PROPERLY FUNCTIONING CONDITION

October 23, 1998 Version

RAPID ASSESSMENT PROCESS

I. BACKGROUND

A team was assigned in early 1996 by the Intermountain Regional Office Directors to "Establish a process, including criteria and indicators, which will allow identification of areas not currently in a properly functioning condition" [PFC] (see Appendix A). Besides the assigned team; Steve Munson, Entomologist, Ogden Field Office, was recruited for consultation in developing criteria and indicators. Expectations and timelines for the phase one effort are in Appendix A.

This report is a compilation of three different activities. First is the outline of the process of assessing Proper Functioning Condition.

Second is an example of application of the process at the Intermountain Region scale and third is an example of the application of the process at a sub-regional scale.

Subsequently, some forests and districts have been applying the process at a landscape scale. No examples of the latter applications are included at this time.

The PFC process and assessments fit within an ecological approach to management and within the concept of "Continuous Assessments and Planning".

The process and assessments herein are in draft form as refinements and corrections are made as experience and understanding accumulates. This document should be viewed more as a "work in progress" than a completed event.

This version includes some changes in soil cover that were first sent out in a File Code 2000 letter on August 21, 1997 under the Director of Vegetation Management's signature.

II. CONCEPTS AND DEFINITIONS

This process was developed using concepts of Proper Functioning Condition as described in the Bureau of Land Management publication: TR 1737-9, 1993, "Riparian Area Management, Process for Assessing Proper Functioning Condition" 52 pages by Barrett and others, (1993). The Intermountain Region team was charged with taking the site specific BLM concept and process and apply it to larger scales and to upland conditions.

It must be emphasized that PFC is a rapid assessment process and is a part of a greater whole. This greater whole is termed "Taking an Ecological Approach". The less precise term of "Ecosystem Management" is used by many as it is shorter than the phrase "taking an ecological approach". Much of the philosophical foundation for an ecological approach and the Intermountain Region PFC process is given in Kaufmann and others, (1994).

Definitions of PFC and "Risk" were developed by the team to guide process development and to identify systems at risk of not being in PFC. (It is important to remember that PFC is limited to biological and physical conditions and does not reflect potential management strategies.)

> **Properly Functioning Condition - Ecosystems at any temporal or spatial scale are in a properly functioning condition when they are dynamic and resilient to perturbations to structure, composition, and processes of their biological or physical components.**

Risk - Risk refers to situations in which the outcome is not certain, but the chance of system degradation beyond the point of resiliency and sustainability can be estimated.

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                    _1/
        NOT PFC        THRESHOLD       PROPERLY FUNCTIONING CONDITION
<-----------------------:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::> POTENTIAL

Loss of          Functional but          Biological and physical components of ecosystems are
 important       at risk.                sustainable.  The levels of sustainability in terms of time

biological/                              and spatial scales is dependent on management strategies
physical                          implemented.  (e.g. NEPA decision projects, LMP's. etc.)
components of
ecosystems.
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_1/ Not a finite point.

III. ECOLOGICAL APPROACH

All PFC assessments should use an ecological approach. An ecological approach requires consideration of three spheres {termed "ecological capabilities" and "social and economic needs" by Kaufmann and others, (1994).} 1. biological and physical (bio-physical), 2. social, and 3. economic. Although PFC works mainly within the bio-physical sphere there is significant relevance to the social and economic spheres. For example:

The Forest Service is charged by laws to maintain certain standards such as clean water, clean air, endangered species and soil conservation while at the same time is directed to provide for a variety of goods and services. These laws not only reflect the biological and physical needs for land stewardship but in large part the social expectations of the public. Using an ecological approach requires that each sphere be characterized before synthesizing all three into a sustainable range of choices to complete the entire assessment phase. All possible choices should provide for a PFC of the biological and physical sphere and allow management to implement sustainable proposals that move ecosystems toward their potential.

This is a "coarse filter approach". The assumption is that if vegetative communities and their processes are similar today to those occurring historically; then conditions approximate those under which species evolved. Presumably, therefore, the full complement of species will persist. Kaufmann and others (1994) put it in these words:

> **"Our working assumption is that naturally evolving ecosystems (minimally influenced by humans) were diverse and resilient, and that within the framework of competition, evolutionary pressure, and changing climates, these ecosystems were sustainable in a broad sense. Many present ecosystems modified by modern industrial civilizations do not have all these characteristics. Our guiding premise for sustaining ecosystems and protecting biodiversity now and into the future is to manage ecosystems such that structure, composition and function of all elements; including their frequency, distribution, and natural extinction, are conserved. Conservation focuses on maintaining and restoring suitable amounts of representative habitats over the landscape and through time."**

The PFC assessment process is a coarse filter approach to ecosystem sustainability. The most basic concept inherent in an ecological approach and in PFC is sustainability.

IV. PROCESS

A. Design

The design includes three scales: Regional; Sub-Regional; and Landscape. These scales are directly related to the Forest Service National Hierarchical Framework of Ecological Units developed under a policy of ecosystem management adopted by USDA Forest Service June 4, 1992. Planning and analysis scales were used instead of the hierarchical framework scales for simplicity and because PFC is a planning assessment. Use of any planning and analysis scales for assessments should include full consideration of the ecological units within the hierarchical framework. Refer to Exhibit A for an overview of how the two systems are related. The publication "Ecological Subregions of the United States: Section Descriptions" dated July 1994 is a valuable reference for any assessments.

Basic characteristics of ecosystems include 1. Structure, 2. Composition, 3. Processes, 4. Patterns. A matrix with these four characteristics as criteria and at three scales (See Exhibit B), was developed to assess PFC. The matrix is used to describe each individual subject area to be assessed. At the scale of the Intermountain Region the subject areas include sixteen vegetation types, a hydrologic regime, a soil quality description, and an aquatic and terrestrial animal description. Indicators of a properly functioning condition were developed for each subject area, by criteria, and at each scale.

Ecosystems vary in time and space. Changes may be rapid or gradual but change occurs. The term "historical range of variation" (some authors use “historic” rather than “historical”) refers to ecosystem compositions, structures, processes and patterns for a specified time and for a specific area. Ecosystems have the capacity to change drastically over short or long periods of time and from place to place. As a result, ecosystem components and processes are adapted to a range of conditions. It is believed that native species adapted to and, in part, evolved with the disturbance events of the preceding several thousand years. This provided patterns of landscape and ecosystem variation that were apparently self-sustaining. Successive generations of the same biota under the same conditions give the best indication of sustainability. The potential for survival of native species is reduced if their environment is pushed outside the range of natural variation.

