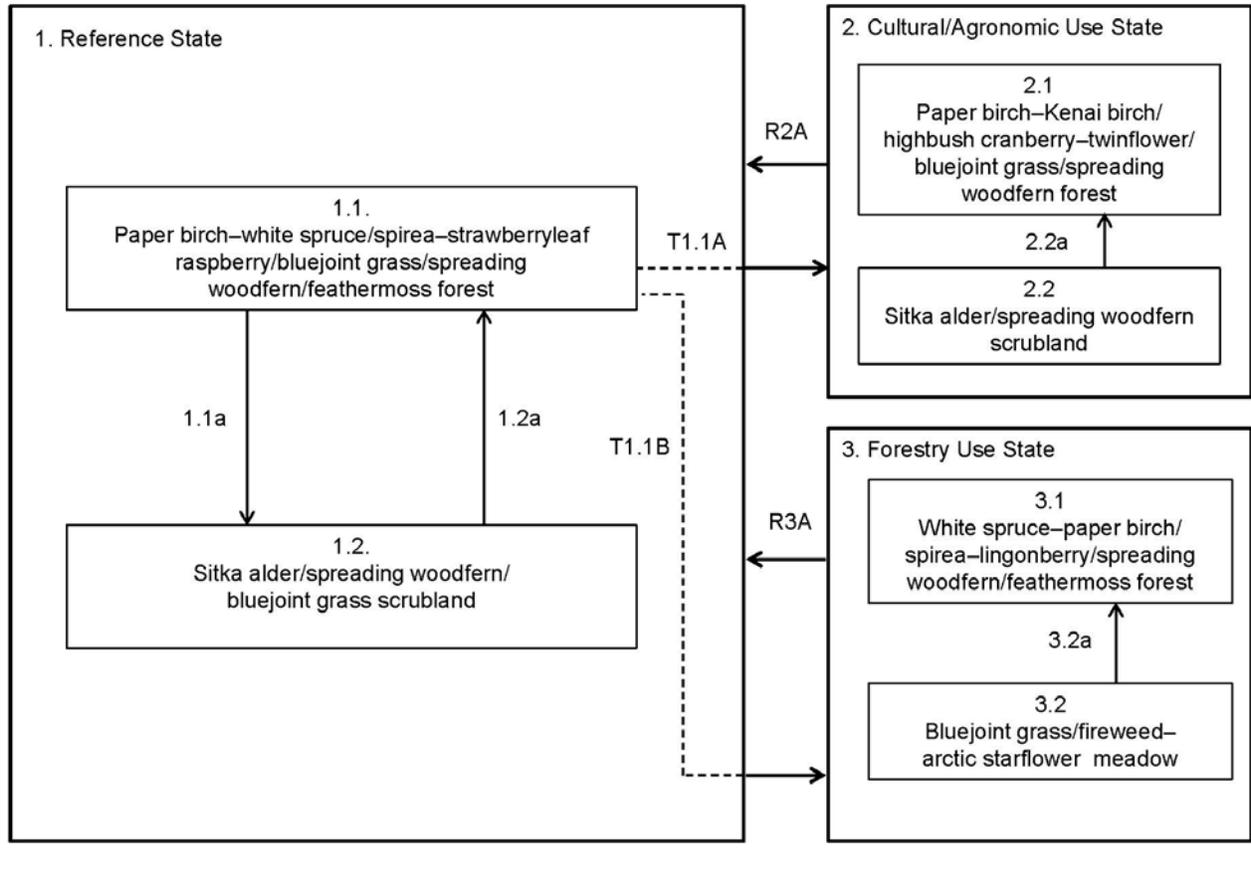


Ecological Site Description ID:	F236XY115AK—Boreal Forest Loamy Slopes, Moist
Ecological Dynamics of the Site:	
<p>This boreal ecological site is on linear to convex upland plains and hills that are undulating or rolling. The site is typically at sea level to an elevation of 984 feet with slopes of 0 to 42 percent. Slope aspect does not appear to influence the plant community dynamics of this site because it is on all aspects.</p> <p>This ecological site is correlated to D36-Boreal forest loamy eolian slopes, moist, and Snagpoint, Duney, Kanakanak, and Ciimaq soils. Due to the relatively large number of soils associated with this ecological site, a variety of soil characteristics have been described. Soil characteristics that are likely to influence plant community dynamics include the cryic soil temperature regime, udic moisture regime with slow to moderately slow soil permeability to a depth of 10 inches, and strongly acidic to ultra acidic (pH 5.5 to 3.4) first mineral horizon. The presence of a restrictive layer is rare, but the Ciimaq soils have one that is commonly at a depth of 9 to 11 inches. The organic material content in the surface layer is 10 to 30 percent. The soils are well drained and have a medium to very high runoff potential. The annual precipitation is 24 to 57 inches, and the annual frost-free period is 80 to 140 days. The parent material varies by soil component, but it typically includes organic material over volcanic ash, loess, and/or eolian deposits.</p> <p>The reference community phase is typified by mixed forest with a patchy understory of shade-tolerant shrubs, bluejoint grass (<i>Calamagrostis canadensis</i>), and forbs. As compared to the other ecological site on linear to convex areas of boreal plains and hills, this site is unique and differentiated by its location on undulating and rolling hills. Ecological site F236XY157AK (Boreal Woodland Loamy Slopes, Moist) is in nearly level areas that have lower slope gradients and long slopes. The soil associated with that site are more poorly drained and have cooler temperatures than those associated with this site. These differences along with ensuing dissimilarities in disturbance regimes, reference states, and community phases make use of separate ecological sites necessary.</p> <p>Windthrow is the major documented disturbance regime for this ecological site. It is considered to be a natural event that is generally unmanaged. The available background information shows that windthrow is typically a small-scale disturbance caused by bole snap or uprooting of susceptible trees, commonly related to tree age and height, rooting depth, and soil saturation (FS-R10-FHP, 2013). This disturbance regime normally creates forests with patchwork community phases along forest edges and in mature forests.</p> <p>Fire disturbances more than 100 years ago have been documented in the soil horizons, but there is no <i>in situ</i> vegetative documentation on the effects of fire. Because many of the data points associated with this ecological site were in and around villages, it is hypothetically possible that fires have occurred on this ecological site but have since been suppressed by human fire prevention.</p> <p>Browsing by moose on shrubs is also possible on this site, but it does not appear to affect the ecological processes significantly enough to alter the communities.