USDA Natural Resources Conservation Service

Ecological site R022BI210CA
Frigid Loamy Flood Plains

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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.

MLRA notes

Major Land Resource Area (MLRA): 022B–Southern Cascade Mountains

Site Concept –
Riparian Complex: Hydrologically connected by a “C” type stream channel.
Slopes: 0 to 3 percent
Landform: Flood plain, but also includes dynamics involving the associated stream channel and stream terrace.
Soils: Very deep, poorly drained soils that formed in alluvium from volcanic rocks.
Temp regime: Frigid.
MAAT: 42 to 43 degrees F (5.5 to 6.1 degrees C).
MAP: 45 to 87 inches (1,143 to 2,210 mm).
Soil texture: Stony ashy loam.
Surface fragments: 0 to 21 percent composed of: 5 percent subrounded fine gravel, 5 percent subrounded medium and coarse gravel, and 5 percent subrounded stones.
Vegetation: Several riparian stream communities including a pioneer forb community, a thinleaf alder community and a Sierra lodgepole pine forest.

Associated sites

F022BI120CA	**Frigid Gravelly Sandy Loam Outwash-Stream Terraces** This white fir-Sierra lodgepole pine forest is found on adjacent old terraces and hillslopes.

Similar sites

R022BI215CA	**Frigid Gravelly Flood Plains** This riparian ecological site is associated with larger stream flow with a C to D type channel succession.
R022BI213CA	**Frigid Sandy Flood Plains** This riparian site is associated with smaller, B type channels.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Alnus incana ssp. tenuifolia* (2) *Salix lemmonii*
Herbaceous	(1) *Carex angustata* (2) *Carex nebrascensis*

Physiographic features

This site encompasses the stream channel, its associated flood plains and lower terraces. This site is found between 5,240 and 6,460 feet in elevation. Slopes range from 0 to 3 percent.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Stream terrace
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	1,597–1,969 m
Slope	0–3%
Water table depth	0–130 cm
Aspect	Aspect is not a significant factor

Climatic features

This ecological site receives most of its annual precipitation during winter months in the form of snow. The mean annual precipitation ranges from 45 to 87 inches (1,143 to 2,210 mm) and the mean annual temperature ranges from 42 to 43 degrees F (5.5 to 6.1 degrees C). The frost free (>32F) season is 70 to 90 days. The freeze free (>28F) season is 85 to 200 days.

There are no representative climate stations for this site.

Table 3. Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	200 days
Precipitation total (average)	2,210 mm

Influencing water features

This ecological site is associated with small stream channels and the associated flood plains and lower terraces.

Soil features

The Aquandic Humaquepts, Flood Plains soil component is associated with this site. It consists of very deep, poorly drained soils that formed in alluvium from volcanic rocks. The A horizons have a stony ashy loam texture with medium subsurface textures and a high percentage of rock fragments. Redoximorphic features including masses of oxidized iron and gleyed soil colors are present 7 inches below the surface. The water table is high after spring snow melt but drops quickly.

This ecological site has been correlated with the following map units and soil components:

Map Unit/ Component /Component percent
789125 Aquandic Humaquepts, flood plains/ 40

Table 4. Representative soil features

Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Moderate
Soil depth	152 cm
Surface fragment cover <=3"	0–16%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	7.77–21.74 cm
Soil reaction (1:1 water) (0-101.6cm)	4.5–6.5
Subsurface fragment volume <=3" (Depth not specified)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0–30%

Ecological dynamics

This site is associated with alluvial deposits from Holocene age stream processes, and a Rosgen “C” type channel. These channels are in lower gradient, glacially carved U shaped valleys, where deposition occurs to form flood plains. The alluvial deposits and channel migration are restricted to the valley floors. As the channels migrate in the confined corridors, former channels are buried with overbank deposits from subsequent channel courses and typically form soil profiles with coarser channel deposits under finer overbank deposits. As down cutting occurred (likely due to uplift) the streams cut down into the original flood plain surfaces and transformed them into stream terraces and formed new flood plains at the lower channel level (NRCS, 2010).

This site supports a "C" type channel according to the Rosgen classification scheme. A "C" type channel is a slightly entrenched single thread meandering channel with a well defined floodplain. The channel has moderate to high sinuosity generally with less than 2 percent gradient, but it can range from 2 to 3.9 percent (b modifier) . These channel types generally have a width to depth ratio greater than 12, which means they are wide and shallow. They are often found in broad valleys with well developed alluvial floodplain terraces and such channels typically flood over bank two years out of three. In an undegraded state, a 50 year flood event should overflow onto the floodplain.

