

Appendix B:

APPENDIX B-1:

MATRICES FOR ALTERNATIVE 2: PROPOSED ACTION

APPENDIX B-2:

DESIRED CONDITIONS FOR ALTERNATIVE 2: PROPOSED ACTION



This page has been left blank intentionally.



APPENDIX B-1: MATRICES FOR ALTERNATIVE 2: PROPOSED ACTION

STREAM GROUP

- Elevation: 4,500-10,000 feet
- Slope: 0-40%
- Depth to groundwater: 0-50 centimeters

STREAM GROUP	Attribute #	Attribute Description	Functioning	Functioning at Risk	Functioning Below Threshold
Stream Water Quality	⇨ 1	Temperature	≤20°C	20 to 22°C	>22°C
	⇨ 2	Dissolved oxygen	≥6 mg/l	<6 mg/l	<6 mg/l
	⇨ 3	Nitrogen as nitrate	≤10 mg/l	>10 mg/l	>10 mg/l
	4	Fecal coliform	≤200/400 per 100 ml	>200/400 per 100 ml	>200/400 per 100 ml
Stream Condition	⇨ 5	Streambank stability	≥80% (≥90% TES streams)	70%-80% (70-90% TES streams)	<70%
	⇨ 6	Head cuts	None present	<50 cm depth	>50 cm depth
Vegetation	7	Relative cover of species in Group "A"	>80%	40-80%	<40%
	8	Relative cover of species in Group "B"	<20%	20-60%	>60%
	9	% leader growth remaining (for woody plant communities)	> 45% of two year leader growth present	< 45% of two year leader growth present	< 45% of two year leader growth present
	⇨ 10	Cover of noxious weeds	None	≤5%	>5%

Notes:

- For a site to be classified as "functioning," attributes #1 through #3, #5, #6, and #10 should be "functioning."
 - If a majority of attributes and attributes #5 and #6 are are functioning below threshold," then the site has crossed an ecological threshold and may not be ecologically or economically feasible to restore.
 - Matrices are to be used as guidelines to evaluate functioning level.
 - Fecal coliform will not be sampled as frequently as the other attributes due to logistical difficulties in sampling.
- ⇨ = Priority Attributes



STREAM GROUP

Group A – Species Indicative of Desired Function

Willows: *Salix lucida lasiandra* (Pacific willow), *Salix boothii* (Booth willow), *Salix geyeriana* (Geyer's willow), *Salix lutea* (yellow willow), *Salix exigua* (coyote willow) at low elevations, *Salix lemmonii* (Lemmon willow), *Salix scouleriana* (Scouler willow), *Salix orestera* (Sierra willow), *Salix eastwoodiae* (mountain willow), *Salix lasiolepis* (arroyo willow), *Salix bebbiana* (Bebb willow), and *Salix drummondiana* (Drummond willow).

Other shrubs/trees: *Cornus sericea* (dogwood), *Ribes inerme* (currant), *Ribes aureum* (golden currant), *Alnus incana* (alder), *Prunus virginiana* (chokecherry), *Rhus trilobata* (skunkbush), *Ledum glandulosum* (Labrador tea), *Lonicera involucrata* (twinberry), *Artemisia cana* (silver sagebrush), *Shepherdia argentea* (silver buffaloberry), *Mahonia repens* (Oregon grape), *Populus angustifolia* (narrowleaf cottonwood), *Populus balsamifera trichocarpa* (black cottonwood) and *Populus tremuloides* (aspen).

Graminoids: *Deschampsia caespitosa* (tufted hairgrass), *Calamagrostis canadensis* (bluejoint), *Calamagrostis scopulorum* (reedgrass), *Carex nebrascensis* (Nebraska sedge), *Carex microptera* (smallwing sedge), *Carex aquatalis* (water sedge), *Carex utriculata* or *Carex rostrata* (beaked sedge), *Carex scopulorum* (mountain sedge), *Carex simulata* (analogue sedge), *Carex pellita* (woolly sedge), *Carex aurea* (golden sedge), *Carex vesicaria* (blister sedge), *Carex athrostachya* (slender beaked sedge), *Glyceria striata* (fowl mannagrass), *Glyceria grandis* (American mannagrass), *Juncus ensifolius* (swordleaf rush), *Juncus nevadensis* (Nevada rush), *Phleum alpinum* (alpine timothy), *Poa secunda* (Sandberg's bluegrass), and *Scirpus microcarpus* (bulrush).

Forbs: *Mimulus primuloides* (little yellow monkeyflower), *Mimulus guttatus* (yellow monkeyflower), *Allium validum* (swamp onion), *Dodecatheon alpinum* (alpine shooting stars), *Caltha leptosepala* (marsh marigold), *Polemonium occidentale* (Western polemonium), *Heracleum lanatum* (cow parsnip), *Angelica kingii* (King's angelica), *Ligusticum grayi* (Gray's licorice-root), *Mertensia ciliata* (tall bluebells), *Veronica americana* (speedwell), *Maianthemum stellatum* (false Solomon's seal), *Aconitum columbianum* (monkshood), *Saxifraga odontoloma* (brook saxifrage), *Parnassia palustris* (grass of Parnassus), *Pedicularis groenlandica* (elephantshead), *Viola spp.* (violets), *Sidalcea spp.* (checker mallow), *Polygonum bistortoides* (American bistort) and *Platanthera stricta* (slender bog orchid).

Group B –Species Indicative of Management Problems

Graminoids: *Poa pratensis* (Kentucky bluegrass), *Alopecurus aequalis* (short-awn foxtail), *Alopecurus pratense* (meadow foxtail), *Hordeum brachyantherum* (meadow barley), *Hordeum jubatum* (foxtail barley), *Agrostis stolonifera* (redtop), *Agrostis exarata* (spike bentgrass), *Agrostis scabra* (rough bentgrass), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Muhlenbergia filiformis* (pull-up muhly), *Juncus balticus* (Baltic rush), *Carex douglasii* (Douglas sedge), *Poa palustris* (fowl bluegrass), and *Eleocharis spp.* (spikerush).

Forbs: *Rumex spp.* (sorrel or dock), *Cirsium spp.* (thistle, any species), *Cicuta douglasii* (water hemlock), *Thermopsis rhombifolia* (yellow pea), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Symphyotrichum spp.* (aster, any species), *Veratrum californicum* (false hellebore), *Iris missouriensis* (wild iris), *Potentilla spp.* (cinquefoil, any species), *Epilobium spp.* (willow herb), *Penstemon* (any species), *Urtica dioica* (stinging nettle), *Equisetum spp.* (horsetail), *Nemophila brevifolia* (basin blue eyes), *Rorippa nasturtium-aquaticum* (watercress), *Myriophyllum verticillum* (water milfoil), *Lemna spp.* (duckweed), and *Arnica chamissonis* (arnica).

Shrubs: *Rosa woodsii* (Wood's rose), and *Artemisia tridentata* (any subspecies big sagebrush).

WET MEADOW GROUP

- Elevation: 5,200-10,000 feet
- Slope: 0-12%
- Depth to groundwater: 10-100 centimeters

WET MEADOW GROUP	Attribute #	Attribute Description	Functioning	Functioning at Risk	Functioning Below Threshold
Soil	⇒ 1	Root depth	> 20 cm.	15-20 cm.	< 15 cm.
	2	Soil structure is blocky or platy in the rooting zone (0-30 cm)	Structure soft, granular	Structure firm, blocky to platy	Structure hard, platy
	3	Soil saturation	0-50 cm.	20-100 cm	50-100+ cm.
	⇒ 4	Bare ground	<5%	5-10%	>10%
Vegetation	⇒ 5	Relative cover of perennial grasses or grasslikes in Group "A"	≥ 80%	20-80%	< 20%
	⇒ 6	Relative forb cover	≤ 20%	20-80%	> 80%
	7	Relative cover of Juncus balticus.	≤ 20%	> 20%	≥ 40%
	⇒ 8	Relative cover of the graminoids in Group "C"	0-5%	>5%	>5%
	⇒ 9	Relative cover of forb or shrub species in Group "D"	< 2%	≥ 2%	≥ 5%
	⇒ 10	Cover of Noxious Weeds	None	≤ 5%	>5%
Hydrology	⇒ 11	Presence of head-cutting resulting in incision.	No head-cutting present	Head-cutting present, incision < 50 cm.	Head-cutting present, incision ≥ 50cm.
	⇒ 12	Presence of hummocks	None	Hummocks present	Hummocks abundant

- Notes:
- If a majority of non-priority and all priority attributes meet functions as desired, then the site is classified as "functioning."
 - If a majority of non-priority and any priority attributes are functioning at risk, then the site should be classified as "functioning at risk."
 - If a majority of attributes 11 is at functioning below threshold, then the site has crossed below threshold and may not be ecologically or economically feasible to restore.
 - Matrices are to be used as guidelines to evaluate functioning level.
- ⇒ = Priority Attributes



WET MEADOW GROUP

Group A – Species Indicative of Desired Function

Species with 0-80% cover may include: *Deschampsia caespitosa* (tufted hairgrass), *Calamagrostis canadensis* (bluejoint), *Carex nebrascensis* (Nebraska sedge), *Carex microptera* (smallwing sedge), *Carex aquatalis* (water sedge), *Carex utriculata* or *Carex rostrata* (beaked sedge), *Carex scopulorum* (mountain sedge), *Carex simulata* (analogue sedge), and *Carex pellita* (woolly sedge).

Group B – Associated Species Indicative of Desired Function

Graminoids: *Poa secunda* (Sandberg's bluegrass), *Deschampsia* spp. (hairgrass), *Calamagrostis scopulorum* (reedgrass), *Glyceria striata* (fowl mannagrass), *Glyceria grandis* (American mannagrass), *Phleum alpinum* (alpine timothy), *Carex praegracilis* (field sedge), *Carex athrostachya* (slender beaked sedge), *Carex aurea* (golden sedge), *Juncus balticus* (Baltic rush), *Juncus ensifolius* (swordleaf rush), *Juncus nevadensis* (Nevada rush), and *Scirpus microcarpus* (bulrush). Note: In a moist meadow type, any of the graminoid species listed above could dominate the site and indicate desirable conditions.

Forbs/shrubs: *Mimulus primuloides* (little yellow monkeyflower), *Dodecatheon alpinum* (alpine shooting stars), *Caltha leptosepala* (marsh marigold), *Stellaria longipes* (longstalk starwort), *Pedicularis groenlandica* (elephants head), *Viola* spp. (violets), *Sidalcea* spp. (checker mallow), *Polygonum bistortoides* (American bistort), and *Equisetum* spp. (horsetail). Note: *Salix* spp. (willows) may be present where water is flowing or in wet depressions.

Group C – Graminoid Species Indicative of Management Problems

Poa pratensis (Kentucky bluegrass), *Alopecurus aequalis* (short-awn foxtail), *Alopecurus pratense* (meadow foxtail), *Hordeum brachyantherum* (meadow barley), *Hordeum jubatum* (foxtail barley), *Agrostis stolonifera* (redtop), *Agrostis exarata* (spike bentgrass), *Agrostis scabra* (rough bentgrass), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Muhlenbergia filiformis* (pull-up muhly), *Carex douglasii* (Douglas sedge), *Poa palustris* (fowl bluegrass), and *Eleocharis* spp. (spikerush).

Group D – Forb/Shrub Species Indicative of Management Problems

Rumex spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Cicuta douglasii* (water hemlock), *Thermopsis rhombifolia* (yellow pea), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Symphyotrichum* spp. (aster, any species), *Veratrum californicum* (false hellebore), *Iris missouriensis* (wild iris), *Potentilla* spp. (cinquefoil, any species), *Epilobium* spp. (willow herb), *Penstemon* spp. (any species), *Urtica dioica* (stinging nettle), *Equisetum* spp. (horsetail), *Nemophila brevifolia* (basin blue eyes), *Rosa woodsii* (Wood's rose), and *Artemisia tridentata* (any subspecies big sagebrush).

DRY-TO-MOIST MEADOW GROUP

- Elevation: 5,200-10,500 feet
- Slope: 1-10%
- Depth to ground water:
55-100 centimeters for moist meadow
100+ centimeters for dry meadow

DRY-TO-MOIST MEADOW GROUP	Attribute #	Attribute Description	Functioning	Functioning at Risk	Functioning Below Threshold
Soil	⇨ 1	Root depth	> 10 cm.	5-10 cm.	< 5 cm.
	2	Soil structure is blocky or platy in the rooting zone (0-30 cm)	Structure soft, granular	Structure firm, blocky to platy	Structure hard, platy
	⇨ 3	Bare ground	<5%	5-10%	>10%
Vegetation	⇨ 4	Relative cover of perennial grasses or grasslikes in Group "A"	≥ 75%	60-75%	< 60%
	5	Relative forb cover	≤ 25%	25-40%	> 40%
	6	If moist meadow, relative cover of Douglas sedge	≤ 20%	20-50%	> 50%
	⇨ 7	Relative cover of the graminoids in Group "C"	<3%	3-30%	>30%
	⇨ 8	Relative cover of forb and/or shrub species in Group "D"	< 3%	3-20%	>20%
	⇨ 9	Cover of Noxious Weeds	None	≤ 5%	>5%
	⇨ 10	Relative cover of species in Group "E"	< 3%	3-40%	≥ 40%
Hydrology	⇨ 11	Presence of head-cutting resulting in incision.	No head-cutting present	Head-cutting present, incision < 50 cm.	Head-cutting present, incision ≥ 50 cm.
	12	Presence of hummocks	None	Hummocks present	Hummocks abundant

- Notes:
- If a majority of non-priority and all priority attributes are functioning, then the site is classified as "functioning."
 - If a majority of non-priority and any priority attributes are functioning at risk, then the site should be classified as "functioning at risk."
 - If a majority of attributes or attributes 10 or 11 are functioning below threshold, then the site has crossed below threshold and may not be ecologically or economically feasible to restore.
 - Matrices are to be used as guidelines to evaluate functioning level.
- ⇨ = Priority Attributes



DRY-TO-MOIST MEADOW GROUP

Group A – Species Indicative of Desired Function

Species with 0-70% cover may include: *Poa secunda* (Sandberg's bluegrass), *Elymus trachycaulus* (Slender wheatgrass), *Leymus cinereus* (Great Basin wildrye), *Deschampsia caespitosa* (tufted hairgrass), *Danthonia* spp. (oatgrass, any species), *Carex exserta* (shorthair sedge), and *Carex douglasii* (Douglas sedge). Note: Douglas sedge may dominate a dry site in functioning condition, but also tend to indicate a drying trend in a moist meadow.