The range of historical variation includes any process or pattern which may or probably could have occurred on a given landscape over time, under natural conditions. The definition as often employed is relatively narrow, and generally reflects those processes which were more cyclical and occurred with a more or less predictable frequency. Examples would includes cycles of drought, fire incidence and population fluctuations in biota. Other events that were much less common may be part of an expanded concept of historical range. For example, the range of historical variation for an area would include evidences of the light to moderate intensity fires which swept through an open ponderosa pine savannah every 7 to 12 years over a 100 year period. The range of historical variation would not usually include an event which occurred once in 500+ years when an intense fire combined with an intense rainstorm produced massive amounts of sediment on the same area. That possibility may be described, but is not usually included in the general definition of range of historical variation for that particular area (extreme events versus more normal, reoccurring events).

Reference conditions are used to help establish the historical range of variation. Kaufmann and others, (1998) have a good discussion of reference conditions for vegetation.

> **Reference and existing conditions are both moving targets, however, because vegetation is constantly changing. Thus reference conditions are not useful for providing detailed maps and descriptions of geographically specific patterns in the landscape that can or should be restored to their historic condition. Rather, reference conditions help determine characteristics such as the amount and kinds of heterogeneity in spatial patterns that existed before significant human impact occurred, and the natural disturbance patterns and conditions that created these patterns over time. This knowledge can provide a basis for evaluating existing conditions and identifying places in the landscape where management activities might efficiently bring current forests into alignment with historic landscape features. Reference conditions can help clarify which management activities work in the direction of improving ecosystems sustainability and which ones might further exacerbate ecosystem unsustainability. (Kaufmann and others, 1998, p. 5)**

In the western states, conditions present prior to European settlement is often used as the reference condition to indicate the historical range of variability. Conditions then are more readily determined than those of earlier times and many biotic and abiotic elements are continuous from then to the present (e.g.

many individual plants and most land forms are the same or little changed). Generally, 100 to 500 years prior to the present is the most commonly employed time frame.

There are problems with the selection of any time period used as the reference condition and these must be kept in mind by the team. For example the reference period just prior to European settlement occurred at a time when Native American populations were much lower than in previous centuries because of the large numbers of Native Americans who fell victim to European diseases. It is difficult to measure or even estimate the impact of Native American populations on ecosystems because these are rarely recorded or separable from other processes. More or less concurrent with the great reductions in Native American populations was a major shift in climate. The large-scale climatic pattern known as the "Little Ice Age" occurred from about 1550 to around 1860 ((there are conflicting dates given in the references). Much of the European settlement was at the end of or just after the Little Ice Age so it may be difficult to separate changes in biota from those caused by settlement from changes driven by mainly by climate change.

Criteria in the matrix are structure, composition, disturbance regime (a surrogate for more basic ecosystem processes), and patterns.

Structure is a means to express the balance of age and size classes for included subject areas related to vegetation types. A defined balance of size classes was estimated to reflect one that would sustain the type in the long term. Simply this means there must be adequate recruitment in the type to sustain a range of age classes. For many of the conifer types the selected range of classes includes: 10 percent Grass/Forb; 10 percent Seedling/Sapling; 20 percent Young Forest; 20 percent Mid Aged Forest; 20 percent Mature Forest; and 20 percent Old Forest. These percentages are estimates or approximations and are not presented as absolute values but are suggested general proportions. The basis for using these vegetative structural stages comes from the work done by Reynolds and others, (1992). They recommended this mixture of classes because it sustained both forest cover types and a large suite of wildlife species. There are exceptions but in general if these relative proportions are sought most of the wildlife and social needs in forested landscapes can be met. For other subject areas such as non conifers, non forest types, riparian/wetlands, soil quality, hydrologic regime, and aquatic and terrestrial animals, structure is expected to reflect a balance not exceeding the sustainable biological and physical capabilities of the resource. The indicators for these subject areas are based on the experience and education of the team members and the knowledge of the scientific studies.

Composition is an expression of species present in each of the subject areas. For vegetation and fauna this includes the dominant species. In the case of vegetation it means the recruitment and sustainability of early seral species while still providing the diversity of all successional species (flora and fauna). In many of the forest, shrub or woodland subject areas this requires a lower cover by mature plants to allow development of associated species such as grasses, forbs, and shrubs to limit the amount of bare soil.

Disturbance regime was used to characterize processes and includes all known historical disturbances that have effected the ecosystems. These include past grazing, human trampling, logging, foraging by ungulate wildlife, wind, flood, insects, diseases, and fire. Each ecosystem or biome differs in which disturbance factors are or have been active. The most common factors are fire, insects and disease. For each ecosystem the historical fire regime was described in terms of lethal and not lethal fire intensities and frequencies. This was based on available sources of information from published research and recorded histories. Insect and disease conditions were based on current and past aerial surveys for the ecosystem and the known scientific work and experience. More fundamental ecosystems processes such as carbon balances, nutrient and energy cycles, etc. are more difficult and costly to ascertain at broad scales so disturbance regimes were used as a more easily observed surrogate.

Patterns are an indication of how ecosystems function among and between themselves. Criteria addressed the size, shape, age class, distribution, and juxtaposition of structures and composition in and adjacent to each ecosystem. Patterns are evaluated by comparison to their historical ranges (e.g. 100-500 years) . Changes between ecosystems such as juniper movement into big sagebrush/grass and conifer succession into aspen were not the primary objective of the criteria but are part of the consideration of changes in patterns if a type had lost area or grained area.

Threshold ranges or values are suggested to establish acceptable ranges of PFC to provide for ecosystem sustainability and resiliency. Thresholds are developed using the concept of the historical range of variation.

SUBJECT AREAS:

- Alpine
- Subalpine timberline forests and woodlands
- Engelmann spruce - subalpine fir
- Quaking aspen
- Lodgepole pine
- Grand fir/white fir complex
- Interior Douglas-fir
- Ponderosa pine/Jeffrey pine complex
- Ponderosa pine Southern Utah type
- Pinyon - Juniper
- Mountain mahogany
- Gambel oak
- Tall Forb
- Mountain brush complex
- Big sagebrush/Grasslands
- Hydrologic regime
- Soil quality
- Riparian/wetlands
- Aquatic and terrestrial animals -

To assist the assessment process a "Standard Checklist" (Exhibit C) was created for an assessment team's use. In addition the Standard Checklist for Riparian/Wetlands (Exhibit D) developed by the Bureau Of Land Management should be used specifically for site specific assessments in the riparian/wetlands subject area. These checklists provide a place to initiate discussion and a systematic way to help conduct the assessment.

