2020

NEBRASKA

Statewide Forest Action Plan

NEBRASKA FOREST SERVICE
University of Nebraska–Lincoln

INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES

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About the Cover

The tree featured on the cover is stewarded by Ralph Naber near Beatrice. It is recognized as the largest cottonwood in the United States by American Forests. (Photo by: Graham Herbst, NFS)

Special thanks to the Nebraska Game and Parks Commission for the use of their images of Nebraska's landscapes.

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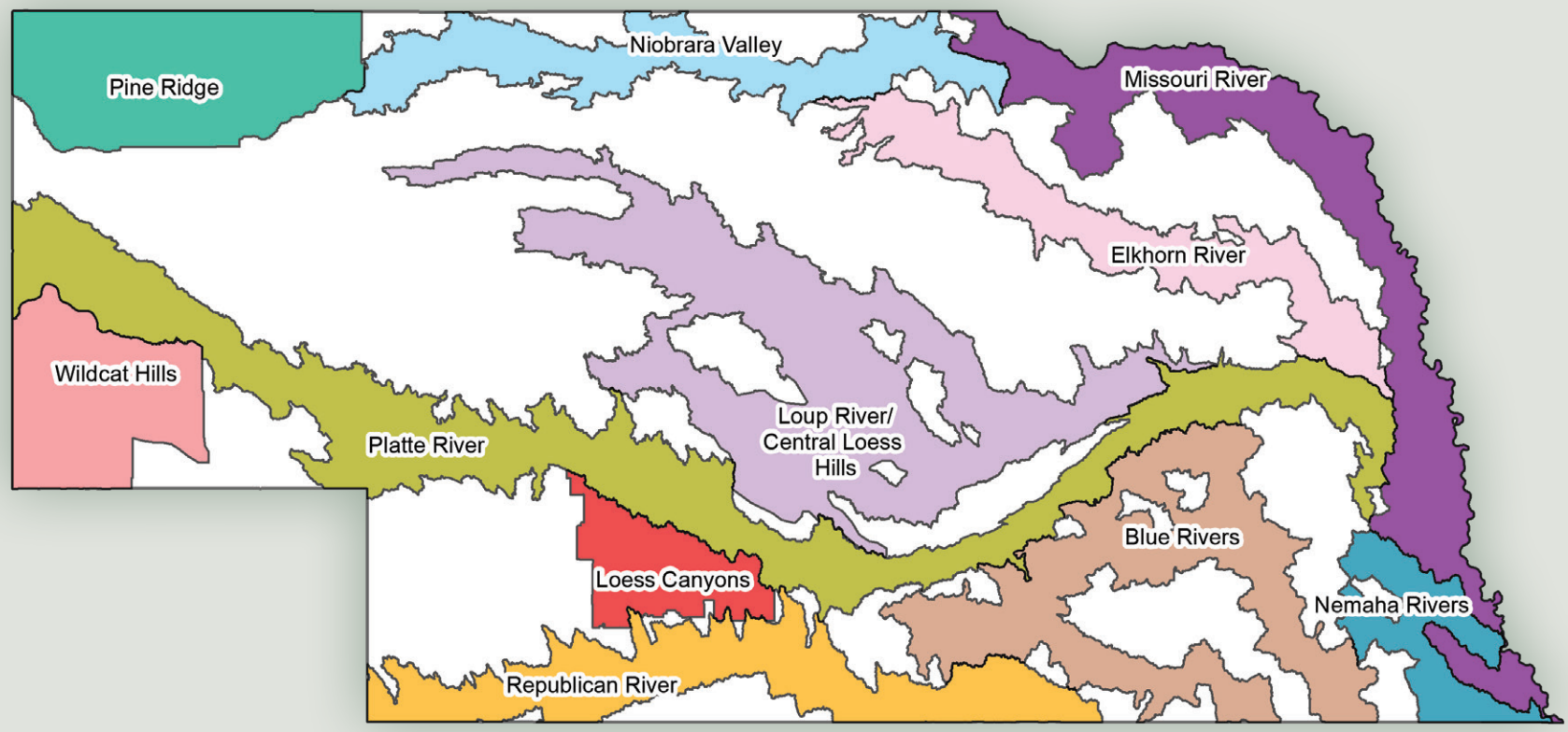
Commonly Used Acronyms

AoN – Forest Legacy Assessment of Need
BMP – Best Management Practices
BUL – Biologically Unique Landscape
CWPP – Community Wildfire Protection Plan
FAP – Forest Action Plan
FIA – Forest Inventory and Analysis Program
NGPC – Nebraska Game and Parks Commission
NFS- Nebraska Forest Service
NRD – Natural Resource District
NRCS – Natural Resource Conservation Service
PFL – Priority Forest Landscape
USFS – United States Forest Service
VFD – Volunteer Fire Department
WUI – Wildland Urban Interface

Nebraska's Priority Forest Landscapes



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Executive Summary

Nebraska possesses a diverse array of forest resources. From ponderosa pines in the panhandle to the riparian hardwood forests overlooking the Missouri River, trees and forests play important roles in Nebraska's ecology and its economy. Nebraska's wood products manufacturing industry, for example, employs more than 2,200 workers with an annual economic output of $286 million (U.S. Census Bureau, 2005). Much of Nebraska's wildlife—nearly 2,200 species of animals and plants and over 10,000 insects—directly or indirectly depend on trees for food or habitat (Nebraska Game and Parks Commission, n.d.). Despite the wide-ranging benefits provided by trees, there are a number of factors that must be addressed in order for trees to thrive in the state.

Like other areas in the Great Plains, Nebraska's forest resource experiences an array of challenges posed by severe weather, land-use conversion, invasive species encroachment, pest and disease spread, and the increasing threat of large wildfires. Individually, any one of these forces can place enormous pressure on forests and the species that utilize trees for survival. If assessed as an aggregate, given predicted shifts in climate by Nebraska researchers, the state's trees and forests face pressures that have not been observed in modern history.

Nebraska's Forest Action Plan – 2020 represents a multi-year effort by Nebraska Forest Service staff to ensure trees continue to play a role in the lives of all Nebraskans. It includes assessments in locations considered to be priority forested areas; the strategies that will be implemented to address the challenges described in the preceding paragraph; and, how the agency's resources will coalesce to bring the state's trees and forests to a healthy and sustainable condition. Additionally, this plan maintains flexibility that allows for response to changes in the natural environment, state or federal policy, and the priorities of constituents and stakeholders.

Preface

The Nebraska Forest Service (NFS), part of the University of Nebraska-Lincoln's Institute of Agriculture and Natural Resources, provides comprehensive forestry education, technical and financial assistance, and many other services to all Nebraskans. The NFS is firmly committed to leading the state in sustaining and improving Nebraska's tree and forest resources. This will be accomplished by caring for and utilizing these resources wisely and helping develop the people who will steward them now and in the future.

Trees and forests provide many benefits to the residents of Nebraska. They create valuable wildlife habitat and livable communities, provide recreational opportunities, clean water and air, save energy, and contribute to the "Good Life" that Nebraskans enjoy. These resources also bolster Nebraska's forest industry, which creates thousands of jobs and generates substantial economic benefit.

The staff of the NFS operates under the guidance of the agency's mission, vision, and core values.

Mission

To enrich the lives of all Nebraskans by protecting, restoring, and utilizing Nebraska's tree and forest resources.

Vision

The NFS leads the state by inspiring and assisting others to create and sustain healthy, productive forests.

Core Values

- Integrity in all interactions
- Responsible and sustainable stewardship
- Outstanding service

Legislative Mandates

Nebraska Forest Service: Mission; Core Programs; Duties (2004) requires the NFS to "provide education and services covering all aspects of planting, protection, care, and utilization of the state's tree and forest resources and shall provide fire protection to all rural land in cooperation with the state's rural fire protection districts. The NFS shall provide education and services through four core programs:

1. Rural Forestry Assistance
2. Urban and Community Forestry
3. Forest Health
4. Rural Fire Protection and Control

The statute requires cooperative relationships with federal, state, and local entities to maximize services and funding.

Nebraska Stat. § 81-825-828, otherwise known as the Wildfire Control Act (2013), was passed in response to massive and highly destructive fires in the state. The Act has dramatically increased the capacity of the state to reduce risk to life and property while enhancing the management and suppression efforts of wildfires. The law states the Nebraska Forest Service shall:

1. Administer programs to thin forests to reduce forest fuel-loads in order to substantially reduce wildfire risk, intensity, and rate of spread and develop markets for woody biomass generated from forest thinnings;
2. Provide expanded training programs for volunteer firefighters, private landowners, and communities in Nebraska in fire suppression tactics of wildfires in order to increase suppression effectiveness and safety;

3. Expand the federal excess property programs sponsored by the United States Department of Agriculture and the United States Department of Defense and managed by the Nebraska Forest Service in Nebraska;
4. Oversee the rehabilitation of forestlands that have been destroyed by wildfires;
5. Manage single-engine air tanker bases and operations in Nebraska; and
6. Contract to construct at least two single-engine air tanker bases and develop one or more mobile single-engine air tanker bases in Nebraska.

Voluntary Best Management Practices

Some states have adopted specific laws and complex regulations governing forest management activities. The state of Nebraska implements a voluntary alternative, allowing landowners the flexibility to manage forestlands to meet their own objectives. However, both state and federal laws (e.g., Clean Water Act, Endangered Species Act, etc.) may apply to some management activities.

Voluntary Best Management Practices (BMPs), when carefully applied, ensure the sustainability and productivity of woodlands during timber harvesting, forest management, tree planting, and other forest management activities. The goal is sustainable production of a mixture of "outputs" with minimal negative environmental impacts. Outputs can mean traditional wood products such as logs or fence posts, but can also include recreation and aesthetic value, water, and other nontraditional products. Some short-term negative impacts may result from woodland management, as they do from most human activities. However, negative impacts resulting from good management are normally acceptable and temporary. A reference to identify common BMPs for Nebraska can be found in Appendix C.

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Chapter 1: Introduction

The *Nebraska Statewide Assessment and Strategy – 2010* provided the foundation and guidance for managing sustainable, healthy forests across the state. The *2015 Forest Action Plan* update built upon that work and identified gaps in the original planning document. It reflected new assessment information obtained after 2010 and provided an opportunity to re-engage NFS staff and partners in identifying new issues and opportunities. Much of the focus, organization, and direction of the original planning process remains the same; however, changes in circumstances and new information have illuminated assessment gaps that are addressed in this update.

The planning process for the *Nebraska Forest Action Plan – 2020* primarily focused on new and updated information. Management staff worked with local units and NFS forest districts to identify needs using a grassroots, bottom-up approach. This technique identified specific needs and issues with the assistance of foresters and other professionals familiar with each Priority Forest Landscape Area (PFL). This provided detailed information about the current threats, opportunities, strengths and weaknesses, and desired outcomes from stakeholders within each PFL. Members of the public in each landscape were also invited to participate through attending informational meetings, reviewing a draft of the publication, or submitting comments directly to the FAP planning committee.

National Priorities

The NFS provides over 250 workshop and outreach events to Nebraska's residents, reaching more than 200,000 people annually. All NFS program areas, discussed at length in Chapter 5, have components of education, outreach, and stewardship that meet the national priorities. The goals, objectives, strategies, and tactics in this Forest Action Plan (FAP) tie directly to the three nationally identified priorities of:

- Conserve and Manage Working Forest Landscapes for Multiple Values and Uses,
- Protect Forests from Threats, and
- Enhance Public Benefits from Trees and Forests.

These national priorities form the underpinning of this FAP. Matrixes and tables are present in Chapters 8-11 of this document to assist the reader in understanding the relationship of each topic to the national priorities. The following are brief examples that demonstrate how NFS programs achieve the national priorities in Nebraska.

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

Nebraska's Forest Stewardship and Forest Legacy—functions of Rural Forestry Assistance—are programs that address this priority. Forest Stewardship Plans and management plans promote sustainable planning and active management to support multiple landowner objectives through voluntary BMPs (see Appendix C). The NFS develops over 300 forest plans annually and has implemented tree planting and forest improvement projects on over 25,000 acres over past 18 years.

Forest Legacy, for its part, protects working forests from conversion to other uses such as ranchette development and agricultural expansion. An example is maintaining a 461-acre Forest Legacy project, Chat Canyon, in north central Nebraska.

National Priority: Protect Forests from Threats

The NFS addresses this priority through collaborative efforts among the Rural Forestry, Community Forestry, Forest Health, and Rural Fire Protection and Control programs. Rural Fire Protection and Control efforts include fire training, fire prevention programs, building capacity, and forest fuels reduction. Additionally, this program helped acquire over 850 pieces of wildland firefighting equipment throughout the state for use by volunteer fire departments (VFDs). The Forest Health Program includes a strong detection and monitoring component to help detect and mitigate insect, disease, and invasive species outbreaks. Recent successes include the Nebraska Emerald Ash Borer Working Group and Tree Pest Detector Initiative, which set guidelines and provided training for participants to respond to pest outbreaks in their areas.

National Priority: Enhance Public Benefits from Trees and Forests

A wide range of NFS programs and projects address this priority. The Rural Forestry Assistance Program helps landowners manage their forests for multiple uses, including increased value and productivity, improved wildlife habitat, and enhanced forest health. These byproducts also create additional public benefits, such as improved water quality, that increase as more landowners recognize the value of sound forest management. Additionally, the NFS implements forest utilization programming that seeks to develop and promote new and innovative wood products. These efforts aim to bolster a growing forest products industry while increasing workforce and rural economic development.

The Community Forestry Program works closely with municipal staff, arborists, community tree advocates, and residents to promote and enable tree conservation and planting on both public and private properties in communities. The resulting tree inventories, management plans, and tree planting projects not only increase species diversity, but expand the community canopy and ecosystem services provided to residents. More than 300 communities have participated in community forest programs. This program also aims to continually enhance the value of community forests, helping certify over 90 communities as Tree City USA, four utility providers as Tree Line USA, and six campuses as Tree Campus USA.

Forest Action Plan

The United States Department of Agriculture (USDA), specifically the Farm Bill, requires State Forest Action Plans, including *Nebraska's Statewide Assessment and Strategy – 2010,* to be updated at least every ten years, with a review at year five of the plan. The plan guides the agency's efforts to promote sustainable management of Nebraska's nearly 1.5 million acres of forestland and 1.314 million acres of other land with trees (USDA Forest Service, 2018).

The *Nebraska Forest Action Plan – 2020* was reorganized in response to observed and perceived threats to the forest resource. These threats include a shifting climate with more flooding, winter storms, droughts, and wildfires; new-to-Nebraska invasive species such as the emerald ash borer; and, landscape fragmentation and land-use conversion. This plan includes newly collected data from sources such as the NFS' Nebraska Growth and Drain study and the Forest Inventory Analysis by the US Forest Service. It also details management guidelines, new initiatives, and a comprehensive guide to how the NFS will implement this latest version of the FAP.

Plan Components

The following list provides an at-a-glance overview of the chapters and the content one can anticipate finding in each section. For a comprehensive list with respective page locations, please refer to the table of contents found at the beginning of this document.

Statewide Forest Resource Assessment (Chapters 1-7)

- Introduction and document overview
- Nebraska forest facts and the planning process
  - Partner engagement
  - Public review process
- Identification of PFLs including:
  - Conditions and trends of forest resources
  - Threats to forestlands and resources
  - Consistency with national priorities
  - Desired outcomes
  - Local priorities
- Multi-state resources that are of regional priority
- Description of NFS programs and how each relates to this FAP.
- Other statewide concerns
  - Extreme weather events compounded by a changing climate
  - Threatened and endangered species
  - Invasive and aggressive native plant species

Statewide Forest Resource Strategy (Chapters 8-13)

- 2020 FAP: Goals and strategies
- 2020 FAP: Implementation approach
- Crosswalk of 2010/2015/2020 FAP goals
- 2015 FAP: Summary of implementation and challenges
- Funding and resources

Desired Outcomes

Desired outcomes are the conditions the NFS is striving to achieve over the next ten years for each of the PFL and issue areas outlined in this document. These are "stretch goals" for the agency and for the resource, crafted in a specific manner as to push the limits of what might ordinarily be achieved. The NFS will apply the principles of desired future condition at a landscape level, driving the direction of management within the priority landscapes and areas adjacent to these resources. A desired outcome will not necessarily apply to every acre within each priority landscape, nor will it cover all acres across every ownership type. Instead, it outlines an optimum overall condition for each landscape. Key elements of the desired outcomes are:

- Creating healthy, sustainable forests and landscapes;
- Increasing biological diversity within ecosystems;
- Ensuring productive forest systems contribute to economically healthy, vibrant communities and forest-related jobs; and
- Utilizing the agency's established BMPs, following individual site prescriptions.

Priority Forest Landscapes

According to the National Association of State Foresters (2019a), the Forest Stewardship Program is the primary private forest landowner assistance program in the U.S. It serves as a gateway through which landowners can access a variety of assistance programs including USDA cost-share, state tax abatement, and forest certification. State forestry agencies use the program to facilitate shared stewardship by working across landscapes and land ownerships to address key resource issues. The National Association of State Foresters (2018) endorsed the concept summarized below:

- States will identify geographic priority areas for delivering landowner assistance.
- States will strategically deploy federal assistance to address one or more of the following critical issues:
  - Reducing wildfire risk to communities,
  - Protecting water resources,
  - Enhancing wildlife habitat, and
  - Supporting jobs in the woods.
- All federal stewardship dollars will be spent within geographic priority areas.
  - Matching state funding can occur elsewhere.
- New performance measures will better communicate federal investment outcomes.

For states electing to identify their Forest Stewardship Program priority areas as part of the FAP revision process, the state/federal task force offers this guidance:

- Priority area(s) need to be specific geographic areas, not more than 50% of the total eligible lands for state forest stewardship.
- More than one priority area is acceptable, but collectively:
  - Areas must be of a reasonable size, reflecting that these are truly areas where focused attention should be dedicated.
  - These areas must be responsive to one or more of the National Association of State Foresters' list of critical issues.
- Area selection and delineation must show a clear strategy aimed at achieving progress on the identified issues within an area where this achievement is most needed and likely to occur.

Since FAPs are 10-year plans, a desirable outcome would be demonstrating measurable progress on key issues within critical locations during that timeframe. FAPs, and therefore PFL Areas, can be revised anytime there is a need because of significantly changed issues, opportunities, or resources. NFS staff will designate the Stewardship geographic priority areas with PFLs in mind.

Based on the aforementioned guidance, the NFS surveyed its foresters and field staff, who provided specific information pertinent to their area's PFLs. This information was compiled and assessed to examine related issues across forested landscapes. Chapter 3 reflects this exercise, where themes were developed to demonstrate how a cohesive strategy will be applied to move all treed and forested areas toward a desired future condition. The specific strategies that will be implemented to meet FAP goals can be found in Chapter 8.

Multistate Priorities

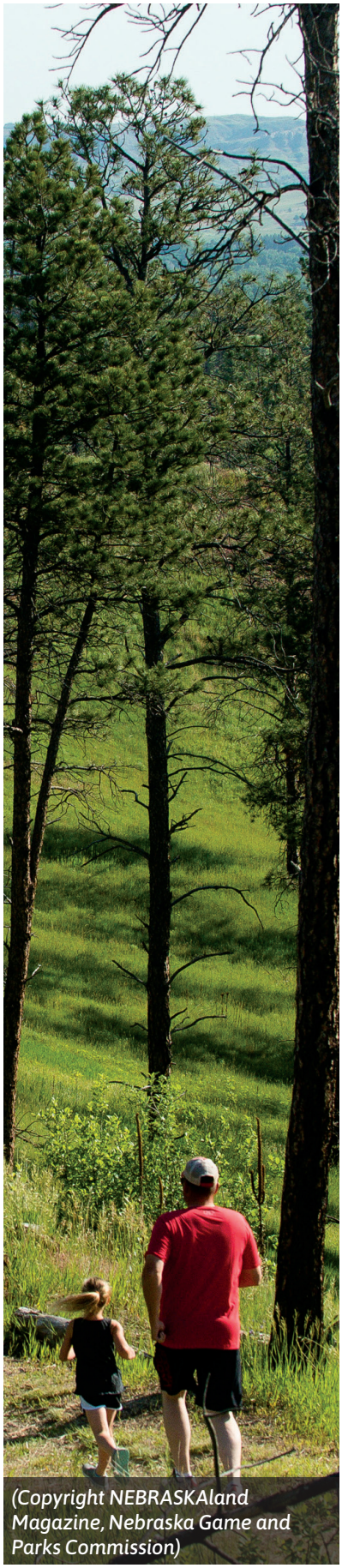
This FAP identifies six multistate priority areas where opportunities exist for interstate, landscape-level collaboration and management. These areas represent upstream and downstream components of riparian forest systems, and forests that occur on the eastern extent of their natural range. It also includes a metropolitan area that resides within an important forested area in Nebraska and Iowa.

These forest resources afford the NFS an opportunity to prioritize management activities that can positively influence outcomes regionally. Nebraska's multistate priority areas, detailed in Chapter 4, include:

- Niobrara River, shared with Wyoming and South Dakota
- Missouri River, shared with Iowa, Kansas, Missouri, and South Dakota
- Pine Ridge, shared with South Dakota and Wyoming
- Republican and Blue River systems, shared with Kansas
- South Platte and North Platte systems, shared with Colorado and Wyoming
- Omaha-Council Bluffs Metro, shared with Iowa

Forest Legacy

The Forest Legacy Program authorizes the USDA Forest Service or state governments to purchase critical forestlands to prevent conversion to a non-forest use. In Nebraska, priority is given to forestlands that contain important scenic, cultural, recreational, fish and wildlife habitats, water, or other ecological resources that support working forest uses. Lands purchased under this program will continue or become productive, working forestlands with active management plans. Nebraska's Forest Legacy Assessment of Need (AoN) can be found in Appendix A.



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Chapter 2: Nebraska Forest Facts and the Planning Process

This chapter provides an overview of the planning process, including coordination with existing management plans across the state. Tables and graphs are grouped at the end of this chapter to outline trends for both forestlands and trees present throughout the state.

Stakeholder Participation

Protecting, enhancing, and utilizing the state's tree and forest resources is a large task that no one agency or organization can do independently. Partnerships with a diverse array of organizations are critical to meeting the National State and Private Forestry Priorities outlined in Chapter 1. The NFS works with a large number of partners, described in detail in Chapter 7. The FAP aligns with existing partners and their management activities, including, but not limited to:

- USDA Forest Service (USFS): Nebraska National Forest and Grasslands
- Nebraska Natural Resources Conservation Service (NRCS)
- Nebraska's 23 Natural Resources Districts (NRDs)
- Nebraska Game and Parks Commission (NGPC)
- Nebraska Department of Agriculture
- USDA Animal and Plant Health Inspection Service
- Nebraska's 481 rural fire districts
- Nebraska Emergency Management Agency
- Nebraska State Fire Marshal Agency

Aligning with Other Plans

This assessment also relies heavily on technical documents devised to better understand the state's forest resources. The NFS consulted previous documentation and requested feedback from the following technical committees including, but not limited to:

- Forest Legacy – AoN
- State Forestry Stewardship Coordinating Committee
- State Technical Committee (NRCS)
- Nebraska National Forests and Grasslands Resource Management Plan (USFS)
- Nebraska Natural Legacy Project (NGPC)
- Nebraska Community Wildfire Protection Plans

Table 1: Priority Forest Landscape Alignment with Other Management Plans				
PRIORITY FOREST LANDSCAPE	FOREST LEGACY ASSESSMENT OF NEED	NE NATIONAL FORESTS & GRASSLANDS PLAN	NE NATURAL LEGACY	COMMUNITY WILDFIRE PROTECTION PLANS
Pine Ridge	X	X	X	X
Wildcat Hills	X		X	X
Loess Canyons			X	X
Niobrara Valley	X	X	X	X
Missouri River	X		X	X
Nemaha River				X
Big Blue River			X	X
Little Blue River			X	X
Eastern Platte River	X		X	X
Western Platte River	X		X	X
Central Platte River	X		X	X
Republican River	X			X
Loup River	X		X	X
Elkhorn River	X		X	X

Public Comment and Informational Meetings

In line with guidance from the USDA Forest Service, the NFS solicited feedback from Nebraskans about trees and forestlands throughout the state. Eight informational meetings were held over the course of two weeks within or near each of the PFLs. To better address local issues and conditions, meetings consisted of an overview of the respective PFLs, analysis of conditions and threats, and review of adjacent multi-state priority areas. Questions were fielded from attendees, and an option to submit written feedback was provided. Additionally, a draft version of the plan was posted on the NFS website for review and the submission of comments. A series of press releases were circulated statewide announcing the informational meetings, the opening of a 45-day public commenting period, and detailed information on how the public and partners could participate.

Assessment Process

This assessment evaluates current, historical, and spatial data gathered for the *Nebraska Forest Action Plan 2020*. In order to present the most detailed and updated information, the NFS expounded on its existing forest resource data with publicly-available information from a variety of sources, including the National Land Cover Dataset, USFS Spatial Analysis Project, U.S. Census Bureau, NGPC, Nebraska Department of Transportation, Nebraska NRDs, USFS – Nebraska National Forest, among others. The richness of information provided additional insights about the nature, complexity, and value of Nebraska's forest resources. This increased the agency's ability to clearly define PFLs, current conditions, and the management actions needed to move toward the desired future condition.

The spatial analysis identified ecological units with like features for the purposes of mapping and delineating the PFLs. During this process,

the NFS compared the priority landscapes from the 2010 assessment to the 2008 Nebraska Natural Legacy Project's Biologically Unique Landscapes (BULs). Previously identified areas were adjusted to better reflect the presence of all forested acres within and adjacent to the defined area. Boundaries also closely adhere to the hydrology of the watershed, local and regional interests, as well as the goals defined by the Forest Legacy AoN.

Seven of the 11 PFL boundaries (Pine Ridge, Wildcat Hills, Niobrara Valley, Platte River, Republican River, Elkhorn River, and Missouri River) align with predefined Forest Legacy Area boundaries. Boundaries for three of the priority landscape areas (Loup, Nemaha, and Blue Rivers) were produced through extrapolation of existing Forest Legacy Area boundaries using a hydrologic unit code (HUC12) to determine the boundaries of the watershed. These were augmented to also include forestland in the drainage areas of the rivers. The Loess Canyons PFL boundary aligns with adjacent county boundaries. The Missouri River PFL boundary includes all areas within Douglas and Sarpy counties to account for forested areas in Omaha's surrounding populated areas.

Statewide Data and Trends

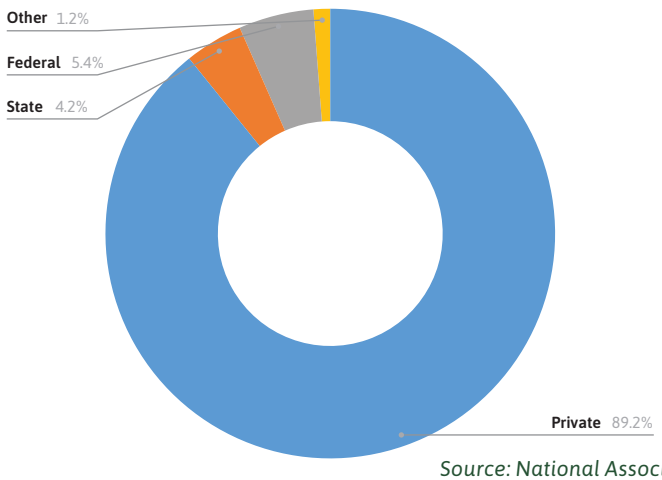
The following data was compiled from a variety of sources to demonstrate the condition of Nebraska's forestlands and other areas with trees. Nebraska is mostly privately owned, with approximately two percent of the total land area held by the public. Treed areas—including forestland and other areas with trees—follow a similar trend. Over 2.5 million acres are held privately and 278,000 acres fall within the public domain (National Association of State Foresters, 2019a).

Table 2: Nebraska's Land and Forest Ownership

	PERCENT OF AREA	LAND AREA (acres) [1]	FORESTLAND AND OTHER AREAS WITH TREES (acres) [2]
Public (state, federal, other)	2.4	1,180,000	278,000
Private and other	97.6	48,326,065	2,517,000
Total	100	49,506,065	2,795,000

Sources: [1]Nebraska Game and Parks Commission, 2020; [2]Meneguzzo, Lister, & Sullivan, 2018

Figure 1: Nebraska Forests by Ownership Type



Source: National Association of State Foresters, 2019a

Table 3: Forest Productivity Facts

TOTAL FOREST/ TREED AREA (acres)	2,795,000
Forestlands[1]	1,481,000
Land with trees[2]	1,314,000
TOTAL LAND AREA (acres)[3]	**49,506,065**
FORESTLAND OWNERSHIP[4]	
Private	89%
State	4%
Federal	5%
Other	1%
VOLUME (cubic feet)[1]	
Average annual gross growth (growth)	64,112,495
Average annual mortality (drain)	51,982,011
Average annual net growth	12,130,492
Average annual removals (including management and harvest removals)(drain)	15,407,190
Net growth/drain	-3,276,696
CONSERVATION LANDS (acres)	
Non-federal lands[3]	577,000
Forest Legacy (Chat Canyon WMA)	461
Federal lands[3]	601,000
NUMBER OF LIVE TREES	**502,438,892**
Forestland trees[1]	383,217,991
Non-forestland (trees in rural areas)[2]	106,161,897
Non-forestland (trees in urban areas)[2]	13,059,004

Sources: [1]USDA Forest Service, 2018; [2]Meneguzzo, Lister, & Sullivan, 2018; [3]Nebraska Game and Parks Commission, 2020; [4]National Association of State Foresters, 2019a

Forestlands

According to information from the USDA Forest Service (2018) and Meneguzzo, Lister, and Sullivan (2018), Nebraska has approximately 1.5 million acres of forestlands. These reports use an industry accepted definition that states forestland is:

> Land that has at least 10 percent crown cover by live tally trees of any size or has had at least 10 percent canopy cover of live tally species in the past, based on the presence of stumps, snags, or other evidence. To qualify, the area must be at least 1.0 acre in size and 120.0 feet wide. Forestland includes transition zones, such as areas between forest and non-forestlands that meet the minimal tree stocking/cover and forest areas adjacent to urban and built—up lands. Roadside, streamside, and shelterbelt strips of trees must have a width of at least 120 feet and continuous length of at least 363 feet

Table 4: Nebraska's Primary Forest Landscapes & Their Extent*

PRIMARY FOREST LANDSCAPES	ACRES
Pine Ridge	211,892
Wildcat Hills	52,114
Loess Canyons	111,715
Niobrara Valley	167,410
Missouri River	283,697
Nemaha River	48,109
Big and Little Blue River	68,456
Platte River	115,311
Republican River	94,236
Loup River	175,000
Elkhorn River	56,867
Non-forestland with trees	1,314,877
TOTAL	**2,699,684**

** These numbers reflect spatial analysis of forested acres with respective priority forest landscapes.*

Sources: USDA Forest Service, 2018; Meneguzzo, Lister, & Sullivan, 2018

to qualify as forestland. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest if they are less than 120 feet wide or less than an acre in size. Tree-covered areas in agricultural production settings, such as fruit orchards, or tree–covered areas in urban settings, such as city parks, are not considered forestland.

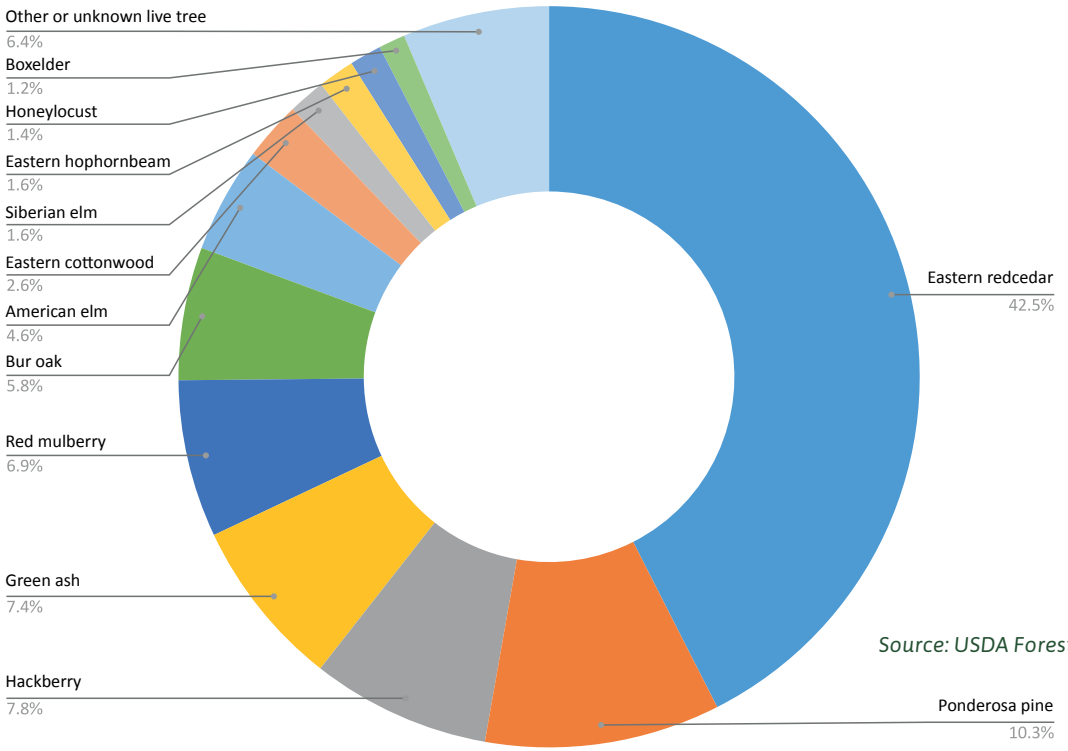
Nebraska's forestlands produce 64.1 million cubic feet of growth on an annual basis. Current natural mortality is 52.0 million cubic feet and removals (timber harvest plus other removals) is 15.4 million cubic feet, resulting in a net drain in the wood supply of 3.3 million cubic feet (USDA Forest Service, 2018). This leaves nearly 40 million cubic feet available for utilization. While there is a net loss in the available volume, this is mostly due to mortality in forests (see Table 3). The most abundant tree species in these forests are eastern redcedar with nearly 163 million trees and ponderosa pine with over 39 million trees.

Table 5: Total Live Trees of Common Tree Species in Forestlands

SPECIES	LIVE TREES
Eastern redcedar (*Juniperus virginiana*)	162,753,452
Ponderosa pine (*Pinus ponderosa*)	39,341,628
Hackberry (*Celtis occidentalis*)	29,925,071
Green ash (*Fraxinus pennsylvanica*)	28,367,724
Red mulberry (*Morus rubra*)	26,323,843
Bur oak (*Quercus macrocarpa*)	22,234,769
American elm (*Ulmus americana*)	17,709,887
Eastern cottonwood (*Populus deltoides*)	9,866,703
Siberian elm (*Ulmus pumila*)	6,235,265
Eastern hophornbeam (*Ostrya virginiana*)	6,090,186
Honeylocust (*Gleditsia triacanthos*)	5,358,773
Boxelder (*Acer negundo*)	4,439,062
Other or unknown live trees	24,571,628
TOTAL	383,217,991

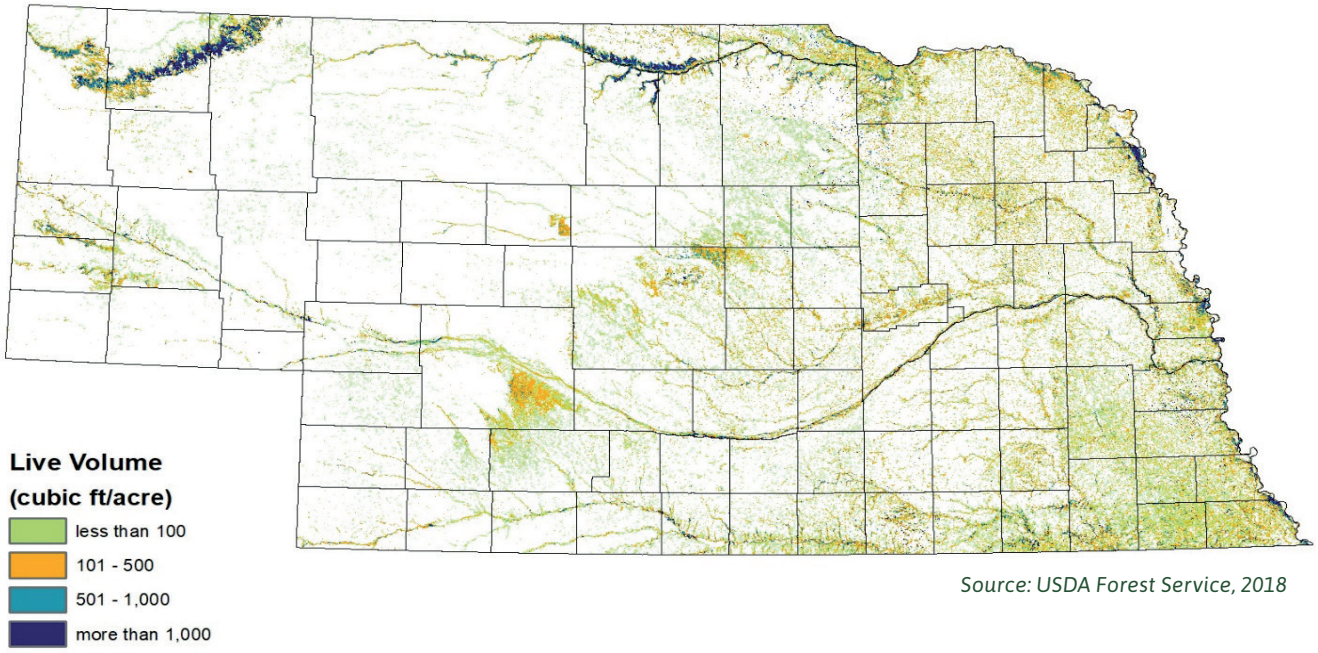
Source: USDA Forest Service, 2018

Figure 2: Tree Species Composition of Forestlands



Source: USDA Forest Service, 2018

Figure 3: Live Volume on Forestlands



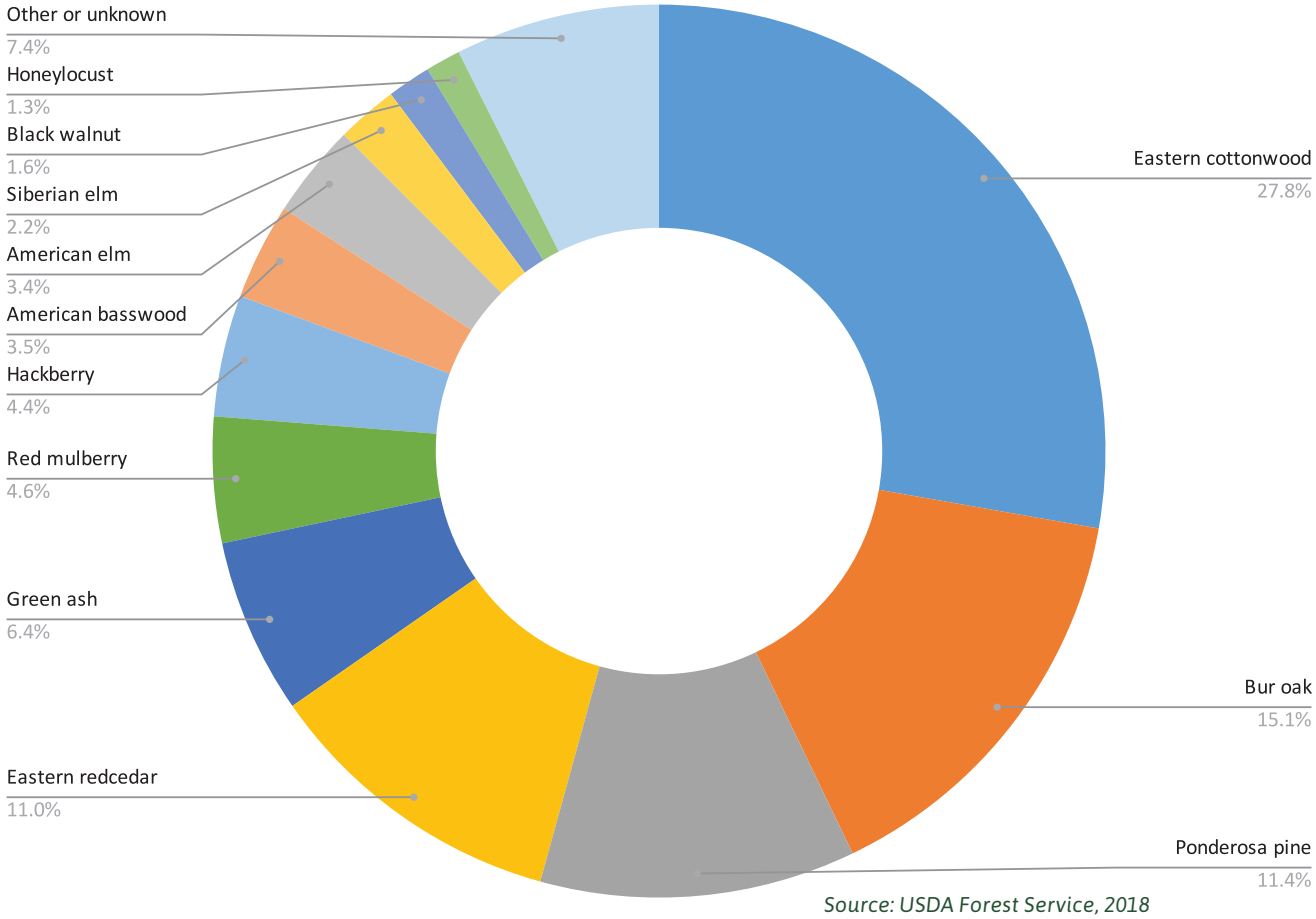
Source: USDA Forest Service, 2018

Table 6: Top 12 Species by Standing Cubic Foot Volume on Forestlands

SPECIES	VOLUME (cubic feet)
Eastern cottonwood (*Populus deltoides*)	588,912,284
Bur oak (*Quercus macrocarpa*)	319,875,750
Ponderosa pine (*Pinus ponderosa*)	242,247,819
Eastern redcedar (*Juniperus virginiana*)	234,269,157
Green ash (*Fraxinus pennsylvanica*)	134,674,516
Red mulberry (*Morus rubra*)	96,645,729
Hackberry (*Celtis occidentalis*)	93,312,463
American basswood (*Tilia americana*)	73,992,610
American elm (*Ulmus americana*)	72,057,711
Siberian elm (*Ulmus pumila*)	46,906,494
Black walnut (*Juglans nigra*)	33,578,799
Honeylocust (*Gleditsia triacanthos*)	26,844,342
Other or unknown live trees	157,099,468
TOTAL	**2,120,417,142**

Source: USDA Forest Service, 2018

Figure 4: Total Volume by Species in Forestlands



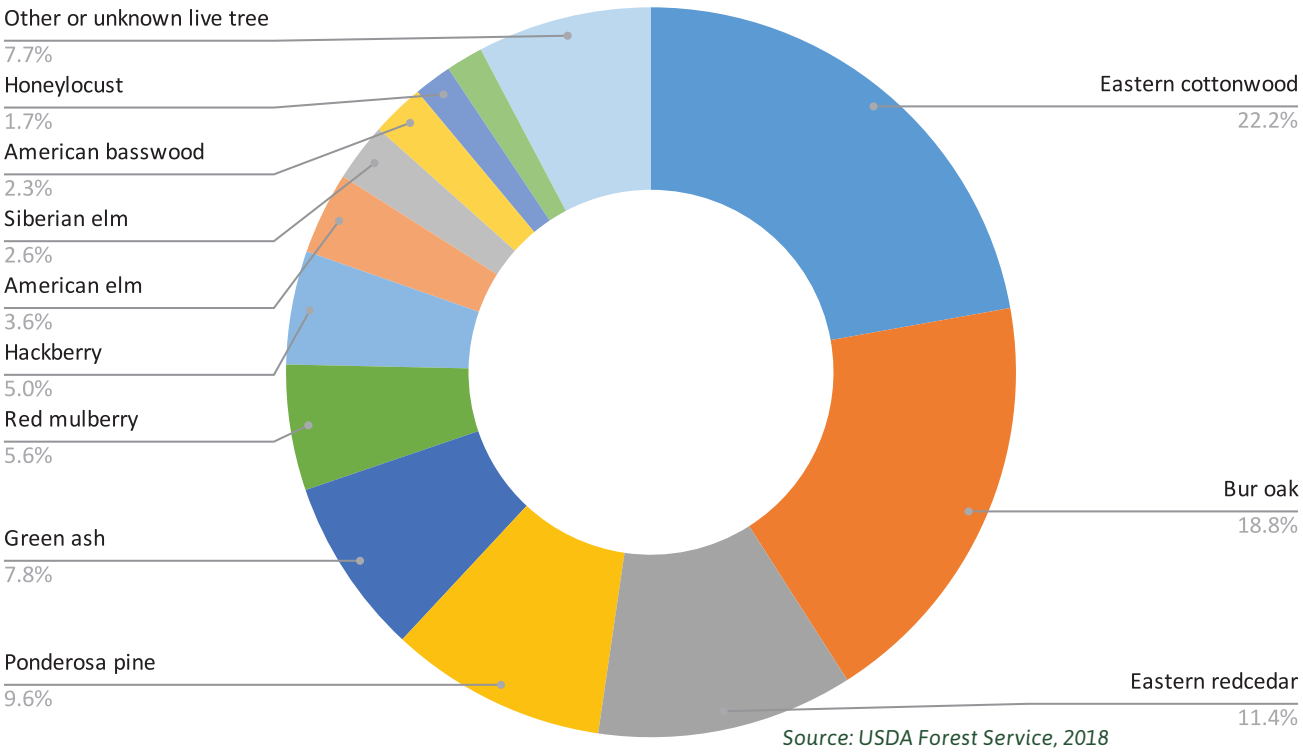
Source: USDA Forest Service, 2018

Table 7: Top 12 Species, Standing Dry Ton of Biomass on Forestlands

SPECIES	TOTAL (dry tons)
Eastern cottonwood (*Populus deltoides*)	10,143,913
Bur oak (*Quercus macrocarpa*)	8,588,809
Eastern redcedar (*Juniperus virginiana*)	5,191,042
Ponderosa pine (*Pinus ponderosa*)	4,397,081
Green ash (*Fraxinus pennsylvanica*)	3,585,573
Red mulberry (*Morus rubra*)	2,546,175
Hackberry (*Celtis occidentalis*)	2,302,177
American elm (*Ulmus americana*)	1,662,979
Siberian elm (*Ulmus pumila*)	1,186,140
American basswood (*Tilia americana*)	1,072,761
Honeylocust (*Gleditsia triacanthos*)	770,735
Black walnut (*Juglans nigra*)	749,752
Other or unknown live tree	3,533,175
TOTAL	**45,730,312**

Source: USDA Forest Service, 2018

Figure 5: Total Standing Biomass Available in Forestlands



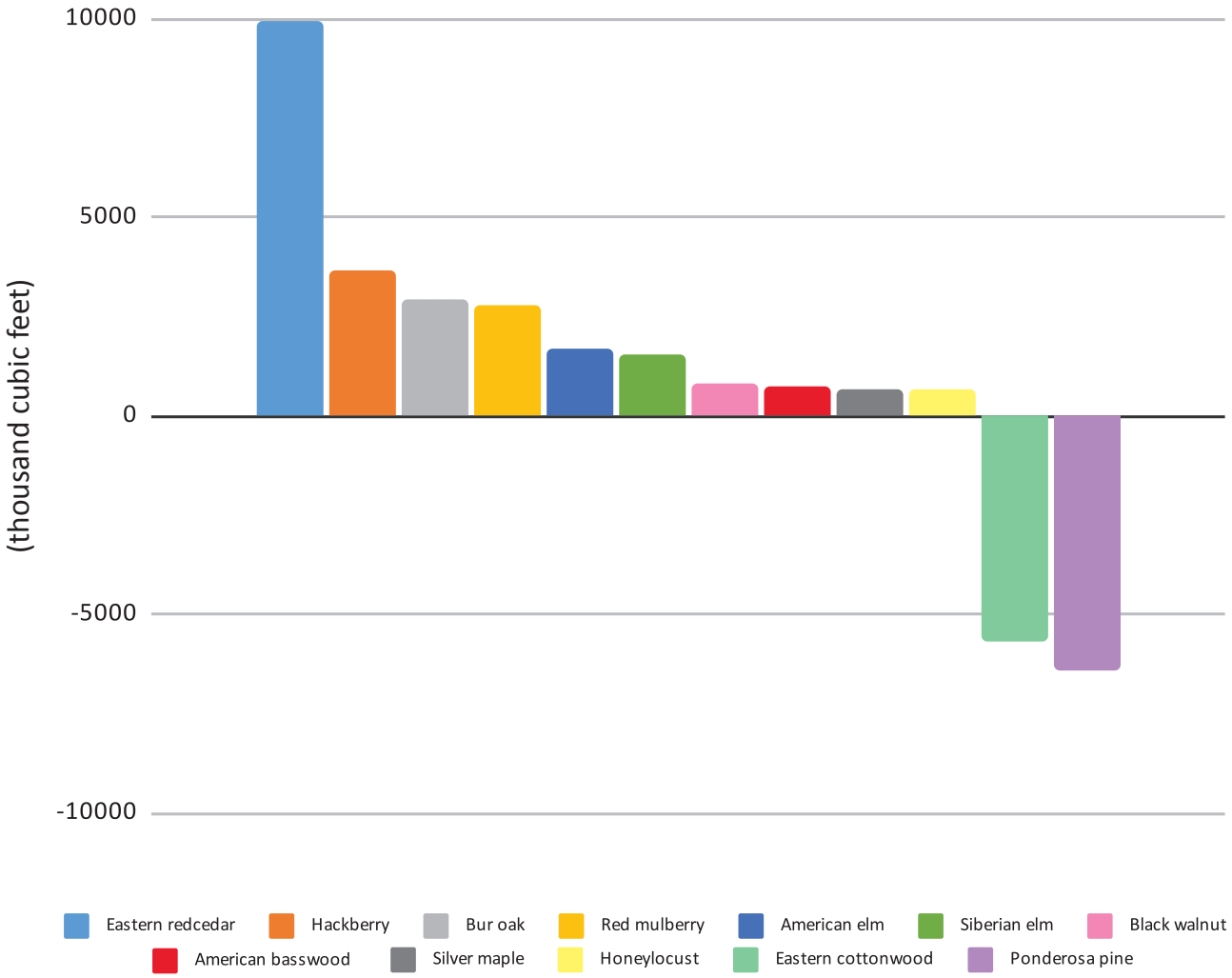
Source: USDA Forest Service, 2018

Table 8: Average Annual Net Growth of Dominant Tree Species on Forestlands

SPECIES	AVERAGE ANNUAL NET GROWTH (cubic feet)
Eastern redcedar (*Juniperus virginiana*)	9,983,758
Hackberry (*Celtis occidentalis*)	3,651,239
Bur oak (*Quercus macrocarpa*)	2,934,970
Red mulberry (*Morus rubra*)	2,826,122
American elm (*Ulmus americana*)	1,688,057
Siberian elm (*Ulmus pumila*)	1,577,468
Black walnut (*Juglans nigra*)	834,133
American basswood (*Tilia americana*)	759,436
Silver maple (*Acer saccharinum*)	684,582
Honeylocust (*Gleditsia triacanthos*)	654,473
Eastern cottonwood (*Populus deltoides*)	-5,713,447
Ponderosa pine (*Pinus ponderosa*)	-6,436,260

Source: USDA Forest Service, 2018

Figure 6: Average Annual Net Growth of Dominant Species on Forestlands



Source: USDA Forest Service, 2018

Non-Forestland

Non-forestland—commonly referred to as "other areas with trees"—is defined as the presence of trees on areas less than one acre in size, less than 120 feet wide, and less than 10 percent stocked (Meneguzzo, Lister, and Sullivan, 2018). The USDA (2018) expounds further by stating non-forestland is:

> "Land that does not support or has never supported, forests and lands formerly forested where use of timber management is precluded by development for other uses. Includes area used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining rights-of-way, powerline clearings of any width, and noncensus water."

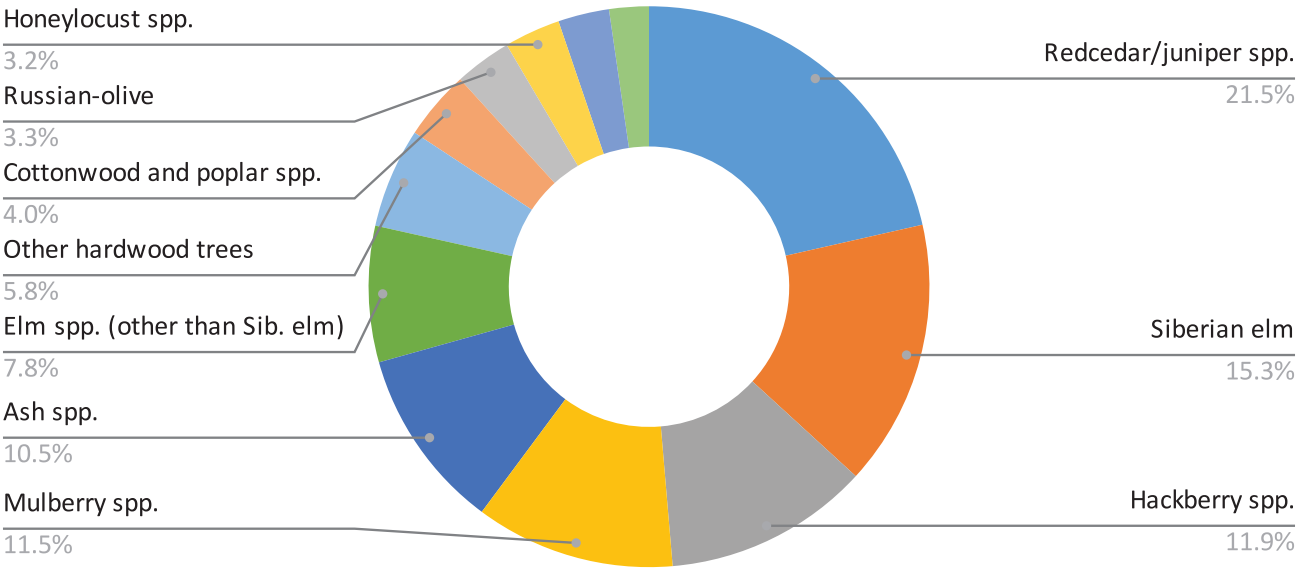
By this definition, Nebraska has an estimated 119 million trees, possessing over 1 billion cubic feet of volume, on 1.3 million acres in rural and urban areas statewide. As detailed in Table 9, eastern redcedar and Siberian elm constitute the largest number of individual trees, while cottonwood holds the most significant volume with more than 348 million cubic feet

Table 9: Estimated Live Trees by Species or Genus Growing on Non-forestland* in Nebraska

SPECIES	NUMBER OF TREES
Redcedar/juniper (*Juniperus* spp.)	24,184,273
Siberian elm (*Ulmus pumila*)	17,301,813
Hackberry (*Celtis* spp.)	13,361,994
Mulberry (*Morus* spp.)	12,976,368
Ash (*Fraxinus* spp.)	11,820,328
Elm (*Ulmus* spp.)	8,840,412
Other hardwood trees	6,491,168
Cottonwood/poplar (*Populus* spp.)	4,501,891
Russian olive (*Elaeagnus angustifolia*)	3,702,206
Honeylocust (*Gleditsia* spp.)	3,649,989
Willow (*Salix* spp.)	3,322,601
Boxelder (*Acer negundo*)	2,575,234

**Non-forestland is defined as less than one acre in size, less than 120 feet wide and less than 10% stocked. Source: Meneguzzo, Lister, & Sullivan, 2018*

Figure 7: Top 12 Species Growing in Non-forestland



Source: Meneguzzo, Lister, & Sullivan, 2018

Table 10: Number of Live Trees on Non-forestland*

SPECIES	RURAL	URBAN	TOTAL
Redcedar/juniper (*Juniperus* spp.)	23,108,069	1,076,204	24,184,273
Spruce (*Picea* spp.)	56,623	428,615	485,238
Pine (*Pinus* spp.)	20,887	52,180	73,067
Ponderosa pine (*Pinus ponderosa*)	147,793	19,755	167,548
Scotch pine (*Pinus sylvestris*)	499,441	352,297	851,738
Maple (*Acer* spp.)	199,121	230,974	430,095
Boxelder (*Acer negundo*)	2,433,327	141,907	2,575,234
Silver maple (*Acer saccharinum*)	919,362	221,119	1,140,481
Birch (*Betula* spp.)	-	105,245	105,245
Hackberry (*Celtis* spp.)	11,253,387	2,108,607	13,361,994
Ash (*Fraxinus* spp.)	10,808,630	1,011,698	11,820,328
Honeylocust (*Gleditsia* spp.)	3,405,525	244,463	3,649,988
Walnut (*Juglans* spp.)	252,690	464,392	717,082
Osage-orange (*Maclura pomifer*)	2,186,203	45,811	2,232,014
Apple (*Malus* spp.)	72,702	340,419	413,121
Mulberry (*Morus* spp.)	11,169,845	1,806,523	12,976,368
Cottonwood/poplar (*Populus* spp.)	4,203,611	298,279	4,501,890
Cherry/plum (*Prunus* spp.)	510,607	186,163	696,770
White oak (*Quercus alba*)	608,096	175,184	783,280
Northern red oak (*Quercus rubra*)	7,886	125,841	133,727
Willow (*Salix* spp.)	3,283,034	39,567	3,322,601
Basswood (*Tilia* spp.)	14,848	111,468	126,316
Elm (*Ulmus* spp.)	7,953,889	886,523	8,840,412
Siberian elm (*Ulmus pumila*)	15,619,792	1,682,022	17,301,814
Russian olive (*Elaeagnus angustifolia*)	3,700,401	1,805	3,702,206
Unknown hardwood	3,726,127	859,765	4,585,892
TOTALS	**106,161,896**	**13,016,826**	**119,178,722**

Non-forestland is defined as less than one acre in size, less than 120 feet wide and less than 10% stocked.
Source: Meneguzzo, Lister, & Sullivan, 2018

Table 11: Total Estimated Cubic Feet Volume by Species on Non-Forestland

SPECIES	RURAL NON-FORESTLAND	URBAN NON-FORESTLAND	TOTAL
Redcedar/juniper (*Juniperus* spp.)	99,922,733	4,756,338	104,679,072
Spruce (*Picea* spp.)	134,636	6,692,143	6,826,779
Pine (*Pinus* spp.)	2,832	1,146,544	1,149,376
Ponderosa pine (*Pinus ponderosa*)	15,676,071	679,444	16,355,515
Scotch pine (*Pinus sylvestris*)	8,662,964	4,821,685	13,484,649
Unknown conifer	-	899,170	899,170
Maple (*Acer* spp.)	37,874	2,453,105	2,490,979
Boxelder (*Acer negundo*)	18,815,638	865,727	19,681,365
Silver maple (*Acer saccharinum*)	14,144,474	22,370,608	36,515,083
Birch (*Betula* spp.)	-	691,002	691,002
Hackberry (*Celtis* spp.)	55,767,826	22,360,859	78,128,686
Ash (*Fraxinus* spp.)	122,485,896	11,915,734	134,401,630
Honeylocust (*Gleditsia* spp.)	24,681,327	6,295,273	30,976,600
Walnut (*Juglans* spp.)	1,124,073	2,525,193	3,649,265
Osage-orange (*Maclura pomifer*)	16,052,126	401,743	16,453,870
Apple (*Malus* spp.)	252,735	2,482,382	2,735,117
Mulberry (*Morus* spp.)	37,340,146	7,173,876	44,514,022
Cottonwood/poplar (*Populus* spp.)	331,651,606	16,421,939	348,073,545
Cherry/plum (*Prunus* spp.)	14,615,034	693,825	15,308,859
White oak (*Quercus alba*)	26,116,997	13,311,809	39,428,806
Northern red oak (*Quercus rubra*)	183,663	4,083,105	4,266,768
Willow (*Salix* spp.)	55,166,341	935,451	56,101,791
Basswood (*Tilia* spp.)	727,083	5,919,012	6,646,095
Elm (*Ulmus* spp.)	45,634,354	7,772,097	53,406,451
Siberian elm (*Ulmus pumila*)	120,601,811	16,145,402	136,747,213
Russian olive (*Elaeagnus angustifolia*)	8,551,995	79,559	8,631,554
Unknown hardwood	10,764,529	4,843,659	15,608,188
TOTALS	**1,029,114,765**	**168,736,686**	**1,197,851,451**

Source: Meneguzzo, Lister, & Sullivan, 2018

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Chapter 3: NFS Priority Forest Landscapes

This Forest Action Plan (FAP) aligns Priority Forest Landscapes (PFLs) with the Biologically Unique Landscapes (BULs) identified in the Nebraska Natural Legacy Project, the Forest Legacy Assessment of Need (AoN), spatial analysis of forestlands, and staff, stakeholder and public input. The Nebraska Natural Legacy Project (see Appendix C) defined a series of BULs through identification of key habitats and known occurrences of natural communities and at-risk species. The AoN (see Appendix A) focuses on at-risk priority landscapes. Areas identified in prior FAPs were also adjusted to better reflect the presence of all forested acres within and adjacent to the defined area. PFL boundaries also closely adhere to the hydrology of the watershed, local, and regional interests.

