



What Does My Plot Form Summary Tell Me?

SLOPE

The Influence of Slope on Timber

- When harvesting trees on slopes greater than 40%, consider using cable equipment.
- As slope increases, road distance, road construction costs, timber harvesting costs, management costs and potential soil erosion increases.
- Growth of trees is often better on the lower portions of a slope than upper, due to increased soil depth.
- The effect of aspect differences becomes more dramatic as slope increases. *Example:* Solar radiation on steep south slopes is more intense. Soils dry out sooner.

The Influence of Slope on Range

- As slope increases, livestock use decreases (cattle prefer slopes less than 20%).
- Little grazing will occur on slopes greater than 40%.
- Water for livestock is limited on steep slopes.

The Influence of Slope on Wildlife

- Snow depths are shallower on slopes than on flat areas. *Example:* A 50% slope produces an 11% shallower snow depth.
- Wildlife move more easily in shallow snow areas.
- Some species such as elk prefer gentle slopes for calving and bedding areas.
- South facing slopes and ridges exposed to wind and sunlight result in reduced snow depths, allowing for easier movement of deer and elk.

ASPECT

The Influence of Aspect on Timber

South and West Aspects:

- Warmer and drier
- Trees grow more slowly
- Seedlings are more difficult to establish
- Stands are more open
- Fewer trees per acre

North and East Aspects:

- Cooler and wetter
- Trees grow more quickly
- Seedlings are easier to establish
- Stands are more dense

The Influence of Aspect on Range

South and West Aspects:

- Grasses, forbs and shrubs start growing earlier in the spring
- Less forage grows
- Seeps and springs flow for a shorter period of time
- Plants are more palatable
- Grass seeding more difficult after timber harvesting

North and East Aspects:

- As forage dries out on south and west aspects, livestock move to north and east aspects to graze
- More forage grows
- Seeps and springs flow longer
- Plants are less palatable (unless artificially seeded)
- Responds better to grass seeding following timber harvesting

The Influence of Aspect on Wildlife

South and West Aspects:

- Warmer and drier
- More direct sun (warmer) during winter daylight hours
- Grasses and shrubs are more accessible during winter
- Good winter range for elk and deer
- Less snow accumulation, providing ease of movement

North and East Aspects:

- Cooler and wetter
- Denser forest stands for hiding and thermal cover
- Grasses and shrubs are less accessible during winter
- More water
- Greater snow accumulation

Wildlife may migrate between different aspects on a daily or seasonal basis. *Example:* Elk in winter use **south** slopes for day beds and move to **north** aspects at night and use dense clumps of trees for night beds (thermal cover).

FOREST STRUCTURES

The Influence of Forest Structure on Timber

Forest structures give an indication of a forest's previous history and the stand's stage of development.

Prone to higher fire hazard:



14 2-story stand. Overstory and understory dense. Few openings.



16 3 or more story stand. Trees in a group same size and height.

Prone to insect and disease:



2 2-story stand. Overstory & understory dense. Few openings.



14 2-story stand. Overstory & understory dense. Few openings.



18 Three story stand. Trees vary in size and height. Few openings.

Structures 14 and 16 are more susceptible to fire because of their "stair step" tree layers. Fire can move from ground to tree tops because there is no fuel break.

Old growth and dense forest structures (numbers 2, 14 and 18) are more prone to insect and disease activity.

The Influence of Forest Structure on Range



2 Dense one-story stand, closed crown. Trunks bare below crowns.

Not Thinned



10 One-story stand, occasional larger trees with small openings.

Thinned



4 Open 1-story stand. Trunks bare below crowns.

Likely



14 2-story stand. Overstory & understory dense. Few openings.

Unlikely

Forest structure indicates whether or not the stand can be altered to produce more forage for livestock.

Forest structure indicates how open the stand is and how likely it is to have forage.

The Influence of Forest Structure on Wildlife

Layering of forest foliage provides nesting sites, prey locations, hiding cover, weather protection, territorial defense, and courtship areas. Different foliage arrangements can be identified by forest structure types. Forest structures indicate the potential for certain wildlife species.