B. Assessment Process

1. Define scale of assessment both temporal and spatial.

2. Assemble team of technical experts for scale(s) being considered.

3. Utilize the appropriate matrices by subject area to determine kinds of resource information needed and available.

4. Select the appropriate subject areas and by evaluating all of the criteria together to make a considered determination if the subject area is: non-functional; or functional - at risk; or within proper functioning condition.

Step 5 is optional. Some teams may want to make the risk assessment in step 5. Others may be uncomfortable with assigning a risk value. We have found the risk assessment useful as a relative ranking procedure. It is a team decision whether or not to assign a risk category.

5. If subject area(s) are not in (PFC) estimate the degree of departure or risk (e.g. low, medium or high) from PFC.

6. Summarize the results for the selected geographical and temporal scale(s).

EXHIBIT A: Introduction from: "Ecological Subregions of the United States: Section Descriptions". Compiled by W. Henry McNab and Peter E. Avers. July 1994. United States Department of Agriculture, Forest Service, Ecosystem Management, Washington, DC.

EXHIBIT B: Matrix used to assess major subject areas.

SUBJECT:	**INDICATORS OF A PROPERLY FUNCTIONING CONDITION** (BY GEOGRAPHIC SCALE)

CRITERIA	**REGIONAL**	**SUBREGIONAL:**	**LANDSCAPE**
STRUCTURE			
COMPOSITION			
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)			
PATTERNS (e.g. connectivity, shapes, size, distribution)			

EXHIBIT C: **STANDARD CHECKLIST** (All subject areas except Riparian/Wetlands)

Subject Area Name:_____

Date:_____ **ID Team Members:**_____

_____

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Yes	No	N/A	SOIL/HYDROLOGIC
			(1). Surface litter, duff, plant residue and large woody debris is present in quantities sufficient to sustain soil productivity and nutrient cycling.
			(2). Ground cover is adequate to protect soils from eroding by overland flow.
			(3). Soil infiltration/percolation is adequate to prevent or reduce overland flow.
			(4). Water and sediment being supplied by the watershed to the stream is in balance with the stream's transport capability.
			(5). Vegetation provides adequate cover and soil binding properties to reduce erosion and encourage infiltration of water.

Yes	No	N/A	VEGETATIVE
			(6). Structural classes diverse or balanced for sustainability or recovery.
			(7). Diverse composition of vegetation or preferred seral species.
			(8). Insect and disease populations at endemic levels.
			(9). Fire regimes within historical ranges.
			(10). Other disturbance regimes within historical ranges.
			(11). Patterns among and between subject areas consistent with historical ranges for ecological units.

Yes	No	N/A	AQUATIC AND TERRESTRIAL ANIMALS
			(12). Age classes and reproductive cohorts of native amphibians, fish and (vertebrate and invertebrate) wildlife are present, and adequate to maintain sustainable populations within historical ranges.
			(13). Physical and biological habitat elements (communities, species, stages, morphology) are available within seasonal home ranges of native species.
			(14). Native fish, amphibian and wildlife species are present in sustainable populations in adapted habitats.
			(15). Historical predators, competitors, prey, and habitat modification processes are present, supporting species' viability and sustainability.
			(16). Exotic species, diseases, or human uses do not limit, displace, or reduce viability of native species.
			(17). Disturbances affect only small portions of animal's annual ranges. (Especially for small, sedentary species with limited movement.)

			(18). Animal populations exhibit genetic integrity and diversity, and successful reproductive interchange, without isolation, across historically occupied habitats. Migration, distribution and reproduction unhindered by habitat management or disturbance within historical ranges.

EXHIBIT D:

STANDARD CHECKLIST

(From "Riparian Area Management - TR 1737-9, 1993. BLM, pp. 41-42)

Name of Riparian-Wetland Area:_____

Date:_____ Area/Segment ID;_____Miles_____

ID Team Observers:_____

Yes	No	N/A	HYDROLOGIC
			1) Flood plain inundated in "relatively frequent" events (1-3 years)
			2) Active/stable beaver dams
			3) Sinuosity, width/depth ration, and gradient are in balance with the landscape setting (i.e., land form, geology, and bioclimatic region)
			4) Riparian zone is widening or has achieved potential extent
			5) Upland watershed not contributing to riparian degradation

Yes	No	N/A	VEGETATIVE
			6) Diverse age-class distribution (recruitment for maintenance/recovery)
			7) Diverse composition of vegetation (for maintenance/recovery)
			8) Species present indicate maintenance of riparian soil moisture characteristics
			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
			10) Riparian plants exhibit high vigor
			11) Adequate vegetative cover resent to protect banks and dissipate energy during high flows
			12) Plant communities in the riparian area are an adequate source of coarse and/or large woody debris

Yes	No	N/A	SOILS-EROSION DEPOSITION
			13) Flood plain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody debris) adequate to dissipate energy
			14) Point bars are revegetating
			15) Lateral stream movement is associated with natural sinuosity
			16) System is vertically stable
			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1995)

APPENDIX A:

CHARTER TO TEAM AND TEAM MEMBERS

In late February and early March of 1996, the Regional Forester for the Intermountain Region developed a list of Ecosystem Management Expectations and priorities. The first priority on the list was stated as:

> **In total, our management actions are designed to ensure the public's riparian areas, rangelands and forest are in a "properly functioning condition."**

As part of this priority setting and direction a meeting was called by the Board of Directors on March 8, 1996 and a team assembled. The following written direction was given the team:

Tasks Related to Identifying
Properly Functioning Condition

Phase One - Identification: Establish a process, including criteria and indicators, which will allow identification of areas that are not currently in a PFC.

Phase Two - Evaluation: Establish procedures which assure appropriate identification and evaluation of risks, costs, and benefits.

Phase Three - Decision Phase: Define organizational strategy which allows strategic decisions to be made resulting in establishing priority for treatment across time.

Phase Four - Implementation Phase: While conducted by Forest/Eco-Groups, there is a critical need to assure that budget, training, and policy and procedural direction or guidance enables this phase.

Phase Five - Monitoring Phase: Monitoring Phase - Monitoring would be conducted at various scales to determine how well we are performing in increasing and maintaining the acreage of National Forest System land that is in a properly functioning condition.

The Board of Directors selected a team with Jack Amundson as team leader.

Team Leader:

Jack Amundson, Regional Silviculturist.