</p> <p>This ecological site has two alternative states. Cultural or agronomic practices, such as clearing, mowing, and planting/seeding, create vegetative communities distinct from those described in the reference state. These communities are mainly within the villages and towns, where the anthropogenic use of land is highest. Another alternative state is areas that have undergone forestry practices, such as tree thinning and firewood harvesting. These activities generally create a state that undergoes a unique community progression.</p>	

State and Transition Diagram:

Boreal Forest Loamy Slopes, Moist

F236XY115AK



**LEGEND**

- 1.1a = Windthrow
- 1.2a = Windthrow recovery
- T1.1A = Cultural land use
- T1.1B = Forestry land use
- R2A, R3A = Anthropogenic land use recovery

Ecological Site Description for Bristol Bay-Northern Alaska Peninsula, North and Bordering Areas, Alaska

State ID Number:	1	State Name:	Reference State
State Narrative:	<p>The reference state supports two community phases, grouped by the structure and dominance of the vegetation (e.g., trees, shrubs, and graminoids) and their ecological function and stability. The presence of these communities is temporally and spatially dictated by windthrow events. The reference community phase is represented by mixed forest with an understory of various shrubs, forbs, and bluejoint grass (<i>Calamagrostis canadensis</i>). Two alternative states are also present, one a result of forestry activities and the other a result of cultural/agronomic anthropogenic disturbances.</p> <p>This report provides baseline vegetation inventory data for this site. Future data collection is needed to provide further information about existing plant communities and the disturbance regimes that would result in transitions from one community to another.</p>		
Phase 1.1			
Community Phase Number:	1.1	Community Phase Name:	Paper birch-white spruce/spirea-strawberryleaf raspberry/bluejoint grass/spreading woodfern/feathermoss forest

Community Phase Narrative:

The reference community phase for this ecological site is characterized by mixed forest with a diverse understory of shrubs, forbs, and bluejoint grass (*Calamagrostis canadensis*). Annual plant production is visually estimated to be highest among trees and shrubs, though forb and graminoid production may be high in some areas. Trees are from all four height strata. Typically, the overstory is paper birch (*Betula papyrifera*) and white spruce (*Picea glauca*) and the understory is medium to dwarf shrubs, including spirea (*Spiraea stevenii*), strawberryleaf raspberry (*Rubus pedatus*), Lapland cornel (*Cornus suecica*), and blueberries (*Vaccinium ovalifolium*, *V. uliginosum*). Forbs such as spreading woodfern (*Dryopteris expansa*) and horsetails (*Equisetum spp.*) and bluejoint grass are common. A wide variety of other shrubs and forbs may be present, including fireweed (*Chamerion angustifolium*), sidebells wintergreen (*Orthilia secunda*), arctic starflower (*Trientalis europaea*), twinflower (*Linnaea borealis*), and many others. Mosses generally make up a large percentage of the ground cover (total mean cover ~56 percent), of which feathermoss species (*Hylocomium splendens*, *Pleurozium schreberi*, and *Ptilium crista-castrensis*) are most prevalent. Other ground cover commonly includes herbaceous litter (~52 percent) and woody litter (~6 percent).