C type channels are constantly in the process or transporting and storing sediments from upstream sources or bank erosion. As the particle size of the channel bottom material decreases, the sediment supply generally increases and so does the erosion potential. The channel on this site supports cobble- bottom (C3), gravel-bottom (C4), and sand bottom (C5) reaches which have moderate to very high erosion potentials, respectively. The sensitivity to disturbance is very high for both C4 and C5 types, and moderate for C3. Vegetation exerts a very high controlling influence on stream dynamics in all three types (Rosgen, 1994).

The plant community along the channel occurs in distinct zones related to variable water table depth and disturbance events. A shrub community comprised of thinleaf alder or a mix of thinleaf alder and Lemmon’s willow dominates the site in an undisturbed state. The riparian shrub community requires seasonal flooding and a water table that normally remains within 3 feet of the surface. Both thinleaf alder and Lemmon’s willow are flood and shade tolerant and act as an important stabilizing component of the streambank. Streambanks anchored by these shrubs are stable and can withstand relatively severe spring runoff and flooding. As alder and willow thickets develop after floods finer fluvial deposits are trapped within the extensive root networks, facilitating sediment accumulation. Thus the coarse channel deposits of cobble, gravel or sand, where thinleaf alder and willow typically establish, eventually develop a loam or sandy loam surface soil texture from overbank deposits overlaying the coarser channel deposits. In addition, thinleaf alder improves soil fertility through the addition of nitrogen to the soil from nitrogen-fixing root nodules and a nitrogen-rich leaf litter. The finer sediment (overbank deposits) and increased fertility enables establishment and retention of a native herbaceous community that provides valuable forage and habitat for wildlife. At this site, the adjacent upland habitat is a coniferous forest of Sierra lodgepole pine and white fir.

C type channels can become unstable due to disturbances which impact the stream bank vegetation, change the flow regime, or alter the channel morphology. Overgrazing and excessive trampling by livestock can seriously reduce streambank stability. Continued disturbance can entrench the stream, disconnecting it from its floodplain and creating a deeply incised G or F type channel. These channels (“G” and “F”) generally lose the wetland obligate species and become dominated by upland grass, shrub and/or forest plant communities. Eventually, a new entrenched “C” type channel may form that resembles the original “C” type channel. The entrenched channel supports wetland plant communities but it is constrained by terraces to the lower floodplain where a lower water table supports a greater proportion of upland plants.

This ecological site is a complex of riparian plant communities that are interrelated by hydrology. This is a relatively new concept for ecological sites. The state and transition diagram below illustrates the change in plant community component composition as a result of disturbance, rather than focusing on the succession of one plant community. Although there is considerable qualitative experience supporting the pathways and transitions within the State and Transition Model (STM), there is no quantitative information to specifically identify threshold parameters that distinguish between natural equilibrium and altered states in this ecological site. For information on STMs, see the following citations: Bestelmeyer el al. 2003, Bestelmeyer et al. 2009, and Stringham and Shaver 2003.