Members:

Karen Ogle, Fire Ecologist, Boise National Forest.
Alma H. Winward, Regional Ecologist.
Peter J. Stender, Regional Hydrologist.
David A. Newhouse, Regional Wildlife Ecologist.
Thomas M. Collins, Regional Soil Scientist.
Kris Lee, Regional Fisheries Program Manager
David M. Neeley, Transportation Systems Engineer.

Jack Amundson requested that Clinton K. Williams be added to the team and it was done.

The Board of Directors gave the following Expectations and Timeline:

- To expand the concepts developed for the riparian areas as defined by Wayne Elmore, BLM, and transfer in a holistic manner to the uplands.

- At Phase One, the team is charged to identify a process, establish criterion, and test this methodology in one or more areas.

- We expect that a draft of the process is developed by April 1 and presented to the Resource Directors and representative for Forest Service Research for review and comment.

- By May 1, we expect a final draft of the process including criteria for identification.

- At the May Leadership Team Meeting, we expect this team would present its final product and elicit Forest volunteers for testing.

- After test phase is completed (1 month), we expect a final product for decision.

- In that this team is charged with only Phase One, and we see need for another team to develop Phase Two, we expect this team to share information and embrace Team Two and its objectives.

APPENDIX B:

SUBJECT AREAS

SUBJECT: ALPINE	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Characterized by a lack of arboreal vegetation, landscape dominated by shallow soils, fell-fields, boulders, tundra and turf-forming vegetation with some areas with low shrubs. (e.g. <1 ft. tall.)	Characterized by a lack of arboreal vegetation, landscape dominated by shallow soils, fell-fields, boulders, tundra and turf-forming vegetation with some areas with low shrubs. (e.g. <1 ft. tall.)	Characterized by a lack of arboreal vegetation, landscape dominated by shallow soils, fell-fields, boulders, tundra and turf-forming vegetation with some areas with low shrubs. (e.g. <1 ft. tall.)
COMPOSITION	Dominated by native, perennial plant species. Indicator lichens and bryophytes are within historical ranges.	Native perennial plant cover ≥50%. Indicator lichens and bryophytes are within historical ranges.	Bare ground < 15%. Indicator lichens and bryophytes are within historical ranges.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Trampling, treading and herbivory are within historical ranges. Hydrologic regime within historical ranges.	Trampling, treading and herbivory are within historical ranges. Catchment, storage and release of water within historical ranges.	Trampling, treading and herbivory are within historical ranges. Catchment, storage and release of water within historical ranges.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Pattern of rocks, boulder fields and alpine plant communities within historical ranges.	Boulder fields, alpine turf and meadows within historical ranges.	Boulder fields, alpine turf and meadows within historical ranges.

SUBJECT: SUBALPINE TIMBERLINE FORESTS (primarily dominated by 5-needle pines)	**INDICATORS OF A PROPERLY FUNCTIONING CONDITION** (BY GEOGRAPHIC SCALE)

CRITERIA	**REGIONAL**	**SUBREGIONAL:**	**LANDSCAPE**
STRUCTURE	Balanced range of structures, sizes and age classes. 20-40% of acres have trees greater than 10 feet tall and 80 or more years of age.	Balanced range of structures, sizes and age classes. 20-40% of acres have trees greater than 10 feet tall and 80 or more years of age.	Balanced Range: Grass/forb, seedlings and saplings = 10-20%* Young, Mid Aged and mature forest = 30-50%* Old Forest = 20-40%* [Basal areas typically are less than 100 square feet and SDI is less than 100.] (* indicates proportion of acres)
COMPOSITION	More than 70 % of trees are 5 needle pines (e.g. whitebark, limber or bristlecone) and less than 20% of trees are spruce, true firs or Douglas-fir.	More than 70 % of trees are 5 needle pines (e.g. whitebark, limber or bristlecone) and less than 20% of trees are spruce, true firs or Douglas-fir.	More than 70 % of trees are 5 needle pines (e.g. whitebark, limber or bristlecone) and less than 20% of trees are spruce, true firs or Douglas-fir.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic levels of insect and disease activity are present. Less than 10% of acres have white pine blister rust present. Fire regime is mixed severity with a 100-150 year interval between stand-replacing fires.	Endemic levels of insect and disease activity are present. Less than 10% of acres have white pine blister rust present. Fire regime is mixed severity with a 100-150 year interval between stand-replacing fires.	Endemic levels of insect and disease activity are present. Pockets of mortality do not exceed groups of 5 trees per acre. Aerial detection surveys indicate mortality does not occur in groups exceeding 10 trees. Less than 10% of the 5 needle pine trees have white pine blister rust present. Fire regime is mixed severity with a 100-150 year interval between stand-replacing fires and 50-70 years between surface fires.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Open forests to woodlands, canopies do not close and trees are distributed in sparse stands or widely spaced clumps of trees.	Open forests to woodlands, canopies do not close and trees are distributed in sparse stands or widely spaced clumps of trees.	Open forests to woodlands, canopies do not close and trees are distributed in sparse stands or widely spaced clumps of trees.

SUBJECT: ENGELMANN SPRUCE - SUBALPINE FIR (*Picea engelmannii - Abies lasiocarpa*)	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Balanced range of structural stages.	40% is Mature and Old.	Balanced Range: Grass/forb ≈10% Seedling/Sapling ≈10% Young Forest ≈20% Mid Aged Forest ≈20% Mature Forest ≈20% Old Forest ≈20% 40% of the stands have multiple canopies. Stand Density Index (SDI) not greater than 335 and Basal Area less than 150.
COMPOSITION	Engelmann spruce is dominant.	More than 40% of trees are Engelmann spruce.	More than 40% of trees are Engelmann spruce.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insect and disease populations. <10% of the host type has root disease centers. Fire regimes are within historical ranges. Lethal fire regime on a 100 to 300 year cycle.	Endemic insect and disease populations. Insect and disease activity in groups of <50 trees. Fire regimes are within historical ranges. Lethal fire regime on a 100 to 300 year cycle.	Endemic insect and disease populations. No defoliation of >50% of crown is observed. Mortality in groups of <5 or more trees per acre. Avalanche, windthrow or landslides do not affect more than 2% of the spruce trees 10 inches or greater d.b.h. < 5% of acres in root disease centers. Fire regimes are within historical ranges. Mixed severity and lethal fire regimes. Mixed severity regime on a 50 to 80 year cycle and lethal regime on a 100 to 300 year cycle.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Patterns are within historical ranges. The role of fire is to influence species distribution and age classes.	Patterns are within historical ranges. (corridors present and functional.) The role of fire is to influence the distribution of structure classes, composition, and pattern across the subregion.	Patterns are within historical ranges. (Pattern sizes, shapes and corridors are maintaining processes.) The role of fire is to maintain a heterogenous pattern of species and structure classes. A mixed severity fire regime produces vegetation mosaics due to patchy nature of the fire, preventing development of large continuous blocks of homogenous ages and species.