Fewer Numbers of Wildlife Species



2 Dense one-story stand, closed crown. Trunks bare below crowns.



4 Open 1-story stand. Trunks bare below crowns.



8 Overstory removal. All overstory gone. Many openings in understory.

Greater Numbers of Wildlife Species



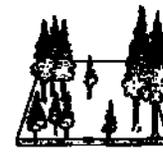
11 Openings in overstory and understory. Snags and down trees present.



15 Some overstory trees remain with scattered understory.



16 3 or more story stand. Trees in a group same size and height.



17 3 or more story stand. Trees in same size & height. Openings larger than in #16.

SHRUB UNDERSTORY

The Influence of Shrub Understory on Timber

- Inhibits seedling growth by competing for light and soil moisture.
- Very heavy ground cover can make logging more difficult.
- Some shrub species can harbor tree diseases. *Example:* currant (*Ribes*) carries white pine blister rust.
- Shrubs help reduce soil erosion potential after harvesting.
- Heavy shrub understory with multiple layers can be a fire hazard. It acts as a ladder, carrying fire into the tree crowns.

The Influence of Shrub Understory on Range

- May reduce the amount of grass and forbs available by competing for light and moisture in the soil.
- Can be a barrier to livestock movement.
- Can be a source of forage for livestock. *Example:* Serviceberry, Elderberry, and Willow.

The Influence of Shrub Understory on Wildlife

- Provides forage for many birds and mammals.
- Provides hiding and escape cover for many species of wildlife.
- Provides nesting habitat for many birds and small mammals.
- Provides corridors for migration.

SOIL CONSIDERATIONS

The Influence of soil characteristics on Timber

- Greater soil depth and organic layer indicates current and future growth potential for trees.
- Compaction and drainage can indicate erosion potential and regenerative capacity of the site if a timber harvest is planned.

The Influence of soil characteristics on Range

- Soil and organic layer depth, drainage and compaction all impact the density, vigor and species composition of range/forage plants.

The Influence of soil characteristics on Wildlife

- As soil and organic layer depth, drainage and compaction impact the species composition of range/forage plants, these plant communities also dictate the wildlife species that may utilize the area.

The Influence of soil characteristics on Water Quality

- Compacted, poorly drained soils combined with steeper slopes, can have a high erosion potential. Poor water quality can be a direct result.

TREE CROWN COVER (%)



20%



40%



60%



80+%

The Influence of Tree Crown Cover on Timber

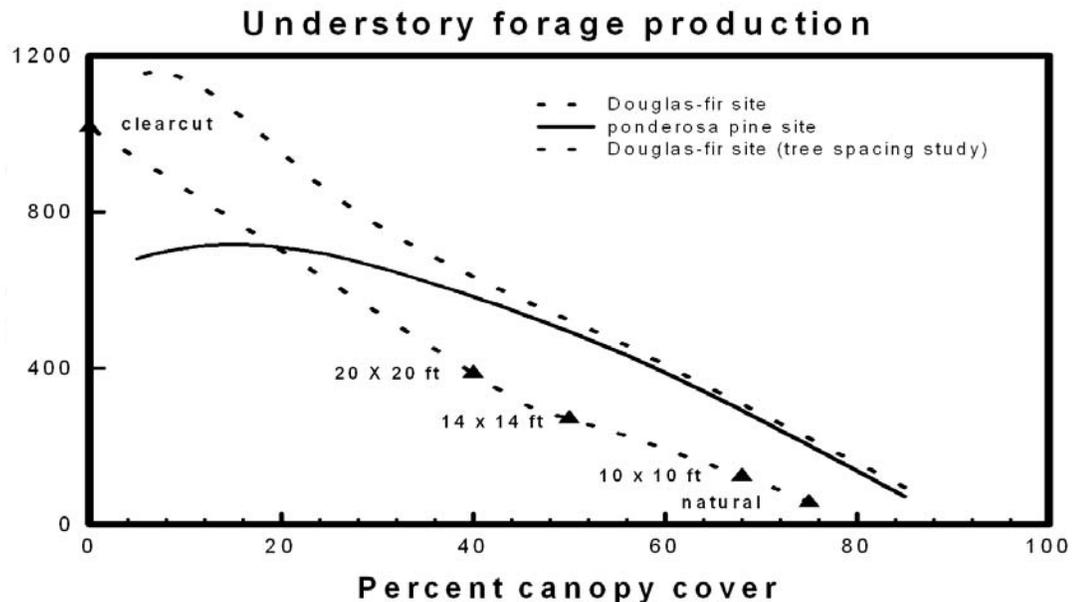
Lower % crown cover:

