Name_____

Vocabulary T-Chart

KEY ISSUE, TERM or CONCEPT	DEFINITION – EXPLANATION – EXAMPLE
1. biomass	
1. biomes	
2. catastrophic fire	
3. chaparral	
4. perennial grasses	
5. lodgepole pine and ponderosa pine	
6. clear cutting forests	
7. crown fires or “crowning”	
8. low-intensity surface fires	
9. ecosystem	
10. ecology	
11. fire ecology	
12. fire-dependent forests	
13. fire cycles	

14. fire regimes
15. fire suppression policy
16. forest regeneration
17. forest restoration
18. forest stewardship
19. forest sustainability
20. grasslands
21. Healthy Forest Initiative
22. low-intensity surface fires
23. natural resources
24. nutrient, energy, and water cycles
25. prescribed or controlled burns
26. Pulaski fire-fighting tool
27. resilience
28. Santa Ana winds
29. stasis

30. strategic and tactical

31. plant or forest succession

32. old-growth forests

33. climax forest

34. volatile fuels

35. fuel loads

36. wildland-urban interface

Vocabulary Answer Key

Biogeography is the study of the geographical patterns of plant and animal species.

Biomass is the amount of living matter in a given habitat.

A **biome** is often referred to as a global-scale community of plants and animals and is the largest subdivision of the biosphere. A biome may contain many different kinds of smaller ecosystems. Biomes are typically distinguished on the basis of the characteristics of their vegetation because it makes up the largest portion of biomass.

It's a term that carries a heavy political load in the debates about how to manage a forest after fire has swept through. In ecological terms, a **catastrophic fire** would have to bring a drastic change akin to the eruption of Mount St. Helens in Washington in 1980. Such a change would push an ecosystem to a point that it can't recover. The report, "The Myth of Catastrophic Wildfire: A New Ecological Paradigm of Forest Health", authored by Chad Hanson of the John Muir Project, is a comprehensive synthesis of the scientific evidence regarding wildland fire and its relationship to biodiversity and climate change in western U.S. forests. It stands many previously held assumptions on their heads, including the assumptions that forest fires burn mostly at high intensity (where most trees are killed), and that fires are getting more intense, as well as the assumption that high-intensity fire areas are ecologically damaged or harmed. The report finds that the scientific evidence contradicts these popular notions.

Chaparral is a semi-arid, shrub dominated association of woody plants shaped by summer drought, mild, wet winters, and infrequent fires (with natural intervals between fires being 30 to 150 years plus). Chaparral is California's most extensive, native plant community. It is also the state's most characteristic wilderness, dominating foothills and mountain slopes from the Rogue River Valley in southern Oregon to the San Pedro Martir in Baja California.

Perennial grasses are plants with narrow leaves and live for multiple years. They are an extremely volatile fuel in May, June, and July, which can lead to large, fast fires.

Lodgepole pine is a highly adaptable tree that can grow in all sorts of environments, from water-logged bogs to dry sandy soils. It is common in western North America growing from mid elevation to subalpine sites. Lodgepole pine is one of the first trees to invade after a wildfire. Its cones are protected by a seal of pitch that requires fire or heat to release the seeds. This allows seeds to stay on the tree or on the ground for many years until disturbance provides suitable growing conditions.

***P*onderosa pine** are also called bull pine, blackjack pine, or western yellow pine. It is a very large pine tree of variable habit native to western North America, but widespread throughout the temperate world. The fire cycle for ponderosa pines is five to 10 years, in which a natural ignition sparks a low-intensity fire. Forests of ponderosa pine cover many of the higher mesas and mountains of the Colorado Plateau from 6000 feet to about 8000 feet in elevation. On higher terrain above 6500 feet in the southern part of the region, including the Kaibab Plateau and atop the Mogollon Rim, ponderosa pine often forms nearly pure stands covering tens of thousands of acres. The forest stretching from near Flagstaff along the rim to the White Mountains region is the largest ponderosa pine forest on the continent.