The information in this chapter includes the description of the resources present, assessment of forestlands and trees, agricultural and census data, perceived threats or challenges, desired outcomes, and local priorities of NFS staff and stakeholders. While this section provides an overview of each PFL, it does not capture every possible action required or requested in the landscape. Rather, it is prioritized and described in broad detail to align agency resources and staff to address priorities at a landscape level. Specific implementation, which will vary in applicability due to local conditions, can be found in Chapter 9.

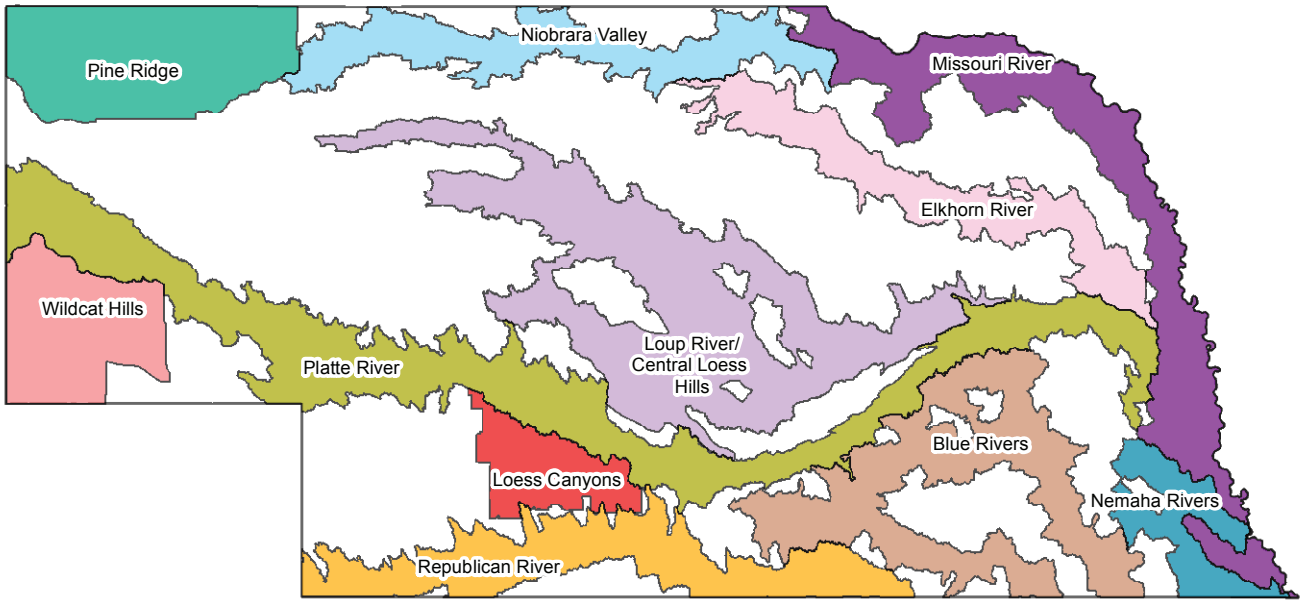
Overview

Nebraska's terrain slopes gently upward from southeast to northwest, with elevation increasing by an average rate of 10.5 feet per mile. Nebraska's lowest elevation (840 feet above sea level) lies along the Missouri River in Richardson County (southeast Nebraska), and the highest point (5,424 feet above sea level) is in Kimball County in western Nebraska.

The state has fertile and productive soils derived from alluvial, colluvial, or glacial deposits. Sandhills soils, occupying much of north central Nebraska, are derived from wind-blown sand. Elsewhere, the soils have formed from wind-blown silt and clay or loess (extremely fine loam deposited by the wind).

The 1.5 million acres of forestland (defined in Chapter 2) in Nebraska can be loosely categorized as central hardwood forests representative of the eastern United States, ponderosa pine forests representative of the Rocky Mountains, and birch/aspen forests representative of northern boreal forests (Meneguzzo, et al., 2008). These forest types, combined with elm-ash-cottonwood riparian forests, mixed conifer forests, conservation tree and agroforestry plantings, and urban forests, create a highly unique array of tree and forest resources growing within an agricultural and range landscape.

Figure 8: Overview Map of Nebraska's Priority Forest Landscapes



These 11 priority forest landscapes reflect locations where the three National Priorities can be met, the National Association of State Foresters' (2018) recommendations can be followed, and the Biologically Unique Landscapes developed through the Nebraska Natural Legacy Project are observed.

Source: Meneguzzo, Lister, & Sullivan, 2018

Nebraska's non-forestlands, or other areas with trees (defined in Chapter 2), consists of approximately 1.3 million acres of trees scattered throughout the state (USDA Forest Service, 2018). These trees provide unique benefits such as rural home wind protection, snow drift management, energy savings, livestock protection, crop protection and yield increases, water quality and soil protection, wildlife habitat, and many other ecosystem services. Although not large units individually, together these areas are greatly beneficial to Nebraska's rural landscape. When combined with forestlands, there are approximately 2.8 million acres of forested and other areas with trees in Nebraska.

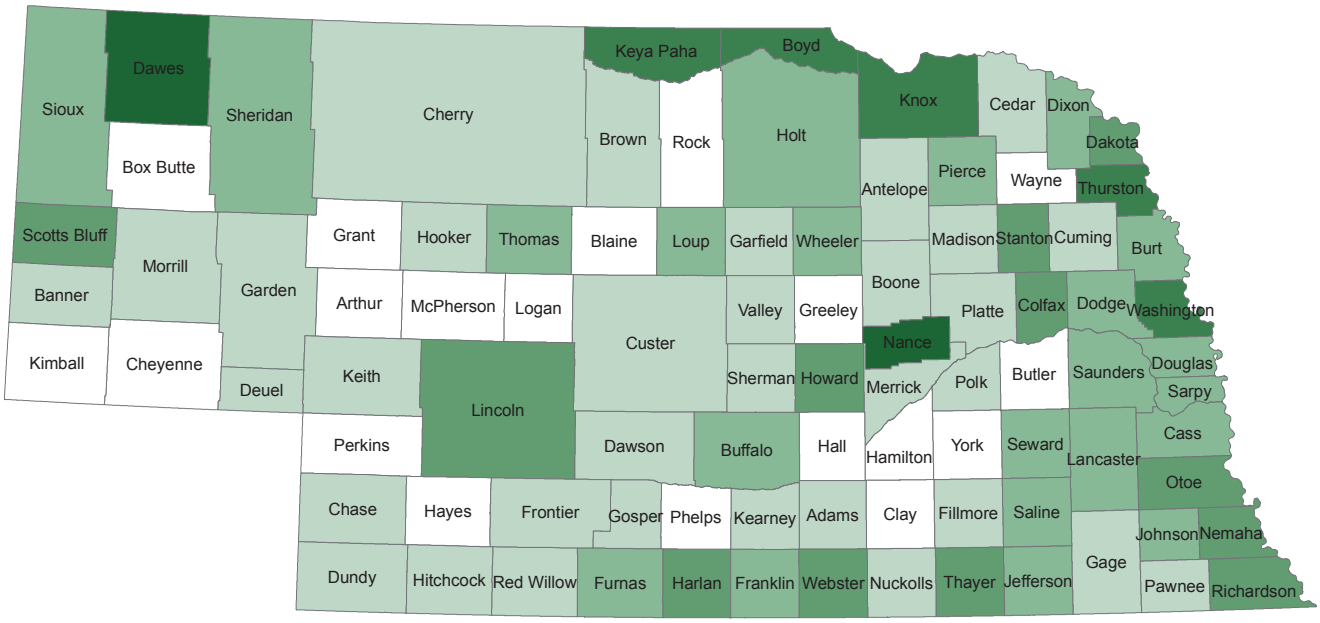
Coniferous Forests

Nebraska's PFLs comprised of coniferous forest include: Pine Ridge, Wildcat Hills, and Loess Canyons. Nebraska's coniferous forests are largely composed of three species: ponderosa pine *(Pinus ponderosa)*, eastern redcedar *(Juniperus virginiana)*, and Rocky Mountain juniper *(Juniperus scopulorum.)* These trees are described in more detail in the succeeding paragraphs.

Ponderosa pine is found in the Pine Ridge, eastward along the Niobrara and Snake Rivers, and in other scattered pockets in western Nebraska, such as the Wildcat Hills south of Scottsbluff. North America's easternmost extensions of ponderosa pine forest occur in Nebraska, with potentially unique genetic adaptations of value in a world with a changing climate. Ponderosa pine is also one of the state's most valuable timber resources; an annual 4.4 million dry tons are available in Nebraska's forests (USDA Forest Service, 2018). While it is a fire-resilient species, decades of fire suppression have led to an overabundance of forest fuel, resulting in large and uncharacteristic wildfires. In some locations, these fires burned at temperatures that eliminated entire swaths of forest—and with those a viable seed source for regeneration.

Eastern redcedar is a native tree that has long been a fixture in Nebraska's landscape, providing

Figure 9: Forestland Composition in Nebraska's Counties



Source: Forest Inventory and Analysis, 2018

wood products, wind and soil protection, and habitat for a variety of wildlife species. However, its rapid spread is an increasingly serious ecological and economic issue with substantial impacts statewide. Addressing the spread of eastern redcedar poses challenges of a magnitude that exceed the capacity of any one agency or organization. In 2013, a coalition of stakeholders came together to develop a vision to address the expanding population of eastern redcedar in the state. This group, the Nebraska Conservation Roundtable, defined the extent of the problem, determined what opportunities may exist, and identified specific actions it believed would slow the species' spread. The resulting white paper can be found in Appendix B.

The Nebraska Conservation Roundtable (2016) lists Rocky Mountain Juniper as a "drought tolerant, slow growing tree native to the panhandle of Nebraska." The medium-sized evergreen is often found on hillsides and prairies, sometimes in woodlands. It is a valuable conservation tree, with a form and size that is well suited for windbreak and other conservation plantings. The species is known to succumb to Cercospora needle blight outside of the Panhandle region, but is not known to "escape" from plantings into other areas. There is a body of research that conceptually supports the hybridization of Rocky Mountain juniper and eastern redcedar in overlapping ranges (Anderson, 2003; Bonner, 2008; Lawson, 1990). While observed anecdotally in the aforementioned research and in Nebraska, genomic analyses are needed to confirm this occurrence.

Priority Forest Landscape: Pine Ridge

Figure 10: Pine Ridge Priority Forest Landscape Map

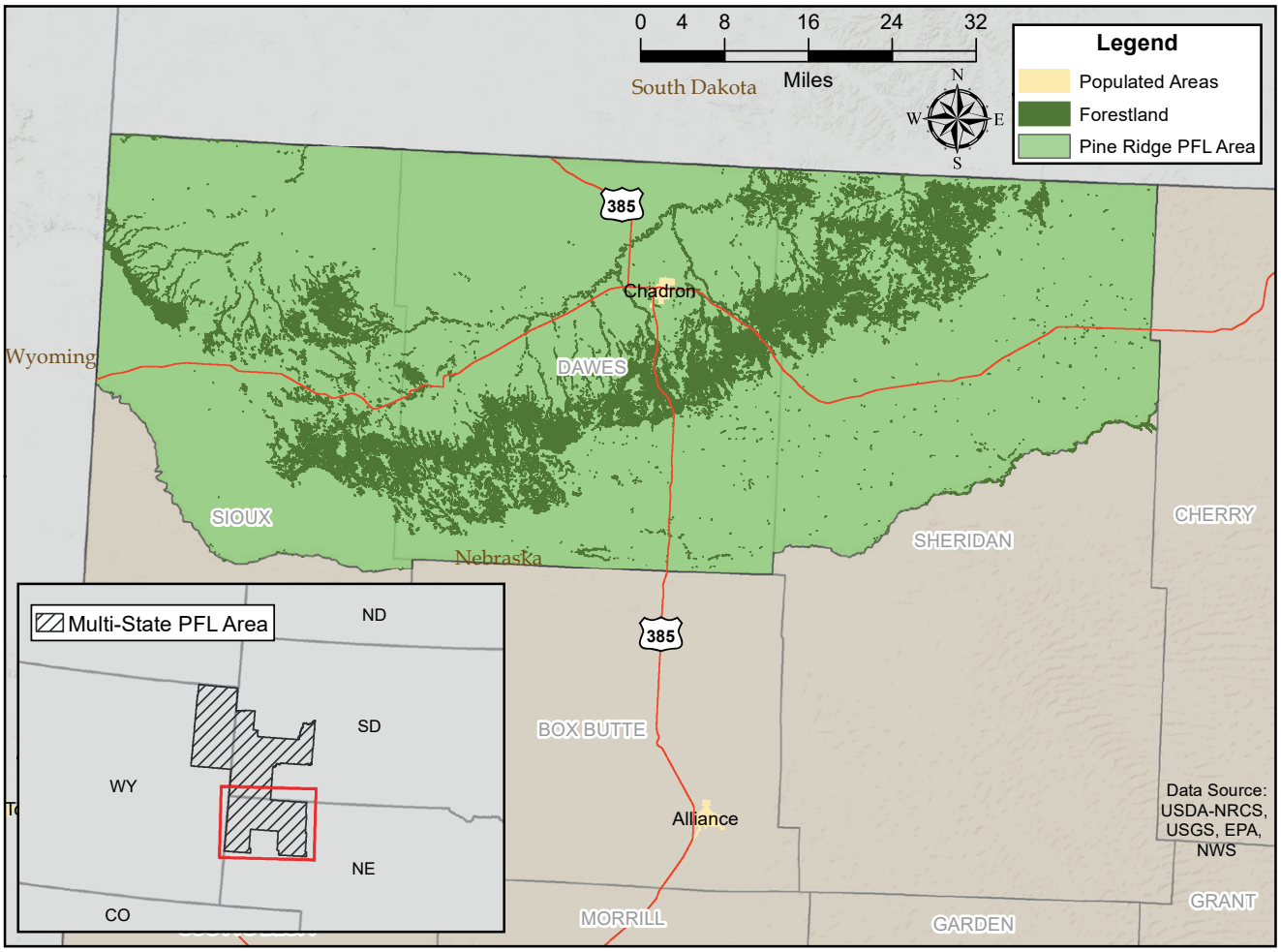


Table 12: Forestland Area of Pine Ridge Priority Forest Landscape

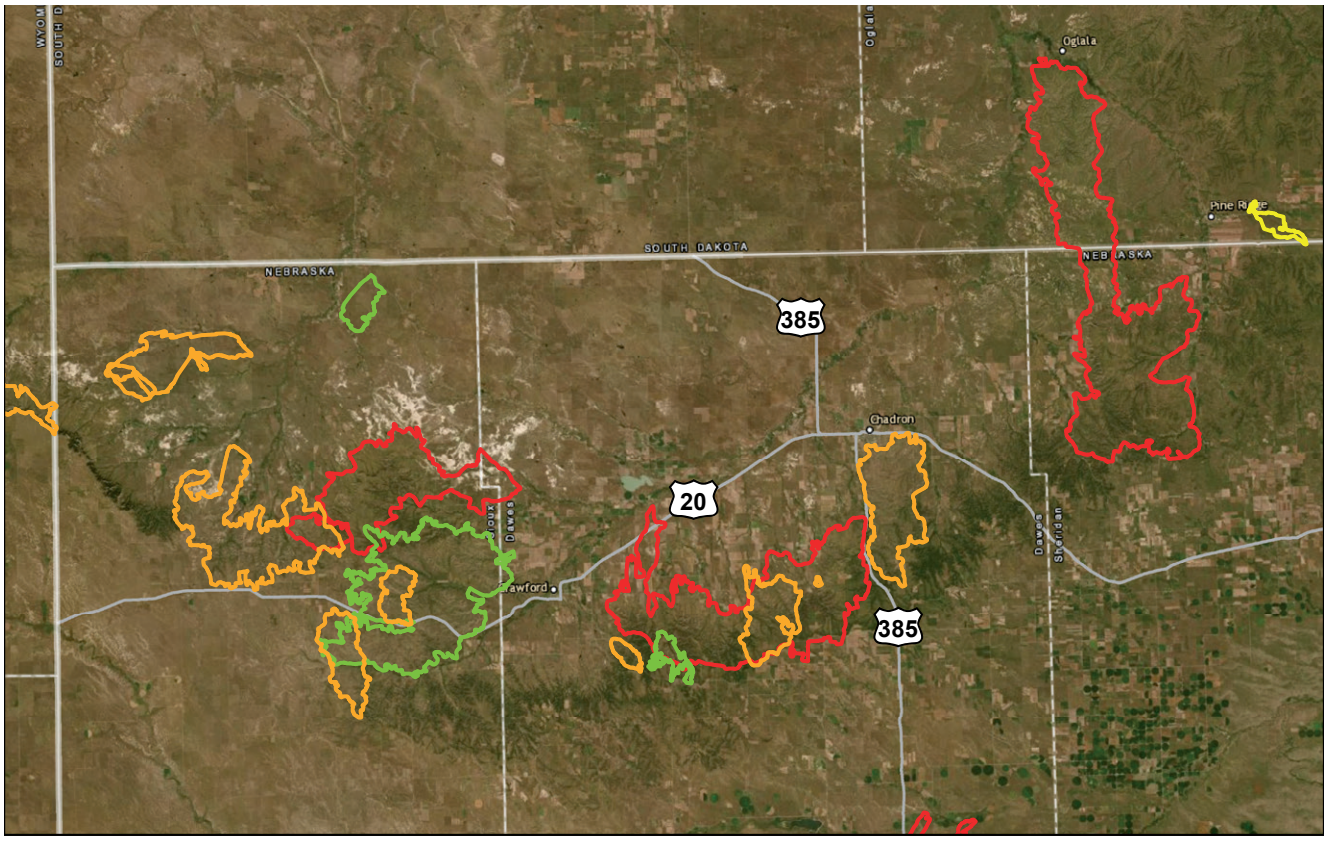
PINE RIDGE	2006	2011	2018
Acres of forestland*	236,832	242,474	211,892

**As defined by methodology in USFS FIA program Source: USDA Forest Service, 2018*

Description

The Pine Ridge's namesake comes from the pine-dominated escarpment that exists within the Great Plains ecosystem. The Pine Ridge is a rocky precipice rising several hundred feet from the surrounding plains in Sioux, Dawes, and Sheridan counties in northwest Nebraska. Ponderosa pine woodlands (open stands of trees, generally forming 25-60% cover) and forests (trees with crowns overlapping, forming 60-100% cover) occupy many of the north/east-facing slopes and bottoms. Pine woodlands and mixed-grass prairie often occupy the south/west-facing slopes.

Figure 11: Large Wildfire Occurrences in Pine Ridge Priority Forest Landscape Since 1984



Source: Monitoring Trends in Burn Severity, 2020

The area is situated near the easternmost edge of the ponderosa pine's native range. It supports many at-risk species, including pinyon jays (*Gymnorhinus cyanocephalus*), fringed myotis (*Myotis thysanodes pahasapensis*), northern long-eared bats (*Myotis septentrionalis*), and the plains spotted skunk (*Spilogale putorius interrupta*). Protected or public lands include the Nebraska National Forest, Fort Robinson State Park, Agate Fossil Beds National Monument, Gilbert Baker Wildlife Management Area, and many others.

The NGPC identified the Pine Ridge as a BUL in its Nebraska Natural Legacy Project. This area also was identified as a priority under Nebraska's Forest Legacy Program. A Community Wildfire Protection Plan (CWPP) has been in place for this area since 2003.

Assessment - Current Condition, Demographics, Productivity

Uncharacteristic wildland fire is changing this ecosystem. It has diminished the wood products supply, which contributes to instability in markets and utilization. It has increased the amount of resources needed by volunteer fire departments (VFDs) — often the first responders and sole suppression force on wildfires. Because large fires can burn for days or weeks, volunteers are absent from their jobs and families with no compensation. The Pine Ridge PFL has experienced large, cyclical wildfires over the past 30 years with a current fire-return interval of 0-35 years. As these fires have increased in size and intensity, the PFL's overall forest cover has decreased by thousands of acres since 1990.

Within the footprints of the wildfires of 2006 and 2012 (see figure 11), there remain large areas of downed, woody fuels that are a continued wildfire hazard. Many unburned areas contain dense stands of ponderosa pine with ladder fuels that, without management, are considered wildfire-prone. Increasing fuel loads further threaten forest health and sustainability, as well as lives and property in wildland urban interface (WUI) areas. Unhealthy forests are increasingly susceptible to insects and disease, invasive species encroachment, and a loss of biodiversity.

The total population of the PFL has declined since 2010. However, in most parts of the Pine Ridge, the farm/ranch size has increased. In high-use recreational areas, subdivision development has led to both fragmentation of the forest and WUI safety issues, primarily due to a lack of strategic fuel breaks aligned with road systems or watersheds. Creating additional fuel breaks would contribute to forestland fragmentation; however, these are considered necessary in order to slow the spread if large, uncharacteristic wildfires were to occur.

Table 13: Population Change 2010-2019 in Pine Ridge Priority Forest Landscape

COUNTY	POPULATION CHANGE
Dawes	Decrease 6.5%
Sheridan	Decrease 4.1%
Sioux	Decrease 11.1%

Source: U.S. Census Bureau, 2019

Table 14: Number of Farms/Average Acres per Farm 2007-2017 in Pine Ridge Priority Forest Landscape

COUNTY	2007	2012	2017
Dawes	469/1,810	493/1,671	491/1,528
Sheridan	574/2,683	525/2,974	515/3,093
Sioux	366/3,530	354/3,459	307/4,006

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Pine Ridge forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests*. Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Pine Ridge forestlands were identified by NFS staff, stakeholders, and the public:

- Increasing risk of catastrophic wildfire due to overstocked forests, increasing fuel loads, chronic drought, and severe weather.
- Declining ponderosa pine forest acreage and lack of natural pine regeneration.
- Increasing residential development and changes in land use increase fragmentation of forest and woodlands.
- Shrinking number of forest management projects adds to a decline in forest health, increasing the likelihood of wildfires because of overstocking.
- Lacking strategic fuel breaks, homeowners, property, and emergency personnel are subjected to elevated wildfire risks.
- Insufficient regional fire suppression capacity and state resources to assist VFDs.
- Absence of sustainable wood markets and timber processors.
- Transporting saw logs to regional markets is limited due to interstate load-limit regulations.
- Growing number of environmental stresses to trees results in the proliferation of diseases and insects, such as Ips engraver beetles and Diplodia blight.
- Rising susceptibility of ash tree populations to emerald ash borer (*Agrilus planipennis*) as the insect progresses across the state.

- Lacking landowner engagement, long-term forest stewardship projects are not established.
- Decreasing landowner confidence in the survivability of bare root seedlings.

Desired Outcomes

The desired future condition of the Pine Ridge PFL is one that creates and maintains healthy, sustainable ponderosa pine forests that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with ranching, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfires. The following desired outcomes utilize specific strategies to meet the desired future condition of the PFL:

- Sustainably managed forestland provides an ecosystem that is profitable for ranchers and forestry practitioners, creates a haven for wildlife, and offers recreational opportunities for Nebraskans.
- Strategically utilized management practices such as grazing, forest thinning, prescribed fire, and maintenance of access roads reduce the likelihood of catastrophic wildfires.
- Hazardous fuels reduction projects are targeted at a landscape scale, focusing on prioritized areas (watersheds, ridgelines, road systems, or natural barriers) or existing projects that will help wildland fire response.
- Safety of emergency personnel is enhanced through the acquisition of proper equipment, qualifications or training, and other firefighting resources.
- Aerial fire suppression program (SEAT) is continued during peak fire season, with additional aircraft accessible on an as needed basis.
- Training exercises for VFDs are increased, with additional focus of advancing firefighters' wildfire qualifications.
- Fire staff maintain high-level wildfire qualifications, increasing the number of nationally-accredited courses they can instruct for VFDs.
- Technical assistance increases the utilization of wood fiber, the maintenance of current markets, and the ability for the industry to expand.
- Planting 100,000 ponderosa pine seedlings each year within the 2000, 2006, and 2012 wildfire footprints continues, and reforestation efforts are expanded over the next ten years.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Support the missions of area VFDs through increased training and the acquisition of firefighting equipment.
- Create and coordinate a state-level fire team, designed to bolster access to firefighting resources during an emergency response.
- Increase training opportunities and availability for fire-related assignments for NFS fire staff.
- Increase the adoption of forest management practices that improve forest sustainability and reduce hazardous fuels in targeted locations.
- Strategically utilize grazing, forest thinning, and maintenance of access roads to keep fires at low intensities.
- Expand forestry assistance programs to reach all constituents.
- Expand reforestation efforts to maintain working forests.
- Improve landowner confidence in reforestation and forest management activities.

Priority Forest Landscape: Wildcat Hills

Figure 12: Wildcat Hills Priority Forest Landscape Map

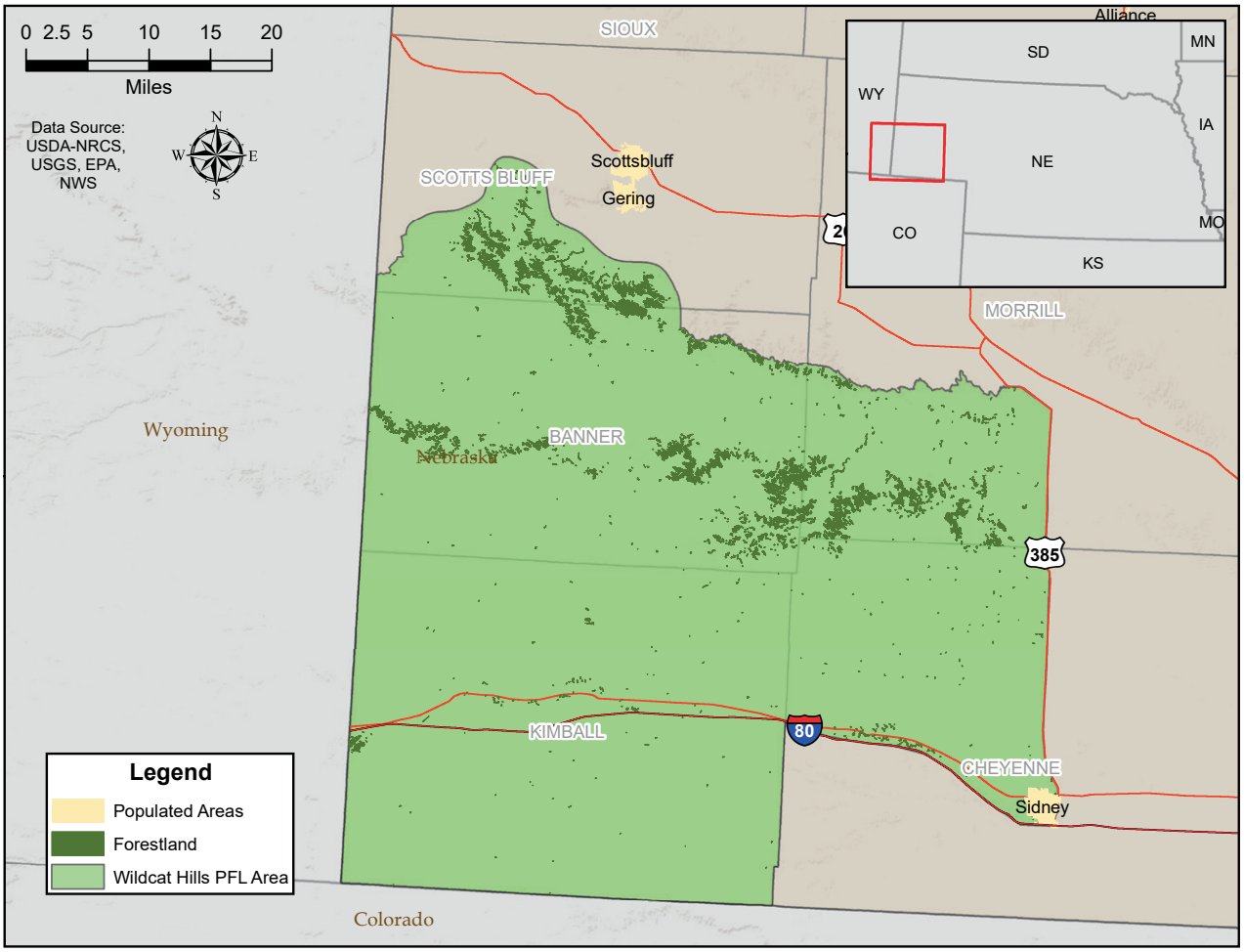


Table 15: Forestland Area of Wildcat Hills Priority Forest Landscape

WILDCAT HILLS	2006	2011	2018
Acres of forestland*	52,371	70,142	52,114

**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Description

Nebraska's Wildcat Hills are a rocky escarpment that rises several hundred feet on the south side of the North Platte River in Scottsbluff, Banner, and Morrill counties, and extends into portions of Kimball and Cheyenne counties. The north bluff consists of steep, deep canyons that support stands of mountain mahogany (*Cercocarpus montanus*), eastern redcedar, and Rocky Mountain juniper. North-facing slopes support ponderosa pine woodlands. Mixed-grass prairie, rock outcrops, and scattered patches of sandsage prairie occupy the remainder of the PFL.

The Wildcat Hills are unique in that they are an intact mosaic of pine woodland and mixed-grass prairie that supports the largest stands of mountain mahogany in the state. This area is also home to Nebraska's only known population of limber pine (*Pinus flexilis*), located in an isolated pocket in the southwest portion of the PFL.

The Wildcat Hills also support habitat for several at-risk species such as the pinyon jay, American burying beetle (*Nicrophorus americanus*), and plains topminnow (*Fundulus sciadicus*). Protected or public lands within the PFL include Wildcat Hills State Recreation Area, Buffalo Creek Wildlife Management Area, Cedar Canyon Wildlife Management Area, Platte River Basin Environments' Carter Canyon, and Scottsbluff National Monument.

The NGPC identified the Wildcat Hills and Wildcat Hills South as BULs in its Nebraska Natural Legacy Project. This area was also identified as a priority under Nebraska's Forest Legacy Program, and a CWPP is in place for this area.

Assessment - Current Condition, Demographics, Productivity

This area is at risk for wildland fires due to changes observed in the ecosystem. Ponderosa pine and Rocky Mountain juniper dominate the landscape, although native eastern redcedar threatens this fragile landscape as it encroaches into the area.

The populace in some portions of the PFL has declined since 2010, but other areas have seen development as large ranches turn into smaller residential and recreational parcels. This fragmentation of the forest resource can be problematic for flora and fauna. It also increases safety issues within WUI areas. For example, there is a lack of strategic fuel breaks aligned with existing road systems or watersheds. Increasing fuel loads threaten forest health and sustainability, as well as lives and property in the PFL. As discussed previously in this document, unhealthy forests are increasingly susceptible to damage from insects and diseases.

Table 16: Population Change 2010-2019 in Wildcat Hills Priority Forest Landscape

COUNTY	POPULATION CHANGE
Banner	Increase 8.0%
Cheyenne	Decrease 10.9%
Kimball	Decrease 4.9%
Morrill	Decrease 7.9%
Scotts Bluff	Decrease 3.7%

Source: U.S. Census Bureau, 2019

Table 17: Number of Farms/Average Acres per Farm 2007-2017 in Wildcat Hills Priority Forest Landscape

COUNTY	2007	2012	2017
Banner	218/1,811	193/2,188	239/1,770
Cheyenne	603/1,251	555/1,267	572/1,328
Kimball	372/1,418	402/1,487	443/1,362
Morrill	495/1,822	512/1,561	426/1,925
Scotts Bluff	730/494	966/461	760/581

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Wildcat Hills forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests.* Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Wildcat Hills forestlands were identified by NFS staff, stakeholders, and the public:

- Increasing risk of uncharacteristic wildfires due to overstocked and increasing fuel loads, chronic drought, and severe weather.
- Declining landowner interest in active forest management or the harvesting of timber.
- Developing new residential areas increases forest fragmentation, leading to greater pressures on habitat, associated wildlife species, and the ecosystem services provided.
- Lacking strategic fuel breaks, residents, emergency personnel, and infrastructure experience elevated wildfire risks.
- Establishing new fuel breaks becomes difficult due to topography and sandy soils.
- Responding local agencies lack wildfire resources from state or regional entities.
- Sustaining wood markets or processing facilities becomes financially unfeasible.
- Harvesting of marketable timber decreases due to inconsistent interstate regulations.
- Increasing environmental stresses result in the proliferation of diseases and insects such as Ips engraver beetles and Diplodia blight.
- Increasing susceptibility of native ash populations to emerald ash borer (EAB) as the insect spreads across the state.

Desired Outcomes

The desired future condition for the Wildcat Hills PFL is to create and maintain healthy, sustainable pine forests that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with ranching, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Sustainably managed forestlands provide an ecosystem that is profitable for ranchers and forestry practitioners, provide a haven for wildlife, and offer recreational opportunities for Nebraskans.
- Uncharacteristically large wildfires rarely occur because management practices such as grazing, forest thinning, prescribed fire, and maintenance of access roads are appropriately utilized.
- Hazardous fuels reduction projects target watersheds, natural barriers, road systems, or existing projects that help wildland fire response.
- Safety of emergency personnel is enhanced through the acquisition of proper equipment, qualifications or training, and other firefighting resources.
- Aerial fire suppression program is maintained through peak fire season.
- Aerial applicator program is utilized year-round to support wildland firefighting operations.
- The number of quality, progressive training experiences for VFDs is increased.
- NFS fire personnel maintain high-level wildfire qualifications, increasing the number of nationally accredited courses they can instruct for VFDs.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.
- Forestry assistance programming is expanded to reach all constituents.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Utilize grazing, forest thinning, prescribed fire, and maintenance of access roads to help keep fires localized.
- Increase landowner participation in WUI grant programs, leading to additional mitigation of hazardous fuels.
- Increase the adoption of voluntary BMPs (best management practices), leading to healthier and properly stocked forestlands.

Priority Forest Landscape: Loess Canyons

Figure 13: Loess Canyons Priority Forest Landscape Map

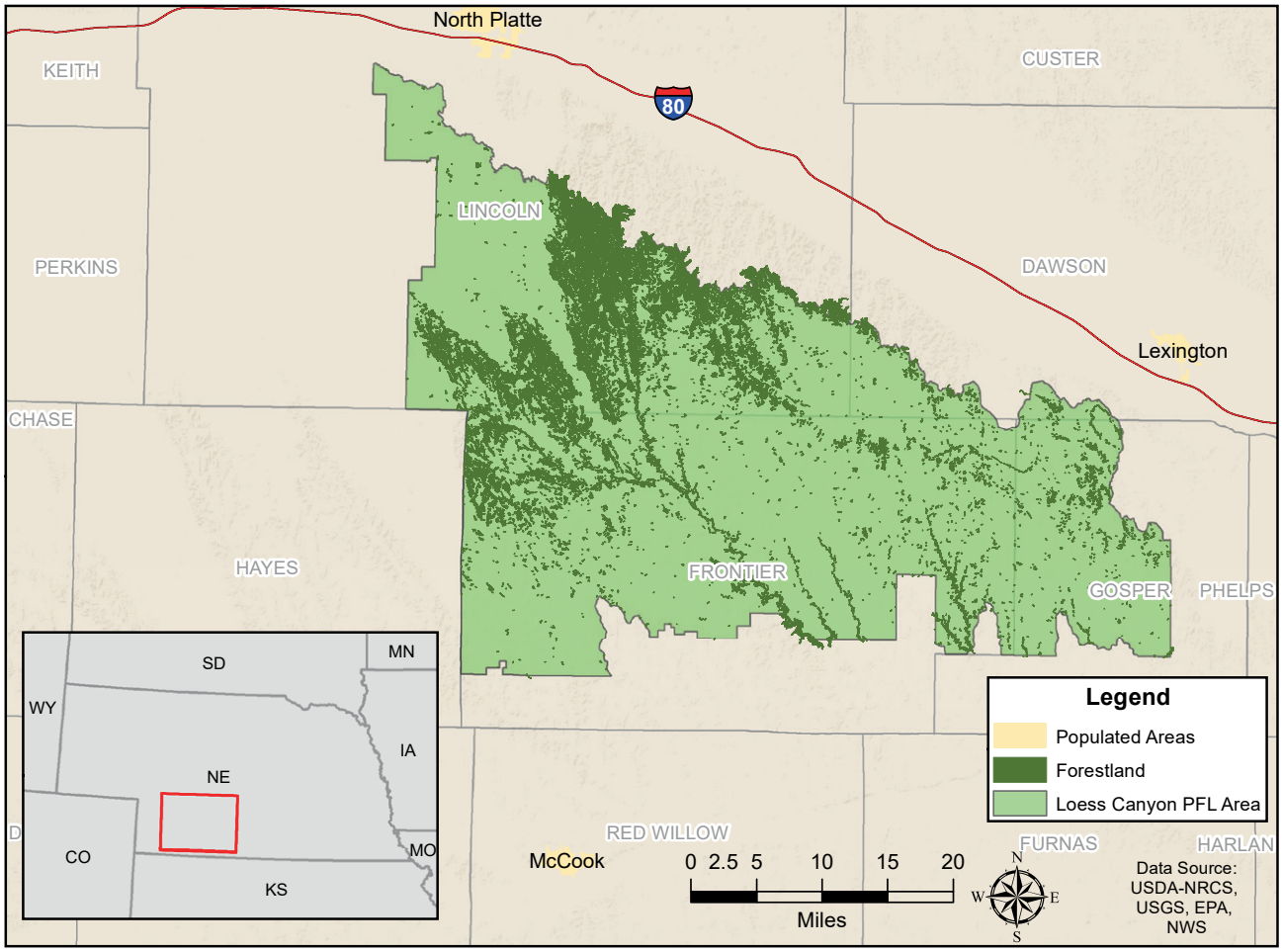


Table 18: Forestland Area of Loess Canyons Priority Forest Landscape

LOESS CANYONS	2006	2011	2018
Acres of forestland*	58,675	99,632	111,715

**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Description

The Loess Canyons consist of steep loess hills and canyons south of the Platte River in Lincoln, Dawson, Gosper, and northern Frontier counties in west central Nebraska. This area supports mixed-grass prairie and is used primarily as rangeland; however, conventional croplands are scattered throughout. In some areas, specific livestock grazing and haying practices have led to an increase in undesirable range species such as cheatgrass *(Bromus tectorum)* and Japanese brome *(Bromus japonicus)*.

In recent decades, eastern redcedar has heavily encroached into these mixed-grass prairies. The lack of naturally-occurring fire regimes on the landscape, coupled with the high cost of management, are limiting factors to stemming the conversion of rangeland to cedar forest. Prescribed burning is increasingly utilized because of cost effectiveness and ecological benefit. There is potential to use this wood resource as biomass for thermal energy, which could offset the costs of management while restoring overall grassland acreage.

The Loess Canyons PFL is also significant because it contains one of the remaining known populations of the federally and state-endangered American burying beetle. Protected or public lands include but are not limited to Wapiti Wildlife Management Area, Darr Strip Wildlife Management Area, and N-CORPE recreation areas. A CWPP has been in place for the region since 2014.

Assessment - Current Condition, Demographics, Productivity

The Loess Canyons PFL is at risk from uncharacteristic wildfires due to changes observed in the ecosystem. Eastern redcedar has aggressively expanded in range across the landscape, resulting in a patchwork of cedar forests that occupy grasslands and hardwood forests. Although it is a native species, eastern redcedar threatens this fragile ecosystem as it encroaches into the area, replacing one plant community with another.

Landscape fragmentation and land-use conversion are also primary factors driving changes in the PFL. Increasing fuel loads threaten forest health and sustainability, as well as lives and property in WUI areas. The resulting fuel loads also hinder the resiliency of the forest system, making the area increasingly susceptible to insects and diseases.

General trends show a decline in the populace for the region, except for the area near North Platte. North Platte is the largest community in Lincoln County, consisting of 13.2 square miles with a population of 24,135 people (U.S. Census Bureau, 2019). Trends in average farm size in the PFL are relatively flat. One specific area where average farm size is in decline is around the community of North Platte.

Table 19: Population Change 2010-2019 in Loess Canyons Priority Forest Landscape and Surrounding Counties

COUNTY	POPULATION CHANGE
Chase	Decrease 1.1%
Dundy	Decrease 15.7%
Frontier	Decrease 4.7%
Gosper	Decrease 2.6%
Hayes	Decrease 4.0%
Hitchcock	Decrease 5.0%
Lincoln	Decrease 3.8%
Perkins	Decrease 2.6%
Red Willow	Decrease 3.0%

Source: U.S. Census Bureau, 2019

Table 20: Number of Farms/Average Acres per Farm 2007-2017 in Loess Canyons and Surrounding Counties

COUNTY	2007	2012	2017
Chase	347/1,602	342/ 1,583	325/ 1,750
Dundy	263/2,262	251/2,075	268/2,016
Frontier	283/1,679	317/1,426	371/1,305
Gosper	218/1,035	260/1,115	287/983
Hayes	275/ 1,650	235/ 1,639	220/ 1,985
Hitchcock	272/1,279	299/1,450	288/1,363
Lincoln	1,053/1,521	1,168/1,219	1,040/1,305
Perkins	446/1,252	394/ 1,413	418/ 1,330
Red Willow	386/1,157	405/1,036	333/1,319

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Loess Canyon's forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests*. Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Loess Canyons PFL were identified by NFS staff, stakeholders, and the public:

- Declining management of forests and rangelands leads to the spread of noxious weeds, aggressive woody species, and invasive species.
- Lacking tree diversity, community canopies decline because of the spread of invasive species or disease.
- Fragmenting of forests and woodlands continues as land use changes and residential development increases.
- Overstocking of forests adds to declines in tree health and increases the likelihood of wildfires.
- Building consensus among stakeholder groups on management strategies becomes more challenging.
- Intensifying variations in weather or climatic patterns make management activities more difficult to perform.
- Firefighting and emergency response teams lack volunteers, leading to decreased resources to support personnel.
- Developing properties in WUI areas increases, resulting in additional risks for first responders, the public, and infrastructure or property.
- Declining landowner interest in windbreaks, the economic and aesthetic value of trees and forests, and the encroachment of undesired species into rangeland.
- Training agencies experience financial or personnel limitations when providing prescribed fire training to practitioners, resulting in varying levels of training and qualifications by prescribed fire organizations.

Desired Outcomes

The desired future condition for the Loess Canyons PFL is to create and maintain healthy, sustainable forestlands that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with ranching and farming, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Forested areas are properly managed according to multiple-use management strategies.
- Uncharacteristically large wildfires occur less often because grazing, forest thinning, prescribed fire, and maintenance of access roads are appropriately utilized.
- Hazardous fuels reduction projects focus on key areas (watersheds, ridgelines, road systems, or natural barriers) and tie into existing projects to aid wildland fire response.
- VFDs are supported with equipment, qualifications or training, and any other firefighting resources needed to enhance the safety of emergency personnel.
- NFS fire staff maintain high-level wildfire qualifications, further increasing the number of nationally accredited courses they can instruct for VFDs.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs,

these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Develop cohesive management plans with participation from stakeholders, practitioners, and agencies.
- Improve resources and trainings that will increase safety for volunteer firefighters.
- Ensure technical information, best management practices (BMPs), and WUI guidelines reach homeowners and landowners.
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.
- Promote and establish Firewise communities.
- Develop landscape-level management objectives for each ecosystem.
- Adapt technical information to encompass broad management principles while retaining straightforward forest management guidelines.
- Facilitate the development of a wood products market.
- Expand forestry assistance programming to reach all constituents.

Transitional Mixed Forests

Nebraska's unusual blend of climate, geology, and topography allow for diverse communities of plants and animals to thrive in transitional forestlands. Varying exposure to sun, wind, and moisture gradients determines vegetative communities and the associated wildlife that can be found in the region. Nebraska's PFL classified as transitional mixed forest is in the Niobrara River Valley. Nebraska's transitional forests are largely composed of three forest types:

- Ponderosa pine
- Eastern redcedar
- Various hardwood species including northern boreal forest species such as aspen (*Populus* spp.) and birch (*Betula* spp.) and northern hardwoods like oaks (*Quercus* spp.) and walnuts (*Juglans* spp.)

Priority Forest Landscape: Niobrara River Valley

Figure 14: Niobrara Valley Priority Forest Landscape Map

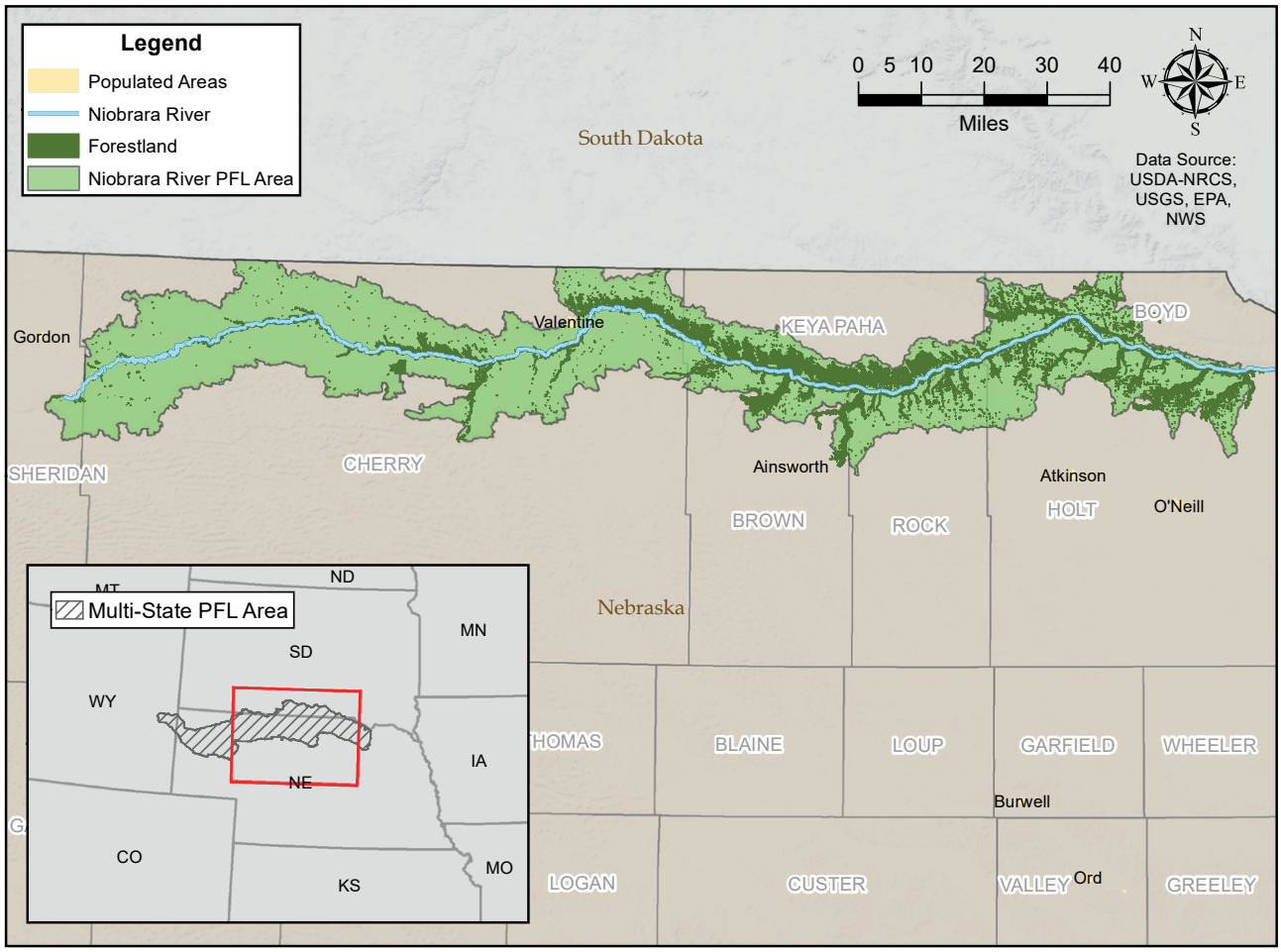


Table 21: Forestland Area of Niobrara River Priority Landscape

NIOBRARA RIVER	2006	2011	2018
Acres of forestland*	157,325	183,321	167,410

**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Description

The Niobrara River begins in the high plains of eastern Wyoming and flows 535 miles to the Missouri River in northeast Nebraska. Six major vegetative types converge in the Niobrara Valley including northern boreal forest, ponderosa pine forest, eastern deciduous forest, tallgrass prairie, mixed-grass prairie, and shortgrass prairie. The NGPC designated the following BULs within this PFL: Lower Niobrara River, Middle Niobrara River, and Upper Niobrara River.

Sandbars on the lower stretch of the Niobrara River from western Holt County eastward support numerous colonies of the federally and state-listed bird species such as the interior least tern (*Sterna antillarum*). Bald eagles (*Haliaeetus leucocephalus*) are also known to nest along this reach of the Niobrara River. Public land areas within the landscape include Red Bird, Bohemia Prairie, and Greenvale Wildlife Management Areas, and Niobrara State Park. A CWPP is in place for this area.

The middle Niobrara River provides habitat for many at-risk species including black-billed cuckoos (*Coccyzus erythropthalmus*), wood thrush *(Hylocichla mustelina)*, northern long-eared bat, and Bailey's eastern woodrat *(Neotoma floridana baileyi*), a subspecies endemic to the valley. The primary public or protected areas within the landscape include The Nature Conservancy's Niobrara Valley Preserve, Fort Niobrara National Wildlife Refuge, Smith Falls State Park, and several state wildlife management areas and state recreation areas. A CWPP is in place for this area.

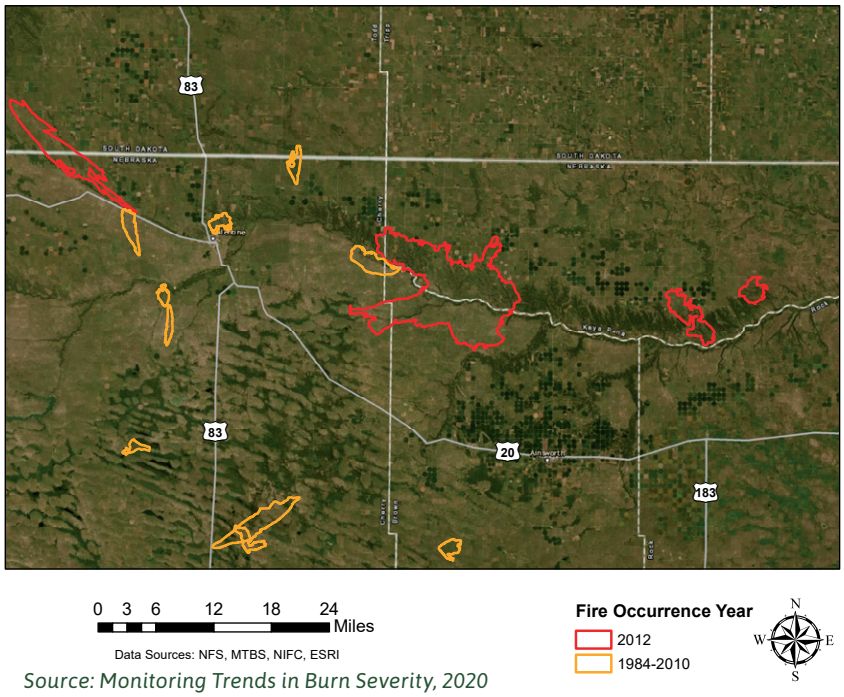
The upper Niobrara River supports a unique assemblage of cold-water fish including the pearl dace *(Margariscus margarita)*, the state-listed blacknose shiner *(Notropis heterolepis)*, and finescale dace *(Chrosomus neogaeus)*. This area was also identified as a priority under Nebraska's Forest Legacy Program, and includes Chat Canyon, owned by the NGPC and jointly managed by the NFS and the NGPC. A CWPP is in place for this area.

Assessment - Current Condition, Demographics, Productivity

This area is at risk for uncharacteristically large wildfires due to changes in the ecosystem. The buildup of forest fuels over several decades has created a forestland that is highly fire-prone. Eastern redcedar encroachment compounds this risk as these trees are highly combustible in dry conditions and are expensive to actively manage. Furthermore, high densities of this particular species can make firefighting operations difficult or unsafe for emergency personnel during an active wildfire.

The threat of wildfire has additional implications for the region's water quality as erosion increases following burns and the hydrologic cycle is disrupted. Bank stabilization through tree plantings or drainage improvements may be necessary to limit

Figure 15: Fire Occurrence in Niobrara Valley Priority Forest Landscape Since 1984



Source: Monitoring Trends in Burn Severity, 2020

sediment loading that would negatively impact aquatic species. There are also concerns about water availability in the region as climatic shifts occur. Ensuring forestlands remain healthy and resilient are important contributions the agency can undertake to maintain the richness of plant and animal species in this region.

General trends show a decline in the populace for the Niobrara Valley PFL, except for the area near Valentine. Valentine is the largest community in Cherry County with a population of about 3,000 people. The average farm size in the PFL has remained relatively stable, but shows a slight downward trend. One area where farm size is strongly declining is around Valentine. This area is also experiencing fragmentation and development to support recreational activities along the river.

Table 22: Population Change 2010-2019 in Niobrara River Priority Forest Landscape

COUNTY	POPULATION CHANGE
Boyd	Decrease 8.6%
Brown	Decrease 6.0%
Cherry	Decrease 0.4%
Holt	Decrease 3.5%
Keya Paha	Decrease 2.2%
Rock	Decrease 11.2%

Source: U.S. Census Bureau, 2019

Table 23: Number of Farms/Average Acres per Farm 2007-2017 in Niobrara Priority Forest Landscape

COUNTY	2007	2012	2017
Boyd	259/972	266/1,094	286/1,129
Brown	292/2,266	328/2,212	268/2,295
Cherry	560/6,714	566/6,637	567/6,284
Holt	1,171/1,309	1,279/1,106	1,142/1,220
Keya Paha	206/2,347	244/1,909	237/1,784
Rock	237/2,666	247/2,610	220/2,655

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Niobrara Valley's forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests.* Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Niobrara Valley PFL forestlands were identified by NFS staff, stakeholders, and the public:

- Increasing risk of catastrophic wildfire because of overstocked forests, growing fuel loads, chronic drought, and severe weather.
- Fragmenting of forest and woodlands continues as residential development and changes in land use increase.
- Rare or regionally unique species decline in the absence of management or allocation of necessary resources.
- Eastern redcedar expands further into prairies, ponderosa pine, and hardwood forests.
- Inadequate grazing management leads to erosion, compaction, and general declines in ecosystem health.
- Additional undesired or invasive species establish populations in the region.
- Increasing environmental stresses to ponderosa pine forests results in elevated susceptibility to bark beetles.
- Deterioration of native ash tree (*Fraxinus* sp.) population if EAB is introduced in this area.
- Lacking support for fire suppression activities, training, and other firefighting resources, VFDs are unable to support regional wildfire responses.
- Wood utilization markets decrease, leading to declines in forest management and overall forest health.

- Engaging landowners in long-term stewardship does not increase.
- Dwindling confidence of landowners in the survivability of bare root seedlings.

Desired Outcomes

The desired future condition for Niobrara Valley PFL is to create and maintain healthy, sustainable forests and grasslands that provide long-term economic and recreational benefits for Nebraskans. This includes a forest ecosystem that is compatible with ranching, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Actively increase sustainable forest management in the region, improving timber stands while increasing the number of fuels reduction projects.
- Landowners increasingly utilize Nebraska's voluntary forestry BMPs to benefit water quality, water availability, and aquatic species.
- Forestlands are managed with an increased emphasis on maintaining biodiversity.
- Properly-stocked forestlands increase because of technical assistance from NFS staff.
- Technical assistance that is provided leads to properly-stocked forestland that is not overgrazed.
- Actively support VFDs through the acquisition of proper equipment, qualifications or training, and firefighting resources to enhance safety and well-being of emergency personnel.
- Actively engaged forest stewardship by landowners results in the long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Reduce fire risk through fuels treatment projects and management of fine fuels through grazing.
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.
- Reduce eastern redcedar encroachment into grasslands and existing forest types.
- Support responsible residential development by providing relevant Firewise assistance and WUI information.
- Increase road maintenance in remote areas to better establish this infrastructure as fuel breaks.
- Require NFS wildland fire staff to maintain high-level wildfire qualifications, further increasing the number of nationally accredited courses they can instruct for VFDs.
- Support the missions of area VFDs through increased training and the acquisition of firefighting equipment.
- Reduce forest stocking to provide for healthier forests, mitigating some of the risks of decline due to insects and diseases.
- Expand reforestation program efforts to maintain working forests.
- Improve landowner confidence in reforestation and forest management success.
- Expand forestry assistance programming to reach all constituents.

Riparian Forests

Riparian forests and wetlands serve as an interface between aquatic and terrestrial ecosystems. These areas often are more diverse in stand structure and species than other forested systems. Riparian zones are considered to be the areas adjacent to lakes, rivers, and streams. In these locations, a steady water supply creates a saturated, more productive habitat than that of nearby uplands. These areas are crucial to the hydrological cycle, helping filter sediment and cycle nutrients throughout the system.

These systems are primarily composed of ash, cottonwood *(Populus deltoides)*, elm *(Ulmus* spp.), red mulberry (*Morus rubra*), hackberry *(Celtis occidentalis)*, boxelder (*Acer negundo*), sycamore *(Platanus occidentalis)*, willow *(Salix spp.)*, black walnut (*Juglans nigra)*, and increasingly, eastern redcedar. Some species, such as willow and cottonwood, are reliant on high water scouring events to create conditions necessary for regeneration. There are more than 824,000 acres of riparian forests in Nebraska, making them the largest and most important component of Nebraska's forest resource. In fact, nearly two-thirds of Nebraska's forestland is adjacent to streams and rivers.

