North Dakota Forest Action Plan

Thomas Claeys, State Forester
NDSU-North Dakota Forest Service
916 E. Interstate Ave., Suite 4
Bismarck, ND 58503

May, 2020

Introduction

Forest action plans were integral to the state and private forestry (S&PF) redesign and were required as an amendment to the Cooperative Forestry Assistance Act (CFAA) as enacted in the 2008 farm bill. Forest action plans serve as a strategic framework to outline priority forest resources, designate important issues, and identify strategies to address challenges and opportunities. State forest action plans (FAP) are intended to ensure that federal and state resources are being focused on important landscape areas, with the greatest opportunity to address shared management priorities and achieve measurable outcomes.

North Dakota's forest action plan provides a long-term, comprehensive, coordinated strategy for leveraging state, federal and partner resources to address the management and landscape priorities identified. North Dakota's identified priorities align with the following national themes and associated management objectives:

- **Conserve working forestlands:** conserving and managing working forest landscapes for multiple values and uses
- **Protect forests from harm:** protect forests from threats, including catastrophic storms, flooding, insect or disease outbreaks, and invasive species
- **Enhance public benefits from trees and forests:** including air and water quality, soil conservation, biological diversity, carbon storage, forest products, forestry-related jobs, production of renewable energy and wildlife

The plan was developed through partner and stakeholder input, incorporation of existing statewide management plans, and data derived from the best geospatial data available.

The forest action plan consists of two primary components:

1. **Statewide assessment of forest resources** — provides an analysis of forest conditions and trends in the state, delineates priority rural and urban forest landscape areas, and identifies priority issues
2. **Forest resource strategy** — provides long-term strategies for investing state, federal and other resources to manage priority landscapes identified in the assessment, focusing where federal investment can most effectively stimulate or leverage desired action and engage multiple partners

Statewide Assessment of Forest Resources

The statewide assessment of forest resources provides a detailed account of the forest resources of North Dakota, an assessment of forest conditions and trends, and an analysis of challenges and threats to forest resources, and delineates priority forest resources in the state.

Section 1. Forest and Tree Resources of North Dakota

North Dakota is characterized as a prairie state due to the topography, soils and climate that promote perennial grasses and forbs, and limit the natural succession to forestland. Soil formations derived from prehistoric glaciation (Figure 1) and low annual precipitation (Figure 2) limit the natural distribution of native forests and present logistical challenges to community and conservation tree planting efforts.

Despite these physiographic challenges for trees and forests, several diverse and unique forest resources persist in the state. Forest and tree resources found in North Dakota include upland forests, riparian forests, conservation plantings and community forests.

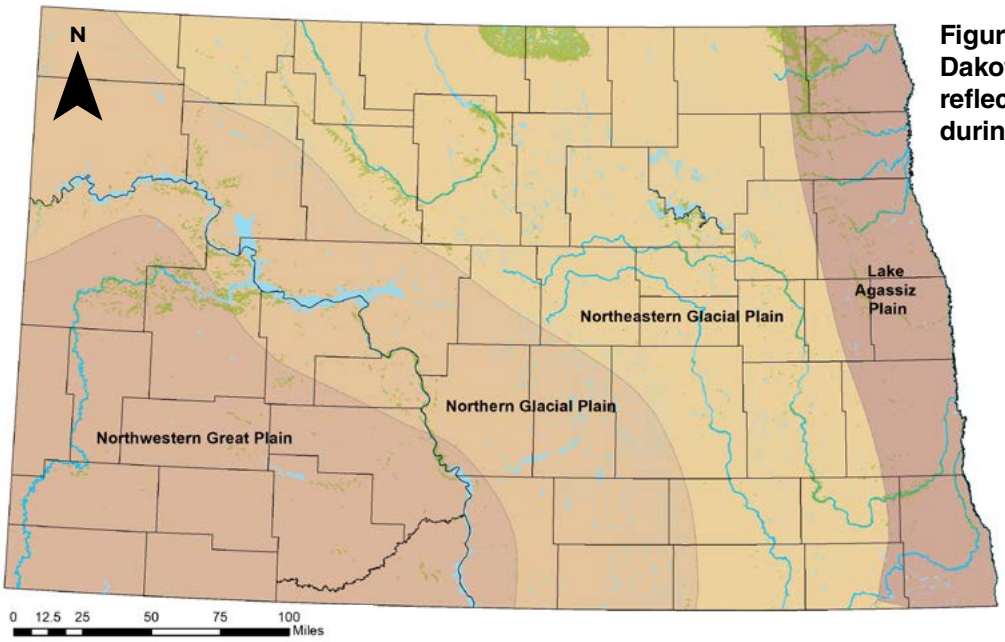


Figure 1. Ecoregions of North Dakota. The current landscape reflects glaciation that occurred during the Pleistocene era.

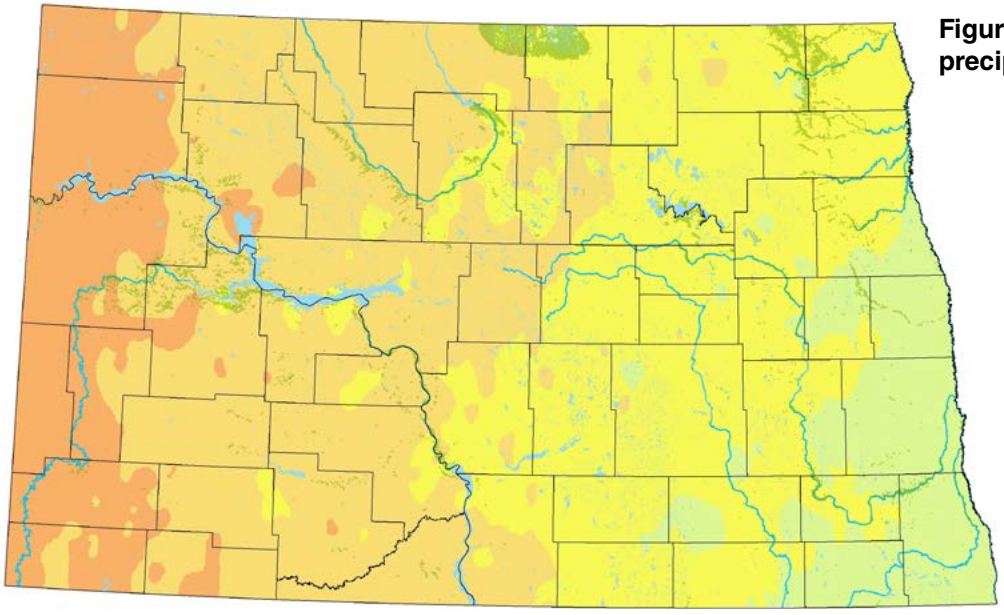


Figure 2. Average annual precipitation (inches) 1980 – 2010

Cartographer:
Michael Kangas, ND Forest Service
Source: NDGIS Hub, NRCS
North Dakota state agencies and the NDGIS Hub

Upland forests (including deciduous and coniferous forests and wooded shrublands) and riparian forests encompass 815,000 acres, or 1.8% of the total land area (Paulson, 2018). Eastern deciduous forest types and western coniferous forest types are found in North Dakota. Deciduous forest types comprise approximately 72% of the state's forestland (Figure 3).

Conservation tree plantings account for hundreds of thousands of acres of additional forest resources. Conservation tree plantings include farmstead windbreaks, living snow fences, wildlife plantings and field windbreaks. An estimated 30,000 linear miles of field windbreaks can be found in the state (Kangas, 2016).

Community forests include boulevard trees, trees planted in city parks and trees that naturally occur in city limits or public rights of way. Community forests are important infrastructure of the state's 387 communities, and represent 629 square miles (400,640 acres – U.S. Census 2010).

Upland and riparian forests, conservation tree plantings and community forests provide numerous ecological, social and economic benefits to North Dakota.

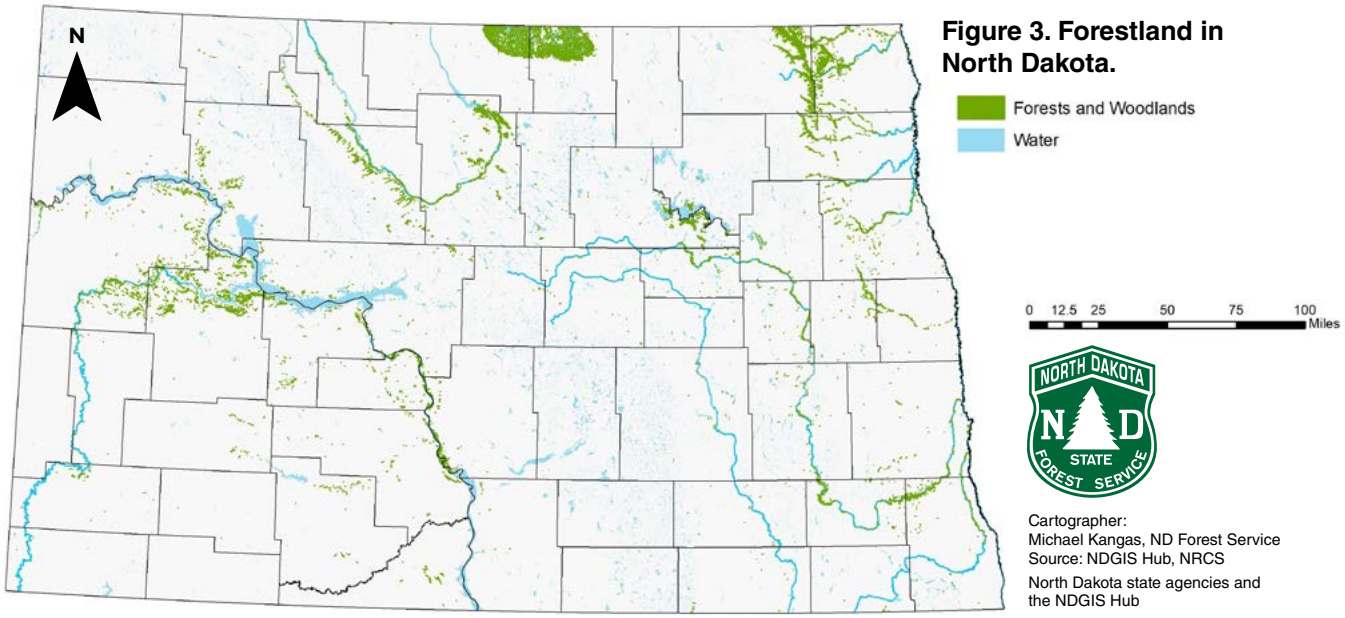


Figure 3. Forestland in North Dakota.

Upland Forests

Upland forests can be found throughout the state but are most prevalent in the eastern half and northern areas of the state. The majority of these forests consist of deciduous species, most notably aspen/birch (*Populus tremuloides*/*Betula papyrifera*) and bur oak (*Quercus macrocarpa*).

Forest types are categorized by the dominance of one or a few tree species, although numerous species may comprise each forest type. Bur oak and aspen/birch forests are common in the Turtle Mountain region, the Devils Lake Hills and the Pembina Gorge (Figure 3).

Pinyon/juniper forest types represent 28% of the state's forestland. Isolated stands consisting of ponderosa pine (*Pinus ponderosa*) and limber pine (*Pinus flexilis*) are in the southwestern counties of the state. Although not considered forestland, woodlands of Rocky Mountain juniper (*Juniperous scopulorum*) can be found in the Badlands of western North Dakota.

Aspen woodlands in the Turtle Mountains.

Riparian Forests

A riparian zone is the area between a body of water and the adjacent upland terrestrial zone; it is identified by soil characteristics and distinctive vegetation that requires an excess of water. Generally, it consists of trees and shrubs, as well as understory vegetation that includes a variety of grasses and forbs. The elm/ash/cottonwood forest type is the most abundant of all forest types in North Dakota and occurs along rivers, lakes and streams.

In North Dakota, riparian forests often are associated with sites that have deep alluvial soils, which are present at the base of slopes and often are present in coulees that were formed by glaciation and water erosion. Thick layers of organic matter are common in the deep soils of these areas.

Species such as green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*) and basswood (*Tilia americana*) may dominate along the eastern rivers, while cottonwood (*Populus deltoides*), ash and boxelder may be more common in the western part of the state. Other associated species include American elm (*Ulmus americana*), hackberry (*Celtis occidentalis*), bur oak and willow (*Salix* spp.). Riparian shrub species include chokecherry (*Prunus virginiana*), gooseberry (*Ribes* spp.) and snowberry (*Symphoricarpos* spp.).

Conservation Tree Plantings

Conservation tree plantings generally refer to farmstead plantings, shelter belts, living snow fences, wildlife plantings, riparian buffer strips and others that are designed to achieve conservation, economic and societal goals.

North Dakota is largely a rural state with an economy that is deeply rooted in agriculture. North Dakota has a long history of tree planting efforts dating back to the Timber Culture Act of 1873. Early settlers planted trees to provide wind protection, fuel and food.

The Dust Bowl of the 1930s had far-reaching social, economic and environmental consequences, which accelerated tree planting programs. The most notable program was the Prairie States Forestry Project, which resulted in the planting of 217 million trees in the Great Plains. Tree planting efforts have continued throughout the state into present times.

Common species found in conservation tree plantings include green ash, Colorado blue spruce (*Picea pungens*), ponderosa pine, eastern redcedar (*Juniperus virginiana*), Rocky Mountain juniper, Siberian elm (*Ulmus pumila*), Siberian peashrub (*Caragana* arborescens) and cottonwood.

Shelter belts in central North Dakota.

Community Forests

Community forests include boulevard trees, trees planted in city parks and trees that naturally occur in city limits or public rights of way. The management of such tree resources may fall under the responsibility of city foresters, public works departments and/or community tree boards.

The community forest also includes trees that are planted on private or commercial properties. Common tree species found in residential communities include cultivars of elm (*Ulmus* spp.), linden (*Tilia* spp.), ash (*Fraxinus* spp.), oak (*Quercus* spp.), hackberry (*Celtis occidentalis*) and silver maple (*Acer saccharinum*).

Arbor Day is celebrated by many communities across the state each spring.

Section 2. Forest Conditions and Trends

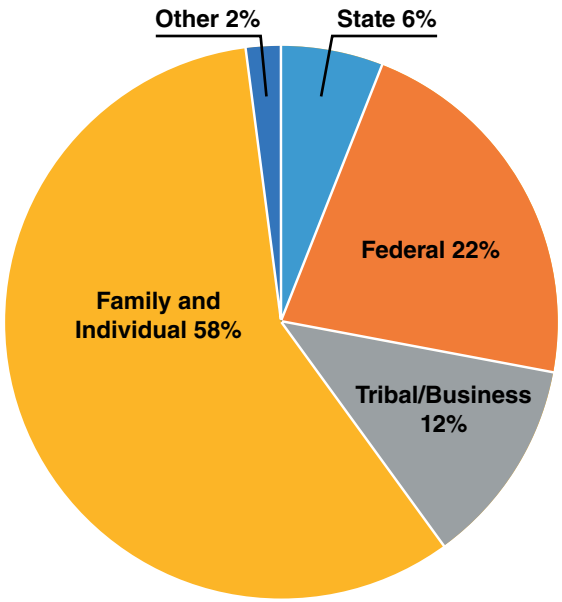
Native Forests

Native forests including upland and riparian forests encompass 815,000 acres, or 1.8% of North Dakota's total land area. Eastern deciduous forest types and western coniferous forest types are found in the state. Deciduous forest types comprise approximately 72% of the state's forestland (Paulson, 2018).

The majority of the forestland in North Dakota is owned by families and individuals or other private groups (for example, corporations, tribes); collectively, private owners possess 70% of the state's forestland (Haugen et al., 2009).

The scarcity and limited distribution of native forests in North Dakota underscore their importance as these resources confront growing pressures. The Forest Legacy[1] Area Nomination process identified several distinct upland and riparian forests as being threatened by conversion to nonforest.

Figure 4. Forest Ownership in North Dakota.



[1]The Forest Legacy Program is a U.S. Forest Service program. States that implement this program protect environmentally sensitive forestlands through conservation easements, legally binding agreements and transferring a negotiated set of property rights from one party to another without removing the property from private ownership. On April 3, 1995, northern regional forester David Jolly issued a letter terminating the Forest Legacy process in North Dakota because of a conflict identified during the creation of the "Assessment of Needs" between state and federal law related to the program. Federal law that created the program requires that conservation easements that are obtained under the program be held in perpetuity, but North Dakota law limits any easements obtained by the state from third parties to 99 years, at which time the easement is canceled and the property is returned to the landowner with no continuing restrictions. Because this conflict in laws, at the time, could not be corrected by the North Dakota Legislature or the federal government, regional forester Jolly issued the termination letter releasing North Dakota from the program. The feasibility of the Forest Legacy Program recently was re-evaluated, but to date, no lead agency has been identified.