Clear cutting forests is a harvesting technique that removes all trees, regardless of size, in one operation. In Pennsylvania, a clearcut can be an effective tool to regenerate a new forest of shade intolerant species like black cherry, aspen or yellow poplar. Clear cutting is often a controversial issue. (deforestation)

A **crown fire** is when fire burns and spreads through the crown or canopy of trees. The influence of wind is greater in the tree canopy and where this canopy is interconnected.

Low-intensity fires are in the long run, beneficial to maintaining a healthy forest. In fact, many Arizona tree species and plant communities evolved with low-intensity fire as part of the natural system. These fires clear out the underbrush, thin out young trees that may be too numerous, and reduce the amount of fuel accumulating on the forest floor, thereby lessening the chance of future high intensity wildfires

Surface fires are low to high intensity fires that burn on the surface of the ground. The tree canopy may be scorched but does not burn to the extent that it will carry a fire. A **ground fire** can occur in any conditions and is where peat, coal, tree roots or other materials ignite and burn under the ground. Ground fires can burn through to the surface and become surface fires.

An **ecosystem** includes living things, such as plants and animals, and things that are not living, such as rocks, soil, sunlight, and water. There are two kinds of ecosystems, aquatic and terrestrial. An ecosystem is comprised of habitats, biological communities, and ecotones.

Ecology is the study of the interactions among organisms.

Fire ecology probes the relationship of fire with living organisms and their environment. Three concepts provide the basis for fire ecology. Nature doesn't waste anything. Burned forests, especially severely burned forests, are forests that have been "restored." The burned trees are essential for maintaining an important part of the biological diversity and are the foundation for the forests of the future.

Fire-dependent forests – In the 1930's, researchers in the southern United States argued against the negative perspective that has surrounded fire, with the belief that all fire is bad. These researchers recognized that there are species of plants that rely upon the effects of fire to make the environment more hospitable for regeneration and growth. Fire in these environments prepares the soil for seeding by creating an open seedbed, making nutrients more available for uptake and often killing plants that are invading into the habitat and competing with native species.

Fire regime refers to the patterns of fire that occur over long periods of time and the effects of fire in the ecosystem in which it occurs.

By definition **fire suppression** is simply the act of putting out a wildland fire using safe and efficient methods.

Forest regeneration is the act of renewing tree cover by establishing young trees, generally promptly after the previous stand or forest has been removed. Many of the accepted forest regeneration concepts were first introduced to North America by German forestry professors during the late 19th Century. Germany had practiced these forest reproduction schemes for centuries and one of the earliest books on the subject was written by German forestry pioneer

Heinrich Cotta during the late 17th century.

Forest restoration is a complex task, complicated by diverse ecological and social conditions, that challenges our understanding of forest ecosystems. The term restoration is used indiscriminately and it is difficult to define in a way that encompasses all situations found in the literature and practice. Generally, restoration is seen as symmetric with degradation: an undisturbed forest in a natural or historical condition can be degraded, and a degraded forest can be restored to that natural or historical condition. Reality is often more complicated and the fully restored state is probably unattainable. Terminology, however, is not merely an academic issue; definitions related to forestry and restoration are used under several international conventions such as climate change and biodiversity where distinctions and nuance have important policy implications.

Forest stewardship is defined as active management of forests and related resources to keep these lands in a productive and healthy condition for present and future generations, and to increase the economic, environmental and social benefits of these lands.

One definition for **forest sustainability** comes from the British Columbia Forest Service - "Sustainability: A state or process that can be maintained indefinitely. The principles of sustainability integrate three closely interlined elements - the environment, the economy and the social system-into a system that can be maintained in a healthy state indefinitely.

Grassland biomes are large, rolling terrains of grasses, flowers and herbs. Grasses can survive fires because they grow from the bottom instead of the top. Their stems can grow again after being burned off.

The **Healthy Forests Initiative** (HFI) was launched in August, 2002 by President Bush with the intent to reduce the risks severe wildfires pose to people, communities, and the environment. The Healthy Forests Restoration Act (HFRA) of 2003 was passed as part of HFI administrative reforms and was the first major piece of forestry legislation affecting public lands since the 1970s.