SUBJECT: ASPEN (*Populus tremuloides*)	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Balanced range of structural stages.	30% is Mature and Old age classes.	Balanced Range: Grass/forb and regeneration and saplings ≈ 40% Young, Mid Aged and mature forest ≈ 30% Old Forest ≈ 30% Stand Density Index (SDI) not greater than 300 and Basal Area less than 140.
COMPOSITION	Aspen is dominant. Less than 15%of area is succeeding to other cover types. Shrub and herbaceous layers well developed.	Conifer encroachment is minimal (e.g. Conifer composition not more than 15% cover in stands.) Shrub and herbaceous layers well developed.	Mature and Old Forest aspen less than 150 years old. Conifer composition not more than 15% cover in stands. Shrub and herbaceous layers well developed. Ground cover at least 85% .
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insect and disease populations. Insect activity affects 20% or less of type. Fire regimes are within historical ranges. The fire regime is a lethal fire regime burning on a 20 to 100 year cycle.	Endemic insect and disease populations. <10% of clones with root disease. Tree mortality <10% in mature and old age classes. Fire regimes are within historical ranges. The fire regime is a lethal fire regime burning on a 20 to 100 year cycle.	Endemic populations of insects and disease. <30% topkill and branch mortality in mature and old age classes. A fire interval of 20 to 50 years generally occurs in seral stands. Low to moderate intensity surface fires slow conifer encroachment. Intervals that approach 100 years are typical of climax aspen stands that don't require frequent disturbance to perpetuate the clone.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Patterns are within historical ranges. The role of fire is to maintain presence of aspen.	Patterns are within historical ranges. (corridors are present and functional.) The role of fire is to influence distribution of structural classes and patterns across the subregion.	Patterns are within historical ranges. (Pattern sizes, shapes and corridors are maintaining processes.) The role of fire is to influence distribution of structural classes and patterns across landscapes.

SUBJECT: LODGEPOLE PINE (*Pinus contorta*)	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Balanced range of structural stages.	40% is Mature and Old.	Balanced Range: Grass/forb ≈10% Seedling/Sapling ≈10% Young Forest ≈20% Mid Aged Forest ≈20% Mature Forest ≈20% Old Forest ≈20% 20% of the stands have multiple canopies. Stand Density Index (SDI) not greater than 350 and Basal Area less than 90 sq. ft.
COMPOSITION	Lodgepole pine is dominant.	More than 80% of the trees are lodgepole pine.	More than 80% of trees are lodgepole pine
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insect and disease populations. Fire regimes are within historical ranges. The fire regime is lethal. Fires occur every 150 to 300 years.	Endemic insect and disease populations. Fire regimes are within historical ranges. The fire regime is lethal. Fires occur every 150 to 300 years.	Endemic insect and disease populations. Fire regime is a combination of mixed severity and lethal. Persistent lodgepole stands are typically in the lethal fire regime. Fires burn every 150 to 300 years in the lethal regime.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Patterns are within historical ranges. The role of fire is to maintain presence of lodgepole pine stands.	Patterns are within historical ranges. (corridors are present and functional.) The role of fire is to maintain presence of lodgepole pine stands.	Patterns are within historical ranges. (Pattern sizes, shapes and corridors are maintaining processes.) Fire maintains a heterogenous pattern of age and size classes across the landscape.

SUBJECT: GRAND FIR/WHITE FIR COMPLEX (Assumed to be managed for seral species such as Douglas-fir, ponderosa pine or western larch)	**INDICATORS OF A PROPERLY FUNCTIONING CONDITION** (BY GEOGRAPHIC SCALE)

CRITERIA	**REGIONAL**	**SUBREGIONAL:**	**LANDSCAPE**
STRUCTURE	Balanced range of structural stages.	40% is Mature and Old.	Balanced Range: Grass/forb ≈10% Seedling/Sapling ≈10% Young Forest ≈20% Mid Aged Forest ≈20% Mature Forest ≈20% Old Forest ≈20% Not more than 50% of the stands have multiple canopies. Stand Density Index (SDI) not greater than 335 and Basal Area less than 180.
COMPOSITION	Ponderosa pine, western larch and Douglas-fir are dominant.	More than 75% is ponderosa pine, western larch and Douglas-fir	Grand fir/white fir composition is less than 25%.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insect and disease populations affect less than 5% of the host type. Fire regimes are within historical ranges. This is a nonlethal fire regime. The fire interval ranges from 10 to 60 years.	Endemic insect and disease populations affect 10% or less of host type. Pockets of mortality do not have more than 50 trees. Fire regimes are within historical ranges. The fire interval ranges from 10 to 40 years on dry sites. On more mesic sites the interval is longer (30 to 60 years).	Endemic insect and disease populations. No defoliation of more than 50% of the crowns. Mortality pockets not greater than 5 trees per acre with more than 10 trees in a group. Fire regimes are within historical ranges. The fire interval ranges from 10 to 40 years on dry sites. On more mesic sites the interval is longer (30 to 60 years).
PATTERNS (e.g. connectivity, shapes, size, distribution)	Patterns are within historical ranges. The role of fire is to maintain seral stands of ponderosa pine/Douglas-fir/ western larch/ lodgepole pine with fir as a minor component.	Patterns are within historical ranges. (corridors are present and functional.) Fire maintains dominance of seral species with fir as a minor component.	Patterns are within historical ranges. (Pattern sizes, shapes and corridors are maintaining processes.) Fires of low to moderate severity favor open, seral stands of ponderosa pine, Douglas-fir and western larch and possibly lodgepole pine.