Upland Forests

Despite their limited acreage, upland forests are important resources in North Dakota. These forests provide wildlife habitat and recreational opportunities, stabilize river banks, filter water runoff from adjacent agricultural lands, provide wood products, serve as seed sources for conservation tree production and increase the botanical diversity of the state. Woodlands and forests serve as important habitat for many species of animals, including birds, mammals, reptiles and amphibians (Hagen et al., 2005).

Upland forests provide numerous recreational opportunities, including hiking, camping, fishing, hunting, bird watching, cross-country skiing and snowmobiling. These are popular activities in the Turtle Mountains, Pembina Gorge, Devils Lake Hills and Sheyenne River Valley. These "outdoor laboratories" are critical for teaching future generations about nature and conservation.

Quaking aspen in the Turtle Mountain region of North Dakota.

Aspen and Oak Forests

Nearly 27% of North Dakota's timberland (a subset of "forestland" based on growth potential) is classified as the aspen/birch forest type (Haugen et al., 1999). The majority of this forest type is in the Turtle Mountain region and represents the state's largest concentration of forestland.

Aspen forests also can be found in the Pembina Gorge, Mouse River sandhills, Badlands of western North Dakota, Killdeer Mountains and Sheyenne River Valley. Quaking aspen is the dominant species in these stands; however, paper birch, bur oak and green ash also are common on these sites.

A significant portion of this aspen resource can be characterized as decadent, with a high incidence of stem decay associated with stand overmaturity. In the absence of stand-replacing disturbances to encourage vigorous aspen regeneration, aspen stands age and deteriorate through time as the result of numerous inciting, predisposing and contributing factors. These may include frost injury, drought, hail damage, windstorms and several forest pests.

Defoliating insects, wood-rotting fungi and canker diseases contribute to the deterioration of these aspen stands. Aspen forests are prone to periodic defoliation episodes caused by the forest tent caterpillar (*Malacosoma disstria*) and large aspen tortrix (*Choristoneura conflictana*). Defoliation reduces growth, predisposes trees to other damaging agents and exacerbates the senescence of aging aspen stands.

Internal decay of live aspen trees is common in mature aspen stands, particularly those more than 50 years of age. Stem decay caused by the fungus *Phellinus tremulae* reduces the amount of useable wood in a stand in addition to increasing the probability of stem breakage.

The wood volume loss due to this stem decay has been increasing as the aspen resource continues to age. Similarly, mortality of large-diameter trees due to Hypoxylon canker (*Hypoxylon mammatum*) contributes to the deterioration of older stands (Kangas, 2007).

The damage caused by these pests should not be perceived as "unnatural," but rather it reflects a shift of the disturbance regime. Without disturbance, whether by fire, harvesting or other means, to encourage vigorous aspen regeneration, pests and environmental factors deteriorate the aging aspen and give way to other species.

Throughout its western and eastern range, aspen is a pioneer species that often is succeeded (replaced) by shade-tolerant conifer species in the absence of disturbance. However, many aspen forests of the northern prairie regions of North America convert to shrubland where shade-tolerant conifers do not occur naturally (Perala ,1990; Harniss, 1981).

This successional scenario is apparent in some areas of the Turtle Mountains, where hazel (*Corylus* spp.) dominates the understory of deteriorating aspen stands and prevents the establishment of other tree species. During a 25-year period, the aspen forest type in the stand age category of zero to 20 years has decreased by more than 35,000 acres, while 60% of aspen stands in the state in 2005 were 40 years of age or older (Haugen et al., 2009).

Pine Forests

Pine forests occupy 6,000 acres in the southwestern region of North Dakota. Ponderosa pine is the most common species; however, a small stand of limber pine is in Slope County. Rocky Mountain juniper, a small tree, dominates much of the Badlands, occupying about 600,000 acres. The preponderance of Rocky Mountain juniper is largely the result of decades of fire suppression and is considered undesirable by many resource managers.

Many stands of the state's ponderosa pine are very dense and prone to pest damage. Damage caused by herbivory, pests and pathogens has been documented in the native ponderosa pine stands of southwestern North Dakota. Animal damage caused by deer and porcupines is very common.

Shoot death and branch dieback caused by Western gall rust (*Endocronartium harknessii*), diplodia shoot blight and canker (*Diplodia pinea*), and pine pitch nodule maker (*Retinia metallica*) are encountered commonly. Such damage may incite tree mortality if conditions favor repeated infections/infestations for several years.

Pine weakened by these pests and other factors are more prone to colonization by pine engraver beetles (*Ips pini*) or turpentine beetles (*Dendroctonus valens*). Despite the presence of pests, these isolated pine stands are quite resilient and the level of tree mortality has remained low.

Perhaps the greatest concern in these areas has been wildfire. Such concerns were realized as a prairie fire (designated as the Deep Creek Fire) spread into portions of the native ponderosa pine stands of Slope County in September 2004. The fire occurred in an area of heavily overstocked ponderosa pine with heavy fine fuels and excessive ladder fuels.

These factors, coupled with unfavorable weather conditions, led to extreme fire behavior. A sustained crown fire threatened property and lives.

High stand densities persist in other pine stands in southwestern North Dakota due to years of fire suppression. Thinning, coupled with prescribed fire, would benefit this resource and create a healthier, fire-resistant, natural stand condition.

Riparian Forests

Riparian forests provide many environmental and social benefits. Trees and woody plants along watercourses help control soil erosion and filter agricultural chemicals from reaching rivers. In addition, riparian forests provide recreational opportunities and provide habitat for numerous wildlife species. The two most prominent riparian forest types found in North Dakota are elm/ash forests and cottonwood forests.

Riparian forests along the Red River of the North in eastern North Dakota.

Elm/Ash Riparian Forests

The elm/ash forest type is the most abundant of all native forestland and is common along rivers throughout the state. These forests have experienced significant alterations in the past decades due to Dutch elm disease (*Ophiostoma ulmi* and *O. novo-ulmi*), overgrazing, altered water flows and conversion to nonforest.

Since the first detection of Dutch elm disease in 1969, the disease has spread throughout North Dakota. The American elm was a major component of the state's riparian forests and occupied a wide range of sites. Dutch elm disease spread aggressively and decimated the elm population that once comprised a large portion of the riparian forests along the Red, James, Sheyenne and Pembina rivers. In addition, the disease continues to kill elms that occur in the wooded draws of western North Dakota.

Although the American elm has not been eliminated entirely from these forests, the species primarily persists as a small understory tree, occupies a small proportion of the total stand basal area and often succumbs to mortality prior to reaching maturity. The loss of American elm dominance in these systems has shifted the species composition toward green ash, boxelder and other species. The dominance of ash in riparian forests is a major concern to resource managers because the emerald ash borer (*Agrilus planipennis*) continues to spread throughout the Midwest.

In addition to the impacts of invasive tree pests, many riparian forests have been converted to nonforest through agricultural and residential development, particularly along the rivers of eastern North Dakota. The Forest Legacy Area Nomination process identified the lower Sheyenne River from Highway 46 to the confluence of the Red River as one of the riparian forest areas most threatened by conversion to nonforest.

Riparian forests are impaired further by damaging factors such as overgrazing and water flow alterations that gradually have reduced the vigor of existing trees and destroyed understory woody vegetation. Such forest changes and conversions adjacent to watercourses have important implications for water quality, flood control, wildlife habitat and recreation opportunities.

Cottonwood Riparian Forests

The cottonwood forests that occur in the Missouri River flood plain are in poor condition that has resulted from progressive mortality of mature trees and the absence of natural regeneration to replace those that have died. Prior to flood mitigation, the Missouri flood plain experienced periodic inundation as high spring water flows deposited sand in low-lying areas.

These moist sandbars serve as seedbeds for cottonwood and are critical for natural regeneration of the species (Burns et al., 1990). This historical disturbance regime of periodic flooding drove the succession, distribution and age class structure of cottonwood forests along the flood plain (Ball, 1997).

In the absence of flooding and subsequent sandbar formation, the sustainability of cottonwood forests is questionable because recruitment of cottonwood seedlings is limited to replace the overmature trees that are in a state of senescence. Consequently, the flood plain that once persisted as a fluctuating mosaic of backwater wetlands, sandbars and cottonwood forests now exists as a xeric, fire-prone flood plain bisected by a channelized river. The cottonwood component of the Missouri flood plain eventually may die out and give way to other tree species (native and non-native) with the exception of a few isolated sites adjacent to the ever-deepening river channel.

Fall colors being displayed by a Missouri River cottonwood.

In 1980, an estimated 66,000 acres were in the cottonwood forest type; by 2005, that had dropped to 55,000 acres, a decrease of approximately 20% (Haugen et al., 2009). During a 25-year period, the cottonwood forest type in the stand age category of zero to 20 years dropped to zero acres.

Across all forest types in the state, the number of cottonwood saplings in the 1- to 2.9-inch-diameter range is zero and only 445,000 saplings were in the 3- to 4.9-inch-diameter range from 1994 to 2005 (Haugen et al., 2009). These estimates illustrate the lack of cottonwood regeneration in the state. If these trends persist across the state, the area and the number of cottonwood trees growing in the state will continue to decrease.

Conservation Tree Plantings

Conservation tree plantings generally refer to farmstead plantings, shelterbelts, living snow fences, wildlife plantings and others that are designed to achieve conservation, economic and societal goals. These resources are an important component of many agricultural systems and can improve rural life in the northern Plains.

For example, field windbreaks reduce soil erosion during years of drought, reduce water evaporation from adjacent cropland and increase crop yields. Similarly, some plantings are designed to stabilize streambanks, filter water runoff from adjacent agricultural lands, provide wildlife habitat, protect stretches of highway prone to severe snow accumulation, provide wind protection for livestock or protect farmsteads and rural homes from snow and wind.

Although many rural tree plantings occur in areas where the historical vegetation type was prairie, these resources are critical for the present needs of rural residents who live in the current agricultural landscape. According to a geospatial evaluation, North Dakota has an estimated 29,784 linear miles of field windbreaks alone (Kangas, 2016). Countless additional acres/miles of trees have been established across the landscape in the form of farmstead plantings, living snow fences, livestock protection plantings, wildlife plantings and riparian buffer strips.

Living snow fences protect rural homes and stretches of highway from blizzards.

Tree plantings of the northern Plains are exposed to numerous pests and environmental conditions that hinder planting success, reduce their effectiveness and limit long-term survival. Deterioration of tree plantings often is incited by drought, flooding, frosts, inadequate spacing, weed competition, herbicide exposure, defoliating insects and foliar diseases. As trees become weakened, canker diseases and wood-boring insects may cause further damage to these plantings.

Lack of species diversity is an underlying factor in the decline of many rural plantings. Plantings composed of one or few species often experience episodes of abrupt decline simply because all trees are vulnerable to the same damaging factors. Similarly, these plantings are more susceptible to pest outbreaks in comparison with those that consist of several different (or nonhost) species.

Some examples include the decline of single-row Siberian elm (*Ulmus pumila*) field windbreaks due to herbicide exposure, marginal cold hardiness and canker diseases; the decline of Colorado blue spruce (*Picea pungens*) plantings due to yellowheaded spruce sawfly (*Pikonema alaskensis*), needlecasts (*Rhizosphaera spp. and Stigmina spp.*) and valsa (formerly cytospora) canker (*Leucostoma kunzei*). The impacts of these damaging factors could have been greatly reduced had additional species been incorporated into these plantings.

The damage to rural plantings caused by these cumulative factors are prevented more effectively than treated. Incorporating various weed control techniques, manipulating planting density and arrangement, and selecting species most suitable for the site have been effective to achieve greater longevity and utility of rural tree plantings.

In recent years, state, federal and university forestry/tree care professionals have promoted species diversification in an attempt to avoid past experiences in tree planting decline. In practice, these techniques greatly enhanced the effectiveness of rural plantings.

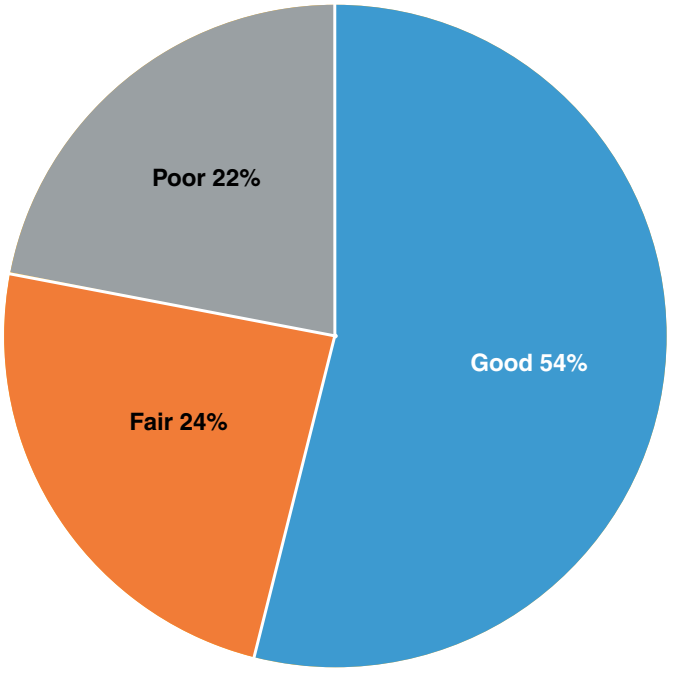
Research focusing on the identification of species and seed sources that perform well in the northern Plains is still a critical need for conservation tree planting efforts. The number of suitable native species for the northern Plains is relatively limited in comparison with more forested regions of the country. Therefore, the loss of a single species due to the introduction of invasive pests or other factors is magnified and further limits tree planting options and diversification efforts.

The removal of windbreaks has been a growing concern during the past decade. Following the dust bowl of the 1930s, field windbreaks were planted extensively throughout the Great Plains to reduce soil erosion on adjacent agricultural lands. The trend continued into the 1970s.

Many of these resources have begun to deteriorate due to lack of maintenance and old age (Figure 5). In recent decades, farming practices and the equipment used has changed dramatically. The cumulative effect of larger equipment, windbreak deterioration, fluctuating commodity prices and changing perspectives of windbreaks' value has directed the removal of many conservation tree plantings.

An estimated 1,128 linear miles of field windbreaks were removed between 2010 and 2015 (Kangas, 2016). The continued loss of windbreaks has negative implications for soil erosion control and winter wildlife habitat. Dust storm events associated with recent open winters have drawn renewed awareness of this issue.

Figure 5. Only 54% of windbreaks surveyed were classified as in "good" condition. (Johnson 2020)



Community Forests

Community forests provides many benefits. Green infrastructure can reduce energy expenses by reducing summer cooling costs and winter heating costs. Trees increase the aesthetic appeal of residential environments. Trees also can improve air quality, reduce storm water runoff and add to property values of homes. Vibrant, diverse community forests have been associated with enhanced human health and overall well-being.

The green infrastructure also is a source of employment as arborists and foresters are employed to maintain this resource. A survey of 108 North Dakota community forests revealed an estimated annual economic benefit of $31,292 per community (North Dakota Forest Service 2020).

Trees that are planted in residential areas are exposed to insects, diseases and environmental stresses. Commonly observed forest pests in residential areas include various defoliating insects, piercing insects, wood-boring insects, foliar diseases and canker diseases. In addition, abiotic stressors such as compacted soils, turf herbicides, lack of (or too much) watering, nutrient deficiency and mechanical injuries often exacerbate the damage caused by insects and disease.

Despite the copious environmental stresses and pests, Dutch elm disease continues to be one of the most prominent damaging factors of community tree resources. This disease has eliminated many of the stately elms that once graced North Dakota communities.