Natural resources are naturally occurring substances that are considered valuable in their relatively unmodified (natural) form. A natural resource's value rests in the amount of the material available and the demand for it.

Prescribed or controlled burning is a technique used in forest management. Fire is a natural part of both forest and grassland ecology and controlled fire can be a tool for foresters. Controlled burning stimulates the germination of some desirable forest trees, thus renewing the forest. Some seeds, such as sequoia, remain dormant until fire breaks down the seed coating.

The famous **Pulaski firefighting tool** combines a cutting axe blade on one side and a trenching tool on the other end to combine two effective firefighting tools into one easy to carry tool. The tool was designed by US Forest Ranger Ed Pulaski but he never got a patent for the tool nor did he receive any compensation for his invention from the US Forest Service. The 1910 fires brought fame to Pulaski for saving his firefighting crew by guiding them to a mine tunnel as the forest fire overtook them and cut off all escape.

In ecology, **resilience** is the capacity of an ecosystem to respond to a disturbance by resisting damage and recovering quickly.

Santa Ana winds are dry and warm (often hot) winds in the Southern California area that blow in from the desert -- which includes the Great Basin of the western United States, incorporating Nevada and part of Utah. In addition to flowing downslope, Santa Ana winds tend to be channeled through passes and canyons, locally increasing their speed. Santa Ana conditions can exist at any time in which the Great Basin tends to be cooler than Southern California -- typically the September to March period. However, the winds garner the most attention around October because of unique aspects of Southern California climate which enhances fire danger in the autumn season. The fire threat never completely vanishes - especially during dry winters -- but it usually decreases as the winter wears on.

Stasis is a state in which a species exhibits little evolutionary change.

The easiest way to think about the difference between a **strategic** plan and a **tactical** plan is to think of strategy as what you want to do and tactics as how you'll do it.

Natural vegetation of a particular location evolves in a sequence of steps. The evolutionary process is known as **plant succession**.

Generally speaking**, old growth** means a forest that has not undergone any major unnatural changes (such as logging) for more than 100 to 150 years, contains young, mature and standing dead trees (snags) and provides a home for a diversity of wildlife species.

A **climax forest** is the result of a long period of plant succession. Climax forests usually exhibit a good deal of species diversity and thus are relatively stable systems.

Pitch pine, oak, and chaparral shrubs are extremely **volatile fuels** that burn with high intensity. Grassland fires tend to be less intense than pitch pine scrub oak fuels under similar weather conditions but burn quickly and respond quickly to changes in weather. Grassland fires travel at a high rate of speed and experience high intensity surface fire behavior.

Fuel loads are the mass of combustible materials available for a fire usually expressed as weight of fuel per unit area (20 tons per acre).

The **Wildland Urban Interface (WUI)**, defined as areas where homes are built near or among lands prone to wildland fire. The increase in the WUI threat has been steep because of continued development and exposure.

***The 1910 Fires* Worksheet** **Name**_____

1. What conditions or situations undoubtedly contributed to the devastating series of fires in 1910?

2. Describe the extent of damage and the impact created by the 1910 fires.

3. What was a possible result of the efforts by the Forest Service and its supporters to defend its reputation and mission and how did this contribute to the lack of an objective study of the wildfires for nearly nine decades?

4. Explain how or why the Forest Service policy (of attempting to quickly extinguish wildfires) get called into question by the fires of 1910. How did the disastrous fire season influence the policy of the Forest Service?

5. What was Ferdinand Silcox's plan for eliminating fire disasters?

6. Describe the contending or differing views following the fires of how wildfire should be viewed in the American landscape. Which of these views prevailed during the greater part of the 20th century?

