

Ecological Sites

An ecological site is a conceptual division of the landscape that is defined as a distinctive kind of land, based on recurring soil, landform, geologic, and climatic characteristics. It differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and to respond similarly to management practices and natural disturbances.

Climate, geomorphology, and soils interact to determine how plant species are distributed along environmental gradients and how the resulting associations of plant species (plant communities) respond to disturbances and management. More than a century of observation and experimental research have established the importance of climate, landscape position, soil characteristics, and disturbance regimes in determining how changes in disturbances and management practices can be expected to affect the composition and structure of a plant community. A systematic understanding of how management practices and disturbances interact with abiotic and biotic factors is a critical element in understanding ecological processes and functions. This understanding is also necessary to assess the risk of degradation, implement appropriate management practices, and assess land capability.

An ecological site incorporates abiotic and biotic environmental factors such as climate, soils/landform, hydrology, vegetation, and natural disturbance regimes that define a site. Each ecological site is identified, differentiated, and described based on the relationships between these environmental factors and how they influence plant community composition. While abrupt or distinct breaks between landforms, soils, and vegetation occasionally occur, more commonly the transition is gradual and indistinct. In addition, precipitation, temperature, and other climatic patterns as well as microclimatic variables, such as elevation, change gradually across the landscape. An ecological site classification, therefore, should be viewed as a landscape model. The boundaries between ecological sites are sometimes arbitrary and approximate. On the ground, the characteristics and properties within and between ecological sites are complex and variable and commonly overlap to some degree.

The characteristics differentiating ecological sites and their abiotic and biotic features are documented in ecological site characterization reports. The reports include the following:

- Data used to define the distinctive properties and characteristics of the sites.
- Biotic and abiotic characteristics that differentiate the sites, including climate, physiography, soil characteristics, and plant communities,
- State and transition models that describe the ecological dynamics for the sites and how the plant community responds to disturbance and/or management.

Ecological Site Concept

The identification and classification of ecological sites are based on a fundamental premise that the composition, structure, and function of plant communities are governed by energy, moisture, and nutrient gradients as well as disturbance regimes. In decreasing order of scale, these gradients vary due to differences in macroclimate, geology, geomorphology, topography (elevation, slope, aspect, and landform position), and physical and chemical characteristics of the soils. Collectively, these factors

determine soil temperature, moisture, and nutrient regimes that affect patterns and processes associated with particular ecological sites.

At the local scale, soil temperature, moisture, and nutrient regimes are characterized based on key physical and chemical properties of the soils, which are used as differentiating criteria in defining an ecological site. Key soil properties are identified using direct measures of edaphic conditions, including soil morphology, depth, texture, water holding capacity, and pH. Key soil properties are also determined based on knowledge of plant-soil relationships, and vegetation is an indirect indicator of environmental gradients.

The floristic criteria used in combination with environmental factors to define an ecological site are ecologically significant associations of plant species, or indicator plant communities, which serve as indicators of important environmental conditions. Indicator plant communities are composed of species that are strongly associated with a narrow range of environmental conditions. When used in combination with direct measurements of environment, indicator species indicate features that can be readily observed in field applications, such as onsite investigations or ecological site mapping. Knowledge of these associations of indicator species and their relationship to environmental conditions may be from experts following field investigations, through the incorporation of existing vegetative classifications, or objectively developed through analyses of floristic and soil data collected from sites representing the site concept. These relationships define soil moisture and nutrient gradients associated with differences in inherent land capability to support specific kinds of vegetation and provide detectible environmental thresholds that allow for separation of one ecological site from another.

The inherent complexities of vegetation dynamics, or how vegetation originated in an area and how it might change in the future, require an understanding of historical vegetation, disturbance regimes, climatic variability, and existing (current) vegetation. Long-term trends in historic vegetation can be determined using pollen analysis and other dendroecological techniques. The relevance of such data diminishes over time due to increasing differences in climate, disturbance regimes, and species distribution. A 500-year period or shorter immediately preceding European settlement is a reasonable time period for establishing reference conditions within the United States (Winthers and others, 2005).

The ecological site concept is defined based on reference conditions representing natural states. The state changes and transitions are subsequently estimated based on understanding of succession and ecological thresholds. Reference states and their component community phases represent the historical range of variability due to successional dynamics following disturbances. Within this natural, historical, or reference state, the community phase used to define an ecological site is termed the reference community phase.

The reference community phase is identified as the community phase that exhibits the characteristics of the reference state and contains the full complement of plant species that historically occupied the site (Bestelmeyer and others, 2010; Briske and others, 2008). The reference community phase formed as a result of interacting environmental gradients, natural disturbance regimes, and physiological characteristics of species comprising the community. Within landscapes that historically experienced relatively infrequent disturbances, late successional communities that required long-time periods to develop are typically selected as the reference community phase. On landscapes where frequent natural disturbances occurred, however, the geographically dominant community in the reference state may be more relevant and therefore selected as the reference community phase, since the latter stages of succession seldom occurred. For example, the tall grass prairie occurs within a relatively moist macroclimatic zone that would have succeeded to woodland or forest in the absence of disturbance. Frequent fires maintained the prairie over the majority of its natural geographic extent for thousands of years.

State and Transition Model

Ecological dynamics describe the changes to vegetation and soils and the causes of those changes that can occur on an ecological site. Details on the alternative states, ranges of variability within states, and the processes that cause plant community shifts within states as well as transitions among states are described in the text and diagram of a state and transition model (STM).

An STM can include single or multiple states, depending on the nature of the system, and incorporates the concepts of ecological resilience and resistance. Ecological resilience is a measure of the amount of change or disruption that is required to transform a system from being maintained by one set of mutually reinforcing processes and structures to a different set of processes and structures (Peterson and all, 1998). This definition is distinct from that of engineering resilience, which describes the rate at which ecosystems return to their original stable state following disturbance (Holling, 1996). The conditions sufficient to modify the structure and function of a state beyond the limits of ecological resilience result in the formation of an alternative state.

An STM is organized as a collection of community phases and states that communicate data about the ecological dynamics of an ecological site and can provide management alternatives and information about restoration. Alternative states are separated by thresholds that can be induced by natural or human-caused events. Crossing a threshold from one state to another (the transition) indicates persistent changes in vegetation and commonly in dynamic soil properties. The persistence or resilience (Peterson and others, 1998) of alternative states is caused by feedback between environmental conditions and vegetation or long-time lags in vegetation responses to natural events or management practices, such as grazing pressure. In such cases, even if the effects of management or environment, such as grazing pressure or high rainfall, return to a previous state, the vegetation may not return to its earlier state or will do so only slowly or in response to unusual events. When transitions are undesirable, costly restoration practices commonly are required to return the community to a previous state within management timeframes or restoration may not even be possible with current technology.

Each state may have one community phase or more representing system dynamics within the limits of the state. The dynamics among community phases may be driven independently or in combination with natural events, such as succession or disturbance, or human activities, such as land management practices (Walker and others, 2004).

STMs provide data on plant succession, ecological thresholds, non-equilibrium dynamics, and functional and structural change in response to disturbances and management practices. They describe relationships among vegetation; soils; animals; hydrology; disturbances such as fire, lack of fire, grazing and browsing, drought, unusually wet periods, insects, and disease; and management practices. This information is used to describe existing soil-vegetation relationships, document historical vegetation and dynamics as well as restoration outcomes, and measurements of ecosystem properties and processes occurring within states, such as cover, soil aggregate stability, erosion rates, and net primary production.

STMs are developed using published literature, expert knowledge, existing agency datasets (for example, National Resources Inventory, Forest Inventory and Analysis data, and legacy datasets), newly collected inventory data, and research data. STMs begin as a working hypothesis based largely on expert knowledge and available inventory data. They are refined as a result of empirical information obtained through research, monitoring, and data collection. STMs ideally are developed using inventory data of soil properties and vegetation; historical reconstructions using long-term monitoring data, historical records, or photography; recent monitoring data, including responses to climate variability and management practices; and process-based research and studies that test for the mechanisms causing or constraining ecosystem responses. The goal in producing STMs is to provide a conceptual understanding of the ecological dynamics that can occur

on an ecological site, the drivers and mechanisms of ecosystem change, and the management actions that can be used to influence change.

Ecological Dynamics

Wildfire and flooding are two common recurring disturbance factors in the survey area. Most evidence of fire is in the vicinity of Skagway, the site of the historic town of Dyea, and along the historic travel corridors of the Chilkoot Trail and the White Pass Railroad. While natural fires started by lightning are not unheard of in the area, little evidence of fire is in the more remote areas, leading to the conclusion that most of the fires in the area are anthropogenic.

In mountain slope environments, post-fire vegetation succession on maritime forest sites is accompanied by a gradual increase in the abundance and thickness of the moss-organic layer on the soil or rock surface. Initially, the stand is populated by paper birch and lodgepole pine. As the stand matures, Sitka spruce and western hemlock become established and may in time completely overtake the stand.

Flooding, a common recurring disturbance on floodplains, can interrupt or retard site progression. Depending on the velocity and duration of a flood event, vegetation may be destroyed by the physical abrasion of sediment, prolonged saturation of the site, or burial. Depending on the intensity and duration of the flood, significant site retrogression can occur quickly from a single episode. The degree of alteration is influenced by the distance of the site above active channels as well as its position and orientation to the channel.

Whether or not site retrogression occurs depends on site factors and the intensity and duration of the flood event. Higher lying flood plains are subject to less frequent flood events and the more mature plant communities, such as forest types, are less sensitive to brief periods of flooding. Well established vegetation reduces the velocity of a flood and encourages deposition of sediment. Lower lying flood plains are subject to more frequent flooding and support young, commonly herbaceous and shrub communities that are relatively rapid growing and can quickly colonize a site following significant flooding. The soils commonly are gravelly as a result of the deeper, high-gradient floodwaters and a regime in which sandy and silty sediment is removed from the surface.

Floodplains consist of a number of terraces that have a successively lower frequency of flooding as the elevation above active channels increases. The vegetation on each flood plain level reflects the dominant flood regime. Site and soil properties and vegetation associated with each flood regime are expressed by a single potential natural community (PNC). In addition to identifying the latest successional stage as the PNC, ecological site classification provides a framework for recognizing and describing progression-retrogression dynamics and relationships.

Soil-Ecological Site Correlation

An ecological site consists of one or more soils that have similar vegetative and ecological potentials and processes. A number of different soils might be grouped together in an ecological site, but an individual soil can be included in only one site. To establish soil-site relationships and maintain the one-to-one correlation, vegetative characteristics, ecological patterns and processes, soil characteristics, and other criteria specified in *Soil Taxonomy* (Soil Survey Staff, 1999) and *Keys to Soil Taxonomy* (Soil Survey Staff; 2010) are used to develop the soil classification.

Because of the one-to-one correlation between a soil and an ecological site, the ecological site can be determined by understanding the soil. This is particularly useful in areas where the vegetation is not a definitive indicator of the site. For example, the vegetation has been altered by disturbance or management or the vegetation on two sites is similar in composition and structure. Because of this correlation, an ecological site map can be derived from the soil map. The ecological sites as correlated to the soil components in the survey area are given in [table 4](#).

Ecological Site Characterization Reports

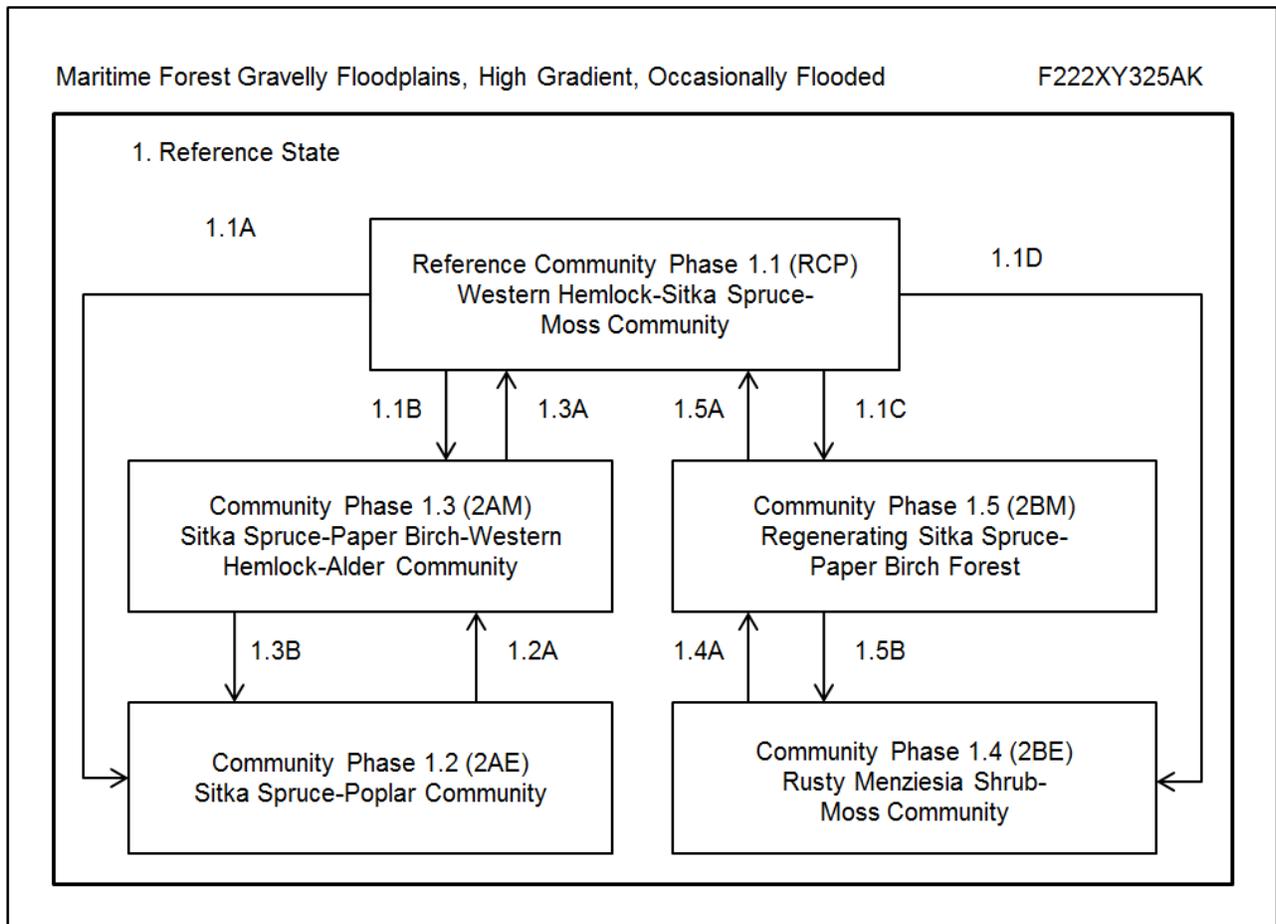
The ecological site characterization reports for the soils in the survey area are provided in this section.

| | |
|--|-------------|
| Ecological Site Description ID: | F222XY325AK |
|--|-------------|

Ecological Dynamics of the Site:

This ecological site is a maritime, high-gradient, mountain-confined flood plain. The ecological dynamics of the site are driven by occasional, brief flooding and brush management. The reference vegetation on these moderate to steep slopes is a closed canopy forest of mature Sitka spruce (*Picea sitchensis*), subalpine fir (*Abies lasiocarpa*), and western hemlock (*Tsuga heterophylla*). Early successional flood plain communities are comprised of bare rock and soil with approximately 30 percent cover of species such as dwarf fireweed (*Chamerion latifolium*) and Sitka alder (*Alnus viridis ssp. sinuata*). Soils on this site are cobbly and exhibit little development.

State and Transition Model:



| | | | |
|--|---|------------------------------|---|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Western Hemlock-Sitka Spruce Forest Community |
| Community Phase Narrative: | | | |
| <p>The reference community phase for this ecological site is characterized by a closed canopy of Sitka spruce (<i>Picea sitchensis</i>), paper birch (<i>Betula papyrifera</i> var. <i>papyrifera</i>), and western hemlock (<i>Tsuga heterophylla</i>). Subalpine fir (<i>Abies lasiocarpa</i>) may occur at the higher elevations. The subcanopy layer is variable. Some areas have minimal shrub and forb cover and 40 percent moss cover. Other sites have a mixed shrub-forb-moss understory with a high diversity of species. Common shrub species include devilsclub (<i>Oplopanax horridus</i>), Sitka alder (<i>Alnus viridis</i> ssp. <i>sinuata</i>), squashberry (<i>Viburnum edule</i>), rusty menziesia (<i>Menziesia ferruginea</i>), and oval-leaf blueberry (<i>Vaccinium ovalifolium</i>). Forb species include western oakfern (<i>Gymnocarpium dryopteris</i>), common ladyfern (<i>Athyrium filix-femina</i>), spreading woodfern (<i>Dryopteris expansa</i>), claspleaf twistedstalk (<i>Streptopus amplexifolius</i>), northern groundcone (<i>Boschniakia rossica</i>), arctic starflower (<i>Trientalis europaea</i>), sidebells wintergreen (<i>Orthilia secunda</i>), and single delight (<i>Moneses uniflora</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | Occasional, brief flooding | | |
| 1.1B | Occasional, lower velocity, brief flooding | | |
| 1.1C | Partial tree removal or brush management | | |
| 1.1D | Total tree removal | | |

| | | | |
|--|--|------------------------------|-------------------------------|
| Phase 1.2 |  | | |
| Community Phase Number: | 1.2 | Community Phase Name: | Sitka Spruce-Poplar Community |
| Community Phase Narrative: | | | |
| <p>Following a flood of brief duration, lichen becomes established on bare rock, resulting in an early successional lichen community. The ground cover is approximately 15 percent bare rock, 75 percent lichen, and 10 percent moss. Common lichen species include snow lichen (<i>Stereocaulon</i>) and greengreen reindeer lichen (<i>Cladina rangiferina</i>). Overstory vegetation includes nearly 35 percent regenerating to medium-sized Sitka spruce (<i>Picea sitchensis</i>), western hemlock (<i>Tsuga heterophylla</i>), and balsam poplar (<i>Populus balsamifera</i>). Shrub cover may be as much as 80 percent, including menziesia (<i>Menziesia</i>) and Sitka alder (<i>Alnus viridis ssp. sinuata</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Time since a flood | | |

