



Forest Service  
U.S. DEPARTMENT OF AGRICULTURE

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NATIONAL FOREST SYSTEM  
**REFORESTATION  
STRATEGY**

GROWING AND NURTURING  
RESILIENT FORESTS

Cover photo: Larch trees starting to turn color in the fall on the Flathead National Forest in Montana. Larch is one of the few deciduous conifer species—that is they change color and drop their needles in the fall. USDA Forest Service photo.

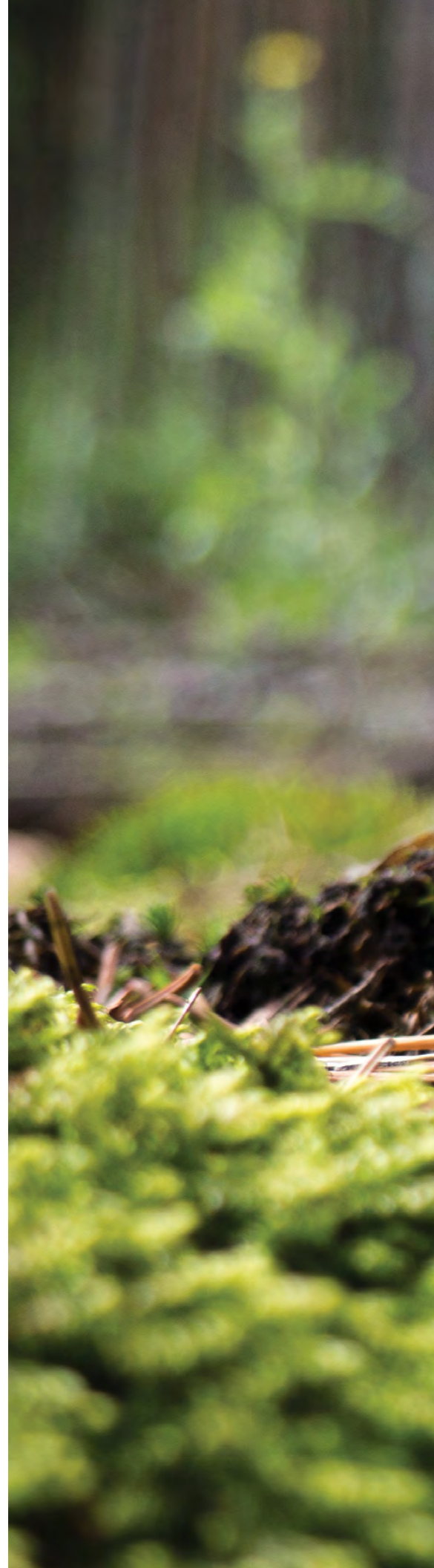


# CONTENTS

<b>What Is Reforestation?</b> . . . . .	<b>4</b>
<b>The Challenge</b> . . . . .	<b>8</b>
<b>The REPLANT Act</b> . . . . .	<b>10</b>
<b>The Vision</b> . . . . .	<b>13</b>
<b>The National Reforestation Strategy</b> . . . . .	<b>14</b>
<b>Guiding Principles</b> . . . . .	<b>14</b>
<b>GOAL ONE</b> . . . . .	<b>16</b>
Understand Current and Future Reforestation Needs	
<b>GOAL TWO</b> . . . . .	<b>18</b>
Develop a Set of Shared Priorities Across the Agency and With Partners	
<b>GOAL THREE</b> . . . . .	<b>20</b>
Expand Reforestation Workforce Capacity, Seed Production, Nursery Capacity, and Related Infrastructure	
<b>GOAL FOUR</b> . . . . .	<b>22</b>
Ensure Today’s Seedlings Grow Into Tomorrow’s Resilient Forests	
<b>GOAL FIVE</b> . . . . .	<b>24</b>
Nurture Forests To Enhance Future Resilience	
<b>GOAL SIX</b> . . . . .	<b>26</b>
Cultivate a Shared Story	
<b>Endnotes</b> . . . . .	<b>30</b>

