Best Management Practices

For Road Rehabilitation

Road-To-Trail Conversion

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Best Management Practices
Road-to-Trail Conversion

Definition
Conversion of a road to a trail by mechanically narrowing the road surface. Excavation of road embankment and landing fill and stabilization of excavated materials on the inboard edge of the cutbench. A narrow portion of the road cutbench is preserved to serve as the trailbed.

Synonymous Terms
Trail construction, Road conversion

Purpose
To convert suitable portions of designated roads to recreation trails using a combination of stream crossing removal and modified road-to trail conversion. To construct a trail to current State Park construction standards along an abandoned road. To eliminate road cutbanks along a trail route in order to improve aesthetic values of a trail system. To develop a low maintenance trail by construction of an outsloped well drained, narrow trail alignment. To reduce effects of new trail construction where designated roads are located on a suitable alignments. To eliminate interception and diversion of runoff on the road surface. To prevent erosion of road embankment fill. To prevent direct sediment delivery to the drainage network from failed embankment fill. To prevent runoff diversions that cause severe gullying on roads and slopes below. To prevent mass movements caused by diverted flow directed onto interfluve slopes. To eliminate direct linkage between streams and roads, which increases sediment transport distance. To eliminate road surface areas that collect water causing interbasin transfer of runoff to adjacent sub-watersheds causing increased streamflow, bank erosion, channel migration, and inner-gorge mass wasting.

Planning Considerations
- General Plan compliance
- Anticipated future road and trail use
- Accessibility to nearby rehabilitation sites
- Suitability of road for conversion to trail
- Accessibility to site with heavy equipment and service vehicles
- Offsite disturbance caused by accessing site
- Availability of suitable locations for embankment fill either nearby or offsite
- Stockpiling of woody debris for post-treatment mulching

Construction Specifications

- The excavator shall prepare the site by first removing all trees and brush growing on the cutbank, roadbed, and embankment fillslope. Mulch may be stockpiled in piles but shall be left accessible to the excavator when earthmoving tasks are complete. Generally, with road-to trail projects, the excavator has limited mobility once the earthmoving tasks are complete so mulch should be stockpiled in locations where it can be retrieved as the excavator straddles the new trailbed. Trees growing in undisturbed soil that were partially buried by road embankment fill may be left standing, however all embankment fill shall be excavated away from around the base. Care should be taken not to damage roots. An excavator mounted vegetation masticator may be used to remove trees and brush. Tree boles shall be left a minimum of 24" high for later extraction with the excavator or dozer. If a masticator is used, a dozer may be employed to accumulate and pile ground mulch for use on finished surfaces.

- Following the clearing operations, the inspector will identify the location of the trailbed on the road surface with marking paint or wire flags. The markings consist of two lines, one indicating the inboard edge of the trail and one the outboard edge. The heavy equipment operators use the marks to visualize the location of the trail prior to decompaction and earthmoving. It is important to locate the new trail on the cutbench portion of the road or stable well compacted embankment fill. The trail alignment on the road surface can be meandered back and forth to soften the linear appearance that often results on long, straight sections of road. In locations where the road crosses topographic swales or at road-stream crossings, the trail alignment should meander to the inboard edge of the road and in some cases may pull up into the drainage above the road.

- Once the trail alignment is marked, a dozer equipped with rippers shall decompact the inboard ditch and the inboard edge of the cutbench portion of the road to a minimum depth of 12 inches. Care must be taken to avoid decompacting the proposed trailbed. The cutbank shall be stripped of all organic accumulations using the dozer or the excavator, or a combination of the two. Organic material shall be incorporated into the fill material and used to recontour the cutbench. Woody debris greater than 1 inch in diameter should not be incorporated into the fill. Accumulations of large organic debris shall be gathered by the excavator and stockpiled with trees and brush removed from the roadway.

- As the dozer begins to cut embankment fill from the outboard edge of the road a thin layer of soil is pushed over the intended trailbed. This protects the compacted surface from damage and decompaction as the heavy equipment moves back and forth over the surface.

- Once the trail is covered, the dozer drops onto or below the embankment fill and begins cutting and pushing fill across the trail into the cutbank in maximum 6-inch lifts. The fill is contoured into the cutbank extending out as far as the inboard trail marking leaving a 3 to 6 foot wide section (depending on trail design specifications) of the former road bench to serve as the trailbed. The dozer continues to push material against the cutbank compacting it in lifts until the material becomes too steep on which to operate, or no more fill is available locally. As the dozer cuts embankment fill it leaves a berm on the outside (downslope) edge to prevent material from being sidecast downslope.

- Cutbanks exposing seeps or springs, or those along the axes of topographic swales, shall not be recontoured. Instead, the embankment fill adjacent to the wet area shall be exported to nearby dry section of the road. The trail meanders into the cutbank at these locations and a swale is installed on the trailbed to facilitate drainage. In locations where the groundwater is perennial, a drain lens or an armored swale may be used to convey flow under or over the trail surface.

- The excavator follows the dozer and makes a pass removing the berm and what remains of the embankment fill beyond. In most cases, the excavator straddles the trailbed to complete the final earthmoving task. The excavator completes the slope match at the top of the cutbank. Where a complete match is not possible due to a deficit of fill material, the excavator shall pull down the top of the cutbank where practical and blend with the fill below. Where recontoured slopes permit, the final surface is smoothed by back-dragging with the dozer blade, or by sliding the back of the excavator bucket back and fourth across the recontoured slope.