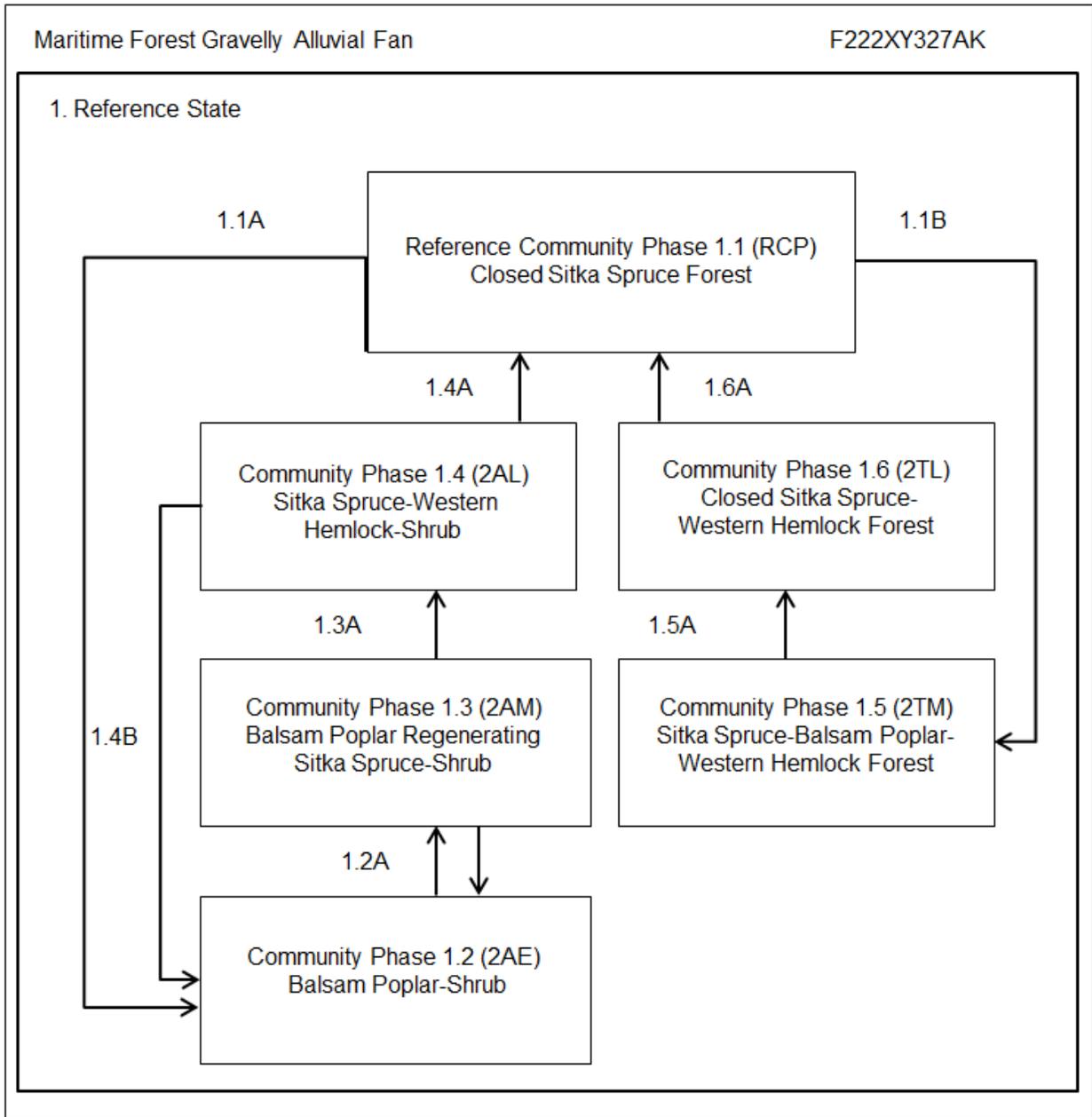
| | | | |
|---|--|------------------------------|--|
| Phase 1.3 |  | | |
| Community Phase Number: | 1.3 | Community Phase Name: | Sitka Spruce-Paper Birch-Western Hemlock-Alder Community |
| Community Phase Narrative: | | | |
| <p>This is the mid to late sere community phase following a flood. As the plant community progresses from an early sere community into a mid sere community, shrub cover decreases and tree cover and size of trees increases. This shrub community consists dominantly of Sitka alder (<i>Alnus viridis ssp. sinuata</i>) and menziesia (<i>Menziesia</i>) and smaller proportions of Sitka willow (<i>Salix sitchensis</i>). Shrub cover is as much as 80 percent. Tree canopy cover is about 25 percent and is comprised mostly of medium-sized trees (15 to 40 feet tall) and some tall trees (more than 40 feet), including balsam poplar (<i>Populus balsamifera</i>), western hemlock (<i>Tsuga heterophylla</i>), and Sitka spruce (<i>Picea sitchensis</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | 1.3 | | |
| 1.3A | Time since a flood | | |
| 1.3B | Occasional, brief flooding | | |

| | | | |
|--|--|------------------------------|--------------------------------------|
| Phase 1.4 |  | | |
| Community Phase Number: | 1.4 | Community Phase Name: | Rusty Menziesia Scrub-Moss Community |
| Community Phase Narrative: | | | |
| <p>This is an early sere plant community that is recovering from brush management. This community phase is of limited extent adjacent to roads. The vegetation is dominantly shrubs such as rusty menziesia (<i>Menziesia ferruginea</i>) and oplopanax (<i>Oplopanax</i>). Regenerating Sitka spruce (<i>Picea sitchensis</i>) and paper birch (<i>Betula papyrifera</i> var. <i>papyrifera</i>) may make up as much as 15 percent tree cover. Moss cover may be as much as 25 percent.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.4A | Time since brush removal | | |

| | | | |
|--|--|------------------------------|--|
| Phase 1.5 |  | | |
| Community Phase Number: | 1.5 | Community Phase Name: | Regenerating Sitka Spruce-Paper Birch Forest |
| Community Phase Narrative: | | | |
| <p>This is a mid sere plant community that is recovering from brush management. The community phase is comprised of a few tall western hemlock (<i>Tsuga heterophylla</i>) and Sitka spruce (<i>Picea sitchensis</i>) trees and as much as 15 percent cover of regenerating Sitka spruce (<i>Picea sitchensis</i>) and paper birch (<i>Betula papyrifera</i> var. <i>papyrifera</i>). Shrub cover may be nearly 40 percent with species such as devilsclub (<i>Oplopanax horridus</i>), menziesia (<i>Menziesia</i>), red currant (<i>Ribes triste</i>), squashberry (<i>Viburnum edule</i>), American red raspberry (<i>Rubus idaeus</i> ssp. <i>idaeus</i>), and bride's feathers (<i>Aruncus dioicus</i>). Forb cover may be nearly 40 percent with species such as western oakfern (<i>Gymnocarpium dryopteris</i>), spreading woodfern (<i>Dryopteris expansa</i>), dogwood (<i>Cornus</i>), claspleaf twistedstalk (<i>Streptopus amplexifolius</i>), and fireweed (<i>Chamerion angustifolium</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.5A | Time since brush management or total tree removal | | |
| 1.5B | Brush management | | |

| | |
|---|-------------|
| Ecological Site Description ID: | F222XY327AK |
| Ecological Dynamics of the Site: | |
| <p>This ecological site is a high-gradient flood plain on alluvial fans. Alluvial fans typically are in areas where steep mountain drainageways emerge onto flatter plains. As the stream gradient decreases, coarse-grained sediment is deposited. This reduces the capacity of the channel to transmit water and forces the stream to change direction, referred to as channel avulsion. As the channel moves back and forth across the fan depositing sediment, a mounded, shallow conical fan is created.</p> <p>Three different landform segments have been identified on this ecological site, including the active channel, the adjacent flood plain, and the fan terrace. The active channel is the current conduit for the stream to flow down the fan. During periods of high rainfall or snowmelt, some localized flooding may occur, which affects the flood plain. The fan terrace makes up the majority of the spatial extent of the alluvial fan. The climax plant community on the fan terrace is a closed Sitka spruce forest with an understory of moss and forbs. Anthropogenic disturbance from forest management practices may also influence the successional dynamics on this site.</p> <p>Fan terraces are relatively free of flooding unless channel deposition or flow results in avulsion. A new active channel and adjacent flood plain will develop, depending on the size and velocity of the flood. A balsam poplar forest with little understory cover will become established in the recently abandoned channel. Over time, Sitka spruce and western hemlock will also become established in the abandoned channel.</p> <p>The soils on the alluvial fans are coarse grained and gravelly and exhibit little development on the flood plains or buried older pedogenic horizons that formed on the terrace. The soils on the terraces are also gravelly but commonly have been stable for a long enough period of time for podzolization to occur, which is a process resulting from the mobilization and precipitation of dissolved organic matter, iron, and aluminum.</p> | |

State and Transition Model:



| | | | |
|--------------------------------|--------------------------|------------------------------|----------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 | Photograph not available | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Closed Sitka Spruce Forest |

| | | | |
|---|---|------------------------------|-------------------------------|
| Community Phase Narrative: | | | |
| <p>The majority of this alluvial fan ecological site is characterized by a fan terrace. The reference plant community is a closed Sitka spruce (<i>Picea sitchensis</i>) forest. The canopy cover is dominantly tall Sitka spruce with a smaller proportion of medium to tall western hemlock (<i>Tsuga heterophylla</i>) and tall balsam poplar (<i>Populus balsamifera</i>). The understory is approximately 40 percent moss cover and 40 percent forb cover. Forb species may include sweetcicely (<i>Osmorhiza berteroi</i>), common ladyfern (<i>Athyrium filix-femina</i>), western oakfern (<i>Gymnocarpium dryopteris</i>), and spreading woodfern (<i>Dryopteris expansa</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | Occasional, brief flooding on a high-gradient flood plain. When the water flows over the flood plain channel, a new channel may form on the alluvial fan. This removes the understory vegetation in the climax plant community, and the tree canopy structure shifts from a Sitka spruce forest to mostly bare ground with some balsam poplar (<i>Populus balsamifera</i>) and Sitka alder (<i>Alnus viridis ssp. sinuata</i>). | | |
| 1.1B | Brush management and tree removal | | |
| Phase 1.2 |  | | |
| Community Phase Number: | 1.2 | Community Phase Name: | Balsam Poplar-Shrub Community |
| Community Phase Narrative: | | | |
| <p>This is an early sere flood plant community. Following a flood, a balsam poplar (<i>Populus balsamifera</i>) forest establishes with minimal understory vegetation. The forest canopy may have as much as 40 percent tall balsam poplar with regenerating to medium-sized western hemlock (<i>Tsuga heterophylla</i>), subalpine fir (<i>Abies lasiocarpa</i>), and Sitka spruce (<i>Picea sitchensis</i>). Sitka alder (<i>Alnus viridis ssp. sinuata</i>) is the dominant shrub species.</p> | | | |

| Community Pathways | | | |
|---|---|------------------------------|---|
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Time since a flood | | |
| Phase 1.3 |  | | |
| Community Phase Number: | 1.3 | Community Phase Name: | Balsam Poplar-Regenerating Sitka Spruce-Shrub Community |
| Community Phase Narrative: | | | |
| <p>This mid succession community phase is characterized by 25 to 50 percent forest cover. Tree species include mature balsam poplar (<i>Populus balsamifera</i>) and regenerating to medium-sized Sitka spruce (<i>Picea sitchensis</i>). Below the canopy, a shrub-graminoid layer with as much as 70 percent cover is comprised of western oakfern (<i>Gymnocarpium dryopteris</i>), devilsclub (<i>Oplopanax horridus</i>), bride's feathers (<i>Aruncus dioicus</i>), and a small proportion of Sitka alder (<i>Alnus viridis</i> ssp. <i>sinuata</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | 1.3 | | |
| 1.3A | Time since a flood | | |
| 1.3B | Occasional, brief flooding. Flowing water may remove regenerating tree and understory cover. If the waterflow or deposition event is significant enough, the flow will breach the channel and create a new channel. See community pathway 1.1A. | | |

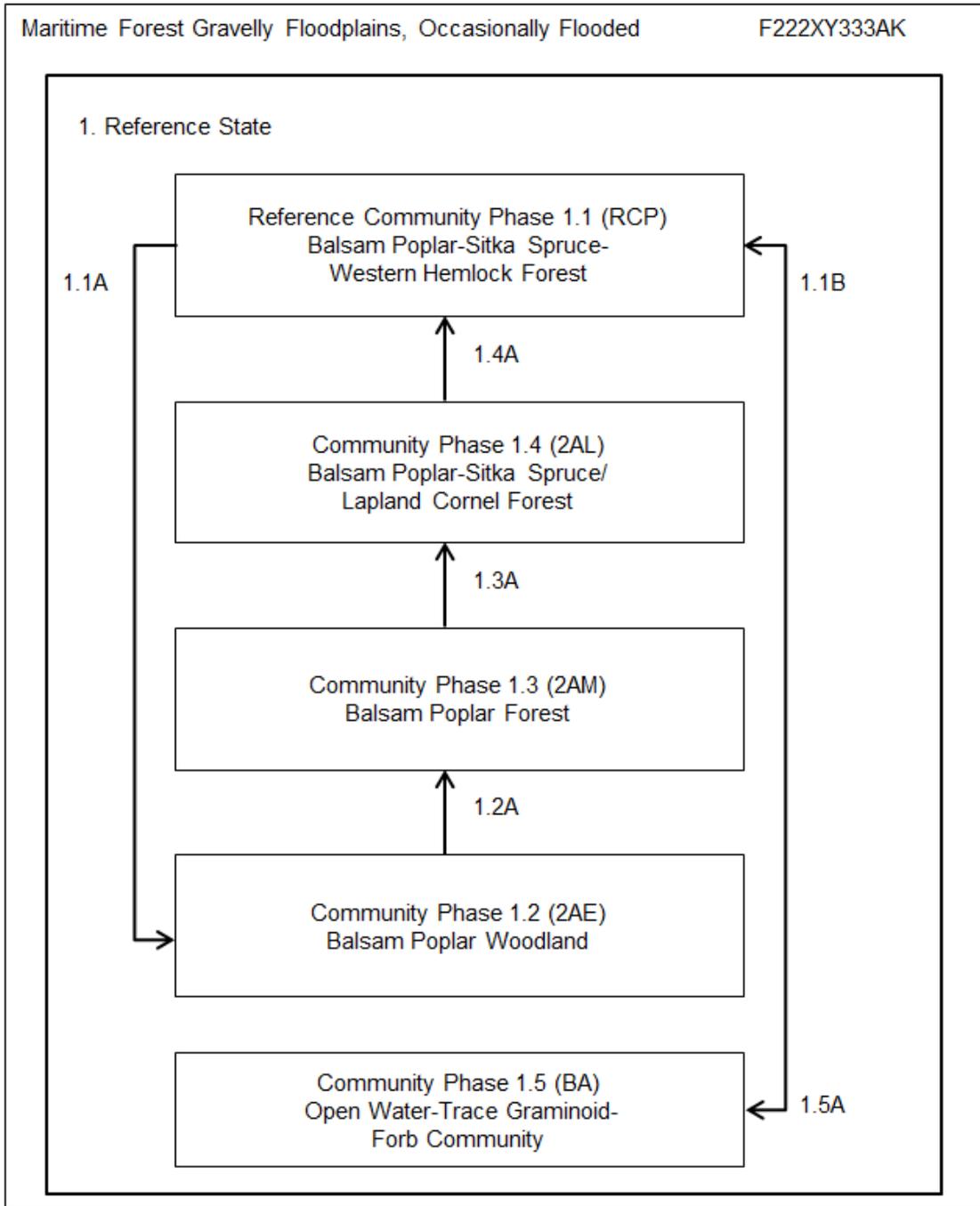
| | | | |
|---|--|------------------------------|------------------------------------|
| Phase 1.4 |  | | |
| Community Phase Number: | 1.4 | Community Phase Name: | Sitka Spruce-Western Hemlock-Shrub |
| Community Phase Narrative: | | | |
| <p>This late succession community phase is characterized by 40 percent forest cover or more. Tree species include tall western hemlock (<i>Tsuga heterophylla</i>) and Sitka spruce (<i>Picea sitchensis</i>) with a smaller proportion of medium-sized western hemlock (<i>Tsuga heterophylla</i>) and Sitka spruce (<i>Picea sitchensis</i>). The shrub cover consists of rusty menziesia (<i>Menziesia ferruginea</i>), oval-leaf blueberry (<i>Vaccinium ovalifolium</i>), squashberry (<i>Viburnum edule</i>), devilsclub (<i>Oplopanax horridus</i>), and bunchberry dogwood (<i>Cornus Canadensis</i>). Moss cover may be as much as 80 percent.</p> | | | |
| Community Pathways | | | |
| Pathway Number | 1.4 | | |
| 1.4A | Time since a flood | | |
| 1.4B | Occasional, brief flooding on a high-gradient flood plain | | |

| | | | |
|--|--|------------------------------|---|
| Phase 1.5 |  | | |
| Community Phase Number: | 1.5 | Community Phase Name: | Sitka spruce-balsam poplar-western hemlock forest |
| Community Phase Narrative: | | | |
| <p>This mid succession community phase is recovering from forest management. The plant community is characterized by approximately 50 percent forest cover. Tree cover is dominantly tall Sitka spruce (<i>Picea sitchensis</i>), a few tall balsam poplar (<i>Populus balsamifera</i>), and regenerating to medium-sized Sitka spruce (<i>Picea sitchensis</i>). Below the canopy, a shrub-graminoid layer with as much as 70 percent cover is comprised of shrubs such as devilsclub (<i>Oplopanax horridus</i>) and squashberry (<i>Viburnum edule</i>) and forbs such as western oakfern (<i>Gymnocarpium dryopteris</i>). Moss cover is approximately 30 percent.</p> | | | |
| Community Pathways | | | |
| Pathway Number | 1.5 | | |
| 1.5A | Time since brush management or tree removal | | |

| | | | |
|---|--|-------------------------------------|---|
| <p>Phase 1.6</p> |  | | |
| <p>Community Phase Number:</p> | <p>1.6</p> | <p>Community Phase Name:</p> | <p>Closed Sitka Spruce-Western Hemlock Forest</p> |
| <p>Community Phase Narrative:</p> | | | |
| <p>This late succession community phase is recovering from timber management and is characterized by a closed canopy of Sitka spruce (<i>Picea sitchensis</i>) and western hemlock (<i>Tsuga heterophylla</i>). Tree species include mature balsam poplar (<i>Populus balsamifera</i>) and regenerating to medium-sized Sitka spruce (<i>Picea sitchensis</i>). The understory is comprised of 60 to 70 percent moss cover with trace lichen and forbs such as licorice fern (<i>Polypodium glycyrrhiza</i>) and sidebells wintergreen (<i>Orthilia secunda</i>).</p> | | | |
| <p>Community Pathways</p> | | | |
| <p>Pathway Number</p> | <p>1.6</p> | | |
| <p>1.6A</p> | <p>Time since brush management or tree removal</p> | | |

| | |
|--|-------------|
| Ecological Site Description ID: | F222XY333AK |
| Ecological Dynamics of the Site: | |
| <p>This ecological site is on low-gradient, maritime flood plains. It is in a mid flood plain position that is subject to occasional flooding. Because the frequency of flooding is occasional, a forest community can establish following flooding. The plant community varies from an early sere balsam poplar woodland to a closed forest climax community with balsam poplar, Sitka spruce, and western hemlock.</p> <p>The community dynamics of this ecological site may be influenced by flooding and beaver ponding. It may also be influenced by urban development. Historical photographs and documentation suggest that fire and logging during the late 1800's to mid-1900's influenced the ecological dynamics of the site. Field documentation describing how fire and timber management affected plant succession is not available. It is likely that flooding transported ash and logging debris away from the site, removing evidence of these past disturbances.</p> | |