# WHAT IS REFORESTATION?

Reforestation is a management action to renew tree cover by establishing young trees.<sup>1</sup> This work is done to maintain appropriate forest cover, achieve desired ecological conditions, and restore forests for wildlife, watersheds, and recreational experiences.<sup>2</sup> The U.S. Department of Agriculture (USDA), Forest Service recognizes that reforestation includes planting, seeding, and activities that facilitate natural regeneration of forests. These activities are crucial to fulfilling legal requirements to reestablish and maintain forests as forests. Over the last 5 fiscal years, the Forest Service has annually reforested an average of 190,000 acres, including 60,000 acres of tree planting and 130,000 acres of activities that support natural regeneration.







Conifer seedling growing in a forest. Adobe Stock photo.



# REFORESTATION ENSURES HEALTHY AND RESILIENT FORESTS

Reforestation is at the core of efforts to ensure healthy and resilient forests. Resilient forests are one of the best natural climate change solutions and are necessary to meet climate change mitigation goals. Climate-informed reforestation, including both natural regeneration and tree planting, is vital to growing more resilient forests that will help address the wildfire crisis, sequester carbon, and enhance biodiversity and ecosystem services. This Reforestation Strategy focuses on National Forest System (NFS) lands as a critical component of global reforestation opportunities. It provides the Forest Service with a plan to address the NFS's accumulated reforestation needs and prepare for the future. With action now, we will restore and maintain the Nation's forests.

Planting ponderosa pine seedlings on the Lolo National Forest in Montana. National Forest Foundation photo by Dave Gardner Creative.









