Arch Cape Forest

Multi-Resource Management Plan:

Management Policies and Procedures

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SPRINGBOARD FORESTRY

March 16, 2023

ABOUT THIS MULTI-RESOURCE MANAGEMENT PLAN

The organization and contents of this multi-resource management plan reflect the vision, goals and objectives of the Arch Cape Domestic Water Supply District Board of Directors and the Arch Cape Forest, Forest Management Advisory Committee. In addition, this plan has been structured to satisfy the requirements of the United Stated Department of Agriculture (USDA) Forest Service Forest Legacy and Community Forest funding programs, the State of Oregon's Forest Management Planning standards, and the standards for Forest Stewardship Council Certification.

Separate sections within this plan focus on five goals established by the advisory committee: water quality and quantity, affordability, community connection, forest ecology, and habitat. Each of these sections includes the following:

- Background on the current status and conditions of the Arch Cape Forest relating to that goal.
- Objectives for achieving or maintaining the forest in relation to the goal.
- Strategies, actions and tools relating to that goal.
- Monitoring and performance measures that will indicate accomplishment of various objectives.
- Stakeholder input from the Forest Management Advisory Committee.

Many topics cut across multiple goals. These topics, such as road management and silviculture, appear in multiple goal sections with associated relevant policies and practices.

ACKNOWLEDGMENTS

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INTRODUCTION

In 2016 the Arch Cape Domestic Water Supply District, (referred to herein as "the District") began to explore the acquisition of 1,441 acres in and surrounding the Arch Cape drinking water intakes on Shark and Asbury Creeks . The District had previously engaged in management decisions on the watershed when Stimson Lumber Company owned the property. The effort to create this community forest represents one of the largest recent acquisitions of forest for municipal drinking water protection in Oregon. This project and the neighboring North Coast Land Conservancy Rainforest Reserve protect in perpetuity approximately 5,000 acres. Forest management reflects community input while undertaking projects that maintain or improve the ecological capacity of the forest to provide reliable quantities of high-quality source water. In addition, forest stewardship helps to protect both forest health and water affordability for the foreseeable future.

Beginning in 2016, when Ecotrust Forest Management purchased the Arch Cape Forest from Stimson Lumber, the Board and Staff of the District began pursuing the acquisition of their source watershed and the development of a Community Forest. This forest is the immediate backdrop for the coastal community of Arch Cape and located directly east of Hwy 101. The drinking water catchment area (referred to as the drinking watershed) for the community of Arch Cape covers the central

WATER QUALITY AND TREATMENT

The water filtration system uses a Toray PVDF hollow fiber membrane. These systems rely on source water with low turbidity and nutrients for efficient, low-cost water treatment. Without high-quality source water, water filtration will cost more. Turbidity and suspended nutrients can result from floods, soil disturbance, and road runoff. Suspended organic material also creates a risk of process byproducts (discussed in further sections). Good forest stewardship decreases source water turbidity and nutrients, which in turn decreases the cost of water filtration.

INTRODUCTION

portion of the property, while the remainder provides an important recreational, economic, and aesthetic resource.

BACKGROUND

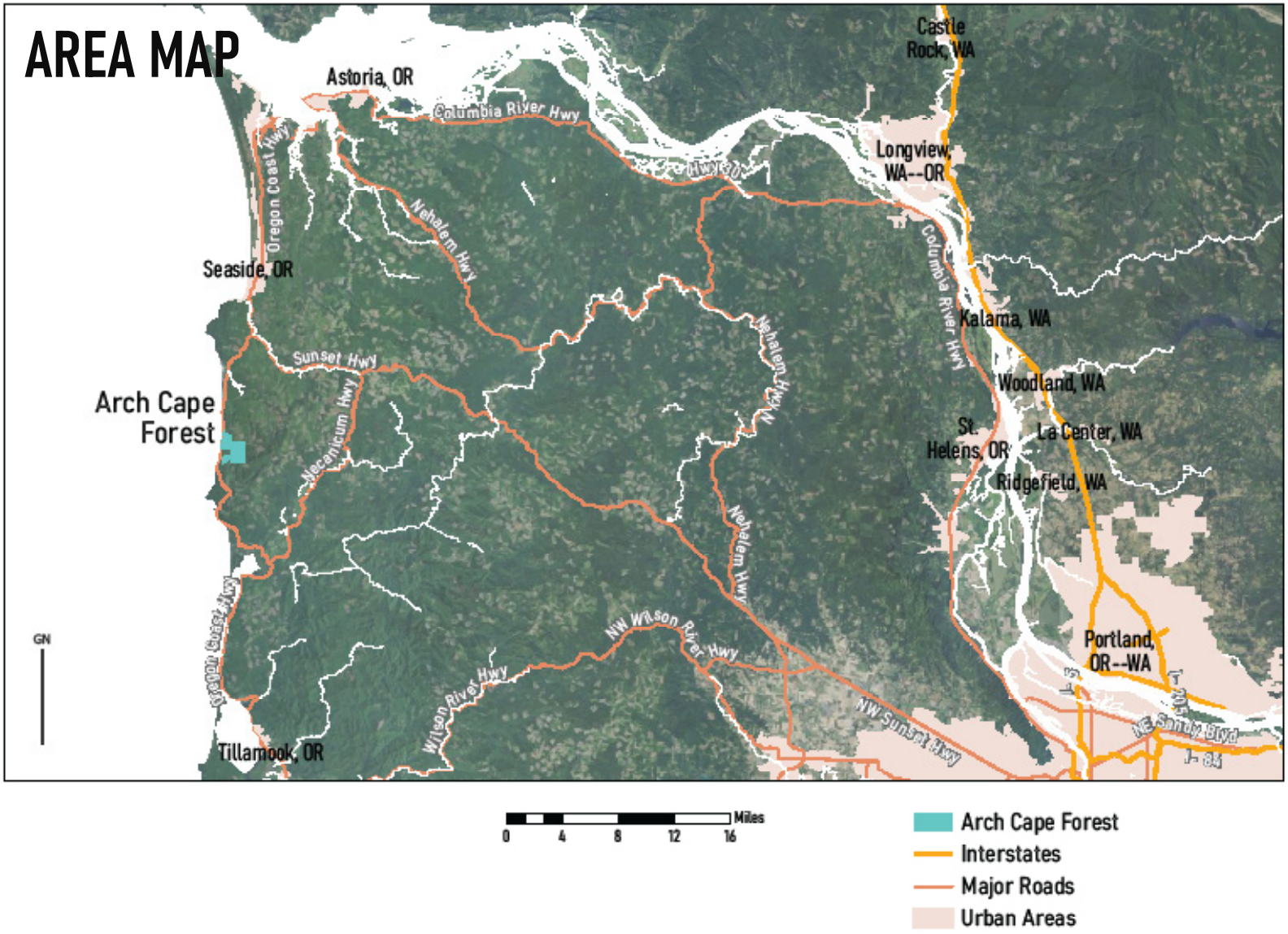
The Arch Cape Forest builds on a regional effort by community and non-profit groups to establish community forests. These projects range from Eastern Oregon to Northwest Washington and all points in between. Community Forests also include everything from state- and non-profit owned forests to municipal watersheds. The common thread between these community forests is local buy-in and involvement in acquisition, planning, and management activities.

INTRODUCTION

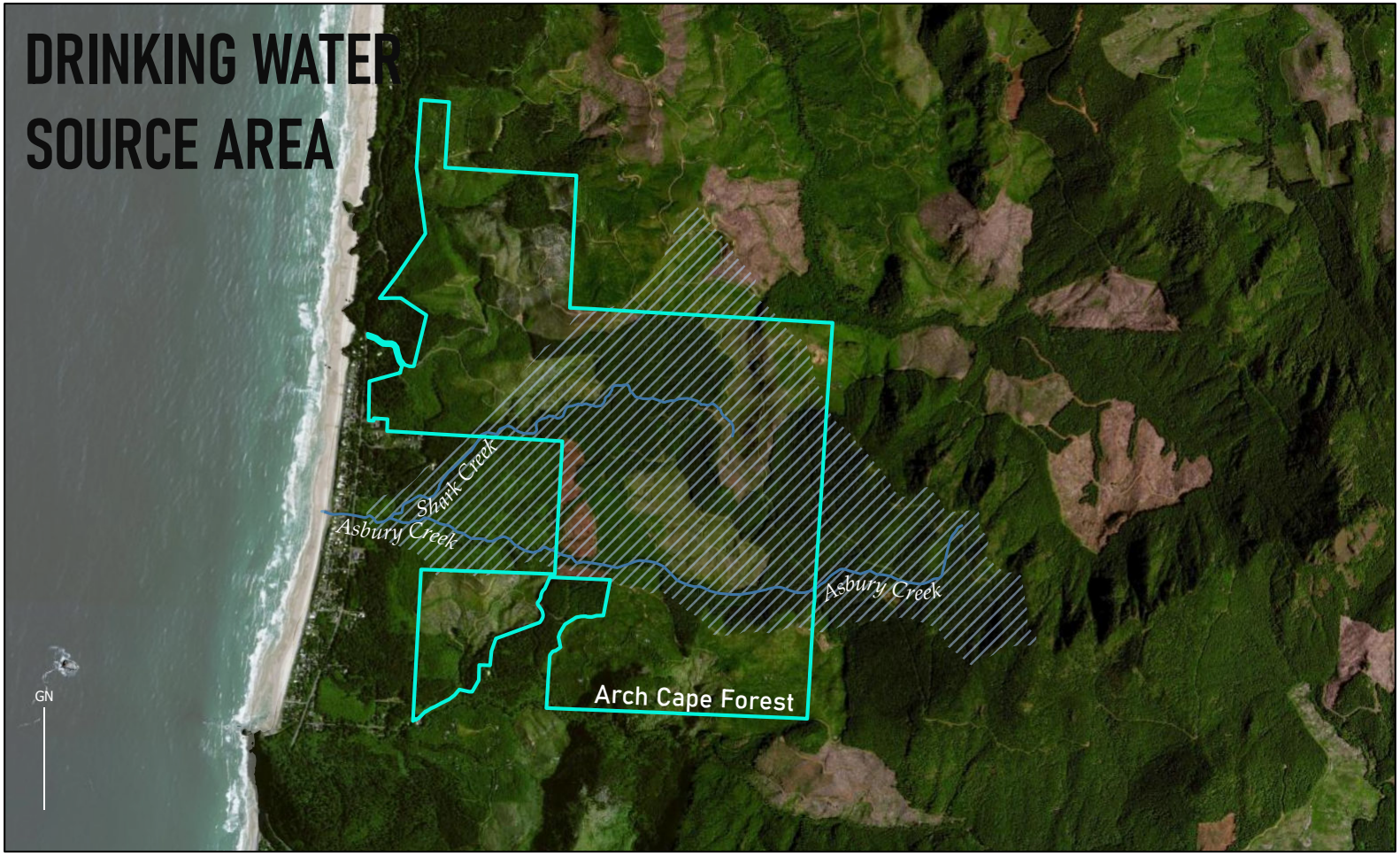
The Arch Cape Forest has been led, planned, and executed by a dedicated group of staff and volunteers. This includes but is not limited to the boards of the Water Supply and Sanitary Districts, the Forest Management Advisory Committee, and countless other volunteers. In addition, staff from the Oregon Department of Forestry and United States Forest Service have played instrumental roles in assisting the forest. Other important partners include the staff of the North Coast Land Conservancy, which owns the surrounding Rainforest Reserve (acquired October 26th, 2021), and volunteer legal counsel that assisted the District during acquisition.

The District Board directed staff and volunteers to develop a plan for the property that balances excellent watershed protection with active forest management. This plan will be in effect for the initial ten years of forest ownership, through 2033, subject to revisions as the forest and circumstances change.

