Road grades steeper than 10 percent may be permitted where the Fire Authority and ECM Administrator recommend that the mitigation measures are adequate and the approval authority approves the mitigation measure.

- The proposed roadway grade will not exceed 10 percent.

(j)

Turnouts and Turnarounds Required:

Driveways. Where the required driveway is greater than 300 feet, it shall be provided with turnouts or turnarounds at locations approved by the approval authority with recommendation from the Fire Authority.

- Two turnarounds have been provided on the shared private driveway. Individual driveways will be required to have appropriate turnarounds based on the their design.

Turnarounds Required: The fire authority may provide a recommendation regarding turnarounds. Dead-end emergency vehicle lanes in excess of 300 feet in length shall be provided with turnouts and turnarounds as approved by the approval authority. The turnaround at the terminus shall have a minimum radius of 50 feet. The approval authority shall be authorized to approve, as an alternative, a "hammerhead" turnaround to provide emergency vehicles with a three-point turnaround.

- An approved hammerhead has been provided at 750 feet from the road and a 50 foot radius cul-de-sac has been provided at the end of the private shared driveway.

For any further information regarding Black Forest Fire Department, please, reference their website at https://www.bffire.org and Black Forest Community Wildfire Protection Plan. (Appendix G)

MITIGATION

Some treatments have been completed, including some projects identified in the 2007 CWPP. Treatments completed to date have been accomplished by individual landowners taking responsibility to create defensible space. The owners have hired a third party to preform mitigation activities on an Annual basis. The following activities have already been preformed on Site:

- Cut undergrowth
- Removed dead and diseased trees (beetle kill trees)
- Removed low hanging ladder fuels
- Returned chips to site to help with soil rejuvenation

According to the site planning and maintenance within defensible zones, each residential site will be encouraged to address the principles of protection zones within this grassland

environment with the goal of reducing dense and tall landscape materials within the initial 15' zone around structures. This would include thinning and branching-up of existing tress and ground plain materials. Other mitigative techniques/forest treatment options include hand thinning, mechanical thinning, mastication, chipping, and prescribed fire. See Black Forest Community Wildfire Protection Plan: Section 4.2.

Mitigation efforts can be reviewed in the EPC Community Wildfire Protection Plan for Unincorporated El Paso County, with reference to Forest Action Plan, provided by the Colorado State Forest Service.

FORESTRY MANAGEMENT

The Project is in compliance with the Forestry management criteria outlined in Land Development Code (LDC) Section 6.3.4

The Colorado Forest Action Plan (Appendix H) should be utilized as a basis for forest management altogether. The Black Forest area consists primarily of Ponderosa Pine trees. Threats to Ponderosa Pine trees are mostly related to the introduction of the Douglas-Fur tree to the ecosystem. In a wildfire scenario, the understory Douglas-Fur will facilitate the movement of fire into the pine crowns. Forestation / wildland fire mitigation efforts, as shown below, should be implemented to for fire mitigation and better health of these forests.

Other Forestry Best Management Practices Include:

- Road Maintenance
- Road Drainage
- Stream Crossings and Stream Bank Protection
- Slash Treatment and Site Preparation
- Re-vegetation of Disturbed Areas

Forestry management begins at the time of development but extends as an obligation of the HOA and property owners into perpetuity. Per 6.3.4(B)(3) Maintenance Responsibilities of the El Paso County LDC, the ranking of responsibility for maintenance and mitigative actions is as follows: 1: Home/Property Owner; 2: HOA (Common areas, HOA enforcement against homeowners, obligation to maintain in private road tracts, etc.); 3: Builder (removal or thinning of existing vegetation and potential ground fuel; 4: Developer (responsibility to complete requirements of the plan, relationship to financial assurance, relationship to warranty/maintenance bond, relationship to future filings, relationship to buildings, etc.).

This Forestry Management Plan shall be recorded on the final plat and related documents, if required by the County. Mitigation efforts can be reviewed in the EPC Community Wildfire

APPENDIX A

SITE PLAN

11480 LAST STANLEY POINT

555' INTERSECTION SIGHT TRIANGLE (50 MPH)

11485 LAST STANLEY POINT

5590 BURGESS ROAD

5650 BURGESS ROAD

5680 BURGESS ROAD

BURGESS ROAD

25' EOP

EXISTING DRIVEWAY ACCESS

EXISTING DRIVEWAY CENTERLINE

PROPERTY LINE

EXISTING FENCE

PROP. 50' PRIVATE ACCESS EASEMENT

PROP DRIANAGE EASEMENT (WIDTH VARIES)

PROP. 50' PRIVATE ACCESS EASEMENT

EXISTING GATE POST

MAINTAIN EXISTING DRIVEWAY ACCESS

EX. 59' ROW

PROPOSED 20' ROW PRESERVATION EASEMENT

PROPOSED WILDLIFE PROTECTION ZONE (NO-BUILD AREA)

PROP. 30' DRAINAGE EASEMENT

150.0'

PROP. LOT 3
8.69 ACRES
(378,626.80 SF)
ACCESS EASEMENT-3,461 (0.08 AC)
NO BUILD WILDLIFE EASEMENT-
24,650 SF (0.57 AC)

PROPERTY LINE

PROP. 30' DRAINAGE EASEMENT

PROPERTY LINE

EXISTING FENCE

LA FORET CONFERENCE AND RETREAT
12150 BLACK FOREST ROAD

PROPOSED PROPERTY LINE

5565 BURGESS ROAD

PROP. LOT 1
8.62 ACRES
(375,461.23 SF)
ACCESS EASEMENT-31,195 (0.72 AC)
ROW PRESERVATION EASEMENT
11,109.82 SF (0.26 AC)

555' INTERSECTION SIGHT TRIANGLE (50 MPH)

PROPOSED PROPERTY LINE

PROP. LOT 2
17.06 ACRES
(742,989.35 SF)
ACCESS EASEMENT-39,500 (0.91 AC)

HOLMES ROAD

PROPERTY LINE

EXISTING FENCE

5980 BURGESS ROAD

7330 WINDING OAKS DR.

811 Know what's below. Call before you dig.

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

GRAPHIC SCALE IN FEET
0 40 80 160

NORTH

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
2022 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue Suite 900
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: MJK
DRAWN BY: MJK
CHECKED BY: KRK
DATE: 02/1/2023

5740 BURGESS ROAD
EL PASO COUNTY, COLORADO
CONSTRUCTION DOCUMENTS
SITE PLAN

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
196624000

SHEET
1

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APPENDIX B

NRCS SOIL RESOURCE REPORT

United States Department of Agriculture

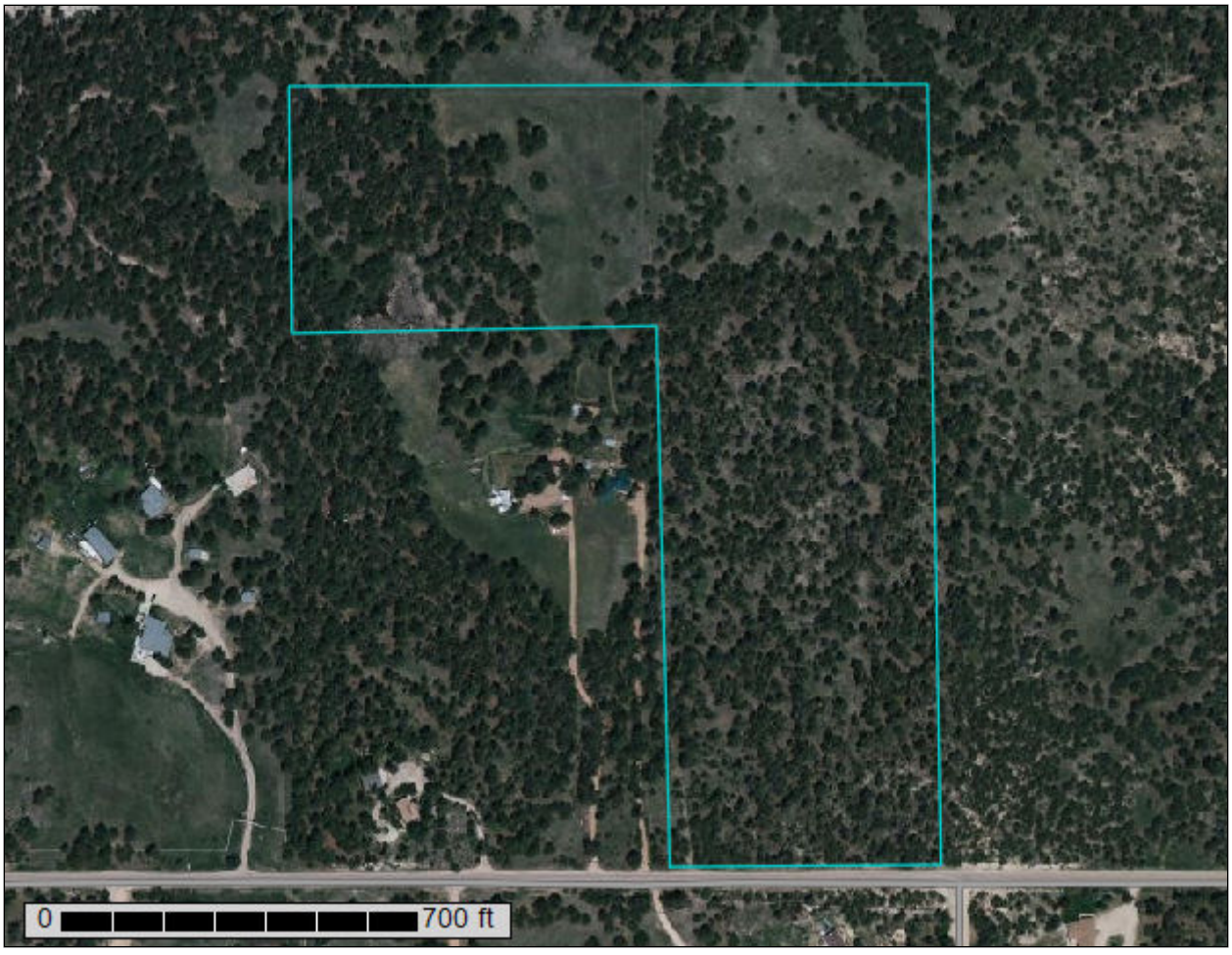
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for El Paso County Area, Colorado

Renehan Subdivision



January 9, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

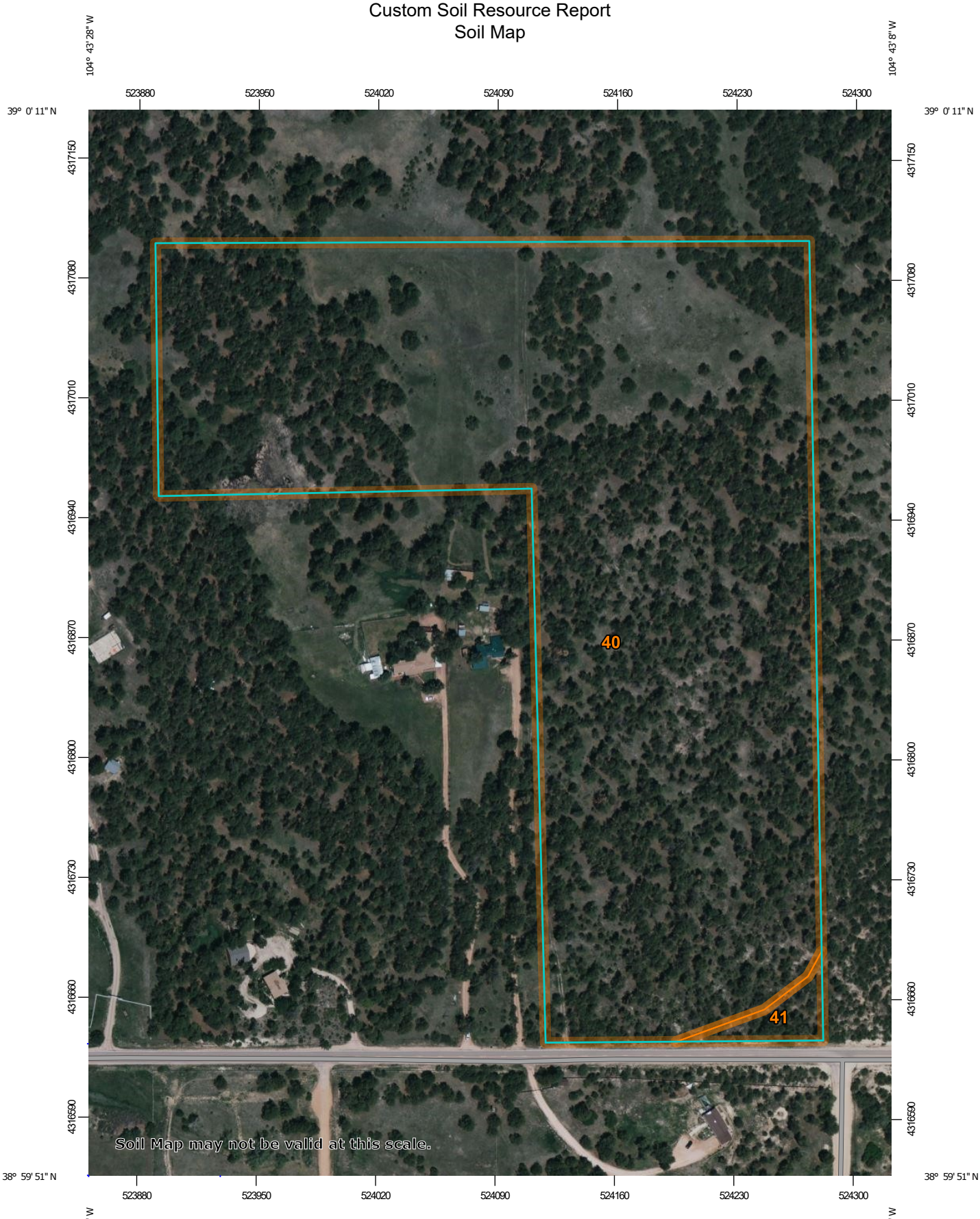
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,030 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	26.6	98.6%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	0.4	1.4%
Totals for Area of Interest		**27.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

40—Kettle gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368g
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

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APPENDIX C

FEMA FIRM MAP

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

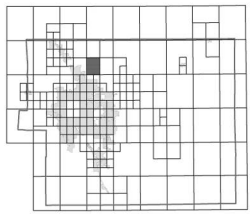
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

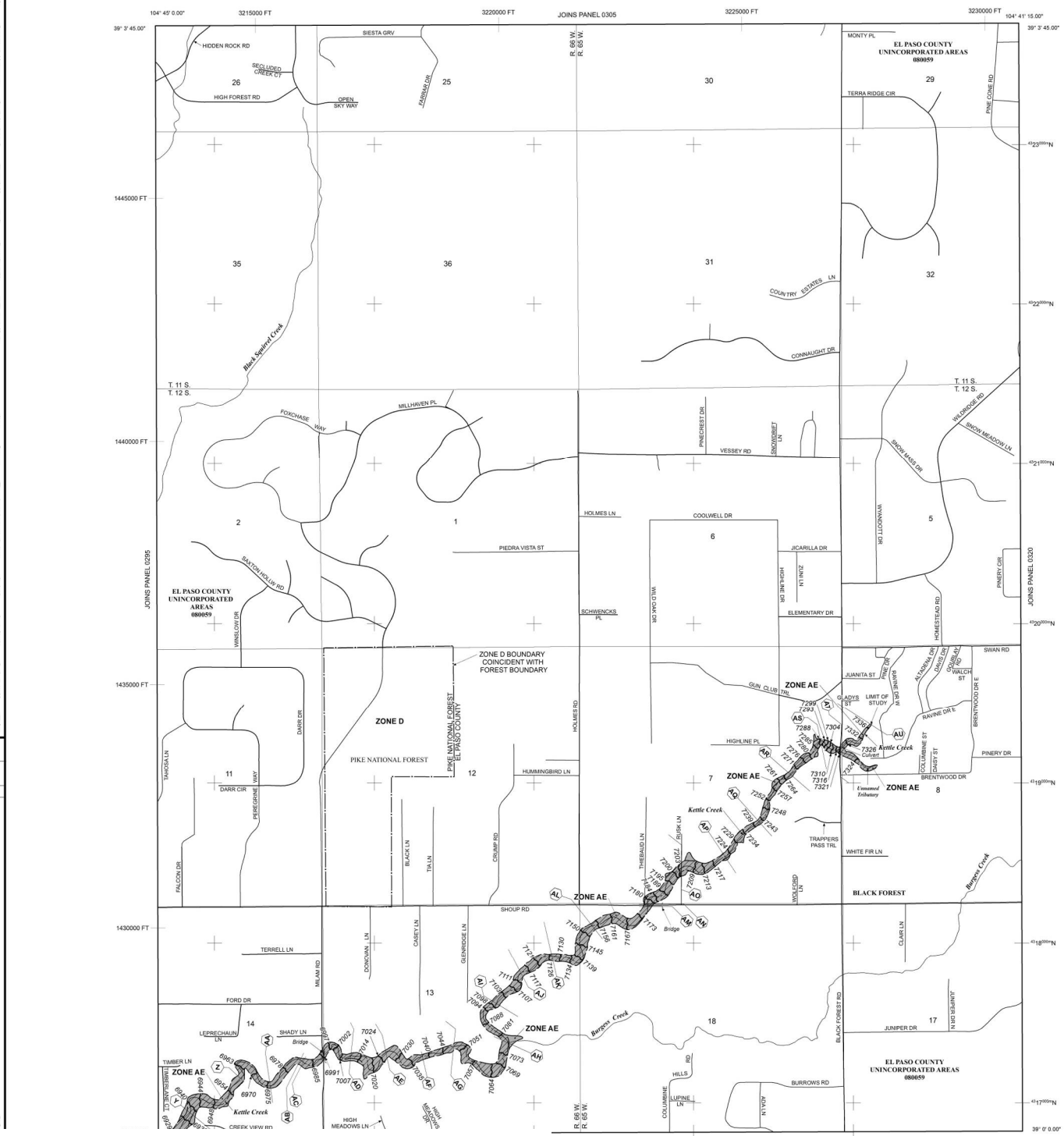
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line
23 — 23 — Transect line
97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0315G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 315 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0315	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0315G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

APPENDIX D

CSFS WILDFIRE RISK MAP

Colorado Wildfire Risk Public Viewer

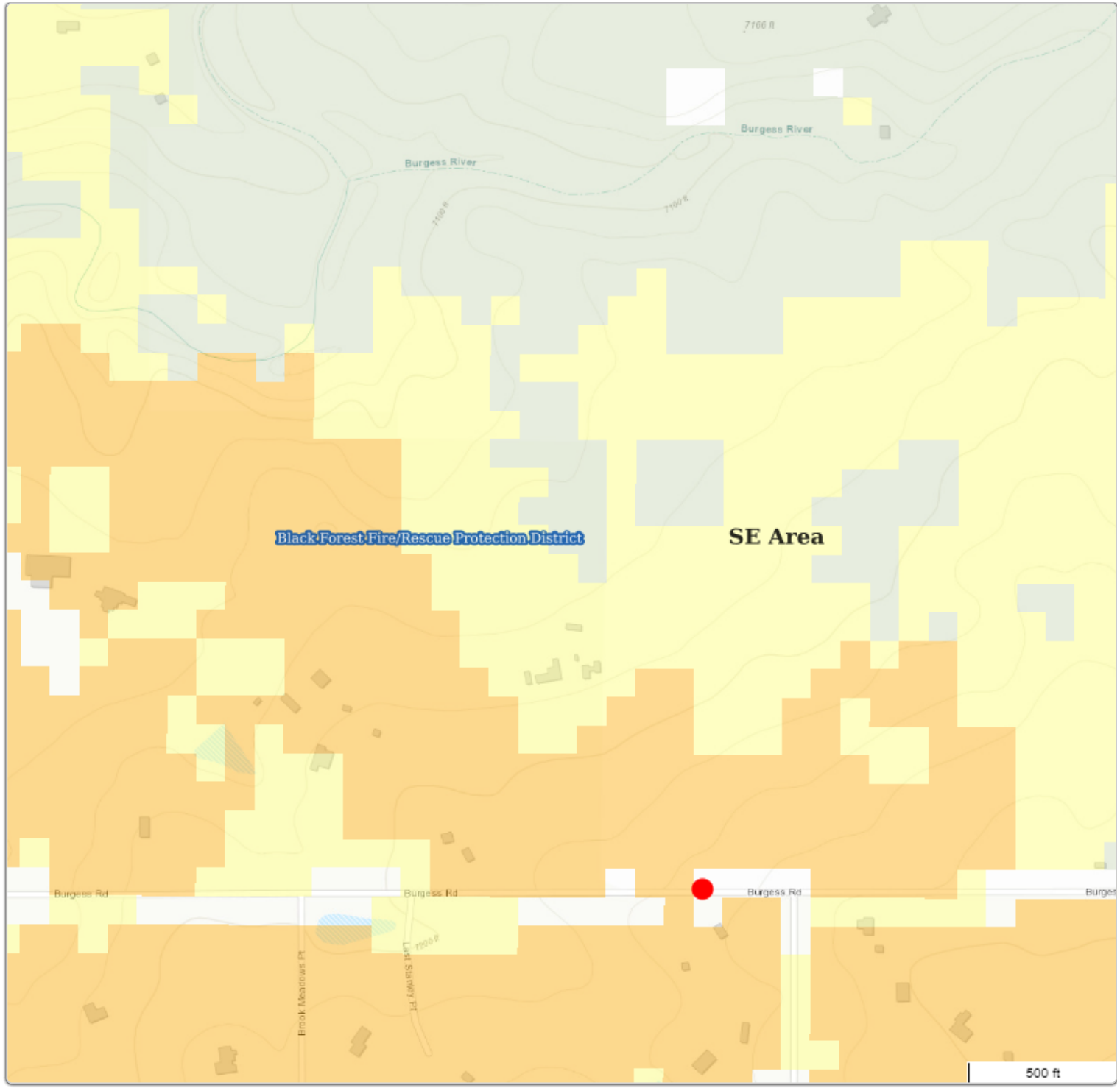
https://co-pub.coloradoforestatlas.org

Wildfire Risk - Renehan Subdivision

The overall composite risk occurring from a wildfire derived by combining Burn Probability and Values at Risk Rating.

Created on:

1/16/2023, 11:56 AM



Disclaimer

APPENDIX E

COLORADO WILDFIRE RISK – WUI WORKSHEET

COLORADO WILDFIRE RISK

Understanding the wildland-urban interface risk index

EL PASO COUNTY

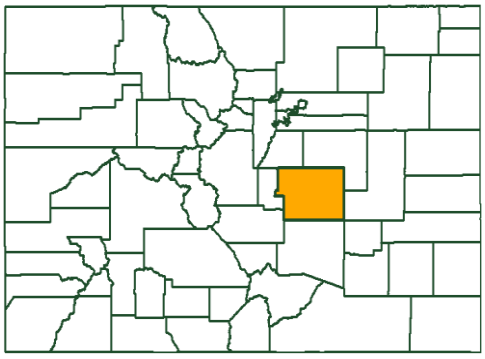
Adapt, Prepare by Knowing Fire Risk

Each county in Colorado is unique, with a character shaped by individual history, land, climate, people and resources. However, something every county in the state shares is the potential to be negatively affected by wildfires.

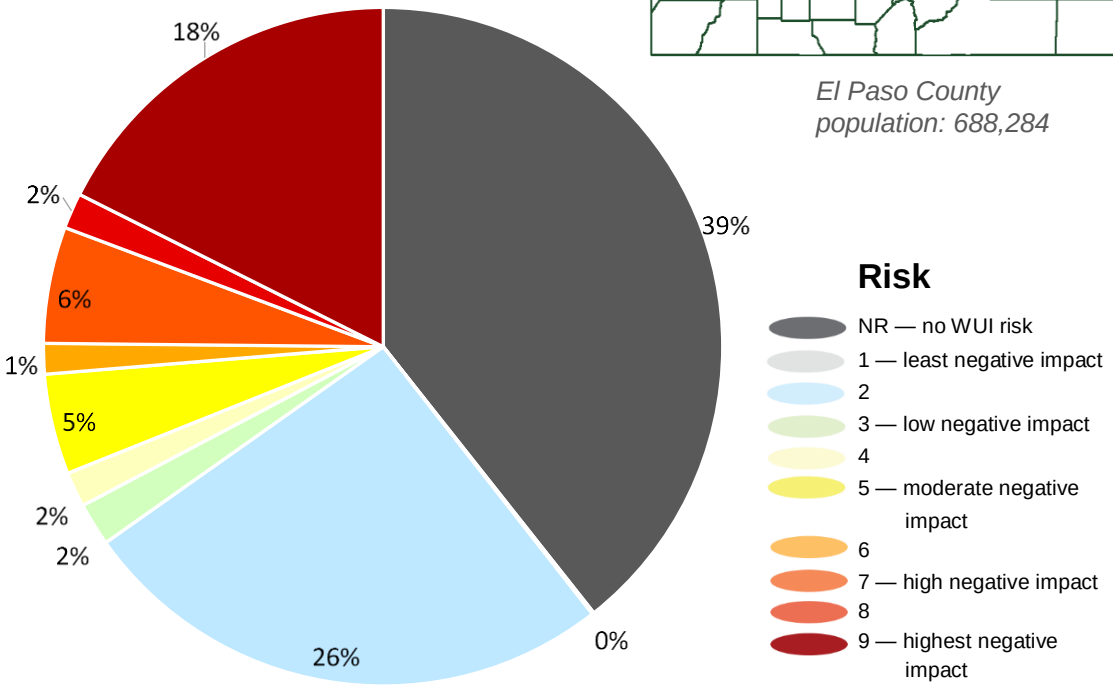
In order to effectively prepare for the impact of wildfires, residents, leaders and community planners must be aware of the wildfire risk associated with living in the wildland-urban interface and recognize actions that can be taken to reduce this risk. Connecting with wildfire resources — like those listed below — can help guide wildfire adaptation efforts from a personal to a community-wide level.

WUI Risk

This chart shows the portion of El Paso County's residents who live within the wildland-urban interface classified by level of wildfire impact on lives and property.



El Paso County population: 688,284



THE DATA: *The Wildland-Urban Interface Risk Index, created by the Colorado State Forest Service, is a rating of the potential impact of a wildfire on people and their homes. It is created using housing density combined with modeled fire behavior to determine where the greatest potential impact to people and homes is likely to occur. The index is calculated consistently for each Colorado county, available in the Colorado Forest Atlas at coloradoforestatlas.org.*

WUI

The wildland-urban interface (WUI) is an area where structures or other human developments meet or intermingle with wildland vegetation or fuels.

Approximately half of Colorado's population lives in the WUI. As of 2018, 2.9 million of the state's 5.7 million residents live in these vulnerable areas.

Wildfire Impact

Wildfires are a natural part of every ecosystem in Colorado. However, wildfire can also harm human improvements and health.

The impact a fire can have in any WUI location is determined primarily by ignitability of structures, natural vegetation (fuel) present, and the proximity of fuels to human improvements.

What Can Be Done?

There are many actions that can reduce wildfire risk. From homeowners establishing defensible space and hardening structures, to community-wide mitigation efforts and fire department risk assessments, to county-wide building code and regulation adoption. Programs exist to guide efforts to adapt to living with wildfire in Colorado.

Learn more

The Colorado State Forest Service offers more about wildfire mitigation at csfs.colostate.edu/wildfire-mitigation.

Legend

https://co-pub.coloradoforestatlas.org

Wildfire Risk

- Lowest Risk
- Low Risk
- Moderate Risk
- High Risk
- Highest Risk

CSFS Areas

- < 1:2,200,000 (labeled)

County Boundaries

- < 1:1,500,000

Fire Protection Districts

- < 1:250,000 (labeled)

APPENDIX F

BFFR GUIDANCE FOR FIRFIGHTING ACCESS AND ROADS

Black Forest Fire/Rescue Protection District
11445 Teachout Road
Colorado Springs, Colorado 80908
Ph-719.495.4300
Fax 719.495.7504
Web- www.bffire.org

"Always Ready, Always Forward, Always Learning."

Office of the Fire Marshall

Guidance Document for Firefighting Access and Roads

The Black Forest Fire/Rescue Protection District as a title 32 Special Fire District which has the responsibility to oversee fire code adherence within its legal boundaries in accordance with current laws and standards established by the state and local county government. The purpose of these codes is to provide for the safety of the public and ensure that the fire district and its firefighters can safely and effectively perform their job to protect life, property and the environment.

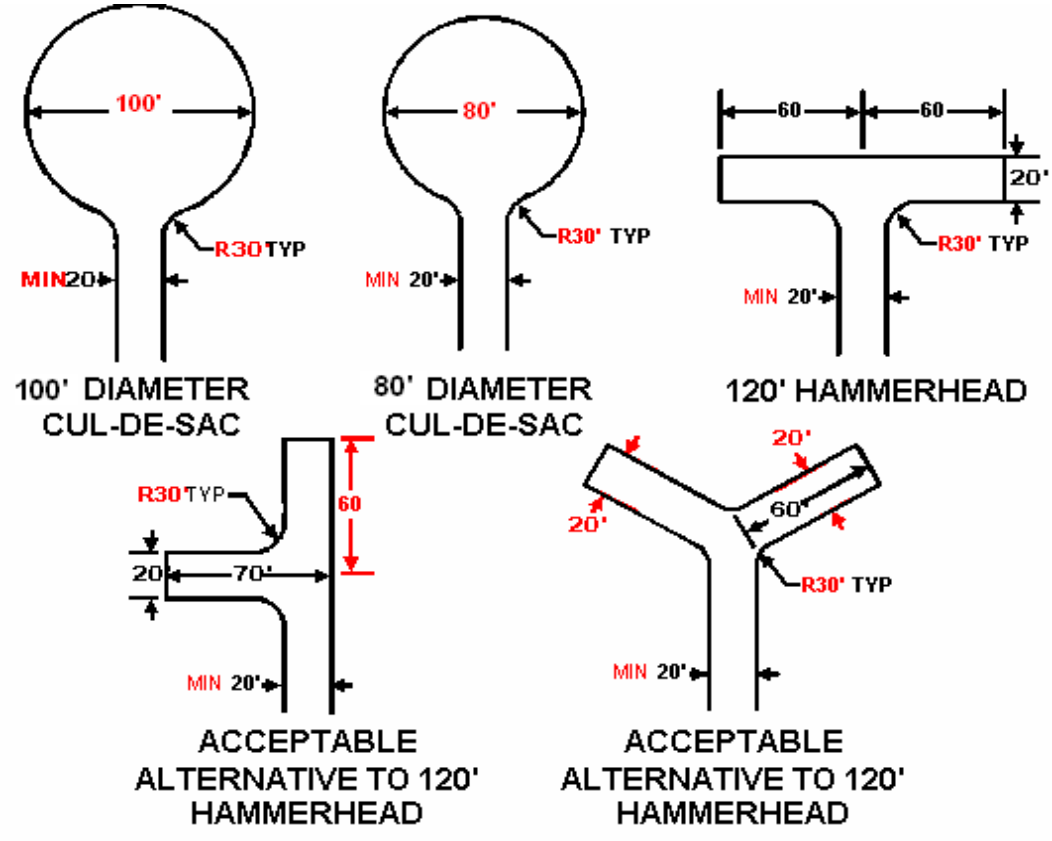
Under current El Paso County (EPC) Land Development Code effective date 01/09/2018 and International Fire Code (IFC) 2015, Black Forest Fire Rescue Protection District (BFFRPD) has a responsibility and duty to ensure that proper firefighting access roads and driveways are constructed within the fire protection district as development occurs. Without proper access to include turnarounds and turn outs the safety of the public and the firefighters is unduly put in jeopardy.

Our goal with this document is to give all developers or residents wanting to subdivide their property, guidance and information on the requirements of the BFFRPD, as it pertains to firefighting access and roadways within the boundaries of the Black Forest Fire/Rescue Protection District.

Requirements for roads and driveways that will handle fire access (2015 IFC D103.4) shall be as follows in table 1;

DEAD-END LENGTH (FEET)	MINIMUM ROAD WIDTH (FEET	APPROVED TURNAROUND OPTIONS (See Figure D103.1)
0 - 150	20	NONE REQUIRED
151 – 500	20	1) 120-FOOT HAMMERHEAD 2) 60-FOOT "Y" 3) 80- FOOT DIAMETER CUL-DE-SAC FOR DEAD-ENDS WITH CURB AND GUTTER 4) 100-FOOT DIAMETER CUL-DE-SAC FOR DEAD-ENDSWITHOUT CURB AND GUTTER
501 – 750	20	100-FOOTDIAMETER CUL-DE-SAC (ADDITIONAL INTERMEDIATE TURNAROUNDS MAY BE REQUIRED)
OVER 750		SPECIAL AHJ APPROVAL IS REQUIRED

See acceptable construction type diagrams on next page.



Minimum Vertical Clearance

All roads and driveways must have a minimum vertical clearance height of 13 feet 6 inches.

Grades

Fire apparatus access roads shall not exceed 10 percent in grade.

- Grades steeper than 10 percent must be approved by the fire code official or Fire Chief.

Fire Apparatus Access Road Gates

Gates securing the fire apparatus access road shall comply with the following criteria:

1. The minimum gate width shall be 2 feet wider than the traveled way. (EPC-LDC)
2. Gates shall be swinging (shall not open outward) or sliding type.
3. Construction of gates shall be of materials that allow manual operation by one person.
4. Gate components shall always be maintained in an operative condition and replaced or repaired when defective.
5. Electric gates shall be equipped with a means of opening the gate by fire department personnel for emergency access. All emergency opening devices shall be approved by the fire code official.
6. Manual opening gates shall not be locked with a padlock or chain and padlock unless they are capable of being opened by means of forcible entry tools or when a key box containing the keys

to the lock in installed at the location. Knox padlock system is preferred when locking with a padlock.

7. Locking devices shall be approved by the fire code official.
8. Gates intended for automatic operation shall be designed, constructed, and installed to comply with the requirements of American Society for Testing and Materials, ASTM-F 2200.

Driveways in the WUI (IWUIC Sec 403)

1. Driveways shall be provided when any portion of an exterior wall of the first story of a building is located more than 150 feet (45 720 mm) from a fire apparatus access road. (403.2)
2. Driveways shall provide a minimum unobstructed width of 12 feet (3658 mm) and a minimum unobstructed height of 13 feet 6 inches (4115 mm). (403.2.1)
3. Driveways more than 150 feet (45 720 mm) in length shall be provided with turnarounds. (403.2.2)
4. Driveways more than 200 feet (60 960 mm) in length and less than 20 feet (6096 mm) in width shall be provided with turnouts in addition to turnarounds. (403.2.2.)

5. A driveway shall not serve more than five dwelling units. (403.2.3)

    - **Exception:** When such driveways meet the requirements for an access road in accordance with the International Fire Code sec 503.

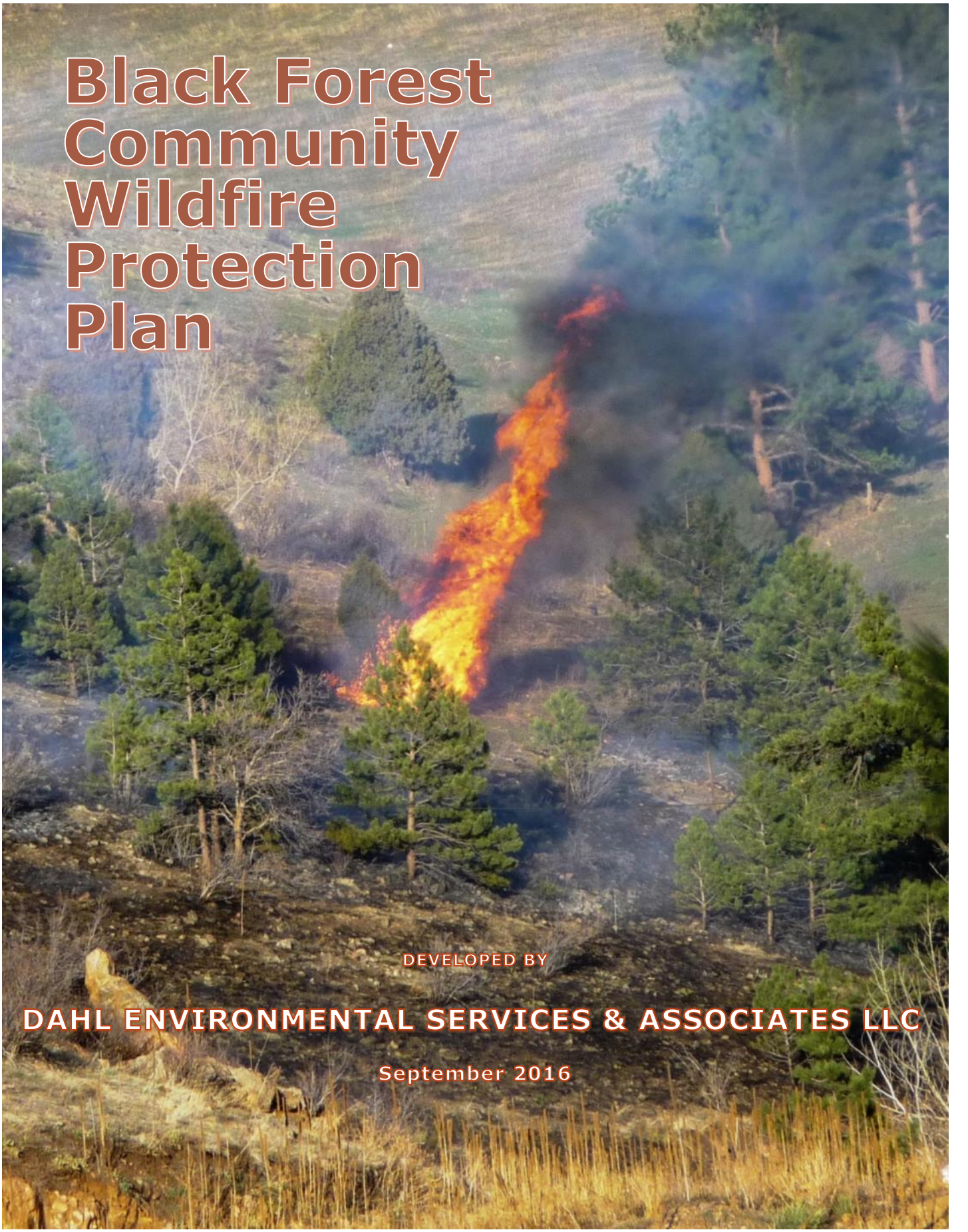
6. Driveway turnarounds shall have inside turning radii of not less than 30 feet (9144 mm) and outside turning radii of not less than 45 feet (13 716 mm). (403.2.4)
7. Driveways that connect with a road or roads at more than one point may be considered as having a turnaround if all changes of direction meet the radii requirements for driveway turnarounds. (403.2.4)
8. Driveway turnouts shall be an all-weather road surface at least 10 feet (3048 mm) wide and 30 feet (9144 mm) long. (403.2.5)
9. Driveway turnouts shall be located as required by the code official (403.2.5)
10. Address markers shall be posted at each driveway entrance and visible from both directions of travel along the road. Driveway address markers shall be posted at the beginning of construction and be maintained thereafter. (403.6)
    - If multiple address uses the same driveway additional signs shall be posted where the driveway divides. (403.6.2)
11. Black Forest Fire Rescue provides a driveway sign program to assist with compliance of this code.

Questions should be directed to the fire code official at 719-495-4300 or firemarshal@bffire.org

APPENDIX G

BFFR COMMUNITY WILDFIRE PROTECTION PLAN

Black Forest Community Wildfire Protection Plan



DEVELOPED BY

DAHL ENVIRONMENTAL SERVICES & ASSOCIATES LLC

September 2016

PROJECT LEADERSHIP TEAM

DAHL ENVIRONMENTAL SERVICES, LLC and ASSOCIATES

Bjorn Dahl

Society of American Foresters, Certified Forester; Association of Consulting Foresters

Natural Resource Consultant

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Society of American Foresters, Certified Forester; Association of Consulting Foresters

Natural Resource Consultant

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BUILDING A FUTURE TOGETHER

BLACK FOREST TOGETHER INC

FOREST PLAZA CENTER

11460 BLACK FOREST ROAD

BLACK FOREST, CO 80908

719 495 2554

RECOGNITION

The Core Leadership Team developed this Community Wildfire Protection Plan in partnership with the communities it serves. The Project Leadership Team provided development of the Black Forest CWPP. A directory of current team representatives is provided in the beginning of this report.

Over 100 community members attended plan scoping meetings and submitted personal responses that are documented in the appendix of this report. Many individuals and organizations also participated in the development of the Goals and Objectives that develop the future desired condition of the Black Forest community. We thank the many participants that contributed their time and effort to this plan, and for their dedication and commitment to preparing our community for wildfire.

Special thanks for advice, review and the valuable comments provided by, Nancy Trosper, Fire Chief Bryan Jack, Rick McMorran, Dave Root, John Padgett, Carolyn Brown, Bob Sturtevant, Bill Kappel, Judy Von Ahlefeldt, Len Lankford, Keith Worley and a very special thanks to Edward R Bracken, Sr.

We also want to recognize the extraordinary commitment El Paso County and the Colorado State Forest Service that contributed valuable staff time and resources to support the creation and approval of this document.

The State of Colorado Department of Local Affairs and the federal government for this CWPP grant. The unprecedented level of support received from federal, state, and local entities will be instrumental in the forthcoming implementation of the Black Forest Community Wildfire Protection Plan. Thank you to the authors of the 2007 Black Forest CWPP for contributing to this 2016 CWPP.

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BLACK FOREST COMMUNITY WILDFIRE PROTECTION PLAN

September 2016

Plan Approval Document

As required by the Healthy Forest Restoration Act, the undersigned representatives, Chairman of the Black Forest Inc., El Paso County Board of County commissioners, Fire Chief, and the Colorado State Forest Service acknowledge that they have reviewed and approved the contents of this plan. The following agencies have reviewed and agree to this Community Wildfire Protection Plan.

Black Forest Together

Chairman, Edward R. Bracken, Sr. Date

El Paso County Representative

Chair of the Board of County Commissioners Date

El Paso County Sherriff's Office

Deputy Fire Warden, Commander, John Padgett Date

Black Forest Fire - Rescue Protection District

Chairman of the Board, Rick McMorran Date

Black Forest Fire - Rescue Protection District, Fire Chief

Chief, Bryan Jack Date

Colorado State Forest Service

Larry Long, District Forester, CSFS Date

Black Forest Community Representative

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EXECUTIVE SUMMARY

Wildfire is inevitable in the front range of Colorado. In fact, many of the Black Forest's native plant and animal species are dependent on the natural disturbance caused by wildfires. Species in the Black Forest are fire-adapted and have developed strategies to survive and thrive in the presence of wildfire. However, wildfires become disasters when they threaten lives, burn homes, destroy infrastructure, and damage watersheds. Developing and implementing strategies to make human communities fire-adapted can reduce the severity of such disasters. This Community Wildfire Protection Plan (CWPP) provides strategies that can be implemented by community leaders, residents, fire professionals, and others that will make the Black Forest community better prepared for the next inevitable wildfire.

The Black Forest CWPP is a strategic plan that identifies specific wildland fire hazards and risks facing neighborhoods and the Black Forest community. This is a completely new CWPP prepared for the Black Forest community and provides recommendations designed to reduce those hazards and risks. The Black Forest Fire of 2013, taking two lives, destroying over 500 homes, and burning over 14T,000 acres, increased awareness of the devastating impacts wildfire can have on a community. The primary goal of this CWPP through outreach, education, strategic planning, and action, is to protect human life, animals, private property, the forest itself, and essential infrastructure and resources.

As was shown during the 2013 Black Forest Fire, the ignition risk is high throughout the community [refer to the Black Forest Fire Risk Map below]. Physical conditions and development in the wildland-urban interface emphasize the need for extensive and ongoing fuel reduction and fuels management. Many homeowners in the Black Forest community have wisely initiated a number of thinning and defensible space projects. Yet much remains to be done in a coordinated effort to address forest health and community safety objectives, reduce the potential for catastrophic crown fires, and safeguard Black Forest natural resources and the residents who live among them. The greatest pending danger from future wildfire arises from the ashes of the 2013 burnt over area with standing, black, dead timber in fields of grass. When these dead trees fall on the ground

CWPP GOALS

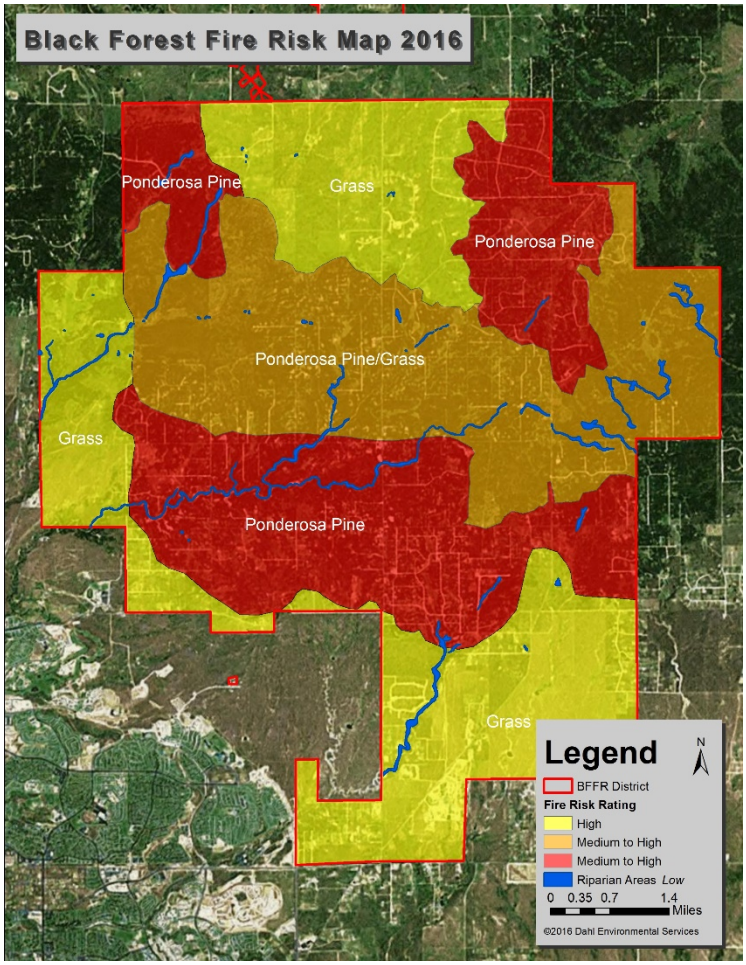
PROTECT LIVES, PROPERTY AND RESOURCES: This CWPP provides the Black Forest Community a framework and recommendations with an outcome that will save lives, reduce losses of property and community resources.

CREATE A FIRE-ADAPTED COMMUNITY: This plan provides mitigation strategies and community-driven action items to help create a community where citizens are engaged and active in preparing for wildfire. It facilitates interagency cooperation, and strengthens communication and support between agencies and the Black Forest community.

RESTORE & MAINTAIN FIRE-RESILIENT LANDSCAPES: This plan provides prioritized recommendations for fuel reduction treatments, to enable the Black Forest community to effectively address risks to the community and its ecosystems at a landscape scale.

PROVIDE EFFECTIVE & EFFICIENT WILDFIRE RESPONSE: This plan provides strategic treatments on the landscape that will facilitate safer and more successful fire suppression. It provides a plan for tracking, reporting, and sharing of both fuel reduction accomplishments and homeowner/community initiatives, and it will support risk-based management decisions and tactical actions.

they become heavy, large hazardous fuels creating extreme explosive fire behavior capable of running through the community at 3 miles per hour or more (i.e., from Black Forest Road to Vollmer Road in less than 20 minutes). Only 3-years post-burn, standing dead trees have already begun to fall.



Homeowners throughout the Black Forest community must be ever diligent and cognizant of creating and maintaining the necessary defensible space around their homes and other structures. The presence of untreated fuels on undeveloped parcels within Black Forest neighborhood boundaries increases the risk of wildland fire. Every effort must be made to encourage property owners to maintain fire-safe vegetative conditions throughout the community. The ongoing need for maintenance of fuel reduction and defensible space treatments must remain a priority for property owners choosing to live in the Black Forest community.

This plan recommends that the Black Forest community CWPP Leadership Team (BFT, BFFR, CSFS) (CWPP LT), move quickly to provide a pathway to reducing hazardous fuel accumulations within the community. To protect against the rain of burning embers from wildfires, we recommend that business owners, private landowners, with small and large tracts of land, eliminate their wildfire risks around their structures and inside the home ignition zone in a timely manner. Further, we strongly recommend forest treatments in closed canopy conifer stands adjacent to major evacuation routes and travel ways be seriously implemented as identified as high priority work areas in this plan. Additionally, we remind that all lands will need annual ongoing maintenance and retreatment.

With a great sense of urgency, we recommend continuing the strong reforestation program to maintain the ecosystem of the Black Forest community. Further, continue to recognize the work of volunteers in the community and the support of the El Paso County Slash-Mulch Program in the Black Forest. All citizens should maintain a watchful eye to eliminate dangerous insect and diseases that threaten the forest environment.

It's a basic premise of this plan that in "being prepared", the Black Forest community can minimize-or even prevent the more devastating effects of wildfire, and in doing so, better safeguard community and personal resources. Evacuation planning before a wildfire is essential. Residents should identify in advance normal and alternate escape routes out of the community and be prepared to Ready-Set-Go

when danger is near. Landowners with pets and large animals should consider their needs as an integral component of evacuation planning.

Embracing these goals and implementing the strategies and recommendations will make the Black Forest Community better prepared for the next inevitable wildfire. We suggest that a Firewise leader, homeowner in the community be recognized each year for their outstanding achievements.

This CWPP was developed in coordination with the Black Forest Fire Rescue Protection District (BFFR), Black Forest Together (BFT), Colorado State Forest Service (CSFS) and the Black Forest community. Every agency, organization, neighborhood, or individual in the Black Forest community that might be affected by the next wildfire has a role to play in creating a fire adapted community. This plan provides a common frame of reference for engaging and finding common solutions, implementing actions, and monitoring progress towards the CWPP goals.

ACRONYMNS AND ABBREVIATIONS

ACF	Association of Consulting Foresters of America
BFFR	Black Forest Fire Rescue Protection District
BFT	Black Forest Together
CO-WRAP	Colorado Wildfire Risk Assessment Portal
CSFS	Colorado State Forest Service
CWWP	Community Wildfire Protection Plan
DBH	diameter at breast height
FM	fuel model
HFRA	Healthy Forests Restoration Act
HOA	homeowners' association
ISO	Insurance Services Organization
NFFL	Northern Forest Fire Laboratory, USDA- Forest Service Research
SAF	Society of American Foresters
SI	Site Index
SAMCOM	El Paso County Slash and Mulch Committee
WUI	wildland-urban interface

1. INTRODUCTION

1.1 COMMUNITY WILDFIRE PROTECTION PLAN PURPOSE

Wildland fire in Colorado is well documented. It's been occurring for eons, and has shaped the landscape we treasure. It brings nutrients to the soil and diversity to the vegetation and wildlife, and in doing so benefits all of us who later live in its path. More to the point, we cannot stop wildfire from occurring. Our attempts to do so – our suppression of all wildland ignitions for most of the 20th century, without active vegetation management, have actually made a complicated "fire management" situation more difficult. Decades of aggressive fire suppression practices in fire-adapted ecosystems such as the Black Forest, have removed a critical natural cleansing mechanism from the vegetation regeneration cycle. Fire exclusion has altered historic forest and shrubland conditions, and contributed to an unprecedented and unnatural accumulation and buildup of naturally occurring flammable fuels. Additionally, years of persistent drought have resulted in stressed timber and regional epidemics of insect infestation. At the same time, demographic trends have shifted the nation's population growth, as well as Colorado's growth, to western states and communities where fire adapted ecosystems are predominant. The region where human development is pushing into these stressed ecosystems is known as the wildland-urban interface (WUI) and represents the area where potential loss due to wildfire is the greatest.

The Community Wildfire Protection Plan (CWPP) is a strategic plan that identifies specific wildland hazards and risks facing the Black Forest community and neighborhoods and provides prioritized mitigation recommendations that are designed to reduce wildfire hazards and risks. This document emphasizes *collaboration,* and *reduction of hazardous fuels and structural ignitability*. It gives Black Forest residents "notice" of their wildfire hazards and risks and offers suggestions for actions to address them. Once the CWPP is approved and adopted, it becomes the Black Forest community's responsibility to move forward and implement the action items identified in this plan. This may require further planning at the project level, acquisition of funds, or simply motivating individual homeowners to take action.

Crown fire from ladder fuels

Not that long ago, the job of protecting communities and other valued resources from wildland fire appeared to belong to the fire fighter. The citizen's job was to report the wildfire ignition to 911 and run to safety. This is still true, of course, but with a trend toward more episodes of severe wildland-urban interface fire in the United States, there is an increasing recognition that everyone within a community must be involved in protecting lives and property from fire. That means there is a role for property owners, developers, community planners, public officials, insurance agents, fire professionals, and many more. The task begins before a wildfire occurs. This demands planning and participation by those potentially affected.

Precipitated by over a century of increasing wildfire activity, spiraling suppression costs, and dramatic losses, the National Fire Plan was developed in 2000. Subsequently, President George W. Bush proposed the Healthy Forests Initiative, which was enacted into law by the Healthy Forests Restoration Act (HFRA) of 2003 (Public Law 108-408). The act helped implement the elements of the National Fire Plan and provided the foundation for wildfire risk assessment and planning. Communities were encouraged to create CWPPs to collaboratively designate areas in the Wildland-Urban Interface (WUI) that were the most in need of thinning at county and community level. The HFRA refers to this level of planning as the CWPP process. The HFRA provides a framework for hazard evaluation and strategic planning for community action to create resilient communities.

A CWPP must be collaboratively developed by local and state representatives in consultation with other interested parties…

Healthy Forests Restoration Act

The purpose of this CWPP is to protect lives, property and the environment within the Black Forest community from wildfire by implementing prioritized fuels reduction projects and engaging the public in becoming a Fire Adapted Community. This CWWP serves to identify the Black Forest community risks, identify what constitutes the risk, and develop an action plan to mitigate the risk, thereby providing a vegetative structure for the community that is resilient to the effects of wildland fire.

The HFRA defined the minimum requirements for a CWPP. These are:

COLLABORATION: Local and state government representatives, in consultation with federal agencies and other interested parties, must collaboratively develop a CWPP.

PRIORITIZED FUEL REDUCTION: A CWPP must identify and prioritize areas for hazardous fuel reduction treatments, and recommend the types and methods of treatment that will protect one or more at-risk communities and essential infrastructure.

TREATMENT OF STRUCTURAL IGNITABILITY: A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan.

The Black Forest CWPP is a community-wide assessment of the risks, hazards, and mitigation and prevention opportunities associated with wildfire in the Black Forest community. The Black Forest community changed dramatically as a result of the June 2013 Black Forest Fire. The development of this CWPP is specifically tiered to update the Black Forest CWPP dated October 11, 2007. Funding for this update is provided under the State of Colorado Community Development Block Grant Disaster Recovery Program from the federal government.

Authority and responsibility for managing vegetation on private property within Black Forest rests with the landowner. El Paso County and individual landowners share the authority and responsibility for managing vegetation on the road rights-of-way.

The CWPP will be reviewed annually to identify changes or updates; evaluate effectiveness of coordination between cooperating agencies; community groups, and neighborhoods; evaluate progress

in meeting specific performance measures; and will adjust any monitoring protocols as needed. Coordination and communication will be critical operative requirements. The CWPP Steering Committee will conduct a thorough review and risk analysis every 5 years. The steering committee is represented by representatives from BFFR, BFT, CSFS, El Paso County and SAMCOM.

Black Forest Together (BFT) has recognized that the community may be at risk from wildfires moving into or originating within the BFFR Protection District (District). BFFR has provided leadership to educate homeowners to develop defensible space for several years in conjunction with implementing the 2007 CWPP. One of the success of the 2007 CWPP has been creating and implementing Firewise concepts in the Black Forest community.

1.2 NEED FOR A COMMUNITY WILDFIRE PROTECTION PLAN

Historically, natural wildfire would pass through this area with relative frequency allowing forests, shrub lands, and grasslands to adapt morphology, growth and reproductive patterns to a periodic cleansing by fire. Land management policies centered on fire suppression have altered this cycle and exacerbated the potential for high-intensity wildfire by allowing fuels to build up and facilitating the decline of forest health.

Weather plays a critical role in determining fire frequency and behavior. A dry climate and available fuels in an area prone to strong gusty winds can turn any ignition into a major wildfire in a matter of several minutes.

The Black Forest community is characterized by a combination of a relatively dense population, heavily utilized travel routes, fire-adapted vegetation, and the potential for natural and human ignitions. These factors combine a degree of hazard, ignition risk, and values at risk that require serious evaluation. The combination of environmental esthetics, recreational opportunities, and proximity to a major metropolitan area make the Black Forest community a desirable location to live and work.

However, the community is characterized by several factors that typify a hazardous WUI: human development within fire-adapted ecosystems, uneven topography, frequent natural and human-caused ignitions, presence of hazardous fuels, prolonged drought, and dry, windy weather conditions. Each neighborhood or subdivision represents a distinct area with a unique combination of wildfire fuels, predominant building construction materials, topography, access, available resources, and opportunities for fuels mitigation.

The CWPP provides a coordinated assessment of neighborhood wildfire risks and hazards, and outlines specific mitigation treatment recommendations designed to make the Black Forest community a safer place to live, work, and play. The CWPP development process can be a significant educational tool for people who are interested in improving the environment in and around their homes. It provides ideas, recommendations, and guidelines for creating a defensible space around the house and ways to reduce structural ignitability through home improvement and maintenance.

HFRA places emphasis on local community wildfire protection and response planning by extending a variety of benefits to communities with a wildfire protection plan in place. This 2016 revised CWPP will meet or exceed the minimum standards established by the Colorado State Forest Service (CSFS).

Individual home and property owners should strive to understand and apply principles and guidelines in the CSFS Publication, *Protecting Your Home from Wildfire: Creating Wildfire Defensible Zones FIRE 2012-1*, and seek to implement the Firewise recommendations found at www.firewise.org.

This CWPP update covers 46 Sections or about 29,440 acres of the BFFR District. This plan has been prepared by professional foresters, certified by the Society of American Foresters (SAF) and the national Association of Consulting Foresters (ACF), at the request of the BFT, to guide them in development of a CWPP for the Black Forest community.

1.3 THE CWPP PLANNING PROCESS

The HFRA designed the CWPP to incorporate a flexible process that can accommodate a wide variety of community needs. This CWPP is tailored to meet specific goals as identified by the Core Team, following the standardized steps for developing a CWPP as outlined in *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities* (SAF 2004) and the CSFS Minimum Standards for Community Wildfire Protection Plans (CSFS 2006). Table 1 outlines the CWPP step-wise development process.