- The final pass is made with the excavator. Straddling the trailbed the excavator removes the thin layer of soil placed on the trail to protect it being careful not to rake the teeth of the bucket into the compacted trail surface. A grooming blade attached to the bucket teeth will provide a superior trail finish and is easily installed following the bulk of the earthmoving tasks. Trees and brush removed and stockpiled prior to excavation are then raked across the cut and fill surfaces with the excavator to remove the equipment tracks. Finally, the remaining mulch is spread evenly over the cut and fill surfaces. At some locations, mulch material may be saved and redistributed at stream crossings where more complete mulch coverage may be necessary to reduce surface erosion. Mulch is not spread across the trail alignment.

- Following heavy equipment work, a small trail dozer may be used to outslope the trailbed and shape the adjacent fill and cut slopes. Hand crews are also employed to install various trail structures, clean up and spread any remaining brush, and compact the trail surface using a vibratory compactor.

- At some locations where the sideslopes along the road are gentle (< 20%), it is difficult to do the finish work on the trail surface without creating a berm or through-cut along the outboard edge. This is because a sizable quantity of loose fill remains on the trail and the trailbed often must be outsloped during the finishing process. To address this problem, a notch is created by the excavator on the final earthmoving pass. As the excavator grades the cut slope below the trail, the grade is intentionally lowered to intersect the outboard edge of the trail approximately 12 to 24 inches below the design trailbed. This creates a notch along the trail for spoils to collect as the trail surface is reworked, shaped and compacted. The depth of the notch is dictated by the amount of spoils that will be scraped from the trail and the amount of outsloping required. As the trail is finished, the notch fills with spoils that are compacted and forms a gentle slope away from the trail.

- If a section of road is not suitable for road-to-trail conversion, the road is fully or partially recontoured and the trail is rerouted to a suitable alignment. In many road-to trail conversions, combinations of recontouring and road-to trail conversion techniques are employed to provide a quality trail built to current construction standards. Refer to Best

Management Practices – Full Road-to trail conversion or Partial Road-to trail conversion for details on road-to trail conversion options.

- Road-stream crossings are fully excavated during road-to-trail conversions. As the road approaches the crossing, the trail alignment is meandered toward the inboard edge of the road to intersect with the stream on contour. The final trail-stream crossing construction is completed using hand crews following the heavy equipment work. Refer to Best Management Practices – Road Stream Crossing Removal for details on crossing removal.

Environmental Considerations:

Aesthetics

Eliminating wide eroding road scars and replacing them with narrow recreational trails built to high standards will improve aesthetic values. Short-term effects to local forest and prairie settings will occur as vegetation is disturbed for conversion work. Exposed earth and dried vegetation may be visible for several years following treatment. Typically, prairie settings are more widely visible, but recover within several months. Grass reoccupies the disturbed area during the first growing season following construction. Forest settings take longer to recover but have a limited visibility and typically do not affect park viewsheds.

For safety reasons, work areas are closed to the public during construction. Therefore, the general public will not view temporary visual effects at construction sites. Interpretative signs shall be posted with information about the project at the nearest public use area and at all access points. The interpretive panels help the public visualize the final appearance of the converted road. After the closures are lifted, the public will be able to view the work locations, however, the final project condition is an improvement over pre-construction conditions and quickly blends into the surrounding area as duff and herbaceous plants cover the exposed soil.

Trees are removed and scattered on exposed soil as mulch during road-to trail conversion work. This can present a negative aesthetic effect, particularly in a park setting. The effect is transitory, however, as vegetation recovery is generally rapid in the north coast region.

Air Quality

Diesel exhaust and dust will be produced as part of the heavy equipment work. Air quality in the vicinity of the work is generally high, unless wildfires or prescribed burns are occurring, and the products of the heavy equipment will be rapidly dispersed. The equipment will be moving through the project sites so that any individual site will not receive prolonged exhaust.

Heavy equipment operations may expose workers in the project area and vicinity to exhaust fumes and dust. Heavy equipment operators shall be cautioned to avoid prolonged exposure to exhaust and dust. The cabs of heavy equipment shall be kept in good serviceable condition to provide protection from exhaust and dust. Seals, windows and doors should be kept in good condition to provide protection when necessary. Detected exhaust leaks shall be repaired immediately to protect workers from exhaust exposure and reduce fire hazard. Project inspectors can position themselves upwind of heavy equipment operations to reduce exposure to exhaust and dust. In extreme dust situations a respirator may be worn. Respirator use shall be in compliance with the Department's Respirator Policy and Respirator Handbook.

Heavy equipment engines and hydraulics generate heat during the work. However, sources of high heat are shielded by equipment covers and do not expose nearby object to high heat. The effects of residual heat diminish rapidly within a short distance of the equipment. Heat shields shall be maintained in good serviceable condition to prevent high heat exposure. The removal of some trees and brush from the roads prior to conversion will allow increased sun into the sites and may increase daily temperatures on the soil surface. However, rapid natural revegetation is expected due to fertile soils, summer fog, and high winter rainfall in this area. Heat generated during road-to trail conversion work will not affect local air temperatures, or regional or global climate.