SUBJECT: INTERIOR DOUGLAS-FIR (*Pseudotsuga menziesii*)	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Balanced range of structural stages.	40% is Mature and Old.	Balanced Range: Grass/forb ≈10% Seedling/Sapling ≈10% Young Forest ≈20% Mid Aged Forest ≈20% Mature Forest ≈20% Old Forest ≈20% Not more than 50% of the stands have multiple canopies. Stand Density Index (SDI) not greater than 298 and Basal Area less than 160.
COMPOSITION	Ponderosa pine or Douglas-fir are dominant.	More than 75% is ponderosa pine or Douglas-fir.	True fir composition is less than 25%.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insect and disease populations affecting 5% or less of the host type. Fire regimes are within historical ranges. This is a mixed severity fire regime with an interval of 10 to 50 years.	Endemic insect and disease populations affecting less than 10% of the host type and not over 25 trees in a mortality group. A nonlethal and mixed severity fire regime. On dry sites the interval ranges from 10 to 25 years and typically is a nonlethal surface fire. On cooler, wetter sites, the interval is longer (30 to 50 years) and fires burn under the mixed severity regime.	Endemic insect and disease populations with less than 50% crown defoliation. Mortality less than 5 trees per acre in groups of less than 10 trees. Less than 15% of acres with root disease centers. A nonlethal and mixed severity fire regime. On dry sites the interval ranges from 10 to 25 years and typically is a nonlethal surface fire. On cooler, wetter sites, the interval is longer (30 to 50 years) and fires burn under the mixed severity regime. Fires of low to moderate severity open dense stands of pole-sized or larger trees. Subsequent light burns maintain these stands in a park-like condition.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Patterns are within historical ranges. Fire's role is to maintain Douglas-fir or ponderosa pine where they are seral species.	Patterns are within historical ranges. (corridors are present and functional.) Fire's role is to maintain Douglas-fir or ponderosa pine where they are seral species.	Patterns are within historical ranges. (Pattern sizes, shapes and corridors are maintaining processes.) Fire's role on dry and mesic sites is to prevent a shade tolerant understory from developing. Subsequent light burns maintain these stands in a park- like condition.

SUBJECT: **PONDEROSA PINE/JEFFREY PINE COMPLEX** (*Pinus ponderosa, Pinus jeffreyi*)	**INDICATORS OF A PROPERLY FUNCTIONING CONDITION** (BY GEOGRAPHIC SCALE)

CRITERIA	**REGIONAL**	**SUBREGIONAL:**	**LANDSCAPE**
STRUCTURE	Balanced range of structural stages.	20% is in grass/forb and seedling/sapling stages with 40% in Mature and Old stages.	Balanced Range: Grass/forb ≈10% Seedling/Sapling ≈10% Young Forest ≈20% Mid Aged Forest ≈20% Mature Forest ≈20% Old Forest ≈20% 75% of multiple canopy structure is ponderosa or Jeffrey pine. Stand Density Index (SDI) not greater than 234 and Basal Area less than 140.
COMPOSITION	Ponderosa or Jeffrey pine is dominant.	More than 75% is ponderosa or Jeffrey pine.	More than 75% of trees are ponderosa or Jeffrey pine.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insect and disease populations. 5% or less of host type with insect activity and 30% or less of trees have dwarf mistletoe. Fire regime is a nonlethal type with a fire return interval of 5 to 25 years.	Endemic insect and disease populations. Tree mortality not over 10% of host type and mortality groups have less than 50 trees. <40% of trees have dwarf mistletoe; <10% with stem rust and root disease centers. Fire regime is a nonlethal type with a fire return interval of 5 to 25 years.	Endemic insect and disease populations. Pockets of mortality do not exceed 5 trees per acre. Mortality groups of <10 trees. <1% of trees with black stain, <10% with root disease, <20% with dwarf mistletoe or stem rust. Fire regime is a nonlethal type with a fire return interval of 5 to 25 years.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Patterns are within historical ranges. The role of fire is to maintain both seral and climax stands of ponderosa pine or Jeffrey pine.	Patterns are within historical ranges. (corridors are present and functional.) The role of fire is to maintain both seral and climax stands of ponderosa or Jeffrey pine.	Patterns are within historical ranges. (Pattern sizes, shapes and corridors are maintaining processes.) The role of fire is to maintain open stands of pine by removing competing shade tolerant understory fir seedlings. Periodic fires can create uneven-aged stands comprised of groups of trees that vary in age from group to group.

SUBJECT: PONDEROSA PINE - SOUTHERN UTAH(*Pinus ponderosa*)	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Balanced range of structural stages.	20% is in grass/forb and seedling/sapling stages with 40% in Mature and Old stages.	Balanced Range: Grass/forb ≈10% Seedling/Sapling ≈10% Young Forest ≈20% Mid Aged Forest ≈20% Mature Forest ≈20% Old Forest ≈20% 75% of multiple canopy structure is ponderosa pine. Stand Density Index (SDI) not greater than 158 and Basal Area less than 120.
COMPOSITION	Ponderosa pine is dominant.	More than 75% is ponderosa pine.	More than 75% is ponderosa pine.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insect and disease populations. 5% or less of host type with insect activity and 30% or less of trees have dwarf mistletoe. Fire regime is a nonlethal type with a fire return interval of 5 to 25 years.	Endemic insect and disease populations. Tree mortality not over 10% of host type and mortality groups have less than 50 trees. <40% of trees have dwarf mistletoe; <10% with stem rust and root disease centers. Fire regime is a nonlethal type with a fire return interval of 5 to 25 years.	Endemic insect and disease populations. Pockets of mortality do not exceed 5 trees per acre. Mortality groups of <10 trees. <1% of trees with black stain, <10% with root disease, <20% with dwarf mistletoe or stem rust. Fire regime is a nonlethal type with a fire return interval of 5 to 25 years.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Patterns are within historical ranges. The role of fire is to maintain open stands of ponderosa pine.	Patterns are within historical ranges. (corridors are present and functional.) Role of fire is to maintain open stands of ponderosa pine.	Patterns are within historical ranges. (Pattern sizes, shapes and corridors are maintaining processes.) Periodic fires create uneven-aged stands composed of various even-aged groups.