7. Defend or negate Ferdinand Silcox's argument "of eliminating fires from the landscape."

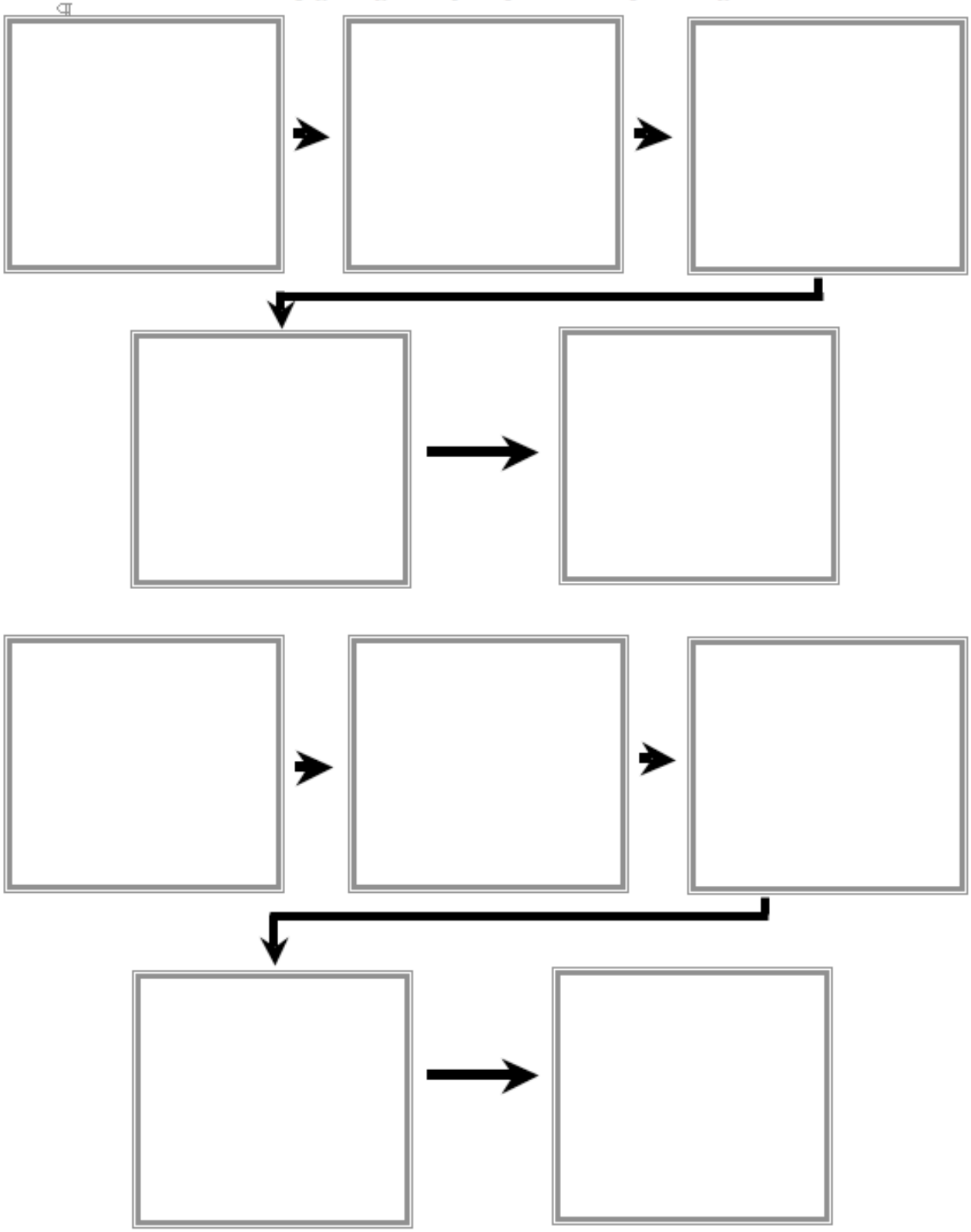
8. Describe the cooperative approach to fighting fires supported by Forest Service Chief Henry Graves and the impact on this approach of the 1911 Weeks Act.

9. Select, define, and explain by example, three vocabulary terms and/or concepts from this reading that were new to you.
   a.

   b.

   c.