State and Transition Model:



| | | | |
|---|---|------------------------------|---|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Balsam Poplar-Sitka Spruce-Western Hemlock Forest |
| Community Phase Narrative: | | | |
| <p>This is the climax community phase for this ecological site. This closed forest community supports dominantly tall balsam poplar (<i>Populus balsamifera</i>) and Sitka spruce (<i>Picea sitchensis</i>) and a smaller proportion of regenerating western hemlock (<i>Tsuga heterophylla</i>). It is probable that the tree cover may have a higher proportion of tall Sitka spruce and medium-sized western hemlock than was documented in the field.</p> <p>As the canopy cover increases, the shrub cover decreases. The shrub cover is less than 15 percent with species such as squashberry (<i>Viburnum edule</i>) and devilsclub (<i>Oplopanax horridus</i>). Forb cover is approximately 70 percent with species such as western oakfern (<i>Gymnocarpium dryopteris</i>), claspleaf twistedstalk (<i>Streptopus amplexifolius</i>), and field horsetail (<i>Equisetum arvense</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | Occasional flooding erodes the understory vegetation and may remove larger trees, shifting the plant community from a closed balsam poplar and Sitka spruce forest to balsam poplar woodland. | | |

| | | | |
|--|--|------------------------------|------------------------|
| Phase 1.2 |  | | |
| Community Phase Number: | 1.2 | Community Phase Name: | Balsam Poplar Woodland |
| Community Phase Narrative: | | | |
| <p>This early sere community phase develops following a flood and is characterized by an open canopy of balsam poplar (<i>Populus balsamifera</i>). Tree cover may be as much as 25 percent, and shrub cover is 30 to 90 percent. Common shrub species include Sitka alder (<i>Alnus viridis ssp. sinuata</i>) and squashberry (<i>Viburnum edule</i>). Forb and graminoid cover commonly is 5 to 35 percent with species such as fireweed (<i>Chamerion angustifolium</i>), deercabbage (<i>Nephrophyllidium crista-galli</i>), meadow barley (<i>Hordeum brachyantherum</i>), and bluejoint grass (<i>Calamagrostis canadensis</i>). This early successional community phase shifts toward a mid sere community as the canopy cover increases and regenerating Sitka spruce (<i>Picea sitchensis</i>) begins to establish.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | <p>Time since a flood and plant growth facilitates the shift from an early flood sere community to a mid sere community. The establishment of Sitka spruce is an indication of a shift in the plant community.</p> | | |

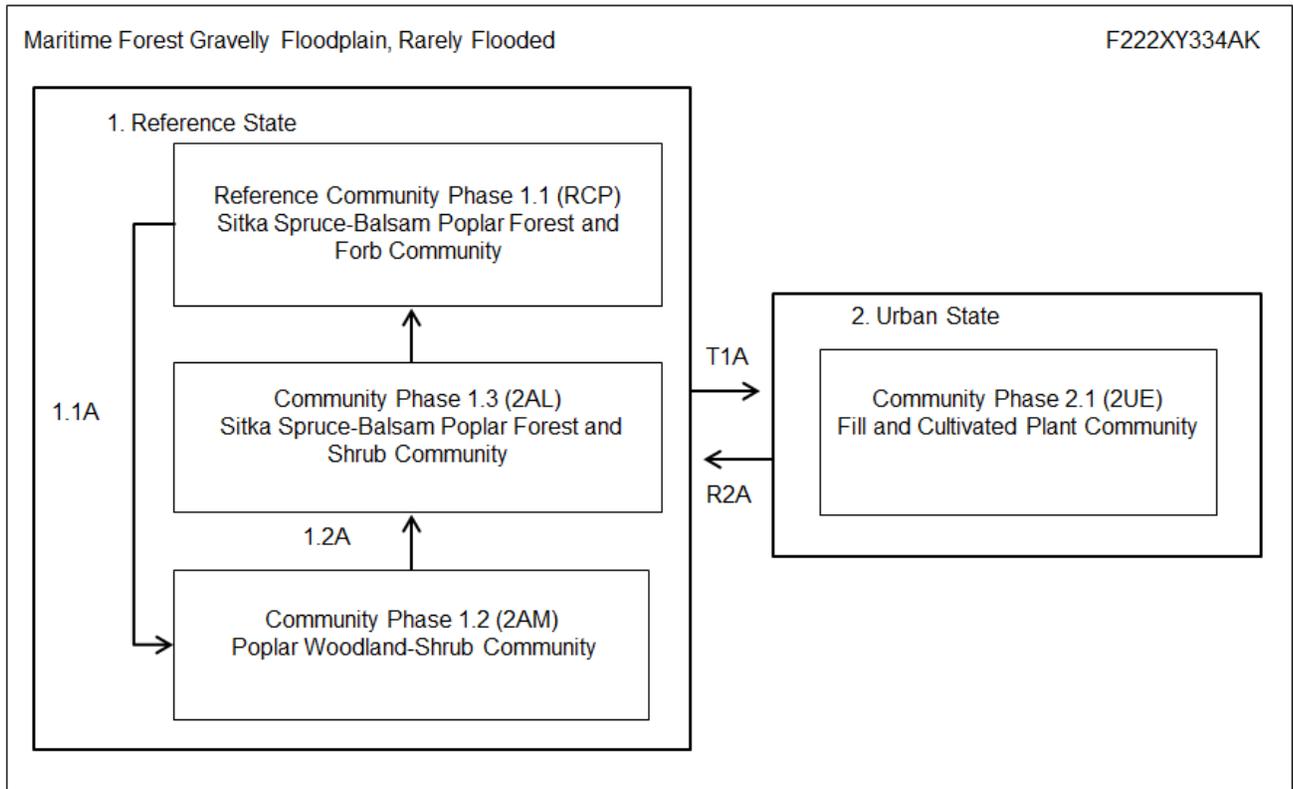
| | | | |
|--|---|------------------------------|---|
| Phase 1.3 |  | | |
| Community Phase Number: | 1.3 | Community Phase Name: | Balsam Poplar Forest |
| Community Phase Narrative: | | | |
| <p>This mid sere community phase is characterized by a closed canopy of balsam poplar (<i>Populus balsamifera</i>). Tall balsam poplar cover is 30 to 50 percent with trace regenerating western hemlock (<i>Tsuga heterophylla</i>) and Sitka spruce (<i>Picea sitchensis</i>). Shrub cover commonly is 20 to 50 percent and consists dominantly of Sitka alder (<i>Alnus viridis ssp. sinuata</i>) and a smaller proportion of squashberry (<i>Viburnum edule</i>) and redosier dogwood (<i>Cornus sericea ssp. Sericea</i>). Forb cover commonly is a trace amount to 10 percent with species such as claspleaf twistedstalk (<i>Streptopus amplexifolius</i>), spreading woodfern (<i>Dryopteris expansa</i>), and field horsetail (<i>Equisetum arvense</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | 1.3 | | |
| 1.3A | Time since a flood and plant growth facilitates the shift from a mid flood sere community to a late sere community. The decrease in shrub cover is an indication of a shift in the plant community. | | |
| Phase 1.4 | Photograph not available | | |
| Community Phase Number: | 1.4 | Community Phase Name: | Balsam Poplar-Sitka Spruce Forest and Shrub Community |

| Community Phase Narrative: | | | |
|---|--|------------------------------|---|
| <p>This community phase represents a late sere community on a low-gradient flood plain. The plant community is characterized by a closed canopy consisting of tall balsam poplar (<i>Populus balsamifera</i>) and a few tall Sitka spruce (<i>Picea sitchensis</i>) and regenerating western hemlock (<i>Tsuga heterophylla</i>). Forb cover may be as much as 70 percent with species such as western oakfern (<i>Gymnocarpium dryopteris</i>), claspleaf twistedstalk (<i>Streptopus amplexifolius</i>), and field horsetail (<i>Equisetum arvense</i>). Shrub cover commonly is less than 10 percent with species such as squashberry (<i>Viburnum edule</i>) and devilsclub (<i>Oplopanax horridus</i>). As this late sere community begins to transition into the climax community phase, the shrub cover shifts to dense Lapland cornel (<i>Cornus suecica</i>) and viburnum (<i>Viburnum</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.4A | Time since a flood and plant growth facilitates the shift from a late flood sere community to the climax plant community. The decrease in shrub cover and increase in forb cover is an indication of a shift in the plant community. | | |
| Phase 1.5 |  | | |
| Community Phase Number: | 1.5 | Community Phase Name: | Open Water-Trace Graminoid-Forb Community |

| Community Phase Narrative: | |
|--|---|
| <p>This is an early sere community that establishes following beaver ponding. Following the construction of beaver dams, ponded water kills the forest and leaves behind standing dead tree snags and large pieces of downed wood. This early sere community phase is characterized by as much as 97 percent standing water with trace forbs, graminoids, and regenerating balsam poplar (<i>Populus balsamifera</i>) and Sitka spruce (<i>Picea sitchensis</i>). Forb cover is minimal, but the diversity of the species is high. Trace species include bride's feathers (<i>Aruncus dioicus</i>), marsh marigold (<i>Caltha leptosepala</i>), fringed willowherb (<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i>), field horsetail (<i>Equisetum arvense</i>), and hollyfern (<i>Polystichum</i>). Graminoid cover includes bluejoint grass (<i>Calamagrostis canadensis</i>) and silvery sedge (<i>Carex canescens</i>). As this site begins to recover, the surface water decreases and graminoid cover increases. As much as 50 percent graminoid cover has been observed in the field.</p> <p>The mid and late succession plant communities were not observed in the field, so these community phases were not included in the state and transition diagram. It is likely that shrub and regenerating tree cover will increase with time. A late successional community would likely be characterized by a closed mixed balsam poplar (<i>Populus balsamifera</i>) and Sitka spruce (<i>Picea sitchensis</i>) forest with variable shrub and understory cover.</p> | |
| Community Pathways | |
| Pathway Number | 1.5 |
| 1.5A | Degradation or removal of beaver dam and time |

| | |
|---|-------------|
| Ecological Site Description ID: | F222XY334AK |
| Ecological Dynamics of the Site: | |
| <p>This low-gradient flood plain ecological site is on the outer edges of the flood plains. Because of the distance from or elevation relative to the flood plain channel, the site is subject to rare, brief periods of flooding approximately every 100 years. The flood plain soils of the lower Skagway River and the middle reaches of the Taiya River are characterized by coarse grained, gravelly deposits, which indicate a fairly high-energy streamflow and flooding regime. The soils exhibit minimal development. The lower reaches of the Taiya River have a substantial layer of loamy sediment over sand and gravel. This indicates a lower energy flooding regime. The soils commonly have stratified organic matter throughout the profile, which is indicative of relatively long periods of stability interspersed with deposition events.</p> <p>This ecological site has two states—a reference state and an urban state. The reference state is influenced by flooding, fire, and logging. The reference state plant community varies from an early flood sere graminoid community phase to a closed canopy Sitka spruce forest with moss cover.</p> <p>Historical photographs and documentation suggest that fire and logging during the late 1800's to mid-1900's influenced the ecological dynamics of the site. Field documentation describing how fire and timber management affected plant succession is not available. It is likely that flooding events transported ash and logging debris away from the site, removing evidence of these past disturbances.</p> <p>This ecological site is also influenced by urban development. In the towns of Dyea and Skagway, buildings and land cultivation drastically altered the forest community, creating an alternative state. The community phase in the urban state will not transition back to a forest community unless the towns are abandoned or the areas are actively restored through reforestation efforts.</p> | |

State and Transition Model:



| | | | |
|-------------------------|--|--------------------|-----------------|
| State ID Number: | 1 | State Name: | Reference state |
| State Narrative: | <p>The climax community for the reference state of this ecological site is a closed Sitka spruce-balsam poplar forest with an understory of dominantly forbs. The reference state is affected primarily by flooding and beaver ponding. Flooding may remove the tree and shrub species. The early flood sere community was not documented in the field, but a forb-graminoid community likely will establish following a rare period of flooding.</p> <p>Historical documentation suggests that this ecological site was disturbed by fire, logging, and urban development. During the turn of the century, an influx of people migrated to the towns of Dyea and Skagway in route to the goldfields of the Klondike. As the towns boomed, the surrounding low-elevation forests were heavily impacted by logging and fire. During the Gold Rush, timber was imported from the Pacific Northwest but the demand for timber was supplemented by local sawmills. The sawmills in Dyea produced rough-cut timber for buildings, heating, powering the wood-fired electrical generating plant in Skagway, and railroad and wagon road construction. Historical photographs show that the lower valleys and hillslopes were denuded by logging operations at the turn of the century. The demand for wood slowed quickly as the Gold Rush boom began to diminish; however, logging activity increased again during the 1930's to 1960's.</p> <p>The Dyea Wood Company supplied wood for Skagway residents, and the Skagway Lumber Company provided wood, primarily spruce, for wharf pilings,</p> | | |

| | | | |
|---|---|-------------------------------------|---|
| | <p>bridge timbers, and railroad switch ties. Currently, there is little logging activity within the park.</p> <p>Historical photographs and articles document multiple fires near the towns of Dyea and Skagway at the turn of the century. The fires occurred within an approximate 20-year period around 1900. By the late 1920's, the fires and logging had removed nearly all of the trees surrounding Skagway to an elevation of about 1,000 feet. Minimal evidence of logging and fire has been collected in the field. It is likely that charcoal and logging debris were transported downstream or buried with sediment from floods, removing or burring evidence of the disturbance.</p> <p>The disturbance from urban development surrounding Skagway and Dyea caused the reference state to transition into an urban state. During the turn of the century, the flood plains along the Taiya River transitioned into an urban state with development of the mining town of Dyea. The forest community transitioned into a state characterized by roads, buildings, and bare ground. When Dyea was abandoned, the forest began to come back, marking the transition back to the reference state. Similarly, the flood plains surrounding Skagway transitioned into an urban state and are currently maintained in that state.</p> | | |
| <p>Phase 1.1</p> |  | | |
| <p>Community Phase Number:</p> | <p>1.1</p> | <p>Community Phase Name:</p> | <p>Sitka Spruce-Balsam Poplar Forest and Forb Community</p> |
| <p>Community Phase Narrative:</p> | | | |
| <p>This is the reference community for the outer extent of a low-gradient flood plain. This community is characterized by a closed Sitka spruce-balsam poplar forest. Medium-sized balsam poplar (<i>Populus balsamifera</i>) or paper birch (<i>Betula papyrifera</i> var. <i>papyrifera</i>) may be present in small proportions. The understory for the climax plant community is dominantly forbs, which make up 5 to 50 percent cover. Forb species include spreading woodfern (<i>Dryopteris expansa</i>), liverleaf wintergreen (<i>Pyrola asarifolia</i> ssp. <i>asarifolia</i>), and twistedstalk (<i>Streptopus</i>).</p> | | | |

| Community Pathways | | | |
|---|----------------------------|------------------------------|---|
| Pathway Number | Pathway Name & Description | | |
| 1.1A | Rare, brief flooding | | |
| 1.1B | Beaver ponding | | |
| Phase 1.2 | Photograph not available | | |
| Community Phase Number: | 1.2 | Community Phase Name: | Poplar Woodland-Shrub Community |
| Community Phase Narrative: | | | |
| <p>This is a mid succession plant community phase following a 100-year flood. Forest cover may be 30 to 70 percent paper birch (<i>Betula papyrifera</i> var. <i>papyrifera</i>) and regenerating, medium-sized, and tall Sitka spruce (<i>Picea sitchensis</i>). Shrub cover may be as much as 50 percent and consists dominantly of Sitka alder (<i>Alnus viridis</i> ssp. <i>sinuata</i>) and squashberry (<i>Viburnum edule</i>) and a smaller proportion of redosier dogwood (<i>Cornus sericea</i>), red currant (<i>Ribes triste</i>), and prickly currant (<i>Ribes lacustre</i>).</p> <p>The early flood sere community was not documented in the field, so an early sere community phase was not included in the state and transition model. It is likely that rare flooding in high flood plain positions will remove the tree, shrub, and herbaceous species and a graminoid community will begin to establish as the ecological site recovers from flooding.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Time since a flood | | |
| Phase 1.3 | Photograph not available | | |
| Community Phase Number: | 1.3 | Community Phase Name: | Sitka Spruce-Balsam Poplar Forest and Shrub Community |
| Community Phase Narrative: | | | |
| <p>This is a late succession forest community. As the ecosystem continues to recover from disturbance and shift from a mid to late successional phase, the forest community will shift from mixed tall paper birch (<i>Betula papyrifera</i> var. <i>papyrifera</i>) and Sitka spruce (<i>Picea sitchensis</i>) to a forest that supports dominantly Sitka spruce and a smaller proportion of paper birch. The shrub community becomes less prevalent and the moss cover increases as the canopy increases and shades the understory.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.3A | Time since a flood | | |

| State Transition Pathways | | | |
|-----------------------------------|---|--------------------|---|
| Transition Number | From | To | Transition Narrative |
| T1A | 1 | 2 | Urban development. The rarely flooded maritime flood plain may be influenced by urban development as a result of building and crop cultivation in the Skagway area. Within the city limits, a small proportion of the flood plain has been converted into a garden site that includes cultivated plants, gravel, and buildings. |
| State Restoration Pathways | | | |
| Restoration Pathway Number | From | To | Restoration Pathway Narrative |
| R2A | 2 | 1 | <p>It is likely that the small extent of this ecological site that was disturbed by tillage and cultivation in the Skagway area will remain in this state until the urban areas are abandoned or active restoration takes place.</p> <p>The Dyea area was restored to the reference state when the town of Dyea was abandoned and logging operations were discontinued.</p> |
| State ID Number: | 2 | State Name: | Urban state |
| State Narrative: | <p>Urban development in the Skagway and Dyea areas caused the reference state to transition into an urban state. During the turn of the century, the flood plains along the Taiya River transitioned into an urban state with the development of the mining town of Dyea. The forest community transitioned into a state characterized by roads, buildings, and bare ground. When the town of Dyea was abandoned, the forest began to re-establish, marking a transition back to the reference state. Similarly, the flood plains of the Skagway area transitioned into an urban state and are currently maintained in that state.</p> <p>The urban state is characterized by buildings, roads, bare ground, and cultivated plants.</p> | | |

| | | | |
|--|--|-------------------------------------|--|
| <p>Phase 2.1</p> |  | | |
| <p>Community Phase Number:</p> | <p>2.1</p> | <p>Community Phase Name:</p> | <p>Fill and Cultivated Plant Community</p> |
| <p>Community Phase Narrative:</p> | | | |
| <p>This community phase is on developed land in the Skagway area and historically in the Dyea area. The climax plant community in the reference state transitions into this community phase when the land is developed. It is characterized by cultivated garden plants, gravel, and buildings. This community phase was sampled in the urban area of Skagway.</p> | | | |