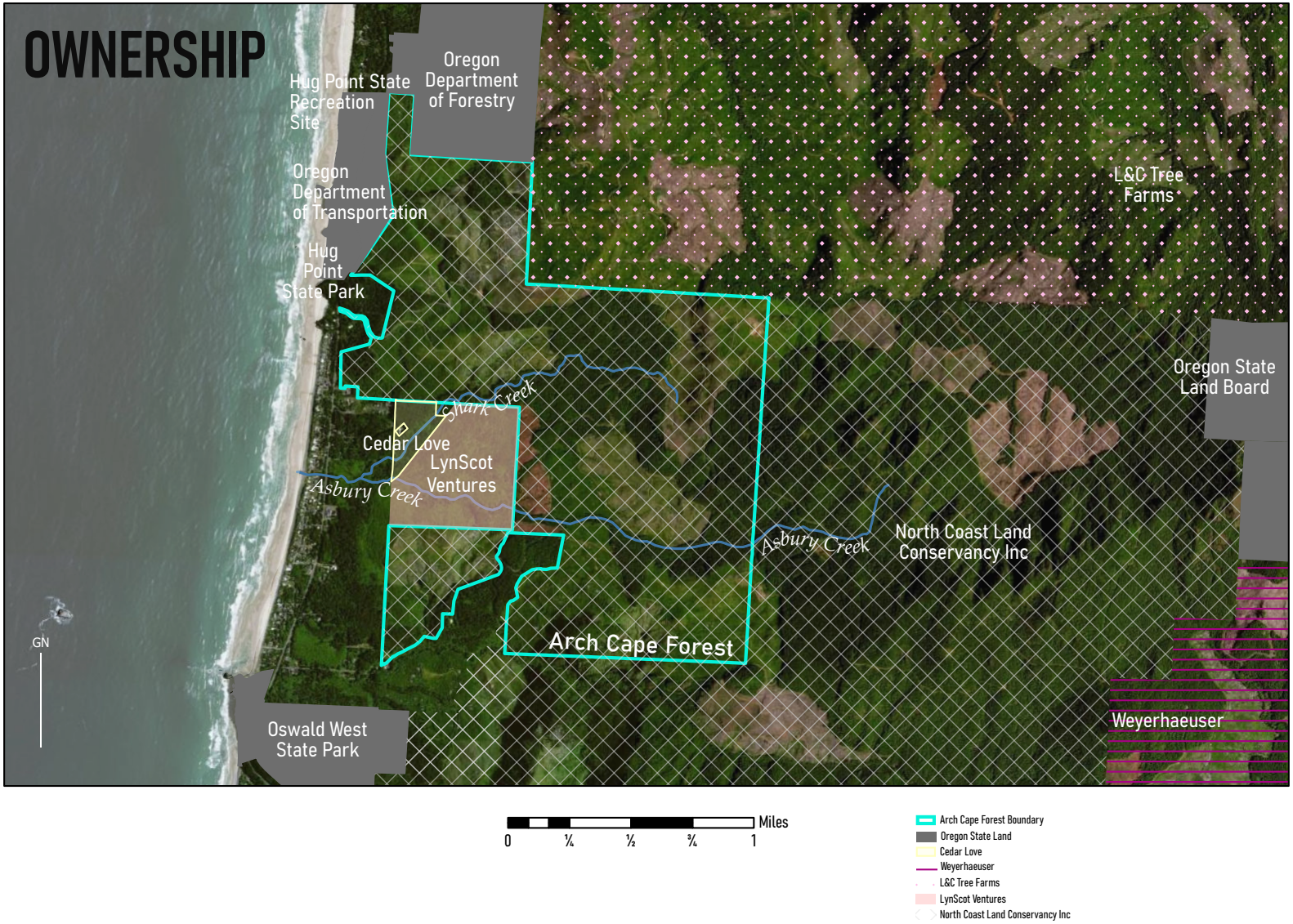
INTRODUCTION



INTRODUCTION



INTRODUCTION



PLAN PURPOSE

SECTION 1

This multi-resource management plan provides District staff, volunteers, and consultants with guidance and policies for the ongoing stewardship of the Arch Cape Forest. The plan lays out a proposed framework for management, beginning with goals and objectives, describing existing resources, and proposing implementation and monitoring activities. This framework is intended to guide the responsible long-term stewardship of the Arch Cape Forest.

Periodic operating plans will be added to this plan as future appendices. Annual and 5-year operating plans will play a key role in all future forest management activities including harvest, road maintenance, recreation, invasive plant treatment, and thinning activities. Forest inventory and spatial property data are available at www.archcapeforest.org, through an online mapping application.

The advisory committee and consultants evaluated a wide range of management decisions and, in the following pages, lay out a framework based on broadly agreed upon goals

TYPES OF MANAGEMENT PLANS

Strategic plans: provide big-picture goals, objectives, means of achieving them, and systems for monitoring accomplishments. They can exist for any organizations of any size or type.

Operational plans: determine actions, timelines, and responsibilities for a fixed timeframe and fixed resource. Annual or bi-annual operating plans commonly exist for forest operations.

Technical plans: typically relate to an individual resource but often draw from a larger body quantitative research or professional experience.

What type of plan is this? The Arch Cape Forest Multi-Resource plan is primarily a strategic plan with significant technical components. Periodic operating plans will be developed based on the strategy and technical approaches outlined. Many of the forestry sections combine technical data and research with the goals and objectives agreed upon by the Forest Management Advisory Committee.

and objectives. The advisors and consultants believe that the plan laid out in this document is the most likely to find widespread support in the Arch Cape community. This path is specific but allows sufficient flexibility to adapt to community needs and local conditions.

This plan should also be seen as a living document. The goals and conditions of the Arch Cape Forest and community differ from any other forest in the region. Every management action, even the decision to do nothing, provides a learning opportunity that can influence future decisions. Through active monitoring and adaptive management, the Arch Cape Forest will receive the best stewardship possible.

VISION STATEMENT

Our vision is to provide clean, safe, and affordable drinking water to Arch Cape residents and visitors, through the creation of a working community-owned forest to sustain the rich character and beauty of Oregon's coastal rainforest for generations.

GOALS

The Forest Management Advisory Committee for the Arch Cape Forest and consulting team began the process of drafting a multi-resource management plan by workshopping a set of goals. These goals were generated directly from the Vision Statement. These goals underly a set of four objectives. In turn, the four objectives support policies. Many of the policies cut across multiple goals and objectives. Each policy is described in the following sections and then associated with goals, in ranked order.

The goals of the Arch Cape Forest are:

1. ***Provide reliable quantities of high-quality drinking water***
2. ***Retain affordable water***
3. ***Engage the community in the forest***
4. ***Retain and restore natural forest structure and aesthetics***
5. ***Provide intact terrestrial and aquatic wildlife habitat***

OBJECTIVES

Four objectives support the Arch Cape Forest goals and vision statement. Each of these objectives cut across goals. In ranked order, they are:

The Arch Cape Forest will…

1. ***Protect and enhance the watershed, watershed resilience, and source water quality and quantity.***
2. ***Protects the affordability of drinking water, which may include active timber harvest.***
3. ***Connect with the local community.***
4. ***Retain and restore natural forest structure and species diversity.***

POLICIES

In order to achieve the Arch Cape Forest vision, goals and objectives, the Advisory Committee considered a set of eight broad policies related to future forest management decisions. These policies create a framework for determining operational plans and financial feasibility. These policies also meet or exceed the requirements of the Oregon Forest Practices Act and Forest Stewardship Council Pacific Standard.

The policies include specific requirements and tolerances related to:

- Stream Buffers
- Harvest Levels
- Opening Size
- Tree Retention
- Road Maintenance
- Chemical Use
- Invasive Species
- High Conservation Value Forest / Steep Slopes

GOVERNANCE

SECTION 2

The District Board of Directors ("Board") holds ultimate decision-making responsibility for the Arch Cape Forest. The Board has financial responsibility for Arch Cape Forest Operating Budget. A new 3-member Arch Cape Forest Management Committee (separate from the Forest Management Advisory Committee, which was responsible for this plan) has responsibility for working within that Budget to determine an optimum approach for executing the budget (e.g. staff, consultant, vendors, partnerships) and working with staff / consultants / vendors / partners to execute the operating plan.

The new 3-member Arch Cape Forest Management Committee will recommend periodic (5-year) operating plans to the Board and will work with managers and consultants to execute operating plans, as well as develop a long-term 50 year financial plan. Eventual decision making and approval of operating plans requires approval from the Board.

The Board has overall responsibility for the management of the Arch Cape Forest. The Arch Cape Forest will be established as a separate, distinct business unit. As such, the Arch Cape Forest will maintain separate financial controls and reporting. These will include business unit specific long-range operating & financial plans, annual budgets, bank accounts, and financial reporting (e.g., balance sheet, income statement, and cash flow statement). Both Arch Cape Forest and the existing Water business units will report to the Board. Both business units will follow Board approved policies in accordance with State of Oregon law & Special District guidelines.

MANAGEMENT SCHEDULE

Quarterly: Forest Management Committee meeting with property manager and forester

Annual: Forest Management Committee update to Board and community, budgeting, operating plan proposal and execution.

5-year: Minor update to multi-resource management plan, approved by Board

10-year: Major updates to multi-resource management plan, approved by Board

GOVERNANCE

SECTION 2

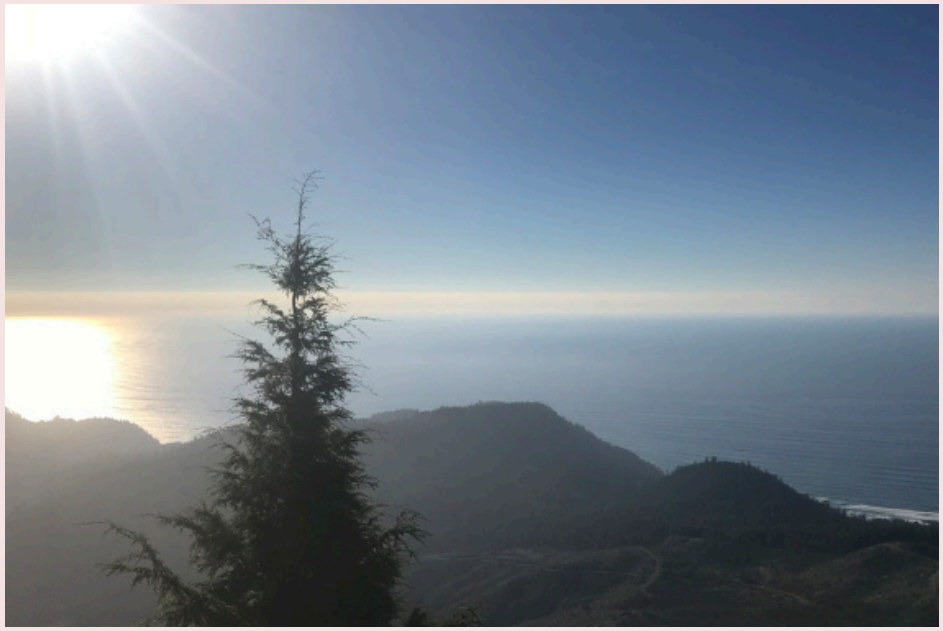
The 3-member Forest Management Committee will be made up of individuals with professional experience in conservation, forestry, academia, watershed management, or business operations, or strong connection to the Arch Cape Forest. The committee members will be nominated by members of the Board and appointed by the Board for 3-year terms.

The Forest Management Committee will oversee all property management decisions. The property manager is responsible for public relations, reporting, contracts, and other day-to-day operations. The property management capacity could be provided through the District's existing staff, through a contracted manager, or through partnership with other regional organizations. The forester will provide specific consulting related to forest and road stewardship, monitoring, and planning, working in partnership with the property manager.

The property management responsibilities include contract administration, board and management committee administration, bookkeeping, grant applications, administration and reporting, as well as public engagement.

GOALS AND OBJECTIVES

SECTION 3



The following sections describe a set of goals and associated policies for the Arch Cape Forest. These goals and policies provide a framework for how the forest and watershed will be managed. The goals are listed in order of importance and reflect the underlying motivations for acquisition of the Arch Cape Forest. Each goal cuts across a number of policies, which are accordingly associated with and described in multiple goal sections.

While some goals may be aspirational, policies are intended for direct application across all management practices. These goals and practices were developed as part of the 2021-2022 management planning process with the Forest Management Advisory Committee for the Arch Cape Forest. Also note, this multi-resource management plan does not include recreational uses at this stage. A separate public access plan is being developed through the National Park Service Planning Framework process and will be included as an appendix.

WATER QUALITY AND QUANTITY

The Arch Cape Forest includes 58% of the Arch Cape drinking water source area. The drinking water source area designation encompasses any area that would naturally drain into Shark or Asbury Creeks upstream of the water intakes. The headwaters of the drinking water source area primarily extend into the North Coast Land Conservancy's Rainforest Reserve, with small areas falling on Nuveen Natural Capital's Lewis and Clark Timberlands. A combination of steep slopes, erodible soils, roads, and past management practices have created high water treatment costs because of high turbidity in source water from throughout the drinking water source area.

GOALS AND OBJECTIVES

SECTION 3

All management practices will first and foremost protect and improve source water quality and quantity, at present and into the future. This includes impacts from sediment, nutrients, temperature, large scale disturbances (e.g., pest outbreaks), and human impacts. In addition, the overall forest structure and stand composition has dramatic long-term impacts on low and peak flow conditions, which are increasingly important with unpredictable weather events and climate change.

SEDIMENT

Sediment and in-stream nutrients are a primary driver of water treatment costs. High turbidity can necessitate installation of additional filtering systems or drive up the intensity of existing treatment. Sediment comes from a variety of sources, the most common being erosion within existing stream channels, extension of stream channels through the road ditch and drainage network, erosion from soil disturbance associated with logging, and mass wasting events or landslides.

Erosion within existing streams takes place primarily as streams incise. In the Northern Oregon Coast Range, this can occur due to shifts in geomorphological conditions such as the removal of woody debris from a stream or from a shift in flow patterns like a large flood. In the former case, efforts to place wood in a stream can halt or even reverse incision, causing the stream channel to aggrade and store sediment. Much of the Oregon Coast Range saw significant removal of woody debris in the 1940s – 1980s, largely with the goal of improving fish habitat. Instead, this led to dramatic incision in many coastal streams, including on those within the Arch Cape Forest. In the ensuing 40 years, natural and artificial in-stream woody structures have caused channels to aggrade. In general, however, Asbury, Shark and other creeks on the property are dramatically incised and do not appear to be aggrading back to a historic stream channel.