The initial step in developing the Black Forest CWPP was to organize an operating group to serve as the core decision-making team. The Core Leadership Team consists of representatives from local government, local fire authorities, and the CSFS. In addition, the Core Leadership Team includes active community residents and homeowners' association (HOA) stakeholders. Collaboration between agencies and with communities is an important CWPP component because it promotes sharing of perspectives, plans, priorities, and other information that is useful to the planning process. Together these entities guide the development of the CWPP as described in the HFRA and must mutually agree on the plan's final contents.

Community Engagement

The CWPP team held two community meetings in order to obtain Black Forest citizen input to the planning process. These meetings were held prior to development of the Draft plan. The Core Leadership Team assisted in organizing the community meetings held at the BFFR station. BFT advertised by word-of-mouth, posting in local businesses and news releases in the community newspaper. A slide presentation was used at these gatherings to describe the CWPP process and to solicit concerns and recommendations.

Public participation was very good; however, attendance was minimal at these community meetings (see meeting summaries in Appendix 10.4). Meaningful discussion focused on fire protection, hazardous fuels reduction, communication, and evacuation priorities. These conversations also capture the need for consistent community education and awareness. The product of public participation is framed in the CWPP as the desired future condition of the Black Forest community (Mission Statement), Goals, and Objectives.

Collaboration

BFT was the organization that initiated the collaborative efforts with key partners, targeting a cross-jurisdictional, regional approach to best leverage resources and was based on the collaborative process which is a key requirement the Congress established for a CWPP. Collaboration is simply people working together to address a shared problem. One of the significant outcomes of the collaborative process build trust, working relationships and partnerships among the community. Effective collaboration ensures that all bases are covered in the planning process and that potential problems are identified.

BFFR-BFT collaborative CWPP community meeting

The 2013 Black Forest Wildfire devastated 14,000 acres of forest in northern El Paso County, crossing over multiple fire districts. The majority of the fire occurred in the BFFR District with significant burn in the east bordering Falcon Fire Protection District and some burn in the west bordering Donald Wescott Fire Protection District. Additional neighboring fire districts were impacted with mandatory evacuation. A wildfire in El Paso County is a threat to the entire geographic area and in order to be effective it needs to be addressed on a regional level.

Successful collaboration at a regional level in northern El Paso County is already underway as demonstrated by mitigation projects between BFT, BFFR District and the Donald Wescott Fire Protection District. These projects have focused on the expansion of shaded fuel breaks along emergency evacuation routes on roadways used by both fire districts and also alignment on strategic projects that benefit the geographic area. This partnership is in the process of being expanded with additional neighboring fire districts as well as ongoing alignment with El Paso County, the Colorado State Forest Service, the Black Forest Slash/Mulch Program and private industry.

In addition, the recent fires in Colorado have demonstrated to residents the need for homeowners to take more responsibility to protect and preserve the forest in which they live. A cultural shift of shared responsibility and partnership between fire districts, municipalities, forestry organizations and homeowners is critical to achieve the common goal of healthy forests and watersheds. This collaboration needs to grow in order to leverage regional mitigation with limited funding.

This plan was developed in collaboration with representatives from:

El Paso County Planners
El Paso County Commissioners
Black Forest Fire-Rescue District #1
El Paso County Sheriff's Office
Falcon Fire District
National Audubon Society
Colorado State Forest Service
Society of American Foresters
Black Forest Trails Association
Association of Consulting Foresters
Pikes Peak Region Humane Society
La Foret Forest and Camp Officials
Black Forest Citizens, Business owners
BFFR Board of Directors
Animal Groups in the Black Forest
Homeowners Associations
Professional Foresters in the Black Forest Area

THE CWPP METHODOLOGY

After the establishment of the Healthy Forests Restoration Act, a variety of planning framework models were developed throughout the country. This framework was developed by the National Association of State Foresters, National Association of Counties, Society of American Foresters and others. This framework, known as the "NASF" model and the CSFS model was chosen for the Black Forest CWPP process. Below is a summary of the steps identified in the process.

Table 1. CWPP Development Process

Step	Task	Explanation
1	Convene Decision Makers	Form a Core Leadership Team comprised of representatives from local government, BFFR, and the CSFS.
2	Involve Federal Agencies	Engage local representatives of appropriate Federal agencies.
3	Engage Interested Parties	Contact and encourage participation from a broad range of interested organizations and stakeholders.
4	Establish a Community Base Map	Develop a base map of the Black Forest community that provides an understanding of communities, critical infrastructure, and forest/open space at risk.
5	Develop a Community Risk Assessment	Develop a risk assessment that considers fuel hazards, community and commercial infrastructure, resources, and preparedness capability. Rate the level of risk and incorporate into the base map as appropriate.
6	Establish Community Priorities and Recommendations	Use the risk assessment and base map to facilitate a collaborative public discussion that prioritizes fuel treatments and nonfuel mitigation practices to reduce fire risk and structural ignitability.
7	Develop an Action Plan and Assessment Strategy	Develop a detailed implementation strategy and a monitoring plan that will ensure long-term success.
8	Finalize the CWPP	Finalize the Black Forest CWPP and communicate the results to interested parties and stakeholders.

1.4 MISSION, GOALS, AND OBJECTIVES

The mission of the Black Forest Team is to protect lives, property, and the environment within the District from wildfire by implementing prioritized fuel reduction projects and engaging the public in becoming a Fire Adapted Community.

Wildfire is inevitable in the Black Forest community. Many of the Black Forest's plant and animal species are dependent on the natural disturbance caused by wildfire. Such species are fire-adapted, and have developed strategies to survive and thrive in the presence of wildfire. The disturbance creates opportunities for new growth, cycles nutrients through soils, and maintains biological diversity.

Wildfires become disasters when they threaten life, burn homes, destroy infrastructure, and damage watersheds. Developing and implementing strategies to make human communities more fire adapted can prevent such disasters. This CWPP provides strategies that can be implemented by residents and the community that will make the Black Forest better prepared for the next inevitable wildfire. This plan recommends that the Black Forest community move quickly to reduce hazardous fuel buildup on properties in the community. The goals and objectives of the plan are to:

PROTECT LIVES, PROPERTY & RESOURCES: This CWPP provides the Black Forest Community a framework and recommendations with an outcome that will save lives, reduce losses of property and community re

Objective: Develop a comprehensive plan providing a suite of strategies to reduce hazardous fuels, improve communications, education and awareness to protect lives, property and the Black Forest ecosystem.

CREATE A FIRE-ADAPTED COMMUNITIY: This plan provides mitigation strategies and community-driven action plans to help create communities where citizens are engaged and active in preparing for wildfire. It facilitates interagency cooperation and strengthens communication and support between agencies and the Black Forest community.

Objective: Increase the ability to prepare, respond, and recover from wildfires in the Black Forest community.

- Update education and awareness materials
- Encourage evacuation planning and readiness
- Encourage the use of fire-resistant materials/design of non-combustible homes
- Assist community planners with comprehensive planning to mitigate disasters
- Clearly delineate evacuation routes and identify evacuation centers
- Eliminate hazardous trees along right of ways.
- Generate site development standards to enhance structural survivability in fire-prone areas.

Objective: Increase community understanding of living in a fire prone ecosystem.

- Develop monthly and annual education sessions on becoming a Firewise Community and high risk wildfire areas.
- Develop partnerships with those that can have an influence on wildfire risk to District residents and their forests.
- Instill as sense of personal responsibility for taking preventative actions regarding wildfire.
- Update emergency notification procedures and processes.

RESTORE & MAINTAIN FIRE-RESILIENT LANDSCAPES: This plan provides prioritized locations for fuel reduction treatments, to enable the Black Forest community to effectively address risks to the community and its ecosystems.

Objective: Protect against losses to life, property, and natural resources from wildfire at a landscape scale.

- Treat fuels to reduce potential flame lengths. The heat from a fire with flame lengths of four feet or more can be lethal to firefighters, people and animals. In areas where flame lengths exceed four feet, reduce fuels so that potential flame lengths are four feet or less.
- Identify erosion mitigation actions to reduce potential flooding impacts.

WHAT IS A FIRE-ADAPTED COMMUNITY?

A Fire Adapted Community is a community that has made a decision to reduce their vulnerability to destruction by wildfire. Fire Adapted Community members collectively share an understanding of wildfire threat, and the high probability of serious loss. This common understanding results in changes of behavior, and residents take action to mitigate the threat. Fire Adapted Community residents join together to prepare the community, themselves, and their homes for the inevitable occurrence of wildfire.

A Fire Adapted Community can survive a wildfire with little or no assistance from firefighters. These communities are characterized by homes that are built of fire resistant materials, and where vegetation and flammable items have been reduced around the homes to provide good defensible space. They are buffered by fuel breaks where flammable vegetation has been modified to slow the spread of flames, and provide a zone where firefighters can aggressively fight a fire.

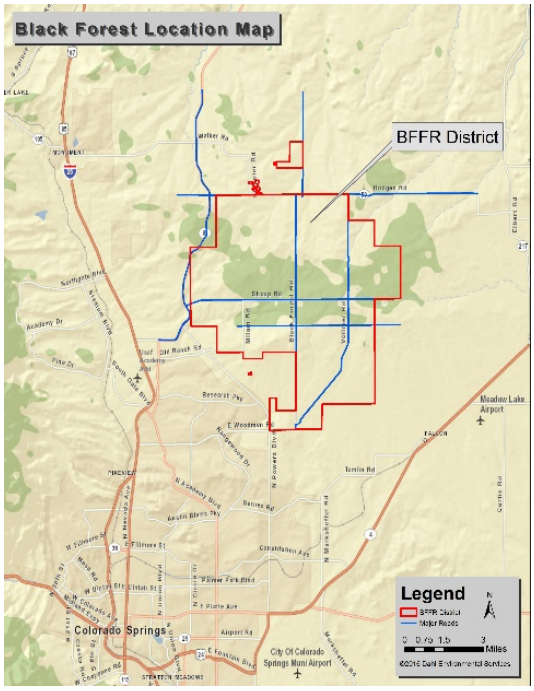
PROVIDE EFFECTIVE & EFFICIENT WILDFIRE RESPONSE: This plan provides strategic treatments on the landscape that will facilitate safer and more successful fire suppression. It provides for tracking, reporting, and sharing of both fuel reduction accomplishments and homeowner/community initiatives, and it will support risk-based management decisions and tactical actions.

Objective: Improve fire prevention and suppression.

- Update mutual aid agreements with El Paso County and adjacent fire districts.
- Update fire response pre-plans in the District.

2. BLACK FOREST COMMUNITY PROFILE

2.1 COMMUNITY SETTING



Location Map

For the purposes of this CWPP, the BFFR District is defined as the WUI. The District is located in El Paso County just north of Colorado Springs, Colorado, approximately seven miles east of Interstate 25, along County Road 228 (**Appendix 10.1**). See Black Forest Location Map.

BFFR District Characteristics

The BFFR District is located in the north portion of unincorporated El Paso County, Colorado. The southern boundary of the District abuts the city limits of Colorado Springs. The average elevation is approximately 7,369 feet with a total land area of 50 square-miles. There are nine HOAs inside the BFFR. They are: (1) Longview Estates, (2) High Forest Ranch, (3) Cathedral Pines, (4) New Breed Ranch, (5) Wildwood Village, (6) Pine Cone Acres, (7) Pine Ranch, (8) Forest Gate and, (9) Park Forest States. Only the High Forest Ranch has a HOA CWPP (**Appendix 10.1**).

Demographic Characteristics

Located within the District boundaries is a resident population of approximately 13,000 individuals and approximately 5,000 residential/commercial structures. The population density, based on the 2000 census was 103.9 people per square mile. A majority of the properties in the Black Forest community vas located on 5 acre lots. The median income for a household was $77,085, and the median income for a family was $80,556. Males had a median income of $59,568 versus $32,043 for females. The average income was $30,786. About 1.9% of families and 2.9% of the population were below the poverty threshold limit including 3.9% of those under age 18 and 2.3% of those age 65 or over (Wikipedia). Historically, the District was classified as a rural area, but over the course of the past several years has seen suburban growth. The BFFR protects more than 5,000 structures with a 2014 estimated market value of $1.0 billion. The Black Forest community receives wildfire suppression from the BFFR, which has mutual aid agreements with all surrounding fire agencies, including the City of Colorado Springs (**Appendix 10.1**).

2.2 CLIMATE

Precipitation amounts for Black Forest are varied with the western (mountainous) portion receiving 28 to 60 inches annually, primarily in the form of snow. Climatic data from a weather station in Colorado Springs Municipal Airport, Colorado, 15 miles south of the Black Forest,

provides the following averages based on 42 years of continuous data collection (Western Regional Climate Center 2008):

- Average annual maximum temperature: 62.9 °F
- Average annual minimum temperature: 35.8 °F
- Average annual total precipitation: 14.4 inches
- Average annual daily wind speed: 9.6 MPH

2.3 TOPOGRAPHY

The Black Forest topography is varied with its highest point being the top of Vollmer Hill at 7,704 feet and the lowest elevation being 7,000 feet where the Burgess Creek crosses into Colorado Springs. The northern part of the District crests at the Palmer divide and flows northward to the Cherry Creek watershed. The south side of the District flows into the Fountain Creek drainage and into the Arkansas River watershed. The Black Forest mainly consists of private land managed by individual homeowners with some public parcels that are included within the Black Forest community. The city of Colorado Springs is located on the on the south side of the District.

2.4 WILDLAND VEGETATION & FUELS

The plant communities found in the Black Forest are typical of the Rocky Mountain Montane ecosystem. Vegetation type and distribution is controlled primarily by available soil moisture, which is closely related to slope aspect. Existing vegetation is the fuel source for wildland fire and has a direct effect on fire behavior. Understanding the fire behavior characteristics of particular fuel types facilitates effective fuel treatment strategies on individual properties and the community landscape. The Black Forest community is dominated by ponderosa pine *(Pinus ponderosa)*, with significant areas of grass and Gambel oak *(Quercus gambellii*) including shrub communities. All of these vegetative types can be extremely flammable under certain weather conditions.

MERITS OF PONDEROSA PINE

Ponderosa pine is the most common pine tree in the District. Ponderosa pines survived frequent fires that burned around the District prior to European settlement by evolving fire adaptations. Its thick bark and deep roots help insulate sensitive growing tissue from the heat of a wildfire. Ponderosa pine also "self-prunes", shedding its lower branches as it grows. This self-pruning provides spaces that separates low branches from the heat of a wildfire below, helping to protect the needles of mature trees from ignition.

Ponderosa pine depends on fire or similar disturbances to reproduce and thrive. Its seeds establish best on mineral soil that has been cleared of needles and duff. It is shade-intolerant, requiring open space and ample sunlight to grow. In the absence of fire, ponderosa pine forests can be overtaken by shade-tolerant trees like Douglas-fir, and these dense stands are more susceptible to insect attack, and to high-intensity "stand-replacing" wildfires that kill most trees.

On June 11, 2013, the Black Forest wildfire started around Highway 83 and Shoup Road, within Black Forest community. Nearly 35,500 people within and around Black Forest, Colorado Springs, and Elbert County were evacuated, and a portion of Douglas County was placed on pre-evacuation notice. Over 15,000 acres burned, 511 buildings were destroyed, and there were two fatalities. Based on number of homes destroyed, it surpassed the Waldo Canyon Fire as the most destructive wildfire in Colorado history. (Wikipedia)

Ponderosa pine closed canopy stand

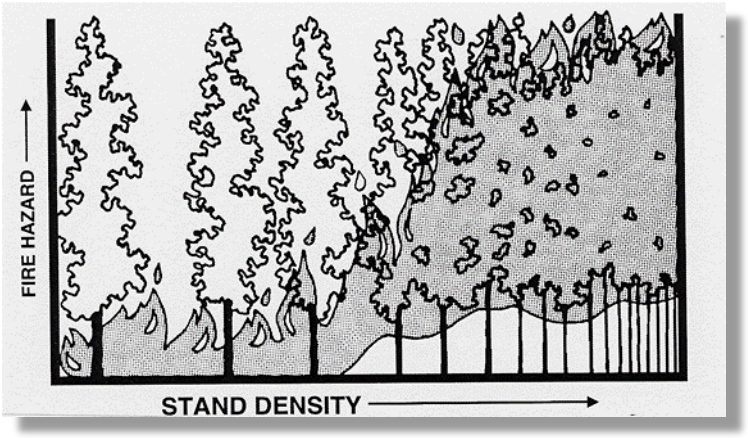
PONDEROSA PINE

Within the Black Forest, generally unburned areas have untreated ponderosa pine stands with closed canopies, and dense understory with other conifers and Gambel oak. Regeneration of these species is varied throughout the stand. The primary forest cover type is ponderosa pine stands, which is very representative of the Black Forest "forest vegetative type."

Within a representative stand in this community (La Foret Property), there is an average of 255 live trees per acre and 51 dead trees per acre, which have an average diameter at breast height (DBH) of 12.0 inches and an average height of 45 feet. The stand is two-aged with lesser stems of ponderosa pine and cohorts of 6 to 10 inch DBH which are trees about 75 to 100 years old, and a cohort of trees 14 inches DBH and greater that are approximately 180 years old. Site Index (SI, is an estimate of tree height at an index age, which is a measure used by foresters to describe a site's relative productivity) for ponderosa pine is estimated at 40 feet for a 100-year base (Lynch 2005). The representative stand has approximately 4,246 board feet per acre (as measured by Scribner board foot scale) and 1,768 cubic feet per acre. Average stand density is 120 square feet of basal area per acre. Slopes vary between 0 and 35 percent. There is some high incidence of older Ips beetle (*Ips pini*) activity (Cranshaw 2002), and dwarf mistletoe (*Arceuthobium americanum*), which are pest species affecting the ponderosa pine. Operability for tractor skidding is very good.

Of greatest concern to BFFR professionals is the, "closed canopy ponderosa pine with very dense under stories of biomass". The illustration below demonstrates how wildfire in dense conifer stands quickly transitions from a ground fire to a crown fire following ignition (Wildfire Spread Model). See the fuel models for rate of spread in Section 2.5.

Wildfire Spread Model



MEADOW / GRASS COMPLEX

Grass Complex

The meadows and savanna grassland, comprise the meadow/grass complex. Many of the meadows have been created as a result of wildfire and dead tree removal and have had little or no reforestation. Previous ponderosa pine stands have been converted to large meadow/pasture complexes. No inventory of the meadow area was done for this plan. The meadow complex basically surrounds the forested areas and is mainly in the central portion of the District. It consists of mostly native grasses and forbs. Some meadows may be currently used for hay production and livestock pasture. Many of these meadow grass complexes have standing dead fire-killed trees that are serious safety hazards. There is evidence of elk and deer use within the meadow/grass complex.

2.5 BLACK FOREST FUEL MODELS

Estimates of surface fuels are combined with fuel behavior maps to create fuel models (FMs) that are useful for quantifying current stand conditions. The data generated by the FMs are used for rating fire danger and predicting fire behavior (Anderson 1982). There are two main classification systems used in wildland fire management. The most recent system is presented in the USDA Forest Service General Technical Report RMRS-GTR-153 *Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model* (Scott and Burgan 2005). The other classification system is published in USDA Forest Service General Technical Report INT-GTR-122 *Aids to Determining Fuel Models for Estimating Fire Behavior* (Anderson 1982). The latter remains in use because it is somewhat easier to apply and comprehend, making it an effective tool for non-technical applications. A cross-walk table in (Scott and Burgan 2005) was applied to the Colorado Wildfire Risk Assessment Portal (CO-WRAP) report results so the categories on the FM map (**Appendix 10.1**) can be interpreted based on the (Anderson 1982) models. In the sections that follow, the (Anderson 1982) model is followed by the (Scott and Burgan 2005) model with a brief description of each FM and the total Black Forest acres that fall into each category.

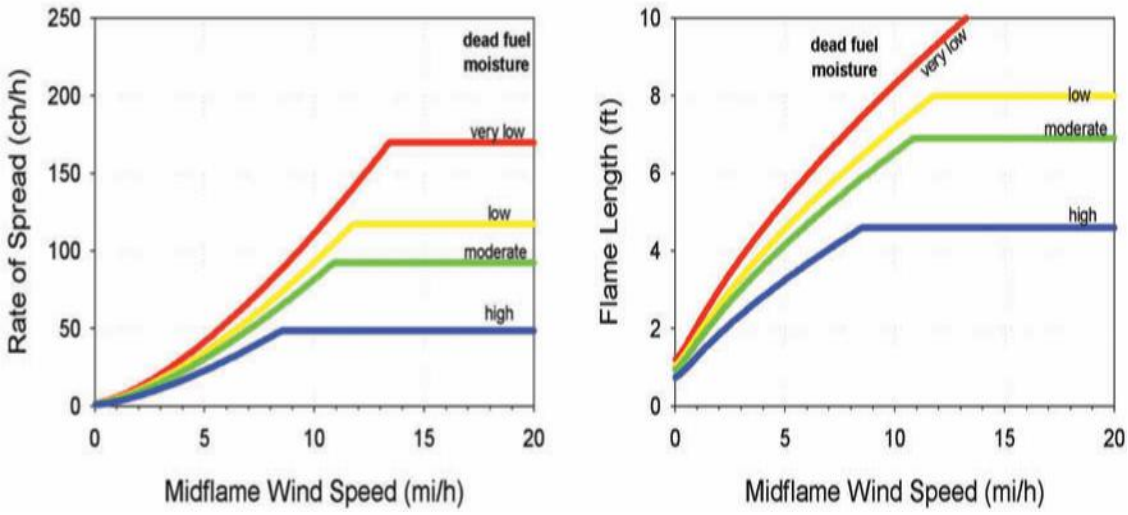
Wildfire fuel models are simply a tool for predicting wildfire behavior in different vegetative conditions. Wildland hazardous fuels have been classified into four basic groups—grasses, brush, timber, and slash. The differences in fire behavior among these groups are basically related to the fuel load on the ground environment. Fuel load and depth are significant fuel properties for predicting whether a fire will be ignited, its rate of spread, and its wildfire intensity. Flame lengths in excess of four feet, which is the upper limit at which fires can be attacked with persons using hand tools, and at which handline can be expected to hold a fire. Flame lengths in excess of four feet increase the chance that equipment may have to be relied on for suppression efforts to be effective (**Andrews 1986**).

The best representative FMs for describing fuel conditions in the Black Forest are 1, 2, 9 and 12, as described below.

Short Grass Standard Fire Behavior Fuel Model 1 (NFFL 1)

Fuel model 1 Grass

(GR2, a dry climate grass-ground cover is the primary carrier of wildfire and is present across the meadows). In this model, fire spread is governed by the fine, herbaceous fuels that have cured or are nearly cured. Wildfires are surface fires that move rapidly through cured grass and associated material. Relatively little shrub or timber is present on less than one third of the areas. Annual and perennial grasses are included in this FM. **In layman's terms:** With very dry moisture in the dead fuels and a mid-flame wind speed of 20 mph, the rate of spread is about 193 feet per minute (175 chains per hour or 11,550 feet per hour, or 2 miles per hour). The flame length is estimated to be 14 feet. Flame length is one of the factors used to determines the degree of difficulty in suppressing wildfire. The heat from fires with flame lengths of four feet or more can be lethal to firefighters.



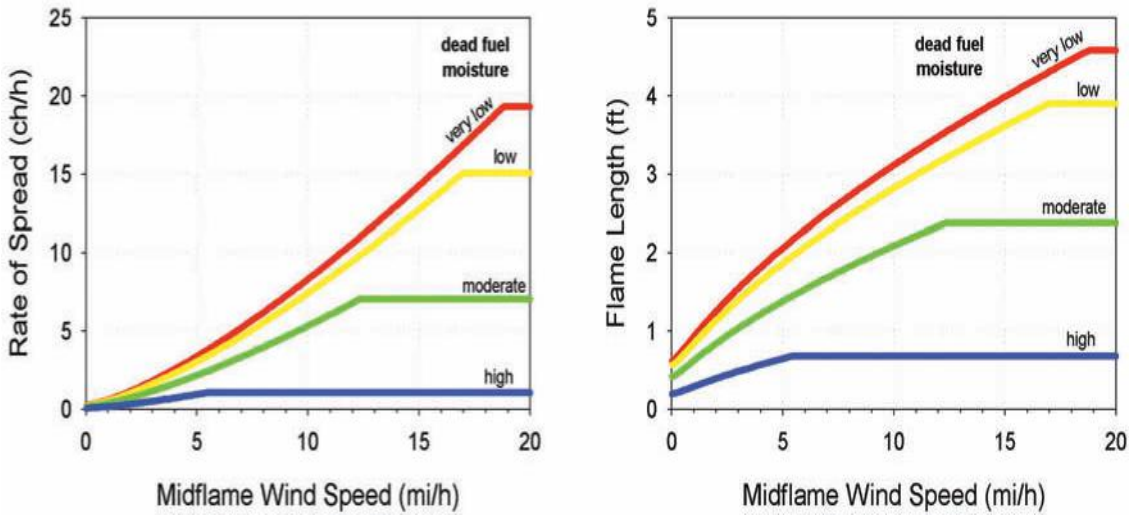
Reproduced from USDA Forest Service Gen. Tech. Rep. RMRS-GTR-153 (Scott and Burgan 2005)

Grasses are perhaps the most pervasive and abundant surface fuel in Colorado. Grasses and weeds should be mowed as often as needed throughout the growing season to keep them shorter than 6 inches. This applies to irrigated lawns and wild or native grasses. Mowing is critical in the fall, when grasses dry out, and in the spring, after the snow is gone but before plants green-up**.**

Timber-Litter Standard Fire Behavior Fuel Model 2 (NFFL 2)

(TU1, low load, dry climate timber-grass-shrub; the primary carrier of wildfire is a low load of grass and/or shrub with litter. Spread rate is low; flame length low). The effect of live herbaceous moisture content on rate of fire spread intensity is strong and depends on the relative amount of grass and shrubs in the FM. The primary carrier of fire is the fine herbaceous understory. Litter and dead twigs and branches from the conifer overstory contribute to fire intensity. Tree crown base heights are generally high and ladder fuels (live or dead vegetation in the understory that allows a fire to climb up from the forest floor into the tree canopy) are uncommon, so wildfire risk is low in this model. Fuel loads are usually less than 1.3 tons per acre and less than 12 inches deep. **In layman's terms**: With very dry moisture in the dead fuels and a mid-flame wind speed of 20 mph, the rate of spread is about 20 feet per minute (18 chains per hour or 1,188 feet per hour). The flame length is estimated to be 5 feet. The heat from fires with flame lengths of four feet or more can be lethal to firefighters

Fuel model 2 Ponderosa pine, BFFR Section 16



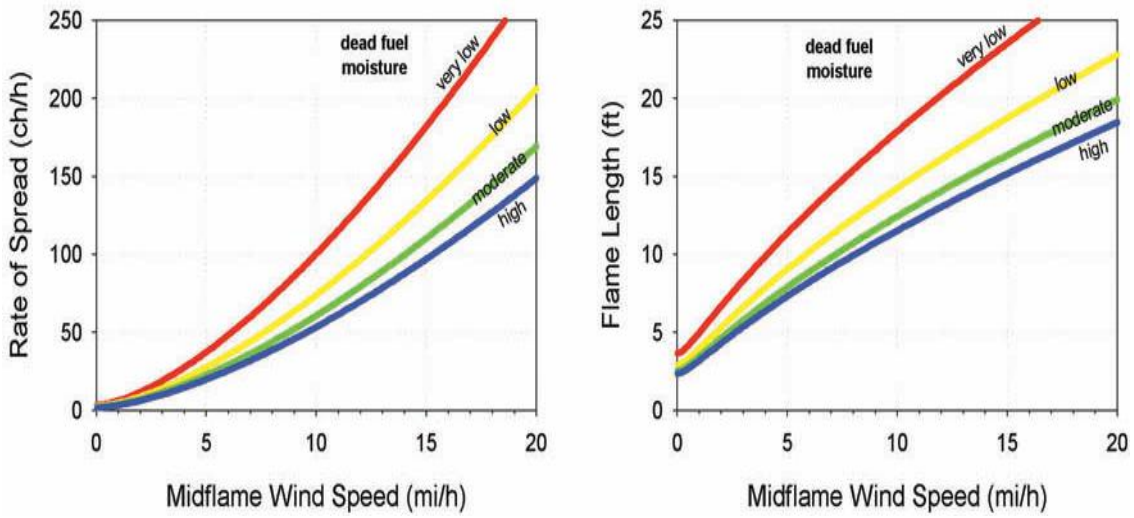
Reproduced from USDA Forest Service Gen. Tech. Rep. RMRS-GTR-153 (Scott and Burgan 2005)

However, when dry fuels are scarce and wind speeds are low, as seen in the image above, a fire cannot build momentum and intensity, which makes it much easier to control and is more likely to be beneficial to the land.

Timber-Litter Standard Fire Behavior Fuel Model 2 (NFFL 2)

Potential fuel model 12 (dead trees ready to fall)

(TU1, low load, dry climate timber-grass-shrub, the primary carrier of wildfire is a low load of grass and/or shrub with litter). Within 3 to 10 years when the aerial dead ponderosa pine trees fall to the ground and become serious surface fuels, this FM will change to a **NFFL Standard Fire Behavior Fuel Model 12** (SB3, the primary carrier of wildfire is dead and down blowdown material). Blowdown is moderate, trees compacted near the ground. Spread rate is high; flame length is high. The surface fuel loads can be 35 to 75 tons per acre creating rapidly spreading fires with high intensities capable of generating firebrands, or floating embers. **In layman's terms:** With very dry moisture in the dead fuels and a mid-flame wind speed of 18 mph, the rate of spread is about 275 feet per minute (250 chains per hour or 16,500 feet per hour or 3 miles per hour). The flame length is estimated to be 25 feet. When these dead trees fall on the ground they become heavy large hazardous fuels creating extreme explosive fire behavior capable of running thru the community at 3 miles per hour or more i.e., from Black Forest Road to Vollmer Road in less than 20 minutes. The heat from fires with flame lengths of four feet or more can be lethal to firefighters



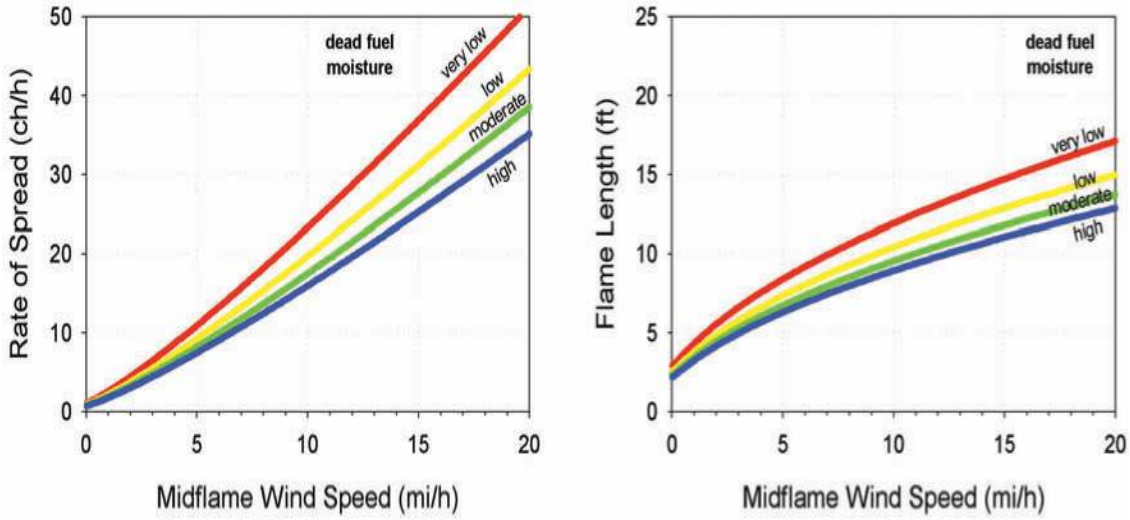
Reproduced from USDA Forest Service Gen. Tech. Rep. RMRS-GTR-153 (Scott and Burgan 2005)

When hazardous fuels become abundant, and if all the dead trees move from vertical fuels and become ground fuels as discussed above, a fire can be uncontrollable and very destructive. **This FM 12 has the potential to be the most destructive in the Black Forest community** if no treatment is done to remove dead trees from the areas burned in 2013.

Closed Canopy Long-Needled Conifer Standard Fire Behavior Fuel Model 9 (NFFL 9)

Closed canopy Conifer stand

(TU5, the primary carrier for wildfire is heavy forest litter with a shrub or small tree understory. Spread rate is moderate; flame length moderate; this FM model is for the closed canopy ponderosa pine cover type). Fires generally carry through the surface litter and low brush with low flame lengths. Interlocking tree crowns and the presence of concentrations of fuels coupled with low fuel moisture, low humidity, high temperatures, and moderate to high winds can increase spread rates and intensities and move fire into the tree crowns. The primary carrier of wildfire is forest litter in combination herbaceous and scrub fuels. Spread rate is moderate: flame length moderate. Fine fuel load is 7.0 tons per acre. Dead fuel load in this FM is about 3 tons per acre with an average depth of .2 feet**.** High-level winds in excess of 10 mph may move a fire into the tree crowns. **In layman's terms:** Wildfire hazard is currently moderate, but mortality from bark beetles like Ips or mountain pine beetle (**Cranshaw and Leatherman 2002**) and subsequent deadfall could increase hazard to high in the absence of fuel reduction treatments. With very dry moisture in the dead fuels and a mid-flame wind speed of 20 mph the rate of spread is 55 feet per minute (50 chains per hour or 3,300 feet per hour). The flame length is estimated to be 15 feet. The heat from fires with flame lengths of four feet or more can be lethal to firefighters



Reproduced from USDA Forest Service Gen. Tech. Rep. RMRS-GTR-153 (Scott and Burgan 2005)

When dry fuels are abundant and wind speeds increase, as shown in the image above, a fire can be uncontrollable and destructive.

2.6 FIRE SUPPRESSION WATER RESOURCES

Firefighting water supplies are available through hydrant systems in the developed portions of the BFFR District, which are served by the Park Forest and Cherokee Metro Water Districts. However, the more rural areas within the District are dependent on cisterns or hauled water. Current cisterns and hydrants are displayed on the water source map (**Appendix 10.1**). These are inspected annually by fire department staff.

Water supplies are critical for maintaining lower Insurance Services Organization (ISO) ratings that affect homeowner insurance rates. The BFFR District should continue to require such water supplies for all new subdivisions, as outlined in the El Paso County Land Use Code. Additionally, the District will make a concerted effort to identify other static water sources (e.g., ponds, pools) that may be utilized as drafting or dip sites during wildfire events. Land use agreements shall be made with private property owners prior to utilizing these sites (**Appendix 10.1**).

2.7 BLACK FOREST FIRE RESCUE RESOURCES

The Black Forest Fire Rescue Protection District (BFFR) is a mostly volunteer, combination fire department. Physically, the district serves approximately fifty square miles in Northern El Paso County, Colorado. We are an all hazards, emergency response agency that prides ourselves on providing professional, timely and fiscally responsible service to the residents and visitors of the district.

Historically, the district was classified as a rural area but over the course of the past several years we have seen suburban growth within our response area. This pattern of growth and development is projected to continue into the foreseeable future.

Emergency fire, medical and rescue services within the Black Forest community are provided by BFFR, which is comprised of 30 volunteer firefighters, 17 part-time firefighters, 6 full-time firefighters/EMTs, 3 full-time firefighter/paramedics, a full-time Chief and Assistant Chief and one Administrative Assistant. There are currently 2 Lieutenants, 1 Captain, and 1 Assistant Chief under the command of the Chief of BFFR. All operational staff is certified as wildland fire fighters, 27 are certified as basic national wildland firefighter, 5 are certified as advanced, 10 are certified as Sawyers, 9 Engine Bosses 3 Strike-Team Leaders and 1 Incident Commander Type 3.

BFFR operates out of two stations with the following apparatus:

Station 1

Located in the heart of the Black Forest Community, this is the primary response station for BFFR. Station #1 became operational in December of 2003 and replaced the station at the intersection of Shoup Road and Black Forest Road. Station #1 serves as the District headquarters. Additionally, this station provides a regional training room/Incident Command Center, community room, first-aid room and the District fitness center.

***Station 1* Shoup Road and Black Forest Road.**

Apparatus at Station 1 include:

- (2) Engines
- (2) Water tenders (water trucks)
- (2) Brush trucks
- (2) Ambulances
- (2) Command vehicles

Station 2

Located on Ridge Run Road, Station #2 is currently staffed with part-time employees from 0800-2000 hours (8 a.m. to 8 p.m.). Station #2 serves the northern portion of the District and provides back-up for Station #1's response area. Station #2 also has a regional training classroom and a fitness center. Additionally, Station #2 will house the District's Resident Firefighter Program in the future. This program will augment Station #2 staffing, with a goal of providing 24-hour coverage from Station #2.

Apparatus at Station 2 include:

- (1) Engine
- (1) Water tender
- (1) Brush truck
- (1) Ambulance

Brush Truck and Initial Attack Crew

BFFR protects the following critical infrastructure: gas/oil pipelines, natural gas sub-stations, cellular communication sites, Wolford Elementary School, School in the Woods, historical structures, and an 800-mhz radio tower; and provides many services to the community including:

- Structural fire response and suppression
- Wildland fire response and suppression
- Emergency Medical Services first response and transport
- Hazardous Materials Response
- Rescue Operations- Vehicle Extrication and Ice Rescue
- Fire Prevention- Youth, Firewise, Ready-Set-Go
- Community outreach and safety programs that include community education, driveway identification program, and blood pressure checks
- Regional Training Site for cooperating agencies
- Community Room for local citizen groups

BFFR Wildland Firefighters

2.8 COMMUNITY VALUES AT RISK

Given the diversity of people and resources in the Black Forest community, there are a large number of real and perceived values at risk. In any hazard and risk assessment, human life and welfare are the most important resources to protect. Homes, community infrastructure, and the forested characteristics of the Black Forest are important values to the community. In addition to the 5,000 homes and various found within the community. The damage or loss of this ecosystem could lead to serious erosion of bare soil areas as well as the destruction of habitat for the many birds and animals that thrive in the community, and could damage the valuable headwaters watershed for Colorado Springs. Potential loss of aesthetic values and the adverse effect on property values are some of the important risks to the Black Forest community. Common values at risk in the Black Forest community include:

Homes	Horses, cattle, other animals
Businesses	Air quality
Community infrastructure	Forest health
Watersheds	View shed
Water quality	Wildlife habitat
	Historic structures

Protect values at risk by understanding your wildfire weather severity during drought conditions. The US National Weather Service issue warnings during high wildfire danger. These Red Flag warnings are further issued by local television and radio stations. The Black Forest Fire Rescue Protection District: www.bffire.org post these Red Flag warnings during severe fire weather conditions. Red Flag warnings for the community are important information from BFRR for early alerts to potential for catastrophic wildfire conditions, such as the 2013 Black Forest Fire. All residents of the Black Forest community should become educated and knowledgeable about the Red Flag warnings.

A RED FLAG WARNING

A Red Flag Warning is issued by the U.S. National Weather Service to inform area firefighting agencies that conditions are ideal for wildland fire ignition and rapid spread. When a Red Flag warning is issued, firefighting agencies prepare for the increased risk. The public must also have a heightened awareness that fire danger is very high with an increased probability of flames spreading quickly. Red flag conditions occur when relative humidity is less than 25 percent with temperatures greater than 75 degrees and sustained winds of 15 mph or greater. The criteria for Fire Weather Watches and Red Flag Warnings is based on local vegetation type, topography, distance from major water sources, wind speed and direction, and temperatures, (Wikipedia). Red flag warnings should always indicate the need to have your Ready-Set-Go bag available.

Wildfires leave severe and long-term impacts on all natural and ecological values that people often take for granted. The actions recommended in this CWPP are designed to lower the wildfire risk to neighborhoods, as well as the ecological and economic values of the Black Forest community. Wildland wildfire may result in a significant decline in property values, resale values, and forested properties within the Black Forest community.

3. WILDFIRE RISK ASSESSMENT

Wildfire risk represents the possibility of loss or harm occurring from a wildfire. Wildfires are unwanted and unplanned fires that result from natural ignition or unauthorized human-caused wildfire. BFFR actively suppresses all wildfire ignitions within the District and attempts to have them under control by 10 a.m. the following day.

Wildland fires may be further classified as ground, surface, or crown fires. Ground fire refers to burning/smoldering materials beneath the surface including duff, tree or shrub roots, punchy wood, peat, and sawdust that normally support a glowing combustion without flame. Surface fire refers to fuels burning on the surface of the ground such as leaves, needles, and small branches, as well as grasses, forbs, low and medium shrubs, tree seedlings, fallen branches, downed timber, and slash. Crown fire is a wildland fire that moves rapidly through the crowns of trees or shrubs.

Home not mitigated to wildfire

3.1 WILDFIRE BEHAVIOR

Fire behavior is the manner in which a fire reacts to the influences of fuel, weather, and topography. Fire behavior is typically modeled at the flaming front of the fire, and described most simply in terms of fire line intensity (flame length) and in rate of forward spread. The implications of observed or expected fire behavior are important components of suppression strategies and tactics, particularly in terms of the difficulty of control and effectiveness of various suppression resources.

Fire risk is the probability that wildfire will start from natural or human-caused ignitions. Fire hazard is the presence of ignitable fuel coupled with the influences of topography and weather, and is directly related to fire behavior. Fire severity, on the other hand, refers to the immediate effect a fire has on vegetation and soils. This image is taken at night of the Black For

Black Forest 2013 fire viewed from Colorado Springs

The characteristics of fuels, topography, and weather conditions combine to dictate fire behavior, rate of spread, and intensity. Wildland fuel attributes refer to both dead and live vegetation and include such factors as density, bed depth, continuity, density, vertical arrangement, and moisture content.
Structures with flammable materials are also considered a fuel source.

When fire burns in the forest understory or through grass, it is generally a surface fire or a **good fire** as illustrated in the image to the right. When fire burns through the canopy of vegetation, or overstory, it is considered a crown fire or a **bad fire**. The vegetation that spans the gap between the forest floor and tree crowns can allow a surface fire to become a crown fire and is referred to as ladder fuel.

Ponderosa pine thinning survives wildfire (Pineries). Courtesy Bruce Short

For fire to spread, materials such as trees, shrubs, or structures in the flame front must meet the conditions of ignitability. The conditions needed are the presence of oxygen, flammable fuel, and heat. Oxygen and heat are implicitly available in a wildland wildfire. However, if the potential fuel does not meet the conditions of combustion, it will not ignite. This explains why some trees, vegetation patches, or structures may survive a wildland wildfire and others in the near vicinity are completely burned.

Weather conditions such as high ambient temperatures, low relative humidity, and windy conditions favor fire ignition and high-intensity fire behavior. Under no-wind conditions fire burns more rapidly and intensely upslope than on level terrain; however, wind tends to be the driving force in fire behavior in the most destructive WUI wildfires. The “chinook” winds common along the Front Range can rapidly drive wildfire downslope, (Black Forest CO-WRAP).

3.2 FIRE BEHAVIOR ANALYSIS

Fire behavior is defined as the manner in which a fire reacts to the influences of fuel, weather, and topography. Two key measures of this behavior are rate of spread and the intensity. Rate of spread is expressed by the fire community in “chains per hour”. A chain is 66 feet, and one chain per hour closely approximates a fire spread of 1.1 feet per minute. The flaming front is the zone of a moving fire where the combustion is primarily flaming. Fire intensity is reflected by the flame length at the flaming front. Behind this flaming fire zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front; however, the heat from a fire with flaming front that has a flame length of four feet or less can be lethal to firefighters, people and animals.

The Colorado State Forest Service (CSFS) has developed the *Colorado Wildfire Risk Assessment* (CO-WRAP) web portal (www.coloradowildfirerisk.com), which provides

information for communities to make informed decisions based on treatment priorities to reduce the risk of loss from a wildfire for each homeowner as well as the community as a whole. CO-WRAP was used in the development of this CWPP to assess potential fire behavior in the Black Forest community by incorporating fuel models, topography, and local weather

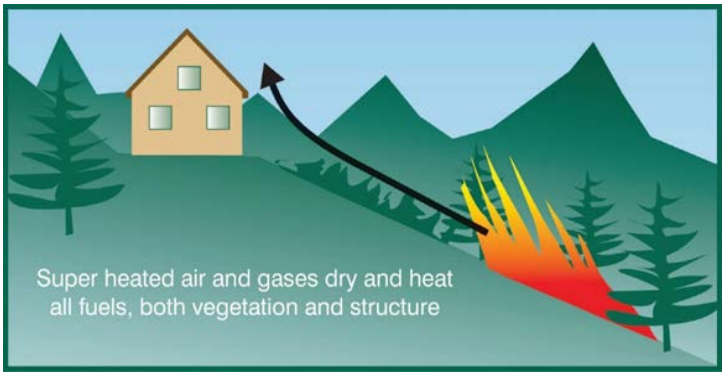
TRANSFORMED BY THE CATASTROPHIC BLACK FOREST FIRE, MORE THAN 14,000 ACRES OF PINE FORESTS WERE CONVERTED TO A GRASS FUEL TYPE: With this dramatic change in fuel types wildfire behavior changes as does wildfire risk. Cured grasses and surface fuels demonstrate high rates of spread, even with lower flame lengths, create high risks to homes and resources. Rapidly moving grass and surface fuels generate embers, just as canopy fires, creating ignitions for homes and other structures.

GRASS FUELS BECOME LADDER FUELS, MOVING QUICKLY FROM THE GROUND AND SURFACE INTO CROWN FUELS: Grass-fueled fires travel much faster than heavy-fueled fires. The changes in fuel structure and fuel type in the Black Forest community require continued awareness of the potential high risk of a rapidly spreading wildfire in this grass fuel type.

patterns and conditions. However, following the 2013 Black Forest wildfire a new revised Wildfire Risk Map was developed to forecast future wildfire behavior (**Appendix 10.1**). Fuel types changed following the Black Forest Fire. Ponderosa pine timber types have been replaced with grass.

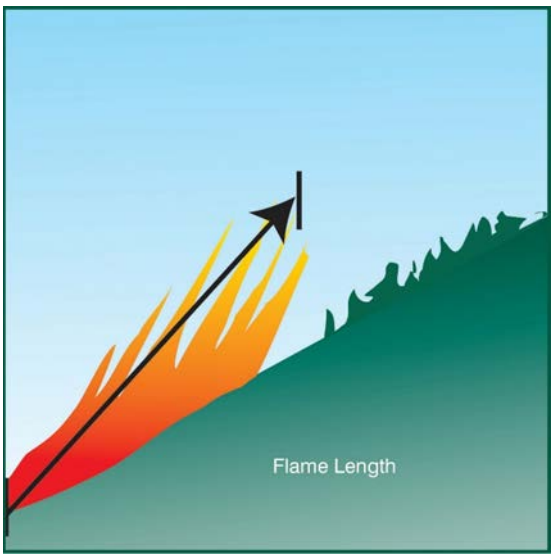
One significant indicator of concern for the Black Forest community is Fire Intensity Scale. Similar to the Richter scale for earthquakes, the Fire Intensity Scale provides a standard scale to measure potential wildfire intensity. Nearly 75 percent of the Black Forest community is rated moderate to high intensity. The Fire Intensity Scale is a fire behavior output and is influenced by three environmental factors – fuels, weather and topography. Weather, as experienced during the Black Forest Fire, is by far the most dynamic variable (**Appendix 10.1**).

Rate of Spread is the representative rate of spread of a potential fire, indicating the speed with which a fire moves in a horizontal direction across the landscape or community. Like the fire intensity scale, rate of spread is influenced by the three same environmental factors – fuels, weather and topography. Approximately 60 percent of the Black Forest community is predicted to have a rate of spread ranging from moderate to extreme, with corresponding rates of spread from approximately 1200 to 16,500 feet per hour, or approximately 20 to 275 feet per minute (**Appendix 10.1**).



Grasses are perhaps the most pervasive and abundant surface fuel in Colorado. Mow grasses and weeds as often as needed throughout the growing season to keep them shorter than 6 inches. This applies to irrigated lawns and wild or native grasses. This is critical in the fall, when grasses dry out,

and in the spring, after the snow is gone but before plants green-up, see **Appendix 10.2** and CSFS Quick Guide FIRE 2012-1, (**Colorado 2012**) for more details on specifics for mitigation in the grass fuel environment.



Characteristic ***Flame Length*** is the typical or representative flame length of a potential fire based on a weighted average of four percentile weather categories. Flame Length is defined as the distance between the flame tip and the midpoint of the flame depth at the base of the flame, which is generally the ground surface. It is an indicator of fire intensity and is often used to estimate how much heat the fire is generating. Flame length is typically measured in feet. Flame length is the measure of fire intensity used to generate the Fire Effects outputs for the CO-WRAP risk assessment. Predicted flame lengths vary from 8 feet to 150 feet in length, exhibiting great potential for harm or damage to life and property. In the grass fuel models, predicted flame lengths, with an average 20 mile per hour wind, flame lengths will vary between 14 feet to 25 feet. Flame lengths that are 4 feet or greater are lethal to firefighters, people and animals.

Flame length is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in Colorado. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform, (**Slack 2000**).

3.3 APPROACH TO THE WILDFIE RISK ASSESSMENT

The wildfire risk assessment for the Black Forest community considers a variety of factors that ultimately result in a hazard rating for the community. Wildland fire impacts are dramatic as evidenced by the 2013 Black Forest Fire behavior. The spectrum of factors that influence fire behavior in the Black Forest community include vegetation and fuels, topography, and weather. Community infrastructure risk is evaluated in terms of emergency response, defensibility, and structural flammability. Analyzing the relationship between expected fire behavior and the built environment in the Black Forest community is the core of an effective community wildfire risk assessment. From this process, mitigation recommendations are developed that directly address the hazards and, that if implemented, will greatly reduce the risk of loss from a wildfire for each homeowner as well as the community as a whole.

Fire hazard, in this assessment refers to vegetation or naturally occurring wildland fuels, in terms of its contribution to fire behavior and its resistance to control. Risk is the probability of

ignition of wildland fuels. Values at risk include infrastructure, structures, improvements, and natural resources that are likely to suffer long term damage from the direct impacts of wildfire.

As part of this assessment, a concerted effort was made to solicit and include input and suggestions from the community, and Black Forest fire professionals. Community meetings were held to explain the CWPP process and to present the findings and recommendations of the CWPP analysis to the community, and to solicit comment for the final CWPP.

3.4 WILDLAND URBAN INTERFACE

The wildland-urban interface (WUI) is defined as the zone where communities and wildland fuels interface and is the central focus of this CWPP. The WUI layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. Every fire season catastrophic losses from wildfire plague the WUI in our country. Homes are lost, businesses are destroyed, community infrastructure is damaged, and most tragically, lives are lost. Precautionary action taken before a wildfire strikes often makes the difference between saving and losing a home (**Appendix 10.1**).

Unmitigated homes in the WUI subject to wildfire danger

While reducing hazardous fuels around a structure is very important to prevent fire loss, recent studies indicate that, to a great extent, the attributes of the structure itself determine ignitability. Studies of home survivability indicate that homes with noncombustible roofs and a minimum of 30 feet defensible space have an 85 percent fire survival rate. Conversely, homes with shake roofs and less than 30 feet of defensible space had a 15 percent survival rate (Foote 1996).

3.5 WILDFIRE RISK TO THE BLACK FOREST COMMUNITY

The current fire regime in the Black Forest community is characterized by high intensity fires rather than the majority of low intensity fires that historically occurred in the area. Fire intensity assessment in the CO-WRAP is supported by the observed 2013 Black Forest fire behavior. With ladder fuels and closed crown canopies, future high intensity fires are predicted to result in high mortality of the forest resources of the Black Forest community, and could result in extensive property loss and large amounts of erosion and sedimentation adversely affecting water quality.

WILDFIRE HAZARD ON STRUCTURES AND ROADWAYS

Transportation Road Right-of-Ways

Roads in the Black Forest serve several purposes during a wildfire. Roads are access routes for emergency vehicles and serve as escape routes for residents during a fire. The important network of roadways needs to provide safe simultaneous access for emergency vehicles and public evacuation. Vegetation management strategies for access routes in the Black Forest can serve as effective fuel breaks to provide fire protection, assist in fire suppression efforts, and improve effective evacuation. Most of the right-of-way's in the subdivision need active intervention – removal, reduction, or conversion of on-site fuels. This image characterizes the very dense pockets of regeneration trees.

Homes, Structures and Other Sites

The goal of vegetation management is to create a modified fuel area in which flammable vegetation surrounding buildings is reduced to creating an environment that will not support high-intensity crown fires. The main objective of fuel management in this site is to create conditions that will only support surface fires of lower intensity and lower rates of spread.

Black Forest Water Resources

Ponds and water bodies are valuable water resources during interface suppression situations. Many incidences resulting in tragic and costly losses are often the result of inadequate water supply. Water supply for suppression in many communities is often limited to the amount carried on responding emergency vehicles.

Wildfire suppression requires substantial quantities of water from a dependable source. The capability of responding fire agencies is often limited by the adequacy of the water supply. Reducing wildfire risk and protecting the Black Forest water infrastructure is a priority. Water sources should be clearly identified.

Municipal Drinking Water Sources

Ponds and water bodies are valuable water resources during interface suppression situations. These infrastructure facilities become extremely important and should be protected with defensible space as the highest priorities. This water supply can be available with appropriate signed agreements for wildfire suppression and emergencies. Many incidents resulting in tragic and costly losses are often the result of inadequate water supply.

Evacuation Routes

Pre-designated principal evacuation routes should be well marked with easily identifiable signs. Secondary evacuation routes are also important to the safety of BFRR District residents. They may be the only routes to safety in the event the principal evacuation route is blocked by fire, vehicle accidents, or by emergency vehicles. The secondary evacuation route should be marked, known and accessible to all residents.

A Dangerous Dead End Road

Emergency Exit Gates

Gated and dead-end systems should be designed for easy escape and with mechanical openings should electrical or solar powered systems become inoperable. Fire service personnel must have access to any locking mechanism on any gate restricting access to the Black Forest community.

The wildfire mitigation must involve interested community members, private landowners, stakeholders, and interest groups in the implementation process. The community base map (**Appendix 10.1**) illustrates important features such as landownership, structures, roads, surface water, fire district boundaries, and major utility corridors. The map's importance is that it illustrates community values from which recommendations concerning wildfire planning can occur.

The risk assessment will provide critical information to make informed decisions. Community members should be actively involved in the risk assessment step. Items that may be addressed include risk of wildfire occurrence, structure hazard and risk, economic and ecological values at risk, local fire authority, preparedness and capability, and hazardous fuels.

Fire Hydrants

Hydrants provide fire service agencies additional wildfire suppression resources. Hydrants should be well marked and maintained annually. Vegetation management should reduce fuel loading to protect hydrant infrastructure and provide safe access to these important suppression resources.

Power Communication Natural Gas Utilities Resources

Wildfire suppression requires substantial quantities of energy from a dependable source. The capability of responding fire emergencies is often limited by the adequacy of the communications, and energy and infrastructure supply. Reducing wildfire risk and protecting the Black Forest power utilities infrastructure is a huge priority. Energy sources should be clearly identified and protected by defensible space around all utility infrastructure. The utility infrastructure shown in these pictures is at high risk for wildfire and should be immediately mitigated for defensible space.

Electrical Utilities

Communication Utilities

Natural Gas Utilities

4. A FIRE-ADAPTED COMMUNITY

4.1 APPROACH TO MITIGATION PLANNING

Wildfire mitigation can be defined as those actions taken to reduce the likelihood of loss due to wildfire. Effective wildfire mitigation can be accomplished through a variety of methods including reducing hazardous fuels, managing vegetation, creating defensible space around individual homes and neighborhoods, utilizing fire-resistant building materials, enhancing emergency preparedness, and developing programs that foster community awareness and action. Once implemented, these actions will significantly reduce the risk of loss due to wildfire for an individual home, and on a larger scale, for an entire community.

Mitigation recommendations for the Black Forest community were identified and developed through fuel hazard assessments that evaluated elements such as vegetation and hazardous fuels, predicted fire behavior, topography, and community infrastructure. The vegetation pattern forms a hazardous forest canopy creating an extreme wildfire hazard risk. In moderate to extreme fire weather conditions, a wildfire ignition, such as the 2013 fire, has the potential to generate catastrophic losses in the community. Defensible space and strategic forest treatment recommendations will address the wildfire fuel hazards associated with this area of concern.

Another area of concern is community access and egress. Despite paved roads throughout the community, in an emergency evacuation scenario, the entire Black Forest community is forced to use two principal routes: Black Forest Road and Shoup Road.

Most mitigation projects involve some level of vegetation management, since wildland fuels are the common hazard to communities in the WUI. This plan identifies and develops projects that address the wildfire hazards to protect lives and property in the Black Forest community.

All projects are designed to change vegetation conditions to modify fire behavior and reduce the potential for wildfire by altering three primary fuel conditions as necessary: surface fuels, ladder fuels, and overstory crown fuels. This is accomplished through the implementation of a variety of treatments, commonly using more than one treatment type on the same piece of ground to achieve the desired condition. The following discussion describes the most common treatment types that are currently used in similar timber types such as the Black Forest ponderosa pine stands. It is important to note that the vegetation conditions that pose a fuels hazard today are dynamic, with continued growth, needle cast, litter fall, and new growth of understory vegetation continually occurring. As such, future treatments will need to occur over time on the same area to sustain the benefits of the previous treatment.

Some treatments have been completed, including some projects identified in the 2007 CWPP. Treatments completed to date have been accomplished by individual landowners taking responsibility to create defensible space.

Forest Health

Black Forest residents should be encouraged to monitor forest health on their property. The current mountain pine beetle epidemic has gravely impacted much of Colorado's lodgepole pine,

though lodgepole pine is not a significant component of forest lands in the BFFR District. Ponderosa pine may also be attacked by the mountain pine beetle, and diligence on the part of the property owner is warranted. Other forest pathogens, such as dwarf mistletoe (Jacobi 2002), are observed at endemic levels in some areas of the District.

4.2 TREATMENT OPTIONS

Treatment options for wildfire mitigation include thinning, mastication, chipping, and prescribed burns. Mechanical and hand thinning are used to remove ladder fuels and reduce tree densities that contribute to extreme fire behavior. Initial entries generally reduce the density of smaller trees on the site that typically create ladder fuels and can wick fire into the overstory. Overall tree densities are also decreased to reduce the likelihood of crown fire, and to increase overall forest resilience to natural disturbances such as fire or insect infestation.