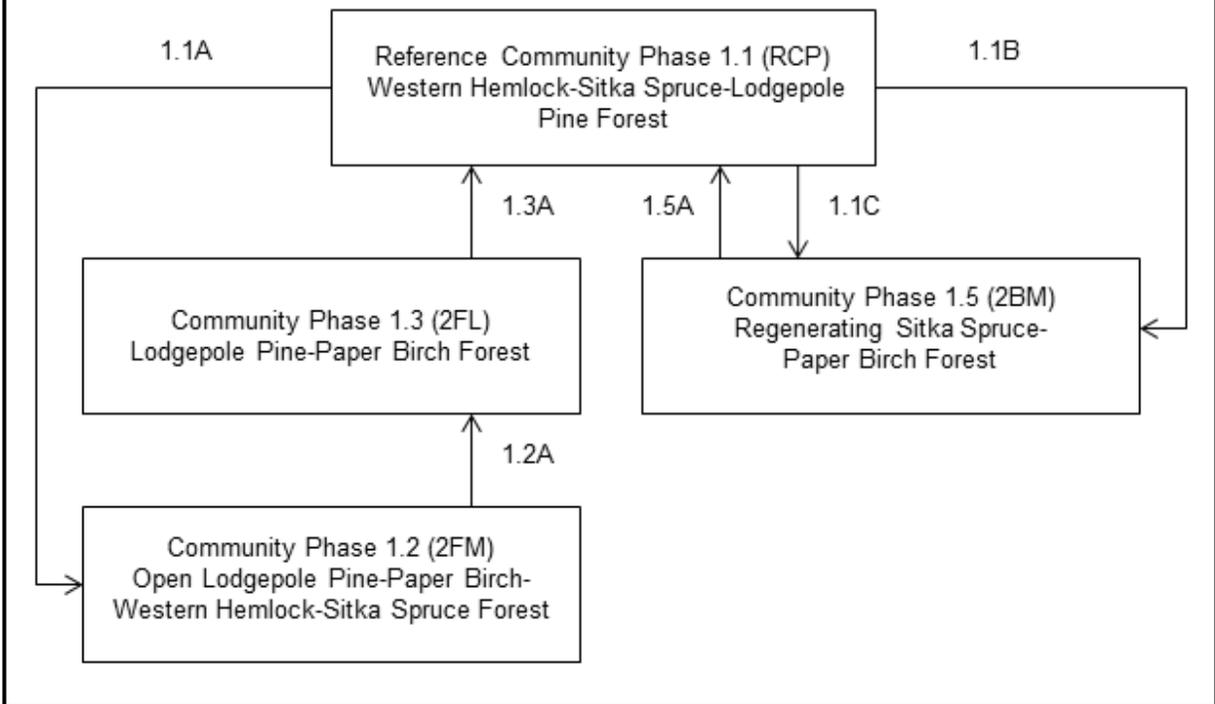
| | |
|---|-------------|
| Ecological Site Description ID: | F222XY337AK |
| Ecological Dynamics of the Site: | |
| <p>This maritime ecological site is throughout the low- to mid-elevation mountain slopes. The soils consist of shallow to moderately deep, gravelly mineral material or shallow, dry organic material.</p> <p>The reference plant community is characterized by a closed canopy forest of western hemlock (<i>Tsuga heterophylla</i>), Sitka spruce (<i>Picea sitchensis</i>), lodgepole pine (<i>Pinus contorta</i>), and paper birch (<i>Betula papyrifera</i>). The understory is comprised of moss and herbaceous plants. Shrub cover commonly is 15 percent.</p> <p>The ecological dynamics of this site are affected by several disturbance regimes. The site is influenced by the natural succession processes from age-related decline in forest productivity. As the forest stand ages, individual trees die and fall over, creating gaps in the forest canopy. This canopy gap allows for more light to reach the ground, which favors growth of understory plants and regenerating trees.</p> <p>This ecological site may also be influenced by erosion on the steeper mountain slopes. In areas where the slope creeps, the boles of the trees appear bent at the base. The downward movement of the soil causes the trees to lean, and they develop curved boles to continue to grow upward toward the light. The extent and severity of the disturbance from soil creep is minimal as compared to the disturbance from fire and logging during the Gold Rush era.</p> <p>During the turn of the century, an influx of people migrated into the towns of Dyea and Skagway in search of gold. As the towns boomed, the surrounding low-elevation forests were heavily impacted by logging and fire. During the Gold Rush, timber was imported from the Pacific Northwest but demand for timber was supplemented by local sawmills. The sawmills in Dyea produced rough-cut timber for buildings, heating, powering the wood-fired electrical generating plant in Skagway, and railroad and wagon road construction. Historical photographs show that the lower valleys and hillslopes were denuded by logging operations at the turn of the century. The demand for wood slowed quickly as the Gold Rush boom began to diminish; however, logging activity increased again during the 1930's to 1960's. The Dyea Wood Company supplied wood for Skagway residents, and the Skagway Lumber Company provided wood, primarily spruce, for wharf pilings, bridge timbers, and railroad switch ties. Currently, there is little logging activity within the park.</p> <p>Historical photographs and articles document multiple fires on the mountain slopes surrounding Dyea and Skagway at the turn of the century. The fires occurred during an approximate 20-year period around 1900. By the late 1920's, the fires and logging had removed nearly all of the trees surrounding Skagway to an elevation of about 1,000 feet. Because of the complexity of the disturbance regimes influencing the ecological dynamics of this site, it is difficult to isolate the effects of fire and logging on the successional trajectory of the forest.</p> | |

State and Transition Model:

Maritime Forest Gravelly Slopes

F222XY337AK

1. Reference State



| | | | |
|---|---|------------------------------|--|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Western Hemlock-Sitka Spruce-Lodgepole Pine Forest |
| Community Phase Narrative: | | | |
| <p>The reference community phase is characterized by a mixed western hemlock (<i>Tsuga heterophylla</i>), Sitka spruce (<i>Picea sitchensis</i>), lodgepole pine (<i>Pinus contorta</i>), and paper birch (<i>Betula papyrifera</i>) forest. Because of the complexity of the disturbances from fire, logging, and natural mortality, the structure of the stand is variable. The difference in the overstory/understory composition is influenced by interacting disturbance regimes, variations in fire intensity, natural age-related decline in productivity, slope, and aspect. Isolating these differences is too complex for the scope of this survey. As a result, the reference community phase has variable canopy and understory composition. In general, the tree canopy has more than 60 percent cover and consists dominantly of western hemlock, Sitka spruce, and lodgepole pine. The understory varies from 70 to 80 percent moss to a mixture of forbs, moss, and shrubs. Some drier sites have a higher proportion of lichen cover and minimal herbaceous and shrub cover. Lichen species include star reindeer lichen (<i>Cladina stellaris</i>), snow lichen (<i>Stereocaulon</i>), greygreen reindeer lichen (<i>Cladina rangiferina</i>), and reindeer lichen (<i>Cladina mitis</i>). Forb cover commonly is less than 10 percent. Forb species include licorice fern (<i>Polypodium glycyrrhiza</i>), liverleaf wintergreen (<i>Pyrola asarifolia</i>), western oakfern (<i>Gymnocarpium dryopteris</i>), spreading woodfern (<i>Dryopteris expansa</i>), and sidebells wintergreen (<i>Orthilia secunda</i>). Shrub cover commonly is less than 15 percent and includes species such as rusty menziesia (<i>Menziesia ferruginea</i>), oval-leaf blueberry (<i>Vaccinium ovalifolium</i>), redosier dogwood (<i>Cornus sericea</i> ssp. <i>sericea</i>), bunchberry dogwood (<i>Cornus canadensis</i>), and red baneberry (<i>Actaea rubra</i>).</p> | | | |

| Community Pathways | | | |
|--|--|------------------------------|---|
| Pathway Number | Pathway Name & Description | | |
| 1.1A | Fire and logging remove the forest canopy. Fire also removes the understory vegetation. | | |
| 1.1B | Brush management removes the forest canopy along roads. The spatial extent of this disturbance is minimal. | | |
| Phase 1.2 | Photograph not available | | |
| Community Phase Number: | 1.2 | Community Phase Name: | Open Lodgepole Pine-Paper Birch-Western Hemlock-Sitka Spruce Forest |
| Community Phase Narrative: | | | |
| <p>This mid serot community phase follows disturbance from logging and/or fire. This phase generally has a lower percentage of canopy cover as compared to the reference community phase. The canopy cover consists of tall lodgepole pine (<i>Pinus contorta</i>) and paper birch (<i>Betula papyrifera</i>) with a smaller proportion of regenerating to medium-sized western hemlock (<i>Tsuga heterophylla</i>) and Sitka spruce (<i>Picea sitchensis</i>). The drier positions generally recover more slowly, resulting in some of the trees having a stunted appearance. Moss cover is 20 to 50 percent with species such as big red stem moss (<i>Pleurozium schreberi</i>) and mountain fern moss (<i>Hylocomium splendens</i>). Lichen cover may be as much as 20 percent with species such as snow lichen (<i>Stereocaulon</i>), star reindeer lichen (<i>Cladina stellaris</i>), greygreen reindeer lichen (<i>Cladina rangiferina</i>) and reindeer lichen (<i>Cladina arbuscula</i>). Forb and graminoid cover is sparse.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Time since fire and logging | | |

| | | | |
|---|--|--|--|
| <p>Phase 1.3</p> | |  | |
| <p>Community Phase Number:</p> | <p>1.3</p> | <p>Community Phase Name:</p> | <p>Lodgepole Pine-Paper Birch Forest</p> |
| <p>Community Phase Narrative:</p> | | | |
| <p>This is a late sere community phase affected by fire and logging. The plant community is characterized by a forest cover of 50 to 65 percent that consists of tall western hemlock (<i>Tsuga heterophylla</i>), tall Sitka spruce (<i>Picea sitchensis</i>), and tall lodgepole pine (<i>Pinus contorta</i>). Paper birch (<i>Betula papyrifera</i> var. <i>papyrifera</i>) may be present in small proportions. The subcanopy layer is comprised of moss species such as mountain fern moss (<i>Hylocomium splendens</i>), dicranum moss (<i>Dicranum fuscescens</i>), goose neck moss (<i>Rhytidiadelphus</i>), and big red stem moss (<i>Pleurozium schreberi</i>). Shrub and forb cover commonly is minimal; however, a higher proportion of shrub and forb cover may be in wetter areas. Shrub cover may be as much as 35 percent with species such as squashberry (<i>Viburnum edule</i>), devilscub (<i>Oplopanax horridus</i>), and mountain ash (<i>Sorbus sitchensis</i>). Forb cover may be as much as 45 percent with species such as wintergreen (<i>Pyrola asarifolia</i>) and western oakfern (<i>Gymnocarpium dryopteris</i>).</p> | | | |
| <p>Community Pathways</p> | | | |
| <p>Pathway Number</p> | <p>Pathway Name & Description</p> | | |
| <p>1.3A</p> | <p>Time since fire and logging</p> | | |

| | | | |
|--|---------------------------------------|--|--|
| Phase 1.4 | |  | |
| Community Phase Number: | 1.4 | Community Phase Name: | Regenerating Sitka Spruce-Paper Birch Forest |
| Community Phase Narrative: | | | |
| <p>This community phase results from brush management along roads. The plant community is characterized by a 15 percent cover of regenerating paper birch (<i>Betula papyrifera</i> var. <i>papyrifera</i>). Shrub cover is nearly 100 percent with species such as Labrador tea (<i>Ledum groenlandicum</i>), lingonberry (<i>Vaccinium vitis-idaea</i>), and menziesia (<i>Menziesia</i>). Hylocomium feather moss (<i>Hylocomium</i>) cover is 20 percent, and greygreen reindeer lichen (<i>Cladina rangiferina</i>) cover is 5 percent.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.4A | Time since fire and logging | | |

| | |
|--|-------------|
| Ecological Site Description ID: | F222XY338AK |
| Ecological Dynamics of the Site: | |
| <p>This is a high-elevation, maritime forest ecological site on mountain slopes and shoulders. The soils are generally shallow and gravelly or are organic. The reference community is a forest of subalpine fir and mountain hemlock. Subalpine fir and mountain hemlock commonly are associated with colder, high-elevation mountain slopes. At the higher elevations, the forest transitions into a subalpine forest. In this transition zone, subalpine fir (<i>Abies lasiocarpa</i>) is prevalent and mountain hemlock (<i>Tsuga mertensiana</i>) and Sitka spruce (<i>Picea sitchensis</i>) appear stunted. At lower elevations, subalpine fir is not prevalent and mountain hemlock is replaced by western hemlock.</p> <p>This ecological site is similar to F222XY337AK, which is at the lower elevations that support western hemlock. Lodgepole pine (<i>Pinus contorta</i>) is also present in the early to late fire sere communities on ecological site F222XY337AK. Evidence of fire was not observed in areas of F222XY338AK.</p> <p>This ecological site is influenced by the natural succession processes from age-related decline in forest productivity. There is minimal documentation of disturbance from slope erosion. The reference and mid sere community phases have been documented in the field. It is likely that an early sere community phase may be associated with this ecological site, but it has not been documented.</p> | |
| State and Transition Model: | |
| <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <div style="display: flex; justify-content: space-between; margin-bottom: 10px;"> Maritime Forest Gravelly Slopes, High Elevation F222XY338AK </div> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <p>1. Reference State</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 60%; text-align: center;"> Reference Community Phase 1.1 (RCP) Subalpine Fir-Mountain Hemlock Forest </div> <div style="text-align: center;"> 1.2A ↑ </div> <div style="border: 1px solid black; padding: 5px; width: 60%; text-align: center;"> Community Phase 1.2 (2EM) Subalpine Fir-Mountain Hemlock Woodland </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="text-align: right;">1.1A ←</div> </div> </div> </div> | |

| | | | |
|--|---|------------------------------|---------------------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Subalpine Fir-Mountain Hemlock Forest |
| Community Phase Narrative: | | | |
| <p>This is the climax community phase for this ecological site. The forest has approximately 30 to 50 percent tree cover that is characterized by medium-sized and tall mountain hemlock (<i>Tsuga mertensiana</i>) and tall subalpine fir (<i>Abies lasiocarpa</i>). As much as 10 percent cover of medium-sized Sitka spruce (<i>Picea sitchensis</i>) has also been documented, but it does not occur in all subalpine fir-mountain hemlock forest communities. Shrub cover is 30 to 65 percent consisting of medium-sized shrubs such as oval-leaf blueberry (<i>Vaccinium ovalifolium</i>) and rusty menziesia (<i>Menziesia ferruginea</i>). Dwarf shrub cover consisting of strawberryleaf raspberry (<i>Rubus pedatus</i>) may be as much as 30 percent in some areas. Moss cover is 70 to 80 percent in most areas and includes species such as peat moss (<i>Sphagnum girgensohnii</i>), big red stem moss (<i>Pleurozium schreberi</i>), mountain fern moss (<i>Hylocomium splendens</i>), and dicranum moss (<i>Dicranum scoparium</i>). Forb cover commonly is minimal and may include species such as bunchberry dogwood (<i>Cornus canadensis</i>), spreading woodfern (<i>Dryopteris expansa</i>), western oakfern (<i>Gymnocarpium dryopteris</i>), and common ladyfern (<i>Athyrium filix-femina</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | <p>The subalpine fir-mountain hemlock woodland community shifts to a subalpine fir-mountain hemlock forest community following age-related decline in forest productivity. There is limited documentation for disturbance from slope erosion.</p> | | |

| | | | |
|--|---------------------------------------|--|---|
| Phase 1.2 | |  | |
| Community Phase Number: | 1.2 | Community Phase Name: | Subalpine Fir-Mountain Hemlock Woodland |
| Community Phase Narrative: | | | |
| <p>The subalpine fir-mountain hemlock woodland community is a mid sere community that develops following natural succession from age-related decline in the forest or from slope erosion. The community is characterized by an open forest canopy with as much as 20 percent cover of tall subalpine fir (<i>Abies lasiocarpa</i>) and regenerating and medium-sized mountain hemlock (<i>Tsuga mertensiana</i>). Shrub cover is about 60 percent and includes species such as strawberryleaf raspberry (<i>Rubus pedatus</i>), oval-leaf blueberry (<i>Vaccinium ovalifolium</i>), and rusty menziesia (<i>Menziesia ferruginea</i>). Moss cover is about 70 percent.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Time and slope stabilization | | |

| | |
|--|-------------|
| Ecological Site Description ID: | F222XY341AK |
|--|-------------|

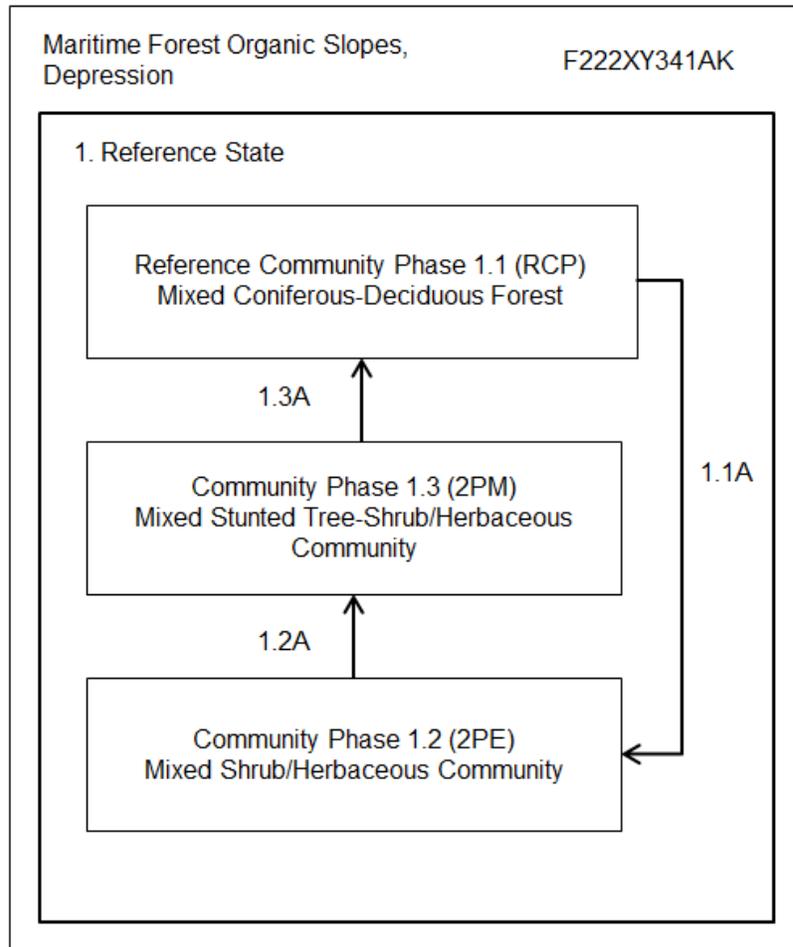
Ecological Dynamics of the Site:

This maritime ecological site is in depressions along lower elevation mountain slopes. The reference plant community is a closed canopy mixed forest with a diversity of tree species, including Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), lodgepole pine (*Pinus contorta*), and paper birch (*Betula papyrifera* var. *papyrifera*).