Incision and sediment transport, leading to turbidity in source water, also results from high peaks flows or other shifts in stream flow patterns. Widespread logging across the property over the past century shifted stream flow patterns. At the landscape scale, mature and complex forests serve as a sponge, storing water during wet periods and slowly releasing it during dry periods. Young forests, in contrast, lack this ability. Instead, young forests use large quantities of water quickly because they do not have the same water storage capacity. Given the high proportion of sapwood per tree in young stands, increased evapotranspiration leads to severe summer moisture deficits and accordingly low stream flows. This distinction between older and

younger forests has important implications on source water quality. In general, low flows are lower and peak flows are higher in a young forest than in older and more complex forests. The result of widespread logging across the Arch Cape Forest was probably an increase in peak flows, which would have had the secondary impact of increased soil erosion.

Soil erosion is both constant, and occurs irrespective of exogenous forces; however, human activities have the potential to dramatically increase the erosion process. A good example is absence or presence of a road and its current maintenance condition. This is because roads intercept water that is moving along the forest floor, often as subsurface flow, and convert it to surface flow, either in a ditch or on the road surface itself. Road ditches can extend a stream network by as much as 50%. This additional stream network increases the potential for erosion and decreases the ability of the forest floor to filter out sediment.

Road surfaces are also a primary source of fine sediments that remain suspended in the water column. These fine sediments are often the most costly and problematic for source water treatment systems as they can both clog systems and create disinfectant byproduct issues (for more details see nutrients section). Poorly maintained roads and ditches can create significant water quality issues and are a primary management concern for the Arch Cape Forest. A well built and maintained road network decreases erosion, while poor maintenance both increases erosion and contributes to fine sediment runoff.

Any form of soil disturbance, particularly those that expose mineral soil, can create sediment issues. Primary examples of this are logging and post-logging erosion, as well as any mass wasting event. All land management activities have an impact on water quality and run along a spectrum from minimal impact to catastrophic impact. Land managers attempt to minimize any negative impacts of erosion. This can be achieved most effectively by selecting appropriate forest management treatments or stewardship projects, executing them with experienced operators, and planning post-treatment mitigation. In addition, policies such as stream buffers, steep slope / high landslide risk harvest restrictions, and equipment limitations can provide broad protection from soil disturbance.

ORGANIC MATTER

Suspended nutrients in source water create significant issues within the treatment and water distribution system. Nutrients that pass through ultra filtration react with chlorine in the water system to create disinfectant byproducts, the most common of which are haloacetic acid (HAA) and trihalomethanes (THM or TTHM- total trihalomethanes): chloroform, bromodichloromethane, dibromochloromethane, and bromoform.

HAA and THM are the result of gaseous chlorine or liquid sodium hypochlorite water treatment. The chlorine reacts with organic material in the water to create HAA and THM.

The source of the organic material, tannic acid, is typically the result leaf litter that falls near streams and decomposing cedar and hemlock root mass in or around streams or wetlands. As these organic materials decompose, they release tannic acid into the water. That tannic acid is not fully filtered out through typical filtering processes and accordingly reacts when gaseous chlorine is added to the water.

TEMPERATURE

While the Arch Cape water system does not utilize reservoirs or other pre-filtration large storage capacity, stream temperature may still impact water treatment costs. Colder water generally carries fewer nutrients and is easier and cheaper to treat. Shade and stream bed structure directly impact temperature. Streams with sufficient shade and stream channel structure that supports hyporheic flow provide colder water than exposed streams with eroded channels. Hyporheic flow is the water that flows beneath the surface of the stream channel through rocks, gravel and other substrate. An incised stream will often have less hyporheic flow and, accordingly, warmer summertime water.

DISTURBANCE AND RESILIENCE

The Oregon Coast Range has a long history of large-scale disturbance including fire, pest and pathogen outbreaks, landslides, and windthrow. These types of disturbance often have immediate and severe impacts on water quality. These impacts can range from large sediment pulses to long term shifts in hydrological patterns.

Large scale disturbances, by their very nature, create challenges for management during and following the event. The primary management approach for disturbance is to cultivate and develop appropriately scaled resilience, such that the watershed still provides the maximum ecological function during and following the event. Managers accomplish this through ecological heterogeneity, primarily in the forms of species diversity and structural complexity on a stand level and managing for a mosaic of stand types across the landscape. Fire ignition, a significant issue for disturbance, is discussed in greater detail under the “human impacts” section.

The scale of ecological disturbance is anticipated to increase with climate change, while the predictability of these events will decrease. Examples of disturbances that are likely to affect the Arch Cape Forest include extreme weather events with wind and/or rain, pathogen outbreaks such as Spruce budworm or Hemlock looper, and wildfire.

Similar to how a financial investor selects different investment types in order to create portfolio diversity, a forest manager focused on resilience will manage towards a more diverse and complex forest. Pests and pathogens typically only attack certain species, various tree species and ages have differing susceptibility to windthrow, and a diverse forest stands will respond differently to the large stand-replacing fire historically present in the Oregon Coast Range. For the financial investor, some investments will continue to yield whether or not others fail. For a forest manager, some species of trees and stand types will continue to provide high quality water filtration when others are unable to do so. This resilience is key to managing for long-term water quality in a drinking watershed.

The present stands on the Arch Cape Forest display significant spatial heterogeneity but relatively low species diversity or structural complexity on a stand level. Over time, active management can select for increased species diversity and complexity. An example of this management is pre-commercial thinning that selects trees to increase diversity. In older stands, variable retention harvests can increase spatial complexity while creating a multi-strata stand. This type of stand displays the characteristics of resilience. Over time, management interventions will create a forest more capable of providing high quality drinking water despite the challenges of climate change and pre-existing ecological disturbance risk.

HUMAN IMPACTS

Humans are the primary exogenous force acting on the Arch Cape Forest. From forest management decisions to recreational activities, human actions have and will continue to shape this landscape. Human impacts can be positive and negative in terms of water quality. Positive impacts would include invasive species treatments and resilience-oriented forest management decisions. Negative impacts are far more varied and include fire ignition, erosion, and source water contamination. This section focuses on the three latter issues.

While fire ignition is not fully tracked, anecdotally and from conversations with the Oregon State University fire resilience extension staff, most fire ignitions in the Oregon Coast Range are human-caused. Typically, fires start because of both a poor understanding of fire propagation and risky behavior or a combination of the two. The easiest way to limit human-caused fire ignition is to exclude humans from a landscape. This human exclusion has become an annual

occurrence, with most private forestland owners closing all public access during periods of high fire risk. Other measures can be taken including limitations on vehicle and power-driven machinery use, campfire bans, smoking bans, limitations on slash burning, and improved signage and public education. Fires in Northwest Oregon have historically been large and stand replacing with relatively long (over 100 years) return intervals. More recently, a number of fires on and around the subject property have ignited due to slash burning. Improved slash treatment practices are mandatory for fire management, including considerations of chipping, small piles, and an outright ban on slash burning on the property. This again would be in-line with comparable watersheds on the coast that do not burn slash.

Erosion is another primary concern for source water and can occur from human uses of a property. One of the most common is through poor trail building practices or illegal trails. Active monitoring of trails and intentional planning of recreational uses is important for avoiding unintended impacts. Trails should be carefully planned and located away from running water on any steep slope areas where increased erosion risk exists. Motorized use trails present the most severe erosion risk. As with the construction of road networks, trails create additional surface runoff and present a risk of fine sediment, which will remain suspended in the water column through most source water intake systems. Any trail with exposed mineral soil must be planned in accordance with best management practices with erosion taken into consideration. Source water contamination due to human actions remains relatively rare but can have enormous impacts on source water and filtration.

Another concern on drinking water source areas is unmanaged use and trash dumping. Without an intentionally managed public access program, road pullouts can become dumping sites, camping can become a pervasive issue, and water contamination risk can result from both. Management of public access and enforcement of access policies are essential to protection source water.

A separate but related source water risk comes from wildlife populations, and particularly elk. Elk can habituate themselves to wallows in low-gradient streams and wetlands. In turn, these wallows create significant sediment pulses downstream. Elk also actively browse most conifer species with the exception of Sitka spruce, causing challenges for stand establishment post-harvest in areas with increased elk presence. Active hunting through a managed program can limit elk issues including erosion and tree browse. A program such as this should include active hunter education and follow-up to monitor source water contamination risk.

In addition to hunting risk, all recreational uses bring the risk of human waste, including bodily waste, in and around water sources. Evaluation of human waste risk and a plan for human management should be included in public access planning.

WATER AFFORDABILITY AND WORKING FORESTRY

Active management of the Arch Cape Forest could play a role in property acquisition and the ongoing stewardship costs associated with forest ownership. In turn, timber sale revenue and cost management will have long-term impacts on water affordability. While not all management activities generate revenue, most planned harvests will generate some financial returns. These funds can then support the upfront acquisition cost as well as long-term property maintenance. In most cases these ongoing maintenance costs have tandem benefits of protecting or improving source water quality while also paying living wages to local contractors to complete the work.

The Arch Cape Forest has an important legacy as a working forest that provides social and economic benefits throughout the community. Active forest management, also referred to as "working forestry", including silviculture, maintenance, and harvest, supports a range of employment opportunities while also improving the affordability of drinking water in Arch Cape. The harvested logs, which are restricted from export, support jobs in local sawmills. The fiber goes on to supply the construction industry throughout the Pacific Northwest and harvest taxes provide financial support for a range of programs. For almost a century, Oregon has held position as the top US lumber producing state and active management of properties such as the Arch Cape Forest helps to support this.

GOALS AND OBJECTIVES

SECTION 3

Managing the Arch Cape Forest as a sustainable working forest creates a public example of how active management, source water protection, and long-term climate resilience can work together.

As described in the "Disturbance and Resilience" section, active harvesting is an important tool for increasing species diversity and structural complexity in the forest. A strong legacy of active management has created a pre-existing mosaic of stand ages and compositions across the property. Ongoing management will continue to increase diversity and watershed scale resilience to disturbances and increased climate change risk.

COMMUNITY CONNECTION

The Arch Cape Forest provides not only the aesthetic backdrop for the community of Arch Cape but also supports recreational uses, sport and subsistence hunting and gathering, and a strong community sense of place. In addition, the purchase of the forest creates an opportunity for ongoing forestry research and education.

As a result of common practice over the past century, the Arch Cape Forest property has remained open to public access. With significant transitions among private landowners, public access is no longer a given and some landowners have begun charging for any access. A significant risk exists that without public purchase, the Arch Cape Forest could be closed to public access and some areas of the property planned for development.

Recreational and community property use will be addressed in a separate public access plan. The plan will outline current property use including but not limited to hiking and running, wildlife viewing, photography, bicycling, hunting, gathering, equestrian use, education, and research. The Arch Cape Forest is an ecologically and socially unique forest and thoughtful evaluation of community property use is essential. The public access plan will be incorporated into future revisions of this multi-resource plan and included as an appendix in the initial plan adoption.

FOREST ECOLOGY

Oregon's coastal forests sit at the far southern extent of a coastal rainforest type that extends north to Alaska's Prince William Sound. The Arch Cape Forest and neighboring Rainforest Reserve are particularly unique in that they span from creek-bottom Western red cedar stands to mid-elevation Pacific silver fir, Douglas fir, Sitka spruce and Western hemlock, to high elevation Western hemlock / Sitka spruce forest. In addition, the topography and rocky geology present challenges to timber harvest that have allowed some stands to grow far beyond a traditional commercial rotation of 40-70 years. This unique example of plant succession and coastal rainforest has significance in terms of both forest ecology and forest function.

The Arch Cape Forest exists along a stark elevation gradient with highly varied levels of soil productivity, slope and aspect. These different sites support dramatically different forest types. Plant communities on the Arch Cape Forest and Rainforest Reserve provide an excellent example of plant succession from

young stands that have yet to reach a point of competitive exclusion to old stands that have begun to create gap openings, allowing for establishment of new cohorts of young trees and plants. In addition to the notable tree diversity across elevational bands, herbaceous plants and shrubs display a unique diversity within a relatively small area.

Furthermore, the Arch Cape Forest provides a prime example of forest functional characteristics. While almost none of the Arch Cape Forest would be considered virgin forest, some older areas of the forest have functional characteristics similar to an old forest type. This is the result of active windthrow and other natural disturbance that creates gap openings and increases structural complexity. While these characteristics are more pronounced on the neighboring Rainforest Reserve, stand dynamics on the Arch Cape Forest continue towards a complex forest with old forest function. The result of this is a forest with a high capacity to store and filter water, relatively high ecological resilience in the face of disturbance and climate change, and relatively high potential to store carbon. Many

of these functional characteristics will continue to grow as the age-class distribution across the forest normalizes. At present, the age-class distribution tends towards many young stands, some old stands, and very few stands in between. With the normalization of this distribution, the forest will continue to grow in its importance for forest function.