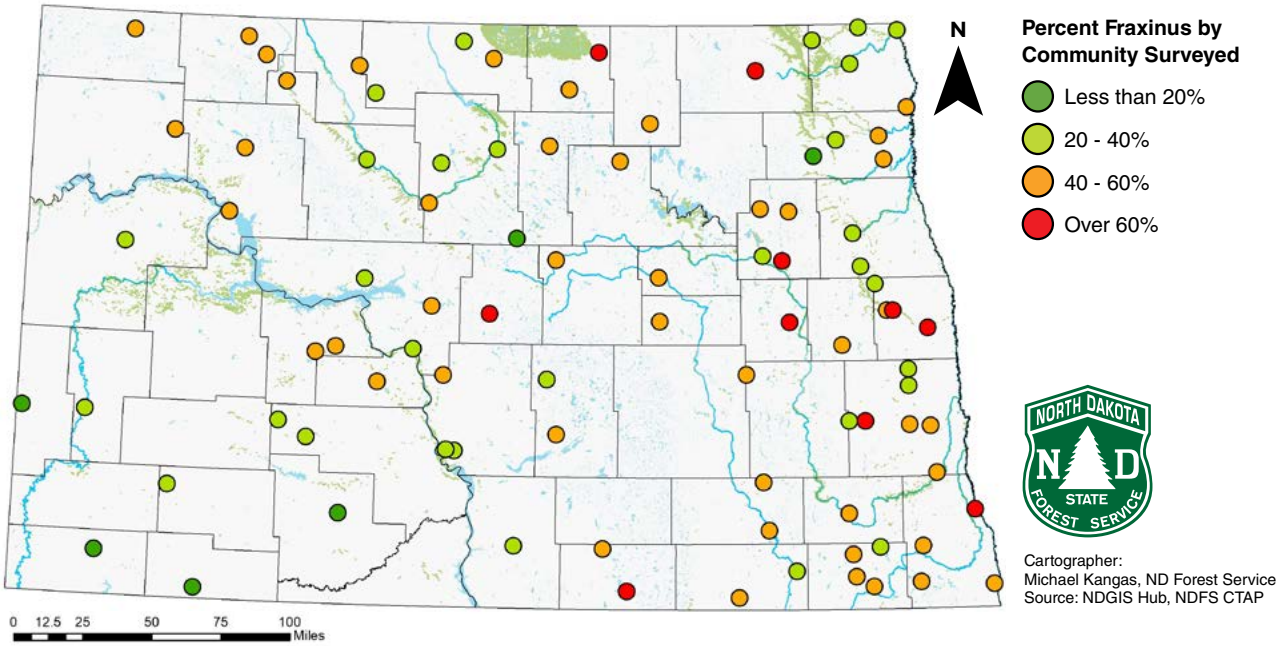
Several of the larger cities have developed management programs to combat Dutch elm disease with notable success. However, smaller communities that lack the resources to support a forestry program have been and continue to be severely impacted by this disease.

Ash and cultivated varieties of the species were the most common replacements for dying elm trees following Dutch elm disease. As a result, many community forests that once were dominated by elm now are dominated by ash. Although ash performs well on a variety of sites and conditions, the overabundance of this species has raised concerns since the discovery and spread of the emerald ash borer in adjacent states and provinces.

Many North Dakota communities have realized that their community tree resources are susceptible to another episode of tree mortality once emerald ash borer spreads into North Dakota (Figure 6). As a result, many communities are beginning to embrace the concept of species diversification in their respective community forests. This awareness has driven many communities to conduct inventories, prioritize removals and identify alternative species to plant.

Rural communities such as Stanton, N.D., receive numerous benefits from community tree resources.

Figure 6. Vulnerability of surveyed North Dakota communities to emerald ash borer.



Section 3. Challenges and Threats to Forest Resources

The following narratives describe challenges and threats to resources identified by North Dakota Forest Service (NDFS) forestry personnel, natural resource professionals and stakeholders. These threats are intended to align the state and private forestry national objectives of conserving working forestlands, protecting forests from harm, and enhancing public benefits from trees and forests.

Invasive Tree Pests

Invasive tree pests (exotic or non-native tree insects and pathogens) are perhaps the greatest threat to forests, shade trees and woody ornamentals in the U.S. Non-native insects and pathogens such as the Gypsy moth (*Lymantria dispar*), Dutch elm disease fungus and chestnut blight (*Cryphonectria parasitica*) have impacted ecological, cultural and economic resources throughout the U.S. More recently, invasive pest detections such as the emerald ash borer, Japanese beetle **(***Popillia japonica*) and Ramorum blight (*Phytophthora ramorum*) pathogen in the U.S. have raised great concerns among foresters, scientists, arborists and nursery personnel.

North Dakota, too, has felt the impact of invasive tree pests. Since 1969, Dutch elm disease has spread throughout the native forests, rural plantings and community tree resources of the state. This invasive pathogen has altered riparian forests, decimated field windbreaks and eliminated many boulevard trees in communities.

The **emerald ash borer** is a prominent threat to North Dakota's tree and forest resources. According to U.S. Forest Service Forest Inventory and Analysis data, North Dakota has an estimated 90 million ash trees in its woodlands, upland forests and riparian forests (Paulson, 2018).

Green ash is a dominant species in the state's riparian forests, occupying as much as 70% of the total canopy composition. An estimated 26% of North Dakota's windbreaks consist of ash (Johnson, 2020). Ash is the most common tree planted in North Dakota communities, representing approximately 42% of the state's community tree resource (Figure 7) (NDFS 2020).

Ash-lined street in Michigan before (top) and after (bottom) the arrival of emerald ash borer. (photo courtesy of Bioforest Technologies Inc.)

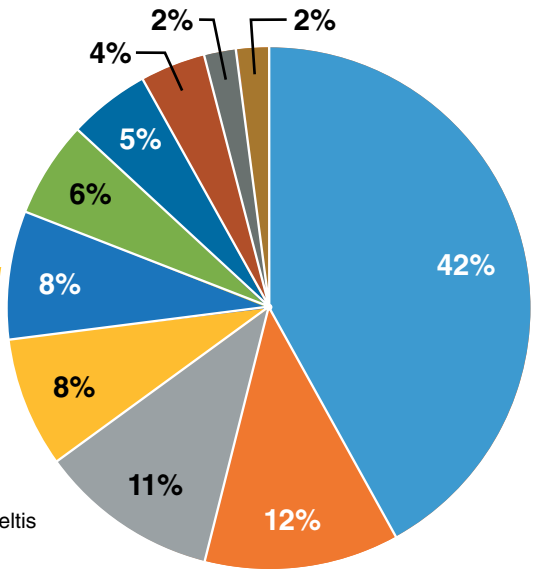


Figure 7. Forest composition by genus for North Dakota communities.

Percent Composition by Genus

Fraxinus, Acer, Not Specified, Ulmus, Picea, Tilia, Malus, Populus, Prunus, Celtis

Forest Decline Associated With Natural Disturbance Alterations

Native forests in North Dakota are limited in overall acreage but provide numerous environmental services. The species composition and distribution of these forests are largely a reflection of natural disturbances, notably fire and flooding. Alterations to natural disturbance cycles have a corresponding impact on these forest resources.

Fire suppression impacts have been most apparent in the aging aspen forests of the Turtle Mountain region. In the absence of disturbance to regenerate declining aspen stands, many stands eventually will succeed to hazel scrubland.

Fire exclusion has impacted the ponderosa pine stands of southwestern North Dakota. Years of fire suppression have resulted in overly dense pine thickets that will experience stand replacement fires when fire is reintroduced.

Similarly, disruption of flooding regimes has impacted the cottonwood forests of several of the state's river systems. Prior to flood control infrastructure, spring-time flooding was critical to sandbar formation necessary for cottonwood regeneration. The lack of recruitment of cottonwood saplings to replace the aging declining overstory has resulted in undesirable changes to these forests, notably the predominance of non-native shrubs and forbs.

Brome grass encroachment in a declining cottonwood stand.

Vulnerability to Damaging Agents Due to Limited Species Diversity

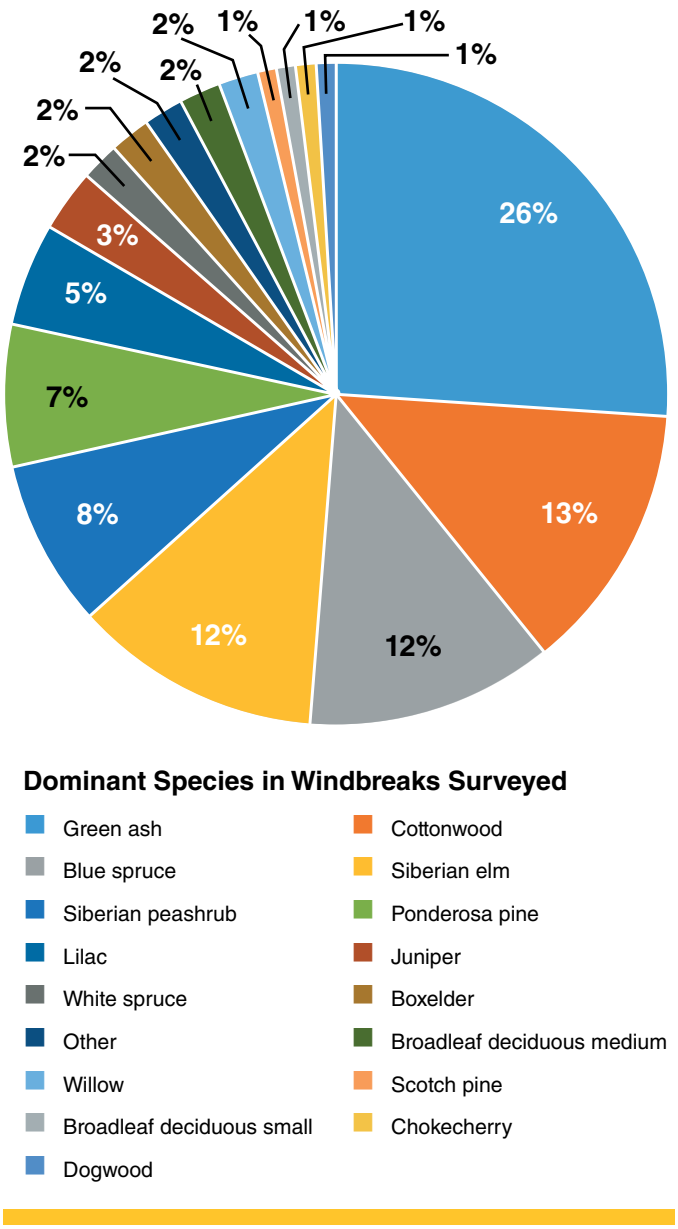
Limited species diversity limits the success and sustainability of the state's rural tree plantings and community forests. The climate and soils of the northern Plains restricts the number of tree species that can be utilized.

Tree plantings composed of one or few species are more likely to experience episodes of abrupt decline as a result of vulnerability to the abiotic factors. Similarly, monocultures are more susceptible to pest outbreaks in comparison with plantings that consist of several different (or nonhost) species.

In the state's conservation tree plantings, four species constitute 63% of all plantings (Figure 8) (Johnson, 2020). Additionally, two genera make up more than 50% of the state's community forests (NDFS, 2020). Such limited species diversity highlights the susceptibility to damaging agents and stresses the need for continued tree research focusing on hardy adaptable plant material for the northern Plains.

Limited species diversity is most notable in western North Dakota, where average annual rainfall is less than 15 inches per year. This, coupled with pests and abiotic pressures, limits the number of species suitable for conservation and community tree plantings. Additional investments in woody plant improvement research remains an important need for the region.

Figure 8. Species composition of surveyed North Dakota windbreaks.



Societal Disconnect From Forests and Natural Resources

The public's perception of the role trees and forests play in society is changing constantly. An understanding of people's dependence on the land and its natural resources for survival is no longer inherent. A disconnect from nature is developing in children as they spend more time indoors engaging in technology.

In the coming decades, the public will be called upon more frequently to understand complex forestry issues, assess risk, evaluate proposed environmental plans, and understand the local and global impacts individual decisions affect. Creating a scientifically informed citizenry is critical to the long-term sustainability of forest resources.

Utilizing new technologies, social networks and distance learning opportunities will be key in the future to providing access to lifelong learning opportunities for younger, more technology oriented generations. Utilizing electronic opportunities must be accompanied by opportunities to connect youth to nature.

Research shows that people who grow up to care about the environment enjoyed meaningful experiences in the outdoors as a child. The North

Dakota Forest Service's *Project Learning Tree* program is committed to creating those meaningful experiences for today's K-12 youth.

Educating decision makers about the importance of trees, the ecological and social services they provide, and the benefits to communities remains an important issue to ensure policies incorporate the best available science.

Conversion to Nonforest

Conversion to nonforest is a pressure to upland forests, riparian forests and rural tree plantings. Conversion takes on many forms, including residential development, clearing for agricultural uses, removal of windbreaks and fragmentation of land ownership in smaller, less manageable parcels.

Although North Dakota generally is regarded as a rural state, urbanized areas do exist. Recently, residential development has encroached into historically wooded riparian areas as communities such as Fargo, Bismarck, Grand Fork, West Fargo and Minot have expanded. This trend may continue because larger communities have shown the greatest population growth in North Dakota.

Economic pressures may result in the conversion of nonproductive forestland to agricultural uses. This conversion may be driven in part by reduced productivity and vigor of the stands, coupled with a lack of harvesting opportunities for private landowners. Private landowners are inclined to clear low-production forests and use the land for agricultural purposes.

Conversion of aspen to nonforest has been prominent in the Turtle Mountains. This conversion may be driven in part by reduced productivity and vigor of the stands, coupled with a lack of harvesting opportunities for private landowners. As a result, some private landowners are inclined to clear low-production forests and use the land for agricultural purposes that generate marginal economic benefits.

In 1980, an estimated 154,000 acres were in the aspen/birch forest type; by 2005, the area of aspen/birch had dropped to 116,000 acres, a decrease of approximately 25% (Haugen et al., 2009). The aspen/birch forest type accounted for 88,200 acres in the Turtle Mountains in 2017 (Paulson, 2018).

During the past 50 years, a majority of the riparian areas in eastern North Dakota watersheds have been degraded by activities such as overgrazing, intensive agriculture and indiscriminate logging (Rush, 2005). According to estimates, more than 50% of the original forest cover in many watersheds in eastern North Dakota has been cleared for agricultural use.

In addition, unmanaged grazing has damaged a significant portion of the remaining riparian forests. Overgrazing, in combination with periodic drought, has left many riparian areas in a weakened condition and susceptible to insects and diseases.

Many rural tree plantings were established following the Dust Bowl of the 1930s to help curb soil erosion. Farming practices have changed substantially since that time and many producers opt for no-till farming instead of establishing windbreaks.

In addition, many windbreaks have been removed because they limit the use of larger farm machinery. The role of windbreaks needs to be considered in future farm systems.

Potential land transfer may increase fragmentation and further limit management opportunities. Private individuals own 58% of North Dakota's forestland. Among these forest owners, 59% are 65 years of age or older; suggesting the potential for a larger intergenerational shift in ownership by sale or transfer to an heir (Haugen et al., 2005).

Wildland Fire

Wildfire always has been common and widespread in North Dakota. Travelers, settlers and explorers, including Lewis and Clark, documented huge fires on the horizon, with the constant smell of smoke and miles of blackened prairie.

The fire regime on the northern Plains has been disrupted severely since Euro-American settlement. Due to the intermingled land ownership pattern and land use, naturally occurring fires across the landscape are less frequent than the historical fire return interval of every three to four years. This disruption of the natural fire has influenced North Dakota's fire regimes in a multitude of ways, including changing fuel types, modifying fuel structure and fuel continuity, and the introduction of human-caused ignitions in different seasons under various weather conditions (Bowman et al., 2011).

Despite the conversion of much of the indigenous prairie to non-native grasses and crops, the majority of the state's fuels are still highly combustible. These light fuels can burn readily and rapidly,

given the right environmental conditions. Large unbroken acreages of native mixed grasses persist in the central and western portions of the state and uncontrolled wildfire still remains a threat to North Dakota's people, property and natural resources.

Wildland fire can be destructive, causing economic disruption, loss of life, damage to physical and mental health, and degradation of natural resources (Bowman et al*.,* 2011). Despite the undesired social and economic impacts of wildland fire, it is crucial for the functioning of many ecosystems, augmenting ecological services and maintaining biological diversity. The introduction of prescribed fire in these fuels is imperative for maintaining and restoring prairie ecosystems and for limiting the buildup of hazardous fuels (Figure 9).