Biological Resources

A primary goal of road recontouring is the improvement of habitat for, and protection of threatened, endangered, and rare species. Short-term adverse effects shall be less than significant or shall be mitigated to reduce the adverse effects to a less than significant level. All appropriate design features and mitigation measures shall be incorporated into project planning. Projects shall be conducted in compliance with all applicable State and Federal threatened and endangered species protection laws and regulations.

The U.S. Fish and Wildlife Service (USFWS) shall be requested in writing to provide Technical Assistance under Section 10 of the Endangered Species Act (ESA) in cases when there is a question about whether a specific project has the potential to effect the habitat of threatened & endangered (T&E) species. Under Section 10, and USFWS can provide assistance in project planning and design to avoid effects to T&E species. At the State level, the California Department of Fish and Game (CDFG) may also provide informal consultation on projects that may effect T&E species.

When effects to T&E species cannot be avoided by design and mitigation an Incidental Take Permit shall be requested under Section 7 of the ESA. A Federal nexus must exist as a requirement for an Incidental Take Permit from a Federal agency under Section 7. If no Federal nexus exists, consideration shall be given to the development of a habitat conservation plan (HCP).

All projects shall be reviewed by the District's State Park Senior Resource Ecologist (SPSRE) to ensure protection of natural, cultural and historical resources. Site visits including the project manager and SSPRE may be necessary to review a specific site and its effects on State Park resources.

The SPSRE shall work closely with the project manager to implement the following practices to protect biological resources:

Plants: Qualified technicians shall conduct rare plant surveys on all roads planned for recontouring prior to project implementation. If any rare plants are located, they shall be avoided to the maximum extent practicable. If rare plants cannot be avoided, appropriate mitigation measures shall be developed in consultation with the SSPRE and CDFG. The mitigation measures shall be incorporated into construction specifications. Final reports shall be required on all plant surveys conducted by consultants or contractors. Consultants shall be requested to list any locally designated species or species of concern, should they exist in the project area.

Trees: All trees, regardless of DBH (diameter breast height), growing in road embankment fill will be removed as part of the road recontouring process. Trees greater than 24 inches DBH buried by embankment fill that predate road construction may be retained. Limbs of these trees may be removed if required for access. Small trees, less than 24 inches DBH, buried in embankment fill that predate road construction shall be left whenever practical. Equipment operators shall be required to avoid striking retained trees to minimize damage to the tree structure or bark. Tree roots shall be avoided, as the excavations will not be deeper than original ground surface. Some advantageous roots may be damaged that have grown into embankment fill.

Fish: Road recontouring projects shall be designed to have minimum effects to fish by incorporating practices that reduce erosion of road surfaces and reduce turbidity in streams.

On roads where potential sediment delivery to streams exists, construction activities after October 15th shall proceed on a day-by-day basis in consultation with CDFG and according to the 24-hour National Weather Service forecast. Work in the rainy season shall occur during dry spells with materials for erosion control on-site at all times. Work shall be conducted so that no more than one-half day's work is active at one time and all work shall be completed by the end of each day. When winterization of access roads is required, all access road shall be winterized prior to any additional earth moving tasks.

Any soil disturbance adjacent to stream channels shall receive evenly distributed mulch coverage with masticated brush and trees to reduce sheet erosion. Mulch generated during the clearing phase of the rehabilitation work shall be used to the maximum extent practicable. Refer to construction specifications for details regarding mulch coverage adjacent to stream channels.

Birds: Potential habitat for the State and Federally listed marbled murrelet exists in various locations throughout North Coast Redwoods District. To avoid noise disturbances, any work within ¼ mile of the suitable habitat for murrelets shall take place after September 15th. Potential habitat for the Northern Spotted Owl exists in various locations throughout North Coast Redwoods District. To avoid noise disturbances, work within 1000 feet of suitable roosting and nesting habitat for Spotted Owl shall take place after July 10. In most cases, habitat trees will not be affected by road recontouring, however, if trees need to be removed that are potential Owl habitat, protocol surveys shall be conducted prior to construction. No habitat disturbances shall occur within 1000 feet of a nesting site.

The Senior State Park Resource Ecologist shall assess each project for the presence of "fully protected" bird species listed under the California Fish and Game Codes. If the potential exists for the presence of these species, USFWS and CDFG consultation shall occur to develop avoidance measures.

Operations shall occur prior to these dates only if approved surveys indicate the absence of protected species or, incidental take permits are obtained from USFWS. The ¼ mile distance rule shall be reduced if geographic features such as a ridge separate the site from suitable habitat (See Technical Assistance Report, April 2001). On sites where background noise is greater than the noise caused by road recontouring equipment, such as adjacent to a major highway, construction may occur prior to the above dates because noise disturbance is no longer an issue.

Amphibians: Field technicians shall document the presence of suitable habitat for sensitive amphibians at road recontouring locations. Amphibian habitat shall be avoided wherever practicable. Once road fill is removed and drainage is restored, habitat quality both in the crossing vicinity and in the watershed overall will be greatly increased. If listed species are located and avoidance is not practicable, incidental take authorization shall be obtained from CDFG and/or USFWS.

If rare species are located the project work shall avoid individuals and their habitat. If T&E species are encountered and cannot be avoided the same process outlined under biological resources above shall be used to avoid effects, obtain a take permit or develop a HCP.

Final reports shall be required on all biological surveys conducted by consultants or contractors. Consultants shall be requested to list any locally designated species or species of concern, should they exist in the project area.