Active management as planned for the Arch Cape Forest is designed to mimic natural ecological processes and accelerate the forest's ability to provide essential ecosystem service functions. The policies relating to harvest, stream protection and invasive species all strive to support natural forest ecological process while also planning for a future with greater variability and severity in terms of disturbance risk.

HABITAT

The Arch Cape Forest provides important habitat to a wide range of species as a result of location, proximity to protected forests, and forest ecology. Species present on the property or in streams flowing from the property include Roosevelt elk, deer, black bear, cougar, Coho and steelhead, numerous bird species, and a multitude of insects, fungi, and other organisms. These communities could not exist without the important habitat provided by the Arch Cape Forest. Continued stewardship and management will serve to support and improve habitat values across the forest.

As described in the preceding section, the Arch Cape Forest exists at the southern edge of a coastal rainforest type that extends over 2,000 miles north. Many of the species found on the Arch Cape Forest are the same as those found in British Columbia or Southeast and South-central Alaska. In addition, the forest is home to other species more commonly found to the south in coastal Douglas fir and Redwood forests, or to the east in the Coast Range forests of Northwest Oregon. This location at the ecological edge of four distinct habitat types (coastal Western hemlock, coastal Douglas fir, coast-range mixed fir, and marine), supports the relatively high species diversity on the Arch Cape Forest.

The forest is surrounded to the North by large areas of institutional forestland managed by Greenwood Resources and Oregon Department of Foresty forestland, on the second side by the protected Rainforest Reserve, on the third side by Oswald West State Park, and on the fourth by the relatively narrow community of Arch Cape with the Pacific Ocean beyond. This combination of surrounding forests creates unique connectivity and a clear connection to both saltwater marine habitat as well as freshwater creeks and streams. In addition, the 18 square mile Cape Falcon Marine Reserve lies just to the west. These areas provide important protected land and ocean connectivity, supporting habitat, ecological processes, and the wildlife that depend on them. Of particular note is the Marbled murrelet, which have identified nest sites both in State forestland to the north and Oswald West State Park to the south.

Finally, the mosaic of forest stand characteristics and relatively intact forest ecological processes present on the Arch Cape Forest currently support important habitat with the potential for dramatically increased future habitat quality. Steep slopes and large riparian buffers have created barriers to harvest, resulting in reserve areas across the subject property. Over time, continued plant succession patterns will create habitat that is unique on the Northern Oregon Coast.

FOREST MANAGEMENT ACTIVITIES

SECTION 4

INTRODUCTION

This section outlines proposed management and stewardship activities for the Arch Cape Forest. The proposed activities comply with the policies and practices included in the Arch Cape Forest Multi-Resource Management Plan (referred to as the 'Plan'). All activities are intended to accomplish the underlying goals of improving or retaining reliable quantities of high-quality source water. This document provides an overview of management – annual operating plans for the activities will be reviewed on a regular basis by the three-member forest management committee. Activities include:

- Timber Harvest
- Road Maintenance
- Timber Stand Improvement
- Planting
- Access / Fire Management

These five areas of stewardship activity are costs to the owner, with no potential for revenue generation except during timber harvest. Each is described in the following sections.

TIMBER HARVEST

The Arch Cape Forest has a long history as a drinking water source area and of forest management, including active timber harvest. The purchase of the forest was driven by a need to protect the source water area. While certain conditions may exist where commercial timber harvest contributes to improved ecological and forest health, which has positive water implications, the forest is very young, and the few remaining older stands support this plan's stated objectives. The harvest of these stands would have negative near term implications for both the quality and quantity of source water.

It is the recommendation of the Advisory Committee to not to harvest timber for financial reasons in the Arch Cape Forest. This must be balanced against the financial reality of community forest ownership and stewardship. Any harvests that are planned should be completed to first and foremost to accomplish long-term forest resilience and health goals.

The Management Committee and Board of the Arch Cape Water District must approve any timber harvests. These timber harvests must comply with the Oregon Forest Practices Act, Forest Stewardship Council standards, and the policies described in section 5. These policies are seen as a minimum level of protection required to protect the quality and quantity of source water.

ROAD MAINTENANCE

The Arch Cape Forest has a highly varied road system including mainlines, primary spur roads, and secondary spur roads. All roads are built with a crushed rock base and were originally constructed with appropriate drainage, grades, and width for their intended uses for timber management. Road maintenance can be divided into two types: road restoration (e.g., reconstructing decommissioned spurs) and regular maintenance (e.g., mowing, grading). This plan covers regular road maintenance of mainline roads, which should occur on a routine basis. Mainline roads are identified in the road map (see page 52 of the Plan) and must remain open and useable both for standard management-associated property access, and in accordance with road easements. Mainline roads should be maintained to a USFS Road Maintenance Level 3, defined as "passable to a prudent driver in a standard passenger car during the normal season of use" (see pages 20 to 27 in "Guidelines for Road Maintenance Levels" https://www.fs.usda.gov/t-d/pubs/pdf/11771811.pdf).

Road restoration and decommissioning, which would occur primarily on spur roads, is not part of this document and is covered by the Ecological Road Assessment.

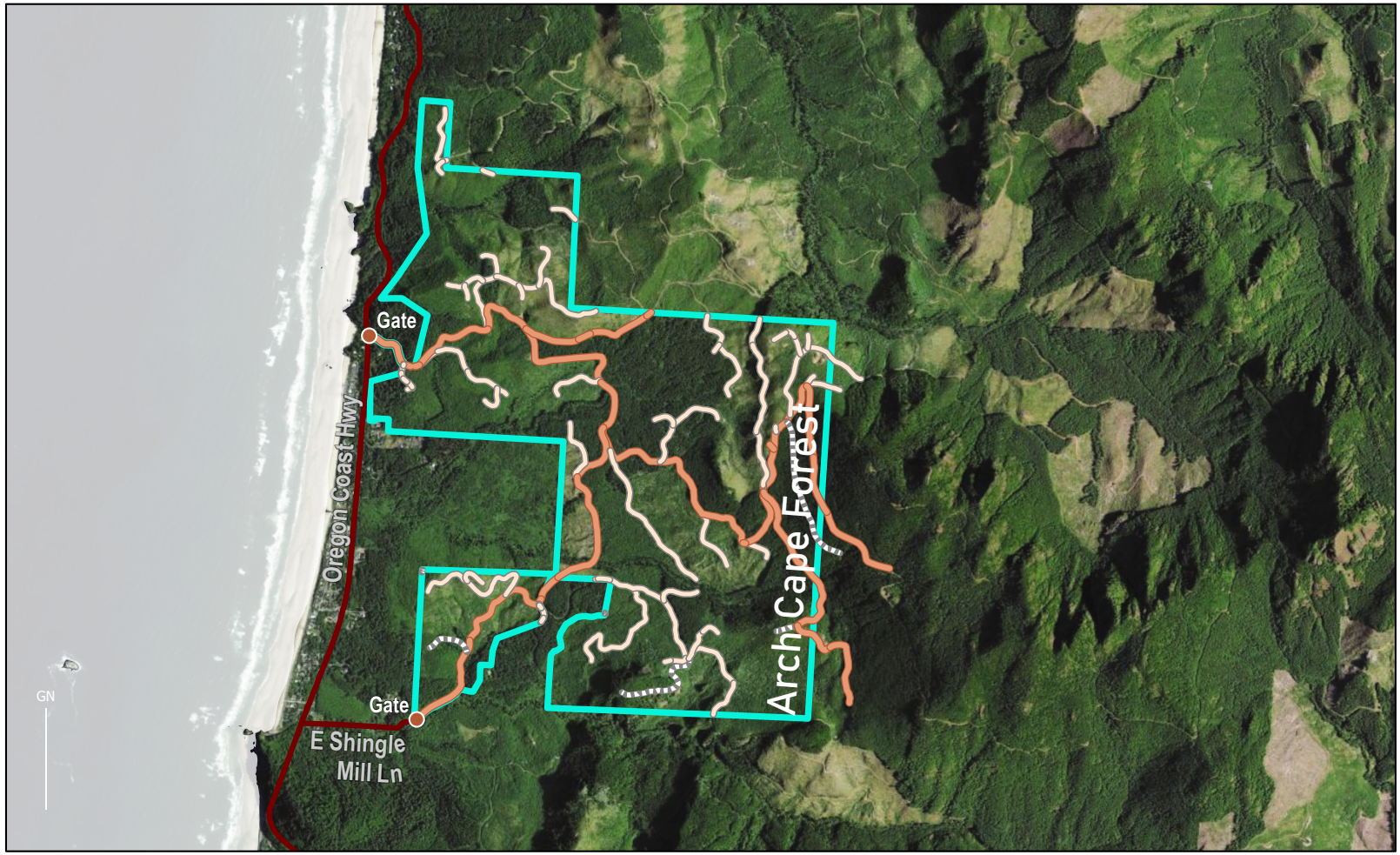
Regular road maintenance activities on mainline roads includes the following:

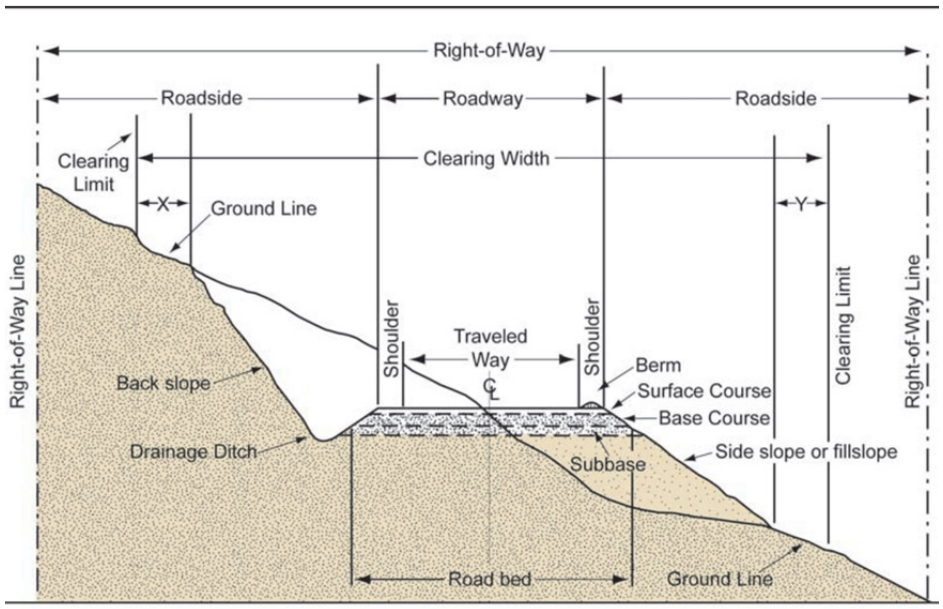
- road brushing / mowing
- maintenance, repair or replacement of cross drainage
- addition of crushed rock to road surfaces
- grading and rolling

All management activities outlined above occur within the road prism. The road prism extends from the upslope cutbank or outside ditch line (where the ground line meets the back slope) to the far extent of fill or downhill ditch line (where the fill meets the ground line). Road prisms on the Arch Cape Forest range from 20' to 30' or greater.

FOREST MANAGEMENT ACTIVITIES

SECTION 4





USDA Forest Service Guidelines for Road Maintenance Levels (https://www.fs.usda.gov/t-d/pubs/pdf/11771811.pdf)

Each road maintenance activity and the standard maintenance interval is described below:

ROAD BRUSHING (EVERY 2-3 YEARS):

Road brushing should occur such that all vegetation in the road surface and within the specified clearing width and limit is mowed or masticated to a height of 4" or less. Standard brushing width is 12' from road center, for total brushing width of 24'. Boundaries of brushing should be vertical or sloped outwards to the clearing limit, at 14'. Trees over 6" DBH within the brushing width should have limbs removed on the road-side of the trunk. Brushing should occur with a wheeled or tracked machine with an arm capable of reaching the outside of the clearing width without leaving the rocked road surface. Brushing can be accomplished with a flail or rotary mower capable of masticating up to 4" material.

CROSS DRAINAGE MAINTENANCE (ANNUAL):

Cross drainage allows water to flow from the uphill side to the downslope side of the road,

where it can disperse into the forest or flow through a ditch. The Arch Cape Forest road system primarily relies on culverts to achieve cross drainage. These culverts must be clear of debris and functionally pass water to the downslope side. Common issues are plugging of culverts, breakage, rust on metal culverts, or erosion below the culvert outlet. Culverts should be surveyed for operational status on a regular basis, and at minimum, should be visited and evaluated annually. Failed or non-functional cross drainage should be cleared, repaired, or replaced immediately.