SUBJECT: <u>PINYON - JUNIPER</u> (*Pinus edulis or P. monophylla* with *Juniperus osteosperma*)	**INDICATORS OF A PROPERLY FUNCTIONING CONDITION** (BY GEOGRAPHIC SCALE)

CRITERIA	**REGIONAL**	**SUBREGIONAL:**	**LANDSCAPE**
<u>STRUCTURE</u>	Balanced range of structural stages.	40% is Mature and Old.	Balanced Range: Grass/forb ≈10% Seedling/Sapling ≈10% Young Forest ≈20% Mid Aged Forest ≈20% Mature Forest ≈20% Old Forest ≈20%
<u>COMPOSITION</u>	Pinyon - Juniper are dominant.	Forbs, grasses and shrubs are resilient.	Shrub, forb and grass composition make up 20% or more of total vegetation. Bare ground less than 30%. Rock cover is common.
<u>DISTURBANCE REGIME</u> (e.g. fire, insects, pathogens, flood, wind)	Endemic insect and disease populations cause less than 10% mortality in host type. <40% have dwarf or true mistletoe. < 5% have black stain fungus. Fire regimes are within historical ranges. The fire return interval is 10 to 30 years.	Endemic insect and disease populations cause less than 10% mortality in host type. <30% have dwarf or true mistletoe. < 5% have black stain fungus. Fire regimes are within historical ranges. The fire return interval is 10 to 30 years.	Endemic insect and disease populations. Fires burning every 10 to 30 years prevent pinyon-juniper stands from spreading into neighboring grasslands/shrublands.
<u>PATTERNS</u> (e.g. connectivity, shapes, size, distribution)	Patterns are within historical ranges. Fire maintains open (sparse) stands of pinyon-juniper and limits the spread of pinyon-juniper into other vegetation types.	Patterns are within historical ranges. (corridors are present and functional.) Fire maintains open (sparse) stands of pinyon-juniper and limits the spread of pinyon-juniper into other vegetation types.	Patterns are within historical ranges. (Pattern sizes, shapes and corridors are maintaining processes.) Pinyon - Juniper is primarily limited to habitats which offer protection from fire such as bare ridgetops and rock outcrops.

SUBJECT: MOUNTAIN MAHOGANY (*Cercocarpus* spp.)	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Balanced range of structural stages, sizes and ages of individual shrubs. >35% annual leader growth is retained each year to assure flowering and seed set.	Balanced range of structural stages, sizes and ages of individual shrubs. >35% annual leader growth is retained each year to assure flowering and seed set.	Balanced Range: Grass/forb ≈ 10-20% Early seral ≈ 20-40% Mid seral ≈ 20-40% Late seral ≈ 20-40%
COMPOSITION	Herbaceous layers well developed. (i.e. 20% or more total cover.) Bare ground is less than 25% cover.	Herbaceous layers well developed. (i.e. 20% or more total cover.) Bare ground is less than 25% cover.	Herbaceous layers well developed. (i.e. 20% or more total cover.) Bare ground is less than 25%.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insects and disease affect less than 40% of the host type. 50-70 year fire cycles with a mixed severity/lethal fire regime.	Endemic insects and disease affect less than 30% of the host type. 50-70 year fire cycles with a mixed severity/lethal fire regime.	Endemic insects and disease and weather affect less than 20% of the host type. Insect defoliation <50% on individual plants for 3+ years. 50-70 year fire cycles with a mixed severity/lethal regime.
PATTERNS (e.g. connectivity, shapes, size, distribution)	20-40% of acres are in mid-seral or later structural stages in patches of >25 acres. Pattern is a more or less heterogenous mosaic of structural classes.	20-40% of acres are in mid-seral or later structural stages in patches of >25 acres. Pattern is a more or less heterogenous mosaic of structural classes.	20-40% of acres are in mid-seral or later structural stages in patches of >25 acres. Pattern is a more or less heterogenous mosaic of structural classes.

SUBJECT: GAMBLE OAK (*Quercus gambelii*)	INDICATORS OF A PROPERLY FUNCTIONING CONDITION

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Balanced range of size and age classes.	Balanced range of size and age classes.	Balanced Range: Grass/forb ≈ 10-20% Early seral ≈ 20-40% Mid seral ≈ 20-40% Late seral ≈ 20-40%
COMPOSITION	Herbaceous layers well developed. (i.e. 25% or more total herb cover.) < 10% composition of maple species.	Herbaceous layers well developed and distributed. Less than 10% of tree strata is made up of *Acer, Pinus, Pseudotsuga,* or *Abies* species.	Herbaceous layers well developed and distributed, bare ground is less than 25%. Less than 10% of tree strata is made up of *Acer, Pinus, Pseudotsuga,* or *Abies* species.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insects and disease affect less than 40% of the host type. Crown fires have a 20 to 50 year interval in this mixed severity fire regime.	Endemic insects and disease affect less than 30% of the host type. Crown fires have a 20 to 50 year interval in this mixed severity fire regime.	Weather, endemic insects and disease affect less than 20% of the host type. <20% branch and clump mortality caused by insects, disease or winter mortality. <50% insect defoliation for more than 3 years. Crown fires have a 20 to 50 year interval in this mixed severity fire regime.
PATTERNS (e.g. connectivity, shapes, size, distribution)	20-40% of acres are in mid-seral or later structural stages in patches of >25 acres. Pattern is a more or less heterogenous mosaic of structural classes. Fire helps to maintain these classes.	20-40% of acres are in mid-seral or later structural stages in patches of >25 acres. Pattern is a more or less heterogenous mosaic of structural classes. Fire helps to maintain these classes.	20-40% of acres are in mid-seral or later structural stages in patches of >25 acres. Pattern is a more or less heterogenous mosaic of structural classes. Fire helps to maintain these classes.

SUBJECT: TALL FORB	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Dominated by tall forb species.	Dominant tall forb component with 50% or more composition community by tall forb species.	Minimum ground cover of 85% leading into the winter season.
COMPOSITION	Minimum of 50% composition of tall forb indicator species on suitable habitat. (e.g. *Ligusticum* spp., *Osmorhiza* spp., *Geranium* spp.)	Mosaic dominance of tall forb indicator species.	Mosaic dominance of tall forb indicator species.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Herbivory in balance with restoration of tall forb habitat. Fire regime is within historical ranges.	Demonstrated stable or upward trend in tall forb indicator species. (See Lewis, 1990 and Mueggler, 1988.) Fire regime is within historical ranges.	Demonstrated stable or upward trend in tall forb indicator species. (See Lewis, 1990 and Mueggler, 1988.) Fire regime is within historical ranges.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Patterns within historical range on areas still suitable for Tall forb dominance.	Patterns within historical range on areas still suitable for Tall forb dominance.	Patterns within historical range on areas still suitable for Tall forb dominance.

SUBJECT: MOUNTAIN BRUSH COMPLEX	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Multiple vegetation layers.	Multiple vegetation layers with alternating vertical dominance.	Multiple vegetation layers with alternating vertical dominance.
COMPOSITION	Balanced acreages of islands and stringers within other vegetation types.	Balanced shrub/herbaceous understory components.	Alternating prominence of shrub/herbaceous components with historical disturbance regimes, bare ground is less than 25%. Dominance of sprouting species.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Endemic insect, disease and fire regimes within historical ranges. Fire regime is mixed severity.	Insect, disease and fire intervals within 20-40 year cycles. Fire regime is mixed severity.	Insect, disease and fire intervals within 20-40 year cycles. Fire regime is mixed severity.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Interspersed island and stringers within historical ranges.	Acreages and dispersion within historical ranges.	Acreages and dispersion within historical ranges.