State and transition model

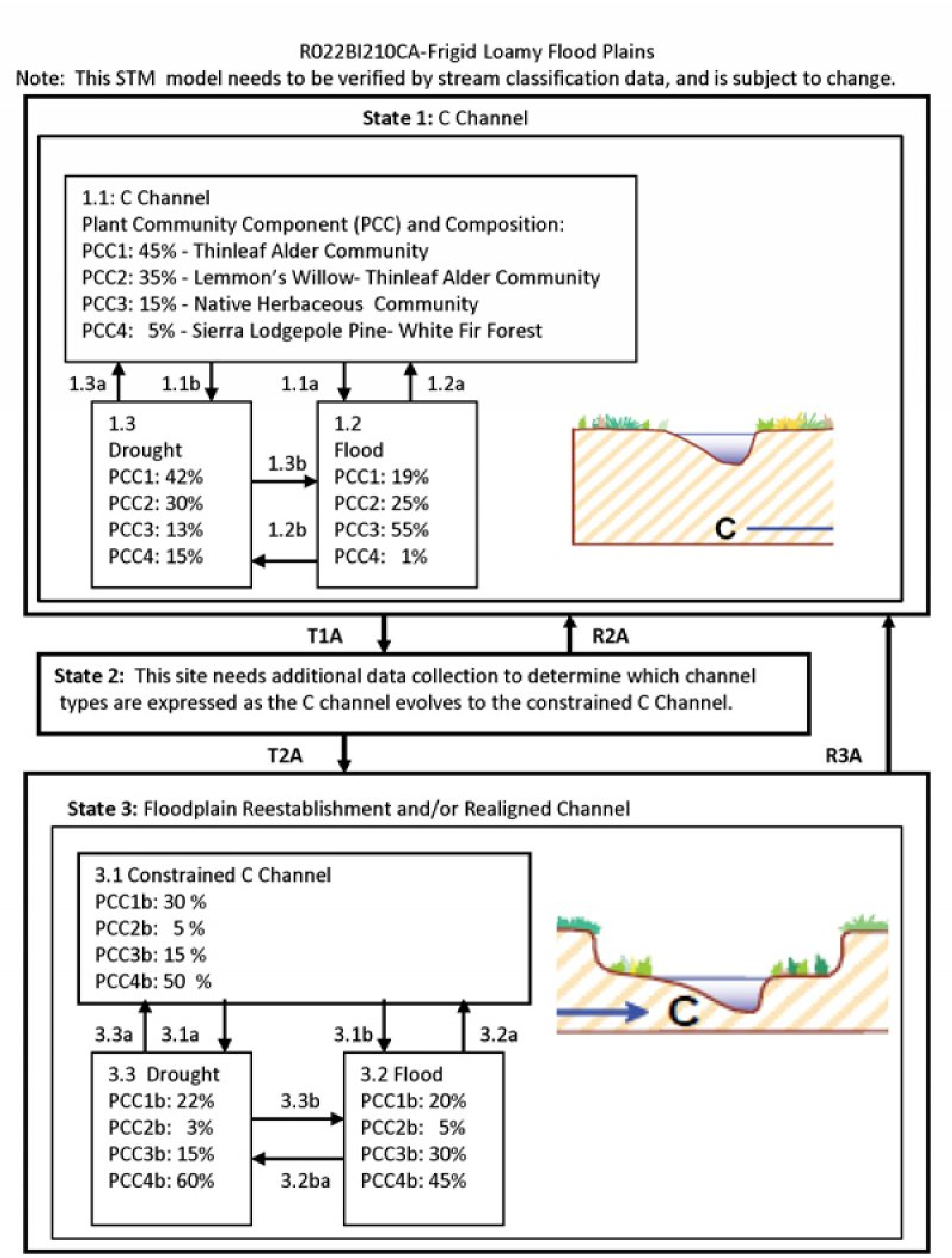

Figure 3. Frigid Loamy Floodplains Model

State 1

C Channel

This state is a single thread C type channel set in a broad valley bottom with gentle slopes associated with Holocene alluvial deposits. C channels are considered slightly entrenched and have a moderate to high width to depth ratio. Sinuosity is moderate to high, resulting in a well-defined meandering channel. The slope is low gradient and point bar formation and riffle/pool morphology are common features. C channels tend to be wide and shallow with a well-defined floodplain and may have alluvial terraces of abandoned floodplains. Obligate wetland species dominate the site in the undisturbed community phase. A shrub community comprised of thinleaf alder is found on the stream banks of the active channel while a mixed community of thinleaf alder/Lemmon’s willow is found on the floodplains. A pioneer plant community of native herbs is found on recently exposed substrate, generally along the stream channel, but may also be found on upper side channels. The adjacent upland habitat is coniferous forest of Sierra lodgepole pine and white fir.