In Nebraska, several agencies are tasked with applying state and federal water laws. The NFS, by legislative mandate, does not provide oversight or enforcement of how water resources are managed. However, stewardship plans created by NFS staff with participating landowners support regulations such as the Clean Water Act through the implementation and certification of voluntary forestry BMPs. These actions, if acted on accordingly, can improve both water quantity and quality issues on the landscape. More information about Nebraska's BMPs can be found in Appendix C.

Nebraska's PFLs in the riparian forest type include: Missouri River, Nemaha River, Big and Little Blue Rivers, Platte River, Republican River, Loup Rivers, and Elkhorn River.

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Priority Forest Landscape: Missouri River

Figure 16: Missouri River Priority Forest Landscape Map

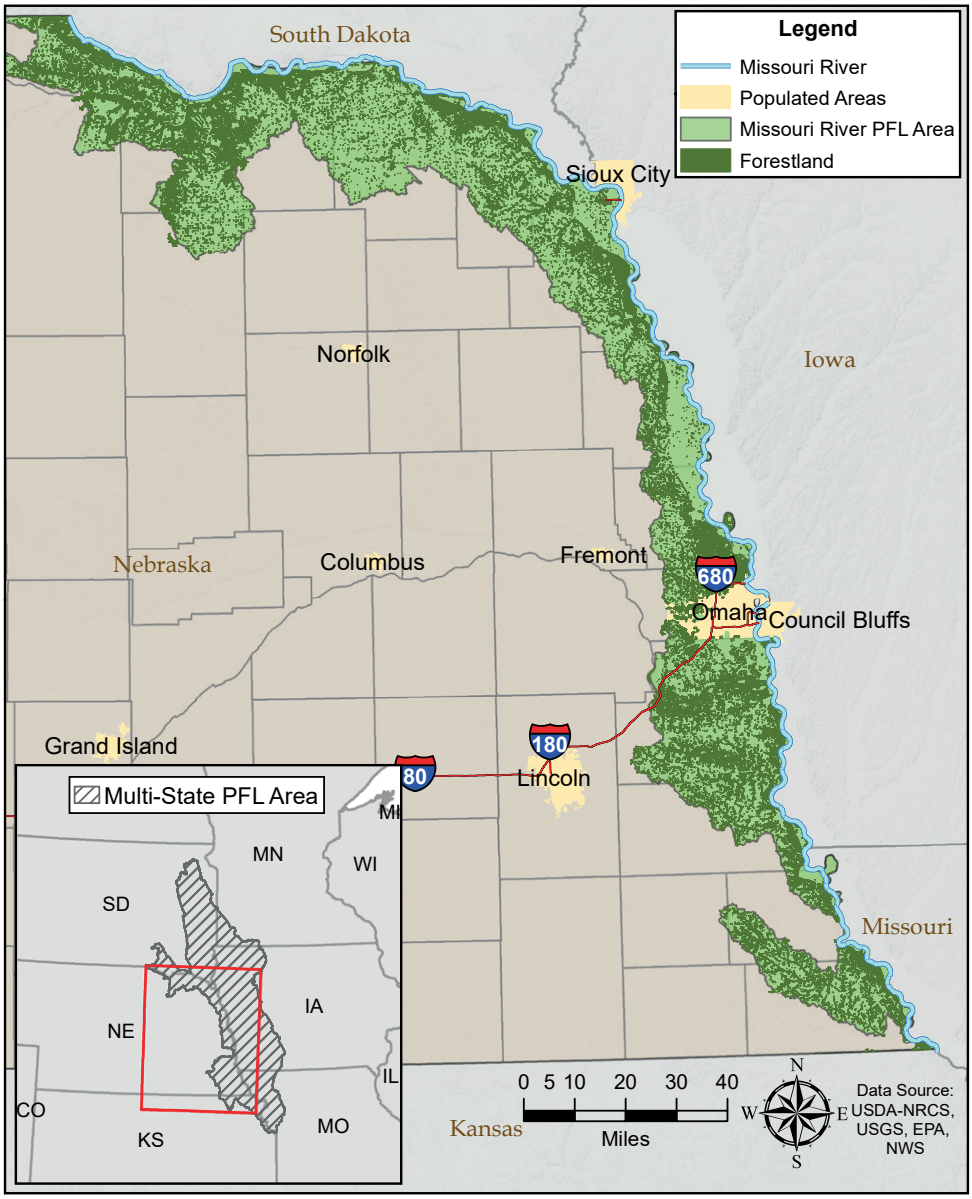


Table 24: Forestland Area of Missouri River Priority Forest Landscape

MISSOURI RIVER	2006	2011	2018
Acres of forestland*	244,509	322,576	283,697

**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Description

The Missouri River extends along the eastern edge of Nebraska, from its shared border with South Dakota/Iowa to its shared border with Missouri/Kansas. Upland deciduous forests cover the river bluffs, loess hills, and rolling uplands within the watershed. Much of the flood plain's riparian forests have been converted to row-crop agriculture.

These forestlands are classified as oak-hickory forests and contain species typical of central hardwood forests. However, the mix and diversity of forest species depends on latitude. The upland deciduous forests in the southern section of the Missouri River corridor often include northern red oak (*Quercus rubra)*, black oak *(Quercus velutina)*, bur oak, chinkapin oak (*Quercus muehlenbergii*), shagbark hickory *(Carya ovata)*, bitternut hickory *(Carya cordiformis)*, basswood (*Tilia Americana)*, black walnut, honeylocust, Kentucky coffeetree *(Gymnocladus dioicus)*, hop-hornbeam *(Ostrya virginiana)*, red mulberry, redbud *(Cercis canadensis)*, red elm *(Ulmus rubra)*, American elm (*Ulmus americana*), boxelder, and hackberry. The northern reaches of the corridor generally do not include hickories, black oak, chinkapin oak, red mulberry, or redbud. Missouri River forests also contain eastern cottonwood and eastern redcedar.

There are 11 state-listed threatened or endangered species that occur within the Missouri River corridor–six of which are also federally listed. State-listed species include American ginseng (*Panax quinquefolius)*, the southern flying squirrel (*Glaucomys volans)*, and the northern long-eared bat. The NGPC designated several BULs in this region as part of the Nebraska Natural Legacy Project: Missouri River, Indian Bluffs, Ponca Bluffs, Rulo Bluffs, and Thurston-Dakota Bluffs. This area was also designated a priority under Nebraska's Forest Legacy Program. CWPPs for portions of this area were completed in 2015 and 2020. CWPP development for the remainder of the PFL is underway, with an anticipated completion date of 2022.

Assessment - Current Condition, Demographics, Productivity

The area within the Missouri River corridor is increasingly at risk from uncharacteristically large and sustained flooding events. Major flooding occurred in 2011 and 2019, with each event lasting months and resulting in tree mortality. While periodic flooding is important in the life cycle of some woody species (e.g. *populus* spp.), the long-term effects of these sustained high-water events are not well understood across all tree species. Additionally, as tree mortality occurs, there are opportunities for invasive species to establish within the floodplain.

The encroachment of eastern redcedar in riparian forestland is also a concern. If its expansion continues, there is the potential for this species to destabilize the hardwood forest ecosystem. Efforts to spatially analyze and ground-truth this information with inventories will be important assessment functions over the life of this plan.

Trends in the populace show a decline in rural areas along the Missouri River bluffs, and a population increase in the counties in and around Omaha. This is the largest metropolitan area in Nebraska, with a population of about 950,000 people that covers about 142 square miles (U.S. Census Bureau, 2019).

The average farm size in the PFL has remained relatively constant, but it exhibits a slight downward trend. This is not true in the counties immediately adjacent to and within the metro area. Here, the trend in farm size is in strong decline. Subdivisions for housing development and other urban amenities are driving this trend. The resulting forest fragmentation and land-use conversion is expected to continue as urban expansion increases.

Table 25: Population Change 2010-2019 in Missouri River Priority Forest Landscape

COUNTY	POPULATION CHANGE
Boyd	Decrease 8.6%
Burt	Decrease 5.8%
Cass	Increase 4.0%
Cedar	Decrease 5.1%
Dakota	Decrease 4.7%
Dixon	Decrease 6.1%
Douglas	Increase 10.5%
Knox	Decrease 4.2%
Nemaha	Decrease 3.8%
Otoe	Increase 1.7%
Richardson	Decrease 6.0%
Sarpy	Increase 17.9%
Thurston	Increase 4.1%
Washington	Increase 2.5%

Source: U.S. Census Bureau, 2019

Table 26: Number of Farms/Average Acres per Farm 2007-2017 in Missouri River Priority Forest Landscape

COUNTY	2007	2012	2017
Boyd	259/972	266/1,094	286/1,129
Burt	549/501	560/553	521/572
Cass	682/412	731/472	766/452
Cedar	924/514	939/497	784/604
Dakota	278/599	243/650	267/624
Dixon	568/438	570/525	567/492
Douglas	362/233	396/217	367/247
Knox	863/622	1,080/581	956/628
Nemaha	449/474	451/562	410/636
Otoe	804/401	897/432	815/479
Richardson	707/395	736/434	708/483
Sarpy	360/280	396/232	417/239
Thurston	372/537	367/675	309/751
Washington	762/285	821/302	747/332

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Missouri River forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests*. Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Missouri River PFL forestlands were identified by NFS staff, stakeholders, and the public:

- Declining gallery forests lead to negative ecological and economic impacts in the region.
- Overharvesting of high-value trees in some areas leaves low-value, poor-quality stands that do not adequately contribute to the overall health of the forest.
- Ongoing infestations of invasive woody species Russian olive (*Elaeagnus angustifolia*), honeysuckle (*Lonicera* spp.), buckthorn (*Rhamnus cathartica*), invasive non-woody species such as garlic mustard (*Alliaria petiolata*), and aggressive native species like eastern redcedar negatively impact ecosystem health.
- Grazing of forestlands is done improperly, negatively affecting forest health and sustainability.
- Increasing use of herbicides and other agricultural chemicals results in abnormal tree growth or tree mortality.
- Fragmenting of forests and woodlands accelerates due to urban development and the conversion of forest to cropland.
- Increasing susceptibility of green ash and black walnut populations due to EAB and thousand cankers disease, respectively.
- Oak woodland forest type declines because natural regeneration and replanting efforts are unsuccessful.
- Unprecedented flooding events degrade soil and vegetative compositions.

- Managing forestlands is cost prohibitive due to a lack of markets for the resulting forest products.
- Conserving at-risk species becomes more difficult as habitat or breeding grounds are inadequately managed, resulting in species decline.

Desired Outcomes

The desired future condition for the Missouri River PFL is to create and maintain healthy, sustainable riparian forestlands that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with farming, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Private woodlands are actively managed to provide sustainable, healthy, resilient forests with improved natural regeneration, biodiversity, and wildlife habitat.
- Forest health is enhanced and wildfire risks are reduced as the removal of invasive and aggressive native species occur.
- Newly conducted inventories assist foresters in managing gallery forests after unprecedented flooding events.
- Forest health and sustainability are improved as herbicide damage to off-target woody species is minimized.
- Public understanding of complex issues like EAB is increased, resulting in better community inventories, response preparedness, and diversification of tree species during plantings.
- The integrity and resiliency of the river system is improved as riparian forests are expanded and restored.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Improve bur oak regeneration; restore cottonwood forest stands.
- Control herbicide damage.
- Maintain woodland quality; increase biodiversity.
- Slow the conversion of forestland to agricultural use.
- Reduce the incidence of tree and shrub removal with no replacement.
- Remove/control eastern redcedar encroachment.
- Identify, reduce, or eradicate invasive non-native plants.
- Increase public understanding of the threat posed by EAB.
- Reduce the number of abandoned farms transitioning to undesirable species.
- Increase the use of prescribed fire for forest management.
- Perform tree inventories in flooded woodlands.
- Expand forestry assistance programming to reach all constituents.
- Promote and establish Firewise communities.
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.

Priority Forest Landscape: Nemaha Rivers

Figure 17: Nemaha Rivers Priority Forest Landscape Map

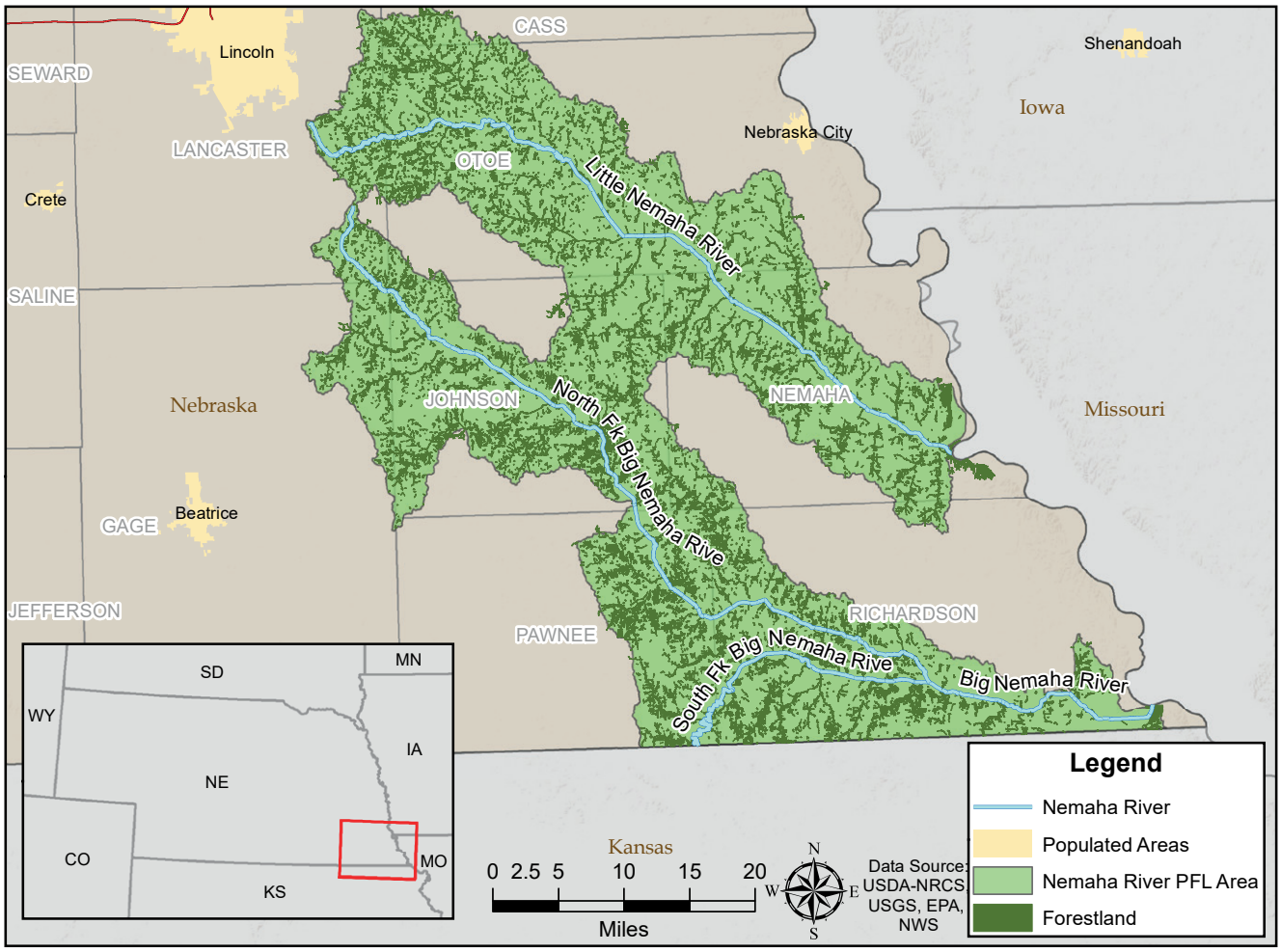


Table 27: Forestland Area of Nemaha River Priority Forest Landscape

NEMAHA RIVER	2006	2011	2018
Acres of forestland*	37,247	60,648	48,109

**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Description

Southeast Nebraska's Nemaha River Basin, containing both the Big and Little Nemaha Rivers, is situated south of the Platte River Basin and drains directly into the Missouri River. Forests typically follow these waterways and contain a significant component of upland central hardwood forests. Marginal agricultural land no longer in crop production is increasingly succeeding to upland forests composed of honeylocust, hackberry, bur and red oak, walnut, hickory, Osage orange (*Maclura pomifera*), and eastern redcedar.

Assessment - Current Condition, Demographics, Productivity

The Nemaha PFL is at risk from unprecedented flooding, significant storm damage, and other climate-influenced events. Major flooding occurred in 2011 and 2019, with each event resulting in tree mortality. In addition, invasive species and encroaching eastern redcedar threaten the stability of this hardwood forest ecosystem.

General trends show a decline in the populace for the rural counties in the Nemaha River Basin. Meanwhile, a population increase in the counties associated with the Lincoln and Omaha metro areas has been observed. The Lincoln metro area covers about 96.5 square miles with a population of nearly 260,000 people. This is the second largest metropolitan area in Nebraska (U.S. Census Bureau, 2019).

The average farm size is trending flat to slightly smaller. The areas where this is strongly declining are the counties immediately adjacent to and within the Lincoln and Omaha metros. Subdivision and urban development continue to drive this trend with both areas experiencing major fragmentation, rising population growth, and land-use conversion.

Table 28: Population Change 2010-2019 in Nemaha Rivers Priority Landscape

COUNTY	POPULATION CHANGE
Cass	Increase 4.0%
Gage	Decrease 3.6%
Johnson	Decrease 2.8%
Lancaster	Increase 11.8%
Nemaha	Decrease 3.8%
Otoe	Increase 1.7%
Pawnee	Decrease 5.8%
Richardson	Decrease 6.0%

Source: U.S. Census Bureau, 2019

Table 29: Number of Farms/Average Acres per Farm 2007-2017 in Nemaha Rivers Priority Forest Landscape

COUNTY	2007	2012	2017
Cass	682/412	731/472	766/452
Gage	1280/422	1263/423	1188/454
Johnson	541/324	587/337	502/393
Lancaster	1698/248	1836/266	1786/237
Nemaha	449/474	451/562	410/636
Otoe	804/401	897/432	815/479
Pawnee	489/445	540/498	460/593
Richardson	707/395	736/434	708/483

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Nemaha River forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests*. Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Nemaha River PFL were identified by NFS staff, stakeholders, and the public:

- Increasing susceptibility of green ash and black walnut populations due to EAB and thousand cankers disease, respectively.
- Fragmenting of forests and habitats increases as pressure mounts to convert these areas to suburban or agricultural purposes.
- Recurring flooding of riparian corridors causes changes in bank structure and vegetation, furthering erosion and impairing water quality.

- Applying agricultural herbicides during critical stages of tree development negatively affects regeneration and leads to declines in forest health.
- Increasing populations of noxious, invasive, or aggressive native species leads to a decline in forest health and resiliency.
- Utilizing important agroforestry species declines because of negative stakeholder perceptions.
- Encroaching eastern redcedar trees elevate the risk of wildfires in the area.

Desired Outcomes

The desired future condition for the PFL is to create and maintain healthy, sustainable forests that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with farming/ranching, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Municipalities encourage responsible development through the use of NFS forestland data, helping ease woodland removal trends in the area.
- Partnerships are formed that use geospatial information to quantify how eastern redcedar affects pasture and woodlands.
- Active woodland management increases as landowners receive technical support and resources from area foresters.
- Partnerships among agencies assist landowners in increasing the number of new or renovated windbreaks.
- Erosion and sedimentation decreases as native woody species are utilized to restore and stabilize stream banks.
- Water quality is improved through the use of voluntary forestry BMPs; specifically, the use of riparian forest buffers near suburban development and agricultural settings.
- Biodiversity and resiliency increase because of strategic management of region's forest systems.
- Planting and harvesting of marketable timber species increases as incentives are tailored to meet the needs of landowners and land managers.
- New or reinvigorated partnerships reduce the incidence of off-target herbicide damage to woody species.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Assess the impacts of flooding to riparian woodlands.
- Slow the conversion of forest to cropland, and the removal of trees/shrubs without replacement.
- Slow the establishment and encroachment of invasive and aggressive native species.
- Improve woodland quality, wildlife habitat, and biodiversity.
- Increase the number of projects focused on oak woodland restoration.
- Increase the number of windbreak renovations.
- Expand forestry assistance programming to reach all constituents.
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.
- Promote and establish Firewise communities.

Priority Forest Landscape: Big & Little Blue Rivers

Figure 18: Blue Rivers Priority Forest Landscape Map

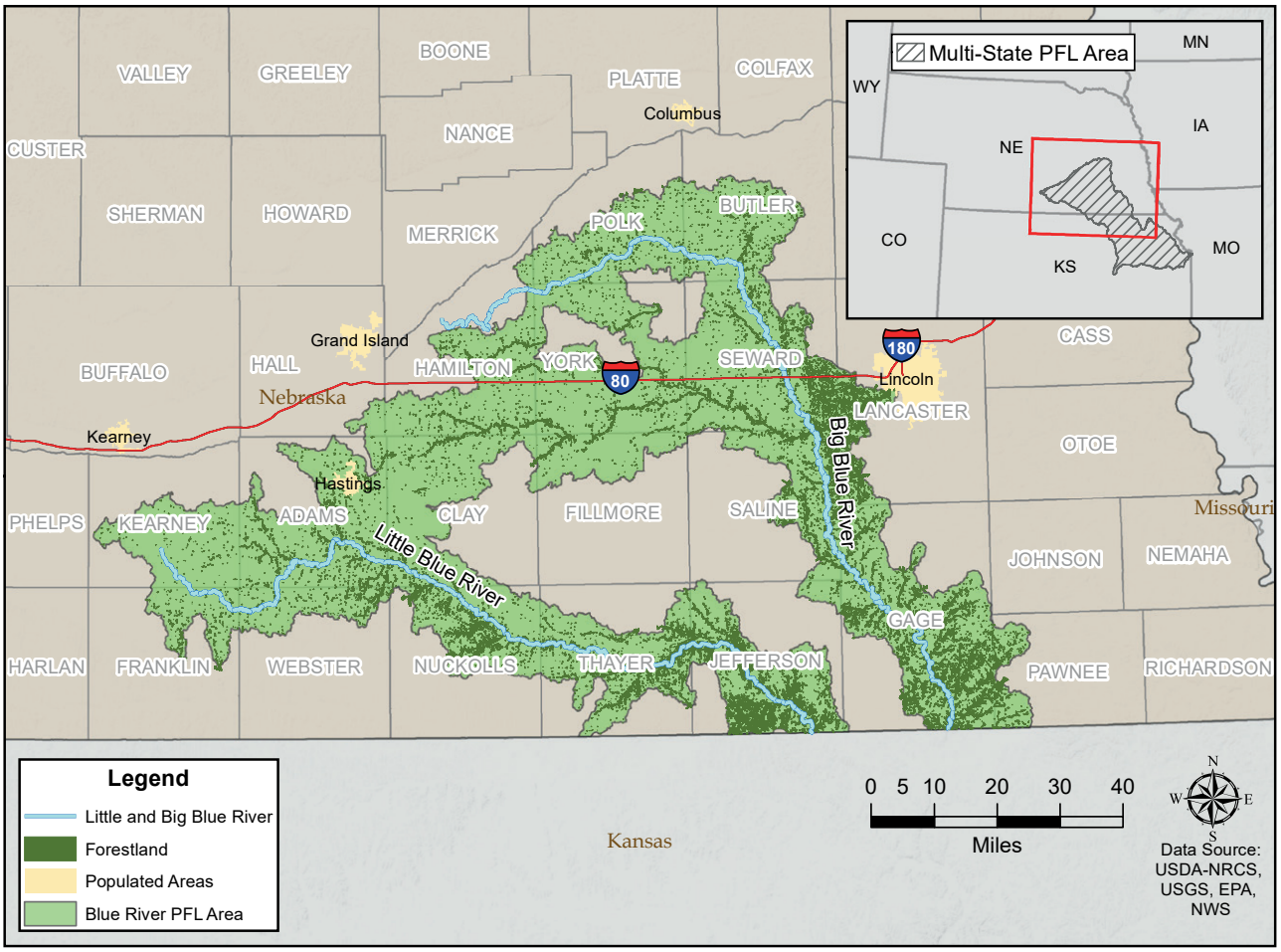


Table 30: Forestland Area of Blue Rivers Priority Forest Landscape

BLUE RIVER	2006	2011	2018
Acres of forestland*	71,261	104,218	68,456

**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Description

The Big Blue River is located in south central Nebraska and flows into Kansas, eventually becoming a tributary of the Kansas River. The Little Blue River is also located in south central Nebraska and flows into Kansas, eventually becoming a tributary of the Big Blue River. Riparian forests generally follow the drainages of watersheds. Marginal cropland no longer in production is succeeding to mixed hardwoods and eastern redcedar.

Portions of this area are encompassed in the Rainwater Basin BUL, as designated by the NGPC through the Nebraska Natural Legacy Project. Public lands within the PFL include, but are not limited to: Harvard Marsh Waterfowl Production Area, Alexandria Wildlife Management Area, and Pioneer Trails Recreation Area. A CWPP is in place for this area.

Assessment - Current Condition, Demographics, Productivity

The area within the Blue River system is considered at risk due to unprecedented flooding, significant storm damage and other climate-influenced events. Major flooding occurred in 2011 and 2019, with each event resulting in tree mortality. Both the riparian forest system and water quality in these areas are also at risk due to encroaching agricultural activities and the use of fertilizer and herbicide.

The removal or alteration of riparian systems has implications beyond that of forest-dependent species. Macroinvertebrates, fish, and other aquatic wildlife can be adversely affected as habitat is displaced or converted to other uses. Additionally, wetlands and other riparian components play critical roles in the hydrologic function of the watershed. The disruption of these natural processes are expected to become more apparent as municipalities seek to increase water usage to meet growing demand.

General trends show a decline in the populace of the Blue River Basin. This downward trend is consistent across the counties except for the areas associated with Lincoln and Grand Island. Lincoln, Nebraska's second-largest city, covers about 96.5 square miles, with a population about 260,000 people. Grand Island is the third largest city in Nebraska, with a population of 51,000 people within a 30-square-mile area. The average farm size in the PFL is trending flat to slightly larger.

Table 31: Population Change 2010-2019 in Blue Rivers Priority Forest Landscape

COUNTY	POPULATION CHANGE
Adams	Unchanged
Butler	Decrease 4.5%
Clay	Decrease 5.1%
Fillmore	Decrease 7.3%
Franklin	Decrease 7.6%
Gage	Decrease 3.6%
Hall	Increase 4.7%
Hamilton	Increase 2.3%
Jefferson	Decrease 6.6%
Johnson	Decrease 2.8%
Kearney	Increase 0.1%
Lancaster	Increase 11.8%
Nuckolls	Decrease 7.8%
Polk	Decrease 3.5%
Saline	Increase of 0.2%
Seward	Increase of 3.2%
Thayer	Decrease of 4.3%
Webster	Decrease of 8.5%
York	Increase of 0.1%

Source: U.S. Census Bureau, 2019

Table 32: Number of Farms/Average Acres per Farm 2007-2017 in Blue Rivers Priority Forest Landscape

COUNTY	2007	2012	2017
Adams	485/632	567/601	545/624
Butler	809/440	840/441	723/517
Clay	454/804	457/723	441/723
Fillmore	478/758	472/696	439/750
Franklin	312/934	338/851	317/998
Gage	1,280/422	1,263/423	1,188/454
Hall	608/540	593/556	582/564
Hamilton	550/580	572/532	586/533
Jefferson	601/542	627/562	590/608
Johnson	541/324	587/337	502/393
Kearney	381/851	344/854	342/852
Lancaster	1698/248	1836/266	1786/237
Nuckolls	405/758	435/804	431/829
Polk	505/533	466/526	432/581
Saline	702/425	756/479	717/503
Seward	893/272	992/358	944/385
Thayer	483/727	432/727	414/787
Webster	430/710	423/715	406/810
York	549/630	541/628	521/665

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Blue Rivers' forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests.* Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Blue River PFL were identified by NFS staff, stakeholders, and the public:

- Increasing susceptibility of green ash and black walnut populations due to EAB and thousand cankers disease, respectively.
- Eastern redcedar encroaching into hardwood forests, pastures, and windbreaks.
- Removing conservation tree plantings and riparian forest buffers during conversions to cropland.
- Impairment of the region's water quality due to agricultural and urban activities.
- Habitats in low-lying areas are degraded because of unusually intense and repeated flooding events.
- Exposing woody species to herbicides during critical growth stages leads to a decline in forest health and natural regeneration.
- Declining species diversity and resiliency as woodland management lessens in the region.
- Falling populations of oak-dependent species if natural regeneration and replanting of oak woodlands are not increased.

Desired Outcomes

The desired future condition for the PFL is to create and maintain a healthy, sustainable riparian forest system that provides long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with agriculture, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Conversions of forestlands to agricultural purposes are reduced.
- Inventories and spatial assessments illustrate how eastern redcedar encroachment affects pasture and woodlands.
- Landowners are actively involved in forest management.
- Total number of new and renovated windbreaks increases in the region.
- Hydrologic function and water quality improves following plantings of native species during stream bank stabilization efforts.
- Habitat, biodiversity, and sustainability of woodlands are improved as landowners are actively engaged in forest management.
- Tree species diversity is increased in communities.
- Amount of eastern redcedar encroachment into pastures, grasslands, and hardwood forests is reduced.
- Planting marketable timber species increases in the area.
- Fire risk decreases because of fuels reduction programs that offer technical or financial assistance.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Increase woodland quality and reduce degraded wildlife habitat.
- Decrease the conversion of forest and removal of trees/shrubs without replacement.
- Reduce populations and encroachment of invasive and aggressive native species.
- Restore oak woodland forest type.
- Increase the number of windbreak renovations.
- Improve the area's water quality through the adoption of voluntary BMPs.
- Reduce the percentage of ash present in communities.
- Improve wildlife habitat throughout the PFL.
- Educate the public on the benefits of using eastern redcedar in conservation plantings while emphasizing the need for management.
- Expand forestry assistance programming to reach all constituents.
- Promote and establish Firewise communities.

Priority Forest Landscape: Platte River

Figure 19: Platte River Priority Forest Landscapes Map

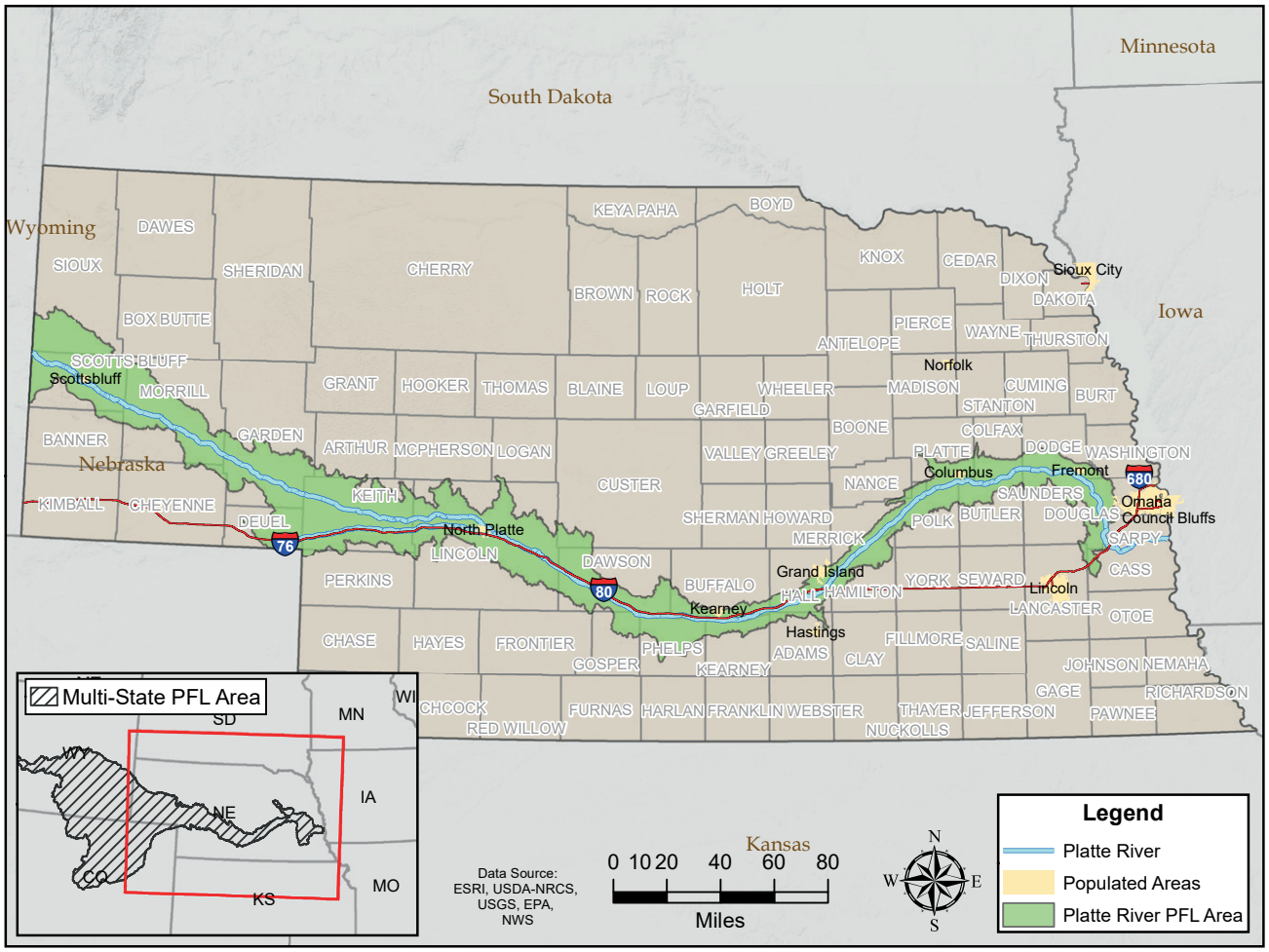


Table 33: Forestland Area of Platte River Priority Forest Landscapes			
PLATTE RIVER	**2004**	**2011**	**2018**
Acres of forestland*	107,481	120,725	115,311

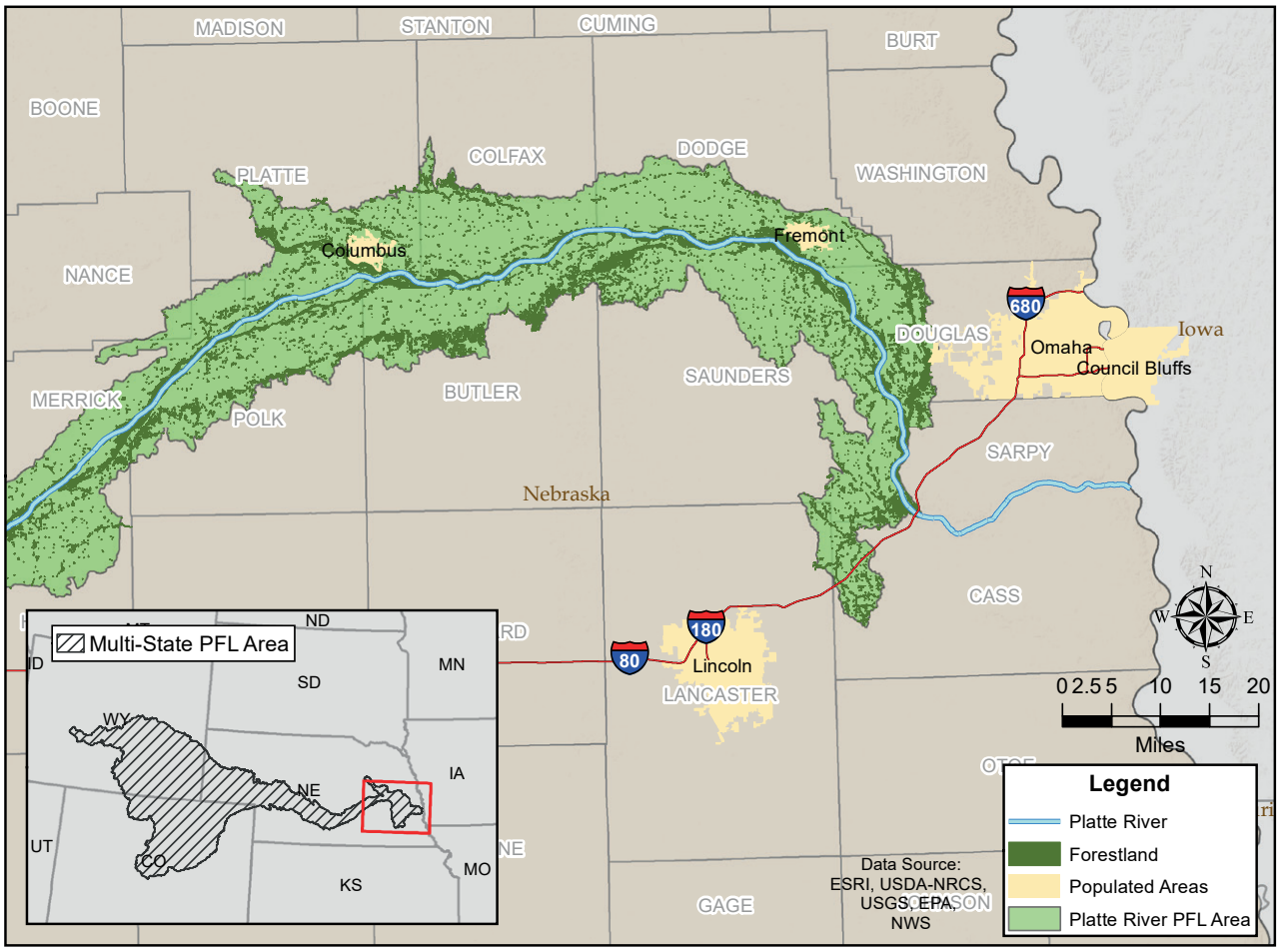
**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Overview

The Platte River flows across the entire state of Nebraska and encompasses 115,311 acres of forestland, including 71,704 acres of deciduous forest, 16,982 acres of coniferous forest, 12,396 acres of mixed forest, and 14,267 acres of non-stocked forest (USDA Forest Service, 2018). Because of the river's length and differing habitat types present, the NFS considers the Platte River to be three distinct PFLs, discussed separately ~~below.~~

Eastern Platte River

Figure 20: Eastern Platte River Priority Forest Landscape Map



Description

The lower portion of the Platte River includes the Platte River channel and its floodplain from the river's confluence with the Loup River in Platte County eastward to its mouth in Sarpy County.

Much of the stream bank is wooded. The dominant species observed are cottonwood and eastern redcedar, along with red mulberry, hackberry, northern catalpa (*Catalpa speciosa*), black walnut, and boxelder. Because river courses have changed and flooding patterns are varied, native cottonwood stands established during natural, scouring floods are now over-mature, decadent, and beginning to decline in the absence of this natural disturbance. These stands are succeeded by eastern redcedar or hardwoods (e.g., hackberry, red mulberry, green ash, Russian olive). The conversion to eastern redcedar is creating a new, highly flammable riparian forest type.

The Eastern Platte River also supports many rare, large river fish including lake sturgeon *(Acipenser fulvescens)*, blue sucker *(Cycleptus elongatus)*, sturgeon chub *(Macrhybopsis gelida)*, and pallid sturgeon *(Scaphirhynchus albus)*. Public or protected lands along this reach of the Platte River include Two Rivers State Recreation Area, Louisville State Recreation Area, Platte River State Park, and Mahoney State Park. The Central Platte and Southeast Nebraska CWPPs cover portions of this PFL. CWPPs covering the remainder of this area are in development and scheduled for completion by 2022.

Assessment - Current Condition, Demographics, Productivity

The Eastern Platte River is at risk from unprecedented flooding, significant storm damage, and other climate-influenced events. Major flooding occurred in 2019 along the river, and minor flooding also occurred in 2017-2018 along the lower reaches of the river system. Continued encroachment of agricultural activities place the riparian forest system and water quality in these areas at risk.

General trends show an increase in the populace for the Eastern Platte River watershed, and in the counties in and surrounding the Omaha metropolitan area. The exception is Butler County, a rural area with a steadily declining population. The Omaha metropolitan area is about 142 square miles with a population about 950,000 people. This is the largest metropolitan area in Nebraska (U.S. Census Bureau, 2019).

Table 34: Population Change 2010-2019 in Eastern Platte River Priority Forest Landscape

COUNTY	POPULATION CHANGE
Butler	Decrease 4.5%
Cass	Increase 4.0%
Colfax	Increase 1.8%
Dodge	Decrease 0.3%
Douglas	Increase 10.5%
Merrick	Decrease 1.3%
Platte	Increase 3.8%
Polk	Decrease 3.5%
Sarpy	Increase 17.9%
Saunders	Increase 3.9%

Source: US Census Bureau, 2019

Table 35: Number of Farms/Average Acres per Farm 2007-2017 in Eastern Platte River Priority Forest Landscape

COUNTY	2007	2012	2017
Butler	809/440	840/441	723/517
Cass	682/412	731/472	766/452
Colfax	589/415	519/411	516/508
Dodge	715/473	767/430	676/499
Douglas	362/233	396/217	367/247
Merrick	473/524	492/478	483/503
Platte	882/483	942/453	836/459
Polk	505/533	466/526	432/581
Sarpy	360/280	396/232	417/247
Saunders	1,131/378	1,204/390	1,118/429

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Eastern Platte River forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests.* Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Eastern Platte River forestlands were identified by NFS staff, stakeholders, and the public:

- Increasing risk of uncharacteristic wildfires as fuel loads from historically absent species rise (e.g. eastern redcedar).
- Differing approaches when managing for water availability and quality.
- Declining cottonwood gallery forests results in negative ecological and economic impacts.

- Resiliency of forestlands suffers as infestations of invasive woody species (Russian olive), aggressive native species (eastern redcedar), and non-woody invasives phragmites *(Phragmites australis)*, and purple loosestrife (*Lythrum salicaria)* impact forest health.
- Understanding of the negative implications of forest fragmentation does not increase as residential development or land-use conversion increases.
- Removing wetlands or other critical floodplain vegetation occurs as agricultural activities expand.
- Green ash and black walnut populations become increasingly susceptible to EAB and thousand cankers disease, respectively.
- Flooding events are exacerbated as naturally-occurring riparian corridors are removed and not restored, compounding issues that ultimately degrade forest health.
- Declining forest health resulting from excessive harvests of high-value timber species in some areas (e.g. black walnut), leaving low-value, poor-quality trees that cannot aid in natural forest succession.
- Repeated exposure of off-target species during herbicide applications interrupts critical growth stages of woody species, leading to declines in forest health.

Desired Outcomes

The desired future condition for the PFL is to create and maintain healthy, sustainable riparian forest systems that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with farming, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Landscape-level management plans, based on condition assessments of woodlands in relation to flooding events, are adopted to help mitigate risks to communities and overall forest system.
- Collaboratively address eastern redcedar encroachment with management plans that target range expansion in upland and riparian corridors.
- Public/private stewardship activities increase, leading to the expansion of diverse, native riparian forest.
- Nebraska's BMPs are increasingly utilized, ensuring riparian forest renovations enhance the river corridor and species therein.
- Landowners are better prepared for the harvesting of black walnut trees because of on-the-ground consultation and dissemination of technical information.
- Availability of habitat for threatened and endangered species is increased through integration of forest management strategies and landowner objectives.
- Leveraging grant opportunities, communities build more diverse and robust community tree canopies.
- Identify funding opportunities that manage and reduce undesired or invasive species, leading to a healthier forest system.
- Locally-suited, marketable timber species are increasingly planted for future harvest and sale.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Perform woodland flooding assessment, documenting changes in species composition and forest health.
- Expand riparian forest buffers to protect

the river corridor and populations of native species.

- Focus on management activities that will reverse woodland removal trends.
- Tailor outreach and technical assistance activities to manage forests while improving wildlife habitat and forest health.
- Reduce overharvesting of marketable timber species.
- Engage landowners and communities in EAB preparedness and invasive plant species removal.
- Assess the extent of eastern redcedar encroachment and mitigate negative impacts to forestlands.
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.
- Expand forestry assistance programming to reach all constituents.
- Promote and establish Firewise communities.

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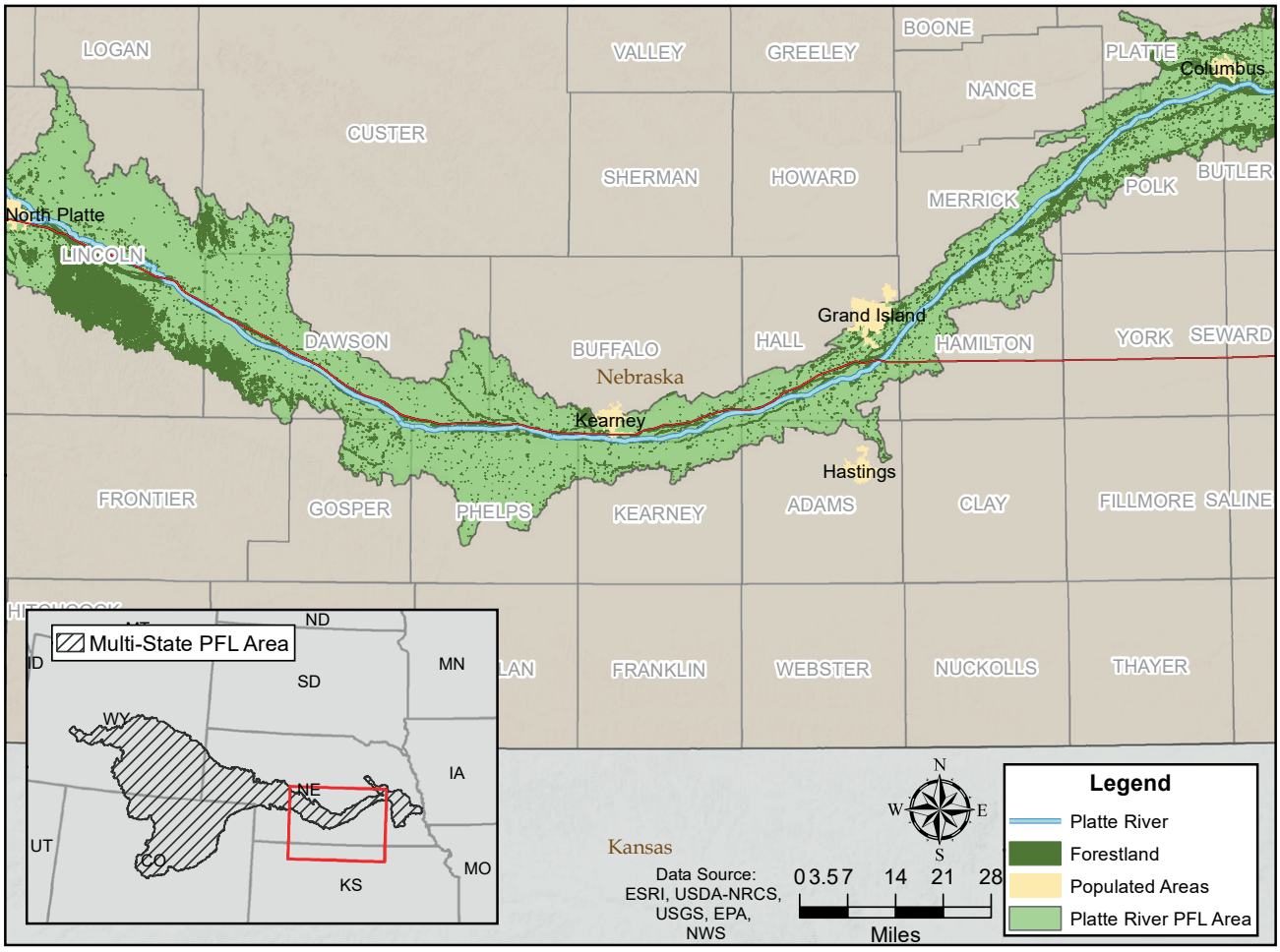
Central Platte River

Figure 21: Central Platte River Priority Forest Landscape Map



Description

The Central Platte River includes the Platte River channel and floodplain from the confluence of the North and South Platte Rivers in Lincoln County eastward to the river's confluence with the Loup River in Platte County. Sandbars and wooded islands are common within the channel. Much of the stream bank is extensively wooded; the dominant species observed are cottonwood and eastern redcedar, along with red mulberry, hackberry, green ash, and Russian olive. There are a number of woodland-dependent species that are at risk in this section of the river, including the red-bellied snake (*Storeria occipitomaculata*) and black-billed cuckoo.

The staging of Sandhill cranes (*Grus canadensis*) during spring migration on the Platte River is a unique, world-class ecological phenomenon. It is also a critical staging site in the life cycle of the mid-continent population of Sandhill cranes. Roosts numbering in the tens of thousands are scattered throughout the Platte River. The shortage of wet meadows in spring on the Platte River is considered to be a potential threat to the bird's population. The International Union for Conservation of Nature considers the protection of the Platte River as migratory habitat for Sandhill cranes a priority for conservation.

In addition to Sandhill cranes, millions of geese, ducks and other waterfowl, and a variety of shorebirds use this stretch of the river as stopover habitat along the Central Flyway. Three state-listed species occur along the Central Platte: river otter *(Lutra canadensis)*, whooping crane, and interior least tern. This portion of the Platte is designated as critical habitat for whooping cranes (*Grus americana)* and the federally-listed piping plover *(Charadrius melodus)*. The Platte River Whooping Crane Maintenance Trust, the Audubon Society, The Nature Conservancy, and NGPC own and manage a number of protected areas within this reach of the river.

Other issues in this PFL include the increased demand for irrigation water and widespread populations of invasive *phragmites*, saltcedar, purple loosestrife, and Russian olive along hundreds of miles of river.

Assessment - Current Condition, Demographics, Productivity

The area within the Central Platte River PFL is at risk from unprecedented flooding, significant storm damage, and other climate-influenced events. Flooding occurred in 2011 with high tree mortality. Flooding in this area is common when spring runoff is significant, often resulting from melting snowpack in Colorado. Encroachment of agricultural systems place riparian forest systems and water quality at risk.

General trends show an increase in the populace around the communities of Grand Island and Kearney. However, a downward trend is exhibited across the other counties within the PFL. Grand Island is the third largest community in Nebraska with a population of 51,000 people; Kearney has a population of 31,000 people (U.S. Census Bureau, 2019). The average farm size in the Central Platte River PFL area is relatively flat but trending slightly higher.

Table 36: Population Change 2010-2019 in Central Platte River Priority Forest Landscape

COUNTY	POPULATION CHANGE
Adams	Unchanged
Butler	Decrease 4.5%
Buffalo	Increase 7.7%
Dawson	Decrease 3.0%
Gosper	Decrease 2.6%
Hall	Increase 4.7%
Hamilton	Increase 2.3%
Kearney	Increase 0.1%
Lincoln	Decrease 3.8%
Merrick	Decrease 1.3%
Platte	Increase 3.8%
Polk	Decrease 3.5%
Phelps	Decrease 1.7%

Source: U.S. Census Bureau, 2019

Table 37: Number of Farms/Average Acres per Farm 2007-2017 in Central Platte River Priority Forest Landscape

COUNTY	2007	2012	2017
Adams	485/632	567/601	545/624
Butler	809/440	840/441	723/517
Buffalo	949/645	1046/555	953/554
Dawson	728/880	806/782	686/889
Gosper	218/1035	260/1115	287/983
Hall	608/540	593/556	582/564
Hamilton	550/580	572/532	586/533
Kearney	381/851	344/854	342/852
Lincoln	1053/1521	1168/1219	1040/1305
Merrick	473/524	492/478	483/503
Platte	882/483	942/453	836/459
Polk	505/533	466/526	432/581
Phelps	420/810	405/181	371/921

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Central Platte forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests*. Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Central Platte PFL were identified by NFS staff, stakeholders, and the public:

- Shifting weather patterns, abnormal wildfires, land-use conversion, and pressure from insects and diseases bring about uncharacteristic changes to forest type.
- Growing fuel loads from overabundant and historically absent species (e.g. eastern redcedar) increase the threat of uncharacteristic wildfire.
- Differing approaches when managing for water availability and quality.
- Declining cottonwood gallery forests contribute to an array of negative ecological and economic impacts.
- Decreasing resiliency of forestlands if management of invasive woody species (Russian olive), aggressive native species (eastern redcedar), and non-woody invasives (*phragmites*, purple loosestrife) are not undertaken.
- Forestlands lacking management are no longer suitable habitat for migratory species or resident wildlife populations.
- Increasing susceptibility of native ash tree populations as EAB spreads through the region.
- Agreeing on landscape-level management strategies becomes more difficult as stakeholder goals and objectives evolve.
- Inadequate grazing management leads to erosion, compaction, and declines in forest health.
- Appraising the benefits of windbreak establishment/renovation decreases, leading to anecdotal perceptions trees lack economic, ecologic, and aesthetic value.
- Lacking management, undesirable or invasive species encroach into forests and rangelands.
- Utilizing prescribed burning to benefit forest and range health becomes a less desirable management option.
- Tree plantings in communities, agriculture, and conservation lack species diversity.
- Increasing number of wildfire-prone areas pose new risks to public, property, and emergency personnel.
- Removing or not restoring naturally-occurring riparian corridors exacerbates flooding events, negatively impacting the region's forestlands.
- Natural regeneration and appropriate age-class mix does not improve among forest stands.

Desired Outcomes

The desired future condition for the Central Platte PFL is to create and maintain healthy, sustainable forestlands that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with farming and ranching, provides excellent migratory bird habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Actively engaged in forest stewardship, landowners provide sustainable, resilient forests with properly stocked stands, appropriate age-class mix, optimal natural regeneration, enhanced biodiversity, and improved wildlife habitat.
- An informed public employs multi-use management and understands what prescriptions are appropriate to achieve a desired future condition.
- VFDs are actively supported with acquisitions of proper equipment,

qualifications or training, and other firefighting resources to enhance the safety of emergency personnel.
- Demonstrate how BMPs accentuate landowner objectives and restore the river's natural functions, including creating habitat for migratory, threatened, or endangered species.
- Removal of invasive and aggressive native species improves forest health and decreases wildfire hazards.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Develop and implement a cohesive, multi-use forest management strategy with local and regional applicability.
- Increase tree regeneration and improve age-class mix of forestlands.
- Improve forest resiliency to enhance wildlife habitat while increasing forest health.
- Develop actionable tactics for stakeholders that align with forest management principles.
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.
- Reduce overgrazing in riparian corridors and woodland areas.
- Actively manage aggressive native species.
- Identify and eradicate or reduce the spread of invasive non-native species.
- Protect native species in the riparian buffer; expand forestland to protect the river corridor.
- Establish cost-share programming to encourage the reduction of forest fuels.
- Disseminate technical information on active forest management and responsible development in WUI areas.
- Encourage wood products market development, incentivizing the active management of forest resources.
- Support the missions and safety of area VFDs through increased training and the acquisition of firefighting equipment.
- Expand forestry assistance programming to reach all constituents.
- Promote and establish Firewise communities.

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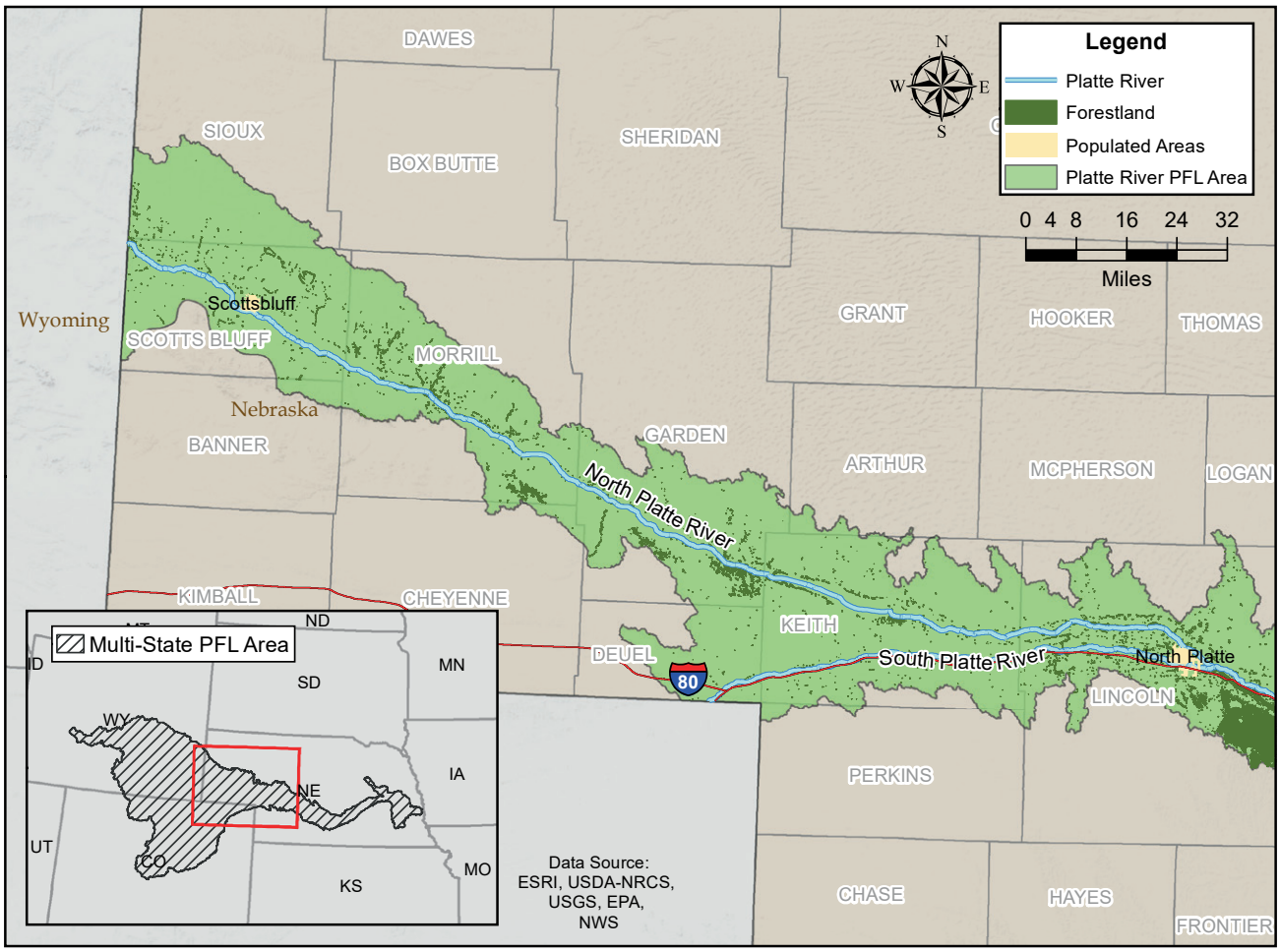
Western Platte River

Figure 22: Western Platte River Priority Forest Landscape Map



Description

The westernmost portion of the Platte River in Nebraska includes the North and South Platte River Valleys from their confluence in Lincoln County, and the land between them in Lincoln and Keith Counties, westward to the Colorado state line in Deuel and Scottsbluff Counties.

Both the North Platte and South Platte Rivers in this reach are shallow streams with braided, mostly wooded channels. These streams are unique in that they support several species of rare cold-water fish, including the northern redbelly dace (*Chrosomus eos*) and finescale dace. The streams also support wetland species, such as the parasitic Platte River dodder (*Cuscuta plattensis*), longnose mayfly (*Sparbarus nasutus*), and oxbow snail (*Galba cockerelli*). Russian olive, *phragmites*, saltcedar, and eastern redcedar have colonized the floodplain woodlands and meadows.

A number of public or protected lands exist in this area. These include, but are not limited to, Clear Creek Wildlife Management area, Frey Wildlife Area, and Spotted Tail. Several CWPPs are already in place for the PFL; the entire area will be covered by CWPPs by 2022.