- Faster growth of individual trees.
- More favorable conditions for establishment of shade intolerant tree species such as aspen, western larch, ponderosa pine and lodgepole pine.
- Individual trees likely to have bushier crowns.

Greater % crown cover:

- The greater the competition between trees, the slower the growth of the stand (that's the reason for tree thinning).
- More favorable conditions for the establishment shade tolerant tree species such as Douglas-fir, subalpine fir, etc.

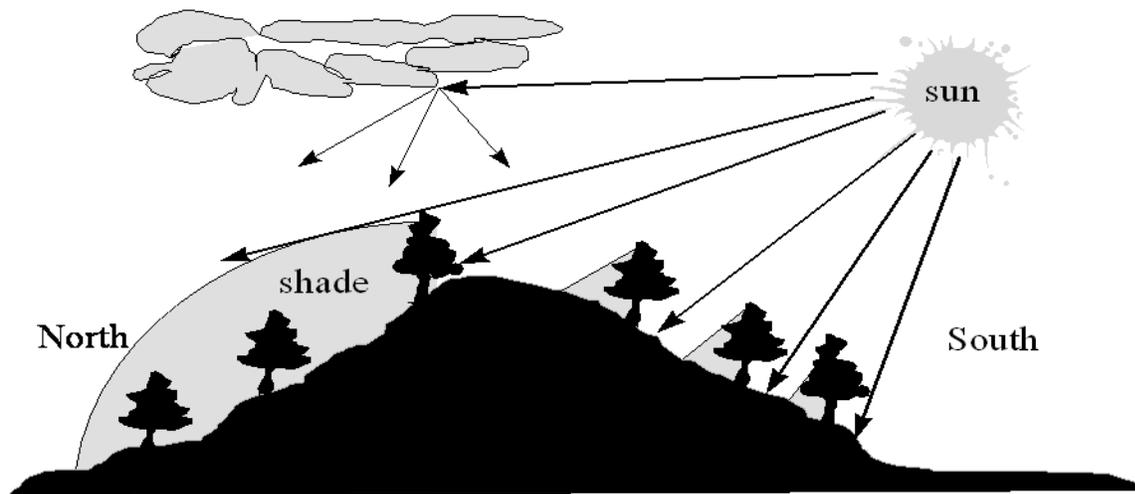
The Influence of Tree Crown Cover on Forage



This figure shows measured increases in forage production three years after thinning trees on three forested sites. The triangular symbol represents tree spacing for corresponding canopy cover on one Douglas-fir site. For a more complete summary of this study refer to the handout titled Forestland Grazing: Understory Forage Management by Dr. Peter Kolb.

TREE CROWN COVER (%)

The effect of aspect on sunlight diffusion through a forest canopy



The impacts of a forest canopy on understory plants can vary with aspect and slope and tree species. For a more complete summary of tree crown cover affect refer to the handout titled [Forestland Grazing: Understory Forage Management](#) by Dr. Peter Kolb.

The Influence of Tree Crown Cover on Range

Lower % crown cover:

- Less than 20% will have little effect on the amount of forage. (Further reductions in tree cover will have little impact on forage production.)
- Between 20-50% results in moderate reductions in forage growth.

Greater % crown cover:

- Greater than 60% produces little or no forage.
- Affects forage by competing for sunlight and water.
- The plants in the forage understory may change depending on the % of tree crown cover (due to shade tolerance).