Community Phase Canopy Cover

(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
T	White spruce	<i>Picea glauca</i>	PIGL	198.4*	18.1^
T	Paper birch	<i>Betula papyrifera</i>	BEPA	170.0*	25.6^
S	Beauverd spirea	<i>Spiraea stevenii</i>	SPST3	95.9	6.2
S	Strawberryleaf raspberry	<i>Rubus pedatus</i>	RUPE	77.1	12.8
S	Lapland cornel	<i>Cornus suecica</i>	COSU4	84.4	6.1
S	Twinflower	<i>Linnaea borealis</i>	LIBO3	66.4	1.6
G	Bluejoint grass	<i>Calamagrostis canadensis</i>	CACA4	92.6	13.1
F	Spreading woodfern	<i>Dryopteris expansa</i>	DREX2	93.4	28.1
M	Feathermosses	Includes 3 genera		82.0, 79.5, 79.5#	17.9, 15.2, 13.7

\* Trees may be present in multiple strata within one plot; therefore, it is possible for species of this plant group to have a constancy value of more than 100 percent.

^ Tall, medium, and stunted individuals are counted as canopy trees. Regenerative individuals are not included.

# Feathermosses are represented by three species—*Hylocomium splendens*, *Pleurozium schreberi*, and *Ptilium crista-castrensis*, respectively.

Community Pathways	
Pathway Number	Pathway Name & Description
1.1a	<p>Windthrow.</p> <p>Tall deciduous and coniferous trees may be susceptible to windthrow during high wind events on these long slopes. This disturbance can create nonvegetated areas in which fast-growing, pioneer plants may become established. The time period necessary for this to occur is unknown, though it is dependent on a variety of factors, including tree height, rooting depth, and windspeed.</p>
Phase 1.2	

Ecological Site Description for Bristol Bay-Northern Alaska Peninsula, North and Bordering Areas, Alaska

Community Phase Number:	1.2	Community Phase Name:	Sitka alder/spreading woodfern/bluejoint grass scrubland		
Community Phase Narrative:					
<p>This is the early windthrow community phase, characterized by tall, dense scrubland with shade-tolerant species in the understory. Annual plant production is visually estimated to occur primarily among shrubs, though there may be areas of high graminoid and forb production. Total production is hypothesized to be less than that of the reference community phase due to the lack of trees, though increased production among shrubs may negate the loss in production from trees. Typically, this community consists of dense Sitka alder (<i>Alnus viridis ssp. sinuata</i>), spreading woodfern (<i>Dryopteris expansa</i>), and bluejoint grass (<i>Calamagrostis canadensis</i>). Other species include arctic starflower (<i>Trientalis europaea</i>), spirea (<i>Spiraea stevenii</i>), and myriad low and dwarf shrubs in low abundance. The ground cover commonly includes herbaceous litter (total mean cover ~94 percent) and woody litter (~6 percent).</p>					
Community Phase Canopy Cover					
(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)					
Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
S	Sitka alder	<i>Alnus viridis ssp. sinuata</i>	ALVIS	100.0	82.0
G	Bluejoint grass	<i>Calamagrostis canadensis</i>	CACA4	80.0	5.8
F	Spreading woodfern	<i>Dryopteris expansa</i>	DREX2	100.0	61.4
F	Arctic starflower	<i>Trientalis europaea</i>	TREU	80.0	1.1
Community Pathways					
Pathway Number	Pathway Name & Description				
1.2a	<p>Natural succession: Time and growth without windthrow.</p> <p>As time passes, deciduous and coniferous trees may begin to colonize and eventually become dominant in the overstory. Alders may then be shaded out, allowing for a species-rich understory to become established. The time needed for this transition to occur is unknown, but it is likely influenced by the effects of propagule pressure and encroachment by nearby standing trees.</p>				

Ecological Site Description for Bristol Bay-Northern Alaska Peninsula, North and Bordering Areas, Alaska