Group B – Associated Species Indicative of Desired Function

Graminoids: *Phleum alpinum* (alpine timothy), *Carex athrostachya* (slender beaked sedge), *Bromus carinatus* (Mountain brome), *Muhlenbergia richardsonis* (mat muhly), *Achnatherum nelsonii* (Columbia needlegrass), *Achnatherum lettermanii* (Letterman's needlegrass), *Carex praegracilis* (field sedge), *Juncus balticus* (Baltic rush), and *Juncus ensifolius* (swordleaf rush).

Group C – Graminoid Species Indicative of Management Problems

Poa pratensis (Kentucky bluegrass), *Hordeum brachyantherum* (meadow foxtail), *Hordeum jubatum* (foxtail barley), *Agrostis stolonifera* (redtop), *Poa palustris* (fowl bluegrass), and *Carex douglasii* (Douglas sedge) in moist meadows.

Group D – Forb/Shrub Species Indicative of Management Problems

Ceratocephala testiculata (Bur buttercup), *Cirsium* spp. (thistle, any species), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Symphyotrichum* spp. (aster, any species), *Potentilla* spp. (cinquefoil, any species), *Rumex* spp. (sorrel or dock), *Penstemon* spp. (any species), *Urtica dioica* (stinging nettle), *Equisetum* spp. (horsetail), *Nemophila brevifolia* (basin blue eyes), and *Artemisia tridentata* (any subspecies big sagebrush).

Group E – Species Indicating a Breach of Ecological Threshold

More than 40% *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Wyethia* spp. (mule's ears any species), *Iris missouriensis* (wild iris), *Chrysothamnus viscidiflorus* (green rabbitbrush), and *Rosa woodsii* (Wood's rose).

COTTONWOOD GROUP

- **Elevation: 5,000-7,600 feet**
- **Slope: 2-15%**
- **Depth to groundwater: generally >100 centimeters, often variable**

COTTONWOOD GROUP	Attribute #	Attribute Description	Functioning	Functioning at Risk	Functioning Below Threshold
Soil	1	Root depth	> 15 cm.	10-15 cm.	< 10 cm.
	2	Soil structure is blocky or platy in the rooting zone (0-30 cm)	Structure soft, granular	Structure firm, blocky to platy	Structure hard, platy
	⇒ 3	Bare ground	<2%	2-20%	>20%
Vegetation	4	Absolute canopy cover of cottonwood	20-60%	10-20%	< 10%
	⇒ 5	% understory cover of cottonwood saplings or suckers less than 60 in.	5-70%	<5%	None
	6	Relative cover of understory shrubs in Group "A"	20-50%	5-20%	< 5%
	⇒ 7	Relative understory cover forbs in group "C"	≤ 2%	2-25%	>25%
	⇒ 8	Relative understory cover of graminoids in Group "D"	<5%	5-25%	>25%
	⇒ 9	Canopy cover of shrub species in Group "E"	< 5%	5-30%	>30%
	⇒ 10	Cover of Noxious Weeds	None	≤ 5%	>5%
Hydrology	11	Presence of head-cutting resulting in incision.	No head-cutting present	Head-cutting present, incision < 50cm.	Head-cutting present, incision ≥ 50cm.

Notes:

- If a majority of non-priority and all priority attributes are functioning, then the site is classified as "functioning."
 - If a majority of non-priority and any priority attributes are functioning at risk, then the site should be classified as "functioning at risk."
 - If a majority of attribute 5 is functioning below threshold," then the whole site has crossed below threshold and may not be ecologically or economically feasible to restore.
 - *Matrices are to be used as guidelines to evaluate functioning level.*
- ⇒ = Priority Attributes



COTTONWOOD GROUP

Group A – Shrub Species Indicative of Desired Function

Shrub species with 0-50% understory cover may include: *Amalanchier alnifolia* (serviceberry), *Ribes* spp. (currant or gooseberry), *Prunus virginiana* (chokecherry), *Alnus incana* (alder), *Salix* spp. (willow), *Cornus sericea* (dogwood), and *Rhus trilobata* (skunkbush sumac). Shrub species with 0-10% understory cover include: *Artemisia tridentata tridentata* (basin big sagebrush), *Artemisia tridentata vaseyana* (mountain big sagebrush), *Symphoricarpos oreophilus* (snowberry), *Rosa woodsii ultramontana* (Wood's rose).

Group B – Associated Species Indicative of Desired Function

Graminoids: *Elymus glaucus* (blue wildrye), *Leymus cinereus* (basin wildrye), *Elymus trachycaulus* (slender wheatgrass), *Leymus triticoides* (beardless wildrye), *Elymus lanceolatus* (streambank wheatgrass), *Bromus carinatus* (mountain brome), and *Poa secunda* (Sandberg's bluegrass), *Poa fendleriana* (muttongrass), *Poa cusickii* (Cusick's bluegrass), *Agrostis pallens* (shore bentgrass), *Koeleria macrantha* (Junegrass), *Calamagrostis canadensis* (bluejoint), *Melica spectabilis* (purple oniongrass), *Carex microptera* (smallwing sedge), *Carex vesicaria* (blister sedge), *Scirpus micocarpus* (bullrush), and *Carex praegracilis* (field sedge).

Forbs/shrubs: *Thalictrum* spp. (meadowrue), *Aquilegia formosa* (columbine), *Aconitum columbianum* (monkshood), *Maianthemum stellatum* (False Solomon's seal), *Osmorhiza occidentalis* (sweet anise), *Geranium richardsonii* or *Geranium viscosissimum* (wild geranium), *Paeonia brownii* (wild peony), *Viola palustris* (marsh violet), *Epilobium angustifolium* (fireweed), and *Clematis ligusticifolia* (western white clematis), *Galium boreale* (bedstraw), *Lupinus caudatus* (tailcup lupine), *Lupinus argenteus* (silver lupine) or *Lupinus leucophyllus* (velvet lupine), *Senecio* spp. (groundsel), *Allium* spp. (wild onion), *Achillea millefolium* (yarrow), *Cicuta douglasii* (water hemlock), and *Solidago canadensis* (goldenrod).

Group C – Forb Species Indicative of Management Problems

Rumex spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Descurainia pinnata* (tansy mustard), *Artemisia ludoviciana* (herbaceous sage), *Symphotrichum* spp. (aster, any species), *Urtica dioica* (stinging nettle), *Chorispora tenella* (cross flower), *Thlaspi arvense* (pennycress), *Potentilla* spp. (cinquefoil, any species), *Tragopogon dubius* (yellow salsify), *Hackelia floribunda* (stickseed or forget-me-not), and *Nemophila pedunculata* (littlefoot nemophila).

Group D – Graminoid Species Indicative of Management Problems

Poa pratensis (Kentucky bluegrass), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), and *Carex douglasii* (Douglas sedge).

Group E – Shrub Species Indicative of Management Problems

Rosa woodsii (Wood's rose), *Chrysothamnus vicidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), and *Artemisia tridentata* (any subspecies big sagebrush).

ASPEN GROUP

- **Elevation: 6,100-9,000 feet**
- **Slope: 2-40%**
- **Depth to groundwater: generally >100cm., often variable**

ASPEN GROUP	Attribute #	Attribute Description	Functioning	Functioning at Risk	Functioning Below Threshold
Soil	1	Root depth	> 20 cm.	10-20 cm.	< 20 cm.
	2	Soil structure is blocky or platy in the rooting zone (0-30 cm)	Structure soft, granular	Structure firm, blocky to platy	Structure hard, platy
	⇒ 3	Bare ground	<5%	5-20%	>20%
Vegetation	4	Absolute canopy cover of aspen	>40%	10-40%	<10%
	⇒ 5	Aspen suckers / saplings less than 150 cm. (60")	Multiple age classes or at least one young age class >500 stems per acre	≥50 parent trees & <500 suckers / saplings per acre	<50 parent trees & <500 saplings / suckers per acre
	⇒ 6	Relative cover forbs in group "C"	≤2%	2-25%	>25%
	⇒ 7	Relative cover of graminoids in Group "D"	≤5%	5-25%	>25%
	⇒ 8	Relative cover of shrub species in Group "E"	≤5%	5-30%	>30%
	⇒ 9	Relative cover of Noxious Weeds	None	≤ 5%	>5%
Hydro-logy	10	Presence of head-cutting resulting in incision.	No head-cutting present	Head-cutting present, incision < 50 cm.	Head-cutting present, incision ≥ 50 cm.

Notes:

- If a majority of non-priority and all priority attributes are functioning, then the site is classified as "functioning."
 - If a majority of non-priority and any priority attributes are functioning at risk, then the site should be classified as "functioning at risk."
 - If a majority of attributes 5 is functioning below threshold, then the site has crossed below threshold and may not be ecologically or economically feasible to restore.
 - Matrices are to be used as guidelines to evaluate functioning level.
- ⇒ = Priority Attributes

ASPEN GROUP

Group A – Shrub Species Indicative of Desired Function

Shrub species with up to 50% understory cover may include: *Symphoricarpos oreophilus* (snowberry), *Amalanchier alnifolia* (serviceberry), *Ribes* spp. (currant or gooseberry), *Prunus virginiana* (chokecherry), *Alnus incana* (alder), *Salix* spp. (willow), *Cornus sericea* (dogwood), *Rubus parviflora* (thimbleberry), *Mahonia repens* (Oregon grape), and *Acer glabrum* (vine maple).

Group B – Associated Species Indicative of Desired Function

Forb: *Thalictrum* spp. (meadowrue), *Aquilegia formosa* (columbine), *Aconitum columbianum* (monkshood), *Maianthemum stellatum* (False Solomon's seal), *Osmorhiza occidentalis* (sweet anise), *Mertensia oblongifolia* (mountain bluebells), *Geranium* spp. (wild geranium), *Achillea millefolium* (yarrow), *Delphinium* spp. (larkspur), *Galium* spp. (bedstraw), *Lupinus argenteus* (silver lupine), *Rudbeckia occidentalis* (coneflower), *Valeriana* spp. (valerian), *Sidalcea oregana* (checker mallow), *Ligusticum grayi* (licorice root), *Actea rubra* (baneberry), and *Agastache urticifolia* (horsemint). Note: Annual forbs are less than 2% of the understory cover.

Graminoid: *Elymus trachycaulus* (slender wheatgrass), *Elymus glaucus* (blue wildrye), *Elymus lanceolatus* (streambank wheatgrass), *Bromus carinatus* (mountain brome), *Glyceria striata* (fowl mannagrass), *Calamagrostis canadensis* (bluejoint), *Melica spectabilis* (purple oniongrass), *Poa wheeleri* (Wheeler bluegrass), *Deschampsia elongata* (slender hairgrass), *Carex microptera* (smallwing sedge), *Carex rossii* (Ross' sedge), *Carex pellita* (woolly sedge), and *Juncus ensifolius* (swordleaf rush).

Group C – Forb Species Indicative of Management Problems

Rumex spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Cicuta douglasii* (water hemlock), *Taraxacum officinale* (dandelion), *Symphyotrichum* spp. (aster, any species), *Veratrum californicum* (false hellebore), *Urtica dioica* (stinging nettle), *Wyethia amplexicaulis* (mule's ears), *Potentilla* spp. (cinquefoil, any species), *Equisetum* spp. (horsetail), *Descurainia pinnata* (Western tansymustard), *Senecio* spp. (groundsel), and *Nemophila brevifolia* (basin blue eyes).

Group D – Graminoid Species Indicative of Management Problems

Poa pratensis (Kentucky bluegrass), *Agrostis stolonifera* (redtop), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Poa palustris* (fowl bluegrass), and *Eleocharis* spp. (spikerush).

Group E – Shrub Species Indicative of Management Problems

Rosa woodsii (Wood's rose) or *Artemisia tridentata* (any subspecies big sagebrush).

WYOMING BIG SAGEBRUSH GROUP

- Elevation: 4,500-6,800 feet
- Slope: 0-45%
- Precipitation: 6-13 inches

WYO-MING SAGE-BRUSH GROUP	Attribute #	Attribute Description	Functioning	Functioning at Risk	Functioning Below Threshold
Soil	⇒ 1	Bare ground	< 20%	> 20%	> 50%
	⇒ 2	Soil surface decomposing organic matter or biological crust	Present, acting to stabilize soil	Diminished, found where protected	Absent from soil surface
	⇒ 3	Terracing of hill slopes	≤ 5 terraces evident on hill slopes	> 5 terraces evident on hill slopes	Terracing extensive, < 5 ft. apart
	⇒ 4	Erosion pavement	< 5%	5-20%	> 20%
Vegetation	⇒ 5	Wyoming big sagebrush canopy cover	10-30%	< 10%	< 5% and has been for ≥10 years
	6	Relative cover of non-native grasses in Group "C"	≤ 30%	30-50%	> 50%
	⇒ 7	Relative cover of annual grass species in Group "D"	≤ 5%	5-30%	≥ 30%
	⇒ 8	Relative cover of forbs in Group "E"	< 1%	≥ 1%	≥ 5%
	⇒ 9	Cover of Noxious Weeds	None	≤ 5%	>5%
Hydrology	⇒ 10	Presence of rills / rill formation	No recent formation, old rills with muted features	Active rills formation in exposed areas	Rill formation is severe and well-defined
	⇒ 11	Presence of pedestalling behind plants and rocks	No build-up of soil or litter evident	Recent build-up of soil or litter evident	Build-up of soil or litter extensive, roots exposed
Distur-bance	12	Fire frequency	20-60+ years	10-20 years	<10 years

Notes:

- If a majority of non-priority and all priority attributes are functioning, then the site is classified as "functioning."
- If a majority of non-priority and any priority attributes are functioning at risk, then the site should be classified as "functioning at risk."
- If a majority of priority and non-priority attributes or attributes 5, 7, or 12 are functioning below threshold, then the site has crossed below threshold and may not be ecologically or economically feasible to restore.
- Matrices are to be used as guidelines to evaluate functioning level.