The Influence of Tree Crown Cover on Wildlife

(See Forest Structure and Shrub Understory)

Lower % crown cover:

- More shrub understory and available forage for wildlife.

Greater % crown cover:

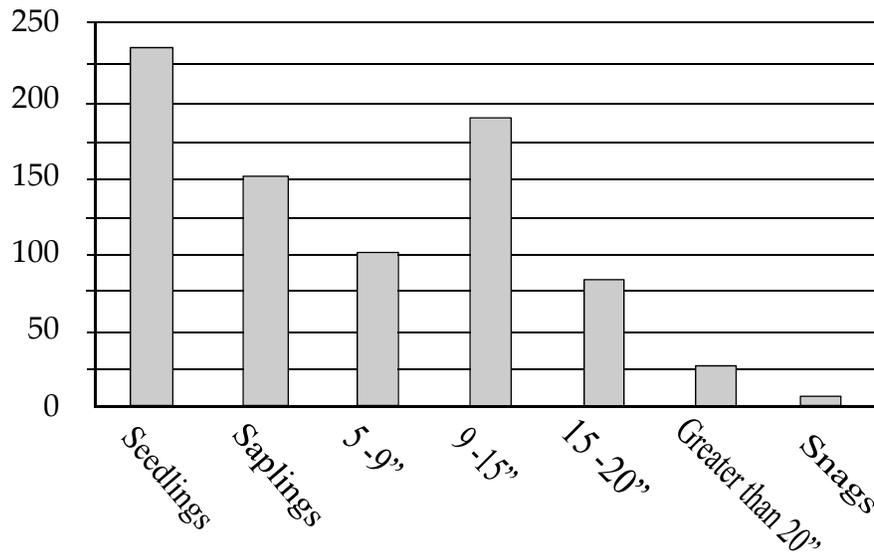
- Provides greater wildlife hiding cover.
- Less shrub understory and available forage for wildlife.
- Trees collect snow in their branches making it easier for wildlife to move on the ground.
- Better thermal cover for wildlife.

SIZE CLASSES

(Seedling, Sapling, 5 - 9", 9 - 15", 15 - 20", greater than 20")

The Influence of Size Class on Timber

- Size class information provides a detailed description of the forest.
- This information can be used to develop a stand table—a picture of the trees in your forest based on their size and number.



The Influence of Size Class on Range

- Size class information indicates the potential loss of forage as the stand closes; trees get larger and their crown cover becomes more dense. As this occurs, the plants under trees are reduced in number, due to shade.

The Influence of Size Class on Wildlife

- Size class information indicates the number of current snags and potential for future snags.
- This information also indicates the varieties of habitat that exist in an area. *Example:* Is the forest a one-story, two-story, or a multi-story stand?
- This information indicates the potential for large, downed woody material.

PRIMARY & SECONDARY TREE COVER TYPE

The Influence of Tree Cover Type on Timber

- Tree cover type may influence the wood products available from your forest.

Example:

lodgepole pine - posts and poles sawlogs, house logs

ponderosa pine - sawlogs, peeler logs, mill wood (window frames, doors, etc.)

- Tree cover type indicates the present commercial value of the stand. *Example:* Mature ponderosa pine and Douglas-fir are highly valued; subalpine fir and grand fir are less valuable.

The Influence of Tree Cover Type on Range

- Depending on the tree cover type, more light will reach the ground in spring, resulting in earlier growth.

Example: Shrubs under larch green up earlier in the spring.

The Influence of Tree Cover Type on Wildlife

- Depending on the tree cover type, wildlife will vary.

Example: Ponderosa pine and western larch are most important trees for snags. Douglas-fir and spruce are better snow interceptors, wind reducers and provide better hiding cover due to their branching characteristics.

INCREMENT BORED TREES

Increment bored trees provide information on tree age and tree diameter.

Why is Tree Age Important?

- Tree age indicates the stage of development your forest is in. (Young versus older forest.)
- Knowing trees are 80 years old or 180 years old can indicate their expected life span.
- Some tree species live longer than others. *Example:* lodgepole pine has a life span of 80-150 years, while western larch can live 300-400 years.