State ID Number:	2	State Name:	Cultural/Agronomic State
State Narrative:	<p>This alternative state results from cultural or agronomic activities. Practices such as clearcutting commonly result in intense soil disturbance that in turn can produce an alternative state early community phase similar to that of the reference state. As this anthropogenic community phase progresses, however, it typically produces a different forest community. This forest consists of many species extant in the reference community phase, but it includes little if any white spruce (<i>Picea glauca</i>), has a lower abundance of shrubs, forbs, and graminoids, and has much less moss cover.</p> <p>Continued anthropogenic activities typically prevent the forest from returning to the reference state. If community phase 2.1 is allowed to naturally progress, however, it is probable that shade-tolerant species such as white spruce will colonize, perhaps shifting the community toward the reference state.</p>		
Phase 2.1			
Community Phase Number:	2.1	Community Phase Name:	Paper birch-Kenai birch/highbush cranberry-twinflower/bluejoint grass/spreading woodfern forest
Community Phase Narrative:			
<p>This late cultural/agronomic community phase is characterized by deciduous forest with an open but diverse understory of shrubs, graminoids, and forbs. Annual plant production is visually estimated to occur mostly among trees, though there are areas of high graminoid and forb production. Typically, the overstory is paper birch (<i>Betula papyrifera</i>) and the understory is highbush cranberry (<i>Viburnum edule</i>), bluejoint grass (<i>Calamagrostis canadensis</i>), spreading woodfern (<i>Dryopteris expansa</i>), and claspleaf twistedstalk (<i>Streptopus amplexifolius</i>). A variety of less common and abundant shrubs and forbs is also typically present, including twinflower (<i>Linnaea borealis</i>), Lapland cornel (<i>Cornus suecica</i>), field horsetail (<i>Equisetum arvense</i>), woolly geranium (<i>Geranium erianthum</i>), and fireweed (<i>Chamerion angustifolium</i>). Mosses (total mean cover ~12 percent) typically have a small presence in these communities; lichens are generally not present. Other ground cover commonly includes herbaceous litter (~85 percent) and woody litter (~2 percent).</p>			

Community Phase Canopy Cover

(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
T	Paper birch	<i>Betula papyrifera</i>	BEPA	100.0	50.0^
S	Highbush cranberry	<i>Viburnum edule</i>	VIED	66.7	8.5
G	Bluejoint grass	<i>Calamagrostis canadensis</i>	CACA4	66.7	25.0
F	Claspleaf twistedstalk	<i>Streptopus amplexifolius</i>	STAM2	100.0	1.4
F	Spreading woodfern	<i>Dryopteris expansa</i>	DREX2	66.7	18.5

^ Tall, medium, and stunted individuals are counted as canopy trees. Regenerative individuals are not included.

Note: The vegetation and soils for this community were sampled at three separate locations. Due to the limited data available for this community phase, personal field observations were used to aid in describing this plant community.

Phase 2.2



Ecological Site Description for Bristol Bay-Northern Alaska Peninsula, North and Bordering Areas, Alaska

Community Phase Number:	2.2	Community Phase Name:	Sitka alder/spreading woodfern scrubland
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Community Phase Narrative:

This is the early cultural/agronomic community phase, characterized by dense scrubland with limited species in the understory. Annual plant production is visually estimated to occur primarily among shrubs, though areas of thick ferns or grasses can contribute to the overall production. Typically, the overstory is tall Sitka alder (*Alnus viridis ssp. sinuata*) with patches of red elderberry (*Sambucus racemosa*) and the understory is spreading woodfern (*Dryopteris expansa*) and bluejoint grass (*Calamagrostis canadensis*). Other species may also be in the understory, including woodland horsetail (*Equisetum sylvaticum*), claspleaf twistedstalk (*Streptopus amplexifolius*), and arctic starflower (*Trientalis europaea*). Mosses are commonly a minor component of this community (total mean cover ~3 percent). The ground cover typically consists dominantly of herbaceous litter (~92 percent) and woody litter (~7 percent).