Ponderosa pine Seed Trees

Depending on the fuels reduction treatment prescribed and equipment used, very large volumes of limbs and small diameter trees can be generated on site, particularly from an initial entry. It has long been recognized that leaving excessive slash on site substantially increases surface fuels and resultant fire intensity. Therefore, slash must be reduced or reconfigured by mechanical removal, chipping on site, or burning. Slash that can be removed by mechanical means can be transported to a biomass facility where electrical energy, heat, or landscaping material can be produced. Thus, mechanical removal of biomass will also reduce the amount of pile burning and resulting smoke. However, mechanical systems can only be used on slopes with less than a 30 percent grade, and where there is access to a landing or processing site where the biomass and timber can be processed, sorted and hauled. For some areas of the District, hand thinning and pile burning will be employed because of the steep slopes and challenging access.

Hotshot Crew hand thinning immature Ponderosa pine
Courtesy National Park Service

Proper thinning produces excellent regeneration for a new future forest.

Hand Thinning

To thin a forest, you remove the smaller, weaker trees to enable the trees you want—your main tree crop—to flourish. BFRR Fire Chief Jack says “you take the worst and leave the best.”

Hand thinning is conducted with crews of approximately 10-30 individuals who cut trees with chainsaws and pile the resulting slash. Hand thinning is generally used to cut smaller trees (less than 10-14 inches diameter) on steep slopes where machines cannot operate, or in environmentally sensitive areas where the wrong machine could have a significant environmental impact. Hand thinning is not as effective as mechanical thinning at restoring tree densities to pre-European colonization conditions because many of the suppressed trees in a stand can be greater than 14 inches in diameter. However, hand thinning is very effective at removing sufficient fuel to modify fire behavior.

Production rates with hand crews vary with fuel type and density. However, in general, a 10-person crew can treat 0.5 to 2 acres daily, depending on the type and amount of material that is removed. Unlike mechanical thinning, hand thinning only describes how the vegetation will be cut and does not address how the material is disposed. Hand thinning may be the appropriate method for vegetation cutting, but some other mechanical means may be necessary for removal of the cut material from the site. One or more of the following disposal treatments must be applied in combination with hand thinning to remove the fuels from the forest.

Mechanical Thinning

Mechanical thinning ` Courtesy John Deere

Mechanical thinning utilizes equipment with hydraulically driven saws to cut and remove trees (generally under 24 inches in diameter). Mechanical thinning equipment is most effective on slopes less than 30 percent.

The two major mechanical thinning systems used in the District include cut-to-length systems which carry the logs to the processing site, and whole tree removal systems that typically skid or drag the logs to the processing site. Cut-to-length systems use a harvester to cut trees and to remove the branches before automatically cutting trees into predetermined log lengths. This is known as processing at the stump. The branches from the trees can be distributed across the forest floor or laid to form a path that is used for travel by the cut-to-length equipment depending on soil sensitivity. In either case, the slash must be processed into chip or removed from the site in order to effect real fuels reduction. In cut-to-length systems the slash is typically masticated on site. The masticator can both treat the slash from the tree falling operations, and can also treat dead and down fuels and brush or other finer fuels on the site. In some cases, where it is preferable to completely remove all of the cut material, whole tree chippers can be used to drive to the slash and chip it on site.

Mastication

Machine mastication with skid steer

Mastication uses excavators with purpose-built grinding heads to grind small trees (up to 10 inches DBH), surface fuels, and dead and down wood into chips. Mastication provides a quick and cost effective method to modify the fuel structure and reduce flame length, and therefore potential fire intensity. Mastication is a very useful tool in brush fields and for thinning small trees and roadside maintenance. Cutting, processing and disposal of material occur in a single action. Chips are left on the ground where decomposition will take place. Like other mechanical methods, rocky sites, sites with heavy downed logs, and sites dominated by large trees are difficult places to operate mastication equipment. Additionally, sparks from mastication heads have the potential to start fires and, when working on public land, these machines are subject to the same activity-level restrictions that apply to most other heavy equipment.

Chipping

BFT sponsored chipper

Chipping may be used as an alternative to pile burning for removing cut vegetation. However, its usefulness is greatly reduced because of the necessity to carry material to the chipper. The Black Forest community slash/mulch program, supported by volunteers and th been extremely successful in facilitating the disposal of slash and thinning material. The program accepts material up to eight inches in diameter, producing mulch through a tub grinder. The chipper is operated by BFT volunteers who have been trained and equipped to use it safely because BFT cannot simply loan the chipper to a property owner due to safety and liability issues. Homeowners help by bringing the slash from the land to the machine. This provides an efficient, simple, and safe division of labor for effective disposal of brush and slash.

Prescribed Fire

There are two types of prescribed burning: pile burning and broadcast/understory burning. Pile burning is used where hand thinning is employed for the initial treatment of a property where large volumes of cut debris must be disposed of. Broadcast/under-story burning is intended to thin trees while also consuming surface fuels.

BFFR permitted pile burning

Pile burning is another disposal method for landowners in the Black Forest Community since it provides homeowners an efficient means of disposing thinning and slash debris. During hand thinning projects, crews cut small trees, brush, and surface fuels and stack them into piles that are typically four to eight feet in diameter and height. Piles are allowed to cure, generally at least one year, and then burned when conditions are favorable such as under snow cover or after recent precipitation events. County ordinances are very specific regarding burning conditions. Check with BFFR before lighting any slash piles or other prescribed fire activities.

Multiple resource benefits of fuel reduction projects

The benefits of fuel reduction projects are more-fully realized when implemented using an "all-lands" or "all neighbor" approach. This approach requires understanding the role that each project plays within the broader landscape ecologically, socially, and economically. When considering all-lands within the Black Forest community, projects can be designed that span multiple ownerships and accomplish landscape-scale fuel reduction and forest restoration.

By engaging with multiple stakeholders and gaining a full understanding of a region at the landscape scale, fuel reduction projects can be developed that will provide multiple resource benefits, including the enhancement of water quality, wildlife habitat, forest vegetation, recreation and scenic resources, and carbon sequestration.

BUILDING PARTNERSHIPS

A Community Leader's Perspective by Bob Sturtevant, Forester from the La Foret Firewise Community

The La Foret Conference and Retreat Center recognizes the potential danger from wildfire coming from adjacent properties as well as a fire starting on their property and spreading offsite. The property managers feel a responsibility to protect the center's improvements, many of which are listed on the National Register of Historic Places, as well as being a good neighbor and doing their part in promoting the health and safety of the surrounding Black Forest area.

Over the past 30+ years, La Foret has been under a forest management plan that has directed the center to complete periodic thinnings, remove heavily dwarf mistletoe-infected trees, and to complete mitigation around their buildings. Since the 2013 Black Forest fire, fire mitigation efforts have been expanded to a larger area of the property with the objectives of both fire resistance and improved forest health. Ultimately, we would like the entire property to be managed in a sustainable manner, that is resilient to a wildfire, provides quality wildlife habitat, and maintains the esthetics that has been the hallmark of the retreat center. We hope that our work will add to the efforts of other Black Forest landowners.

This plan supports prioritized hazardous fuel reduction and forest health improvement treatments across multiple jurisdictions on a landscape scale to maximize realized co-benefits. Environmental co-benefits provided by the projects include the protection and enhancement of water quality, wildlife habitat, and forest vegetation. Socio-economic benefits include the protection of community assets from wildfire, improved public health and safety, increased institutional capacity for future projects, and providing greenhouse gas emission and carbon sequestration benefits. High-intensity wildfires have extraordinary effects on ecosystem processes and human communities. The projects in this plan will substantially reduce potential fire intensity by altering ground fuels and reducing stand density, serving as a surrogate for the frequent, low-intensity wildfires that frequently burned throughout the region. Selective thinning will reduce competition among desired tree species, and improve resistance to insects and disease. Thinning will favor the retention of, and provide regeneration opportunities for fire-tolerant tree species, such as ponderosa pine, and promotes a structurally diverse forest stand better suited for a wide variety of species.

La Foret portal to property/camp

The reduced potential fire behavior within treated areas will prevent resource impacts associated with high-intensity wildfires. Water quality will be protected by preventing significant vegetation loss that can result in flooding, erosion, mass wasting, and the rapid transport of nutrient loaded sediment into surface waters. Flooding that occurred following the 2013 Black Forest Fire provides evidence of the

potential for post-fire impacts. Forest vegetation will be protected by preventing stand-replacing wildfire, which would make the area vulnerable to infestation by invasive species. In addition to protection of environmental assets, reduced potential fire intensity will help prevent damage to high-value community assets, including homes, businesses, municipal watersheds, and utility infrastructure. Following the implementation of this plan, wildfires will be less likely to threaten the Black Forest community, and the fires will be more easily controlled, enhancing the safety of the public and emergency responders. The collaborative approach to fuel reduction in this plan provides an opportunity to increase capacity by implementing multi-owner projects at the landscape scale.

CSFS Assisting Roadside Fuelbreak Thinning

This collaborative approach is illustrated in the image to the right whereby the CSFS, BFFR, BFT and La Foret Community are working together on shaded fuel breaks along Shoup Road. This roadside project will provide demonstration areas for the community to witness active forest management for strategic wildfire defensible space zones along major evacuation routes.

Community Slash Disposal

The Black Forest community has also benefited greatly from the 23 years of the slash/mulch operation that has substantially reduced our fuel load. Run by the Slash and Mulch Committee (**SAMCOM**), manned by numerous volunteers, and under major sponsorship of El Paso County Solid Waste Management, this program has been exceptionally successful. Located southeast of the intersection of Shoup and Herring Roads, the site accepts trees up to eight inches in diameter, as well as pine needles, and hires a commercial tub grinder to produce mulch, which is then provided to all who want it for free. There is a $2 fee for each entry regardless of size, although to Black Forest Cares are gratefully accepted donations.

SAMCOM process site

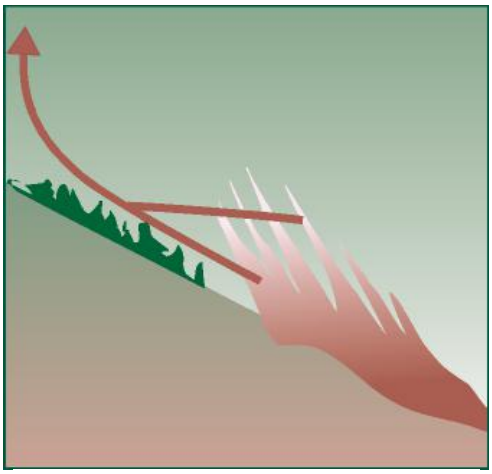
Rainbow over the Mulch Pile means a Glowing Success.
Photo courtesy Judy von Ahlefeldt

COMMUNITY SLASH AND MULCH COMMITTEE (SAMCOM)

Carolyn Brown, Director

When residents create defensible space around their homes by thinning shrubs and trees, it can be difficult to dispose of the cut material. To help make it easier to create and maintain defensible space, BFT offer community chipping to residents or they can bring their slash to the SAMCOM site which is located southeast of the intersection of Shoup and Herring Roads. The program has a $2 fee. More information can be found by visiting bfslash.org or the BFT website. Run by the Slash and Mulch Committee (SAMCOM), manned by numerous volunteers, and under major sponsorship of El Paso County Solid Waste Management, this program has been exceptionally successful. The site accepts trees up to eight inches in diameter, as well as pine needles and any other tree debris except roots and stumps, and hires a commercial tub grinder to produce mulch which is free to the community.

4.3 REDUCING STRUCTURE IGNITABILITY



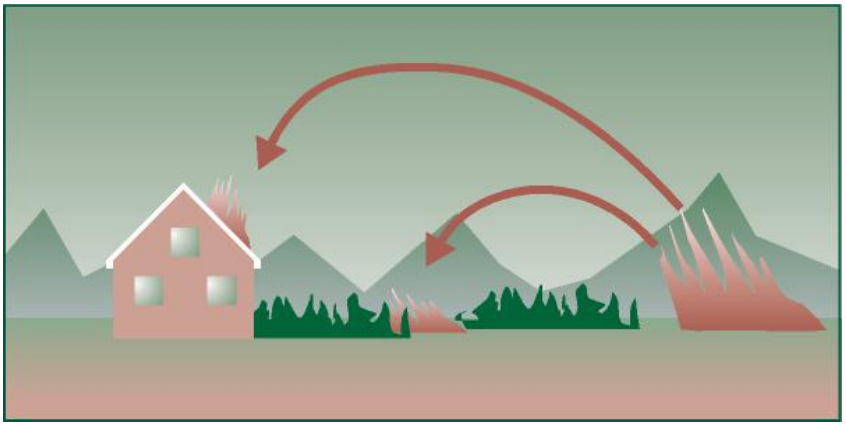
Convective and radiant energy from a

Wildland wildfire prevention and Firewise programs in the Black Forest community are intended to reduce the chances of home ignition by reducing wildland fuels and reducing opportunities for structure ignition, and then by increasing the resilience of the structure. Firebrands from wildfire become a major source for home ignitions. Wildfires can also ignite structures through radiation, convection or conduction. Wood is very resistant to ignition from radiation. This means that the heat from a fire is very unlikely to ignite a home. Convection occurs when heat is carried by air currents. In wildland fire, this is known as pre-heating. Pre-heating can make the home and landscape far more vulnerable to fire, but rarely, by itself, ignites a home. Conduction is the primary ignition source for homes, generally through direct flame impingement, or by the accumulation of burning embers that then ignite a receptive fuel bed around the home and inside the home ignition zone (HIZ).

Recognizing the methods of home ignition then leads to a strategy to protect against structure fire. The approach is three-pronged, and includes building with ignition resistant construction, creating defensible space, and reducing wildland fuels within the wildland-urban interface. Ignition resistant construction means using materials and building methods that resist ignition. All plans for new construction and substantial remodels should be reviewed by an El Paso County Fire Marshal's office to incorporate as much ignition resistance design and materials as possible.

Vulnerable construction elements on the exterior structure are the roofing, siding, venting, windows and decking or attached structures. Gutters can be particularly vulnerable as they can hold light flashy fuels and catch embers. Decks, walkways and fencing that are combustible can act much like a fuse and wick fire to the structure. Building these attached structures with non-combustible or flame resistant materials can greatly reduce the likelihood of ignition (**Appendix 10.2**).

How the home is constructed is also as important as the products used in construction. Common features where construction methods should be evaluated include the gables, gutters, eaves, and venting. These areas of the home can either resist fire intrusion, or can actually funnel heat and embers into the building envelope. An example is the gable end of a structure and the vents used. The eave overhanging the gable can trap heat and wick embers and heat into the attic. Inside corners are also particularly vulnerable to fire, as winds tend to swirl in the corner, effectively creating a vortex of fire that can reach beyond the roofline. *Firewise Construction, Design* and *Materials* by Peter Slack, printed in 2000 has excellent information on protecting the home ignition zone and structure protection (**Slack 2000**).



Firebrands major source of home ignitions

Structural Flammability

Improving the fire-resistant characteristics of a structure goes hand-in-hand with the development of defensible space. Extensive recommendations can be found in CSFS publications available at http://csfs.colostate.edu/csfspublications/ (**Appendix 10.2**). The most significant improvement that can be made to many of the homes in the assessment areas is the replacement of wood shake roofing with noncombustible roofing material, as is required for all new and replaced roofs in the El Paso County WUI. All homeowners should also keep roofs and gutters clear of leaves and pine needles. Screening of gutters and roof vents with 1/8th inch metal screening is recommended. Firebrands or embers from a wildfire can become windborne and travel long distances before settling and become a source of home ignitions.

Common structural fuel hazards associated with homes in the WUI include:

- Combustible roofing and siding;
- Combustible decks with exposed undersides;
- Combustible material under decks;
- Plastic culverts; replace with metal
- Flammable debris on roofs or in gutters.
- Plastic gutters; should be replaced with metal.
- Plastic soffit vents; replace with metal

Community Design

Ideally, all efforts to protect communities in high fire hazard areas should begin with appropriate community design and layout. In the Black Forest today, with the existing stage of community development, it is not likely that many new communities will be built where contemporary

design features can be employed. More likely, given the trend toward the redevelopment of existing properties, it is possible to incorporate some elements of safe community design into the Black Forest community.

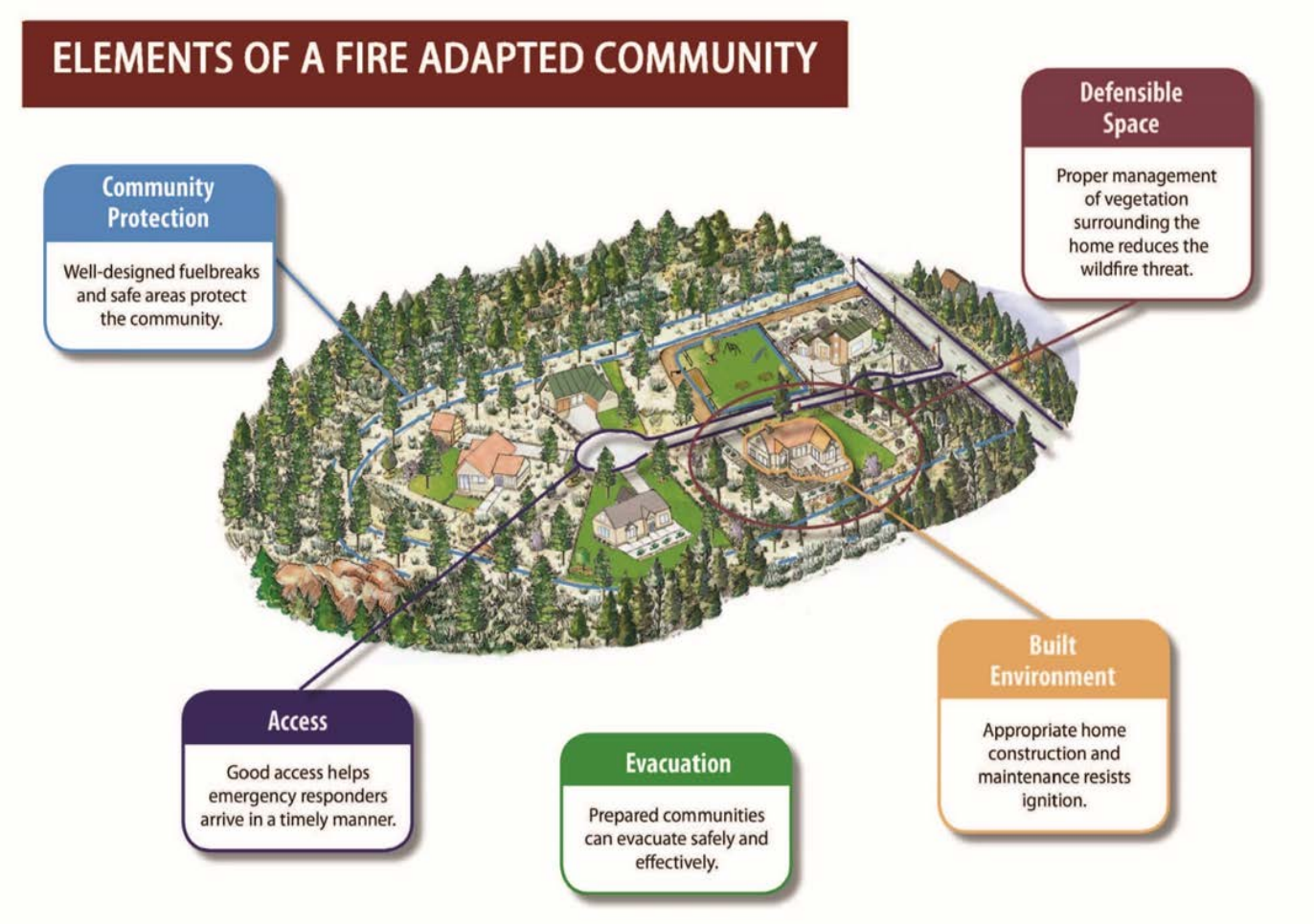
The basics of Fire Adapted Community design include:

ENCOURAGE INDIVIDUAL PREPARATION FOR EACH STRUCTURE IN THE COMMUNITY: Design guidelines required by neighborhood associations can be stricter than applicable state defensible space laws. Require ignition resistant landscapes and building materials/methods

PREVENT WILDFIRE INTRUSION INTO THE COMMUNITY: Design a reduced fuel zone around the community that will be maintained to prevent extreme fire behavior and to provide a safe zone for firefighters to engage an approaching wildfire

FACILITATE EVACUATION: Design the community with at least two access roads and provide adequate space to turn large equipment. Many neighborhoods in the Black Forest community have only a single road for ingress and evacuation.

FACILITATE EMERGENCY RESPONSE: Fire engines used for structure and community protection are typically greater than 30 feet in length and 10 feet in width. An engine must be able to enter the community, quickly turn and prepare to retreat to a safe zone and then begin operations. Turnarounds provide engine crews with the ability to safely maneuver equipment and allow them to maintain access to escape routes.



Wildfire is everyone's responsibility. Every year thousands of wildfires burn millions of acres across the United States. It's not if, but when the next wildfire will threaten your community. The Fire Adapted Communities website offers information and specific actions you can take, no matter what your role, to reduce your risk to the next wildfire www.fireadapted.org.

Defensible Space on Structures

Homes constructed in the natural vegetation of Colorado's landscapes such as the Black Forest are inherently at risk from a wildfire. Wildfires are a natural part of Colorado's varied forest ecosystems, hence living in the wildland requires Firewise planning to reduce fire hazards. Defensible space is the natural and landscaped area around a home or other structure that has been modified to reduce fire hazard, Defensible space gives your home a fighting chance against an approaching fire. The CSFS (2012) publication, *Protecting Your Home from Wildfire: Creating Wildfire-Defensible Zones* (**CSFS Quick Guide FIRE 2012-1**), serves as a useful guide for homeowners to better understand the defensible space options for their homes and community.

Defensible space provides another important advantage during a fire: increased firefighter safety. Firefighters are trained to protect structures only when the situation is relatively safe for them to do so. They use a process called "structural triage" to determine if it is safe to defend a home

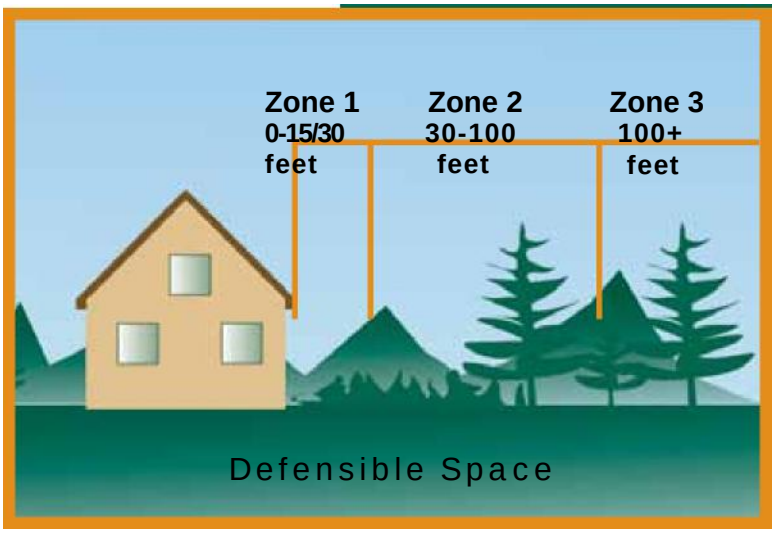
from an approaching wildfire. The presence or absence of defensible space around a structure is a significant determining factor used in the structural triage process, as defensible space gives firefighters an opportunity to do their job safely. In turn, this increases their ability to protect your home.

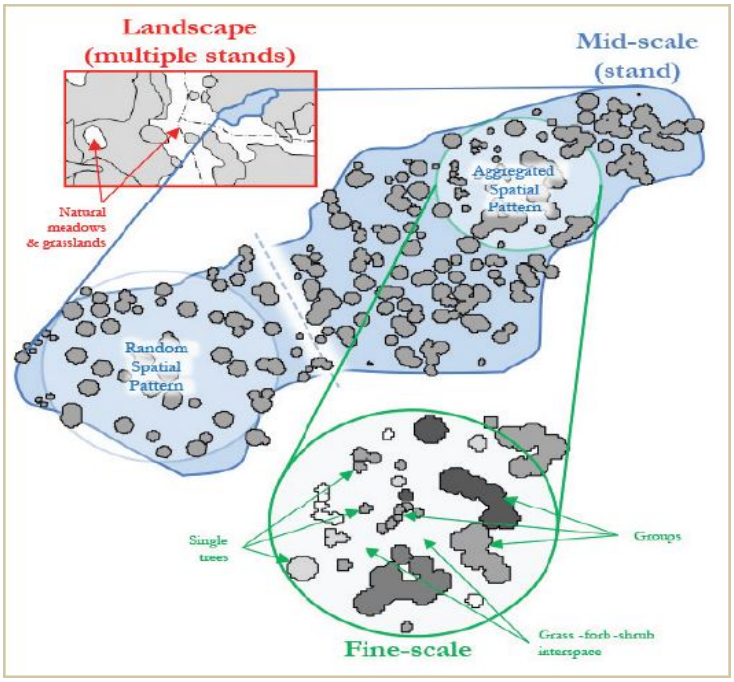
If firefighters are unable to directly protect your home during a wildfire, having an effective defensible space will still increase your home's chance of survival. It is important to remember that with wildfire, there are no guarantees. Creating a proper defensible space does not mean that your home is guaranteed to survive a wildfire, but it does significantly improve the odds (**CSFS 2012**).

Effective defensible space consists of a fuel-free zone adjacent to the home, a treated secondary zone that is thinned and cleaned of surface fuels, and if the parcel is large enough, a transitional third zone that is basically a managed wild land area. These component all work together in a proven and predictable manner.

Zone 1, a noncombustible area keeps fire from burning directly to the home. This area extends from the structure 15 to 30 feet. In this area most flammable vegetation is removed. Increasing the width of Zone 1 will increase the structure's survivability.

Zone 2, lean, clean and green. This is a transitional area of fuels reduction between Zones 1 and 3 and extends out 100 feet from all structures. Zone 2 reduces the adjacent fire intensity and the likelihood of torching crown fire. Treatment objective is to remove enough trees to create at least 10 feet of separation between crowns. Zone 2 should extend 30 feet from each edge of the driveway to the road. Remove all ladder fuels from under remaining trees, pruning branches to a height of 10 feet from the ground. On smaller trees leave at least 2/3 of the crown with green needles. (**CSFS 2012**).





Zone 3, wildland fuel reduction area. This area extends from the lean, clean, and green area with no specified width. In the wildland fuel reduction area, the objective is to minimize the horizontal and vertical continuity of wildland fuels. Creating a stand structure incorporating "groupie clumpie" prescriptions breaks up fuel and crown continuity as well as providing a sustainable forest

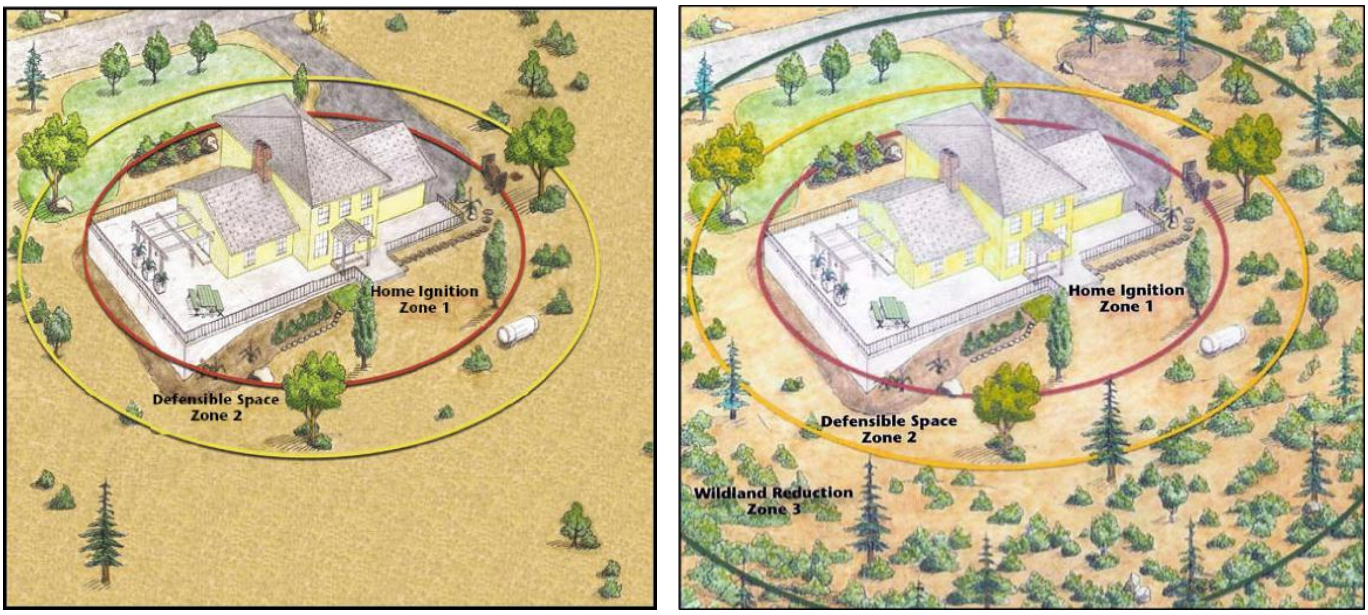
Characteristic vegetation patterns at three spatial scales for frequent-fire forests in the Southwest. The landscape-scale illustrates the importance of multiple stands (patches), meadows, and grasslands. The mid- and fine-scales illustrate grass-forb-shrub interspaces and uneven-aged stand conditions consisting of single, random, and grouped trees of different vegetation structural stages (from young to old), represented by different shades and sizes at the fine-scale. Also depicted are two different tree spatial patterns at the mid-scale (separated by the dashed line): trees are randomly spaced on the left side of the dashed line and are aggregated on the right (given the definition of stand as a homogenous area, both patterns could not actually be present) (**Reynolds et al. 2013**).

Home Ignition Zone

Two factors have emerged as the primary determinants of a home's ability to survive a wildfire – the quality of the defensible space and a structure's ignitability. Together, these two factors create a concept called the Home Ignition Zone (HIZ), which includes the structure and the space immediately surrounding the structure. To protect a home from wildfire, the primary goal is to reduce or eliminate fuels and ignition sources within the HIZ (CSFS 2012, **Appendix 10.2**).

The illustrations below show how to effectively implement defensible space inside the home ignition zone with wildfire resistant plants (**Appendix10.2**) in two types of wildland settings. The first image is of a home site in a grassland setting. The second image is home site located in a forested landscape.

Grassland Meadow Landscape **Forested Landscape**

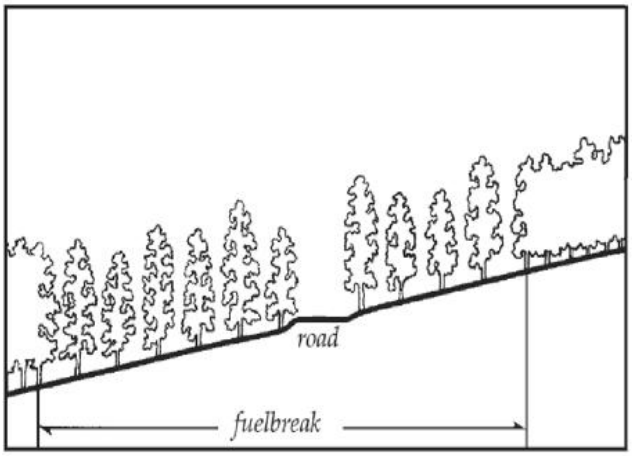


Access

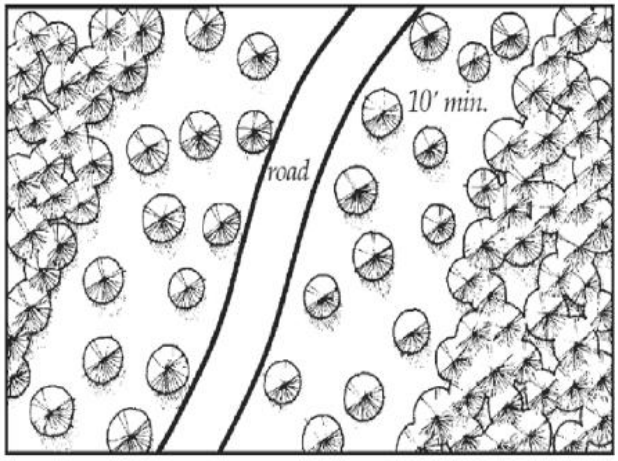
Access is an important component of any community's wildfire hazard and risk profile. Availability of ingress/egress, characteristics of road surface, road layout and design, treatment of dead ends, grade, characteristics of switchbacks, and width all factor into access assessment and emergency scenario and evacuation planning. Road conditions within the District were found to be adequate with paved access throughout. Conversely, emergency access onto secondary roads and cul-de-sacs were found to be restricted with single lanes and limited dead end turn arounds that would hamper emergency access and two-way traffic flow in the event of an evacuation. Further, the entire southern and central portions of the community have very limited egress access along the Black Forest Road to Hodgen Road to the north and Woodmen Road on the south; Shoup Road to the west, and Meridian Road to the east in the BFFR District Roads.

Shaded Fuelbreaks on Roadways

Reducing the forest canopy along access roads enhances the effectiveness of the physical forest canopy break the road provides, as well as critical safety factors along likely evacuation and incident access routes. This creates a safer emergency ingress/egress scenario while greatly aiding potential tactical suppression efforts. Consult *Fuelbreak Guidelines for Forested Subdivisions & Communities* (**Dennis 2005**) for further guidance on creating shaded fuelbreaks in subdivisions (**Appendix 10.2**).



Cross-section of a typical fuelbreak built in conjunction with a road.



Plan view of fuelbreak showing minimum distance between tree crowns.

Project priority should be given to the forested road margins of the primary El Paso County Roads, Black Forest Road (North and South), Shoup Road (West), Shoup/ Meridian (East), Milam Road South to Old Ranch Road and Burgess Road (East) as evacuation routes at intersections and along where traffic flow for residents is restricted. Shaded fuelbreak treatment has been identified along the entire El Paso County Road system through the BFFR District,

Forest treatment reducing fuels along existing roads will create shaded fuelbreaks improving firefighter access and resident egress in the case of fire evacuation. Shaded fuelbreak treatments should be modified as seen on the Fuelbreak Width/Slope chart where percent of slope extends treatment boundaries according to the chart recommendations.

Fuelbreak Width / Slope

Percent Slope	Minimum Uphill	Minimum Downhill	Total Width of Modified fuels
(%)	Distance (ft.)	Distance (ft.)	(ft.) *
0	150	150	300
10	140	165	303
20	130	180	310
30	120	195	315
40	110	210	320
50	100	225	325
60	100	243	340

*As slope increases, total distance for cut-and-fill for road construction rapidly increases, improving fuelbreak effective width.

The next images visually depict an open ponderosa pine stand with similar conditions before and after harvest.

Before and After Thinning in Conifer Stands with Slash Deposal Remaining

Strategic Community Fuelbreaks

Thinning recommendations may also target stands posing specific wildfire threat to neighborhoods, typically where a steep forested gully or slope runs up into a subdivision. Strategic fuelbreaks may be designed with shaded fuelbreaks characteristics or as a fuel buffer for more aggressive fuel reduction. Strategic fuelbreaks along neighborhood margins should mutually support adjacent defensible space efforts.

To date, stand treatment in the BFFR District has focused primarily on timber units within community-owned private land parcels. While this strategy has provided streamlined access to critical hazardous timber units, the majority of additional recommended treatments involve surrounding private lands as well as closed canopy timber stands located inside of the District. Treatments at this scale may be of critical strategic importance but will involve more complex hurdles including negotiations with private land owners, public support, presiding agency support, funding and capacity, as well as environmental impact concerns. Coordination with these entities may be necessary to implement strategic community fuelbreaks.

4.4 OUTREACH & PUBLIC EDUCATION

There is an ongoing need to continually inform landowners and community members regarding the risks posed by wildfire, and to educate them about strategies for living safely in the WUI, preventing fire, minimizing risk, protecting structures and resources, and participating in evacuation procedures. Both the BFFR and BFT provide educational information and programs to the Black Forest community. Additionally, the CSFS and the El Paso County Sheriff's office provide prevention, education and land stewardship programs and information. These organizations are recognized for their effective leadership in community education, and for collaborating to achieve results in the Black Forest community.

The most effective means to initiate local action is through community education and public outreach. Community education may target a number of goals and objectives including:

- Identify wildfire hazards and risks;
- Introduce the benefits of defensible space and Firewise construction principals;
- Urge homeowners to take action on their own property and influence neighbors, friends, and HOAs;
- Initiate creation of an oversight group to drive CWPP implementation and grant application;
- Increase awareness of current forest conditions and how hands-on management practices can help restore forest health and reduce wildfire risk; and
- Create awareness of the historical role fire has played in the regional ecosystem and forest and rangeland health.

Some parcels within subdivisions may be undeveloped and/or owned by absentee owners. A lack of fuels management on these lots can impact the entire community. An effort should be made to contact these landowners and determine how to address their concerns and overcome potential obstacles to conducting hazard fuel mitigation on their land.

4.5 FIREWISE COMUNITY

BFFR has had a long-standing Firewise Program. This program provides our community and surrounding communities through inter-department relationships, assessments and mitigation assistance. This provides our community with valuable information for keeping their home and family as safe as possible. Within this program we also provide Ready, Set, Go!, a program that prepares homeowners and families for an evacuation during any kind of natural disaster. This program is administered by the membership as a whole utilizing career and Volunteer members of the BFFR District.

BECOME A FIREWISE HOME AND LANDSCAPE

Concerned about brush, grass or forest fires where you live? Use this section to learn more about Firewise principles. Find tips and tools to make your home and neighborhood safer from wildland fire. This home in the BFFR community demonstrates excellence in Firewise principles and landscaping.

Firewise homeowner in compliance with wildfire mitigation

Find out from the BFFR and the experts on how the best way to make your home and neighborhood safer from wildfire. From the basics of defensible space and sound landscaping techniques to research on how homes ignite (and what you can do about it), there are tips, tools and teachings you can use!

Share your knowledge with others using our Firewise Toolkit tip sheets, our Communicators' Guide, or our videos and Public Service Announcements (PSAs).

For information on BFFR Firewise Programs see www.bffire.org.

These guidelines complement Colorado State Forest Service Publication, *Protecting Your Home from Wildfire: Creating Wildfire Defensible Zones*. Individual home and property owners should strive to understand and apply these principles and guidelines and seek to implement the Firewise recommendations found at www.firewise.org (**Appendix 10.2**).

5. RESTORE AND MAINTAIN FIRE RESILIANT LANDSCAPES

5.1 POST-FIRE RECOVERY RESTORATION

Post-fire landscapes present significant community challenges. Key considerations for the Black Forest community include identifying both the desired future condition for the Black Forest and defining the community action to get there. Immediate post-fire stabilization activities, such as erosion control, generally has broad levels of support. Removal of hazard trees, particularly along roads, is highly supported. Broader management decisions, such as salvage logging, tend to elicit a greater range of opinions.

Similar to other natural disasters, experiencing wildfire can lead to a variety of responses. For some, the experience will increase motivation to take proactive measures while others may be less likely to engage in risk reduction behaviors due to a sense of fatalism or a belief that risk reduction is unnecessary because "lightning doesn't strike twice" (**Toman et al. 2013**). See **Appendix 10.3**.

The ponderosa pine forest of the Black Forest community provides important amenities and services to the community including quality habitat for wildlife, biodiversity of plant and animal communities, clean water, aesthetic benefits, and recreational opportunities. Timely reforestation to restore forest cover on denuded lands following a major catastrophic event, such as the Black Forest Fire, is important to maintaining forest ecosystems and deriving associated ecological, social, and economic benefits.

Seedlings are available from the CSFS nursery in Fort Collins

Reforestation is an element of a land stewardship ethic that includes growing, nurturing trees to meet specified resource objectives while conserving soil, air, and water quality in harmony with other resource management concerns. Reforestation of areas denuded by catastrophic fire is important to sustaining the values important to the Black Forest community (see **Appendix 10.3)**. BFT has initiated a Tree Donor and Recipient Program to assist land owners who lost trees in the June 2013 Black Forest Fire. This program matches landowner donors with those landowners requesting replacement trees. For those landowners that are interested in either donating trees or purchasing transplanted trees, a Donor Registration Form and instructions are available on the BFT website.

Catastrophic wildfires, such as the Black Forest Fire, have resulted in significant losses to critical wildlife habitat, imperiled fisheries, watersheds, and municipal water sources. These events also

threaten the long-term productivity of forest soils, through erosion and changes in soil properties, as well as many other resources.

Restoring forested ecosystems following a large-scale disturbance typically involves a series of steps:

- Emergency stabilization to prevent threat to life, property, and further damage to watersheds;
- Rehabilitation of resources affected by the disturbance that are unlikely to recover without human intervention; and
- Longer term restoration treatments, including reforestation, that span many years and are needed to restore functioning ecosystems.

On some occasions, natural regeneration can serve to meet forest management objectives. In other instances, active reforestation actions such as planting seedlings may be necessary.

Seedlings, which can be obtained for a range of species and sizes from the CSFS Nursery, can be used for a diverse range of conservation efforts, which include (**CSFS 2016**):

- Reforestation in areas devastated by fire and flood
- Stabilizing soil and contributing to erosion control
- Providing an edible landscape while enhancing pollinator and wildlife habitats
- Creating shelterbelts and wind rows to protect livestock, crops and homes

Black Forest post-fire recovery and restoration projects have been underway by Black Forest Together since 2014. These projects have been made possible through dedicated volunteers focused on fire cleanup, erosion control and forest restoration. Recovery from a wildfire is a long-term process and requires continued commitment with both time and funding.

Following the June 11, 2013 Black Forest Fire, El Paso County mobilized an assessment team to identify the hazards to life and safety and risks to County Parks infrastructure and adjacent properties. The assessment report addresses burn severity, outlines recovery methods and provides recommendations to address long-term impacts. The recommendations are applicable across the 14,000 impacted by the Black Forest Fire. The assessment report, *Black Forest Fire Burn Assessment,* can be accessed through the following link: http://adm.elpasoco.com/CommunityServices/planning/Documents.

The assessment report, *Black Forest Fire Burn Assessment,* has information on recovery methods and long-term impacts of the Black Forest Fire. Information can be accessed through the following link: http://adm.elpasoco.com/CommunityServices/planning/Documents.

5.2 NOXIOUS WEEDS

Common Mullin

The Colorado Agriculture Commission has established a three-tiered ranking system to determine if a noxious weed should be eradicated immediately (List A), plants that should be stopped before they spread (List B) or if they are selected for recommended control methods (List C). Weeds can easily spread across the property by wind, birds, animals and vehicle traffic. Listed B plant species observed during the field inventory include Canada thistle (*Cirsium arvense*), leafy spruge (*Euphorbia esula*), diffuse knapweed (*Centaurea deusa*), and musk thistle (*Carduus nutans*). Common mullein (*Verbascum Thapsus*), a List C species has also been observed on the property. Additional information is available on the Black Forest Together web site, www.blackforesttogether.org Forest Recovery, Best Management Practices and in **Appendix 10.3**

6. EFFECTIVE AND EFFICIENT WILDFIRE RESPONSE

6.1 NOTIFICATION AND EMERGENCY ALERTS

Large scale explosion in conifer stand wildfire

In the event that the El Paso County Sheriff orders the community to evacuate because of threatening wildfire, residents should leave in an orderly manner. The Sheriff would proclaim the preferred evacuation routes and safe sites. The need to evacuate may be communicated by telephone, media, and/or direct contact from emergency personnel. Emergency notification was a community concern expressed during the development of this CWPP. Recommendations to improve communications and emergency notification resulted from these discussions. However, if a wildfire is threatening the area it is not necessary to wait for an evacuation order to leave.

The Black Forest community has unique challenges when it comes to evacuation planning and conducting an evacuation during a wildfire. Historically, fire department and offices of emergency services have relied on a reverse 911 call system (where you receive an emergency call to your home) to notify residents when an evacuation has been ordered in their community. With the proliferation of mobile phone services, reverse 911 may result in communications with only a limited number of residents. Cell phones may be rendered even more ineffective when large numbers of people try to use them at once and exceed carrier capacity.

DETERMINE WHAT SYSTEM for emergency notification or method of notification would best fit and implement it throughout the Black Forest community. A coordinated countywide approach would make it easier for anyone in the Black Forest community to be notified of an emergency and be advised as to what actions to take in the event of an evacuation order. This is particularly important as it applies to electronic notification on mobile phones or computers. A system similar to an “Amber Alert” could be effective.

PRESENT A CONSISTENT MESSAGE to the community of what to do to prepare for an emergency. Numerous fire districts use similar documents, but some may need to be updated. There should be one preparedness guide for all the districts in El Paso County that could be periodically updated and conveniently made available on the internet and through other publication and distribution channels.

EVCUATION PLANNING IS CRITICAL and scenarios for evacuation should be run periodically with law enforcement, fire personnel, and local community members. Community evacuation practice opportunities help residents understand the importance of evacuation planning, and law enforcement and emergency personnel can understand potential evacuation challenges. More also need to be done to inspire community members to prepare their own evacuation plans. The recent wildfire tragedy in Fort McMurray, Alberta, Canada, where recovery efforts are now underway after catastrophic wildfire destroyed 2,400 structures and caused over 80,000 residents to flee their homes (**The Globe and Mail 2016)**, demonstrates the critical nature of community evacuation planning.

Reverse 911 Notification

Reverse 911 calls are not automatically routed to cellular phones. El Paso and Teller Counties maintain an Emergency Notification System to alert the public of emergency situations that are a threat to life or property. To be certain to receive notifications, residents' landlines, cell phones, text message, VOIP, TYY/TDD, and email addresses should be registered at: http://member.everbridge.net/index/1772417038942752#/signup; more information is provided at www.elpasoteller911.org. It is important to note that telephone lines that carry a solicitation blocker (where a caller has to enter their phone before the line will ring) may prevent emergency calls from being delivered (El Paso-Teller County Emergency Notification System 2016).

6.2 EVACUATION PLANNING AND PREPARATION

Planning for evacuation from fire is challenging because fire emergencies are dynamic with the location and direction of spread varying depending on start location, weather, topography, and fuel. With flood and earthquakes, the area that will be most greatly impacted is typically better understood, and residents can plan their evacuation knowing where the high water will be over the roads or where the areas of most likely earthquake damage will occur. In these situations, the location of the emergency evacuation centers will be relatively stable.

Black Forest Fire looking West on Shoup Road - Courtesy Smitty

With a wildfire evacuation, the location and direction of the fire may change rapidly, so the evacuation route must be determined specific to the incident. Emergency evacuation centers will also be established based on the location of the fire, the size of the incident, and area ordered to evacuate. Being prepared to evacuate before the fire is the single most important action people can take to safely evacuate. BFFR actively supports **Ready, Set, Go!**, a program that prepares homeowners and families for an evacuation during any kind of natural disaster This program helps residents be **Ready** with preparedness understanding, be **Set** with situational awareness when fire threatens, and to **Go**, acting early when a fire starts. This

program is administered by the membership as a whole utilizing career and volunteer members of the department. Tips and tools for residents are provided by Ready, Set, Go! at www.wildlandfirersg.org/Resident.

There is no "magic recipe" for evacuation. By knowing all possible options community residents are better prepared when the order is given. There are several consistent elements of basic emergency preparedness:

- Understand and identify all ingress and egress routes that take you to a major roadway. Depending on the emergency, some routes may be unusable. Listen carefully to the evacuation instructions provided by the El Paso County Sheriff.
- Consider discussing evacuation with your neighbors in an effort to watch out for each other. BFFR will gladly meet with you (or preferably a group of neighbors) to make this plan neighborhood-specific.
- While the emergency alert system and television stations are a potential source of emergency information, the power may be out leaving your vehicle's radio as your only information option. Program local radio stations (KRDO 105.5 FM or 1240 AM, KVOR 740 AM, or KZNT 1460 AM) into your car radio as part of emergency preparedness.

Recommended emergency preparedness actions

Each household or other group should prepare or review their Emergency Family Evacuation Plan and prepare a To-Go Bag. An Emergency Evacuation Plan should contain the following elements:

- Meet with household members. Explain dangers to children and work as a team to prepare your family or household for emergencies.
- Discuss what to do about power outages and personal injuries.
- Post emergency phone numbers near phones.
- Learn how to turn off the water, gas and electricity at your home.
- Select a safe meeting point. During an emergency you may become separated from family, household or other group members.
- Complete a family/household communication plan. Your plan should include contact information for family members, work and school.
- Complete an inventory of household contents and photograph/videotape the house and landscape. Place files in your To-Go Bag. A second copy of these files should be stored in a location away from your community.
- Identify escape routes and safe places. In a fire or another emergency, you may need to evacuate very quickly. Be sure everyone in your family/household knows the best escape routes out of your home and where safe places are in your home for each type of disaster. Draw an escape plan with your family/household highlighting two routes out of each room.

- Prepare “EVACUATED” signs and if you have an emergency water source (pool, pond or hot tub), “WATER SOURCE HERE” signs. Select sites to post the signs where they will be clearly visible from the street. After planning, the family/household is encouraged to prepare to evacuate and plan to leave within minutes. Pre-packing relieves the stress of sudden evacuation and enables the family/household to focus on evacuating.
- The To-Go Bag enables a household to grab important paperwork, pictures and enough personal effects that the family can focus on learning the safe evacuation routes and evacuate. When a wildfire is approaching, evacuees may only have enough time to retrieve this bag. At a minimum this should contain:
    - Clothing, personal toiletries and prescription medicines.
    - Inventory of home contents and photographs/videotape of the house and landscape.
    - Flashlight, portable radio tuned to an emergency radio station and extra batteries (change batteries annually).
    - Extra set of car and house keys.
    - Extra pair of eyeglasses.
    - Contact information for family, friends and physicians.

Evacuation plans are intended to organize a family or household actions during an emergency so that everyone can safely evacuate and reunite. Grouped together at the community level, the elements of the family evacuation plan can be incorporated into a community evacuation plan. The community evacuation plan should consider evacuation of persons with special needs, such as the elderly or those with medical conditions. Consider the following when preparing evacuation plans for those with special needs:

- If the family/household member is dependent upon medications or equipment, or has special dietary needs, plan to bring those items with you. Documentation about insurance and medical conditions should also accompany the person.
- Transportation available to the general public during an emergency evacuation may not be suitable for family members with special needs. Plan ahead for their transportation
- Many special-needs persons are easily upset and stressed by sudden and frightening changes. Your plans should ensure that a caregiver or trusted family member is able to stay with them at all times during an evacuation.

Pets and large animals always have special needs during an evacuation and many evacuation centers cannot accommodate pets. It is therefore imperative that people consider how their pets can be cared for during the entire period of the evacuation. Plan to take your animals with you or have other arrangements in place. Never simply turn them loose. Contact El Paso animal services department for advice on animal and livestock/horse evacuation (**Appendix 10.5**).

- Make sure dogs and cats wear properly fitted collars with identification, vaccination, microchip and license tags.

- Your pet evacuation plan should include routes, transportation needs and host sites. Share this plan with trusted neighbors in your absence.
- Exchange veterinary information with neighbors and file a permission slip with the veterinarian authorizing emergency care for your animals if you cannot be located.
- Make sure all vehicles, trailers and pet carriers needed for evacuation are serviced and ready to be used.
- Assemble a pet To-Go Bag with a supply of food, non-spill food and water bowls, cat litter and box, and a restraint (chain, leash or harness). Additional items to include are newspaper, paper towels, plastic bags, permanent marker, bleach/disinfectant solution and water buckets.

6.3 EVACUATION ROUTES

Notification to evacuate will be issued by the El Paso County Sheriff by means of a reverse emergency notification system. The message will indicate the safest and preferred evacuation route. Residents should follow directions provided in the recorded message. Other notifications may come from local TV and radio stations.

- TV: KOAA Channel 5 (NBC), KKTV Channel 11 (CBS), KRDO Channel 13 (ABC), KXRM Channel 21 (Fox)
- Radio: KRDO 105.5 FM or 1240 AM, KVOR 740 AM, or KZNT 1460 AM)

The primary evacuation routes are: Major north and south routes are Highway 83, Black Forest, Vollmer, Meridian and Milam Roads; Major east and west routes are Shoup Road, Burgess Road and Hodgen Road. (**Appendix 10.1 Maps).**

6.4 LARGE ANIMAL EVACUATION CENTERS

The following is a list of potential evacuation centers and shelters for large animals for disaster and wildfire events. Refer to **Appendix 10.1** for maps.

West side:
Pikes Peak Community College
New Life Church

South:
St. Francis Medical Center
6001 East Woodmen Road
Colorado Springs, Colorado
(719) 571-1000

East:
Latigo Equestrian Center
(Large Animal Facility)
13710 Hallelujah Trail
Elbert, Colorado 80106
(719) 495-0176

North:
Wolford Elementary School
13701 Black Forest Road
Colorado Springs, Colorado 80908
(719) 234-4300

Ray Kilmer Elementary School
4285 Walker Road
Colorado Springs, Colorado 80908
(719) 488-4740

- Black Forest Animal Sanctuary (719) 494 0158
- Shiloh Ranch (719) 208 7058
- El Paso County Fairgrounds (719) 520 7880
- Elbert County Fairgrounds (303) 621 3152
- Humane Society of the Pikes Peak Region (719) 473 1741
- National Mill Dog Rescue (719) 495 7679
- Wild Blue Animal Rescue (719) 964 8905

6.5 STAGING AREAS

The District has identified locations where responding mutual aid or auto aid fire departments may be staged for assignment in the early stages of a wildland event, or until an Incident Command Post or Emergency Operations Center is established. BFFR will determine the establishment of Command or Operation Center as an emergency event unfolds. Other considerations for staging area locations include: type of incident, expected duration, number of resources, and other operational and logistical needs.

Emergency Preparedness

BFFR is fortunate to maintain adequate staff and equipment to effectively handle the vast majority of the most likely fire and medical emergencies. Mutual Aid agreements with adjacent fire protection districts and other fire agencies, with participation with the Colorado Springs Fire Department, are in place to cover incidents that may overload current BFFR resources.

7. IMPLEMENTATION

7.1 RECOMMENDED ACTIONS

The wildland wildfire treatment prescription is to aggressively thin the closed canopy conifer stands as prescribed in this report, progressively remove dead trees, and initiate a widespread reforestation campaign program. The objective is to restore the great forests of the Black Forest community before losing control of the ecosystem.

The following recommendations should be considered to ensure adequate forest management, wildfire mitigation, and to increase the forest health in the BFFR community:

- Develop an CWPP Annual BFFR Operation Plan with the community to implement the CWPP action plan and control work.
- Develop an annual event to celebrate the top three Firewise home and landscape winners.
- Schedule an annual strategic community fuelbreak thinning to create a healthy forest with a fire-resistant stand structure.
- Remove all portions of trees, including the bole (wood) and slash (limbs) from the mitigation project area.
- Develop an annual strategic community fuelbreak project along the major access roads aimed for ingress and egress.
- BFT should complete an annual voluntary community survey for insects and diseases between October and June, and prepare a treatment plan for the community.
- Seek highly qualified certified foresters to marked all designated trees and administer mitigation project work.
- Adhere to Colorado's Best Management Practices (**Appendix 10.9**).
- Work in cooperation with the neighboring residents where feasible in implementing this BFFR CWPP plan. If similar management measures can be implemented on adjacent lands in conjunction with this property, it will strengthen the forest management for the entire BFFR area.
- Implement the *Colorado State Forest Service Quick Guide for 2012* **(Appendix 10.2)**.
- Retain ponderosa pine over Douglas-fir in general but select for Douglas-fir if this species has superior form and crown condition locally.
- Retain clumps of trees across all stands to maintain natural aesthetics and provide thermal cover for wildlife.
- Maintain defensible space for existing structures using the standards listed in the Colorado State University Cooperative Extension resource publication: *Colorado State Forest Service Quick Guide for 2012* (**Appendix 10.2**).
- Encourage community homeowners to work together with BFFR and initiate an emergency response pre-attack plan and become a Colorado Firewise Community, www.firewise.org.

- For additional grants and grant application assistance visit: Rocky Mountain Wildland Fire Information - Grant Database: www.rockymountainwildlandfire.info/grants.htm
- Grant Writing Handbook: www.theideabank.com/freeguide.html

The CWPP Action Plan and wildfire mitigation priorities are based on a 5-year timeline and were derived from the identified priorities and the wildfire risk assessment. Each action (defined in Action Plan below) is stated in the wildfire mitigation priorities.

Table 2. CWPP Action Plan

Objective	Actions	Responsible Party	Target Date
Outreach/Public Education	• Encourage stakeholder participation in community meetings. Become a Firewise community. • Distribute Firewise materials. • Assess individual homes.	BFFR and BFT	
Defensible Space	• Establish a Firewise fuel zone around homes. • Establish a treated second zone that is thinned, pruned, and cleared of excess surface fuels. • Extend treatment to property boundary to improve natural forest conditions and reduce excess hazardous vegetation. • Where lots are small and housing is dense, coordinate efforts between multiple homes to maximize effectiveness. • Employ defensible space practices around identified resources such as cisterns, dip and draft sites, potential safety zones, or observation areas.	BFFR, BFT, and Homeowners	
Firewise Building Improvements	• Replace shake roofs with fire resistant roofing material. • Implement Firewise construction principals for all remodels. • Enclose exposed decks and gables. • Screen vents and chimneys.	Homeowners	
Shaded Fuelbreaks	• Treat fuelbreaks along primary and secondary evacuation routes. • Improve/expand utility right-of-ways.	BFFR, BFT, Adjoining landowners and El Paso County	
Access/Egress Improvements	• Improve hazardous primary access routes. • Create/improve dead end turn arounds. • Create/improve secondary evacuation routes where needed. • Improve identification of DEAD END streets. • Mark driveways with reflective non-flammable house numbers.	BFFR, BFT, and Homeowners	
Supporting Actions	• Support grant funding acquisition actions.	BFFR and BFT	
Emergency Preparedness	• Involve El Paso County in evacuation improvements. • Consider County rules addressing defensible space requirements for home sales.	BFFR	
Fire Department Preparedness	• GIS and update all water resources. • Survey potential dip sites and safety zones. • Develop and distribute community incident pre-attack plans. • Continue community education and outreach. • Continue recruitment, training, and certification. • Continue mutual aid strategic planning. • Continue apparatus, facility, and personal protective equipment (PPE) upgrades.	BFFR	

Outreach and Public Education

Action Item: All community meetings should include reminder information concerning the benefits of defensible space, recommended methods to reduce structural ignitability, forest health issues, as well as wildfire probability. Yard slash disposal opportunities should be coordinated on an annual basis. The Black Forest community has also benefited greatly from the 25 years of the slash/mulch operation that has substantially reduced our fuel load. Run by the Slash and Mulch Committee (SAMCOM). This is coordinated with the Education/Awareness activities and may include the coordination of a central disposal site, mobile chipping services, or a hauling service.