There is minimal field documentation of the plant community dynamics for this ecological site. An early sere mixed shrub-herbaceous community has been observed in the field. This plant community becomes established after ponding. Late sere plant communities were not observed in the field.

Very poorly drained organic soils are in the depressions.

State and Transition Model:



| | | | |
|---|--|------------------------------|-----------------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Mixed Coniferous-Deciduous Forest |
| Community Phase Narrative: | | | |
| <p>This is the reference community phase for this ecological site. The plant community is characterized by a closed canopy forest with approximately 40 to 55 percent cover. The canopy is comprised of variable cover and tree-sized stratum of paper birch (<i>Betula papyrifera</i>), Sitka spruce (<i>Picea sitchensis</i>), and western hemlock (<i>Tsuga heterophylla</i>). Lodgepole pine (<i>Pinus contorta</i>) may make up as much as 5 percent cover. Shrub cover commonly is 20 to 40 percent with species such as squashberry (<i>Viburnum edule</i>), rusty menziesia (<i>Menziesia ferruginea</i>), red elderberry (<i>Sanguisorba canadensis</i>), Sitka alder (<i>Alnus viridis</i> ssp. <i>sinuata</i>), and arctic blackberry (<i>Rubus arcticus</i>). Forb cover is 10 to 15 percent with species such as bunchberry dogwood (<i>Cornus canadensis</i>), liverleaf wintergreen (<i>Pyrola asarifolia</i>), field horsetail (<i>Equisetum arvense</i>), and western oakfern (<i>Gymnocarpium dryopteris</i>). Moss cover is as much as 75 percent.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | Water ponding in the depressions may kill the tree and understory species. | | |

| | | | |
|---|--|------------------------------|----------------------------------|
| Phase 1.2 |  | | |
| Community Phase Number: | 1.2 | Community Phase Name: | Mixed Scrub-Herbaceous Community |
| Community Phase Narrative: | | | |
| <p>This early sere community develops following ponding in a forest depression. The closed forest canopy in the reference community is replaced by an open mixed shrub, graminoid, forb, and moss community. Graminoid cover is 60 percent with species such as common spikerush (<i>Eleocharis palustris</i>), mountain hairgrass (<i>Vahlodea atropurpurea</i>), and tall cottongrass (<i>Eriophorum angustifolium</i>). Moss cover is 30 percent. Shrub cover is 20 percent and consists mainly of alpine laurel (<i>Kalmia microphylla</i>). Forb cover is 25 percent with species such as Altai fescue (<i>Fauria crista-galli</i>), subalpine fleabane (<i>Erigeron peregrinus</i>), violet (<i>Viola</i>), avens (<i>Geum</i>), tofieldia (<i>Tofieldia</i>), fireweed (<i>Chamerion angustifolium</i>), scentbottle (<i>Platanthera dilatata</i>), fringed grass of Parnassus (<i>Parnassia fimbriata</i>), field horsetail (<i>Equisetum arvense</i>), and roundleaf sundew (<i>Drosera rotundifolia</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | The plant community shifts toward a forest community as the soil dries. | | |

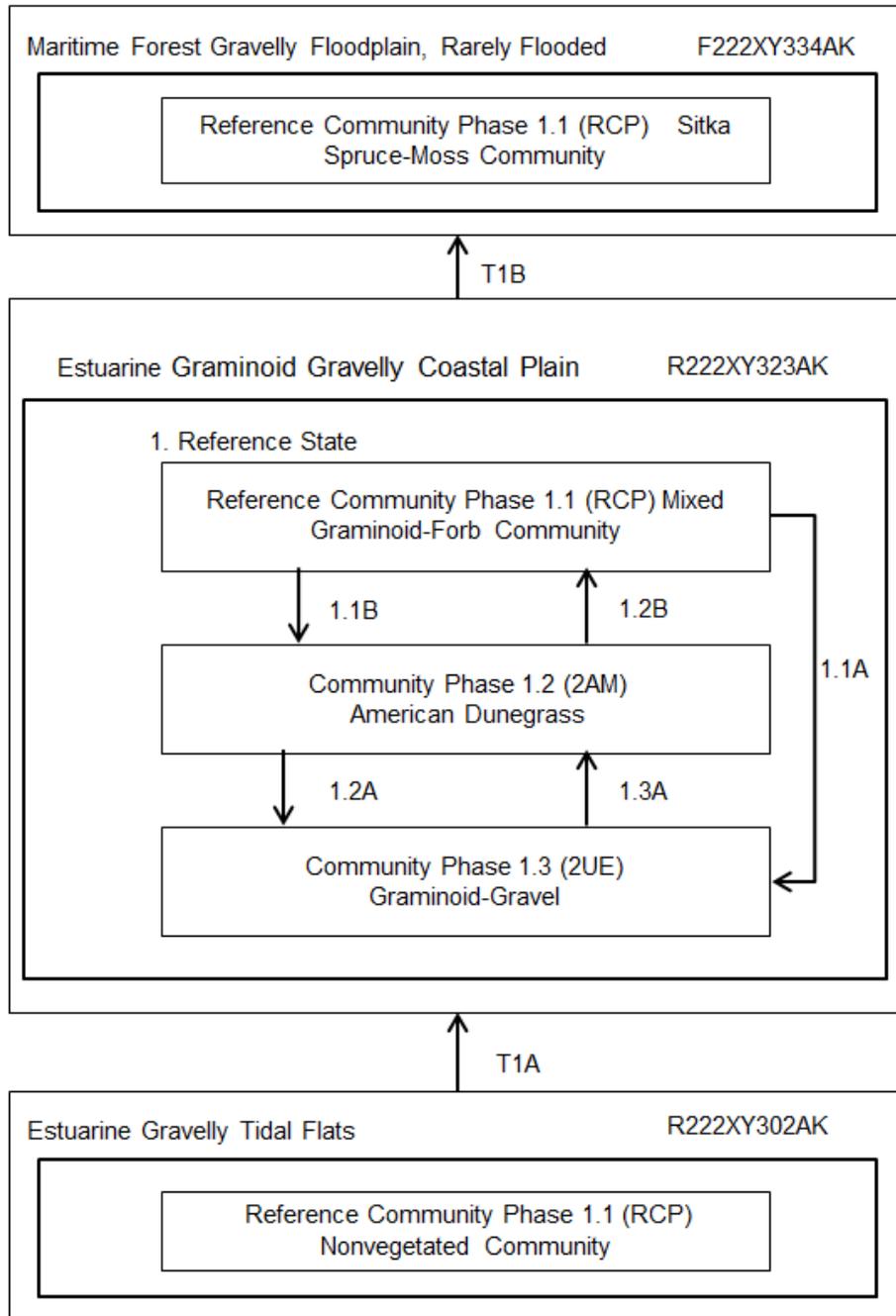
| | | | |
|--|--|------------------------------|---|
| Phase 1.3 |  | | |
| Community Phase Number: | 1.3 | Community Phase Name: | Mixed Scrub-Herbaceous-Stunted Tree Community |
| Community Phase Narrative: | | | |
| <p>This mid sere plant community develops as the soils in the depressions dry out. This plant community is characterized by mixed moss, shrubs, and forbs. As compared to the early sere community, this community has more shrub cover. Shrub cover is about 90 percent with species such as marsh Labrador tea (<i>Ledum palustre</i> ssp. <i>decumbens</i>), small cranberry (<i>Vaccinium oxycoccos</i>), alpine laurel (<i>Kalmia microphylla</i>), and bog blueberry (<i>Vaccinium uliginosum</i>). Stunted western hemlock (<i>Tsuga heterophylla</i>), Sitka spruce (<i>Picea sitchensis</i>), and lodgepole pine (<i>Pinus contorta</i>) make up 5 percent cover. Sphagnum moss cover is 65 percent, and forb cover is 50 percent. Forb species include roundleaf sundew (<i>Drosera rotundifolia</i>) and Rocky Mountain pond-lily (<i>Nuphar lutea</i> ssp. <i>Polysepala</i>).</p> <p>A late sere community phase was not observed for this ecological site. It is likely that tree canopy cover will increase with time, leading to mixed paper birch (<i>Betula papyrifera</i>), Sitka spruce (<i>Picea sitchensis</i>), and western hemlock (<i>Tsuga heterophylla</i>) woodland.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.3A | The plant community will shift toward a forest community as the soil continues to dry out. | | |

| | |
|---|-------------|
| Ecological Site Description ID: | F222XY350AK |
| Ecological Dynamics of the Site: | |
| <p>This ecological site is in linear to concave positions in the subalpine life zone. These areas generally are more protected from wind as compared with linear to convex positions (ecological sites F222XY352AK and F222XY355AK). The soils are gravelly and shallow to moderately deep.</p> <p>This plant community is a krummholz forest of mountain hemlock (<i>Tsuga mertensiana</i>) and Sitka spruce (<i>Picea sitchensis</i>). Exposure to cold temperatures and wind in the subalpine zone limits tree growth, giving the trees a stunted and deformed appearance. The trees commonly grow in high elevation areas sheltered by rock formations or in concave positions.</p> | |
| State and Transition Model: | |
| <p style="text-align: center;">Subalpine Forest Gravelly Slopes F222XY350AK</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <p style="margin: 0;">1. Reference State</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 60%; text-align: center;"> <p style="margin: 0;">Reference Community Phase 1.1 (RCP) Stunted Mountain Hemlock and Sitka Spruce Forest</p> </div> </div> | |

| | | | |
|---|--|------------------------------|--|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Stunted Mountain Hemlock and Sitka spruce Forest |
| Community Phase Narrative: | | | |
| <p>This community phase represents the historical climax community. It is characterized by a krummolz forest with as much as 40 percent stunted tree cover of mountain hemlock (<i>Tsuga mertensiana</i>) and Sitka spruce (<i>Picea sitchensis</i>). Subalpine fir (<i>Abies lasiocarpa</i>) may be present in small proportions. Various dwarf shrubs, lichen, and moss are between clumps of stunted trees. Dwarf shrub species include black crowberry (<i>Empetrum nigrum</i>), bunchberry dogwood (<i>Cornus canadensis</i>), strawberryleaf raspberry (<i>Rubus pedatus</i>), yellow mountainheath (<i>Phyllodoce glanduliflora</i>), clubmoss mountain heather (<i>Cassiope lycopodioides</i>), and partridgefoot (<i>Luetkea pectinata</i>). Lichen cover 0 to 50 percent. Commonly observed lichen species include star reindeer lichen (<i>Cladina stellaris</i>), greygreen reindeer lichen (<i>Cladina rangiferina</i>), arctic kidney lichen (<i>Nephroma arcticum</i>), and snow lichen (<i>Stereocaulon</i>). Moss cover may be as much as 15 percent, and forb cover is less 5 percent with species such as wood saxifrage (<i>Saxifraga mertensiana</i>) and fireweed (<i>Chamerion angustifolium</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| Not applicable | No community phase pathways have been observed. | | |

| | |
|---|-------------|
| Ecological Site Description ID: | R222XY323AK |
| Ecological Dynamics of the Site: | |
| <p>This estuarine, graminoid, coastal plain ecological site is comprised of three community phases with varying composition of graminoid species and percent cover. The plant community phases range from a pioneering graminoid community consisting of sparse graminoids to a climax community that is dominantly mixed cover of graminoids, forbs, and regenerating Sitka spruce (<i>Picea sitchensis</i>). The disturbance regimes that affect the dynamics of the plant community include isostatic rebound, alluvial flooding, and motorized vehicle traffic.</p> <p>Alluvial flooding and motorized vehicle traffic affect the plant community dynamics within the ecological site, whereas isostatic rebound following glacial retreat is a larger scale process that may shift the ecological site to an associated ecological site. Following glacial retreat, the ground uplifts at a rate of 0.76 inch per year. As the areas rebound, the influence of daily tides is removed and the salt deposited through tidal activity begins to leach out. Over time, the earth transitions from an estuarine tidal flats system (ecological site R222XY302AK) to an estuarine coastal plain system (ecological site R222XY323AK).</p> <p>Historical documentation suggests that this ecological site was altered by urban development during the Gold Rush era. Historical photographs show that buildings and a pier were constructed in the Dyea Flats area. Pier pilings are on the flats, but there is little evidence of this disturbance in the soil profile and plant community.</p> | |

State and Transition Model:



| | | | |
|--|--|------------------------------|--------------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Mixed Graminoid-Forb Community |
| Community Phase Narrative: | | | |
| <p>This is the climax community phase for this ecological site. The community is comprised of graminoids, moss, and forbs and a smaller proportion of colonizing Sitka spruce (<i>Picea sitchensis</i>). Graminoid cover may be nearly 30 percent with species such as Lyngbye's sedge (<i>Carex lyngbyei</i>), American dunegrass (<i>Leymus mollis</i> ssp. <i>mollis</i>), arctic rush (<i>Juncus arcticus</i>), and Gmelin's sedge (<i>Carex gmelinii</i>). There is a high diversity of forb species, including silverweed cinquefoil (<i>Argentina anserina</i>), pea (<i>Lathyrus</i>), sea milkwort (<i>Glaux maritima</i>), saxifrage (<i>Saxifraga</i>), darkthroat shootingstar (<i>Dodecatheon pulchellum</i>), Pacific hemlockparsley (<i>Conioselinum gmelinii</i>), goose tongue (<i>Plantago maritime</i>), common yarrow (<i>Achillea millefolium</i>), and common sheep sorrel (<i>Rumex acetosella</i>). Juniper polytrichum moss (<i>Polytrichum juniperinum</i>) is the dominant moss species, and it may make up as much as 60 percent cover. Regenerating Sitka spruce (<i>Picea sitchensis</i>) and shore pine (<i>Pinus contorta</i> var. <i>contorta</i>) commonly are in trace amounts, but cover may be as much as 25 percent in areas where this ecological site transitions into a maritime forest gravelly flood plain ecological site.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | Urban disturbance from motorized vehicle traffic | | |
| 1.1B | Rare, brief, high-velocity flood | | |

| | | | |
|--|---------------------------------------|--|--------------------|
| Phase 1.2 | |  | |
| Community Phase Number: | 1.2 | Community Phase Name: | American Dunegrass |
| Community Phase Narrative: | | | |
| This plant community phase becomes established following alluvial flooding or recovery from motorized vehicle traffic. The community is characterized by a continuous cover of American dunegrass (<i>Leymus mollis</i> ssp. <i>mollis</i>). | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Motor vehicle use | | |
| 1.2B | Time since a flood | | |

| | | | |
|--|----------------------------------|--|----------------------------|
| Phase 1.3 | |  | |
| Community Phase Number: | 1.3 | Community Phase Name: | Graminoid-Gravel Community |
| Community Phase Narrative: | | | |
| <p>This community phase is a mixture of graminoids and forbs. The cover may be as much as 80 percent with exposed gravel resulting from motorized vehicle traffic. American dunegrass (<i>Leymus mollis</i> ssp. <i>mollis</i>) is the dominant graminoid. Forb cover may be as much as 70 percent with species such as goose tongue (<i>Plantago maritima</i> var. <i>juncooides</i>) and common yarrow (<i>Achillea millefolium</i> var. <i>alpicola</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | 1.3 | | |
| 1.3A | Time since motorized vehicle use | | |

| State Transition Pathways | |
|---------------------------|---|
| Transition Number | Transition Narrative |
| T1A | T1A represents an irreversible transition from the Estuarine Gravelly Tidal Flats ecological site (R222XY302AK) to the Estuarine Graminoid Coastal Plain ecological site (R222XY323AK) as a result of isostatic rebound. During the glacial period, the weight of the ice bowed the earth's crust. When the glacier retreated, the earth began to rebound at a rate of 0.76 inch per year. As the earth continued to lift out of the nonvegetated tidal flats, the salts began to leach from the soil and plants began to become established. Over time, the earth will continue to rebound and the graminoid coastal plain ecological site will transition into flood plain site (see T1B narrative). |
| T1B | Isostatic rebound is a continuous process that affects the ecological dynamics of an ecosystem. T1A represents the early stages of isostatic rebound, and T1B represents the later stages. As the Estuarine Graminoid Coastal Plain ecological site continues to rebound, tidal influence diminishes and the site transitions out of an estuarine system into a maritime flood plain system. The establishment of Sitka spruce (<i>Picea sitchensis</i>) triggers the transition between ecological sites. Once the Sitka spruce cover reaches 25 percent, the Estuarine Graminoid Coastal Plain ecological site becomes the Maritime Forest Gravelly Flood Plain, Rarely Flooded (F222XY334AK) site. |

| | |
|--|-------------|
| Ecological Site Description ID: | R222XY324AK |
| Ecological Dynamics of the Site: | |
| <p>This is a high-gradient, mountain-confined flood plain surrounding a moderate to very steep, deeply entrenched, debris transport stream. The ecological dynamics of this site are driven by high energy floods and high sediment supply due to the steep channel slopes. The late seral vegetation on these steep slopes is a Sitka alder (<i>Alnus viridis ssp. sinuata</i>) shrub community. The mid successional flood plain community is comprised of bare soil with gravel, cobbles, and boulders and approximately 30 percent vegetation cover of species such as dwarf fireweed (<i>Chamerion latifolium</i>). Over time without flooding, it is expected that few balsam poplar (<i>Populus balsamifera</i>) trees may begin to establish; however, this was not observed in the field.</p> | |
| State and Transition Model: | |
| <div style="border: 1px solid black; padding: 10px; margin: 0 auto; width: 80%;"> <p style="text-align: center;">Maritime Shrub Gravelly Floodplain, Mountain Confined R231XY324AK</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <p style="text-align: center;">1. Reference State</p> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: 80%; text-align: center;"> <p>Reference Community Phase 1.1 (2AL) Alder Shrub Community</p> </div> <div style="display: flex; justify-content: center; align-items: center; margin: 5px 0;"> <div style="text-align: center; margin-right: 10px;"> ↓ 1.1A </div> <div style="text-align: center; margin-left: 10px;"> ↑ 1.2A </div> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: 80%; text-align: center;"> <p>Community Phase 1.2 (2AM) Open Forb Community</p> </div> </div> </div> | |

| | | | |
|---|--|------------------------------|-----------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Alder Shrub Community |
| Community Phase Narrative: | | | |
| <p>This is the late sere community following flooding. The shrub community is dominantly Sitka alder (<i>Alnus viridis ssp. sinuata</i>), which makes up as much as 80 percent cover.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | High-velocity flood | | |

