NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FOREST TRAILS AND LANDINGS

(Ac.)

CODE 655

DEFINITION

A temporary or infrequently used route, path or cleared area within a forest.

PURPOSE

- Provide infrequent access to forest stands for management activities including fire suppression.
- Provide periodic access for removal and collection of forest products.

CONDITIONS WHERE PRACTICE APPLIES

Trails and landings are applicable on forested areas. Refer to the standard Access Roads, 560, for travel-ways that will be designed and used frequently or repeatedly for vehicular traffic to access the forest trails and landings.

CRITERIA

General Criteria Applicable To All Purposes

Predetermined trails and landings will be of a size, gradient, number and location to accomplish the intended purpose.

On forest land the Californian Forest Practices Act sets standards for all management activities. Standards can vary depending upon location, forest type, harvesting methods, etc. Contact CalFire (CDF) before making any road, harvest trail or landing specifications on forest lands.

They shall be located to minimize adverse onsite and off-site impacts such as accelerated erosion, riparian area degradation, stream channel and streambank damage, hydrology modification, aesthetics or unacceptable damage to advance regeneration, residual growing stock or wildlife habitat.

Timing and use of equipment will be commensurate with site and soil conditions to maintain site productivity and minimize soil erosion, displacement and compaction.

Slash, debris and vegetative material left on the site after use will not present an unacceptable fire or pest hazard or interfere with the intended purpose. Excess slash material will be treated. Refer to Forest Slash Treatment - 384.

Drainage and erosion control measures, such as water bars, rolling dips, culverts, bridges, rock plunge pools, and other drainage measures for trails shall be used and located to minimize water flows and erosion rates. They will be of sufficient size, intervals and gradient for adequate drainage and erosion control. Use currently available technology, such as WEPP, for spacing, etc.

Measures, including the use and treatment of equipment, will be used to control or protect against locally invasive species. If pesticides are planned to be utilized, refer to Pest Management - 595.

Additional Criteria

Fish Passage. For construction and maintenance of water crossings where the movement of fish or other aquatic organisms is a concern refer to the Practice Standard – Fish Passage, 396.

Stream Crossing. For construction and maintenance of ephemeral, intermittent or perennial watercourse crossings refer to the

Practice Standard –Stream Crossing, 578.

Air Quality concerns. For the reduction or minimization of particulate matter refer to Atmoshperic Resource Quality Management Practice Standard, 370.

CONSIDERATIONS

Assure safe ingress and egress to site.

Locate landings and trails to preserve aesthetic qualities.

Roads, skid trails and landings have been identified as major sources of sediment from forestland. Consider the following measures for soil protection: (1) maintaining a high level of organic matter on the soil surface; (2) seeding/mulching disturbed areas in a timely fashion; (3) limiting concentration of water, (4) not locating roads and landings in slide areas; (5) reducing water energy at culvert outlets; (6) keeping stream crossings to a minimum and (7) maintaining adequate stream side buffers.

Avoidance by equipment of critical areas that can produce erosion control problems, including geologically fragile areas, is an essential part of forestland planning. Use of soil surveys, geological hazard maps, observing and locating known areas of mass movement, locating treadways away from watercourses and steep areas can help prevent erosion and resulting sediment. Consult geologic hazards maps for slides, slips and debris flow potentials. Debris flows, also called debris avalanche, debris torrent, and mudflow, are difficult to detect in heavily forested areas. In fragile mountainous terrain ground reconnaissance may be required.

Harvest trails (skid trails) are a necessary part of a harvest operation. Skidding by ground based equipment can cause severe and unacceptable damage if left unchecked. If a system is not planned, up to 40 percent of the area may be covered with skid trails during a single entry. Multiple entries can raise the percent of area damaged another 10-15 percent.

Soil compaction and disturbance problems can be reduced by limiting the area covered by skid trails during a harvest operation.

Compaction from equipment can lead to less productivity in the forest. Severe compaction has been shown that individual tree diameter growth can be reduced up to 40 percent.

A goal of less than 15 percent of the harvest area in skid trails, including landings but excluding haul roads, is considered reasonable.

When requiring skid trails to be used, advance planning and clearly flagging trails is required. When laying out skid trails leave a strip of undisturbed vegetation parallel to all waterways, or other sensitive areas to reduce delivery of sediment.

Skid trails should be regarded as a permanent part of forest landscape. They will be used for later entries into the forest, thereby reducing additional impact to the site.

Locating Harvest Trails

Generally, harvest (skid) trails are spaced from 75 to 150 feet apart. The closer distance will be on more sloping terrain and the farther spacing on flatter terrain.

Limit skid trail width to 12 feet or less.

On steeper, broken, or highly dissected terrain expect a higher percentage of skid trails to occur.

Skid trails have two common pattern systems, branching and parallel. Branching is more commonly used on flatter terrain. It has one or more main trails with side trails branching off it. Parallel skid trail systems are used on steeper slopes and run parallel to the slope as much as possible.