Exotic Plants: Freshly disturbed ground created by heavy equipment during road treatments may provide habitat for exotic plant species. Heavy equipment may also introduce exotic plant seeds or spread existing seed into the landscape. To minimize potential effects, all heavy equipment shall be pressure washed prior to entering the park or moving from a known infested area within the park to a non-infested area. Anti-fungal wash agents may be specified if the equipment has been exposed to any pathogen that could affect park resources. All heavy equipment contracts shall specify pressure washing of the machines prior to entering the park. Park equipment operators are required to pressure wash equipment before transporting to different units within the District.

In areas where exotic species may exploit disturbed soils and dominate the revegetation, treatments using mulch, seeding, herbicide applications or combinations thereof may be used to reduce the invasion of exotic species.

Wetlands: Natural wetland habitat such as marsh, riparian, and vernal pools shall not be filled by road recontouring projects. Some work will occur in riparian corridors at stream crossings. However, equipment will be working within existing road alignments at the crossings and will only treat previously affected areas. Equipment shall remain on existing road alignments to the maximum extent practicable. Equipment may travel off road only when no other alternative is available and after the project inspector and District specialists consultants have reviewed the route. Where appropriate, the U.S. Army Corps of Engineers shall be consulted for permitting work in the vicinity of wetlands.

Wildlife Corridors: Wildlife dispersal or migration corridors may be temporarily altered from the natural migration routes during the heavy equipment work because of daytime noise effects. However, there may be alternative routes adjacent to the work areas suitable for their use. Stabilizing the landform will reduce future potential landslides and large gullies that inhibit wildlife movement. Road to trail conversions are conducted on existing roads. The location of the road alignment is not changed during the conversion process. Following the conversion process, the canopy over the trail can close due to the narrowing of the road surface.

Cultural Resources

Road-to trail conversion projects require the movement of earth that could have adverse effects on significant cultural resources. Therefore, review under Public Resources Code

5024 is required to identify any significant cultural resources within the area of potential effect for a proposed project. In the event that avoidance of a cultural resource is not practicable, mitigation measures to decrease the effects of a conversion project to less than significant shall be proposed. Construction monitoring shall take place to decrease the potential for effects to cultural resources in areas of moderate to high sensitivity during construction.

In the event that previously undocumented cultural resources are encountered during project construction (including but not limited to dark soil containing shellfish, bone, flaked stone, or groundstone, or deposits of historic trash), work within 100 feet of that location shall stop until a State qualified archeologist has evaluated the area. If any human bones or remains are uncovered, work shall stop until the County Coroner, State qualified archeologist, and appropriate Native American representatives have evaluated the find. Effects to sacred or religious sites shall be avoided to the maximum extent practicable. If a sacred or religious site exists in a project area, formal State Historic Preservation Office consultation shall occur as well as review by the Native American Heritage Commission.

Abandoned logging and ranch roads have potential cultural or historical significance, either individually or collectively. Therefore, all roads and road networks scheduled for conversion projects shall be reviewed to determine their historical significance. Individual ranch and logging roads that are eligible for listing with the OHP shall be preserved and protected to the maximum extent practicable. Road networks that may represent a historical district shall be evaluated within the scope of the project to determine if treatment of roads within the network will negatively affect the network as a whole. All abandoned roads that are proposed for conversion have already shown evidence of deterioration or have failed in part. Over the long term these roads will fail of their own accord. Roads identified as candidates for conversion that are also identified as having cultural significance can be improved by preserving the road bench, narrowing it and providing improved drainage while preserving the original alignment and character of the road. Roads with historical significance that are not candidates for conversion will not be treated and will be avoided by vehicles or heavy equipment.

Geology/Soils

Road-to trail conversion work reduces mass wasting and surface erosion by eliminating the anthropogenic cause of these problems such as roads, landings, and stream crossings. Treatments are designed to restore surface hydrology thereby increasing the stability of the conversion sites. Inspectors trained in landform rehabilitation conduct direct oversight of the work to ensure that the treatment designs are complete, have a stable geometry, and blend well into the surrounding natural topography.

Minor slope adjustments and surface erosion may occur after treatment, as soil is re-exposed during the conversion. However, monitoring of past sites indicates that post-treatment soil loss and mass wasting are minor compared to the soil saved by eliminating road related erosion. Bare ground shall be mulched with vegetation removed during the work to the maximum extent practicable to minimize surface erosion. Refer to construction specifications for details regarding mulch coverage adjacent to stream channels. Road-to trail conversion work will significantly improve the stability of the work sites and reduce surface erosion from the existing condition.

Heavy equipment operators shall be cautioned to minimize their exposure to unstable slopes that may occur naturally or result from the earthmoving process. Inspectors shall continually evaluate slope geometry and caution operators if unstable conditions are indicated. A qualified geologist shall review road-to trail conversion sites during project planning to determine if any geologic conditions exist requiring additional assessment or alteration of prescriptions. If unique features do exist, a licensed geologist shall conduct a geologic assessment/investigation.

The NCRD lies within a highly active seismic region. Portions of the Northern Coast Ranges Fault System (San Andreas Fault Zone), the Mendocino Triple Junction, and the Cascadia Subduction Zone lie within or near the NCRD. Exposure to strong ground shaking is possible throughout the District. Seismic events will expose workers to direct effects from ground shaking, and possible secondary effects from ground rupture, seismically induced mass wasting, and seismically induced tree failure. However, rehabilitation workers are not exposed to a higher level of hazard than those in other settings. The time-weighted-average exposure to seismic hazards is less at conversion site than it would be in an urban or suburban setting. Due to the remote location of most conversion projects, seismic effects are unlikely to affect park visitors or staff. Conditions for tsunami generally do not exist because road-to trail conversion locations are generally inland from water bodies. No volcanic hazards exist in the project vicinity.