CRUSHED ROCK, GRADING, ROLLING (ANNUAL, OR AS NEEDED):

A clean, high-quality rock surface minimizes fine particulate erosion and turbidity, which helps to maintain water quality. Under regular use, crushed rock on the road surface will move to the shoulders of the road, pack into the road base, or decrease in size and quality. Adding crushed rock, grading road surfaces, and in some cases compacting with a roller will maintain a high-quality rock surface. Areas in need of additional crushed rock should be identified on an annual or as-needed basis. Mainline road surfaces consist of clean crushed rock of 1.5" minus size. Rock should be of high-quality and uncontaminated with dirt or other materials, with sufficient fine material to bind together. Rock should be spread with a dump truck to a minimum depth of 2" (a "driveway" spread) and a maximum 4" lift, unless specified per site. Areas and lengths of spread should be identified with pin flags to create 10' to 20' of overlap between spreads. After spreading, grading and rolling allows for mixing of rock into the existing road surface and ensures compaction. In addition, a grader can re-establish road shoulders during this process. Grading may occur with a road motor grader or bladerunner type machine.

Road restoration and decommissioning is detailed in the Ecological Road Assessment. These larger road projects are limited to discreet road sections where road failure has occurred or is in the process of occurring. In addition, long-term road maintenance and decommissioning will be described in the Ecological Road Assessment.

TIMBER STAND IMPROVEMENT

Timber stand improvement (TSI) is a forest management activity involving thinning of young forest stands (under 20 years of age). These activities are also called "hand thinning" or "pre-commercial thinning (PCT)". In this outline of management activities, the term "hand thinning" will be used. Hand thinning occurs using chainsaws or hand saws in young stands. No material is removed from the site, but instead is left in the forest to decompose and improve soil health and nutrient cycling. This is not logging—hand thinning is widely practiced by conservation landowners such as parks and land trusts—and is an activity designed purely to achieve positive forest health outcomes.

Harvested areas of coastal forest regenerate with a very high number of trees per acre. Many areas within the Arch Cape Forest were harvested within the past 20 years. These areas were all replanted primarily with Western hemlock. In addition to the planted trees, additional seedlings have grown naturally. As a result, many of these areas are dominated by a single tree species, and have upwards of 1,000 trees per acre, all of which are competing for limited light, moisture, and soil nutrients. To improve tree health and species diversity, some of the trees in these dense, young forests can be cut and left on site. The trees left behind will decompose, cycling their nutrients back into the soil. The remaining trees now receive additional light, moisture, and nutrients, improving their vigor and health, while also creating growing space for other tree and plant species in the understory. Hand thinning has additional benefits in terms of enhancing wildlife habitat and increasing forest diversity and structure, leading to healthier, more resilient forests in the future.

FOREST MANAGEMENT ACTIVITIES

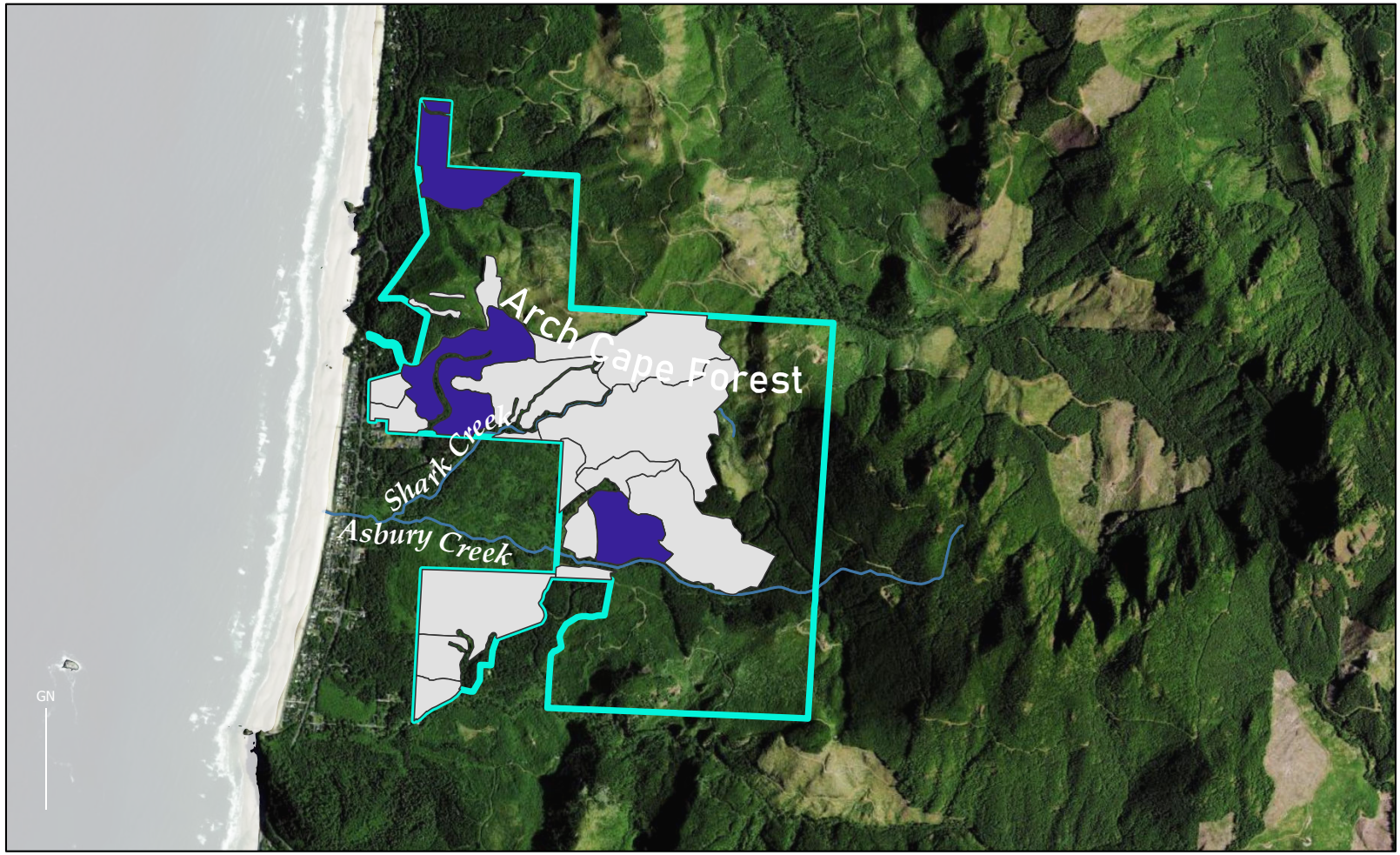
Specific objectives for hand thinning are determined site by site, and all activity will be outlined, contracted, and overseen by a Springboard forester. Residual tree spacing depends heavily on conditions including site productivity, stand age, species composition, and any anticipated future management activities. As an example, a forester may elect to retain all Western red cedar while prioritizing the cutting of Hemlock and Spruce. The work is accomplished by small crews with saws working on foot in the forest. The crews select trees to keep based on spacing, tree characteristics, and location. No mechanized equipment is used for hand thinning in Western Oregon.

FOREST MANAGEMENT ACTIVITIES

141.1 acres of the Arch Cape Forest are due or overdue for hand thinning. Many areas that would typically have been thinned during the past 6 years were not thinned. These areas will be slightly more difficult to thin, with a correspondingly higher cost. Hand thinning should occur as soon as possible in all areas identified as “high priority” (stand age 16-19 years) and within 1 to 2 years for “low priority” (stand age 11-15 years).

FOREST MANAGEMENT ACTIVITIES

SECTION 4



PLANTING

All of the Arch Cape Forest has been harvested at various times. Much of the forest today regenerated naturally from surrounding trees; however, areas harvested in the past 50 years were replanted. While most areas were successfully replanted, with good survival rates, some small, isolated areas failed to survive. These areas are located in stands harvested in the past 10 years. Replanting of these areas will help to develop a more diverse and complex forest going forward.

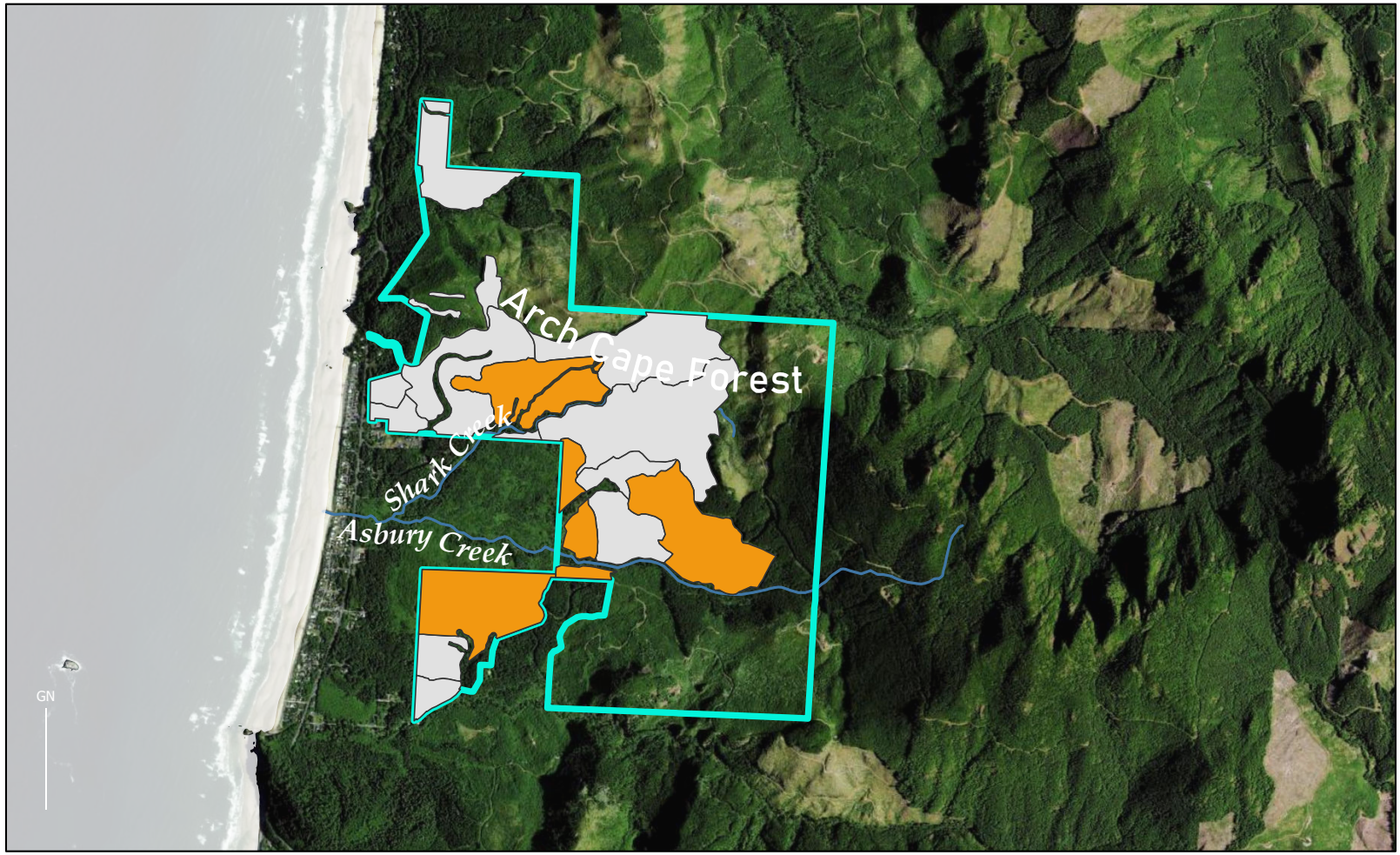
Plantings should prioritize species that increase the diversity and resiliece of the forest. Seeldings should be of native species and appropriate seed zones. Priority species include Western red cedar, Red alder, Sitka spruce and Western hemlock.

Stands under 10 years of age should be surveyed to evaluate the need for additional planting. Initial estimates put the total area in need of replanting at less than 10 acres. Many of these areas may also require slashing or brushing prior to planting. This is accomplished with handheld tools (chainsaws or brush saws) in the immediate area of seedlings and does not generate widespread disturbance. Brushing creates space around the seedlings to reduce competition and improve survival rates. An individual walking in the forest or along the roads would be unlikely to notice the difference between a replanted stand with brushing around seedlings and a replanted stand with no brushing activity.

Any re-planting should be identified and executed within 1 to 2 years. Planting occurs January to March and any site preparation prior to planting should occur immediately before planting. No herbicide shall be used for site preparation, as identified in the policies section of the Plan.

FOREST MANAGEMENT ACTIVITIES

SECTION 4



ACCESS / FIRE MANAGEMENT

Access is required for both forest stewardship and fire protection. In addition, the public has a long history of non-motorized access to the Arch Cape Forest.

At present, non-motorized access is permitted on the forest with specific posted restrictions. The property may be closed at any time due to fire risk or other resource concerns. Almost all source water areas owned and managed by municipalities or water districts in the Pacific Northwest are closed to public access. Any public access in the source water areas of the Arch Cape Forest should be closely managed and restricted to activities appropriate for a source water area. Ongoing monitoring will be required to manage any recreational use.

In addition to public access, property access is required for land managers, existing easement holders, fire and emergency response, and other approved activities.