Community 1.1
C Channel

Figure 4. Lemmons Willow-Thinleaf Alder Community

The plant communities along the C channel occur in distinct zones related to variable water table depth and disturbance events. Approximately 45% of the total vegetation is a thinleaf alder community that forms a continuous stringer immediately adjacent to the stream where the water table stays relatively high year round. A mixed thinleaf alder/ Lemmon’s willow community occupies the floodplains and accounts for 35% of the total vegetation. This community requires seasonal flooding and a water table that normally remains within 3 feet of the surface. Both thinleaf alder and Lemmon’s willow are flood and shade tolerant and act as an important stabilizing component of the streambank. These shrubs produce copius amounts of seeds in the fall and winter and seeds germinate immediately after dispersal when conditions are favorable. Germination and seedling establishment is optimal on exposed mineral substrate. Thinleaf alder may also reproduce vegetatively through spreading underground rhizomes or suckers, but Lemmon’s willow does not have this capacity. Both species can re-sprout vigorous following a top cut or fire. Streambanks anchored by these shrubs are stable and can withstand relatively severe spring runoff and flooding. As alder and willow thickets develop after floods finer fluvial deposits are trapped within the extensive root networks, facilitating soil development. In addition, thinleaf alder improves soil fertility through the addition of nitrogen to the soil from nitrogen-fixing root nodules and a nitrogen-rich leaf litter. The improved soil texture and fertility enables establishment and retention of an understory dominated by sedges. The extensive root mats formed by the sedge component further stabilizes the streambank. Drought and flood are the primary forces that drive transitions between alternate community phases. A lower water table from prolonged drought facilitates encroachment of the upland community on the floodplain and an associated reduction in the thinleaf alder/Lemmon’s willow community. Conversely, a flood destroys sections of the thinleaf alder community within the active channel and favors establishment of the pioneering native herb community that colonizes recently exposed substrate and provides valuable forage and habitat for wildlife. Plant Community Component (PCC) and Composition: PCC1: 45% - Thinleaf Alder Community: This community is found on the stream banks of the active channel. Data was not collected for this community component, for this state. However, it most likely has similar species as PCC1b, which is present in the constrained C channel in State 3. Thinleaf alder is the dominant shrub, associated species may be squirrel tail (*Elymus elymoides*), panicled bulrush (*Scirpus microcarpus*), common rush (*Juncus effusus*), smallwing sedge (*Carex microptera*), bigleaf sedge (*Carex amplifolia*), swordleaf rush (*Juncus ensifolius*), fowl mannagrass (*Glyceria striata*), bentgrass (Agrostis spp.), narrowfruit sedge (*Carex specifica*), stinging nettle (*Urtica dioica*), western pearly everlasting (*Anaphalis margaritacea*), fringed willowherb (*Epilobium ciliatum*), common cowparsnip (*Heracleum maximum*), stickywilly (*Galium aparine*) , seep monkeyflower (*Mimulus guttatus*), American vetch (*Vicia americana*), bugle hedgenettle (*Stachys ajugoides*), field horsetail (*Equisetum arvense*), Douglas' thistle (*Cirsium douglasii*), California false hellebore (*Veratrum californicum* var. californicum), naked buckwheat (*Eriogonum nudum*), sweetcicely (*Osmorhiza berteroi*), Douglas' sagewort (*Artemisia douglasiana*), sticky cinquefoil (*Potentilla glandulosa*), tall phacelia (*Phacelia procera*). PCC2: 35% - Lemmon's Willow-Thinleaf Alder Community: This plant community is found on floodplains. There is about 40% cover of Lemmons' willow (*Salix lemmonii*), and 10% cover of thinleaf alder (*Alnus incana* ssp. tenuifolia). Sedges dominate the understory. Common plants are panicled bulrush (*Scirpus microcarpus*), widefruit sedge (*Carex angustata*), Nebraska sedge (*Carex nebrascensis*), manyrib sedge (*Carex multicostata*), lakeshore sedge (*Carex lenticularis*), mountain rush (*Juncus arcticus* ssp. littoralis), bluejoint (*Calamagrostis canadensis*), pale false mannagrass (*Torreyochloa pallida*), field horsetail (*Equisetum arvense*), threepetal bedstraw (*Galium trifidum*), violet (Viola sp.), bugle hedgenettle (*Stachys ajugoides*), common cowparsnip (*Heracleum maximum*), Utah serviceberry (*Amelanchier utahensis*), and other sedges (Carex spp.). Total annual production ranges from 1800 to 3500 lbs acre. Widefruit sedge produced the majority of the understory production. PCC3: 15% - Native Herbaceous Community: This is a pioneer plant community, which is found on recently exposed substrate, generally along the stream channel but may also be found on upper side channels. Data was not collected on this PCC, but it may be similar to PCC3b, which is associated with squirrel tail (*Elymus elymoides*), common rush (*Juncus effusus*), swordleaf rush (*Juncus ensifolius*), fowl mannagrass (*Glyceria striata*), bentgrass (Agrostis spp.), stinging nettle (*Urtica dioica*), western pearly everlasting (*Anaphalis margaritacea*), tiny trumpet (*Collomia linearis*), fringed willowherb (*Epilobium ciliatum*), common cowparsnip (*Heracleum maximum*), stickywilly (*Galium aparine*) , seep monkeyflower (*Mimulus guttatus*), American vetch (*Vicia americana*), bugle hedgenettle (*Stachys ajugoides*), field horsetail (*Equisetum arvense*), Douglas' thistle (*Cirsium douglasii*), California false hellebore (*Veratrum californicum* var. californicum), naked buckwheat (*Eriogonum nudum*), sweetcicely (*Osmorhiza berteroi*), Douglas' sagewort (*Artemisia douglasiana*), sticky cinquefoil (*Potentilla glandulosa*), tall phacelia (*Phacelia procera*). common sheep sorrel (*Rumex acetosella*) Jones' sedge (*Carex jonesii*) PCC4: 5% - Sierra Lodgepole Pine- White Fir Forest: This plant community is on rarely flooded flood plains. It would not be extensive in this state, because the high water table and occasional flood would keep the forest from establishing. This is often an open forest with multiple age classes of trees. The understory is dominated by grasses. Sierra lodgepole pine (*Pinus contorta* ssp. murrayana) is the dominant tree, with white fir (*Abies concolor*), incense cedar (*Calocedrus decurrens*), Jeffrey pine (*Pinus jeffreyi*), sugar pine (*Pinus lambertiana*), and black cottonwood (*Populus balsamifera* ssp. trichocarpa) occasionally present in small amounts. The dominant understory plants include blue wildrye (*Elymus glaucus*), bearded mellicgrass (*Melica aristata*), and western needlegrass (*Achnatherum occidentale*). Other plants are white hawkweed (*Hieracium albiflorum*), sweetcicely (*Osmorhiza berteroi*) naked buckwheat (*Eriogonum nudum*), dusky onion (*Allium campanulatum*), stickywilly (*Galium aparine*), yarrow (*Achillea millefolium*), American vetch (*Vicia americana*), Pacific bleeding heart (*Dicentra formosa*), California false hellebore (*Veratrum californicum* var. californicum), tiny trumpet (*Collomia linearis*), whitestem gooseberry (*Ribes inerme*), Gray's licorice-root (*Ligusticum grayi*), starry false lily of the valley (Smilacina stellata), whiskerbrush (*Leptosiphon ciliatus* ssp. ciliatus), California stickseed (*Hackelia californica*), common sheep sorrel (*Rumex acetosella*), little oniongrass (*Melica fugax*), narrowfruit sedge (*Carex specifica*), Jones' sedge (*Carex jonesii*), and California brome (*Bromus carinatus*). Total production is between 500 and 800 lbs/acre.