Subsidence of land is not anticipated to be a problem at road-to trail conversion locations. Soil and geologic conditions that could result in subsidence such as expansive soils and soluble bedrock do not exist in the NCRD. Road-to trail conversion will not affect unique geologic or physical features.

Hydrology/Water Quality

Existing (altered) drainage patterns will be restored to pre-disturbance patterns. In some cases where pre-disturbance patterns cannot be restored, conversion work may require the realignment of a stream segment. To ensure that channel stability will be maintained, project planners will establish new drainage segments only after thorough review by a qualified geologist, geomorphologist, or hydrologist. Reconnecting diverted streams to their natural flow pattern will increase discharge in abandoned channels. However, significant geomorphic adjustments are not likely to occur due to the increased discharge because the reoccupied channels had originally formed under the post-treatment flow regime. Offsite affects of reestablishing pre-disturbance drainage patterns and discharge shall be evaluated to ensure increased discharge will not adversely impact fluvial geomorphic functioning downstream.

Water quality will be improved as watershed rehabilitation is implemented within an impacted watershed. However, following conversion work a short-term increase in suspended sediment and bed load will occur downstream of the conversion sites that are directly adjacent to streams. Sediment is delivered to the stream from ravel along the adjacent slopes and minor amounts of soil lost downslope during excavation. These effects are limited to the first winter following treatment and in most cases are limited to the first runoff-generating event of the winter. The affect on aquatic habitat is observed immediately downstream of the conversion sites but does not typically extend more than several hundred feet downstream. Sediment delivery from road segments not directly adjacent to

streams would be limited to highly mobile debris flows or torrents, which have not been observed during post-treatment project reviews.

Road-to-trail conversions are limited in their geographic scope, often representing a small fraction of the area in a subwatershed. Short-term (post-treatment) water quality effects are not experienced in a large geographic area simultaneously. Long-term transport rates of suspended load and bed load will be higher without conversion work.

The cumulative effect of converting roads on water quality will be a reduction in suspended and bed load transport, improved fluvial-geomorphic functioning, and an improvement in the aquatic habitat throughout the drainage network.

Shallow subsurface flow will be influenced by changes in surface drainage patterns and/or changes in porosity of the soil at conversion sites. Changes in the direction or rate of shallow subsurface flow may be influenced by changes in surface drainage patterns. Because conversion work typically does not intersect the water table, and no wells exist that provide direct conduits to the groundwater supply, groundwater quality is not likely to be affected.

Road-to trail conversion projects will not have a significant affect on the amount of groundwater available for public water supplies. Project planning shall identify public water supply and Park water systems that may be affected. Persons responsible for the maintenance of these water systems shall be consulted and if negative effects are anticipated, mutually agreeable mitigations shall be developed.

Hazards and Hazardous Materials

Failure of, or leakage from, vehicles or heavy equipment could result in the release of hazardous substances (primarily petroleum based products) to the ground or water. Equipment is required to be leak free throughout road-to-trail conversion projects. Leaks that develop are repaired immediately in the field or work is suspended until repairs can be made. Spill kits are maintained on site in the event of accidental spillage. Appropriate agencies shall be notified in the event of significant spillage.

The NCRD has adopted a general safety protocol for backcountry heavy equipment operations. The general protocol outlines broad safety issues common to all projects and presents guidelines on how to address those issues. The general protocol also directs project managers to develop a project specific safety plan for each conversion project. The plan shall identify any existing emergency response plans. The project shall be designed and implemented to avoid any conflicts with existing plans and to avoid any increase in emergence response time.

Workers spend most of their work hours in remote wildland settings and may be exposed to natural hazards consistent with that environment (e.g., wild animals, insects, noxious plant, lightning, wind, etc.). All employees are issued first aid kits and are trained how to respond to anticipated and unanticipated incidents. Employees are asked to disclose any sensitivity that might affect their employment tasks.

Heavy equipment can get very hot during the warmer part of the work season; this equipment is sometimes in close proximity to flammable vegetation. Equipment that is not properly outfitted can generate sparks from exhaust systems. Friction between metal parts

crushing rocks could also generate sparks. Spark arrestors or turbo-charging (which eliminates sparks in exhaust) and fire extinguishers are required for all heavy equipment. Heavy equipment itself can be used for fighting fire in the backcountry. The safety plan developed for each project is reviewed by all project staff and includes job site characteristics to reduce the potential for fire. Park staff is required to have a State Park radio on site, which allows direct contact to California Department of Fire Protection and centralized dispatch center. Construction crews shall be required to park service vehicles away from flammable material such as dry grass and brush. At the end of each workday, heavy equipment shall be parked over mineral soil to reduce the chance of fire.

Land Use/Planning

Project design shall include review of any General Plan that has been developed for a park unit. The General Plan shall be used to guide the general direction and level of road-to-trail conversion efforts. Any reference to a project in a General Plan shall be included in the CEQA document. Projects shall not be implemented if they are in conflict with a General Plan.

