USDA Natural Resources
Conservation Service

Ecological site F227XY101AK
Loamy High Flood Plains Hogan cool, Hogan, Klute, Kluna, Tangoe occasionally flooded, and Klute occasionally flooded

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Table 1. Dominant plant species

Tree	(1) *Picea glauca*
Shrub	(1) *Salix alaxensis*
Herbaceous	(1) *Equisetum*

Physiographic features

This site consists of level to moderately sloping high flood plains formed in stratified sandy and silty alluvium over very gravelly and cobbly alluvium. Terrace height above the mean summer channel level is typically 3 to 10 feet (0.9 to 3.0 m) and the site is occasionally to rarely flooded. In many areas, particularly on the highest flood plains positions, permafrost is present within the soil profile. Elevation is generally 2300 to 2600 feet (701 to 792 m).

In the Gulkana River area, this site is common along the Middle Fork, the Main Stem north of canyon rapids, and the upper reaches of the North and South Branches. It also occurs along major side streams and drainages above the river corridor. This site undoubtedly occurs along the other rivers and streams in the Copper River basin.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Terrace
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Rare to occasional
Elevation	2,300–2,600 ft
Slope	0–10%
Water table depth	36–60 in
Aspect	Aspect is not a significant factor

Climatic features

The subarctic continental climate of this site is characterized by long cold winters and short warm summers. Mean January temperature is minus 5.81 ?F.; mean July temperature is 57 ?F. Mean annual precipitation ranges from less than an inch to 11 to 13 inches. Annual snowfall ranges from 46 to 102 inches. The frost-free season is about 60 to 80 days (28 ?F. base temperature). The growing season varies greatly from year to year and frosts can occur during any summer month.

Table 3. Representative climatic features

Frost-free period (average)	80 days
Freeze-free period (average)	0 days
Precipitation total (average)	13 in

Influencing water features

The Gulkana River is a young, low to moderate gradient, perennial river system and one of the few non-glacial, clear water rivers in the Copper River Basin. Along most reaches, the river cut a narrow valley through glaciolacustrine and glaciofluvial deposits. Down-cutting incised the river valley as much as 200 feet (61 m) in places. The channel ranges from straight to highly sinuous. Lateral channel movement widened the valley bottom to a mile or more in some downstream locations. Compared with glacial rivers, the Gulkana River experiences considerably greater variation in seasonal stream flow. However, to a large degree, poorly developed tributary drainage networks and several large lakes within the drainage system tend to buffer peak flows (Shelby et al. 1990). Many lakes and ponds in the watershed are not part of integrated surface drainage networks.

Soil features

The weakly developed soils on this site typically have a mantle of stratified sandy and silty alluvium 12 to over 60 inches (30 to 152 cm) thick over very gravelly and cobbly alluvium. Rarely, the sandy and silty layer is less than 12 inches (30 cm; Tangoe soils). The depth to seasonal high water table ranges from 40 to over 60 inches (102 to 152 cm) and the soils are moderately well to well drained. Aquic conditions, including redox depletions and/or a reduced matrix are found on occasions below 40 inches (102 cm). On some of the older terraces, permafrost is found between about 20 to more than 60 inches (102 to 152 cm). Permafrost soils usually do not have a perched water table on the permafrost surface.

The soil names and phases that occur on this site are Hogan cool, Hogan, Klute, Kluna, Tangoe occasionally flooded, and Klute occasionally flooded.

Table 4. Representative soil features

Surface texture	(1) Very fine sandy loam (2) Fine sandy loam (3) Silt loam
Family particle size	(1) Loamy

Drainage class	Moderately well drained to well drained
Soil depth	60 in
Available water capacity (0-40in)	0.13–0.16 in

Ecological dynamics

This site is susceptible to wild fire, which are commonly recurring events in the Copper River basin. Because of its thin bark, *Picea glauca* is poorly adapted to survive wild fire and most trees are usually killed when a stand burns. The Salix spp. that dominant the forest understory readily sprout after burning and post-fire succession would be expected to pass through a short herb-shrub sprout stage to a dense low willow scrub stage. If suitable seed trees remain in or adjacent to the burned stand, *Picea glauca* should eventually re-establish itself. The presence of *Picea mariana* in the pre-fire stand or in nearby unburned stands could lead to a black spruce or mixed spruce stage in the post-fire succession. Based on observations and data collected in the Gulkana River area, this site appears to develop from 172Xy200AK - Gravelly Flood Plains, Moderately Wet or 172Xy201AK - Loamy Flood Plains, Moderately Wet. In some places, a short steep escarpment separates adjacent flood plain levels. The higher flood plains support White spruce/willow forest characteristic of site 172Xy101AK - Loamy High Flood Plains while Low willow/herb scrub is found on the low flood plains characteristic of sites 172Xy200AK and 172Xy201AK. In a many places on islands and in areas of high channel sinuosity, a gradual increase in terrace height away from the channel is evident. The transition to site 172Xy101AK - Loamy High Flood Plains and White spruce/willow open forest on the higher positions usually includes a relatively narrow zone dominated by white spruce saplings and small trees protruding through the dense willow scrub.