Mainline roads will remain fully open in accordance with existing easements and prioritize full property access. Mainline roads are identified on the following map. Turnarounds for large vehicles exist at the terminus of all mainline roads. Spur roads are identified but should not be used for large vehicles without local knowledge.

FOREST MANAGEMENT ACTIVITIES

SECTION 4

PUBLIC ACCESS

The Arch Cape Forest will remain open for emergency, fire response, and stewardship access.

This is not a public access plan.

Public access will be decided upon separately by the board of the water district with input from Arch Cape ratepayers and property owners. In the meantime, the legacy public access policy of past landowners will remain in place, as posted on the gates.

Signage should delineate the property line delineate the Drinking Water Source Area (watershed) portion of the property.

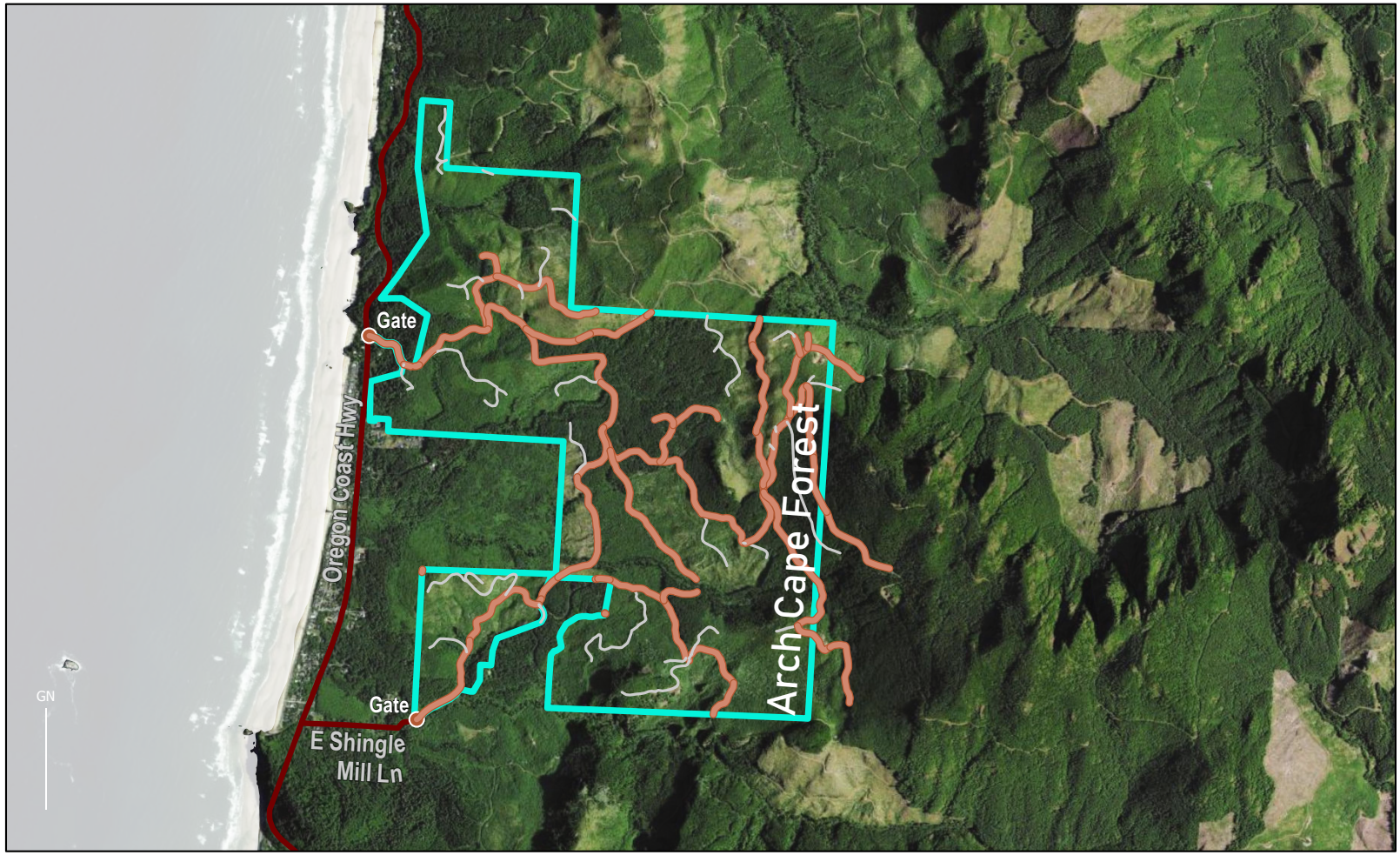
MANAGEMENT ACCESS

The Arch Cape Water District will maintain a key log document with name, organization, phone number, email, and purpose identified for all issued property keys. All parties checking out keys must be briefed on proper gate locking procedures,

Arch Cape Water District locks are on the two primary property access points (Hug Point Gate and Arch Cape Creek Gate) and no other key is required to access the property. Arch Cape Water District locks are the only locks on internal property gates.

FOREST MANAGEMENT ACTIVITIES

SECTION 4



CONTACTS / EMERGENCY

For all emergencies in the Arch Cape Forest, call 911.

Additional emergency contacts (notify all in the case of fire on or near the property):

Arch Cape Domestic Water Supply District Staff: 503-436-2790
Cannon Beach Fire Non-Emergency: 503-436-2949
Oregon Department of Forestry, Astoria: 503-325-5451
Springboard Forestry (forest management): 971-678-9464
Lewis and Clark Timberlands (neighboring lands): 503-738-6351
North Coast Land Conservancy (neighboring lands): 503-738-9126

Arch Cape Forest
32065 East Shingle Mill Lane
Arch Cape, OR 97102

(503) 436-2790
archcapeforest.org

MANAGEMENT POLICIES

SECTION 5

The following section includes a set of management policies intended to support and ensure the goals and objectives described in the preceding section. These policies are intended as the minimum level of watershed protection, and all efforts to provide greater protection for source water and other goals will be considered. Each section begins with a description of the policy question. An outline of policy function follows. Then, the section concludes with the Arch Cape Forest policy adopted for the specific resource issue.

- Definition
- Purpose
- Policy

Management policies range from written in stone, to flexible policies intended for revision. The policies are intended to be simple, easy to understand, and effective for implementation. The purpose of each policy provides additional details on how and why the policy protects source water, and potential areas for further strengthening of the policy.

STREAM BUFFERS

STREAM BUFFER DEFINITION:

Stream buffers represent the first line of defense in stream protection. Technical terms for stream buffers include riparian management zones (RMZs) or riparian areas. Buffers are typically measured in feet of distance from bank full width of a stream, with various activities allowed in “inner” versus “outer” buffers. Inner buffers typically allow no logging while outer buffers require a specific basal area retention and / or equipment limitations for ground-based logging. Both state laws and forest management certifications specify both where buffers should be applied, and how large buffers must be. Oregon’s system relies on the size of the stream as well as fish presence. Streams can be identified through a statewide streams geodatabase administered by the Oregon Department of Fish and Wildlife, although streams not listed in the database also require survey and protections.

STREAM BUFFER PURPOSE:

Stream protections provide a range of water quality, ecological, and resilience benefits. Water filters through intact riparian vegetation, removing sediment and decreasing the velocity of rainfall– runoff patterns. The protection also decreases the potential of sediment mobilization, particularly from exposed mineral soil in the riparian area. This filtration and limits on soil disturbance are most important immediately adjacent to the stream channel, however the full extent of a riparian buffer has been shown to decrease sediment transport and provide filtration. The decreased runoff velocity is particularly important for decreasing peak flow events and retaining soil moisture in order to maintain base flows. While less of an immediate concern for water filtration, the long-term impacts are significant and there are direct benefits of increased buffer widths.

In addition to filtration, stream buffers provide shade and have the potential of increasing hyporheic flow. Both shade and hyporheic flow serve to cool warm water or maintain already cold-water temperatures. This has habitat benefits but also can dramatically influence filtration costs. While the Arch Cape water system does not rely on large reservoirs or storage systems, warm water may still present issues in terms of nutrient load and algae. As a general rule, colder water tends to decrease both filtration costs and the need to add chlorine to filtered water through the transmission system.

Finally, stream buffers benefit natural forest structure and species diversity, as well as wildlife habitat. The presence of increased species diversity and structural complexity surrounding streams creates greater system resilience. In practice this means that a specific disturbance, whether endogenous or exogenous, has a decreased probability of fully replacing a stand of trees. Instead, the riparian areas may be retained post disturbance, or some component or species of the riparian area may survive. This was exhibited during

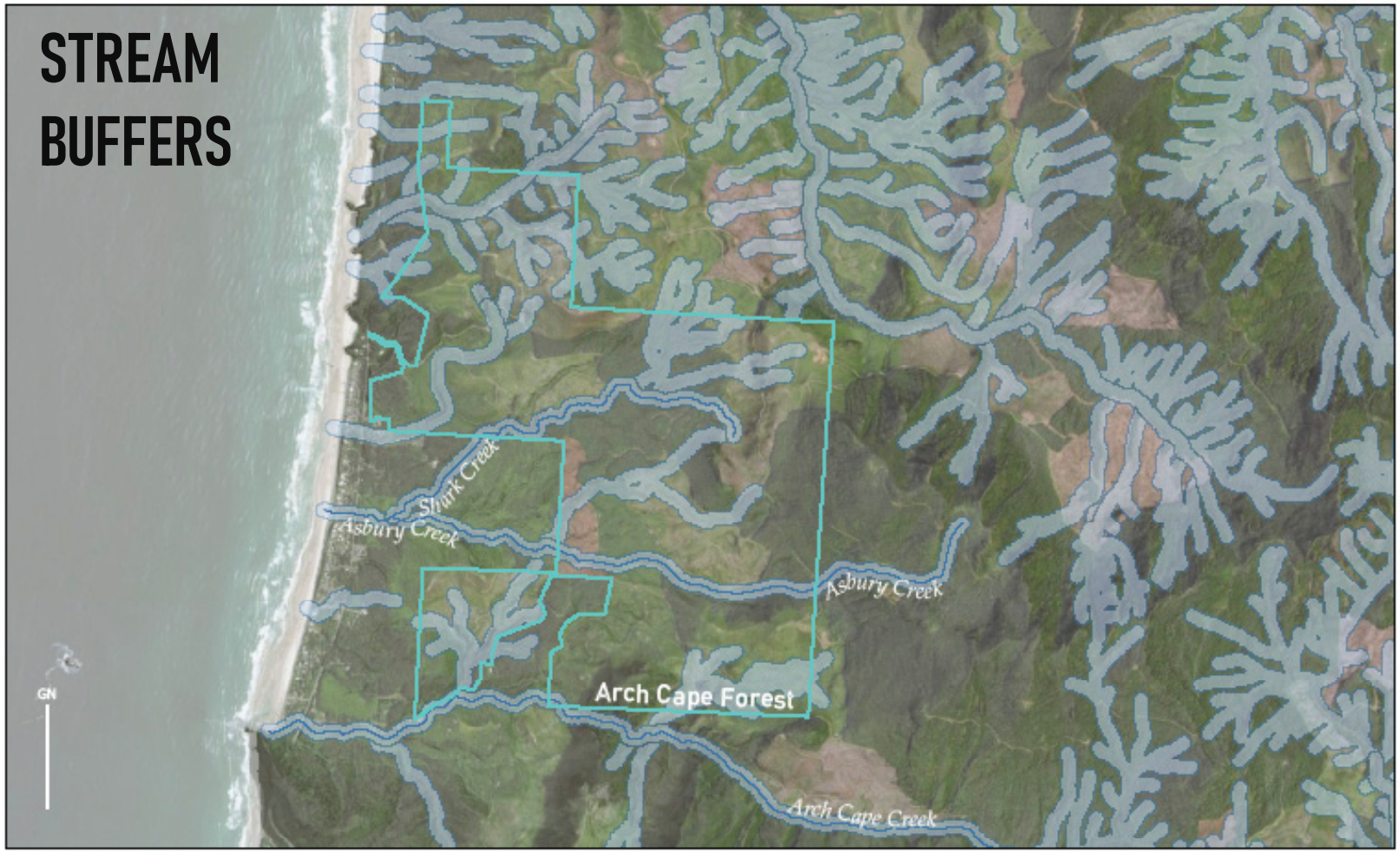
the 2020 fires in western Oregon when some riparian areas with older, more complex, and moister forest types exhibited lower mortality levels than surrounding even-age plantation forests.

STREAM BUFFER POLICY:

The Arch Cape Forest riparian buffers are designed to comply with both the Oregon Forest Practices Act (OFPA) and the Forest Stewardship Council (FSC) certification. In addition, on type D (domestic source water) all perennial streams will receive a 150 ft. no-harvest zone in absolute (non-averaged) horizontal distance. The total riparian management zone on type D perennial streams will be 150 ft. or comply with the FSC or OFPA standards, whichever provides a higher level of protection.