Defensible Space

Action Item: Creating and improving defensible space around individual homes is the most effective method to reduce hazard fuels and the threat of wildfire within the BFFR. It is suggested that the above outreach efforts be used to coordinate and spur implementation and slash disposal at the individual homeowner level. Broad participation on an individual basis ultimately leads to effective hazard reduction at the neighborhood or community level. In neighborhoods where lots are smaller and housing density is high, coordinating efforts between multiple adjacent lots may be necessary to achieve recommended zone dimensions. Many homeowners with the highest need for defensible space are directly adjacent to public community open space properties. Coordinating fuel reduction activities between public, open space, and private lands creates a mutually beneficial environment. Establishing a procedure whereby homeowners who have established defensible space on their property to petition for fuels management on adjacent public lands would facilitate more effective fuels reduction and increase opportunities to enhance forest health.

Effective defensible space consists of a reduced fuel zone adjacent to the home, a treated secondary zone that is thinned and cleaned of surface fuels, and, if the parcel is large enough, a transitional third zone that is basically a managed wildland or forest area. These components all work together in a proven and predictable manner. **Zone 1** keeps fire from burning directly to the home; **Zone 2** reduces the adjacent fire intensity and the likelihood of torching, crown fire, and ember production; and **Zone 3** does the same at a broader scale, keeping the fire intensity lower by maintaining a more historic condition, which in turn reduces the risk of extreme/catastrophic fire behavior.

Structural Flammability

Action Item: Provide for community education, outreach, and information distribution through HOAs and other neighborhood associations. Coordinate public education through existing spring cleanup programs. Grassroots action can be as simple and straightforward as coordinating with a local scout troop to distribute applicable CSFS flyers door-to-door.

Shaded Fuelbreaks on Roadways

Action Item: All access roads within the BFFR with vegetation or timber encroachment should be considered for shaded fuelbreak treatment and/or seasonal mowing. Project priority should be given to the forested road margins of the primary evacuation routes along The Black Forest Road to Hodgen Road to the north and Woodmen Road on the south; Shoup Road to the west, and Meridian Road to the east. Shaded fuelbreak treatment units have been identified in this CWPP.

Future treatments may be coordinated with property owners along adjoining private land and along public or community right-of-ways. Conifer regeneration and reproduction in previously mitigated areas should be addressed. It is recommended that any mitigation projects that involve timber thinning be evaluated, coordinated and monitored by a CSFS mitigation specialist and/or certified forester (**Appendix 10.2**), CSFS *Fuelbreak Guidelines for Forested Subdivisions and Communities*, has been included as procedural and methodology reference for all thinning projects.

Strategic Community Fuelbreaks

Action Item: The current strategy of targeting specified timber units on community open space should be continued. Treated stands within the district will be much less likely to support significant fire behavior in the event of an ignition.

Specific strategic fuel break recommendations target neighborhood margins overlooking steep forested drainages, slopes in along evacuation routes, and community fuel breaks. Showcase demonstration areas like the vegetation management project at La Foret along Shoup Road.

Access

Action Item: Existing turn-arounds should be evaluated for adequate turning radius and improved to meet minimum requirements, restricted critical dead-ends should be evaluated for upgrades to support apparatus turning radius. Remaining dead-ends should be mapped and identified as back-in-access-only for emergency response.

Incident evacuation must support 2-way traffic flow accommodating both residents and emergency responders. Considering existing road infrastructure, incident pre-planning efforts should identify the egress routes for residents. In the event of an incident that requires evacuation, this scenario would provide separate 2-way flow for both residents and responding emergency units. Should these routes become blocked, secondary emergency access should be established through the other public private road connecting BFFR Roads.

Emergency Preparedness

Action Item: Mutual Aid agreements should be reviewed and amended annually to reflect changing conditions. Tactical pre-attack plans should be developed to support larger scale incidents involving Type III, II or I Incident Management Teams, i.e. identify all dead-ends, hydrants, dip sites, security gate locations and access codes, etc. Map books or District runbooks should be created or enhanced with updated strategic and tactical information,

including evacuation routing and hazardous cul-de-sacs. Coordination of evacuation plans should be executed with the El Paso County, Office of Emergency Management.

Forest Health

Action Item: Residents should monitor the health of trees on their property and contact their local CSFS District Forester or a professional arborist with concerns. Further information is available at http://csfs.colostate.edu/districts/.

7.2 MONITORING AND EVALUATION

Maintaining the momentum created by this process is critical to successful CWWP implementation and ongoing community wildfire hazard reduction. Ownership of this responsibility lies with each individual, neighborhood, and HOA in the Black Forest community.

As wildfire hazard reduction efforts are implemented over time and the characteristics of the community change, neighborhoods may wish to reassess particular areas and update the findings of the CWPP. Monitoring the progress of project implementation and evaluating the effectiveness of treatments are important components of CWPP oversight and maintenance. Successes, challenges, and new concerns should be noted and subsequently guide any modifications to the CWPP that better accommodate the changing landscape.

Residents will be responsible for CWPP monitoring and evaluation through regular meetings, public involvement, and coordination with BFFR, neighborhood communities, and HOAs. Monitoring is the collection and analysis of information acquired over time to assist with decision making and accountability and to provide the basis for change. Evaluation includes analysis of the effectiveness of past fuels reduction and non-fuels mitigation projects, as well as recent wildfire suppression efforts. Monitoring and evaluation measures should progress over time in a way that will determine whether the CWPP goals and objectives are being attained.

Table 3. Monitoring and Evaluation Tasks

Objective	Specific Tasks	Timeline	Responsible Party & Date Accomplishment
Risk Assessment	Use reliable data that is compatible among partner agencies.	Annually	
	Update the CWPP as new information becomes available.	Annually	
	Continue to assess wildfire risk neighborhoods and landowners.	Annually	
Fuels Reduction	Identify and prioritize fuels treatment projects on public land through development of a 5-year plan.	Annually	
	Track fuels reduction projects and defensible space projects on private land.	Annually	
	Monitor fuels reduction projects on evacuation routes.	Annually	
	Track grants and other funding sources and make appropriate application.	Ongoing	
Emergency Management	Review suitability and the need for fuels reduction along evacuation routes.	Annually	
Public Outreach	Plan and hold Firewise education week.	Annually	
	Provide Firewise pamphlets at public events.	Annually	
	Evaluate techniques used to motivate and educate private landowners.	Annually	

8.0 GLOSSARY

Abiotic factors: The non-living components of the environment, such as air, rocks, soil, water, peat, and plant litter.

Acre: an area of land containing 43,560 square feet. A square acre would be about 209 feet by 209 feet. A circular acre would have a radius of 117.75 feet.

Afforestation: The establishment of trees on an area that has lacked forest cover for a very long time, or has never been forested.

Aerial fuels: Standing and supported live and dead combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, cones, bark, and vines: typically used in reference to the crowns of trees.

Basal area: the cross-sectional area of a single stem, including the bark, measured at breast height (4.5 feet).

Blowdown: trees or trees felled or broken off by wind.

Cambium: A single layer of cells between the woody part of the tree and the bark. Division of these cells result in diameter growth of the tree through formation of wood cells (xylem) and inner bark (phloem).

Canopy: The forest cover of branches and foliage formed by tree crowns.

Chain: A measuring tape, often nylon, 50 meters or 75 meters in length, used to measure distances. This term is derived from an old unit of measurement (80 Chains = 1 mile).

Chimney: A topographical feature such as a narrow drainage on a hillside or the upper end of a box canyon that could channel wind, smoke or flames up the slope; acting as a fireplace chimney would to draw smoke and heat upward.

Class A roof: Effective against severe fire test exposures, as classified by the Universal Building Code (UBC). Under such exposures, roof coverings of this class are not readily flammable, afford a fairly high degree of fire protection to the roof deck, do not slip from position, and are not expected to produce flying brands.

Class B roof: Effective against moderate fire test exposures, as classified by the Universal Building Code (UBC). Under such exposures, roof coverings of this class are not readily flammable, afford a moderate degree of fire protection to the roof deck, do not slip from position, and are not expected to produce flying brands.

Class C roof: Effective against light fire test exposure, as classified by the Universal Building Code (UBC). Under such exposures, roof coverings of this class are not readily flammable, afford a measurable degree of fire protection to the roof deck, do not slip from position, and are not expected to produce flying brands.

Clearcut: The cutting of essentially all trees, producing fully exposed microclimate for the development of a new age class. An area of forest land from which all merchantable trees have recently been harvested.

Climax forest: A forest community that represents the final stage of natural forest succession for its locality, i.e. for its environment.

Coarse Woody Debris (CWD): Sound and rotting logs and stumps that provide habitat for plants, animals, and insects, and a source of nutrients for soil development.

Colorado Champion Tree: The largest known tree of its species in the state. Trees are ranked by a point system based on three measurements: trunk circumference in inches at 4.5 feet above the ground, tree height in feet, and the average crown spread in feet.

Commercial thinning: A silviculture treatment that "thins" out an overstocked stand by removing trees that are large enough to be sold as poles or fence posts. It is carried out to improve the health and growth rate of the remaining crop trees.

Competing vegetation: Vegetation that seeks and uses the limited common resources (space, light, water, and nutrients) of a forest site needed by preferred trees for survival and growth.

Conifer: Cone-bearing trees having needles or scale-like leaves, usually evergreen, and producing wood known commercially as "softwoods."

Conservation: Management of the human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. It includes the preservation, maintenance, sustainable utilization, restoration, and enhancement of the environment.

Crown fire / Crowning: A form of extreme wildland fire behavior consisting of fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as running or dependent to distinguish the degree of independence from the surface fire.

Dead fuels: Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity segmentation), dry-bulb temperature, and solar radiation

Deciduous: Perennial plants that are normally leafless for some time during the year.

Defensible space: An area around a structure where fuels and vegetation are treated, cleared or reduced to slow the spread of wildfire towards the structure. An area within the perimeter of a parcel, development, neighborhood, or community where basic wildland fire protection practices and measures are implemented, providing the key point of defense from an approaching wildfire or defense against encroaching wildfires or escaping structure fires. The perimeter as used herein is the area encompassing the parcel or parcels proposed for construction and/or development, excluding the physical structure itself. The area is characterized by the establishment and maintenance of emergency vehicle access, emergency water reserves, street names and building identification, and fuel modification measures. In simplest terms, it is adequate space between structures and flammable vegetation which allows firefighters a safe working area from which they can attack an oncoming wildfire. Defensible Space is the best element of fire protection for individual property owners.

Defoliator: An agent that damages trees by destroying leaves or needles.

Dripline: The outer most leaves on a tree defines its dripline and the ground within the dripline is known as the drip zone; also defined as the area defined by the outermost circumference of a tree canopy.

Deforestation: The removal of a forest stand where the land is put to a non-forest use.

Direct attack: A method of fire suppression where actions are taken directly along the fire's edge. In direct attack, burning fuel is treated directly, such as by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

Eave opening: A vent located in an eve or soffit which allows airflow into the attic and/or walls of a structure.

Ecosystem: A functional unit consisting of all the living organisms (plants, animals, microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size a log, pond, field, forest, or the earth's biosphere but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation; for example, forest ecosystem, old-growth ecosystem, or range ecosystem.

Engineering: Engineering is a fire mitigation strategy used to remove or reduce ignition sources from what can ignite or readily burn.

Escape route: A preplanned and understood route firefighters take to retreat from an unsafe or fire-threatened area and move to a safety zone or other low-risk area**.**

Extreme fire behavior: A level of fire behavior that ordinarily precludes firefighting methods involving direct attack on the fire. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

Felling: The cutting down of trees.

Firebrands: Flaming or glowing fuels lofted into the air during intense burning by strong upward convection currents. Also referred to as airborne embers.

Fire behavior: The manner in which a fire reacts to the influences of fuel, weather and topography.

Fire break: A natural or constructed fuel-free barrier used to stop or check fires that may occur, or to provide a control line from which to work.

Fire danger: The broad-scale condition of the rules as influenced by environmental factors.

Fire front / Flame front: The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter.

Fire Dependent: Requiring one or more fires of varying frequency, timing, severity, and size in order to achieve optimal conditions for population survival or growth.

Fire hazard: The presence of ignitable fuel coupled with the influence of terrain and weather.

Fire intensity: A general term relating to the heat released by fire.

Fire hazard mitigation: Various methods by which existing fire hazards can be reduced in a certain area, such as fuel breaks, non-combustible roofing, spark arresters, etc.

Fire management: The activities concerned with the protection of people, property, and forest areas from wildfire and the use of prescribed burning for the attainment of forest management and other land use objectives, all conducted in a manner that considers environmental, social, and economic criteria.

Fire suppression: All activities concerned with controlling and extinguishing a fire following its detection.

Firewise: A National Fire Protection Association's (NFPA) program encouraging local solutions for wildfire safety by involving homeowners, community leaders, planners, developers, firefighters, and others in the effort to protect people and property from wildfire risks.

Flame Height: The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope.

Flame Length: The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface); an indicator of fire intensity.

Flaming Front: The zone of a moving fire where the combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front. Also called fire front.

Forest fire: Any wildfire or prescribed burn that is burning in forest, grass, alpine, or tundra vegetation types.

Forest type: A group of forested areas or stands of similar composition (species, age, height, and stocking) which differentiates it from other such groups.

Fuel: Any living or dead material that will burn.

Fuelbreak: An existing barrier or change in fuel type (to one that is less flammable than that surrounding it) or a wide strip of land on which the native vegetation has been modified or cleared, that acts as a buffer to fire spread so that fires burning into them can be more readily controlled. Often selected or constructed to protect a high value area from fire.

Fuel management: The act or practice of controlling flammability and reducing resistance to control of wildland fuels through mechanical, chemical, biological, or manual means, or by fire in support of land management objectives.

Fuel reduction zone: An area similar to a fuel break but not necessarily linear, in which fuels have been reduced or modified to reduce the likelihood of ignition and/or to reduce fire intensity thereby lessening potential damage and resistance to control.

Germination: The development of a seedling from a seed.

Improvement cutting: the removal of less desirable trees of any species in a stand of poles or larger trees, primarily to improve composition and quality.

Home Ignition Zone (HIZ): An area including the home and its immediate surroundings within which burning fuels could potentially ignite the structure; usually considered to be an area extending out roughly 100 feet from the home. The HIZ is often used to describe the area in which fuel modification measures should be taken to protect the home.

Ladder fuels: Fuels that provide vertical continuity between the surface fuels and crown fuels in a forest stand, thus contributing to crown fires. Vegetative materials with vertical continuity that allows fire to burn from the ground level up to the branches and crowns of trees (Dennis 1999).

Lines of effort: Tasks sets or sets of actions that are linked or coordinated with other task sets to accomplish a larger mission or reach a desired end state. Lines of effort allow leaders and decision makers to direct a variety of separate actions toward a unified result.

Litter: the surface layer of a forest floor that is not in an advanced stage of decomposition, usually consisting of freshly fallen leaves, needles, twigs, stems, bark, and fruits.

Maximum density: The maximum allowable stand density above which stands must be spaced to a target density of well-spaced, acceptable stems to achieve free-growing status.

Mid flame wind speed (MFWS): is defined as the velocity winds, in miles per hour taken at the mid-height of the flame length.

National Fire Protection Association (NFPA): A private, non-profit organization dedicated to reducing fire hazards and improving fire service.

Noxious weed: a plant specified by law as being especially undesirable, troublesome, and difficult to control.

Patch: a small part of a stand or forest.

Phloem: A layer of tree tissue just inside the bark that conducts food from the leaves to the stem and roots.

Pitch tubes: A tubular mass of resin that forms on bark surface at bark-beetle entrance holes.

Prescribed burning: Controlled application of fire to wildland fuels, in either their natural or modified state, under certain conditions of weather, fuel moisture, soil moisture, etc. as to allow the fire to be confined to a predetermined area and at the same time to produce results to meet planned land management objective.

Ready, Set, Go! (RSG): A program, managed by the International Association of Fire Chiefs (IAFC), seeking to develop and improve the dialogue between fire departments and residents. The program helps fire departments teach individuals who live in high-risk wildfire areas how to best prepare themselves and their properties against fire threats.

Regeneration: The act of renewing tree cover by establishing young trees, naturally or artificially note regeneration usually maintains the same forest type and is done promptly after the previous stand or forest was removed.

Riparian area: related to, living, or located in conjunction with a wetland, on the bank of a river or stream but also at the edge of a lake or tidewater.

Saddle: A depression, dip or pass in a ridgeline; significant in wildland firefighting because winds may be funneled through a saddle, causing an increase in wind speed.

Safety zone: An area essentially cleared of flammable materials, used by firefighters to escape unsafe or threatening fire conditions. Safety zones are greatly enlarged areas in which firefighters can distance themselves from threatening fire behavior without having to take extraordinary measure to shield themselves from fire/heat.

Sapwood: The light-colored wood that appears on the outer portion of a cross-section of a tree.

Serotinous: Pertaining to fruit or cones that remain on a tree without opening for one or more years note in some species cones open and seeds are shed when heat is provided by fires or hot and dry conditions.

Shaded fuelbreak: A fuelbreak built in a timbered area where the trees within the break are thinned and limbed up to reduce crown fire potential, yet retain enough crown canopy to provide shade, thereby making a less favorable microclimate for surface fires.

Silviculture: The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands. Silviculture entails the manipulation of forest and woodland vegetation in stands and on landscapes to meet the diverse needs and values of landowners and society on a sustainable basis.

Snag: A standing dead tree or part of a dead tree from which at least the smaller branches have fallen.

Stand: A continuous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit.

Spot Fire / Spotting: Fires ignited beyond control lines or outside the perimeter of a fire by firebrands landing on/among flammable material. Spot fires/spotting are a form of extreme fire behavior typically resulting from high wind conditions.

Structure protection: A defensive strategy in wildland firefighting in which firefighters are assigned to evaluate, prepare and, when possible, defend structures/homes that may be threatened by a wildfire.

Structure triage: Evaluating and sorting structures/homes into categories based on their relative likelihood of surviving a wildland fire threat (*defensibility*). Triage decisions are based multiple factors and conditions occurring during an actual fire - weather, fire behavior, home ignition potential, defensible space, presence of escape routes, and availability of firefighting resources, among others - with the goal of doing the most good with the resources available.

Succession (or ecological succession): The replacement of one plant and/or animal species over time by another in progressive development toward climax vegetation.

Surface fuels: Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low-lying live vegetation.

Survivable space: A term typically used to describe the area around a structure/home indicating that fuels in the area have been reduced to the point that there is little or no serious fire threat to the structure; the structure has a high probability of surviving a wildland fire without anyone on scene providing active protection.

Thinning: A cutting made in an immature crop or stand primarily to accelerate diameter increment, but also, by suitable selection, to improve the average form of the tree that remain.

Topography: Also referred to as "terrain." The physical parameters of the "lay of the land" that influence fire behavior and spread. Key elements are slope (in percent), aspect (the direction a slope faces), elevation, and specific terrain features such as canyons, saddles, "chimneys," and chutes.

Torching: The burning of the foliage of a single tree or a small group of trees, from the bottom up. Sometimes, also called candling. Torching is an extreme form of fire behavior, similar to but less extreme than crowning in that crowning affects larger numbers, even entire stands of trees.

USDA FS: United States Department of Agriculture - Forest Service, what is commonly known as just "The Forest Service."

Windbreak: A strip of trees or shrubs maintained mainly to alter wind flow and microclimates in the sheltered zone, usually farm buildings.

Windfirm: trees able to withstand strong winds and resist windthrow.

Wildland-Urban Interface or Wildland-Urban Intermix (WUI): The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Although ***Interface*** is the more general, more commonly used term; it technically refers specifically to the area where development and wildlands meet. ***Intermix*** indicates the presence of wildland vegetation/fuels intermingled throughout the developed area.

[Source: Helms, J. A., 1998, Jeffco CWPP 2011, Falcon CWPP 2016 and CSFS 2012]

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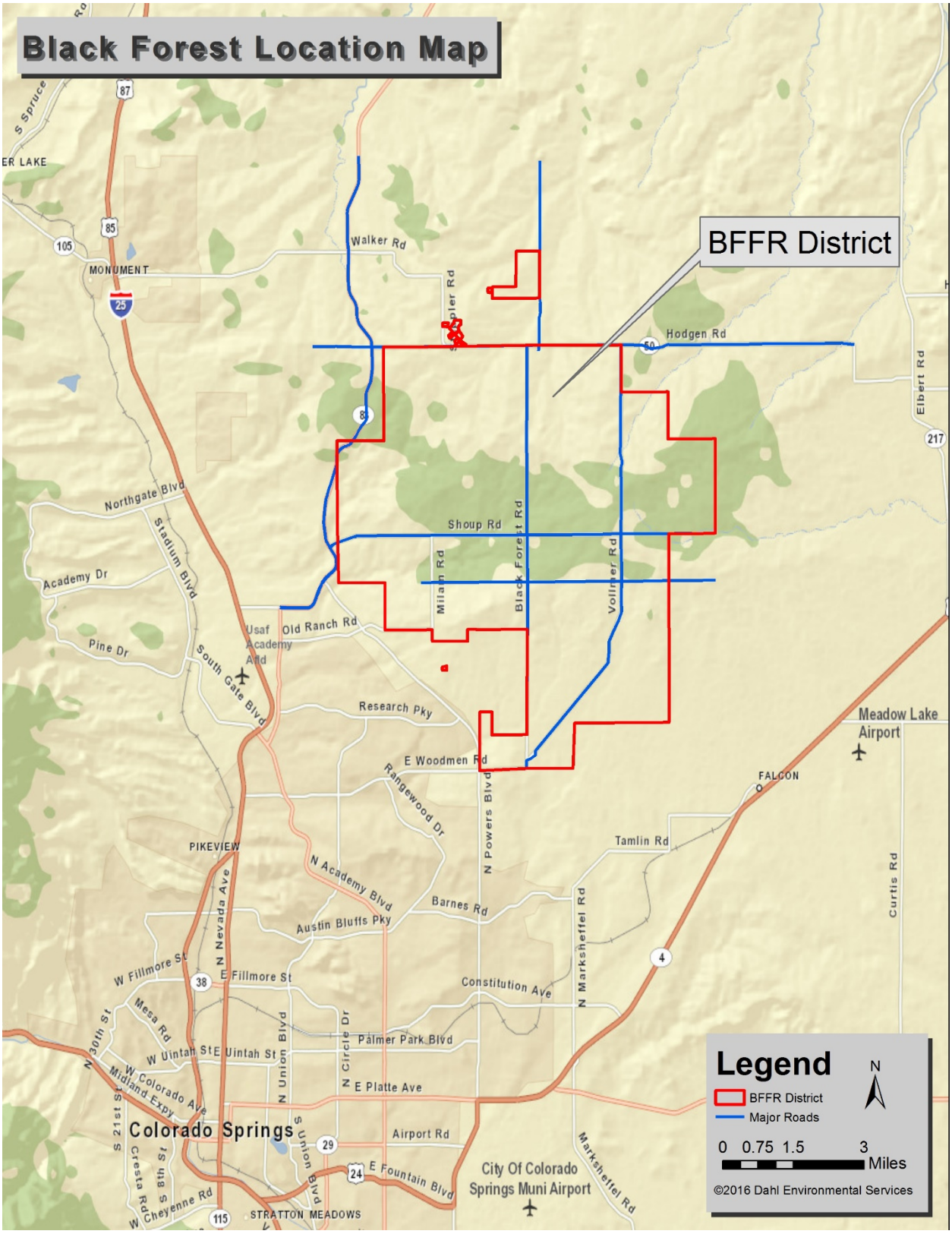
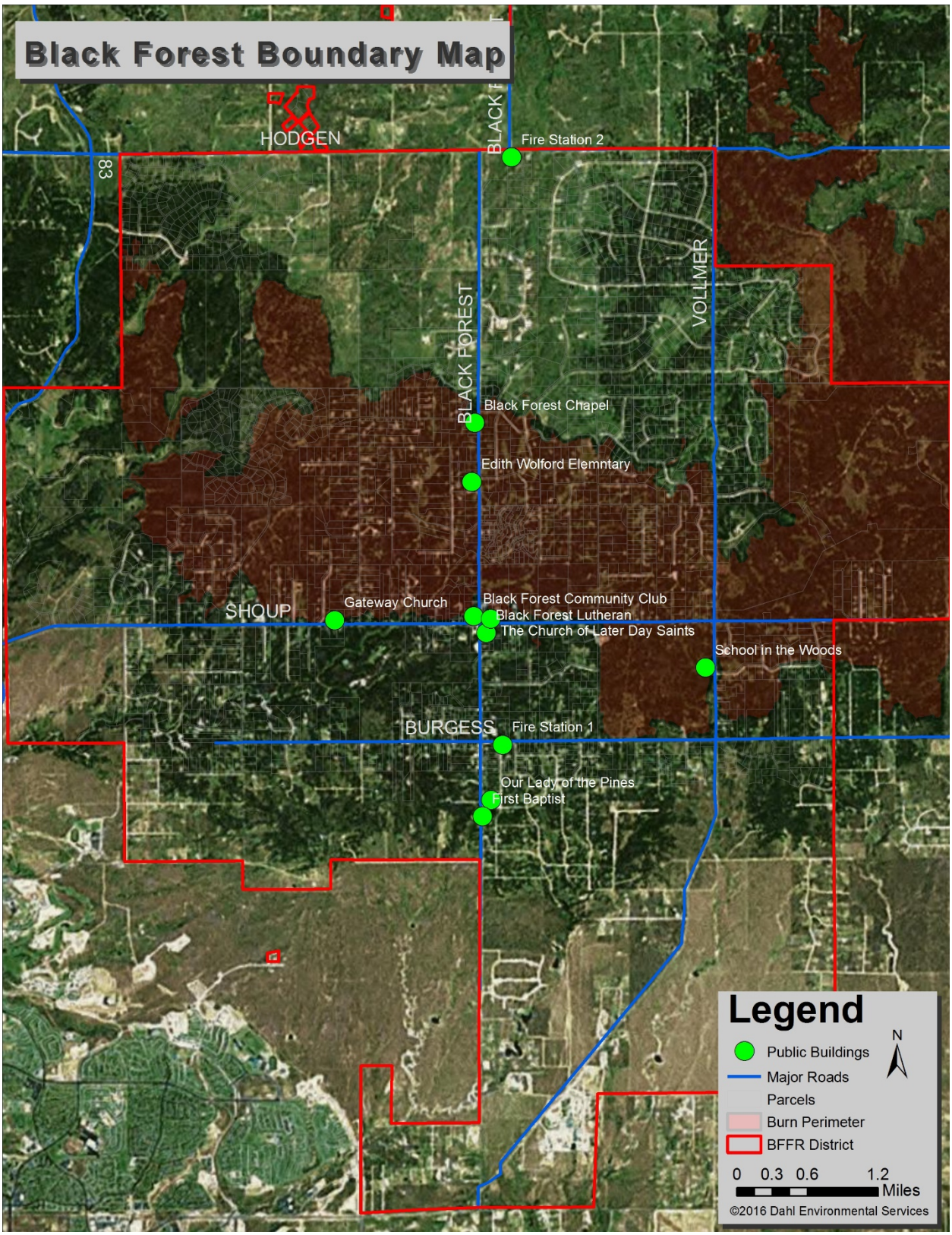
10. APPENDICES

APPENDIX 10.1 MAPS

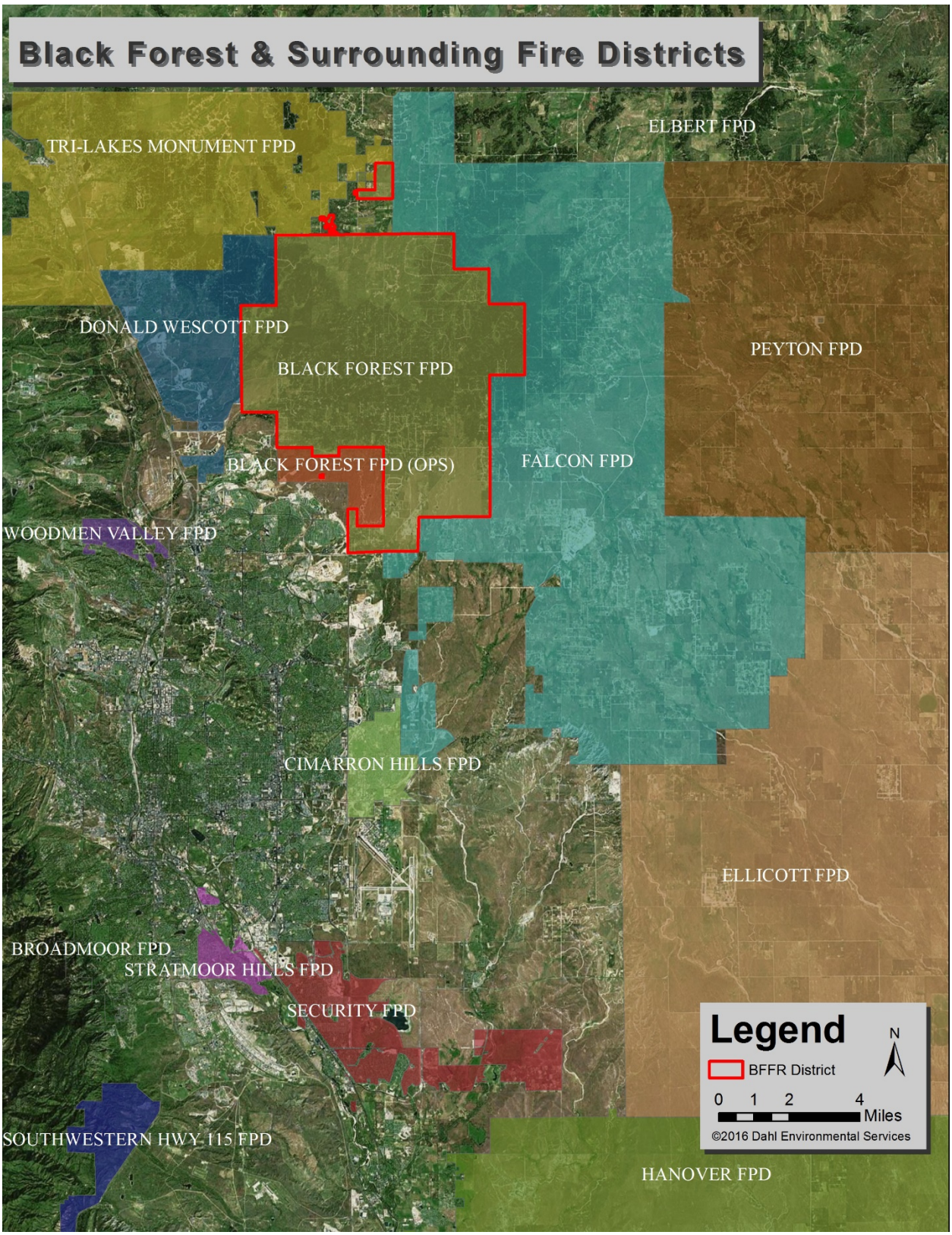
1. Location Map



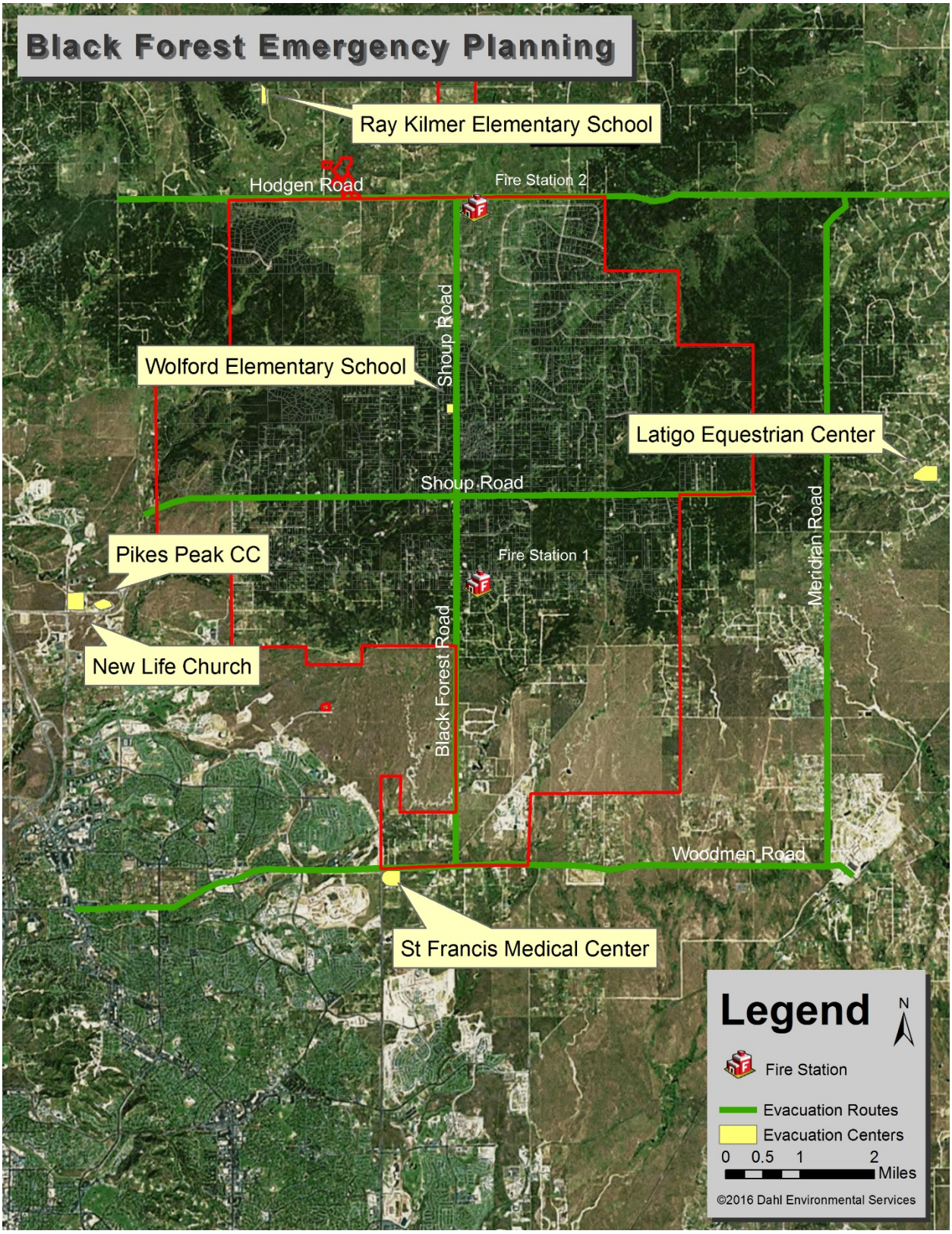
2. Community Fire Protection District Base Map



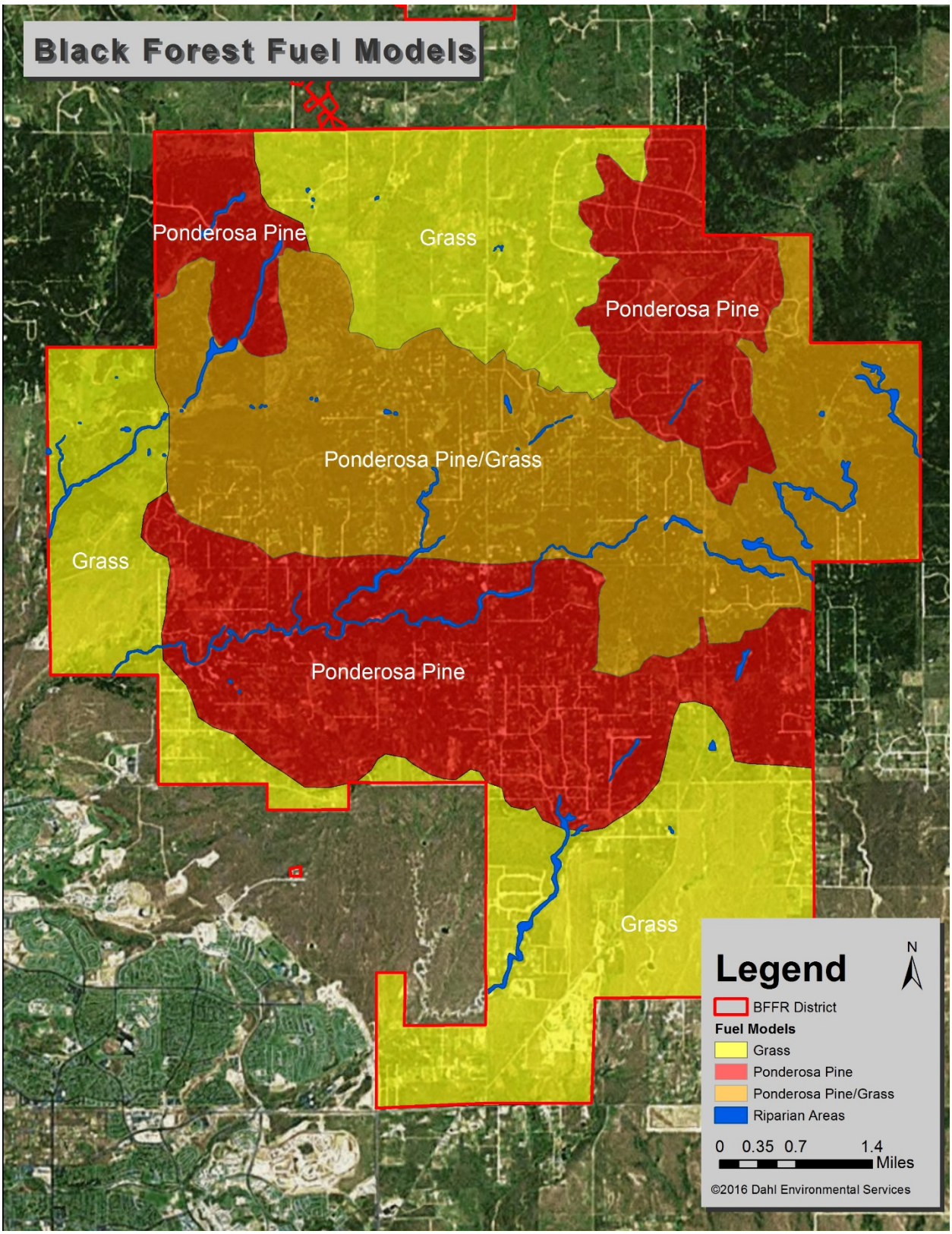
3. Fire Districts Map



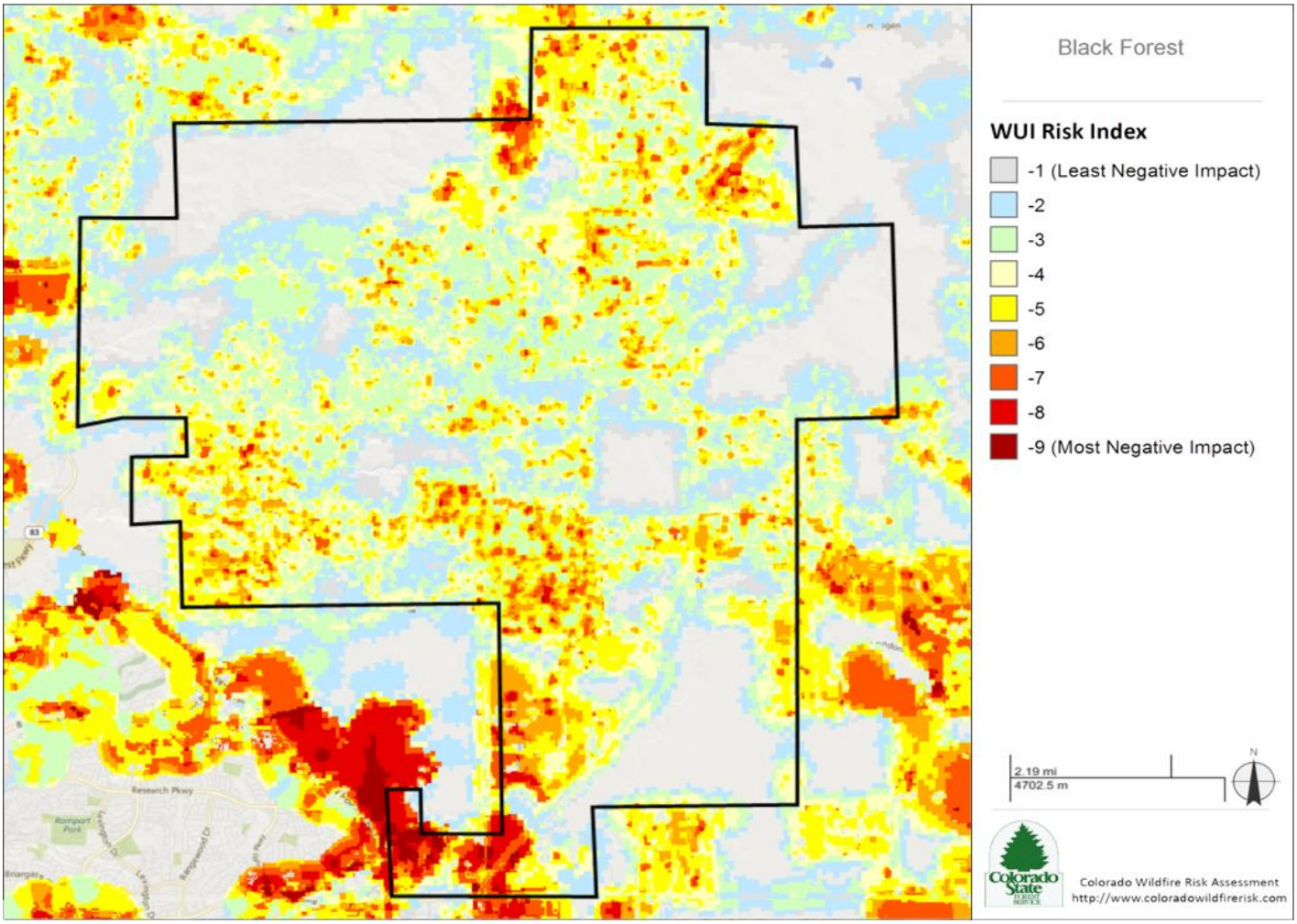
4. Emergency Planning Map



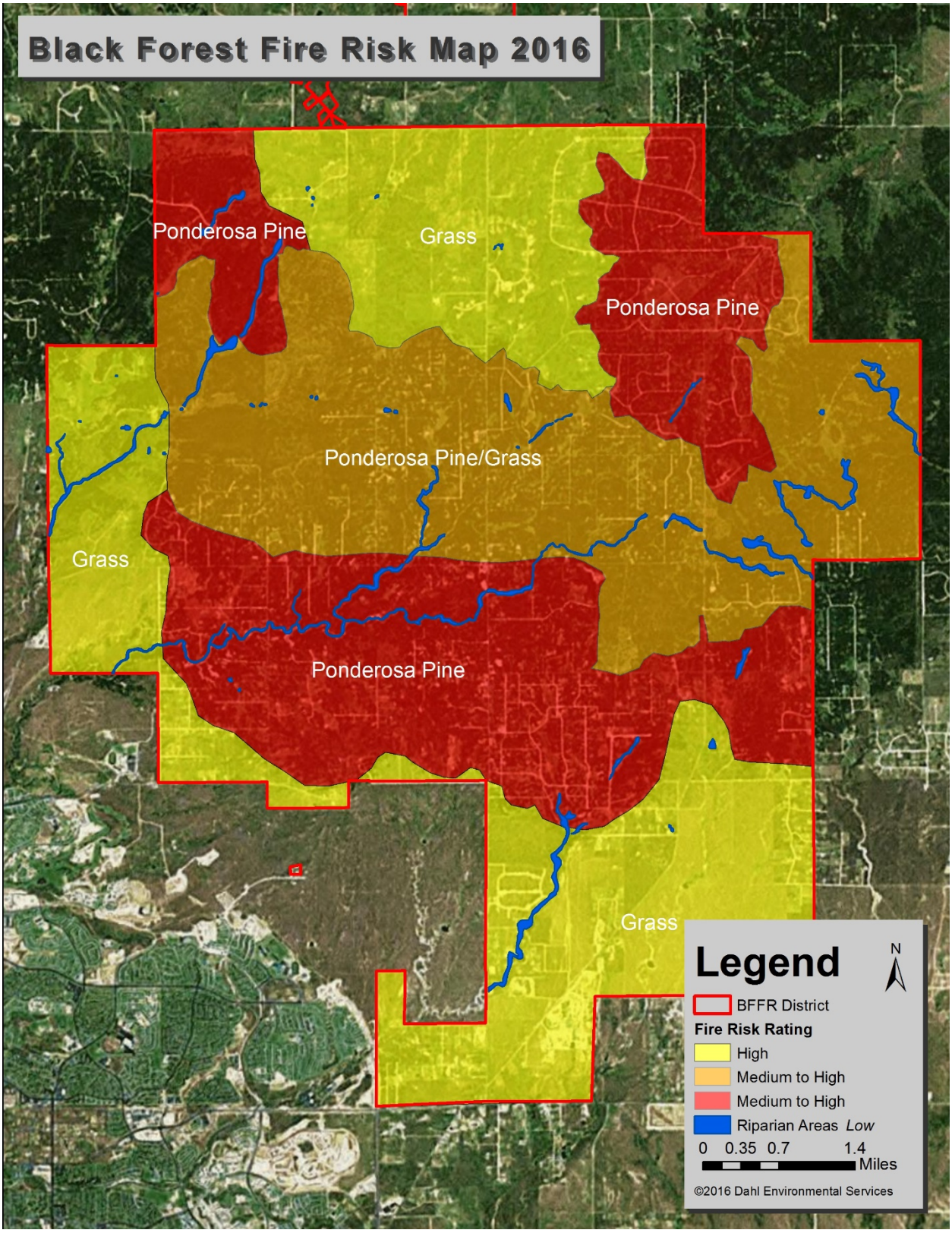
5. Fuel Models Map



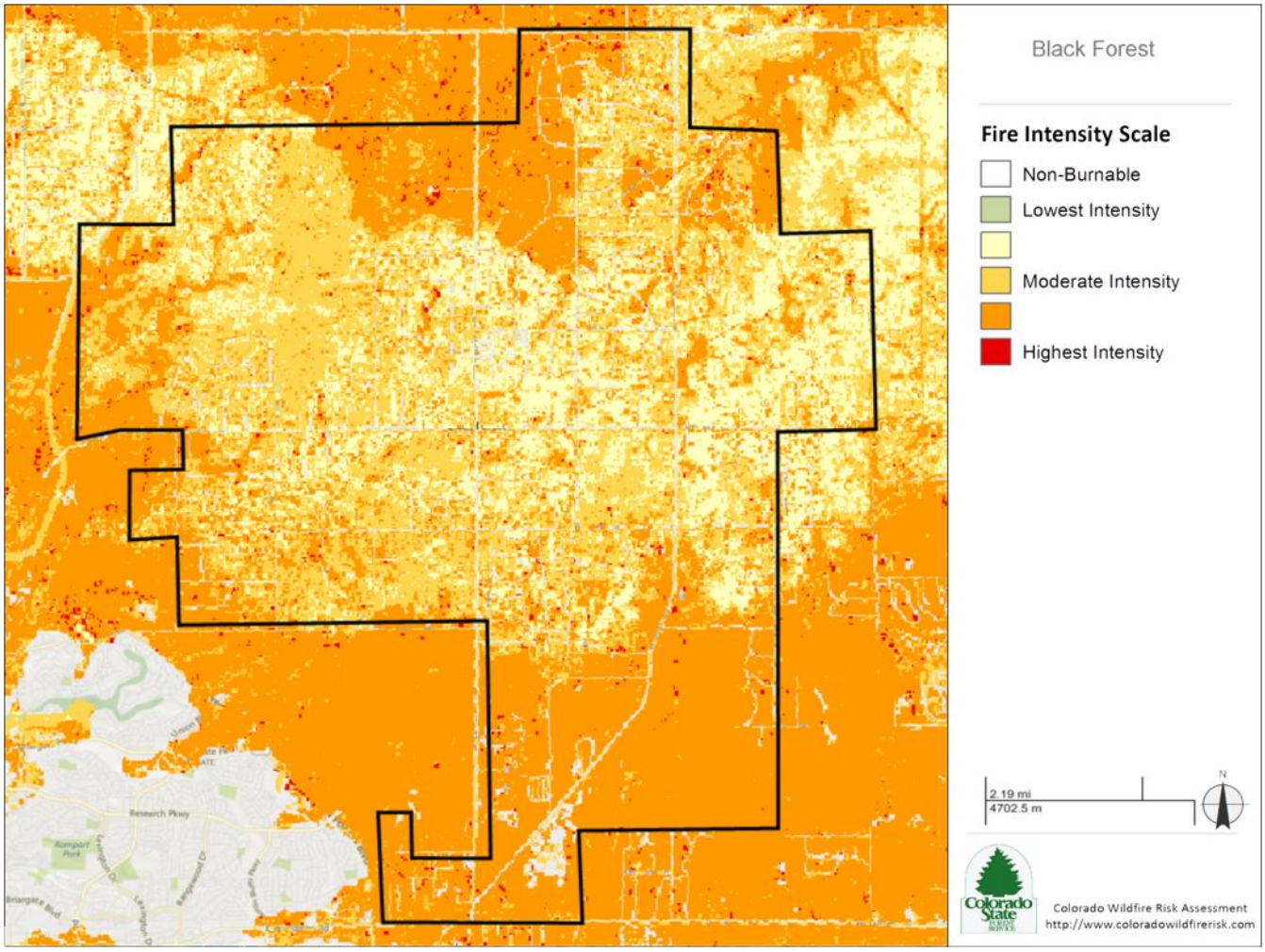
6. WUI (from Co-Wrap Fire Risk) Map



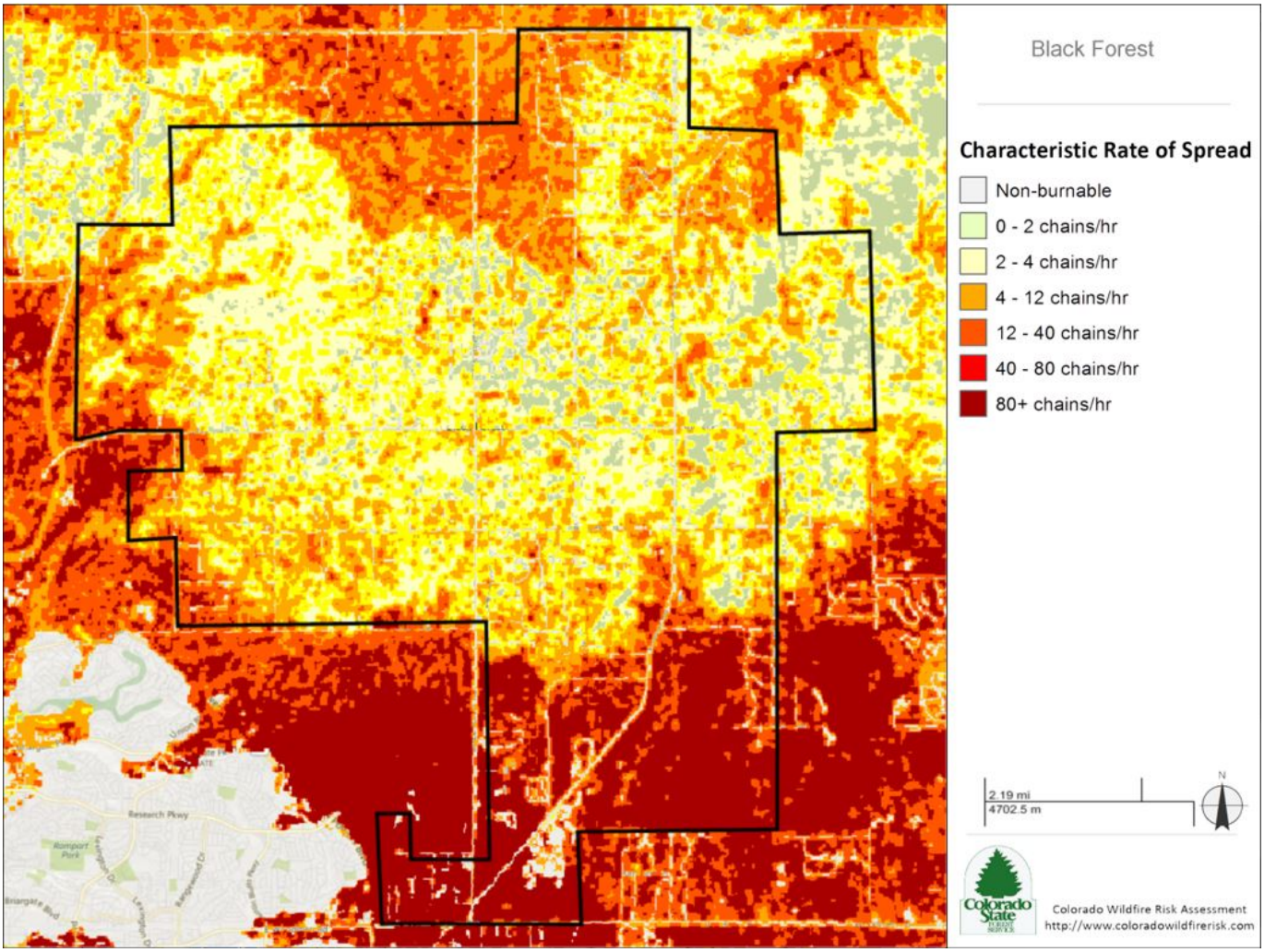
7. Post Fire Risk Map



8. Fire Intensity Scale Map (from Co-Wrap)



9. Rate of Spread Map (from Co-Wrap)



APPENDIX 10.2 WILDFIRE MANAGEMENT

Links to Important Documents and Websites

Colorado Wildfire Risk Assessment Report
http://www.coloradowildfirerisk.com/CoWRAPReportDocs/RiskSummaryReport_Black_Forest_20160623_190207.docx

Creating Wildfire-Defensible Zones Quick Guide
http://static.colostate.edu/client-files/csfs/pdfs/FIRE2012_1_DspaceQuickGuide.pdf

Fire Resistant Landscaping
http://static.colostate.edu/client-files/csfs/pdfs/06303.pdf

FireWise Plant Materials
http://static.colostate.edu/client-files/csfs/pdfs/06305.pdf

Creating Fuelbreaks
http://static.colostate.edu/client-files/csfs/pdfs/fuelbreak_guidellines.pdf

Forest Home Fire Safety
http://static.colostate.edu/client-files/csfs/pdfs/06304.pdf

Colorado Fire Adapted Communities
http://csfs.colostate.edu/wildfire-mitigation/colorado-fire-adapted-communities/

Colorado Firewise Communities
http://csfs.colostate.edu/wildfire-mitigation/colorado-firewise-communities/

Wildfire and Insurance
http://csfs.colostate.edu/media/sites/22/2014/02/co_wildfire_guide.pdf

USDA Forest Service Research on Saving Homes from Wildfire

- Dr. Jack Cohen, Fire Science Researcher with the U.S. Forest Service, explains current research about how homes ignite during wildfires, and the actions that homeowners can take to help their home survive the impacts of flames and embers. This video was produced by the National Fire Prevention Association http://forestpolicypub.com/2016/06/22/u-s-forest-service-expert-explains-how-your-home-can-survive-a-wildfire/.
- Uncontrolled, extreme wildfires are inevitable. These are the conditions when wildland-urban interface disasters occur the hundreds to thousands of houses destroyed during a wildfire.
- Does that mean that wildland-urban interface is inevitable as well? No! We have great opportunities as homeowners to prevent our houses from igniting during wildfires. There is lot that we can do, the little things – to our house and its immediate surroundings – in order to reduce the ignition potential of that house. Jack Cohen (Cohen 1997/2016).

Local Websites

For more information, visit these local websites:

Black Forest Together
A source of resource information, CWPP plan implementation information.
www.blackforesttogether.org

Black Forest Fire/Rescue
Local tips for preparing for wildfire.
Download the brochure "Wildfire... Are You Prepared?" www.bffire.org.

Slash-Mulch to collect what you cut www.bfslash.org. Note: All slash disposal procedures should be implemented to avoid attracting mountain pine bark beetle to the project area.

The FireWise Web Site
A wealth of wildfire information, defensible space advice, and preparation tips
www.firewise.org.

Colorado State Forest Service
Protect Your Home and Forest section; Grants and Funding
http://csfs.colostate.edu/homeowners-landowners/

U.S. Forest Service: Rocky Mountain Area Coordination Center
Everything you ever wanted to know about wildfire.
This page includes links to all information below: http://gacc.nifc.gov/rmcc/.

U.S. Drought Monitor
http://droughtmonitor.unl.edu/

The Fire Weather and Intelligence Page

Potential and activity in the Rocky Mountain region
http://www.blm.gov/co/st/en/BLM_Programs/fire/interagency_coordination.html

Observed Fire Danger Class

http://www.fs.fed.us/land/wfas/fd_class.png

Fire Weather Outlook U.S. Forest Service: Rocky Mountain Region

Visual summary of weather conditions http://www.fs.fed.us/r2/fire/rmafwx.png

Fire Weather Forecast

Detailed text report of local fire weather is provided by the Pueblo Dispatch Center
(Black Forest is Zone 226) http://www.srh.noaa.gov/ridge2/fire/

How to survive a wildfire by Dr. Jack Cohen

http://forestpolicypub.com/2016/06/22/u-s-forest-service-expert-explains-how-your-home-can-survive-a-wildfire/

Firewise information at the Black Forest Fire Department

For a free Firewise Assessment from a uniformed Fire Department volunteer
e-mail firewise@bffire.org to set up an appointment.