Site 172Xy101AK - Loamy High Flood Plains is the end point of site progression and vegetative succession on flood plains. Over the life of the initial white spruce stand, the willow understory gradually is replaced by ericaceous shrubs and the organic mat on the soil surface accumulates and thickens. Continued development and thickening of the organic mat results in a gradual decrease in soil temperatures and depth to permafrost and a reduction in nutrient availability and cycling. Observations in the Gulkana River area suggest that, without some degree of disturbance, which delays or retards succession, permafrost develops within the soil profile and site productivity decreases markedly towards the end of the life span of the original forest stand. Without disturbance, site progression and vegetative succession would lead to site 172Xy104AK - Stream Terraces and Spruce/shrub birch woodland and in some places possibly even 172Xy103AK - Stream Terraces, Frozen and Spruce/spruce muskeg sedge open forest.

The transition between 172Xy101AK - Loamy High Flood Plains and 172Xy104AK - Stream Terraces is usually indicated by the White spruce/ericaceous shrub open forest vegetation type. This type consists of decadent stand of tall, large diameter white spruce, many of which have already died and fallen partly to completely over. Below the deteriorating overstory is a younger, smaller stand of mixed white and black spruce. Trees within this layer often appear poorly formed, slow growing, and have yellowish green foliage characteristics of cold, low productivity sites. Ericaceous shrubs are prominent in the understory by this point