Assessment - Current Condition, Demographics, Productivity

The area within the Platte River system is at risk from unprecedented flooding, significant storm damage, extreme drought, and other climate-influenced events. Due to high summer temperatures, low humidity and wind, this area can also experience large wildfires. The encroachment of agricultural systems in some areas have placed the riparian forest system and water quality at risk.

General trends show a decrease in the populace for the communities in this area. A downward trend is consistent across all counties. The average farm size in the Western Platte Priority Landscape is trending flat to slightly larger.

Table 38: Population Change 2010-2019 in Western Platte River Priority Forest Landscape

COUNTY	POPULATION CHANGE
Deuel	Decrease 7.1%
Garden	Decrease 7.8%
Keith	Decrease 4.1%
Lincoln	Decrease 3.0%
Morrill	Decrease 7.1%
Scotts Bluff	Decrease 2.7%
Sioux	Decrease 11.1%

Source: U.S. Census Bureau, 2019

Table 39: Number of Farms/Average Acres per Farm 2007-2017 in Western Platte River Priority Forest Landscape

COUNTY	2007	2012	2017
Deuel	240/1,162	237/1,168	225/1,227
Garden	297/3,530	261/3,932	221/4,608
Keith	398/1,461	388/1,395	318/1,546
Lincoln	1,053/1,521	1,168/1,219	1,040/1,305
Morrill	495/1,822	512/1,561	426/1,945
Scotts Bluff	730/494	966/461	760/581
Sioux	366/3,530	354/3,459	307/4,006

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Western Platte River's forestlands is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests.* Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Western Platte PFL were identified by NFS staff, stakeholders, and the public:

- Increasing risk of uncharacteristic wildfires as fuel loads grow, further exacerbated by the encroachment of historically isolated species (e.g. eastern redcedar).
- Differing approaches when managing for water availability and quality.
- Declining cottonwood gallery forests results in negative ecological and economic impacts in the area.
- Spreading of invasive woody species (Russian olive, honeysuckle, buckthorn), invasive non-woody species (garlic mustard), and aggressive native species (eastern redcedar) continue to negatively impact ecosystem health.
- Fragmenting of forestland and associated habitat continues as lands are converted to suburban or agricultural purposes.
- Expanding development into WUI areas creates new wildfire safety issues for residents, first responders, and property.
- Building a consensus on landscape-level management among stakeholder groups becomes more challenging.
- Growing perception among landowners that windbreak establishment/renovation is not worth economic investment.
- Tree plantings in communities, conservation plantings, and other agroforestry applications lack regionally appropriate species diversity.

- Shifting weather patterns, fire, land-use conversion, and insects and diseases bring about rapid and uncharacteristic changes to forest type.
- Broadening opinion that forestlands and trees do not have economic value.

Desired Outcomes

The desired future condition for the Western Platte River PFL is to create and maintain healthy, sustainable riparian forest systems that provide long-term benefits for all Nebraskans. This includes a forest ecosystem that is compatible with farming/ranching, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Multiple-use management is increasingly adopted as a stewardship and planning strategy across the landscape.
- Acres of riparian forest buffer are retained or increased through technical assistance and cost-share opportunities.
- Positively impact riparian forests and stream health through the implementation of stewardship plans that address undesirable species in the region.
- Training is increasingly centered on experiential learning, allowing landowners to sustainably manage the function and health of their forest or woodlands.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Provide necessary conditions to allow for the regeneration of cottonwood gallery forest type.
- Develop and implement a cohesive multi-use forest management strategy across the landscape.
- Ensure NFS technical information is reaching forest landowners.
- Develop clear management guidelines for forest landowners.
- Mitigate invasive or aggressive native species in the river corridor (e.g. Russian olive).
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.
- Expand forestry assistance programming to reach all constituents.
- Promote and establish Firewise communities.

Priority Forest Landscape: Republican River

Figure 23: Republican River Priority Forest Landscape Map

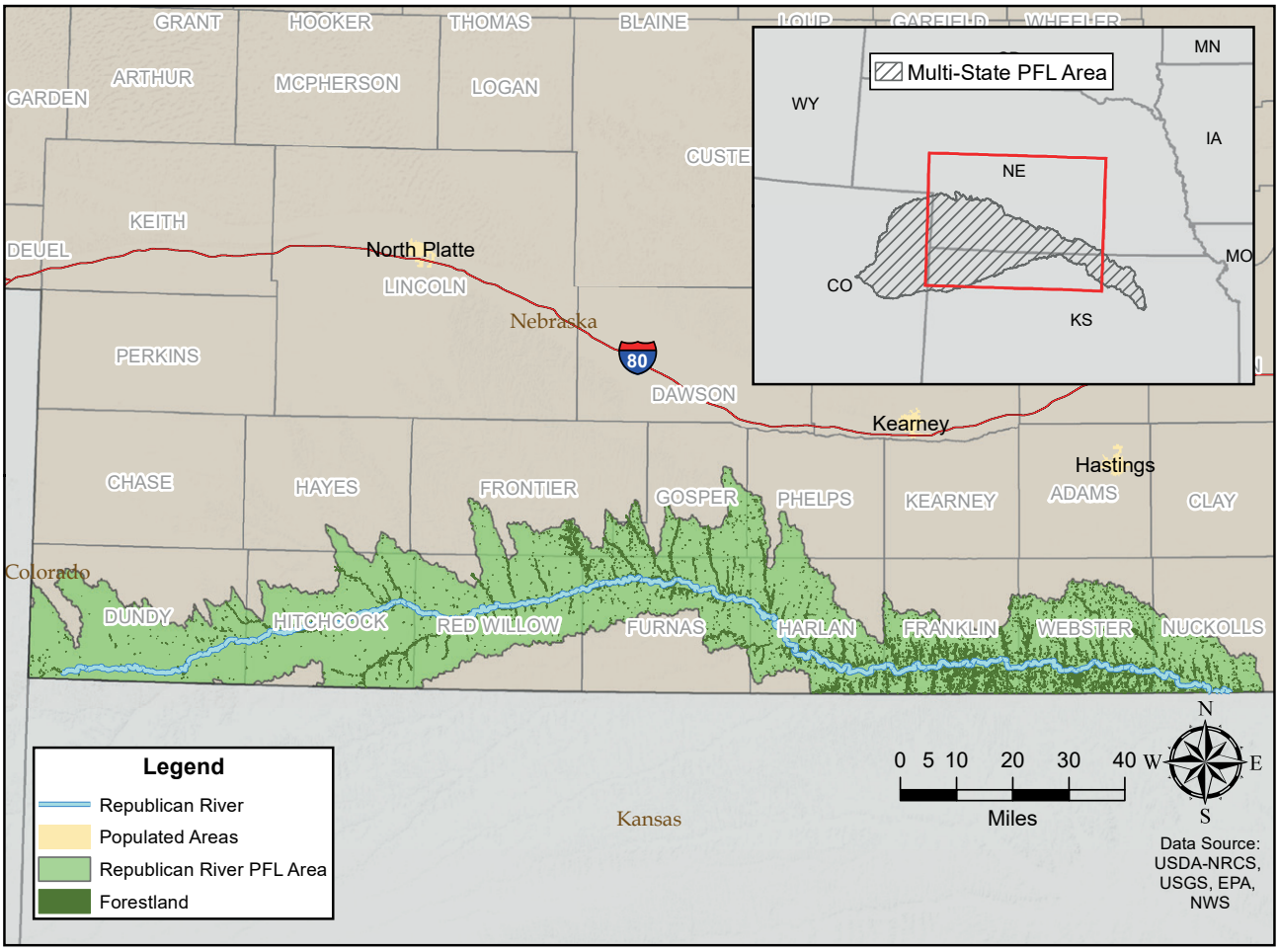


Table 40: Forestland Area of Republican River Priority Landscape*

REPUBLICAN RIVER	2006	2011	2018
Acres of forestland*	74,446	89,526	94,236

**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Description

The North Fork of the Republican River flows southeast out of Colorado into Dundy County in southwest Nebraska, where it converges with the South Fork of the Republican River flowing northeast out of Kansas. The Republican River crosses southwest and south central Nebraska before dropping south into Kansas from Nuckolls County. Riparian forested stands along the river—characterized by diverse stands of eastern cottonwood, red mulberry, hackberry, green ash, eastern redcedar, Russian olive, black walnut, and northern catalpa—are home to deer (*Odocoileus* spp.), turkey (*Meleagris* spp.), beavers (*Castor canadensis*), bald eagles, herons, coyotes (*Canis latrans*), and foxes (*Vulpes vulpes*).

These forests have experienced significant damage due to declining water tables in recent drought years. Over the past decade, much of the eastern reaches of this river were invaded by *phragmites*, requiring massive control efforts to restore streamflow. Western reaches have experienced significant expansion of Russian olive and saltcedar (*Tamarisk* spp.) populations. Eastern redcedar is increasingly prevalent among deciduous riparian forests along the central portion of the river—resulting in a decline of hardwood trees and other desirable species in these stands.

Public and protected lands exist within the PFL. These include, but are not limited to, Swanson Reservoir Wildlife Management Area, Harlan County Reservoir, and Indian Creek Wildlife Management Area. A CWPP is in place for a portion of the PFL. Development of plans for the remainder of the area are underway and will be completed by 2022.

Assessment - Current Condition, Demographics, Productivity

The area within the Republican River PFL is at risk from unprecedented flooding, significant storm damage, extreme drought, and other climate-influenced events. High summer temperatures, lower humidity, high winds, and the encroachment of eastern redcedar have left this area increasingly at risk to uncharacteristic wildfires. The expansion of redcedar also poses an issue for the riparian forest systems in this area.

General trends show a decrease in the populace for all counties in the region. The average farm size in the Republican River PFL is generally trending flat.

Table 41: Population Change 2010-2019 in Republican River Priority Forest Landscape

COUNTY	POPULATION CHANGE
Chase	Decrease 1.1%
Dundy	Decrease 15.7%
Franklin	Decrease 7.6%
Frontier	Decrease 4.7%
Furnas	Decrease 5.7%
Gosper	Decrease 2.6%
Harlan	Decrease 1.1%
Hayes	Decrease 4.0%
Hitchcock	Decrease 5.0%
Lincoln	Decrease 3.8%
Nuckolls	Decrease 7.8%
Phelps	Decrease 1.7%
Red Willow	Decrease 3.0%
Webster	Decrease 8.5%

Source: U.S. Census Bureau, 2019

Table 42: Number of Farms/Average Acres per Farm 2007-2017 in Republican River Priority Forest Landscape

COUNTY	2007	2012	2017
Chase	347/1,602	342/1,583	325/1,750
Dundy	263/2,262	251/2,075	268/2,016
Franklin	312/934	338/851	317/998
Frontier	283/1,679	317/1,426	371/1,305
Furnas	365/1,221	389/1,120	377/1,194
Gosper	218/1,035	260/1,115	287/983
Harlan	384/914	360/869	281/1,188
Hayes	275/1,650	235/1,639	220/1,985
Hitchcock	272/1,279	299/1,335	288/1,363
Lincoln	1,053/1,521	1,168/1,219	1,040/1,305
Nuckolls	405/758	435/804	431/829
Phelps	420/810	405/818	371/921
Red Willow	386/1,157	405/1,036	333/1,319
Webster	430/710	423/715	406/810

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Republican River forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests*. Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Republican River forestlands were identified by NFS staff, stakeholders, and the public:

- Growing fuel loads from overabundant and historically absent species (e.g. eastern redcedar) increase the threat of uncharacteristic wildfire.
- Decreasing water availability or usage conflicts reduces valuations of riparian forests.
- Declining cottonwood gallery forests create negative ecological and economic impacts in the region.
- Growing populations of invasive woody species (Russian olive), aggressive native species (eastern redcedar), and non-woody invasives (*phragmites*, purple loosestrife) degrade the health of the riparian forest system.
- Lacking management, forestland habitat otherwise suitable for migratory or resident wildlife deteriorates.
- Developing forested areas results in the fragmentation of critical wildlife habitat.
- Increasing susceptibility of green ash and black walnut trees because of introductions of EAB and thousand cankers disease.
- Building consensus on landscape level management strategies becomes more challenging.
- Managing forestlands and trees declines due to perceptions these areas do not have economic, ecological, or aesthetic value.
- Growing disconnect among stakeholders on the value of windbreak establishment/renovation.
- Developing in wildfire prone areas increases risks for the public, emergency personnel, and property.
- Shifting weather patterns, fire, land-use conversion, and insects and diseases leads to uncharacteristic changes to forest type.
- Tree plantings in communities, conservation, or agroforestry applications do not emphasize species diversity.

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Desired Outcomes

The desired future condition for the Republican River PFL is to create and maintain healthy, sustainable riparian forests that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with farming/ranching, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Multiple-use management is increasingly adopted by practitioners who are knowledgeable about which prescriptions apply to a given condition on the landscape.
- Private woodlands are actively managed, creating sustainable, resilient forests that are properly stocked, have appropriate age-class mix, exhibit natural regeneration, enhance biodiversity, and improve terrestrial and aquatic habitat.
- Conservation objectives are increasingly achieved as the removal of invasive and aggressive native species expands.
- VFDs are actively supported through the acquisition of proper equipment, qualifications or training, and firefighting resources that enhance safety and emergency response.
- Tree plantings are strategically targeted to areas that will improve or restore the riparian river corridor.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Support the missions and safety of area VFDs through increased training and the acquisition of firefighting equipment.
- Develop cohesive landscape management objectives for each ecosystem; develop broad management activities with simple guidelines for stakeholders.
- Retain or increase the total acreage of riparian forest buffers through landowner technical assistance and cost-share opportunities.
- Mitigate invasive and aggressive native species in the river corridor.
- Disseminate technical information for active forest management and responsible development in WUI areas.
- Increase the biodiversity and resiliency of forestlands.
- Encourage wood products market development, incentivizing active management of forest resources.
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.
- Expand forestry assistance programming to reach all constituents.
- Promote and establish Firewise communities.

Priority Forest Landscape: Loup Rivers

Figure 24: Loup Rivers Priority Forest Landscape Map

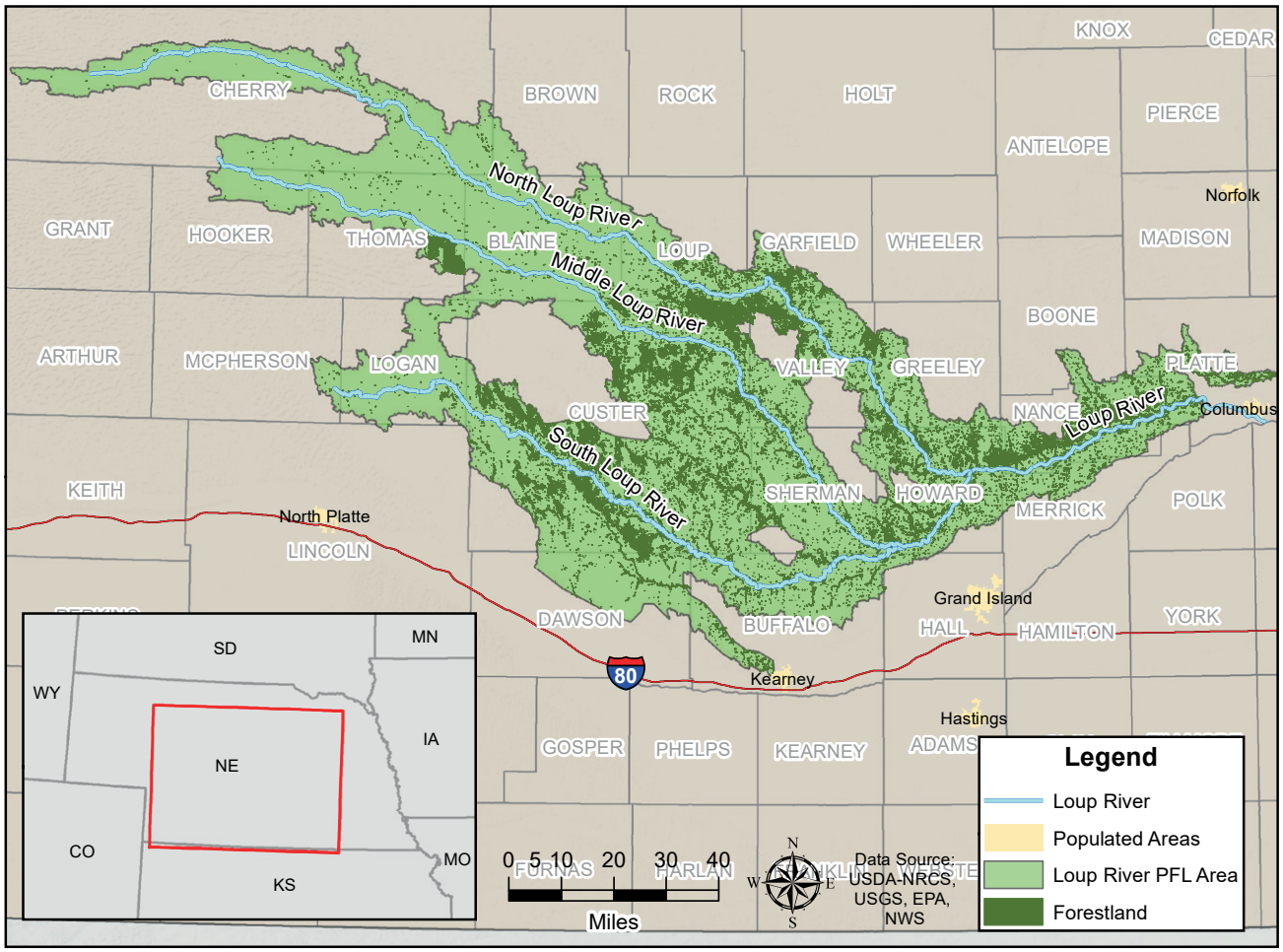


Table 43: Forestland Area of Loup Rivers Priority Landscape

LOUP RIVER	2006	2011	2018
Acres of forestland*	120,536	164,964	175,000

**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Description

The Loup Rivers PFL includes all of the the North Loup, Middle Loup, and South Loup Rivers to the confluence with the Platte River in Platte County. Sandbars on the lower reaches of the Loup River support nesting colonies of the federally and state-listed interior least tern. The federally and state-endangered whooping crane uses sandbars and wet meadows in the Loup River floodplains as migratory stopover habitat. Bald eagles also nest in tall cottonwoods along the Loup's rivers. Nebraska's most extensive population of the state-threatened small white lady's-slipper *(Cypripedium candidum)* occurs in wet meadows in the Middle Loup River floodplain. The American burying beetle,

another state and federally-listed species, is known to utilize open woodlands for habitat.

The upper reaches of these rivers and some of the tributaries are significant because they support assemblages of rare fish, including the Topeka shiner *(Notropis topeka)*, blacknose shiner *(Notropis heterolepis)* and finescale dace. The federally and state-endangered whooping cranes use wider, braided reaches of the stream channels and associated meadows as migratory stopover habitat. The federally and state-threatened western prairie fringed orchid *(Platanthera praeclara)* occurs in wet meadows within the valleys. The American burying beetle is also found within this landscape. Protected or public areas within the landscape include portions of the Nebraska National Forest (Bessey District) and several wildlife management areas.

The Central Loess Hills are a unique geological feature also encompassed within this PFL. It contains the loess hills portions of Custer, Valley, Loup, and Garfield counties in central Nebraska from the Sandhills south to the Platte River valley. The landscape consists of rolling to steep loess hills dissected by the valleys of the Loup Rivers. The hills are a mosaic of eastern redcedar forest, isolated stands of relict ponderosa pines, mixed-grass prairie, and cropland. The flatter parts of this landscape contain playa wetlands that are used by whooping cranes during migration.

The NGPC designated the Upper Loup River, Lower Loup River, and the Central Loess Hills as BULs in the Nebraska Natural Legacy Project. The entire area is covered by CWPPs.

Assessment - current condition, demographics, productivity

The area within the Loup Rivers PFL is at risk from both flooding and drought, significant storm damage, and other climate-influenced events. Due to high summer temperatures, low humidity, and wind, this area is also at risk of wildfires. In some cases, this may be exacerbated by the encroachment of eastern redcedar into rangeland or riparian areas. Increases in irrigated row-crop acreage may correspond with reductions in riparian forest health and water quality.

General trends show a decrease in the populace for most areas within the region. One exception is in Buffalo County, which includes the City of Kearney. The largest community in the PFL, Kearney occupies nearly 14 square miles and has a population of approximately 34,000 people (U.S. Census Bureau, 2019). The average farm size in the Loup Rivers PFL is generally trending flat. However, in areas of the Central Loess Hills and Central Sandhills it is trending slightly downward. One exception is in Buffalo County around Kearney. This area is experiencing fragmentation as development activities increase.

Table 44: Population Change 2010-2019 in Loup Rivers Priority Forest Landscape

COUNTY	POPULATION CHANGE
Blaine	Decrease 2.7%
Buffalo	Increase 7.7%
Cherry	Decrease 0.4%
Custer	Decrease 1.5%
Dawson	Decrease 3.0%
Garfield	Decrease 3.9%
Grant	Increase 1.5%
Greeley	Decrease 7.2%
Hooker	Decrease 7.3%
Howard	Increase 2.7%
Logan	Decrease 2.2%
Loup	Increase 5.7%
Merrick	Decrease 1.3%
Nance	Decrease 5.8%
Platte	Increase 3.8%
Sherman	Decrease 4.8%
Thomas	Increase 11.3%
Valley	Decrease 2.4%

Source: U.S. Census Bureau, 2019

Table 45: Number of Farms/Average Acres per Farm 2007-2017 in Loup Rivers Priority Forest Landscape

County	2007	2012	2017
Blaine	114/3,888	117/3,440	101/3,630
Buffalo	949/645	1,046/555	953/554
Cherry	560/6,714	566/6,637	567/6,284
Custer	1,187/1,360	1,352/1,112	1,108/1,358
Dawson	728/880	806/782	686/889
Garfield	223/1,640	226/1,531	202/1,696
Grant	84/5,899	80/6,167	64/7,736
Greeley	334/845	389/870	369/919
Hooker	88/5,190	82/5,327	97/4,402
Howard	564/494	682/458	617/455
Logan	152/2,391	149/2,216	117/2,547
Loup	137/2,589	138/2,051	130/2,152
Merrick	473/524	492/478	483/503
Nance	362/625	355/586	375/587
Platte	882/483	942/453	836/459
Sherman	448/706	411/657	384/809
Thomas	103/4,125	87/4,225	90/4,313
Valley	391/911	402/869	362/969

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Loup River forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests*. Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the Loup Rivers PFL's forestlands were identified by NFS staff, stakeholders, and the public:

- Growing fuel loads from overabundant and historically absent species (e.g. eastern redcedar), coupled with chronic drought, increase the threat of uncharacteristic wildfires.
- Expanding eastern redcedar populations in grasslands reduces rangeland productivity.
- Fragmenting of forestland increases due to development, shifting ownership patterns, and changes in land use.
- Shifting weather patterns, fire, land-use conversion, and insects and diseases bring about rapid and uncharacteristic changes to forest type.
- Tree plantings in communities, conservation settings, and agroforestry applications lack species diversity.
- Differing approaches when managing for water availability and quality.
- Declining cottonwood gallery forests results in negative ecological and economic impacts in the region.
- Encroaching invasive woody species (Russian olive) and aggressive native species (eastern redcedar) displace desired riparian and rangeland plant communities.
- Managing habitat and breeding grounds in forested areas declines, leading to reductions of species considered to be of high conservation value.
- Increasing susceptibility of green ash and black walnut trees due to introductions of EAB and thousand cankers disease, respectively.
- Inadequate grazing management negatively affects forest health and sustainability.
- Overstocking, incorrect age-class mix, and the presence of invasive species reduces the health and desired future condition of forestlands.
- Building consensus on landscape level management among stakeholder groups becomes more challenging.
- Growing perceptions among landowners that trees do not add value in agricultural settings.
- Prescribing fire to a landscape is not seen as a beneficial management activity.

Desired Outcomes

The desired outcome for Nebraska's Loup Rivers PFL is to create and maintain healthy, sustainable riparian forests that provide long-term, wide ranging benefits for Nebraskans. This includes a forest ecosystem that is compatible with farming/ranching, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Multiple-use management is increasingly employed by an informed public that knows which prescriptions are appropriate to achieve a desired condition on the landscape.
- Forestlands are adequately stocked, have appropriate age-class mix distribution, and are properly grazed.
- Technical information regarding forestry BMPs is easily adaptable, fitting the experience level of any practitioner.
- Uncharacteristic wildfires are increasingly uncommon as practices such as grazing, forest thinning, prescribed fire, and maintenance of access roads are utilized across the landscape.
- Riparian forest habitat and river function improves as management plans directly address invasive or aggressive native species.
- Economic development opportunities are provided through the utilization of forest products.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Reduce the range and populations of invasive and aggressive species.
- Focus stewardship planning and associated management activities to maximize multiple uses across the landscape.
- Achieve and maintain healthy, properly-stocked forest stands with appropriate age-class mix distribution.
- Adapt technical information to encompass actionable management options while retaining the principles of sound forest management.
- Utilize practices such as grazing, forest thinning, prescribed fire, and maintenance of access roads to reduce the likelihood of uncharacteristic wildfires.
- Provide economic development opportunities through the utilization of forest products.
- Expand forestry assistance programming to reach all constituents.
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.
- Promote and establish Firewise communities.

Priority Forest Landscape: Elkhorn River

Figure 25: Elkhorn River Priority Forest Landscape Map

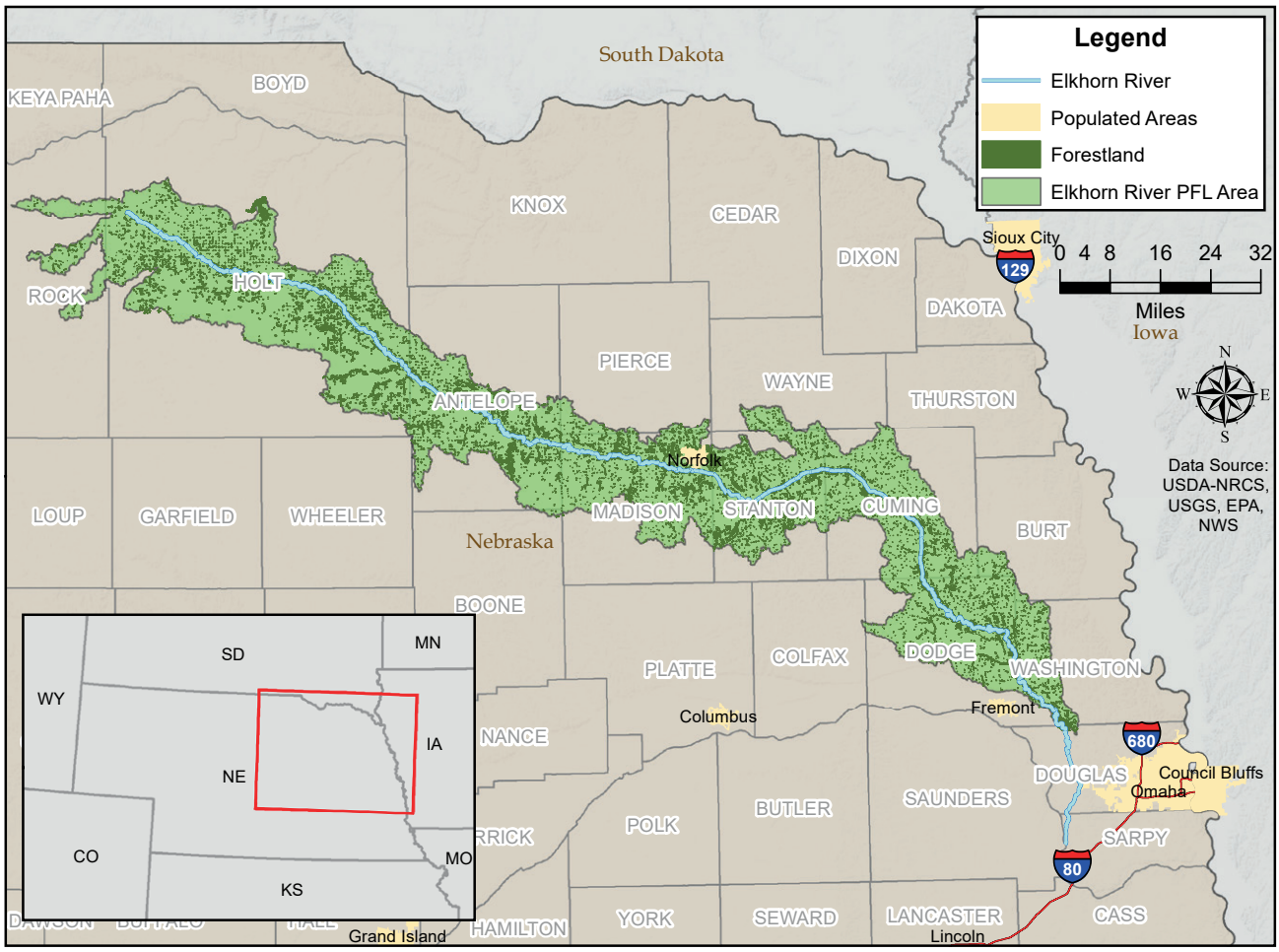


Table 46: Forestland Area of Elkhorn River Priority Forest Landscape*

ELKHORN RIVER	2006	2011	2018
Acres of forestland*	75,534	49,022	56,867

**As defined by methodology in USFS FIA program. Source: USDA Forest Service, 2018*

Description

The Elkhorn River originates in north central Nebraska and joins the Platte River near Gretna. The floodplain is primarily cropland but contains cottonwood-dominated woodlands, wet meadows, and freshwater marshes. The uplands on the south side of the river are composed of sand dunes originating from river alluvium. Dry-mesic sand prairie is mostly grazed while bur oak woodlands occupy the dunes.

The NGPC designated the Elkhorn Confluence as a BUL in its Natural Legacy Project. Public or protected lands include, but are not limited to: Dry Creek Wildlife Management Area, Wood Duck Wildlife Management Area, and Dead Timber State Recreation area.

Assessment - Current Condition, Demographics, Productivity

The area within the Elkhorn River system is at risk from flooding, significant storm damage, and other climate-influenced events. Encroachment of agricultural systems places both the riparian forest and water quality at risk. Eastern redcedar encroachment is an issue within this system.

General trends show a decrease in the populace for the region, except for the eastern part of the PFL which is increasing. The average farm size in the PFL is generally trending flat to slightly larger.

Table 47: Population Change 2010-2019 in Elkhorn Priority Forest Landscape

COUNTY	POPULATION CHANGE
Antelope	Decrease 5.8%
Cuming	Decrease 3.2%
Dodge	Decrease 0.3%
Douglas	Increase 10.5%
Holt	Decrease 3.5%
Madison	Increase 0.6%
Pierce	Decrease 1.6%
Rock	Decrease 11.2%
Stanton	Decrease 3.4%
Washington	Increase 2.5%
Wayne	Decrease 2.2%

Source: U.S. Census Bureau, 2019

Table 48: Number of Farms/Average Acres per Farm 2007-2017 in Elkhorn River Priority Forest Landscape

COUNTY	2007	2012	2017
Antelope	716/721	767/619	704/699
Cuming	863/471	918/395	804/452
Dodge	715/473	767/430	676/499
Douglas	362/217	396/217	367/247
Holt	1,171/1,309	1,279/1,106	1,142/1,220
Madison	699/451	753/467	659/536
Pierce	645/491	677/486	625/550
Rock	237/2,666	247/2,610	220/2,655
Stanton	636/371	619/411	571/466
Washington	762/285	821/302	747/332
Wayne	573/483	518/540	485/580

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service, 2009, 2014, 2019

Threats

Protecting the Elkhorn River forestlands from threats is consistent not only with the national priority of *protecting forests from threats*, but also with *conserving and managing working forest landscapes for multiple uses and value* and *enhancing the public benefits of sustainable forests*. Through the identification of threats across the entire PFL, management actions can be adopted and implemented at a landscape level. This inherently protects adjacent or presently unaffected areas as each unit is recognized as part of the broader forest ecosystem. This also ensures that all forest resources can continue to be sustainable and provide benefits to both landowners and the public. The following threats to the PFL's forestlands were identified by NFS staff, stakeholders, and the public:

- Growing fuel loads from an overabundance of historically isolated species (e.g. eastern redcedar) increase the risk of uncharacteristic wildfire.
- Diminishing availability of water hampers attempts to manage woodland habitat or endangered species.

- Declining cottonwood gallery forests bring about negative ecological and economic impacts in the area.
- Encroaching invasive woody species (Russian olive, buckthorn) and aggressive native species (eastern redcedar) continues unmitigated.
- Lacking management, forestlands become unsuitable habitat to support migratory bird species or resident wildlife.
- Fragmenting of forestlands for suburban or agricultural use decreases habitat availability.
- Increasing susceptibility of green ash and black walnut trees to EAB and thousand cankers disease, respectively.
- Riparian forest corridors and low-lying areas are substantially degraded after repeated, unprecedented flooding events.
- Overharvesting of mature black walnut trees reduces age diversity and health of forest.

Desired Outcomes

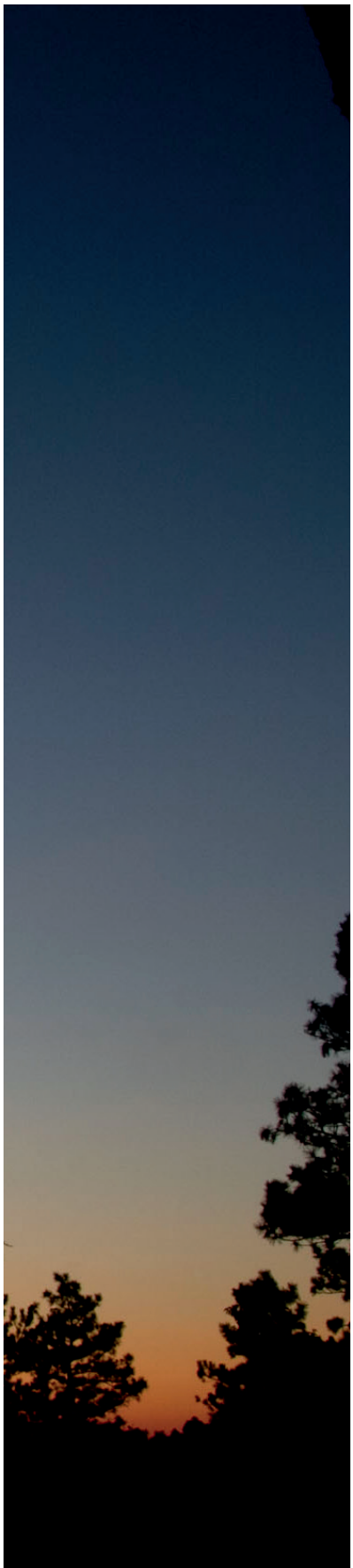
The desired future condition for the PFL is to create and maintain healthy, sustainable riparian forests that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with farming/ranching, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire. The following desired outcomes utilize specific strategies to meet the desired condition of the PFL:

- Management activities create more acres of diverse, healthy riparian forests and properly functioning aquatic systems.
- Riparian assessments are conducted and guide management actions pre/post flooding events.
- Eastern redcedar's presence is quantified through the use of spatial inventories.
- Water quality improves through streambank stabilization and reductions in erosion.
- Technical information and agency resources improve harvests of black walnut trees.
- Wildlife habitat throughout the riparian system is expanded and its condition is improved.
- Overall diversity of tree species within a community's canopy is increased.
- Landowners are actively engaged in forest stewardship, ensuring long-term sustainability and resiliency of regional forests.

Local Priorities

Local priorities reflect the direct feedback and insights of NFS field staff. As the primary conduit for stakeholder feedback, field observations, and intuitive assessments of Nebraska's PFLs, these staff recommendations encompass technical expertise and local knowledge that might otherwise be absent from this FAP. Their many years of service and field experience led to the identification of the following as local priorities for this landscape:

- Increase planting and regeneration of native trees and shrubs.
- Perform riparian tree inventories to assess extent of flooding damage.
- Create more riparian forest acres (stream buffers) through targeted tree plantings.
- Address the removal, without replacement, of riparian woodlands and conservation tree plantings in upper stretches of the river system.
- Reduce the overharvesting of mature black walnut stands.
- Use spatial data to assess the extent of eastern redcedar encroachment and impacts to forestland.
- Prepare communities for the arrival of EAB and subsequent loss of tree canopy.
- Decrease fire risk through fuels reduction programs that offer technical or financial assistance.
- Expand forestry assistance programming to reach all constituents.
- Promote and establish Firewise communities.



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Chapter 4: Multi-State Priority Areas

The Missouri, Platte, Niobrara, Republican, and Blue River systems are unique ecological assets to Nebraska and the Great Plains region. Aside from the aesthetic value each provides, these interstate waterways are integral to agriculture, municipal water supplies, and the management of threatened, endangered, and other wildlife species.

Expansive development and rapid growth of the populace also prompted the identification of the Omaha/Council Bluffs area as a multi-state priority landscape. Straddling Nebraska and Iowa, this area presents management issues for the resiliency of the Missouri River's riparian and bluff forest systems, as well as invasive species mitigation and management of the communities' forest resources.

This chapter provides a description of the management challenges that occur in these landscapes. Full assessments of each priority landscape can be found in Chapter 3.

Missouri River *States: South Dakota, Iowa, Nebraska, Kansas, Missouri*

The Missouri River extends along the eastern edge of Nebraska. The river is over 2,300 miles long, flowing from Montana to the Gulf of Mexico. This shared waterway presents enormous challenges to forest and wildlife management, invasive species eradication, and water management.

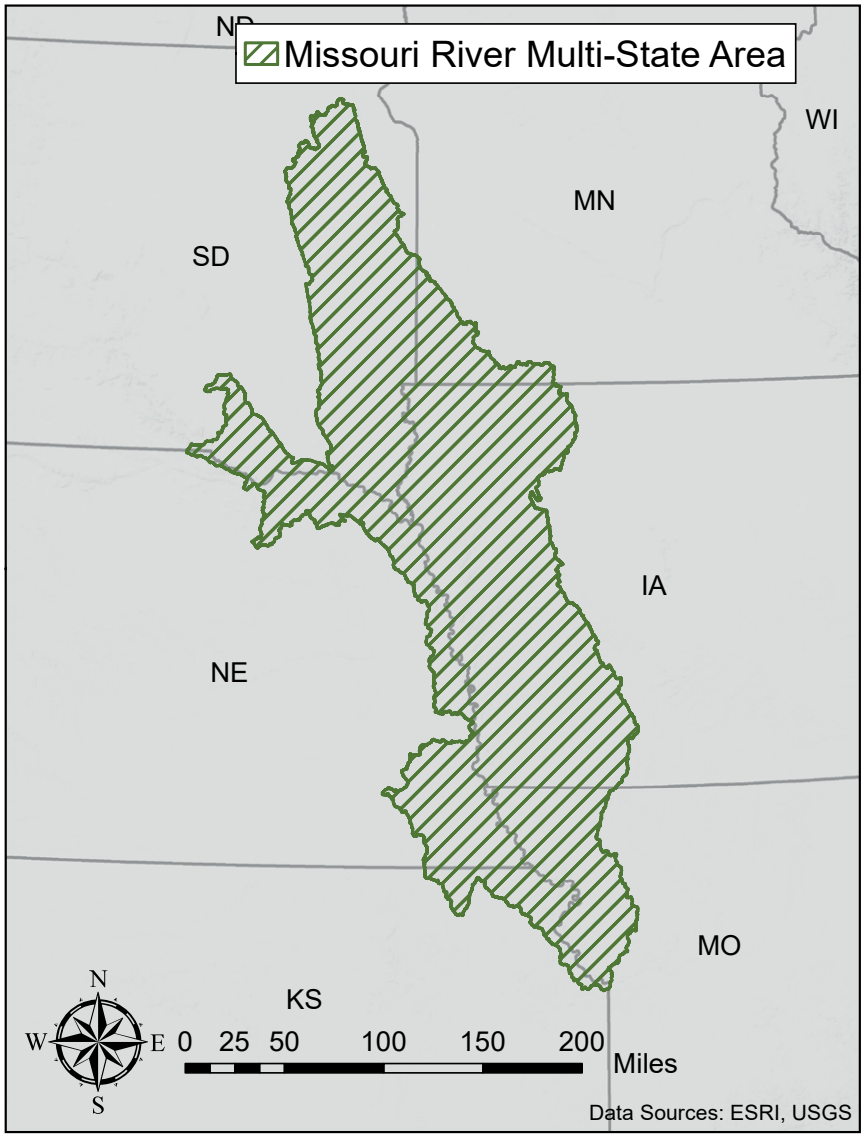
While many entities manage this landscape, the lack of a cohesive strategy has long-lasting implications. A history of channelization and the installation of water control devices have significantly reduced naturally-occurring flooding events which are crucial to the maintenance and sustainability of forestlands adjacent to the river.

Additionally, expansive efforts were undertaken to manage *phragmites*, purple loosestrife, Russian olive, and non-native cattails over the last two decades. However, without contiguous mitigation, a population reserve exists that may propagate downstream areas once localized management activities end.

As the aforementioned species gain strongholds, native flora and fauna are often displaced. Currently, there are 11 state-listed threatened or endangered species that occur within the Missouri River corridor, six of which are also federally listed. Simultaneously, the majority of the floodplain's riparian forests have been converted to cropland or urban development. This has severely limited natural regeneration and led to declines of forest and riparian dependent species that were once prominent in the river basin.

The lack of management in remaining forestlands have allowed for other undesired, native species (e.g. eastern redcedar) to encroach into woodlands. The net result is further loss and declines of habitat in the system. The area is considered a high priority due to the combined losses of wildlife and habitat, loss of "non-typical" tax revenues through declines in tourism and recreation, and the reduction of economic development from the utilization of forest products throughout the region.

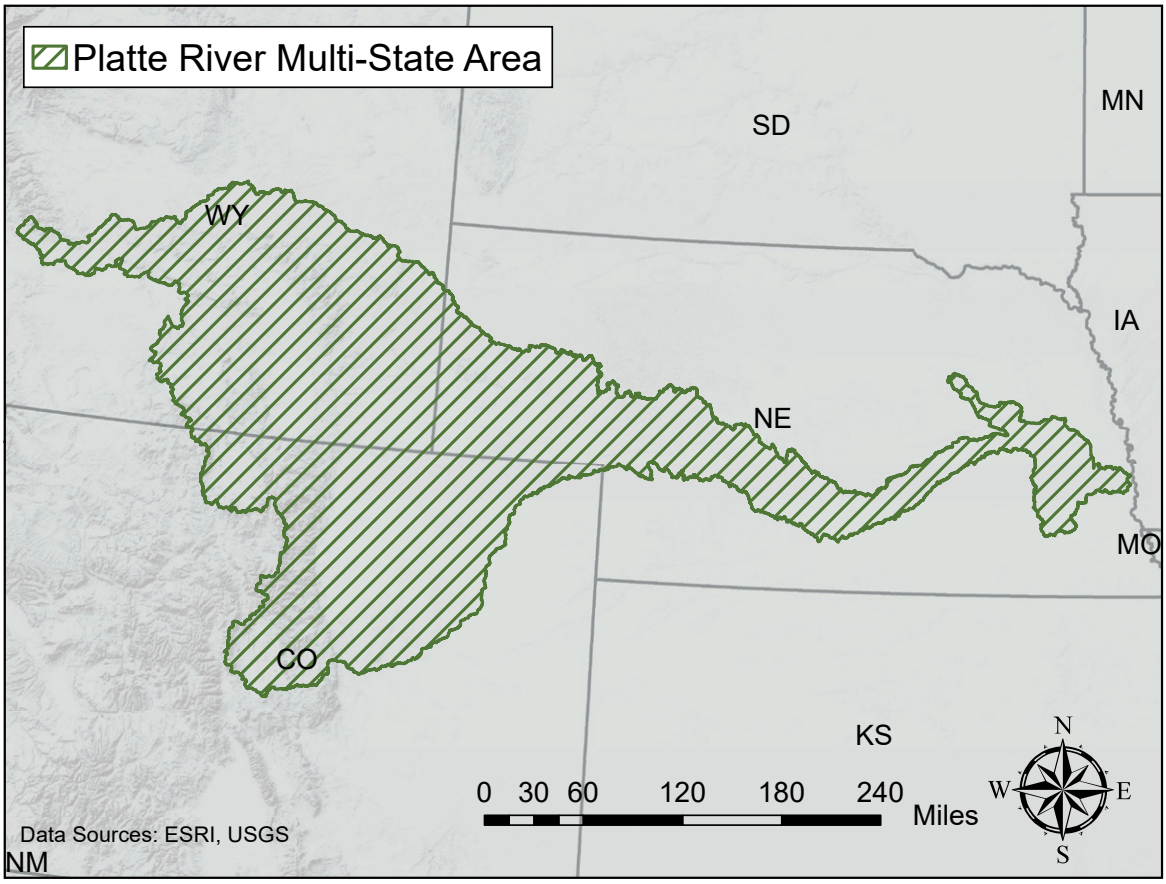
Figure 26: Missouri River Multi-State Priority Area Map



Platte River

States: Wyoming, Colorado, Nebraska

Figure 27: Platte River Multi-State Priority Area Map



The headwaters of the Platte River are in eastern Colorado and south central Wyoming. The river flows west to east through Nebraska and into the Missouri River near Plattsmouth. The integrity of this watershed has immense value for agriculture, wildlife conservation, and the well-being of millions of residents who depend on the river for drinking water and electricity ("Platte River Recovery Implementation Program," n.d.).

Cooperative agreements are in place across the basin to increase stream flows, enhance habitat lands for target species, and accommodate certain new water-related activities ("Platte River Recovery Implementation Program," n.d.). One such effort, the Platte River Recovery Implementation Program, is a joint venture between basin states to improve management of the Platte River system.

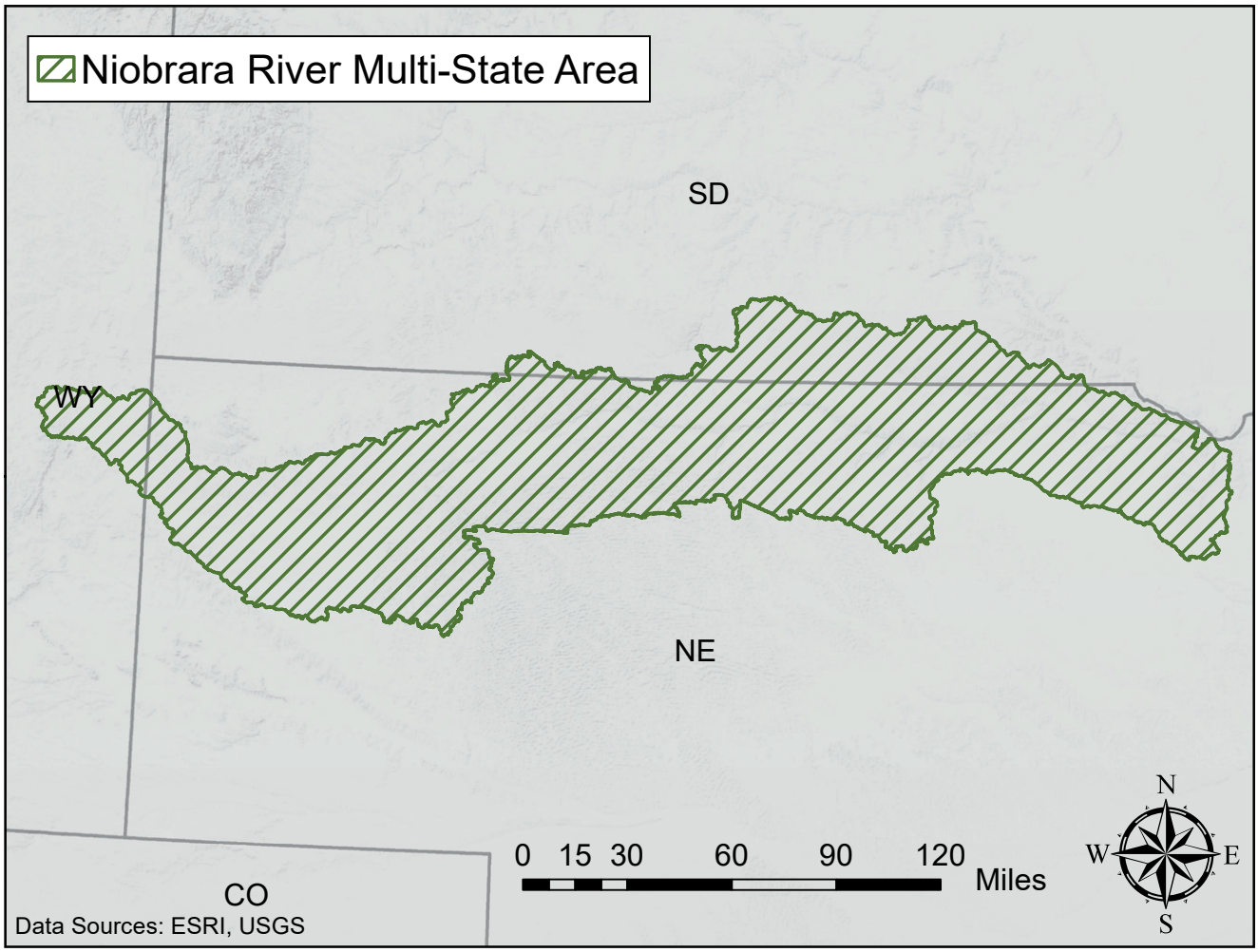
A number of ecological challenges exist for trees and forests in this system. Because river patterns and flooding cycles have been altered, native cottonwood stands are overmature, decadent, and beginning to break up. Invasive species such as Russian olive, *phragmites*, and saltcedar are established in many areas, threatening the resiliency of the river system.

The encroachment of aggressive, native species such as eastern redcedar presents additional management and ecological challenges. As rangelands succeed to dense stands of cedar forest, mitigation is often cost prohibitive and hazardous. If trees are left to fully mature, this results in a new, highly flammable forest type. These hot burning, fast moving fires pose serious risks to first responders, the public, critical infrastructure, and private property.

Niobrara River

States: Wyoming, Nebraska, South Dakota

Figure 28: Niobrara River Multi-State Priority Area Map



The Niobrara River begins in the high plains of eastern Wyoming and flows 535 miles across northern Nebraska to the Missouri River in northeast Nebraska. Six major ecosystems converge in the Niobrara Valley: northern boreal forest, ponderosa pine forest, eastern deciduous forest, tallgrass prairie, mixed grass prairie, and shortgrass prairie.

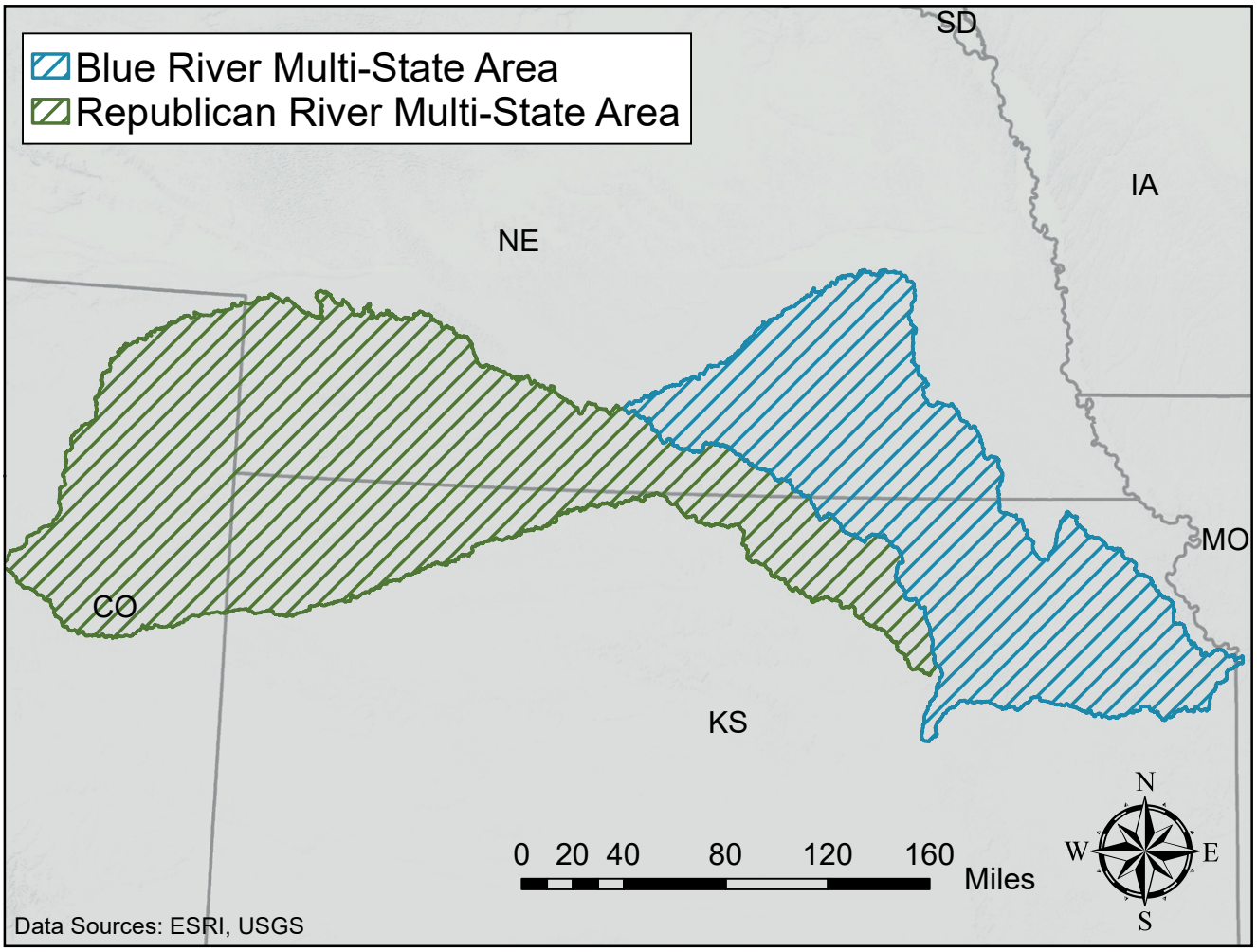
As a major tributary of the Missouri River, this watershed presents unique challenges to forest and wildlife management, invasive species mitigation, and water management.

Unprecedented wildfires have occurred over the past 20 years in the basin, leading to lower regeneration of native species, increased erosion, and encroachment of undesirable and invasive species. Expanding agricultural activities in riparian areas of the river have also led to increased sediment loads in the system. Sustained flooding events can result in the mortality of riparian woodland species ill-adapted for long periods of submersion. This results in declines in species diversity, age-class mix, and the resiliency of forestland.

Republican and Blue Rivers

States: Colorado, Nebraska, Kansas

Figure 29: Republican and Blue Rivers Multi-State Priority Area Map



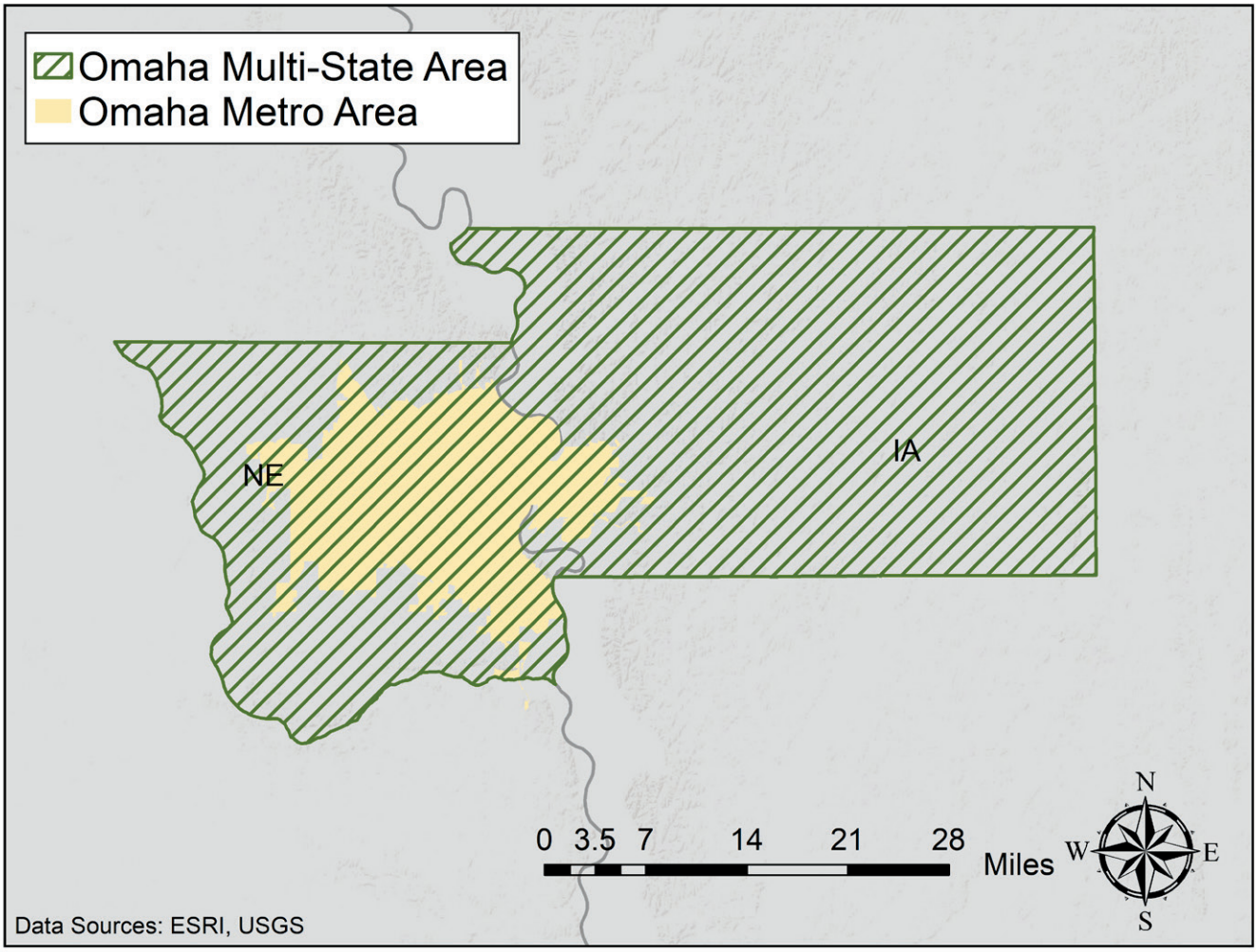
The North Fork of the Republican River flows southeast out of Colorado into southwest Nebraska, where it converges with the South Fork of the Republican River flowing northeast out of Kansas. Riparian forests on the Republican have experienced significant damage due to declining water tables in drought years. Additionally, the establishment of invasive *phragmites*, saltcedar, and Russian olive are known to reduce stream flow and ecological function. The Republican River Compact is the primary regulatory framework for governing water usage and availability throughout the system.

The Little Blue River in south central Nebraska flows into Kansas, eventually becoming a tributary of the Big Blue River. The Big Blue River flows from south central Nebraska into Kansas, where it joins the Kansas River. Increases in agricultural activities have led a decline in riparian forest type and increased sediment loads in the river system. Marginal cropland no longer in production is succeeding to mixed hardwoods and eastern redcedar. The Big Blue River Compact is the primary regulatory framework for governing water usage and availability throughout the system.