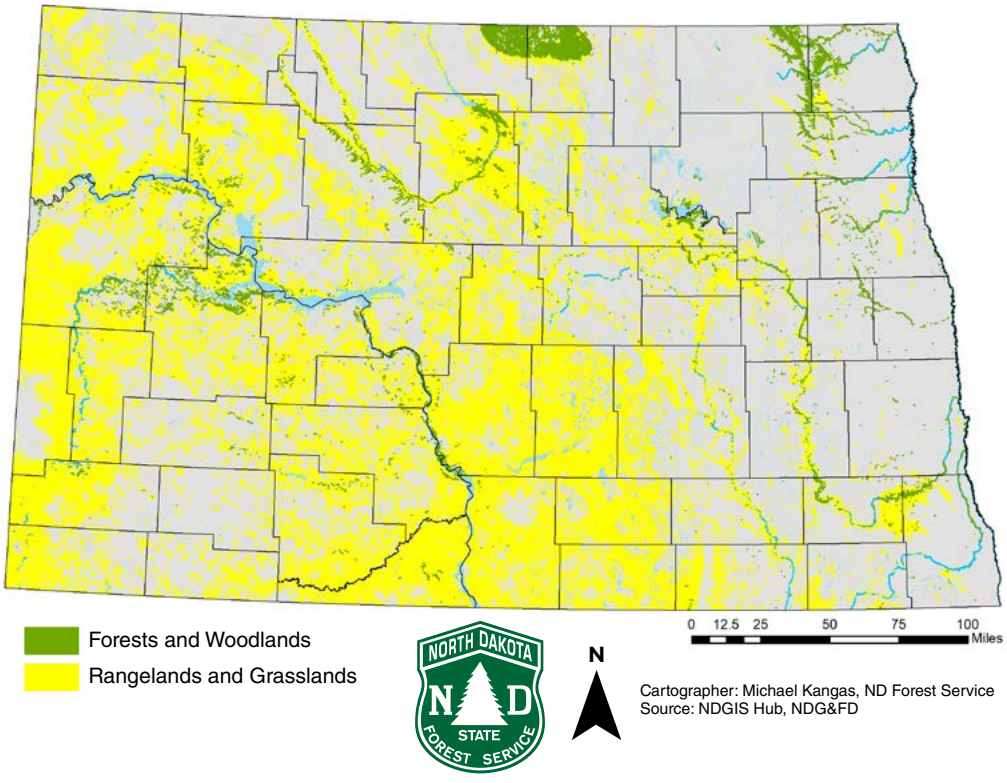
The occurrence of catastrophic wildfire in forests is rare in North Dakota due to the limited acreage and location of the forestland. Wildfire can be beneficial and detrimental to forested upland, depending upon management objectives and stand conditions.

Overmature aspen forests, as seen in many areas of the Turtle Mountains, may benefit from the introduction of fire because disturbance facilitates vigorous regeneration. Opportunities to implement such treatments are limited because homes and other properties are in these areas.

The population across much of North Dakota has increased with the oil and gas development in the western portion of the state. The development of oil and gas in rural North Dakota has led to an increased wildland urban interface and oil and gas interface that fire departments will face, with some areas of multi-resident facilities with limited infrastructure and a high population density of a transient workforce. Additionally, the oil and gas interface has created complex fire hazards in the wildland setting by introducing hazardous material sites with large amounts of extremely volatile fuels.

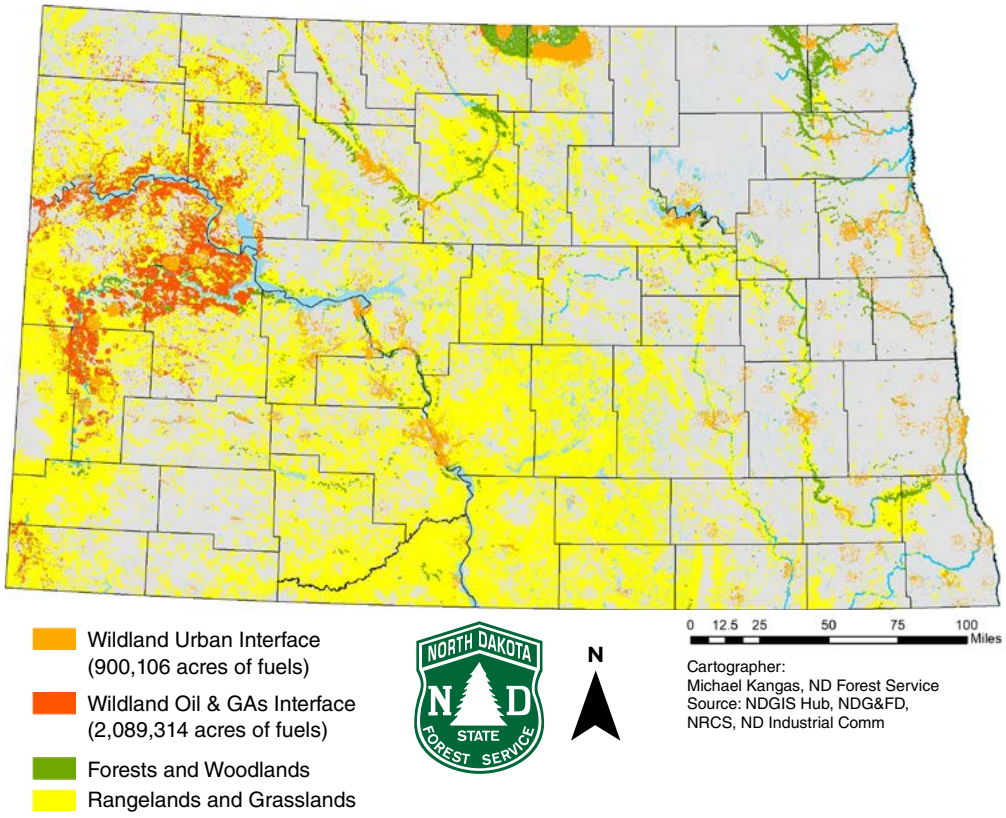
This additional complexity, coupled with infrastructure development associated with oil and gas extraction, increases wildland fire risks. The construction, maintenance and operation of well pads, pipelines and other infrastructure adjacent to fuels exerts additional pressures on fire departments (Figure 10).

Figure 9. Distribution of wildland fuels in North Dakota.



Oil and gas exploration has added additional complexity to wildland fire.

Figure 10. Distribution of WUI and WOGI in North Dakota.



Limited Wood Utilization Incentives

North Dakota's wood products manufacturing industries employ more than 2,000 workers and have an output of approximately $355 million (U.S. Commerce, 2005). Most of the wood product manufacturers in the state are secondary manufacturers, such as cabinet and mill works.

Sawmills are the primary wood-using industry in the state (Haugen et al., 2009). North Dakota's primary wood-using industry consists mainly of small sawmills operating on a part-time basis. Products include rough lumber, pallet cants, chips, planking and other unfinished products of cottonwood, green ash, American elm, basswood, bur oak and ponderosa pine (Harsel, 2014).

A mill survey was conducted of all known primary wood-using mills in North Dakota between 2010 and 2015 (Meneguzzo et al., 2018). The study included the size of the industry, the amount of roundwood harvested and its uses. Information on the generation and distribution of wood residues also was included.

The top three hardwood species harvested in the state were cottonwood, aspen and bur oak, while spruce was the top softwood species harvested. A total of 609,000 board feet of saw logs was processed and 120,000 cubic feet of roundwood was harvested.

Cottonwood remains the most commonly harvested species in the state. This is partly due to the fact that the elm/ash/cottonwood forest type covers an estimated 165,000 acres of forestland, and cottonwoods are some of the state's largest trees. Interest from Minnesota's timber industry in this resource is periodic (Haugen et al., 2009).

As previously illustrated, North Dakota's wood product manufacturing industry is very small. The absence of viable forest product markets limits the economic incentive of landowners to manage forest resources sustainably.

Climate Change

North Dakota has experienced temperature increases, with annual average temperatures increasing at a rate of 0.26 degree per decade since 1990. This increase is most evident in winter warming, which has been characterized by the much below-average occurrence of extremely cold days since 1980 (Frankson, 2016).

Climate changes will affect disturbance regimes, insect and disease outbreaks, fire season length, recreational values and productivity. Forests should be managed sustainably to help them adapt to anticipated changes. Practices such as afforestation and agroforestry, reforestation, lengthening of forest rotation, protection of forestland from conversion, and community and urban forestry offer opportunities for carbon offsets.

Forests, woodlands and grasslands have an important role in mitigating climate change. Mitigation addresses the mechanisms by which ecosystems can sequester carbon, mechanisms to increase carbon stored in wood products, and the ways that forests and woodlands can provide renewable energy from woody biomass to offset fossil fuel consumption. Mitigation also includes ways state and federal agencies can reduce their environmental footprint and lead by example in greening our practices.

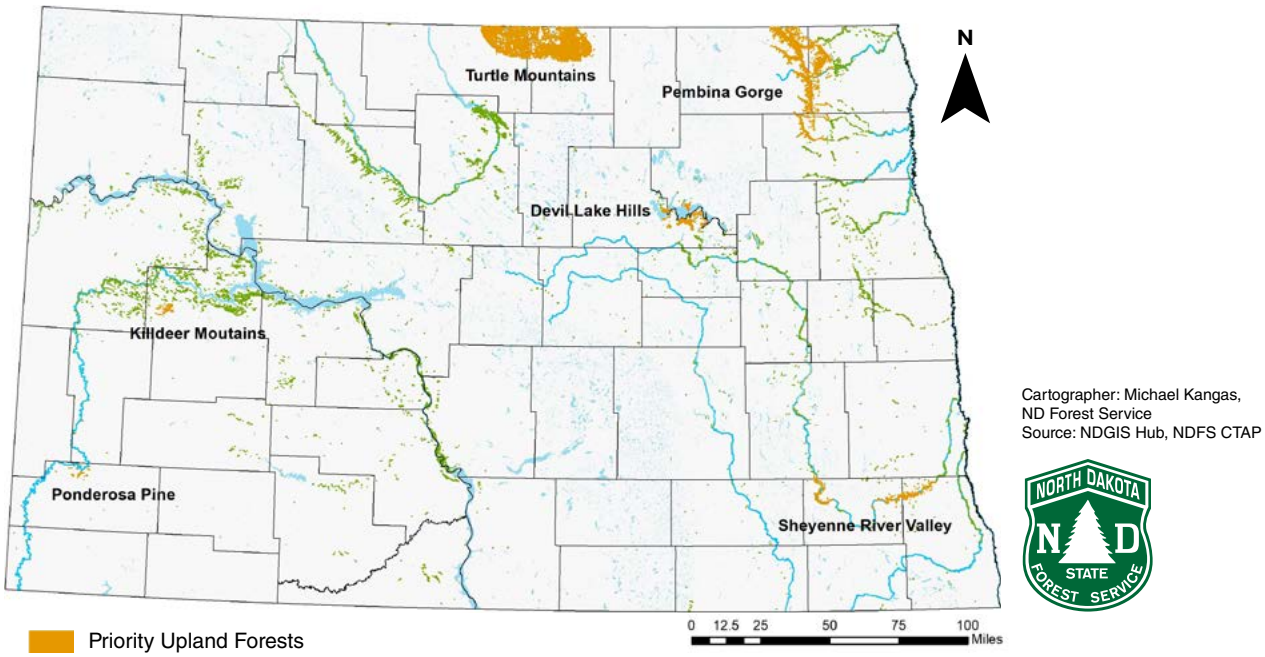
Section 4. Priority Forest Resources

This section provides a brief description of priority forest resources identified by stakeholders. These forested resources are categorized as upland forests, riparian forests, rural tree plantings, community forests and multistate resources.

Upland Forests

Priority areas of upland forests are delineated primarily on the basis of the concentration of forested lands in the state. Priority areas may include the Turtle Mountains, Devils Lake Hills, Pembina Gorge, Sheyenne River Valley, Killdeer Mountains and the pine forests of southwestern North Dakota (Figure 11). The following provides a brief description of priority areas.

Figure 11. Upland forest priority areas.



Pembina Gorge

Area: 68,000 acres

Description and condition: Nominated as a potential Forest Legacy Area, the Pembina Gorge is a steep, dissected escarpment on the edge of the drift prairie and bordering the Red River Valley and Canada. The steep slopes maintain the natural woodland community, consisting of bur oak, quaking aspen, green ash, cottonwood and American elm. Other areas have been cleared for cropland of small grains, sunflowers and flax. A few areas are used for cattle grazing. Primary ownership groups include non-industrial private forest owners, the North Dakota Forest Service, North Dakota Game and Fish and North Dakota Parks and Recreation.

Turtle Mountain region

Area: 90,000 acres

Description and condition: Nominated as a potential Forest Legacy Area, the Turtle Mountain plateau rises 800 feet above the surrounding northern drift prairie. The elevational change results in an extra 10 inches of precipitation per year that support a deciduous forest cover of bur oak, aspen, green ash, paper birch, boxelder, Juneberry and snowberry. Hundreds of large, deep wetlands and lakes are present throughout this geologic feature. Many areas have been cleared for crops and pastureland despite the soil being rather erodible and poorly suited for farming.

Sheyenne River Valley

Area: 12,000 acres

Description and condition: Nominated as a potential Forest Legacy Area. The valley slopes maintain a natural woodland community consisting of bur oak, basswood, ironwood, quaking aspen, green ash, cottonwood and American elm.

Devils Lake Hills

Area: 10,500 acres

Description and condition: The deciduous forest surrounding Devils Lake bears many similarities to the Pembina Gorge. Fluctuating water levels have inundated many of the forests along the lake.

Killdeer Mountains

Area: 3,000 acres

Description and condition: Nominated as a potential Forest Legacy Area, the Killdeer Mountains rise 700 to 1,000 feet above the surrounding prairie/badlands landscape. These forests consist of bur oak, quaking aspen, green ash, paper birch, black birch (*Betula fontinalis*) and American elm. Grazing is common on private land.

Pine Forests

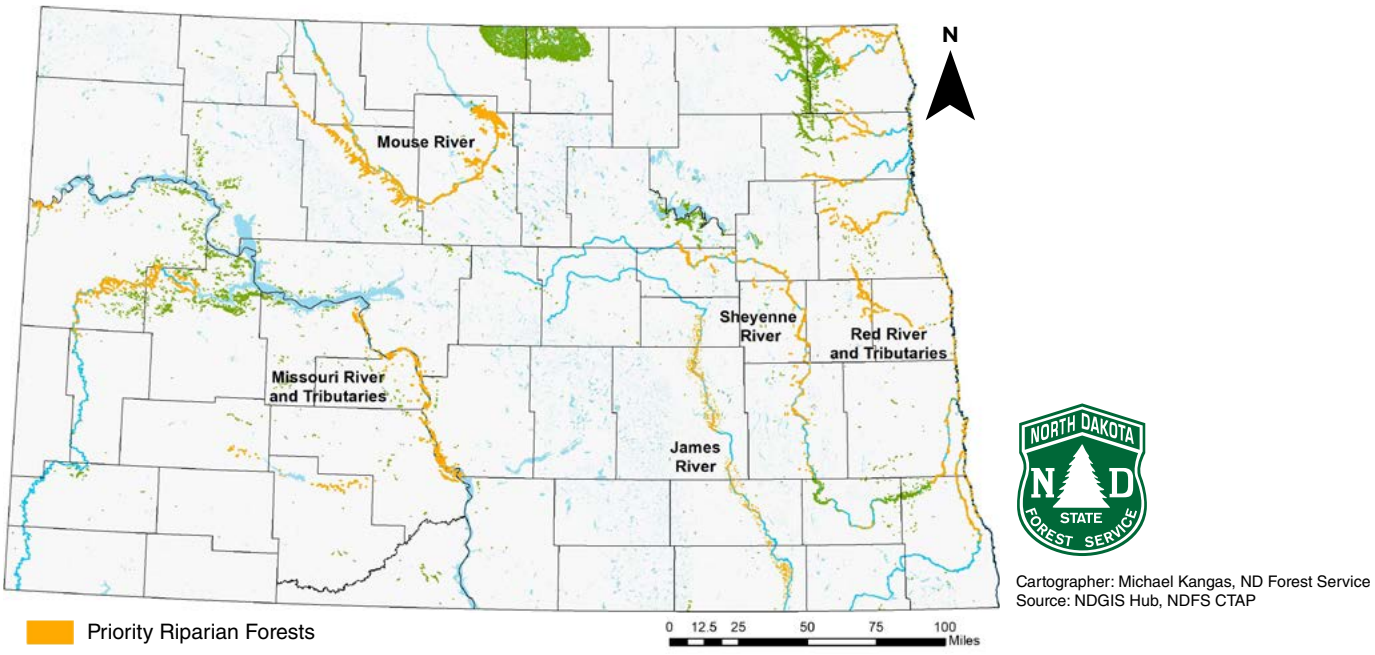
Area: 6,000 acres

Description and condition: Native stands of ponderosa pine and limber pine can be found in the southwestern counties of North Dakota. These stands encompass approximately 6,000 acres. In addition, Rocky Mountain juniper covers vast areas of the North Dakota Badlands. These woodlands are not considered "forests," and their widespread occurrence is largely a reflection of fire suppression throughout the region. The encroachment of Rocky Mountain juniper into draws and the adjacent prairie landscape has emerged as a significant management issue because the species is prone to stand-replacing crown fires that threaten property, infrastructure and wildlife habitat.