Non type-D streams, ponds and wetlands must comply with the higher of FSC or OFPA standards. Seasonal streams will be treated as a small non-fish streams (Type N) under OFPA standards.

These standards and additional protections have been designed based on the risk presented by machinery caused soil disturbance in the inner buffer zone, as well as the benefits provided by increased species diversity and forest structural complexity afforded by thinning in the outer zone. These standards also align with similar domestic drinking watersheds in the Pacific Northwest and align with rainfall runoff modeling completed for the Arch Cape Forest.


STREAM BUFFERS
Shark Creek
Asbury Creek
Asbury Creek
Arch Cape Forest
Arch Cape Creek
GN
0
¼
½
¾
1
Miles
Arch Cape Forest Boundary
Streams 150 ft. Buffer

HARVEST LEVELS

HARVEST LEVEL DEFINITION:

The specific harvest level on a property indicates the proportion of overall forest growth subject to harvest over an extended period of time. If the annual timber growth on the subject property is X, the harvest level could be greater than X, which over time would deplete the inventory, or less than X, which would create a long-term increase in inventory. Harvest level may also vary depending on ecological disturbances such as wind damage or pest / pathogen outbreak. A standard approach to harvest level is "sustained yield" where harvest level equals growth on an averaged basis, creating a steady flow of logs from a property and stabilizing both inventory and age distribution.

HARVEST LEVEL PURPOSE:

The harvest level over an extended period will determine the overall stocking and composition of a forest ownership. In the case of the Arch Cape Forest, historically high harvest levels led to an uneven age distribution and relatively low inventory on operable acreage. Large proportions of the commercial forest acreage are in a very young age class, and in a 50+ age class. Very little of the property is between 10 and 50 years of age.

HARVEST LEVEL POLICY:

The Arch Cape Forest will be managed with harvest equal to or lower than growth across commercial forest acres. To comply with this, spatial analysis has been used to remove non-commercial acreage and stream buffers (approximately 33% of the total acreage). The remaining 67% of the property will be harvested at a rate of approximately 3% per year, based on current standing inventory, with the rate updated to reflect a normalization of age distribution over the initial 20 years of ownership.

Due to the extremely uneven age distribution, harvest in the first 20 years may exceed growth in terms of scribner board foot log volume due to the low board foot conversion of young timber.

OPENING SIZE

OPENING SIZE DEFINITION:

Forest stewardship and harvest activities generally occur for a specific "unit" of land. For any harvest activites, various restrictions exist to limit the maximum size of opening created. These harvest size restrictions apply to both clearcuts and other overstory removals (variable retention), however thinning units may be larger. In addition, harvest may not occur on adjacent units until one has healthy growing seedlings and a specific distance is required between non-adjacent units.

The Oregon Forest Practices Act stipulates a maximum opening size of 120 acres. The Forest Stewardship Council standard caps total opening size to 60 acres with the average across an ownership not to exceed 40 acres. The Forest Stewardship Council also requires a graduated level of tree retention such that a 40-acre harvest unit appears more akin to a variable retention harvest than a true clearcut.

OPENING SIZE PURPOSE:

Opening size plays a critical role in determining the overall mosaic of future forest stand characteristics. Opening size also helps to define forest structure under FSC requirements as a result of the graduated tree retention requirements. Later sections provide a details description of retention requirements.

Historically, smaller opening size was seen as a positive in terms of watershed protection and forest ecology. Current research indicates that the importance of harvest prescription (e.g., clearcut versus variable retention, versus thinning) can have greater importance than unit size. For variable retention and thinning activities, large units provide both efficiency benefits and create larger-scale structural complexity than small units. Large harvest units can also create aesthetic issues, especially when visible from major roads.

OPENING SIZE POLICY:

Since this plan does not include a recommendation for active harvesting with overstory removal, opening size should not be an issue. In the case that an exception is made, the Arch Cape Forest will comply with both Oregon Forest Practices Act and Forest Stewardship Requirements for openings size. This means that no openings will exceed 60 acres and an average not to exceed 40 acres.

Unit and opening size are unlikely to present an efficiency or operational challenge issue for the Arch Cape Forest due to the average stand size and the stated management objectives. In the case that harvest did occur, streams and riparian areas bisect many logical harvest units, resulting in natural division of possible openings and large areas of retention (upwards of 50% in most stands).

TREE RETENTION

TREE RETENTION DEFINITION:

Any harvest type removes trees, but almost all harvests also leave trees behind. These trees are "retained" and represent some proportion of the pre-harvest forest condition. Tree retention ranges from large proportions of the healthiest trees, for instance in a thinning treatment, to no tree retention in a small patch cut. Tree retention requirements exist for live trees, snags, and woody debris. Retention may also be dispersed or clumped, with clumping often occurring around stream buffers. Retention is often specified as representative of trees in the stand pre-harvest, meaning that a forester cannot only leave small or less valuable trees. In addition to standard retention, foresters often select wildlife trees based on unique, habitat-friendly tree characteristics such as broken tops, large scaffold branches, or other form.

TREE RETENTION PURPOSE:

Tree retention creates the long-term legacy of forest structure. In a thinning treatment, the retained trees may retain even-age monoculture characteristics in a stand. On the other extreme a variable retention harvest will often leave a diverse mix of species and tree sizes in clumped and / or dispersed retention. This level of retention creates high levels of structural complexity and species diversity with a multi-strata stand. Over the long-term this type of retention can also create natural regeneration. These aspects, over time, increase the ecological resilience of the forest in the face of disturbances such as wind, fire and pathogen outbreak.

Harvest with high levels of tree retention is also generally more expensive to complete than clearcuts and present some risk in terms of regeneration, especially if managers rely on natural regeneration. Retention creates an operational obstacle and increases the difficulty of yarding logs. The difficulty mandates hiring experienced loggers willing to work around retention without creating damage. Loggers

often charge more based on the difficulty of the work. This is particularly the case with thinning, which may be quite expensive due to the high value of the retention trees and the additional cost of appropriate equipment.

TREE RETENTION POLICY:

The Arch Cape Forest will comply with the requirements of both the Oregon Forest Practices Act and Forest Stewardship Council certification. This mandates a graduated level of retention based on opening size, with the maximum retention reached at 40 acres overall harvest unit size.

Retention must serve to increase stand diversity through tree selection. Retention may be clumped, dispersed, or a combination of both. The high windthrow risk present on the Arch Cape Forest will mandate a majority of retention in linear clumps oriented in-line with prevailing storm winds. Retention areas will also be located around streams, adding to the existing riparian buffers to provide further protection in areas with windthrow or erosion risk.

ROAD MAINTENANCE

ROAD MAINTENANCE DEFINITION:

Road maintenance includes all activities associated with the road network, as well as the prioritization and monitoring of roads. At a basic level, scheduled maintenance includes vegetative control (brushing or herbicide application), grading and possibly rolling, addition of crushed rock as necessary, cleaning of cross-drain structures, and replacement or addition of drainage infrastructure as needed.

Road maintenance relies on an iterative prioritization of needs and uses. Mainline roads require maintenance in addition to what smaller spur roads may require. Small spurs may simply be allowed to re-grow while roads with drainage issues may require decommissioning. Decommissioning ranges from relatively minor excavation to complete re-grading and revegetation of abandoned road surfaces.

ROAD MAINTENANCE PURPOSE:

A forest road network provides essential access throughout a property for a multitude of tasks. These range from harvest activities to fire suppression, monitoring, forest health treatments, and recreation. A well-maintained road network improves the feasibility of harvest activities while decreasing the risk of high-cost repairs or road damage.

Road maintenance is also critical to source water management for two primary reasons: 1) to decrease the risk of catastrophic failure events and associated erosion issues and 2) to minimize the fine sediment mobilization in runoff from road surfaces. These issues are critical to the quality of source water and accordingly the cost of water treatment.

MANAGEMENT POLICIES

SECTION 5

1. Catastrophic Failure Risk: Road systems both run parallel to streams and perpendicular to streams at existing crossings. . Roads additionally interrupt sub-surface runoff and transfer it to surface runoff in roadside ditches. This concentration of water combined with active erosion in and around streams creates a significant risk of catastrophic road failure. This could be as minor as a blocked culvert overtopping the road surface or as significant as a landslide or major slump. These events are almost always attributable to either poor initial road design or a lack of maintenance. Regular maintenance and monitoring protect against the risk of catastrophic failure. Catastrophic failure presents a source water risk in terms of large quantities of mobilized sediment, although they often occur as a short pulse and larger particles may settle out if the failure is sufficiently far from intakes.
2. Fine Sediment Mobilization: While catastrophic road failure events are noticeable and usually fixable, fine sediment mobilization from road surfaces are an ever present and significant cause of source water contamination and increased filtration costs. Roads, particularly when heavily used, generate fine sediment and concentrate it in roadside ditches. These ditches contribute the fine sediment directly to streams. Fine sediment remains suspended in the water column through the stream and source water intakes, creating significant water filtration issues. Any logging activity will generate increased sediment through any road system. Accordingly, a challenge exists in building and maintaining a road system with minimal risk from fine sediment.

ROAD MAP


GN
Arch Cape Forest
0
¼
½
¾
1
Miles
Arch Cape Forest Boundary
Roads
Mainline
Secondary
Spur

ROAD MAINTENANCE POLICY:

The Arch Cape Forest will have a perpetual ownership responsibility of maintaining and monitoring a significant road network. The overall strategy will focus on minimizing risk of catastrophic failure and fine sediment mobilization while prioritizing mainline roads.

An up-to-date map of roads and inventory of condition is critical to prioritizing maintenance activities. Smaller or less frequently used roads will either require decommissioning or be abandoned. Mainline and essential spurs will be maintained on a scheduled basis with repairs as needed. The road prioritization must be done in cooperation with other users including neighbors, government agencies, and local fire officials.

Road maintenance will focus on updating roads to current watershed best management practices. These practices focus on transferring water to the downhill side of all roads while minimizing the potential or water concentrating in roadside ditches. Strategies include out-sloping roads where possible, frequent cross drains, and disconnecting culverts from active stream channels. Natural forest understory vegetation provides the best sediment filter available for forest roads.

In addition to planning for and maintaining the road system, any logging will focus on dry-season operations and close monitoring of truck traffic and road conditions for erosion and fire risk. Active log hauling was found to increase fine sediment contribution 7.5x from background levels in a regional study, while infrequent use by non-hauling vehicles contributes only 0.9% as much sediment as during logging. As a result, logging only during dry seasons and monitoring roads is critical for source water quality.

INVASIVE SPECIES

INVASIVE SPECIES DEFINITION:

While the Arch Cape Forest is home to a wide range of healthy native flora and fauna, a number of non-native species also grow across the property. These non-natives include relatively minor species as well as aggressively invasive species. These include Himalayan blackberry, Cutleaf blackberry, Scotch broom, English holly, English ivy, Tansy ragwort, and three species of knotweed.

INVASIVE SPECIES PURPOSE:

Invasive plants present a competitive challenge to native vegetation. This includes significant risk from knotweed, blackberry and Scotch broom, which can overwhelm all native species and create a monoculture thicket. By competing aggressively for light and moisture, these invasive species will either kill native species that occupy a site or preclude the establishment of native plant communities.

Invasive species can create challenges for working forestry and for source water. In order to grow a healthy forest, native trees, primarily conifers, must outcompete any invasive species present on a site during stand establishment. If a risk exists of failure to establish a forest, foresters typically consider mechanical and chemical treatment of invasive at significant expense. Many commercial forest managers proactively broadcast treat harvest units in order to decrease the risk of invasive and to decrease competition from invasive and native herbaceous plants.

Invasive species also present a range of risks source water. Some of these species, such as Reed canary grass, change stream channel patterns and present erosion risk either in the stream channel or from cutbanks. Others may establish along riparian corridors and outcompete native vegetation. These plants can increase overall evapotranspiration, decreasing overall soil moisture. Over time, this condition

will lead to decreased base flow and less reliable summertime source water.

INVASIVE SPECIES POLICY:

The Arch Cape Forest has active but minor invasive species issues. The primary species are Himalayan blackberry and Scotch broom. Himalayan blackberry concentrates along roads and abandoned landings while Scotch broom is dispersed across recent harvest units.

Arch Cape Forest will work with partners to utilize the best available science and treatments for the management of invasive species. Invasive species are an inevitable component of ecosystems on the Oregon Coast, but forest managers will strive to manage for native species and diverse ecological communities.

The most viable and permanent treatment for most sun-loving invasive species is shade. The establishment of mature stand structure across the property and, where possible, retaining a component of overstory trees through harvest rotations, has the potential of shading out most invasive species.

Tansy ragwort caterpillar (cinnabar moth)

FOREST CHEMICAL USE

FOREST CHEMICALS DEFINITION:

Forest chemicals include pesticides, and fertilizers. A wide range of products exist and are applied through a variety of methods. Broadcast application covers an entire unit with the selected chemical either through aerial application, mechanized application, or manual application. Spot or roadside applications typically utilize manual (backpack) application or vehicle mounted sprayers. Increasingly, drone application has and will continue to become widespread and allow for more targeted spot herbicide application.