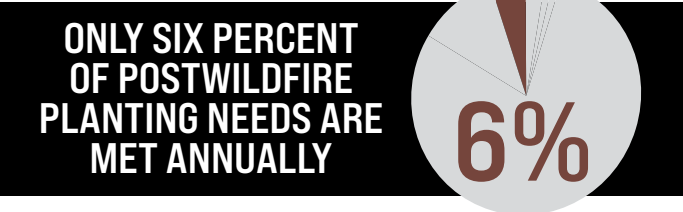


# THE CHALLENGE

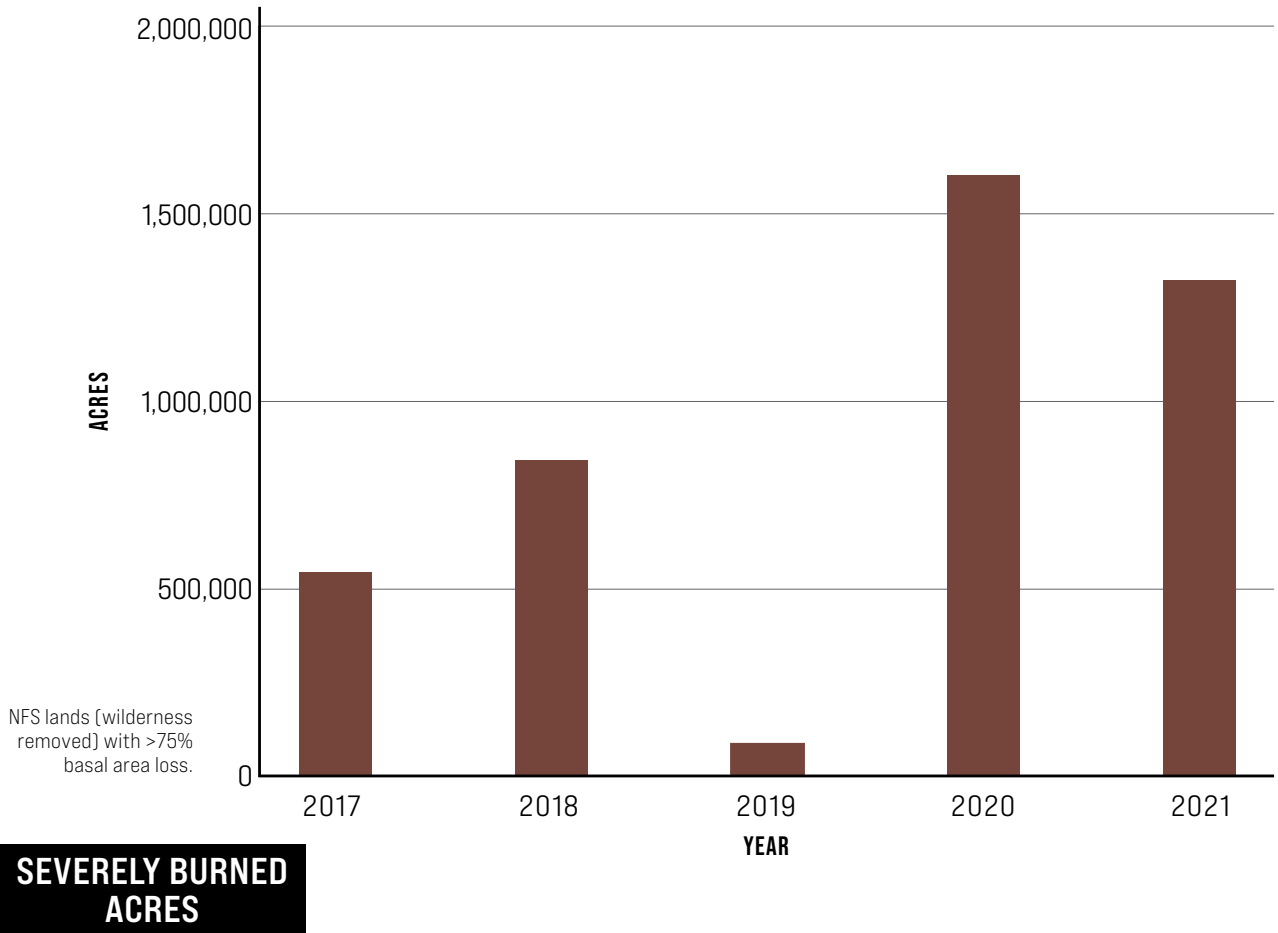
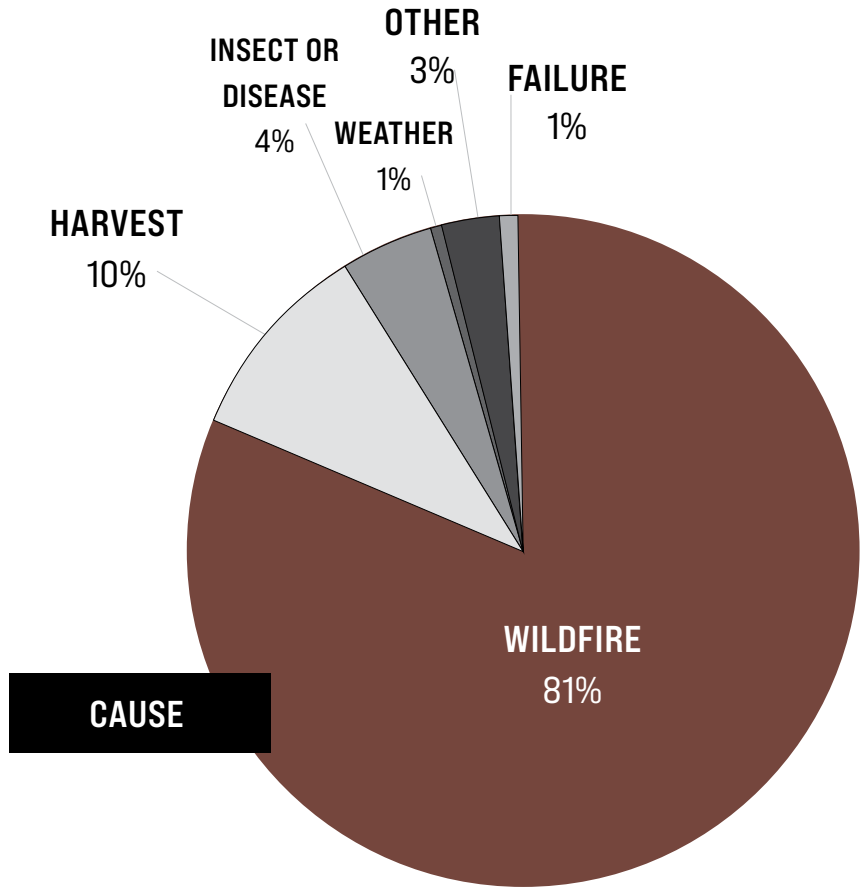
Severe threats to forested landscapes continue to escalate in size, frequency, and intensity. Uncharacteristic wildfire, insect infestations, diseases, drought, flooding, invasive species, and climate change endanger forests and create a need for restoration. Wildfire alone causes approximately 80 percent of reforestation needs on NFS lands. Severely burned areas are vulnerable to invasive species, which, along with climate change, increases the risk of forest conversion. A substantial portion of the 4 million acres of potential reforestation needs on NFS lands stems from wildfires over the last 2 years. In 2020 and 2021, more than 2.5 million acres of NFS lands burned with high severity,<sup>3</sup> compounding the 1.5<sup>4</sup> million acres of previously identified and verified reforestation needs.