⇒ = Priority Attributes



WYOMING BIG SAGEBRUSH GROUP

Group A – Shrub Species Indicative of Desired Function

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) is the dominant shrub canopy cover component. Other overstory shrubs may include: *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), *Atriplex canescens* (four-wing saltbush), *Grayia spinosa* (spiny hopsage), *Krascheninnikovia lanata* (winterfat), *Atriplex confertifolia* (shadscale), *Eriogonum* spp. (shrubby buckwheat), and *Tetrademyia canescens* (gray horsebrush).

Group B – Grass/Forb Species Indicative of Desired Function

Graminoids: *Leymus cinereus* (Great Basin wildrye), *Achnatherum hymenoides* (Indian ricegrass), *Achnatherum thurberianum* (Thurber's needlegrass), *Hesperostipa comata* (needle and thread), *Carex exserta* (shorthair sedge), *Psuedoroegneria spicata* (bluebunch wheatgrass), *Elymus elymoides* (squirreltail), and *Poa secunda* (Sandberg bluegrass). Graminoid species indicating desired function that may be present in smaller amounts include: *Pascopyron smithii* (western wheatgrass), *Koeleria macrantha* (Junegrass), *Pleuraphis jamesii* (galleta), and *Festuca idahoensis* (Idaho fescue).

Forbs: *Sphaeralcea coccinea* (scarlet globemallow), *Phlox hoodii* (Hood's phlox), *Phlox longifolia* (longleaf phlox), *Opuntia polyacantha* (pricklypear), *Chaenactis douglasii* (pincushion), *Erigeron* spp. (fleabane/daisy), *Lupinus* spp. (lupine), *Astragalus* spp. (milkvetch or locoweed), *Lomatium* spp. (biscuitroot), *Stanleya pinnata* (Prince's plume), *Calochortus* spp. (mariposa and sego lily), *Castilleja* spp. (Indian paintbrush), *Ranunculus glaberrimus* (sagebrush buttercup), *Packera* & *Senecio* spp. (groundsel), *Delphinium* spp. (larkspur), and *Stenotus acaulis* (goldenweed).

Group C – Non-Native Grass Species Indicative of Management Problems

Agropyron cristatum (crested wheatgrass), *Agropyron fragile* (Siberian wheatgrass), *Agropyron desertorum* (desert wheatgrass), or other seeded, non-native species.

Group D – Annual Grass Species Indicative of Management Problems

Bromus tectorum (cheatgrass), *Bromus rubens* (red brome), *Vulpia octoflora* (six-week fescue), or other annual grasses.

Group E – Forb Species Indicative of Management Problems

Leptodactylon pungens (prickly phlox) or annual forbs such as *Descurainia* spp. (tansy mustard), *Halogeton glomeratus* (halogeton), and *Salsola tragus* (Russian thistle) exceed 1% of canopy cover.

Group F – Eriogonum Species Indicative of Desired Function

Eriogonum caespitosum (matted buckwheat), *Eriogonum brevicaulis* (shortstem buckwheat), *Eriogonum heracleoides* (parsnipflower buckwheat), *Eriogonum microthecum* (slender buckwheat), *Eriogonum ovalifolium* (cushion buckwheat), *Eriogonum racemosum* (redroot buckwheat), and *Eriogonum umbellatum* (sulphur buckwheat).

MOUNTAIN BIG SAGEBRUSH GROUP

- Elevation: 6,000-10,000 feet
- Slope: 2-50%
- Precipitation: 10-25 inches

MOUNTAIN BIG SAGEBRUSH GROUP	Attribute #	Attribute Description	Functioning	Functioning at Risk	Functioning Below Threshold
Soil	⇒ 1	Bare ground	< 20%	> 20%	> 50%
	⇒ 8	Soil surface decomposing organic matter or biological crust	Present, acting to stabilize soil	Diminished, found where protected	Absent from soil surface
	3	Terracing of hill slopes	≤ 5 terraces evident on hillslopes	> 5 terraces evident on hillslopes	Terracing extensive, < 5 ft. apart
	⇒ 4	Erosion pavement	< 10%	10-35%	> 35%
Vegetation	5	Mountain or sub-alpine big sagebrush absolute canopy cover	10-25%	< 10% or >25%	< 5% for ≥10 yrs.
	6	Relative cover of non-native grasses in Group "C"	≤ 30%	30-50%	> 50%
	⇒ 7	Relative cover of annual grass species in Group "D"	≤ 5%	5-30%	≥ 30%
	8	Canopy cover of shrubs or trees in Group "E"	0-5%	5-30%	>30%
	9	Relative cover of perennial forbs / perennial grasses	5-50% forbs; 15-65% grasses	<5% forbs; <10% grasses	<5% forbs; <10% grasses
	⇒ 10	Noxious Weed cover	None	≤ 5%	>5%
Hydrology	11	Presence of rills/ rill formation	No recent formation, old rills with muted features	Active rills formation in exposed areas	Rill formation is severe and well-defined
	12	Presence of pedestalling behind plants and rocks	No build-up of soil or litter evident	Recent build-up of soil or litter evident	Build-up of soil or litter extensive, roots exposed
Disturbance	13	Fire frequency	10-40 yrs.	<10 or >40 yrs.	<10 yrs.

- Notes:
- If a majority of non-priority and all priority attributes are functioning, then the site is classified as "functioning."
 - If a majority of non-priority and any priority attributes are functioning at risk, then the site should be classified as "functioning at risk."
 - If a majority of attributes or attribute 7 is functioning below threshold, then the site has crossed below threshold and may not be ecologically or economically feasible to restore.
 - Matrices are to be used as guidelines to evaluate functioning level.
- ⇒ = Priority Attributes



MOUNTAIN BIG SAGEBRUSH GROUP

Group A – Shrub Species Indicative of Desired Function

Artemisia tridentata spp. *Vaseyana*, (mountain big sagebrush) and/or *Artemisia tridentata* spp. *spiciformis* (subalpine big sagebrush) dominate the shrub canopy cover component. *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), *Purshia tridentata* (bitterbrush), *Symphoricarpos oreophilus* (snowberry), *Amelanchier alnifolia* / *Amelanchier utahensis* (serviceberry), *Ceanothus velutinus* (snowbrush), *Artemisia arbuscula* (low sagebrush), *Eriogonum* spp. (shrubby buckwheat), *Tetradymia canescens* (horsebrush), *Rosa woodsii* (Wood's rose), *Ribes* spp. (currant / gooseberry), *Ephedra viridis* (Mormon tea), and *Atriplex canescens* (four-wing saltbush).

Group B – Grass/Forb Species Indicative of Desired Function

Graminoids: *Leymus cinereus* (basin wildrye), *Festuca idahoensis* (Idaho fescue), *Pseudoroegneria spicata* (bluebunch wheatgrass), *Elymus trachycaulus* (slender wheatgrass), *Achnatherum thurberianum* (Thurber's needlegrass), *Achnatherum occidentale* (western needlegrass), *Achnatherum lettermanii* (Letterman's needlegrass), *Achnatherum nelsonii* (Columbia needlegrass), *Achnatherum nevadense* (Nevada needlegrass), *Achnatherum pinetorum* (pine needlegrass), *Carex exserta* (shortawn sedge), *Elymus elymoides* (squirreltail), *Poa secunda* (Sandberg's bluegrass), *Poa fendleriana* (muttongrass), *Leucopoa kingii* (spike fescue), *Bromus carinatus* (mountain brome), *Pascopyron smithii* (Western wheatgrass), *Koeleria macrantha* (Junegrass), *Hesperostipa comata* (needle and thread grass), *Melica bulbosa* (oniongrass), *Melica spectabilis* (purple oniongrass), and *Achnatherum hymenoides* (Indian ricegrass)

Forbs: *Balsamorhiza sagittata* (arrowleaf balsamroot), *Hackelia floribunda* (wild forget-me-not), *Hackelia patens* (spotted stickseed), *Phlox longifolia* (longleaf phlox), *Lithospermum ruderae* (stoneseed), *Potentilla* spp. (cinquefoil), *Achillea millefolium* (yarrow), *Erigeron* spp. (fleabane/daisy), *Lupinus* spp. (lupine), *Astragalus* spp. (milkvetch/locoweed), *Lomatium* spp. (biscuitroot), *Agastache urticifolia* (giant hyssop), *Calochortus* spp. (mariposa and sego lily), *Castilleja* spp. (Indian paintbrush), *Antennaria rosea* (rosy pussytoes), *Frasera speciosa* (elkweed), *Penstemon* spp. (penstemon), *Helianthella uniflora* (one-flowered sunflower), *Crepis acuminata* (hawksbeard), *Senecio* spp. (groundsel), *Delphinium* spp. (larkspur), *Allium* spp. (wild onion), *Geranium viscosissimum* (geranium), *Geum* spp. (avens), and *Euthamia occidentalis* (western goldentop).

Group C – Grass Species Indicative of Management Problems

Agropyron cristatum (crested wheatgrass), *Agropyron desertorum* (desert wheatgrass), *Agropyron fragile* (Siberian wheatgrass), *Thinopyrum intermedium* (intermediate wheatgrass), *Poa bulbosa* (bulbous bluegrass), *Bromus inermis* (smooth brome) or other seeded or non-native graminoid species.

Group D – Annual Grass Species Indicative of Management Problems

Bromus tectorum (cheatgrass), *Bromus japonicus* (Japanese brome), *Bromus briziformis* (rattlesnake brome), *Bromus rubens* (red brome), *Vulpia octoflora* (six-week fescue) or other annuals.

Group E – Shrub/Tree Species Indicative of Management Problems

Chrysothamnus viscidiflorus (yellow rabbitbrush) and *Ericameria nauseosus* (rubber rabbitbrush).

Group F – Eriogonum Species Indicative of Desired Function

Eriogonum caespitosum (matted buckwheat), *Eriogonum brevicale* (shortstem buckwheat), *Eriogonum heracleoides* (parsnipflower buckwheat), *Eriogonum microthecum* (slender buckwheat), *Eriogonum ovalifolium* (cushion buckwheat), *Eriogonum racemosum* (redroot buckwheat), and *Eriogonum umbellatum* (sulphur buckwheat).

MOUNTAIN BRUSH GROUP

- **Elevation: 6,000-10,000 feet**
- **Slope: 4-50%**
- **Precipitation: 12-22 inches**

MOUNTAIN BRUSH GROUP	Attribute #	Attribute Description	Functioning	Functioning at Risk	Functioning Below Threshold
Soil	⇒ 1	Bare ground	< 20%	20-30%	> 30%
	⇒ 2	Soil surface decomposing organic matter or biological crust	Present, acting to stabilize soil	Diminished, found where protected	Absent from soil surface
	3	Terracing of hill slopes	≤ 5 terraces evident on hillslopes	> 5 terraces evident on hillslopes	Terracing extensive, < 5 ft. apart
	⇒ 4	Erosion pavement	< 10%	10-30%	> 30%
Vegetation	⇒ 5	Canopy cover of shrubs in Group "A"	25-60%	10-25%	< 10%
	⇒ 6	Relative cover of forbs and grasses in Group "B"	>10% forbs; 30-65% grasses	5-10% forbs; 10-30% grasses	<5% forbs; <10% grasses
	7	Relative cover of grasses in Group "C"	≤ 30%	30-50%	> 50%
	⇒ 8	Relative cover of annual grass species in Group "D"	≤ 5%	5-30%	≥ 30%
	9	Relative cover of shrubs or trees in Group "E"	0-5%	5-40%	>40%
	⇒ 10	Cover of Noxious Weeds	None	≤ 5%	>5%
Hydrology	11	Presence of rills/ rill formation	No recent formation, old rills with muted features	Active rills formation in exposed areas	Rill formation is severe and well-defined
	12	Presence of pedestalling behind plants and rocks	No build-up of soil or litter evident	Recent build-up of soil or litter evident	Build-up of soil or litter extensive, roots exposed
Disturbance	13	Fire frequency	30-100 yrs.	<30 yrs.	<5 yrs.

Notes:

- If a majority of non-priority and all priority attributes are functioning, then the site is classified as "functioning."
 - If a majority of non-priority and any priority attributes are functioning at risk, then the site should be classified as "functioning at risk."
 - If a majority of attributes or attribute 8 are functioning below threshold," then the site has crossed below threshold and may not be ecologically or economically feasible to restore.
 - Matrices are to be used as guidelines to evaluate functioning level.
- ⇒ = Priority Attributes



Mountain Brush Group

Group A – Shrub Species Indicative of Desired Function

Purshia tridentata (bitterbrush), *Amelanchier utahensis* (serviceberry), *Ribes cereum* (wax currant), *Ribes montigenum* (gooseberry currant), *Holodiscus dumosus* (rockspirea), *Artemisia tridentata* spp. *Vaseyana*, (mountain big sagebrush), *Artemisia tridentata* spp. *spiciformis* (subalpine big sagebrush) and/or *Artemisia arbuscula* (low sagebrush). Other common shrubs that may occur in the stand with a cover generally less than five% each are: *Symphoricarpos oreophilus* (snowberry), *Crataegus douglasii* (hawthorne), *Rhus trilobata* (sumac), *Shepherdia argentea* (buffaloberry), *Shepherdia canadensis* (buffaloberry), *Sambucus nigra* (elderberry), *Sambucus racemosa* (elderberry), *Ceanothus velutinus* (snowbrush), *Artemisia frigida* (prairie sagewort), *Eriogonum* spp. (shrubby buckwheat), and *Ephedra viridis* (Mormon tea).

Group B – Associated Species Indicative of Desired Function

Graminoids: *Leymus cinereus* (basin wildrye), *Festuca idahoensis* (Idaho fescue), *Psuedoroegneria spicata* (bluebunch wheatgrass), *Elymus trachycaulus* (slender wheatgrass), *Achnatherum occidentale* (western needlegrass), *Achnatherum lettermanii* (Letterman's needlegrass), *Achnatherum nelsonii* (Columbia needlegrass), *Achnatherum nevadense* (Nevada needlegrass), *Achnatherum pinetorum* (pine needlegrass), *Achnatherum hymenioides* (Indian ricegrass), *Carex exserta* (shortawn sedge), *Elymus multisetus* (tall squirreltail), *Elymus elymoides* (squirreltail), *Poa secunda* (Sandberg's bluegrass), *Poa fendleriana* (muttongrass), *Poa canbyi* (canby bluegrass), *Leucopoa kingii* (spike fescue), *Hesperostipa comata* (needle and thread), and *Bromus carinatus* (mountain brome). At higher elevations: *Carex rossii* (Ross's sedge), *Carex phaeocephala* (dunhead sedge), and *Calamagrostis rubescens* may be found.