Riparian Forests

Nearly one-fifth of North Dakota's forests occur within 200 feet of water. Major rivers in North Dakota include the Red River (and tributaries), Sheyenne River, Mouse River, James River and Missouri River (and tributaries) (Figure 12). Each of these major river systems is composed of numerous tributaries and subwatersheds.

Figure 12. Priority riparian forests.



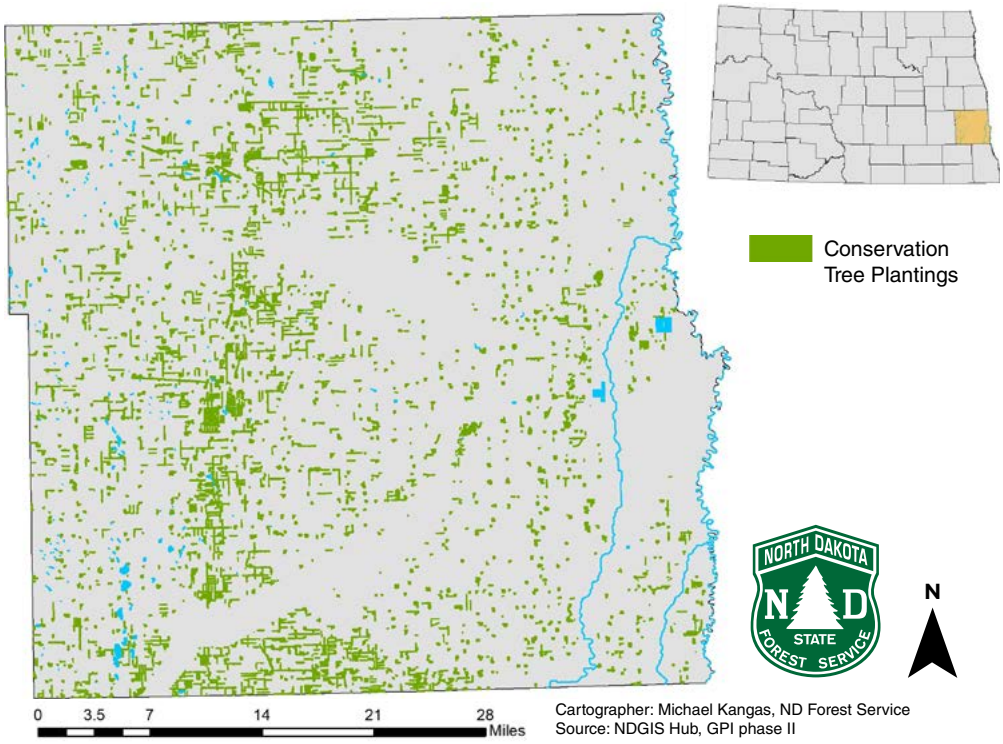
Cartographer: Michael Kangas, ND Forest Service
Source: NDGIS Hub, NDFS CTAP

Conservation Tree Plantings

Conservation tree plantings are an important component of many agricultural systems and improve the quality of rural living in the northern Plains. Rural tree plantings generally refer to field windbreaks, farmstead shelterbelts, living snow fences, wildlife plantings, riparian buffer strips, livestock protection plantings and others that are designed to achieve conservation, economic and societal goals.

For example, field windbreaks reduce soil erosion during years of drought, reduce water evaporation from adjacent cropland and increase crop yields. Similarly, some plantings are designed to stabilize riverbanks, filter water runoff from adjacent agricultural lands, provide wildlife habitat, protect stretches of highways prone to severe snow accumulation, provide wind protection for livestock, or protect farmsteads and rural homes from snow and wind. Collectively, conservation tree plantings form an extensive green infrastructure system across the northern Plains landscape (Figure 13).

Figure 13. Conservation tree plantings in Cass County, N.D., alone encompass more than 19,000 acres.



Conservation tree plantings such as living snow fences, field windbreaks, farmstead protection plantings and riparian buffer strips form an extensive green infrastructure that provides many environmental, social and economic benefits.

Community Forests

Community forests include boulevard trees, trees planted in city parks and trees that naturally occur in city limits or public rights of way. The management of such tree resources may fall under the responsibility of city foresters, public works departments and/or community tree boards.

The level of forest management in communities can be categorized as managing, developing and underserved. "Managing" refers to a program with all four community forestry program elements (performance indicators) in place. They are an ordinance, an advocacy organization (tree board), a management plan and a professional staff.

A "developing" program refers to a program with one, two or three of the listed elements in place. A "potential" program refers to a community with none of the four elements (Figure 14).

Wildland Fire Priority Areas

Wildland fire risk varies by county and the region of the state (Figure 15). By incorporating factors such as historical fire occurrences, weather data, wildland urban and wildland oil and gas interface data, preponderance of fuels and wildfire protection plans, wildland fire risk across North Dakota's landscape can be discerned.

Multistate Priority Areas

The states that make up the northern Plains region bear many similarities in terms of forest resource types and forest resource issues. Concerns about the deterioration of cottonwood forests extend throughout the watersheds of large rivers and beyond state borders.

Vulnerability to emerald ash borer and other invasive pests in the northern Plains will have wide-ranging implications for all states in the region. Similarly, the deterioration and removal of windbreaks has been observed throughout the region. All of the priority issues outlined in the North Dakota Forest Action Plan bear some resonance in adjacent states and the need for interstate collaboration exists to discover creative solutions to these shared issues.

Figure 14. Community forest program status, 2020.

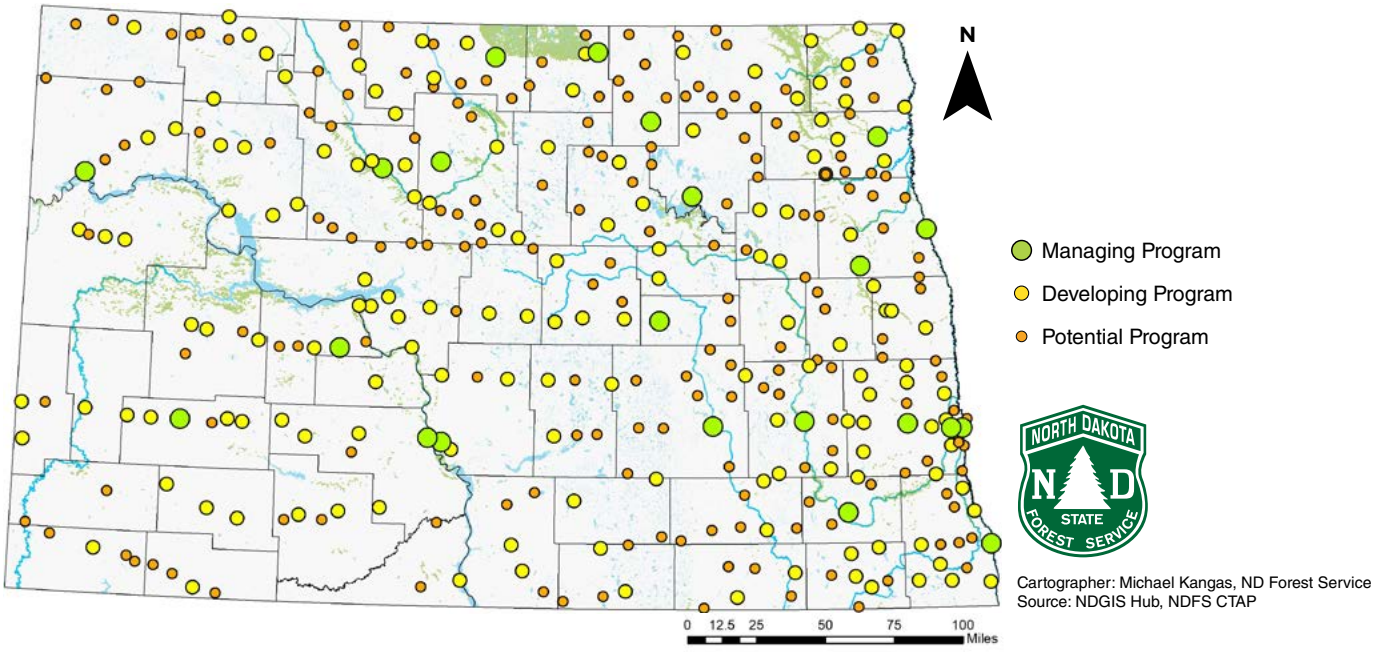
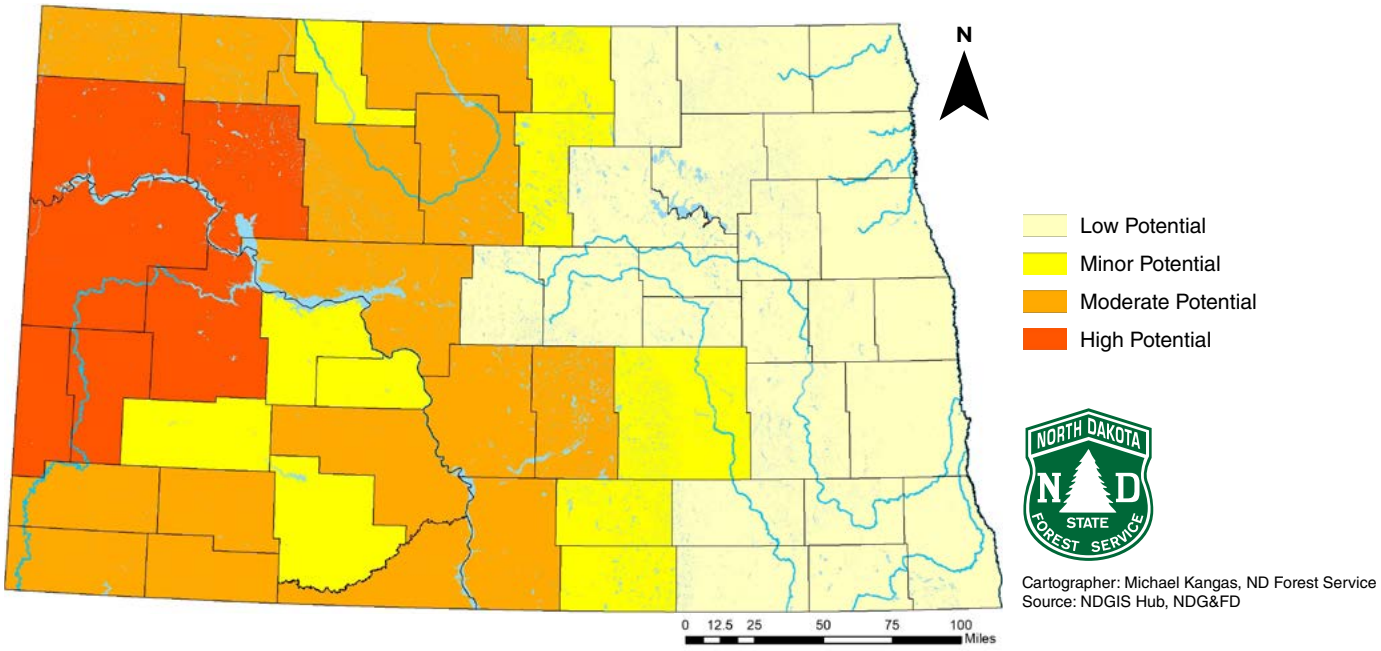


Figure 15. Wildfire risk by county.



Section 5. Incorporation of Existing State Resource Plans

State Wildlife Action Plan

The farm bill requires states to consider existing state wildlife action plans and community wildfire protection plans as state assessments are being developed. The intent is to build upon and complement such resource plans, identify opportunities for coordination and avoid contradictions or omission of key items. The North Dakota Forest Service coordinated with the North Dakota Game and Fish Department planning staff to identify areas of mutual interest to address resource needs.

The North Dakota comprehensive wildlife conservation strategy, developed by the North Dakota Game and Fish Department, represents a strategy rather than a detailed plan to guide the process of preserving the state's fish and wildlife resources for the foreseeable future. The plan is habitat based rather than species based.

North Dakota was divided into nine primary landscape components, which are essentially the state's major habitat types. They are tall-grass prairie (Red River Valley); eastern mixed-grass prairie (Drift Prairie); mixed-grass prairie (Missouri Coteau); western mixed-grass/short-grass prairie (Missouri Slope); planted or tame grassland; wetlands and lakes; rivers, streams and riparian; Badlands; and upland deciduous forest.

The 2015 state wildlife action plan identifies important forest resources in the Turtle Mountains, Pembina Gorge, Devils Lake Hills, Killdeer Mountains and pine forests of southwestern North Dakota. These priority areas align closely with those identified in the North Dakota Forest Action Plan. Notable forest-dependent species of interest include little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), northern long eared bat **(***Myotis septentrionalis*), golden eagle **(***Aquila chrysaetos*), American marten **(***Martes Americana*) and horned grebe **(***Podiceps auritus*) (Dyke et al., 2015).

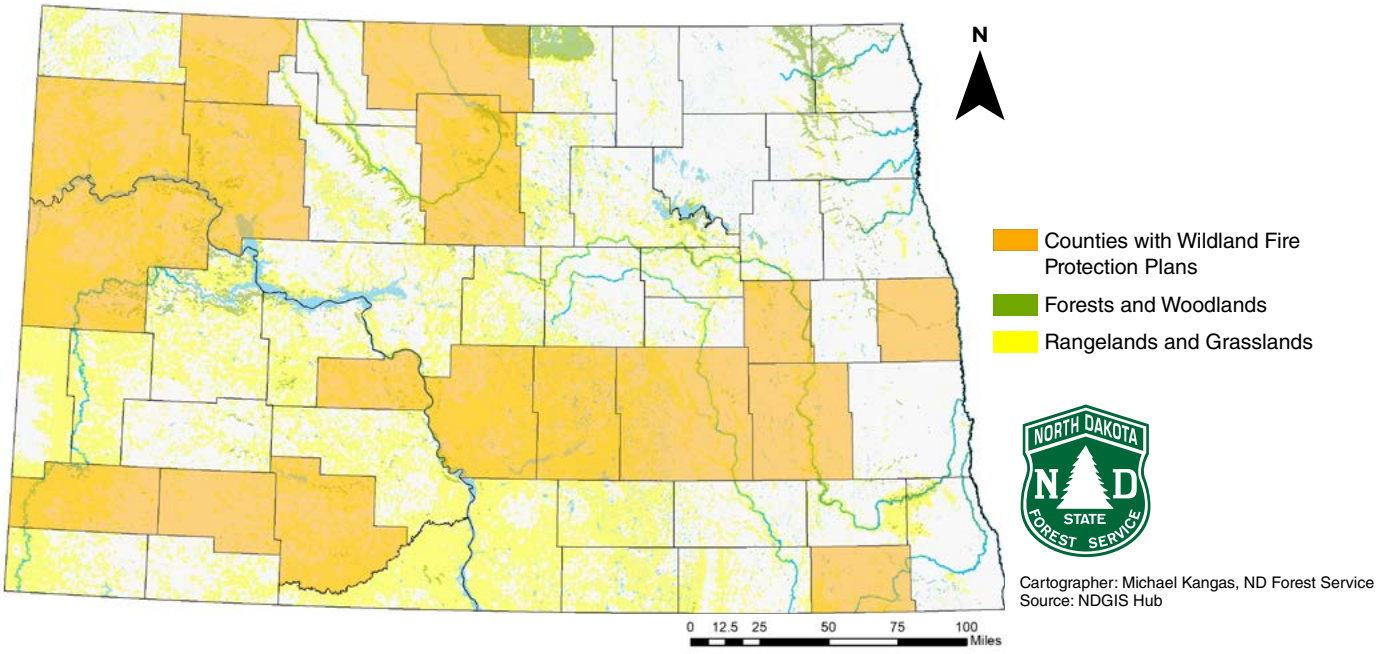
Community Wildfire Protection Plans

Community wildfire protection plans (CWPP) were incorporated in the implementation of the statewide assessment through countywide wildfire assessments. CWPP are developed to address issues such as wildfire response, hazard mitigation, community preparedness and structure protection in communities. The local scale of these plans may limit their incorporation into the state assessment. Seventeen counties in North Dakota have CWPP in place. These are Barnes, Bottineau, Burke, Burleigh, Grant, Griggs, Hettinger, Kidder, McHenry, McKenzie, Mountrail, Oliver, Sargent, Slope, Stutsman, Traill and Williams (Figure 16).