Community Phase Canopy Cover

(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
S	Sitka alder	<i>Alnus viridis ssp. sinuata</i>	ALVIS	100.0	77.9
S	Red elderberry	<i>Sambucus racemosa</i>	SARA2	57.1	2.8
G	Bluejoint grass	<i>Calamagrostis canadensis</i>	CACA4	71.4	4.2
F	Spreading woodfern	<i>Dryopteris expansa</i>	DREX2	100.0	73.6

Community Pathways

Pathway Number	Pathway Name & Description
2.2a	<p>Time and growth without human interference or natural disturbance.</p> <p>If this community is not disturbed, it is probable that birch (<i>Betula spp.</i>) trees can become colonized, creating a shaded understory that results in a decline in the alder population. This may allow for colonization by various understory shrubs, graminoids, and forbs. The time needed for this to occur is unknown, but it is likely partially determined by the rate of colonization and growth of birch trees.</p>

Ecological Site Description for Bristol Bay-Northern Alaska Peninsula, North and Bordering Areas, Alaska

State ID Number:	3	State Name:	Tree Thinning/Forestry State
State Narrative:	<p>This alternative state results from selective forestry practices, such as tree thinning and firewood harvesting, near and in the villages and towns. De-limbing and selective felling of white spruce and birch can open up the understory to space and light in a way that does not create a major soil disruption, such as is common with windthrow or the other disturbances. This type of disturbance can allow forbs and graminoids to thrive, producing an early community phase much different than that of the reference state. As trees eventually reclaim the canopy, a forest that has similar richness but is different in abundance than that of the reference community typically becomes established.</p> <p>Continued harvesting of trees generally prevents the forest from returning to the reference state. If community phase 3.1 is allowed to naturally progress, however, it is possible that the forest canopy will close further and the understory shrubs, graminoids, and forbs will increase in richness and abundance, shifting the community toward the reference state.</p>		
Phase 3.1			
Community Phase Number:	3.1	Community Phase Name:	White spruce-paper birch/spirea-lingonberry/spreading woodfern/feathermoss forest

Community Phase Narrative:

This is the late forestry community phase, characterized by mixed forest with a relatively open understory of shrubs, forbs, and bluejoint grass (*Calamagrostis canadensis*). Annual plant production is visually estimated to be highest among trees and shrubs, though high productivity may be expected in areas of dense forbs and graminoids. Typically, the overstory consists of white spruce (*Picea glauca*) and paper birch (*Betula papyrifera*) forest and the understory consists of spirea (*Spiraea stevenii*), twinflower (*Linnaea borealis*), bluejoint grass, spreading woodfern (*Dryopteris expansa*), and stiff clubmoss (*Lycopodium annotinum*). Other species include lingonberry (*Vaccinium vitis-idaea*), black crowberry (*Empetrum nigrum*), strawberryleaf raspberry (*Rubus pedatus*), common ladyfern (*Athyrium filix-femina*), and others. Mosses, including feathermosses and sphagnum (*Sphagnum spp.*) mosses, are widespread (total mean cover ~60 percent), and lichens are a relatively minor component (~1 percent). Other ground cover commonly includes herbaceous litter (~36 percent) and woody (~7 percent) litter.

Community Phase Canopy Cover

(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
T	White spruce	<i>Picea glauca</i>	PIGL	209.9*	17.5^
T	Paper birch	<i>Betula papyrifera</i>	BEPA	154.6*	15.7^
S	Beauverd spirea	<i>Spiraea stevenii</i>	SPST3	90.9	19.9
S	Twinflower	<i>Linnaea borealis</i>	LIBO3	81.8	5.6
S	Black crowberry	<i>Empetrum nigrum</i>	EMNI	81.8	6.5
G	Bluejoint grass	<i>Calamagrostis canadensis</i>	CACA4	100.0	8.9
F	Spreading woodfern	<i>Dryopteris expansa</i>	DREX2	81.8	13.5
F	Arctic starflower	<i>Trientalis europaea</i>	TREU	90.9	2.4
F	Stiff clubmoss	<i>Lycopodium annotinum</i>	LYAN2	54.6	9.3
M	Feathermosses	Includes 3 genera		81.8, 72.7, 54.6#	12.8, 25.0, 23.3

\* Trees may be present in multiple strata within one plot; therefore, it is possible for species of this plant group to have a constancy value of more than 100 percent.

^ Tall, medium, and stunted individuals are counted as canopy trees. Regenerative individuals are not included.

# Feathermosses are represented by three species—*Hylocomium splendens*, *Pleurozium schreberi*, and *Ptilium crista-castrensis*, respectively.