Forbs: *Balsamorhiza sagittata* (arrowleaf balsamroot), *Hydrophyllum capitatum* (dwarf waterleaf), *Linum lewisii* (Lewis flax), *Hackelia floribunda* (wild forget-me-not), *Hackelia patens* (spotted stickseed), *Phlox longifolia* (longleaf phlox), *Lithospermum ruderale* (stoneseed), *Potentilla* spp. (cinquefoil), *Achillea millefolium* (yarrow), *Erigeron* spp. (fleabane/daisy), *Lupinus* spp. (lupine), *Astragalus* spp. (milkvetch or locoweed), *Lomatium* spp. (biscuitroot), *Agastache urticifolia* (giant hyssop), *Castilleja flava* (yellow paintbrush), *Castilleja angustifolia* (Indian paintbrush), *Mertensia ciliata* and *Mertensia longifolia* (bluebells), *Penstemon* spp. (penstemon), *Helianthella uniflora* (one-flowered sunflower), *Crepis acuminata* (hawksbeard), *Senecio* spp. (groundsel), *Delphinium* spp. (larkspur), *Geranium viscosissimum* (geranium), *Lithophragma* spp. (woodland star), and *Solidago canadensis* (Canada goldenrod).

Group C – Non-native Grass Species Indicative of Management Problems

Agropyron cristatum (crested wheatgrass), *Agropyron desertorum* (desert wheatgrass), *Agropyron fragile* (Siberian wheatgrass), *Thinopyrum intermedium* (intermediate wheatgrass), *Bromus inermis* (smooth brome), *Poa pratensis* (Kentucky bluegrass), *Poa compressa* (Canada bluegrass), and *Poa bulbosa* (bulbous bluegrass) or other seeded, non-native species.

Group D – Annual Grass Species Indicative of Management Problems

Bromus tectorum (cheatgrass), *Bromus rubens* (red brome), *Bromus japonicus* (Japanese brome), *Bromus briziformis* (rattlesnake brome), *Vulpia octoflora* (six-week fescue) or other annuals.

Group E – Shrub/Tree Species Indicative of Management Problems

Chrysothamnus viscidiflorus (yellow rabbitbrush) or *Rosa woodsii* (Wood's rose).

APPENDIX B-2: Desired Conditions for Alternative 2: Proposed Action

STREAM GROUP

Elevation: 4,500-10,000 feet

Slope: 0-40%

Depth to groundwater: 0-50 centimeters

FUNCTIONING

Stream Condition

Streambanks are 80% or more stable (90% stable for streams with threatened, endangered, or sensitive species [TES]) (Amendment #2, Humboldt NF LRMP). A stable stream bank shows no evidence of slumping, tension fractures, breakdown (clumps broken away), or vertical cuts and erosion (Overton et al. 1997). There are also no stream head cuts present, and soil saturation occurs at depths of 0 -50 centimeters.

Water Quality

Water quality data are compared to Nevada surface water standards (NAC 445A) that are applicable to the surface water body being monitored. In locations where there is only a narrative standard (no numerical standard) for a water quality parameter, numerical data are collected to monitor trend.

Stream temperature is within a range (20°C or less) that maintains resident aquatic species, including LCT, without stress and complies with Nevada water quality standards (Dunham 1999, Nevada Administrative Code (NAC) 445A).

Bull trout waters, Jarbidge District - If the stream is located within bull trout habitat or potential bull trout habitat, then the stream temperature must be 16°C or less. The riparian management objectives (RMO's) in Amendment #5 of the Humboldt Land and Resource Management Plan (Inland Native Fish Strategy (INFISH)) call for no measurable increase above a maximum water temperature 15°C in adult bull trout habitat. Maximum temperature is calculated by averaging the daily maximum temperatures over the warmest consecutive 7-day period.

Water pH is within the range allowable under the applicable Nevada surface water quality standard (NAC 445A).

Dissolved oxygen is within the range allowable under the applicable Nevada surface water quality standard (NAC 445A).

The concentration of fecal coliforms is within the range allowable under the applicable Nevada surface water quality standard (NAC 445A).

Turbidity value is within the range allowable under the applicable Nevada surface water quality standard (NAC 445A).

Vegetation (Group A)

At least 80% of the vegetation species present should be one or more of the following:

- **Willows:** *Salix lucida lasiandra* (Pacific willow), *Salix boothii* (Booth willow), *Salix geyeriana* (Geyer's willow), *Salix lutea* (yellow willow), *Salix exigua* (coyote willow) at low elevations, *Salix lemmonii* (Lemmon willow), *Salix scouleriana* (Scouler willow), *Salix wolfii* (Wolf willow), *Salix orestera* (Sierra willow), *Salix commutata* (undergreen willow), *Salix eastwoodiae* (mountain willow), *Salix lasiolepis* (arroyo willow), *Salix bebbiana* (Bebb willow), and *Salix drummondiana* (Drummond willow) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

- **Other shrubs/trees:** *Cornus sericea* (dogwood), *Ribes inerme* (currant), *Ribes aureum* (golden currant), *Alnus incana* (alder), *Betula occidentalis* (birch), *Prunus virginiana* (chokecherry), *Rhus trilobata* (skunkbush), *Ledum glandulosum* (Labrador tea), *Lonicera involucrata* (twinberry), *Artemisia cana* (silver sagebrush), *Chamaebatiaria millefolium* (fernbush), *Shepherdia argentea* (silver buffaloberry), *Mahonia repens* (Oregon grape), *Populus angustifolia* (narrowleaf cottonwood), *Populus balsamifera trichocarpa* (black cottonwood), *Populus fremontii* (Fremont cottonwood), and *Populus tremuloides* (aspen) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

In woody species dominated systems, the number of suckers and saplings exceeds the number of mature, decadent and dead woody plants (Winward 2000). Browsing of woody plants as seen by examining leader growth, either current year or previous year, is less than 55% of leader growth on young plants (Winward 2000).

- **Graminoids:** *Deschampsia caespitosa* (tufted hairgrass), *Calamagrostis canadensis* (bluejoint), *Calamagrostis scopulorum* (reedgrass), *Carex nebrascensis* (Nebraska sedge), *Carex microptera* (smallwing sedge), *Carex aquatalis* (water sedge), *Carex utriculata* or *Carex rostrata* (beaked sedge), *Carex scopulorum* (mountain sedge), *Carex simulata* (analogue sedge), *Carex pellita* (woolly sedge), *Carex aurea* (golden sedge), *Carex vesicaria* (blister sedge), *Carex microptera* (ballhead sedge), *Carex athrostachya* (slender beaked sedge), *Glyceria striata* (fowl mannagrass), *Glyceria grandis* (American mannagrass), *Juncus ensifolius* (swordleaf rush), *Juncus nevadensis* (Nevada rush), *Phleum alpinum* (alpine timothy), *Poa secunda* (Sandberg's bluegrass), and *Scirpus microcarpus* (bulrush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).
- **Forbs:** *Mimulus primuloides* (little yellow monkeyflower), *Mimulus guttatus* (yellow monkeyflower), *Allium validum* (swamp onion), *Dodecatheon alpinum* (alpine shooting stars), *Caltha leptosepala* (marsh marigold), *Polemonium occidentale* (Western polemonium), *Heracleum lanatum* (cow parsnip), *Angelica kingii* (King's angelica), *Ligusticum grayi* (Gray's licorice-root), *Mertensia ciliata* (tall bluebells), *Veronica americana* (speedwell), *Maianthemum stellatum* (false Solomon's seal), *Sphenosciadium capitellatum* (woollyhead parsnip), *Aconitum columbianum* (monkshood), *Saxifraga odontoloma* (brook saxifrage), *Parnassia palustris* (grass of Parnassus), *Pedicularis groenlandica* (elephantshead), *Viola* spp. (violets), *Sidalcea* spp. (checker mallow), *Polygonum bistortoides* (American bistort), and *Platanthera stricta* (slender bog orchid) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

FUNCTIONING AT RISK / INDICATORS OF MANAGEMENT PROBLEMS

Stream Condition

Streambanks are between 70-80% stable (70-90% for TES streams). A stability level of 70% is the minimum necessary to maintain streambank condition (Cowley 2002). Head cut is present, but is less than 50 centimeters in depth.

Water Quality

Stream temperatures are 20-22°C.

Bull trout waters, Jarbidge District - If the stream is located within bull trout habitat or potential bull trout habitat, then stream temperatures greater than 16°C would indicate management problems.

Water pH exceeds the range allowable under the applicable Nevada surface water quality standard (NAC 445A).

Dissolved oxygen is less than is allowable under the applicable Nevada surface water quality standard (NAC 445A).

The concentration of fecal coliforms exceeds the range allowable under the applicable Nevada surface water quality standard (NAC 445A).

Turbidity exceeds the range allowable under the applicable Nevada surface water quality standard (NAC 445A).

Riparian Vegetation (Group B)

Composition of the following species is greater than 20%:

- **Graminoids:** *Poa pratensis* (Kentucky bluegrass), *Alopecurus aequalis* (short-awn foxtail), *Alopecurus pratense* (meadow foxtail), *Hordeum brachyantherum* (meadow barley), *Hordeum jubatum* (foxtail barley), *Agrostis stolonifera* (redtop), *Agrostis exarata* (spike bentgrass), *Agrostis scabra* (rough bentgrass), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Muhlenbergia filiformis* (pull-up muhly), *Juncus balticus* (Baltic rush), *Poa palustris* (fowl bluegrass), or *Carex douglasii* (Douglas sedge), and *Eleocharis* spp. (spikerush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999, Winward 2000).
- **Forbs:** *Rumex* spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Cicuta douglasii* (water hemlock), *Thermopsis rhombifolia* (yellow pea), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Symphotrichum* spp. (aster, any species), *Veratrum californicum* (false hellebore), *Iris missouriensis* (wild iris), *Potentilla* spp. (cinquefoil, any species), *Epilobium* spp. (willow herb), *Penstemon* (any species), *Urtica dioica* (stinging nettle), *Equisetum* spp. (horsetail), *Nemophila brevifolia* (basin blue eyes), *Rorippa nasturtium-aquaticum* (watercress), *Myriophyllum verticillum* (water milfoil), *Lemna* spp. (duckweed), and *Arnica chamissonis* (arnica) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999, Winward 2000).
- **Shrubs:** *Rosa woodsii* (Wood's rose) and *Artemisia tridentata* (any subspecies big sagebrush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

The number of mature, decadent and dead woody plants exceeds the number of saplings and suckers of woody plants (Winward 2000). Browsing of woody plants as seen by examining leader growth, either current year or previous year, exceeds 55% of leader growth on young plants (Winward 2000).

Noxious Weeds: Presence of any species on the All States or Western States Noxious Weed List (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

INDICATORS THAT THRESHOLD LEVELS HAVE BEEN MET OR EXCEEDED:

Stream Condition

Streambanks are measured to be less than 70% stable. Head cuts are present and are more than 50 centimeters in depth.

Water Quality

Stream temperatures are greater than 22°C or for bull trout streams, greater than 16°C, and the limits for pH, dissolved oxygen, fecal coliform, and turbidity are the same as "Functioning at Risk."

Riparian Vegetation (Group B)

Vegetation is composed of 60% or more of the following species:

- **Graminoids:** *Poa pratensis* (Kentucky bluegrass), *Alopecurus aequalis* (short-awn foxtail), *Alopecurus pratense* (meadow foxtail), *Hordeum brachyantherum* (meadow barley), *Hordeum jubatum* (foxtail barley), *Agrostis stolonifera* (redtop), *Agrostis exarata* (spike bentgrass), *Agrostis scabra* (rough bentgrass), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Muhlenbergia filiformis* (pull-up muhly), *Juncus balticus* (Baltic rush), *Carex douglasii* (Douglas sedge), and *Eleocharis* spp. (spikerush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999, Winward 2000).
- **Forbs:** *Rumex* spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Cicuta douglasii* (water hemlock), *Thermopsis rhombifolia* (yellow pea), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Symphyotrichum* spp. (aster, any species), *Veratrum californicum* (false hellebore), *Iris missouriensis* (wild iris), *Potentilla* spp. (cinquefoil, any species), *Epilobium* spp. (willow herb), *Penstemon* (any species), *Urtica dioica* (stinging nettle), *Equisetum* spp. (horsetail), *Nemophila brevifolia* (basin blue eyes), *Rorippa nasturtium-aquaticum* (watercress), *Myriophyllum verticillum* (water milfoil), *Lemna* spp. (duckweed), and *Arnica chamissonis* (arnica) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).
- **Shrubs:** *Rosa woodsii* (Wood's rose) and *Artemisia tridentata* (any subspecies big sagebrush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

There are remnant mounds, or in some cases remnant stems of crowns indicating the presence of willows on the site at one time, but willows are no longer found or only a couple decadent willows are present (Winward 2000).

- **Noxious weeds:** Represent more than 5% of vegetative cover (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

WET MEADOW GROUP**Elevation: 5,200 - 10,000 feet****Slope: 0 - 12%****Depth to groundwater: 10 - 100 centimeters****FUNCTIONING:**

Effective rooting depths are greater than 20 centimeters (8 inches) (Howell 2003; Weixelman and others 1993a, 1999). The soil is saturated at a depth of 0-50 centimeters (0-20 inches) (Howell 2003; Weixelman and others 1993a, 1999). Soil surface is moist and cool to the touch. Vegetative composition is 80% or more perennial grasses, sedges or rushes. Forb and shrub composition is 0-20% (Howell 2003; USDA FS 2001; USDA FS 2001; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999). Bare ground does not exceed 5%, unless the meadow is within the flow area for a spring or stream system where litter can be removed by water (Howell 2003; Manning and Padgett 1995; Weixelman and others 1993a, 1999). If the meadow has free-flowing water, then the interspaces between plant basal areas should not exceed 5 centimeters (2 inches).