Firewise Construction, Design and Materials

The basics of defensible space and the "home ignition zone"

Firewise Landscape/Construction Guide

How to have a Firewise home

Preparing a Home for Wildfire Season

Wildfire Approaching

Explore a Firewise Home

http://firewise.org/wildfire-preparedness/wui-home-ignition-research/the-jack-cohen-files.aspx

Research About How Homes Ignite

A Homeowner's Guide to FireSafe Landscaping (2005), www.firesafecouncil.org

The Five Steps to be Recognized as a FireWise Community

1. Form a Firewise board or committee
2. Obtain a wildfire risk assessment from the CSFS and local fire department and create an action plan
3. Hold a Firewise event once per year
4. Invest a minimum of $2 per capita in local Firewise actions for the year
5. Submit an application to the state Firewise liaison (Courtney.Peterson@colostate.edu)

To learn more about the FireWise Communities/USA recognition program or to fill out an application, visit the National Firewise website

APPENDIX 10.3 POST FIRE RECOVERY

Reforestation- Restoration- Noxious weeds

Grass Seed Mixes to Reduce Wildfire Hazard
http://static.colostate.edu/client-files/csfs/pdfs/06306.pdf

Insect and Disease Associate with Forest Fires
http://static.colostate.edu/client-files/csfs/pdfs/06309.pdf

Soil Erosion After Wildfire
http://static.colostate.edu/client-files/csfs/pdfs/06308.pdf

Veg Recovery After Wildfire
http://static.colostate.edu/client-files/csfs/pdfs/06307.pdf

Noxious Weeds and Control Methods, El Paso County, Colorado
http://adm.elpasoco.com/Environmental%20Division/Forestry%20and%20Noxious%20Weeds/Documents/Noxious%20Weed%20Control%20Book%202014.pdf

APPENDIX 10.4 PUBLIC MEETING SUMMARIES

Black Forest Community Wildfire Protection Plan
Community Information Workshop
April 5, 2016
Issues and Concerns

Group 1

Issues
Black Sticks
Non-mitigators (Black and Green)
County Road – Non mitigating (Large dead trees – ROW) Not seeding post fire
Access – driveways – loops (Cul de sacs)
Concerns
Erosion
Insect pests – MPB
Weed growth – post fire
Lawns –Water use; households (less shade, more water)
Restoration Forest Pattern (tree clusters)
Personal emergency evacuation plan

Group 2

(H) Communication Breakdown (Broadcast)
(H) Implementation (fuel reduction)
Rule enforcement (mandatory or voluntary)
Standing dead trees
(H/M) Erosion
(H) Roadways/firebreaks (Right aways cleared; turnarounds for fire department)
(H) Notifications – Individual
(H) Water Resources
Fire Resistant structures
(H) All Fire Fighting Resources

Group 3

Remove fuels from rights of way
Evacuation is a concern
Publicize FD risk assessment and triage for saving a house
Fire breaks throughout B.F.
What is the actual boundary of the CWPP?
Collaboration with FD & County – Cherokee WD
Enforcement of mitigation
Access in/out of B.F.
Individual H>O> standards for mitigation
Promote fire suppression inside homes
Make Structures fire resistant

Group 4

Unmitigated properties
Methods of fire/emergency/ all notifications (Special fire alerts)
Community involvement in restoration
Overcome independent attitudes
Evacuation plans/routes

Black Forest Community Wildfire Protect Plan
April 5, 2016
Community Meeting Themes

Fuel Management

- Right of ways
- Defensible space – properties
- Fire breaks
- Mitigation
- Utilization

Public Safety

- Hazard tree removal
- Evacuation planning
- Notification (Communications)

Restoration

- Vegetative
- Watershed restoration
- Erosion
- Flooding

Education and Awareness

Protection Capability

Preliminary Update to the Black Forest Community Wildfire Protection Plan to be Presented at Community Briefing May 17

Highlights of the preliminary Black Forest Community Wildfire Protection Plan (CWPP) update will be presented to the community the evening of Tuesday May 17th, 7-9 PM, at the Black Forest Fire/Rescue Station 1, 11445 Teachout Road, Black Forest. This updated CWPP is being collaboratively developed by Black Forest Together, Black Forest Fire/Rescue Protection District and the Black Forest community.

The CWPP is a comprehensive planning document with project and community recommendations that have been proven to effectively reduce wildland fire danger. The current planning effort will update the CWPP developed in 2007. The updated plan will address the dramatic changes in the community following the 2013 Black Forest Fire. It will provide a strategic framework for how property owners, organizations and the Black Forest Fire/Rescue Protection District can work together to lessen the risk of loss from wildland fire.

The Healthy Forest Restoration Act of 2003 created the concept of CWPPs. The updates to the Black Forest CWPP are incorporating the elements common to successful programs from across the country. Its goals are to:

- **Create fire-adapted communities:** The plan provides mitigation strategies and a community action plan to create a community where residents are engaged and active in preparing for wildfire. It strengthens communications and support between agencies and community residents.
- **Restore and maintain fire-resilient landscapes**: The plan provides prioritized locations for fuel reduction treatments to address risks to the Black Forest community on a landscape scale.
- **Provide effective and efficient wildfire response**: The plan provides strategic treatments on the Black Forest landscape that will facilitate safer and successful suppression response. This plan provides for tracking, reporting and sharing of both fuel reduction accomplishments and homeowner/community initiatives.

This plan is based on ideas and information shared by community members who took time to participate in the development of this plan. While Black Forest Together and Black Forest Fire/Rescue Protection District will be the stewards of this plan, it will be the Black Forest community that makes this plan a reality and a viable solution to the wildfire risks facing the Black Forest community.

For more information, contact Lyle Laverty, Black Forest CWPP Planning Team, at 720-490-6878.

Black Forest Community Wildfire Protection Plan

CWPP Update Agenda
Black Forest Fire Station #1
11445 Teachout Road
Black Forest
Tuesday May 17, 2016

7:00 PM

7:00	Welcome/ Introductions	Chief Bryan Jack Bjorn Dahl
7:10	Evening Overview • Evening expectations	Lyle Laverty
7:15	Community Wild Fire Protection Plan Review • What is it? • What does it do? CWPP Update • Community Assessment • Goals/ Objectives • Recommendations	DES Team
8:00	Breakout Group Conversations • Recommendations Assessment • Majority/Minority perspectives • Alternatives for action	Lyle Laverty
8:30	Group Reports	All
8:45	Next Steps	Lyle Laverty
9:00	Adjourn	Chief Bryan Jack Bjorn Dahl

Black Forest Community CWPP Update

Black Forest Fire Rescue Station

May 17, 2016

Raw Meeting Minutes (Recommendations)

- Outreach by BFFR
    - Existing Fire Department contact w/ Homeowners
    - Needs a broader outreach
- Communication
    - BFT email blasts
    - District 20 notifications; Churches
    - Non profits
    - Establish committees responsible for specific avenues of communications
- Establish committees to address specific objectives
- Safety zones, facilities outside the district
- Need sirens
- Marking roads/signs for evacuation routes
- What is natural and not
    - How does that affect how we respond?
- Consistency among Insurance companies
- Executive summary that summarizes and encapsulates" What needs to be done"
- How to influence ISO ratings
- Best recommendations for county planning requirements for development
- Change paradigm of how we manage forests "now" to "clumpy/groupy" strategy
- Establish a Firewise community
- Getting insurance companies to work together
- How to get community to "buy into" "implementing the plan of action"
- Add one recommendation: Mitigate zone 3 with "clumpy/groupy"
- Distinguish between "resiliency" and "resistance" and what makes it that way
- Vegetation models in COWRAP do not accurately represent BF and should not be used.
- Build on HOA that have mitigation efforts in place
- Cite existing legislation or laws (other states?) that may assist with future efforts
- This CWPP is mechanism to:
    - Grants
    - Schedule of action
    - A how for best management practices … restoration
- Who will be "in charge" of information and education? Or any of the other recommendations
    - This was lacking in previous plan

APPENDIX 10.5 ANIMAL EVACUATION

Wildfire Preparedness for Horse Owners

http://extension.colostate.edu/topic-areas/agriculture/wildfire-preparedness-for-horse-owners-1-817/

APPENDIX 10.6 WEBSITE LINKS

Wildfire Resources

Black Forest Fire Rescue Protection District: www.bffire.org

Colorado State Forest Service: www.csfs.colostate.edu

El Paso County Sheriff's Office: www.EPCSheriff.com

Pikes Peak Wildfire Prevention Partners: www.ppwpp.org

Emergency Notification System (ENS) Signup: www.elpasoteller911.org
(NOTE: If you do not have a phone land line through Century Link, your phone number may not be in the ENS (often referred to as "Reverse 911"). Homeowners who rely only on their cell phone or Voice-over-internet-protocol (VIOP) through their cable provider must register their devices and phone numbers at this web site.

Firewise Links

Firewise Communities web site: www.firewise.org
1. Resources, contacts and access to library
2. "How to's" for homeowners with downloadable pdf's

Ready! Set! Go! (RSG)
Sign up at: www.wildlandfirersg.org
Ready, Set, Go! Your Personal Wildfire Action Plan brochure

Ready Colorado: www.readycolorado.com
READY Colorado Pack a Kit brochure (pdf) -*Pet Preparedness* brochure (pdf)

Insurance Institute for Business and Home Safety (IBHS) Web site:
www.disastersafety.org
1. Site has regional guides for retro-fitting homes for wildfire.
2. Wildfire Home Assessment & Checklist
3. View videos of ember ignition lab tests.

Rocky Mountain Insurance Information Association: www.rmiia.org
Wildfire and Insurance brochure (pdf)

Fire Adapted Communities (FAC): www.fireadapted.org
Waldo Canyon post-fire report viewable.

National Cohesive Strategy:
www.forestsandrangelands.gov/strategy/documents/strategy/CSPhaseIIINationalStrategyApr2014.pdf

APPENDIX 10.7 COLLABORATION

Black Forest Community Wildfire Protection Plan Contacts

Megan Astrella, El Paso County, Public Information Office
Jarrod Biggs, Colorado Department of Local Affairs, Division of Local Affairs
Melissa Bottorff, Black Forest Fire Rescue
Edward Bracken, Black Forest Together, Inc.
Carolyn Brown
Peter Burleson
Ken Clark, Black Forest Together, Inc.
Sallie Clark, El Paso County Commissioner
Daryl Glenn, El Paso County Commissioner
Sarah Dunlier
Tom Flynn, Front Range Arborists
Don Gray
Jack Hinton
Gary Hoffman
Phil Hosmer
Bryan Jack, Chief, Black Forest Fire Rescue
Steve Jacobs
Elaine Kleckner, El Paso County, Community Services Department
John Kowall
Joen Krantz
Cathy Lane
Len Lankford
Chuck Liddenhall
Sherri Little
Dick Losee
Bill Manita, Black Forest Together, Inc.
Cathy Martin
Jay Matheson
Emmy McAllister
Anita McMorran
Rick McMorran, Black Forest Fire Rescue
Craig Meeks
Alex Murchant
Bob North
John Padgett, El Paso County Sheriff's Office
James Rebitski, Black Forest Fire Rescue
Reggie Blackwell, Black Forest Fire Rescue
Dave Root, Colorado State Forest Service
Amber Rossman
Bruce Sardeson
Bob Sturtevant, La Foret, Colorado State Forest Service
Linda Subie
Dave Thorne
Nancy Trosper, Black Forest Together, Inc.
Judy von Ahlefeldt
Rebecca Wellin
Tim Wolken, El Paso County Parks
Stephen Fischer, El Paso County Appraiser Office

APPENDIX 10.8 FIRE HISTORY

June is a very critical fire weather month for El Paso County in general and for Colorado in particular. You will readily note that many of Colorado's largest, most destructive fires have occurred during the month of June, particularly within the first two weeks. Among other factors, drought due to low rainfall and/or snowpack, low snow water equivalence, high nocturnal temperatures from midnight to 0600, low humidities, strong winds, moderate (5) to high (6) Haines Indices, and low fuel moistures have contributed to the extreme fire behavior and large fire growth. The huge lesson learned from the information below is that June is wildfire month in Colorado. Therefore, watch out, June can be the Red Flag month of the wildfire season!

The twelve Colorado, June 2000 to 2013 wildfires enumerated below are listed in chronological order and detailed by the fire name, location (city and county), dates, and the number of acres and structures burned.

1. High Meadow Fire, Bailey (Park County), June 12 to 20, 2000; 10,800 acres, 51 structures;
2. Trinidad Complex, Stonewall/Trinidad (Las Animas County); June 2 – 14, 2002; 33,000 acres;
3. Coal Seam Fire, Glenwood Springs (Garfield County), June 7 to July 9, 2002, 12, 209 acres; 43 structures;
4. Hayman Fire, Lake George (Park County); June 8 – July 18, 2002, 138,114 acres, 133 structures;
5. Missionary Ridge Fire, Durango (La Plata County); June 9 – July 14, 2002, 71,739 acres, 56 structures;
6. Spring Creek Complex, New Castle (Garfield County); June 22 to July 21, 2002, 13,490 acres;
7. Bridger Fire, Piñon (Las Animas County) June 8 - July 9, 2008; 45,800 acres; 3 structures;
8. Last Chance Fire, (Las Animas County) June 5 – 21, 2011; 44,662 acres; 11 structures;
9. Shell Fire, Kim (Las Animas County), June 7 to 17, 2011, 14,390 acres; 7 structures;
10. High Park Fire, Fort Collins (Larimer County); June 9 – 30, 2012, 87,250 acres, 259 structures;
11. Waldo Canyon Fire, Colorado Springs (El Paso County); June 23 - July 10, 2012; 18,247 acres, 346 structures; and taking two lives.
12. Black Forest Fire, Black Forest (El Paso County); June 11 to 21, 2013; 14,280 acres, 487 structures; and taking two lives.

The most recent and devastating wildfire in the Black Forest was during the summer of 2013. The Black Forest Fire started on Tuesday, June 11th. The cause is undetermined. The fire was located in Black Forest, Colorado. Rich Harvey's Great Basin Type 1 Incident Management Team took over management of the fire on Wednesday June 12th at 6 a.m.

This wind driven fire moved very quickly the first day. The current assessment has determined 488 structures have been destroyed and 18 were damaged. Several thousand residents were evacuated. As areas cool down and have been cleared of potential safety hazards, residents are being allowed to

return to their homes. Safety assessments of structures are ongoing. Multiple resources have been released and re-assigned to other incidents. Full containment of the fire we reached on Thursday evening, June 20. Management of the fire was transferred to a local Type 4 organization on Friday morning, June 21.

The historic fire event in Black Forest that started on June 11, 2013, has generated more studies and reports than most of fires in our country. Many dynamics complicated the responses and the actions to address this historic event. The weather condition, the fuel loads, the various residential configurations, agency collaborations, community preparedness, mitigation or non-mitigation, and so many other factors contributed to a devastating and complex conflagration.

For complete Black Forest Fire History see website below:
http://www.blackforesttogether.org/history.html

This Community Wildfire Protection Plan was developed by the Core, Leadership and Steering Team (CLST) an action-oriented forum of individuals involved in implementing the BFFR Black Forest CWPP with citizens in the community. It builds on previous planning efforts, and covers the wildland-urban interface for all partners in the adjacent Black Forest fire protection districts and departments. Chapters 1 through 7 examine common issues faced by Black Forest communities and general strategies for mitigation. Chapters 8 through 12 provide an in-depth assessment of each geographic division and provide specific recommendations, actions, and projects for improving community resiliency to wildfire.

APPENDIX 10.9– COLORADO BEST MANAGEMENT PRACTICES

Forestry Best Management Practices to Protect Water Quality in Colorado
http://static.colostate.edu/client-files/csfs/pdfs/ForestryBMP-CO-2010.pdf

APPENDIX H

CSFS COLORADO FOREST ACTION PLAN

COLORADO STATE FOREST SERVICE
EST. 1955

Colorado Forest Action Plan

2020

The Colorado State Forest Service is a steward of the state's forestlands, committed to the challenge of creating and maintaining healthy, resilient forests for generations to come.

RED MOUNTAIN *peeks over the San Juan ridgetops along the Million Dollar Highway, a stretch of Hwy. 550 that connects Ouray and Silverton.*

ON THE COVER *The banks of Lost Lake, in Colorado's Grand Mesa National Forest, are flanked by forestland that helps filter sediment and nutrients to keep the water clean. Healthy forests play an integral role in providing drinking water for residents in Colorado, 18 other states and Mexico.*

Photos: Kamie Long, CSFS

CONTENTS

THEMES AND GOALS FOR COLORADO'S FORESTS:

ONLINE APPENDICES AVAILABLE AT
csfs.colostate.edu/forest-action-plan

Colorado State Forest Service Creates Path to Guide Stewardship of Colorado's Forests

Michael B. Lester

In your hands, or on your screen, you are viewing the path forward for Colorado's forests – and in many ways the future of our way of life in Colorado. Our forests play a vital role in what makes Colorado special. Healthy forests provide habitat for Colorado's abundant wildlife; the basis for our world-renowned recreation opportunities; clean air; clean water for residents, 18 other states and Mexico; forest products that bolster local economies; and carbon sequestration that helps mitigate climate change.

To ensure our forests — and these critical resources — persevere, the Colorado State Forest Service's updated *2020 Colorado Forest Action Plan* provides an in-depth analysis of the trends affecting Colorado's forests and guidance on how to improve forest health and resiliency.

To conduct the analysis for the action plan, the CSFS assembled experts from across the state. The action plan is the result of the work of these dedicated professionals, including diverse stakeholders with expertise in forestry, hydrology, engineering, government and other natural resource disciplines. This action plan covers all forests in Colorado, across all ownerships.

Much of Colorado's forests are not healthy. When forests are in an unhealthy state, wildland fires can grow into catastrophic fires that threaten public safety. These threats include destruction of our communities in the wildland-urban interface, pollution of our air and damage to our limited, valuable water supplies. Uncharacteristic wildfires substantially reduce the ability of forests to sequester carbon.

Current and emerging conditions are threatening the health and resiliency of forests in Colorado. There is a solution, but it requires an investment in our forests that cannot be sporadic. Rather, that investment must be focused and strategic, cross-boundary and collaborative. With more than 24 million acres of forest, where should we focus our efforts? That is where this action plan comes in. Driven by science and organized by themes, this plan informs us where the areas of greatest need are in Colorado. It includes data that can assist Colorado's decision-makers in investing in our forests where these investments will make the most difference.

Our forests are essential to our way of life, and they provide us with priceless benefits. However, we cannot take them for granted. This proactive Forest Action Plan can lay the groundwork for critical investments that will enhance the health of Colorado's forests for current and future generations.

Michael B. Lester,
State Forester and Director,
Colorado State Forest Service

THE COLORADO STATE FOREST SERVICE *is a service and outreach agency of the Warner College of Natural Resources at Colorado State University and provides staffing for the Division of Forestry within the Colorado Department of Natural Resources.*

THE MISSION *of the CSFS — to achieve stewardship of Colorado's diverse forest environments for the benefit of present and future generations — permeates through 17 field offices, the state office and five divisions within the organization. Implementation of the* 2020 Colorado Forest Action Plan *builds on this mission and will require collaboration, communication and coordination with partners and stakeholders, both across Colorado and in neighboring states.*

Action Plan Maps Colorado's Priorities in Forest Stewardship

The *2020 Colorado Forest Action Plan* provides a strategic framework to address the benefits, conditions and trends in Colorado's forests, as well as the threats and challenges the state's forests face across political, jurisdictional and ecological boundaries. State forest action plans are mandated by the Cooperative Forestry Assistance Act of 1978, passed by Congress and amended by the 2008 and 2014 U.S. farm bills. This is an update to the *2010 Colorado Forest Action Plan*.

A Colorado State Forest Service team developed the *2020 Colorado Forest Action Plan* and solicited feedback from partners and stakeholders through a series of meetings across the state, using participatory geospatial analysis and iterative strategy development. While there are unique natural resource priorities for different regions of the state, the top priority identified statewide is reducing the risk of uncharacteristic wildfire.

THE FOREST ACTION PLAN RESOURCE ASSESSMENT is organized around six themes: forest conditions, living with wildfire, watershed protection, forest wildlife, urban and community forestry and forest products.

Each theme includes a map and associated goals, strategies and approaches that fall within one or more of the national priorities of states' forest action plans:

CONSERVE and manage working forest landscapes for multiple values and uses.

PROTECT forests from threats.

ENHANCE public benefits from trees and forests.

The action plan also includes a Forest Legacy Program Assessment of Need. A composite priority map in the Forest Action Plan Resource Assessment section highlights areas of the state where forest management and risk reduction activities are urgently needed and multiple goals can be met. Based on this map, about 10% of Colorado's 24 million acres of forest are in urgent need of treatment to address forest health, wildfire risk and watershed protection threats, at a cost of approximately $4.2 billion.

THE FOREST ACTION PLAN RESOURCE STRATEGIES sets the stage for how the CSFS will use this plan. Importantly, implementation of this action plan extends beyond the CSFS mission and operations, requiring collaboration, communication and coordination among partners and stakeholders in Colorado and neighboring states.

An overview of the gap between necessary and existing program opportunities is provided in the Resource Strategies. Coupled with the composite priority map, this can be used as a foundation to guide how federal, state and private program funds and other grant funding are applied. Additionally, it can be used to identify new potential funding opportunities in priority forests moving forward.

This Forest Action Plan will be reviewed in five years, and new data and information will be incorporated, as applicable, making this a living document. The CSFS encourages and welcomes feedback on this plan for future consideration.

ACCESS ACTION PLAN DATA ONLINE IN COLORADO FOREST ATLAS

The data and information contained within this plan are for public use. All analyses were conducted statewide, by aggregating data and information at a watershed scale.

Ancillary data and information should be incorporated at the local level to refine this statewide priority analysis.

The statewide priority assessment data can be accessed through a Forest Action Plan application in the CSFS Colorado Forest Atlas, coloradoforestatlas.org.

To begin developing the *2020 Colorado Forest Action Plan*, a Colorado State Forest Service team consulted with external partners and stakeholders to determine six themes and set goals for forest stewardship moving forward. These themes can be tracked throughout the plan using the following icons:

FOREST CONDITIONS

Colorado's diverse forests cover about 24 million acres across a broad elevation gradient. Forests provide many benefits including clean water for agriculture, municipal and industrial use, recreation, habitat, grazing opportunities, nutrient cycling and soil retention, improved air quality and carbon sequestration and storage. They also provide for resource use and cultural significance and offer a sense of place. Increasing pressures on forests are expected to continue as a changing climate challenges the forests' natural defenses against insects and disease. Longer fire seasons and more uncharacteristic wildfires also are expected. Adaptive forest management will be necessary to address the dynamic threats to forest health in Colorado.

LIVING WITH WILDFIRE

Wildfire plays a critical role in maintaining the health of many ecosystems in Colorado. Frequent, low-intensity fires burn in lower elevation montane forests to reduce understory vegetation, while high-intensity fire helps with regeneration in some high-elevation forest types, such as lodgepole pine. A long legacy of fire suppression has altered historic fire cycles and led to the dangerous buildup of fuels in some areas. Coupled with the effects of climate change, this makes living with wildfire a challenge in Colorado. Risk-reduction practices must be promoted as populations increase in the wildland-urban interface.

WATERSHED PROTECTION

Colorado's forested watersheds deliver clean water to residents, 18 other states and Mexico, and provide the biological diversity needed for a future that is balanced both socially and ecologically. Current and expected future conditions, including persistent droughts and uncharacteristic wildfires, have and will continue to negatively impact forest health and the source water and habitat these forests provide. Water is an increasingly limited resource in Western states. Therefore, practicing forest management to improve forest health is critical to protecting and enhancing this precious resource.

Photo: pixabay.com

ACTION PLAN ICONS

FOREST WILDLIFE

Colorado's forest habitats are home to diverse wildlife, including many of the 159 species that Colorado Parks and Wildlife identifies are in need of conservation. Habitat quality continues to be affected by widespread forest disturbances such as wildfire and insect and disease outbreaks, which can intensify with drought and climate change. These disturbances alter critical components of habitat, including native vegetation, water, food and cover. As urban development continues to threaten ecological connectivity, maintaining unfragmented forested habitat is essential.

URBAN AND COMMUNITY FORESTRY

Colorado's urban areas are their own varied ecosystems, comprised of green infrastructure such as trees, yards, open spaces, parks, greenways, rivers, ponds and habitat corridors. These provide residents with access to clean air and water, reduce energy consumption and noise pollution, increase property values and enhance mental and physical health. Urban forests regulate climate by providing shade, mitigating the heat island effect and reducing extreme weather impacts. To sustain these forests, planning will be required that considers expected population growth, climate resilience, invasive species and civic engagement.

FOREST PRODUCTS

Important Colorado timber species include lodgepole pine, spruce, ponderosa pine, Douglas-fir, true firs and aspen. In recent history, there has been a steep decline in the value of timber due to market conditions, widespread insect and disease infestations and large wildfires. Additionally, the loss of harvesting and processing capacity has contributed to a declining contractor workforce. To meet future timber harvesting and forest management program needs in Colorado, mill and workforce capacity must be addressed, and new and emerging markets such as biochar and pellets should be promoted.

National Action Plan Priorities

Theme sections address conditions, trends, challenges and threats to each respective theme. Goals and strategies outlined in the themes are connected to the national priorities of state forest action plans using these icons:

CONSERVE working forestland

PROTECT forests from harm

ENHANCE public benefits from trees and forests

The Colorado State Forest Service has documented forest conditions and monitored changes in forest health since the agency was established in 1955. Photo: CSFS

History and Challenges: Improving Forest Health Remains Crucial in Colorado

Colorado has about 24 million acres of forests that provide multiple environmental, social and economic benefits. A state's forest action plan provides the opportunity "to shape and influence forest land use on a scale and in a way that optimizes public benefits from trees and forests for both current and future generations" (State and Private Forestry Redesign Initiative; 2008 U.S. Farm Bill). The Colorado State Forest Service has designed this plan to provide a road map for improving forest health across Colorado in the coming decade.

Colorado's forests vary widely across a broad elevation gradient — from Arkansas River riparian habitat at 3,350 feet, dominated by plains cottonwoods, to spruce-fir forests growing up to approximately 12,000 feet. Above treeline, alpine habitat reaches up to 14,440 feet on Mount Elbert, the highest peak in Colorado.

Major forest types in Colorado can be categorized by the dominant overstory vegetation; these include conifer-hardwood, conifer, mixed conifer, hardwood (primarily aspen), lodgepole pine, oak shrubland, piñon-juniper, ponderosa pine,

FOREST HEALTH

"The perceived condition of a forest derived from concerns about such factors as its age, structure, composition, function, vigor, presence of unusual levels of insects or disease, and resilience to disturbance."

— The Society of American Foresters

COLORADO'S FORESTS: FOREST TYPES AND LOCATIONS

FIGURE A

Roughly 65% of Colorado's forests are managed by the federal government, 30% are in private ownership and 5% are managed by other entities (e.g., state, tribal, local, nongovernmental organizations and land trusts) [1]. The CSFS does not own land; it provides service and outreach as the leading state forestry organization and is a source of professional expertise across the state. The CSFS works with all forestland owners, through partnerships and collaborations. Map: CSFS

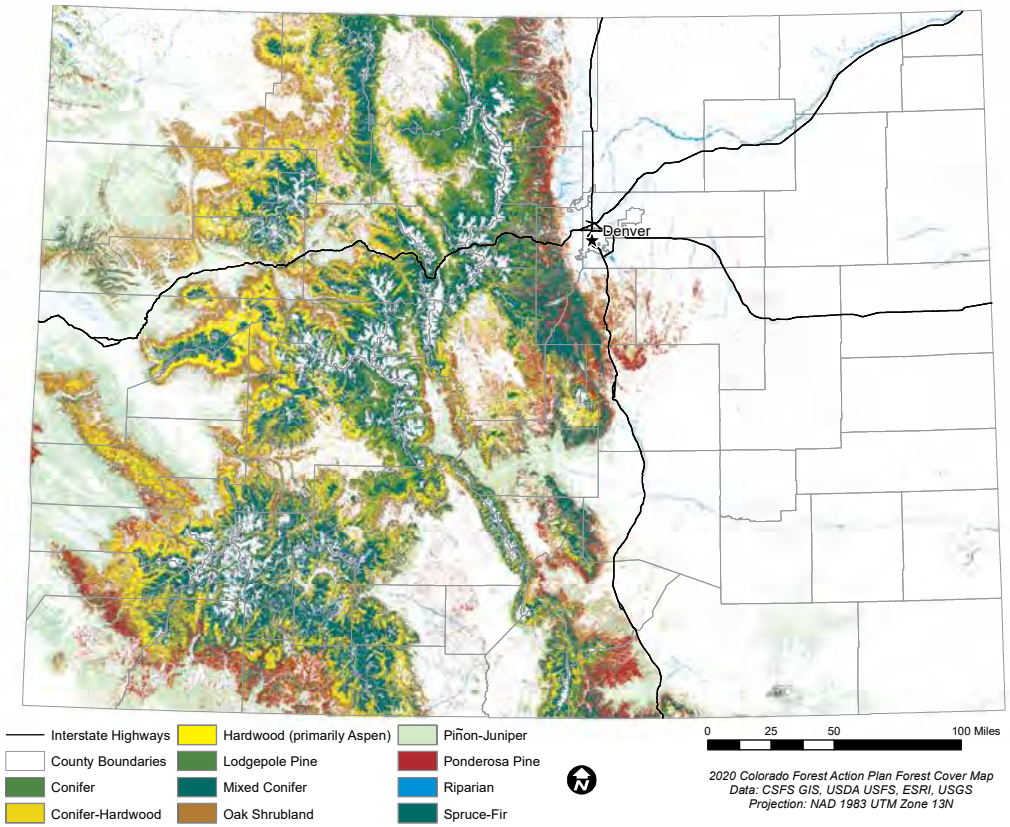
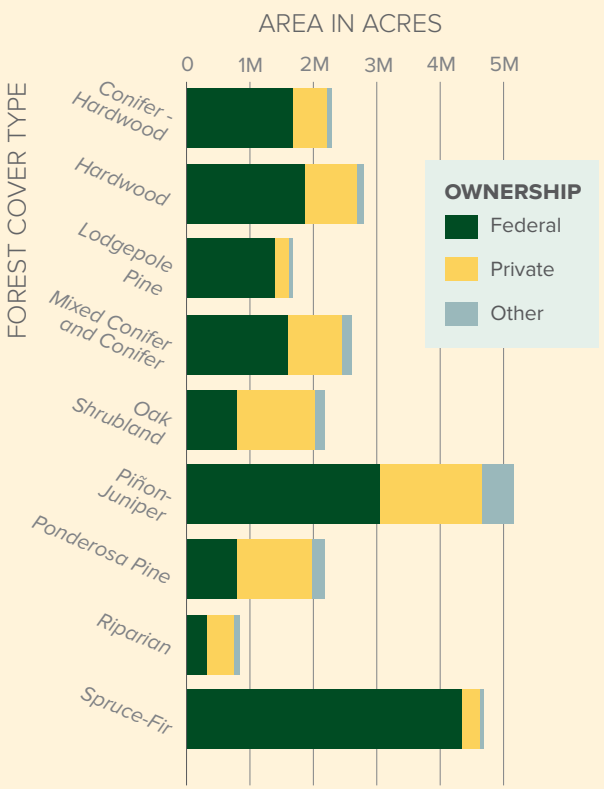


FIGURE B

FORESTED ACRES: OWNERSHIP AND COVER TYPE [1,2]



riparian and spruce-fir *(Figure A)*.

Wildfires play an important role as a natural disturbance in some of these forest types; they can increase diversity and landscape heterogeneity. One example is high-elevation lodgepole pine forests, which rely on high-intensity heat to open their serotinous cones, releasing seeds to regenerate growth. Other disturbances including insect and disease infestations, grazing/herbivory, flooding, avalanches and windstorms can stimulate forest regeneration, promoting a variety of forest types, age classes and densities.

More information about forest cover types is on the CSFS website at *csfs.colostate.edu/colorado-forests/forest-types*.

Colorado's forested watersheds are the headwaters for four major rivers — the Colorado, Arkansas, Rio Grande and South Platte. These pass through many of Colorado's urban centers and contribute water to 18 other states and Mexico. Forests have various effects on the natural water cycle — they affect the quantity and quality of water — and forest health impacts watershed health. Water is stored in forest soils, used by trees to produce biomass and released into the air as oxygen and water vapor. This process impacts precipitation timing and quantity. Tree roots collect and filter rainfall and runoff, reducing the concentration of pollutants in water downstream and decreasing sedimentation and erosion.

Forests also play a major role in atmospheric cycles. Not only do trees absorb carbon dioxide and produce oxygen through photosynthesis, they can also absorb ozone, carbon monoxide, sulfur dioxide, nitrogen oxides and particulates. Fossil fuel use, an open system that does not have a mechanism to recapture emitted carbon dioxide, continuously adds carbon to the atmosphere. Private

TALK LIKE A FORESTER

WATERSHED
is a land area that channels rainfall and snowmelt to creeks, streams and rivers, and eventually to outflow points such as reservoirs, bays and the ocean [3].

WATERSHED HEALTH
is a measure of ecosystem structure and function [4].

STRUCTURE
is the three-dimensional spatial distribution of trees, plants and other nonliving elements, such as soils, slopes and hydrology. Measurements of structure can include tree shapes, heights, spacing, arrangement, diameter and age.

FUNCTION
refers to ecosystem processes such as the water cycle, nutrient cycling, energy flow and succession.

and public forests provide a critical avenue to help mitigate these additional atmospheric carbon dioxide concentrations. Forested lands in the United States offset approximately 11% of the total U.S. fossil fuel emissions [5] while representing over 90% of the land's carbon sequestration capacity [6].

Understanding the pathways between sequestration, storage (stock) and emissions provides insight into the forest carbon cycle *(Figure C)*.

Carbon Sequestration:
How Healthy Forests Help

Carbon sequestration refers to the carbon dioxide (CO_2) that is absorbed by trees during photosynthesis.

It is stored within various biomass pools that may eventually return to the atmosphere through respiration, decomposition or disturbance (i.e., fire or insect outbreak causing mortality) [6,7].

These biomass carbon pools have five components:

- Aboveground live biomass includes all living biomass above the soil, such as stems, stumps, branches, bark, seeds and foliage. This includes live understory vegetation.
- Belowground live biomass includes all living biomass of coarse, living roots thicker than 0.08 of an inch in diameter.
- Dead wood includes all nonliving woody biomass either standing, lying on the ground (but not including litter) or in the soil.
- Forest floor litter includes the leaves, needles and branches less than 3 inches in diameter that are lying on the ground.
- Soil organic carbon includes all organic material in soil to a depth of 1 meter, but excluding the coarse roots of the belowground pools.

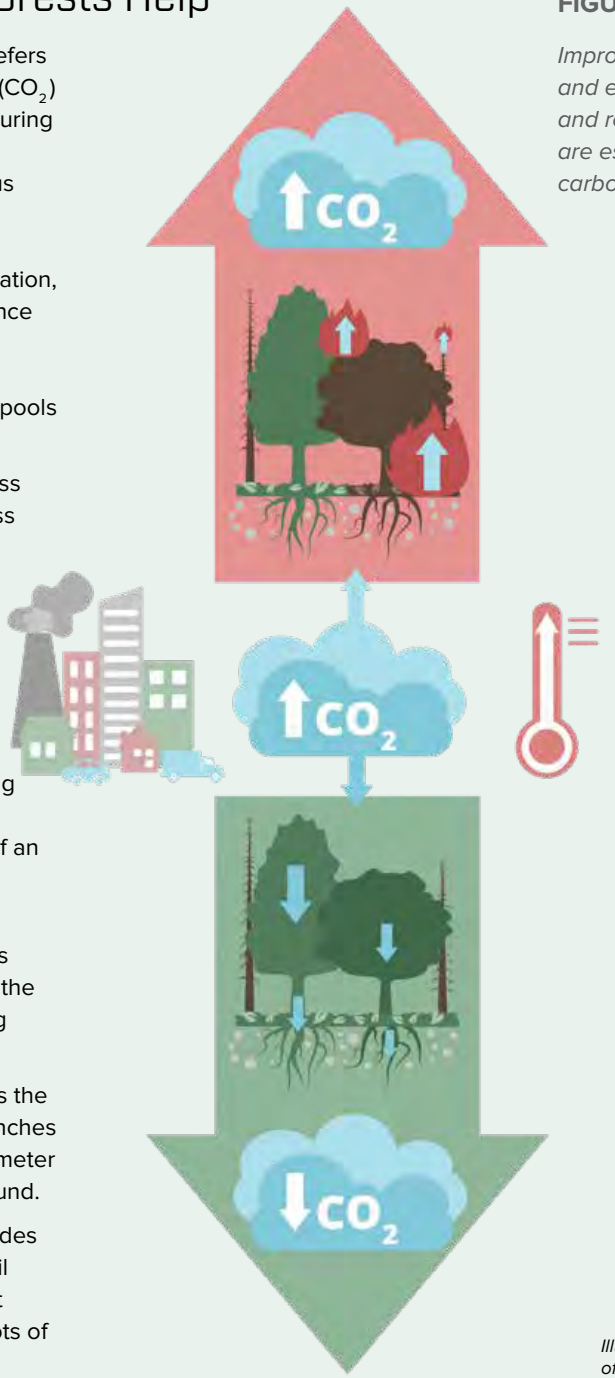


FIGURE C

Improving overall forest health, and ensuring forest restoration and regrowth in burned areas, are essential for increasing carbon sequestration.

1 *Higher average temperatures can lead to drought conditions in forests, which can increase fire frequency and severity. Fire releases carbon from forests into the atmosphere.*

2 *Increasing CO_2 concentrations in the atmosphere and higher average temperatures stimulate trees and vegetation to take in carbon (sequester).*

3 *When trees take in carbon, it lowers carbon concentrations in the atmosphere. Standing dead trees, litter and soil in forests store carbon. Decomposing trees emit some carbon.*

Illustration: Northern Institute of Applied Climate Science

WHAT HAPPENS WHEN COLORADO'S FOREST HEALTH DECLINES?

Potential effects could include:

- ***Negative impacts to water quality*** *and quantity that affect cities, communities, municipalities, industries and agriculture*
- ***Reduced air quality*** *and carbon storage and sequestration*
- ***Elevated risk of uncharacteristic wildfire*** *that negatively impacts habitat, forests, watersheds, economies and public health*
- ***Diminished scenic value*** *and decline in recreation opportunities and experiences*
- ***Decline in hunting and fishing*** *related to habitat loss*
- ***Heightened public safety concerns*** *related to standing dead and fallen trees and fire evacuations*
- ***Unstable forest products markets*** *and decline in local economies*

Whether hunting, biking, hiking or more, residents and visitors seek out Colorado's forests for a variety of recreational pursuits — generating $37 billion [14] in consumer spending annually. From 2018 to 2019, Colorado Parks and Wildlife reported more than $96 million dollars in revenue from the purchase of hunting and fishing licenses. Photo: CSFS

Forests are Central to Colorado's Economy, Culture, Lifestyle

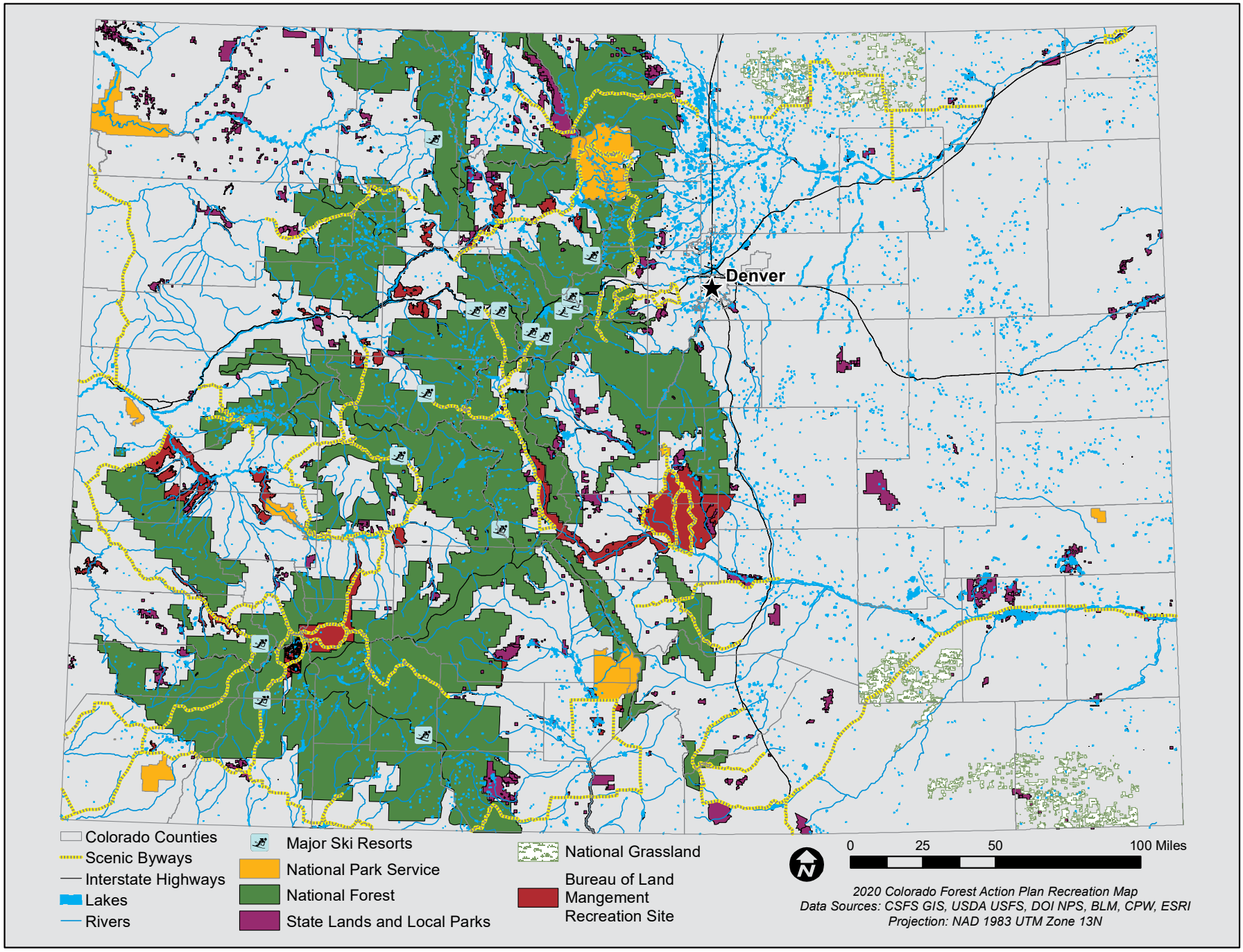
Colorado's forests shape the state's economic and social character, so investment in their future is imperative. To **CONSERVE**, **PROTECT** and **ENHANCE** the health of our forests will help ensure Colorado's legacy. Strategic planning such as this Forest Action Plan is necessary to address threats and challenges to ecosystem services in what is known as "Colorful Colorado."

Healthy forests provide a wide range of tangible goods and intangible benefits. These ecosystem services [8,9,10] — the direct and indirect benefits humans get from the environment — provide clean and ample water, clean air, carbon sequestration and storage, recreation opportunities, scenic views, habitat for plants and wildlife, wood products, renewable energy, nontimber market commodities, cultural history and a sense of place.

In 2015, 80% of Colorado residents relied on forested watersheds to deliver municipal water supplies [4]. These watersheds also provide critical water to rural agricultural lands. The Colorado Department of Agriculture reports agricultural activities contribute $41 billion annually in economic output, employ nearly 173,000 people and export goods to over 100 countries.

Recognizing the inseparable link between healthy forests and the ecosystem services they provide, more cross-boundary projects are being implemented in Colorado to support management and stewardship of these resources. One example is the From Forests to Faucets program, a collaboration among the U.S. Forest Service, Denver Water, the Colorado State Forest Service and the Natural Resources Conservation Service. This program was designed to improve forest conditions in watersheds that supply critical drinking water to the city of Denver.

Recreation Lands: Colorado's Designated Outdoor Spaces



TALK LIKE A FORESTER

FOREST HEALTH
is the perceived condition of a forest, derived from concerns about such factors as its age, structure, composition, function, vigor, presence of unusual levels of insects or disease, and resilience to disturbance (*as defined by the Society of American Foresters*).

UNCHARACTERISTIC WILDLAND FIRE
is an increase in wildfire size, severity and resistance to control, as compared to that which occurred historically in the native system [16].

WILDLAND-URBAN INTERFACE (WUI)
is where structures and other human developments meet or intermingle with wildland vegetation.

WILDFIRE RISK
is the likelihood of a fire occurring (*likelihood*), the associated fire behavior when a fire occurs (*intensity*) and the effects of the fire (*susceptibility*) on highly valued resources and assets.

Introducing youth to the benefits of trees is critical to the CSFS mission of creating healthy forests for future generations. CSFS Supervisory Forester Adam Moore, right, explains how to plant the lilacs that participants in the PALS afterschool program will take home with them after an annual tree planting in Alamosa. PALS has been helping the CSFS with the planting project for 10 years. The conservation seedlings were grown and donated by the CSFS Nursery. Photo: PALS

By 2021, the program will have invested more than $64 million in forest management to protect Denver's water supply.

Based on U.S. Forest Service Forest Inventory and Analysis 2019 data, total carbon storage (C) on Colorado's forest approximates 1,386 million metric tons (MMT) [5]. This is equivalent to the amount of coal (made primarily of carbon) that can be carried in 1,000 incredibly long trains. Each train would take up the entire 280-mile distance from Fort Collins to Gillette, Wyo., the "Energy Capital of the Nation" [11].

In Colorado, 811,000 acres [12] of urban and community forests provide green infrastructure for clean water and air, energy conservation, stormwater attenuation, reduction in noise pollution, property value enhancement, connectivity of habitat corridors and improved mental and physical health [12,13]. These ecosystem services provide monetary benefit; for example, 556,000 urban trees catalogued in COTreeView equate to approximately $48 million annually.

Across urban and rural economies, outdoor recreation in Colorado generates $37 billion in consumer spending annually, and 511,000 direct jobs [14].

From 2018 to 2019, Colorado Parks and Wildlife reported over $96 million dollars in revenue from hunting and fishing license sales.

Resource use also is an important income source in both urban and rural communities; the primary wood products industry in Colorado had estimated sales of $98.1 million and employed 6,650 people in 2016 [15].

Colorado's forests also are central to the state's cultural identity. There are over 1,500 sites and buildings listed with National Register of Historic Places, eight national monuments and four national parks within the state.

Forest resources are stewarded by the indigenous Ute Mountain Ute and Southern Ute on tribal lands. Numerous museums and annual events reflect Colorado's pride in outdoor recreation, mining history, livestock trade, ski resorts, and brewing and film industries.

Colorado's Forests Face Persistent Challenges, Increasing Temperatures, More Uncharacteristic Wildfires

In the *2010 Colorado Forest Action Plan*, the major threats to Colorado's forests were climate change and drought, uncharacteristic wildfire and post-fire erosion, insects and disease and human development. These challenges persist in 2020 and are expected to continue in the next 10 years and beyond. These drivers of change in Colorado's forests also affect the ability of trees to sequester and store carbon.

Averaged across Colorado, mean annual temperatures have increased by 2 degrees Fahrenheit over the past 30 years [17]. All future climate models project a continued increase in mean annual temperatures, with the greatest warming expected in the summer months *(Figure E)* [18,19].

By the middle of this century, there could be as many as 40 fewer days when the temperature in high-elevation areas of the state drops below 32 degrees, and the entire Southwestern U.S. is expected to experience more prolonged droughts [20].

The challenge faced by the CSFS, and all forest stewards, is to manage forests to provide benefits now and into the future. The *2020 Colorado Forest Action Plan* is a tool to meet this challenge.

Warm, drought years in Colorado are increasingly common compared to decades past [17]. Colorado has already seen the cascading disturbance effects of extreme drought conditions, including increased fire and area burned and forest insect outbreaks, leading to widespread tree mortality. Tree mortality leads to soil erosion, which negatively impacts water quality and watershed health. The longer dead trees stand on the landscape, the less they are worth to the forest products industry. Tree mortality also affects aesthetics and property values.

Decades of fire suppression that began in the early 1900s in the Western U.S. altered historical wildfire regimes and led to a dangerous buildup of vegetative fuels in some areas [21]. Over time, this resulted in higher incidence of uncharacteristic wildfire, which is a particular concern for water quality since sedimentation may increase and water quality can decrease after such fires [22]. Between 2000 and 2019, there were 450 wildfires in Colorado greater than 100 acres in size, totaling approximately 1.8 million acres [23]. Every wildfire can have positive and negative impacts on natural systems and human life and property, almost always in some combination. Some recent fires had overall positive impacts on forest conditions (e.g., West Fork, Decker), some had negative impacts to watersheds including high rates of post-fire erosion (e.g., Hayman, High Park) and others had significant negative impacts to human life and property (e.g., Black Forest, Waldo Canyon). Ultimately, fire cannot be excluded from natural systems in Colorado; however, risk reduction is more important than ever, as the increasing trend of uncharacteristic

After a wildfire in mountainous terrain, steep slopes can direct runoff and sediment into streams, causing a decrease in water quality and an impact on stream health. Photo: CSFS

INSECTS AND DISEASE: ACRES AFFECTED BY MOUNTAIN PINE BEETLE AND SPRUCE BEETLE SINCE 1996

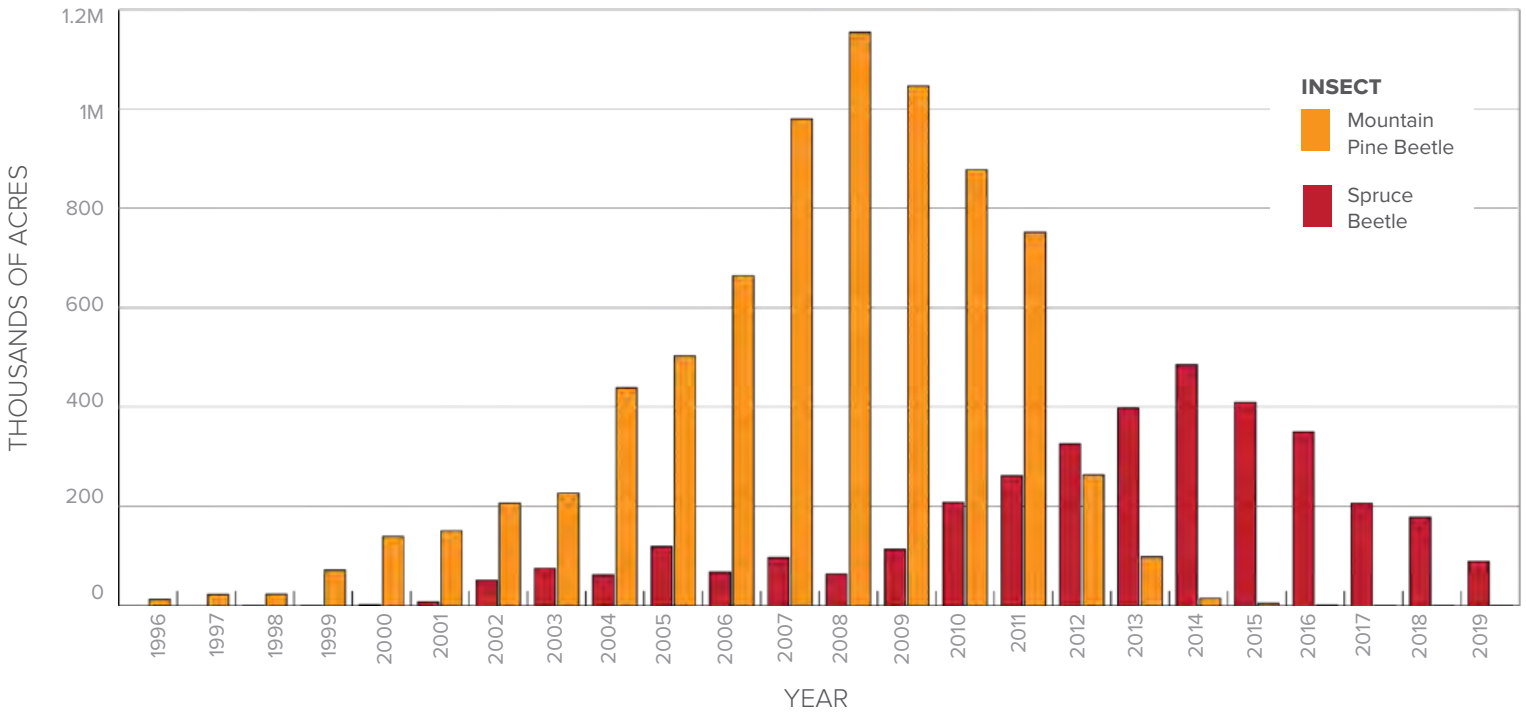


FIGURE D
Acres affected in Colorado by mountain pine beetle and spruce beetle, as determined by aerial detection surveys conducted by the U.S. Forest Service and the Colorado State Forest Service. Graphic: Dan West, Ph.D., CSFS

wildfires in Colorado is expected to continue based on drought and climate change projections [21,24,25].

Between 2010 and 2020, oscillations in the Palmer Drought Severity Index (PDSI) — a measure of dryness based on recent precipitation and temperature [26] — exacerbated tree susceptibility to bark beetle-caused mortality. Approximately 64% of pine forests were significantly affected by mountain pine beetle from 1996-2015 [27]. Although not every tree in every acre was affected, some acres saw more intense tree mortality than others.

On the heels of mountain pine beetle-caused mortality, approximately 40% of high elevation spruce-fir forests have been affected by spruce beetle, another native bark beetle, since the mid-2000s.

Lower in elevation, western spruce budworm has defoliated Douglas-fir trees, contributing to negative aesthetic effects and decreased tree vigor, which has subsequently increased Douglas-fir bark-beetle-caused mortality.

Combined, these disturbances have affected more than 20% of Colorado's forests since the turn of the century, and have resulted in millions of acres of standing dead wood *(Figure D)*.

Human development adds additional complexity to managing forests that are already under increased threat of disturbance from things like wildfire and insect outbreaks. The population of Colorado continues to increase; it grew 145% from 1970 to 2015 (2.2 million to 5.5 million) and is forecast to increase another 41%-70% by 2050 [28].

In 2017, the wildland-urban interface (WUI), where structures and other human developments meet or intermingle with wildland vegetation, encompassed an estimated 3.2 million acres and 2.9 million people [2].

In Colorado, grasslands, shrublands and forests all can be considered part of the WUI. Forests with dense canopies or heavy vegetative fuel loads in close proximity to development are the highest for WUI risk. Models project the WUI could encompass 9 million acres by 2040 [29].

In 2017, approximately 11% of Colorado's population lived in the highest WUI risk areas *(WUI risk categories 7-9; Figure F)*.

Wildfire risk is defined as the likelihood of a fire occurring (likelihood), the associated fire behavior when a fire occurs (intensity) and the effects of the fire (susceptibility) on highly valued resources and assets [30].

CLIMATE: OBSERVED / PROJECTED TEMPERATURE CHANGE

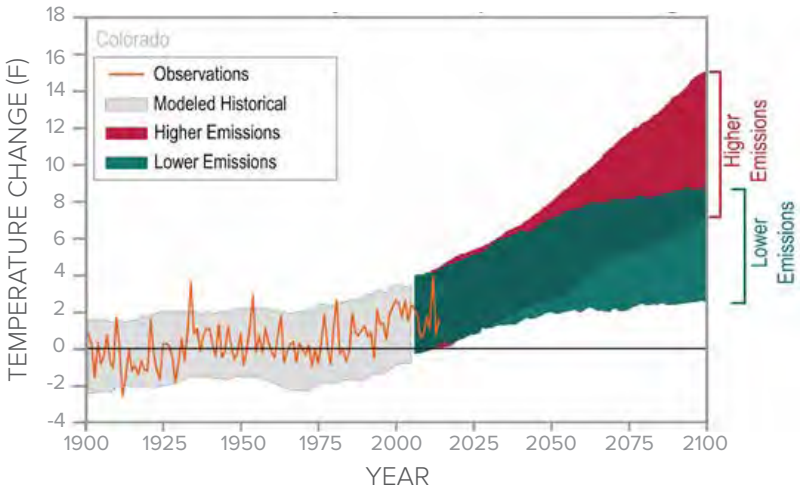


FIGURE E

Observed and projected changes are shown in near-surface air temperature for Colorado. Observed data are from the period 1900-2014. Projected changes for 2006-2100 are from global climate models for two possible futures: a higher greenhouse gases (GHG) emissions scenario and a lower GHG emissions scenario. Shading indicates the range of variation for the models. Graphic: Reproduced with permission from RMRS-GTR-376 [19]

WUI RISK: STATEWIDE WILDLAND-URBAN INTERFACE RISK POPULATION, 2017

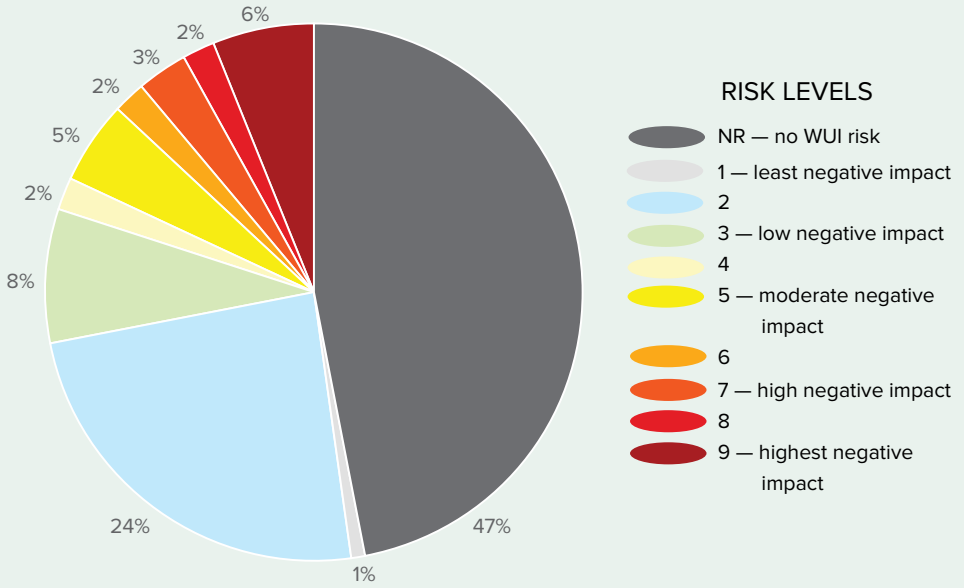


FIGURE F *The wildland-urban interface includes the portions of Colorado where human development meets wildland vegetation. The majority of Coloradans live in places with at least some increased risk of wildfire or heightened fire intensity. Graphic: Colorado Forest Atlas, CSFS*

Another layer of complexity in managing Colorado's forests under increased disturbance is understanding the impacts of these drivers of change to the carbon cycle. Decomposing dead wood releases some carbon into the atmosphere, and some is stored in the soil; these ratios are influenced by climate, wood type and soil type, among other variables.

Since 1990, Colorado's total forest ecosystem carbon stock has decreased by approximately 6% [5]. This 30-year decline was experienced across all biomass carbon pools except dead wood, which increased from 33 MMT C in 1990, to 113 MMT C in 2019 — a striking 342% increase. Since at least 1990, Colorado's forest ecosystems are estimated to be a net source of carbon rather than a net sink. In 2018, these forests emitted approximately 11.1 MMT CO_2 eq (does not include trees on nonforested land).

Within the contiguous 48 states, only Montana and Idaho experienced similar shifts in carbon stocks — but neither as severe as Colorado's.

These 30-year carbon flux trends also are magnified and compounded by socio-economic demands. Further expansion of the wildland-urban interface will continue to result in the loss of forestland. Forest conversion to other uses limits food and habitat for wildlife. Depressed timber markets and inadequate infrastructure limit the long-term carbon storage ability of wood products and building construction.

These trends are connected by ongoing ecological processes. Climatic changes in precipitation and temperature will continue to negatively impact forest health, alter carbon sequestration rates of forest ecosystems and increase the probability of uncharacteristic wildfire. Wildfires release additional carbon into the atmosphere while reducing the potential short-term carbon sequestration rate of forests.

Highly disturbed watersheds without restoration will continue to lose carbon as snowmelt and rain create flash-flood scenarios that remove carbon-rich mineral soils and forest floor litter. Continued widespread insect and disease outbreaks will also impact carbon fluxes as live trees become dead standing snags and downed dead wood. Inadequate natural and artificial regeneration following disturbances, and a lack of forest management efforts at the pace and scale necessary to address these drivers of change, will have long-term negative impacts on the ecosystem services provided by Colorado's forests.