All projects shall be in compliance with the Resource Management Directives of California State Parks and all State and Federal environmental laws.

Projects shall be compatible with existing land use in the vicinity of projects. The existing land use on State Park property includes recreation and preservation. Road-to trail conversion will not affect agricultural resources. Agricultural resources on adjoining property will benefit from road-to trail conversion by improving water quality and quantity. Illegal agricultural activities have been discovered on State Parks during planning and inventory phase of road-to trail conversion projects. All illegal uses are immediately reported to Park Law enforcement officials. Information signs are placed at all points of entry into project areas prior to implementation, informing the public of the upcoming project to help deter illegal agricultural uses.

In general, established communities do not exist within the boundaries of any North Coast Redwood Parks. Road-to trail conversion will not disrupt or divide the physical arrangement of an established community. If a project is identified in an established community, alternative transportation routes shall be developed to mitigate the conversion of roads. Community members shall be notified of projects that may have any effect on the community and agreements shall be developed that are mutually agreeable.

Mineral Resources

Road-to trail conversion will not conflict with adopted energy conservation plans. The projects will not involve wasteful and inefficient use of non-renewable resources. Heavy equipment shall be used in as efficient manner as possible and project designers shall continue to research and implement the most energy efficient techniques. Road-to trail conversion will not affect availability of a known mineral resource that would be of future value to the region and residents of the state.

Noise

Noise levels will temporarily increase at the work site, although the noise generally diminishes rapidly with distance. Equipment operation at sites close to campgrounds or residences shall be limited to daytime hours between 08:00 to 16:00 Monday through Friday.

Workers in close proximity to the heavy equipment are exposed to high noise levels. Workers shall be advised to wear ear protection when in close proximity to the heavy equipment. Earplugs shall be provided to all workers and extra earplugs shall be stored in all vehicles and equipment. All operations are in compliance with OSHA regulations.

Population/Housing

Road-to trail conversion will have no cumulative effect on regional or local population projections. Road-to trail conversion will not induce growth of human populations or communities. Road-to trail conversion will not displace existing housing or affect affordable housing.

Public Services

Road-to trail conversion may affect fire protection abilities because converted roads will require additional heavy equipment time to reopen to a road for emergency vehicle traffic. Most roads proposed for conversion are already impassable to vehicles due to crossing failures and natural revegetation. A network of service roads shall be maintained throughout the North Coast Redwoods Parks to aid in fire suppression.

If road-to trail conversion is planned for a road that is currently open to vehicle traffic, park rangers shall be consulted to determine appropriate mitigation measures to maintain law enforcement access. However, road-to trail conversion sites are usually along abandoned roads covered with thick vegetation and numerous road failures. Therefore, road-to trail conversion will not affect emergency access.

Recreation

Road-to trail conversion projects will not directly affect campground facilities within park units. Occasionally if campsites are located close to or downslope of a conversion site, the sites may be temporarily closed for public safety. Backcountry road-to trail conversion areas will be closed to the public temporarily during the construction season to protect visitors from worksite hazards. All trails and roads within the Park backcountry that are not within the project area will remain open during the summer work season. Park visitor services and ranger staff shall be informed of any area closures and will affect visitors or other park operations. Area closure signs shall be posted at all access points to projects and at campground and visitor center kiosks. Official closure notices shall be obtained and posted during the project implementation and post-treatment recovery phases.

Transportation/Traffic

Traffic by workers to and from the work sites will be required on County roads and State highways. Given logistical constraints of the amount of heavy equipment work that can occur simultaneously in the project the maximum number of round trips required per day will be less than 10 in any given park, which is insignificant compared to current levels of traffic.

Heavy equipment is generally transported on a lowboy transport and is classified as a wide load on State highways. All equipment transport operations shall be in compliance with State and local laws and all permits shall be obtained as necessary. Pilot trucks shall be assigned to accompany the transport as required by State and local laws. Transportation of heavy equipment is common on roads and highways in this region due to logging and gravel mining industries.

Parking capacity will not be affected by road-to trail conversion because the projects are located in backcountry areas and do not affect visitor day use areas.

Road-to trail conversion does not increase traffic hazards to the public. Road-to trail conversion eliminates roads and the hazards associated with them.

Road-to trail conversion will not result in conflicts with adopted policies supporting alternative transportation. They will not result in effects to rail, waterborne or air traffic.

Glossary for Best Management Practices

aggrade - the filling of a stream channel with sediment. This usually happens when the supply of sediment is greater than the stream is transporting. Compare to “degrade” and “graded stream.”

alignment - the area affected by a road or trail including the fill slopes, road bench, and cut bank. Also a linear representation of features on a map such as a stream channel.

curvilinear - road or trail alignments following the contours of the land and crossing those contours at low angles. The curvilinear layout keeps the alignment perpendicular to the overland sheet flow or runoff.

cutbench - the portion of a roadway that has been cut into bedrock or native soil. Compare with embankment.

decommissioning - the treatment of a road to eliminate diversion potential during periods of nonuse. A road is typically decommissioned when the road will not be used for a period of time but may be used some time in the future. Decommissioning includes the removal of stream crossing fill and partially recontouring or outsloping road segments between crossings.

degrade - refers to the erosion of a stream channel. This usually happens when the supply of sediment is less than the amount the stream is transporting. Compare to “aggrade” and “graded stream.” Also refers to poor water quality or a disturbed watershed function.