Community 1.2
Flood

This community phase develops after a major flood event. The plant community components remain the same, as described in Community phase 1.1, but the proportion of each community type shifts after flooding scours sections of the active channel, exposing mineral substrate in some locations and depositing large quantities of sediment in other areas. The destruction of sections of the thinleaf alder community in the channel is accompanied by a dramatic increase in the herbaceous pioneer community. After the flood the early seral grasses like squirrel tail and herbs quickly colonize the recently exposed substrate and within a season the herbaceous community may comprise over half (55%) of the total riparian vegetation. Estimate of plant community component composition in this phase: PCC1: 19% PCC2: 25% PCC3: 55% PCC4: 1%

Community 1.3
Drought

This community phase results from prolonged drought. Drought reduces the water flow in the stream and lowers the seasonal water table. A lower water table facilitates encroachment of the upland Sierra lodgepole pine- white fir forest on the floodplain, and an associated reduction in the thinleaf alder/Lemmon's willow community. Estimate of plant community component composition in this phase: PCC1: 42% PCC2: 30% PCC3: 13% PCC4: 15%

Pathway 1.1a
Community 1.1 to 1.2

This pathway is created when a flood scours the channel of existing vegetation, depositing a layer of sediment and initiating regeneration.

Pathway 1.1b
Community 1.1 to 1.3

This pathway is created by natural processes that cause the site to become drier, usually several years of drought.

Pathway 1.2a
Community 1.2 to 1.1

This pathway is created with time and allows for the recovery of the plant communities after a flood event.

Pathway 1.2b
Community 1.2 to 1.3

This pathway is created with prolonged periods of drought.

Pathway 1.3a
Community 1.3 to 1.1

This pathway is created when the site becomes wetter for natural reasons, such as the end of a drought cycle.

Pathway 1.3b
Community 1.3 to 1.2

This pathway is created when a flood causes bank erosion and sediment deposition.

State 2
Stream Channel Succession

Additional stream classification data is required to determine which channel types are expressed as the C channel evolves in response to disturbance. In a typical succession scenario, the "C" type channel in State 1 down-cuts into an entrenched low gradient "G" type channel that naturally begins to widen over time into an entrenched "F" type channel. The plant community components associated with these possible successional channel types is not known. However, deeply incised "G" and "F" channels generally lose the wetland obligate species and become dominated by upland grass, shrub and/or forest plant communities. As the water table lowers at the site, the adjacent conifer community of Sierra lodgepole and white fir would encroach and reduce the thinleaf alder and mixed willow riparian community. Upland grass species like blue wildrye and western neeedlegrass would begin to dominate the native herbaceous community.