SUBJECT: **BIG SAGEBRUSH/GRASSLAND** (*Artemisa tridentata* complex)	**INDICATORS OF A PROPERLY FUNCTIONING CONDITION** (BY GEOGRAPHIC SCALE)

CRITERIA	**REGIONAL**	**SUBREGIONAL:**	**LANDSCAPE**
STRUCTURE	Balanced range of structural stages.	Balanced range of structural stages. 40% of area with 15% or more crown cover (as measured by line intercept).	Balanced Range: 10% of area with 0-5% sagebrush crown cover. 50% of area with 5-15% sagebrush crown cover. 40% of area with >15% sagebrush crown cover. Bare ground less than 20% for Mtn. sagebrush with 15"+ precipitation, and less than 40% bare ground in valley sagebrush types with 7-15" of precipitation.
COMPOSITION	Big sagebrush is dominant with an understory component of grasses and forbs.	Big sagebrush is dominant on all but 0-5% of the historical habitat.	Big sagebrush is dominant on all but 0-5% of the historical habitat.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Fire has a lethal fire regime on an approximately 20 year return cycle.	Fire has a lethal fire regime on an approximately 20 year return cycle. Drier sites may have a 20 to 40 year return interval.	Fire has a lethal fire regime on an approximately 20 year return cycle. Drier sites may have a 20 to 40 year return interval.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Patterns are within the historical range.	Patterns are within the historical range.	Patterns are within the historical range.

SUBJECT: AQUATIC AND TERRESTRIAL ANIMALS	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Age-classes/ reproductive cohorts of native fish, amphibians, and terrestrial wildlife present in adequate quantities and ratios to maintain viable populations.	Physical and biological habitat features (e.g. communities, seral stages, water bodies, etc.) are adequate to maintain viable animal populations, long-term.	Physical and biological habitat features (e.g. plant communities, seral stages; large woody debris; water body morphology) available within annual home range, adequate to maintain viable populations, long-term.
COMPOSITION	All native, adapted species are present, in stable to increasing populations, in suitable habitats. Exotic species, diseases and their vectors do not limit, displace or reduce the long-term viability of native species.	All native, species present, stable to increasing in suitable habitats. Exotic species and diseases do not limit, displace or reduce long-term viability of native species.	Extant native species present at sustainable population levels in habitats to which they are adapted.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Historical predators, prey, foods and habitats of native species are present, and support animal populations' viability, reproductive strategy and long-term sustainability.	Disturbances to animal habitats affect only small portions (<5%?) of animals' annual range or habitats.	Habitat features adequate to sustain viable populations are available within annual ranges of animals, even after disturbance. Population levels are sustainable within historical ranges.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Migration, distribution, reproduction, and genetic diversity of animal populations facilitated/unhindered by habitat distribution or connectivity. Populations stable in historical ranges.	Migration, distribution, reproduction, and genetic diversity of animal populations facilitated/unhindered by habitat distribution or connectivity. Populations stable in historical ranges.	Animal populations exhibit genetic and reproductive integrity, without habitat or sub-population isolation or fragmentation.

SUBJECT: HYDROLOGIC REGIME	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Water quantity and distribution within ranges defined for area.	Quantity and timing of flows within normal range. Little or no evidence of stream malfunction.	Stream base level stable. Head cuts and sediment are within historical ranges. Peak flows and base flows are within historical ranges of variability.
COMPOSITION	N/A	N/A	N/A
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Peak flows, mass movements, and flooding within historical range of variation. Percent of basin altered or disturbed within the historical range of variation.	Peak flows, mass movements, and flooding within historical range of variation. Percent of sub-basin altered or disturbed within the historical range of variation.	Peak flows, mass movements, and flooding within historical range of variation. Percent of watershed altered or disturbed within the historical range of variation.
PATTERNS (e.g. connectivity, shapes, size, distribution)	N/A	Channel maintains flows sufficient to maintain diverse water dependent landscape components.	Stream flow release sustain landscape components such as wet meadow, riparian areas, springs and seeps.

SUBJECT: SOIL QUALITY	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Amount of bare soil and soil loss within historical range of variation.	Amount of bare soil and soil loss within historical range of variation.	Absence of excessive erosion indicators such as rill/gullying and pedestaling. Intensity and area extent of soil displacement and compaction are within acceptable ranges.
COMPOSITION	Large woody material and organic matter within historical range of variation.	Large woody material and organic matter within historical range of variation.	Large woody material and organic matter within historical range of variation. (e.g. in tons/acre by cover/habitat type required for soil sustainability.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Area or extent altered or disturbed within historical range of variation.	Area or extent altered or disturbed within historical range of variation.	Area or extent altered or disturbed within historical range of variation. Infiltration and percolation ranges sustain soil hydrologic function and minimize overland flow.
PATTERNS (e.g. connectivity, shapes, size, distribution)	N/A	N/A	N/A

SUBJECT: RIPARIAN/WETLANDS	INDICATORS OF A PROPERLY FUNCTIONING CONDITION (BY GEOGRAPHIC SCALE)

CRITERIA	REGIONAL	SUBREGIONAL:	LANDSCAPE
STRUCTURE	Balance between the vegetation, soil and water resources.	Balance between the vegetation, soil and water resources.	Amount and type of vegetation community types present that maintain riparian dependent resources and provide a high rate of recovery following disturbance.
COMPOSITION	Extent and distribution of riparian and wetland areas reflective of historical ranges.	Amounts and kinds of vegetation and physical properties sustain riparian dependent resources.	The plant community type composition emphasizes hydrophytic vegetation. Stream gradients, meanders, sediment amounts and general flow regimes are within historical range of variation.
DISTURBANCE REGIME (e.g. fire, insects, pathogens, flood, wind)	Within historical spatial and temporal disturbance patterns and recovery rates.	Rapid recovery of degraded or disturbed conditions. Frequently inundated flood plains reduce intensity of flooding.	Minimal carryover of disturbance features into the following years. Although dynamic, plant communities and hydrologic functions persist or recover rapidly.
PATTERNS (e.g. connectivity, shapes, size, distribution)	Sizes and distribution are within historical ranges.	Sizes and distribution are within historical ranges and maintain hydrologic functions.	Plant community type compositions and accompanying riparian ecosystem functions maintain proper ground water recharge, storage, delivery, water tables, channel morphology and bank stability.