ditch memory - subsurface water flow along a former drainage ditch after road removal is completed. This often occurs when ditches have not been ripped. Also see memory.

ditch relief culvert - see road cross drain

diversion potential - the potential for water to divert down a roadway if a stream crossing becomes plugged. Stream crossings with diversion potential have a high likelihood of contributing massive volumes of sediment to streams if the diversion causes gullies or landslides. Diversion potential is reduced by construction of a fail safe crossing (critical dip with rock armor) or by complete stream crossing removal.

drain lens - buried angular rock wrapped in filter fabric used to drain subsurface water from springs or seeps.

duff - partially decayed organic material composed of needles, leaves, and twigs on the forest floor .

embankment - fill excavated from the cutbench and used to construct the outboard road bench. This is often referred to as the fill slope or outboard fill material.

endhauling - the transportation of excavated material to a stable storage location using a dump truck.

energy dissipater - material such as rock riprap or a structure made of logs, metal pipe, or poured concrete that is used to reduce the energy of flowing water below culvert outlets or

Glossary for Best Management Practices
(continued)

dips.

erosion control - activities that prevent soil from being detached and moved down slope including, but not limited to, road removal, revegetation, mulching with brush, out sloping, and compaction of unstable fill.

erosion prevention - cost effective techniques used to prevent erosion before it happens.

fail safe crossing - a stream crossing that has been constructed in a way that has no potential for diversion. The ultimate fail safe crossing would include an oversized culvert, road approaches that slope upward in both directions, a critical dip that drains back into the stream, energy dissipaters, brush rack, and a headwall.

fall line - an imaginary line on a sloped surface that follows the steepest angle. You can think of the fall-line as the line that would be made by a ball rolling down the slope.

fill - material used to construct roads and related structures. Fill can include soil, rock, and large organic debris.

full recontouring - the treatment of a road that completely eliminates (obliterates) the road from the landscape. Full recontouring is accomplished by recovering all available fill and burying the cutbank until the surrounding terrain is fully matched. This type of treatment is also referred to as road removal or road obliteration. See obliteration.

geomorphology - the study of the earth's surface and the processes that shape it. Geomorphology is closely related to geology.

geomorphologist - a person who studies geomorphology.

grade - the natural, proposed, or planned ground surface. Usually grade is set to match the surrounding topography.

graded stream - a stream that, over a long period of time can move as much sediment as is supplied to it. Compare to "aggrade" and "degrade."

gradient - the measurement of the angle along the length of a road or a stream. This term is often confused with grade (see grade).

gully - a steeply sided channel caused by concentrated surface runoff erosion. Gullies can usually be identified by their location away from natural stream valleys. Gullies are at least 1 square foot in cross-sectional area. Compare with rill.

Humboldt crossing - a stream crossing constructed with logs set parallel to the stream channel and covered with fill.

hydrology - the science dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rock, and in the atmosphere. This term is

Glossary for Best Management Practices
(continued)

often confused with hydrogeology, which is the science of groundwater.

inboard - refers to the upslope side of a road, trail or other feature.

inboard ditch - a drainage ditch cut along the inboard side of the roadbed to intercept drainage from the slope above or small streams. Inboard ditches usually direct their water through a culvert that crosses under the road.

large woody debris (LWD) - also known as large organic debris (LOD), refers to logs and stumps found in stream channels, road fills, etc., having a diameter greater than 12 inches and a length greater than 6 feet.

legacy road - a road originally constructed for another purpose that remains in use. Many of today's park roads were originally constructed as logging roads but now serve as back-country access roads.

mass wasting - a general term that includes many types of massive earth movements. These include rock slides, debris slides, debris flows, and earthflows, etc.

meander - a series of gentle curves in a stream, road, or trail.

memory - a subsurface zone where water will preferentially flow due the presence of a gully or inboard ditch buried in recontoured fill. Also see ditch memory.

obliteration - to completely remove the road feature from the landscape. This is accomplished by full recontouring. See full recontouring.

outboard - refers to the downslope side of a road, trail or other feature.

operator - the person operating heavy equipment or other machines.

outsloping - the treatment of a road to eliminate diversion potential along the roadbed during road reengineering. Outsloping includes excavation of some of the road fill along the outboard edge of the road and placing it against the cutbank to eliminate the inboard ditch and provide drainage toward the outside of the road. Outsloped roads are commonly graded and covered with compacted road base to harden the surface.

partial recontouring - similar to outsloping, this term is reserved for roads that are to be removed or decommissioned. The partial recontour often has a steeper cross slope on the former roadbed to ensure proper drainage. Partially recontoured roads are not matched at the top of the cutbank like fully recontoured roads.

permeability - a measure of the rate at which water can pass through soil.

rill - a small erosional feature similar to a gully in morphology but less than 1 square foot in cross-sectional area. Rills often form on soft bare soil or road surfaces. Compare with gully.