Why is Tree Diameter Important?

- Tree diameter is measured at 4.5 feet above the ground.
- If you know the age of your trees and the average diameter, you can determine how fast they have grown.
- *Example:* Are your trees growing 9 inches in 100 years, or 15 inches in 100 years? Which would you rather have?
- Proper thinning could make the difference.

How Does Tree Diameter Relate to Basal Area?

Two stands may have the same basal area, but the stand with the smaller average diameter will have more trees per acre. *Example:* Compare two stands with basal area of 78.5 square feet per acre. If the average diameter in one stand is 6 inches, it will have approximately 400 trees per acre. A second stand with an average diameter of 24 inches would have approximately 25 trees per acre.

Why Measure Rings/Inch Growth Increment?

This measurement gives an indication of how fast your trees are growing. *Example:* If your tree has grown one inch in the last twenty years the tree has actually grown 2 inches in diameter over the twenty-year period (an inch on both sides). If your tree has grown one inch in the last 5 years, or 2 inches in diameter, then this tree is growing better and gaining more volume and probably putting on more height than the first tree.

If you desire to grow bigger trees or a trees with a specific diameter of trees, you can extrapolate how long it will take a tree to reach that size. If a tree is 12 inches in diameter, you want it to be 24 inches, and is growing at a rate of one inch per five years, it would take 30 years for it to reach 24 inches. (12 inches growth divided by 2 is 6 inches times five years is 30 years.)

Potential Mean Maximum Ages		
* these ages will vary based on tree density, site quality, and pest & pathogen occurrence.		oldest
ponderosa pine	150-500	955
Douglas fir	150-400	1,350
western larch	300-500	1,000
lodgepole pine	80-200	600
Engelmann spruce	150-300	850
western red cedar	300-500	1,460
western white pine	100-500	615
grand fir & sub alpine fir	80-250	500
western hemlock	100-300	1,200
mountain hemlock	100-300	1,542
cottonwood	80-150	
quaking aspen tree	30-100	
quaking aspen clone	50-500	80,000

BASAL AREA *(Loggers)*

The Influence of Basal Area on Timber

- Basal area is the cross-sectional area of a tree stem (4.5 feet from the ground). Adding up the individual basal area of every tree on an acre results in the total basal area per acre. Basal area is expressed as square feet (sq. ft.) per acre.
- Basal area is an index of stand density when used with average diameter of trees in the stand.
- Basal area can be used with other data to determine timber volumes.
- Basal area can be used as a guide for thinning or tree harvest. *Example:* We can reduce the basal area from 160 to 110 by removing approximately 30% of the trees in the stand.

The Influence of Basal Area on Range

- Basal area provides information on stand density which may be related to competition between the forest overstory and understory.
- Generally, the lower the basal area, the higher the grazing potential.

The Influence of Basal Area on Wildlife

- Used to calculate hiding cover.
- May give an indication of the potential for snow interception and thermal cover.

TREES PER ACRE

The Influence of Trees Per Acre on Timber

- The number of trees per acre indicates stocking (how many trees are spaced over an acre).
- Knowing the average DBH of the stand tells even more. *Example:* A stand with 200 trees per acre, 4 inches in diameter, might be under stocked. A stand with 200 trees per acre, 16 inches in diameter, could be overstocked.
- Excessively high trees per acre increases the probability of insect and disease.
- High trees per acre can result in reduced growth rates.
- Trees per acre can be used with other data to estimate timber volume.

Spacing (feet)	Trees /Acre
3 x 3	4,840
5 x 5	1,742
7 x 7	889
10 x 10	436
12 x 12	303
14 x 14	222
16 x 16	170
18 x 18	134
20 x 20	109
25 x 25	70
30 x 30	48
40 x 40	27

The Influence of Trees Per Acre on Range

- Depending on tree diameter, high trees per acre result in little or no forage.
- High trees per acre may pose a barrier to grazing (little or no cattle access).