Extreme wildfires are not the only disturbances that stress and threaten forests. In 2019, monitoring revealed over 7 million acres with dead trees and an additional 5.4 million acres damaged by insects and disease.<sup>5</sup> The 2020 hurricane season saw a record-breaking 30 named storms with 12 hitting the United States.<sup>6</sup> Hurricanes, tornadoes, and other wind events can significantly impact forest structure.<sup>7</sup> Climate change increases temperatures and the volatility of precipitation, which compound other stressors.

The Forest Service recognizes the urgency to increase the rate of reforestation and to integrate the best available science and technology in deployment of climate-informed reforestation techniques to meet these unprecedented needs. Climate-informed reforestation includes a suite of strategies that together consider how to mitigate compounding disturbances, adjust planning for how climate will move seed zones and forested areas, and protect forests as essential carbon stores. Ever-increasing needs have outpaced staffing, resources, and capacity across the agency. Over the last decade, only 6 percent of postwildfire planting needs were addressed annually, which is insufficient to sustain the forests on which we depend. Until passage of the REPLANT Act,<sup>8</sup> fully addressing current and future reforestation needs on national forests required five to six times available resources. This gap forced hard decisions about resource allocation and resulted in delayed action with ecological consequences.







PIE CHART: Reforestation needs by causal agent as of end of fiscal year 2021.  
 BAR CHART: Rapid Assessment of Vegetation Condition after Wildfire (RAVG) data for 2017-2021 showing severely burned areas.



# THE REPLANT ACT

## A CLEAR MANDATE TO ADDRESS UNPLANNED REFORESTATION NEEDS

The Repairing Existing Public Land by Adding Necessary Trees or REPLANT Act was signed into law as part of the Infrastructure Investment and Jobs Act (Public Law 117-58, Title III, Section 70301-70303) on November 15, 2021. The REPLANT Act provides a historical opportunity and a clear mandate to address postwildfire and other unplanned reforestation needs. It also significantly increases resources by removing the funding cap on the Reforestation Trust Fund. Fully addressing NFS reforestation needs lays the foundation for future resilient forests.







A crew plants whitebark pine seedlings on the Flathead National Forest in Montana. USDA Forest Service photo.



Fall colors in the George Washington and Jefferson National Forests in Virginia. USDA Forest Service photo.





# THE VISION

## Grow and Nurture Resilient Forests for Tomorrow

Reforestation in the right place, at the right time, with the right species, and at appropriate scales can change the current trajectory. To succeed at scale, the Forest Service must use the best available science and data and work in collaboration with partners, including other Federal agencies engaged in reforestation. Now is the time to leverage reforestation as a tool to mitigate climate change and grow future forests resilient to environmental threats.