Forest Firefighting Policy Sequence Graphic Organizer



Internet-based Resources

American Memory – Library of Congress – Map of US Territory Woodlands, released in 1873 based on 1870 census information.
http://memory.loc.gov/cgi-bin/map_item.pl?data=/home/www/data/gmd//gmd370m/g3701m/g3701gm/gct00008/ca000055.jp2&style=setlmap&itemLink=r?ammem/gmd:@field%28NUMBER+@band%28g3701gm+gct00008%29%29&title=Statistical+atlas+of+the+United+States+ht

American Forests - American Forests, the oldest national nonprofit conservation organization in the country, advocates for the protection and expansion of America's forests.
http://www.americanforests.org

The American Museum of Natural History – Drought and Wildfires
http://www.amnh.org/

ArcGIS
http://www.arcgis.com/home/index.html

Chaparral Facts
http://www.californiachaparral.com/chaparralfacts.html

The Clearcutting Controversy: Facts and Myths –Virginia Dept of Forestry
http://www.dof.virginia.gov/infopubs/Clearcutting-Facts-and-Myths-2014-05_pub.pdf

CLIMAS – University of Arizona Climate Assessment for the Southwest
https://www.climas.arizona.edu/

Ecological Restoration Center - The mission of ERI is to serve as an objective leader in research, scholarship, and education, and in collaborative efforts to plan and implement restoration treatments for frequent-fire forest and woodland landscapes of the Interior West.
http://nau.edu/ERI/

Ecological Succession
https://en.wikipedia.org/wiki/Ecological_succession

EcoTrust
http://www.ecotrust.org/

The Environment Directory
http://www.webdirectory.com/

Esri Public Information Map - View an interactive map of US wildfire locations, perimeters, fire potential areas, global burn areas, wind conditions, and precipitation via streaming data from NIFC, GeoMAC, NHSS, MODIS, METAR/TAF, and the USDA Forest Service, Fire Modeling Institute.
http://www.esri.com/services/disaster-response/wildlandfire/latest-news-map

Federal Legislation – Selected websites
Weeks Act: http://whitemountainhistory.org/Weeks_Act.html

White Mountain National Forest: http://whitemountainhistory.org/Logging_Railroads.html

Clark-McNary Act: http://www.foresthistory.org/ASPNET/Publications/region/9/history/chap3.aspx

Active Fire Maps
https://fsapps.nwcg.gov/afm/

Fire Ecology
http://www.fs.fed.us/database/feis/plants/tree/pinponp/all.html#FIRE%20ECOLOGY
http://www.pacificbio.org/initiatives/fire/fire_ecology.html

Fire in a Changing Climate
http://www.nasa.gov/pdf/710932main_AGU2012_Firebriefing_2.pdf

Fire in the Forest - What Impact?
http://whyfiles.org/2011/wildfire-2/

Firewise Communities - Updated map
https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Firewise-USA/Firewise-USA-Resources/Firewise-USA-sites

Florida Forest Service
http://www.floridaforestservice.com/

Forest Fire in the American Southwest: Putting the Pieces Together – Due to lack of funding, this website is no longer updated, but it still contains a wealth of information.
http://forestfire.nau.edu/index.htm

The Forest Foundation – Downloadable Material for Teachers and Students
http://www.calforestfoundation.org/

Forest Health - Modern loggers look at forest's health
https://www.fs.fed.us/foresthealth/protecting-forest/forest-health-monitoring/

The Forest History Society – A rich source of many great articles and history about American forests and fire.
http://www.foresthistory.org

When the Mountains Roared: Stories of the 1910 Fires – https://foresthistory.org/wp-content/uploads/2017/01/When-the-Mountains-Roared.pdf

GeoMAC Wildland Fire Support - The Geospatial Multi-Agency Coordination Group or GeoMAC, is an internet-based mapping application originally designed for fire managers to access online maps of current fire locations and perimeters in the conterminous 48 States and Alaska. Using a standard web browser, fire personnel can view this information to pinpoint the affected areas. With the growing concern of western wildland fires in the summer of 2000, this application also became available to the public. http://www.geomac.gov/index.shtml

Gifford Pinchot - father of U.S. Forest Service; history available at The Daily News Online
http://tdn.com/lifestyles/gifford-pinchot-was-father-of-u-s-forest-service/article_bba03335-149a-5611-bbe4-392d0ac62eec.html#.UbEzh3xTFCA.email