Since the passage of the Healthy Forests Restoration Act (HFRA) in 2003, communities have been charged with becoming active partners in their own protection from wildfire. Drafting CWPP in collaboration with state and local officials, communities identify prominent sources of fire risk, summarize structural ignitability concerns and prioritize areas for fuels reduction treatment.

The main purpose of CWPP is for localities to improve their wildfire mitigation capacity and work with government agencies to coordinate efforts to identify high fire risk areas and prioritize areas for mitigation, suppression and emergency preparedness management. State governments have a key role to play in the formulation of CWPP because communities may look for long-term guidance from outside experts.

Figure 16. Counties with CWPP in place.



Forest Resource Strategy

Overview

North Dakota's forest action plan provides a long-term, comprehensive, coordinated strategy for investing state, federal and leveraged partner resources to address the management and landscape priorities identified in the assessment. The plan incorporates existing statewide forest and resource management plans (such as community wildfire protection plans and the state wildlife action plan) and provides the basis for future program, agency and partner coordination.

The overall goal of the North Dakota forest resource strategy is to identify a long-term, coordinated strategy for investing state, federal and leveraged partner resources to address forestry issues of interest. Partner and stakeholder input were integrated to identify resource issues, priority areas and strategies to address resource needs.

Specifically, the North Dakota Forest Service coordinated with the North Dakota State Stewardship Coordinating Committee, North Dakota Community Forestry Council, North Dakota State Technical Committee, North Dakota Game and Fish Department, U.S. Forest Service- Dakota Prairie Grasslands, tribal liaisons and other land management agencies in the development and update of the forest action plan.

Timeline of Events – Forest Action Plan Update 2020

June 2010 – Final submission of 2010 forest action plan to secretary of agriculture for approval

July 2015 – Completed a five-year review of the forest action plan as required

December 2018 – SSCC/CFC coordination session

January through July 2019 – Online survey for partner and stakeholder feedback

May 2019 – Coordination meeting with NDG&FD

July 2019 – Forest action plan coordination meeting with U.S. Forest Service-Dakota Prairie Grasslands

Fall 2019 and winter 2020 – Data and feedback summarization and geospatial analysis

Spring 2020 – Plan reviewed by internal and external stakeholders

The forest resources strategy consists of two components. **Section 1** outlines the national priorities and the corresponding state priorities. **Section 2** describes the resources and programs available to implement the strategic actions targeting the national and state priorities.

Section 1.

Conserve and Manage Working Forest Landscapes for Multiple Values and Uses

North Dakota Priority Issue 1.1: Forest Decline Associated With Natural Disturbance Alterations

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.1b: Develop incentives and cost-effective measures for management (harvesting, Rx burn, thinning)
Strategy 1.1c: Strengthen collaborative and large-scale planning at city, county, state and federal levels
Strategy 1.1d: Develop strategies to reach/motivate landowners to apply principles of sustainable forest management

North Dakota Priority Issue 1.2: Conversion to Nonforest

Strategy 1.2a: Encourage retention of forestland at risk for urban sprawl, agricultural clearing and utility development
Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

North Dakota Priority Issue 1.3: Limited Wood Utilization Incentives

Strategy 1.3a: Identify wood utilization and biomass opportunities
Strategy 1.3b: Actively and sustainably manage trees and forests

Protect Forests From Threats

North Dakota Priority Issue 2.1: Native and Invasive Tree Pests

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability
Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication
Strategy 2.1c: Coordinate efforts with state and federal regulatory partners to augment prevention and suppression efforts
Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species
Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

North Dakota Priority Issue 2.2: Vulnerability to Damaging Agents Due to Limited Species Diversity

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state
Strategy 2.2b: Promote species diversity and forest health practices in communities
Strategy 2.2c: Encourage commercial production of less common well-adapted tree species
Strategy 2.2d: Promote tree species diversity and forest health practices in windbreak and conservation tree plantings
Strategy 2.2e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

North Dakota Priority Issue 2.3: Wildland Fire

Strategy 2.3a: Provide training and assistance to communities and rural fire departments to meet critical preparedness needs, including firefighter safety, fire planning, firefighter training, increased initial attack capacity, and mobilization readiness for the efficient suppression and prevention of wildfires on nonfederal forestlands and other nonfederal lands
Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities
Strategy 2.3c: Implement prescribed fire to assist in meeting hazardous fuel-reduction, ecosystem maintenance/restoration, wildlife habitat improvement, native plant community restoration, forest health and silvicultural practice goals

Enhance Public Benefits From Trees and Forests

North Dakota Priority Issue 3.1: Societal Disconnect From Forests and Natural Resources

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

North Dakota Priority Issue 3.2: Climate Change

Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2b: Reduce forest conversion
Strategy 3.2c: Plant new trees to increase carbon sequestration
Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

Section 2.

Resources and Programs to Address Strategic Actions

The following descriptions provide an overview of existing state and private forestry programs, initiatives, and leveraged state and federal programs that are employed in North Dakota to address shared management priorities and achieve measurable outcomes. For each program, the corresponding strategic actions addressed are listed.

NDFS — Forest Health Protection Program

The forest health program provides statewide surveys to assess threats to our trees and forest resources; provides technical assistance and training for natural resource professionals, arborists/city foresters and educators; and provides timely reports documenting pests conditions.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands

Strategy 1.1c: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 1.1d: Develop strategies to reach/motivate landowners to apply principles of sustainable forest management

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.1c: Coordinate efforts with state and federal regulatory partners to augment prevention and suppression efforts

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 2.2d: Promote tree species diversity and forest health practices in windbreak and conservation tree plantings

Strategy 2.2e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 2.3b: Restore fire-adapted lands and implement fuel-reduction activities

Strategy 2.3c: Implement prescribed fire to assist in meeting hazardous fuel-reduction, ecosystem maintenance/restoration, wildlife habitat improvement, native plant community restoration, forest health and silvicultural practice goals

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

NDFS — Forest Stewardship Program (FSP)

The FSP provides technical assistance to nonindustrial, private forest landowners to encourage and enable active, long-term forest management. The Forest Stewardship Program offers a written forest stewardship plan to private landowners. These 10-year plans are designed to help landowners better understand their forest and manage the forest to meet their individual goals, for the benefit of the landowners and the resource.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands

Strategy 1.1b: Develop incentives and cost-effective measures for management (harvesting, Rx burn, thinning)

Strategy 1.1c: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 1.1d: Develop strategies to reach/motivate landowners to apply principles of sustainable forest management

Strategy 1.2a: Incentivize retention of forestland at risk for urban sprawl, agricultural clearing and utility development

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 1.3a: Identify wood utilization and biomass opportunities

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state

Strategy 2.2d: Promote tree species diversity and forest health practices in windbreak and conservation tree plantings

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2b: Reduce forest conversion

Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

NDFS — Community Forestry Program

The community forestry program provides statewide technical and financial assistance to all North Dakota communities. The NDFS provides a variety of community forestry grants to stimulate the development of innovative and effective community forestry program development projects or community forestry tree planting projects that increase the diversity of trees in the community. These include America the Beautiful (ATB) program development (ATB PD) and tree planting (ATB TP) grants. Community family forest (CFF) grants were developed to honor families in the state by planting trees in North Dakota communities and to strengthen the tradition of annual tree planting. The state also established the North Dakota disaster recovery task force, a long-term recovery team intended to assist local leaders deal with disaster recovery planning for green infrastructure. The project included a damage inventory of community forest and tree resources, an assessment of biomass utilization opportunities, a disaster recovery guide for communities, and assistance to communities for tree removal and replanting.

Strategies Addressed:

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2c: Plant new trees to increase carbon sequestration

Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

NDFS — Conservation Education

Natural resource conservation education funds are used to raise awareness about natural resource values, support informed decision making and foster individual responsibility for forest resources in stewards of all ages. The North Dakota Forest Service (NDFS) delivers Project Learning Tree (PLT) professional development, curriculum, resources and a support network to natural resource educators and teachers of students in grades PreK-16. PLT workshops and hands-on activities use the Excellence in EE Guidelines established by the North American Association for Environmental Education (NAAEE) and are used in school and university classrooms, informal settings and outdoors. The outreach and educational program participates in Marketplace for Kids, Envirothon, Eco Eds, the Keep North Dakota Clean poster contest and many other programs used to educate youth about becoming stewards of the environment.

Strategies Addressed:

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1c: Coordinate efforts with state and federal regulatory partners to augment prevention and suppression efforts

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

NDFS — Cooperative Fire Protection

State fire assistance (SFA) and volunteer fire assistance (VFA) funds provided technical and financial assistance to North Dakota fire departments and aided in acquiring and managing the state's federal-excess firefighting property program. Partnership efforts continue with the North Dakota Firefighter's Association (NDFA) to conduct regional training opportunities focused on wildfire suppression. The NDFS and its partners provided comprehensive fire training to more than 866 firefighters from 175 communities. VFA funds were utilized to provide cooperative fire protection assistance grants to 30 fire departments for the purchase of personal protective equipment, fire-suppression equipment, communication equipment and fire-suppression vehicles. SFA funds were utilized for training fire staff, maintaining the NDFS fire cache, prepositioning of fire staff and equipment during high fire danger events and suppression-assistance requests from fire departments. Funds also were used to secure new equipment to bolster suppression capacity, maintain five Type 6 wildland fire engines and two initial attack utility terrain vehicles (UTV). These investments were critical for suppressing wildfires across North Dakota and in neighboring states, as well as strengthening national interagency cooperation and coordination.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high priority native forestlands

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 2.3a: Provide training and assistance to communities and rural fire departments to meet critical preparedness needs, including firefighter safety, fire planning, firefighter training, increased initial attack capacity, and mobilization readiness for the efficient suppression and prevention of wildfires on nonfederal forestlands and other nonfederal lands

Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities

Strategy 2.3c: Implement prescribed fire to assist in meeting hazardous fuel-reduction, ecosystem maintenance/restoration, wildlife habitat improvement, native plant community restoration, forest health and silvicultural practice goals

Strategy 3.2a: Manage existing forests to improve health

NDFS – Federal Excess Property Program

Through the Federal Excess Personal Property (FEPP) and Department of Defense (DOD) Firefighter Property (FFP) programs, the federal government allows states the opportunity to access excess property that can be used for wildland and structure firefighting. In North Dakota, administration and oversight of this opportunity is the responsibility of the NDFS. Federal excess property for firefighting items may be received through two programs: Federal Excess Personal Property (FEPP) Program and (2) Firefighter Property (FFP) Program.

The **Federal Excess Personal Property (FEPP)** program refers to U.S. Department of Agriculture Forest Service (USDA FS)-owned property that is on loan to state foresters for the purpose of wildland and rural firefighting. Most of this property originally was owned by the USDA FS or other federal agencies but became excess to their needs. Ownership of FEPP property remains with the USDA FS.

The **Firefighter Property (FFP)** program refers to items obtained from the Defense Logistics Agency – Disposition Services (DLA-DS) for use in fire and emergency services by a state agency and its cooperators. Ownership may pass to the user after program requirements are met.

Both programs authorize the USDA FS to manage the transfer of items to North Dakota through memorandum of agreements (MOA). Strict program controls are in place to ensure proper accounting, inventory and use of items in both programs.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 2.3a: Provide training and assistance to communities and rural fire departments to meet critical preparedness needs, including firefighter safety, fire planning, firefighter training, increased initial attack capacity, and mobilization readiness for the efficient suppression and prevention of wildfires on nonfederal forestlands and other nonfederal lands

Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities

Strategy: Implement prescribed fire to assist in meeting hazardous fuel-reduction, ecosystem maintenance/restoration, wildlife habitat improvement, native plant community restoration, forest health and silvicultural practice goals

Forest Stewardship Tax Law (FSTL)

More than 44,000 acres are enrolled in the FSTL, which is authorized by North Dakota Century Code Chapter 57-57 and administered by the state forester. The FSTL offers tax incentives to landowners for preserving and protecting forest resources. The program reduces value-based property taxes to 50 cents per acre per year on eligible lands.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands

Strategy 1.1b: Develop incentives and cost-effective measures for management (harvesting, Rx burn, thinning)

Strategy 1.2a: Incentivize retention of forestland at risk for urban sprawl, agricultural clearing and utility development

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2b: Reduce forest conversion

Nature Preserves Act

In 1975, the North Dakota Legislature passed the Nature Preserves Act (NDCC 55-11), which gives the North Dakota Parks and Recreation Department the responsibility to set aside a system of natural areas and nature preserves for the benefit of North Dakota citizens. Three programs that are managed by the North Dakota Parks and Recreation Department are related. The natural area designation means any area of land and/or water, whether in public or private ownership, that has unique natural features. Five areas have been enrolled in the Natural Areas program. Public or private landowners also may enter into a nonbinding agreement to protect their land through the Natural Areas Registry Program. Approximately 50 sites have been registered successfully to date. The Natural Heritage Inventory identifies North Dakota's natural features and establishes priorities for their protection. Since the inventory's inception in 1981, more than 5,000 records of important species and habitats have been identified and catalogued.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2b: Reduce forest conversion

North Dakota State Wildlife Action Plan (SWAP)

The 2015 North Dakota SWAP replaces the 2005 North Dakota Comprehensive Wildlife Conservation Strategy as the principal document for safeguarding rare and declining fish and wildlife species in North Dakota. The SWAP is a habitat-based rather than a species-based approach. The landscape classification system includes rivers, streams and riparian; Badlands; and upland forests, and identifies forested focus areas for each classification.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2b: Reduce forest conversion

Great Plains Initiative (GPI) Phase II

This project will characterize the current status of linear agroforestry systems, focusing on windbreaks across the Great Plains in Kansas, Nebraska, South Dakota and North Dakota. The assessment will produce high-resolution geospatial datasets that allow users to determine location, extent and functioning condition of windbreaks based on criteria developed in GPI I. These detailed images will assist Great Plains forestry agencies and partners in identifying sites where forestry investments will produce the greatest soil and water quality conservation investment return. Utilizing this data, new educational and outreach approaches will be developed that increase landowner adoption of windbreak renovation and establishment practices. State and federal cost share programs (for example, CRP, EQIP) will support outreach efforts. The project also will assess risk and potential economic impacts from invasive pests such as the emerald ash borer, thousand cankers disease of walnut, Asian long-horned beetle and other non-native and indigenous plants, insects and diseases.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.1c: Strengthen collaborative and large-scale planning at city, county, state and federal levels
Strategy 1.3a: Identify wood utilization and biomass opportunities
Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

Hazardous Fuels Reduction — North Dakota Forest Service (NDFS)

The NDFS hazardous fuel reduction project is targeted at nonfederal lands adjacent to National Forest System (NFS) lands. These lands are targeted due to the USDA-FS prescribed fire program in the areas of concern, and provide risk mitigation by removing hazardous fuel and offering a higher degree of protection to communities and homes that may be at risk. The hazardous fuels reduction efforts are centered in the southwest portion of North Dakota, west of Amidon. The Ponderosa Pine Hazardous Fuels Reduction Prescription is outlined in the landowner's forest stewardship management plan. This multiyear effort is taking place on private land, treating overstocked, deteriorating ponderosa pine stands adjacent to the Dakota Prairie Grasslands.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 1.3a: Identify wood utilization and biomass opportunities

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities

Strategy 2.3c: Implement prescribed fire to assist in meeting hazardous fuel-reduction, ecosystem maintenance/restoration, wildlife habitat improvement, native plant community restoration, forest health and silvicultural practice goals

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

Good Neighbor Authority — NDFS/USFS

Good Neighbor Authority allows the USDA Forest Service to enter into agreements with state forestry agencies to do the critical management work to keep our forests healthy and productive. This multiyear effort is taking place on federal land and treating overstocked, deteriorating ponderosa pine stands in the Dakota Prairie Grasslands.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 1.3a: Identify wood utilization and biomass opportunities

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities

Strategy 2.3c: Implement prescribed fire to assist in meeting hazardous fuel-reduction, ecosystem maintenance/restoration, wildlife habitat improvement, native plant community restoration, forest health and silvicultural practice goals

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

Forestry Best Management Practices (BMP)

The NDFS developed BMP to help ensure productivity of forestland during tree planting, timber harvesting, thinning and other forest management activities. BMP serve as a basis for sound management decisions and often can be applied directly by the landowner. The NDFS provides assistant to landowners to develop a forest stewardship plan for their forestland and planting areas.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.
Strategy 1.3a: Identify wood utilization and biomass opportunities
Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication
Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability
Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication
Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2b: Reduce forest conversion
Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

Shared Stewardship

The Shared Stewardship strategy builds on a foundation of collaborative work, such as the Joint Chief's Landscape Restoration Partnership, National Cohesive Strategy for Wildland Fire Management and Collaborative Forest Landscape Restoration Program. It also builds on authorities created or expanded in the 2018 omnibus bill and 2018 farm bill, such as Good Neighbor Authority.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.
Strategy 1.3a: Identify wood utilization and biomass opportunities
Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication
Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels
Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

Community Threat Assessment Protocol (CTAP)

CTAP is a community forest survey and assessment approach that was developed under the first project phases of the Great Plains Initiative (GPI). Rapid street tree inventories are conducted in selected communities across North Dakota by North Dakota Forest Service Community Forestry Program staff. These inventories provide detailed and specific assessments of the environmental and economic impacts of selected invasive pests on these communities at the community level. In addition, the use of iTree and Forest Health Risk Assessment protocols provide a means of data analyses, spatial mapping and reporting. Emerald ash borer is one of the primary potential threats facing North Dakota's community forests. Preliminary summaries of CTAP street tree data reveal populations of green ash ranging from 16% to nearly 80%, with an average street tree population consisting of 46% green ash. In 2012-2019, NDFS community forestry staff completed 95 CTAP assessments in communities.