Healthy forests provide life-sustaining benefits, goods, and services. Outdoor recreation is the most popular activity supported by America's public lands. National forests average 150 million visits annually that contribute more than \$11 billion to the economy.<sup>9</sup> Forests have tremendous value as natural infrastructure with NFS lands providing 20 percent of the Nation's water supply.<sup>10 11</sup> Besides filtering and storing water, forests provide a rich environment for understory and soil organisms that enrich the land's productivity.<sup>12</sup> Climate mitigation relies on healthy forests and their soils for carbon sequestration and storage.<sup>13</sup>

Forests also deliver goods that support communities, rural economies, and Tribal Nations, including timber, food, fuelwood, and forest products for cultural and traditional use.<sup>14 15</sup>

Other benefits are less tangible but no less appreciated by residents, recreationists, artists, and visitors. Forests' scenic beauty contributes to well-being and can improve mental health.<sup>16</sup> Forests support biodiversity and provide critical habitat for numerous threatened and endangered species.<sup>17</sup> Biodiversity is crucial to sustaining adaptation capacity and ecosystem resilience.<sup>18 19</sup> Cultural and sacred features of NFS landscapes foster traditional uses and provide connections to ancestral lands with opportunities for interpretive learning.

Achieving this vision of growing and nurturing resilient forests for tomorrow requires action today. It will require internal and external collaboration with partners on research, technology, workforce, seed collection, nursery capacity, and climate-informed innovations. This strategy provides the framework for fully addressing current and future reforestation needs.



TOP LEFT: A Kirtland's warbler in the Huron-Manistee National Forest in Michigan. BOTTOM LEFT: The Santa Fe National Forest in New Mexico and the Pueblo of Jemez work together to process the timbers harvested from restoration work into wood pellets for heating, poles for utilities, beams and vigas for conventional and traditional home building, ties for railroads, posts for fences, milled lumber, mulch, and firewood. RIGHT: A boater sets out for a day of fishing on Wade Lake on the Beaverhead-Deerlodge National Forest in Montana. USDA Forest Service photos.



# THE NATIONAL REFORESTATION STRATEGY

The National Reforestation Strategy outlines the goals and objectives necessary for successful reforestation on national forests. These goals and objectives build a robust framework to increase the pace and scale of reforestation to address existing needs, anticipate future events, and meet the provisions of the recently passed REPLANT Act (Public Law 117–58). Five goals describe actions needed throughout the reforestation process while the sixth goal emphasizes the importance of strategic communication and developing a shared understanding of reforestation. The Forest Service will develop national and regional 10-year implementation plans with specific actions for each goal. Three overarching principles guide the strategic framework and describe the approach the Forest Service will take to implement this strategy and fulfill requirements of the REPLANT Act.



## GUIDING PRINCIPLES

### FOR THE NATIONAL REFORESTATION STRATEGY





### 1 LEAD WITH SCIENCE AND TECHNOLOGY

The scope and scale of needed reforestation requires leveraging the best available science to inform decisions and expedite work. Practitioners and scientists coproducing research and tools can streamline application and use. Training is necessary to employ cutting-edge technologies. The Forest Service needs to develop new policy and experiment with new approaches.

### 2 STRENGTHEN INTERNAL RESOURCES AND CAPACITY

Well-trained professionals are crucial to the entire process, from determining reforestation needs to growing and nurturing trees. However, as reforestation needs have increased, personnel levels have decreased. The Forest Service needs to prioritize resources and invest in capacity commensurate with the scale of reforestation needs.

### 3 PARTNER AND COLLABORATE TO ACCELERATE AND AMPLIFY SUCCESS

The Forest Service recognizes that successfully increasing reforestation is dependent on strong partnerships with other organizations. The agency will need to effectively collaborate with Federal, Tribal, State, local, nonprofit, and other partners to achieve landscape-scale results.





# GOAL ONE

## Understand Current and Future Reforestation Needs

**Assess and identify reforestation needs from disturbances to improve ecological conditions, adapt to change, and promote resilience.**

**OBJECTIVE 1A:** Promptly assess and report reforestation needs following disturbances across NFS lands.

**OBJECTIVE 1B:** Leverage new technologies, models, and approaches for reforestation assessments and reporting.

**OBJECTIVE 1C:** Anticipate and prepare for near-term and future changes driven by climate change and extreme events.





The Mt. Hood National Forest Clackamas River valley has a mix of burn severity after the Riverside Fire in Oregon. USDA Forest Service photo.