State Goal of Reducing Greenhouse Gas Requires Adopting Strategic Carbon Plan

A cohesive, statewide strategic carbon plan for sequestration is needed to address many complex issues, including land-use planning and conversion; urban and community forestry; afforestation, reforestation and regeneration; forest age, structure and composition; timber and wood product markets; silvicultural practices; natural and uncharacteristic disturbance types and regimes; climate change; soil health; watershed off-site flows; carbon markets; and continued data collection, analysis and modeling.

Colorado is a member of the U.S. Climate Alliance, a bipartisan coalition of governors, state agencies and nonprofit organizations committed to reducing greenhouse gas emissions that align with the 2016 Paris Agreement [31].

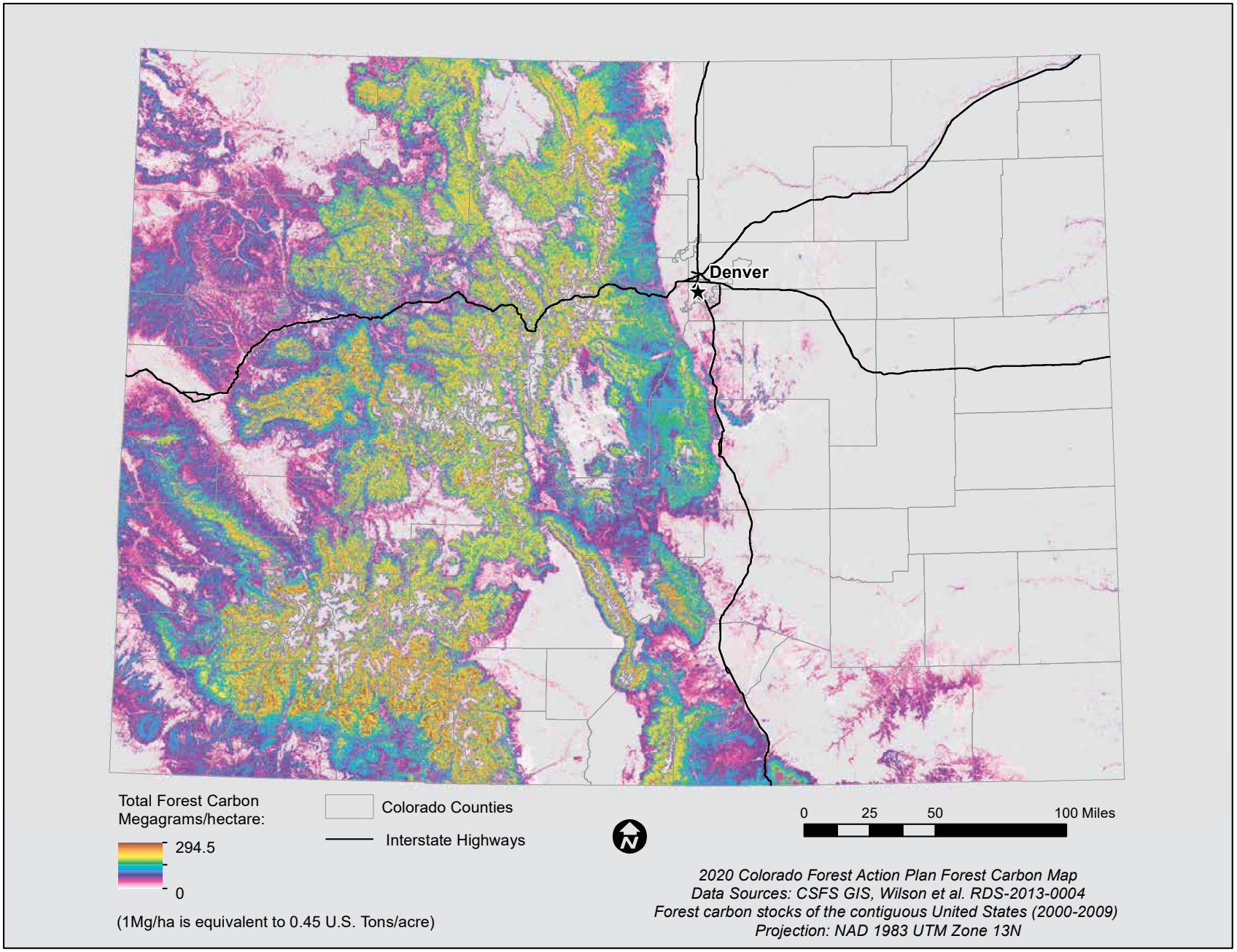
To help meet these goals, lawmakers introduced House Bill 19-1261, which would require a statewide goal to "reduce 2025 greenhouse gas emissions by at least 26%, 2030 greenhouse gas emissions by at least 50%, and 2050 greenhouse gas emissions by at least 90% of the levels of statewide greenhouse gas emissions that existed in 2005" (HB 19-1261).

A major component of U.S. Climate Alliance goals is to manage natural and working lands (NWL) to become resilient and healthy landscapes that sequester and store carbon. Healthy forests provide significant and cost-effective opportunities to offset greenhouse gas emissions. The Colorado NWL Climate Task Force [32] — comprised of members from the Colorado State Forest Service, Colorado State University, Colorado Department of Agriculture and Colorado Department of Natural Resources — is developing recommendations for a series of management pathways and practices on the state's forests, farms, rangelands and wetlands that would help meet HB 19-1261 goals. These efforts, combined with the Northern Institute of Applied Climate Science forest carbon management menu of adaptation strategies and approaches that were used to develop the goals, strategies and approaches of this action plan [33], will be critical components in creating a statewide carbon strategic plan to support climate change adaptation to **CONSERVE**, **PROTECT** and **ENHANCE** resilient and healthy forest resources.

This Forest Action Plan is part of this process; HB 19-1261 and the Colorado NWL Climate Task Force also are critical to creating healthy and resilient forests in Colorado.

Establishing and maintaining healthy, resilient forests increases their ability to offset greenhouse gas emissions. Photo: CSFS

Carbon: Colorado's Aboveground Forestland Carbon Stocks 2000-2009



Data Source: Wilson, Barry Tyler; Woodall, Christopher W.; Griffith, Douglas M. 2013. Forest carbon stocks of the contiguous United States (2000-2009). Newtown Square, PA: U.S. Forest Service, Northern Research Station. https://doi.org/10.2737/RDS-2013-0004

A Douglas-fir seedling grows in the hollowed bowl of an old Douglas-fir stump on La Jara Reservoir State Trust Land. Developing healthy forests starts with forest management and identifying priority areas and projects. Photo: Adam Moore, CSFS

Action Plan Process: How the CSFS Involved Stakeholders in Shaping the Future

The Colorado State Forest Service action plan team consulted with external partners and stakeholders to determine six themes with forest stewardship goals that fall under the national priorities of **CONSERVE**, **PROTECT** and **ENHANCE**.

THE FIRST OVERARCHING GOAL of a state forest action plan is to identify areas of greatest need and opportunity for forests. Based on this, three of the six themes were selected to develop a priority composite map for Colorado: forest conditions, living with wildfire and watershed protection.

THE SECOND OVERARCHING GOAL of a state forest action plan is to develop a long-term strategy to address areas of greatest need and opportunity. The CSFS action plan team worked across the five CSFS divisions: Administration, Communications and Communities, Forest Planning and Implementation, Forestry Services, and Science and Data, as well as with partners across the state to achieve this goal (see Contributors, page 83).

The *2020 Colorado Forest Action Plan* highlights statewide, cross-theme resource strategies that will be implemented to address goals in priority subwatersheds, as well as the gap between existing and necessary programs needed to achieve these goals.

The Forest Legacy analysis of need overview is included after the theme sections, and the full analysis is attached as Appendix 1.

BUILDING THE PLAN BEGAN BY SELECTING THEMES

- *Forest Conditions*
- *Living with Wildfire*
- *Watershed Protection*
- *Forest Wildlife*
- *Urban and Community Forestry*
- *Forest Products*

THEME DEVELOPMENT

CLIMATE CHANGE WORKSHOP GUIDED ACTION PLAN THEMES

As forests respond to a changing climate, adaptive forest management uses the best available science to play a role in these responses with the overarching goal of sustaining ecosystem services [35]. To address climate change within the six themes, the CSFS action plan team attended a two-day forest action plan workshop hosted by the Northern Institute of Applied Climate Science and the Department of Forest and Rangeland Stewardship at Colorado State University. During the workshop, the team derived goals, strategies and approaches for each theme.

The workshop used the NIACS Climate Change Response Framework, a cross-boundary approach among land managers, scientists and landowners to incorporate climate change considerations into natural resource management [34].

It was the first workshop of this kind conducted in the development of a state forest action plan and covered regional and local effects of climate change on Colorado's forest ecosystems; adaptive and sustainable forest management; and identification of resources and tools to integrate climate adaption into on-the-ground management.

Through a variety of CSU and NIACS presentations, small-group work sessions and facilitated roundtable discussions, action plan theme leads identified unique climate change impacts; projected likelihood of impacts and severity; selected potential adaptation actions from NIACS menus of adaptation strategies and approaches as applicable; and summarized strategies and approaches for action and monitoring.

For each theme and the Forest Legacy Program content, a risk matrix was used to identify and prioritize projected climate change impacts and severity *(Appendix 2)*.

Adaptation actions derived from the workshop, the NIACS menus of adaptation strategies and approaches, and the Adaptive Silviculture for Climate Change framework were integrated into the strategies and approaches section of each Forest Action Plan theme.

ASCC Research Network Examines How Forest Management Can Adapt for Climate Change

Current forest management methods can integrate adaptive approaches to mitigate climate change effects [35,36].

The Adaptive Silviculture for Climate Change (ASCC) [37] is a long-term research network partnership that currently has one project in the San Juan National Forest of Colorado, and leaders are planning a new project in the Colorado State Forest near Walden in collaboration with the CSFS.

The ASCC conducts experiments across various forest ecosystem types in the U.S. and Canada, linking managers with scientists to produce operational tactics that can facilitate adaptive responses to uncertain future climate. Under the ASCC framework, silvicultural systems can be designed with the intent of resistance, resilience or transition *(Figure G)*.

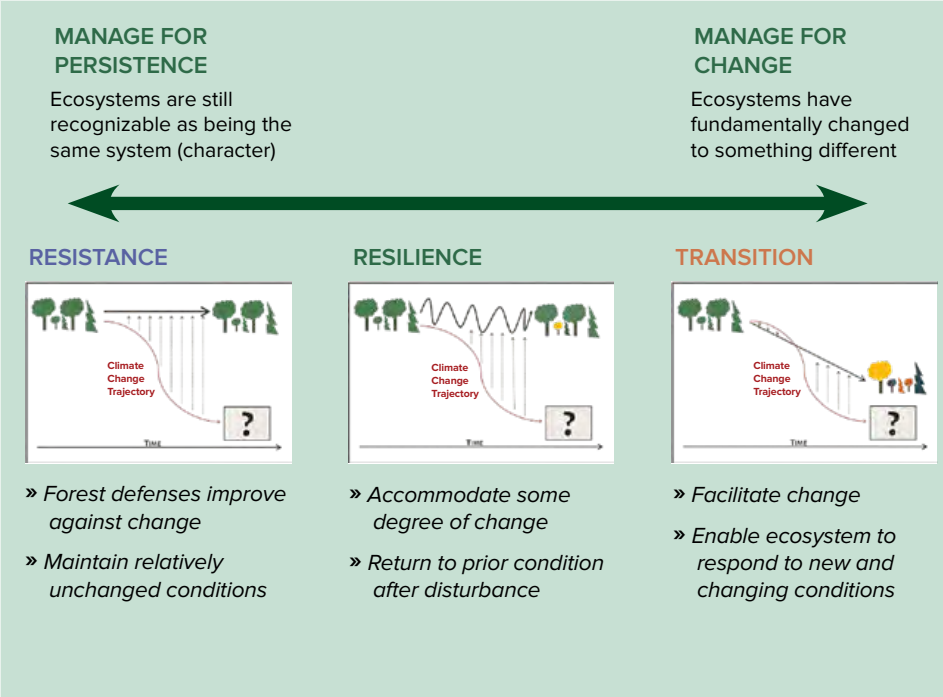


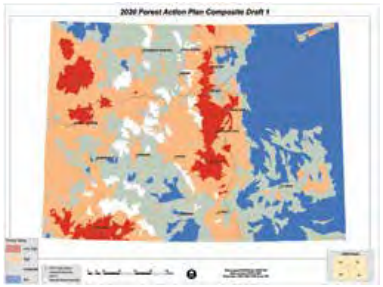
FIGURE G
The Adaptive Silviculture for Climate Change (ASCC) framework [34,37]. Resistance (to change in species composition and structure) will typically require the most investment and effort. Developing more flexible composition and structural goals designed for resilience is more likely to promote elasticity in regard to disturbances and climate shifts. Silvicultural systems designed for transition include alterations to species composition and structure and planning for alternate and adaptive actions over time.

PRIORITY COMPOSITE MAP: A PROGRESSIVE DEVELOPMENT

DRAFT 1

CSFS field office review

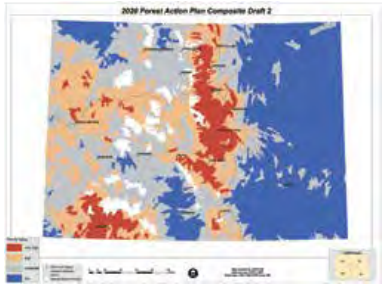
***RESULT:** Adjust statewide layer weights*



DRAFT 2

External review

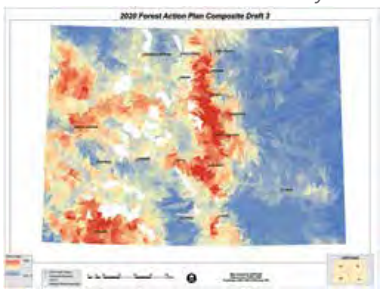
***RESULT:** Adjust statewide layer weights*



DRAFT 3

Forest Health Advisory Council review

***RESULT:** Add CDPHE source water layer*



FINAL MAP

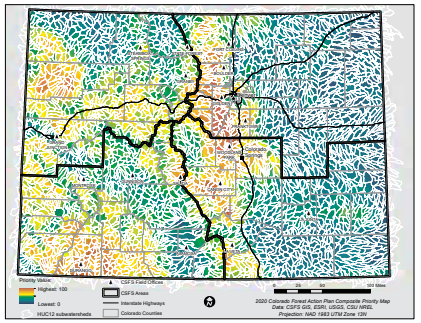


FIGURE H *The Forest Action Plan composite priority map was created through an iterative, participatory process to capture natural resource priorities statewide. Note: Weights for action plan themes are different for each version of the composite priority map. The purpose of this iterative process was to capture the majority of subwatersheds identified as a priority during internal and external meetings.*

Statewide Participation Helped Incorporate Priority Watersheds in Composite Map

The high-priority areas identified in the action plan composite map are subwatersheds where goals from the forest conditions, living with wildfire and watershed protection themes can be achieved on the same management footprint by a project or activity. The CSFS staff, partners and stakeholders joined in collaborative meetings held across the state to lend their knowledge and expertise to the priority mapping effort and strategy development.

Each of these three themes has unique geospatial layers, weighted based on progressive feedback from experts statewide, before being included in the final priority map (*Figure H and detailed GIS methods in Appendix 3*).

ITERATIVE, PARTICIPATORY MAPPING PROCESS

The first draft composite priority map was presented to CSFS staff in each of the four CSFS areas — Northeast, Northwest, Southeast and Southwest. Staff members provided feedback on the level of priority for groups of subwatersheds in their area, addressing the following questions:

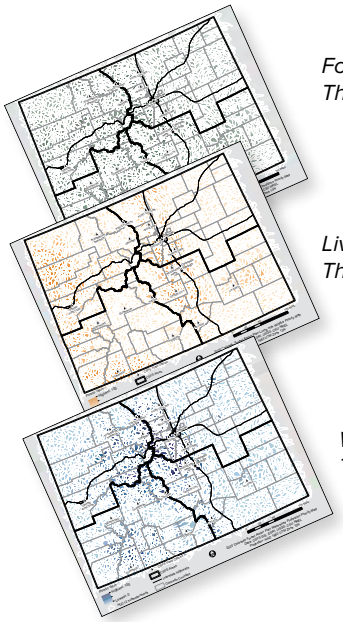
1. What are the goals in this area?
2. What type of work is planned or in progress in this area?
3. What is the scale of the planned or in-progress work?
4. Who are the existing and potential partners in this area?

Using this feedback, the layer weights were tested at a statewide scale and evaluated based on a layer that included all subwatersheds identified in the feedback. The resulting second draft map was based on the weighting scheme that captured the greatest proportion of high-priority subwatersheds.

During the fall of 2019, the CSFS held eight stakeholder outreach meetings across the state to gain feedback from subject

FIGURE I

PRIORITY MAP:
LAYER INCLUSIONS



Forest Conditions Theme Priority Map

+

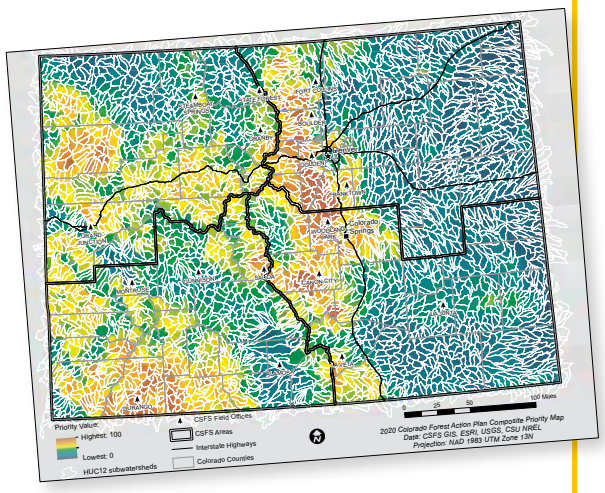
Living with Wildfire Theme Priority Map

+

Watershed Protection Theme Priority Map

=

Priority Composite Map



matter experts on the second draft composite priority map and layers (*Appendix 4*). About 90 partners and stakeholders participated, providing information regarding priority natural resource goals around the state, outlined in the Priority Resource Goals table on page 25.

The CSFS hired an independent contractor to serve as a nonbiased facilitator for these meetings.

"The team took their forest action plan development very sincerely. They took the time to design a process that elicited participants' best thinking and deep experience. ... They considered their experience from the previous forest action plan, learned from that experience and used it to develop this process and this plan. It's how adaptive management is supposed to work when it works well," the contractor said.

Each meeting was structured for participants to work in teams on large, laminate printouts of the second draft map, marking groups of subwatersheds and their level of priority. The teams addressed the same four questions asked of CSFS staff.

Each team presented its map at the meeting and gave the rationale for selecting groups of subwatersheds. The CSFS staff collected the maps and accompanying feedback sheets, then digitized subwatersheds for evaluation *(Appendix 5 map)*.

Feedback from the meetings helped the CSFS identify new statewide layers that could capture critical watershed protection issues (e.g., source water, diversions, conveyances), as well as ancillary geospatial layers to be compiled for use in local projects (e.g., infrastructure – *layer info in Appendix 6*).

After integrating the new watershed protection layers, all potential weighting scenarios were tested and evaluated. Then, the final composite priority map was selected based on the weighting scenario that captured the greatest proportion, 58% *(Appendix 5),* of the subwatersheds that were identified in the internal and external feedback.

All of the composite map layers were processed at the 12-digit hydrologic unit code (HUC) sixth-level scale [38], with continuous values from 0 to 100, where increasing values indicate increasing priority. The 12-digit HUC represents subwatersheds; most are 10,000 to 40,000 acres in size and there are 3,159 in Colorado.

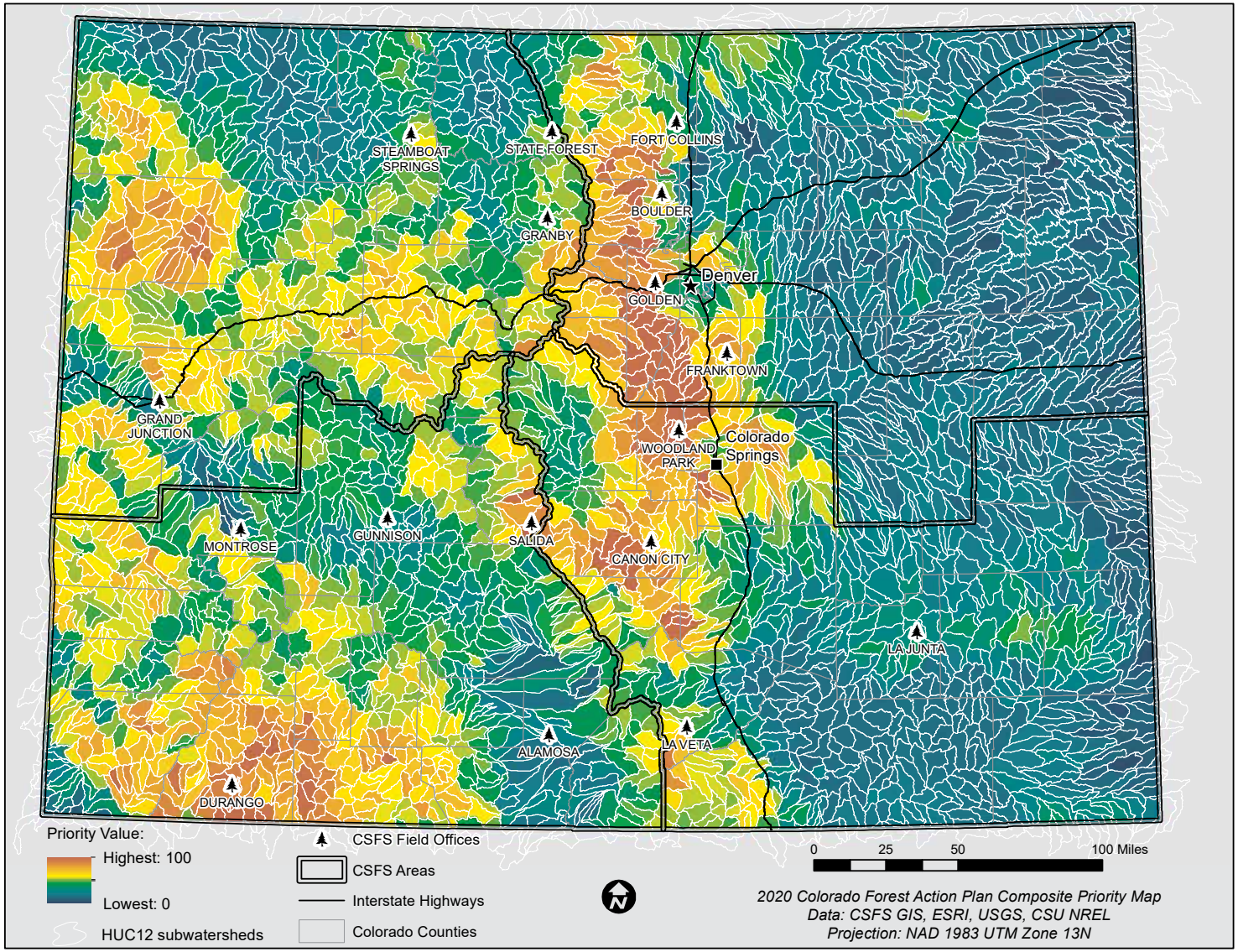
The subwatershed unit was chosen because it represents the required scale to address forest stewardship goals across the state, while incorporating regional variability.

The Colorado Forest Action Plan working group met with regional experts around the state to form the priority composite map. Photo: CSFS

MORE ONLINE

View and download county reports from the composite priority map and theme priority maps in the Forest Action Plan application of the Colorado Forest Atlas, coloradoforestatlas.org

Subwatershed Priority Composite Map: About 10% of Colorado's forests are at the highest priority for action, with a cost of approximately $4.2 billion



Geospatial layers incorporated (Figure I):

» *Forest Conditions Theme Priority Map (weighted 2x)*

» *Living with Wildfire Theme Priority Map (weighted 1x)*

» *Watershed Protection Theme Priority Map (weighted 1x)*

For details concerning geospatial weighting and methodology, see individual theme sections and Appendix 3.

FACTORS AFFECTING TREATMENT COSTS PER ACRE:

- ***Acres —*** *size of project*
- ***Location —*** *travel distance to project site, cost to mobilize equipment*
- ***Handwork —*** *lop and scatter, specialty and involved amount of handwork*
- ***Accessibility —*** *slope/terrain*
- ***Harvesting and hauling*** *vs. mastication vs. lop and scatter vs. on-site whole tree chipping*
- ***Timber sale*** *vs. fuels reduction/forest health project*
- ***Product utilization requirements*** *— hauling timber, mulching, chipping*
- ***Complexity*** *of project*
- ***Equipment and crew*** *needed*
- ***Work around homes*** *(involving handwork/thinning and mastication). High-maintenance projects with frequent revisits, small lots, multiple landowners, structure types and values add complexity. All costs increase in wildland-urban interface.*

(For an analysis of average costs and harvesting case studies, see Appendix 7.)

Treatment Costs Vary Greatly, Depend on Commercial Value, Accessibility

Cost of treatment by acre is highly variable; some forest cover types have little commercial value (e.g., piñon-juniper) and will require high investment per acre. Large landscapes that are identified as high priority are sometimes largely inaccessible based on topography. Regional to local data and information should be incorporated in priority subwatersheds to identify additional considerations including operational capacity.

Total Acres of Colorado Forestland in priority watersheds, by cover type

All numbers are estimates. Treatment costs do not include overhead/administration, which averages 35% but can be up to 51%.

Forest Cover Type	Total acres in state	Acres in composite priority sub-watersheds	% of total acres in composite priority sub-watersheds*	Acres treated in composite priority subwatersheds 2008-2017**	% total acres in composite priority sub-watersheds treated 2008-2017**	Average cost per acre for treatment ***	Total cost for untreated acres
Piñon-Juniper	5,162,565	664,579	12.9	6,125	0.9	$1,733	$1,141,100,782
Mixed Conifer	2,490,326	667,949	26.8	65,235	9.8	$2,087	$1,257,864,118
Spruce-Fir	4,679,814	202,948	4.3	7,224	3.6	$1,925	$376,768,700
Ponderosa Pine	2,081,808	482,355	23.2	53,084	11.0	$1,581	$678,677,451
Conifer-Hardwood	2,290,536	203,429	8.9	12,554	6.2	$1,500	$286,312,500
Hardwood	2,807,121	111,255	4.0	6,730	6.0	$1,416	$148,007,400
Oak Shrubland	2,183,640	77,361	3.5	3,503	4.5	$1,050	$77,550,900
Lodgepole Pine	1,676,906	86,617	5.2	12,306	14.2	$1,700	$126,328,700
Riparian	833,745	67,029	8.0	4,869	7.3	$1,950	$121,212,000
Conifer	116,593	2,856	2.4	85	3.0	$2,087	$5,783,077
STATE TOTAL/AVG.	**24,323,054**	**2,566,378**	**10.6**	**171,715**	**6.7**	**$1,702.90**	**$4,219,605,628**

**Considered subwatersheds with priority value greater than 60. Values of 60 considered high priority based on natural breaks in the data.*

***Includes CSFS, USFS, BLM. Dissolved based on geometry — only physical vegetation management at stand and plan level, prescribed fire and wildfire; does not include planned projects*

****CSFS estimates; does not include cost offsets for timber sales*

Identifying Priorities: Where watersheds meet regional resource goals

Priority Resource Goals	Number of HUC 12 subwatersheds identified
Reduce risk of uncharacteristic wildfire	453
Enhance wildlife habitat	282
Protect drinking water infrastructure	254
Protect drinking water supply	238
Riparian habitat restoration	165
Improve resiliency to pests and pathogens	149
Protect irrigation water supply	81
Protect power infrastructure	80
Maintain transportation corridors	63
Mitigate bark beetle impacts	62
Enhance recreation and tourism opportunities	54
Watershed protection	53
Community protection	39
Policing dispersed recreation/transient population	39
Protect cultural resources	37
Maintain forest products industry	33
Protect communication infrastructure	24
Protect active mining operations	23
Protect important forest areas from development and fragmentation	21

Counting Subwatersheds Helps Prioritize

One of the outcomes of the statewide meetings was identifying priority resource goals based on regional knowledge. Calculating the number of HUC 12 subwatersheds that could be associated with each goal helped prioritize them. Reducing wildfire risk was the top priority statewide, with 453 subwatersheds identified based on this resource goal.

One unexpected outcome of this exercise was the prioritization of power and communication infrastructure protection. The CSFS compiled statewide data for these infrastructure types and developed a subwatershed prioritization map for each that can be used as ancillary data *(Appendix 6)*.

Priority Resource Goals	Number of HUC 12 subwatersheds identified
Protect national monuments	21
Protect train infrastructure	9
Prevent flooding, sediment delivery, erosion	8
Facilitate social community adjustments through a deeper understanding of living with fire	7
Erosion prevention	7
Mitigate recreation impacts	5
Preserve and protect biodiversity	5
Restore departed forest conditions	4
Protect gas infrastructure	3
Aspen enhancement	2
Restore native species	2
Prevent timber encroachment	2

The White River National Forest between Aspen and Crested Butte is one of the areas CSFS Forest Inventory and Analysis crews routinely survey. The CSFS crews are leaders in FIA certification training and data academy workshops within the Interior West. Photo: Wilfred Previant, for CSFS

FOREST THEMES AND GOALS

Action Plan Themes: Focus Areas for Improving Forest Health in Colorado

Each of the six action plan themes includes conditions and trends, challenges and threats, goals, strategies and approaches, as well as a theme map.

The goals of each theme align with the national priorities.

28 FOREST CONDITIONS

46 FOREST WILDLIFE

34 LIVING WITH WILDFIRE

52 URBAN AND COMMUNITY FORESTRY

40 WATERSHED PROTECTION

58 FOREST PRODUCTS

National Action Plan Priorities

CONSERVE working forestland

PROTECT forests from harm

ENHANCE public benefits from trees and forests

FOREST CONDITIONS

Background

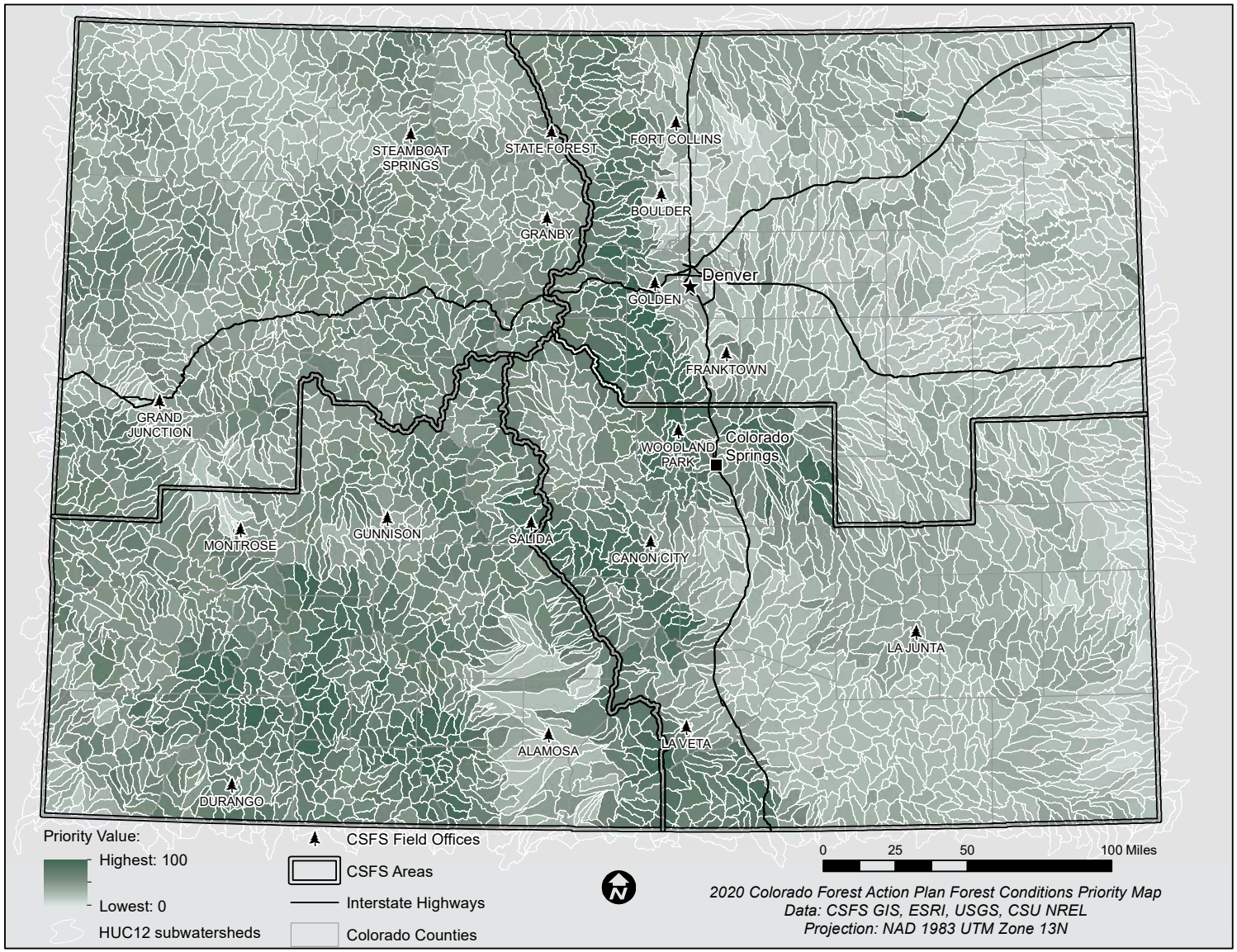
Colorado's approximately 24 million acres of forested lands [2] can be classified into general forest types based on primary canopy cover and environmental conditions including elevation, climate and soils. Major forest types in Colorado include conifer-hardwood, conifer, mixed conifer, hardwood (primarily aspen), lodgepole pine, oak shrubland, piñon-juniper, ponderosa pine, riparian and spruce-fir.

Approximately 65% of Colorado's forests are under federal management, primarily by the U.S. Forest Service and the Bureau of Land Management [1]. Private ownership accounts for approximately 30% of forestland. The remaining 5% spans various public entities including state, county and city, tribal and nongovernmental organizations *(Figure B)*.

Forests provide a wide range of social, economic and ecological benefits, including clean water for agriculture, municipal and industrial use, habitat, grazing, nutrient cycling and soil retention, improved air quality, carbon sequestration (uptake) and storage, recreational opportunities and resource use, as well as offer residents cultural significance and a sense of place.

CSFS Forester Ashley Garrison holds up a prism as part of a survey in a ponderosa pine plot for forest inventory data. Inventories help determine forest management needs based on current tree counts and conditions. Photo: CSFS

Subwatershed Priority Map for Implementing Forest Condition Goals



Geospatial layers incorporated:

These layers were selected to evaluate potential forest threats in the coming decades.

» *Basal area (density) loss projected based on potential insect and disease disturbance through 2027 (weighted 2x) [39]*

» *Potential for canopy fire in 2017 (weighted 2x) [2]*

» *Wildland-urban interface (WUI) projected to 2040 (proxy for land use conversion) (weighted 1x) [29]*

CONDITIONS AND TRENDS

» **Over 22% of the standing tree volume in Colorado's forests is dead wood**, with the leading causes of mortality being insects (65%), disease (23%) and fire (4%) [40,41]. Increasing pressures on forests will continue as temperature increases affect natural defenses from insects and disease.

» **Longer fire seasons are expected**, with larger and more intense wildfires. The three wildfires that have accounted for the largest loss of structures in Colorado have all occurred in the past decade — High Park, Waldo Canyon and Black Forest fires [42].

» **Colorado's population is predicted to increase** another 41%-70% from 2015 levels by 2050 [28], much of which will be in the wildland-urban interface and contribute to forest conversion. In addition, increasing population will increase demands on recreation and other forest uses.

» **Some forests are experiencing a negative net growth** (live tree volume increase relative to dead tree loss) when considering species (e.g., lodgepole, aspen, piñon-juniper, true fir) 5 inches or larger in diameter [40].

CHALLENGES AND THREATS

» **An increase in insect and disease activity** and its effects on forests

» **Lengthening wildfire seasons** with larger, higher intensity wildfires

» **Lack of seedling regeneration** after forest disturbance

» **Reduced soil moisture** in summer

» **Warmer temperatures**, both annual and seasonal

» **Conversion of forest** to nonforest through development and disturbance

Planting seedlings and reforesting areas impacted by large-scale disturbances, such as wildfire, is an important approach to address forest conditions. Photo: CSFS

GOALS AND STRATEGIES

GOAL #1

CONSERVE

PROTECT

KEEP FORESTS AS FORESTS

Conversion and fragmentation of forests comes in many forms including disturbances, land use conversion, climate stressors and air pollution. While these changes in forest cover may occur due to various drivers, maintaining and improving forestland provides valuable ecosystem services. Forest management challenges can increase substantially with fragmentation, which complicates planning and implementation across jurisdictional boundaries. Colorado's forests respond to disturbances in a variety of ways based on forest type, climate stress and usage.

STRATEGY 1: Maintain and, where practical, increase forest cover. Promote forest retention and creation.

Approaches

1. Enhance economic incentives, such as the Colorado Forest Agriculture incentive and Forest Legacy Program
2. Promote silvicultural practices that support forest regeneration
3. Encourage natural regeneration through forest management
4. Address afforestation and reforestation through planting and re-planting trees appropriate to current and expected future conditions (especially post-disturbance)
5. Use agroforestry such as wind breaks, living snow fences, tree farms and silvopasture practices in agricultural settings
6. Use native or new, future-adapted genetic variations of species as appropriate in restoration and adaptive management projects

STRATEGY 2: Reduce the impacts of biological stressors. Manage for more resilient forests that can better survive disturbances and changing climate.

Approaches

1. Use silvicultural practices that identify and promote biological and structural diversity, including thinning and regeneration techniques
2. Remove/prevent invasive and non-native species
3. Actively manage forests to improve resilience to insects and disease

STRATEGY 3: Plan for post-disturbance recovery and transition.

Approaches

1. Preserve forest systems that will maintain resilience to future disturbance
2. Monitor and manage for potential transitions in forest systems
3. Promote post-fire recovery through various means including planting and soil stabilization

---

GOAL #2

PROTECT

ENHANCE

IMPROVE FOREST PRODUCTIVITY

This requires expert interaction with local knowledge that addresses the challenges of maintaining current forest productivity, recognizes the difficulties of improving productivity and understands the effort and capacity required to renew forest productivity following disturbances.

A wide variety of silvicultural tools and techniques can be used to actively manage forest structure, composition and diversity to improve productivity and forest health. By sustainably improving productivity, Colorado's current and future forests will be more adaptable, have increased carbon sequestration rates, be more resistant and resilient to short- and long-term disturbances, provide for a more robust timber market and improve habitat, water and air quality.

STRATEGY 1: Maintain and enhance species and structural diversity and complexity. Diversify species and structure to provide myriad ecosystem services.

Approaches

1. Maintain and enhance existing and new forest productivity by managing for diversity in tree age and size classes and stocking/density
2. Address afforestation and reforestation using viable species with the potential to increase forest productivity over time
3. Retain dead trees, both standing and fallen, to maintain carbon storage stocks and provide high-quality habitat cover and food for wildlife
4. Support a wood products industry to harvest stored carbon and promote regeneration for future

Forester Nate Beckman, right, meets at a residence near Golden to discuss an ongoing fuels mitigation project to remove debris and dead trees and create migration corridors for wildlife in the populated foothills area. The family is working with the CSFS to ensure the needs of wildlife are met while also reducing wildfire risk on their property. Photo: Amy Bulger, CSFS

GOALS AND STRATEGIES (CONT.)

GOAL #2

PROTECT

ENHANCE

carbon storage and sequestration

STRATEGY 2: Promote the ability of forest systems to resist and rebound from disturbances.

Approaches

1. Manage fire-dependent forest systems to maintain and promote resistance to fire mortality
2. Protect regeneration and planting from mortality induced by environmental factors or human activity
3. Seed and replant post-disturbance to renew the forest system's carbon storage and sequestration capacity, especially in young stages of relatively rapid growth

TALK LIKE A FORESTER

ADAPTIVE MANAGEMENT
is a structured, iterative process for decision making to reduce uncertainty through structured hypothesis testing and monitoring of outcomes. This approach supports decision making that meets resource management objectives while simultaneously accruing information to improve future management (*as defined by the U.S. Forest Service*).

GOAL #3

CONSERVE

ENHANCE

PROMOTE ADAPTIVE MANAGEMENT

Use adaptive management to support current sustainable forests and plan for future disturbances and forest type change, acknowledging that environmental, social and economic changes require adaptation. This will require identifying forested areas and forest systems that are healthy and resilient to environmental and economic pressures. In addition, as environmental and economic conditions change, there is a need to identify forest types that will be more resilient to disturbance and environmental change.

In conjunction with adaptive management, developing monitoring protocols and social approval of forest management are critical to success.

STRATEGY 1: Reduce impacts of biological stressors. Manage for appropriate diversity and complexity in species, age and size.

Approaches

1. Manage for resistant and resilient forest composition, age, structure and function
2. Mitigate invasive plant species
3. Consider reforestation with species mixes better suited to expected future climate conditions

STRATEGY 2: Facilitate forest community adjustments through species retention and transitions. Promote continued ecosystem function by managing species and structure.

Approaches

1. Encourage native species that are expected to adapt to future conditions
2. Protect seedlings and saplings
3. Identify productive sites and best adapted species
4. Monitor natural regeneration response to changing environmental conditions

STRATEGY 3: Maintain and create refugia (areas of relative stability to climate change). Identify desired forested landscape compositions that are resilient.

Approaches

1. Inform management decisions regarding key desirable tree species and forest structure
2. Create species reserves both in forests and in nursery operations, including legacy trees
3. Monitor for forest response to treatments and harvesting, natural disturbance and climate change

LIVING WITH WILDFIRE

Background

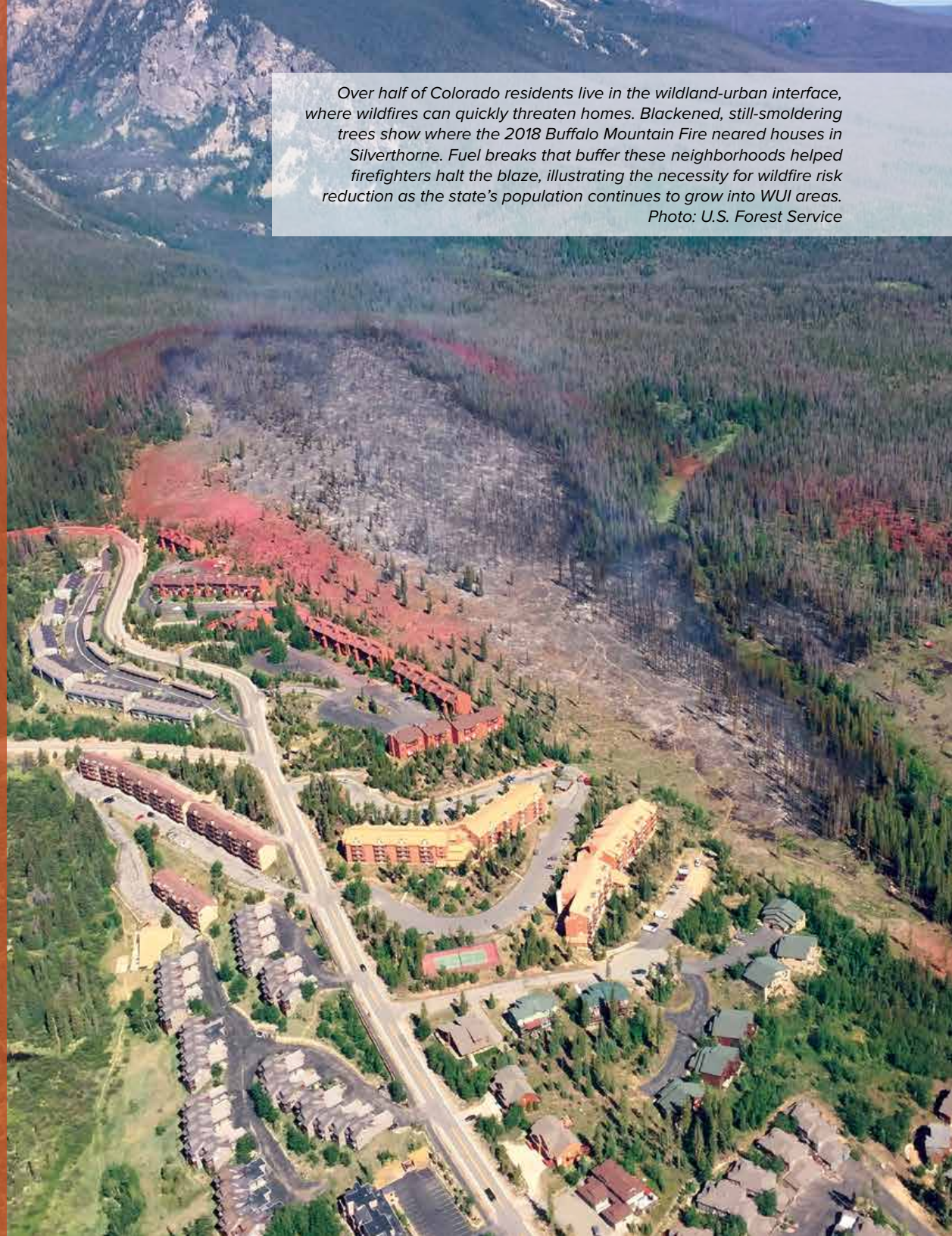
Fire plays a critical role in maintaining the health of fire-dependent forest, shrubland and grassland ecosystems in Colorado. Some lower-elevation forests rely on frequent, low-intensity fires to control regeneration and reduce understory vegetation, while some high-elevation forest types, such as lodgepole pine, rely on high-intensity fire to regenerate the forest. However, a long history of fire suppression and lack of forest management have altered historical fire cycles and led to a dangerous buildup of fuels in some areas, leading to higher incidence of uncharacteristic wildfire.

Fire creates carbon emissions through direct burning followed by the decay of trees and other vegetation destroyed by the fire. Uncharacteristic wildfires can damage soils and impair future forest recovery, which leads to potential loss of future carbon sequestration from those acres impacted [33].

Population growth into the wildland-urban interface — the area where structures and other human developments meet or intermingle with wildland vegetation — presents additional challenges for public safety and community resiliency [43]. As more people choose to live in wildfire-prone areas, additional homes and lives are at increased risk of being affected by wildfires. Wildfire risk is calculated by three factors: the likelihood of a fire occurring (likelihood), the fire behavior when a fire occurs (intensity) and the effects of the fire on highly valued resources and assets (susceptibility) [30].

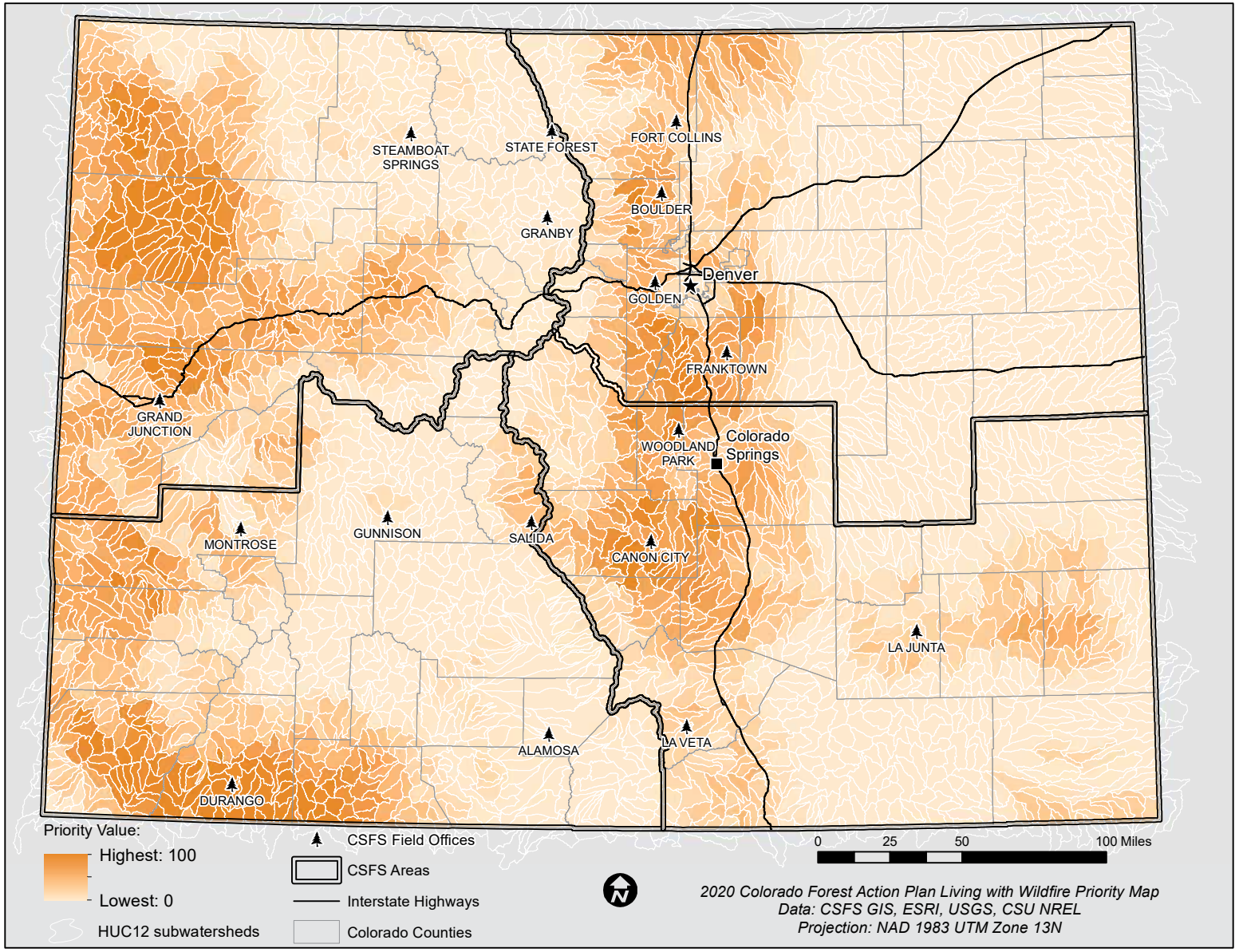
The National Cohesive Wildland Fire Management Strategy is the framework land management agencies and stakeholders use for addressing wildfire issues in Colorado. This strategy is a collaborative process that seeks all-lands solutions to wildland fire management issues, focusing on three goals: 1) restore and maintain resilient landscapes; 2) create fire-adapted communities; and 3) safe and effective fire response.

In Colorado, the first two goals are the primary responsibility of the CSFS, while goal three is the primary responsibility of the Division of Fire Prevention and Control. The Forest Action Plan focuses on addressing resilient landscapes and fire-adapted communities. Fire management goals and strategies are addressed in DFPC's August 2018 *Strategic Plan for Supporting Colorado's Fire Agencies*.



Over half of Colorado residents live in the wildland-urban interface, where wildfires can quickly threaten homes. Blackened, still-smoldering trees show where the 2018 Buffalo Mountain Fire neared houses in Silverthorne. Fuel breaks that buffer these neighborhoods helped firefighters halt the blaze, illustrating the necessity for wildfire risk reduction as the state's population continues to grow into WUI areas. Photo: U.S. Forest Service

Subwatershed Priority Map for Implementing Living with Wildfire Goals



Geospatial layers incorporated:

» *Wildfire risk 2017 — defined as the possibility of loss or harm occurring from a wildfire and includes four values at risk: current wildland-urban interface, drinking water assets, forest assets and riparian assets, which are combined with burn probability. Layer weights consistent with 2017 Colorado Wildfire Risk Assessment [2].*

CONDITIONS AND TRENDS

» **Of the 10 largest recorded wildfires** in Colorado history, seven have occurred since 2010 and have burned more than 897,000 acres combined [42].

» **The wildfire season has lengthened** due to a changing climate, resulting in wildfires that start earlier, last longer, cost more to suppress, cause more damage and threaten more lives than ever before. Climate impacts and vulnerabilities are influencing vegetation and fire occurrence through warmer temperatures (annual and seasonal), more days with extreme heat and more variable precipitation.

» As of 2017, more than 2.9 million people, **half of the state's population, live in Colorado's wildland-urban interface** [2]. The largest recent increases in population growth within the WUI are in areas where agricultural lands are becoming fallow or being developed. Currently, the WUI covers approximately 3.2 million acres in Colorado; models project it could encompass over 9 million acres by 2040 [29]. Colorado's population will increase another 41%-70% from 2015 levels by 2050 (7.7 million to 9.3 million) [28]. As Colorado's population increases in the WUI, human exposure to the negative impacts of wildfire, including post-fire erosion impacting water sources and reduction in air quality due to smoke, will become a significant public health issue.

The same tree with a crooked trunk in the center of these photos shows how a CSFS forest management project near Evergreen cleared dense trees to reduce wildfire risk. Tree thinning is one forest management tool that can bolster forest health and protect property. Photo: Emma Brokl, CSFS

» **Communities have been proactively addressing wildfire hazards** through the development of Community Wildfire Protection Plans (CWPPs). These plans bring together diverse local interests to discuss mutual concerns for public safety, community sustainability and natural resources [44]. Currently there are 239 CWPPs in Colorado (50 county-level, 48 fire protection district-level and 141 local-level). CWPPs can quickly become outdated due to lack of capacity, changes in community structure, available information and technology. Over 85% of Community Wildfire Protection Plans are over five years old, and almost half are more than 10 years old.

» **Social dynamics in the WUI add complexity** to wildfire risk reduction strategies: longer-term residents with legacy community knowledge relocate [45], and differences are seen between urban and rural populations in shared values and perspectives, as well as in organizing as a community [46].

CHALLENGES AND THREATS

» **Community capacity for wildfire risk reduction planning** and implementation

» **Wildfire risk reduction activities** are often done at the scale of an individual parcel, rather than strategically linked across communities and landscapes

» **Limited understanding of living in a fire-dependent environment** including risk from wildfire and potential post-fire impacts (socio-economical, environmental)

» **Lack of understanding of fire-adapted community concepts** amongst stakeholders

» **Limited understanding of social dynamics** within WUI communities

» **Lack of consistent land use regulations and building codes** to address infrastructure in WUI areas

» **Uncertainty about climate** impacts and vulnerabilities

» **Limited wood products markets**, contractors and funding for fuels reduction activities

» **High potential for wildfire smoke** to impact more people due to an increase in the size and intensity of wildfires, paired with increased population in and near the WUI

» **Current level of planning and implementation** of wildfire risk reduction activities does not typically occur at the scale necessary to reduce wildfire risk

» **Social and environmental constraints** of using prescribed fire

GOALS AND STRATEGIES

GOAL #1

PROTECT

ENHANCE

PROMOTE COMMUNITY FIRE ADAPTATION

Fire-adapted communities take personal responsibility and implement actions to reduce wildfire risk. These communities consider people, developments, businesses, infrastructure, cultural resources and natural resources in planning efforts to prepare for the effects before, during and after a wildfire. Actions communities take not only reduce wildfire risk but also increase forest health through sound management practices.

The goal is to make communities and ecosystems more resilient to the negative impacts of wildfire and to create safer and healthier conditions for both people and the environment.

STRATEGY 1: Facilitate social community adjustments through a deeper understanding of living with wildfire.

Approaches

1. Collaborate with land management agencies, fire protection districts, place-based collaboratives and insurance organizations to promote fire-adapted concepts that lead to reduction of risk to communities
2. Utilize existing programs and networks (i.e., Firewise USA®, Ready-Set-Go, Fire Adapted Communities Learning Network)
3. Realign community expectations before, during and after a wildfire
4. Ensure wildfire risk reduction information is current and incorporates the latest science (socio-economical, environmental)
5. Work with communities to improve the understanding of living in a fire-dependent environment
6. Take advantage of current events (i.e., a local fire) to engage communities

STRATEGY 2: Enhance community wildfire risk reduction planning.

Approaches

1. Support the development, revision and implementation of Community Wildfire Protection

GOALS AND STRATEGIES (CONT.)

GOAL #1

PROTECT

ENHANCE

Plans. Integrate CWPP elements into the Federal Emergency Management Agency's Hazard Mitigation Plans

2. Maintain and enhance the Colorado Wildfire Risk Assessment to provide a consistent statewide risk assessment for risk reduction planning efforts
3. Promote placed-based efforts for wildfire risk reduction activities
4. Reduce structural ignitability; establish and enhance evacuation routes
5. Enhance land use planning through adoption of building codes that address home ignition zone concepts
6. Integrate post-fire recovery (social and environmental), smoke impacts, evacuation and at-risk population considerations into CWPPs

STRATEGY 3: Increase pace and scale of wildfire risk reduction efforts.

Approaches

1. Coordinate fuels treatments at a scale, and strategic value, that will significantly reduce wildfire risk
2. Support local funding solutions for wildfire risk reduction work (i.e., county ballot initiatives)
3. Collaborate with local, state and federal land management agencies, communities and private landowners to link fuel treatments to increase effectiveness on a landscape scale

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GOAL #2

CONSERVE

PROTECT

ENHANCE

REDUCE THE RISK OF UNCHARACTERISTIC WILDFIRE

Wildfire plays a critical role in fire-dependent ecosystems; however, current fuel and climate conditions are contributing to uncharacteristic wildfires that are having negative impacts on watersheds and communities. Focusing on reducing risk through vegetation management will help minimize the negative impacts of wildfires.

STRATEGY 1: Reduce the risk and long-term impacts of severe disturbances.

Approaches

1. Alter forest structure or composition to reduce risk or severity of wildfire
2. Collaborate with local, state and federal land management agencies, communities and private landowners to link fuel treatments to increase effectiveness on a landscape scale
3. Promptly revegetate sites after disturbance with appropriate plant material

STRATEGY 2: Maintain and enhance species and structural diversity.

Approaches

1. Promote diverse forest age classes where ecologically appropriate
2. Maintain and restore diversity of native species
3. Utilize fire as a tool, including prescribed fire and managed wildfire

STRATEGY 3: Facilitate community adjustments pre- and post-disturbance through species transitions.

Approaches

1. Favor or restore native species that are expected to be adapted to future conditions
2. Guide changes in species composition at early stages of stand development
3. Disfavor species that are distinctly maladapted
4. Manage for species and genotypes with wide moisture and temperature tolerances

GOAL #3

ENHANCE

PROMOTE THE ROLE OF FIRE IN ECOLOGICAL PROCESSES

Fire plays a critical role in Colorado's ecosystems and years of exclusion have negatively affected forest health and function. Integrating fire back onto the landscape through prescribed fire and managed wildfire will improve forest health and reduce the negative impacts of wildfire on human populations. Prescribed fire is an effective means to reduce hazardous fuels and to reintroduce fire into fire-dependent ecosystems. The amount of smoke produced from prescribed fires is significantly less compared to the amount generated during large wildfires, especially long-duration fires [47]. Prescribed fires can help mitigate adverse public health impacts of larger wildfires.