Community 2.1
Stream Channel Succession

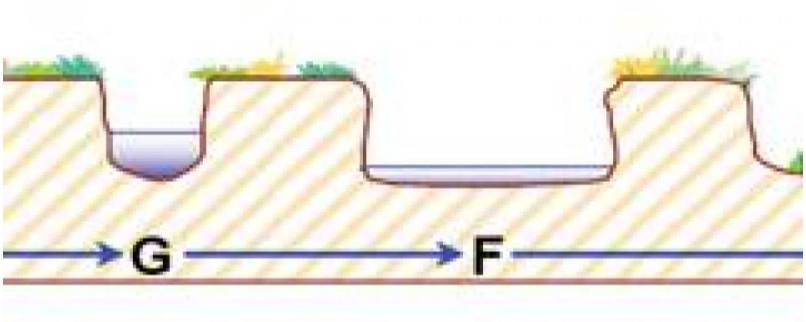

Figure 5. Rosgen Stream Succession Scenario #9

As the “C” type channel in State 1 down-cuts through deposits naturally or as a result of stream bank erosion, an entrenched low gradient “G” type channel develops. This gully-like entrenched channel is unstable and will naturally begin to widen over time into an entrenched “F” type channel. The broadly entrenched “F” type channel allows for sediment deposition, which builds point bars and floodplains with a meandering channel. As riparian vegetation begins to reestablish on the new floodplains, channel stability increases, and an entrenched “C” type channel with a developed floodplain and a meandering channel will eventually develop within the entrenched “F” type channel. This new entrenched “C” type channel may resemble the original “C” type channel with wetland plant communities, but it will be constrained by terraces to the lower floodplain area. The old floodplain becomes a terrace, disconnected from flood events. The terrace has a lower seasonal water table which supports a greater proportion of upland plant communities.

State 3
Constrained C Channel

This C Channel has re-established a floodplain and natural sinuosity. It is constrained by the old flood plain, which is now a hydrologically disconnected terrace.

Community 3.1
Constrained C Channel

Figure 6. Loamy Flood Plains

Figure 7. PCC4 encroaching PCC1b

This community phase has similar plant community components as community phase 1.1, but the species composition may have changed, and the overall distribution of the community components has changed. The species composition may include non-native species such as Kentucky bluegrass (*Poa pratensis*), common dandelion (Taraxicum officinale), common mullein (*Verbascum thapsus*), and rat-tail fescue (*Vulpia myuros*). The composition of the plant communities has shifted primarily, because the stream channel incised through deposits creating a terrace with an upland plant community (PCC4). The riparian communities are confined to a smaller area within the new floodplain. In some areas, the sedges associated with the Lemmon's willow- thinleaf alder community (PCC2) have been replaced by grasses because of lower water tables. PCC1b: 30% This plant community is found along the stream banks. There are point bars, vertical and over hanging banks, and eroded un-vegetated banks. Thinleaf alder is the dominant shrub, with about 27 percent cover, and 2600 lbs/acre annual production. This plant community component may be similar to PCC1 in state 1, but has experienced bank erosion, channel incision, and the introduction of non-native species. Common species are: Kentucky bluegrass (*Poa pratensis*) squirrel tail (*Elymus elymoides*), panicled bulrush (*Scirpus microcarpus*), common rush (*Juncus effusus*), smallwing sedge (*Carex microptera*), bigleaf sedge (*Carex amplifolia*), swordleaf rush (*Juncus ensifolius*), fowl mannagrass (*Glyceria striata*), bentgrass (Agrostis spp.), timothy (Phleum pretense), narrowfruit sedge (*Carex specifica*), stinging nettle (*Urtica dioica*), western pearly everlasting (*Anaphalis margaritacea*), fringed willowherb (*Epilobium ciliatum*), common cowparsnip (*Heracleum maximum*), stickywilly (*Galium aparine*) , seep monkeyflower (*Mimulus guttatus*), American vetch (*Vicia americana*), bugle hedgenettle (*Stachys ajugoides*), field horsetail (*Equisetum arvense*), Douglas' thistle (*Cirsium douglasii*), California false hellebore (*Veratrum californicum* var. californicum), common mullein (*Verbascum thapsus*), naked buckwheat (*Eriogonum nudum*), sweetcicely (*Osmorhiza berteroi*), Douglas' sagewort (*Artemisia douglasiana*), sticky cinquefoil (*Potentilla glandulosa*), Bolander's madia (*Kyhosia bolanderi*), and tall phacelia (*Phacelia procera*). PCC2b: 5% This plant community is similar to PCC2, but the composition of grasses and forbs has increased, while the sedges have decreased. The production of thinleaf alder (*Alnus incana* ssp. tenuifolia) and Lemmon's willow (Salix lemmoni) is less than PCC2, in state 1. Lemmon's willow may be much less abundant in PCC2b, than in PCC2. Total annual shrub production is about 1100 lbs/acre. Dominant plants are widefruit sedge (*Carex angustata*), blue wildrye (*Elymus glaucus*), California brome (*Bromus carinatus*), meadow barley (*Hordeum brachyantherum*), mountain rush (*Juncus arcticus* ssp. littoralis), and California false hellebore (*Veratrum californicum* var. californicum). Other species present are sedges (Carex spp.), Kentucky bluegrass (*Poa pratensis*), Gray's licorice-root (*Ligusticum grayi*), bugle hedgenettle (*Stachys ajugoides*), Lemmon's yampah (*Perideridia lemmonii*), longstalk clover (*Trifolium longipes*), Douglas' knotweed (*Polygonum douglasii*), spreading groundsmoke (*Gayophytum diffusum*), Sierra stickseed (*Hackelia nervosa*), violet (Viola spp.), knotweed (Polygonum spp.), Rydberg's penstemon (*Penstemon rydbergii*), Ashland cinquefoil (*Potentilla glandulosa* ssp. ashlandica), aster (Aster spp.), yarrow (*Achillea millefolium*), American vetch (*Vicia americana*), Douglas' thistle (*Cirsium douglasii*), Oregon checkerbloom (*Sidalcea oregana* ssp. spicata), and rat-tail fescue (*Vulpia myuros*). Understory production ranges from 900 to 1200 lbs per acre. PCC3b: 15% This pioneer plant community is found on recently disturbed point bars and side channels. Common species are squirrel tail (*Elymus elymoides*), common rush (*Juncus effusus*), swordleaf rush (*Juncus ensifolius*), fowl mannagrass (*Glyceria striata*), bentgrass (Agrostis spp.), timothy (Phleum pretense), stinging nettle (*Urtica dioica*), western pearly everlasting (*Anaphalis margaritacea*), tiny trumpet (*Collomia linearis*), fringed willowherb (*Epilobium ciliatum*), common cowparsnip (*Heracleum maximum*), stickywilly (*Galium aparine*) , seep monkeyflower (*Mimulus guttatus*), American vetch (*Vicia americana*), bugle hedgenettle (*Stachys ajugoides*), field horsetail (*Equisetum arvense*), California false hellebore (*Veratrum californicum* var. californicum), common mullein (Verbascum