Assessing the ability of forests to recover after disturbance is complex. It requires determining whether the forest will recover naturally or need assistance through planting or enhancing natural regeneration to meet land management objectives. Reforestation needs assessments should consider the landscape context and needs of multiple resources.

Recent increases in wildfires and hurricanes challenge the Forest Service's capacity to quickly and effectively assess reforestation needs. New technology and data are improving assessment methods. Improved consistency will ensure comparability across regions and expedite reporting reforestation needs. The Forest Service will clarify expectations for reporting, which may require

database training and reviewing business rules. The agency will also explore new tools and approaches, such as unmanned aerial systems, increased technology use in the field, and improved integration across data systems.

Fully documenting current reforestation needs is not enough. The Forest Service must anticipate and plan for future changes and disasters. Climate projections and vulnerability analyses should inform plans for future reforestation needs. They also can support managing changes in site potential and species distributions. Critical refugia need to be identified and conserved for their species and diversity. Preserving biodiversity will maintain adaptive capacity and ensure resilient future forests.<sup>20</sup>





## GOAL TWO

Develop a Set of Shared Priorities Across the Agency and With Partners

**Strengthen reforestation prioritization to ensure the resilience of future forests by promptly addressing reforestation needs.**

**OBJECTIVE 2A:** Identify current and future NFS reforestation priorities and share broadly.

**OBJECTIVE 2B:** Communicate existing laws and regulations regarding reforestation, including the establishment and stewardship of forests.

**OBJECTIVE 2C:** Work in partnership to consider reforestation needs and priorities across shared landscapes.





Developing shared priorities internally and with partners is critical to address current and future reforestation needs on NFS lands. Proactively developing postdisturbance reforestation plans could help prepare for future events by identifying recovery priorities before disturbance occurs. Reforestation priorities support provisioning water, restoring forest cover, and sustaining multiple resources, among other objectives.

Legal mandates require maintaining and restoring forest cover. The agency's reforestation work is bound by laws, including the National Forest Management Act and REPLANT Act, as well as regulations, policies, and land management plans.

Multiple authorities direct reforestation activities and facilitate partnerships, such as stewardship, good-neighbor, and Tribal authorities.

The Forest Service will explore how agency priorities align with those of partners to work more effectively with Federal, Tribal, State, local, nonprofit, and other private organizations across shared landscapes. Through meaningful dialogue and mutual understanding of capabilities, consensus will be built toward shared priorities.





## GOAL THREE

Expand Reforestation Workforce Capacity, Seed Production, Nursery Capacity, and Related Infrastructure

**Ensure the Forest Service has the resources, materials, infrastructure, and people to address the agency's reforestation needs.**

**OBJECTIVE 3A:** Collect and produce high-quality seed to meet reforestation needs.

**OBJECTIVE 3B:** Invest in infrastructure to scale up reforestation.

**OBJECTIVE 3C:** Sustain a professional, diverse workforce focused on reforestation.





Lucky Peak Nursery in Boise, Idaho. USDA Forest Service photo.

Growing a tree requires resources, effort, time, and an initial investment in seed. The Forest Service collects seed from diverse species and a range of locations. Seed orchards maintain genetic diversity and supply locally adapted seed. Forest Service geneticists use climate and site information to match selected seed to future planting locations. Considering current conditions improves the odds of establishing the tree, while considering future conditions improves long-term survival. Seed zones will shift with climate change. The Forest Service will explore partnerships across NFS boundaries to facilitate seed exchange and increase seed supply. The agency will improve databases to better track genetic diversity and tree survival. Maintaining genetic diversity supports adaptation and will be key to preserving vulnerable species.