The most common forms of chemical use in coastal Oregon forests are broadcast and spot herbicide application. These applications are either focused on decreasing herbaceous competition or treatment for specific invasive species issues. Pesticide use is rare and fertilizer application varies between landowners. Fertilizer use is extremely rare on public lands.

FOREST CHEMICALS PURPOSE:

Forest chemical treatments generally focus on three forest stewardship goals.

1. Controlling plant competition during regeneration in order to improve seedling survival and growth.
2. Treatment of invasive species that pose a risk of spread or competition with native plants.
3. Maintenance of road systems in order to control grass, invasive plants, and brush. Road spraying allows for less frequent brushing and retains rock surfaces.

Each of the above options exists along a spectrum from intensive application to light application and include a range of application methods. Goals 1 and 2 apply specifically post-harvest in order to control the regeneration and establishment of a new stand. Alternatives to herbicide application exist for most circumstances, including options of manual vegetation control (slashing or saw treatment), and pro-active silvicultural

strategies beginning before any harvest takes place. In addition, roadside mowing provides a viable method of maintaining roads without herbicide.

Some extreme circumstances, such as widespread Scotch broom, exist with few alternatives to herbicide treatment. These circumstances do not currently exist on the Arch Cape Forest and efforts will be taken to avoid future invasive species issues.

FOREST CHEMICALS POLICY:

The Arch Cape Forest will not use any pesticide or fertilizer for any type of treatment. The Arch Cape Forest will work proactively with neighbors to establish agreements for herbicide use adjacent to or within the watershed. In addition, operating plans will include roadside mowing and manual treatment as needed post-harvest.

The Arch Cape Forest acknowledges the possible necessity of herbicide use for treatment of invasive species, particularly Scotch broom and knotweed, as well as the challenges of herbicide use in and surrounding the drinking water source area. Any exception to the ban on pesticide and fertilizer use requires a recommendation from the management committee and majority Board approval.

HIGH CONSERVATION VALUE FOREST

HIGH CONSERVATION VALUE FOREST DEFINITION:

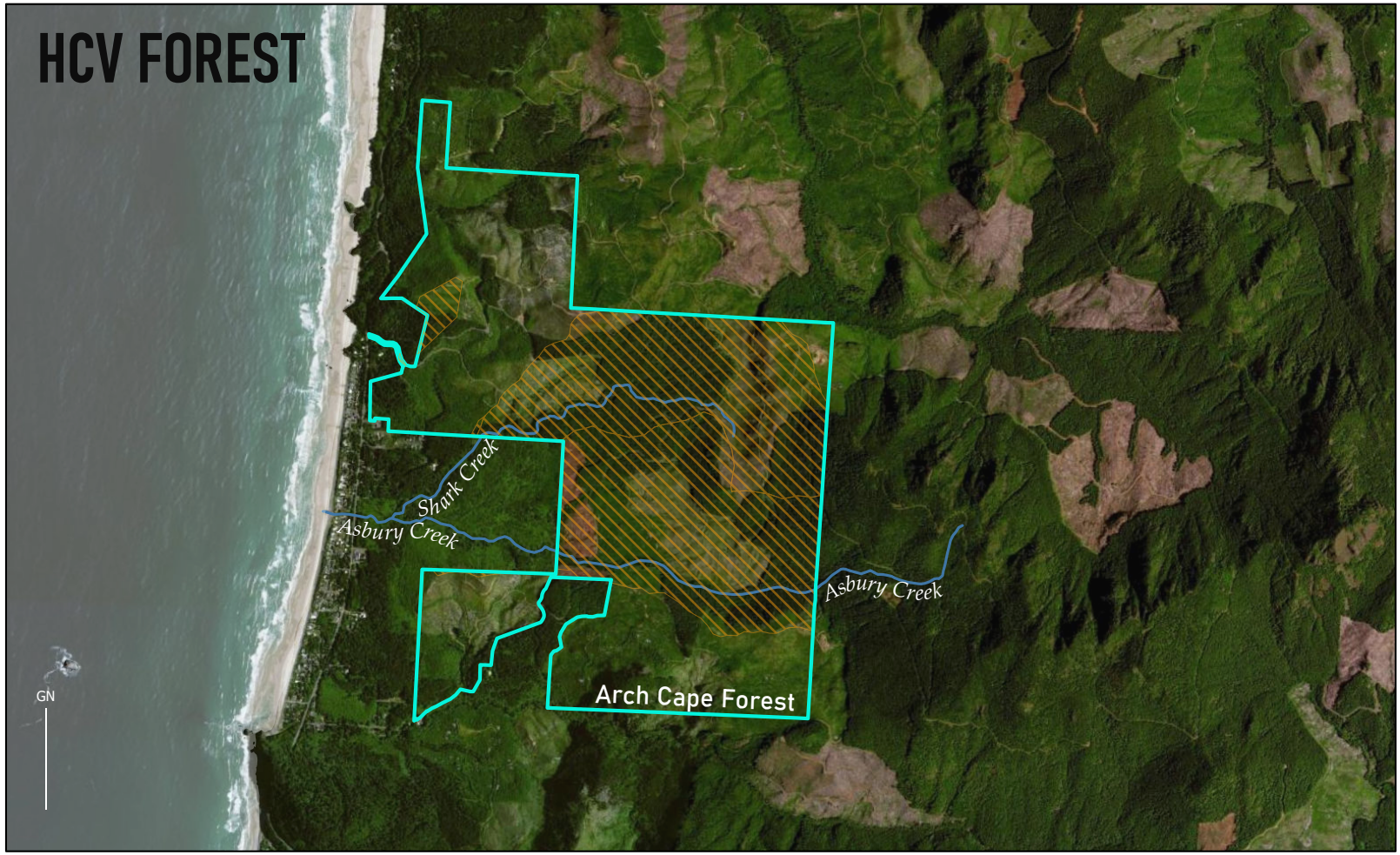
The Forest Stewardship Council and other conservation non-governmental organizations provide guidance for the identification of high conservation forest. The standard methodology identifies six criteria: 1) species diversity, 2) landscape level ecosystems, 3) ecosystems and habitats, 4) critical ecosystem services, 5) community needs and 6) cultural values. The HCV methodology then relies on a standards adaptive management framework for identifying a value, assessing the value, developing management plan, plan implementation, monitoring, and adaptive long-term management. At a tangible property scale, this process includes a range of discovery tasks to determine high conservation value forest, incorporation into existing or new plans, followed by long-term iterative management, monitoring, and adaptation with the goal of providing an additional level of protection for the underlying conservation value.

HIGH CONSERVATION VALUE FOREST PURPOSE:

High Conservation Value Forest provide protection for unique values, such as drinking water, as well as an additional layer of decision-making oversight for ecologically unique landscapes. In the case of a drinking watershed, designation as High Conservation Value draws attention to the importance of the landscape in providing reliable quantities of clean, safe drinking water. Other areas that will receive an additional level of scrutiny include forests with unique tree species or legacy areas of old growth forest.

HIGH CONSERVATION VALUE FOREST POLICY:

The Arch Cape Forest will identify High Conservation Value forests within the larger forest, including but not limited to the drinking water source area. Areas identified as High Conservation Value will be evaluated for management on a case-by-case basis with increased stakeholder review and input. Active harvesting and forest management may continue within the High Conservation Value forest areas based on the standard


HCV FOREST
Shark Creek
Asbury Creek
Asbury Creek
Arch Cape Forest
GN
0
¼
½
¾
1
Miles
Arch Cape Forest Boundary
High Conservation Value Forest

approval process with the Forest Management Committee and Board.

Due to the high proportion of forest identified as High Conservation Value, no slash pile or controlled burning will be permitted on the Arch Cape Forest. Instead, small slash piles will be allowed to naturally decompose, both decreasing the rate of carbon emitted from slash and reducing fire ignition risk. Areas of high conservation value forest will be subject to frequent (bi-monthly) monitoring by District staff or contracted property managers / volunteers, and adaptive management across all high conservation value areas.

STEEP SLOPES

STEEP SLOPES DEFINITION:

The Arch Cape Forest exists along a gradient from low-angle stands at the bottom of the property to extremely steep and cliffy stands on the southeast corner of the ownership. Many of these slopes are considered steep and / or are categorized as high landslide risk.

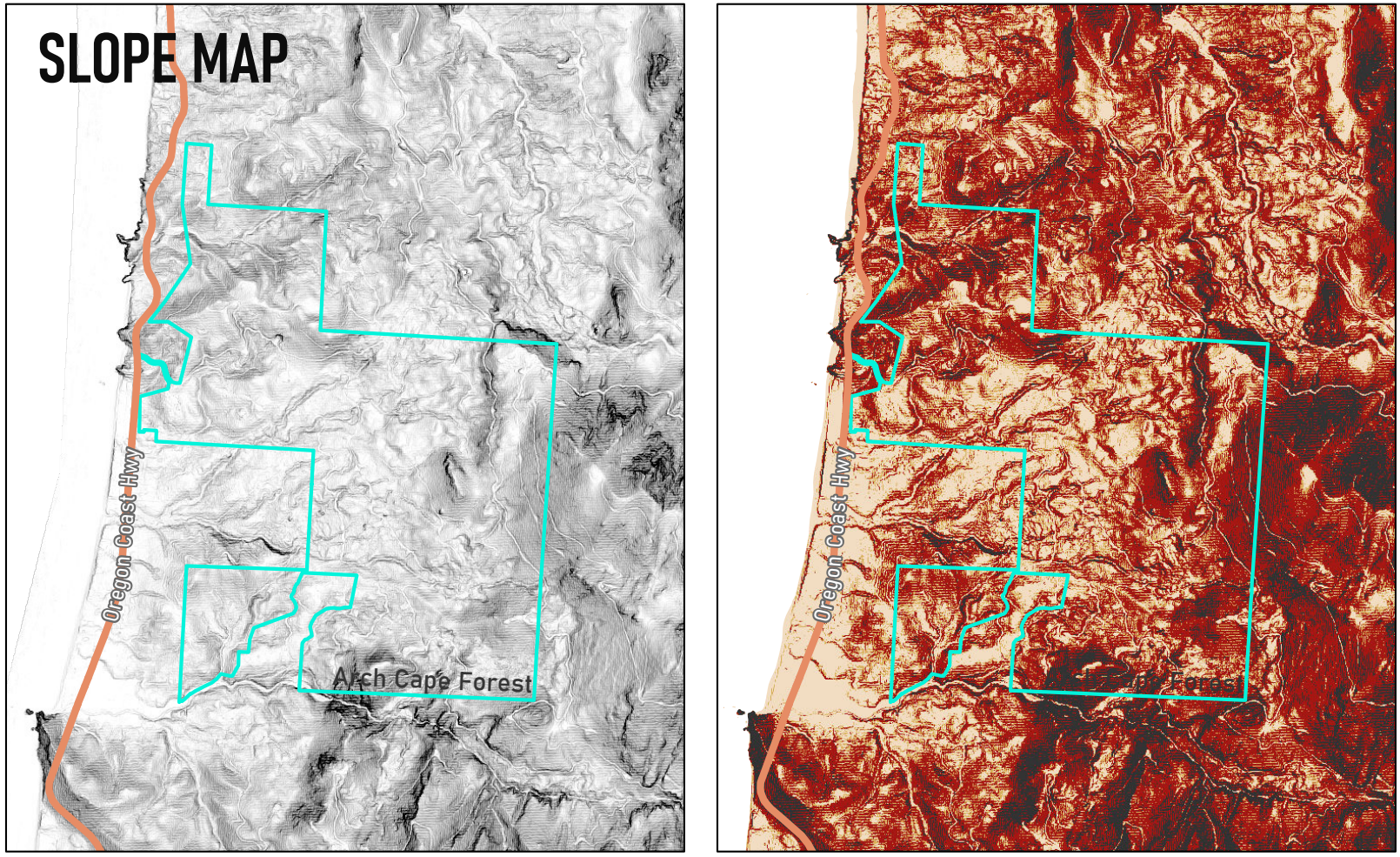
STEEP SLOPES PURPOSE:

Steep slopes present an increased risk of erosion, particularly as a result of mass soil movement or landslides. Steep slopes also increase the difficulty of completing harvest activities with significant tree retention. The underlying cost of logging on steep slopes is at minimum 50% more expensive than traditional, non-cable logging, and often far more expensive.

Many of the steep slopes in the Arch Cape Forest contain the oldest and most mature forest stands with the highest timber volume per acre. This is the result of logistical challenges associated with timber harvest.

STEEP SLOPES POLICY:

The Arch Cape Forest will limit operations to slopes less than 70% (hand thinning), with a policy of avoiding harvest completely on slopes > 35%.


SLOPE MAP
Oregon Coast Hwy
Arch Cape Forest
Oregon Coast Hwy
Slope
High
Low
Miles
0
¼
½
¾
1
Slope Classes
0-20% (Low Slope Ground based Logging)
20-30% (Steep Slope Ground based Logging)
≤ 70% (Cable Logging)
>70% (Steep/Inoperable)

ARCH CAPE FOREST