Skid trails on less than 20 percent side slopes do not require trail excavation. Side slopes beyond 20 percent may require excavating one to two feet of soil, at the trail center, to establish the skid trail. This is necessary because a loaded vehicle tends to slide down hill. Erosion control measures should be planned and applied under these situations.

Spacing	*% Area in Skid Trail*
75 ft	14%
100 ft	11%
150 ft	7%

When planning skid trail layout consider the following for trail alignment:

1. Make trails as straight as possible for as long a distance as possible.
2. Remove all trees from the skid trail and cut all stumps down to ground level.
3. Make intersections at 45° angles or less with respect to travel toward the landing.
4. Parallel the contour of the terrain and make up slope skid trails follow the ridge crest.
5. To reach long corners of a unit use short trail branches.
6. Do not place branching side trails directly opposite each other on the main trail.
7. Avoid sharp curves at the bottom of steep downhill segments.

Skid Trail Grade

The grade (slope) of a skid trail effects the productivity of the operation. Skidding down hill is preferred in all ground-based systems. For main trails an adverse (generally uphill) grade needs to be no greater than 10 percent and favorable (down hill) grades not greater than 20 percent. Short steep uphill grades, up to 20 percent and 100-200 feet long, are feasible if the trail is straight and ground is firm enough for good traction.

On steeper side slopes where skid trails run up and down slope the vehicle runs perpendicular to the slope and maintains greater stability. With this operation increased protection from soil erosion will be required on the skid trails.

Tree Felling for Skid Trails

Felling trees that make them accessible from designated skid trail is the key to a successful harvest operation.

Trees must be felled toward the skid trail or alternately away in the opposite direction. This is called "felling to lead". This allows for the winch line to be pulled directly to the tree.

When a tree is felled in the wrong direction, winched trees might be damaged or trees felled on top may be damaged. Review of the skidding plan should be done with those who are felling the trees to head off any problems.

When harvesting small trees either the tops or butts are suitable for winching. Winching large diameter trees, with the butt of the tree facing the skid trail, may lead to extra soil disturbance due to it digging into the soil.

Felling trees at approximately a 45° angle to the skid trail, and towards the main road leads to easier removal.

Felling trees may obliterate skid trail markings. Felling the trees first, where the trails will be, can help in directing the felling of the remaining trees.

Skid Trails not Feasible

When skid trails are not feasible or practical, for one reason or another, off trail skidding may be used when:

1. Low-pressure ground equipment (10 lb. PSI or less) is used.
2. The number of passes over any area is limited.
3. Slash, litter or other vegetation is dense enough to support harvest equipment, 10 inches minimum.
4. The ground is covered with 2 feet or more of snow.
5. The ground is frozen to a depth of 4 inches or more.

Landings

Avoid locating landings on flood plains, slide areas, steep slopes, erosive soils or wet meadows.

Landings should be located first when laying out the skid trail system. Landing locations should involve the least amount of excavation or filling, but be efficient for skidding and

loading operations. Landings should be large enough to handle the loader, trucks and log decks.

Landings can be spaced up to 1200-1500 feet apart, but shorter distances are more efficient. Distances of 800 feet or less are more efficient and cost effective. If additional environmentally safe landings can be located and used, the efficiency of the operation can be improved.

Erosion Control

Where concentrated flow is unavoidable a number of materials are available to slow water velocity and to divert concentrated flows. These include natural vegetation, duff areas, stumps, stable channels, or flat areas. Lopping and scattering tops and limbs and crushing, where possible, in skid trails and other disturbed areas filters sediment. Protect discharge areas by the use of stones and rocks, grass, slash, brush, logs, or anything that will reduce water velocity. (Stones and rocks are defined as anything greater than 3 inches and less than 24 inches in diameter. Observations have noted rocks and stones that are not round tend to stay in place longer than ones which are well rounded).

Erosion control measures on skid trails and landings will be part of the skid trail system design. Skid trails can have slash distributed on them, seeded with grass, water bars installed or any combination to minimize erosion and sediment reaching streams.

Slash material, tops and limbs, may be lopped and scattered on skid trails and landings to filter sediment, slow water velocity and divert concentrated flows to stable areas. Do not place slash materials in drainage ways with perennial water or in watercourses unless being used as vegetative rip-rap for bank stabilization and installed according to NRCS specifications.

Deflector logs (small logs) can be placed across the slope and anchored to trap sediment, reduce water velocity, and divert concentrated flows to more stable areas.

Filter strips are needed to filter out sediment before water reaches a watercourse. The width of filter strips can be calculated using the following formula:

Filter Strip Width = 50' + 2 x percent slope (of area next to stream). Under no circumstances shall the filter strip width be less than what is required by the Forest Practices Act for riparian areas (WLPZ).

Water bars can be installed on all skid trails and roads where infrequent traffic is expected.