Graminoids: Species with up to 80% cover may include: *Deschampsia caespitosa* (tufted hairgrass), *Calamagrostis canadensis* (bluejoint), *Carex nebrascensis* (Nebraska sedge), *Carex microptera* (smallwing sedge), *Carex aquatalis* (water sedge), *Carex utriculata* or *Carex rostrata* (beaked sedge), *Carex scopulorum* (mountain sedge), *Carex simulata* (analogue sedge), and *Carex lasiocarpa* (woolly-fruit sedge) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

Other graminoid species that may occur with up to 20% cover include: *Poa secunda* (Sandberg's bluegrass), *Deschampsia* spp. (hairgrass), *Calamagrostis scopulorum* (reedgrass), *Glyceria striata* (fowl mannagrass), *Glyceria grandis* (American mannagrass), *Phleum alpinum* (alpine timothy), *Carex praegracilis* (field sedge), *Carex athrostachya* (slender beaked sedge), *Carex aurea* (golden sedge), *Juncus balticus* (Baltic rush), *Juncus ensifolius* (swordleaf rush), *Juncus nevadensis* (Nevada rush), and *Scirpus microcarpus* (bulrush). *Note: In a moist, but not wet, meadow types, many of the graminoid species listed above could dominate the site and indicate desirable function.* (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999, Winward 2000).

Forbs: Forb species that occur at up to 3% vegetative cover include *Mimulus primuloides* (little yellow monkeyflower), *Dodecatheon alpinum* (alpine shooting stars), *Caltha leptosepala* (marsh marigold), *Stellaria longipes* (longstalk starwort), *Pedicularis groenlandica* (elephants head), *Viola* spp. (violets), *Sidalcea* spp. (checker mallow), *Polygonum bistortoides* (American bistort) and *Equisetum* spp. (horsetail). *Salix* spp. (Willows) may be present where water is flowing or in wet depressions (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

FUNCTIONING AT RISK/INDICATORS OF MANAGEMENT PROBLEMS:

Effective rooting depths are less than 20 centimeters (8 inches) (Howell 2003; Weixelman and others 1993a, 1999). Soil surface may be dry and warm to the touch. Platy or subangular blocky soil structure occurs in the top 30 centimeters of soil. Other indicators include presence of hummocks, patches of bare ground greater than 5 square centimeters (2 inches) in size and/or total average bare ground greater than 5%, and channel incision or bare, steep banks along stream/spring channel (Cosgrove and others 2001; Howell 2003; Manning and Padgett 1995; USDA FS 1989; USDA NRCS 2001; Weixelman and others 1993a, 1999).

Vegetative cover is 20% or more forbs and/or non-willow shrubs (Howell 2003; USDA FS 2001; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999), plus more than 20% cover of *Juncus balticus* (Baltic rush).

Graminoids: More than 5% cover of any of the following graminoids: *Poa pratensis* (Kentucky bluegrass), *Alopecurus aequalis* (short-awn foxtail), *Alopecurus pratense* (meadow foxtail), *Hordeum brachyantherum* (meadow barley), *Hordeum jubatum* (foxtail barley), *Agrostis stolonifera* (redtop), *Agrostis exarata* (spike bentgrass), *Agrostis scabra* (rough bentgrass), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Muhlenbergia filiformis* (pull-up muhly), *Poa palustris* (fowl bluegrass), *Carex douglasii* (Douglas sedge), and *Eleocharis* spp. (spikerush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

Forbs or Shrubs: More than 2% cover of any of the following forbs or shrubs: *Rumex* spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Cicuta douglasii* (water hemlock), *Thermopsis rhombifolia* (yellow pea), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Symphyotrichum* spp. (aster, any species), *Veratrum californicum* (false hellebore), *Iris missouriensis* (wild iris), *Potentilla* spp. (cinquefoil, any species), *Epilobium* spp. (willow herb), *Penstemon* (any species), *Urtica dioica* (stinging nettle), *Equisetum* spp. (horsetail), *Nemophila brevifolia* (basin blue eyes), *Rosa woodsii* (Wood's rose), and *Artemisia tridentata* (any subspecies big sagebrush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

Noxious Weeds: Presence of any species on the All States or Western States Noxious Weed List (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

INDICATORS THAT THRESHOLD LEVELS HAVE BEEN MET OR EXCEEDED:

Effective rooting depths are less than 15 centimeters (6 inches) (Howell 2003; Weixelman and others 1993a, 1999). Platy, subangular blocky or hard, massive soil structure beginning within the upper 30 centimeters of the soil horizon (Cosgrove and others 2001; USDA FS 1989; USDA NRCS 2001). Soil surface horizons are light in color due to loss of topsoil and organic matter. Surface likely to be warm and dry to the touch. Incision of the stream channel or extensive hummocking has occurred resulting in drying of the meadow as seen by vegetation changes and remnant mottles or gleying in the soil profile (Cosgrove and others 2001; USDA NRCS 2001). Bare ground is greater than 10% of ground cover (Howell 2003; Manning and Padgett 1995; Weixelman and others 1993a, 1999; Winward 2000).

Graminoids: Vegetative cover is 25% or more individually, or 40% total: *Juncus balticus* (Baltic rush), *Alopecurus aequalis* (short-awn foxtail), *Agrostis* spp. (redtop or bentgrass), *Poa pratensis* (Kentucky bluegrass), *Hordeum brachyantherum* (meadow barley), *Bromus inermis* (smooth brome). Vegetative cover is greater than 10% *Eleocharis* spp. (spike rush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

Forbs or Shrubs: More than 5% cover of any of the following forbs or shrubs: *Rumex* spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Cicuta douglasii* (water hemlock), *Thermopsis rhombifolia* (yellow pea), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Symphyotrichum* spp. (aster, any species),



Veratrum californicum (false hellebore), *Iris missouriensis* (wild iris), *Potentilla* spp. (cinquefoil, any species), *Epilobium* spp. (willow herb), *Penstemon* (any species), *Urtica dioica* (stinging nettle), *Equisetum* spp. (horsetail), *Nemophila brevifolia* (basin blue eyes), *Rosa woodsii* (Wood's rose), and *Artemisia tridentata* (any subspecies big sagebrush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999; Winward 2000).

Noxious Weeds: Noxious weeds represent more than 5% of vegetative cover (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

DRY-TO-MOIST MEADOW GROUP**Elevation: 5,200 - 10,500 feet****Slope: 1 - 10%****Depth to ground water: 55 - 100 centimeters for moist meadow, 100+ centimeters. for dry meadow****FUNCTIONING:**

Effective rooting depths are greater than 10 centimeters (4 inches) (Howell 2003; Weixelman and others 1993a, 1999). Soil structure is granular to 30 centimeters (12 inches) depth (Howell 2003; Weixelman and others 1993a, 1999). Vegetative composition is 75% or more perennial grasses, sedges or rushes (Howell 2003; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999). Forb and shrub composition is 0-25% (Howell 2003; USDA FS 2001; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999). Bare ground does not exceed 5% (Howell 2003; Manning and Padgett 1995; Weixelman and others 1993a, 1999).

Graminoids: Species that dominate with up to 70% cover may include: *Poa secunda* (Sandberg's bluegrass), *Elymus trachycaulus* (Slender wheatgrass), *Leymus cinereus* (Great Basin wildrye), *Deschampsia caespitosa* (tufted hairgrass), *Danthonia* spp. (oatgrass, any species), *Carex exserta* (shorthair sedge), and *Carex douglasii* (Douglas sedge) (Howell 2003; Manning and Padgett 1995; USDA FS 2001; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999). *Note: Douglas sedge may dominate a dry site in functioning condition, but also tends to indicate a drying trend in a moist meadow.*

Species that may also be included, but not dominate at up to 30% cover include: *Bromus carinatus* (Mountain brome), *Muhlenbergia richardsonis* (mat muhly), *Achnatherum nelsonii* (Columbia needlegrass), *Achnatherum lettermanii* (Letterman's needlegrass), *Phleum alpinum* (alpine timothy), *Poa palustris* (fowl bluegrass), *Carex athrostachya* (slender beaked sedge), *Carex praegracilis* (field sedge), *Juncus balticus* (Baltic rush), and *Juncus ensifolius* (swordleaf rush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

FUNCTIONING AT RISK/INDICATORS OF MANAGEMENT PROBLEMS:

Effective rooting depths are less than 10 centimeters (4 inches) (Howell 2003; Weixelman and others 1993a, 1999). Subangular blocky or platy soil structure is present in the top 30 centimeters of the soil horizon and/or a pointed probe pushed in the ground meets with strong resistance (Cosgrove and others 2001; USDA FS 1989; USDA NRCS 2001). Soil surface contains hummocks, patches of bare ground greater than 5 square centimeters (2 inches) in size and/or bare ground greater than 5% (Cosgrove and others 2001; Howell 2003; Manning and Padgett 1995; USDA FS 1989; USDA NRCS 2001; Weixelman and others 1993a, 1999). Another indicator is a stream/spring channel with incised or bare, steep banks along stream/spring channel (Cosgrove and others 2001; USDA FS 2001; USDA NRCS 2001).

Vegetative cover that is 40% or more annual grasses, forbs and/or shrubs (Howell 2003; Manning and Padgett 1995; USDA FS 2001; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Graminoids: More than 3% cover of any of the following grasses: *Poa pratensis* (Kentucky bluegrass), *Hordeum brachyantherum* (meadow foxtail), *Hordeum jubatum* (foxtail barley) *Agrostis stolonifera* (redtop), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), and *Poa bulbosa* (bulbous bluegrass) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Forbs or Shrubs: More than 3% but less than 40% cover of any of the following forbs or shrubs: *Ceratocephala testiculata* (Bur buttercup), *Cirsium* spp. (thistle, any species), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Symphotrichum* spp. (aster, any species), *Wyethia* spp.

(mulesears, any species), *Iris missouriensis* (wild iris), *Potentilla* spp. (cinquefoil, any species), *Chrysothamnus viscidiflorus* (Green rabbitbrush), *Rosa woodsii* (Wood's rose), and *Artemisia tridentata* (any subspecies big sagebrush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Presence of any species on the All States or Western States Noxious Weed List (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

INDICATORS THAT THRESHOLD LEVELS HAVE BEEN MET OR EXCEEDED:

Effective rooting depths are less than 5 centimeters (2 inches) (Howell 2003; Weixelman and others 1993a, 1999). Platy, subangular blocky or hard, massive soil structure beginning within the upper 10 centimeters of the soil horizon where a pointed probe pushed into the ground meets with strong resistance (Cosgrove and others 2001; USDA FS 1989; USDA NRCS 2001). Stream channel incision or extensive hummocking has occurred resulting in drying of the meadow as seen by vegetation changes and remnant mottles or gleying in the soil profile (Cosgrove and others 2001; USDA FS 2001; USDA NRCS 2001). Bare ground exceeds 10% of basal ground cover (Howell 2003; Manning and Padgett 1995; Weixelman and others 1993a, 1999).

Vegetative cover that is 60% or more annual grasses, annual or perennial forbs and/or shrubs (Howell 2003; Manning and Padgett 1995; USDA FS 2001; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Graminoids: Conversion of the meadow cover toward a dominance of any of the following grasses or grasslike plants: *Poa pratensis* (Kentucky bluegrass), *Hordeum brachyantherum* (meadow foxtail), *Hordeum jubatum* (foxtail barley), *Agrostis stolonifera* (redtop), *Juncus balticus* (baltic rush), and *Carex douglasii* (Douglas sedge) in moist meadows (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Forbs or Shrubs: More than 20% cover of any of the following forbs or shrubs: *Ceratocephala testiculata* (Bur buttercup), *Cirsium* spp. (thistle, any species), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Symphotrichum* spp. (aster, any species), *Potentilla* spp. (cinquefoil, any species), *Rumex* spp. (sorrel or dock), *Penstemon* (any species), *Urtica dioica* (stinging nettle), *Equisetum* spp. (horsetail), *Nemophila brevifolia* (basin blue eyes), and *Artemisia tridentata* (any subspecies big sagebrush) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

More than 40% of the following species: *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Wyethia* spp. (mulesears, any species), *Iris missouriensis* (wild iris), *Chrysothamnus viscidiflorus* (green rabbitbrush), and *Rosa woodsii* (w=ild rose) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Noxious Weeds: Noxious weeds represent more than 5% of vegetative cover (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

COTTONWOOD GROUP**Elevation: 5,000 – 7,600 feet****Slope: 2 - 15%****Depth to groundwater: Generally >100 centimeters, often variable****FUNCTIONING:**

Effective rooting depths are greater than 15 centimeters (6 inches) (Howell 2003; Weixelman and others 1993a). Bare ground does not exceed 2% of soil surface cover (Howell 2003; Johnson and Elsbernd 1997; Weixelman and others 1993a). Soil surface horizon is dark and cool to the touch. A pointed probe pushed in the ground meets with little resistance indicating a good capacity for infiltration and root growth in the top 20 centimeters (8 inches) of the soil horizon (Cosgrove and others 2001; USDA FS 1989; USDA NRCS 2001). Soil may contain gravelly or stony layers indicating past depositional flood events. No exposed roots are visible on the soil surface (Pellant and others 2000; USDA NRCS 2001).

Vegetative composition is 20-70% overstory cover of trees (Hamilton 1992; Howell 2003; Manning and Padgett 1995; Szaro 1989; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a). Understory composition is 20-50% shrubs, 20 - 50% graminoids and 10 - 20% forbs (Boggs 1992; Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a). Cottonwood suckers and saplings, less than 150 centimeters (60 inches) tall average 5 - 10% of understory cover in a mature stand and 20-70% understory cover in a recently disturbed (by fire or flood) stand (Howell 2003, USDA NRCS 1991a,b, 1987-1999, 2003a,b;).

Graminoids: Graminoid species with 0 - 20% understory cover may include: *Elymus glaucus* (blue wildrye), *Leymus cinereus* (basin wildrye), *Elymus trachycaulus* (slender wheatgrass), *Leymus triticoides* (beardless wildrye), *Elymus lanceolatus* (streambank wheatgrass), *Bromus carinatus* (mountain brome), and *Poa secunda juncifolia* (Sandberg's bluegrass). Graminoid species with 0 - 5% understory cover may include: *Poa fendleriana* (muttongrass), *Poa cusickii* (Cusick's bluegrass), *Agrostis pallens* (shore bentgrass), *Koeleria macrantha* (Junegrass), *Calamagrostis canadensis* (bluejoint), *Melica spectabilis* (purple oniongrass), *Carex microptera* (smallwing sedge), *Carex vesicaria* (blister sedge), *Scirpus micocarpus* (bulrush), and *Carex praegracilis* (field sedge) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a).