Phase 3.2			
Community Phase Number:	3.2	Community Phase Name:	Bluejoint grass/fireweed-arctic starflower meadow
Community Phase Narrative:			
<p>This is the early forestry community phase, typically characterized by a meadow consisting of graminoids and forbs. Overall annual production is visually estimated to occur dominantly in the graminoid plant group; however, productivity is dependent on the type and intensity of the forestry activity. For example, Sitka alder (<i>Alnus viridis ssp. sinuata</i>) stands may be harvested in one area and not in another, resulting in differences in the productivity of the shrub group. Regardless of the harvesting technique, this community typically consists of bluejoint grass (<i>Calamagrostis canadensis</i>), spirea (<i>Spiraea stevenii</i>), fireweed (<i>Chamerion angustifolium</i>), and arctic starflower (<i>Trientalis europaea</i>). Myriad other species may also be present, including Altai fescue (<i>Festuca altaica</i>), sweet vernalgrass (<i>Anthoxanthum odoratum</i>), spreading woodfern (<i>Dryopteris expansa</i>), common ladyfern (<i>Athyrium filix-femina</i>), and Rocky Mountain goldenrod (<i>Solidago multiradiata</i>). Regenerative, medium, and tall paper birch (<i>Betula papyrifera</i>) and white spruce (<i>Picea glauca</i>) trees may be present. Feathermosses are commonly present (total mean cover ~18 percent). Other ground cover commonly includes herbaceous litter (~70 percent) and woody litter (~4 percent).</p>			

Community Phase Canopy Cover

(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
S	Beauverd spirea	<i>Spirea stevenii</i>	SPST3	66.7	1.5
G	Bluejoint grass	<i>Calamagrostis canadensis</i>	CACA4	100.0	38.3
F	Fireweed	<i>Chamerion angustifolium</i>	CHAN9	66.7	1.6
F	Claspleaf twistedstalk	<i>Streptopus amplexifolius</i>	STAM2	66.7	Trace
M	Feathermosses	Includes 3 genera		66.7, 33.3, 66.7#	10.0, 20.0, 5.0

# Feathermosses are represented by three species—*Hylocomium splendens*, *Pleurozium schreberi*, and *Ptilium crista-castrensis*, respectively.

Note: The vegetation and soils for this community were sampled at three separate locations. Due to the limited data available for this community phase, personal field observations were used to aid in describing this plant community.

Community Pathways

Pathway Number	Pathway Name & Description
3.2a	<p>Time and growth without forestry activities.</p> <p>It is probable that deciduous and coniferous trees will colonize this community if it is left undisturbed. This transition to a forested state may be accompanied by a change in the understory plant community. The progression of plants and length of time needed is likely dependent on various factors, including the size of the thinned area, the number of trees left untouched, the frequency of collection, and the rate of reproduction and growth of trees.</p>

State Transitions and Restoration Pathways

State Transition Pathways			
Transition Number	From	To	Transition Narrative
T1.1A	1	2	Cultural or agronomic pressures can cause a shift to an alternative state. The initial use of these areas creates a shrub and graminoid early community phase, similar to the early community phase of the reference state. This is hypothesized because the soil disturbance from clearcutting by heavy machinery is thought to be similar to that from windthrow of trees.

Ecological Site Description for Bristol Bay-Northern Alaska Peninsula, North and Bordering Areas, Alaska

T1.1B	1	3	The use of selective forestry techniques, including tree thinning and limbing and firewood harvesting, can create a meadow community. The disturbance of the soil is thought to be less in this transition than in T1.1A, which could partially explain the differences between these two alternative states in the early community phase.
State Restoration Pathways			
Restoration Pathway Number	From	To	Restoration Pathway Narrative
R2A	2	1	Continued anthropogenic use of these areas typically prevents the forest from returning to the reference state. However, it is thought that a transition from the cultural/agronomic alternative state to the reference state may be possible naturally, depending on total disturbance. The early community phases of both states are similar in plant species richness and abundance. If an area was briefly used and the seed bank was not greatly disrupted, it is probable that shade-tolerant species such as white spruce will grow. This may then transition this alternative state back to the reference state. The time needed for this to occur would depend on various factors, such as the level of previous use and the spread and growth rate of trees.
R3A	3	1	Discontinuation of any ongoing forestry activity would be required for the alternative forestry state to return to the reference state. Forestry community 3.1 and the reference state communities differ mainly in species abundance (not richness); therefore, stopping all woodcutting and harvesting activity may allow the species in phase 3.1 to continue to spread and grow, possibly transitioning the community back to the reference state. The time needed for this to occur would depend on various factors, such as the level of previous use and the spread and growth rate of trees.

Bibliography

FS-R10-FHP. 2013. Forest health conditions in Alaska 2012. Anchorage, Alaska. U.S. Department of Agriculture, Forest Service, Alaska Region. Publication R10-PR-32.

*This report is interim and subject to change.*