Thapsus), naked buckwheat (*Eriogonum nudum*), sweetcicely (*Osmorhiza berteroi*), Douglas' sagewort (*Artemisia douglasiana*), sticky cinquefoil (*Potentilla glandulosa*), common sheep sorrel (*Rumex acetosella*), Jones' sedge (*Carex jonesii*), and tall phacelia (*Phacelia procera*). Production data was not collected for this PCC. PCC4b: 50% This plant community is similar to Community Phase 1.1, Sierra Lodgepole Pine-White Fir Forest (PCC4), but includes several non-native grasses. As drier terraces now occupy a larger component of the valley bottom, the upland community comprises 50% of the formerly riparian vegetation. Please refer to the species listed in PCC4 in Community phase 1.1. Additional non-native species include Kentucky bluegrass (*Poa pratensis*) and rat-tail fescue (*Vulpia myuros*), but they are of limited extent.

Community 3.2
Flood

This community phase develops after flooding scours sections of the active channel, exposing mineral substrate in some locations and depositing large quantities of sediment in other areas. The plant community components remain the same, as described in Community phase 1.1, but the proportion of each community types shifts. The destruction of sections of the thinleaf alder community in the channel is accompanied by a dramatic increase in the herbaceous pioneer community. However since the channel is constrained, the old flood plain is now a hydrologically disconnected terrace. With a lowered water table, the upland community gradually replaces the thinleaf alder /Lemmon's willow and may eventually occupy 45% of the formerly riparian vegetation. Estimate of plant community component composition in this phase: PCC1b: 20% PCC2b: 5% PCC3b: 30% PCC4: 45%

Community 3.3
Drought

This community phase results from prolonged drought. Drought reduces the water flow in the stream and lowers the seasonal water table. A lower water table facilitates encroachment of the upland Sierra lodgepole pine- white fir forest on the floodplain, and nearly eliminates the thinleaf alder/Lemmon's willow community. Estimate of plant community component composition in this phase: PCC1b: 22% PCC2b: 3% PCC3b: 15% PCC4: 60%

Pathway 3.1b
Community 3.1 to 3.2

This pathway is created when a flood creates erosion and deposition, leaving barren soil for early successional species to establish.

Pathway 3.1a
Community 3.1 to 3.3

This pathway is created by natural processes that cause the meadow to become drier, such as prolonged drought.

Pathway 3.2a
Community 3.2 to 3.1

This pathway is created with time and allows for the recovery of the plant communities after a flood event.

Pathway 3.2b
Community 3.2 to 3.3

This pathway is created when the site becomes drier due to drought or other causes.