Most seed must be processed, stored, and cultivated into seedlings for reforestation efforts. The Forest Service Nursery System has six nurseries and two seed extractories located across the country that serve the Forest Service and other Federal, State, and Tribal partners. Growing trees and reforestation are processes that do not align with fiscal years. The agency needs to fully leverage current funding mechanisms, including expanded resources through the REPLANT Act and the Reforestation Trust Fund.

The number of seedlings produced needs to quadruple to meet the Forest Service's current and future needs. The Forest Service Nursery System has the capacity to increase production, although not without first addressing deferred maintenance and seed production needs. Repairs and upgrades to facilities can improve efficiencies in energy use, water consumption, and seedling production. However, the Forest Service will need to expand nursery system facilities and explore new partnerships to fully address reforestation and other restoration needs. All investments should ensure the nursery system and seed networks are resilient to future climate impacts.

Reforestation, from initial planning to monitoring established trees, requires a diverse workforce with specialized knowledge. This workforce includes employees, contractors, and partners. Forest Service reforestation staffing levels have declined, and institutional knowledge has been lost. As the pace and scale of reforestation increase, more trained agency personnel and skilled contractors will be needed. The agency needs to invest in a broad range of positions including technical specialists, contractors, and others that support reforestation. The Forest Service should explore new organizational structures and staffing approaches, including innovative partnerships.





A recently planted ponderosa pine seedling on the Dixie National Forest in Utah. USDA Forest Service photo.

## GOAL FOUR

### Ensure Today's Seedlings Grow Into Tomorrow's Resilient Forests

**Create a favorable environment to establish seedlings that will develop into resilient forests.**

**OBJECTIVE 4A:** Consider the landscape context when determining where and when to establish trees.

**OBJECTIVE 4B:** Ensure seeds and seedlings have the best chance of survival through site preparation, planting, and continued care to enhance resistance to threats.

**OBJECTIVE 4C:** Use innovative approaches to scale up reforestation and improve monitoring.





Establishing resilient forests requires naturally regenerating or planting the right species, in the right place, at the right time, and at the appropriate density. The Forest Service will decrease the time between disturbances and reforestation to avoid losing forest cover.

The Forest Service's reforestation work will set forested landscapes on a trajectory that ensures appropriate structure and composition as the forest develops. The agency must continue to recognize the multiple ecosystem services needed from forested landscapes to thoughtfully plan reforestation that helps restore and sustain benefits into the future. Reforestation, whether natural regeneration or planting, needs to consider future ecological conditions, forest community structure, wildfire risk, and other factors. The agency will further integrate across resource areas to identify opportunities where reforestation can mitigate threats and address the needs of multiple resources.

Establishing seedlings is a continual exercise in risk management and requires a broad range of approaches to address the range of variability and uncertainty. Local knowledge and expertise inform site-level decisions and approaches that improve seedling survival. Tools and techniques vary considerably across regions and ecosystems. The Forest Service will facilitate peer-to-peer learning across regions to address knowledge gaps and operational barriers. The Agency will foster collaboration between practitioners and researchers to develop and use new research to improve seedling establishment.

To address the magnitude of reforestation needs, the Forest Service will partner to explore and develop new technologies to implement reforestation at appropriate scales. Collaborating with researchers, nonprofits, and other partners will provide additional resources to monitor and help implement adaptive management. Adaptive management relies on feedback from monitoring to enhance success and mitigate future uncertainty.



# GOAL FIVE

## Nurture Forests To Enhance Future Resilience

**Sustain healthy forests to provide abundant ecosystem goods and services.**

**OBJECTIVE 5A:** Tend stands throughout forest development to enhance resilience and to foster ecosystem services.

**OBJECTIVE 5B:** Account for future stand tending and other forest management activities in reforestation project design.

**OBJECTIVE 5C:** Develop a long-term strategy to address accumulated stand-tending needs.





## Stand Tending

Also known as stand improvement, stand tending is a set of management actions that are implemented in young forests to improve overall condition and health of the forest now and into the future. These actions may include weeding (release), pruning, fertilizing, thinning, and prescribed fire. Weeding minimizes competition with other plants until tree seedlings grow large enough to survive. Thinning lowers competition for water and nutrients while improving structure and age-class diversity over time. Prescribed fire increases available nutrients and reduces risk of devastating wildfire. As trees grow, stand tending promotes diversity in forest structure, composition, and function. This supports multiple ecosystem benefits from wildlife habitat to recreation and enhances resilience to disturbance.