Strategies Addressed:

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.1c: Coordinate efforts with the state and federal regulatory partners to augment prevention and suppression efforts

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2c: Plant new trees to increase carbon sequestration

Tree City, Tree Line, Tree Campus USA and Arbor Day

Tree City USA is a national recognition program that began in 1976 and is sponsored by the Arbor Day Foundation in partnership with the U.S. Forest Service and National Association of State Foresters. By meeting four fundamental standards, an incorporated municipality of any size can qualify for certification in the program. In 2020, 53 Tree City USA communities were certified in North Dakota for their outstanding accomplishments in forestry including Sibley, the smallest Tree City USA with a population of 20 residents. Today, nearly 70% of North Dakota's residents live in a Tree City USA community. A healthy community forest is the result of proper planning, management and community investment. Key messages include benefits depend on healthy trees, healthy trees require good-quality care, and good-quality care depends on tree advocates and decision makers.

Tree Line USA recognizes public and private utilities across the nation that demonstrate practices that protect and enhance America's community forests. Best practices in utility arboriculture result in healthier and more abundant community forests and increased reliability of service because properly pruned and maintained trees result in fewer downed lines during storms. Montana-Dakota Utilities Co. is North Dakota's only utility certified in the program.

The Tree Campus USA program is designed to award national recognition to college campuses promoting healthy community forest management and engaging the campus community in environmental stewardship. NDSU and Dakota College at Bottineau are certified in the program, along with United Tribes Technical College, one of the first tribal campuses to be certified as a Tree Campus USA.

Arbor Day is a holiday on which individuals and groups are encouraged to plant and care for trees and is one of the annual requirements for a Tree City USA. It provides an opportunity to teach people about the importance of trees and how to plant and care for them properly. Trees planted today will Improve water quality and protect our drinking water; slow and reduce stormwater runoff, reducing silt and sediment in our streams, rivers and lakes; restore damaged forests and rebuild healthy ecosystems; provide food and animal shelters; shade our homes, lowering energy bills for all of us; clean our air and reduce air pollution; beautify our homes, parks, streets and schools; and make the quality of life better in our neighborhoods.

Strategies Addressed:

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.1c: Coordinate efforts with state and federal regulatory partners to augment prevention and suppression efforts

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2c: Plant new trees to increase carbon sequestration

Hazardous Fuel Reduction — National Park Service

The North Dakota Forest Service provides assistance to National Park Service units in North Dakota with a variety of fuels work for the purpose of fuels reduction and management. Tasks range from cutting, thinning, piling, pile burning and assistance with prescribed fire activities. This effort assists both agencies with fire-suppression efforts in and outside the parks boundaries by reducing fuels and making fires easier to control while reducing the risk of fires starting in the parks and burning outside their boundaries.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 1.3a: Identify wood utilization and biomass opportunities

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities

Strategy 2.3c: Implement prescribed fire to assist in meeting hazardous fuel-reduction, ecosystem maintenance/restoration, wildlife habitat improvement, native plant community restoration, forest health and silvicultural practice goals

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

State Fire School

The NDFS and NDFA work as partners to conduct the annual NDFA State Fire School. Education and firefighter and public safety are top priorities for both entities. The NDFA hosts and facilitates an annual state fire school with training on wildland firefighting including basic wildland firefighting skills, wildland fire leadership classes and wildland fire practical classes. Nearly 800 firefighters from all across the state attend the event for training from basic level firefighter up to leadership training for the fire officer.

Strategies Addressed:

Strategy 2.3a: Provide training and assistance to communities and rural fire departments to meet critical preparedness needs, including firefighter safety, fire planning, firefighter training, increased initial attack capacity, and mobilization readiness for the efficient suppression and prevention of wildfires on nonfederal forestlands and other no-federal lands

Outdoor Heritage Fund (OHF) — Windbreak Renovation Initiative

The Windbreak Renovation Initiative is a $1.8 million grant ($3.6 million project) provided to the NDFS by the North Dakota Industrial Commission through the Outdoor Heritage Fund. The project serves to ensure that windbreaks remain a part of North Dakota's conservation heritage and viable part of the agricultural landscape; reduce the number of windbreaks destroyed by offering incentives to replace dead/deteriorating windbreaks; incorporate species diversity and select species most suitable for the site to mitigate future losses due to abiotic factors or insect and disease issues; provide technical and financial assistance to landowners to help achieve their conservation goals; and administer a simple, effective, statewide cost-share program that leverages landowners' match with a source of grant funds for a variety of windbreak renovation practices.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.1b: Develop incentives and cost-effective measures for management (harvesting, Rx burn, thinning)
Strategy 1.2a: Incentivize retention of forestland at risk for urban sprawl, agricultural clearing and utility development
Strategy 1.3a: Identify wood utilization and biomass opportunities
Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication
Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings
Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2b: Reduce forest conversion
Strategy 3.2c: Plant new trees to increase carbon sequestration

Mitigation Tree Planting Partnerships

Mitigation criteria established by the North Dakota Public Service Commission (PSC) ensures that trees and shrubs lost or destroyed during construction projects are replaced at a 2:1 ratio. A minimum of 75% of these replacement trees and shrubs must be living at the end of three growing seasons to meet the mitigation requirements. The PSC also is responsible for authorizing mitigation tree planting partnerships. The NDFS has facilitated multiple tree mitigation partnerships, including the Keystone Pipeline (Case # PU-06-421) - 158 projects with 85,316 trees and shrubs planted; Bridger Pipeline, LLC (Case # PU-09-750) - 246 projects with 106,656 trees and shrubs planted; and Enbridge (Case #s PU-10-612, PU-10-613, PU-11-232, and PU-11-606) - 11 projects with 1,869 trees and shrubs planted.

Strategies Addressed:

Strategy 1.2a: Incentivize retention of forestland at risk for urban sprawl, agricultural clearing and utility development
Strategy 3.2b: Reduce forest conversion
Strategy 3.2c: Plant new trees to increase carbon sequestration

OHF — Tree Planting Assistance

The North Dakota Conservation District Employees Association, in partnership with the NDFS and North Dakota Association of Soil Conservation Districts, were successful in securing a $1.878 million OHF - Tree Planting Assistance grant from the Industrial Commission. The effort engages stewards to embrace conservation practices that promote the ecological services trees provide. The initiative focuses on encouraging and providing financial assistance to implement agroforestry practices in North Dakota, including farmstead, feedlot and field windbreaks; forestry, wildlife and riparian plantings; buffers; and living snow fences.

Strategies Addressed:

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.2c: Plant new trees to increase carbon sequestration

USDI — Theodore Roosevelt National Park

Theodore Roosevelt National Park's prescribed fire program addresses three interrelated goals. Resource benefit burning is intended to impact specific species and is performed to the benefit or detriment of a certain species. Examples include promoting grass growth by reducing woody plants, or controlling invasive plants such as leafy spurge. Hazard fuel reduction removes fuels such as woody plants that contribute to uncontrollable wildfires. Hazardous fuel buildup leads to the destructive wildfires that destroy homes and lives. Wildland-urban interface fires remove fuels adjacent to populated areas to protect lives and property. The goal is to lower the chance of an uncontrollable wildfire. Hazard fuel reduction and wildland-urban interface management goals also are achieved by mechanical means such as cutting and haying.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 1.3a: Identify wood utilization and biomass opportunities

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities

Strategy 2.3c: Implement prescribed fire to assist in meeting hazardous fuel-reduction, ecosystem maintenance/restoration, wildlife habitat improvement, native plant community restoration, forest health and silvicultural practice goals

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

Dakota Prairie Grasslands/Nature Conservancy

The USFS - Dakota Prairie Grasslands and The Nature Conservancy entered into a memorandum of understanding to cooperate in managing prescribed fire activities on the Sheyenne National Grassland and adjacent conservancy lands. This agreement provides capability for the Dakota Prairie Grasslands and The Nature Conservancy to coordinate and assist one another with the use of prescribed fire for restoring, maintaining and conserving the tall grass prairie. Fire is a key disturbance factor in restoring and maintaining the tall grass prairie ecosystem. The two entities continue sharing personnel and equipment, and implementation of cross-boundary prescribed burns that benefit the USFS and conservancy lands.

Strategies Addressed:

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities

Landowner Assistance Program (LAP) - North Dakota Department of Agriculture

The Landowner Assistance Program (LAP) provides weed boards with cost-share assistance for noxious weed control. To be eligible to receive LAP funds, weed boards must levy at least 3 mills for noxious weed control, or budget an amount equal to the revenue that could be raised by a levy of three mills. Historically, a majority of weed boards have used these funds to provide landowners with herbicide cost-share assistance. Eligible county and city weed boards are responsible for developing a LAP cost-share program for their areas.

Strategies Addressed:

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.1c: Coordinate efforts with state and federal regulatory partners to augment prevention and suppression efforts

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.3c: Implement prescribed fire to assist in meeting hazardous fuel-reduction, ecosystem maintenance/restoration, wildlife habitat improvement, native plant community restoration, forest health and silvicultural practice goals

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.2a: Manage existing forests to improve health

USDI Fish and Wildlife Service (USF&WS)

The USF&WS uses prescribed fire on refuges and waterfowl production areas in North Dakota to manage grasslands. Historically, natural fires caused by lightning burned the refuge's grasslands and marshes, recycling nutrients, cleaning out old growth and promoting new vegetation. Refuge staff incorporates prescribed burning to manage grasslands the way natural fires once did. Benefits of burning include improving native habitats and controlling noxious weeds, reducing thatch and promoting seed germination, increasing nesting and escape cover for birds, and stimulating the growth of sprouts that are food for deer and other wildlife.

Strategies Addressed:

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy: Restore fire-adapted lands and implement hazardous fuel-reduction activities

The North Dakota Game and Fish Department — Habitat Improvement Projects

The NDG&F has identified Russian olive as a non-native, exotic, woody invader that out-competes native vegetation such as cottonwoods and willows, degrades wildlife habitat and reduces recreational values. Russian olives have contributed to a change in the riverine habitat by shading river banks, reducing available water resource, and displacing native plant species, herbaceous and woody. The department's habitat improvement projects address habitat fragmentation by removing a non-native, invasive tree species (Russian olive) from native ecosystems, including riparian forests. The project serves to restore riverine systems to a more historical state and directly benefit species identified as species of conservation priority in the North Dakota comprehensive wildlife conservation strategy. The restoration efforts target wildlife management areas around the Missouri-Yellowstone River confluence.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication
Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species
Strategy 3.2a: Manage existing forests to improve health

NDFS — State Forests Program

State forests provide wildlife habitat, clean air and water, recreational opportunities, forest products, scenic beauty and other conservation benefits. The North Dakota Forest Service owns five state forests comprising approximately 13,290 acres that are managed to promote sound forestry practices. State forests play an important role in the economic well-being of several rural communities by attracting hunters, hikers, campers, skiers, snowmobilers, tourists and other outdoor enthusiasts.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.
Strategy 1.3a: Identify wood utilization and biomass opportunities
Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2b: Reduce forest conversion

Tree Promotion Meeting

Since 1999, the NDFS has partnered with SCDs to host an annual tree promotion meeting. The meeting serves to promote, expand and improve conservation tree planting in North Dakota and promote new concepts including climate change, design and planting specifications and tree species selection programs.

Strategies Addressed:

Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species
Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels
Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state
Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings
Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2b: Reduce forest conversion
Strategy 3.2c: Plant new trees to increase carbon sequestration

North Dakota Urban and Community Forestry Association (NDUCFA) — Planning

The NDUCFA developed an emerald ash borer (EAB) preparedness and response plan template for communities to utilize. Guidelines provide additional background, information and resources for each element of a community plan. Preparedness and response assist communities in managing the threat posed by EAB. The materials provide additional information that may be incorporated into plans or referenced by the plan.

The NDUCFA, along with the North Dakota Nursery & Greenhouse Association, hosts a jointly planned annual conference. The event includes speakers, a trade show and social events. The NDUCFA has hosted this conference for 27 years, and topics range from proper tree planting, tree pruning and hazardous tree identification to a variety of EAB-related topics. Many sessions are geared to assist communities in planning to mitigate potential damage caused by invasive tree pests.

Strategies Addressed:

Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability
Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication
Strategy 2.1c: Coordinate efforts with the state and federal regulatory partners to augment prevention and suppression efforts
Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species
Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels
Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state
Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings
Strategy 2.2c: Encourage private-sector production of less common well-adapted tree species
Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2c: Plant new trees to increase carbon sequestration
Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

Biomass Boiler — Bismarck Public Works Landfill Building

Two wood waste biomass projects have been implemented in Bismarck. The city and the NDFS developed a pilot project for the city using wood chips to heat the public works landfill building. The conversion resulted in significant annual savings in the cost of heating the complex. The wood-fired hot water heating system utilizes proven existing technology. Construction consisted of a centrally housed biomass-fired hot water boiler with hot water piping to connect the buildings at the public works landfill buildings and modernization of existing distribution systems to provide maximum heating efficiency.

Strategies Addressed:

Strategy 1.3a: Identify wood utilization and biomass opportunities

Biomass Boiler — Bismarck Aquatic Center

The Bismarck Parks and Recreation District (BPRD) completed a feasibility study to determine that utilizing wood chips to heat the BPRD Indoor Aquatic Wellness Center building is economically viable. Construction of the Indoor Aquatic Wellness Center included utilization of wood chips as a heating fuel source, resulting in significant annual savings in the cost of heating the complex. The wood-fired hot water heating system utilizes proven existing technology and serves as a demonstration site and enhancement to the National Energy Center of Excellence at Bismarck State College.

Strategies Addressed:

Strategy 1.3a: Identify wood utilization and biomass opportunities

Landscape Scale Restoration: Enhancement of Small/Midsize Urban Forests in North Dakota

More than 75% of North Dakota's population resides in cities and benefits significantly from healthy and resilient urban forests. But most cities are small - 95% have less than 5,000 people - and have limited resources for tree stewardship, which generally is undertaken by a volunteer tree board without a full-time municipal forester. In addition, North Dakota's fragmented urban forests are dominated by green ash and American elm, making them a target for invasive species. The North Dakota Urban and Community Forestry Association (NDUCFA) is helping build planning and management capacity of small and midsize North Dakota city tree boards to better protect urban forests. The NDUCFA is providing tools, including the online Tree Inventory and Planning (TIP) tool, training and one-on-one assistance to small and midsize North Dakota cities to encourage ethical practices and help them meet technical standards for arboriculture. They also are connecting experienced North Dakota municipal foresters and certified arborists with small and midsize cities to develop a strong statewide peer network committed to ethical tree stewardship.

Strategies Addressed:

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.1c: Coordinate efforts with the state and federal regulatory partners to augment prevention and suppression efforts

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2c: Plant new trees to increase carbon sequestration

Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

N.D. First Detectors Program

The N.D. First Detectors program trains volunteers to help diagnose and report possible infestations of invasive species to the North Dakota Department of Agriculture. First detectors are a part of the National Plant Diagnostic Network (NPDN) First Detector Program, which promotes the early detection of invasive plant pathogens, arthropods, nematodes and weeds. This component centers on enhancing educational outreach and building capacity to detect and respond to invasive pests and pathogens that threaten the state's forest resources. More than 300 first detectors have been trained since the program was initiated.