The Influence of Trees Per Acre on Wildlife

- The number of trees per acre indicates the type of wildlife that may favor the area.
- High trees per acre indicates good wildlife cover (both security and thermal).
- High trees per acre reduces the effect of wind chill in the winter and heat in summer.
- Trees per acre indicates the number of trees available for future snags and downed woody material.

STAND HEALTH/APPEARANCE

The Influence of Stand Health/Appearance on Timber

- May identify current insect and disease problem, or the potential for a future insect and disease problem. Insect or disease infestations can dramatically slow down the growth rates of trees. In the most severe cases, trees can be killed.
- Commercial value of timber may be affected by the appearance or physical condition of trees. For example: Trees with sweep (curving trunks) are not as valuable as straight trees. Trees that are rotten do not have as much merchantable (sellable) wood.
- Large areas of dead or dying trees may represent a fire hazard.
- A healthy forest will grow faster and from a timber standpoint gain more value each year.
- The timing of a timber harvest or tree thinning may be based on the need to improve or maintain stand health and appearance. For example: A lodgepole pine area has been heavily damaged by a beetle infestation and many trees are dying. A timber harvest may be needed in the near future if the owner is interested in salvaging sawlogs before their quality (value) decreases. The harvest may help to control the beetle problem by controlling their spread.

The Influence of Stand Health/Appearance on Range

- Poor stand health can influence the crown cover.
- Stands with poor health generally have a low crown percent which may allow for increased forage production.
- Good stand health will most likely result in an increase in the amount of crown closure over time, decreasing forage production. A high percent of cattle damage may indicate over-grazing or poor distribution of cattle.

The Influence of Stand Health/Appearance on Wildlife

- Indicates future trends in habitat condition: availability of snags, cover and down wood.
- Poor stand health due to insects may increase certain bird populations.
- Animal use indicates what species are using the area.
- High percent of animal damage may indicate over-population or poor distribution of wildlife may indicate a lack or suitable similar habitat.
- In forests with closed canopies (high percent crown), insect and disease infestations may create natural openings in the forest by killing trees. These openings create diversity in the forest which can benefit many species of wildlife.

DOWN WOODY MATERIAL

The Influence of Down Woody Material on Timber

- Heavy concentrations represent a fire hazard.
- Habitat for rodents which can damage tree seedlings.
- Logs oriented along the slope contour help check soil erosion by slowing surface-water runoff.
- Decaying woody material contributes nutrients and helps maintain soil moisture.

The Influence of Down Woody Material on Range

- Large amounts of dispersed woody material are a barrier to livestock, limiting movement on the site and limiting access to other sites.
- The same is true for grazing wildlife.

The Influence of Down Woody Material on Wildlife

- Logs provide habitat for amphibians, reptiles, birds and mammals.
- Large logs act as hiding cover.
- Rotting logs provide den sites, food storage, and feeding locations for burrowing animals.
- The larger the diameter and greater the length of down woody material, the more useful it is; but small material is better than none.
- Piled logging debris concentrates logs into small areas, reducing their effectiveness.
- Fire-charred logs are not as valuable (result in fewer insects, a principal food source for woodpeckers).
- Logs provide bridges across streams.

FIRE HAZARD

The Influence on Timber

- A large accumulation of fine fuels around the base of trees can burn slowly for a long period of time. The heat generated from the extended time of fine fuel burning can kill the cambium of large diameter thick barked trees resulting in mortality.
- When a fire burns through a smaller accumulation of fine fuels there may be mortality in smaller trees with thin bark and in trees with less fire resistant species.
- Ladder fuels can cause a ground fire to spread into the crowns of trees. Pruning of lower branches can increase the amount of clear wood (wood without knots) as the tree increases in diameter. Thinning trees to reduce ladder fuels can reduce competition among trees.
- Tree crowns touching make it easier for crown fires to travel. In dry sites more shading can offer shade to the understory but can also limit the amount of precipitation that reaches the ground. With more tree crown cover there is more competition for water.

Fire severity risk is a measure of the probable amount of tree and plant death that will occur if a wildfire burns through this condition under “standard bad fire day” weather.