Omaha-Council Bluffs

States: Nebraska, Iowa

Figure 30: Omaha-Council Bluffs Multi-State Priority Area Map



This multi-state area focuses on a 25-mile radius around the Omaha-Council Bluffs metro, where expansion is most evident in the counties adjacent to and encompassing the city. This includes portions of Dodge, Washington, Saunders, and Cass Counties, and all of Sarpy and Douglas Counties in Nebraska. Estimates suggest the metro area will exceed 1 million people before 2025 (Robb, 2020).

Native oak, ash, and hickory forests are common in the area with ash, elm, and cottonwood in the riparian areas. The Platte and Missouri Rivers are two major riparian forest areas that have a high level of recreational value and are at risk of development and fragmentation. The forest areas are at risk from encroaching eastern redcedar and Russian olive. The loss of ash trees due to EAB, which is present in this area, will likely lead to the increased presence of honeysuckle and other less desirable species.

The interstate nature of the metro also poses issues with the quarantining of invasive species and contaminated nursery stock. The high volume of residents and out-of-state commerce makes isolation difficult without interagency collaborations and enforcement.

Pine Ridge

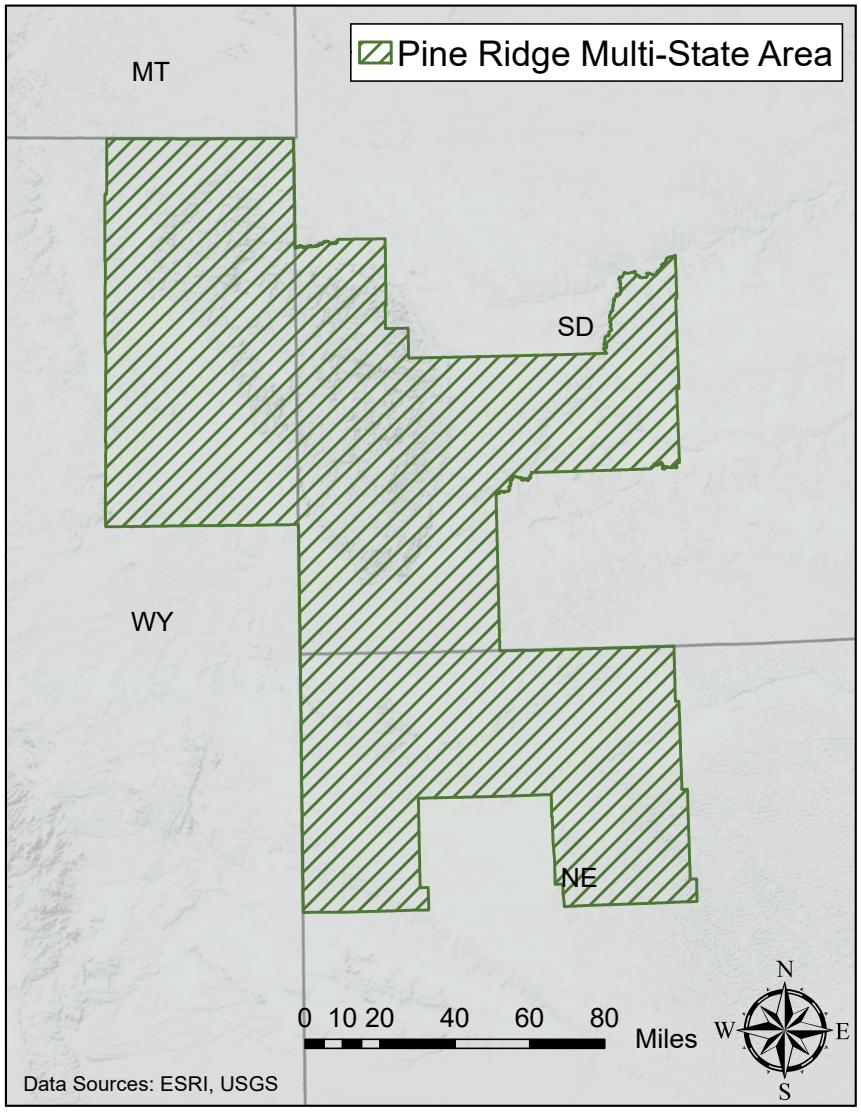
States: Wyoming, South Dakota, Nebraska

The ponderosa pine forestlands of the Pine Ridge region represent a unique ecosystem with several landscape level management opportunities. The catastrophic fires of 2006 and 2012 prompted many interstate collaborations to respond to active wildfires. It also led to targeted efforts to reduce woody fuels in strategic areas of the region.

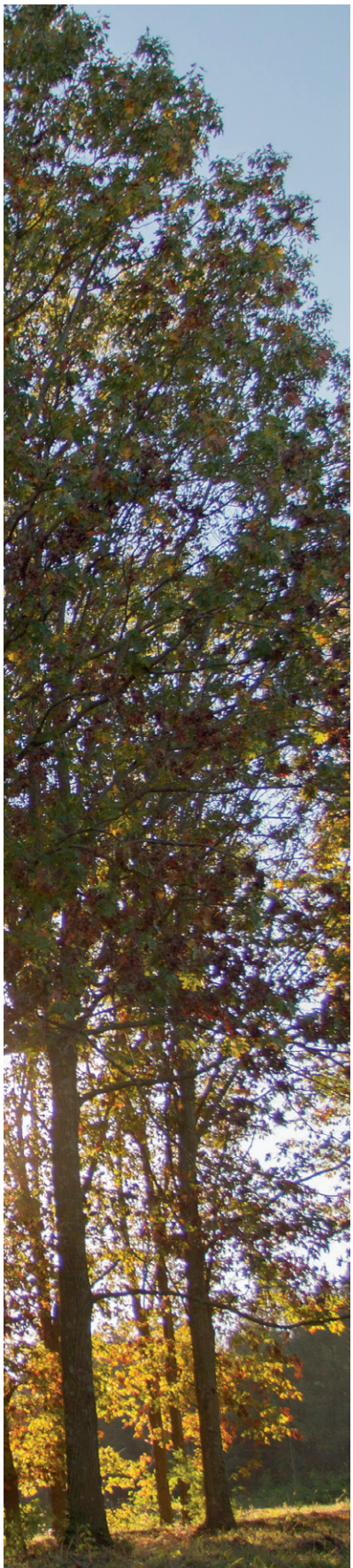
As a result of these disasters, Nebraska implemented the SEAT (Single Engine Air Tanker) program, which can respond to fires across state lines. Additionally, mutual aid districts have responded to out-of-state incidents, bolstering the three-state region's firefighting capacity.

While wildfires pose one of the greater risks to the landscape, there are also interrelated challenges to forest management in the region. For example, load limits for logging vehicles increases operational costs, making the area impractical for some logging operations. This causes buildup of woody fuels and results in overstocked forests that are more expensive and difficult to manage. Over time, overstocking decreases forest health and provides conditions conducive to the spread of unwanted or invasive species. The end result is an unhealthy forest system highly susceptible to wildfires.

Figure 31: Pine Ridge Multi-State Priority Area Map



Cost-share programs for fuels reduction and reforestation are promising management tools. Further opportunities to expand these across the Pine Ridge and tri-state area will be important functions to maintain resilient forestlands, bolster the wood products industry, and sustain a healthy, biodiverse ecosystem in the Great Plains.



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Chapter 5: Programs

To address the threats outlined in Chapter 3, and meet the desired outcomes for Nebraska's PFLs and multi-state areas, the NFS is implementing a wide range of initiatives intended to increase the health and resiliency of forestlands. These apply to forestlands and trees in rural and community settings, and trees used for agroforestry or conservation purposes. The programs in this section are the vehicles for carrying out the 12 FAP goals and 22 resource strategies (see Chapter 8) that address the three national objectives for state and private forestry.

One purpose of this chapter is to highlight how each NFS program addresses the threats, desired outcomes, and local priorities for Nebraska's PFLs. It is also meant to provide a framework for NFS staff to think critically about how each program's objectives need to align in order to meet the long-term goals of these landscapes. The desired future condition for Nebraska's PFLs is to create and maintain healthy, sustainable forestlands that provide long-term benefits for Nebraskans. This includes a forest ecosystem that is compatible with agriculture, provides excellent wildlife habitat and recreational opportunities, contributes to economically viable communities, and provides for a well-trained and well-equipped response to wildfire.

Forest Health

Overview

A healthy forest landscape has the capacity for renewal and recovery from a wide range of disturbances, while continuing to provide public benefits and ecosystem services. Threats to the health of Nebraska's forests include insects, diseases, herbicide damage, invasive and aggressive-native plant species, air pollution, and weather extremes brought on by shifting climatic trends. By identifying forested areas that are especially vulnerable to the aforementioned threats, the NFS will be able to target management to areas that are most likely to prevent or mitigate negative impacts while restoring affected forests.

Current Condition

A number of insect and disease threats affect Nebraska's forests. Extreme environmental conditions and other abiotic stressors also impact forest health. Table 49 provides a partial list of issues that affect the health of Nebraska's forests and trees.

Table 49: Insect Pests and Diseases of Nebraska's Trees

INSECT OR DISEASE	TREES AFFECTED	STATUS	IN ADJACENT STATES
Emerald ash borer (*Agrilus planipennis*)	Ash (*Fraxinus* spp.) Fringetree (*Chionanthus* spp.)	Active, detected in 2016	Yes
Pine wilt (*Bursaphelenchus xylophilus*)	Scotch pine (*Pinus sylvestris*) Austrian pine (*Pinus nigra*)	Native, variable; mortality first noted in 1980	Yes
Asian longhorned beetle (*Anoplophora glabripennis*)	Maple (*Acer* spp.) Buckeye (*Aesculus* spp.) Birch (*Betula* spp.) Willow (*Salix* spp.) Elm (*Ulmus* spp.) Poplar/cottonwood (*Populus* spp.)	No detection	No detection
Gypsy moth (*Lymantria dispar*)	Oak (*Quercus* spp.) Apple (*Malus* spp.) Hawthorn (*Crateagus* spp.) Linden (*Tilia* spp.) Birch (*Betula* spp.) Aspen (*Populus* spp.) Poplar (*Populus* spp.) Willow (*Salix* spp.) Hazelnut (*Corylus* spp.) Serviceberry (*Amelanchier* spp.)	Past detections eradicated	Yes
Thousand cankers disease (*Geosmithia morbida*)	Walnut (*Juglans* spp.)	No detection, but host insect detected	Yes
Drippy blight; bacterium (*Lonsdalea quercina*); scale insect (*Allokermes galliformis*)	Oaks (*Quercus* spp.)	No detection	Yes
Spotted lanternfly (*Lycorma delicatula*)	Tree-of-Heaven (*Ailanthus altissima*) Grapes (*Vitis* spp.) Fruit trees (*Malus* spp., *Prunus* spp.) Maple (*Acer* spp.) Willow (*Salix* spp.) Walnut (*Juglans* spp.)	No detection	No detection
Cercospora blight (*Pseudocercospora juniperi*)	Juniper/redcedar (*Juniperus* spp.)	Native, variable	Yes
Bur oak blight (*Tubakia iowensis*)	Bur oak (*Quercus macrocarpa*)	Native, variable	Yes
Dutch elm disease (*Ophiostoma ulmi*)	Elms (*Ulmus* spp.)	Active, detected in 1960s	Yes

INSECT OR DISEASE	TREES AFFECTED	STATUS	IN ADJACENT STATES
Oak wilt (*Ceratocystis fagecearum*)	Oaks (*Quercus* spp.)	Active, detected in 1950s	Yes
Verticillium wilt (*Verticillium* spp.),	Various hosts Maples (*Acer* spp.)	Active, detected early 20th century	Yes
Bagworm (*Thyridopteryx ephemeraeformis*)	Juniper/redcedar (*Juniperus* spp.) Spruce (*Picea* spp.) Pine (*Pinus* spp.) Arborvitae (*Thuja* spp.) Baldcypress (*Taxodium* spp.) Fir (*Abies* spp.) Apple (*Malus* spp.) Maple (*Acer* spp.) Honeylocust (*Gleditsia triacanthos*)	Native, variable	Yes
Cedar bark beetles (*Phloeosinus* spp.)	Juniper/redcedar (*Juniperus* spp.)	Native, variable	Yes
Pine engraver beetles, Mountain pine beetle, Turpentine beetle (*Ips* and *Dendroctonus* spp).	Pine (*Pinus* spp.)	Native, variable	Yes
Diplodia blight (*Diplodia sapinea)*	Pine (*Pinus* spp.)	Native, variable	Yes
Japanese beetle (*Popillia japonica)*	Linden (*Tillia* spp.) Norway maple (*Acer platanoides*) Japanese maple (*Acer palmatum*) Peach/plum/cherry (*Prunus* spp.) Apple (*Malus* spp.) Black walnut (*Juglans nigra*) Hazelnut (*Corylus* spp.)	Active, established infestations found in 2000	Yes
Oak rough bulletgall (*Disholcaspis quercusmamma)*	Bur oak (Quercus macrocarpa) Swamp white oak (Q. bicolor)	Native, variable	Yes
Pine and spruce needle blights (*Mycosphaerella spp., Rhizosphaera kalkhoffii, Stigmina lautii)*	Pine/Spruce (*Pinus* spp./*Picea* spp.)	Native, variable	Yes
Scale insects (many species)	Various hosts	Native, variable	Yes
Mites (many species)	Various hosts	Native, variable	Yes
Decays (many species)	Many hosts, especially in overmature trees; often found in high numbers in communities	Native, variable	Yes

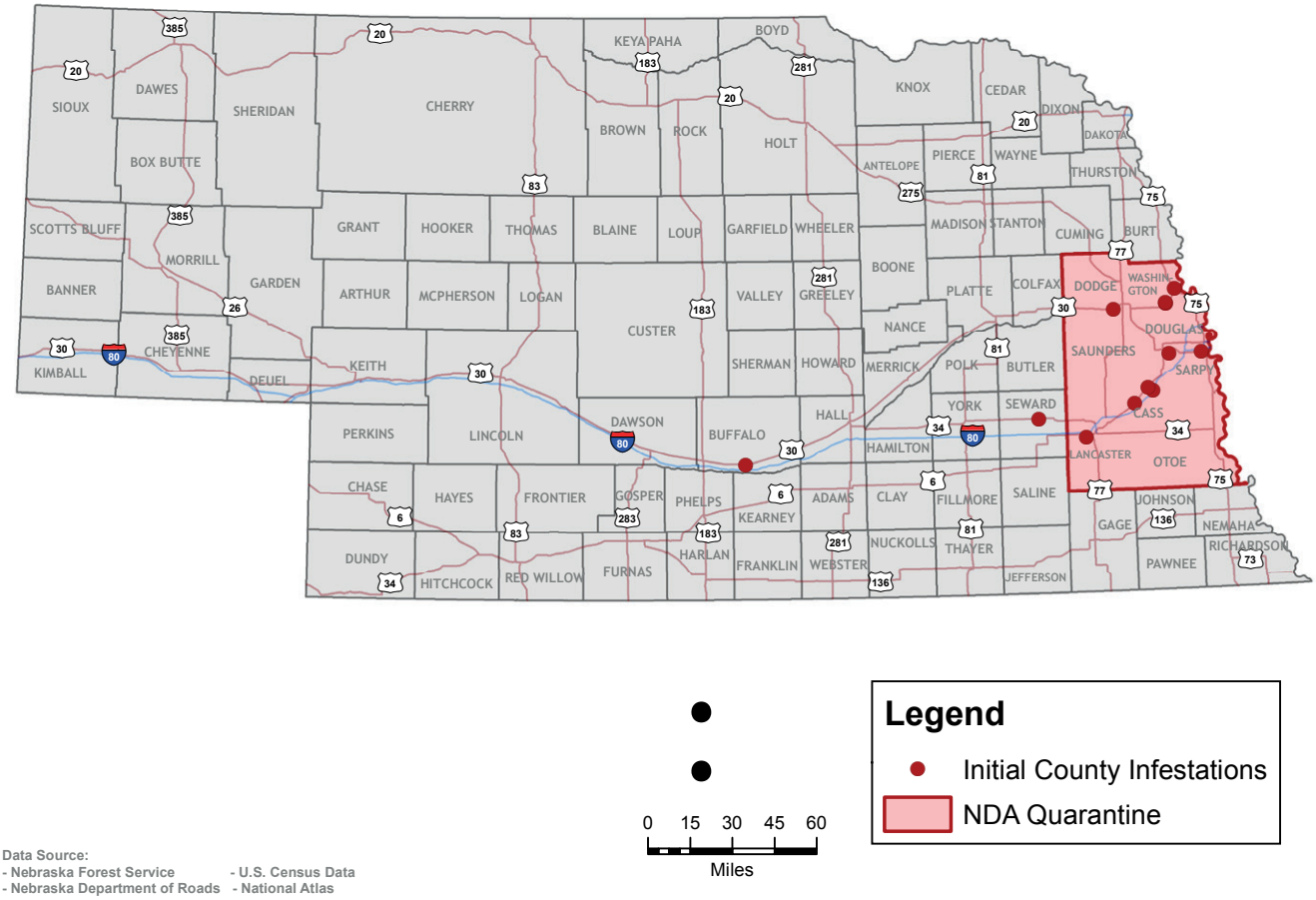
**This table is an overview of diseases, pests, and other biotic concerns for Nebraska. Many species are considered native. Annually, each varies due to fluctuations in weather, climate, and forest resiliency.*

Threats and Challenges

Emerald ash borer (Agrilus planipennis)

EAB is a highly invasive insect that has killed millions of ash trees in the eastern U.S. and Canada since its discovery in 2002. EAB was first detected in Nebraska in 2016 and has now been found in eastern and central areas of the state. On its own, EAB will normally spread a mile or two each year. The transport of infested firewood, nursery stock, and ash wood products is widely accepted as the primary driver for the insect's proliferation around the country. The introduction of EAB puts Nebraska's 44 million ash trees in communities, agroforestry plantings, and native woodlands at high risk.

Figure 32: Emerald Ash Borer Detections in Nebraska as of August 2020



Data Source:
- Nebraska Forest Service
- Nebraska Department of Roads
- U.S. Census Data
- National Atlas

Typically, within four to five years after EAB is discovered in a community, ash mortality escalates. This can overwhelm municipal budgets and staff. Because trees killed by EAB are brittle and prone to failure, they can pose an immediate risk to people and property and should be addressed promptly. However, these trees are dangerous to climb and take down. The combination of these factors can greatly increase removal and mitigation costs. The NFS projects costs to remove, dispose, and replace nearly 1 million municipal and private ash trees to exceed $961 million (Nebraska Forest Service, 2012).

Nebraska communities with limited budgets and a high density of ash trees will be heavily impacted. Additionally, many communities across Nebraska will need to address their extensive inventories of overmature trees. The NFS has promoted EAB readiness planning, species diversity, and detection

training for many years. However, the need for these activities still remains. This is apparent as the state experiences a surge in popularity and subsequent overplanting of maple species; setting the stage for a similar issue in the years ahead.

Pine wilt (Bursaphelenchus xylophilus)

Scotch pine, a popular tree for ornamental plantings, windbreaks, and Christmas trees, is rapidly disappearing from Nebraska's landscape. Tens of thousands of Scotch pines have been killed by pine wilt since the mid-1990s. Austrian pine is also susceptible to the disease. Management of the disease involves burning or chipping infested trees to limit its spread. Injection treatments are available to protect high-value pines but are expensive and provide limited protection. Extensive mortality has occurred in the eastern half of the state and is increasing westward. Awareness and education are needed in these areas.

Herbicide damage

Reports of herbicide damage to off-target vegetation have soared across the state and the country in recent years. In particular, trees exhibiting symptoms typical of growth regulator type herbicides, such as 2,4-D and dicamba, occur in both urban and rural areas. Leaf cupping and curling; twisted, distorted stems; and thin, pale canopies are especially common in some of the more sensitive species: oaks, elms, hackberry, coffeetree, and redbud.

Damage to trees frequently occurs in spring as leaves are emerging from buds, which coincides with spring "burndown" applications to crop fields. It also occurs during the appearance of dandelions in lawns—prompting homeowners and landscape professionals to spray. The high volatility of these herbicides make them prone to long-distance, off-site movement.

Herbicide damage is a complex issue. Nebraska's economy revolves around agriculture, and there is a strong dependence on herbicides to control weeds in crops—particularly glyphosate-resistant weeds. Ideal weather conditions for chemical application are rare, resulting in a greater chance for off-target movement via drift or volatilization. For those with herbicide damaged trees, recompense is difficult.

Chemicals may move long distances, making it challenging to identify the source. The specific chemical responsible may be difficult to determine as well—a vast array of herbicide chemistries and product combinations exist, and there is very limited information on threshold levels in tree tissues that cause symptoms. The chemical may also degrade in tissues before testing occurs. In many areas, trees are exposed to herbicides year after year, which shortens their lifespan.

The effect on human health is yet another concern. A better understanding of changes in farming practices and trends in weather conditions is needed to help address the issue, as well as increased awareness and discussion from stakeholders in agriculture, horticulture, and natural resources.

Weather extremes

Nebraska's climate and weather extremes impact trees directly and are correlated to an increase in pest problems. Hailstorms frequently cause widespread flare-ups of Diplodia blight (*Diplodia sapinea*) in the ponderosa pines of central and western Nebraska. Drought stress makes trees more susceptible to borers, bark beetles, cankers, and root diseases. Bark beetles attack fire-stressed trees: engraver beetles (*Ips* spp.) caused significant mortality to trees surviving the 2012 Pine Ridge and Niobrara fires. Untimely freezes increase canker dieback.

Heavy rains and prolonged flooding have also resulted in dieback and mortality. The generally wetter conditions of recent years have led to more foliar diseases including needle blights in pine and spruce, Cercospora blight (*Pseudocercospora juniperi*) in juniper/redcedar, rust diseases of many trees, and bur oak blight (*Tubakia iowensis*). Chlorosis due to a deficiency of iron or other micronutrients is exacerbated by saturated soils and is common throughout the state.

Mitigating the effects of weather extremes is a challenge that will require adaptive

management practices over the life of this plan. It will also require increasing species diversity and testing of cultivars that can adapt to future conditions. See Chapter 6 for more information on climate and weather extremes.

Other current pests

Wilt diseases, including Dutch elm disease (*Ophiostoma ulmi*), oak wilt (*Ceratocystis fagecearum*), and *Verticillium* wilt (*Verticillium* spp.) continue to cause mortality in hardwoods—particularly in the eastern part of the state. Bagworm (*Thyridopteryx ephemeraeformis*), which is common in eastern Nebraska, is now becoming prevalent in the central part of the state. Extensive defoliation by bagworm occurs on spruce, juniper, and redcedar. Various species of scale, as well as bud/stem-galling insects, are affecting growth and vigor of a broad range of trees. High populations of cedar bark beetles (*Phloeosinus* spp.) in redcedar slash piles are targeting stressed trees in windbreaks as well. Ponderosa pine stands in the west are affected by various decays, western gall rust (*Endocronartium harknessii*), and bark beetles (*Ips* and *Dendroctonus* spp.). A general decline in oak species in the east may be due to a combination of conditions including site disturbance, herbicides, insects, and diseases.

Potential pests

A number of pests not yet known to occur in Nebraska have the potential to cause decline or mortality if introduced. Asian longhorned beetle (*Anoplophora glabripennis*) and gypsy moth (*Lymantria dispar*) are exotic species with broad host ranges. Thousand cankers disease (*Geosmithia morbida*) affects black walnut, which is valued for its wood, nuts, and attractiveness to wildlife. Drippy blight is a disease/insect complex affecting red oaks and is caused by a bacterium (*Lonsdalea quercina*) and a scale insect (*Allokermes galliformis*). Spotted lanternfly (*Lycorma delicatula*) feeds on a wide variety of trees, shrubs and woody vines, causing reduced vigor and occasionally shoot dieback. These and other potential damaging pests are still largely unfamiliar to many of the state's natural resource and green industry professionals and the public.

Invasive and aggressive native plants

Forest health is also affected by invasive and aggressive native plants, which can outcompete native vegetation, lower forest productivity, and alter wildlife habitat. Many problem plants are woody species originally planted in communities and shelterbelts that naturalized in forests, riparian areas, and grasslands. A challenge for community landscapes and working forests is finding species that are tough and adaptable but don't pose an ecological threat of invasiveness. Invasive and aggressive native plants are discussed in Chapter 6.

Human and Urban Conflicts

People are often hard on trees, especially in urban and agricultural settings. Poor pruning, soil compaction, poor management, construction and conflicts, vandalism, pesticides, and other actions exact heavy tolls on trees. One of the larger concerns is the lack of knowledge and connection between people and nature. Exacerbated by modern living, people are excluded from plant and animal communities and often fail to understand the inherent aesthetic, environmental, and ecological value they possess.

The following table ties the national priorities to identified threats, resources available to address them, and the associated State and Private Forestry programs.

Table 50: Forest Health Crosswalk				
THREAT		**RESOURCES AVAILABLE**	**ASSOCIATED S&PF PROGRAMS***	**SUPPORTS NATIONAL PRIORITY (1, 2, 3)****
PESTS				
1	Declining forest health due to insects and disease (including EAB)	State; Federal; Local government; Private; Tribes	CF, FH, RF	1, 2, 3
2	Invasive and aggressive native plants	State; Federal; Local government; Private; Tribes, NRDs	CF, FH , RF	1, 2, 3
WEATHER EXTREMES				
3	Nebraska's severe weather conditions impact trees directly, as well as contribute to an increase in pest problems	State; Federal; Local government; Private; Tribes, NRDs	AF, CF, FH, RF	1, 2, 3
HERBICIDES				
4	Herbicide damage to off-target vegetation	State; Federal; Local government; Private; Tribes, NRDs	AF, CE, CF, CFPT, FH, RF	1, 2

**AF=Agroforestry; CE=Conservation Education; CFPT=Conservation Forestry Planting & Trees; CF=Community Forestry; FH=Forest Health; FL=Forest Legacy; FP=Forest Products; RF=Rural Forestry; WF=Wildland Fire*
***National Priorities: (1) Conserve and Manage Working Forest Landscapes for Multiple Values and Uses; (2) Protect Forests from Threats; (3) Enhance Public Benefits from Trees and Forests*

Trends

The year 2020 marks four years since EAB was discovered in Nebraska, which is typically when ash mortality becomes apparent. In a matter of a few years, mortality will rise substantially in infested areas, and new outbreaks throughout the state will be discovered. Other pests, whether native or exotic, are also likely to arise.

Incidence of herbicide damage to trees will likely increase as more acres are planted to herbicide-resistant crops. If warmer conditions prevail, herbicide volatility will also increase. There is limited research focusing on long-term effects of herbicides on trees, but it is likely that chronic exposure will result in tree decline and mortality.

Climate variability and extreme weather conditions are expected to become more common in the future. An average of several climate models indicate the state will become warmer, with hotter summers, warmer winters, and a fourfold increase in weather "anomalies," presumably including extended and intensified droughts, more frequent heat waves and heavy rainfalls (Karl, Melillo, & Peterson, 2009). The increase in number and severity of weather events will have a direct impact on tree health, and will increase incidence of many pest problems. For example, wetter springs and drier summers in the Pine Ridge will likely lead to more fire events, which can be followed by bark beetle attacks on the residual trees.

Finally, many arborists are turning to trunk injections as their treatment method of choice. Most injection methods require the drilling of multiple holes around the trunk to deliver the pesticide. Both the holes and the chemical itself can damage tree tissues. In general, the larger the holes and the more chemical injected, the greater the damage. Repeated injections over several years can lead to tree decline and death. This may lead to an uptick in mortality of trunk-injected trees in the future.

Impacts

Invasive insect and disease pests are a threat to Nebraska's forests because of their potential to essentially wipe out entire species within the state. In communities, dead and dying trees create a hazard and must be removed at tremendous cost to municipalities and private individuals. In both urban and rural areas, insect and disease pests can result in the loss of many millions of dollars of ecosystem services provided by trees.

Desired Outcomes

Increase Knowledge and Understanding of Current and Future Pest and Environmental Problems

Forest Health goals for the next several years include gaining a better understanding of current pest problems, identifying future pest outbreaks, and developing a better understanding of the role of environmental extremes on tree health. This knowledge will then be transferred to clientele to help them effectively manage current and future tree problems. One step in accomplishing this goal will be to incorporate information exchanges with new NFS staff, stakeholders, and partners.

Increase Collaboration Across Programs

By working with other programs such as Community Forestry, Rural Forestry, and Wildland Fire, the Forest Health program has the potential to help meet other FAP goals, making Nebraska's forests healthier and more sustainable.

Mitigate Herbicide Damage to Forestland and Trees

Through sampling and testing, Forest Health aims to collect data to better understand the effects of drift, volatilization, and its impacts to off-target species. This information can provide NFS staff with enhanced guidance for practitioners and stakeholders. Additionally, this information can be used by coordinating entities to effect change in practices that are contributing to herbicide damage.

Wildland Fire

Overview

Wildfire is a statewide topic of concern for landowners and natural resource agencies. The volunteers in Nebraska's 481 rural fire districts provide fire protection, fire prevention, and education programs to residents of their districts, with some assistance from state and federal resources. The NFS works closely with VFDs to provide planning, training, grant assistance, and equipment that increases districts' capacity to protect life and property and implement effective education programs. The NFS also works closely with the State Fire Marshal's Agency and Nebraska Emergency Management Agency to provide training and support for VFDs, increasing their qualifications and capacity to respond to incidents. Interagency relationships to provide future, collaborative assistance and incident management resources to VFDs are also being formalized.

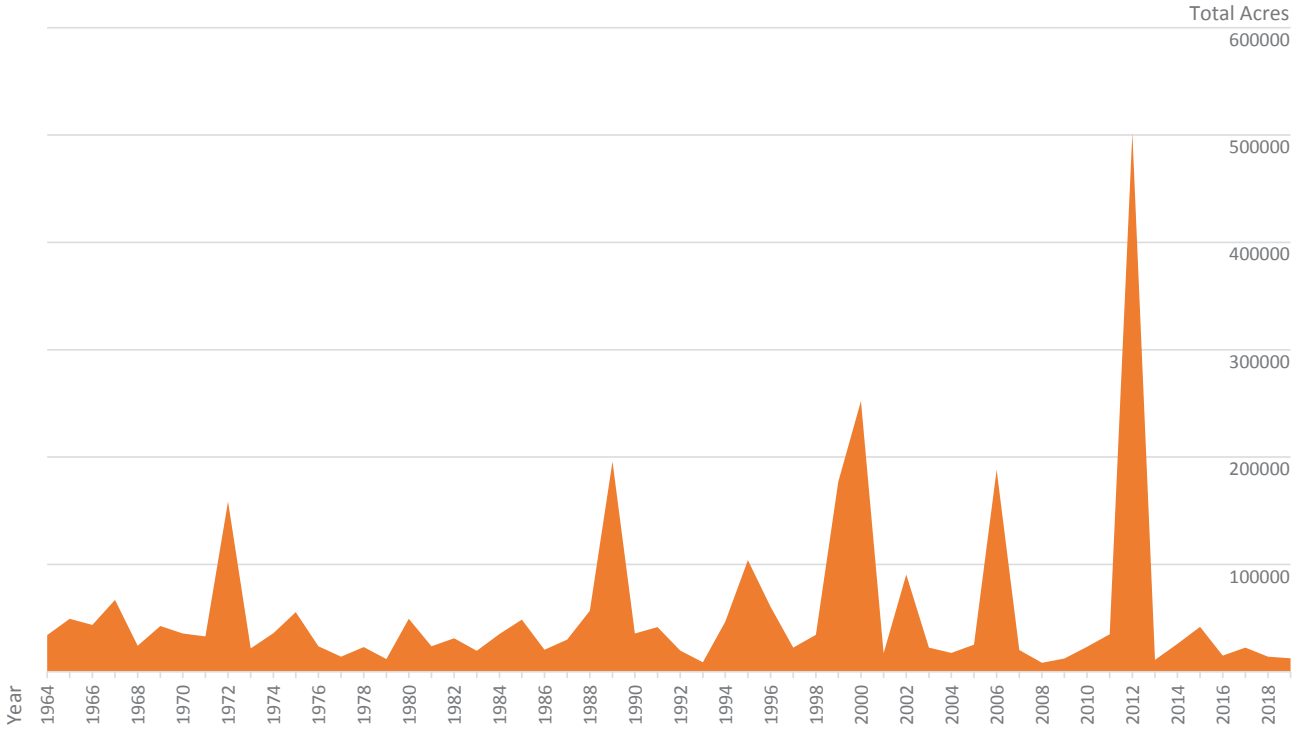
Core objectives of this program include providing fire training to build VFD's response capacity, offering fire prevention programs and materials, managing local and state contracted aviation resources, and helping local jurisdictions with incident management. The NFS currently manages over 850 pieces of wildland fire equipment, valued at over $96 million, placed throughout the state with VFDs. NFS fuels foresters also work with landowners to implement forest management projects to reduce hazardous fuels statewide.

Current Condition

Wildfires no longer burn as they once did, which is problematic for today's growing and dispersing population. For more than 80 years, most wildland fires have been suppressed. This has resulted in fuel load increases to unnatural levels. Because of active fire suppression, pine needles, pine cones, branches and debris have accumulated on the forest floor, and brush and small-diameter trees have become established in the forest understory. This creates "ladder fuels" that serve as pathways for ground fires to spread into tree crowns. When fires reach the upper forest canopy, they behave erratically and can quickly spread and change direction.

This uncharacteristic fire behavior makes high-intensity crown fires hard to suppress. It also makes firefighters' jobs far more difficult and dangerous. For example, when the crowns of trees are consumed by fire, a tremendous amount of energy is released. This heat energy creates powerful columns of rising air capable of carrying firebrands, such as burning pine cones or small branches. These firebrands create additional "spot fires" in front of the advancing flames and rain down on structures in the fire's path. When a fire reaches this stage, its behavior is extremely difficult to predict—meaning that adjacent first responders, private citizens, and property are all now in harm's way.

Figure 33: Total Acres Burned in Wildfires by Year in Nebraska



Source: Nebraska Forest Service, 2018b

Nebraska's fire history includes several stand-replacing fires, such as the fires in 1965, 1972, 1973, 1989, 1999, 2000, 2006, and 2012 (see Figure 33). Fires in recent decades have exhibited extreme fire behavior with high intensity and severity. During the past 50 years, Nebraska has experienced an annual average of 56,946 acres burned by wildfires. In the past two decades, that figure has climbed to over 77,500 acres. The NFS considers active and lengthy fire seasons to be the new normal, in part because of the unique conditions that exist in Nebraska's forests.

The state's ponderosa pine forests are the easternmost occurrence of this species in North America. These forests exhibit unique characteristics that can lead to extreme fire behavior and a high rate of spread. Known for regenerating in dense, overstocked stands, ponderosa pine creates ladder fuels in pockets within the understory. In areas where there are heavy fuel loads of native grasses and eastern redcedar, this fuels arrangement can lead to fast-moving wildfires capable of burning entire forested areas.

The 2006 and 2012 fire seasons demonstrated how significant the wildfire threat is in Nebraska. In July of 2006, the Spotted Tail Fire burned through 12 miles of ponderosa pine forest in less than five hours and entered the community of Chadron. At its peak, this fire consumed more than 20 acres of forestland per minute. In a 10-hour period, the larger complex of fires burned over 23 square miles.

In 2012, dry conditions precipitated the largest wildfire season in Nebraska's recorded history. One of the first large fires was tackled in mid-March near the Nebraska/South Dakota border. Seven months later, 22 fires had started that reached over 1,000 acres in size. Two of these wildfires, the Fairfield Creek Fire and Wellnitz Fire, burned around 77,000 acres each. Cumulatively, these 22 fires burned nearly 400,000 acres in areas across central and western Nebraska (Monitoring Trends in Burns Severity, 2020). An additional 100,000 acres burned in smaller fires across state, bringing the 2012 totals to more than 500,000 acres burned (National Wildfire Coordinating Group, 2020).

The intensity of these fires and removal of large swaths of forestland have left areas with no viable seed source from which to regenerate—leading to the expansion of grasslands in some areas. Ongoing programs for forest fuels reduction in Nebraska are critical to mitigate the risk of further stand-replacing fires. These projects create fuel breaks that are essential for firefighters. It allows them not only to contain fires while they are small, but provides an opportunity for a safer suppression response.

In addition to growing forest fuel loads, another substantial risk is the increasing size of the WUI (Wildland Urban Interface) in Nebraska. As in much of the country, Nebraskans are moving to forested areas at an increasing rate, particularly in coniferous and riparian forest areas. With more people moving into rural, often forested areas, fire suppression has become more difficult and dangerous. Firefighters must now be concerned with evacuations and structure protection—all this while still actively fighting wildfires. The blending of these responsibilities is increasingly problematic because many housing developments have only one access point, and there is often little water available for suppression. With few or no zoning restrictions, countless structures and a growing number of residents are highly vulnerable to large, uncharacteristic wildfires.

WUI interface settings are common in the Pine Ridge, Niobrara Valley, and Wildcat Hills. They are also found in the Loess Hills in southwestern Nebraska, along the Republican, Platte, and Missouri Rivers, and in the Devil's Nest area of northeast Nebraska where eastern redcedar is increasingly common. Many ranches and farmsteads are also at risk.

Threats and Challenges

High-intensity wildfires are one of the greatest threats to forest ecosystems in Nebraska. When fires ignite in areas with high stocking rates or an overabundance of woody or fine fuels, fires are able to spread and quickly build in intensity. This can result in a fire that burns at extremely high temperatures and engulfs any available fuel in its path. When fires reach this magnitude, entire forest systems are at risk. The encroachment of eastern redcedar into pine, mixed-pine, and riparian forests compounds these risks as redcedar is highly combustible in dry conditions. If large forested areas are subjected to high-intensity wildfires, it is probable that the area will convert to grassland. This results in the loss of ecological diversity and economic value associated with the forests.

The 2012 wildfires in western and north central Nebraska are prime examples how these events negatively affect tourism, land values for private forest owners, and public safety. These fires also endanger the integrity of the forest system. For example, in the Pine Ridge, Wildcat Hills, and Niobrara Valley forests, Ips (*Ips* spp.) engraver beetles attack fire-weakened ponderosa pines. This further diminishes the ecosystem's ability to recover, exacerbating the decline of the forest resource.

Table 51 ties the national priorities to identified threats, resources available to address them, and the associated State and Private Forestry programs that are available to respond to these challenges.

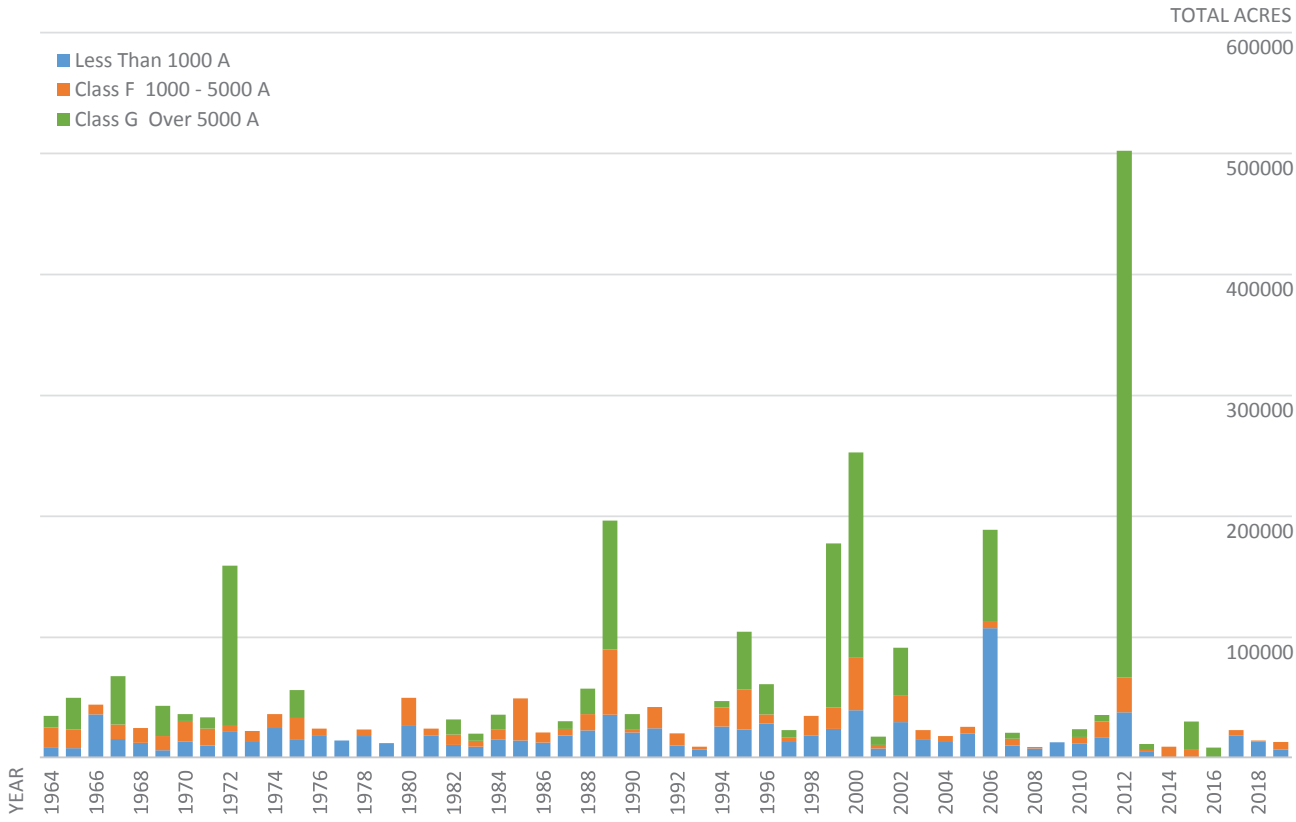
Table 51: Wildland Fire Crosswalk				
THREAT		**RESOURCES AVAILABLE**	**ASSOCIATED S&PF PROGRAMS***	**SUPPORTS NATIONAL PRIORITY (1, 2, 3)****
UNCHARACTERISTIC & HUMAN-CAUSED WILDFIRES				
1	With more people moving into rural, often forested, areas fire suppression has become much more difficult and dangerous	State; Federal; Local government; Private; Tribes, NRDs	AF, CF, RF, WF	2, 3
2	The uncharacteristic wildfires in western and north central Nebraska have negatively affected tourism, land values for private forest owners, and safety of Nebraskans	State; Federal; Local government; Private; Tribes, VFDs	CF, RF, WF	2, 3
WILDLAND URBAN INTERFACE & CAPACITY ISSUES				
3	Poor ingress/egress	State, Local, VFDs	CF, RF, WF	2
4	New subdivisions	State, Local, VFDs	CF, RF, WF	2
5	VFD recruitment/retention	VFDs	CE, WF	2, 3
6	Limited state capacity to respond to wildfires	State, federal, local	RF, WF	1, 2, 3
FUELS				
7	Ongoing programs for forest fuels reduction in Nebraska are critical to mitigate the risk of stand-replacing fires	State; Federal; Local government; Private; Tribes, NRDs	RF, WF	1, 2, 3

**AF=Agroforestry; CE=Conservation Education; CFPT=Conservation Forestry Planting & Trees; CF=Community Forestry; FH=Forest Health; FL=Forest Legacy; FP=Forest Products; RF=Rural Forestry; WF=Wildland Fire*
***National Priorities: (1) Conserve and Manage Working Forest Landscapes for Multiple Values and Uses; (2) Protect Forests from Threats; (3) Enhance Public Benefits from Trees and Forests*

Trends

Nebraska typically experiences an average of 1,500 wildland fires each year during two distinct fire seasons. The first begins in late February and runs through spring green-up, typically in May. A second fire season begins in midsummer and runs through October, sometimes into November. Several trends exist that prolong the state's two fire seasons: increasing forest fuel loads; the encroachment and forest-type conversion by eastern redcedar; the expansion of housing into undeveloped areas, which creates or expands the WUI; and, increasing temperatures and drier conditions may all extend or increase the severity of each fire season.

Figure 34: Nebraska Wildfires, Total Acres Burned by Size Class



Source: Nebraska Forest Service, 2018b

Impacts

Stand-replacing wildfires in Nebraska have converted large swaths of forestlands to grasslands. While not inherently negative, the resulting ecological succession and displacement of native species will have drastic impacts to the forest ecosystem. Additionally, the removal of woody species can lead to higher incidents of water and wind erosion of vulnerable soils, lowering the productivity of rangelands. The increasing intensity and frequency of wildfires in Nebraska, particularly in pine forests, may lead to the displacement or elimination of forest-dependent species. Worse yet, these conditions may precipitate the eventual collapse of the forest ecosystem.

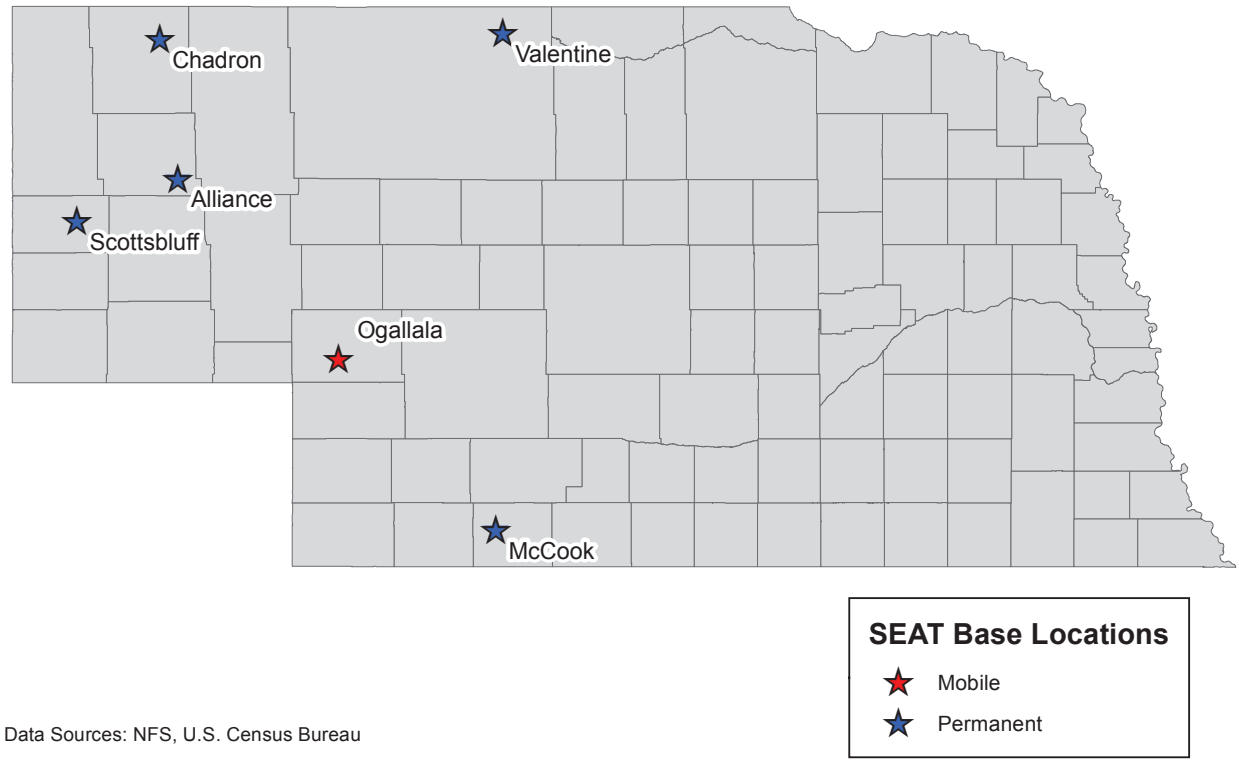
Desired Outcomes

Increase Aerial Support Resources and Training

Background: Fire chiefs can request additional resources from the state during an incident. One resource is the single engine air tanker (SEAT). The airplane is under an exclusive-use contract with the state. There are also 22 aerial applicators who can fly fires on an as needed basis. South Dakota also has agreements with SEAT contractors. However, both states have made their resources available to neighboring states during wildfires. The NFS maintains five permanent SEAT bases, with over 10,000 gallons of holding capacity of retardant at each location, as well as two mobile SEAT bases. The Nebraska Wildfire Control Act (2013) authorizes the NFS to manage these bases with two permanent staff and three on-call SEAT base managers.

Desired Outcome: As fire activity and intensity increases, adding funding to obtain a second SEAT plane and extending the contract of the existing plane during extreme conditions would provide invaluable support for the state's VFDs. Additionally, increasing the qualifications of NFS staff would allow each to train more SEAT base managers and bolster capacity to staff bases in the future.

Figure 35: Locations of Permanent and Mobile Bases for Nebraska's SEAT Program



Data Sources: NFS, U.S. Census Bureau

Build State Suppression Assistance for Volunteer Fire Departments

Background: The NFS and other agencies do not have hand crews or other assets available for directly attacking wildfires. This leaves a void in suppression activities as fires transition from the initial response phase to an extended attack.

Desired Outcome: Create a fuels treatment team and engine crew that provides training opportunities to NFS staff and VFD trainees while providing suppression support during large wildfires.

Collaborate with Nebraska Agencies to Form Incident Command Team

Background: Several agencies within Nebraska are charged with assisting in the development and support of an Incident Management Team (IMT). Nebraska finalized a "Type 3" IMT structure in 2020. The collaborating agencies have a responsibility to support VFDs and suppress wildfires. Each agency falls under different laws and requirements, but all have a responsibility to assist with wildland fire protection in Nebraska.

The State of Nebraska will accept All-Hazard or National Wildland Fire Coordination Group (NWCG) qualifications. Nebraska Emergency Management Agency typically uses All-Hazard qualifications. The NFS follows NWCG qualifications as required by Federal legislation. The State Fire Marshal's Office uses both. Teams will be formed using both qualification systems.

NEMA

According to the Nebraska Emergency Management Act, "It shall be the policy of the Nebraska Emergency Management Agency to enhance Emergency Management operations at disaster sites by enhancing local incident management functions utilizing an Incident Management Team(s) as deemed necessary by the Governor, Director or Assistant Director."

The *National Response Framework* states that a primary role of state government is to supplement and facilitate local efforts before, during, and after incidents. This framework is FEMA's guide to how the nation responds to all types of disasters and emergencies. It is built

on scalable, flexible, and adaptable concepts identified in the National Incident Management System to align key roles and responsibilities across the nation.

NFS

The mission of the NFS is to provide education and services to the people of Nebraska for the protection, utilization, and enhancement of the state's tree and forest resources. As part of carrying out its mission, the NFS "shall provide fire protection to all rural land, in cooperation with the state's rural fire protection districts."

Nebraska State Fire Marshal

This agency's Wildland Incident Response and Assistance Team provides assistance on wildland fire incidents when local organizations have exhausted all resources and strategies. The team is highly trained in Incident Command, including the capability to work large incidents, coordinate water supplies and aerial support, and provide field supervision with tactical considerations and support.

Desired Outcome: Facilitate the development of two Type 3 IMTs. Through collaborations with member agencies, staffing two teams is achievable for Nebraska. The program has the potential to help meet FAP goals of protecting and enhancing Nebraska's forests, resulting in healthier and more sustainable forests.

Increase the Volunteer Force of Nebraska's Fire Departments

Background: Nebraska is seeing a rise in wildfire occurrences and number of acres burned. Nationally, 84% of wildfires are human-caused. The length of fire seasons has tripled, and fires are occurring in areas normally too wet to carry fire naturally. A growing number of people are moving into WUI areas statewide, increasing risks to lives and property. The incidence of human-caused fire in the WUI is also increasing, straining the ability of VFDs to effectively respond. Increasing fuel loads, from species such as eastern redcedar, create an urgent need for more volunteers and prevention programs.

Desired Outcome: Develop a cadet program focused on recruitment and prevention.

Increase Statewide Capacity to Respond to Wildfires

Background: The NFS provides training to VFDs across the state. Certifications through NWCG are available to departments up to the qualifying level of the instructor. NFS staff maintain qualifications for supporting a Type 3 IMT up to and including the position of Incident Commander Type 3.

Desired Outcomes: Build on existing training curriculum to increase NWCG qualifications of NFS staff and Nebraska's firefighters. Work with partner agencies to increase overall qualification and capacity within the state.

Assist Communities with Wildfire Preparedness Measures

Background: During the 2015 update of the FAP, the NFS identified the lack of community wildfire preparedness as a weakness within the state. To improve safety and reduce the risk to life and property, the agency implemented a two-pronged approach: increase awareness of wildfire threats using the Firewise® community recognition program and develop CWPPs for any areas of the state that previously did not have plans.

Desired Outcome: Cover all WUIs in Nebraska under CWPPs; the federal WUI grant program only allows fuels reduction cost-share in areas covered by a CWPP. Creating new CWPPs allows the NFS to apply for WUI grants covering these additional areas, thus expanding the fuels reduction efforts in the state.

Desired Outcome: Garner additional state funding to match federal WUI grant funds. The federal WUI grant program provides 50% cost-share for fuels reduction. Landowners provide 25% match, and the other 25% is matched with state funds. The amount of state-allocated funding limits the number of WUI grants that the NFS can apply for each year. Increasing the amount of state funding creates more opportunities to complete cost-shared, fuels reduction projects in the state.

Desired Outcome: Increase the number of Firewise communities in Nebraska. Valentine and Long Pine are the only two Firewise

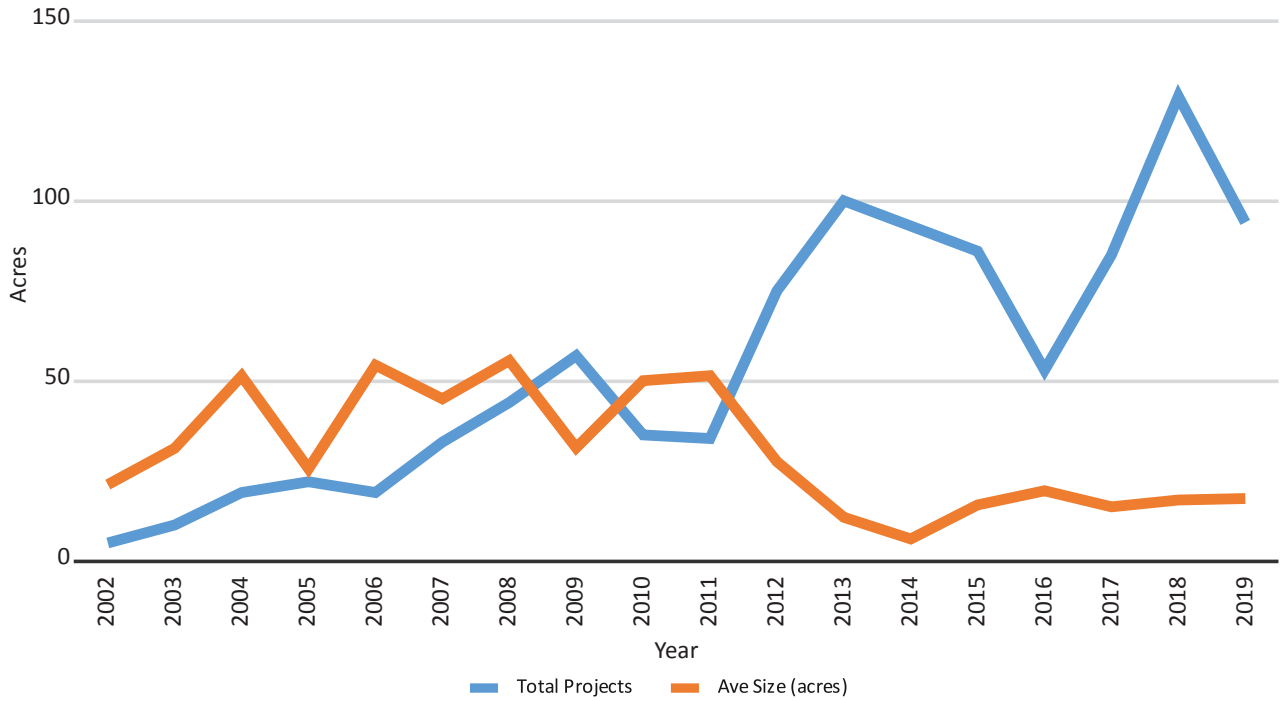
communities in the state. Creating more Firewise communities in Nebraska will help raise wildfire awareness and preparation.

Increase Hazardous Fuels Reduction in Targeted Locations Statewide

Background: The NFS uses federal, state, and NGO funds to leverage landowner investments in hazardous fuels reduction in high-risk areas. Since 2002, over 800 fuels projects have treated nearly 25,000 acres of fire-prone land, primarily in the Niobrara Valley and Pine Ridge regions of Nebraska. Projects are focused on a landscape scale in targeted areas, creating firebreaks that help firefighters respond safely and efficiently to wildfires.

While the total number of hazardous fuels projects has increased since 2002, the average size of each project has decreased (see Figure 36). This correlates to a more strategic approach by the NFS to invest in high-priority areas that will assist firefighters in suppression and containment efforts if a wildfire were to ignite. Fuels treatments within WUI areas are also an agency priority. The number of acres treated has averaged around 1,300 per year since these efforts began. However, in the last three years, treated acres have increased to over 1,700. This upward trend is expected to continue as new staff are hired and these programs are expanded.

Figure 36: Fuels Treatment Projects – Total Projects and Average Size 2002-2019



Source: Nebraska Forest Service, 2019

Desired Outcome: Increase fuels management statewide. NFS staff assist landowners in reducing wildfire hazards on their property. Currently, the NFS has fuels management staff in the Pine Ridge, Niobrara Valley, Loess Canyons, Central Platte, Elkhorn River, Republican River, and Missouri River PFLs. Although there is need for fuels management in other areas, the agency does not have the staff necessary to accommodate this expansion.

Desired Outcome: Increase collaboration by integrating deliverables from other NFS programs (e.g. Rural Forestry and Forest Health). Fuels projects, for example, have the potential to meet other FAP goals by making Nebraska's forests healthier and more sustainable.

Increase the Amount of Firefighting Equipment Placed with Departments

Background: Through the Federal Excess Personal Property (FEPP) and Fire Fighter Property (FFP) Programs, the NFS, in cooperation with the USDA Forest Service (USFS), is able to obtain certain types of equipment that are no longer needed by the federal government. This includes 6x6 trucks, 4x4 trucks, fire trucks, crash trucks, semi-tractors, and generators. This equipment is reconditioned by the NFS and loaned to cooperating rural fire districts. These programs are a tremendous asset to Nebraska as it allows rural fire districts to obtain quality firefighting equipment at a fraction of the assessed value.

At the end of 2018, there were more than 850 pieces of FEPP and FFP equipment on loan to 60% of the rural fire districts across Nebraska. The replacement value of this equipment is nearly $96 million. Some rural fire districts, including Gracy, Rackett, Mid-Cherry, and Barley are equipped exclusively through these programs.

Desired Outcome: Build additional wildland firefighting capacity by increasing the number of vehicles on loan to departments.

Secure Additional Funding for Volunteer Fire Assistance Program

Background: Through the Volunteer Fire Assistance Program, the NFS provides grants to local fire districts for the purchase of materials or equipment to increase their capacity to effectively respond to fires and provide education about fire prevention to their communities. Fire districts may apply for up to 50% of the project cost and must be able to match the award with local funds. The grants come to the NFS through the USFS. In the past 30 years, approximately 80% of Nebraska's 481 local fire districts have received funds through this program. Since 2015, NFS has distributed more than $1.3 million through this program.

Desired Outcome: Increase funding levels of the program to ensure VFDs are equipped to safely respond to the needs of their constituents.

Desired Outcome: Increase VFD participation in VFA grant program.

Build Prescribed Burning Capacity in Nebraska

Background: Nebraska has several burn associations in the state that use prescribed fire to manage vegetation. The NFS believes that prescribed burning is a valuable tool when utilized properly and implemented safely. While it can address several resource needs at once, it requires having trained personnel burning under ideal conditions with the proper safety resources available.