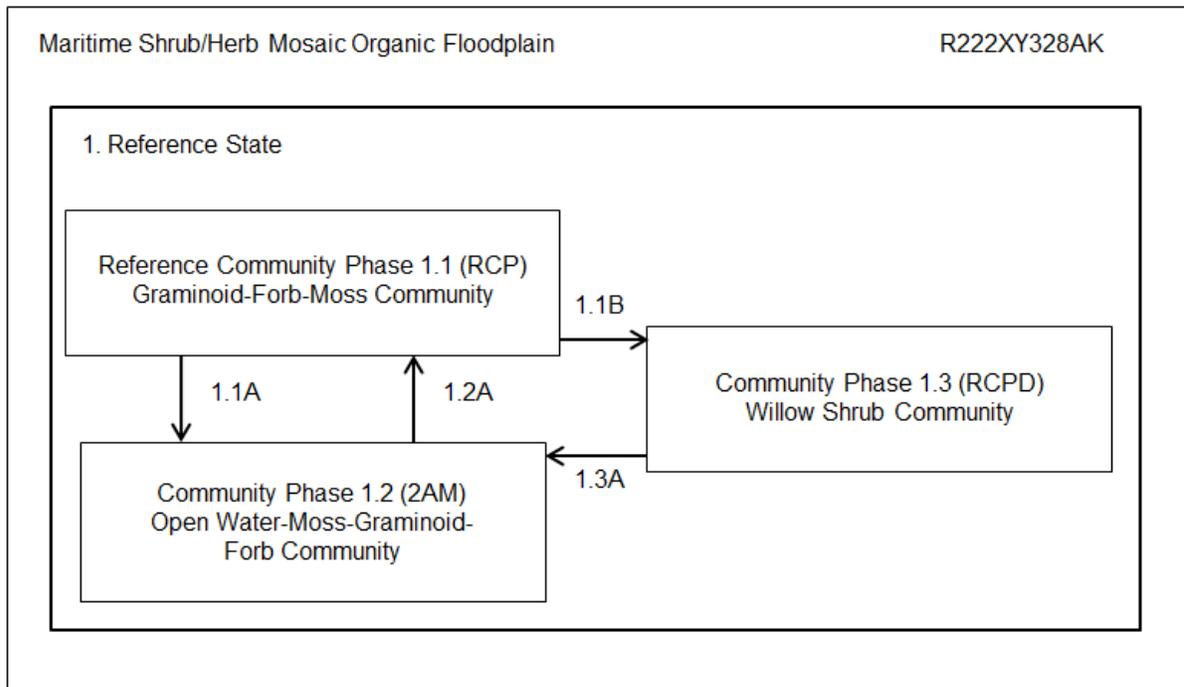
| | | | |
|---|--|--|----------------------------|
| <p>Phase 1.2</p> | |  | |
| <p>Community Phase Number:</p> | <p>1.2</p> | <p>Community Phase Name:</p> | <p>Open Forb Community</p> |
| <p>Community Phase Narrative:</p> | | | |
| <p>Following a high-intensity flood, dwarf fireweed (<i>Chamerion latifolium</i>) and Sitka alder (<i>Alnus viridis ssp. sinuate</i>) may begin to emerge to produce a sparse early successional community. Vegetation cover may be as much as 30 percent with exposed bare soil and surface rock. Lichen and moss commonly cover the surface rock.</p> | | | |
| <p>Community Pathways</p> | | | |
| <p>Pathway Number</p> | <p>Pathway Name & Description</p> | | |
| <p>1.2A</p> | <p>Time since a flood</p> | | |

| | |
|--|-------------|
| Ecological Site Description ID: | R222XY328AK |
|--|-------------|

Ecological Dynamics of the Site:

This is a maritime shrub and herb ecological site that is shaped by the movement of water in discharge wetlands. The movement of water creates a unique banding of vegetation through the formation of string bogs. The bands of vegetation in the early development of a string bog consist of pools of open water with water-loving vegetation and moss. Surrounding the pools, organic matter develops and graminoid and forb cover increases. Over a longer period of time, the organic matter continues to develop and the ecological site transitions from an open water-moss herbaceous state to a shrub state. Once the shrub community develops, it will not transition back to an open water-moss herbaceous state unless the area is drained enough to erode the shrub community and organic mat. A rare ice jam flood may also erode the shrub vegetation and organic layer and deposit a mineral soil over the organic layer. The soils formed in thick organic matter with strata of mineral material of varying thickness.

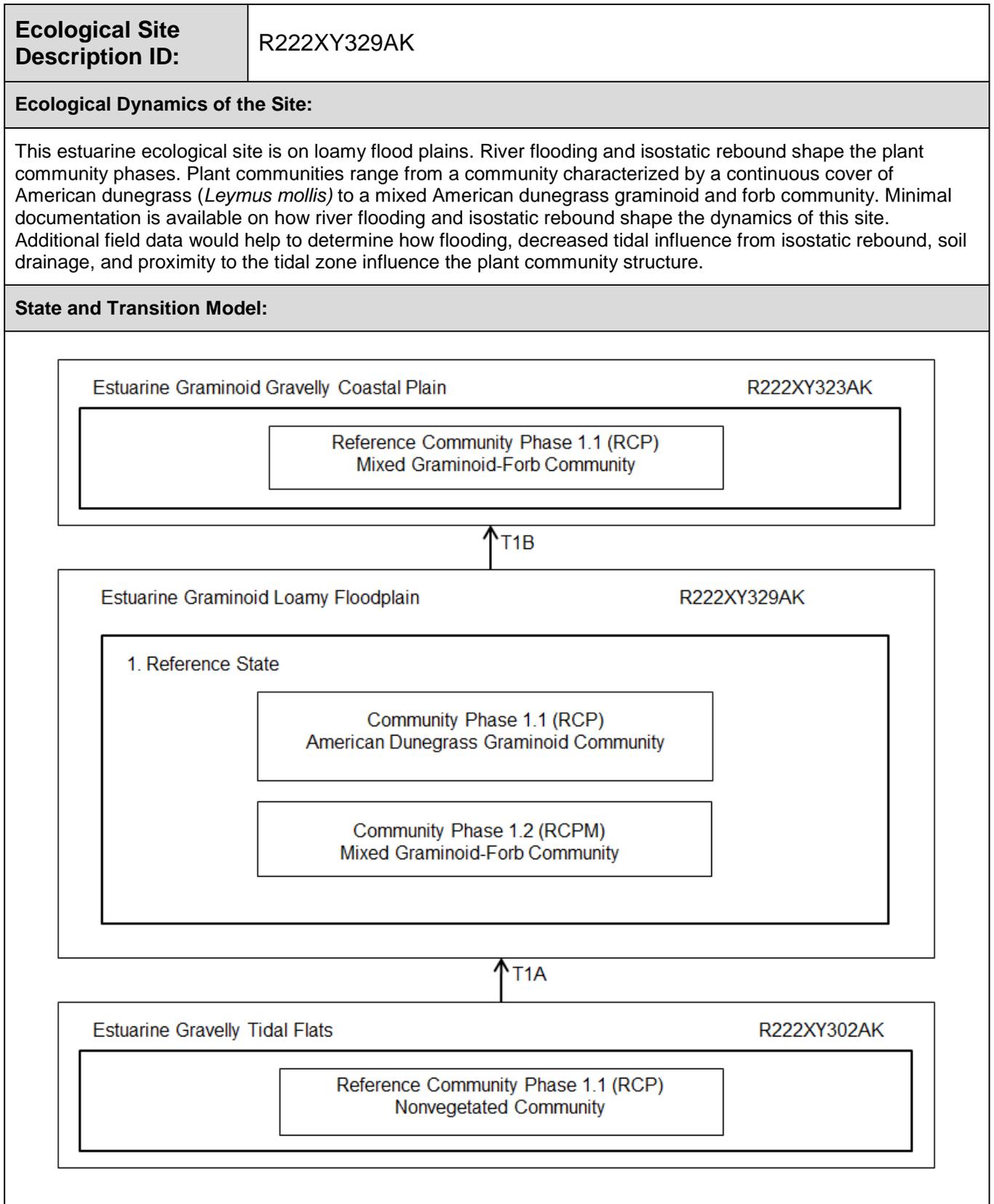
State and Transition Model:



| | | | |
|--|--|------------------------------|-------------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Graminoid-Forb-Moss Community |
| Community Phase Narrative: | | | |
| <p>This is the reference plant community for string bog succession. Waterflow in a discharge wetland produces strings, or bands, of water and vegetation. The vegetative community begins to grow as a layer of organic matter develops. The community is a mixture of moss, graminoids, and forbs. This ecological site has approximately 15 percent standing water. Graminoid cover may be as much as 80 to 90 percent with species such as alpine bulrush (<i>Trichophorum alpinum</i>), water sedge (<i>Carex aquatilis</i>), and livid sedge (<i>Carex livida</i>). Buckbean (<i>Menyanthes trifoliata</i>) is the dominant forb species.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | If drainage is sufficient to erode the organic mat, the graminoid-forb-moss community may transition back to an open water-moss-graminoid-forb community. | | |
| 1.1B | Over a longer period of time, the string bog mosaic of open water and banded vegetation will transition to a more continuous organic mat with vegetation and a smaller proportion of open water. Following the establishment of a graminoid-forb community in the reference community phase, shrub species may begin to encroach. The ecological site will then transition from a graminoid-forb state to a drier shrub state. | | |

| | | | |
|--|--|-------------------------------------|---|
| <p>Phase 1.2</p> |  | | |
| <p>Community Phase Number:</p> | <p>1.2</p> | <p>Community Phase Name:</p> | <p>Open Water-Moss-Graminoid-Forb Community</p> |
| <p>Community Phase Narrative:</p> | | | |
| <p>This community phase is characterized by more than 30 percent open water. Moss may form a mat that makes up as much as 30 percent cover. A continuous cover of forbs such as buckbean (<i>Menyanthes trifoliata</i>), water horsetail (<i>Equisetum fluviatile</i>), and purple marshlocks (<i>Comarum palustre</i>) and graminoids such as water sedge (<i>Carex aquatilis</i>) and creeping sedge (<i>Carex chordorrhiza</i>) may be in small patches and along the edges of the bodies of water.</p> | | | |
| <p>Community Pathways</p> | | | |
| <p>Pathway Number</p> | <p>Pathway Name & Description</p> | | |
| <p>1.2A</p> | <p>In the discharge wetland areas, a layer of organic matter begins to develop. The exact mechanism for the development is unknown, but downslope drainage and accumulation of mud, peat, and debris may contribute to the formation of banded organic material that supports the growth of water-loving graminoid and forb species.</p> | | |

| | | | |
|--|---|------------------------------|------------------------|
| Phase 1.3 |  | | |
| Community Phase Number: | 1.3 | Community Phase Name: | Willow Shrub Community |
| Community Phase Narrative: | | | |
| <p>The willow shrub community is characterized by a mixed graminoid-shrub community with as much as 15 percent open water. Forb and graminoid cover may be 50 to 90 percent. Common graminoids include water sedge (<i>Carex aquatilis</i>) and bluejoint grass (<i>Calamagrostis canadensis</i>). Forb species include purple marshlocks (<i>Comarum palustre</i>) and field horsetail (<i>Equisetum arvense</i>). Shrub cover may be as much as 50 percent. Barclay's willow (<i>Salix barclayi</i>) is the dominant shrub species. Sitka alder (<i>Alnus viridis ssp. sinuata</i>) and squashberry (<i>Viburnum edule</i>) may become established in small proportions along the edges of the discharge wetlands.</p> | | | |
| Community Pathways | | | |
| Pathway Number | | | |
| 1.3A | <p>If water drainage is sufficient enough to erode the shrub community and organic mat, the plant community may transition back to an open water-moss-graminoid-forb community. A rare ice jam flood may also erode the shrub vegetation and organic layer and deposit a mineral soil over the organic layer.</p> | | |



| | | | |
|---|--|------------------------------|--|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | American Dunegrass Graminoid Community |
| Community Phase Narrative: | | | |
| <p>This reference plant community is comprised of a nearly continuous cover of American Dunegrass (<i>Leymus mollis</i>), which is a salt-tolerant species that can become established in brackish water.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| Not applicable | No community phase pathways have been observed. | | |

| | | | |
|---|---|--|--------------------------------|
| Phase 1.2 | |  | |
| Community Phase Number: | 1.2 | Community Phase Name: | Mixed Graminoid-Forb Community |
| Community Phase Narrative: | | | |
| <p>This is a mixed graminoid-forb community in the Estuarine Flood Plain ecological site. This plant community is comprised of 30 percent graminoid cover of American dunegrass (<i>Leymus mollis ssp. mollis</i>) and Lyngbye's sedge (<i>Carex lyngbyei</i>). Forb cover is approximately 40 percent with species such as silverweed cinquefoil (<i>Argentina anserina</i>), sea milkwort (<i>Glaux maritima</i>), trace goose tongue (<i>Plantago maritima var. juncooides</i>), and stickystem pearlwort (<i>Sagina maxima</i>). Compared to the American dunegrass graminoid community, this community phase has a higher proportion of forb species. It is not clear whether this difference is the result of riverine flooding or if it is related to the spatial proximity to the ocean. This community phase is along flood plains near the transition to the tidal zone and may be subject to more frequent tidal influences than the American dunegrass graminoid community.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| Not applicable | No community phase pathways have been observed. | | |

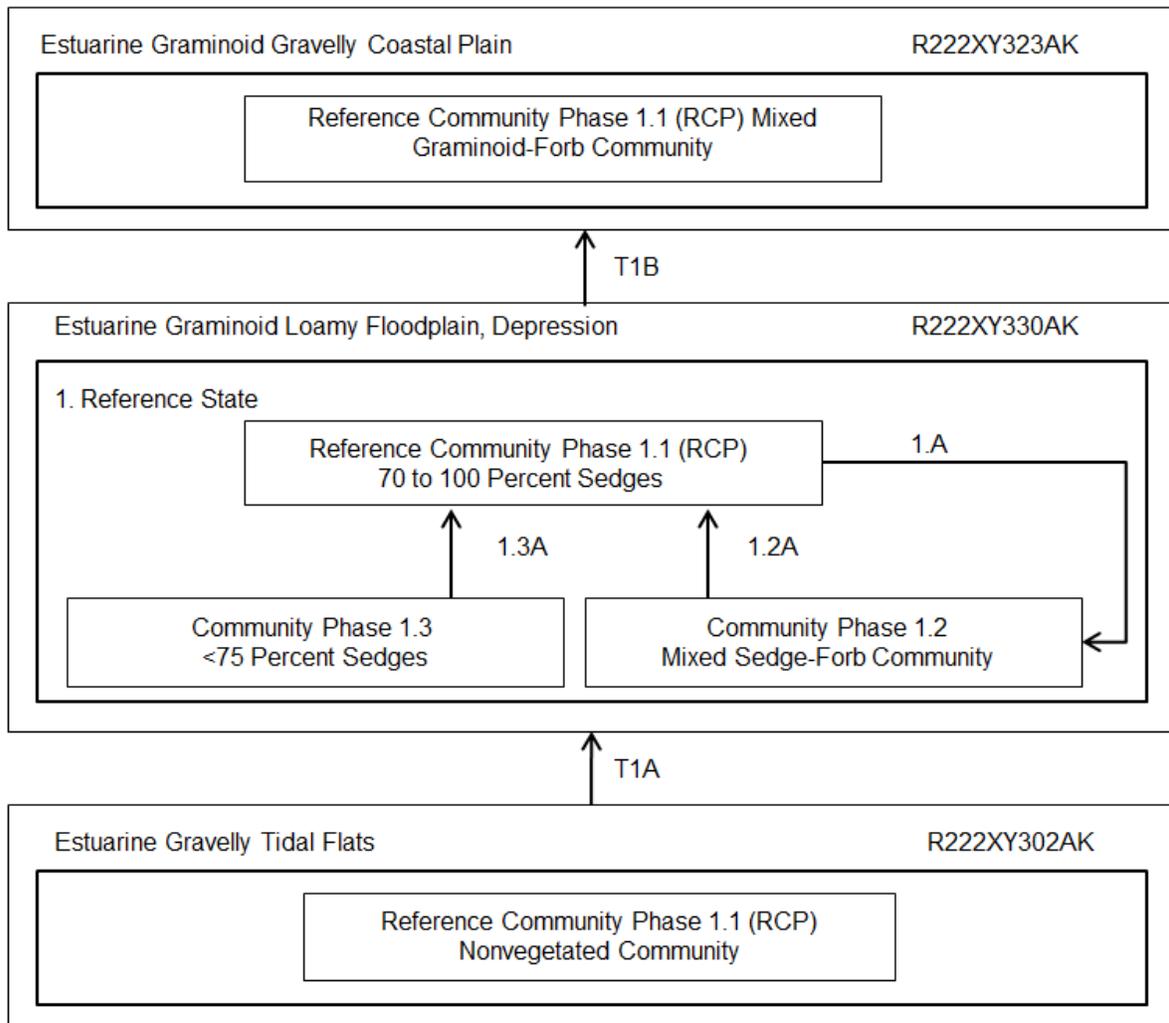
| State Transition Pathways | | | |
|---------------------------|------|----|--|
| Transition Number | From | To | Transition Narrative |
| T1A | 1 | 2 | T1A represents an irreversible transition from the Estuarine Barren Gravelly Tidal Flats ecological site (R222XY302AK) to the Estuarine Graminoid Sandy Floodplain site (R222XY329AK) as a result of isostatic rebound. During the glacial period, the weight of the ice bowed the earth's crust. When the glacier retreated, the earth began to rebound at a rate of 0.76 inch per year. As the earth lifted out of the nonvegetated tidal flats, plants began to establish, marking the transition from the tidal flat ecological site to the graminoid- and forb-dominant floodplain site. Over time, the earth will continue to rebound and the Estuarine Graminoid Sandy Floodplain ecological site will transition to a graminoid coastal plain ecological site (see T1B narrative). |
| T1B | 2 | 3 | Isostatic rebound is a continuous process that shapes the dynamics of an ecosystem. T1A represents the early stages of isostatic rebound, and T1B represents the later stages of isostatic rebound. As the Estuarine Graminoid Sandy Floodplain site continues to rebound, riverine flooding and tidal influences diminish and the ecological site transitions from a flood plain system to a coastal plain system. The removal of low frequency, short duration, high-velocity flooding triggers the transition. The Estuarine Graminoid Sandy Floodplain site becomes the Estuarine Graminoid Sandy Coastal Plain site (R222XY323AK) when the composition of the community transitions from graminoids to mixed graminoids and forbs. |

| | |
|--|-------------|
| Ecological Site Description ID: | R222XY330AK |
|--|-------------|