Fire intensity is a measure of potential fire flame length, energy and also indicates how difficult it will be to contain and suppress a wildfire under the conditions of “standard bad fire day” weather.

The Influence on Range

- A large accumulation of fine fuels can limit the space for forage to germinate and grow.
- A large accumulation of large fuels can inhibit the travel of range animals. This could be beneficial if there is an area that you want to inhibit access.
- A large accumulation of large fuels can inhibit the travel of range animals. This could be beneficial if there is an area that you want to inhibit access.
- For ‘tree crowns touching’ see Tree Crown Cover section.

The Influence on Wildlife

- The amount of fine fuels can affect the amount of available forage.
- A large accumulation of large fuels can be good for some species in some areas.
- A large accumulation of large fuels can inhibit the travel of large ungulates. This could be beneficial if there is an area that you want to inhibit access or travel corridors.
- Trees with ladder fuels: Lower branches offer perching places some small birds and rodents.
- Areas with a close canopy can provide thermal cover although it reduces light to the surface available for forage growth. Variety across the landscape can provide for the different needs wildlife. Also see Tree Crown Cover section.

FORAGE/Ground Cover

The Influence on Timber

- The current ratio of desirable forage species versus undesirable forage species may be altered through timber management activities such as logging.
- The quantity of forage available can be altered in a forest through timber management activities such as thinning, harvesting, and planting of trees.

The Influence on Range

- Sites with few desirable or preferred forage plants may have potential for seeding an area with many preferred species has grazing potential.
- Areas with a moderate coverage of preferred and desirable species may not require seeding after site disturbances. A site disturbance is any activity that exposes mineral soil. (Logging, skid trails, equipment operation, small fire, etc.)

The Influence on Wildlife

- Areas that are capable of producing good cattle forage are likely to have potential for growing good wildlife forage.

CATTLE FORAGE USE

The Influence on Timber

- Heavy use may indicate the potential for seedling and/or sapling damage.
- Light to moderate use of forage may enhance tree seedling growth and survival by reducing competition from forage plants.

The Influence on Range

- Low use shows more grazing could be allowed.
- Significant livestock use of undesirable plants may indicate overuse of a particular area.
- Areas with heavy use may represent a problem with overstocking or a problem with livestock distribution. Livestock distribution problems can be corrected through management such as riding, salting, timing of grazing, etc.

The Influence on Wildlife

- Possible indication of conflicts with wildlife forage or cover.

DEER/ELK FORAGE

The Influence on Timber

- Timber management may affect the ratio of desirable plants to undesirable plants as they existed before logging, thinning, herbicide spraying, etc.
- Forage quantity will likely increase as a result of thinning and tree harvesting in forested areas.

The Influence on Range

- Elk and deer may compete with livestock for available forage.

The Influence on Wildlife

- Areas with a high coverage of preferred species have good potential to provide forage for deer and elk.
- Areas with few or not preferred species are not providing good elk and deer forage.

DEER/ELK FORAGE OVER USE

The Influence on Timber

- Indicates potential for tree seedling and/or sapling damage.

The Influence on Range

- Shows potential for competition with livestock.

The Influence on Wildlife

- Shows over-use of forage species.
- The area being over-used may not be able to sustain the current level of use over time.
- Over-use of an area may result in the amount of undesirable forage plants increasing over time, while the amount of desirable forage plants decrease over time.

PRESENCE OF PELLETS/SCAT

The Influence of Pellets/Scat on Timber

- Indicates potential for damage to tree seedlings from browsing, antler rubbing, and other animal damage. Animal browsing and damage can especially affect conifer seedlings and saplings as well as regenerating aspen and shrubs.

The Influence of Pellets/Scat on Range

- May indicate competition with cattle.
- May indicate amount of use. Wildlife can cause damage to crops and livestock as well as poultry.

The Influence of Pellets/Scat on Wildlife

- Gives indication of animal distribution over area.
- Indicates types of animals using an area.
- May be able to determine the types of foods being used by wildlife.