Desired Outcome: Develop a group of well-trained prescribed fire practitioners that use prescribed fire as a tool to preserve, protect, and enhance natural resources.

Desired Outcome: Increase the use of prescribed fire as a tool for managing ground fuels in existing forests.

Forest Products

Overview

The NFS provides technical and financial assistance to the state's forest products industry, businesses, organizations, municipalities, and individuals to promote and develop wood products and other utilization opportunities for the state's tree and forest resources.

Innovative and strong forest products markets provide economic incentives for landowners and foresters to ensure the health, longevity, and sustainability of Nebraska's forests. From traditional forest products (e.g., lumber) to emerging markets for items such as biochar, nuts, and woody biomass energy fuel, Nebraska's forests offer a plethora of economic development opportunities. These markets will ensure long-term forest health, diversify farm and non-farm income, and revitalize struggling rural communities.

Traditional Wood Products

Nebraska's forest resources contribute significantly to the state's economy through the harvest and use of commodities, non-market environmental services, employment opportunities, and wealth creation. Nebraska's wood products manufacturing industry employs more than 2,200 workers with an output of $286 million (U.S. Census Bureau, 2005). Haugen, Piva, and Smith (2018) summarized a survey of all Nebraska sawmills and other primary wood products manufacturers. Their report found:

- Nebraska's primary wood-using industry includes 42 mills (38 sawmills and 4 mills producing other products).
- Primary wood-using mills processed 2.5 million cubic feet of industrial roundwood in 2014, a 34% decrease from 2009.
- Industrial roundwood production decreased by almost 40%, from 4.1 million cubic feet in 2009 to 2.5 million cubic feet in 2014.
- More than 80% of the industrial roundwood processed by Nebraska mills was cut from Nebraska forests. Cottonwoods accounted for almost 80% of the total volume processed.
- Industrial roundwood harvests were comprised of 70% cottonwood. Eastern redcedar (18%) and black walnut (7%) were the other major species harvested.
- Nebraska sawmills processed 10.6 million board feet of saw logs in 2014, a decrease of 45% from 2009.
- The total volume of wood removed (3.3 million cubic feet) amounted to less than 1% of the total live volume of trees in forestlands.

Woody Biomass Energy

Woody biomass energy is a proven, reliable option for both heating and cooling in the state. These energy systems provide important outlets for forest management wood waste, as well as wood products manufacturing waste. Nebraska's primary wood-using industries generate 40,000 green tons annually of wood residues (slabs, sawdust, bark, etc.); 89% of which were used for fuel, mulch, animal bedding, etc. The remaining 11% of residues went unused.

Nebraska utilizes 35,000 tons of woody biomass fuel each year. Chadron State College is the largest and most recognized biomass energy system. It utilizes 8,000 tons of wood fuel each year, generated from forest management activities that reduce wildfire threats in northwest Nebraska. Other users of woody biomass include the Arbor Day Foundation's Lied Lodge in Nebraska City, a number of alfalfa dehydration plants, and, the Nebraska College of Technical Agriculture. Several other facilities, including primary wood processing facilities, are considering switching to woody biomass as a primary thermal energy source.

Nebraska's forests produce 12 million cubic feet of net growth each year. This is the equivalent of 300,000 net oven-dry tons of biomass annually. The total live-tree biomass on forestland is approximately 46 million oven-dry tons (Meneguzzo & Nelson, 2018). An estimated 36.7 million cubic feet (590,000 net air-dry tons) of woody biomass is also growing on non-forestland with trees across the state (Meneguzzo, Lister, & Sullivan, 2018). As these trees die or are trimmed, a tremendous volume of material is left to decompose or be burned in waste piles. Eighty-eight percent of live woody biomass in Nebraska grows on privately-owned land.

Woody biomass offers opportunities to produce renewable energy, develop bio-based businesses, generate energy cost savings, and create new markets for Nebraska's low-value and waste wood resources. Lane (2008) identified the annual availability of 270,000 green tons of processed and unprocessed woody biomass from forest biomass, residual byproducts, and community waste wood sources.

The biomass utilization in the Pine Ridge PFL helps illustrate the potential for other areas of Nebraska. From 2011 through 2018, fuels treatment activities conducted on 3,400 acres of forestland yielded:

- 45,000 tons of woody biomass
- $670,000 in energy savings for Chadron State College
- 1,200 additional days of full-time employment

Biochar

Biochar is a carbon-rich, charcoal-like product produced from biological material, often woody biomass. It is an emerging wood product that has shown promise when used as a soil amendment, pollutant filtration media, or replacement for traditional activated carbon products. It provides significant opportunity as a commercial wood product as it can be produced from low-quality wood and from a variety of tree species.

There is considerable interest in Nebraska and surrounding states for incorporating biochar in the livestock industry. The NFS and the University of Nebraska-Lincoln's Department of Animal Science are investigating the use of biochar as a feed additive, exploring possible reductions in greenhouse gas emissions from livestock. Additionally, the partnership is researching the applicability to feedlot operations and if biochar can improve the health and growth of the animals.

Biochar is an innovative opportunity that not only utilizes the surplus of low-quality wood waste in Nebraska, it could address important environmental issues while providing economic opportunities for biochar producers.

Specialty Forest Products

Specialty forest products include a variety of forest-based products, such as food products, medicinals, botanicals, decorative florals, crafts, Christmas trees, and specialty woods. While most specialty forest product markets are niche in nature, they can be incorporated into traditional agricultural and agroforestry systems. In Nebraska, producers are looking to woody floral cultivars as well as commercial nut production to diversify their operations. Nebraska also has a cottage industry of talented artisans who create novelty wood items and handcrafted wood furniture.

One specific initiative of specialty forest products in Nebraska involves hybrid hazelnuts. The NFS is one of the founding members of the Hybrid Hazelnut Consortium, a partnership with Oregon State University, Rutgers, and the Arbor Day Foundation. The Consortium is developing hybrid hazelnuts as a widely adapted, high-yielding, and low-input crop that is competitive with annual crops for food, feed, or bioenergy.

The partnership has propagated two distinct cultivars that are being tested in 27 sites in seven states (NE, KS, IA, MN, WI, MO, & SD) across the Midwest. Every year, approximately 1,000 unique seedlings are planted for intense screening in research plots at NFS properties. Current plans involve establishing pilot production sites in northeastern and central Nebraska and expanding test sites to include six additional states (CO, OK, TN, AL, NY, & WV).

Current Condition

With the exception of a relatively small and valuable walnut and red oak component, Nebraska's hardwood forests are largely composed of bur oak, hackberry, red mulberry, silver maple, basswood, cottonwood, and green ash. These species have low or no economic value in traditional forest product markets, with the exception of cottonwood. There is also a very high percentage of cull trees (poor form, decayed, or damaged) in harvested forests due to improper logging practices, grazing, and lack of management. Nebraska's forests have not historically supported a large forest industry. However, the businesses and contractors

which make up the industry play a significant role in forest management, local business development, and creating new employment opportunities in rural Nebraska. The following is a brief overview of the current condition of Nebraska's forest products industry:

- The maturing and declining cottonwood resource will continue to negatively affect the state's pallet industry, as reported by Haugen et al. (2018). Additionally, the decline in quality of cottonwood trees has become apparent and could put Nebraska's one veneer mill at risk.
- There is a resurgence in the ponderosa pine sawlog market in the Pine Ridge, yet it remains sporadic.
- Nebraska sawmill output fluctuates widely from year to year. This industry is dependent on a strong agricultural market to drive the demand for pallets, blocking, and dunnage products.
- Climate and weather events continue to affect the forest products industry. Record wildfire, winter storms, and flooding have impacted forest operations including access to timber, as well as general mortality of timber species. Some of these events have led to sawmill and forest business closures.
- Small nut processing cooperatives struggle due to lack of raw materials and low sales.
- Aging proprietors often close businesses operations due to a lack of successors.

Threats and Challenges

- Frequent and unpredictable severe weather events have led to wildfires, flooding, and storm damage which limits access and opportunities for timber harvests.
- The forest products and forest operations industry is aging, making it difficult to find loggers or maintain a quality workforce.
- A lack of timber harvests in forests has resulted in lower-quality stands, increasing tree mortality, and an increased risk of wildfires.
- Increasing insurance costs for logging operations and sawmills leads to the loss of sawmills and contractors.
- Lack of consistent investment from state and federal agencies for forest products technical assistance. This reduces the opportunities to improve industry conditions and assist with wood products development.
- Lack of collaboration and engagement in issues facing the forest products industry, reducing the industry's opportunity to voice their concerns and improve their standing within the state.
- Lack of consistent-yielding, cold-hardy, and disease-resistant nut cultivars and pollenizers.
- Changing weather patterns affect tree flowering times and can limit nut crop yields.
- Lack of cooperatives force specialty crop producers to develop processing capacity and markets.
- Decline of membership in professional networks threatens specialty crop technical transfer and the longevity of orchards in the state.

Table 52 ties the national priorities to identified threats, resources available to address them, and the associated State and Private Forestry programs.

Table 52: Forest Products Crosswalk				
	THREAT	RESOURCES AVAILABLE	ASSOCIATED S&PF PROGRAMS*	SUPPORTS NATIONAL PRIORITY (1, 2, 3)**
ENVIRONMENT & FORESTLAND MANAGEMENT				
1	Frequent and unpredictable severe weather events have led to wildfires, flooding, and storm damage which limits access and opportunity for timber harvest	State; Federal; Local government; Private; Tribes; NRDs	FP, RF, WF	1, 2 3
2	Lack of timber harvests in forests has resulted in lower-quality stands, increasing tree mortality and exposure to catastrophic wildfire and weather events	State; Federal; Local government; Private; Tribes; NRDs	FP, RF, WF	1, 2, 3
POLICY				
3	Restrictive highway load limits reduce the efficiency and cost-effectiveness of transporting raw material (logs, chips) to market	State	FP, RF	3
INDUSTRY				
4	Forest products and forest operations industry is aging, making it difficult to find loggers or maintain quality workforce in forest products businesses	State; Federal; Local government; Private; Tribes; NRDs	CE, FP, RF	2, 3
5	Increasing insurance costs for logging operations and sawmills leading to the loss of sawmills and contractors	State; Federal; Local government; Private; Tribes, NRDs	CE, FP, RF	1, 2, 3
6	Lack of consistent investment from state and federal agencies in forest products technical assistance reduces the opportunities for service agencies to improve industry conditions and assist with wood products development	State; Federal; Local government; Private; Tribes, NRDs	FP, RF	1, 2, 3
7	Lack of industry collaboration and engagement in addressing issues facing the forest products industry reduces the industry's opportunity to voice their concerns and improve their standing within the state	Private	FP, RF	3

**AF=Agroforestry; CE=Conservation Education; CFPT=Conservation Forestry Planting & Trees; CF=Community Forestry; FH=Forest Health; FL=Forest Legacy; FP=Forest Products; RF=Rural Forestry; WF=Wildland Fire*
***National Priorities: (1) Conserve and Manage Working Forest Landscapes for Multiple Values and Uses; (2) Protect Forests from Threats; (3) Enhance Public Benefits from Trees and Forests*

Trends

Traditional forest products businesses have struggled with maintaining a consistent wood supply, a reliable workforce, and complying with state regulations. Nebraska's forest resource relies on an active and successful forest industry in order to continue and improve management. While traditional industry might be going through a period of decline, the interest areas below show promise for increasing wood utilization in the state:

- Wood utilization and product development as a tool for addressing eastern redcedar encroachment into forests and grasslands.
- Production of wood products from community forests as a disposal method for wood waste generated from management and forest health impacts on trees.
- Innovative uses of biochar to address environmental issues while expanding to large commercial and industrial markets.

Impacts

Identifying and promoting innovative wood product opportunities for Nebraska's tree and forest resources remains a key goal for this program area. Not only can forest products manufacturing provide an economic opportunity for rural communities and businesses, it can also catalyze forest management and improve the health, sustainability, and resiliency of forests. Traditional timber harvests will play a significant role in large-scale utilization and management of the forest resource. Additionally, woody biomass energy and other processed wood products (such as biochar) are non-traditional opportunities that may restore forests to a more diverse and productive condition with higher economic returns. Long-term demand for woody biomass may provide landowners with markets for lower-value trees, creating opportunities to improve the health, vigor, and species composition of forests and conservation tree plantings statewide.

Desired Outcomes

- Engaged forest products industry which works together to address issues and respond to opportunities.
- Increased capacity for state personnel to respond to the needs of the forest products industry and forest landowners.
- Continued development of innovative wood products which have applications within Nebraska's industries.
- Increased support for entrepreneurs working to develop wood products from Nebraska's forests.
- Increased timber harvests and forest products industry investment in the state.
- Engaged landowners increase the utilization of low-quality wood waste.
- Strong partnerships with industry, academia, and state agencies to develop wood utilization opportunities and increase forest products industry recruitment.
- Increased collaboration across NFS programs to meet stated FAP goals, making Nebraska's forests healthier and more sustainable.

Community Forestry

Overview

The NFS provides direct, on-the-ground, technical, and educational assistance to communities and green industry professionals through its Community Forestry Program. Programming investments represent a hybrid strategy of combining the resources and expertise of the NFS along with those of the nonprofit, the Nebraska Statewide Arboretum, Inc. (NSA). Through this collaborative partnership, NFS and NSA are able to provide robust green infrastructure services for municipalities, green industry professionals, and community groups.

A community forest is the interface of trees and people in private and public landscapes within villages, towns, and cities. It involves the planning, establishment, management, and protection of trees and associated plants for social, environmental, and economic sustainability. In Nebraska, there are about 489,000 acres of community forest (Nebraska Forest Service, 2018a) that improve air and water quality, assist in stormwater management, provide habitat for wildlife, and improve the quality of life in towns and communities. Currently, about two-thirds of all Nebraskans live and work inside the boundaries of a community forest.

Growing and maintaining trees, community landscapes, or green infrastructure is not an easy task. Much of the state, particularly in the west, was at one time a near treeless prairie. The stressful environmental conditions brought on by very cold winters followed by hot, dry summers can weaken and disrupt the development of any plant, especially longer-lived plants such as trees. Research and applied efforts in woody plant physiology and seed selection are continually looking for tree species that show the potential for optimal growth under such stressful conditions.

Benefits

Nowak and Greenfield (2010) demonstrated that Nebraska's community forests and green infrastructure provide many valuable benefits important to human and ecological health including:

- Storing 1.4 million tons of carbon, at a value of $31.9 million
- Sequestering 46,000 tons of carbon/ year; at a value of $1 million
- Removing 1,040 tons of total pollutants/ year; at a value of $8.4 million including
    - 18 tons of carbon monoxide/year (value of $24,600)
    - 186 tons of nitrogen dioxide/year (value of $1.8 million)
    - 400 tons of ozone/year (value of $4 million)
    - 62 tons of sulfur dioxide/year (value of $150,200)
    - 372 tons of particulate matter/year (value of $2.4 million)

Other measurable benefits of Nebraska's community forest resource include:

- Surface air temperature reduction
- Increased energy efficiency and reduced fossil fuels use
- Absorption of ultraviolet radiation
- Improved water quality
- Reduced noise pollution
- Improved human comfort, health and psychological well-being
- Increased property values
- Provision of wildlife habitat
- Improved aesthetics
- Improved community cohesion

Other Underserved Landscapes

As city infrastructure, it is important for public trees to be evenly and equitably distributed throughout the community for the benefit of all social and economic demographics. Processes that concentrate minority populations in high densities, often proximate to industrial zones, create a socioeconomic disparity in air quality that increases further when trees are absent.

Establishing quality community forests is a process where investments are made long before the ecosystem services compound to achieve significant benefits. This long-term effort disincentivizes low-income communities from planting trees and drives racial inequity to the degree that race and class are intertwined. The NFS is committed to ensuring that underserved communities have equitable access to all of the financial and educational

resources the agency provides. Furthermore, the agency recognizes the need to provide green infrastructure as a nested public good in modern cities. The NFS is further committed to providing assistance to communities that seek to equitably incorporate green infrastructure for the benefit of *all* of their residents.

Rural Community Landscapes

There are only three cities in Nebraska with more than 50,000 in population, making rural community landscapes a priority for the NFS. Because the largest communities have staff responsible for managing community canopies, most of the technical assistance is prioritized and directed toward smaller rural landscapes in Nebraska.

According to Nebraska Blue Book (2018), the state has a population of 1,929,268, with three-quarters of those residing in the eastern third of the state. Two-thirds of the population lives within communities with a population of 2,500 or more (Nebraska Blue Book, 2018). This means that trees and forests in Nebraska's communities provide a range of valuable environmental, social, and economic benefits. On average, every dollar invested in the community forest resource returns an average of $2.70 in net annual benefits over the lifespan of a publicly owned municipal tree (McPherson, Simpson, Peper, Maco, & Xiao, 2005).

Table 53: A Breakdown of Nebraska's Population by Municipality Size

CATEGORY	POPULATION	# CITIES	COMMUNITY
Metro	300,000+	1	Omaha
Primary	100,000-300,000	1	Lincoln
First Class - Large	50,000-100,000	1	Bellevue
First Class - Small	5,000-50,000	26	-
Second Class	800-5,000	118	-
Village	Under 800	383	-

Source: Nebraska Blue Book, 2018

Current Condition

One challenge for community forests in Nebraska is informing and educating leaders and residents on the importance of trees and the benefits they collectively provide. There is a critical need to not only maintain and replace existing trees, but to expand the total amount of green infrastructure incorporated into the community landscape. This needs to occur despite the constant challenges posed by weather extremes, insects and diseases, herbicide damage, and general human harm. It also needs to be accomplished in situations where there are often significant financial constraints.

The extent of Nebraska's community forest resources have steadily declined in recent years. A combination of severe weather events (1991 freeze, 1997 snow storm, 2007 ice storm, tornadoes, and high winds), chronic drought, poor planting practices, poor species selection, insect and disease pests, and a preponderance of older trees nearing or past their average life span, and growing human apathy have steadily reduced the number of trees in communities across the state. Trends gleaned from more than 200 community tree inventories conducted by NFS since 1977 indicate the state has lost approximately 50% of its urban and community forest resource since the late 1970s (Nebraska Forest Service, 2007).

Tree inventory data from the state's communities over the last ten years reveals that the top three species are hackberry, mulberry, and Siberian elm. These three species, on average, comprise 38.5% of the overall canopy (Nowak, Hoehn, Crane, & Bodine, 2012). The largest condition class is "good"

with 69%, followed by the "fair" class with 16% (Nebraska Forest Service, 2012). Many rural communities show an abundance of mature to over-mature canopies. These canopies were further degraded by repetitive storms, drought, and flooding over the last decade. A declining canopy increases the number of defective and potentially hazardous public trees. Furthermore, the situation is compounded by a lack of species diversity and poor species selection.

Nebraska Tree City USA community data over the last ten years shows an increase in tree removals versus new tree plantings. This data is supported by a recent USFS study (Nowak & Greenfield, 2018) that suggested Nebraska had the third highest net loss of community tree cover in the country. This is due, in part, to limited budgets to manage trees and the need to concentrate on removals due to extreme environmental issues and EAB. However, in 2018, the 93 Tree City USA communities still reported investing $6.6 million in their community trees.

Threats and Challenges

Nebraska's community forest resources face many threats including insects and disease, herbicide damage, inclement weather, and a lack of community support. There are several urgent concerns observed by the NFS that will further reduce the ecosystem services community forests provide. The following are considered "high risk" issues to Nebraska's community forests:

- New or continued spread of insects and diseases.
- Continued declines in community forest cover and overall tree canopy.
- Poor tree resiliency due to improper species selection and lack of age diversity.
- Diminished ability to mitigate climatic change (temperature, wind, and air quality).
- Economic, environmental, and social stress factors continue to increase in urban areas.
- Common-good environmental issues become embedded in partisan politics.
- Complex green infrastructure systems are devalued as essential services because of the finite resources of some municipalities.
- Herbicide damage from off-target drifting increases mortality or reduces tree health.
- Public indifference or general disconnect from trees: lack of knowledge, how they grow, and what resources are needed to sustain them.

Table 54 *(next page)* ties the national priorities to identified threats, resources available to address them, and the associated State and Private Forestry programs.

Trends

State and local governments across Nebraska are experiencing a period where budgets are lean but the list of critical needs is growing. Community forests become less of a priority for many smaller villages and towns out of fiscal necessity. This is problematic when EAB detections are increasing, particularly in the east and central parts of the state. Another concern is the shift in climatic trends, increasing the frequency of damaging storms with high precipitation and strong winds. These two issues alone will present serious challenges to municipalities for current and long-term budget planning.

There is also the issue of dwindling engagement with the community forest resource. Apathy, inaction, and a general disconnect on the benefits of green infrastructure corresponds to declines in maintaining and managing these areas. This can have long-lasting implications as volunteer networks—one of the core elements in managing these areas—becomes obsolete or nonexistent.

Research also shows urban tree canopy cover is inequitably distributed by race. The NFS has an important role to play in encouraging communities to address these disparities with its outreach, grant funding, tree plantings, and other projects (Watkins & Gerrish, 2018).

When combined, the following trends exacerbate issues communities face and lead to the continued decline of Nebraska's community forests:

- Higher prevalence of hazard trees that are not adequately mitigated.
- Increasing pest and disease problems that go unaddressed.
- Declines in overall biodiversity in the landscape.

Table 54: Community Forestry Crosswalk				
THREAT		**RESOURCES AVAILABLE**	**ASSOCIATED S&PF PROGRAMS***	**SUPPORTS NATIONAL PRIORITY (1, 2, 3)****
ENVIRONMENTAL FACTORS				
1	Insects and diseases continue to threaten mature trees	State; Federal; Local government; Private; Tribes	CF, FH, RF	1, 2, 3
2	Change in climate that is causing more intense weather patterns	State; Federal; Local government; Private; Tribes	AF, CE, CF, CFPT, FH, FL, FP, RF, WF	1, 2, 3
3	Communities lack forest management plans to adequately address a changing forest	State; Local government; Private	CE, CF	1
4	Herbicide is a new, complex issue damaging forest resources	State; Federal; Local government; Private	AF, CE, CF, CFPT, FH, FL, FP, RF	1, 3
PUBLIC AWARENESS				
5	Decision makers place low value on complex landscapes, combined with low funding levels and other priorities	State; Federal; Local government; Private	CE, CF, FL	1, 3
6	People don't have the awareness, knowledge, or resources to properly care for trees and landscapes	State; Federal; Local government; Private; Tribes	CE, CF, FL	1, 3
7	Local professionals and landscape design/maintenance contractors don't have access to a wide variety of species and the knowledge of how to use them.	State; Federal; Local government; Private; Tribes	CE, CF	1, 2, 3
VOLUNTEERISM				
8	Decreasing engagement in volunteerism	State; Federal; Local government; Private	CE, CF, RF	1, 3
9	Lack of education and awareness of trees and the value to society	Federal; State, Local; Private	CE, CF, RF	1, 3
COST-SHARE AVAILABILITY				
10	Reduced funding for planting and management	Federal; State; Local government; Private	CF, RF	1, 3

**AF=Agroforestry; CE=Conservation Education; CFPT=Conservation Forestry Planting & Trees; CF=Community Forestry; FH=Forest Health; FL=Forest Legacy; FP=Forest Products; RF=Rural Forestry; WF=Wildland Fire*
***National Priorities: (1) Conserve and Manage Working Forest Landscapes for Multiple Values and Uses; (2) Protect Forests from Threats; (3) Enhance Public Benefits from Trees and Forests*

- Lower volunteerism to assist in community recovery efforts.
- Reduced capacity to adapt to extreme conditions, compounding the loss of benefits:
    - Economic: Heating and cooling costs increase, shorter life of critical infrastructure;
    - Environmental: Decreased water and air quality; decreased biodiversity; and
    - Social: higher crime rates, lower quality of life, diminished learning in schools.

Impacts

Loss of canopy in communities leads to higher heating and cooling costs, higher street and sidewalk maintenance, and a higher incidence of crime. People are healthier in communities with vibrant trees and a robust canopy. Students learn better when a view of nature, especially trees, is available. Stormwater is cleaner when filtered through bio-swales, and the air is cleaner because of community trees. With the decline in community tree cover, a loss in these social, economic, and environmental benefits can be expected.

Desired Outcomes

NFS staff identified the following desired outcomes for the Community Forestry Program:

- Achieve a management balance between resilience, growth, equity, and diversity specific to each community.
- Create a healthy, diverse, and resilient canopy to provide maximum community benefit.
- Increase public awareness and appreciation for value and services provided by the community forest.
- Develop sustainable landscapes to meet the current and future needs of residents.
- Diversify tree inventories to increase landscape resiliency in pursuit of healthy ecosystems.
- Increase community forest age-class mixes across communities and neighborhoods.
- Improve water quality and its conservation at a watershed or landscape level.
- Utilize high-quality, regionally appropriate nursery stock that aligns with community needs and NFS recommendations.
- Increase outreach and awareness to reach greater numbers of youth and adults.
- Recruit and engage new volunteers to assist in tree planting and tree maintenance.
- Provide funding opportunities for communities to invest in green infrastructure and sustainable landscapes.
- Include metrics of diversity and inclusivity in project impacts and programmatic reports.
- Ensure partnerships are racially diverse and focus on inclusivity throughout project development and implementation.
- Encourage trial plantings and tree inventories to facilitate tree replacement recommendations in a changing climate.
- Expand existing partnerships while creating opportunities for new projects and involvement from stakeholders.
- Improve public tree management through inventories, management plans, and improved ordinances.
- Increase programmatic collaboration with other NFS programs, such as Forest Products, Rural Forestry, Forest Health, and Wildland Fire to help meet other FAP goals, making Nebraska's forests healthier and more sustainable.

Conservation Education

Overview

Conservation Education provides both formal and non-formal educators, families, and natural resource professionals with resources to educate Nebraskans on conservation concepts and issues.

The NFS specifically focuses on developing critical thinking and decision making skills to help Nebraskans understand complex environmental issues and make informed decisions. This is accomplished through three main areas of education:

1. Providing professional development for both formal and non-formal educators;
2. Coordinating and facilitating educational field trips on NFS properties; and

3. Creating resource exchanges via class visits, festivals and workshops, and newsletters.

As the state sponsor for both Project Learning Tree (PLT) and Project WET (Watershed Education for Teachers),, the primary focus of professional development is to train educators in the use of high-quality environmental curricula each offers.

Current Condition and Trends

Professional Development

PLT and Project WET professional development works. Educators who complete the workshops indicate that they use the curriculum they were trained in at least once per month. Over the last five years, there has been an increased need for these workshops. This is especially true for Early Learning Professionals, as Nebraska State Standards have become more focused on formal education. Early Learning Professionals must now show that they are completing regular, state-approved professional development surrounding a variety of educational focus areas. With science and nature being one of those disciplines, PLT and WET have found a natural fit with these instructors.

Professional development requirements for formal K-12 educators are also changing. With the rise of standardized testing, standardized professional development has followed. Many districts and schools try to ensure their teachers experience professional development in the latest techniques for teaching math, reading, and writing. One particular challenge for educators is these programs are often required. In order to attend a PLT or WET workshop, teachers need to take unpaid leave and find a classroom substitute. This makes PLT and WET workshops a less desirable option for educators.

This same focus on standardization and increased rigor is also present in non-formal education. This can be seen in a rise in after-school and summer programs focused on education. These programs are often led by non-profit organizations and staffed by part-time, non-professionals. The directors of these programs are often looking for easy-to-use curricula that can be implemented to meet their goals of decreasing the achievement gap. Both PLT and WET fit into this niche nicely and are well-received by this audience.

Educational Field Trips

With large reductions to federal and state budgets since 2009, field trips were cut from most educational programming. Many students in Nebraska now go on one field trip per year. These trips align with specific unit curriculum and remain the same year to year for each grade. Most schools cannot find additional funds to send students off-campus for educational opportunities. The rise in non-formal education (after-school, summer, and school break programs) has increased the need for field trips that are low-cost, enriching experiences. Both the Prairie Pines Nature Preserve and Horning State Farm properties have benefited from this trend. The most popular time for field trips at these locations is currently during summer and school breaks throughout the year.

Information Sharing

With schools and other programs losing the ability to leave for field trips, more and more of these institutions are requesting non-formal educators come to them. Throughout the year, the NFS receives numerous requests for classroom visits, demonstrations, and to host a booth at natural resource themed events. While it is challenging to accommodate every request, hosting or participating in large events has helped reach audiences that might not traditionally interact with the agency.

Threats and Challenges

Professional Development

Currently, the biggest threats to providing professional development for educators are the associated costs and formalized professional development requirements. The NFS cannot currently offer PLT and WET workshops for free, which has made these workshops less accessible to Nebraska's educators. To ensure these important curricula remain available, the NFS must demonstrate how PLT and WET are critical tools for environmental education in the state. In order for professional development to count toward a teacher's continuing education

requirements, the program must be offered by an accredited institution and offer college credit. This means that for PLT or WET to meet these requirements, each must be offered as a university course, pushing the associated costs much higher. Currently, formal educators that attend a PLT or WET workshop do not receive credit for this continuing education.

In 2019, the NFS conducted a survey of all people trained in PLT and WET since 2009. Some of the challenges to using PLT and WET identified were:

- Lack of time during the school day for extra activities/lessons,
- Lack of background knowledge (especially related to complex natural resources issues), and
- Lack of resources (supplies) needed to lead the lessons.

Educational Field Trips

Just as schools have lost funding for field trips, out-of-school programs are also reallocating funding away from these activities. One reason is the high risks associated with transporting children off-campus. If this trend continues, there will be a large gap in experiential learning opportunities. Many education-focused organizations throughout the state, including the NGPC and the Nebraska Museum of Natural History, are using new techniques to bring experiences to students. The NGPC has created traveling kits and trailers that can be checked out and used for educational purposes across the state, at no cost. The Nebraska Museum of Natural History has implemented virtual field trips where classes can log on and participate in virtual tours of the museum and chat with staff and researchers. Both of these techniques have become popular with educators. While both can become easy to maintain once implemented, the start-up funds needed for the NFS to follow suit are currently not available.

Information Sharing

With people becoming busier, and schools reducing travel budgets, the best way for the NFS to reach a wide variety of Nebraskans is to participate in educational events throughout the state. A challenge in this arena is that many of these events only want to provide organizations with booth space. While booths are excellent for handing out small bits of information, they are not ideal for transformative educational experiences. NFS participation in these types of opportunities will continue, but finding events that allow for more impactful contact time with participants will be important.

Another challenge in this area is limited staff capacity. With one staff member located in Lincoln, many opportunities must go unmet because Nebraska's geographical area and dispersed schools are difficult to travel to on a daily basis. While NFS staff throughout the state participate in these opportunities, it becomes a balancing act as their primary role is to service private landowners. Additionally, many staff feel ill-equipped to assist when professional standards and educational needs of Nebraska's students are rapidly changing.

Table 55 *(next page)* ties the national priorities to identified threats, resources available to address them, and the associated State and Private Forestry programs.

Impacts

Forestry education, especially when started at a young age, helps people understand and develop a connection with Nebraska's trees and forests. High-quality conservation education aims to help people develop critical thinking, problem solving, and decision making skills—especially surrounding complex environmental and natural resources issues. When the public is well-informed and educated on an issue, they are more likely to be moved to action. Through a continued focus on quality educational opportunities throughout the state, generations of Nebraskans will better understand how to protect, restore, and utilize Nebraska's tree and forest resources.

Desired Outcomes

- A public that is adequately informed and feels prepared to make decisions about protecting, restoring, and utilizing Nebraska's tree and forest resources.
- Expand reach of the PLT and Project WET programs, especially into traditionally underserved communities.

Table 55: Conservation Education Crosswalk				
THREAT		**RESOURCES AVAILABLE**	**ASSOCIATED S&PF PROGRAMS***	**SUPPORTS NATIONAL PRIORITY (1, 2, 3)****
PROFESSIONAL DEVELOPMENT				
1	Costs	State; Federal; Local government; NGOs; Tribes	CE, RF, AF, FP, CF	1, 3
2	Professional requirements; lack of background knowledge	State; Federal; Local government; Tribes	CE	3
EDUCATIONAL FIELD TRIPS				
3	Funding; funding re-allocated away from field trips	State; Federal; Local government; NGOs; Tribes	RF, CF, CE	1, 3
4	Risk; classrooms and booths are not ideal for transformative educational experiences	State; Federal; Local government; NGOs; Tribes	RF, CF, CE	1, 3
INFORMATION SHARING				
5	Time and budget limit ability to participate in educational events	State; Federal; Local government; NGOs; Tribes	CE, CF, RF	1, 3

**AF=Agroforestry; CE=Conservation Education; CFPT=Conservation Forestry Planting & Trees; CF=Community Forestry; FH=Forest Health; FL=Forest Legacy; FP=Forest Products; RF=Rural Forestry; WF=Wildland Fire*
***National Priorities: (1) Conserve and Manage Working Forest Landscapes for Multiple Values and Uses; (2) Protect Forests from Threats; (3) Enhance Public Benefits from Trees and Forests*

- Increase in experiential learning opportunities on NFS properties.
- Increase collaboration across issue areas: By working with other programs such as Forest Products, Rural Forestry, Forest Health, Community Forestry, and Wildland Fire, Conservation Education has the potential to help meet other FAP goals, making Nebraska's forests healthier and more sustainable.

Rural Forestry

Overview

The NFS provides direct technical support to landowners and other stakeholders throughout Nebraska. This is accomplished primarily through the implementation of the USFS' Forest Stewardship Program (FSP). This program plays a central role in managing and preserving Nebraska's forestlands and other lands with trees. Forest landowners receive technical assistance from staff in forest and woodlot management, windbreak establishment and management, tree planting, reforestation, and other forestry-related activities.

The FSP may also provide landowners with access to cost-share programs and forest certifications, through the preparation and implementation of forest management plans. Since 2015, foresters have provided direct technical assistance to nearly 4,000 woodland owners to help them manage their properties. NFS foresters have prepared nearly 160 Stewardship Plans, covering over 175,000 acres, to help woodland owners access financial assistance to implement stewardship practices on their lands.

Forests and forestry best management practices (BMPs) also help protect, restore and sustain water quality, streamflow, and overall watershed health. Healthy urban and rural forested watersheds absorb rainfall and

snowmelt, slow storm runoff, recharge aquifers, sustain streamflow, and filter pollutants. By identifying areas where continued forest conservation and management is important, water quality, water flows, and watershed health will be sustained and improved. This coincides with opportunities for economic development through specialty forest products, traditional forest products, woody biomass, and ecosystem services.

Current Condition

As previously discussed in Chapter 2, Nebraska has 1.5 million acres of forestland that contains nearly 383 million live trees and represents a unique mix of forest types. In addition to forestland acres, Nebraska has an estimated 1.314 million acres of rural and urban non-forestland. These areas contain approximately 119 million live trees across the state. While these areas are often not large units individually, they provide unique benefits such as rural home wind protection, snowdrift management, energy savings, livestock protection, crop protection and yield increases, water quality and soil protection, wildlife habitat, and other important ecosystem services.

Threats and Challenges

Protecting, conserving, and enhancing forestlands are critical management activities that not only allow for trees to thrive, but entire plant and animal communities to flourish. Indirectly, these actions provide recreational benefits and ecosystem services that countless Nebraskans enjoy. However, there are pressing threats to the state's forest resource:

- The decline and subsequent loss of ash trees in rural forests and urban areas due to EAB.
- Potential losses of merchantable black walnut in rural forests and urban areas due to thousand cankers disease.
- The permanent loss of naturally-occurring ponderosa pine forests after repeated wildfires convert this forest type to grassland.
- A loss of riparian forests, field and farmstead windbreaks, and agroforestry or conservation tree plantings due to the conversion of lands to agricultural purposes.
- A change in tree and forest composition, reducing species diversity, in response to shifts in weather patterns and climate.
- Encroachment of eastern redcedar into other forest types due to successional changes brought on by climatic shifts.
- The loss of sawmills and contractors due to increasing insurance costs, regulation, and a lack of raw materials.
- The degradation or removal of forestlands and habitat as fragmentation and urbanization, particularly near population centers, continues.
- Declines in Nebraska's trees and forest ecosystems as invasive and aggressive native species, insects, and diseases proliferate.
- Off-target herbicide drift damages trees and forests during critical growth periods leading to declines and mortality.
- Waning public perception of the importance, economic value, and benefits of trees and forests.

Table 56 *(next page)* ties the national priorities to identified threats, resources available to address them, and the associated State and Private Forestry programs.

Trends

A challenging environment exists in the rural forests of Nebraska. The declines in industry and farm economies have made land management costs difficult to justify. While commodity operations are cyclical, additional management activities that cannot be directly tied to the bottom line receive heavy scrutiny. Forest management tends to be a deferred maintenance activity, and forest health and productivity often suffer during fiscal uncertainty.

Another challenge is the shift in land use in Nebraska over the past several decades. Absentee ownership has increased, and this is often associated with changes to the management of forestland. Some lands experience a dramatic increase in woody species, including eastern redcedar. In other cases, the land use changes from commodity and livestock production to recreational purposes. These areas are at higher risk

Table 56: Rural Forestry Crosswalk

	THREAT	RESOURCES AVAILABLE	ASSOCIATED S&PF PROGRAMS*	SUPPORTS NATIONAL PRIORITY (1, 2, 3)**
ECOLOGICAL				
1	Land fragmentation, urbanization	State; Federal (S&PF, NRCS, FSA); Private	RF, WF	1, 2, 3
2	Loss of ash, black walnut, ponderosa pine, and riparian forests	State; Federal (S&PF, NRCS, FSA); Private, NRD	AF, CF, CFPT, FH, FL, RF	1, 2, 3
3	Change in forest composition & diversity due to climatic shifts	State; Federal (S&PF, NRCS, FSA); Private, NRD, NGO, Tribes	AF, CE, CF, CFPT, FH, RF	1, 2, 3
4	Invasive and aggressive native species, insects, and diseases threaten Nebraska's trees and forest ecosystems	State; Federal; Local government; Private; Tribes	AF, CE, CF, CFPT, FH, FL, RF	1, 2, 3
ECONOMIC				
5	Loss of field and farmstead windbreaks and other agroforestry practices	State; Federal; Local government; Private; NRDs	AF, CE, RF	1, 3
6	Loss of sawmills and contractors	State, Private	FP, RF	1, 2, 3
7	Herbicide drift	State; Federal (S&PF, NRCS, FSA); Private, NRD, NGO, Tribes	All	1, 2, 3
SOCIAL				
8	Waning public perception of the importance, value, and benefits of trees and forests	State; Federal; Local government; Private; NRDs	AF, CE, CF, CFPT, FH, FL, RF	1, 2, 3

**AF=Agroforestry; CE=Conservation Education; CFPT=Conservation Forestry Planting & Trees; CF=Community Forestry; FH=Forest Health; FL=Forest Legacy; FP=Forest Products; RF=Rural Forestry; WF=Wildland Fire*
***National Priorities: (1) Conserve and Manage Working Forest Landscapes for Multiple Values and Uses; (2) Protect Forests from Threats; (3) Enhance Public Benefits from Trees and Forests*

of wildfire due to the increase in fine fuels (primarily grass) as grazing animals are removed from the system.

Impacts

Land management provides the best opportunity to conserve, protect, and enhance the trees and forests of Nebraska. Proper stewardship allows landowners to create an environment where the species are diverse and the forest is productive. Further, management reduces the amount of fuel loading on the landscape.

Desired Outcomes

- Protect rare tree species that exist on the edge of their natural ranges in Nebraska such as aspen, birch, limber pine, oaks, and hickories.
- Create an informed public that understands the value and benefits of trees in rural settings.
- Empower landowners to make confident and impactful tree and forest management decisions.
- Engage landowners in the FSP to foster long-term forest management.
- Offer readily-accessible programs that provide assistance and incentives to private landowners to keep working forests working and encourage sustainable forest management.
- Increase collaboration across NFS issue areas: By working with other programs such as Community Forestry, Forest Health, Forest Products, and Wildland Fire, the Rural Forestry program has the potential to help meet other FAP goals, making Nebraska's forests healthier and more sustainable.

Conservation Trees

Overview

Trees have long been an important component of Nebraska agriculture. Strategic plantings, commonly referred to as conservation plantings, include windbreaks, shelterbelts, and riparian buffers. Although these are not large units individually, it is another critical resource that provides an array of ecosystem services to Nebraska's agriculture-dominated landscape.

Conservation tree plantings can increase crop yields, reduce soil erosion, and protect livestock from weather extremes. When used as riparian forest buffers, agricultural runoff and sediment are intercepted, protecting water quality. When planted for wildlife, these trees provide critical habitat and food sources. For farmers willing to incorporate conservation plantings into their systems, the benefits can be significant and last for decades.

Tree plantings are also valued additions around Nebraska's farmsteads and ranches, helping protect buildings, livestock, and equipment from inclement weather. Conservation trees have long enhanced the quality of life for farm families, adding beauty and value to their homes and the surrounding landscape.

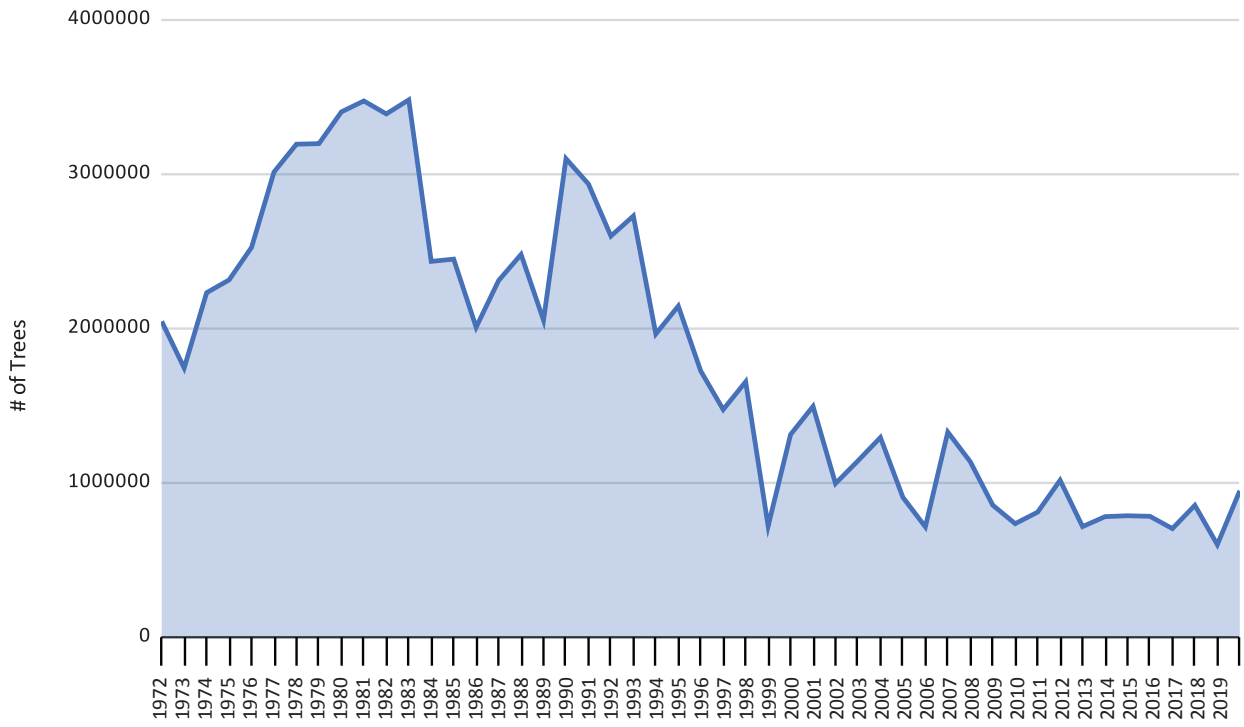
Current Condition

From 1926 through 2002, the NFS administered the state's tree seedling distribution program, which became known as Conservation Trees for Nebraska. This effort remains unique in that there are no state or private nurseries providing tree seedlings for the program. The primary source for trees is the USFS's Bessey Nursery near Halsey, Nebraska.

Since 2002, Conservation Trees for Nebraska has been coordinated by the Nebraska Association of Resources Districts (NARD), with each Natural Resource District (NRD) administering their local tree program. Annual conservation tree/shrub sales in the state have declined from a peak of more than 3.5 million in the 1980s to less than 1 million in 2019 (see Figure 37). The decline is attributed to a combination of factors: fewer but larger farms and ranches, fluctuations in commodity prices, high land values, drought, large-scale expansion of pivot irrigation systems, reduced livestock production, increased planting costs, generational differences in landowner attitudes, and new planting specifications that require fewer trees.

It is estimated that more than 80% of active farmstead/ranch headquarters in Nebraska have some type of shelterbelt planting. Inventories conducted in 2008 and 2009 through the Great Plains Tree and Forests Initiative (GPI) showed an estimated 254,832

Figure 37: Conservation Tree Sales 1972-2019



Source: Nebraska Association of Resource Districts, 2019

acres of planted and naturally occurring tree groupings in Nebraska, providing multiple conservation and environmental benefits to the surrounding areas. The Great Plains Initiative II study was conducted in 2018-2019. This survey further helped illustrate the condition and function of the state's remaining windbreaks.

Results: Great Plains Initiative (2008-2009)

- Approximately 390,000 acres of windbreaks
- 45% of windbreaks in good condition
  - 35% in fair condition
  - 20% in poor condition
- 35% of windbreaks more than 50 years old
  - 40% between 25 and 50 years old
  - 25% less than 25 years old
- Eastern redcedar is the dominant species (approximately 25 million trees)
  - Siberian elm, hackberry, mulberry and ash round out the top 5 species

Preliminary results: Great Plains Initiative II (2018-2019)

- 30% of windbreaks in good condition
  - 65% in fair condition
  - 5% in poor condition
- 20% of windbreaks more than 50 years old
  - 45% between 25 and 50 years old
  - 40% less than 25 years old
- Eastern redcedar remains the dominant species

Threats and Challenges

Protecting conservation tree plantings from threats is consistent not only with the national priority of protecting forests from threats, but also with conserving and managing working forest landscapes for multiple uses and value and enhancing the public benefits of sustainable forests. The NFS has identified the following threats affecting conservation tree plantings in the state:

- A declining agricultural economy increases tree removals to allow for more farmable acres, despite evidence showing negative impacts to yields.
- Increased prevalence or detections of insects and pests, decreasing tree and forest health.
- Limited access to regionally important tree species used in conservation forestry plantings.

- Decreasing public support and awareness of conservation forestry practices.
- Rising costs for renovating or replacing existing windbreaks.
- Lack of alternative species for windbreaks.
- Unpredictable weather extremes resulting in increased bare-root seedling mortality.

Table 57 ties the national priorities to identified threats, resources available to address them, and the associated State and Private Forestry programs.

Table 57: Conservation Trees Crosswalk

	THREAT	RESOURCES AVAILABLE	ASSOCIATED S&PF PROGRAMS*	SUPPORTS NATIONAL PRIORITY (1, 2, 3)**
LOSS OF FORESTLANDS				
1	Declining agricultural economy leads to an increase in tree removals to provide for an increase in farmable acres	State; Federal (S&PF, NRCS, FSA); Private	CE, RF	1,2,3
2	Declining forest health due to insects and disease (specifically EAB) & herbicide drift	State; Federal; Local government; Private; Tribes	FH, RF, CF	1,2,3
3	Extreme weather results in seedling mortality during reforestation efforts	State; Federal (S&PF, NRCS, FSA); Private	RF, AF	1, 3
POLICY				
4	Increased regulation around the species available for use in conservation forestry plantings	Federal; State; Private	RF, CFPT	1,2,3
5	Decreasing public support and awareness for conservation forestry practices	Federal (S&PF, NRCS, FSA); State, Local government; Private; Tribes	All	1, 3
6	Lack of alternative windbreak species to replace eastern redcedar; lack of research and development for replacement species	Federal (S&PF, NRCS, FSA); State, Local government; Private; Tribes	RF, CFPT	1,2,3
COST-SHARE AVAILABILITY				
7	Cost of renovating existing windbreaks	Federal (S&PF, NRCS, FSA); State, Local government; Private	RF, CFPT	1, 3

**AF=Agroforestry; CE=Conservation Education; CFPT=Conservation Forestry Planting & Trees; CF=Community Forestry; FH=Forest Health; FL=Forest Legacy; FP=Forest Products; RF=Rural Forestry; WF=Wildland Fire*
***National Priorities: (1) Conserve and Manage Working Forest Landscapes for Multiple Values and Uses; (2) Protect Forests from Threats; (3) Enhance Public Benefits from Trees and Forests*

Trends
Declining windbreak condition, decreased tree sales, decreasing statewide acreage of tree plantings, and anecdotal observations by retired practitioners tell a story of windbreaks disappearing from the landscape. With a declining agricultural economy, one of the first investments removed from operational activities is the planting or renovation of conservation trees. Without additional incentives or policy intervention, the NFS does not expect large investments by producers for tree planting or windbreak renovation over the life of this plan.

Impacts
The effects from the decline and loss of strategic tree plantings is already playing out in Nebraska. In the spring of 2018, for example, dry and windy conditions triggered two separate dust storms that overtook motorists on Interstate 80. These incidents led to pileups, serious injury, and one fatality. While it can't be said if trees would have completely mitigated these specific incidents, using trees to engineer ecological or environmental outcomes have been in practice since the Dust Bowl.

Tree plantings have also played an important role in shielding Nebraska's livestock industry from extreme weather. Most recently, during a rare bomb cyclone in March of 2019, livestock herds were subjected to blizzards, heavy rains, rapid snowmelt, and catastrophic flooding. While conservation tree planting may do little against flooding, landowners with windbreaks or shelterbelts reported increased survival among newborn cattle and their herds during the blizzard. This becomes important to note, given that livestock and crop losses from this single event reached nearly $1 billion (Gaarder, 2020).

Desired Outcomes
Healthy, strategic tree plantings can increase agricultural profits in a variety of ways. The Conservation Trees for Nebraska program is an important tool that must adapt to modern-day agriculture through the following desired outcomes:

- Increase the use and demand for conservation forestry plantings statewide.
- Establish new plantings using a diverse array of tree and shrub species.
- Use innovative and progressive windbreak designs that reduce the reliance on eastern redcedar to provide conservation benefits.
- With partners and stakeholders, actively pursue opportunities to develop alternative windbreak species for landowners and practitioners.
- Increase landowner awareness of the value and benefit of conservation forestry plantings.
- Provide quality training with partners to improve conservation planning across Nebraska.
- Provide high-quality, container-grown seedlings as alternatives to traditional bare root seedlings.
- Increase collaboration with other programs such as Community Forestry and Rural Forestry, increasing the potential to meet additional FAP goals.

Agroforestry

Overview
Agroforestry provides a unique opportunity to integrate trees and shrubs into crop and animal production systems. The interaction of these components creates practical and viable opportunities for landowners to foster environmental protection and, concurrently, access the economic and social benefits associated with agroforestry.

As the seat of the USDA's National Agroforestry Center (NAC)—a partnership between the United States Forest Service and the Natural Resources Conservation Service)—the state of Nebraska is opportunistically placed as a leader for agroforestry practice in the United States. The goal is to advance the health, diversity, and productivity of working lands, waters, and communities through the incorporation of agroforestry practices.

This program is core to fostering the adoption of agroforestry efforts in the PFLs. It also is essential to building on the relationship

between Nebraska's farm, ranch, and working forest landscapes.

Current Condition and Trends

A typical agroforestry system in temperate areas of the U.S. has five distinct practices: windbreaks, riparian buffers, alley cropping, silvopasture, and forest farming. Regional variations in ecosystems, climate, and land use predispose certain practices to specific regions. Although there may be the potential for the existence of all of these systems statewide, certain practices may be better suited for particular areas.

The state's fertile and productive soils provide many opportunities to incorporate agroforestry systems into agricultural land-use practices, including farming and ranching. There is potential to grow and develop agroforestry systems in the state, leading to diversified revenue streams for farm and ranching families. Agroforestry also presents an opportunity to avert and mitigate—to a considerable degree—the undesirable consequences of a changing climate on agriculture and forestry in Nebraska.

Threats and Challenges

As discussed throughout this document, there are a variety of conditions that exist that make establishing trees difficult. From an agroforestry perspective, these include issues such as shifts in climate and weather; limited staff capacity for training or assistance in the development of new systems; and limited financial support to incentivize the incorporation of these practices. Table 58 (next page) discusses the threats in relation to the national priorities, resources available to address them, and the associated State and Private Forestry programs.

Impacts

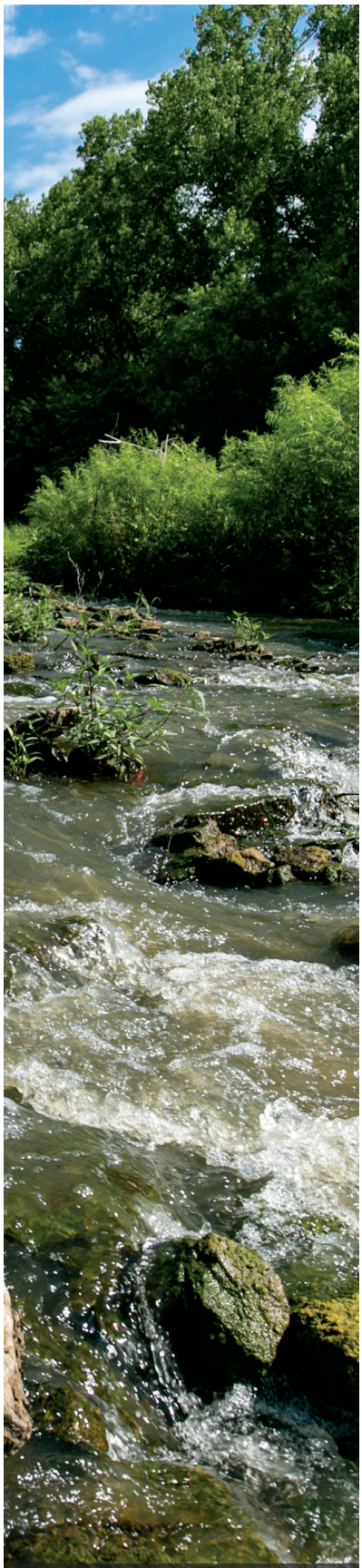
Land management provides the best opportunity to conserve, protect, and enhance trees and forests in Nebraska. Agroforestry systems allow landowners to create an environment where the species are diverse and the forest is productive. Practitioners are also afforded an array of revenue streams as they expand their base of marketable goods.

Desired Outcomes

- Strengthen the relationship between NRCS/NAC and NFS on agroforestry related issues/activities.
- Conduct a statewide assessment and inventory of all agroforestry-related practices.
- Incorporate Trees Outside Forests (TOF) methodology into state level inventories of agroforestry landscapes.
- Develop a repository of all practicing agroforestry landowners in Nebraska, leading to the creation of a state agroforestry working group.
- Use innovative strategies to adapt successful agroforestry models to the environmental and agricultural conditions in the Great Plains.
- Strive for an inclusive and diverse agroforestry working group (e.g. tribal nations, refugees, etc.).
- Develop a state-specific handbook with funding opportunities for agroforestry landowners.
- Organize annual agroforestry information and experience-sharing workshops for landowners.
- Develop, in collaboration with the University of Nebraska-Lincoln, a yearly annotated bibliography of all agroforestry related research.
- Engage researchers at the University of Nebraska-Lincoln on integrating climate mitigation (e.g. carbon sequestration) in agroforestry practices.
- Pursue opportunities to undertake graduate-level research and secure funding for agroforestry.
- Conduct a survey of public interest into agroforestry products.
- Increase collaboration across NFS issue areas: By working with other programs such as Community Forestry, Rural Forestry, and Forest Products, the Agroforestry program has the potential to help meet other FAP goals, making Nebraska's forests healthier and more sustainable.

Table 58: Agroforestry Crosswalk				
	THREAT	RESOURCES AVAILABLE	ASSOCIATED S&PF PROGRAMS*	SUPPORTS NATIONAL PRIORITY (1, 2, 3)**
WEATHER				
1	Difficulty in extreme weather prediction could render some significant level of vulnerability within systems	Federal (S&PF, NRCS, FSA); State, Local government; Private; Tribes	AF, CF, RF	1
POLICY & OTHER				
2	Existing programs and policies favor traditional agricultural activities	State, Local government; Private	AF, CE, RF	1, 2, 3
3	Limited regional production and financial information on agroforestry limits rates of adoption	Federal (S&PF, NRCS, FSA); State; Private; Tribes	AF, RF	1, 2, 3
4	Regional focus of practices and concerns may undermine the efficacy of local working groups	Federal (S&PF, NRCS, FSA); State	AF, RF	1, 3
5	Lack of versatility and flexibility could lead to difficulties in understanding the systems which may foster lack of interest on the part of landowners	Federal (S&PF, NRCS, FSA); State, Local government; Private; Tribes	AF, CE, RF	1, 2, 3
6	Lack of landowner understanding of applicability of specific agroforestry practices	Federal (S&PF, NRCS, FSA); State, Local government; Private	CFPT, RF	1,3
7	Absence of regional demonstrations or models that showcase productive and profitable agroforestry systems	Federal (S&PF, NRCS, FSA); State, Local government; Private	CFPT, RF	1,3
FUNDING				
8	Short-lived funding	Federal (S&PF, NRCS, FSA); State, Local government; Private; Tribes	All	1, 2, 3

**AF=Agroforestry; CE=Conservation Education; CFPT=Conservation Forestry Planting & Trees; CF=Community Forestry; FH=Forest Health; FL=Forest Legacy; FP=Forest Products; RF=Rural Forestry; WF=Wildland Fire*
***National Priorities: (1) Conserve and Manage Working Forest Landscapes for Multiple Values and Uses; (2) Protect Forests from Threats; (3) Enhance Public Benefits from Trees and Forests*



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Chapter 6: Other Statewide Concerns and Topics

Climate

Overview

Nebraska is already a difficult place to grow trees. The state is characterized by hot summers and cold winters, late spring and early fall freezes, fluctuating rainfall and growing seasons, frequent strong to severe winds, early snows, and ice storms. A changing climate presents additional, unique challenges to Nebraska's trees and forests. It is important that the NFS considers climate-related issues as it strives to implement the FAP, its current programs, and builds new initiatives that will serve Nebraskans in the future.

Current Condition

Average annual precipitation in Nebraska (1981 to 2010 climate normals) ranges from 15 inches in the west to 36 inches in the southeast, but can vary markedly from year to year. Precipitation is also received disproportionately throughout the year. Many locations see 75% of their annual average between the months of April and September, oftentimes in the form of rain from thunderstorms. Snowfall throughout the state ranges from 20 to 40 inches yearly, and can be heaviest in the middle of winter or in the spring, depending on the location. The growing season in Nebraska ranges from 120 days in the extreme northwest to 170 days in the southeast.