State and transition model

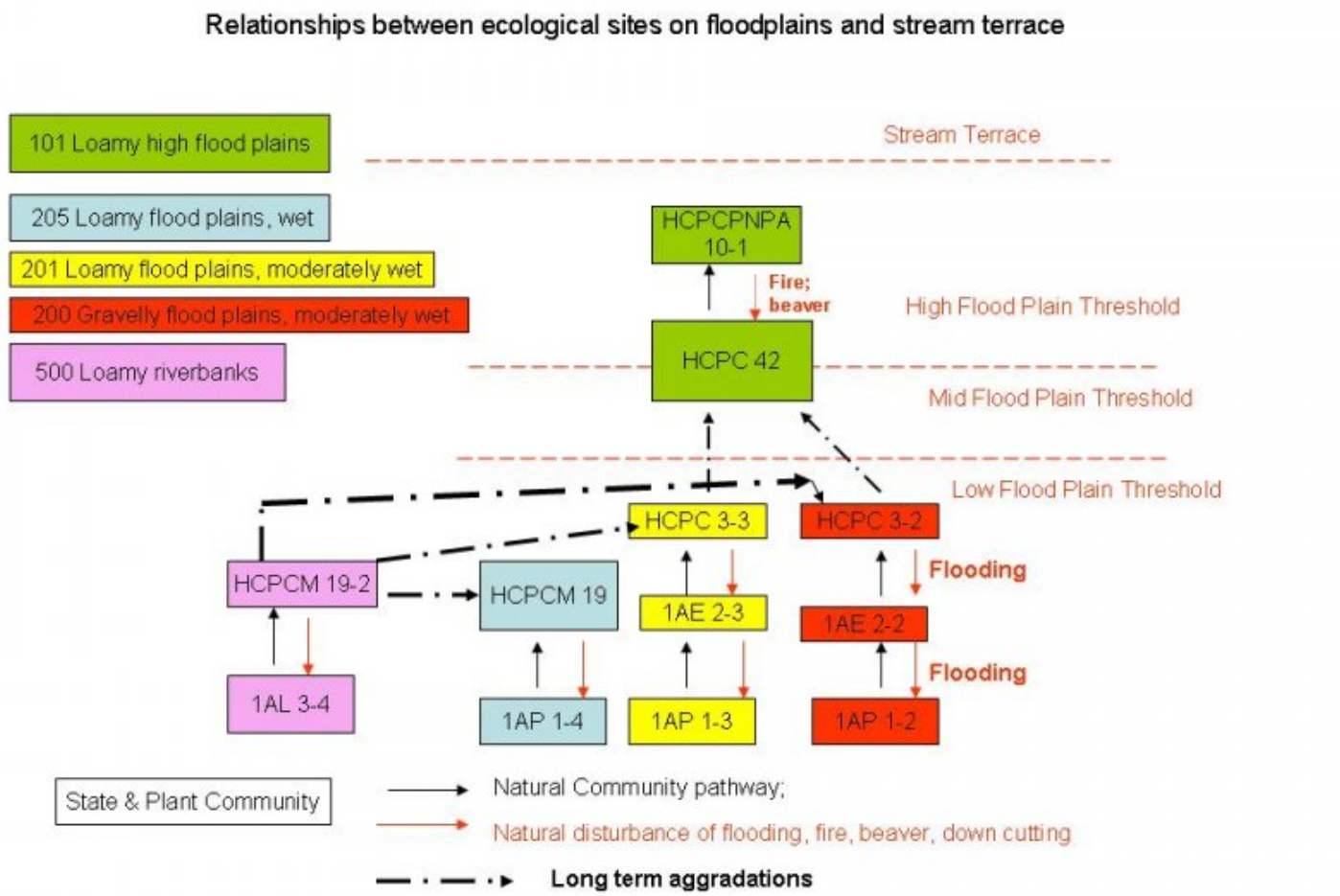

Figure 4. Floodplain & Stream Terrace

State 1
White spruce/ericaceous shrub open forest

Community 1.1
White spruce/ericaceous shrub open forest

The extent and distribution of this site is primarily along the Main Stem south of Canyon Rapids and the West Fork, occasional elsewhere within the river corridor; moderate extent. White spruce/ericaceous shrub open forest represents a transitional stage between White spruce/thinleaf alder open forest (and occasionally White spruce/willow open forest)—the late seral stage of flood plain succession, and Spruce/shrub birch woodland—the major cover type on adjacent stream terraces. In White spruce/ericaceous open forest, the productive *Picea glauca* overstory is dying out and being replaced by a less productive stand of mixed *P. glauca* and *P. mariana*. Flood plain understory species are decreased in abundance while ericaceous shrub, mosses, and other upland species are increased. Changes in the vegetation are likely the effects of the development of permafrost within the soil profile.

Forest overstory. White spruce/ericaceous shrub open forest consists of a woodland to open tall tree layer of mostly decadent Picea glauca and a lower woodland to open tree layer of younger, slower growing P. glauca. P. mariana codominates the lower tree layer in some stands. Trees range from 40 to 70 feet (12.2 to 21.3 m) in height in the upper layer and from 20 to 35 feet (6.1 to 10.7 m) in height in the secondary layer. Total tree canopy cover ranges from 20 to 55 percent in most stands, and up to 70 percent on occasion. Tree basal area in 15 sample stands ranged from 62 to 200 feet2/acre (14.2 to 45.9 m2/ha).

Forest understory. The aspect of the understory is dominated by an open to moderately closed layer of low ericaceous shrubs. Vaccinium uliginosum, V. vitis-idaea, Ledum spp., Empetrum nigrum, and Arctostaphylos rubra

are all common to abundant. In many stands, Rosa acicularis, Betula glandulosa, and Salix spp. also are important. Low shrub canopy cover generally ranges from 30 to 65 percent. Height of the low shrub layer is typically between 2 and 4 feet (0.6 and 1.2 m). The ground layer is dominated by mosses and lichen characteristic of boreal spruce forests. Herbs are generally only common to occasionally abundant. Important herbs include Equisetum spp., Calamagrostis canadensis, Arctagrostis latifolia, and Petasites frigidus. Herbaceous litter and mulch is common, and in places woody litter consisting of medium and large diameter boles of fallen trees is abundant.

Table 5. Ground cover

Tree foliar cover	1-65%
Shrub/vine/liana foliar cover	1-30%
Grass/grasslike foliar cover	1-2%
Forb foliar cover	1-30%
Non-vascular plants	3-85%
Biological crusts	0%
Litter	5-25%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	1-3%

Table 6. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	–
>1 <= 2	–	–	–	1-30%
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	1-30%	–	–
>13 <= 40	–	–	–	–
>40 <= 80	1-65%	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 2
White spruce/willow open forest

Community 2.1
White spruce/willow open forest

White spruce/willow open forest represents the late seral stage of succession on flood plains within the willow zone. It develops directly from Low willow/herb scrub. This vegetation type is the potential natural community.

Forest overstory. White spruce/willow open forest consists primarily of open to moderately open stands of Picea glauca. In a few locations, stands of mixed Picea glauca and Populus balsamifera also occur. Tree canopy cover generally ranges from 35 to 60 percent. Woodland stands (10 to 25 percent canopy cover) occur in a few places, particularly along the upper Middle Fork and Main Stem. Trees are typically 35 to 65 feet (10.7 to 19.8 m) in height and 9 to 14 inches (23 to 36 cm) in diameter at breast height. Tree basal area ranges from 50 to 150 feet2/acre (11.5 to 34.4 m2/ha).