Ecological Dynamics of the Site:

This ecological site is in depressions of estuarine loamy flood plains. The climax plant community is a nearly continuous cover of sedges. The mineral soil is subject to daily tidal influences. The ecological dynamics of this site are driven by post-glacial isostatic rebound and rare, high-velocity flooding. Following post-glacial rebound, the barren tidal flats transition into a flood plain ecological site with sparse sedges. As the flood plain continues to rebound, the community gradually shifts toward the climax community of a nearly continuous cover of sedges. Isostatic rebound will continue to elevate the flood plain until it no longer floods. This marks the transition from a flood plain ecological site to a coastal flood plain site.

State and Transition Model:



| | | | |
|---|---|------------------------------|--------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | 70 to 100 percent sedges |
| Community Phase Narrative: | | | |
| <p>This is the reference community phase for depressions of estuarine graminoid floodplains. This community is characterized by a 70 to 100 percent cover of Lyngbye's sedge (<i>Carex lyngbyei</i>) as the site recovers after post-glacial rebound or river flooding. Lyngbye's sedge is salt-tolerant and grows in areas that are subject to daily tidal events.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | <p>Low frequency, short duration, high-velocity flooding along river channels shape the community structure. Although it has not been documented, it is likely that rare, extreme tidal events may also wash away the established plants.</p> | | |

| | | | |
|---|--|------------------------------|-----------------------------|
| Phase 1.2 |  | | |
| Community Phase Number: | 1.2 | Community Phase Name: | Mixed Sedge-Forb Community |
| Community Phase Narrative: | | | |
| <p>Low frequency, short duration, high-velocity flooding may erode the climax sedge community. Following flooding, a community phase characterized by a mixture of sedges and forbs with as much as 80 percent cover will become established. Lyngbye's sedge (<i>Carex lyngbyei</i>) is the dominant sedge. Smaller proportions of rushes such as arctic rush (<i>Juncus arcticus</i>) and forbs such as darkthroat shootingstar (<i>Dodecatheon pulchellum</i>) are mixed in this sedge-dominant community.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Time since a flood | | |
| Phase 1.3 | Photograph not available | | |
| Community Phase Number: | 1.3 | Community Phase Name: | Less than 75 percent sedges |
| Community Phase Narrative: | | | |
| <p>This community phase was not documented in the field. Following post-glacial rebound, salt-tolerant sedges such as Lyngbye's sedge (<i>Carex lyngbyei</i>) may begin to emerge, producing a sparsely vegetated early successional community.</p> | | | |

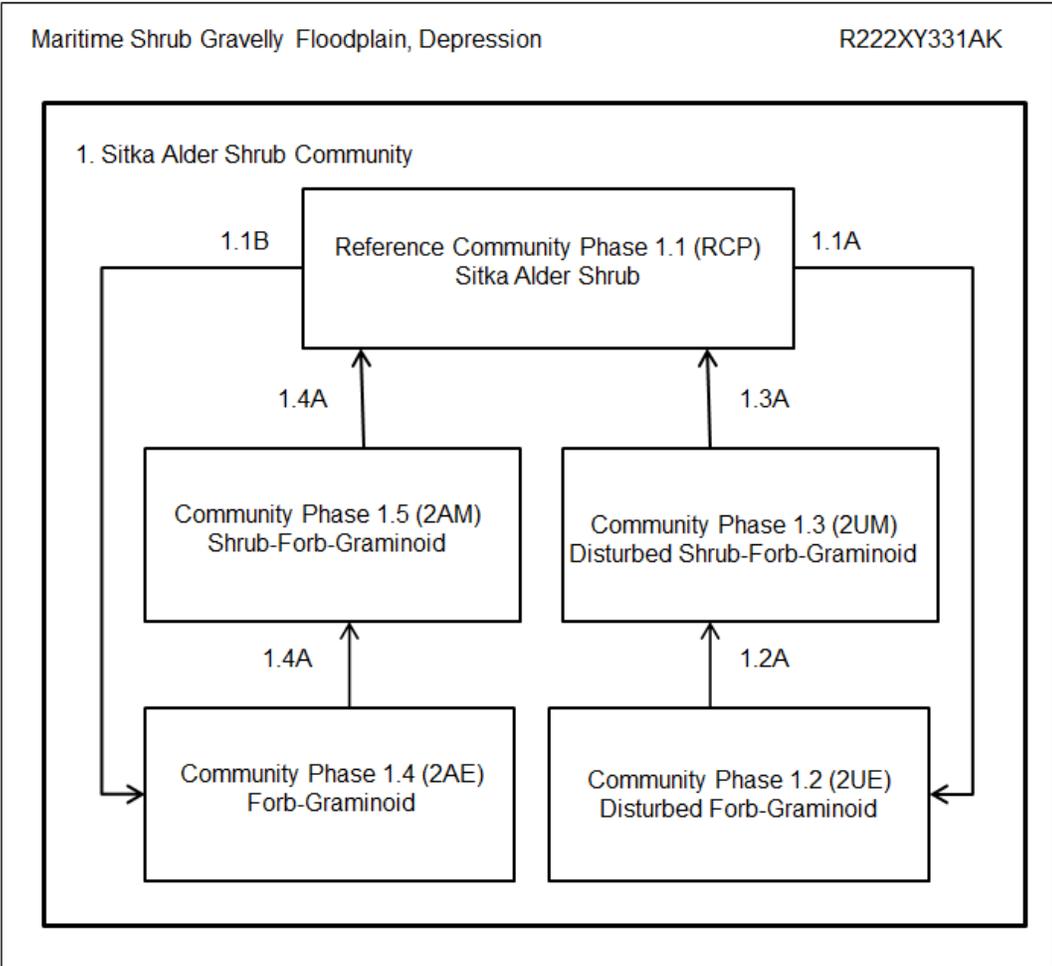
| Community Pathways | |
|----------------------------------|---|
| Pathway Number | 1.3 |
| 1.3A | Post-glacial rebound |
| State Transition Pathways | |
| Transition Number | Transition Narrative |
| T1A | T1A represents an irreversible transition from the Estuarine Barren Gravelly Tidal Flats ecological site (R222XY302AK) to the Estuarine Graminoid Sandy Floodplains, Depression, site (R222XY330AK) as a result of isostatic rebound. During the glacial period, the weight of the ice bowed the earth's crust. When the glacier retreated, the earth began to rebound at a rate of 0.76 inch per year. As the earth continued to lift out of the nonvegetated tidal flats, plants began to establish, marking the transition from the tidal flat ecological site to the graminoid-dominant coastal plain site. Over time, the earth will continue to rebound and the Estuarine Graminoid Sandy Floodplains, Depression, ecological site will transition to a graminoid coastal plain site (see T1B narrative). |
| T1B | Isostatic rebound is a continuous process that shapes the ecological dynamics of an ecosystem. T1A represents the early stages of isostatic rebound, and T1B represents the later stage of isostatic rebound. As the Estuarine Graminoid Sandy Floodplains, Depression, site continues to rebound, riverine flooding and tidal influence diminish and the ecological site transitions from a flood plain system to a coastal plain system. Absence of low frequency, short duration, high-velocity flooding triggers the transition between ecological sites. The Estuarine Graminoid Sandy Floodplains, Depression, site transitions to the Estuarine Graminoid Sandy Coastal Plain site (R222XY323AK) as the composition of the plant community changes from sedges to mixed graminoids and forbs. |

| | |
|--|-------------|
| Ecological Site Description ID: | R222XY331AK |
|--|-------------|

Ecological Dynamics of the Site:

This is a maritime shrub ecological site in low-gradient flood plain depressions. The ecological dynamics of this site are driven by alluvial flooding and urban disturbance from foot traffic. The reference plant community is a Sitka alder shrub community with a variety of other shrub and herbaceous species. Early succession plant community phases are characterized by bare soil with graminoids and forbs. The early sere disturbed community is similar to the early sere flood community, but there is bare ground in areas of high foot traffic.

State and Transition Model:



| | | | |
|--|--|------------------------------|-----------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Sitka Alder Shrub Community |
| Community Phase Narrative: | | | |
| <p>The climax community phase for depressions low-gradient floodplains is characterized by a shrub cover of 20 percent or more with species such as Barclay’s willow (<i>Salix barclayi</i>), Sitka alder (<i>Alnus viridis ssp. sinuata</i>), redosier dogwood (<i>Cornus sericea ssp. Sericea</i>), and arctic blackberry (<i>Rubus arcticus</i>). A field horsetail (<i>Equisetum arvense</i>) forb cover makes up approximately 25 percent, and a bluejoint grass (<i>Calamagrostis canadensis</i>) graminoid cover makes up approximately 10 percent.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | Urban disturbance from foot traffic | | |
| Phase 1.2 | Photograph not available | | |
| Community Phase Number: | 1.2 | Community Phase Name: | Disturbed Forb-Graminoid |
| Community Phase Narrative: | | | |
| <p>This is a disturbed community phase that is subject to flooding and foot traffic. This phase has a field horsetail (<i>Equisetum arvense</i>) forb cover of 50 to 70 percent. A bluejoint grass (<i>Calamagrostis canadensis</i>) graminoid cover may be as much as 10 percent. This site may have a trace cover of moss and shrub species such as Sitka alder (<i>Alnus viridis ssp. sinuata</i>) and Barclay’s willow (<i>Salix barclayi</i>).</p> | | | |

| Community Pathways | | | |
|---|---|------------------------------|--|
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Removal of foot traffic and time since a flood | | |
| Phase 1.3 |  | | |
| Community Phase Number: | 1.3 | Community Phase Name: | Disturbed Shrub-Forb-Graminoid Community |
| Community Phase Narrative: | | | |
| <p>This mid succession plant community phase establishes following flooding and/or urban disturbance. The composition of the plant community is a mixture of forbs, graminoids, and shrubs. Shrub cover is approximately 10 percent with species such as Sitka alder (<i>Alnus viridis ssp. sinuata</i>) and Sitka willow (<i>Salix sitchensis</i>). Fifty to sixty percent of the ground is covered with forb and graminoid species such as field horsetail (<i>Equisetum arvense</i>), Spike bentgrass (<i>Agrostis exarata</i>), and western buttercup (<i>Ranunculus occidentalis</i>).</p> <p>This community phase is similar to phase 1.2; however, this community has not been disturbed by foot traffic. This community was not documented in the field, but it is expected that it will support a graminoid and forb cover of as much as 40 percent with species such as field horsetail (<i>Equisetum arvense</i>) and bluejoint grass (<i>Calamagrostis canadensis</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | 1.3 | | |
| 1.3A | Time since a flood and removal of foot traffic | | |

Soil Survey and Ecological Site Inventory of Skagway-Klondike Gold Rush National Historical Park, Alaska

| | | | |
|--|---------------------------------------|------------------------------|----------------------|
| Phase 1.4 | | Photograph not available | |
| Community Phase Number: | 1.4 | Community Phase Name: | Forb-Graminoid |
| Community Phase Narrative: | | | |
| This community phase represents an early sere community following flooding. This phase was not documented in the field; however, it is believed that the plant community would be similar to that of community phase 1.2 except without the bare ground from foot traffic. | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.4A | Time since a flood | | |
| Phase 1.5 | | Photograph not available | |
| Community Phase Number: | 1.5 | Community Phase Name: | Shrub-Forb-Graminoid |
| Community Phase Narrative: | | | |
| This is a mid sere plant community that establishes following a flood. The community is characterized by mixed herbaceous plants and shrubs. Forb and graminoid cover is approximately 50 to 60 percent with species such as field horsetail (<i>Equisetum arvense</i>), Spike bentgrass (<i>Agrostis exarata</i>), and western buttercup (<i>Ranunculus occidentalis</i>). Shrub cover is approximately 10 percent with species such as Sitka alder (<i>Alnus viridis ssp. sinuata</i>) and Sitka willow (<i>Salix sitchensis</i>). | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.5A | Time since a flood | | |

| | |
|---|-------------|
| Ecological Site Description ID: | R222XY332AK |
| Ecological Dynamics of the Site: | |
| <p>This ecological site is adjacent to stream channels on low-gradient maritime flood plains. The ecological dynamics of this site are driven by frequent flooding. The plant community varies from a sparse Sitka alder shrub phase to a continuous cover of Sitka alder and willow with a dense layer of forbs and graminoids. Because of the high frequency of flooding, tree cover is less than 10 percent and consists of regenerating or medium-sized trees.</p> | |
| State and Transition Model: | |
| <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <div style="display: flex; justify-content: space-between; align-items: center;"> Maritime Shrub Gravelly Floodplains, Frequently Flooded R222XY332AK </div> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <p>1. Reference State</p> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: 80%;"> <p>Reference Community Phase 1.1 (RCP) Sitka Alder Shrub-Graminoid</p> </div> <div style="display: flex; justify-content: center; align-items: center; margin: 5px 0;"> <div style="text-align: center; margin-right: 5px;"> 1.2A ↑ </div> <div style="text-align: center; margin-right: 5px;"> ↓ 1.1A </div> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: 80%;"> <p>Community Phase 1.2 (2AE) Bare Soil-Sitka Alder</p> </div> </div> </div> | |

| | | | |
|--|--|------------------------------|-----------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Sitka Alder Shrub-Graminoid |
| Community Phase Narrative: | | | |
| <p>This is the climax community phase for a maritime gravelly flood plain adjacent to the stream channel. The vegetation community consists of 60 to 100 percent shrub cover of Sitka alder (<i>Alnus viridis ssp. sinuata</i>) and Sitka willow (<i>Salix sitchensis</i>). There is a nearly continuous layer of graminoid and forb species, dominantly field horsetail (<i>Equisetum arvense</i>), bride's feathers (<i>Aruncus dioicus</i>), and claspleaf twistedstalk (<i>Streptopus amplexifolius var. amplexifolius</i>). As much as 5 percent cover of regenerating and medium-sized balsam poplar (<i>Populus balsamifera</i>) has been observed in some areas.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | Frequent flooding | | |

| | | | |
|---|---------------------------------------|---|-----------------------|
| Phase 1.2 | |  | |
| Community Phase Number: | 1.2 | Community Phase Name: | Bare Soil-Sitka Alder |
| Community Phase Narrative: | | | |
| <p>This community phase develops following a flood and is characterized by 60 to 100 percent bare soil and surface rock. This early successional phase consists of 0 to 25 percent cover of Sitka alder (<i>Alnus viridis ssp. sinuata</i>) and willow (<i>Salix</i>). The shrubs are distributed in small clumps. As much as 10 percent moss cover may be in some areas.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Time since a flood | | |

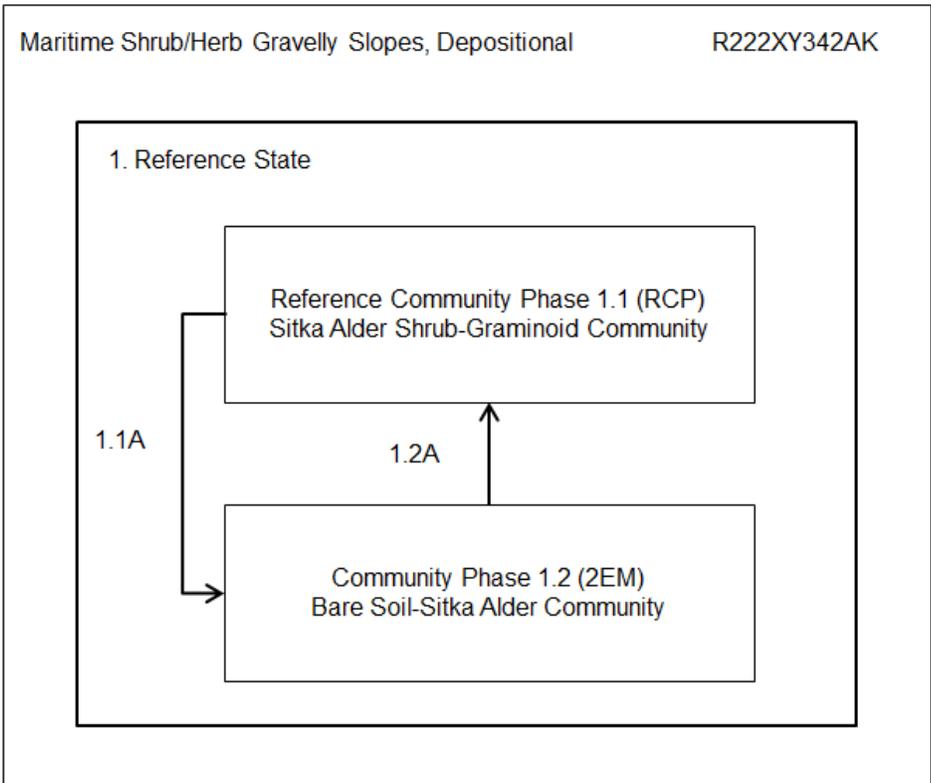
| | |
|--|-------------|
| Ecological Site Description ID: | R222XY342AK |
|--|-------------|

Ecological Dynamics of the Site:

This ecological site is in maritime mountain avalanche chutes. Specifically, it is on mountain chutes and side slopes from sea level to tree line in areas where frequent avalanches or slides occur. This ecological site also includes less steep avalanche slopes in the runout zones at the bottom of the avalanche path. The ecological dynamics of this site are maintained by frequent snow or debris slides that erode the soils and prevent trees from becoming established. The vegetation is dominantly shrubs and graminoids. Tree seedlings may become established in areas that are subject to less frequent avalanches, but growth rarely extends beyond the regenerating phase.