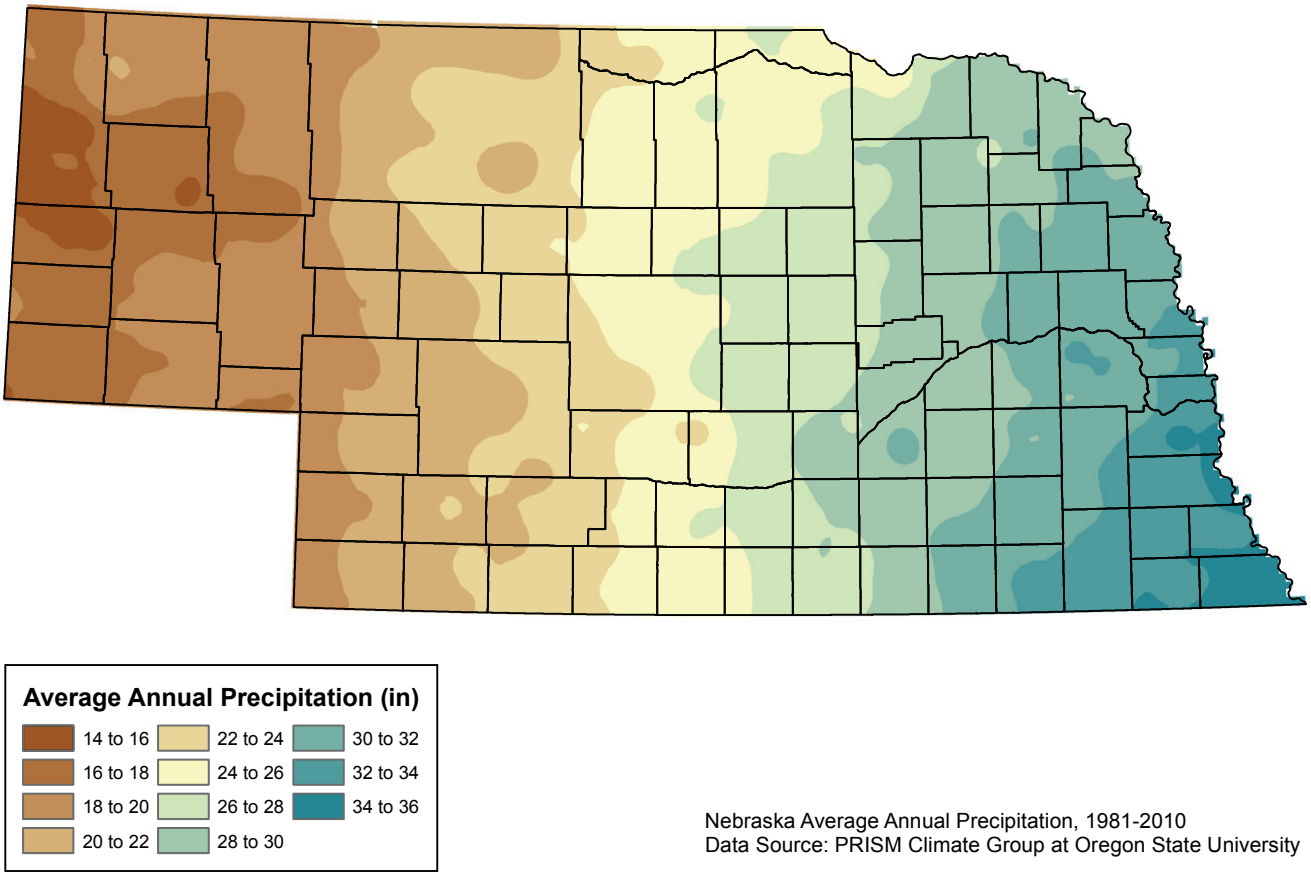
Drought is a regular occurrence in Nebraska, resulting in significant agricultural losses and stress on the state's tree and forest resources. In 16 of the last 20 years, a portion of Nebraska has been impacted by severe drought (D2) or worse, as indicated by the National Drought Mitigation Center's US Drought Monitor. The Panhandle and Sandhills have been hit especially hard, having seen prolonged periods of drought in recent years.

Torrential downpours, severe straight-line winds, tornadoes and hail are common. Tornadoes occur yearly, in varying number and intensity. Hailstorms can be very severe, particularly in western Nebraska, which reportedly has one of the highest hail frequencies in the country. During dry years, dust storms occasionally develop in the Panhandle and in the southwestern part of the state.

Nebraska's variable climate is the result of a combination of geographic features:

1. Nebraska's interior location, far from the moderating effects of large bodies of water; and
2. Nebraska's position on the leeward side of the Rocky Mountains.

Figure 38: Nebraska Average Annual Precipitation, 1981 – 2010



Nebraska Average Annual Precipitation, 1981-2010
Data Source: PRISM Climate Group at Oregon State University

Source: PRISM Climate Group, 2015

Projections

A 2014 report (Pryor, et al. 2014) suggests the Great Plains region can expect to see several changes in climate over the next several decades:

- Rising temperatures,
- Changes in growing season and crop cycles,
- Slow adaptation of species across a fragmented landscape,
- Stressed communities due to extreme weather events, and
- A magnitude of change exceeding the capacity of resources and planning.

Nebraska-centric research by Shulski & Williams (2020) further defines expectations for what changes in climate will mean in the state. The report specifically identifies the following concerns:

- Average annual temperature is expected to rise 2-5 degrees F by 2050.
- Annual number of extreme heat days (over 95 degrees F) is expected to double from about 15 to 30 by 2050.
- Growing season length is expected to increase by several weeks by 2050.
- Winter and spring precipitation is expected to increase by 15-25% while summer precipitation is expected to decrease by 5 to 15%. Fall precipitation will not change much.
- Heavy precipitation events could increase by 25%.

Trends

A changing climate is expected to have significant impacts on the Great Plains. Scientists project that temperatures will continue increasing during this century, with summer changes in the southern and central Great Plains projected to be larger than winter changes (Frankson, Kunkel, Stevens, & Shulski, 2017). Some studies indicate that average temperatures in the Great Plains have increased 1.5 degrees Fahrenheit relative to a 1960 to 1979 baseline (Karl, Melillo, & Peterson, 2009), and that temperatures in Nebraska have increased 1.6 degrees F since 1895.

An average of several climate models indicates the entire state will become warmer, with hotter summers, warmer winters, warmer overnight temperatures, and a fourfold increase in weather "anomalies," presumably including extended and intensified droughts. Other anticipated long-term climatic changes include more frequent heat waves and heavy rainfall that will impact many aspects of life throughout the Great Plains (Karl, Melillo, & Peterson, 2009).

Impacts

Nebraska's nearly 1.5 million acres of forestlands are unique in that they generally exist on the eastern, western, or southern edges of their native ranges, and grow under stressful conditions more conducive to prairie ecosystems rather than forests. However, these tree and forest resources provide critically important economic and ecosystem services. The 2014 report "Understanding and Assessing Climate Change, Implications for Nebraska" suggests climatic change has and will continue to substantially and negatively impact the state's tree and forest resources. Increased incidence and severity of drought and severe weather events, and higher day and night temperatures will seriously affect the health, vitality, and resilience of trees and can be readily observed (Bathke, Oglesby, Rowe, & Wilhite, 2014).

The increase in droughts and temperature is raising the prevalence and intensity of wildfires in the state. Compounded by excessive forest fuel loads, wildfire events have increased in frequency and size over the past 50 years. For example, wildfires in the ponderosa pine forests of the Pine Ridge in northwestern Nebraska have reduced forestlands by thousands of acres since 1994. These forests burned so intensely that nearly all living trees were eliminated across large areas, converting native forests to grassland. The removal of these trees also eliminates the sequestration of atmospheric carbon. Given that these forests represent the easternmost extension of ponderosa pine in North America, their loss would eliminate unique genetic adaptations to low elevation, hotter conditions.

Temperature fluctuations also negatively impact a tree's ability to withstand insect and disease pressure. Higher temperatures, especially at night, reduce carbohydrate reserves essential for vigorous growth and pest resistance, often for several years. Nebraska's pine forests lost thousands of trees in the 2000s to Ips engraver beetles (*Ips* spp.), part of the 35 million acres of forests killed recently by bark beetles in North America. Increasing temperatures and drought also affect community forests, disproportionately killing non-native tree species (e.g., white pine, spruce, etc.) that are poorly adapted to these changing conditions. Reduced vigor and increased mortality of trees in communities will further decrease the capacity of urban forests to mitigate higher urban temperatures, compromising human health.

While Nebraska has historically experienced a wide range of severe weather events, the predicted increases in frequency and intensity will clearly alter tree and forest composition statewide. Unprecedented flooding and other severe weather events common to the Great Plains (tornadoes, straight line winds, ice and early winter snow storms, early fall and late spring freezes) damage Nebraska's trees and forests. An increase in frequency and intensity of these events will likely increase tree mortality in some areas of the state. The loss of windbreaks and riparian forest buffers—coupled with more frequent severe weather events—will increase soil erosion, impair air and water quality, and decrease crop yields across Nebraska.

Desired Outcomes

Because of the wide ranging implications of climate variation to not only trees and forests, but to ecological communities throughout Nebraska, the following desired outcomes are actions agencies like the NFS can undertake to theoretically stem the windfall of negative effects that will certainly result from a shifting climate.

- Increase locally-appropriate species and seed source diversity to enhance resilience of community and conservation plantings.
- Thin coniferous forests to reduce competition for water, improve tree vigor, protect remaining islands of live forest stands isolated by previous wildfires, and decrease the risk of future wildfires.
- Foster the development of new products and markets for wood, especially for bioenergy applications, that create market drivers to support expanded forest thinning operations and offset the use of fossil fuels and further releases of ancient CO_2.
- Undertake large-scale tree plantings, with locally-appropriate species, to encourage the replacement of trees and forests damaged or killed by severe weather events and other conditions brought on by climatic shifts.

Threatened and Endangered Species

Overview

There are 30 species that have been listed as endangered or threatened in Nebraska (Schneider et al., 2018). The PFLs described in Chapter 3 are managed as critical habitat for these and many other species of wildlife. The responsibilities for the preservation of threatened or endangered species is clearly defined for the NFS through the Endangered Species Act (ESA) and the Nebraska Nongame Endangered Species Conservation Act. According to the U.S. Fish and Wildlife Service (2013), the ESA:

> *"...Protects endangered and threatened species and their habitats by prohibiting the "take" of listed animals and the interstate or international trade in listed plants and animals, including their parts and products, except under Federal permit...Federal agencies must consult with the FWS about an endangered or threatened species for an activity that occurs on private land where a Federal agency funds, authorizes, or carries out an activity. Private landowners who rely on Federal lands for activities such as grazing, energy development or recreation could also be affected."*

Additionally, the Fish & Wildlife Service states the ESA prohibits the "take" of any listed animal without a permit. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." Furthermore, the take prohibition includes "significant habitat modification or degradation that results in the direct killing or injury to the listed animal species." While listed plants are not protected from take, it is illegal to collect or maliciously harm them on Federal land.

Nebraska's Nongame Endangered Species Conservation Act (1975) or NESCA is Nebraska's state law regarding the conservation and protection of wildlife and plants found to be threatened or endangered. The NGPC is the state agency with statutory responsibility for administration of the Act. The NESCA prohibits take of any listed threatened or endangered species. Take is defined under section *§ 37-802 (6):*

> *"...Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct."*

While the law prohibits take of threatened and endangered species, exceptions to these prohibitions are outlined under section *§ 37-803,* subsection *(3),* and section *§ 37-806* subsections *(7) and (11)* and also in Nebraska State Regulation Title 163, Chapter 4, Sections 001 and 004. Take may be allowed for the purpose of enhancing the conservation and survival of a species; however, further consultation with the NGPC should occur.

Within the NESCA, section *§ 37-807, subsection (3)*, it is outlined that state agencies shall consult with the NGPC in furtherance of the purposes of NESCA by ensuring that actions do not jeopardize the continued existence of these species or critical habitat. In this section, a state agency is defined as:

> *"... state agency means any department, agency, board, bureau, or commission of the state or any corporation whose primary function is to act as, and while acting as, an instrumentality or agency of the state, except that state agency shall not include a natural resources district or any other political subdivision."*

The NFS, through the implementation of voluntary forestry BMPs and consultation with the NGPC, is committed to ensuring the long-term survival of Nebraska's threatened and endangered species, while continuing to foster management of Nebraska's forests.

Current Condition

Nebraska has 30 state-listed species that are under protection, including 11 that are federally-listed as endangered (Schneider et al., 2018).

There are a number of conservation success stories in regard to the recovery of threatened and endangered species in Nebraska. One recent example is the North American river otter. While it's currently listed as threatened in Nebraska, its population has been growing in the state's waterways since its reintroduction in 1986. New data, expert input, and a successful recovery program, has prompted NGPC to propose removing the river otter from the state threatened species list (Panella & Wilson, 2018).

As the NFS provides financial and technical assistance on both state and federal lands, in addition to private lands, navigating compliance with both state and federal law, can be cumbersome. In situations where the agency collaborates with partners on federally-held public lands, ESA supersedes state law. When working with state agencies or private landowners, NESCA becomes the standard when assessing forest management projects. Additional guidance from both state and federal partners would be advantageous as the NFS grows its services to serve more forestland and tree owners across Nebraska.

Table 59: Threatened and Endangered Species Commonly Present in NFS Project Areas

Priority Landscape	Whooping Crane	Interior Least Tern	Piping Plover*	River Otter	Northern Long-eared Bat	American Burying Beetle	Timber Rattlesnake
Pine Ridge					X		
Niobrara Valley	X	X	X	X	X	X	
Loess Canyons	X	X	X	X		X	
Wildcat Hills				X	X		
Missouri River	X	X	X	X	X		X
Central Loess Hills	X	X	X		X		
Nemaha River					X		
Big/Little Blue Rivers	X				X		
Platte River (E, Central, & W)	X	X	X		X		
Republican River	X				X		
Loup Rivers	X	X	X		X	X	X
Elkhorn River	X	X	X		X	X	X

("X" indicates species range overlap with operational area)
**Piping plover is federally listed as endangered under the Endangered Species Act.*

Before work begins in an area, the NFS completes an assessment to determine which, if any, species may be affected prior to implementing projects. If it is determined that the project may have an adverse effect on a listed threatened or endangered species, further consultation with the appropriate agency occurs. Table 59 (*previous page*) represents species most commonly present in PFLs. Not all species included directly or indirectly impact the work of NFS field staff. To find a reference to Nebraska's current threatened or endangered species, please see Appendix C.

Impacts

Endangered and threatened species are animals and plants whose continued existence in Nebraska is in jeopardy. By officially designating a species as endangered or threatened, plans can be put in place to mitigate extirpation, restore the species, or prevent extinction. While the NFS does not manage wildlife in Nebraska, forests play an important role in the life cycle of many species across the PFLs. Ensuring trees remain healthy and resilient, through the use of forestry BMPs, can make significant contributions to the recovery of protected species in the state.

Desired Outcomes

NFS projects and initiatives will strive to improve the resiliency, health, and sustainability of trees and forests. These, in turn, will create healthier landscapes for threatened and endangered species. This will be achieved through adherence to state and federal law, utilization of forestry BMPs in consultation with landowners and managers, and seeking partnership opportunities that increase the stewardship of forestlands for species recovery.

NFS staff, programs, and projects will continue to consider threatened and endangered species impacts throughout planning and implementation. The agency will maintain frequent communication and collaboration with state and federal wildlife agencies to ensure continued compliance with threatened and endangered species regulations.

Invasive & Aggressive Native Plant Species

Overview

The USDA Natural Resources Conservation Service (n.d.) defines invasive species as species that are non-native to an ecosystem, or species whose introduction to an ecosystem causes or is likely to cause harm to the ecosystem's economy, environment, or human health.

Invasive species can be plants, animals, or other organisms such as microbes. About 400 of the almost 1,000 threatened and endangered species classified under the ESA are considered at risk primarily due to competition or predation by non-native species. In the United States, damages and losses due to invasive species total almost $120 billion each year (Pimentel, Zuniga, & Morrison, 2005).

Aggressive, native plant species are indigenous plants that spread rapidly and can overpower other native vegetation. The USDA uses the term "opportunistic" to describe a native plant that is able to take advantage of a disturbance and spread quickly, outcompeting adjacent plants communities. Plants that are native and opportunistic or aggressive should not be classified as an invasive species. For example, treatment or management of a native species will often have supplemental or negative impacts as these individuals tend to provide at least some benefit to the greater ecological community. In Nebraska, eastern redcedar is the primary species that fits into the category of native/aggressive as it has encroached into pine and deciduous forests as well as prairies.

Current Condition

In Nebraska, purple loosestrife (*Lythrum salicaria*), saltcedar (*Tamarix ramosissima Ledev* and *Tamarix parviflora DC*), and *phragmites* threaten the integrity of aquatic ecosystems across the state. These species spread aggressively throughout rivers and wetlands, outcompeting more desirable native species by blocking and altering the system's hydrology.

Russian olive (*Elaeagnus angustifolia*) is native to southeastern Europe and western Asia. The

tree was introduced to the United States in the late 1800s as an ornamental and windbreak species, but it quickly naturalized itself and spread throughout most of the country. In upland areas of western Nebraska, Russian olive is a valuable conservation tree because of its drought and pest tolerance, ability to thrive in a variety of growing conditions, and its use by local wildlife. However, this seed source is readily dispersed by birds throughout the landscape. Without management, particularly in bottom-land areas where moisture is abundant, Russian olive will spread vigorously and outcompete neighboring species. In many riparian areas, especially in western and central Nebraska, Russian olive is threatening native cottonwood forests.

Other non-native invasive species are becoming serious threats to the ecological stability of central hardwood forests in eastern Nebraska. These include honeysuckle (*Lonicera* spp.) and buckthorn (*Rhamnus* spp.). These particular species are able to quickly colonize unmanaged woodlands and represent one of many ongoing challenges for woodland owners today.

Native to Asia, honeysuckle is a deciduous shrub that was introduced into the United States in 1846. It escaped cultivation due to high seed production and dispersion by foraging wildlife. It forms dense understory thickets in forests, shading out other shrubs and tree seedlings while disrupting tree reproduction and forest succession. The loss of ash species due to EAB will exacerbate existing challenges with honeysuckle management. Common buckthorn is a shrub or small tree that invades open oak woods, deadfall openings in woodlands, woodland edges, roadsides, prairies, and open fields. It forms dense thickets, crowding and shading out native shrubs and herbs, often completely eradicating them.

Japanese barberry (*Berberis thunbergii*) is also a serious invasive pest in eastern hardwood forests. It typically is found in locations of partial sunlight, such as a forest edge, and can survive under an oak canopy where it shades out other understory species. One recent research study (Link, Turnblacer, Snyder, Daugherty, & Utz, 2018) suggests Japanese barberry changes the soil chemistry in the environment it inhabits.

The invasive Callery pear (*Pyrus calleryana*) is adapted to a wide variety of environmental conditions. It has established in forest and woodland understories, open areas in many areas of the eastern US, and is becoming a problem in some eastern Nebraska communities. Other species of concern include autumn-olive (*Elaeagnus umbellata*), Amur maple (*Acer ginnala*), wintercreeper (*Euonymus fortunei*), garlic mustard, goldenraintree (*Koelreuteria paniculata*), privet (*Ligustrum spp.*), white mulberry (*Morus alba*), tree-of-heaven (*Ailanthus altissima),* and Siberian elm (*Ulmus pumila*).

Eastern redcedar, a hardy native tree species, is rapidly expanding across much of the state. Its adaptability to a wide range of conditions, the lack of fire on the landscape, changes in farm and grazing practices, drought, lack of grassland and forest management, changes in land-ownership patterns, and conservation plantings acting as seed sources are contributing factors to its expansion. Redcedar has expanded more than any other species across much of the Midwest and Great Plains, with Nebraska experiencing the greatest forest density of cedar trees/acre of any Midwestern state (USDA Forest Service, 2018). The spread of cedar in Nebraska is especially significant from west-central to eastern Nebraska.

Trends

It is anticipated the ranges of invasive and aggressive native plant species will continue to expand in Nebraska's forests, negatively affecting these ecosystems. This issue will be exacerbated by expected changes in climate, this according to the research of Bathke, Oglesby, Rowe, and Wilhite (2014) in "Understanding and Assessing Climate Change: Implications for Nebraska."

Impacts

Invasive and aggressive native species have the potential to dramatically alter ecosystems by outcompeting species within their natural range. For example, in riparian areas, invasive

species can choke river channels, altering natural hydrologic regimes. In forestlands, the conversion of forest types can displace woodland-dependent species as the habitat changes. In grasslands, the encroachment of aggressive native or invasive species reduces grassland habitat and forage production for livestock.

Eastern redcedar has received considerable attention in the past 20 years because of its rapid spread into rangeland and forests. In addition to habitat and species displacement, dense eastern redcedar stands have created a new fire hazard in many riparian forests and grassland systems. In March 2009, a fire in an eastern redcedar/cottonwood riparian forest intensely burned 640 acres along the Platte River. The fire closed Interstate 80 near Kearney for seven hours and resulted in economic losses of nearly $7 million. If eastern redcedar continues to encroach into cottonwood forests, an entirely new fire-prone forest type will exist along hundreds of miles of river corridor in Nebraska.

Shifts in plant communities due to the spread of invasive or aggressive native species corresponds to a loss in plant diversity and productivity, a change in the water balance of the riparian forest, and a loss in availability of resources for wildlife and livestock. The high cost of managing these species is a limiting factor for many of Nebraska's landowners. In some instances, such as those involving eastern redcedar, active management can create value-added products (posts, shavings, logs, and biomass) that offset management costs or provide returns on investment for landowners. More information about eastern redcedar in Nebraska can be found in Appendix B.

Desired Outcomes

NFS programs and initiatives will increasingly address the challenges of invasive and aggressive native species in Nebraska's trees and forests over the next ten years, through the following activities:

- Make alternative species for conservation plantings available for widespread use.
- Redesign conservation plantings to provide efficiency with alternative species.
- Reduce the total number of acres affected by invasive and aggressive native species.
- Focus tree planting efforts on non-aggressive native species.
- Reduce eastern redcedar ladder fuels in hardwood and coniferous forests, lowering wildfire risks.
- Manage aggressive, native species through targeted mitigation and cost-share programming.
- Increase collaborative efforts with other agencies and landowners to address management needs.
- Develop new approaches to address the challenges of invasive species management.
- Consult with tree planters and nursery growers to discourage the planting of potentially invasive or aggressive species.

Forest Legacy

Overview

Nebraska's forests encompass an array of diverse habitats, but these areas face a wide range of serious threats. Uncharacteristic wildland fires, destructive invasive insects and diseases, a changing climate, increased urbanization, and pressure to convert to agricultural uses can all result in the loss of forests. However, conversion of land for non-forest use is a significant threat that can be addressed by landowners and the NFS.

In Nebraska and nationally, the Forest Legacy Program authorizes the USFS or state governments to purchase critical forestlands for the purpose of preventing those lands from being converted to a non-forest use. In Nebraska, forestlands that contain important scenic, cultural, recreational, fish and wildlife habitats, water, or other ecological resources that will support continued traditional and new forest uses receive priority. Lands purchased under this program must become productive and working forestlands with an active management plan.

Nebraska's Assessment of Need (see Appendix A), adopted in 2016, evaluates forested areas

Table 60: Threats to Forestlands, Forest Legacy Assessment of Need		
CONVERSION AND FRAGMENTATION	**PARCELIZATION**	**URBANIZATION**
Higher value use conversion from forest to agriculture or other use	Conversion from large properties into smaller and smaller ownerships	Conversion from forest to primary homes, ranchettes, and second homes

with important environmental and conservation values for inclusion in Nebraska's Forest Legacy Program. The assessment identifies high-value target areas, provides defined and delineated boundaries, and describes each Forest Legacy area and its reason for inclusion in the program. Table 60 highlights the threats commonly experienced on privately-held forestlands.

The public's attitudes and behaviors toward trees are shifting, especially in agricultural areas. Changes in crop prices and land values have brought back "fencerow to fencerow" planting, where all lands must be in production for an operation to remain profitable. Recent droughts—leading to concerns about trees competing for water—have prompted many landowners to discontinue or remove trees from their lands. The rapid and widespread adaptation of pivot irrigation has spurred landowners to remove riparian and buffer trees across the state. Producers have less time to manage for conservation and opt to simplify their operations by removing trees.

While Nebraska's population growth has been slower than other states, urbanization and parcelization is still occurring. More than half of Nebraska's population lives in Lancaster, Sarpy, and Douglas counties in eastern Nebraska, making protection of riparian forests a critical need in these areas. The Forest Legacy Program is a tool to combat land-use conversion and keep Nebraska's working forests productive for the benefit of Nebraskans.

Current Condition

The 460-acre Chat Canyon Wildlife Management Area is the only Forest Legacy property in Nebraska. It was named for the avid birding that past owners Jackie Canterbury and Jack Gustafson enjoyed on this property. Chat Canyon is in Cherry County and is owned by the NGPC. The NGPC has joint management responsibilities with the NFS, which is the first partnership of this kind for both agencies. These collaborative efforts will fulfill the requirements of the Forest Legacy grant, a program designed to keep "working forests" intact, protect water quality, provide habitat, forest products, opportunities for recreation, and other public benefits.

Trends

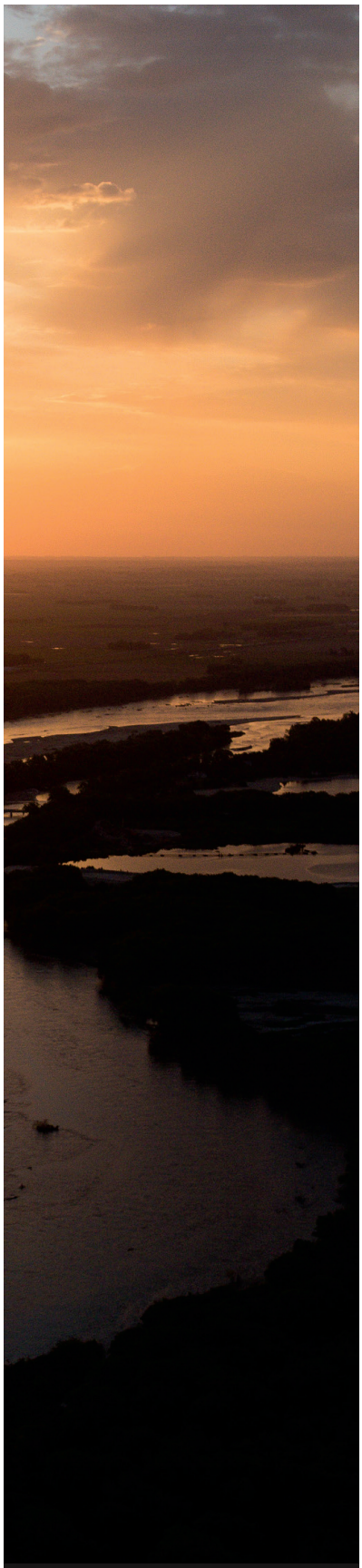
The NFS anticipates that other areas will become eligible for the Forest Legacy Program over the next ten years. However, holding easements is a challenge in Nebraska. The NFS is unable to hold conservation easements, making its role one of facilitation and not administration. If Forest Legacy rules changed to allow conservation groups to hold these easements, several projects in the state would be eligible and likely enrolled in this program.

Impacts

The conversion of native landscapes for human use is a trend that has existed since the earliest days of European settlement in Nebraska. This has made both naturally-occurring and planted forestlands subject to pressure and removal. Forest Legacy provides a mechanism by which important cultural or ecological woodlands can be protected while still providing a wide array of conservation and societal benefit.

Desired Outcomes

The NFS will work with the administrators of Forest Legacy to attempt to amend rules that allow alternative entities to hold easements. This will create conditions necessary to increase program enrollment, allowing more forestlands and forested acres to become permanently protected in the state.



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Chapter 7: Partner and Stakeholder Engagement

The NFS, with its partners, provides leadership and support for Nebraska's trees and forests. While this is specifically the mission of the NFS, it is a mission that cannot be accomplished alone. Nebraska's conservation, environmental, and agricultural interests all play a large role in enriching the lives of Nebraska's residents by protecting, restoring, and utilizing the state's tree and forest resources. The contribution of external partners is critical to carrying out the goals and objectives contained within this FAP. New partnerships are also needed as the NFS moves Nebraska's priority forest landscapes towards a desired future condition.

Collaboration between NFS programs and academic departments is also a priority. The NFS is in the process of a reorganization that will support and expand collaboration during this planning period. This will further develop and grow relationships with units at the University of Nebraska, allowing the agency to find creative and innovative solutions for the challenges facing trees and forests in the state.

The NFS works with a large number of public and private interests, municipalities, state agencies, and many others. Some of these partnerships are briefly described below. This list is meant to be illustrative, not all-encompassing.

USFS State & Private Forestry Program

State & Private Forestry provides technical and financial assistance to forestry agencies to support programs targeted to state and privately-owned forestlands. NFS partners with State & Private Forestry through four separate programs that complement NFS programs: Forest Health, Urban and Community Forestry, Wildland Fire Protection, and Forest Stewardship. The USFS's State & Private Forestry program has long been an enormously valuable and central partner to the NFS and its programs.

USFS staff provide important feedback and guidance to state forestry agencies. As new issues emerge, State & Private Forestry continues to provide critically needed technical support to the state, including areas such as invasive species, rural and community forest inventory and analysis, forest health, and fire protection and suppression. The USFS Rocky Mountain Research Station and other research stations have conducted important studies and provided results of considerable value to the agency and its programs. This partnership will be strengthened in the future as the demands for tree and forestry-related research grow.

The Nebraska National Forest, the only national forest in Nebraska, is also a valuable partner. USFS's staff and NFS conduct

joint planning activities and collaborate across agency missions to achieve landscape-level impacts across forest ownerships in the Pine Ridge and Bessey Unit in north central Nebraska. The USFS's Bessey Nursery in Halsey is also an important tree planting partner for the agency and stakeholders statewide.

Nebraska Natural Resources Conservation Service

The Nebraska Natural Resources Conservation Service (NRCS), which is part of the USDA, is a federal agency responsible for natural resources conservation on private lands. NRCS works in partnership with private landowners and a variety of natural resource agencies to develop and implement conservation plans that promote healthy, sustainable environmental resources. Periodically, NRCS has designated substantial Environmental Quality Incentives Program funding for forestry cost-share activities statewide.

Natural Resources Districts

Nebraska's 23 NRDs are local governmental units charged with protecting the state's natural resources, including soil, water, forests, range, recreation, and fish and wildlife habitat. Nebraska's NRDs work in partnership with state and federal agencies to implement conservation practices that protect Nebraska's natural resources.

Because of the common mission relative to conservation tree planting and forest management, the NFS has developed strong partnerships with individual NRDs and the Nebraska Association of Resource Districts. Since the inception of NRDs in 1972, the NFS has entered into a number of cooperative agreements with individual NRDs to enhance forestry activities. Although agreements vary, they all involve shared funding for NRD foresters or their activities.

All 23 NRDs administer conservation tree programs to provide low-cost tree/shrub seedlings to landowners for conservation purposes. NFS administered the Nebraska Conservation Trees program statewide from 1926 until 2002, at which time program administration was transferred to the NRDs. The NFS continues to strongly support all NRD conservation tree programs.

Nebraska Game and Parks Commission

Established by the Legislature in 1901, the NGPC works to conserve Nebraska's natural resources. The Commission establishes hunting seasons and regulates for game species; manages Nebraska's state parks, state recreation areas and other public lands; manages the fisheries at numerous public lakes across the state; helps landowners establish good conservation practices on their land; works to conserve Nebraska's threatened and endangered species; and provides hunter and boater education, as well as other resources for those who wish to learn to enjoy the outdoors. NGPC is a key partner with the NFS in implementing the state's Forest Legacy Program, reducing forest fuel loads in wildlife management areas and state parks, and in developing improved prescribed burning programs.

Nebraska Department of Agriculture

The Nebraska Department of Agriculture regulates the state's food, farming, ranching, and nursery industries. It also cultivates partnerships with public and private sector organizations to protect and grow these industries. Invasive insect and disease pests pose a substantial threat to Nebraska's forest resources. For this reason, NFS works closely with NDA to develop monitoring and detection activities and preparedness plans for mitigating the impacts of invasive species.

In 2006, the NFS began working with the Department and other partners as part of the Nebraska Emerald Ash Borer Working Group. This group developed a statewide readiness and response plan for delaying the introduction of EAB into the state and to find, contain, delimit, and minimize the impact of EAB once introduced. This preparation greatly facilitated the state's response when EAB was first detected in 2016 in Omaha. In addition, NDA and NFS have compliance agreements for

moving ash wood outside of the quarantine for pest education and wood utilization projects conducted by NFS.

Weed Management Areas

Since 1998, counties and other interested parties have joined forces to control the spread of invasive species in Nebraska. These partnerships allow for the sharing of knowledge and resources to help control the spread of invasive species. Known as Weed Management Areas, these local organizations bring together stakeholders (e.g., landowners, natural resource professionals) to develop plans for managing invasive species within a delineated area. The NFS works with three entities (Northern Dawes County Cooperative Weed Control Project, Northern Sioux County Weed Control, and Sandhills Weed Management Area) that manage lands next to or near federal properties. The NFS reviews weed management projects annually and provides federal cost-share funds to help with weed management activities.

The NFS also participates in the Governor's Riparian Vegetation Task Force and the Nebraska Invasive Species Council providing technical assistance in the management of invasive plant species.

USDA Animal and Plant Health Inspection Service – Plant Protection and Quarantine

APHIS (Animal and Plant Health Inspection Service) is the USDA agency charged with protecting Nebraska's agricultural interests through programs in animal health and welfare, plant protection, biotechnology, animal damage management, emergency preparedness and response, permitting, and regulating agricultural imports and exports. Plant Protection and Quarantine is an APHIS program that protects agricultural and natural resource interests from the entry, establishment, and spread of plant pests and noxious weeds.

Through Nebraska's Emerald Ash Borer Working Group, the NFS worked with APHIS and other groups to develop effective monitoring and detection methods for EAB and to create a statewide readiness and response plan for mitigating EAB's impacts in Nebraska.

Rural Fire Districts

The volunteers in Nebraska's 481 rural fire districts provide fire protection and fire prevention education programs to residents of their districts. The NFS works closely to provide planning, training, grant assistance, and equipment that increases districts' capacity to protect life and property while implementing effective education programs.

University of Nebraska

The NFS is part of the Institute of Agricultural and Natural Resources at the University of Nebraska-Lincoln. Through teaching or training arrangements, NFS staff have become additional resources for student scholarship and career development. Furthermore, through unique positioning within the University, the NFS is able to align missions with other units including Nebraska Extension, Agricultural Research Division, the College of Agricultural Sciences and Natural Resources, and many others. NFS deliverables and impacts are undoubtedly amplified through collaboration with the University.

Others

As the NFS continues to build partnerships to better serve Nebraskans, an ever-growing list of collaborators, stakeholders, and technical experts have provided the agency with critical knowledge to better carry out its mission. This list includes, but is not limited to:

State Fire Marshal's Office, Nebraska Emergency Management Agency, Conservation Roundtable, Nebraska Invasive Species Council, Nebraska Drought Mitigation Center, Nebraska Environmental Trust, Nebraska Statewide Arboretum, The Nature Conservancy, National Wild Turkey Federation, Pheasants Forever, Nebraska Arborists Association, Nebraska Nursery and Landscape Association, Arbor Day Foundation, Keep Omaha Beautiful, Nebraska Community Forestry Council, Prairie Pines Partners, Nebraska Nutgrowers Association, Hybridized Hazelnut Consortium, Great Plains Tree Pest Council, and the public.

Section II: Statewide Forest Resource Strategy

With more than 50 full-time employees, the NFS is a small organization with a large and important responsibility—providing technical and financial support for the improved health of Nebraska's trees and forests. Funded through a combination of state and federal sources, the agency relies heavily on partnerships with other federal and state agencies, nonprofits, and the private sector to jointly implement a diverse portfolio of programs that address state and national issues of high priority.

The NFS, part of the University of Nebraska system, within the Institute of Agriculture and Natural Resources, aligns its strategic goals with issues focusing on:

- Rural economic development and entrepreneurship,
- Natural resources management and environmental quality,
- Economically viable and sustainable food and biomass systems, and
- Communities and appropriate quality of life for individuals and families.

Federal resources used to support NFS programs are focused on contributing to the national programmatic themes of the USFS S&PF Program:

- Conserving working forest landscapes,
- Protecting forests from harm, and
- Enhancing public benefits from trees and forests.

To address these priorities across all lands, the strategic goals and actions detailed in Section II are intended to guide the NFS in achieving its mission of protecting, enhancing, and utilizing Nebraska's tree and forest resources and achieving landscape-level conservation of these forestlands. Several overarching strategies will guide the agency over the life of this FAP:

- Orient existing resources and assets to maximize impacts;
- Develop and strengthen partnerships to expand impacts;
- Seek financial resources from an increasingly broad array of sources; and
- Build capacity while concurrently expanding programming activities and impacts.

Chapter 8: Goals and Strategies

Overview

As detailed in preceding sections, Nebraska's forests and trees provide a plethora of benefits to all Nebraskans. From improved water and air quality to enhanced agricultural productivity, the spectrum of benefits Nebraskans receive is diverse. However, the public and private investment needed to sustain these resources is often unmet. The coalition of state forestry agencies, the USFS, and many partners remain committed to maximizing the ecological, environmental, and emotional benefits that trees and forests provide. This is evident from the development of state FAPs, national forest plans, and state wildlife action plans, all of which focus limited resources on the areas of greatest need.

This chapter identifies goals, strategies, objectives with measurable outcomes, and performance measures for the stewardship of trees and forests in Nebraska. The plan demonstrates how funds are leveraged to provide these results and how national priorities are supported. Strategies focus on supporting the national priorities to conserve, protect, and enhance trees and forest resources across the state.

The goals set forth in this document were designed to stretch the abilities of the NFS and its partners. These goals are not intended to be easy or achieved in isolation; each will challenge the NFS and all Nebraskans if we are to achieve a greater good for the state.

Specific Goals for 2020

Planning for this document began with the expertise of NFS field staff. These teams developed core issue areas for each of Nebraska's PFLs. The identified threats and desired outcomes were then used to directly inform the 12 goals and 22 resource strategies outlined in this chapter. NFS programs, staff, stakeholders, and partners will be essential in implementing the following 2020 FAP goals:

1. Enhance and promote the role of Nebraska's forests and trees for mitigation and adaptation to the global change in climate.
2. Manage trees and forest landscapes to include rural and community forest settings.
3. Manage the function of forest and tree systems in Nebraska for maximum and sustained benefits.
4. Improve, protect, and enhance fish and wildlife habitat in Nebraska.
5. Restore fire-adapted landscapes and reduce risk of wildfire impacts on Nebraska's trees, forests, and communities.
6. Manage for the health and productivity of Nebraska's trees and forests.

7. Manage and build the capacity of Nebraska's trees and forests, in conjunction with the forest products industry, agriculture, and communities, which are all vital to Nebraska's economy.
8. Maintain the natural environments of Nebraska including trees and forests, waterways, and rangelands.
9. Manage Nebraska's forest and trees to enhance the water resources of Nebraska.
10. Improve air quality and energy conservation through tree planting.
11. Connect people to the state's trees and forest resources.
12. Engage Nebraskans in the stewardship of trees and forests.

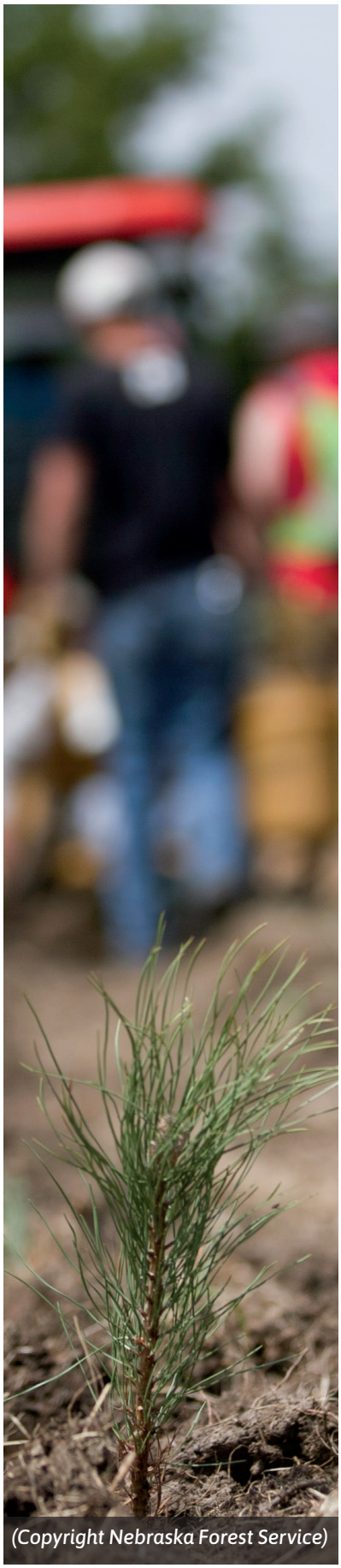
Program/Goals Matrix

The national priorities to conserve, protect, and enhance trees and forests in Nebraska are met by NFS staff, dispersed among nine program areas, that will be the drivers toward implementing the 12 FAP goals outlined in this document. Table 61 specifies which program areas coalesce around the stated goals, under the assumption that each meets all three national priorities.

Table 61: FAP Goals and NFS Program Crosswalk

National Priorities Conserve | Protect | Enhance									
FOREST ACTION PLAN GOALS	**NFS PROGRAMS (INCLUDING S&P FOREST PROGRAMS)**								
	FH	**CF**	**RF**	**FP**	**WF**	**CE**	**FL**	**AF**	**CFPT**
1. Enhance and promote the role of Nebraska's forests and trees for mitigation and adaptation to the global change in climate.	√	√	√	√		√	√	√	√
2. Manage trees and forest landscapes to include rural and community forest settings.	√	√	√	√	√	√	√	√	√
3. Manage the function of forest and tree systems in Nebraska for maximum and sustained benefits.	√	√	√	√	√	√	√	√	√
4. Improve, protect, and enhance fish and wildlife habitat in Nebraska.	√	√	√	√	√	√	√	√	√
5. Restore fire-adapted landscapes to reduce risk of wildfire impacts on Nebraska's trees, forests, and communities.	√		√	√	√	√	√		
6. Manage for the health and productivity of Nebraska's trees and forests.	√	√	√	√	√	√	√	√	√
7. Manage and build the capacity of Nebraska's trees and forests, in conjunction with the forest products industry, agriculture, and communities, which are all vital to Nebraska's economy.	√	√	√	√	√	√	√	√	√
8. Maintain the natural environments of Nebraska including trees and forests, waterways, and rangelands.	√	√	√	√	√	√	√		
9. Manage Nebraska's forest and trees to enhance the water resources of Nebraska.	√	√	√	√	√	√	√	√	√
10. Improve air quality and energy conservation through tree planting.	√	√	√	√	√	√	√	√	√
11. Connect people to the state's trees and forest resources.	√	√	√	√	√	√	√	√	√
12. Engage Nebraskans in the stewardship of trees and forests.	√	√	√	√	√	√	√	√	√

AF=Agroforestry; CE=Conservation Education; CFPT=Conservation Forestry Planting & Trees; CF=Community Forestry; FH=Forest Health; FL=Forest Legacy; FP=Forest Products; RF=Rural Forestry; WF=Wildland Fire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Chapter 9: Implementation Approach

The NFS has developed strategic actions that serve as the vehicles for addressing the FAP's stated goals and the desired future condition of Nebraska's priority forest landscapes. This list was created to align goals, strategies, justifications, objectives, and performance measures with the challenges that are anticipated to occur while implementing Nebraska's FAP.

FAP Goal 1: Enhance and promote the role of Nebraska's forests and trees for mitigation and adaptation to the global change in climate.

Strategy 1: Increase tree planting to improve energy efficiency and air and water quality; address challenges posed by EAB.

Justification: Nebraska's forests offset significant carbon emissions. Additional benefits could be achieved through partnerships and management measures that promote woody biomass energy or plant trees for increased energy efficiency, air quality, and water quality. Because forests' benefits, including biodiversity, wildlife habitat and protection of water quality and quantity, are also affected by climatic shifts, preserving forest landscapes is paramount to ensuring these benefits are sustained.

OBJECTIVES	PERFORMANCE MEASURES
1. Increase #, native diversity, and survival of trees planted	# of trees planted; # of native species planted; survival rate
2. Increase landowner participation in programs	# of participating landowners
3. Increase tree planting capacity	Availability of quality stock; # of tree planters
4. Create carbon sink	# of trees planted

Approach 1: Focus on reforestation efforts.	
Challenges	More than 50 million trees have been lost in high priority landscapes Low survival rates for planted stock in the wildlands ▸ Weather conditions in the summer (hot and windy with limited moisture) lead to poor survival of bare-root planting stock Limited funding ▸ Reforestation cost @ $1.49 per tree or $298 per acre (180,000 acres) would cost approximately $53.6 million Lack of capacity ▸ Professional tree planters Quality seedlings and other planting stock
Tactics	Plant containerized seedlings for increased survivability (survival is near 90%) Plant diverse tree species Prioritize planting at microsites with north/east aspect slopes Engage landowners through outreach and education Develop cost-share programs to assist with planting Work with partners to promote planting Employ more reforestation and community foresters
Gaps in Funding	Need more cost-share programs for planting trees
Gaps in Capacity	Reforestation foresters Qualified tree planters available High-quality containerized seedlings Willing landowners
Gaps in Knowledge	Landowner education on tree planting programs and native/non-native species ▸ Education on non-native invasive species and native species ▸ Outreach to willing landowners and other stakeholders

Approach 2: Assist communities in the recovery from EAB.	
Challenges	These invasive insects threaten 44 million ash trees in Nebraska; one million of these trees are in communities Cost for ash removal, disposal, and replacement will be over $961 million Without replacement, loss of canopy will diminish the ability of communities to adapt to climatic change
Tactics	Comprehensively address EAB in communities: ▸ Work with partners to identify suitable replacement species ▸ Develop sources for alternative species to replace ash ▸ Work with communities to replace dead and dying ash ▸ Diversify community tree canopies ▸ Increase number of certified arborists and community personnel Employ more reforestation and community foresters, both NFS and partners
Gaps in Funding	New and updated community inventories Funding for EAB recovery plans Community recovery funds related to EAB Tree boards Education and outreach Wood utilization and urban wood networks
Gaps in Capacity	Community forestry staff ▸ NFS staff ▸ Community personnel ▸ Certified arborist Available high-quality planting stock
Gaps in Knowledge	Community education on invasive tree pests and disease ▸ Outreach to homeowners and other stakeholders ▸ Firewood sellers and users: lack of understanding of quarantines and compliance agreements ▸ Importance of not moving firewood

Strategy 2: Mitigate the negative impacts of climatic change through partnerships.

Justification: Nebraska's forests have the potential to offset significant carbon emissions. Additional benefits can be achieved through partnerships and management measures that promote the production of wood products as an alternative to disposal/burning and tree planting for energy efficiency and improved air and water quality.

OBJECTIVES	PERFORMANCE MEASURES
1. Leverage partnerships to increase planting and development of woody biomass utilization	# trees planted via partners; # of woody biomass utilization opportunities
2. Leverage partnerships to increase landowner and public understanding of the effects an alternative climate will have on forests and communities	# of people reached
3. Develop, with partners, alternative species for planting and building diversity in tree canopy	# species developed with partners
4. Create carbon sink	# of trees planted

Approach: Promote partnerships and engagement.	
Challenges	Public and political apathy and antagonism about changes in climate Partners sometimes have differing missions and approaches to issues
Tactics	Engage partners, stakeholders, and the public by focusing on common ground and increasing opportunities to work together towards climate stabilization Work with neighboring states and universities to develop alternative species for planting With partners, develop tree species and planting programs that allow trees to thrive in different climate scenarios With partners, develop innovative uses for forest products, including biochar, to provide for long-term carbon storage and reduced greenhouse gas emissions With partners, promote agroforestry systems and conservation tree planting to offset carbon emissions Utilize pivot corners, fence lines, and shelterbelts as planting sites to: ▸ Add to the biodiversity of a site ▸ Provide habitat for wildlife ▸ Store carbon With partners, develop guidelines for forest management on a wide range of topics, including weather extremes and climate shifts ▸ Share the guidelines with landowners, homeowners, and stakeholders via workshops, outreach, & education Use and encourage others to use BMPs in forests to promote healthy, resilient ecosystems Use education and outreach to partners, landowners, homeowners, and other stakeholders to share information about climatic shifts, the effects on forests, and how to mitigate Maintain and enhance community and rural forests across the state ▸ Promote community tree programs ▸ Develop tree advocates such as tree ambassadors and tree pest detectors ▸ Leverage federal community tree programs • Community Forest and Open Space Conservation Program ▸ Promote Arbor Day Foundation programs • Health Care Campus USA, Tree City USA, etc.
Gaps in Funding	Support for agroforestry practices Support for conservation tree planting Support for Arbor Day Foundation programs Support for wood products development Support for education, community forestry, and youth education opportunities
Gaps in Capacity	Agroforesters Reforestation forester Conservation tree programs Conservation educators Wood products experts Expand forest products industry High-quality planting stock Support alternative forest products research
Gaps in Knowledge	Impacts of a changing climate on Nebraska's tree and forest resources Actions to best mitigate and reduce the severity of a climatic shift Detailed, locally-available woody biomass volume information for forestlands, non-forestlands with trees, and community forests Knowledge of agroforestry practices by landowners, partners, and stakeholders

Strategy 3: Promote wood products development and other wood utilization options.

Justification: The manufacture of wood products from woody biomass leverages a carbon-neutral, renewable resource for applications including producing energy for heat, traditional lumber products, and innovative products such as biochar. These opportunities provide income for rural businesses and create products in high demand by consumers, while reducing open burning and the risk and incidence of slash pile fire escapes. Woody biomass is a byproduct of sustainable forest management which, when used, helps "clean" the forest of unwanted debris and hazardous woody fuels. Utilization can turn this waste product into a value-added economic driver for rural communities, reducing the overall costs of forest management and keeping Nebraska's forests sustainable in a changing climate.

OBJECTIVES	PERFORMANCE MEASURES
1. Develop opportunities within the supply chain	# of manufacturers, # of forest management projects which choose utilization over pile burning
2. Understand the inventory and available supply for biomass utilization	Monitor changes in forest conditions and understand forest inventory data
3. Foster product development through public/private partnerships	# of wood utilization projects, # of wood utilization technical assists

Approach: Foster wood product opportunities.	
Challenges	Woody biomass energy conversion is not seen as economically viable ▸ High transportation costs ▸ Economic feasibility of alternative fuels is believed to be better ▸ Haul distances limit resource availability for woody biomass utilization ▸ Fossil fuel alternatives are familiar and cheaper – a situation subject to change and uncertainty Regulatory restrictions impact wood product manufacturing ▸ Vehicle weight and length limits compared to neighboring states ▸ High workers' compensation insurance costs for forest industry businesses
Tactics	Develop regional supply studies of the forest resource Complete in-depth rural tree inventory Complete in-depth community tree inventory Identify areas with limited access to natural gas (biomass hubs) Address regulatory issues impacting industry success (e.g. transportation costs due to weight limit restrictions) Identify opportunities to incorporate wood products into existing markets Utilize partnerships to leverage funding and expertise to develop wood products Develop localized demand for biomass heating/cooling systems Develop localized demand for raw material through business development Incorporate wood utilization options into forest fuels reduction program prescriptions
Gaps in Funding	Supporting marketing and utilization activities Expanded inventory data acquisition and analyses Expanded fuels reduction work in high-risk areas Capital costs for conversion of thermal energy systems to woody biomass
Gaps in Capacity	Forest products and utilization staff are needed for the NFS, communities, loggers and contractors, and facilities that use woody biomass
Gaps in Knowledge	Community and stakeholder understanding and willingness to implement biomass systems Consumer awareness of wood product uses Consumer drivers that shift towards a wood product alternative from existing products Costs of wood utilization alternatives to traditional cut, pile, and burn forest management practices

Strategy 4: Improve forest health to improve forest resiliency.

Justification: Improving overall forest health increases resiliency of forests to alternative climate scenarios and other stressors. Targeted outreach and education on management activities further increases participation in climate mitigation efforts in Nebraska.

OBJECTIVES	PERFORMANCE MEASURES
1. Reduce woody materials in overstocked stands	# acres treated
2. Survey for pests to improve understanding of the problem	# surveys conducted; # acres surveyed

Approach: Expand education and outreach to increase understanding and participation.	
Challenges	Landowner apathy and antagonism about alternate climatic condition
	High per-acre cost of thinning
Tactics	Landowner outreach/education to increase participation
	Expand cost-share program for mechanical thinning to improve forest health
	Encourage safe, targeted use of prescribed fire
	Manage tree pest detection network
	Conduct pest surveys statewide
Gaps in Funding	Support for outreach and education activities
	Cost-share for thinning to improve forest health
Gaps in Capacity	NFS education and outreach staff
	Lack of funding for municipal forestry staff
Gaps in Knowledge	Knowledge of location of pest hotspots

FAP Goal 2: Manage trees and forest landscapes to include rural and community forest settings.

Strategy 1: Encourage long-term conservation efforts to keep forests in rural settings.

Justification: Rural forests are at risk from the effects of a changing climate, leading to an increase in tree pests and disease problems and an elevated threat of wildfires. When bundled with the lack of management, trees and forests in rural areas are at risk of decline. NFS staff works with the landowners, stakeholders, and partners that can build a strong resilient forest in the wildlands of Nebraska through the promotion of forest management, fuels reduction, and wood utilization.

OBJECTIVES	PERFORMANCE MEASURES
1. Increase # of trees planted	# of planted trees
2. Increase landowner participation in forest management	# of participating landowners; # of acres managed
3. Increase species and temporal diversity in rural community plantings	% of species composition of forest inventory
4. Increase forest management planning	# of management plans prepared; # of acres managed
5. Increase demand for forest products	# of timber harvests initiated
6. Increase contracting capacity	# of contractors
7. Foster culture of rural tree planting	# of tree advocates

Approach: Promote good forest management and wood utilization.	
Challenges	Limited markets constrain utilization opportunities ▸ High transportation costs and long haul distances ▸ Raw material is of low grade and value ▸ Haul distances limit resource availability for woody biomass utilization Low regeneration success from both natural and planted methods ▸ Poor cone crops ▸ Low number of high-quality seedlings ▸ High planting costs ▸ Not enough professional planting crews available Lack of landowner understanding on the importance of forest management ▸ Increased threats from fire and forest pests ▸ Reduced plant and animal biodiversity
Tactics	Use containerized stock to improve survival rate Work with partners to develop high-quality containerized seedling programs Engage landowners and work with partners to increase participation in forest management Develop stewardship plans for all properties with forest management activities and cost-share programs Develop growth/drain studies to foster understanding of the resource Develop innovative cost-share programs to promote and implement forestry best management practices, forest products utilization, and rural tree planting Foster development of niche forest products markets Develop legislation to address barriers to industry growth (load limits, workers comp) Provide contractor workshops Promote tree recovery and sustain the rural tree canopy, promote tree species diversity, develop tree advocates Address threatened and endangered species goals while continuing forest management operations Promote agroforestry systems (e.g. windbreaks, shelterbelts and other conservation tree plantings)
Gaps in Funding	Support for development and promotion of wood products Support for reforestation and afforestation Support for forest management activities on private lands
Gaps in Capacity	Seedling and sapling growing capacity NFS staff needed in rural forestry (district and silviculture foresters), forest health (conifer tree health expert), and forest products Logging industry has aging workforce, younger workforce interest, staff, and experience shortages
Gaps in Knowledge	Fine resolution color infrared imagery GIS forest data Drivers for forest landowner action towards managing their forests

Strategy 2: Encourage long-term conservation efforts to keep forests in community settings.

Justification: Community forests are at risk on several fronts. The effects of a changing climate lead to an increase in tree pests, diseases, and the threat of wildfires. When bundled with apathy, tight community budgets, and the lack of management, this causes many community trees to decline along with the ecosystem services that will be critical to making communities livable in an uncertain or hazardous climate.

OBJECTIVE	PERFORMANCE MEASURES
1. Create environment of community tree management and planting	# of tree advocates; # of tree boards; # of tree canopy plans; # of EAB recovery plans

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Approach: Use outreach, education, and training to encourage community engagement.	
Challenges	Two-thirds of the populace lives in cities and towns, with 470,000 acres of community forest at risk of insect and disease pests due to low species diversity
	Changing climate and lack of mitigation; declining forest management
	Projects must now account for a range of issues: severe weather, chronic drought, poor planting practices, poor species selection, insect and disease pests, herbicide damage
	Low funding in community budgets for trees and landscape maintenance
	A preponderance of older trees nearing or past their average life span
	Limited product options and waste management strategies constrain utilization of community wood waste
Tactics	Develop community tree advocates, tree boards
	Develop tree pest detector and herbicide advocate programs
	Develop advocacy group for herbicide issues
	Assist in the development of community tree canopy plans and EAB recovery plans
	Pursue alternative funding from foundations and corporate sources
	Provide training on pests and best management practices
	Develop planting recommendations for communities based on current tree inventories
	Promote alternative wood waste strategies to divert wood byproducts from landfills
	Promote development of higher value products from waste wood
	Continue tree species diversity initiatives
Gaps in Funding	Community forestry programs with limited or no annual budget
	Planting costs make tree replacement a low-priority
	Support for community tree inventories
	Support for tree advocate programs
	Removal of overmature trees (and replanting) on private properties in poor neighborhoods
Gaps in Capacity	More communities need to establish a tree board
	Community and forest health departmental staff is inadequate
	Lack of established tree care ordinances
	Lack of Arbor Day proclamation and observation
	Lack of high-quality nursey stock
Gaps in Knowledge	Fine resolution color infrared imagery
	GIS forest data
	Community tree inventory data
	Community tree canopy cover data
	Wood products manufacturing expertise in communities
	Herbicide issues

FAP Goal 3: Manage the function of forest and tree systems in Nebraska for maximum and sustained benefits.

Strategy: Promote active and sustainable management of Nebraska's forest resources to ensure a continued stream of environmental, economic, social, and human health benefits.

Justification: Keeping Nebraska's trees and forests healthy through management reduces the number of destructive wildfires, maintains healthy growing forests, and builds resilient community tree canopies. These are critical to the success of all species, including those with high conservation value.

OBJECTIVES	PERFORMANCE MEASURES
1. Reduce stocking rates in overstocked forests	# acres treated
2. Increase tree planting in understocked stands	# trees planted
3. Reduce acres burned during uncharacteristic wildfires	# acres burned

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Approach: Work with landowners, partners, and communities to increase forest management.	
Challenges	Markets ▸ Limited markets limit utilization opportunities ▸ High transportation costs; long haul distances ▸ Raw material is low value and low grade ▸ Haul distances limit resource availability for woody biomass utilization Funding ▸ Without markets, funding limits the acres that can be treated ▸ High cost of treatment ▸ Lack of cost-share programs ▸ Lack of funding to diversify the community tree canopy Regulatory ▸ Differences in legal interpretation between agencies; threatened and endangered species may impact ability to conduct forest management ▸ Differences in load limits state-to-state increases hauling costs ▸ High worker compensation rates increases contractor costs
Tactics	Work with landowners to prepare management plans ▸ Develop alternative cost-share programs ▸ Require stewardship/long-term management plans for cost-share funding Work with communities to develop community tree management and EAB recovery plans Promote conservation tree planting ▸ Use of agroforestry and silvopasture systems Provide workshops to communities (train the professionals) ▸ Tree health ▸ Tree management ▸ Tree risk assessment Provide landowner workshops ▸ Best management practices ▸ Management in fire-prone landscapes ▸ Forest management and fuels treatment (silviculture) Develop innovative tree and forest grant programs Work with partners to develop high-quality land management programs
Gaps in Funding	Support for wood innovation and market development Support for landowner outreach Support for community outreach
Gaps in Capacity	Number of NFS staff for conservation foresters, agroforesters, and GIS Contract logging industry lacks experienced personnel and has staffing shortages
Gaps in Knowledge	Known threatened and endangered species presence/absence

FAP Goal 4: Improve, protect, and enhance fish and wildlife habitat in Nebraska.

Strategy 1: Reduce the major threats to fish and wildlife habitat caused by land fragmentation and urbanization.