Trees alone do not grow into future healthy forests with today's constraints; it takes active management. Disturbance, climate change, and encroaching development constrain natural processes that historically fostered resilience. The Forest Service needs to develop and maintain processes that enhance forest resilience, such as fire in fire-dependent ecosystems. Stand-tending actions, such as thinning and prescribed fire, help to develop the desired canopy structure and species composition. These practices build resilience, enhance adaptation, and reduce ecological stress from drought, pests, and future climate impacts. Healthy forests can better sequester and store carbon and aid in mitigating climate change.

Reforestation activities from natural regeneration and planting will generate similar stand-tending needs. Stand tending ensures forests develop toward desired conditions and is a tool for

adaptation. Stand-tending needs on NFS lands have steadily increased to more than 2 million acres. The Forest Service only addresses about 10 percent of needs annually due to financial and operational constraints. Reforestation projects will continue to thoughtfully consider future stand-tending needs.

Ultimately, the Forest Service must develop a long-term strategy to address stand-tending needs. The agency will need to work collaboratively with partners and across silviculture, ecology, fuels, and other resource areas to develop a strategy. This is essential to ensure the agency addresses current and anticipated stand-tending needs. Not tending stands leads to dense, suppressed trees unlikely to mature into a desired, healthy forest.









Central to this strategy is cultivating a shared story about the importance of fully addressing the agency’s reforestation needs. The Forest Service must clearly and effectively communicate internally and externally to build support for each goal of this strategy.

Internal to the agency, this will require explicitly identifying key resource areas connected to reforestation. Effectively addressing multiple management priorities and objectives, including reforestation, requires collaborating and communicating across deputy chief and resource areas. The agency needs to foster cross-disciplinary connections to reforestation to strengthen internal support for reforestation actions. The Forest Service will create an internal communication plan to build a shared understanding and inspire action toward addressing reforestation needs on NFS lands.

Beyond the agency, the Forest Service needs to leverage the strength of its reforestation partners to amplify the story and importance of reforestation. Working with partners to share key messages and knowledge<sup>21</sup> with diverse audiences can improve agency transparency and build public support for reforestation

and the benefits it provides. It can also create opportunities at all levels of the agency to increase resources, facilitate innovation, and promote public involvement in reforestation work.

Both the agency and partners need clear and consistent measures and metrics of success when it comes to reforestation work. Reforestation is typically measured in acres accomplished or number of seedlings established. The Forest Service and partners will collaborate to develop measures that capture the outcomes of successful reforestation. Reforestation can provide wood products, wildlife habitat, food, medicine, clean water, biodiversity, carbon sequestration, and so much more. Qualitative and quantitative outcome-based measures can help to better evaluate and communicate these benefits. This can advance new approaches to support reforestation work, such as conservation finance and other collaborative efforts.

Meaningful metrics combined with shared storytelling and strategic communication will support the actions needed to address the agency’s reforestation needs.





The rings of a tree tell a story about the growth of the tree and the conditions where it grew. Adobe Stock photo.



# FORESTS CYCLE THROUGH PHASES OF GROWTH, MATURATION, MORTALITY, AND REGENERATION

Reforestation is one tool to restore and maintain this 400-million-year-old cycle of life without which water, wildlife, and ways of living are threatened. This strategy creates a framework for the Forest Service to address its reforestation needs now and into the future. It outlines the needed steps to grow and nurture resilient forests for tomorrow. Prioritizing and investing in reforestation today will lay the foundation for sustaining healthy forests we can enjoy and that will sustain us and future generations.



# ENDNOTES

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- 21 Knowledge is recognized as more than Western science and specifically is intended to include other ways of knowing, including (but not limited to) traditional ecological knowledge, native science, Indigenous ways of knowing, and local knowledge.



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