Forbs: Forb species with 0 - 10% understory cover may include: *Thalictrum* spp. (meadowrue), *Aquilegia formosa* (columbine), *Aconitum columbianum* (monkshood), *Maianthemum stellatum* (False Solomon's seal), *Osmorhiza berteroi* (sweet anise), *Geranium richardsonii* or *Geranium viscosissimum* (wild geranium), *Paeonia brownii* (wild peony), *Viola palustris* (marsh violet), *Epilobium angustifolium* (fireweed), and *Clematis ligusticifolia* (western white clematis). Forb species present in the understory from 0 - 2% cover may include: *Galium boreale* (bedstraw), *Lupinus caudatus* (tailcup lupine), *Lupinus argenteus* (silver lupine), or *Lupinus leucophyllus* (velvet lupine), *Senecio* spp. (groundsel), *Allium* spp. (wild onion), *Achillea millefolium* (yarrow), *Cicuta douglasii* (water hemlock), and *Solidago canadensis* (goldenrod). Annual forbs are less than 2% total of the understory cover (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a).

Shrub: Shrub species with 0 - 50% understory cover may include: *Amalanchier alnifolia* (serviceberry), *Ribes* species (currant or gooseberry), *Prunus virginiana* (chokecherry), *Alnus incana* (alder), *Betula occidentalis* (birch), *Salix* species (willow), *Cornus sericea* (dogwood), and *Rhus trilobata* (skunkbush sumac). Shrub species with 0-10% understory cover include: *Artemisia tridentata tridentata* (basin big sagebrush), *Artemisia tridentata vaseyana* (mountain big sagebrush), *Symphoricarpos oreophilus* (snowberry), *Rosa woodsii ultramontana* (Wood's rose), and *Mahonia repens* (Oregon grape) (Boggs 1992; Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a).

FUNCTIONING AT RISK/INDICATORS OF MANAGEMENT PROBLEMS:

Effective rooting depths are less than 15 centimeters (6 inches) (Howell 2003; Weixelman and others 1993a). Exposed sections of the soil surface may be dry, crusted and warm to the touch. A pointed probe pushed in the ground meets with resistance indicating evidence of compaction in the top 20 centimeters of the soil horizon (Cosgrove and others 2001; USDA FS 1989; USDA NRCS 2000). Soil surface may have presence of exposed roots and patches of bare ground over more than 5% of the surface (Howell 2003; Johnson and Elsbernd 1997; Weixelman and others 1993a). Channel incision has occurred or bare, steep banks exist along the stream channel (Cosgrove and others 2001; USDA FS 2001; USDA NRCS 2001).

Overstory cover of cottonwood less is than 20% (Hamilton 1992; Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a;). Understory composition is less than 20% shrubs, less than 20% graminoids, and/or less than 10% forbs (Boggs 1992; Howell 2003, Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a). Cottonwood suckers and saplings, smaller than 150 centimeters (60 inches), average less than 5% of understory cover (Howell 2003; USDA NRCS 1991a,b, 1987-1999, 2003a,b). Cottonwood suckers show low, multi-branched growth form indicative of frequent clipping and/or removal of bark through rubbing or foraging animals. The number of diseased trees in the stand is greater than 30%. Cottonwood stand situated a Forest boundary fence in an area were livestock congregate.

Graminoids: Understory cover of 5-25% any of the following graminoids: *Poa pratensis* (Kentucky bluegrass), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), and *Carex douglasii* (Douglas sedge) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a).

Forbs: More than 2% understory cover of any of the following forbs: *Rumex* spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Descurainia pinnata* (tansy mustard), *Artemisia ludoviciana* (herbaceous sage), *Symphotrichum* spp. (aster, any species), *Urtica dioica* (stinging nettle), *Chorispora tenella* (cross flower), *Thlaspi arvense* (pennycress), *Potentilla* spp. (cinquefoil, any species), *Tragopogon dubius* (yellow salsify), *Hackelia floribunda* (stickseed or forget-me-not), and *Nemophila pedunculata* (littlefoot nemophila). (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a;)

Shrubs: Understory cover of 5 - 30% of the following shrubs: *Rosa woodsii* (Wood's rose), *Chrysothamnus vicidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), and *Artemisia tridentata* (any subspecies big sagebrush) (Boggs 1992; Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a).

Presence of any species on the All States or Western States Noxious Weed List (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

INDICATORS THAT THRESHOLD LEVELS HAVE BEEN MET OR EXCEEDED:

Effective rooting depths are less than 10 centimeters (4 inches) (Howell 2003; Weixelman and others 1993a). A pointed probe pushed in the ground meets with strong resistance indicating evidence of compaction in the top 30 centimeters of the soil horizon (Cosgrove and others 2001; USDA FS 1989; USDA NRCS 2001). Soil surface horizons are light in color due to loss of topsoil and organic matter. Exposed roots are visible on soil surface (Pellant and others 2000; USDA NRCS 2001). Channel incision or bare, steep banks along stream/spring channel are evident (Cosgrove and others 2001; USDA FS 2001; U SDA NRCS 2001). Bare ground exceeds 20% of surface composition (Howell 2003; Johnson and Elsbernd 1997; Weixelman and others 1993a).

Graminoids, Forbs, and Shrubs: Overstory cover of cottonwoods is less than 10% (Hamilton 1992; Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a). Understory composition is less than 5% shrubs, less than 5% perennial graminoids, and/or less than 5% perennial forbs (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a). Annual plant composition is greater than 50% understory cover (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a). Cottonwood suckers and saplings, less than 150 centimeters (60 inches) tall are absent from the stand. More than 50% of trees are diseased. Remnant cottonwood stand is less than one acre in size.

Vegetative cover is 25% or more individually or 40% total: *Rumex* spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Taraxacum officinale* (dandelion), *Achillea millefolium* (yarrow), *Descurainia pinnata* (tansy mustard), *Artemisia ludoviciana* (herbaceous sage), *Symphotrichum* spp. (aster, any species), *Urtica dioica* (stinging nettle), *Chorispura tenella* (cross flower), *Thlaspi arvense* (pennycress), *Potentilla* spp. (cinquefoil, any species), *Tragopogon dubius* (yellow salsify), *Hackelia floribunda* (stickseed or forget-me-not), *Nemophila pedunculata* (littlefoot nemophila), *Bromus inermis* (smooth brome), *Poa pratensis* (Kentucky bluegrass), *Arhenatherum elatius* (tall oatgrass), *Bromus tectorum* (cheatgrass), and *Poa bulbosa* (bulbous bluegrass) (Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a).

Vegetative cover is greater than 30%: *Rosa woodsii* (Wood's rose), *Chrysothamnus vicidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), or *Artemisia tridentata* (any subspecies big sagebrush) (Boggs 1992; Howell 2003; Manning and Padgett 1995; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a).

Noxious Weeds: Noxious weeds represent more than 5% of vegetative cover (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

ASPEN GROUP**Elevation: 6,100 – 9,000 feet****Slope: 2 - 40%****Depth to groundwater: generally >100 centimeters****FUNCTIONING:**

Effective rooting depths are greater than 20 centimeters (8 inches) (Howell 2003; Weixelman and others 1993a, 1999). The soil is saturated at a depth of 70 -100+ centimeters (27 - 39 inches) on riparian sites (Howell 2003; Weixelman and others 1993a, 1999). Bare ground does not exceed 5% of soil surface cover (Howell 2003; Johnson and Elsbernd 1997; Weixelman and others 1993a, 1999). Soil surface horizon is dark and cool to the touch. A pointed probe pushed in the ground meets with little resistance indicating a good capacity for infiltration and root growth in the top 30 centimeters of the soil horizon (Cosgrove and others 2001; USDA FS 1989; USDA NRCS 2001). Exposed roots are not readily visible on the soil surface (Pellant and others 2000; USDA NRCS 2001).

Vegetative composition is 20 - 50% overstory cover of trees (Amundson and others 2000; Campbell 2000; Hamilton 1992; Howell 2003; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999). Understory composition is 20 - 60% shrubs, 10 - 40% graminoids, and 20 - 60% forbs (Howell 2003; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999). Aspen suckers and saplings, less than 150 centimeters (60 inches) tall average, more than 500 per acre (Mueggler 1988). Aspen trees average 500+ per acre (Mueggler 1988). Watershed or landscape composition of age classes within the aspen types is 40% grasses, forbs, aspen suckers and saplings; 30% young, mid-aged and mature forest; and 30% old forest (Campbell 2000; Mueggler 1988).

Graminoids: Graminoid species with up to 20% understory cover may include: *Elymus trachycaulus* (slender wheatgrass), *Elymus glaucus* (blue wildrye), *Elymus lanceolatus* (streambank wheatgrass), *Bromus carinatus* (mountain brome), *Glyceria striata* (fowl mannagrass), *Calamagrostis canadensis* (bluejoint), *Melica spectabilis* (purple oniongrass), *Poa wheeleri* (Wheeler bluegrass), *Deschampsia elongata* (slender hairgrass), *Carex microptera* (smallwing sedge), *Carex rossii* (Ross' sedge), *Carex pellita* (woolly sedge), and *Juncus ensifolius* (swordleaf rush) (Howell 2003; Houston 1954; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Forbs: Forb species with up to 10% understory cover may include: *Thalictrum* spp. (meadowrue), *Aquilegia formosa* (columbine), *Aconitum columbianum* (monkshood), *Maianthemum stellatum* (False Solomon's seal), *Osmorhiza occidentalis* (sweet anise), *Mertensia oblongifolia* (mountain bluebells), *Hackelia floribunda* (stickseed or forget-me-not), *Geranium* spp. (wild geranium), *Achillea millefolium* (yarrow), *Delphinium* spp. (larkspur), *Galium* spp. (bedstraw), *Lupinus argenteus* (silver lupine), *Rudbeckia occidentalis* (coneflower), *Valeriana* spp. (valerian), *Sidalcea oregana* (checker mallow), *Ligusticum grayi* (licorice root), *Senecio* spp. (groundsel), *Actea rubra* (baneberry), and *Agastache urticifolia* (horsemint). Annual forbs are less than 2% of the understory cover (Howell 2003; Houston 1954; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Shrubs: Shrub species with up to 50% understory cover may include: *Symphoricarpos oreophilus* (snowberry), *Amalanchier alnifolia* (serviceberry), *Ribes* species (currant or gooseberry), *Prunus virginiana* (chokecherry), *Alnus incana* (alder), *Betula occidentalis* (birch), *Salix* species (willow), *Cornus sericea* (dogwood), *Rubus parviflora* (thimbleberry), *Mahonia repens* (Oregon grape), and *Acer glabrum* (vine maple) (Hamilton 1992; Howell 2003; Houston 1954; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

FUNCTIONING AT RISK/INDICATORS OF MANAGEMENT PROBLEMS:

Effective rooting depths are less than 20 centimeters (8 inches) (Howell 2003; Weixelman and others 1993a, 1999). Exposed sections of the soil surface may be dry, crusted, and warm to the touch. A pointed probe pushed in the ground meets with resistance indicating evidence of compaction in the top 30 centimeters of the soil horizon (Cosgrove and others 2001; USDA FS 1989; USDA NRCS 2001). Soil surface has presence of exposed roots and/or patches of bare ground over more than 5% of the surface (Howell 2003; Johnson and Elsbernd 1997; Weixelman and others 1993a, 1999). Other indicators include presence of stream incision or bare, steep banks along stream/spring channel (Cosgrove and others 2001; USDA FS 2001; USDA NRCS 2001).

Overstory cover of aspen is less than 20% (Campbell 2000; Hamilton 1992; Howell 2003; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999). Understory composition is less than 20% shrubs, less than 10% graminoids, and/or less than 20% forbs (Hamilton 1992; Howell 2003; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999). Aspen suckers and saplings, less than 150 centimeters (60 inches) tall average less than 500 per acre (Mueggler 1988). Aspen suckers show low, multi-branched growth form indicative of frequent clipping and/or removal of bark through rubbing or foraging animals (Kay 2001, 2002). Aspen trees average less than 500 per acre (Mueggler 1988). The number of diseased trees in the stand is greater than 30% (Amundson and others 2000).

Graminoids: More than 5% understory cover of any of the following graminoids: *Poa pratensis* (Kentucky bluegrass), *Agrostis stolonifera* (redtop), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), *Poa palustris* (fowl bluegrass), and *Eleocharis* spp. (spikerush) (Howell 2003; Houston 1954; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Forbs: More than 2% cover of any of the following forbs: *Rumex* spp. (sorrel or dock), *Cirsium* spp. (thistle, any species), *Cicuta douglasii* (water hemlock), *Taraxacum officinale* (dandelion), *Symphotrichum* spp. (aster, any species), *Veratrum californicum* (false hellebore), *Urtica dioica* (stinging nettle), *Wyethia amplexicaulis* (mules ears), *Potentilla* spp. (cinquefoil, any species), *Equisetum* spp. (horsetail), *Descurainia pinnata* (Western tansymustard), and *Nemophila brevifolia* (basin blue eyes) (Howell 2003; Houston 1954; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Shrubs: More than 5% cover of the following shrubs: *Rosa woodsii* (Wood's rose) and *Artemisia tridentata* (any subspecies big sagebrush) (Campbell 2000; Howell 2003; Houston 1954; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Noxious Weeds: Presence of any species on the All States or Western States Noxious Weed List (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

INDICATORS THAT THRESHOLD LEVELS HAVE BEEN MET OR EXCEEDED:

Effective rooting depths are less than 10 centimeters (4 inches) (Howell 2003; Weixelman and others 1993a, 1999). A pointed probe pushed in the ground meets with strong resistance indicating evidence of compaction in the top 30 centimeters of the soil horizon (Cosgrove and others 2001; USDA FS 1989; USDA NRCS 2001). Soil surface horizons are light in color due to loss of topsoil and organic matter. Exposed roots are visible on soil surface (Pellant and others 2000; USDA NRCS 2001). Stream incision or bare, steep banks along stream/spring channel are evident. Bare ground exceeds 30% of surface composition (Howell 2003; Johnson and Elsbernd 1997; Weixelman and others 1993a, 1999).