Goddard Space Flight Center – Scientific Visualization Studio: Fire Observations
http://svs.gsfc.nasa.gov/vis/a000000/a003500/a003597/

Grasslands and Prairies
http://www.blueplanetbiomes.org/grasslands.htm
http://www.blueplanetbiomes.org/prairie.htm

Great 1910 Fire of Idaho, Montana and Washington Website – an incredible collection of primary source documents and maps from the time period.
http://www.1910fire.com/

Greater Yellowstone Science Learning Center
http://www.greateryellowstonescience.org/

Griffith Park Fire – 1933
http://lafire.com/famous_fires/1933-1003_GriffithParkFire/1933-1003_GriffithParkFire.htm

How a Fire Behaves – Victorian Department of Natural Resources and Environment
http://www.environment.nsw.gov.au/fire/howafirebehaves.htm

John Muir Project
http://www.johnmuirproject.org/

Link to NY Times footage of Black Forest Fire
http://nyti.ms/14FUdSI

Mann Gulch Fire of 1949
http://nationalhumanitiescenter.org/tserve/nattrans/ntuseland/essays/frmaclean.htm
https://foresthistory.org/research-explore/us-forest-service-history/policy-and-law/fire-u-s-forest-service/famous-fires/mann-gulch-fire-1949/

NASA
http://www.nasa.gov/mission_pages/fires/main/index.html#.UeRpNVOGGaw

National Archives
http://docsteach.org/resources
http://www.archives.gov/education/

National Atlas – small scale maps
https://nationalmap.gov/small_scale/

National Environmental Policy Act
http://www.epa.gov/compliance/nepa/

National Geophysical Data Center - Wildland fires are the fastest growing fire threat.
http://www.ngdc.noaa.gov/hazard/wildfire.shtml

National Humanities Center – The Use of the Land: Perspectives on Stewardship
http://nationalhumanitiescenter.org/tserve/nattrans/ntuseland/uselinksfire.htm#policy

National Interagency Coordination Center
http://www.predictiveservices.nifc.gov/outlooks/outlooks.htm
http://www.nifc.gov/fireInfo/fireInfo_stats_lightng.html

NOVA Online: Fire Wars

http://www.pbs.org/wgbh/nova/fire/

Photos of western states reporting stations
http://www.raws.dri.edu/photos/Arizona.html

RAWS: USA Climate Archive - There are nearly 2,200 interagency Remote Automatic Weather Stations (RAWS) strategically located throughout the United States. These stations monitor the weather and provide weather data that assists land management agencies with a variety of projects such as monitoring air quality, rating fire danger, and providing information for research application.
http://www.raws.dri.edu/

Smokey the Bear
http://www.smokeybear.com/

U.S. Forest Service - The Forest Service is the largest forestry research organization in the world. Forest Service scientists in research stations and fire labs across the country conduct leading research in many fields of wildland fire science including social and economic dimensions; atmospheric science; hazardous fuels reduction; ecosystem restoration; and fire ecology, behavior, and chemistry. Forest Service research has direct application to the safe and effective management of wildland fire and helps inform policy makers, citizens, and partners.
http://www.fs.fed.us/fire/science/index.html

U.S. Forest Service Ecological Restoration Animation
http://www.fs.usda.gov/detail/r5/news-events/audiovisual/?cid=stelprdb5362010

U.S. Forest Service Timeline of Fire Policy
http://www.nps.gov/fire/wildland-fire/learning-center/fireside-chats/history-timeline/policy-and-law.cfm

U.S. Forest Service Southwestern Region – Great source for maps, photos, history, other primary source documents from the American Southwest.
http://www.fs.usda.gov/r3

Wildland Fire Assessment Program – Good source of high-definition maps for research
http://www.wfas.net/

Woods Hole Research Center - Scientists at the Woods Hole Research Center have produced a high-resolution "National Biomass and Carbon Dataset for the year 2000" (NBCD2000), the first ever spatially explicit inventory of its kind. - http://www.whrc.org/mapping/nbcd/