Space water bars frequently enough to prevent erosion and to remove water from disturbed or unstable soil areas. Spacing will depend upon soil type, slope, and onsite conditions. Suggested guidelines are included in Table 1 "Water Bar Spacing Guide". Decrease spacing by 1/4 when a road parallels a stream for more than 300 feet.

Place a water bar about 15 feet up from where roads or skid trails cross drainage ways to prevent sedimentation of the drainage.

Insure that water flowing from a water bar does not flow directly into streams or onto lower parallel roads or skid trails. Place water bars about 15 feet up from where the centerline grade steepens to prevent accumulated water from flowing down steeper portions of roads or skid trails.

Place water bars above intersections of roads, skid trails and landings.

Avoid placing water bars in low areas where water has no escape.

Other guidance for controlling erosion on forest and woodland is contained in local or regional guides available from a number of local, state, or federal sources.

Include additional practices that will minimize soil erosion and give maximum watershed protection, such as:

1. Attempt to keep grades under 8 percent on granitic soils, 10 percent on sedimentary soils and 12 percent on soils derived from basic igneous rock.

2. Keep roads out of streams bottoms as specified in the Forest Practice Rules.
3. Provide adequate drainage.
4. Install berms or water barriers across roads when needed, but do not leave berms on edges of roads through the winter unless necessary for drainage patterns or safety.
5. Skid logs away from water courses.
6. Scatter limbs and brush on skid trails and other areas subject to soil erosion.
7. Outslope roads where this practice is feasible.

Trails and landings may be revegetated to control erosion and/or provide other benefits such as wildlife food and cover plantings.

Refer to the standard Critical Area Planting, 342. Favor native species for revegetating trails and landings. Plant species selection will be based on the plants shade tolerance, erosion control effectiveness and resistance to the anticipated use such as traffic, browsing, grazing, etc. (See Field Office Technical Guide – Vegetative Guide for species).

Locally invasive and noxious plants will not be used as permanent revegetation species.

Landings and trails may be utilized as firebreaks.

Consider cultural resources and environmental concerns such as threatened and endangered species of plants and animals, natural areas and wetlands.

Landings and trails no longer needed can be "put to bed" by removing high maintenance structures, such as culverts and bridges, and can be restored to a vegetative cover by planting and seeding.

Cultural Resources Considerations

NRCS policy is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice or associated practices in the plan could have an effect on cultural resources. The National Historic Preservation Act may require consultation with the California State Historic Preservation Officer.

http://www.nrcs.usda.gov/technical/cultural.html is the primary website for cultural resources information. The California Environmental Handbook and the California Environmental Assessment Worksheet also provide guidance on how the NRCS must account for cultural resources. The e-Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

Endangered Species Considerations

If during the Environmental Assessment, NRCS determines that installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat, NRCS will advise the client of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the client selects one of the alternative conservation treatments for installation; or with concurrence of the client, NRCS initiates consultations concerning the listed species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes and narrative statements in the conservation plan, or other acceptable documentation.

Document the following:

- Field location of trails and landings
- Length and width of trails and landings
- Slope calculations
- Location and spacing of waterbars and/or broad based dips.
- Harvest Trails:
    - Will be flagged in the field
- Dust control measures will be identified if required
- Erosion control measures will be identified including Water Control Measures

OPERATION AND MAINTENANCE

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance):

Inspect and maintain water bars annually prior to and during the rainy season. Rebuild berms, clean ditches and outlets as needed. Build additional water bars, as needed.

Periodic inspections of landings and trails will be conducted and maintained as necessary.

Landings and trails utilized as firebreaks will be properly maintained to accomplish this purpose.

Landings and trails shall be closed when and where needed for erosion control, safety and liability, and reduced maintenance costs. Refer to the standard Use Exclusion, 472.

Landings and trails no longer needed, and not used as a firebreak, can be retired. They shall be sufficiently revegetated as needed.

REFERENCES

California Forest Practice Rules, California Board of Forestry.

Handbook for Forest and Ranch Roads, Mendocino County RCD.

Building Water Pollution Control into Small Private Forest and Ranchland Roads, R6-S&PF-006-1980, USFS, SCS.

Low Maintenance Roads For Ranch, Fire and Utilities Access, Wildland Solutions Field Guide Series. Wildland Solutions.

Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment. California Forestry Report No. 1. CDF.

Suggested Water Bar Spacing Guide

Water bar spacings are based upon the road running surface in an unsurfaced condition, the slope, and the soil factor K. Factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is based primarily on the percentage of silt, very fine sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value the more susceptible the soil is sheet and rill erosion by water. Spacings are Table 1 and 2.

Table 1 - K factor greater than 0.35.

% slope	Distance (ft) Between Water Bars
0-2	500
5	200
10	100
15	75
20	50
25	40
30	35
35	30
40 +	25

Table 2 - K factor less than 0.35

% slope	Distance (ft) Between Water Bars
0-2	1000
5	400
10	200
15	150
20	100
25	80
30	65
35	55
40	50
45	45
50	40
55	35
60	30