Prescribed burning is an effective tool in forest management, clearing understory vegetation that may otherwise make wildfires burn with greater intensity. Photo: CSFS

STRATEGY 1: Sustain fundamental ecological functions.

Approaches

1. Reduce impacts to soils and nutrient cycling
2. Reduce competition for moisture, nutrients and light
3. Restore or maintain fire in fire-dependent ecosystems by using it as a tool to achieve species and structural diversity

STRATEGY 2: Improve the understanding of the role fire plays in Colorado's ecosystems, including the need for using prescribed and managed wildfire as tools.

Approaches

1. Increase diversity of partners engaged in the Colorado Prescribed Fire Council
2. Increase outreach and education around fire's natural role in Colorado's ecosystems and the trade-offs of using prescribed fire versus wildfire smoke impacts

STRATEGY 3: Increase the use of prescribed and managed wildfire.

Approaches

1. Foster relationships among researchers, managers, practitioners and emergency responders to facilitate knowledge transfer and resource sharing
2. Integrate potential prescribed fire projects in planning efforts (e.g., forest management plans, CWPPs)
3. Identify areas to manage fire to reduce fuels and restore ecosystems. Coordinate with appropriate entities and integrate information into response plans and management actions

WATERSHED PROTECTION

Background

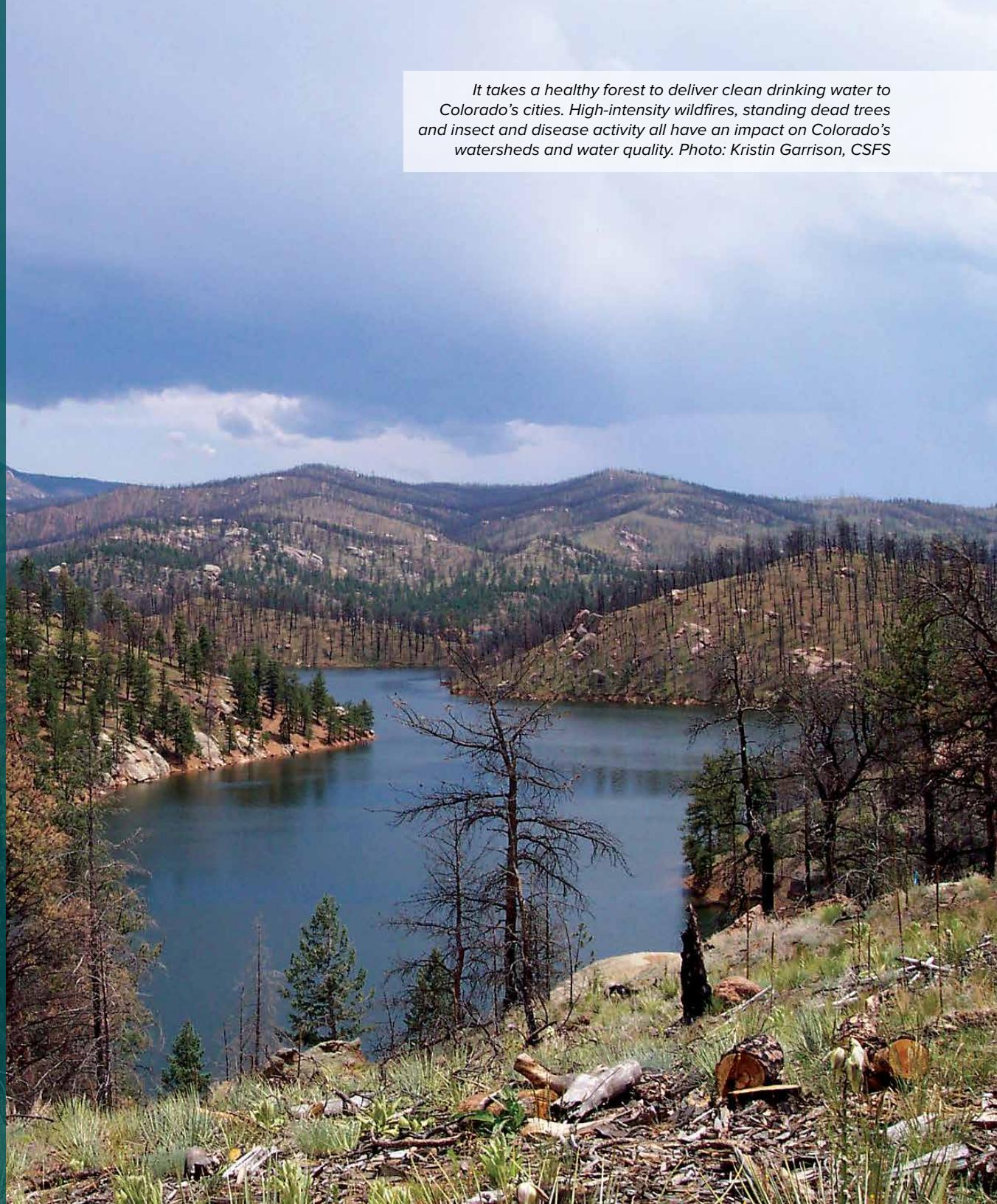
Sustainable water supplies are one of the most critical natural resources in the American West. There is an important connection between the health of forested watersheds and downstream water quality.

According to Colorado's Water Plan, developed by the Colorado Water Conservation Board and its partners, much of the West relies on Colorado for water, with 18 other states and Mexico receiving some supply from the state's watersheds [4]. Water sourced in Colorado has value for a broad range of uses that support economies, livelihoods and the environment, including agricultural production, municipal consumption, recreational activities and wildlife. Colorado's semi-arid climate, recurring droughts and competing demands for an increasingly limited resource make sound management of these water supplies critical.

Colorado's forested watersheds provide the supply of clean water and biological diversity needed for a future that is balanced economically, socially and ecologically. To **CONSERVE**, **PROTECT** and **ENHANCE** Colorado's headwaters requires adaptive forest management.

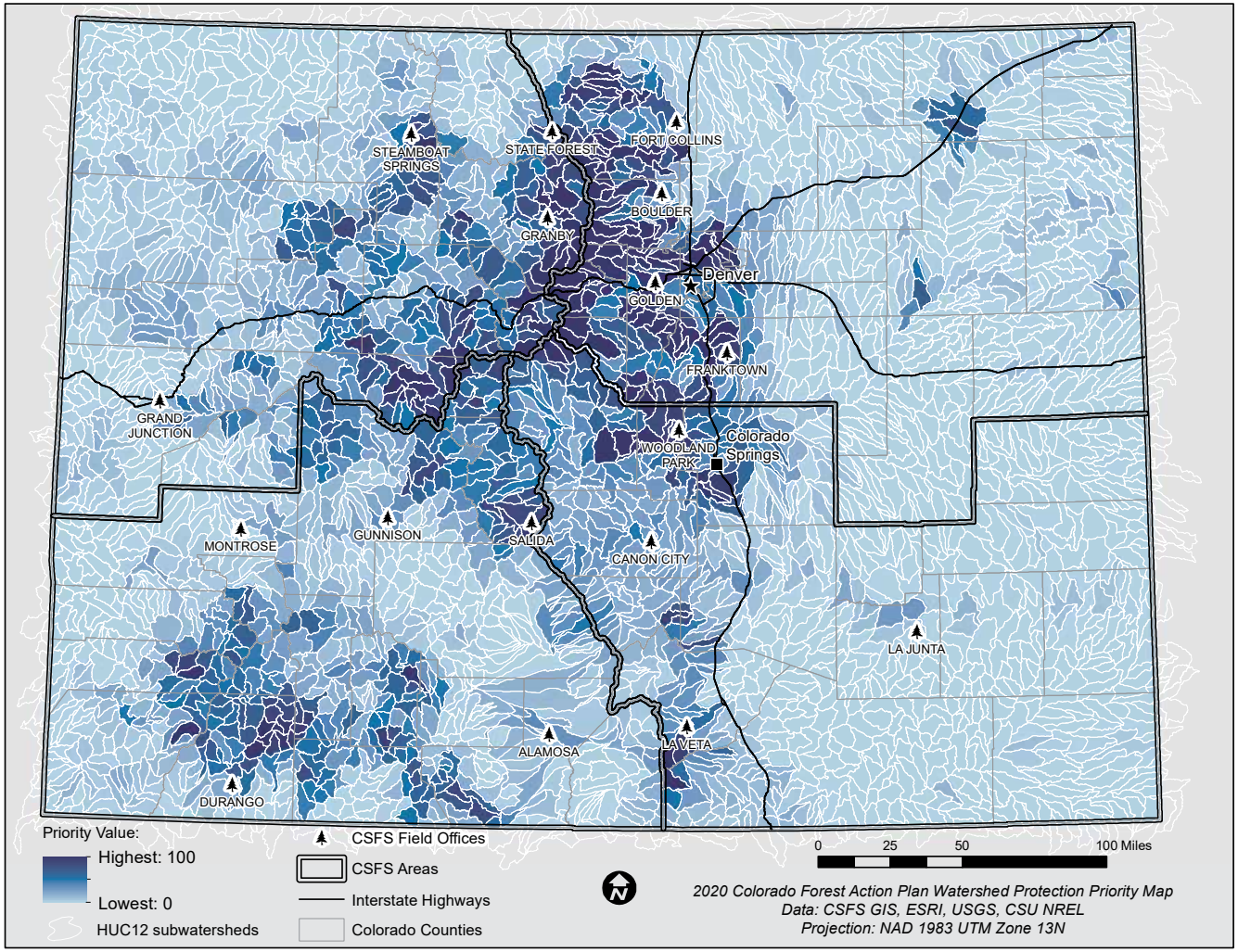
Although forest disturbances including wildfire and insect and disease outbreaks are a natural part of the environment, Colorado has experienced increasing numbers of large, high-intensity wildfires and unparalleled levels of bark-beetle-caused tree mortality [48]. These disturbances are creating concerns over the sustained delivery of clean water from forested watersheds. Effects of uncharacteristic wildland fire on watershed health include sedimentation of water supply infrastructure, undesirable changes in forest conditions and decreased water quality.

Continued integration of forest and watershed health is a critical action to address Colorado's water future. The alignment of management strategies that support the synergy between forests and water will be integrated within future iterations of the Colorado Water Plan. The Colorado Forest Action Plan will inform and mutually support the state's water supply planning efforts.



It takes a healthy forest to deliver clean drinking water to Colorado's cities. High-intensity wildfires, standing dead trees and insect and disease activity all have an impact on Colorado's watersheds and water quality. Photo: Kristin Garrison, CSFS

Subwatershed Priority Map for Implementing Watershed Protection Goals



Geospatial layers incorporated:
Two subthemes were incorporated. Data were integrated from the Colorado Department of Public Health and the Environment's Source Water Assessment and Protection (SWAP) Program to improve consistency with other statewide prioritization efforts.

Subtheme 1 — *Improve and maintain the quality of water (weighted 2x)*
- *Municipal drinking water intakes served by area [49]*
- *Surface water zones [49]*
- *Predicted post-fire erosion rates [50]*
- *Groundwater under the influence of surface water zones [49]*
- *Groundwater zones [49]*

Subtheme 2 — *Infrastructure (weighted 1x)*
- *Conveyances — open channels, ditches, open-channel tunnels [49]*
- *Surface water diversion intakes [49]*
- *Surface water source intakes [49]*
- *Groundwater under the influence of surface water intakes [49]*
- *Groundwater wells [49]*

Midway through thinning in the Pikes Peak Watershed South Slope project, cut logs wait to be decked and removed. Active forest management plays a critical role in maintaining sustainable sources of drinking water needed for Colorado's future. Without it, wildfire and insect-caused tree mortality can adversely affect the quality of water coming from forested watersheds such as this one. Photo: Andy Schlosberg, CSFS

CONDITIONS AND TRENDS

» **Climate change, drought and unhealthy forests** are increasing the occurrence of large wildfires and widespread insect and disease outbreaks. These disturbances negatively impact water quality.

» **Projections of increased disturbance frequency and severity** create concerns regarding the sustained delivery of clean water from headwater forests. According to Colorado's Water Plan, approximately 80% of Colorado's population relies on forested watersheds to deliver municipal water supplies [4]. In addition, Colorado residents, industry and agriculture will have an increasing demand for water as the population increases another 41%-70% from 2015 levels by 2050 [28].

» **A 50%-200% increase in area burned annually** is projected in Colorado by 2050 [24].

» **Over 6 million acres of forestland have been affected by insect outbreaks** in Colorado since the mid-1990s [51].

CHALLENGES AND THREATS

» **Conversion of forest cover**, including species type and deforestation

» **Increase in forest insects and disease**

» **Increase in uncharacteristic wildfire** (frequency, severity and duration)

» **Lack of seedling regeneration** post-disturbance

» **Seasonal changes in precipitation** — more frequent heavy precipitation events and prolonged drought

» **Reduced soil moisture**

» **Population growth** places an additional strain on a limited water supply

» **Maintaining a balance** between public access and protection, including the need for road construction (access vs. impacts)

GOALS AND STRATEGIES

GOAL #1

CONSERVE

PROTECT

ENHANCE

IMPROVE AND MAINTAIN WATER QUALITY AND QUANTITY

Sustained delivery of clean water is closely linked with the health of headwater forests. Water originating from well-managed forested watersheds typically has lower nutrient and sediment concentrations than water originating from forestland in an unhealthy condition.

STRATEGY 1: Maintain and enhance water quality.

Approaches

1. Moderate surface water temperature increases by establishing riparian areas to increase canopy coverage that shades surface water
2. Follow Forestry Best Management Practices to Protect Water Quality in Colorado [52] or other best management practice guidance when engaging in all forest management activities, including product harvests, fuels mitigation projects and forest health treatments
3. Manage headwater forests with efforts that will reduce the risk of post-fire erosion
4. Maintain mature riparian forests
5. Reduce loading of nutrients and other pollutants

STRATEGY 2: Accommodate altered hydrologic processes.

Approaches

1. Manage forests to be able to sustain during periods of decreased water availability
2. Enhance the ability to retain water as snowpack within forests
3. Prepare for frequent, heavy precipitation events and flooding

STRATEGY 3: Sustain fundamental hydrologic processes.

Approaches

1. Maintain or restore forest and vegetative cover in riparian areas
2. Leave coarse woody debris (dead and down) to enhance soil moisture
3. Maintain and restore stream channel form and function
4. Maintain and restore floodplain connectivity

GOAL #2

PROTECT

ENHANCE

IMPROVE RESILIENCY OF CRITICAL WATER INFRASTRUCTURE

Colorado has seen an increase in the severity of post-fire runoff, erosion and debris flows, due in part to fires that are larger and burn more intensely. For example, runoff from the Buffalo Creek (1996) and Hayman (2002) fires created large-scale ash and debris flows into Strontia Springs Reservoir. These burn scars continue to threaten Denver's water supply and have cost $27.7 million in rehabilitation to date.

STRATEGY 1: Prioritize forest management treatments in areas that will have the biggest impact on critical water supply infrastructure [53].

Approaches

1. Alter forest structure or composition to reduce the severity or extent of uncharacteristic wildfire
2. Establish strategic fuel breaks to slow the spread of uncharacteristic wildfire
3. Utilize input from and collaborate with strategic water partners to prioritize treatments around key reservoirs and infrastructure

STRATEGY 2: Promote and restore fire in fire-dependent ecosystems.

Approaches

1. Identify locations where pre-treatments, such as thinning, support the use of prescribed or managed fire
2. Increase outreach and education around fire's natural role in the environment
3. Utilize prescribed fire and manage wildfires as tools to help maintain previous treatments

STRATEGY 3: Collaborate across organizations and land ownerships for landscape-scale treatments.

Approaches

1. Establish relationships with agencies to jointly assess current conditions and identify treatment needs and priorities that will improve critical water infrastructure

Hermits Rest Trail overlooks the Gunnison River and Morrow Point Dam. The CSFS Forest Inventory and Analysis crews work in this and other piñon-juniper woodland forests around the state to monitor forest health biometrics such as fuel loading, growth, productivity and more. Photo: Wilfred Previant, CSFS

GOALS AND STRATEGIES (CONT.)

GOAL #2

PROTECT

ENHANCE

2. Develop treatment plans and prescriptions at appropriate landscape scales
3. Develop maintenance plans to retain treatment effectiveness in the future
4. Monitor for treatment effectiveness

STRATEGY 4: Assist in post-disturbance recovery.

Approaches

1. Enhance site-appropriate tree age and species diversity for overall forest resilience
2. Expedite post-disturbance reforestation and recovery
3. Facilitate forest ecosystem adjustments through species transition
4. Restore disturbed sites with a diversity of species that are adapted to future conditions
5. Control invasive species establishment
6. Repair infrastructure (roads, trails, etc.)

GOAL #3

PROTECT

ENHANCE

SUSTAIN OR RESTORE FUNDAMENTAL ECOLOGICAL FUNCTIONS FOR WATERSHED HEALTH

Healthy watersheds not only provide clean and consistent water supplies, they also help sustain habitat, recreational opportunities, carbon storage, air purification and many other functions.

STRATEGY 1: Support ecological functions that forests provide, including air and water purification, habitat, carbon sequestration and nutrient cycling.

Approaches

1. Maintain resilient forests adapted to a changing climate
2. Support a diversity of approaches in carbon exchange and markets
3. Evaluate carbon sequestration and cycling at landscape scales over long time frames
4. Base forest management and policy decisions on the best available science

STRATEGY 2: Prevent conversion of forested land to nonforested uses.

Approaches

1. Practice reforestation on disturbed or converted land with species expected to adapt to changing conditions, with focus on areas deficient in natural regeneration
2. Prevent forest fragmentation by utilizing easement opportunities such as those offered through the Forest Legacy Program
3. Prioritize remediation of remaining trees following disturbance or conversion

STRATEGY 3: Promote ecosystem services.

Approaches

1. Promote mitigation and adaptation to climate change
2. Recognize that healthy watersheds enhance cultural benefits such as recreation and an increased quality of life
3. Promote sustainable livestock grazing to reduce heavy fuel loads with best management practices

FOREST WILDLIFE

Background

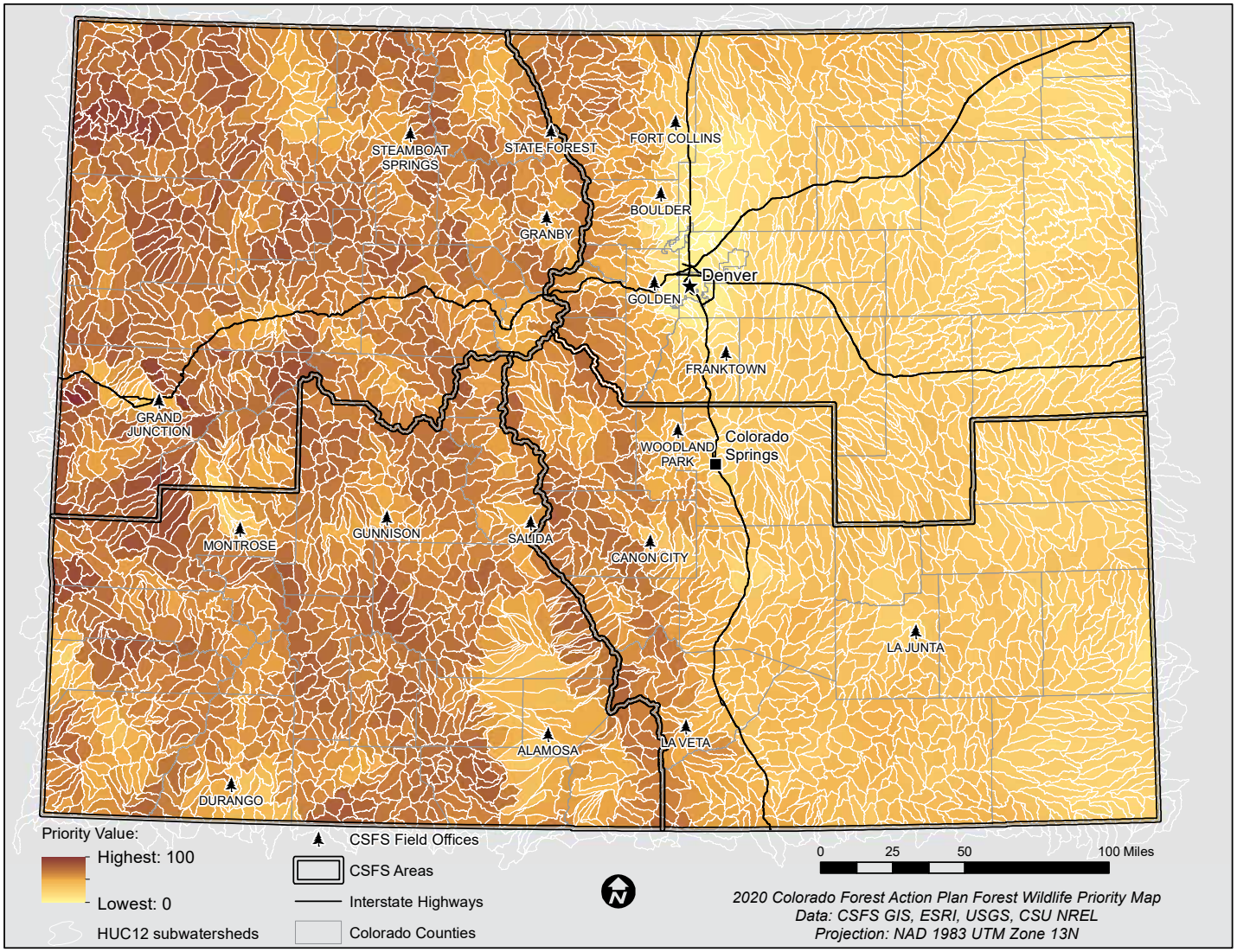
All forest types in Colorado provide important habitat for wildlife, and all forestry activities affect wildlife habitat. Thus, incorporating information and data concerning current conditions and threats to wildlife is critical to forestry planning, implementation and monitoring.

Colorado's *State Wildlife Action Plan*, created by Colorado Parks and Wildlife, identifies best management practices for forest habitat and restoration of natural processes as two of the best ways to help wildlife conservation across the state.

Additionally, consideration of climate-adaptive strategies and approaches is essential to ensuring forest management activities are sustainable. Engaging the public to increase understanding of the connection between forestry and wildlife is a strategy that is underutilized and can promote positive outcomes for both wildlife and habitat.

Effective forest management includes consideration for wildlife habitat. Restoration of natural processes is considered one of the best ways to help wildlife conservation across Colorado. Photo: Amy Bulger, CSFS

Subwatershed Priority Map for Implementing Forest Wildlife Goals



Geospatial layers incorporated: *Two subthemes were incorporated. Data were integrated from Colorado Parks and Wildlife's 2015 State Wildlife Action Plan (SWAP) to improve consistency with other statewide prioritization efforts.*

Subtheme 1 — *Habitat quality and connectivity (weighted 2x)*
- » *Ecological connectivity [54]*
- » *Landscape disturbance index [55]*

Subtheme 2 — *Wildlife distribution (weighted 1x)*
- » *Large mammal ranges [56]*
- » *Critical habitat for species of greatest conservation need (Tier 1 Terrestrial) [56]*
- » *Priority watersheds for Aquatic Tier 1 species [56]*

CONDITIONS AND TRENDS

» **Colorado's 159 "Species of Greatest Conservation Need" are negatively impacted** by a lack of knowledge (including understanding species' needs and responses to management) and natural systems modifications (including natural hydrologic and fire regimes). These were top issues identified in the most recent *State Wildlife Action Plan* by Colorado Parks and Wildlife. The 2015 plan identified the issues, as well as the 159 vertebrate animals and mollusks considered "Species of Greatest Conservation Need" [56].

» **The quantity and quality of habitat** continue to be affected by disturbances such as insect and disease outbreaks and uncharacteristic wildfire across Colorado.

» **Disturbances are amplified** by increasing drought occurrence, climate change (e.g., shifting seasonality of fire and vegetation) and altered native vegetation (e.g., riparian area deforestation, woody encroachment and non-native invasive species).

» **Drought and climate change are depleting available resources** for wildlife including water, food and cover. Available habitat is shifting across the landscape in response. These conditions and trends require implementation of adaptive forestry management techniques that are compatible with habitat structure and function.

» As urban, suburban and exurban **development continues to threaten ecological connectivity**, the need for conservation easements in critical watersheds cannot be overstated.

Moose rely on a variety of forest habitats, from willows for foraging, to thick pines and firs for shade on hot days. Maintaining healthy, varied forests is imperative to sustain the state's wildlife, both large and small.
Photo: Amy Bulger, CSFS

CHALLENGES AND THREATS

- **Changing seasonality**, including early spring thaws and late frosts, less snow and shorter winters, altered timing of precipitation and longer fire seasons
- **Declining health** of streams, riparian areas and wetland ecosystems
- **Altered stream flows**
- **Increases in insect pests**, forest pathogens and non-native invasive species
- **Lack of seedling regeneration** after a disturbance
- **Loss of critical species habitat** and increasing fragmentation with land conversion

As Colorado's wildland-urban interface gains human population, wildlife that live in proximity — such as the iconic bighorn sheep that dwell on cliffsides along the Interstate 70 corridor — face increasing connectivity issues. Proactive forest management can increase habitat paths for animals to seek shelter and migration routes. Photo: Amy Bulger, CSFS

GOALS AND STRATEGIES

GOAL #1

CONSERVE

PROTECT

ENHANCE

CONSERVE, ENHANCE AND PROTECT CRITICAL HABITAT

Addressing the challenges and threats to habitat, forestry activities can help prioritize conserving existing areas of high biodiversity, enhancing and connecting habitat corridors and protecting ecosystem structure and function.

STRATEGY 1: Facilitate shifts in the geographic and elevation ranges of species, in anticipation of future conditions.

Approaches

1. Establish corridors and minimize barriers to allow for wildlife movement to new suitable habitats
2. Prepare suitable habitat in anticipation of future introduction, reintroduction or natural range shift of a species
3. Conserve leading-edge populations (high altitude, northern, etc.)

STRATEGY 2: Sustain positive and reduce negative interspecific and biotic interactions.

Approaches

1. Increase or protect existing native biodiversity
2. Protect functional groups of wildlife or keystone species that help sustain ecosystem functions
3. Detect, monitor and mitigate exotic and invasive forest species

STRATEGY 3: Establish and enhance protected areas and habitat reserves.

Approaches

1. Create and connect existing large, intact and protected habitat
2. Protect areas at high risk of change due to climate effects or land use
3. Conserve sites expected to provide future suitable habitat and create climate refugia
4. Protect habitat connectivity such as adjacent reserves and migration corridors

GOALS AND STRATEGIES (CONT.)

GOAL #2

PROTECT

ENHANCE

INTEGRATE HABITAT CONSIDERATIONS INTO FORESTRY ACTIVITIES

Minimizing human disturbance and replicating natural disturbance, restoring diversity to degraded landscapes and maintaining healthy forests across jurisdictional boundaries will enhance and protect habitat.

STRATEGY 1: Plan for and reduce human disturbance and human-wildlife conflict.

Approaches

1. Reduce or remove human disturbance stress such as forestry activities during sensitive time periods
2. Evaluate where forest management can impact critical habitat for species of greatest conservation need
3. Avoid, minimize or mitigate land conversion that is incompatible with habitat preservation

STRATEGY 2: Protect, restore and maintain sources of food, water and cover as components of habitat.

Approaches

1. Increase plant species diversity and complexity
2. Prioritize native vegetation in habitat improvement projects
3. Create and protect a diversity of microhabitats and microclimates
4. Enhance primary food sources for species that are specialists and/or climate-sensitive
5. Create and maintain replicated sources of food, water and cover in a variety of locations across the landscape
6. Maintain or mimic natural disturbance regimes to enhance habitat
7. Promote livestock grazing where appropriate

STRATEGY 3: Adjust management of food, water and cover that forests provide to align with expected future conditions.

Approaches

1. Use novel, future-adapted genotypes in forest restoration
2. Consider and promote sources of food, water and cover across the annual cycle and different life stages in response to changing phenology

STRATEGY 4: Promote habitat conservation on lands outside of protected areas.

Approaches

1. Identify and restore degraded landscapes with high potential habitat suitability
2. Reduce or limit barriers to wildlife movement across the landscape
3. Maintain healthy forests on private lands near and between public lands
4. Enhance green infrastructure in urban or developed landscapes

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GOAL #3

ENHANCE

INCREASE PUBLIC UNDERSTANDING OF THE CONNECTIONS BETWEEN FORESTRY AND HABITAT

Forestry activities and habitat protection can be incompatible or complementary; however, this is not always well understood. Public engagement and improved coordination with partners and stakeholders are essential to increasing understanding of these connections.

STRATEGY 1: Engage communities in forest wildlife conservation.

Approaches

1. Develop public outreach and technical assistance programs to describe how healthy forests impact wildlife
2. Respect and incorporate landscape values of indigenous communities in activities and decisions
3. Coordinate across agencies and scales to ensure programs are complementary
4. Collaborate with research partners at universities on social science projects to better understand human-wildlife interactions

This dusky grouse in the Flat Tops Wilderness depends on a healthy forest ecosystem. These mountain-dwelling grouse travel the forest floor in search of food and mates, flying short distances into the canopy of large trees to escape danger and find shelter. Photo: Amy Bulger, CSFS

URBAN AND COMMUNITY FORESTRY

Background

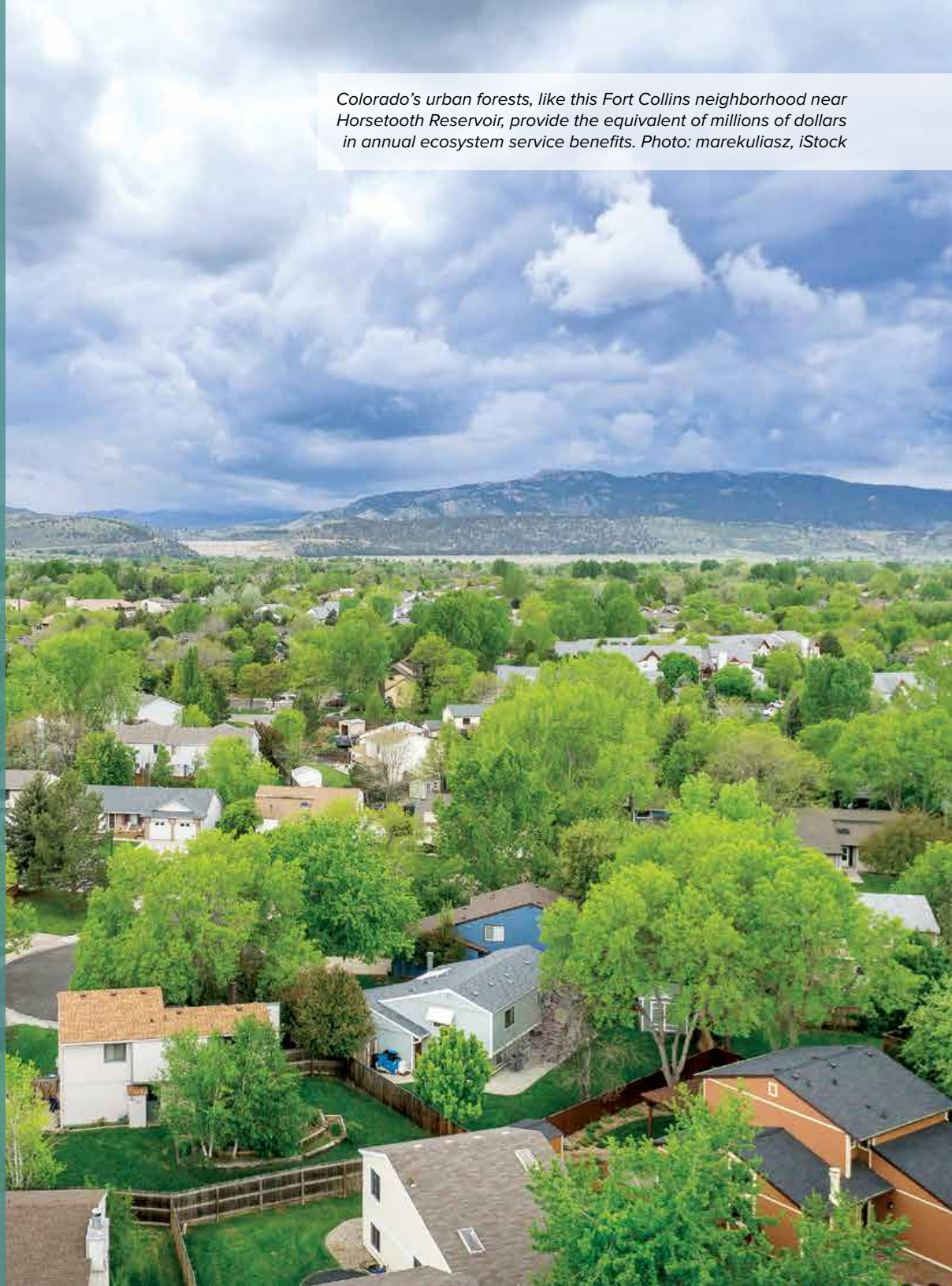
Colorado's cities and towns offer dynamic ecosystems with interconnected social, economic and ecological components. These urban and community forests are comprised of trees in yards, streetscapes, open spaces, parks, greenways, rivers, ponds and habitat corridors. This natural and constructed green infrastructure [57] provides ecosystem services, which are the direct and indirect benefits humans get from a healthy ecosystem. Those include: clean air and water, energy conservation, stormwater mitigation, reduction in noise pollution, improvements in air quality, property value enhancement, connectivity of habitat corridors, carbon sequestration and the betterment of mental and physical health [8].

The sustainable vibrancy of Colorado's urban and community forests will require strategic and adaptive planning that addresses: rapid population growth, wildland-urban interface (WUI) risk, climate resilience, invasive species, sustainable funding, a changing labor force, public awareness, stewardship, education and civic engagement [58].

Colorado's urban and community forests provide the equivalent of millions of dollars in annual ecosystem service benefits. For example, trees on Fort Collins' municipal streets and in parks provide ecosystem services with a net benefit of $1.17 million per year [59]. A similar study of Metro Denver found that the urban forest contributed $551 million in "property value increases, energy savings, carbon storage, stormwater runoff reduction, and air quality benefits" [60].

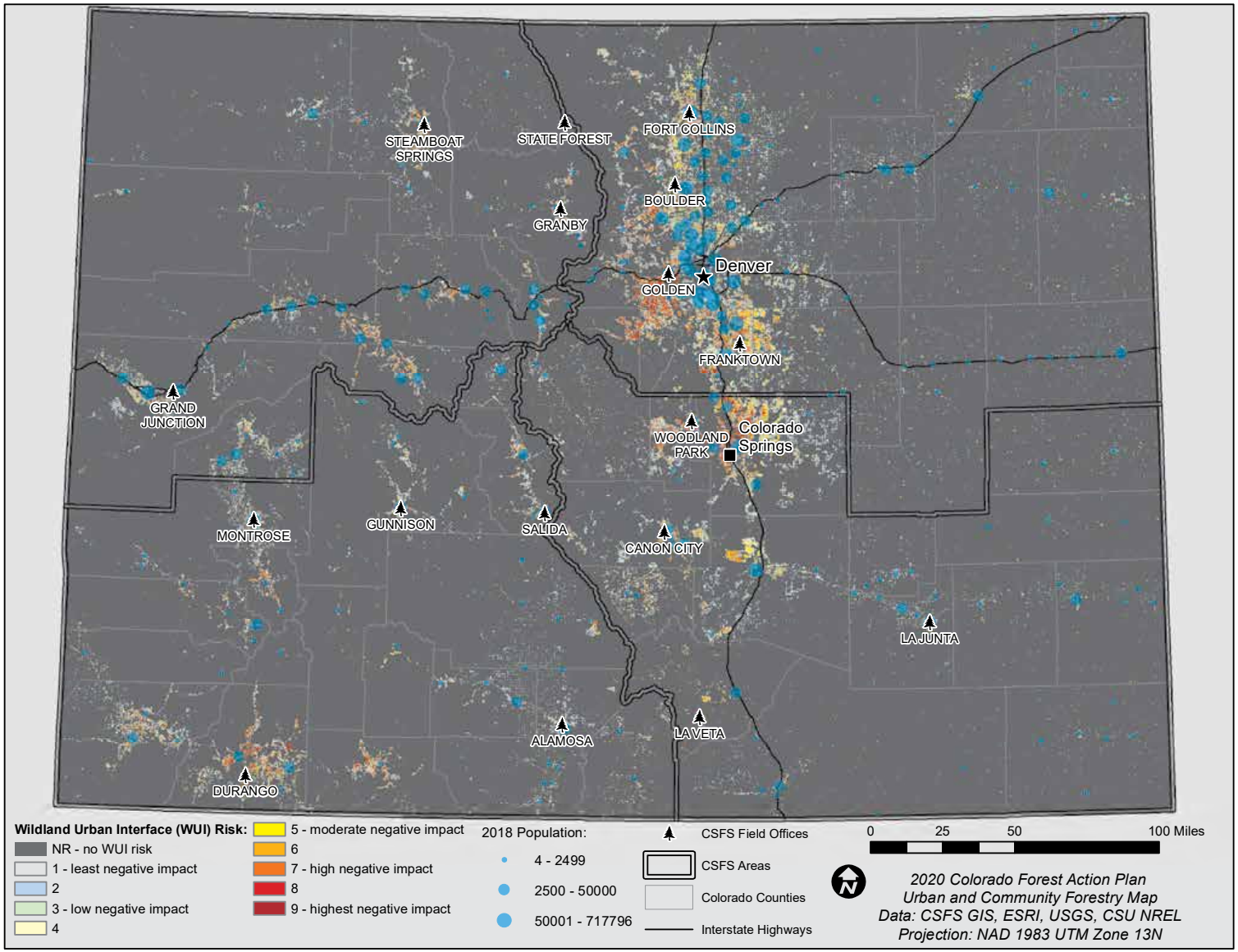
Tree canopy cover is critical to offsetting the impacts of a warmer climate, extreme storm events, energy consumption and the air pollution associated with an increasing population. Increasing the overall canopy cover can be the easiest way to maintain a city's vibrancy, improve social health and contribute to the economy.

Every tree planted creates a twofold, or more, return on that investment [61]. To **CONSERVE**, **PROTECT** and **ENHANCE** urban tree canopies, there are numerous funding, planning, education and inventory resources available. These include Tree Campus USA and Tree City USA programs, the Colorado Tree Coalition and Project Learning Tree. Collectively, these efforts expand awareness about the benefits provided by urban and community forests.



Colorado's urban forests, like this Fort Collins neighborhood near Horsetooth Reservoir, provide the equivalent of millions of dollars in annual ecosystem service benefits. Photo: marekuliasz, iStock

Priority Map: Areas of Opportunity for Urban and Community Forestry



Geospatial layers incorporated:

Data are from 2010 U.S. Census [62] and 2017 Colorado Wildfire Risk Assessment [2]

- *Urban Areas (UAs) > 50,000 people*
- *Urban clusters (UCs) 2,500 – 50,000 people*
- *Rural encompasses all population, housing and territory not included within an urban area, and communities are areas that may contain some, all or none of urban areas (UA/UC) and are recognized by geopolitical boundaries*
- *Wildland-Urban Interface: any area where man-made improvements are built close to, or within, natural terrain and flammable vegetation. WUI risk is a measure of the potential impact on people and their homes from wildfire [2].*

CONDITIONS AND TRENDS

By 2018 estimates, over 5.5 million people live in Colorado. By 2050, this is projected to increase by as much as 4 million people [28].

In 2010, Colorado's urban areas represented 1.5% (977,000 acres) of the state's land, an area expected to double to 3% in 2040 [12,62]. This will result in a projected urban footprint of 1.9 million acres that will require conversion of forest and agricultural lands into urban areas, impacting the quality and availability of clean air, safe water, healthy soil, habitat and green infrastructure.

More challenging, the wildland-urban interface (WUI), the area where structures and other human developments meet or intermingle with wildland vegetation, currently encompasses an estimated 3.2 million acres and 2.9 million people, based on the CSFS 2017 Wildfire Risk Analysis [2]. Models project the WUI could encompass over 9 million acres by 2040 [29]. Strategic planning for green infrastructure across city, regional and state scales to improve human health, wellness and safety is necessary given projected urban and WUI expansion.

Many Colorado classrooms and communities participate in annual Arbor Day celebrations around the state, with the Colorado State Forest Service frequently helping teach children the benefits of trees. Photo: CSFS

Across Colorado, the urban and community tree canopy ranges from 17.6%-21.6%, while impervious surfaces may represent 30%-50% or higher of the land cover [12,60,63].

By 2040, Denver could be 70% paved or built over, further contributing to the urban heat island effect [64]. Denver averages 8.9 acres of park space per 1,000 people, less than the national average of 13.1 acres [64]. In terms of carbon sequestration rates, the lack of green infrastructure ranks Colorado 45th out of 48 states [65].

CHALLENGES AND THREATS

- **Rapid population growth** requiring additional and appropriate levels of supporting green infrastructure
- **Land-use conversion** and fragmentation impacting habitat quality and quantity
- **Population expansion into the wildland-urban interface**, combined with an increased probability of uncharacteristic wildfires
- **Decline of climate resiliency and adaptability** in urban and community forests
- **Human health and wellness** requiring adequate food access, water quality, air quality, hazard tree removal and moderation of the urban heat island effect
- **Impact of invasive pests** on existing community forests
- **Limited funding** to assist with strategic planning and adaptive management
- **Limited financial resources** for inventory, monitoring, outreach and civic engagement

GOALS AND STRATEGIES

GOAL #1

CONSERVE

PROTECT

ENHANCE

PROMOTE THE ROLE AND INFRASTRUCTURE DEVELOPMENT OF URBAN AND COMMUNITY FORESTS TO ADVANCE PUBLIC HEALTH, WELLNESS AND SAFETY

Improving and enhancing urban living environments through healthy and resilient community forests is a cost-effective tool that contributes to positive health outcomes. Strategic planning related to population density and growth, green and gray infrastructure, expansion of the wildland-urban interface and the enhancement of public spaces will maximize community and ecosystem sustainability.

STRATEGY 1: Master planning efforts that include urban and community trees and forests need to occur at city, regional and state scales.

Approaches

1. Increase overall urban canopy to reduce impacts of urban heat sinks and stormwater flow while improving air quality
2. Engage in community planning efforts including public and private tree inventories, monitoring, planting to increase urban canopy, selection of climate-adapted species, proper maintenance schedules and continuous hazard tree removal
3. Reduce landscape fragmentation by creating green infrastructure corridors
4. Alter forest structure and composition to reduce risk or severity of wildfire, focusing on the wildland-urban interface

STRATEGY 2: Develop resources and tools to improve and highlight the positive and synergistic relationships among green infrastructure, forest, trees, and public health and wellness.

Approaches

1. Inventory private and public urban and community forests to monitor ecosystem services with the U.S. Forest Service Urban Forest Inventory and Analysis (UFIA), CO-Tree View and/or i-Tree
2. Utilize USFS Urban Forest Project Reporting Protocol

STRATEGY 3: Expand opportunities for collaboration among residents, collaboratives, agencies and other sectors.

Approaches

1. Create redundancy of habitat types, riparian areas and refugia on the landscape
2. Connect existing tree-affiliated groups and organizations through electronic resources

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GOAL #2

ENHANCE

PROMOTE AND INCREASE PUBLIC AWARENESS, LEADERSHIP DIVERSITY AND EQUITY WITHIN THE URBAN FORESTRY COMMUNITY

Current and projected changes in Colorado's demographics require understanding and engaging different perspectives, cultures, genders and ages. This broadens economic and social opportunities while building and strengthening communities. Understanding the critical importance of community, economics and ecosystem benefits protects, conserves and enhances the urban and community forests of today and tomorrow.

STRATEGY 1: Create, maintain and enhance educational programs that focus on urban and community forests.

Approaches

1. Identify current urban forestry education programs and organizations responsible for the programs (e.g., Project Learning Tree)
2. Enhance educational outreach of urban-forestry-focused organizations (e.g., Colorado Tree Coalition)
3. Coordinate with state agencies that provide education and outreach programs to ensure the largest impact on students and communities

STRATEGY 2: Increase engagement of underserved and minority communities within urban and community forestry.

Approaches

1. Identify underserved and minority communities within Colorado that would benefit from urban and community forestry programs

GOALS AND STRATEGIES (CONT.)

GOAL #2

ENHANCE

2. Determine existing programs to increase engagement (e.g., Project Learning Tree) and assess the need for additional programs
3. Translate existing English publications into Spanish and other languages as needed
4. Partner with professional groups like the International Society of Arboriculture and the Society of American Foresters to host training events in Spanish

STRATEGY 3: Increase workforce development opportunities and green jobs.

Approaches

1. Inventory private and public urban forests to monitor ecosystem services with the U.S. Forest Service Urban Forest Inventory and Analysis (UFIA), CO-Tree View and/or i-Tree
2. Research and develop alternative renewable biomass energy markets and resources
3. Provide education about forestry careers through Project Learning Tree's Green Jobs curriculum

GOAL #3

CONSERVE

PROTECT

ENHANCE

IMPROVE AND ENHANCE ECOSYSTEM HEALTH AND BIODIVERSITY FOR LONG-TERM RESILIENCE BY INTEGRATING URBAN AND COMMUNITY FOREST MANAGEMENT, MAINTENANCE AND STEWARDSHIP INTO ALL SCALES OF PLANNING

A dynamic green infrastructure provides residents, cities, towns and municipalities with a sustainable job market, stormwater management, improved habitat, quality drinking water, energy conservation, and enhanced public health, wellness and safety.

STRATEGY 1: Sustain or restore fundamental ecological functions.

Approaches

1. Increase forest species biodiversity, structure variability, and tree health and resilience to disturbance and climate change
2. Maintain and restore hydrological functions and riparian areas
3. Monitor the introduction of invasive species and mitigate existing invasive species
4. Reduce landscape fragmentation by creating green infrastructure corridors

STRATEGY 2: Enhance carbon storage to mitigate greenhouse gas emissions and support climate change resilience, restoration and sustainability within urban and community forests.

Approaches

1. Increase overall urban canopy to help offset greenhouse gas emissions and lower energy demands for heating and cooling buildings
2. Revegetate sites after natural and land-use conversion disturbances
3. Increase species biodiversity, structure variability and individual tree health
4. Select species that match projected climate and site conditions
5. Realign significantly disrupted ecosystems to meet expected future conditions

More and more residential neighborhoods continue to flank the Denver skyline, commonly stretching into the wildland-urban interface of the foothills, as this view from Morrison shows. Photo: iStock

IN METRO DENVER

» By 2040, Denver could be 70% paved or built over, further contributing to the urban heat island effect [64].

» Denver averages 8.9 acres of park space per 1,000 people, less than the national average of 13.1 acres [64].

ACROSS COLORADO

» In terms of carbon sequestration rates, the lack of green infrastructure ranks Colorado 45th out of 48 states [65].

In 2010, Colorado's urban areas represented 1.5% (977,000 acres) of the state's land, an area expected to double to 3% in 2040 [12,62].

FOREST PRODUCTS

Background

Important Colorado timber species for the forest products industry include lodgepole pine, Engelmann and blue spruce, ponderosa pine, Douglas-fir, true firs (white and subalpine) and aspen. Colorado had 10.52 million acres of nonreserved timberland in 2016 – this is productive forestland that can grow commercial-grade timber and is not permanently reserved from utilization through statute or administrative designation (such as a National Park). Ownership of nonreserved timberland in Colorado is approximately 80% public and 20% private [41]. The private timberland was classified as nonindustrial forestland. Sawtimber volume on timberland was estimated to be 14.5 billion cubic feet [41].

The timber industry in Colorado can be subdivided into two broad groups, though there is much crossover. Harvesting contractors engage in logging and mitigation services that involve removing timber from the landscape, while wood processors have the capability to produce and sell wood products. Many harvesting contractors are willing to sell wood products and some own processing facilities. The interests of these groups are represented by the Colorado Timber Industry Association (CTIA), *coloradotimber.org*.

The most recent in-depth survey of harvesting contractors operating in Colorado was conducted in 2014 [66]. A more limited survey of some harvesting contractors and wood processors was conducted in 2019 by CTIA (unpublished). The 2014 survey identified a sample size of 236 contractors, down from 373 in a similar survey conducted in 2002. Most of these companies were small businesses, and 91% had fewer than 10 employees. The average time in business was 17.8 years, and only about 33% were capable of fully mechanized harvesting operations. In the 2014 survey, 50.6% of respondents were willing to bid on projects over 100 acres in size, though most also reported they preferred small projects on private land ranging from 10 to 100 acres.

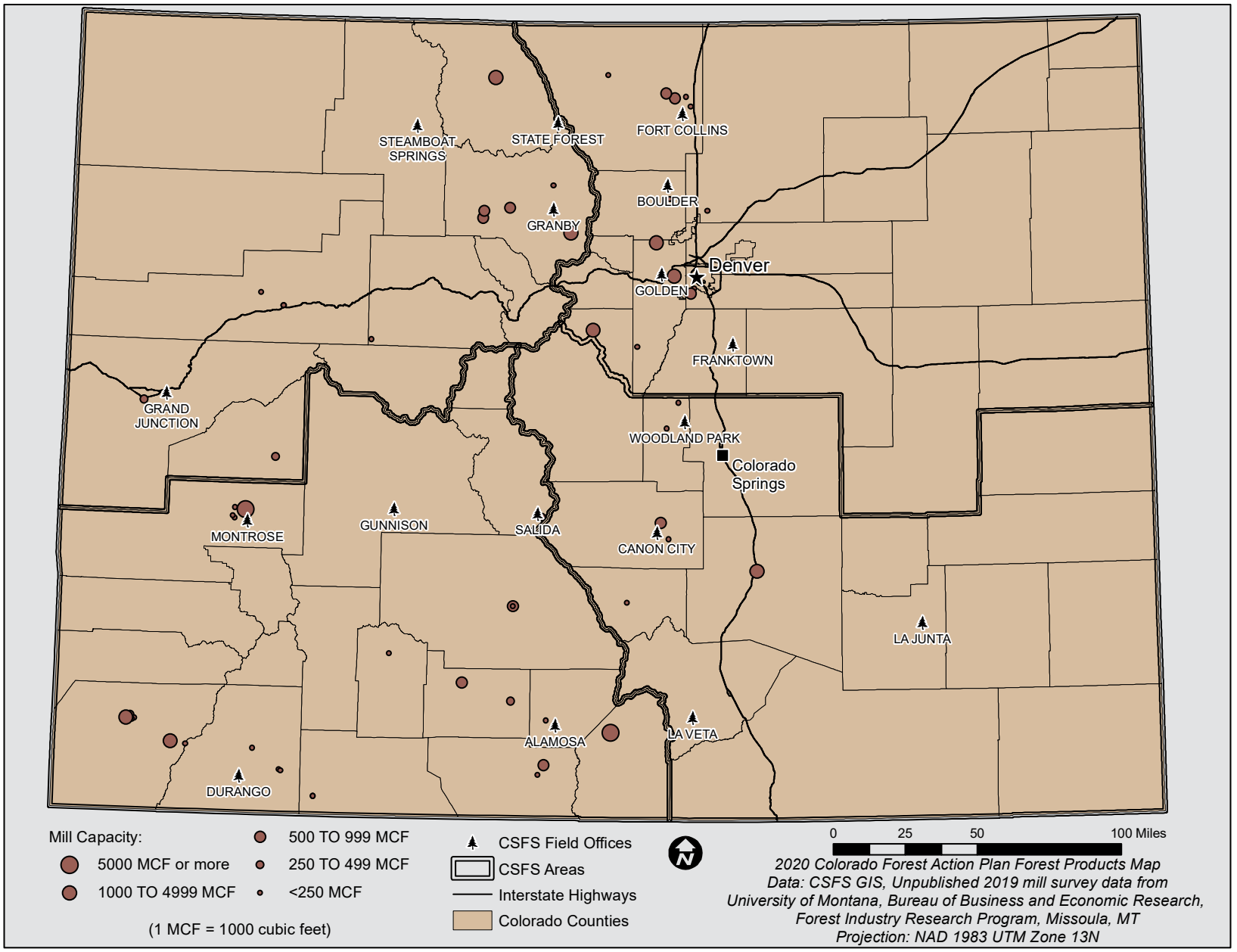
Timber harvested for all public, private and tribal landowners was 116,656 thousand board feet (MBF) in 2016 [15]. The preferred species harvested were 55% lodgepole pine and 22.6% Engelmann and blue spruce. Almost 80% of the logs harvested were sawlogs for lumber; the remaining 20% were used for other wood products.

In 2016, there were 55 primary wood processing facilities in the state, down from 133 in 2002 [15]. Thirty of these facilities produced primarily lumber, 10 produced house logs and log homes, and 15 produced other products such as excelsior, fuel pellets, post, poles, log furniture and biomass/energy.

Most Colorado lumber mills are small — out of the 30 lumber production facilities operating in 2016, 22 mills produced less than 2 million board feet (MMBF) annually and the other eight produced 92% of the state's lumber. The total timber-processing capacity for the state is estimated to be 46,531 MCF (thousand cubic feet) [67]. However, in 2016, only 29,466 MCF were processed, about 63% of capacity. Not all of the logs harvested in Colorado are processed in-state; mills outside of the state also utilize logs from Colorado forests. Nonetheless, Colorado relies heavily on imports from out-of-state to satisfy demand for wood products. Increasing processing capacity and competition by growing the number of businesses that utilize logs for value-added forest products is the best opportunity to offset harvesting costs in the state.

Photo: freeimages.com

Priority Map: Locations and Capacities of Mills in Colorado



Geospatial layers incorporated:

Unpublished mill location and size class data are from the Bureau of Business and Economic Research at the University of Montana (2016) supplemented by CSFS data.

CONDITIONS AND TRENDS

» **The harvesting contractor workforce has declined** significantly since 2002. The existing workforce is expected to be inadequate to meet future timber harvesting and forest mitigation programs in Colorado. Additional capacity will need to be developed and more workers trained.

» **Harvesting costs have escalated** considerably in Colorado over the past decade. Explanations for the escalation include reduced price competition resulting from a diminished contractor base, emphasis on treating densely stocked stands that have a high percentage of small diameter trees and a lack of markets for this woody biomass.

» **The wood processing industry in Colorado declined** considerably from 2002 to 2016, but recently there has been some significant expansion including added sawmill capacity in the San Luis Valley and a cogeneration biomass facility built in Gypsum.

» Although **wood markets** were dramatically impacted by the 2008 housing collapse, they have recovered over the past decade.

» **Strong markets will be necessary** to fully utilize existing capacity and to support future capacity increases. The Colorado State Forest Service's Colorado Wood Utilization and Marketing Program (CoWood, *csfs.colostate.edu/cowood*) promotes wood use in Colorado by providing loans for infrastructure development, offering technical assistance and conducting applied product research.

CHALLENGES AND THREATS

» **Decline in the value** of timber and resulting products generated from the forest due to insect and disease activity and wildfires

» **Loss of processing capacity** for timber harvesting and forest products

» **High cost of forest management treatments** relative to product value

» **Increasing competition** with forest products from out of state

Some of the timber harvested from the Chicken Creek Forest Project near Evergreen was turned into chips, posts and poles, firewood and sawtimber. The 50-acre Forest Restoration and Wildfire Risk Mitigation project, done with the Jefferson County Conservation District, helps reduce active-crown fire potential. The CSFS will monitor the area and evaluate which treatments have the greatest impact on potential fire behavior in various forest types and how long those remain effective. Photo: Wilfred Previant, for CSFS

GOALS AND STRATEGIES

GOAL #1

ENHANCE

MAINTAIN AND DEVELOP MORE RESILIENT INDUSTRY CAPACITY REQUIRED TO MEET FOREST MANAGEMENT NEEDS

Maintaining a sufficient forest products industry is often required to achieve forest management objectives. It will likely be necessary to develop additional capacity to align with future treatment goals.

STRATEGY 1: Maintain the capacity of the forest products industry to align with management needs.

Approaches

1. Determine industry capacity requirements based on projected forest management activities
2. Assess the sufficiency of the existing timber harvesting and forest products industry
3. Support workforce development (recruitment and training), focusing on engagement of younger generations to balance an aging wood utilization workforce
4. Promote increased use of existing capacity
5. Build additional capacity as required through development and support of innovative, sustainable financing mechanisms for local industry
6. Provide a sufficient, consistent supply of timber and/or biomass feedstock to the wood processing industry
7. Explore and adopt public and private partnerships for investing in new biomass processing facilities and markets

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GOAL #2

PROTECT

ENHANCE

INCREASE THE NUMBER OF FORESTED ACRES TREATED ANNUALLY THROUGH COST OFFSETS OF INCREASED UTILIZATION

Costs of forest management activities have been increasing which, in the absence of cost offsets, limits the number of high-priority acres that can be treated. Increased utilization of timber resources provides opportunity for cost offsets. Development of a diverse forest products industry is crucial for success.

STRATEGY 1: Improve the alignment of industry operating areas with forest management needs in high-priority watersheds and wildland-urban interface areas.

Approaches

1. Highlight where industry operating areas overlap high-priority watersheds
2. Design and implement management projects to take advantage of overlap
3. Develop industry capacity in areas where it is lacking
4. Improve the efficiency of agency processes to increase the pace and scale of forest management activities

STRATEGY 2: Diversify industry products and operations to better utilize timber resources (species composition and size class) and increase industry viability.