Strategies Addressed:

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.1c: Coordinate efforts with the state and federal regulatory partners to augment prevention and suppression efforts

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

EAB Awareness Week

EAB Awareness Week is an opportunity for state and local agencies, environmental groups, community organizations, schools, businesses, industry, tourists and citizens to take action against the introduction and spread of emerald ash borer.

Strategies Addressed:

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.1c: Coordinate efforts with the state and federal regulatory partners to augment prevention and suppression efforts

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Invasive Tree Pest Survey

The North Dakota invasive tree pest survey initiative is a collaborative effort involving the USDA's Animal and Plant Health Inspection Service (APHIS), the North Dakota Department of Agriculture, NDFS and tribal cooperators. Invasive pest surveys employ a variety of detection tools to locate potential invasive tree pest populations in North Dakota.

Strategies Addressed:

Strategy 2.1a: Detect, monitor, evaluate and report forest pests and forest health conditions, and conduct activities to improve or maintain forest health conditions and sustainability

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.1c: Coordinate efforts with state and federal regulatory partners to augment prevention and suppression efforts

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

River Keepers

River Keepers has identified riparian forests as being among the most important of all forests in the Great Plains. These forests face tremendous pressures such as invasive pests, noxious weed encroachment and summer flooding that has impacted existing trees and forests. The loss of riparian forest has increased bank slumping, which adds sediment to the river and threatens water quality. River Keepers helps restore riparian forests by establishing local riparian demonstration sites, educating and connecting our urban residents and youth groups, and restoring the natural, social and esthetic values once associated with our riparian forests. Using professionals and volunteers, noxious weeds are removed, new trees planted and interpretive signs installed along recreational trails in the riparian forest.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands

Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.

Strategy 1.3b: Actively and sustainably manage trees and forests

Strategy 2.1b: Reduce damage through effective integrated pest management, including prevention, suppression and/or eradication

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Strategy 3.2a: Manage existing forests to improve health

Strategy 3.2b: Reduce forest conversion

North Dakota State University (NDSU) — Master Gardeners Program

The NDSU Extension Master Gardener Program invests in creating leaders to serve the needs of their communities. Master Gardeners become ambassadors to assist NDSU Extension in providing accurate and environmentally sustainable horticultural advice.

Strategies Addressed:

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

North Dakota State University (NDSU) — Woody Plant Improvement Program

The NDSU woody plant improvement research program involves the breeding, selection, evaluation and introduction of hardy woody plants for the northern Plains. This program has introduced more than 50 superior woody plants for production and sale. These plants have increased disease tolerance and winter hardiness for landscapes throughout the northern Plains. NDSU woody plant introductions are being propagated for sale by commercial wholesale firms in three countries: Australia, Canada and the U.S. (14 states, including 35 nurseries).

Strategies Addressed:

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state

Strategy 2.2b: Promote species diversity and forest health practices in communities

Strategy 2.2c: Encourage private-sector production of less common well-adapted tree species

Strategy 2.2d: Promote tree species diversity and forest health practices in windbreak and conservation tree plantings

Strategy 2.2e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 3.2c: Plant new trees to increase carbon sequestration

Towner State Nursery

Towner State Nursery produces 1 million conifer (evergreen) seedlings in more than 30 different species and stock types annually for distribution to landowners. The trees are used for farmsteads, living snow fences, field windbreaks, wildlife, forestry and other conservation plantings. The nursery is a self-supporting operation, and since 1927, has sold more than 81 million trees. The nursery also provides tree improvement services such as testing, evaluation, selection and development of improved nursery stock for forestry and conservation plantings.

Strategies Addressed:

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state
Strategy 2.2b: Promote species diversity and forest health practices in communities
Strategy 2.2c: Encourage private-sector production of less common well-adapted tree species
Strategy 2.2d: Promote tree species diversity and forest health practices in windbreak and conservation tree plantings
Strategy 2.2e: Strengthen collaborative and large-scale planning at city, county, state and federal levels
Strategy 3.2c: Plant new trees to increase carbon sequestration

USDA NRCS Plant Materials Center (PMC)

The PMC in Bismarck is devoted to promoting and providing plant materials for conservation. Other federal and state agencies, universities and nonprofit organizations are important partners in the process, which includes assembling plants or seed collections from representative areas, evaluating initial performance, determining potential for release, documenting production procedures, evaluating cultural and management techniques, testing under actual use conditions and releasing new plants with cooperators. Its goal is to produce high-quality, pedigreed seed/plants and make them available to commercial growers and nurseries.

Strategies Addressed:

Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state
Strategy 2.2b: Promote species diversity and forest health practices in communities
Strategy 2.2c: Encourage private-sector production of less common well-adapted tree species
Strategy 2.2d: Promote tree species diversity and forest health practices in windbreak and conservation tree plantings
Strategy 2.2e: Strengthen collaborative and large-scale planning at city, county, state and federal levels
Strategy 3.2c: Plant new trees to increase carbon sequestration

Deep Creek Ponderosa Pine Restoration

In September 2004, the Deep Creek Fire burned across private land and USDA Dakota Prairie Grasslands, forcing the evacuation of ranches and threatening the community of Amidon. Many acres of ponderosa pine forest on public and private land were impacted. Due the intensity of the fire, extensive areas are not regenerating due to a lack of adjacent surviving trees to serve as a seed source. NDFS staff has collected ponderosa pine cones from trees in the area and containerized seedling are being grown at the Towner State Nursery. A multiyear reforestation program that reintroduces a local ponderosa pine seed source to the Deep Creak burn area began in 2016.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.2b: Incorporate management techniques and/or disturbances that promote/sustain terrestrial ecosystems. Develop, learn and teach methods to remove nuisance woody plants.
Strategy 1.3a: Identify wood utilization and biomass opportunities
Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2d: Utilize best available data and assessments to anticipate emerging management tools

Community Wildfire Protection Plans (CWPP)

The Healthy Forests Restoration Act (HFRA) in 2003 included the first meaningful statutory incentives for the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) to give consideration to the priorities of local communities as they develop and implement forest management and hazardous fuel-reduction projects. In North Dakota, 17 communities prepared CWPP. CWPP address issues such as wildfire response, hazard mitigation, community preparedness or structure protection - or all of the above.

Strategies Addressed:

Strategy 2.3a: Provide training and assistance to communities and rural fire departments to meet critical preparedness needs, including firefighter safety, fire planning, firefighter training, increased initial attack capacity, and mobilization readiness for the efficient suppression and prevention of wildfires on nonfederal forestlands and other nonfederal lands

Strategy 2.3b: Restore fire-adapted lands and implement hazardous fuel-reduction activities

Geographically FIT (Forestry Institute for Teachers)

The NDFS and North Dakota Geographic Alliance partner to deliver Geographically FIT annually. During the last eight years, participants have toured a portion of North Dakota. This professional development opportunity enables educators to expand their content knowledge of North Dakota's Badlands, forests, geography, geology and grasslands, and provides them with resources for curriculum planning and development.

Strategies Addressed:

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Envirothon

The North Dakota Envirothon is a hands-on, problem-solving environmental education program open to high school students throughout the state. The goal of the North Dakota Envirothon is to promote a desire to learn more about North Dakota's natural environment and equip students with the knowledge and skills needed to apply the basic principles and practices of resource management and ecology to complex environmental issues. Teams are associated with a sponsoring school and usually train the entire school year with their adviser or "coach" in preparation for the annual statewide competition. Study resources in the fields of soils, aquatics, wildlife, prairie (forestry and rangeland) and a current environmental issue are assembled by natural resource professionals and provided to the teams. Using these resources, students learn the skills of thinking and working as a team to assess natural resource issues affecting the environment. In late spring, each team has the option to select five members and one alternate to compete in the North Dakota state Envirothon competition.

Strategies Addressed:

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Eco-Ed

The Barnes County Soil Conservation District (SCD) in North Dakota began a program using an EPA section 319 grant as the basis for improving the format of the county's conservation tour. Five topics of study were identified. Thirty-four SCDs sponsor ECO-Ed, and each event addresses prairie/grasslands, soils, wetlands, woodlands and water quality. All of the subjects are covered in relation to water and its importance.

Strategies Addressed:

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Project Learning Tree (PLT)

PLT is a national award-winning environmental education program designed for teachers and other educators, parents and community leaders working with youth from preschool through grade 12. In PLT, the goal is to teach students how to think, not what to think about complex environmental issues. Recognized as a leader in environmental education for more than 35 years, PLT enhances critical thinking, problem solving and effective decision-making skills. PLT materials are multidisciplinary and aligned with state and national education standards.

Strategies Addressed:

Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species

Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels

Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Trees Bowl and Trees Awards

The Trees Awards recognize individuals, organizations and agencies who contribute in an outstanding way to forestry activities. Forestry activities can include fire mitigation, protection and suppression; tree planting, preservation or maintenance; community forestry efforts; forest management practices; forest recreation; or environmental education.

Strategies Addressed:

Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources

Strategy 3.1b: Connect people to trees and forests and engage them in environmental stewardship activities

Environmental Quality Incentives Program (EQIP)

EQIP has been designed through a locally led process. The North Dakota State Technical Committee, consisting of conservation stakeholders across the state, provides the Natural Resources Conservation Service (NRCS) with invaluable recommendations for localizing the program to meet the natural resource needs in North Dakota. The State Technical Committee helps determine statewide resource concerns, develop application ranking criteria, identify eligible conservation practices, recommend practice payment rates and suggest funding allocations. To accomplish the natural resource goals developed by local work groups, 62% of North Dakota's EQIP allocation will be allocated to the counties. The remaining allocation has been prioritized to address statewide priorities recommended by the State Technical Committee, including the statewide priority of forestry and energy, which aids in enhancing forestry and energy conservation resources.

Strategies Addressed:

Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species
Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels
Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state
Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings
Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2b: Reduce forest conversion
Strategy 3.2c: Plant new trees to increase carbon sequestration

N.D. Petroleum Foundation — Planting for the Future — Outdoor Heritage Fund

This conservation tree planting effort, led by the North Dakota Petroleum Foundation, leverages industry and landowner support for tree planting, which is crucial for the preservation of wildlife and habitat, as well as protection of watersheds and soils. The partnership plants conservation trees in multiple counties using traditional and scalp-planting techniques, depending on the site.

Strategies Addressed:

Strategy 1.1a: Identify, conserve and actively manage high-priority native forestlands
Strategy 1.2a: Incentivize retention of forestland at risk to urban sprawl, agricultural clearing, and utility development
Strategy 3.2c: Plant new trees to increase carbon sequestration

N.D. Conservation District Employees Association — N.D. Statewide Conservation Tree Planting Initiative — Outdoor Heritage Fund

This program engages stewards to embrace conservation practices that promote the ecological services that trees provide. The initiative focuses on encouraging and providing financial assistance to implement agroforestry practices including farmstead, feedlot and field windbreaks; forestry; wildlife and riparian plantings; buffers; and living snow fences.

Strategies Addressed:

Strategy 1.3b: Actively and sustainably manage trees and forests
Strategy 2.1d: Enhance educational outreach efforts to limit the spread of invasive species
Strategy 2.1e: Strengthen collaborative and large-scale planning at city, county, state and federal levels
Strategy 2.2a: Identify seed sources and species adapted to biotic and abiotic conditions of the state
Strategy 2.2b: Promote species diversity and forest health practices in communities and conservation tree plantings
Strategy 3.1a: Increase awareness (educational sessions and distance learning) of the benefits and threats to forest resources
Strategy 3.2a: Manage existing forests to improve health
Strategy 3.2b: Reduce forest conversion
Strategy 3.2c: Plant new trees to increase carbon sequestration

Literature Cited

Ball, J.J. 1997. *Restoration of Bottomland Forests: Challenges and Opportunities*. Proceedings of the North Dakota Academy of Science. Volume 51. supplement 1. pp 40-43.

Bowman, D.M., Balch, J., Artaxo, P., et al. 2011. The human dimension of fire regimes on Earth. *J Biogeogr*. 38(12):2223–2236.

Burns, Russell M., and Barbara H. Honkala, technical coordinators. 1990. *Silvics of North America*: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. Washington, D.C.: U.S. Department of Agriculture, Forest Service. Volume 2, 877 p.

Dyke, Steven, Johnson, Sandra, Isakson, Patrick. 2015. North Dakota State Wildlife Action Plan. North Dakota Game and Fish Department. Bismarck, N.D. 468 p.

Frankson, Rebekah, 2016. NOAA: National Centers for Environmental Information. State Summaries, 149 North Dakota. 4 p.

Hagen, Sandra K., Patrick T. Isakson and Steve R. Dyke. 2005. *North Dakota Comprehensive Wildlife Conservation Strategy.* North Dakota Game and Fish Department. Bismarck, N.D. 454 pp.

Harniss, R.O. 1981. *Ecological Succession in Aspen and its Consequences on Multiple Use Values.* In: DeByle, N.V., editor. Symposium proceedings, Situation management of two intermountain species: aspen and coyotes. Aspen. Logan, Utah: Utah State University. Volume 1, pp 31-39.

Harsel, Robert. 2014. North Dakota Sawmill Directory. North Dakota Forest Service. Bottineau, N.D. 4 p.

Haugen, David E., Michael Kangas, Susan J. Crocker, Charles H. Perry, Christopher W. Woodall, Brett J. Butler, Barry Wilson, Dan J. Kaisershot. 2009. *North Dakota's Forests 2005.* Resource Bulletin NRS-31. Newtown Square, Pa.: U.S. Department of Agriculture, Forest Service, Northern Research Station. 82 p.

Haugen, D.E., R.J. Piva, N.P. Kingsley, R.A. Harsel. 1999. *North Dakota's Forest Resources, 1994*. Research Paper NC-336. St. Paul, Minn.: U.S. Department of Agriculture, Forest Service, North Central Research Station. 101 p.

Johnson, Lezlee. 2018. Unpublished data. North Dakota Great Plains Initiative Phase II. Bottineau, N.D.: North Dakota Forest Service.

Kangas, M. 2007. *North Dakota Forest Health Report 2005 – 2006*. Bottineau, N.D.: North Dakota Forest Service. 16 p.

Kangas, M. 2016. *An assessment of North Dakota's Field Windbreaks 2010-2015*. Bottineau, N.D.: North Dakota Forest Service. 2 p.

Meneguzzo, Dacia M., David E. Haugen, Brian F. Walters, Brett J. Butler, Susan J. Crocker, Cassandra M. Kurtz, Randall S. Morin, Mark D. Nelson, Ronald J. Piva and James E. Smith. 2018. Northern Great Plains Forests 2015. USDA Forest Service – Northern Research Station. NRS-116. 114 p.

North Dakota Forest Service. 2009. *North Dakota Forest Service Fire Management Program*. www.ndsu.edu/ndfs/fire_management/

North Dakota Forest Service 2020. Community Forestry Program: Community Threat Assessment Program. https://ndcitytrees.org/NorthDakota

Oduor, P; L. Kotchman. 2007. *North Dakota Spatial Analysis Project. 2007*. Bottineau, N.D.: North Dakota Forest Service. 127p.

Paulson, Charles. 2018. Forests of North Dakota, 2017. Resource Update FS-149. Newtown Square, Pa.: USDA Forest Service, Northern Research Station. 4 p.

Peper, Paula J. et al., 2004. *City of Bismarck, North Dakota Street Tree Resource Analysis.* Center for Urban Forest Research. Davis, Calif.: University of California, U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 64 p.

Perala D.A. 1990. Quaking aspen. In: Burns, Russell M., and Barbara H. Honkala, technical Coordinators. 1990. *Silvics of North America*: 1. Conifers, 2. Hardwoods. Agriculture Handbook 654. Washington, D.C.: U.S.

Rush, David. 2003. *Red River Basin Riparian Project Phase II*. Section 319 Nonpoint Source Pollution Control Program. Red River Regional Council. U.S. EPA Region VIII. 36pp.

U.S. Census Bureau. 2010. *Census of Population and Housing*. Washington, D.C.: U.S. Department of Commerce.

U.S. Department of Commerce, 2005. *2002 Census of Manufacturers*. Washington, D.C.: U.S. Department of Commerce. Economics and Statistics Administration. Bureau of the Census.

U.S. Global Change Research Program, 2001. Forests: The potential consequences of climate variability and change. A report of the national forest assessment group. USDA, Washington, D.C. 8 p.

North Dakota Forest Action Plan

Partial funding for this report is made available through support from the USDA Forest Service State and Private Forestry Program.

Any inquiries about the North Dakota Forest Service insect trapping or the Forest Health Program in general can be directed to Lezlee.Johnson@ndsu.edu or (701) 231-5138. This publication is available in alternative formats by calling (701) 231-5138.