Pathway 3.3a
Community 3.3 to 3.1

This pathway is created when the site becomes wetter for natural reasons, such as the end of a drought cycle.

Pathway 3.3b

Community 3.3 to 3.2

This pathway is created when a flood leaves barren soil from erosion or deposition, allowing the pioneer plant community to increase in area.

Transition 1A
State 1 to 2

This transition can occur naturally as the “C” type channel in State 1 down-cuts through the valley bottom. The channel on this site supports cobble-bottom (C3), gravel-bottom (C4), and sand-bottom (C5) reaches which have moderate to very high erosion potentials, respectively. Bank erosion is a natural river adjustment process and can as the result of mass wasting, liquification, freeze-thaw, fluvial entrainment, and ice scour. The glacial outwash and alluvial deposits in the U-shaped valley bottom are gradually eroded through these processes. This transition can also be initiated by a disturbance that alters the hydrology of the site or impacts the vegetation along the stream bank. Alterations that can affect the hydrology of this site include channel realignment and/or confinement, culvert installations, and road construction. Such alterations straightened the channel, eliminating its ability to meander. This increases the shear stress along the stream bank, which accelerates stream bank erosion, thereby increasing sediment supply and decreasing sediment transport capacity. As the channel straightens it has a shorter course down the valley, creating a steeper gradient. The stream may adjust by headcutting into the base level of the channel until it establishes a new gradient through the meadow. As the stream bed is lowered, so is the water table in the meadow. The new larger and steeper channel can contain more flow, reducing the frequency of flooding and the extent of the floodplain, creating terraces. Cattle grazing and/or the seeding of non-native grass for forage can cause a similar entrenchment of the channel but through a different mechanism. When cattle reduce vegetation and trample the exposed stream banks, the resulting erosion also leads to eventual straightening and headcutting of the channel. Likewise, when non-native grasses displace the native riparian sedges and rushes, the stabilizing root mats that help prevent erosion are also removed.

Restoration pathway 2A
State 2 to 1

Additional stream classification data is required to determine which channel types are expressed in State 2 as the C channel evolves in response to disturbance. Without this data it is not possible to identify the restoration pathway for the intermediate phase of the stream succession scenario.

Transition 2A
State 2 to 3

This transition occurs when continued sediment deposition in the broadly entrenched “F” type channel allows the riparian vegetation to reestablish on the new floodplain. The vegetation increases channel stability and eventually channel sinuosity returns and a new meandering channel will develop that is constrained by the old floodplain.

Restoration pathway 3A
State 3 to 1

The processes that have altered this stream system may be natural or human-influenced. If the primary reason for channel adjustment is a result of natural erosion through alluvial deposits as a result of uplift, the channel should be fairly well readjusted and left alone. However, if human caused disturbance has caused the erosion, then restoration procedures should be considered. The goal of restoration is to return the channel to its full potential, which is defined as the best channel condition, based on quantifiable morphological characteristics of that stream type. For a constrained C channel the goal is to raise the water table, increase the channel sinuosity, and re-establish riparian vegetation on the stream banks to reduce bank erosion. Each segment of the stream channel should be surveyed to determine the evolutionary stages of channel adjustment and evaluate the potential for natural recovery. If natural recovery does not seem likely, a thorough stream departure analysis can determine the feasibility of restoration, anticipate response to future changes in management, and develop appropriate restoration designs.

Additional community tables

Animal community

This site provides valuable wildlife resources such as water and cover. Thinleaf alder and willow communities often serve as travel corridors for big game animals such as deer and many bird species utilize these riparian corridors for nesting and brood rearing. Overhanging alder and willow branches provide shade and cover for salmonids. In addition, wildlife and livestock depend on the leaves, stems, and seeds of Nebraska sedge, and other various grasses and sedges as forage. The sedges and bunchgrasses provide nesting habitat for waterfowl and cover and forage for small mammals.

Hydrological functions

The hydrological function of the flood plain is to provide a catchment for water, sediments, and nutrients. Floodplains may also provide water storage, which is slowly released down the drainage throughout the year.

Recreational uses

These streams provide scenic hiking corridors with wildlife viewing, fishing and photographic opportunities.

Wood products

N/A

Inventory data references

The following NRCS plots were used to describe this ecological site:

789167- stream terrace
789205
789206- Soil type location
789206b
789206c

Type locality

Location 1: Plumas County, CA	
Township/Range/Section	T30 N R6 E S40
UTM zone	N
UTM northing	4477086
UTM easting	638897
General legal description	The type location is about 0.38 miles west of Kelly Camp, just inside the Lassen Volcanic National Park Boundary.

Other references

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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:**