Overstory cover of aspen is less than 10% (Campbell 2000; Howell 2003; Weixelman and others 1993a, 1999; USDA FS 1989; USDA NRCS 2001). Understory composition is less than 5% shrubs, less than 5% perennial graminoids, and/or less than 10% perennial forbs (Hamilton 1992; Howell 2003; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a,

1999;). Aspen suckers and saplings, less than 150 centimeters (60 inches) tall average less than 100 per acre (Mueggler 1988). More than 80% of aspen suckers have an irregular growth form indicative of frequent clipping, and more than 80% of trees have exposed cambium layers where bark has been removed (Kay 2001, 2002). Remnant aspen stand less than one acre in size or consisting of fewer than 50 trees per acre. More than 50% of trees are diseased (Amundson and others 2000).

Graminoids, Forbs, and Shrubs: Vegetative cover is 25% or more individually or 40% total: *Veratrum californicum* (false hellebore), *Urtica dioica* (stinging nettle), *Wyethia amplexicaulis* (mules ears), *Equisetum* spp. (horsetail), *Bromus inermis* (smooth brome), *Poa pratensis* (Kentucky bluegrass), *Agrostis stolonifera* (redtop), *Arhenatherum elatius* (tall oatgrass), *Bromus inermis* (smooth brome), *Bromus tectorum* (cheatgrass), and *Poa bulbosa* (bulbous bluegrass) (Howell 2003; Houston 1954; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Vegetative cover is greater than 30% *Rosa woodsii* (Wood's rose) or *Artemisia tridentata* (any subspecies big sagebrush) (Campbell 2000; Howell 2003; Houston 1954; Manning and Padgett 1995; Mueggler 1988; USDA NRCS 1991a,b, 1987-1999, 2003a,b; Weixelman and others 1993a, 1999).

Noxious Weeds: Noxious weeds represent more than 5% of vegetative cover (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

WYOMING BIG SAGEBRUSH GROUP**Elevation: 4,500 – 6,800 feet****Slope: 0 - 45%****Precipitation: 6 - 13 inches****FUNCTIONING:**

No recent formation of rills is evident and old rills have blunted or muted features (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). No active pedestalling with build-up of soil or litter is apparent around perennial plants or rocks (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Deposition of erosion pavement is limited to natural drainages in amounts less than 5% of ground cover (Nelson and Jensen 1987). Terracing of hill slopes is limited to one or two livestock or wildlife trails. Bare ground is less than 20% (Goodrich; Johnson and Elsbernd 1997; Nelson and Jensen 1987). Soil surface has loose to granular structure and is stabilized by organic matter decomposition and/or biological crust (USDA FS 1989; USDA NRCS 2001; USDI BLM 2002).

Graminoids are present at a rate of 20 - 50% canopy cover. The shrub layer is 10 - 30% canopy cover. Forbs occur at a rate of 5 - 15% cover. Fire frequency is 40 - 100+ years (Goodrich; Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002). Fire frequency is 20 - 60 years (Goodrich; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Graminoids: Graminoid species that may occur up to 50% cover include: *Leymus cinereus* (Great Basin wildrye), *Achnatherum hymenoides* (Indian ricegrass), *Achnatherum thurberianum* (Thurber's needlegrass), *Hesperostipa comata* (needle-and-thread), *Carex exserta* (shorthair sedge), *Psuedoroegneria spicata* (bluebunch wheatgrass), *Elymus elymoides* (squirreltail), and *Poa secunda* (Sandberg bluegrass). Graminoid species indicating desired function that may be present in smaller amounts include: *Pascopyron smithii* (western wheatgrass), *Koeleria macrantha* (Junegrass), *Pleuraphis jamesii* (galleta), and *Festuca idahoensis* (Idaho fescue) (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Forbs: Common forb species occurring in desired condition include: *Sphaeralcea coccinea* (scarlet globemallow), *Phlox hoodii* (Hood's phlox), *Phlox longifolia* (longleaf phlox), *Opuntia polyacantha* (pricklypear), *Chaenactis douglasii* (pincushion), *Erigeron* spp. (fleabane/daisy), *Lupinus* spp. (lupine), *Astragalus* spp. (milkvetch or locoweed), *Lomatium* spp. (biscuitroot), *Stanleya pinnata* (Prince's plume), *Calochortus* spp. (mariposa and sego lily), *Castilleja* spp. (Indian paintbrush), *Ranunculus glaberrimus* (sagebrush buttercup), *Packera* and *Senecio* spp. (groundsel), *Delphinium* spp. (larkspur), and *Stenotus acaulis* (goldenweed) (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Shrubs: *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) is the dominant shrub with a canopy cover of 10-30%. Overstory shrubs that may occur in the stand with a cover of up to 5% are: *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), *Atriplex canescens* (four-wing saltbush), *Grayia spinosa* (spiny hopsage), *Krascheninnikovia lanata* (winterfat), *Atriplex confertifolia* (shadscale), *Eriogonum* spp. (shrubby buckwheat), and *Tetrademyia canescens* (gray horsebrush) (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).



FUNCTIONING AT RISK/INDICATORS OF MANAGEMENT PROBLEMS:

Active rill formation is evident in exposed areas (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Recent pedestalling and build-up of soil and/or litter is evident around plants and rocks (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Terracing of hill slopes is present more than five layers of terraces along hill slopes. Erosion pavement is found in plant interspaces, outside of natural flow patterns in amounts greater than 5% of ground cover (Nelson and Jensen 1987). Bare ground is greater than 30% (Goodrich; Johnson and Elsbernd 1997; Nelson and Jensen 1987). Soil surface is loose, lacks structure or is hard and crusted. Organic matter and/or biological crusts are lacking (USDA FS 1989; USDA NRCS 2001; USDI BLM 2002).

Graminoids are present at a rate of less than 20% cover. Annual grasses or forbs are greater than 5% canopy cover. Shrub cover is less than 10% or greater than 40% (Goodrich; Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002). Fire frequency is 10 - 20 years (Goodrich; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Graminoids: *Agropyron cristatum* (crested wheatgrass), *Agropyron fragile* (Siberian wheatgrass), *Agropyron desertorum* (desert wheatgrass), or other seeded, non-native species are more than 30% of the total canopy cover. *Bromus tectorum* (cheatgrass), *Bromus rubens* (red brome), or other annual grasses are greater than 5% of the total canopy cover (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Forbs and Shrubs: *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) has a canopy cover of less than 10%. *Eriogonum* spp. (buckwheats) are less than 1% of canopy cover. *Chrysothamnus viscidiflorus* (yellow rabbitbrush) are more than 5% of the total canopy cover. *Leptodactylon pungens* (prickly phlox) or annual forbs such as *Descurainia* spp. (tansymustard), *Halogeton glomeratus* (halogeton), and *Salsola tragus* (Russian thistle) exceed 1% of canopy cover (Allen and Knight 1984; Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

INDICATORS THAT THRESHOLD LEVELS HAVE BEEN MET OR EXCEEDED:

Rill formation is severe and well-defined (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Many rocks and plants are pedestalled and exposed plant roots are common (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Terracing is evident and extensive, with terraces less than five feet apart on hill slopes. Erosion pavement is apparent throughout the soil surface in amounts exceeding 20% of the ground cover (Nelson and Jensen 1987). Organic matter and/or biological crusts are absent (USDA FS 1989; USDA NRCS 2001; USDI BLM 2002). Bare ground exceeds 50% of ground cover (Goodrich; Johnson and Elsbernd 1997; Nelson and Jensen 1987).

Graminoids: *Bromus tectorum* (cheatgrass) and *Bromus rubens* (red brome) are greater than 30% of the canopy cover. *Agropyron cristatum* (crested wheatgrass), *Agropyron fragile* (Siberian wheatgrass), *Agropyron desertorum* (desert wheatgrass), or other seeded, non-native species are more than 50% of the canopy cover (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Forbs: *Leptodactylon pungens* (prickly phlox) or annual forbs such as *Descurainia* spp. (tansymustard), *Halogeton glomeratus* (halogeton), and *Salsola tragus* (Russian thistle) exceed 5% of canopy cover (Allen and Knight 1984; Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Shrubs: *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) cover is less than 5% or non-existent (Goodrich; Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002). *Eriogonum* spp. (buckwheats) are less than 1% of canopy cover or absent. *Chrysothamnus viscidiflorus* (yellow rabbitbrush) are more than 30% of the canopy cover. Fire frequency is

less than 10 years or exceeds 120 years (Goodrich; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Noxious Weeds: Noxious weeds represent more than 5% of vegetative cover (USDA APHIS 2002; USDA ARS 1998; Glover 2003).



MOUNTAIN BIG SAGEBRUSH GROUP

Elevation: 6,000 - 10,000 feet

Slope: 2 - 50%

Precipitation: 10 - 25 inches

FUNCTIONING:

No recent formation of rills is evident and old rills, if present, have blunted or muted features (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). No active pedestalling with build-up of soil or litter is apparent around perennial plants or rocks (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Deposition of erosion pavement is limited to natural drainages in amounts from less than 10% of ground cover (Nelson and Jensen 1987). Terracing of hill slopes is limited to one or two visible livestock or wildlife trails. Bare ground is less than 20% (Goodrich; Johnson and Elsbernd 1997; Nelson and Jensen 1987). Soil surface has loose to granular structure and is stabilized by organic matter decomposition and/or biological crust (USDA FS 1989; USDA NRCS 2001; USDI BLM 2002).

Graminoids are present at a rate of 15 - 65% canopy cover; the shrub layer is 10 - 25% canopy cover; and forbs occur at a rate of 5 - 75% of cover (Goodrich; Linne 1978; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994). Fire frequency is 10 - 40 years (Goodrich; Reid and others 2002; Tart 2003; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Graminoids: Graminoid species that can occur up to 65% cover include: *Leymus cinereus* (basin wildrye), *Festuca idahoensis* (Idaho fescue), *Psuedoroegneria spicata* (bluebunch wheatgrass), *Elymus trachycaulus* (slender wheatgrass), *Achnatherum thurberianum* (Thuber's needlegrass), *Achnatherum occidentale* (western needlegrass), *Achnatherum lettermanii* (Letterman's needlegrass), *Achnatherum nelsonii* (Columbia needlegrass), *Achnatherum nevadense* (Nevada needlegrass), *Achnatherum pinetorum* (pine needlegrass), *Carex exserta* (shortawn sedge), *Elymus elymoides* (squirreltail), *Poa secunda* (Sandberg's bluegrass), *Poa fendleriana* (muttongrass), *Leucopoa kingii* (spike fescue), and *Bromus carinatus* (mountain brome) (Linne 1978; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994).

Graminoid species that may be present in smaller amounts indicating desired function include: *Pascopyron smithii* (Western wheatgrass), *Koeleria macrantha* (Junegrass), *Hesperostipa comata* (needle-and-thread grass), *Melica bulbosa* (oniongrass), *Melica spectabilis* (purple oniongrass), and *Achnatherum hymenoides* (Indian ricegrass) (Linne 1978; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994).

Forbs: Common forb species occurring in desired condition include: *Balsamorhiza sagittata* (arrowleaf balsamroot), *Hackelia floribunda* (wild forget-me-not), *Hackelia patens* (spotted stickseed), *Phlox longifolia* (longleaf phlox), *Lithospermum ruderales* (stoneseed), *Potentilla* spp. (cinquefoil), *Achillea millefolium* (yarrow), *Erigeron* spp. (fleabane/daisy), *Lupinus* spp. (lupine), *Astragalus* spp. (milkvetch or locoweed), *Lomatium* spp. (biscuitroot), *Agastache urticifolia* (giant hyssop), *Calochortus* spp. (mariposa and sego lily), *Castilleja* spp. (Indian paintbrush), *Antennaria rosea* (rosy pussytoes), *Frasera speciosa* (elkweed), *Penstemon* spp. (penstemon), *Helianthella uniflora* (one-flowered sunflower), *Crepis acuminata* (hawksbeard), *Senecio* spp. (groundseal), *Delphinium* spp. (larkspur), *Allium* spp. (wild onion), *Geranium viscosissimum* (geranium), *Geum* spp. (avens), and *Euthamia occidentalis* (western goldentop) (Linne 1978; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994).

Shrubs: *Artemisia tridentata* spp. *vaseyana* (Mountain big sagebrush) and/or *Artemisia tridentata* spp. *spiciformis* (subalpine big sagebrush) dominate the shrub canopy cover component with a canopy cover of 10 - 25% (Goodrich; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; Tart 2003; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994). Common overstory shrubs that may occur in the stand with a cover of up to 5% each are *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), *Purshia tridentata* (bitterbrush), *Symphoricarpos*

oreophilus (snowberry), *Amelanchier alnifolia* / *Amelanchier utahensis* (serviceberry), *Ceanothus velutinus* (snowbrush), *Artemisia arbuscula* (low sagebrush), *Eriogonum* spp. (shrubby buckwheat), *Tetradymia canescens* (horsebrush), *Rosa woodsii* (Wood's rose), *Ribes* spp. (currant/gooseberry), *Ephedra viridis* (Mormon tea), and *Atriplex canescens* (four-wing saltbush) (Linne 1978; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994).

Trees: *Cercocarpus ledifolius* (mountain mahogany), *Populus tremuloides* (aspen), and *Pinus* spp. (other pines) may also be present, but are less than 5% canopy cover (USDA NRCS 1991a,b 1987-1999, 2003a,b).

FUNCTIONING AT RISK/INDICATORS OF MANAGEMENT PROBLEMS:

Active rill formation is evident in exposed areas (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Recent pedestalling and build-up of soil and/or litter is evident around plants and rocks (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Terracing of hill slopes is present more than five layers of terraces along hill slopes (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Erosion pavement is found in plant interspaces and outside of natural flow patterns in amounts greater than 10% of ground cover (Nelson and Jensen 1987). Bare ground is greater than 20% (Goodrich; Johnson and Elsbernd 1997; Nelson and Jensen 1987). Soil surface is loose, lacks structure, or is hard and crusted. Organic matter and/or biological crusts are lacking (USDA FS 1989; USDA NRCS 2001; USDI BLM 2002).