Justification: Fragmentation caused by residential and commercial development disturbs wildlife habitat. Development in riparian areas can also harm aquatic habitat. Managing green infrastructure within and surrounding communities provides many valuable benefits important to human and ecological health. In rural areas, habitat fragmentation can be caused by agricultural land conversion from grasslands and forests to cultivated cropland. Increasing awareness of this and highlighting mitigation methods can help address this issue.

OBJECTIVES	PERFORMANCE MEASURES
1. Discourage riparian development by increasing acres managed in riparian forests	# acres managed
2. Increase public understanding of the relationship of forest function to habitat	# of people reached
3. Maintain/improve habitat quality via active forest management	# of acres managed; # trees planted/replaced
4. Educate landowners and the public on importance of forest habitat protection, particularly in riparian areas	# of people reached

Approach: Use education, training, and cost-share to increase awareness and protection of habitat in and near communities, riparian areas, and rural areas.	
Challenges	Decline in community forest cover over past 30 years stresses woodland-dependent species: ▸ Reduces mitigation of extreme weather ▸ Reduces ability to mitigate changes in climate Inadequate species and age diversity threaten forest sustainability and habitat Herbicide drift can pollute water and damage trees, threatening forest health and sustainability of habitat Economics drive agricultural producers to plant as much area as possible ▸ Leaves fewer buffers, windbreaks, and corridors for habitat
Tactics	Work with homeowners and landowners ▸ Increase available cost-share programs ▸ Encourage incorporation of habitat mitigation into agricultural activities ▸ Promote active management of stormwater and riparian forest buffers Work with communities ▸ Educate youth about the importance of trees and forests • Habitat • Human health ▸ Diversify tree species; develop community tree canopy plans ▸ Utilize Community Green Space/Forest Legacy to protect sensitive lands Provide workshops to communities ▸ Tree management ▸ Value and benefits of trees Develop innovative tree and forest grant programs Work with partners to develop high-quality land management programs Replace declining ash trees in riparian forests with appropriate and diverse tree species Develop new windbreak design practices to improve diversity
Gaps in Funding	Support for conservation education Support for homeowner outreach Support for community and youth programing
Gaps in Capacity	NFS staff in community forestry, forest health, and conservation education to engage homeowners Contracting base Staff and personnel Experienced contractors
Gaps in Knowledge	Community tree canopy inventories

Strategy 2: Reduce the major threats to fish and wildlife habitat caused by invasive and aggressive native plants, insects, and diseases.

Justification: Suitable habitat for resident and migratory wildlife is often threatened by invasive and aggressive native plants, insects, and diseases. As a largely privately-owned state, landowner and community understanding and engagement is essential to mitigating invasive and aggressive species and protecting habitat statewide.

OBJECTIVES	PERFORMANCE MEASURES
1. Educate landowners and the public on importance of forest habitat protection, particularly in riparian areas	# landowners reached
2. Increase number of acres managed, particularly in riparian forests	# acres managed; # acres treated
3. Replace declining ash trees in riparian forests with appropriate tree species	# of ash trees replaced
4. Maintain/improve habitat quality via active forest management	# of acres managed; # trees planted/replaced
5. Manage stormwater for better water quality	Implementation of National Association of State Forester's stormwater recommendations

Approach: Use education, training, and cost-share to increase awareness and protection of habitat in and near communities, riparian areas, and rural areas.	
Challenges	Invasive or aggressive species proliferate in riparian systems Weather extremes Forest pathogens Eastern redcedar encroachment continues due to lack of management or inability to educate absentee landowners
Tactics	Work with ranchers and farmers on land management ▸ Manage buffer zones/restore riparian buffers • Remove encroaching species • Replace dying ash ▸ Forestry planning ▸ Develop alternative cost-share programs Educate landowners about the importance of trees, tree management, and pests ▸ Workshops ▸ Articles & publications Work with partners to develop high-quality land management programs ▸ Develop habitat Work with communities ▸ Diversify species, develop community tree canopy plans ▸ Utilize Community Green Space/Forest Legacy to protect sensitive lands ▸ Provide workshops to communities • Pests • Tree management • Value and benefits of trees Develop innovative tree and forest grant programs
Gaps in Funding	Support for conservation education, homeowner outreach, and community and youth programing
Gaps in Capacity	NFS staff (forest health and conservation education) Contracting base shortages ▸ Staff and personnel ▸ Prescribed burn boss ▸ Support staff for burning
Gaps in Knowledge	Quality eastern redcedar inventory data in rangelands

FAP Goal 5: Restore fire-adapted landscapes and reduce risk of wildfire impacts on Nebraska's trees, forests, and communities.

Strategy 1: Reduce wildfire extent and severity in strategic areas.

Justification: Managing forests strategically to reduce wildfire extent and severity is crucial to the health of Nebraska's forests, the safety of residents in at-risk areas, and the contributions of forests to Nebraska's economy. Decades of fire suppression and changes in weather and precipitation have disrupted natural fire regimes, resulting in fuel buildup, loss of biological diversity, changed species composition, and loss of some fire-dependent species. Strategic forest management and landscape-scale planning will reduce wildfire extent and severity in Nebraska's forests.

OBJECTIVES	PERFORMANCE MEASURES
1. Manage forests to reduce wildfire risk	# acres managed; # of acres treated
2. Increase VFD capacity	# of VFDs participating; # of pieces of equipment placed; # hours of training; # of firefighters trained
3. Increase opportunities for wood products development	# of wood products development projects; # fuels projects with utilization component

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Approach: Use a multi-pronged approach to increase forest and fuels management via education, planning, fuels reduction, training, and equipment placement.	
Challenges	Buildup of forest fuels Expanding wildland urban interface Eastern redcedar encroachment Lack of management; absentee landowners
Tactics	Educate landowners and the public about the importance of managing fuels Manage regional forest types ▸ Implement landscape-scale fuels reduction projects Work with partners to develop high-quality land management programs Work with landowners to manage fire-prone landscapes Develop stewardship plans Plan and implement fuels reduction ▸ Mechanical treatments ▸ Prescribed fire Provide and promote VFD training ▸ Build cadet program Equipment placement with VFDs Increase participation incentives for VFDs Promote the utilization of wood residues Develop innovative tree and forest grant programs
Gaps in Funding	Support for eastern redcedar management Fuels treatments Encroachment into rangelands Firewise funding for communities Wood products development
Gaps in Capacity	NFS forestry staff (fuels reduction, conservation education, forest products utilization) Contracting base ▸ Staff and personnel ▸ Prescribed burn boss ▸ Support staff for burning Contractor base ▸ Fuels contactors with handcrews to increase management in difficult areas or small parcels
Gaps in Knowledge	Quality eastern redcedar inventory data in rangelands Identify and map high-risk impact zones around communities and forests

Strategy 2: Increase the safety of residents and firefighters in at-risk areas, WUI areas, and across wildlands.

Justification: The safety of residents and firefighters in at-risk areas often depends on fire awareness and preparation. Fire-safe landscapes, landowner awareness, and well-trained and equipped fire departments are essential to protecting lives and property.

OBJECTIVES	PERFORMANCE MEASURES
1. Increase landowner awareness and engagement	# landowners reached; # of acres managed and treated; # of structures protected
2. Create fire-safe landscapes	# CWPPs prepared; # of landowners protected; # acres treated
3. Establish and maintain Firewise communities	# of Firewise communities created or renewed
4. Increase fire department preparedness and capacity	# of VFDs participating; # of pieces of equipment placed; # hours of training; # of firefighters trained

Approach: Use education, planning, fuels reduction, training, and equipment placement to increase safety for residents and firefighters.	
Challenges	Buildup of forest fuels Expanding WUI Eastern redcedar encroachment Lack of management; absentee landowners Adoption of National Wildland Fire Coordination Group qualifications by VFDs and state agencies
Tactics	Conduct on-site landowner outreach and workshops Work with private landowners to develop stewardship plans and manage fuels Create innovative fuels management via cost-share programs Prepare CWPPs with relevant stakeholders for all areas of Nebraska Develop new tree and forest grant programs opportunities to reduce woody fuels Outfit VFDs with appropriate suppression equipment; provide enhanced training for higher firefighting qualifications; establish VFD/Prevention Academy to bolster personnel Establish Firewise communities Manage strategic fuel/fire breaks and travel corridors
Gaps in Funding	VFA funding level is below demonstrated need Support for expanded fuels treatments, fire/fuel breaks, and travel corridors Support for training capacity within VFDs Firewise funding for communities
Gaps in Capacity	NFS staff (fuels reduction, conservation education, wildland fire) ▸ Staff qualifications and training opportunities limit statewide training potential VFDs face staffing shortages and personnel with qualifications State-level wildfire incident management Suppression response can exceed resources of VFDs
Gaps in Knowledge	Fuel/fire break locations

Strategy 3: Increase the contributions of forests to Nebraska's economy to ensure that forests are managed, which reduces the risk of large wildfires.

Justification: Markets incentivize forest management which, in turn, reduces hazardous fuels. Creating markets can help make hazardous fuels reduction economically feasible. Wood products utilization and the resulting demand for raw materials can increase the economic feasibility of forest and fuels management by building on existing markets and tools and establishing new ones.

OBJECTIVES	PERFORMANCE MEASURES
1. Encourage the development of markets for traditional and innovative wood products	# markets developed
2. Increase timber harvest	# acres, board feet, cubic feet, and/or tons utilized

Approach: Work with business and others to develop new and expand existing markets for wood products. Use existing tools and develop new ones to increase financial feasibility.	
Challenges	Markets limit utilization opportunities ▸ High transportation costs; long haul distances ▸ Raw material is of low value and grade ▸ Haul distances limit resource availability for woody biomass utilization
Tactics	Work with business owners and others to develop wood products Promote traditional markets Develop innovative uses for raw material Utilize Good Neighbor Authority and other tools Develop alternative cost-share programs Improve technology transfer of new wood products opportunities
Gaps in Funding	Support for research and development of new wood products Support for alternative use programs ▸ Biochar as feed supplement, agricultural uses, and trail armoring
Gaps in Capacity	Training for business owners Rural economic development Forest products program growth and business development
Gaps in Knowledge	Forest products inventory data Biochar uses (digestion efficiency and methane reduction in livestock, cost/benefit) Alternative heat/cooling systems

FAP Goal 6: Manage for the health and productivity of Nebraska's trees and forests.

Strategy: Create healthy forest landscapes that have the capacity for renewal and recovery from a wide range of disturbances while continuing to provide public benefits and ecosystem services.

Justification: Forest health threats include insects, diseases, invasive and aggressive native plant species, herbicide damage, air pollution, and weather extremes. Working across interest groups, the NFS can expand awareness of threats to forest health and increase engagement to address forest and tree health issues.

OBJECTIVES	PERFORMANCE MEASURES
1. Keep trees and forests healthy	Monitor tree mortality trends
2. Reduce herbicide drift damage to trees	Survey; tissue testing
3. Understand and manage current and future insect and disease problems	# surveys; # of surveys completed and used to reduce negative impacts
4. Increase landowner and community engagement	# of workshops; # of people reached; # of tree health advocates
5. Increase green industry engagement	# of green industry conference attendees

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Approach: Work with partners to increase knowledge, provide training, and develop tree health advocates.	
Challenges	Introduction of EAB
	Likelihood other invasives will be introduced
	Native pests affecting non-native tree species (e.g. pine wilt and scotch pine)
	Native insects and pathogens affecting native tree species
	Alternate climatic conditions leads to less resilient forests and trees
	Herbicide damage
	Lack of tree diversity in community forests
	Predicting pest outbreaks
	Poor tree practices contributing to pests
	Overuse of pesticides, including tree trunk injections
Tactics	Conduct statewide pest surveys
	Provide workshops to stakeholders around the state
	Develop tree health advocates
	Provide training to industry professionals
	Train forestry staff alongside land managers, communities, tree advocates, and partners
Gaps in Funding	Research on how herbicide drifts, and effects on trees and forests
	Research on future invasive species
	In-depth research of current pests: range in the state, life cycles, best management, etc.
Gaps in Capacity	Training communities and landowners
	Forest health staff: especially expertise in conifer pests, diseases, and herbicides
	New forestry staff with pest experience/knowledge
Gaps in Knowledge	Herbicide issues
	New pests and diseases
	In-depth knowledge of current pests
	Underlying causes of tree declines
	Green industry, natural resource professionals, community and rural landowners are in need of education on pests, pesticides, quarantines, and proper tree/forest care

FAP Goal 7: Manage and build the capacity of Nebraska's trees and forests, in conjunction with the forest products industry, agriculture, and communities, which are all vital to Nebraska's economy.

Strategy: Utilize the opportunities that forested areas present for economic development while protecting sustainability.

Justification: Wood products utilization and the resulting demand for raw materials can increase the economic feasibility of forest and fuels management by building on existing markets and tools and establishing new ones. Forested areas present opportunities for economic development through specialty forest products, traditional forest products, woody biomass, and ecosystem services.

OBJECTIVES	PERFORMANCE MEASURES
1. Manage forested areas for forest products	# of forest stewardship management plans; # of acres managed
2. Reduce woody fuels and utilize material in value-added products	# of acres treated and material utilized
3. Improve forest health through tree management and utilization	# of acres managed
4. Develop and promote industry and niche markets for forest products	# of forest products businesses

Approach: Work with business and others to develop new and expand existing markets for wood products. Use existing tools and develop new ones to increase financial feasibility.	
Challenges	Limited markets Limited demand for products
Tactics	Engage partners through biochar and biofuel workshops and training Engage NRDs and other partners to identify innovative products Engage and inform landowners, partners, contractors, and green industry on use of woody material and biochar Engage non-traditional partners such as economic development organizations Provide workshops and training on best use of forest products Work with forestry staff to increase their knowledge
Gaps in Funding	Support for research for market development Support for research for new wood products and their uses
Gaps in Capacity	Need to achieve balance between supply and demand Connect landowners and businesses to utilize wood resources Connecting available forest products to the development of markets Market development staff and partners that facilitate or create new markets
Gaps in Knowledge	Forest inventory data How forest products can work with Animal Sciences industry to solve societal issues Biochar ▸ Livestock digestion efficiency ▸ Methane reduction ▸ Cost/benefit Cost/benefit of new systems and opportunities Availability of alternative heating/cooling systems and development of new systems

FAP Goal 8: Maintain the natural environments of Nebraska including trees and forests, waterways, and rangelands.

Strategy 1: Protect and enhance forest and range habitat.

Justification: Protecting, conserving, and enhancing forested habitat are critical to maintaining and enhancing biodiversity. Through concerted partnerships (including UNL, Extension, NRDs, NAC, NRCS and others), the NFS will develop new approaches and expand opportunities for the development of windbreaks, shelterbelts, and riparian buffers that will enhance the resiliency of Nebraska's forests and rangelands.

OBJECTIVES	PERFORMANCE MEASURES
1. Increase diversity by managing forest composition	# species represented
2. Diversify planting stock in communities and across rural lands	# species planted
3. Develop alternatives for eastern redcedar planting	# of alternative species
4. Restore ponderosa pine forests	# of acres restored
5. Conserve and protect rare native species and species on the edge of their natural range	# of individuals within target species

Approach: Utilize partners to expand opportunities to protect and enhance forest and range habitats.	
Challenges	Perceived negative value of conservation trees Lack of diversity in species
Tactics	Engage partners, landowners, and others through workshops and training to manage forests and trees Provide workshops on biodiversity and ecosystem (landscape) management Plant diverse species mix Work with UNL and others to develop alternatives for windbreaks to replace aggressive, native tree species with more desired species Engage non-traditional partners through collaborative initiatives/projects Engage communities and their leaders through community forestry programs Engage youth through conservation education Reduce spread of eastern redcedar into hardwood and pine forests Inventory, map, and identify rare native species
Gaps in Funding	Support for marketing and re-establishment of the conservation tree program Support to identify replacement species to adapt to climatic change and test viability of species in Nebraska Support for restoring ponderosa pine ecosystems
Gaps in Capacity	Riparian foresters, range ecologist, conservation tree coordinator Conservation tree sales platforms and online tools
Gaps in Knowledge	Inventory data on eastern redcedar in rangelands Animal Science partnerships for utilization of eastern redcedar Biochar opportunities to increase demand for eastern redcedar ▸ Digestion efficiency ▸ Methane reduction ▸ Cost/benefit ▸ Feedlot applications ▸ Soil amendments Cost/benefit of new systems Alternative heat/cooling systems

Strategy 2: Protect and enhance Nebraska's waterways.

Justification: Protecting and enhancing riparian areas protects soil and water quality while providing wildlife habitat. Through partnerships with oversight and compliance agencies, as well as landowners and communities, trees and other green infrastructure can be used to protect and enhance riparian buffers and the water quality of Nebraska.

OBJECTIVES	PERFORMANCE MEASURES
1. Engage landowners and communities through workshops on importance of species diversity, and flood mitigation techniques	# of workshops; # of people reached
2. Reduce ladder fuels	# of acres treated
3. Provide species diversity	# species planted
4. Mitigate flooding effects	# of healthy or improved riparian forest acres

Approach: Utilize partners, communities, and landowners to protect riparian areas.	
Challenges	Encroachment of unwanted native and non-native species into riparian systems Flooding in riparian buffers Uncharacteristic, large wildland fires Removal of riparian forests to increase crop planting
Tactics	Engage partners and landowners through workshops, training, and outreach Work with communities and landowners to address flooding issues by providing rain garden and stormwater management information Manage encroachment into riparian buffers by reducing forest fuels Manage fires Plant diverse tree species
Gaps in Funding	Support for reducing encroachment of unwanted species Marketing of trees and forests for water management Marketing of permeable landscapes and programs including trees and other vegetation
Gaps in Capacity	Landowners and businesses willing to work with alternative landscapes (e.g. agroforestry, conservation plantings, riparian buffers) Staff to help connect people with outdoor environment and alternative landscaping Youth conservation education to increase awareness
Gaps in Knowledge	Understanding the connection between healthy forest landscapes and human health benefits Data demonstrating the link between human health and trees; how this connection improves quality of life

FAP Goal 9: Manage Nebraska's forest and trees to enhance the water resources of Nebraska.

Strategy 1: Utilize Nebraska's forestry best management practices to help protect, restore, and sustain water quality, water flows, and overall watershed health.

Justification: Healthy riparian buffers are key to protecting water quality, water flows, and overall watershed health. Incentivizing landowners and partners to utilize sound forestry practices with respect to riparian buffer management will reduce encroachment of unwanted species, increase diversity of riparian species, and assist in managing wildland fires.

OBJECTIVES	PERFORMANCE MEASURES
1. Increase planting in riparian buffers	# of acres or trees planted
2. Restore riparian buffers	# of acres restored
3. Increase tree species diversity in riparian buffers	# species planted
4. Reduce eastern redcedar encroachment in riparian buffers	# of acres of eastern redcedar removal

Approach: Use education and outreach to train and engage stakeholders in practicing sound forestry within riparian buffers.	
Challenges	Encroachment of unwanted native and non-native species into riparian systems Flooding in riparian buffers Wildland fires Mechanisms to reach riparian forest landowners Demonstrating the importance of riparian forest buffers
Tactics	Plant diverse, native trees in riparian buffers Engage landowners and communities to manage invasive species in riparian areas Develop cost-share programs to assist managers with riparian buffer restoration Engage partners and landowners through workshops and training to restore buffers Work with landowners and agencies to install and restore riparian buffers Manage aggressive species encroachment into riparian buffers Manage fires through fuels reduction projects
Gaps in Funding	Lack of cost-share programs and other support to restore riparian buffers and reduce encroachment of unwanted species
Gaps in Capacity	Conservation educators
Gaps in Knowledge	Nebraska-centric data quantifying how forest riparian buffers affect water resources, which in turn benefit human health and local economies

Strategy 2: Build and maintain healthy community and rural forested watersheds to absorb rainfall and snowmelt, slow storm runoff, recharge aquifers, sustain stream flows, and filter pollutants.

Justification: Healthy community and rural forested watersheds serve important functions in the hydrologic cycle. Outreach, education, and cost-share opportunities that engage and train stakeholders to improve and establish high-quality riparian buffers are essential tools to improve the state's water quality and remediate impaired waterways.

OBJECTIVES	PERFORMANCE MEASURES
1. Manage community tree canopy	# of species planted
2. Reduce runoff	Measure runoff by utilizing National Association of State Foresters' performance measures
3. Reduce pollutants in stormwater	Measure nitrogen, phosphorous, and potassium in stormwater by utilizing National Association of State Foresters' performance measures
4. Inventory community forests to establish baseline	# of community forests inventoried

Approach: Use outreach and education to train and engage stakeholders.	
Challenges	Urbanization
	Urban stress factors such as impermeable surfaces leading to increased stormwater runoff
	Apathy toward trees by urban populations
Tactics	Train and engage communities, leaders, tree boards, and volunteers
	Develop markets and cost-share programs
	Engage partners, homeowners, and the public through workshops and training
	Promote riparian buffers and management of encroachment into existing buffers
	Develop community water-wise programs
	Partner with NRD and DNR to improve effectiveness of buffer efforts
Gaps in Funding	Lack of cost-share programs
Gaps in Capacity	NFS staff: conservation education and community forestry
	Community volunteers
Gaps in Knowledge	Nebraska-centric data quantifying how forest riparian buffers affect water resources, which in turn benefits human health and local economies
	Nebraska-centric data that demonstrates the value of healthy riparian systems in reducing pollution
	Nebraska-centric data showing the effects and benefits of stormwater management

Strategy 3: Identify areas for continued forest conservation and management to improve water quality, water flows, and overall watershed health.

Justification Additional riparian buffers added to the existing inventory will improve water resources. Identification of more riparian buffers that can be enhanced will expand the ability to protect water resources in Nebraska.

OBJECTIVE	PERFORMANCE MEASURE
1. Increase, track, and maintain inventory of buffers and plantings of buffers	# of plantings established; # of buffers inventoried

Approach: Use outreach and education to spark interest and engage stakeholders in identifying additional riparian areas for management to improve water resources.	
Challenges	Public understanding of the relationship between water health and human health Movement of fertilizer, herbicides, and pesticides from fields to water; movement from lawn applications to water
Tactics	Use workshops and training to engage landowners, homeowners, and community leaders to expand the number of riparian buffers as well as maintain and improve existing buffers Engage partners to expand the riparian buffer system in and around waterways Workshops with green industry
Gaps in Funding	Lack of cost-share programs for communities
Gaps in Capacity	Connection between people and trees/forest environment
Gaps in Knowledge	Nebraska-centric data quantifying how forest riparian buffers affect water resources and reduce pollution, which in turn benefits human health and local economies Presenting scientific data to the public in a manner that is actionable and understandable on healthy forest landscapes and human health benefits Nebraska-centric data demonstrating the link between human health and trees, and how this connection improves the quality of life

FAP Goal 10: Improve air quality and energy conservation through tree planting.

Strategy: Promote community and exurban forest cover, including agroforestry plantings, to improve air quality, reduce energy consumption and produce biomass for energy production.

Justification: Community and exurban forest cover, including agroforestry plantings, are a significant resource that provides an array of ecosystem services. There is an urgent need to plant more trees in a changing climate. Workshops and cost-share programs can provide information to increase knowledge related to community tree canopy cover, energy conservation, and conservation planting for landowners, producers, and communities.

OBJECTIVES	PERFORMANCE MEASURE
1. Increase conservation tree plantings	# of plantings
2. Increase the users of biomass and clean energy users	# of entities using biomass
3. Increase community tree plantings	# of trees planted

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Approach: Use education and outreach to train and engage stakeholders.	
Challenges	Public apathy toward trees Commodity prices (currently low) drive the removal of conservation plantings Emerald ash borer and other tree pests and diseases Modernized windbreak design and practices for the 21st century ▸ Value of windbreaks vs. the value of the potential crop production Lack of understanding of benefits of community tree canopy
Tactics	Engage partners and landowners through workshops and training; work with communities, homeowner, and landowners to understand trees and the value added by trees Engage communities, leaders, and green industry to adopt clean energy techniques Work with legislature on replacement of lost trees Evaluate community tree canopy cover during community tree inventories
Gaps in Funding	Lack of cost-share programs for agroforestry systems ▸ Agroforesty maintenance ▸ Tree care workshops Support for promoting the value and benefits of trees Support for community tree planting
Gaps in Capacity	Lack of agroforesters Lack of demonstration sites Lack of tree boards in communities
Gaps in Knowledge	Connection to value of trees ▸ Human health benefits ▸ Utility costs and energy usage Connection of trees to healthy agricultural systems ▸ Value and design of windbreaks in modern-era ▸ Data articulating benefits to agriculture when trees are present ▸ Data demonstrating return on investments in current ag systems

FAP Goal 11: Connect people to the state's trees and forest resources.

Strategy: Promote Nebraska's forests as natural backyards for communities; these can function as a connection between people and nature to increase appreciation.

Justification: Many communities in Nebraska are islands of trees in an agricultural or rangeland landscape. Use workshops, seminars, field days and publications to increase interest, knowledge of the value, and the awareness of forests and trees. The focus is reaching an ever-increasing non-farm/ranch population in communities across Nebraska.

OBJECTIVE	PERFORMANCE MEASURE
1. Increase the value residents place on trees and forests	# of workshops /trainings; # of people reached; results of improved public surveys; % workshop participants from underserved or minority communities

Approach: Use education and outreach to decrease apathy and increase awareness of the value of trees and forests.	
Challenges	Public apathy toward trees Low commodity prices drive removals of conservation plantings and riparian buffers Wildfires damage these resources Encroachment of unwanted species into forests and rangelands
Tactics	Engage partners and landowners through workshops and training to connect them with natural environments and the benefits provided by trees Work with communities, homeowners, and landowners to provide understanding of the real value of trees Educate Nebraskans about undesirable species (native and invasive) Track demographic data of workshop participants
Gaps in Funding	Educate Nebraskans on the value of tree plantings Educate Nebraskans of the negative effects of encroachment of unwanted species (both native and non-native species) Educate Nebraskans of the value of restoring forest ecosystems
Gaps in Capacity	Conservation educators Knowledgeable contractor base Restoration ecologist
Gaps in Knowledge	Level of apathy Local community tree priorities (tree boards, certified arborist)

FAP Goal 12: Engage Nebraskans in the stewardship of trees and forests.

Strategy: Promote management of rural and community forests and trees to provide for forests that include diversity in age class, canopy, and species of trees.

Justification: Increasing public engagement in the forest resource will be increasingly important in the decade ahead. Using workshops, seminars, field days, and publications can help inspire Nebraskans to plant trees and get involved in environmental stewardship of their community and rural areas. Engagement must occur among landowners, community leaders, students, stakeholders, and underserved groups and areas in the state. Without direct action in education and outreach, it will remain difficult to improve the state's forests and trees.

OBJECTIVES	PERFORMANCE MEASURES
1. Increase community and rural tree planting	# of trees planted; # of communities; # of rural areas; # of plantings in locations with high percentages of low-income and/or minority representation
2. Manage forest diversity including species, age class, canopy, and density	# acres treated; # of communities
3. Manage community tree canopy	# trees managed, # workers trained

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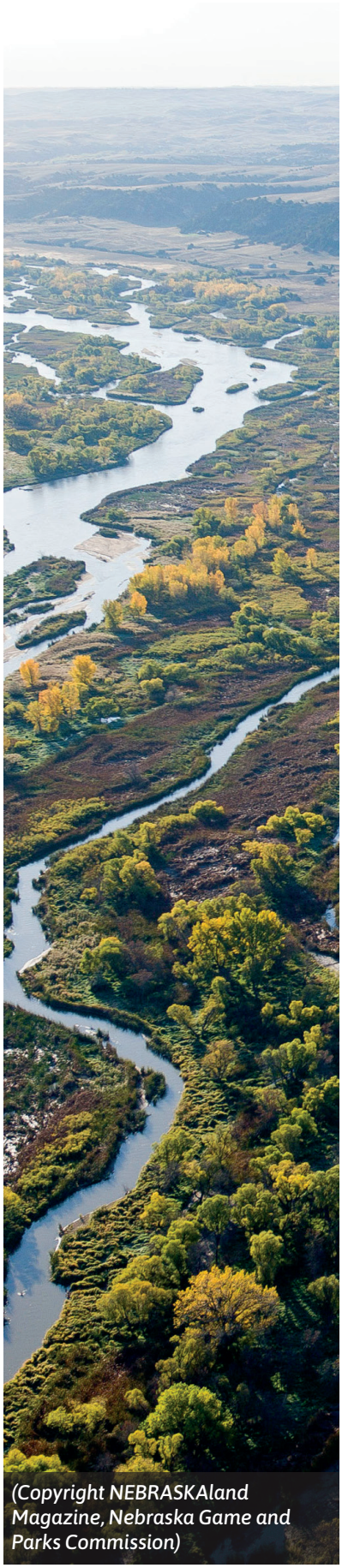
Approach: Use education and outreach to increase public engagement in forest and tree management.	
Challenges	Community tree inventory data is limited Past plantings have limited the number of species in communities Insects and diseases will eliminate some tree species Public and municipalities lack community forestry awareness and support ▸ Apathy, inaction, and human disconnect from tree planting and green space management ▸ Decreasing volunteerism
Tactics	Educate stakeholders to give them tools to manage forest diversity including species, age class, canopy, and density Track demographic and environmental justice data related to every project site Develop a protocol for tracking and reporting training and outreach effectiveness for participants from underserved populations, establishing a baseline for future inclusivity goals Identify organizations that work directly with underserved communities in order to efficiently identify new demographic audiences and effectively provide outreach and assistance that meets their needs Engage partners and landowners through workshops and training Engage landowners and community leaders in tree planting through Arbor Day events and other tree celebrations Work with communities and homeowners to address invasive species Promote the NSA's approved planting list of species for Nebraska
Gaps in Funding	Cost-share programs for planting diverse species mix Funding to acquire planting stock Cost-share programs for bioswales and pollinator habitat
Gaps in Capacity	NFS staff: community forestry, conservation education, and rural foresters
Gaps in Knowledge	Reason for apathy Connection between human health and tree data Lack of data surrounding the impacts of planting projects with underserved communities and populations



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Chapter 10: Crosswalk 2010/2015/2020 FAP Goals

Current FAP goals were cross referenced with the *Nebraska Statewide Assessment and Strategy – 2010* and the *2015 Forest Action Plan* to evaluate the progression of agency goals. An immediate observation was in the NFS' approach to drafting the document. In the current version, the NFS used a grassroots method—incorporating staff feedback, public input, and partner expertise— to draft this assessment and strategy. Previous FAP plans used a top-down method, which was then shared for review and feedback. The grassroots approach has allowed the agency to balance the planning process across all programs and issues areas. As a result, the agency has aligned all stated goals to address each of the three national priorities, while attempting to achieve a desired future condition across the priority forest landscapes (PFLs) discussed in Chapter 3.

These goals were then compared to the national priorities to evaluate changes over time. The NFS assessed how priorities were previously addressed and how adaptations were implemented. As expected, goals and focus areas have changed, along with the priorities within each program. However, this exercise aligns agency resources for the implementation of adaptive management, allowing the NFS to move between PFLs and stated FAP goals to meet the national priorities as circumstances evolve.

Table 62: 2010-15 Goals Comparison with 2020 FAP Goals	
2010-2015 FAP GOAL	**2020 FAP GOALS**
1 Actively and sustainably manage forests	2 Manage trees and forest landscapes to include rural and community forest settings
	3 Manage the function of forest and tree systems in Nebraska for maximum and sustained benefits
	8 Maintain the natural environments of Nebraska including trees and forests, waterways, and rangelands
2 Restore fire-adapted lands and reduce risks of wildfire impacts	5. Restore fire-adapted landscapes to reduce risk of wildfire impacts on Nebraska's trees, forests, and communities
6 Assist communities in planning for and reducing wildfire risks	
3 Identify, manage, and reduce threats to forest and ecosystem health	6 Manage for the health and productivity of Nebraska's trees and forests
4 Protect and enhance water quality and quantity	9 Manage Nebraska's forest and trees to enhance the water resources of Nebraska
5 Improve air quality and conserve energy	10 Improve air quality and energy conservation through tree planting
7 Maintain and enhance economic benefits and value of trees and forests	7 Manage and build the capacity of Nebraska's trees and forests, in conjunction with the forest products industry, agriculture, and communities, which are all vital to Nebraska's economy
8 Protect, conserve, and enhance fish and wildlife habitat	4 Improve, protect, and enhance fish and wildlife habitat in Nebraska
9 Connect people to trees and forests and engage them in environmental stewardship activities	11 Connect people to the state's trees and forest resources
	12 Engage Nebraskans in the stewardship of trees and forests
10 Manage and restore trees and forests to mitigate and adapt to global changes in climate	1 Enhance and promote the role of Nebraska's forests and trees for mitigation and adaptation to the global change in climate

Table 63: FAP Goals 2010-15 and 2020 Crosswalk to National Priorities		
NATIONAL PRIORITY	2010-2015 GOALS	2020 GOALS
Conserve working forest landscapes	1, 7	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Protect forests from harm	2, 3	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Enhance public benefits from trees and forests	4, 5, 6, 7, 8, 9, 10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12


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Chapter 11: Summary of 2015 FAP Update - Implementation and Challenges

This chapter summarizes the implementation of the ten 2015 FAP goals and challenges that occurred between 2015 and 2019. This section provides an evaluation of previous activities, and these summaries were used in the formation of the FAP goals in this assessment. Table 64 is a comprehensive list, but it is not intended to be all-inclusive.

Table 64: 2015 FAP Goals, Implementation Strategies, and Challenges

GOAL	IMPLEMENTATION SUMMARY	CHALLENGES SUMMARY
1: Actively/ sustain-ably manage forests	▸ Provided green infrastructure training for over 35,000 professionals ▸ Engaged 300 communities with project investments for the creation, support, and management of resilient landscape practices & programs ▸ Organized over 600 presentations to 35,000 people ▸ Produced thousands of news items (newsletters, news releases, news coverage) to support the need/opportunity to actively manage the forest resource, reaching an estimated 25% of the state's population ▸ Provided direct technical assistance to over 2,200 woodland owners with existing Stewardship Plans and provided assistance to 2,000 new contacts	▸ Gaining recognition within UNL system of the necessity/benefits of fire management topics to students in natural resources fields ▸ Encouraging communities to adopt practices which lead to meaningful and lasting change beyond the scope of project implementation ▸ Measurable and ongoing climate variations and weather extremes (drought, floods, and temperature fluctuations) continue to degrade community forests. Municipal budget fluctuations have limited consistent, long-term investments in community tree planting efforts ▸ The current volunteer base is aging and recruitment of younger volunteers has lagged, leading to a decrease in community enthusiasm and engagement

GOAL	IMPLEMENTATION SUMMARY	CHALLENGES SUMMARY
	▸ NFS staff prepared over 100 Forest Stewardship Plans covering over 100,000 acres to help woodland owners access financial assistance programs to implement stewardship practices ▸ Provided technical assistance to landowners on timber sales	▸ Scheduling workshops at appropriate times to draw participants, especially during times of the year when they'd prefer to be outdoors ▸ Woodland owner participation in organizations and networks that provide land management assistance has declined ▸ Windbreak plantings have declined significantly, fueled by increasing crop prices and land values ▸ Existing windbreaks have been removed and the land planted to commodity crops in response to changes to the federal tax code that provides tax credits for agricultural land improvement ▸ Catastrophic wildfires in the Pine Ridge and Niobrara Valley have destroyed almost two-thirds of the ponderosa pine woodlands and forests of Nebraska since 2006 ▸ Many burned lands are not regenerating due to destruction of seed banks, loss of shade, as well as the destruction of mature, cone bearing trees ▸ Forest restoration efforts in the Pine Ridge and Niobrara Valley, and the use of ponderosa pine in windbreaks and shelterbelts, have been largely unsuccessful due to high mortality of planted bare-root seedlings ▸ Eastern redcedar is widely planted through the western two-thirds of Nebraska for soil, water, and livestock protection ▸ Need improved access to more detailed, locally-available woody biomass volume information from forestlands, non-forestlands with trees, and urban areas ▸ Eastern redcedar has spread into the understory of native forests, woodlands, and savannas and is replacing understory species, resulting in a slow conversion of species, the loss of natural forests, decrease in the quantity and quality of wildlife habitat, and increased potential for uncharacteristic wildfire

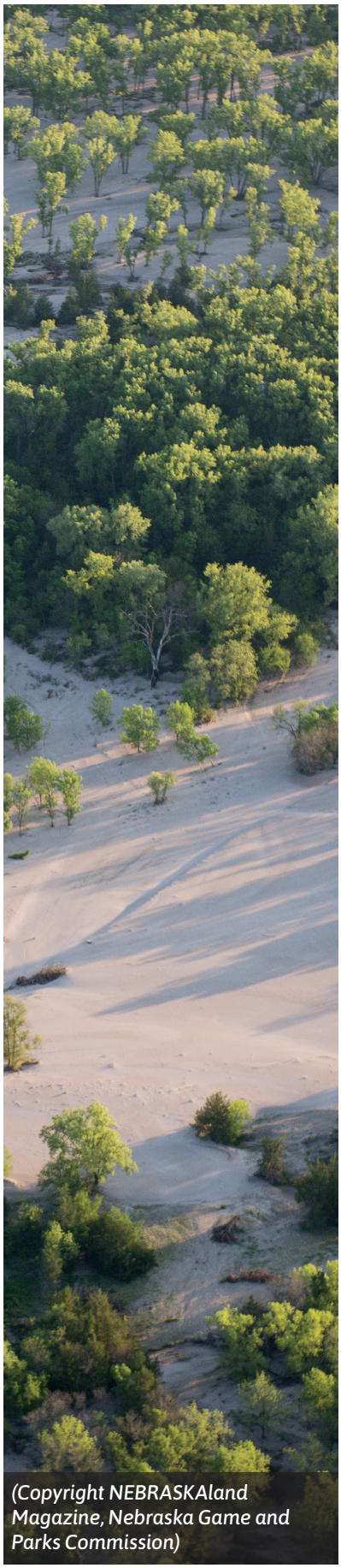
GOAL	IMPLEMENTATION SUMMARY	CHALLENGES SUMMARY
2&6: Restore fire-adapted lands; reduce wildfire risk; assist communities to plan/reduce risks	▸ Established Nebraska's second Firewise community in 2017 ▸ Implemented a highly-leveraged Firewise community protection initiative to increase awareness, and reduce risk and loss ▸ CWPPs completed for: Missouri River Northeast, Wildcat Hills, Central Sandhills, Southwest Nebraska, Southeast Nebraska, Western Sandhills, and Central Platte regions ▸ CWPPs in progress for: Middle Northeast, Missouri River East, South Central East, and South Central West regions ▸ 300 projects fuels reduction projects completed on over 9,500 acres ▸ Constructed five SEAT bases (Valentine, Chadron, Scottsbluff, McCook and Alliance), plus developed one mobile base ▸ Completed training for four SEAT base manager (SEMG) trainees in addition to SEMG trainees from local VFDs or partner agencies ▸ Cooperating aerial applicators: 2010 – 26, 2015 – 19, 2020 – 20, with a total of 32 fixed wing aircraft and one helicopter ▸ Provided fire training to over 25,000 students in 745 classes with over 140,000 training hours ▸ FEPP/FFP: Placed 44 trucks/yr. Increased total trucks from 279 in 2006 to 850 in 2019. Replaced (upgraded) approximately 20/yr. ▸ Developed a Type 3 Incident Management Team with Nebraska State Fire Marshal's Office and Nebraska Emergency Management Agency ▸ Developed/continue to manage the Western & Eastern Nebraska Wildland Fire Academies ▸ Received 10 Wildland Urban Interface grants to provide fuels reduction cost-share, matched by state funding, to reduce forest fuels across the state ▸ Treated over 5,000 acres of woodlands to improve structure, function, and avert loss due to uncharacteristic wildfire ▸ Analyzed the hours expended in fire suppression by VFDs to detect trends ▸ Initiated preparations for the impacts of an increase in fire intensity and frequency, coupled with a nationwide decline in volunteerism	▸ Recruitment and retention of diverse staff ▸ Fuels reduction contractors must be educated on fuels reduction practices and stand manipulation ▸ Fuels reduction contractors require education on bidding fuels reduction projects and general business practices ▸ Lack of fuels reduction contractors ▸ Reduced volunteerism

GOAL	IMPLEMENTATION SUMMARY	CHALLENGES SUMMARY
3: Identify/manage/ reduce threats to forest/ecosystem health	▸ Prepared and distributed new publications with information and recommendations for controlling forest pests, including 9 about the emerald ash borer and related ash problems; 2 about the mountain pine beetle and other bark beetles of pines; 5 about thousand cankers disease of walnut, pine wilt, Diplodia blight of pines, and iron chlorosis of broadleaf trees and conifers ▸ NE Tree Pest Detection Initiative confronts forest threats via comprehensive outreach and public/industry engagement and training ▸ Established Tree Pest Detector network with over 120 volunteers in 48 communities statewide to enhance detection of invasive tree pests and accelerate management interventions ▸ Implemented Nebraska's EAB Response Plan and continue to work with communities at risk or experiencing EAB ▸ Conducted detection surveys for EAB and thousand cankers disease of walnut in communities, parks, plantations, and high-risk sites	▸ Community forest resources remain threatened by invasive insects and diseases, extreme weather, and municipal and state budget limitations ▸ Specific actions needed to mitigate and reduce the negative impacts that accompany climatic change ▸ Impacts of a changing climate on Nebraska's tree and forest resources
4: Protect/enhance water resources	▸ Provided direct technical assistance to implement over 500 acres of timber stand improvement projects, designed to increase the structure and function of riparian forests ▸ Created over 50 acres of riparian forest buffers through direct technical assistance of staff	▸ No challenges were experienced during the implementation of this objective

GOAL	IMPLEMENTATION SUMMARY	CHALLENGES SUMMARY
5: Improve air quality/conserve energy	▸ Established a demonstration of alley-cropping systems (trees with hay crop between rows) at Horning Farm Demonstration Forest, providing a diversified agroforestry approach to management ▸ Tested woody florals planted within tree rows of windbreaks for non-traditional forest products ▸ Established a demonstration of "edible buffers" by restoring degraded field windbreaks that will now produce specialty forest products ▸ Established a demonstration arboretum and community forestry demonstrations to educate the growing urban populations of Douglas, Sarpy, and Cass Counties, and other cities and towns about tree planting techniques, species/cultivar choices, and landscape design ▸ Conducted community tree species and cultivar trials, including those adapted to a changing climate, tree planting techniques, pruning, and permeable pavement/green infrastructure in parking lots ▸ Established a cottonwood restoration project focused on the development of a woody biomass cover crop on a 5 to 7 year rotation ▸ Tested 14 varieties of fast-growing willow species at Timmas Farm Ecological Reserve to determine their suitability for woody crop production	▸ Changing and inconsistent weather conditions created challenges in the establishment of test plots and plantations. In both 2011 and 2019, flooding was a major problem along the Missouri River in eastern Nebraska
7: Maintain/ enhance economic benefits/values of trees & forests	▸ As a result of the passage of the Wildfire Control Act of 2013, NFS established the Forest Products Utilization program. The program seeks to identify new and expanding economic markets for Nebraska's forest products. With local, state and federal partners, the NFS works with businesses and individuals to investigate new forest product options and conduct product and market development projects to improve market strength in the state, leading to increased forest management ▸ Developed the TREES Heat Nebraska program to provide technical and financial assistance to facilities desiring to convert to woody biomass energy	▸ Declining natural gas prices which make woody biomass energy less economically feasible ▸ Increasing insurance costs for logging operations and sawmills ▸ The reduction of sawmills in neighboring states due to the recession of the late 2000s ▸ Lack of statewide understanding of the importance of forest products markets ▸ Lack of technical assistance outside of the NFS for the development of new forest products ▸ Lack of financial assistance for the investigation and development of new forest products and forest products markets ▸ Maintaining consistent program contact with local government and their familiarity of project scope and implementation

GOAL	IMPLEMENTATION SUMMARY	CHALLENGES SUMMARY
	▸ Completed preliminary or engineering feasibility studies for: • City of South Sioux City: city offices • Nebraska Department of Correctional Services: state penitentiary in Lincoln • Papio Valley Nursery: commercial greenhouse nursery in Papillion • Keya Paha County Schools and Courthouse: municipal facilities in Springview ▸ Received a 2015 Wood Innovation Grant to evaluate the feasibility of creating a district heating system originating from the existing woody biomass system at Chadron State College to include nearby school, city, and county facilities ▸ With the NSA, awarded 2015 Nebraska Environmental Trust project investment for Greener Nebraska Towns to make rural communities more resilient, sustainable, diverse, and water-wise ▸ Developed Nebraska's Ten Largest Communities program to provide support and training in NE's largest communities for tree planting, focused on critical issues of energy use, stormwater management, air/water quality, and a changing climate ▸ Developed an arborist safety program to recognize tree issues and mitigate degradation of forest resources ▸ Promoted/implemented certification standards and opportunities for NFS staff with 8 completing/maintaining ISA Certified Arborist, 3 completing ISA Municipal Specialist, and 4 completing Tree Risk Assessment Qualification ▸ Treated over 4,800 acres of woodlands and forests to increase their health and vigor through direct technical assistance of staff ▸ Renovated nearly 100 acres of field windbreaks through direct technical assistance of staff ▸ Assisted 72 landowners with the harvest of over 13 million board feet of timber with an estimated value of over $275,000 ▸ Planted nearly 250,000 trees in Nebraska's woodlands through direct technical assistance of staff ▸ Planted nearly 1,150 acres of field windbreaks through direct technical assistance of staff	▸ Presenting quantifiable information to community leaders how changes in practices increase returns on green infrastructure investments

GOAL	IMPLEMENTATION SUMMARY	CHALLENGES SUMMARY
8: Protect/conserve/ enhance fish & wildlife habitat	▸ In partnership with NSA and UNL Department of Entomology, awarded the Community as Habitat: Nebraska Communities Supporting Pollinators and Landscape Diversity Through Native WaterWise Plant Habitats ▸ Provided technical assistance to landowners resulting in the planting of trees and shrubs to create or improve wildlife habitat ▸ Chat Canyon Forest Legacy project protects 460 acres of Sandhills prairie and forestland along the Niobrara River in Cherry County; management activities are ongoing	▸ No challenges were experienced during the implementation of this objective
9: Connect people to trees/forests & engage them in stewardship activities	▸ Continued investment in Community Marketing for Trees campaign ▸ Completed activities for Full Circle Benefits grant, focusing on market-driven conservation to capitalize on expanding benefits of trees (shade, edible forest landscapes, wood products) in a changing environment ▸ Developed an initiative to directly address declines in public perception of the value of Nebraska's forests ▸ Created and continue to promote social medial presence with an outreach of 15,000+ subscribers ▸ Restructured the Nebraska Community Forestry Council to a 15 member advocacy board with representatives of all major green industry organizations ▸ Completed the ReTree effort for NE, providing support for 220 ReTree Ambassadors and 28 ReTree participating nurseries ▸ Supported and promoted Arbor Day Foundation programs including: Tree City USA, Tree Campus, Tree Line, and Growth Awards	▸ Defining stronger emphasis on ecological benefits such as improved habitat, biodiversity, pollinator support, and use of native and regionally-adapted plant materials ▸ Low interest for new volunteer advocates
10: Manage/restore trees/forests to mitigate/adapt to global climatic change	▸ Inventoried conservation trees in Nebraska via GPI II survey ▸ Established a cottonwood restoration project with short-rotation woody biomass ▸ Testing woody biomass systems and other uses of biochar to replace ancient carbon (fossil fuels) with carbon readily available within the system ▸ Testing short-rotation woody biomass species for growth and suitability as woody crops ▸ Planted 60 tree species to test suitability in Nebraska with considerations for alternative climatic conditions ▸ Planted over 225,000 pine seedlings in burned areas of Nebraska	▸ Finding local contractors with the ability to handle large planting projects



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Chapter 12: Funding and Resources

Funding

The NFS has an annual operating budget of $6.3 million. The funding sources are diversified with 51% coming from the State of Nebraska, 32% from federal sources, and 17% from competitive grant funds (both state and federal). Prior to 2010, the budget was more reliant on federal dollars at 56%, state 28%, and competitive funds 16%.

Today, the allocation of funding for personnel is 57% of the total budget. In 2010, personnel comprised 61% of the total budget. Because of decreasing revenues some positions have remained unfilled over the past several years. As a result, the NFS has reevaluated the structure of the agency to better address the needs around the state. The shift has put more positions in locations where staff can better address the needs of the forest resource and stakeholders. This was accomplished through grant funding, which supported positions to administer more cost-share programs for landowners, homeowners, and partners. The agency continues to leverage relationships to further this effort, working closely with Nebraska's Natural Resource Districts and the Natural Resources Conservation Service. Limitations to revenue will require the NFS and partners to continue to look for creative ways to better serve all Nebraskans.

Figure 39: Funding by Source

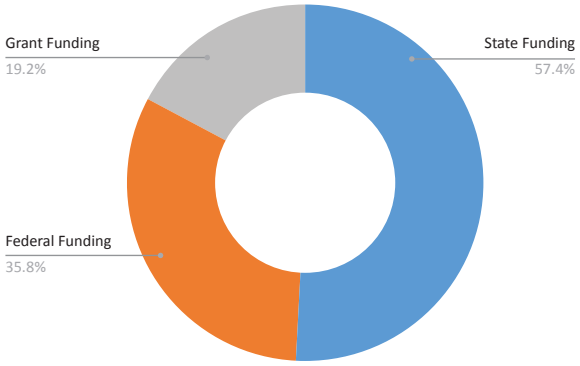
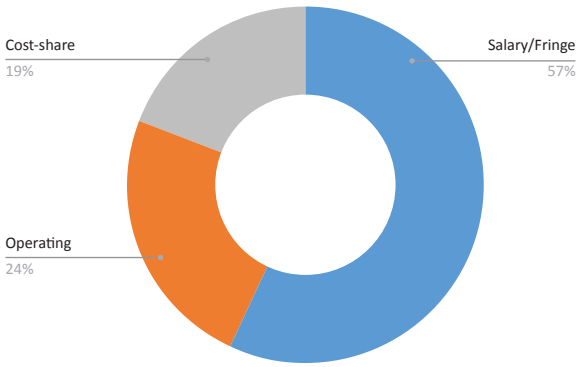


Figure 40: Expenditures by Source



Resources

The ambitious and aggressive strategy described in this FAP will require a comprehensive set of resources and additional capacity to support successful implementation. What follows is a summary of these needs, and the areas that should be bolstered in order to enhance the agency's effectiveness over the life of this plan.

Specific funding, capacity, or research gaps exist in:

- Personnel
  - Supporting marketing and utilization activities
  - Conservation education staff
  - Rural forestry staff to assist landowners
  - Community forestry staff to assist communities
  - Inventory staff
  - Forest health experts to help with EAB and other invasive pests
  - Fire and fuels specialists for training and WUI treatments

- Expanded inventory data acquisition and analyses
  - Rural forests and trees
  - Encroachment of aggressive native species and nonnative invasive species
  - Community forests canopy cover

- Expanded fuels reduction work in high-risk areas
  - Key anchor points for responding to fires
  - More WUI areas identified as additional CWPPs are developed
  - Key fuel breaks along ridges and other critical points

- Capital costs for conversion of thermal energy systems to woody biomass
  - Bioenergy systems (waste to energy)
  - Biosystems engineering (waste to improve efficiency)

- Capturing staff and program accomplishments
  - Consolidating activities of staff into one program to better track performance and accomplishment

- New and expanded cost-share programs
  - Tree planting
  - Thinning for forest health
  - Community canopy inventories and management planning
  - Agroforestry maintenance
  - Tree care workshops
  - Bioswales and pollinator habitat

- Research
  - Development of new wood products
  - Market development
  - Future invasive species
  - Current pests: range in the state, life cycles, best controls, etc.
  - Herbicide damage effects on trees and forests
  - Replacement species to adapt to a changing climate and test viability of species
  - New windbreak designs to emphasize diversity and decrease reliance on redcedar

- Funding for communities
  - Tree boards
  - Arbor Day Foundation programs
  - Tree advocate programs
  - Community and youth programing
  - Support for community forestry programs with limited or no annual budget
  - Firewise funding for communities

- Funding for increasing forest product utilization
  - Wood utilization, urban wood networks, and alternative-use programs
  - Wood innovation and market development
  - Marketing and utilization activities

- Funding for EAB preparedness and response
  - Rural communities with limited staff

- Support for forest management activities on private lands
  - Removal of overmature trees (and replanting) on private properties in poor neighborhoods
  - Support for eastern redcedar management
  - Support for restoring ponderosa pine ecosystems
  - Funding to acquire high-quality planting stock
  - Support for reducing encroachment of unwanted species into forests and rangelands

- Volunteer Fire Assistance grant funding level is below current need
- Support for training capacity within VFDs
- Support for agroforestry practices
- Support for marketing and re-establishment of the conservation tree program
- Marketing of trees and forests for water management
- Marketing of permeable landscapes and programs including trees and other vegetation

Appendix A. Forest Legacy Program Assessment of Need

The Cooperative Forestry Assistance Act of 1978 provides authority for the U.S. Secretary of Agriculture to provide financial, technical, educational, and related assistance to states, communities, and private forestland owners. Section 1217 of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (P.L. 101-624:104 stat.3359), referred to as the 1990 Farm Bill, amended the Cooperative Forestry Assistance Act to allow the Secretary to establish the Forest Legacy Program (FLP) to protect environmentally important forest areas that are threatened by conversion to non-forest uses. The goal of the legislation was to protect scenic, cultural, fish, wildlife, water quality, and recreational resources. This authority continues indefinitely, and permitted the outright purchase of threatened forestland (or development rights via conservation easements) by federal agencies. This legislation was further amended in 1996 to allow state agencies to hold the title or easement on properties in the program. Through the 1996 Farm Bill (federal Agriculture Improvement and Reform Act of 1996; Public Law 104-127); Title III – Conservation; Subtitle G – Forestry; Section 374, Optional State Grant for FLP), the Secretary is authorized, at the request of a participating State, to make a grant to the state to carry out the FLP in the state, including the acquisition by the state of lands and interest in lands. For Nebraska to participate in the FLP, the NFS was identified by the Governor of Nebraska on April 10, 2000, to be the state agency to lead the Forest Legacy Program.

The overall goals are the basis for implementing the FLP in Nebraska. Each goal serves as critical direction for the program. The general goal is to protect ecologically important forest systems in Nebraska. Priorities for protection include:

Protection of flora/fauna diversity	a. Promote diversity of Nebraska's forests and sustained productivity b. Link working forests to the plant and animal diversity c. Protect rare and important ecological systems
Protection of ecologically unique forest environs to include the eastern most extension of ponderosa pine forests in the United States	a. Protect seed source b. Maintain landscape-scale blocks of ponderosa pine
Protection of significant riparian forest	a. Protect threatened riparian forest in urban areas b. Protect biologically unique landscape found around Nebraska's rivers and streams
Connectivity of other conservation lands	a. Link protected forests both private and public b. Build connectivity to conservation lands c. Protection of wildlife, wildlife habitat and threatened and endangered species d. Protect rare species both flora and fauna e. Promote forest management that provides quality wildlife habitat enhancement f. Promote wildlife corridors especially around communities and critical habitat
Protection of forested parcels in danger of conversion or parcelization	a. Protect forests in and around communities to help connect people with trees b. Provide outdoor classroom opportunities in forest environments
Protection of unique geologic areas including minerals and fossil beds	a. Provide protection for unique geologic sites for education, recreation and outreach
Protection of cultural resources including historic sites	a. Protect historic sites and cultural sites b. Provide access to important sites when appropriate c. Protection of forest-based recreation d. Provide public access when possible e. Increase public awareness through forest education and use of these sites
Protection of water resources	a. Protect riparian forest function
Protection of soil productivity	a. Protect highly erodible soils
Forest Products and timber production	a. Promote economic value of the forest resources b. Protect working forest economic value c. Link working forest areas

Nebraska's Forest Legacy Assessment of Need may be viewed in its entirety at the following website: https://nfs.unl.edu/documents/ForestLegacyAssessmentofNeed2017.pdf

Appendix B. Eastern Redcedar in Nebraska Issue Paper

Taking a collaborative approach, in 2013 the members of the Nebraska Conservation Roundtable came together to develop a vision for addressing the rapidly expanding population of cedar in Nebraska, define the extent of the problems, determine the opportunities cedar presents, and identify specific actions to achieve this vision. Roundtable partners envision a future where:

- Grasslands and pastures are managed in ways that reduce cedar populations to improve grass health, vigor and resilience, enhance and conserve native wildlife habitat in grasslands, and protect species diversity at the landscape scale;

- forests containing cedar are managed to enhance timber quality and economic value of all species, increase plant and wildlife diversity within forests, enhance forest ecological resilience and function, and reduce the risk of catastrophic wildfire; and

- cedar is a valuable tree species on the Nebraska landscape, with multiple and profitable markets for its wood, contributing to landowner income, job creation and economic development.

The Conservation Roundtable's Issue Paper No. 1 can be viewed in its entirety at the following website: https://nfs.unl.edu/documents/EasternRedcedarNebraska-2016.pdf

Appendix C. Further Reading

Forestry Best Management Practices for Nebraska

The NFS encourages landowners to prepare forest management plans for their woodland areas. Preparing a management plan is a good way to clarify goals, provide direction, and schedule management activities for the woodland. Guidelines must be applied to specific sites with common sense and flexibility.

Sometimes field situations will need to be interpreted, and on-the-ground activities need to be designed by a forester or other natural resources professional. Flexibility and the ability to modify guidelines to suit local conditions are also needed to effectively apply these practices.

Most activities involving the actual management of forestland are included within these best management practices. Other actions such as land clearing, land leveling, and construction, which might take place in or around forested areas are not included. These activities are considered land-use conversion rather than woodland management.

Nebraska's Forestry best management practices can be found at the following web address: https://nfs.unl.edu/documents/ruralforestry/NebraskaBMP.pdf

Nebraska Community Wildfire Protection Plans

A Community Wildfire Protection Plan gathers together a community's resources to enhance wildfire mitigation and preparedness. The document identifies the steps a community can take to reduce its risk of damage from wildfires. Every CWPP has two key steps: It identifies and prioritizes wildfire risk areas within and adjacent to the community; It identifies measures needed to mitigate those risks, and it creates a plan of action to implement these measures.

To review the current and proposed plans in Nebraska, please visit the following web address: https://nfs.unl.edu/community-wildfire-protection-plan

Nebraska Natural Legacy Project: Revision of the Tier 1 and Tier 2 Lists of Species of Greatest Conservation Need

Nebraska's current State Wildlife Action Plan (Schneider et al. 2011) was approved by the U.S. Fish and Wildlife Service (USFWS) in 2011. One of the federal requirements for a State Wildlife Action Plan (SWAP) is that it identifies Species of Greatest Conservation Need (SGCN) within the state. In Nebraska, the SGCN list is divided into two tiers. Tier 1 species are those that are globally or nationally most at risk of extinction and which occur in Nebraska. Tier 2 species are typically those that are not at risk from a global or national perspective but are rare or imperiled within Nebraska. Tier 1 species are a higher priority and more research and conservation efforts are focused on these species. These lists are used to help prioritize conservation planning and actions and do not have legal or regulatory ramifications. By focusing conservation efforts on Tier 1 and 2 species, Nebraska can help prevent future state/federal listing as threatened or endangered, help recover currently listed species, and ensure that these species remain a part of the flora and fauna of Nebraska.

More information can be obtained by contacting the Nebraska Game and Parks Commission or visiting this web address: http://outdoornebraska.gov/wp-content/uploads/2018/11/NE-SWAP-SGCN-Revision-Supplemental-Document-2018-Final_edited-1.pdf

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