Forest understory. An open to closed layer of willow, mostly 3 to 5 feet (0.9 to 1.5 m) in height, characterizes the forest understory. Many stands also have a sparse to open layer of taller willow as much as 10 feet (3 m) in height. Total shrub cover ranges from 35 to 95 percent. Major low willows include Salix planifolia, S. monticola, and S. barclayi. The most important tall willow is S. alaxensis. Other low and dwarf shrubs common in many stands include various ericaceous shrubs, Potentilla fruticosa, and Rosa acicularis.

Herbs are usually abundant in White spruce/willow open forest. Intermixed with the low shrub layer are well-represented Calamagrostis canadensis, Arctagrostis latifolia, and Epilobium angustifolia. Important medium and low herbs include Equisetum spp., Petasites frigidus, and Hedysarum alpinum. Patches of moss are well-represented, otherwise the ground surface is covered with a nearly continuous layer of leaf litter and mulch.

Table 7. Ground cover

Tree foliar cover	1-65%
Shrub/vine/liana foliar cover	1-75%
Grass/grasslike foliar cover	1-20%
Forb foliar cover	1-80%
Non-vascular plants	1-85%
Biological crusts	0%
Litter	1-60%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	1-3%

Table 8. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	–
>1 <= 2	–	–	–	–
>2 <= 4.5	–	–	30-85%	30-85%
>4.5 <= 13	–	35-90%	–	–
>13 <= 40	–	–	–	–
>40 <= 80	20-60%	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Additional community tables

Animal community

This site is utilized by a wide variety of wildlife. Migrating caribou frequently pass through areas of this site. Limited observations suggest that caribou generally pass through areas closely adjacent to both the river channel and the lacustrine uplands, apparently avoiding extensive dense tall shrub and forest vegetation. Salix alexensis and other willows are occasional to common in many stands and provide limited moose browse. Mature stands of *Picea glauca* provide habitat for marten and weasels, particularly areas with abundant woody debris on the forest floor. Bald Eagles use tall Populus balsamifera and occasionally *Picea glauca* for nest trees; both trees are utilized for perches. The spruce forest provides high quality Spruce Grouse habitat.

Hydrological functions

Based on observations and data collected in the Gulkana River area, this site is the end point of site progression and vegetative succession on flood plains within the alder zone. This site develops from site 172Xy100AK - Loamy Flood Plains as additional accretions of alluvium, channel migration, channel down-cutting, or a combination of these processes increase the height of the terrace surface and decrease the frequency and duration of flooding. White spruce/thinleaf alder open forest on this site is a later successional stage of Balsam poplar-white spruce/thinleaf alder open forest and represents the end point of succession on flood plains.

Eventually periodic flooding all but ceases because of increased terrace height. Continued development and thickening of the organic mat results in a decrease in soil temperatures, a rise in the level of the pemafrost, and a reduction in nutrient availability and cycling. White spruce/ericaceous shrub open forest represents a transitional cover type in the flood plain-stream terrace site progression. This type develops as growing conditions on the site continues to deteriorate and the original white spruce forest on the flood plains begins to die off and be replaced by less productive white and black spruce characteristic of stream terraces. Tall white spruce snags and large diameter downfall are frequent in these stands. Labrador tea, bog blueberry, and other ericaceous shrub and willow, which are well adapted to the nutrient poor sites and begin to increase in abundance and dominate the understory.

Ultimately, site progression and vegetation succession would lead to site 172Xy104AK - Stream Terraces and Spruce/shrub birch woodland and/or 172Xy103AK - Stream Terraces, Frozen and Spruce/spruce muskeg sedge open forest.

Recreational uses

Deteriorating spruce stands in the transitional zone between high flood plains and stream terraces often contain abundant downfall suitable for firewood. Standing dead trees will provide a future source of firewood.

Other information

This site is susceptible to wild fires, which are commonly recurring events in the Copper River basin. In most instances, fire would kill the *Picea glauca* trees and destroy much, if not all, of the existing forest overstory and burn most of the understory back to ground level. Fire also would blacken and at least partially destroy the moss-organic layer on the soil surface, leading to soil warming, a drop in the permafrost level, and increased nutrient availability. It is unlikely, however, that post fire vegetative succession would pass through same seral stages characteristic of flood plain succession that led to the original White spruce/thinleaf alder open forest. The flooding regime, soil moisture patterns, and growing conditions associated with flood plain succession not longer exist. In all probability, vegetative succession would pass through a sequence of scrub and woodland seral stages leading to mixed spruce with Betula glandulosa and ericaceous shrubs in the understory and a well-developed moss-organic layer on the soil surface similar to Spruce/shrub birch woodland.

Table 9. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
white spruce	*PIGL*	50	68	11	25	–	–	–	

Inventory data references

Standard Site Description 1/98 DRK, MHC (NRCS)

Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**