The reference plant community for this ecological site is characterized by mixed shrubs, forbs, and graminoids with minimal exposed bare soil, rock, and rubble. Earlier sere plant communities have more exposed soil and rock and less plant cover. The early sere plant community was not documented in the field, but it is likely to be characterized by extensive bare soil and rock with minimal plant cover.

State and Transition Model:



| | | | |
|---|---|------------------------------|---------------------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Sitka Alder Shrub-Graminoid Community |
| Community Phase Narrative: | | | |
| <p>This is the reference plant community for an avalanche chute. Compared to the early successional community phase, bare soil and rock cover is minimal. Medium-sized shrub cover may be as much as 70 percent. Shrub species include Sitka alder (<i>Alnus viridis ssp. sinuata</i>), Barclay's willow (<i>Salix barclayi</i>), stink currant (<i>Ribes bracteosum</i>), and Sitka willow (<i>Salix sitchensis</i>). Graminoid cover consisting of fowl bluegrass (<i>Poa palustris</i>) is approximately 20 percent. Forb cover is approximately 15 percent with species such as arctic starflower (<i>Trientalis europaea</i>) and spreading woodfern (<i>Dryopteris expansa</i>). Tree seedlings may become established on this site, but growth likely will not extend beyond the regenerating phase because of the frequency and intensity of the disturbance.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | <p>High-frequency avalanches on steep mountainous slopes carry snow and debris from higher elevations to lower elevations. The slides erode the soil and deposit large boulders and rocks at the lower elevations. The movement of snow and rock removes the plants. The high frequency and intensity of the disturbance in the avalanche chutes prevents a forest community from becoming established.</p> | | |

| | | | |
|--|--|--|---------------------------------|
| Phase 1.2 | |  | |
| Community Phase Number: | 1.2 | Community Phase Name: | Bare Soil-Sitka Alder Community |
| Community Phase Narrative: | | | |
| <p>This community phase represents the mid successional sere plant community following an avalanche. The plant community is characterized by shrubs and graminoids with as much as 50 percent bare ground and surface rock. Shrub species may include Sitka alder (<i>Alnus viridis ssp. sinuata</i>), Sitka willow (<i>Salix sitchensis</i>), salmonberry (<i>Rubus spectabilis</i>), and bride's feathers (<i>Aruncus dioicus</i>). Shrub cover may be 10 to 40 percent, and graminoid cover may be 10 to 50 percent. Common graminoid species include sedges (<i>Carex</i>), bluejoint grass (<i>Calamagrostis canadensis</i>), and arctic bluegrass (<i>Poa arctica</i>). Boreal sagebrush (<i>Artemisia arctica</i>) was the only observed forb species; however, it is likely that other species may become established over time.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Time since an avalanche and soil stabilization | | |

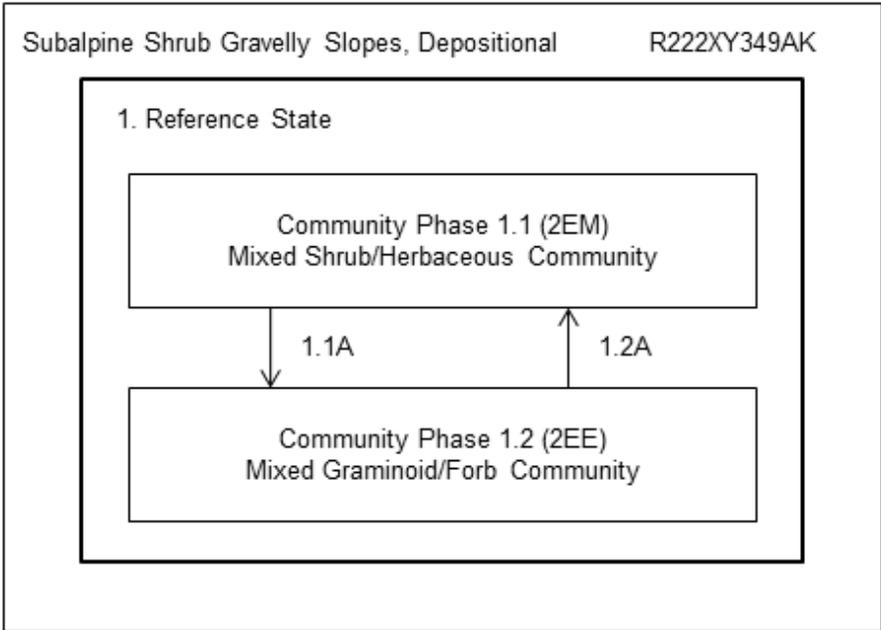
| | |
|--|-------------|
| Ecological Site Description ID: | R222XY349AK |
|--|-------------|

Ecological Dynamics of the Site:

This ecological site is at the outflow of avalanche chutes in the subalpine life zone. Snow and debris are transported from higher elevations and deposited in these areas. The soils are shallow to moderately deep and gravelly, and they exhibit little development.

The vegetation is characterized by a mixed shrub/herbaceous community (2EM) that transitions to an early sere (2EE) herbaceous community following deposition from the downward movement of snow and debris. It is possible that the mixed shrub/herbaceous community will shift to a community that is dominantly dwarf shrubs and stunted mountain hemlock (*Tsuga mertensiana*) over time without deposition. The dwarf shrub and stunted tree community was not included in the state and transition model because it was not observed in the field.

State and Transition Model:



| | | | |
|--|---|------------------------------|----------------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Mixed Shrub/Herbaceous Community |
| Community Phase Narrative: | | | |
| <p>This community phase represents a mid sere plant community following disturbance from the downward movement of snow and debris. The plant community is characterized by a mixture of forb and graminoid species and dwarf to medium-sized shrubs. Medium-sized shrub species include Sitka alder (<i>Alnus viridis ssp. sinuata</i>), marsh Labrador tea (<i>Ledum palustre ssp. decumbens</i>), Barclay's willow (<i>Salix barclayi</i>), stink currant (<i>Ribes bracteosum</i>), yellow mountainheath (<i>Phyllococe glanduliflora</i>), red elderberry (<i>Sambucus racemosa</i>), and devilsclub (<i>Oplopanax horridus</i>). Dwarf shrub species include black crowberry (<i>Empetrum nigrum</i>), oval-leaf willow (<i>Salix ovalifolia</i>), mountain heather (<i>Cassiope</i>), and alpine azalea (<i>Loiseleuria procumbens</i>). Bluejoint grass (<i>Calamagrostis canadensis</i>) and longawn sedge (<i>Carex macrochaeta</i>) are the dominant graminoids. This community supports a diversity of forb species such as western oakfern (<i>Gymnocarpium dryopteris</i>), common ladyfern (<i>Athyrium filix-femina</i>), violet (<i>Viola</i>), curled starwort (<i>Stellaria crispa</i>), claspleaf twistedstalk (<i>Streptopus amplexifolius</i>), spreading woodfern (<i>Dryopteris expansa</i>), dwarf fireweed (<i>Chamerion latifolium</i>), and western moss heather (<i>Cassiope mertensiana</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.1A | The downward movement of snow and debris erodes the hillslope. The resulting deposition either covers or obliterates the existing vegetation. | | |

| | | | |
|--|---------------------------------------|--|--------------------------------|
| Phase 1.2 | |  | |
| Community Phase Number: | 1.2 | Community Phase Name: | Mixed Graminoid/Forb Community |
| Community Phase Narrative: | | | |
| <p>This community phase represents an early sere plant community following slope erosion. The community is characterized by a mixture of graminoid species such as longawn sedge (<i>Carex macrochaeta</i>) and bluejoint grass (<i>Calamagrostis canadensis</i>) and forb species such as white false hellebore (<i>Veratrum album</i>), Sitka valerian (<i>Valeriana sitchensis</i>), arctic lupine (<i>Lupinus arcticus</i>), fireweed (<i>Chamerion angustifolium</i>), and common cowparsnip (<i>Heracleum maximum</i>). Snow creep in some areas may maintain this community phase for extended periods.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| 1.2A | Time since slope deposition | | |

| | |
|---|-------------|
| Ecological Site Description ID: | R222XY352AK |
| Ecological Dynamics of the Site: | |
| <p>This ecological site is in linear to convex positions in the subalpine life zone. These areas generally are drier and less protected from wind as compared to ecological site F222XY350AK, which is in protected concave positions.</p> <p>This site is characterized by shallow organic soils over bedrock. The soils support a mixed shrub-lichen community. The ecological dynamics of the site are driven by exposure to cold temperatures, wind, and a short growing season. The climate and shallow, dry soils generally limit tree growth. The historical climax plant community was the only community phase observed.</p> | |
| State and Transition Model: | |
| <pre> graph TD A["Subalpine Shrub Organic Slopes R222XY352AK"] --- B["1. Reference State"] B --- C["Community Phase 1.1 (RCP) Dwarf Shrub/Lichen"] </pre> | |

| | | | |
|---|--|------------------------------|------------------------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Mixed Dwarf Shrub-Lichen Community |
| Community Phase Narrative: | | | |
| <p>This is the historical climax community phase. The community is characterized by mixed dwarf shrub and lichen. Average dwarf shrub cover is 50 percent. Common dwarf shrub species include black crowberry (<i>Empetrum nigrum</i>) and bog blueberry (<i>Vaccinium uliginosum</i>) with a smaller proportion of beauverd spirea (<i>Spiraea stevenii</i>), yellow mountainheath (<i>Phyllodoce glanduliflora</i>), western moss heather (<i>Cassiope mertensiana</i>), strawberryleaf raspberry (<i>Rubus pedatus</i>), Alaska bellheather (<i>Harrimanella stelleriana</i>), mountain heather (<i>Cassiope</i>), lingonberry (<i>Vaccinium vitis-idaea</i>), and least willow (<i>Salix rotundifolia</i>). Average lichen cover is 45 to 50 percent. Star reindeer lichen (<i>Cladina stellaris</i>) and greygreen reindeer lichen (<i>Cladina rangiferina</i>) are the dominant lichen species with a smaller proportion of reindeer lichen (<i>Cladina portentosa</i>), fruticose lichens (<i>Usnea</i>), foliose lichens (<i>Peltigera</i>), and cup lichen (<i>Cladonia macilenta</i>). Stunted Sitka spruce (<i>Picea sitchensis</i>) makes up less than 5 percent cover. Trace graminoid and forb cover has been observed.</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| Not applicable | No community phase pathways have been observed. | | |

| | |
|--|-------------|
| Ecological Site Description ID: | R222XY355AK |
| Ecological Dynamics of the Site: | |
| <p>This ecological site is in linear to convex positions in the subalpine life zone. These positions generally are drier and less protected from wind as compared to ecological site F222XY350AK, which is in protected concave positions. This ecological site is in similar landscape positions as ecological site F222XY352AK, but it has different soils. This may be the reason for the differences in the plant community structure. The soils on this ecological site are shallow to moderately deep, gravelly Spodosols or Inceptisols.</p> <p>The historical climax plant community is a dwarf shrub community. This was the only plant community phase observed in the field. There were no observed disturbance regimes that alter the plant community dynamics. It is likely that continuous exposure to cold temperatures, wind, and a short growing season maintains this plant community in a steady state phase.</p> | |
| State and Transition Model: | |
| <div style="border: 1px solid black; padding: 20px; text-align: center;"> <p>Subalpine Shrub Gravelly Slopes R222XY355AK</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <p>1. Reference State</p> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: 60%; text-align: center;"> <p>Community Phase 1.1 (RCP) Dwarf Shrub Community</p> </div> </div> </div> | |

| | | | |
|---|--|------------------------------|-----------------------|
| State ID Number: | 1 | State Name: | Reference state |
| Phase 1.1 |  | | |
| Community Phase Number: | 1.1 | Community Phase Name: | Dwarf Shrub Community |
| Community Phase Narrative: | | | |
| <p>This is the reference plant community phase. The community is characterized by mixed dwarf shrub and herbaceous plants. Average dwarf shrub cover is 80 percent. The dominant dwarf shrub species include black crowberry (<i>Empetrum nigrum</i>), yellow mountainheath (<i>Phyllodoce glanduliflora</i>), and western moss heather (<i>Cassiope mertensiana</i>) with smaller proportions of bog blueberry (<i>Vaccinium uliginosum</i>), glacier avens (<i>Geum calthifolium</i>), Alaska bellheather (<i>Harrimanella stelleriana</i>), bunchberry dogwood (<i>Cornus canadensis</i>), strawberryleaf raspberry (<i>Rubus pedatus</i>), and twinflower (<i>Linnaea borealis</i>). Stunted mountain hemlock (<i>Tsuga mertensiana</i>) and Sitka spruce (<i>Picea sitchensis</i>) cover is as much as 10 percent. Graminoid cover generally is less than 5 percent, but it can be as much as 18 percent. Observed graminoid species include black alpine sedge (<i>Carex nigricans</i>), longawn sedge (<i>Carex macrochaeta</i>), alpine sweetgrass (<i>Hierochloa alpina</i>), Piper's woodrush (<i>Luzula piperi</i>), and Drummond's rush (<i>Juncus drummondii</i>). Forb cover is less than 2 percent with species such as redstem saxifrage (<i>Saxifraga lyallii</i>) and spreading woodfern (<i>Dryopteris expansa</i>).</p> | | | |
| Community Pathways | | | |
| Pathway Number | Pathway Name & Description | | |
| Not applicable | No community phase pathways have been observed. | | |

| | | | |
|--|--|--------------------|-----------------|
| Ecological Site Description ID: | R222XY356AK | | |
| Ecological Dynamics of the Site: | | | |
| <p>This ecological site is on mountainous slopes in the alpine life zone. The soils consist of shallow, gravelly, well drained colluvium over residuum.</p> <p>The ecological dynamics of this high-elevation ecological site are driven by long-term exposure to cold temperatures, wind, and a short growing season. The harsh climatic conditions and shallow, gravelly soils limit tree growth. The plant community is characterized by a steady state herbaceous and dwarf shrub community. One plant community phase of this site was observed.</p> | | | |
| State and Transition Model: | | | |
| <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; padding-bottom: 5px;"> Alpine Herbaceous Gravelly Slopes R222XY356AK </div> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 70%;"> <p>1. Reference State</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 60%;"> <p>Reference Community Phase 1.1 (RCP) Dwarf Shrub/Herbaceous</p> </div> </div> </div> | | | |
| State ID Number: | 1 | State Name: | Reference state |
| State Narrative: | The reference state has one plant community phase. No observed at-risk community phases or alternative states were observed. | | |

| | | | |
|--|--|-------------------------------------|-------------------------------|
| <p>Phase 1.1</p> |  | | |
| <p>Community Phase Number:</p> | <p>1.1</p> | <p>Community Phase Name:</p> | <p>Dwarf Shrub/Herbaceous</p> |
| <p>Community Phase Narrative:</p> | | | |
| <p>This is the reference plant community. This ecological site is characterized by an herbaceous-dwarf shrub community interspersed with exposed bedrock and surface rock fragments. Bedrock cover is 10 to 70 percent, and surface rock fragment cover is as much as 50 percent. The plant community is dominantly dwarf shrub species such as bog blueberry (<i>Vaccinium uliginosum</i>), black crowberry (<i>Empetrum nigrum</i>), yellow mountainheath (<i>Phyllodoce glanduliflora</i>), western moss heather (<i>Cassiope mertensiana</i>), alpine azalea (<i>Loiseleuria procumbens</i>), lingonberry (<i>Vaccinium vitis-idaea</i>), and arctic willow (<i>Salix arctica</i>). Dwarf shrub cover generally is 35 to 45 percent. Lichen cover is 5 to 60 percent. Common lichens include star reindeer lichen (<i>Cladina stellaris</i>), greygreen reindeer lichen (<i>Cladina rangiferina</i>), snow lichen (<i>Stereocaulon</i>), reindeer lichen (<i>Cladina arbuscula</i>), cup lichen (<i>Cladonia squamosa</i>, <i>Cladonia gracilis</i>), and foliose lichens (<i>Peltigera</i>). Forb cover generally is less than 10 percent with species such as redstem saxifrage (<i>Saxifraga lyallii</i>), dwarf fireweed (<i>Chamerion latifolium</i>), russethair saxifrage (<i>Saxifraga ferruginea</i>), partridgefoot (<i>Luetkea pectinata</i>), Eschscholtz's buttercup (<i>Ranunculus eschscholtzii</i>), ground cedar (<i>Lycopodium complanatum</i>), stiff clubmoss (<i>Lycopodium annotinum</i>), western oakfern (<i>Gymnocarpium dryopteris</i>), arctic starflower (<i>Trientalis europaea</i>), and arctic sweet coltsfoot (<i>Petasites frigidus</i>). Moss cover is minimal, but it may be as much as 30 percent in areas where lichen cover is minimal. Moss species include sphagnum (<i>Sphagnum capillifolium</i>), mountain fern moss (<i>Hylocomium splendens</i>), big red stem moss (<i>Pleurozium schreberi</i>), feather moss (<i>Rhytidiadelphus</i>), dicranum moss (<i>Dicranum scoparium</i>), and polytrichum moss (<i>Polytrichum commune</i>).</p> | | | |
| <p>Community Pathways</p> | | | |
| <p>Pathway Number</p> | <p>Pathway Name & Description</p> | | |
| <p>Not applicable</p> | <p>No community pathways were observed.</p> | | |