Perennial graminoids are present at a rate of less than 10% cover; perennial forbs occur at less than 5% of canopy cover; annual grasses or forbs are greater than 5% canopy cover; and shrub canopy cover is less than 10% or greater than 50% (Goodrich; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994). Fire frequency is less than 10 years or greater than 40 years (Goodrich; Reid and others 2002; Tart 2003; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Shrubs: *Artemisia tridentata* spp. *vaseyana* (mountain big sage) and/or *Artemisia tridentata* spp. *spiciformis* (subalpine big sagebrush) are less than 10% or more than 25% of the canopy cover (Goodrich; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; Tart 2003; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994). *Eriogonum* spp. (buckwheats) are less than 1% of canopy cover. *Chrysothamnus viscidiflorus* (yellow rabbitbrush), or *Tetradymia canescens* (horsebrush) are individually more than 5% of the canopy cover (USDA NRCS 1991a,b 1987-1999, 2003a,b).

Graminoids: *Agropyron cristatum* (crested wheatgrass), *Agropyron desertorum* (desert wheatgrass), *Agropyron fragile* (Siberian wheatgrass), *Thinopyrum intermedium* (intermediate wheatgrass), *Poa bulbosa* (bulbous bluegrass), *Bromus inermis* (smooth brome), or other seeded or non-native species are more than 30% of the total canopy cover (Reid and others 2002). *Bromus tectorum* (cheatgrass), *Bromus japonicus* (Japanese brome), *Bromus briziformis* (rattlesnake brome), *Bromus rubens* (red brome), *Vulpia octoflora* (six-week fescue), or other annuals are greater than 5% of the total canopy cover.

Noxious Weeds: There is a presence of any species on the All States or Western States List (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

INDICATORS THAT THRESHOLD LEVELS HAVE BEEN MET OR EXCEEDED:

Rill formation is severe and well defined (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Many rocks and plants are pedestalled and exposed plant roots are common (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Terracing is evident and extensive, with terraces less

than five feet apart on hill slopes (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Erosion pavement is apparent throughout the soil surface in amounts exceeding 35% of the ground cover (Nelson and Jensen 1987). Organic matter and/or biological crusts are absent (USDA FS 1989; USDA NRCS 2001; USDI BLM 2002). Bare ground exceeds 50% of ground cover (Goodrich; Johnson and Elsbernd 1997; Nelson and Jensen 1987).

Graminoids: *Bromus tectorum* (cheatgrass), *Bromus japonicus* (Japanese brome), *Bromus briziformis* (rattlesnake brome), *Bromus rubens* (red brome), or *Vulpia octoflora* (six-week fescus) are greater than 30% of the canopy cover (Connelly and others 2000; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b). *Agropyron cristatum* (crested wheatgrass), *Agropyron desertorum* (desert wheatgrass), *Agropyron fragile* (Siberian wheatgrass), *Thinopyrum intermedium* (intermediate wheatgrass), *Poa bulbosa* (bulbous bluegrass), *Bromus inermis* (smooth brome), or other seeded or non-native species are more than 50% of the canopy cover.

Forbs: Perennial forbs occur at less than 5% of canopy cover or are absent (Connelly and others 2000; Goodrich; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994).

Shrubs: *Artemisia tridentata* spp. *vaseyana* (mountain big sage) and/or *Artemisia tridentata* ssp. *spiciformis* (subalpine big sagebrush) are less than 5% of the canopy cover or non-existent and has been for more than 10 years (Connelly and others 2000; Goodrich; Mooney 1985; Nelson and Jensen 1987; Reid and others 2002; Tart 2003; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002; Whitehorse Associates 1994). *Eriogonum* spp. (buckwheats) are less than 1% of canopy cover. *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Tetradymia canescens* (horsebrush), or *Juniperus oosteosperma* (Utah juniper) are more than 40% of the total canopy cover (USDA NRCS 1991a,b 1987-1999, 2003a,b). Fire frequency is less than 10 years (Goodrich; Reid and others 2002; Tart 2003; USDA NRCS 1991a,b 1987-1999, 2003a,b; USDI BLM 2002).

Noxious Weeds: Noxious weeds represent more than 5% of vegetative cover (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

MOUNTAIN BRUSH GROUP**Elevation: 6,000 - 10,000 feet****Slope: 4 - 50%****Precipitation: 12 - 22 inches****FUNCTIONING**

No recent formation of rills is evident and old rills, if present, have blunted or muted features (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). No active pedestalling with build-up of soil or litter is apparent around perennial plants or rocks (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Deposition of erosion pavement is limited to natural drainages in amounts from less than 10% of ground cover (Nelson and Jensen 1987). Terracing of hill slopes is limited to one or two visible livestock or wildlife trails. Bare ground is less than 20% (Amundson and others 2000; Johnson and Elsbernd 1997; Nelson and Jensen 1987). Soil surface has loose to granular structure and is stabilized by organic matter decomposition and/or biological crust (USDA FS 1989; USDA NRCS 2001; USDI BLM 2002).

Graminoids are present at a rate of 30 - 65% canopy cover; the shrub layer is 25 - 60% canopy cover, and forbs occur at a rate of 10 - 20% cover (Nelson and Jensen 1987; Reid and others 2002, USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994). Fire frequency is 30 - 100 years (Amundson 2000 and others; NatureServe 2002, USDA NRCS 1991a,b 1987-1999, 2003a,b).

Graminoids: Graminoid species that can occur up to 65% cover include: *Leymus cinereus* (basin wildrye), *Festuca idahoensis* (Idaho fescue), *Psuedoroegneria spicata* (bluebunch wheatgrass), *Elymus trachycaulus* (slender wheatgrass), *Achnatherum occidentale* (western needlegrass), *Achnatherum lettermanii* (Letterman's needlegrass), *Achnatherum nelsonii* (Columbia needlegrass), *Achnatherum nevadense* (Nevada needlegrass), *Achnatherum pinetorum* (pine needlegrass), *Achnatherum hymenioides* (Indian ricegrass), *Carex exserta* (shortawn sedge), *Elymus multisetus* (tall squirreltail), *Elymus elymoides* (squirreltail), *Poa secunda* (Sandberg's bluegrass), *Poa fendleriana* (muttongrass), *Poa canbyi* (canby bluegrass), *Leucopoa kingii* (spike fescue), *Hesperostipa comata* (needle and thread), and *Bromus carinatus* (mountain brome). At higher elevations, *Carex rossii* (Ross's sedge), *Carex phaeocephala* (dunhead sedge), and *Calamagrostis rubescens* may be found (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994).

Graminoid species indicating desired function that may be present in smaller amounts include Pascopyron smithii (Western wheatgrass), Koeleria macrantha (Junegrass), Melica bulbosa (oniongrass) and Melica spectabilis (purple oniongrass) (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994).

Forbs: Common forb species occurring in desired condition include: *Balsamorhiza sagittata* (arrowleaf balsamroot), *Hydrophyllum capitatum* (dwarf waterleaf), *Linum lewisii* (Lewis flax), *Hackelia floribunda* (wild forget-me-not), *Hackelia patens* (spotted stickseed), *Phlox longifolia* (longleaf phlox), *Lithospermum ruderales* (stoneseed), *Potentilla* spp. (cinquefoil), *Achillea millefolium* (yarrow), *Erigeron* spp. (fleabane/daisy), *Lupinus* spp. (lupine), *Astragalus* spp. (milkvech or locoweed), *Lomatium* spp. (biscuitroot), *Agastache urticifolia* (giant hyssop), *Castilleja flava* (yellow paintbrush), *Castilleja angustifolia* (Indian paintbrush), *Mertensia ciliata* and *Mertensia longifolia* (bluebells), *Penstemon* spp. (penstemon), *Helianthella uniflora* (one-flowered sunflower), *Crepis acuminata* (hawksbeard), *Senecio* spp. (groundsel), *Delphinium* spp. (larkspur), *Geranium viscosissimum* (geranium), *Lithophragma* spp. (woodland star), and *Solidago canadensis* (Canada goldenrod) (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994).

Shrubs: Overstory shrubs are mixed with more than one dominant species including *Purshia tridentata* (bitterbrush), *Amelanchier utahensis* (serviceberry), *Ribes cereum* (wax currant), *Ribes montigenum* (gooseberry currant), *Holodiscus dumosus* (rockspirea), *Arctostaphylos uva-ursi* (kinnikinnick), (*Artemisia tridentata* spp. vaseyana (Mountain big sagebrush) *Artemisia tridentata* spp. spiciformis (subalpine big

sagebrush) and/or *Artemisia arbuscula* (low sagebrush) (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994).

Other common shrubs that may occur in the stand with a cover generally less than five% each are *Symphoricarpos oreophilus* (snowberry), *Crataegus douglasii* (hawthorne), *Rhus trilobata* (sumac), *Mahonia repens* (Oregon grape), *Shepherdia argentea* (buffaloberry), *Shepherdia canadensis* (buffaloberry), *Chamaebatiara millefolium* (fernbrush), *Parthenocissus vitacea* (woodbine), *Sambucus nigra* (elderberry), *Sambucus racemosa* (elderberry), *Rosa woodsii* (Wood's rose), *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Ericameria nauseosa* (rubber rabbitbrush), *Ceanothus velutinus* (snowbrush), *Artemisia frigida* (prairie sagewort), *Eriogonum* spp. (shrubby buckwheat), *Tetradymia glabrata* (horsebrush), and *Ephedra viridis* (Mormon tea) (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994).

Trees: Tree species that may occur in amounts generally less than 5% are: *Cercocarpus ledifolius* (mountain mahogany), *Populus tremuloides* (aspen), and, at higher elevations, *Pinus flexus* (limber pine) (Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994).

FUNCTIONING AT RISK/INDICATORS OF MANAGEMENT PROBLEMS:

Active rill formation is evident in exposed areas (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Recent pedestalling and build-up of soil and/or litter is evident around plants and rocks (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Terracing of hill slopes is present more than five layers of terraces along hill slopes. Erosion pavement is found in plant interspaces and outside of natural flow patterns in amounts greater than 10% of ground cover (Nelson and Jensen 1987). Bare ground is greater than 20% (Johnson and Elsbernd 1997; Nelson and Jensen 1987). Soil surface is loose, lacks structure, or is hard and crusted. Organic matter and/or biological crusts are lacking (USDA FS 1989; USDA NRCS 2001; USDI BLM 2002).

Desired graminoids are present at a rate of less than 30% cover. Perennial forbs occur at less than 10% of canopy cover. Desirable shrub canopy cover is less than 10% (NatureServe 2002; Nelson and Jensen 1987; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994). Canopy cover of tree species is greater than 10%. Fire frequency is less than 30 years (Reid and others 2002, USDA NRCS 1991a,b 1987-1999, 2003a,b;).

Graminoids: *Agropyron cristatum* (crested wheatgrass), *Agropyron desertorum* (desert wheatgrass), *Agropyron fragile* (Siberian wheatgrass), *Thinopyrum intermedium* (intermediate wheatgrass), *Bromus inermis* (smooth brome), *Poa pratensis* (Kentucky bluegrass), *Poa compressa* (Canada bluegrass), or other seeded, non-native species are more than 30% of the total canopy cover (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994).

Bromus tectorum (cheatgrass), *Bromus rubens* (red brome), *Bromus japonicus* (Japanese brome), *Bromus briziformis* (rattlesnake brome), *Vulpia octoflora* (six-week fescue), *Poa bulbosa* (bulbous bluegrass), or other annuals are greater than 5% of the total canopy cover (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994).

Forbs: Presence of more than 2% of the following forbs: *Taraxacum officinale* (dandelion), *Leptodachylon pungens* (prickly phlox), *Iris missouriensis* (wild iris), and *Chenopodium* spp. (goosefoot) (Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b).

Shrubs: *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Rosa woodsii* (Wood's rose), *Symphoricarpos oreophilus* (snowberry), *Tetradymia glabrata* (horsebrush), *Tetradymia canescens* (horsebrush), or *Juniperus oosteosperma* (Utah juniper) are individually more than 5% of the canopy cover (Linne 1978; Nelson and Jensen 1987; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994).

Noxious Weeds: There is a presence of any species on the All States or Western States Noxious Weed List (USDA APHIS 2002; USDA ARS 1998; Glover 2003).

INDICATORS THAT THRESHOLD LEVELS HAVE BEEN MET OR EXCEEDED:

Rill formation is severe and well-defined (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Many rocks and plants are pedestalled and exposed plant roots are common (Cosgrove and others 2001; Pellant and others 2000; USDA NRCS 2001). Terracing is evident and extensive, with terraces less than five feet apart on hill slopes. Erosion pavement is apparent throughout the soil surface in amounts exceeding 30% of the ground cover (Nelson and Jensen 1987). Organic matter and/or biological crusts are absent (USDA FS 1989; USDA NRCS 2001; USDI BLM 2002). Bare ground exceeds 40% of ground cover (Johnson and Elsbernd 1997; Nelson and Jensen 1987).

Desired graminoids are present at a rate of less than 10% cover. Perennial forbs occur at less than 5% of canopy cover. Desirable shrub canopy cover is less than 5% (NatureServe 2002; Nelson and Jensen 1987; USDA NRCS 1991a,b 1987-1999, 2003a,b; Whitehorse Associates 1994). Fire frequency is less than 5 years (Reid and others 2002, USDA NRCS 1991a,b 1987-1999, 2003a,b;).

Graminoids: *Agropyron cristatum* (crested wheatgrass), *Agropyron desertorum* (desert wheatgrass), *Agropyron fragile* (Siberian wheatgrass), *Thinopyrum intermedium* (intermediate wheatgrass), *Bromus inermis* (smooth brome), *Poa pratensis* (Kentucky bluegrass), *Poa compressa* (Canada bluegrass), *Poa bulbosa* (bulbous bluegrass), or other non-native species are more than 50% of the total canopy cover.

Bromus tectorum (cheatgrass), *Bromus rubens* (red brome), *Bromus japonicus* (Japanese brome), *Bromus briziformis* (rattlesnake brome), *Vulpia octoflora* (six-week fescue), or other annuals are greater than 30% of the total canopy cover (Linne 1978; Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b).

Shrubs: *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Rosa woodsii* (Wood's rose), *Symphoricarpos oreophilus* (snowberry), *Tetradymia glabrata* (horsebrush), *Tetradymia canescens* (horsebrush), or *Juniperus oosteosperma* (Utah juniper) are individually more than 40% of the total canopy cover (Reid and others 2002; USDA NRCS 1991a,b 1987-1999, 2003a,b).

Noxious Weeds: Noxious weeds represent more than 5% of vegetative cover (USDA APHIS 2002; USDA ARS 1998; Glover 2003).