Approaches

1. Identify all possible uses for available timber resources
2. Align uses with existing industry product mix
3. Identify opportunities for diversification, including potential industry clusters and facility co-location prospects
4. Conduct research to help identify viable markets and marketing strategies for Colorado wood products businesses
5. Focus on development of value-added niche products
6. Partner with industry to build capacity with a more diverse, profitable product mix

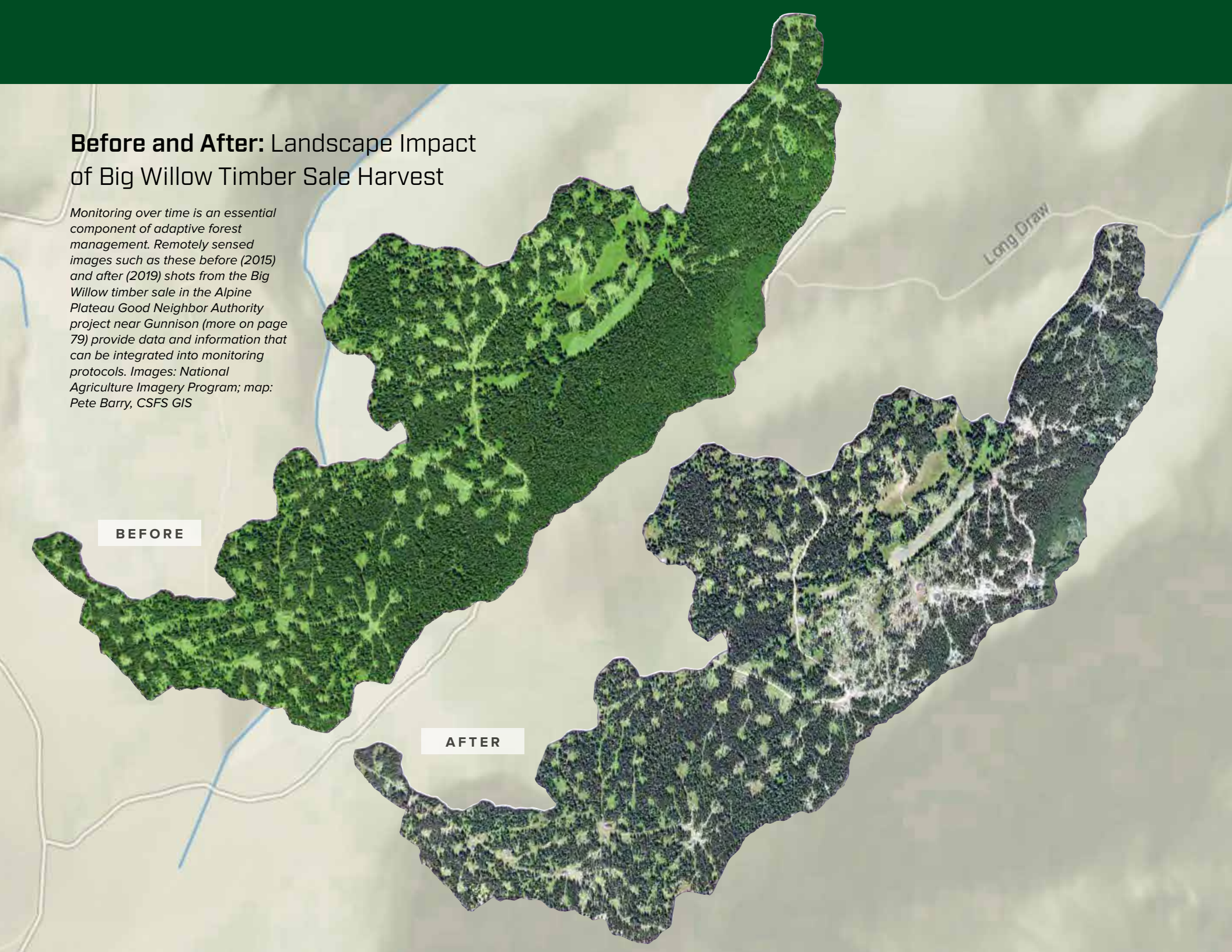
STRATEGY 3: Increase carbon storage by utilizing timber resources.

Approaches

1. Match timber resources to options that maximize utilization and net carbon storage
2. Work with industry to reduce wood residue generation through improved processing efficiency
3. Find product opportunities for underutilized timber resources and processing residues

Before and After: Landscape Impact of Big Willow Timber Sale Harvest

Monitoring over time is an essential component of adaptive forest management. Remotely sensed images such as these before (2015) and after (2019) shots from the Big Willow timber sale in the Alpine Plateau Good Neighbor Authority project near Gunnison (more on page 79) provide data and information that can be integrated into monitoring protocols. Images: National Agriculture Imagery Program; map: Pete Barry, CSFS GIS



PROJECT LOCATOR:
ALPINE PLATEAU GOOD NEIGHBOR AUTHORITY

Identifying Needs and Using the Plan: A Framework for Coordinated Management

Stakeholders and collaborative groups can utilize the *2020 Colorado Forest Action Plan* as a framework toward a coordinated approach to forest management in Colorado, regardless of land ownership.

The CSFS will use the Forest Action Plan to engage stakeholders and collaborators, with an overarching goal to align resources where they will have the most significant and long-term impacts on the landscape. Other national, regional, state and local planning efforts can be used to complement the Forest Action Plan.

To **CONSERVE**, **PROTECT** and **ENHANCE** high-priority subwatersheds identified in the Forest Action Plan composite map, the primary strategy is to plan and implement activities and projects that are most likely to achieve multiple goals in the same project area.

Planning can follow two methods:

» **The first** begins with the composite priority map to identify areas for new activities and supplements the map with other action plan theme data and/or local data and information.

» **The second** begins with local priorities and includes reviewing the action plan composite priority map and other theme data to evaluate areas where activity boundary expansion and/or cross-boundary collaboration can increase efficiency and impact.

The Forest Action Plan sets direction for CSFS staff and programs, and the CSFS will engage stakeholders and collaborators in planning, implementation and monitoring.

Start Using the Action Plan Based on the Priority Map or Targeted Local Need

State forest action plans are mandated by the Cooperative Forestry Assistance Act of 1978 (as amended by the 2008 and 2014 farm bills) in order to receive federal State and Private Forestry funds.

Several competitive funding opportunities require applicants to address priorities identified in the Forest Action Plan.

The Colorado State Forest Service will focus the majority of core services in high-priority subwatersheds in order to:

» **Concentrate resources** where activities can have the greatest impact.

» **Guide program and grant funding** to where it should be applied, to ensure consistency of management activities with top state forest resource issues, management goals and individual program requirements.

» **Work with stakeholders** to develop projects that address mutual priorities in high-priority subwatersheds.

STRATEGY SCOPE

» **Ownership —** Priority and resource strategy recommendations are applicable to all land ownerships.

» **Organization —** Priority and resource strategy recommendations are applicable to all land management organizations that plan and implement forest stewardship activities in Colorado.

» **Scale —** These Resource Strategies are intended to direct project-level planning efforts to priority subwatersheds (sixth level, 12-digit HUCs) and introduce broad strategies and approaches that can be incorporated into more site-specific project-planning efforts.

Tactical and prescriptive planning should occur at the local level by managers and stakeholders who are experts on local conditions.

METHOD 1: THE MAP

Start with the Forest Action Plan composite priority map to identify strategic locations of projects in priority subwatersheds. Individual subwatershed values for the composite priority map can be found in the Forest Action Plan application of the Colorado Forest Atlas, at *coloradoforestatlas.org*.

This map can be supplemented with other action plan data and ancillary local data, as applicable.

To **CONSERVE**, **PROTECT** and/or **ENHANCE** these subwatersheds, activities most likely to achieve multiple priority goals in the same project area should be pursued. Based on project goals, managers should refer to the applicable theme(s) section(s) of this action plan to evaluate potential strategies and approaches.

For example, managers could plan fuels reduction treatments designed to protect high-risk wildland-urban interface areas and critical sourcewater infrastructure. The same project also could incorporate strategies and approaches intended to lower risk of severe insect and disease outbreaks and improve or maintain habitat for target wildlife species.

Projects incorporating these goals as a foundation can then be expanded — where financially, socially, ecologically and operationally feasible — to create a mosaic of diversity and complexity in watersheds, which enhances forest resiliency to disturbance at a larger scale.

Implementation of this resource strategy will improve the efficiency of forest stewardship activities in Colorado by focusing limited resources in the highest priority subwatersheds and improving coordination of efforts across property ownerships and administrative boundaries. Implementation also will produce the greatest benefit to residents by emphasizing areas where the greatest number of key activity goals can be achieved on the same acre or within the same project areas.

Method 1 example:

Cooperative agreements between the CSFS and its partners will benefit from using the *2020 Colorado Forest Action Plan* composite priority map to select project areas that achieve multiple objectives in forest conditions, living with wildfire and watershed protection.

One example of a cooperative agreement is a new Good Neighbor Authority (GNA) project.

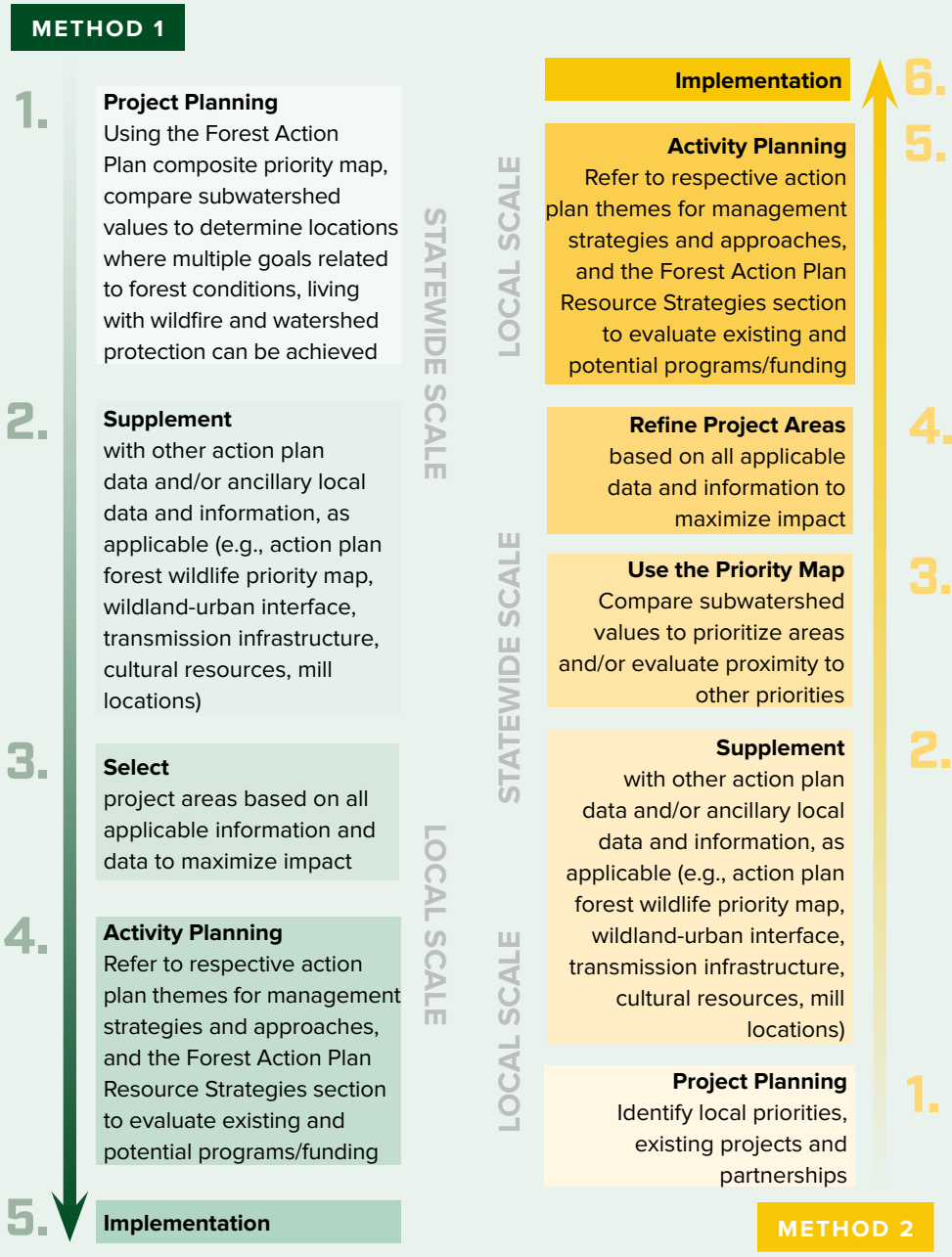
In a GNA Supplemental Project Agreement, the U.S. Forest Service and the CSFS identify a project or multiple projects that are of mutual interest, meet the intent of the GNA and meet the objectives of each agency (for an ongoing GNA example, see page 79 of this report). The action plan composite priority map provides a good starting point to select HUC 12 subwatersheds for a new GNA supplemental agreement, and project area(s) can be further refined using local ancillary data, such as proximity to mill locations, from the forest products theme map in the action plan and/or U.S. Forest Service priority areas data.

METHOD 2: LOCAL NEED

Start with local priorities and existing projects that are not necessarily captured in the *2020 Colorado Forest Action Plan* composite priority map. Examples include implementation of activities in Community Wildfire Protection Plans (CWPPs), update of an existing CWPP if it is more than 5 years old, protection of critical infrastructure such as transmission lines or transportation corridors, urban and community forestry and improvement of forest wildlife habitat.

First, using local data and information, select project areas. Next, compare subwatershed values from the action plan composite priority map in the action plan Resource Assessment (page 23) to identify strategic placement of activities in or adjacent to priority subwatersheds. Refine project areas, as applicable, based on the

PROJECT PLANNING: AN ILLUSTRATION OF TWO METHODS



potential for greater impact. Examples include expansion of project boundary to include a neighboring subwatershed where high wildfire risk threatens drinking water, or cross-boundary collaboration to expand the overall footprint of an activity.

Method 2 example:

The Colorado State Forest near Walden was established by the State Land Board in 1938 to promote grazing, recreation and forestry on 70,980 acres of contiguous land. It became a state park in 1970 and the CSFS began leading forest management there in 1986.

The pine beetle epidemic of the past few decades has increased harvesting of mature, dead stands of lodgepole pine, and the CSFS has worked closely with the State Land Board and Colorado Parks and Wildlife to address potential benefits and conflicts between timber sales and wildlife habitat.

Based on spatial data from the forest wildlife theme in this *2020 Colorado Forest Action Plan*, there are specific areas in the Colorado State Forest that encompass bighorn sheep, elk, mule deer and moose winter range, as well as summer and fall concentrations of black bears. There also are areas with low disturbance and high ecological connectivity. These action plan data layers can be used to identify and prioritize forest management areas with high lodgepole pine mortality that overlaps important wildlife habitat.

Moving forward, as harvest within the State Forest transitions from dead to green trees, action plan data can be used to investigate where mixed stand thinning and regeneration harvests can achieve forest health goals while maintaining important wildlife habitat.

If there are multiple watersheds where work should occur to achieve forest health goals, the composite priority map in the *2020 Colorado Forest Action Plan* can be used to refine project areas to maximize impact.

STATEWIDE CROSS-THEME RESOURCE STRATEGIES, MONITORING, METRICS

» The CSFS will support **cross-disciplinary partnerships** and collaborative work among federal, state and local agencies, nongovernmental organizations, communities and public volunteers to implement the Forest Action Plan. Funding mechanisms will be expanded through these partnerships and innovative grant opportunities. The CSFS will establish, maintain and update a statewide list of partnerships and potential funding mechanisms.

» To address cross-boundary, broad-scale challenges and threats to Colorado's forests and improve the effectiveness of forest stewardship using limited resources, the majority of new CSFS projects will be in **high-priority subwatersheds** identified in this action plan. The CSFS also will strive to expand work in multistate priority landscapes.

» **A Forest Action Plan application** in the Colorado Forest Atlas will allow the CSFS and partners to put action plan data to use in strategic planning efforts, including Shared Stewardship planning with the U.S. Forest Service. Project and activity planning in the Colorado Forest Atlas will be cross-checked with the action plan composite and theme maps to determine level of priority, making the number and acreage of new activities and projects within high-priority subwatersheds quantifiable and reportable. The CSFS will maintain and update the Colorado Forest Atlas to improve data and information sharing statewide.

» The CSFS will **enhance forest resistance and resilience** to climate change, or move toward transitions, and improve carbon storage and sequestration using the adaptive strategies and approaches developed in the Forest Action Plan. This will be achieved through developing new training for CSFS staff, identifying candidates with related education and experience in the hiring process, maintaining and expanding interagency partnerships for integrative project planning and collaborating with research partners at local universities.

» To monitor and quantify change in forest cover, vigor and carbon storage over time, CSFS **archival data and information** will be integrated with current interagency forest management data and Forest Inventory and Analysis data in the Colorado Forest Atlas. Project and activity monitoring protocols will be developed to quantify success at 1- to 10-year increments.

» The CSFS will **expand public understanding** of forest stewardship and its connection to sustaining ecologic, economic and social function in natural and urban systems by maintaining and developing outreach and education programs.

CSFS Programs Contribute to Plan Goals

Appendix 8 illustrates the programs the CSFS administers that will contribute to the implementation of the theme goals and strategies. This exercise highlighted the gap in resources available to implement some goals and strategies *(Figure J)*.

Program areas include state and private forestry, other federal programs, competitive grants, state programs and watershed programs.

There are additional funding mechanisms not listed in the table that could provide resources for CSFS to leverage (e.g., American Forest Foundation and National Wild Turkey Federation).

Given the number of local, state, federal and nongovernmental organizations that are engaged in natural resource management in Colorado, it is challenging to capture all available resources to implement the resource strategies.

A comprehensive list of resources available across organizations needs to be developed and is identified in the Resources Necessary section.

COVERAGE: CSFS PROGRAMS RELATED TO THE ACTION PLAN

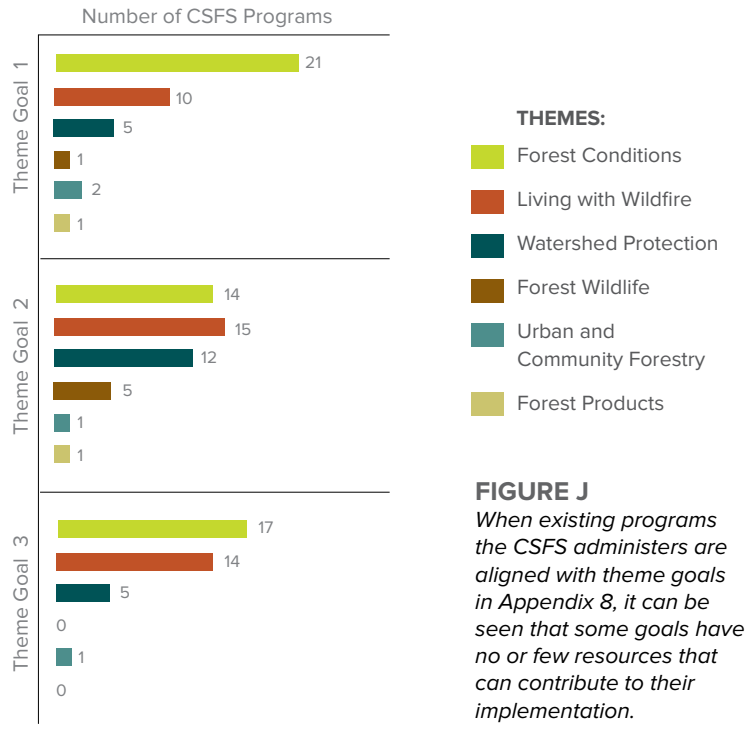


FIGURE J
When existing programs the CSFS administers are aligned with theme goals in Appendix 8, it can be seen that some goals have no or few resources that can contribute to their implementation.

Forests are a critical component of healthy watersheds. The Colorado State Forest Service is committed to protecting Colorado's source water for residents. Photo: David Mark, Pixabay

CSFS Helps Protect Colorado's Drinking Water

The 1996 Amendments to the Safe Drinking Water Act (SDWA), 42 U.S.C. 300f et seq., directed that each state develop a Source Water Assessment and Protection (SWAP) program.

The Colorado Department of Public Health and Environment's SWAP program has supported and facilitated community-based protection and preventative management strategies, through development of source water protection plans, to minimize adverse contamination to public drinking water sources.

Local source water protection implementation is the primary mechanism to protect and preserve our drinking water resources. Federal, state and local interagency coordination also is a necessary component to effectively manage the lands and minimize potential contaminant threats to drinking water supplies.

Forested watersheds in Colorado supply approximately 80% of the state's population with drinking water. Therefore, wildfire mitigation and forest stewardship are essential to protecting drinking water supplies. The CDPHE and the CSFS are committed to working collaboratively in the following ways on drinking water protection strategies:

» **Share source water delineation** and source water protection planning areas (e.g., GIS shapefiles, priority hydrologic unit codes (HUCs)) to define priority landscapes for drinking water protection under data sharing agreements.

» **Maintain and monitor healthy watersheds** and restore degraded forested areas by mutually implementing best management practices, riparian buffers, headwater protections and other forest management strategies identified in source water protection plans and this Forest Action Plan.

» **Establish partnerships**, leverage available funding sources and coordinate with other federal, state and local governments, municipal water providers, communities, landowners, watershed groups and other nongovernmental organizations to mitigate wildfire risk to drinking water supplies.

Working Toward Action Plan Goals Requires Investments in Staff, Funding, Programs

To increase the impact of the CSFS and partner work in priority subwatersheds, all funding must be diversified, leveraged, increased and sustained.

As indicated by the CSFS Funding Trends section on page 70 in this action plan, the CSFS budget is derived from a wide variety of sources that are generally stagnant or declining. Budget increases relative to the scale of the challenges and threats outlined in the Resource Assessment are necessary.

The resources necessary to address the scale of threats and challenges identified in the *2020 Colorado Forest Action Plan* do not end with funding. Increased capacity for planning, implementation and collaboration is critical to achieving the goals, strategies and approaches outlined in the themes of this action plan.

ANALYSIS OF THE 2020 COLORADO FOREST ACTION PLAN

» **Conduct** a funding gap/economic analysis of the cost to achieve the goals of the *2020 Colorado Forest Action Plan*, beyond treatment costs (e.g., staffing, administration)

» **Identify** additional resources available to implement the action plan from local, state, federal and nongovernmental organizations

» **Evaluate** productivity and economic viability of forest management within high-priority subwatersheds

» **Develop** quantifiable metrics with benchmarks for implementing action plan strategies

» **Establish** cross-organization working groups to leverage resources and evaluate geographic areas of agreement between the action plan priority composite map and other priority efforts in the state

» **Create** a centralized database of forest stewardship partners and collaboratives

CAPACITY BUILDING AT CSFS

» **Train** existing staff and increase staffing capacity to address Forest Action Plan goals

» **Increase** staffing at the CSFS for planning, implementation, community collaboration, monitoring and developing an adaptive management program that is responsive to unforeseen major forest disturbances

» **Identify** funding sources to further develop and maintain the Colorado Forest Atlas as a one-stop shop for geospatial data in Colorado, and provide training for CSFS staff and collaborators. *coloradoforestatlas.org*

» **Increase** resources for outreach and education programs including integrating social science into messaging

» **Develop** cross-disciplinary working groups among communication professionals to share common messages about the benefits of forests to the environment, the economy and society

» **Identify** resources to support systems (e.g., i-Tree, CO-Tree View) that help quantify and manage Colorado's urban forest resources

» **Continue** to survey Forest Inventory and Analysis plots that were established by the U.S. Forest Service across the Front Range to monitor the ecological health of urban forests (see *fia.fs.fed.us/program-features/urban/* and *csfs.colostate.edu/forest-management/forest-inventory-analysis/urban-fia/*)

» **Develop** monitoring protocols and identify data analysis needs (e.g., Forest Atlas, FIA data, remote sensing)

COMMUNITY CAPACITY BUILDING

» **Provide** more support to community leaders

> Increased capacity for planning, implementation and collaboration is critical to achieving the goals, strategies and approaches outlined in the themes of the *2020 Colorado Forest Action Plan*.

» **Increase** local government involvement with forest health issues

» **Increase** involvement in cross-boundary landscape planning efforts in the state

WILDFIRE RISK REDUCTION AND POST-FIRE RECOVERY RESOURCES

» **Promote** new wildfire councils capable of supporting local needs for information, resources and coordination

» **Identify** funding to maintain, update and enhance the Colorado Wildfire Risk Assessment

» **Encourage** retrofitting homes to reduce structural ignitability

» **Improve** infrastructure debris removal post-fire

» **Increase** hazard tree removal

» **Improve** flood mitigation efforts

» **Identify** additional funding sources for post-fire recovery efforts and resources, including re-vegetation of the appropriate species for the area

» **Align** the timber industry with post-fire recovery

» **Develop** a statewide plan for coordinating post-fire recovery efforts on nonfederal lands, identifying roles and responsibilities, resources, etc.

FOREST PRODUCTS INDUSTRY IMPROVEMENT

» **Fairly** and equitably support increased forest industry capacity to sustainably address forest health issues, and offset the cost of treatments

» **Develop** low-interest loans for the forest products industry

» **Launch** grants to incentivize use of low-value wood

» **Promote** state tax incentives, including extension of exemption for blue stain wood products (beetle-kill)

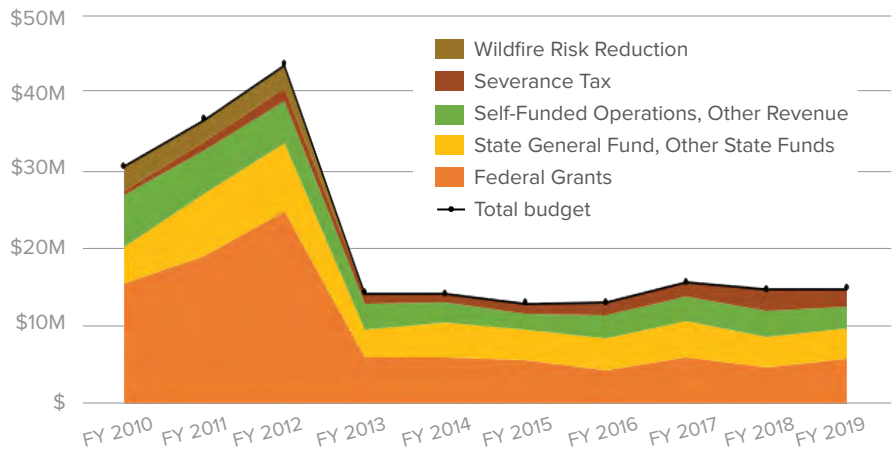
» **Stimulate** infrastructure and markets for handling small diameter material

Forester and CSFS Program Delivery Manager Diana Selby helps clear small trees and branches during a forest management thinning project to bolster forest health. Increasing staffing to help develop an adaptive management program is one of the recommended resources necessary to achieve the goals set forth in the 2020 Colorado Forest Action Plan. *Photo: CSFS*

How the Colorado State Forest Service Is Funded

The Colorado State Forest Service derives its budget from federal grants, state general fund and other state funds, self-funded operations and other revenues, severance tax and wildfire risk reduction funding.

CSFS BUDGET TRENDS: FISCAL YEARS 2010-2019



CSFS GRANT PROGRAM: FOREST RESTORATION AND WILDFIRE RISK MITIGATION GRANT

(formerly DNR Wildfire Risk Reduction Grant)

1 FEDERAL GRANTS

FEDERAL FISCAL YEAR: OCTOBER 1-SEPTEMBER 30

Federal funds are subject to annual appropriations, which vary year to year.

Federal grant funding includes consolidated payment grants, domestic grants, supplemental project agreements, cooperative agreements, challenge cost share agreements, sub-grant agreements, research grants and cost reimbursable agreements.

Federal funding at the CSFS declined after fiscal year 2012 for various reasons, including fire management responsibilities being transferred to the Division of Fire Prevention and Control in July 2012, decreasing U.S. Forest Service regional funds available to states and unsuccessful applications for some competitive federal grants.

Transferring fire management responsibilities, including programmatic funding and staffing, to DFPC contributed to a decrease in related federal and state funding beginning in July 2012.

The CSFS further focused its efforts on forest management, wildfire mitigation, risk reduction planning and forestry outreach objectives in place of fire management responsibilities. As of FY 2019, federal funds account for 33% of CSFS funding sources.

2 STATE GENERAL FUND AND OTHER FUNDS (NON-SEVERANCE TAX)

STATE FISCAL YEAR: JULY 1-JUNE 30

State general fund contributions are subject to annual appropriation by the Colorado Legislature and vary each year.

Other state funds come from agreements with state agencies for specific projects. General fund dollars are used for the CSFS operating expenses, including wages, vehicles, facility leases, safety supplies, operating supplies and services.

Over the past 10 years, there has been a steady increase in state general funding appropriations; in FY 2016, this funding comprised 31% of the CSFS funding sources.

In FY 2020, state general fund appropriations and other state funds (non-severance tax) accounted for 24% of the CSFS funding sources.

3 SEVERANCE TAX

FUNDING FROM 2010-2019

Healthy Forests and Vibrant Communities, House Bill 09-1199, provides $1.3 million in annual funding from the Colorado severance tax revenue fund. It enhances CSFS' capacity to address growing forest management and wildfire mitigation needs and improves technical capacity to:

- **Implement** forest management and fuels reduction projects
- **Reduce** wildfire risk to life, property and watersheds
- **Assist** communities and others to develop Community Wildfire Protection Plans
- **Support** utilization and marketing of wood products
- **Provide** loans to forest products businesses

In 2017, Senate Bill 17-050 reauthorized HB 1199 for seven years. The bill combined the Wildfire Risk Reduction Grant Program (administered by the Colorado Department of Natural Resources) and the Colorado Forest Restoration Grant Program (administered by the CSFS) into one program administered solely by the CSFS through the Healthy Forests and Vibrant Communities Program and called the Forest Restoration and Wildfire Risk Mitigation Grant Program.

Although $1 million was allocated to each program prior to the passage of SB 17-050, the combined programs have an allocation of $1.05 million, which resulted in a reduction of funding for the program.

4 SELF-FUNDED OPERATIONS AND OTHER REVENUE

THE CSFS IS A STATE-ASSISTED AGENCY, mandated by the Colorado Legislature to supplement appropriated general fund monies with revenue generated through fees charged for goods and services.

All residents benefit indirectly from tax-supported funding of CSFS programs and services that ensure long-term management and care of Colorado's nonfederal forest resources. Landowners who more directly accrue the benefits of these programs and services share in the costs of CSFS operations through service fees.

Examples of self-funded activities include professional forestry services for specific projects and programs of work, fees for services and the CSFS Nursery operations.

Self-funded revenue is more variable than other funding sources due to the opportunistic nature of the services. The CSFS is a nonregulatory agency and services are dependent on landowner interest. Over the past 10 years, dramatic fluctuations in needs for services has resulted in self-funded revenue contributing to 12% of the CSFS funding sources in FY 2012, 24% in FY 2013 and 22% in FY 2020.

Self-funded operations fill the gaps in federal and state funding that the CSFS needs on an annual basis.

5 WILDFIRE RISK REDUCTION

THE CSFS ADMINISTERS GRANTS TO FUND PROJECTS that reduce the risk of damage to property, infrastructure and water supplies, as well as those that limit the likelihood of wildfires spreading to populated areas.

From the start of the DNR's Wildfire Risk Reduction grant program in 2013 to the current CSFS-administered program, applications requesting approximately $30.77 million have been submitted, with $15.8 million available to allocate to projects. From 2013-2019, the CSFS was able to fund only 199 of the 378 submitted grant applications, awarding just 51% of the amount requested by Colorado landowners.

Since the funding program was combined and administered by the CSFS, over the last three funding cycles there have been requests for approximately $10.4 million and only $4.2 million available to fund projects, representing 40% of the project funding requested.

> The uncertainty of available funding makes it challenging to have consistency within the Forest Restoration and Wildfire Risk Mitigation Grant Program and program support through Healthy Forests and Vibrant Communities.

Outlook for Severance Tax, Wildfire Risk Reduction

Funding for the Forest Restoration and Wildfire Risk Mitigation Grant Program and CSFS program support from Healthy Forests and Vibrant Communities is derived from Tier 2 of the Colorado severance tax revenue fund.

Funding availability through the severance tax fund is completely dependent on revenue received from oil and gas development. In recent years, the volume of oil and gas development that has occurred in Colorado has been highly volatile, and generally trending downward.

Over the past 10 years, there has been a steady increase in severance tax funds contributing to the CSFS funding sources, with the highest point at 21% of the funding sources in FY 2020. However, the current projections from the state of Colorado point to a sharp decrease in funds for the next three years.

The uncertainty of available funding makes it challenging to have consistency within the Forest Restoration and Wildfire Risk Mitigation Grant Program and program support through Healthy Forests and Vibrant Communities. The Colorado General Assembly passed bills to allocate additional funding to the Tier 2 programs from general funds to backfill the gaps during the 2018 and 2019 legislative sessions.

Former CSFS forester Kathryn Hardgrave and Comet the golden retriever enjoy a fall day helping establish seedlings. Working with landowners, partner agencies and neighboring states helps the CSFS complete as many projects as possible on a limited budget. Photo: CSFS

Ahead of the Curve: As the Population Grows, CSFS Focuses on Greatest Impact

It is more important than ever to **CONSERVE**, **PROTECT** and **ENHANCE** Colorado's forestlands for future generations.

As the state's population continues to grow rapidly, forest and water resources are pressured from competing interests, and forestland is at risk of conversion to other uses.

Colorado is a desirable state to call home, in part because of the ability to live close to recreational opportunities. However, more housing and community developments are encroaching on public and private forestlands, threatening to fragment the very landscape that is one of Colorado's signature traits.

It is essential to work across political, jurisdictional and ecological boundaries to achieve the goals of the *2020 Colorado Forest Action Plan*.

In this section, we highlight the Forest Legacy Program, Shared Stewardship and case studies of the CSFS working with neighbors to **CONSERVE**, **PROTECT** and **ENHANCE** Colorado's forestlands. A National Priorities Report can be found in Appendix 9.

> **"Without natural resources life itself is impossible. From birth to death, natural resources, transformed for human use, feed, clothe, shelter, and transport us. Upon them we depend for every material necessity, comfort, convenience, and protection in our lives. Without abundant resources prosperity is out of reach."**
>
> — *Gifford Pinchot,* Breaking New Ground

Preventing Fragmentation: Forest Legacy Program Offers Support for Landowners While Protecting Forestland

FOREST LEGACY PROGRAM

Since 2007, Forest Legacy projects have protected 21,000 acres in Colorado through eight conservation easements in seven counties. These "working forests" provide benefits including water quality, wildlife habitat, forest products, opportunities for recreation and more.

LEARN MORE

The full 2020 Forest Legacy Program Assessment of Need is in Appendix 1 of this plan.

The Forest Legacy Program is a conservation program administered by the U.S. Forest Service in partnership with the Colorado State Forest Service. It identifies environmentally important, privately owned forests and uses conservation easements or fee-acquisition land purchases to ensure these lands are not converted to nonforest uses. The program gives private landowners the opportunity to retain ownership and management of their land while receiving compensation for unrealized development rights.

Colorado landowners who want to protect private forest areas (that currently or could someday be threatened by development or conversion) have the opportunity to work with the CSFS and apply for funding from the Forest Legacy Program.

The CSFS releases an annual request for proposals for Forest Legacy Program applications. From the submissions, projects are selected through a competitive review process — first at the state level and then at the national level. Federal Forest Legacy funds come from the Land and Water Conservation Fund, which receives money from a small portion of offshore oil and gas royalties (not taxpayer dollars).

APPLICATION TIMELINE

The process of applying, being selected, receiving funding and conducting due diligence on a project can take several years. It requires a high degree of commitment from landowners and partners. If awarded Forest Legacy funding, the funds will not be available to use for two years after the date the application is submitted.

UPDATED ASSESSMENT OF NEED AVAILABLE

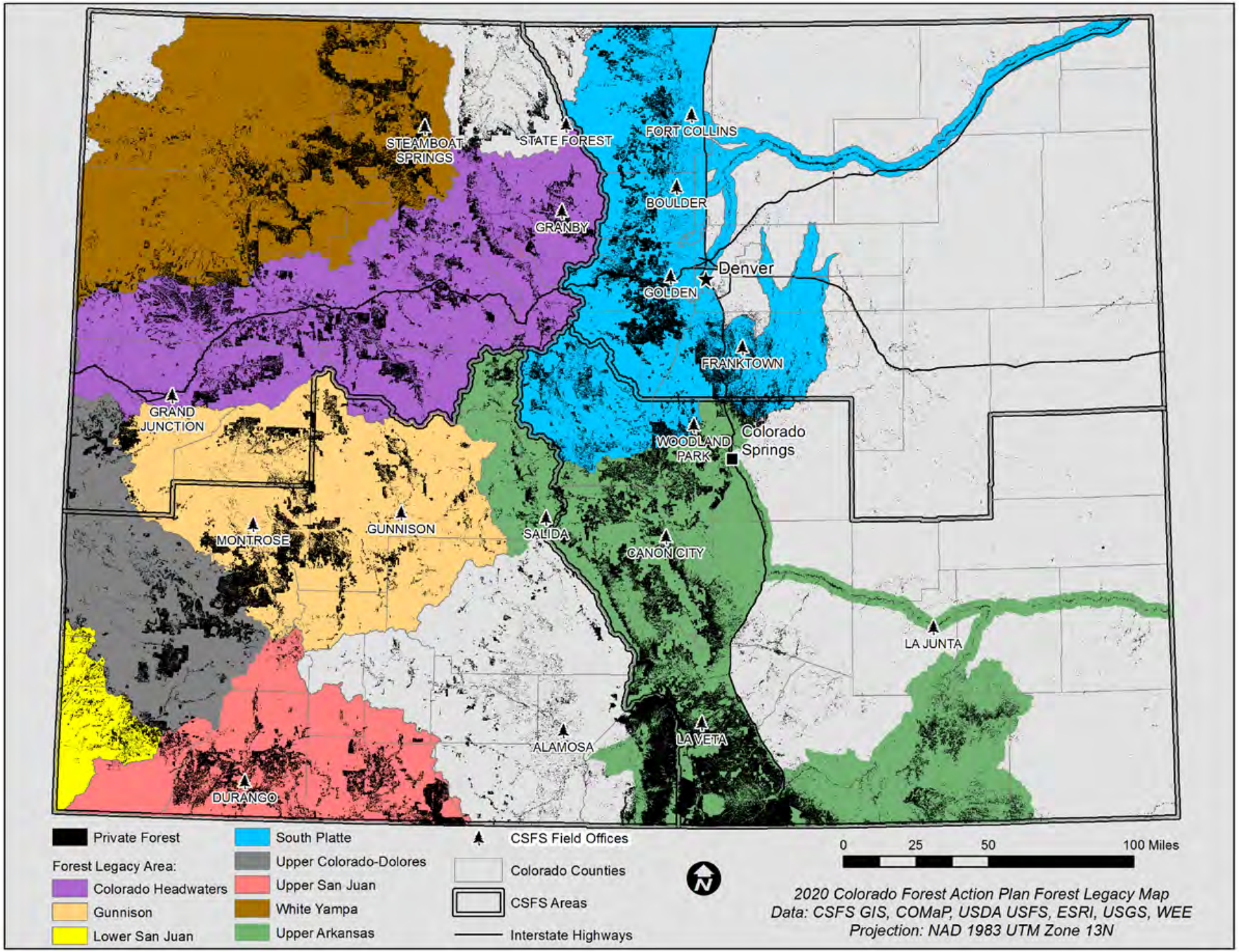
Only landowners in the areas of the state identified as Forest Legacy Areas in the current Colorado Forest Legacy Program Assessment of Need are eligible to apply for Forest Legacy Program funding.

The assessment presents a revised map showing areas eligible for Forest Legacy funding, along with a detailed description of the specific conservation values for each Forest Legacy Area.

The updated assessment reflects areas of eligibility utilizing current land and population data and trends.

The CSFS reached out to a number of prominent land trusts and natural resource conservation organizations in Colorado to get feedback on which criteria identified by the Forest Legacy Program for project selection are most critical. Participants ranked 10 criteria for project selection based on their land conservation goals and criteria, and current/planned conservation work. Their rankings were incorporated into the updated Forest Legacy map.

Forest Legacy Map: Areas Eligible to Apply to the Program



CASE STUDY

TOLLAND RANCH

Forest Legacy Conservation Easement Protects Iconic Ranch, Water Resource

Owned by the Toll family for 120 years and four generations, this beautiful Front Range landscape had long been a priority for conservation, in part because it is central to the history of the area. The Tolland Ranch sits east of the Moffat Tunnel's east portal and west of Rollinsville.

In 1904, the switchback railway known as the Giant's Ladder was built over Rollins Pass.

Thousands of Denver socialites rode the rail line, which stopped at the historic town of Tolland for lunch. Today, Amtrak's California Zephyr still carries passengers through the Toll property on their way from Chicago to San Francisco.

In 1994, brothers Henry Toll, Jr. and Giles Toll conveyed 1,320 acres to the U.S. Forest Service, clearing the way to establish the James Peak Wilderness in 2002. By 2013, the property was the Forest Legacy Program's top national priority.

By 2015, the landowners placed the historic 3,334-acre property in a conservation easement. The Conservation Fund and the Colorado State Forest Service worked with the Toll family, with the support of Boulder and Gilpin counties, to secure federal funding from the Forest Legacy Program, state funding from Great Outdoors Colorado and local funding from Boulder County.

The CSFS holds the easement for this property, one of the largest intact private holdings along the Front Range.

Now protected forever, the property remains in the Toll family's private ownership and the conservation easement protects critical drinking water sources for Boulder and Denver. A 4-mile stretch of upper South Boulder Creek runs through the property, which Denver Water relies upon to help deliver safe drinking water to 1.5 million people.

"The conservation easement provides us with a structure and some resources to continue the preservation ethic of our great-grandparents Katharine and Charles Toll, our grandparents Henry and Cyrena Toll, and our parents Hank and Lydia Toll," said landowner Wolky Toll. "Preservation of land and historic structures is an involved process in the face of a booming Colorado population and all the climatic variables in the high valleys."

A Forest Legacy conservation easement, supported by the Colorado State Forest Service and federal funding, helped forever protect part of the Tolland Ranch that holds a 4-mile stretch of South Boulder Creek, a critical watershed that contributes part of the drinking water for nearly 1.5 million people. Photo: Toll family, for CSFS

The Toll property creates an expansive buffer between the 14,000-acre James Peak Wilderness and rural subdivisions and urban areas to the east.

Through the decades, the Tolls have maintained a deep commitment to practicing sustainable forestry and working with the CSFS to manage forests on the property. A CSFS Forest Stewardship Plan, prepared in cooperation with the landowners, helps guide forest management and meets a requirement of the Forest Legacy Program. Most recently, the landowners have been establishing relationships with the Cheyenne and Comanche tribes to utilize forest products from the conservation easement.

CSFS Assists Tribal Ranches with Wildfire Risk Reduction Projects in Southwest Colorado

The Colorado State Forest Service has a longstanding history of working alongside the Ute Mountain Ute tribe in the southwest corner of Colorado, assisting with forest planning and implementation projects since the 1980s.

Staff members from the CSFS Gunnison and Durango field offices provide assistance by completing forest management plans on tribal ranches (non-reservation lands), such as the Pine Crest Ranch in Gunnison County. This recent Douglas-fir beetle sanitation and thinning project was completed in 2019 to promote wildfire risk reduction, and the non-saw log material that was left was salvaged for the Ute Mountain Ute tribe to use as firewood. This project was funded through the CSFS-administered Forest Restoration and Wildfire Risk Mitigation Grant Program, and a U.S. Department of Agriculture Western Bark Beetle grant.

Two other ongoing collaborations include work on the Adams and Cherry Creek ranches. At Adams Ranch, basal area reduction is being used to promote fuels reduction and reduce the risk of catastrophic wildfire.

The Cherry Creek Ranch narrowly escaped the impact of the East Canyon Fire that burned 2,905 acres directly to the west of the property in June 2020. Prior to that, the ranch and surrounding drainage were impacted by bark beetle outbreaks over the last seven years that have led to significant ponderosa pine mortality. The roundheaded pine beetle, mountain pine beetle and, likely, the western pine beetle all have infested these stands of trees simultaneously, giving this project a multifaceted purpose. The project goals are to reduce the infestation of bark beetles on the forested ranch lands, improve stand vigor of residual ponderosa pines, salvage wood products and reduce fire hazard by reducing fuel loads.

The U.S. Department of Interior Bureau of Indian Affairs Reserve Treaty Rights Lands funding program supports both the Adams Ranch and Cherry Creek Ranch projects.

In 2019, staff from the Colorado State Forest Service's Gunnison Field Office worked with Ute Mountain Ute tribal members to complete a 21.3-acre Douglas-fir beetle sanitation and thinning project on the Pine Crest Ranch in Gunnison County. The CSFS Durango Field Office staff is currently bidding on several projects across multiple Ute Mountain Ute ranches, encompassing more than 150 acres in the Four Corners area. Photo: Sam Pankratz, CSFS

The Colorado State Forest Service provided critical information during the 2019 Decker Fire near Salida that helped firefighters protect residential properties. Photo: Joy Jackson, for CSFS

CASE STUDY

SANGRE DE CRISTO MOUNTAINS

CSFS Key in Assessing Properties During Decker Fire

Lightning started the Decker Fire in the upper elevations of the northern Sangre de Cristo Mountains on Sept. 8, 2019.

Initial wildfire response blended suppression and management for ecological benefits. The rare, late-season, high-altitude wildfire brought with it the possibility that (under certain environmental conditions) it could burn into populated areas, including Salida and other towns along the Highway 50 corridor.

The CSFS played a key role in providing the Incident Management Team with private property wildfire risk assessments that were completed since 2015. The CSFS also helped actively assess properties during the fire.

The CSFS forest management history in Chaffee County, including property assessment efforts since 2015 and the Decker Fire assistance, illustrate direct contributions and influences on the Envision Chaffee County initiative and the depth of knowledge and experience contributing to the revised Community Wildfire Protection Plan.

CASE STUDY

CHAFFEE COUNTY

Community Wildfire Protection Plan Revision Provides Residents with 'Fire-Ready Future'

Chaffee County is home to 20,000 residents, and 80% of the county is on public lands.

The county serves as the headwaters watershed for the Arkansas River, which serves as a major agricultural water source, providing an estimated 1 million downstream residents with their domestic water supply. It also hosts 102 miles of Gold Medal trout fishing waters and is the most visited river for recreational rafting in the U.S.

In 2017 over 1,500 residents and more than 70 organizations created a "vision" of how to preserve and enhance the myriad natural and social resources in Chaffee County, to create a fire-ready future. They named the effort Envision Chaffee County, and in 2018 voters approved the vision and funding for taking action — a large part of which was revising the county Community Wildfire Protection Plan using new ideas and approaches to create "the next generation Community Wildfire Protection Plan."

The CSFS was integral in this effort based on a decades-long history of forest management in the area and a program established in 2015 to provide no-cost wildfire risk assessments for interested communities in the county.

> **"This innovative community-driven wildfire plan delivers a disciplined approach to treat the right acres for the greatest community benefit."**
>
> *— Damon Lange, CSFS Southwest Area Manager's comment in the Chaffee County CWPP*

The assessment program is funded by Chaffee County Title 3 funds and uses advanced spatial prioritization tools that have been supported by the Colorado Forest Restoration Institute to prioritize fuel treatments.

In particular, the CSFS is closely involved in facilitating future boots-on-the-ground forest management activities in support of the Envision Forest Health Council's goals.

CASE STUDY

ALPINE PLATEAU

Good Neighbor Authority Project Clears Dead Trees for Southwestern Community

Authorized in 2000 through the Interior Appropriations Act and limited to partnerships between the Colorado State Forest Service and U.S. Forest Service for the first five years, the Good Neighbor Authority (GNA) was expanded nationally in the 2014 U.S. Farm Bill.

Now, this program provides a mechanism for state forestry agencies to enter cooperative agreements with the U.S. Forest Service and the Bureau of Land Management to accomplish shared objectives across jurisdictional boundaries.

The Good Neighbor Authority allows the CSFS to enter cooperative agreements with federal agencies to accomplish forest management goals across boundaries.

Good Neighbor Authority projects allow state forestry agencies to make cooperative agreements with federal agencies to accomplish shared objectives, such as clearing and utilizing dead trees on the Alpine Plateau near Blue Mesa Reservoir. In early 2020, there were 16 GNA projects completed or in progress across Colorado. Photo: CSFS

Cross-boundary GNA activities can include fuels management, habitat improvement, insect and disease control and commercial timber removal, among others. The GNA is a prime example of shared stewardship in Colorado; it includes cross-boundary activities achieving multiple goals and objectives across a broad landscape, and it promotes ongoing engagement with local, state and federal agencies and legislators.

As of April 2020, there were 16 GNA supplemental project agreements completed or in progress in Colorado *(Appendix 9)*.

The Alpine Plateau GNA project was initiated by the CSFS and USFS on lands in the Gunnison Ranger District, with the primary goals of dead tree utilization and community wildfire protection. Engelmann spruce trees, stressed by years of above-normal temperatures and below-normal precipitation, have succumbed to spruce beetles across hundreds of thousands of Colorado acres, including the area of this GNA project. The Arrowhead and Blue Mesa subdivisions, with over 300 homes, are in the wildland-urban interface just a few miles to the north.

Secondary objectives of this project include facilitating forest recovery and resiliency, reduction of hazardous trees that pose threats to recreationists, increasing public safety and supporting the local forest products economy.

The project is designed to utilize standing dead trees by removing them from the forest while they retain value and before they increase fuel loading on the ground.

This project includes the 2,155-acre Big Willow Salvage timber sale. At 11,000 feet in elevation, it is the largest timber sale administered to date by the CSFS through GNA.

Another planned sale is Ridge Stock Salvage, covering about 1,386 acres, and discussions have begun with partners for new potential GNA projects in the surrounding area.

CSFS Practices Shared Stewardship to Work with Partners Across Landscapes

The U.S. Forest Service conceptualized Shared Stewardship in 2018 as an outcome-based investment strategy to work with partners and stakeholders across landscapes to co-manage risk, use new tools to better target investments, focus on outcomes at the right scale and recalibrate the wildland fire environment for the benefit of people, both now and for generations to come.

This concept aligns well with the Colorado State Forest Service mission. The *2020 Colorado Forest Action Plan* themes also align well with Shared Stewardship, and will be used to plan and evaluate cross-boundary priority landscapes, identify data and information to supplement decision-making, maximize the number of goals achieved by one activity or project, and evaluate resources including programs, partners and potential funding.

In Colorado, a Shared Stewardship memorandum of understanding was signed by Gov. Jared Polis and USDA Undersecretary for Natural Resources and Environment Jim Hubbard on Oct. 23, 2019.

> **"Shared Stewardship is about working together in an integrated way to make decisions and take actions on the land."**
>
> *— Vicki Christiansen, U.S. Forest Service Chief*

It outlines applicable state and federal programs and authorities to carry out shared stewardship, which include state-delivered landowner technical assistance, forest health assistance, wildland fire suppression, prescribed fire, state-delivered U.S. Forest Service State and Private Forestry Programs, Good Neighbor Authority and other farm bill authorities, the Landscape Scale Restoration program, and State Trails and Great Outdoors Colorado grants.

Shared Stewardship: Three Core Elements

1. **Determining management needs on a state level.** The U.S. Forest Service will prioritize stewardship decisions directly with the states, setting priorities together and combining mutual skills and assets to achieve cross-boundary outcomes desired by all.
2. **Doing the right work in the right places at the right scale.** The U.S. Forest Service will use new mapping and decision tools to locate treatments where they can do the most good, thereby protecting communities, watersheds and economies where the risks are greatest.
3. **Using all available tools for active management.** The U.S. Forest Service will use every authority and tool to do more work on the ground, including timber sales, mechanical treatments and carefully managed fire, working with partners and stakeholders to choose the right tools.

— From U.S. Forest Service publication FS-118 August 2018

CASE STUDY

2-3-2 PARTNERSHIP

Colorado's Multistate, Regional Forestry Priorities Align with 2020 Action Plan Map and Shared 2-3-2 Goals for New Mexico

During the development of the *2020 Colorado Forest Action Plan*, the Colorado State Forest Service was involved in discussions with forestry experts in Wyoming, New Mexico, Utah and Kansas regarding their processes and priority mapping efforts.

The forests that extend between Colorado and New Mexico are of particular interest to both states, primarily for reasons related to watershed protection. One example of this is the Two Watersheds – Three Rivers – Two States Cohesive Strategy Partnership, better known as the "2-3-2," launched in 2016. It brings together a diverse "team of teams" comprised of members from 12 nongovernmental organizations and nine federal, state and local agencies, including the CSFS *(Figure K)*.

The 2-3-2 was created by cross-boundary stakeholders who recognized the connection between river headwaters in Colorado and over a million people who rely on the water sourced in the San Juan Mountains. Threats to this connection were starkly realized after the 2013 West Fork Complex, a series of wildfires that threatened these vital headwaters, communities and infrastructure for four months across 109,615 acres that held large tracts of beetle-killed spruce-fir forest.

The 2-3-2 brings together 12 NGOs and nine federal, state and local agencies, including the CSFS. The partnership challenges the notion of administrative boundaries and has secured more than $5 million since 2016 for watershed improvement.

The 2-3-2 has secured more than $5 million and accomplished many goals, including facilitating the use of prescribed fire with resources from multiple forests; leveraging funding to secure Rural Conservation Partnership Program work on private lands; building an online spatial data portal for planning treatments; working with partners to identify future projects; promoting collaborative development of fire management decision support tools; monitoring forest treatments; and facilitating dialogue between forest and wildlife groups.

In 2019, the 2-3-2 completed a three-year strategic plan outlining the following objectives: watershed protection; cross-boundary collaborative planning; the application and management of fire across boundaries; advancement of industry opportunities; elevation and enhancement of local effort successes; encouragement for a holistic approach to forest management; and utilization and promotion of relevant science.

Partners in the 2-3-2 challenge the notion of administrative boundaries and work together to realize a collective impact on a watershed scale.

The Wolf Creek Pass area — within both the San Juan and Rio Grande national forests — has been affected by beetle activity and wildfire damage. The 2-3-2 focuses on coordinating management efforts here for the greatest benefit to forest health and area communities. Photo: 232partnership.org

MORE *information on the 2-3-2 Partnership can be found at 232partnership.org*

CSFS Helping Build Pace and Scale of Forest Management

The Rocky Mountain Restoration Initiative (RMRI) is a stakeholder-driven collaborative process launched in 2019 that aims to increase the resilience of Colorado's forests, wildlife habitats, communities, recreation and water resources across all lands in the Rocky Mountains. The U.S. Forest Service and National Wild Turkey Federation bring representatives from other groups and agencies together for this effort, to increase the pace and scale of restoration under the principles of shared stewardship.

Colorado was chosen as a pilot for the RMRI, due to the large number of headwaters in the state and Colorado's history of collaborative forest and watershed management.

The RMRI recognizes that the U.S. Forest Service, the Colorado State Forest Service and their partners invest significant funding in forest treatments; however, vulnerabilities persist and work must be focused in high-priority landscapes to maximize impact and mitigate risk.

A large portion of southwestern Colorado was selected for the RMRI pilot *(Figure K)*.

When overlaid with the *2020 Colorado Forest Action Plan* priority map, much of the pilot area matches the high-priority subwatersheds identified in the action plan analysis. In fact, individual data layers in the 2020 action plan will likely be very useful in RMRI planning efforts.

In addition to the Southwest Colorado project selected as RMRI's first focus area, the group agreed to explore ways to engage and support the Upper South Platte and Upper Arkansas projects.

The CSFS is looking forward to working with new collaboratives and stakeholder-driven efforts such as RMRI in priority subwatersheds, to appropriately address annual forest threats posed by wildfire, insects and disease across nearly 400,000 acres of the state.

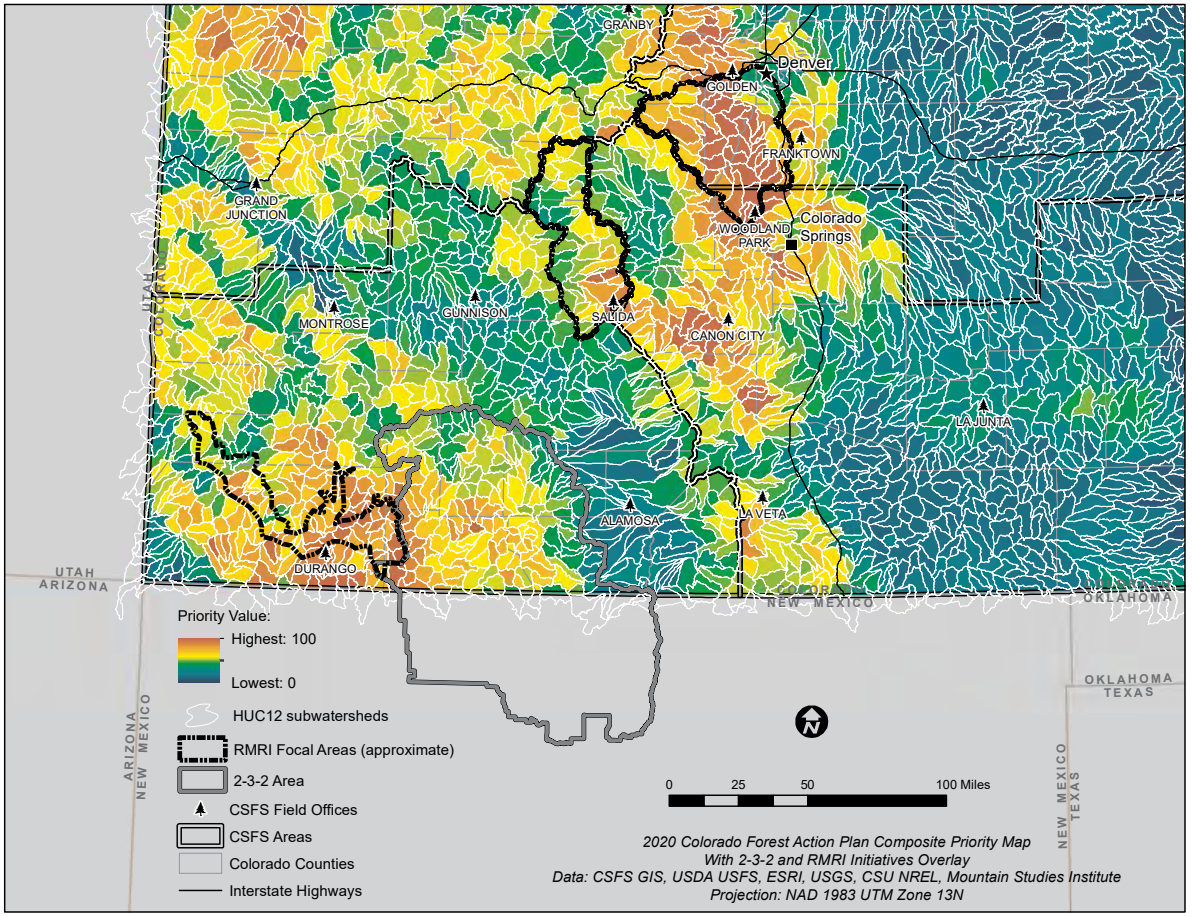


FIGURE K *The* 2020 Colorado Forest Action Plan *composite priority map shows highest priority areas for CSFS work in orange and red, with an outline of the overlapping 2-3-2 (Two Watersheds – Three Rivers – Two States) Cohesive Strategy Partnership focus area and the Rocky Mountain Restoration Initiative focus area. Map: CSFS*

Contributors and Reviewers

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Colorado Parks and Wildlife

The Colorado State Forest Service relies on partners and volunteers, such as this group of residents, to assist with forest management efforts on the ground. Photo: CSFS

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FOREST MANAGEMENT IS FOREST HEALTH

Photo: Amy Bulger, CSFS

OUR MISSION To achieve stewardship of Colorado's diverse forest environments for the benefit of present and future generations

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