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ripping - decompaction of the soil by means of rippers mounted on the rear of a dozer.

roadbed - the surface of the road where driving takes place. The roadbed extends from the inboard ditch or cutbank to the outboard slope break or berm.

road cross drain - a drainage structure which utilizes a culvert to direct water from an inside ditch to an area beyond the outer edge of the road fill.

roadway - the corridor including the cutbank, the inboard ditch, the roadbed, and the embankment.

rolling dip – a shallow dip designed to convey water off of the road surface while allowing vehicles to pass at reduced speed. Rolling dips should be located where stable landscape features exist that can carry runoff without causing erosion.

runoff - rainwater flowing on the surface of the ground. Runoff can be generated by rain falling on saturated ground or from heavy rain that cannot soak in fast enough.

sediment - Silt, sand, clay, and gravel that is moved by water and deposited at some location.

sediment control - activities that filter dirt out of water, including silt fence and sediment retention basins.

slope angle - the angle of the hill slope measured in percent along the fall line.

soil - clay, silt, sand, compost, air, water, and weathered rock mixed in various proportions. Soil consists of horizons or layers that display different amounts of weathering and fertility.

spoils – soil and organic material that is excavated from stream crossings or road embankments that is used for recontouring or can be end-hauled to a stable storage location.

stream crossing - a constructed road section across a natural stream. There are many types of crossings such as bridges, culverts, Humboldt (see definition), and fill crossings.

surfacing – rock aggregate or paving that is placed on the road surface to reduce erosion and weather-proof a road for winter use.

through-cut – a portion of a road that has cutbanks on both sides with drainage flowing down the road or inside ditch.

topography - the natural shape of the land's surface.

topsoil - the uppermost layer of decayed organic matter, seeds, soil, and microorganisms.

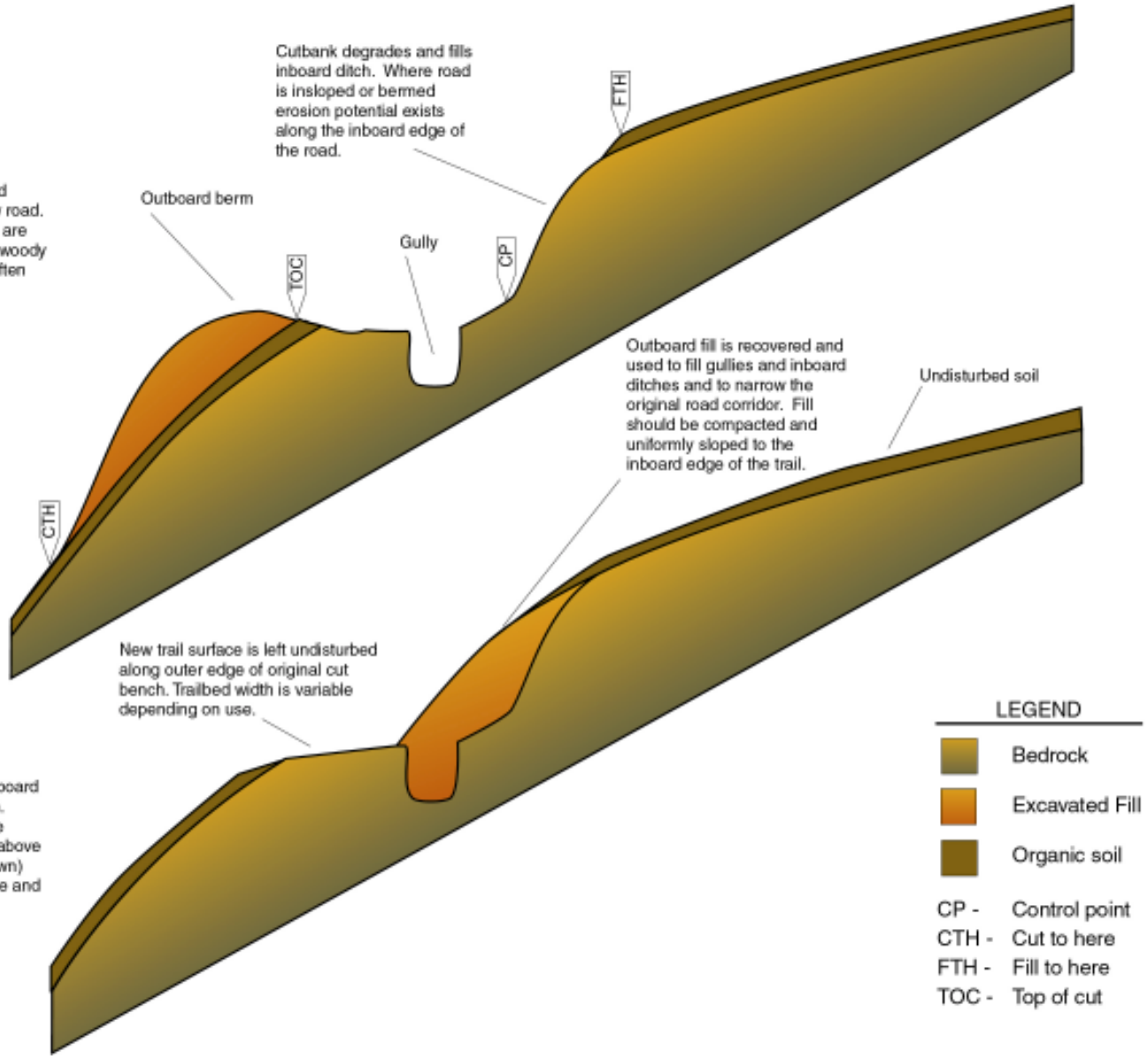
trash rack – a structure located upstream of a culvert inlet designed to trap floating debris to prevent the culvert from becoming plugged.

Road to Trail Conversion - Convex Slope

Cross Section Cutaway

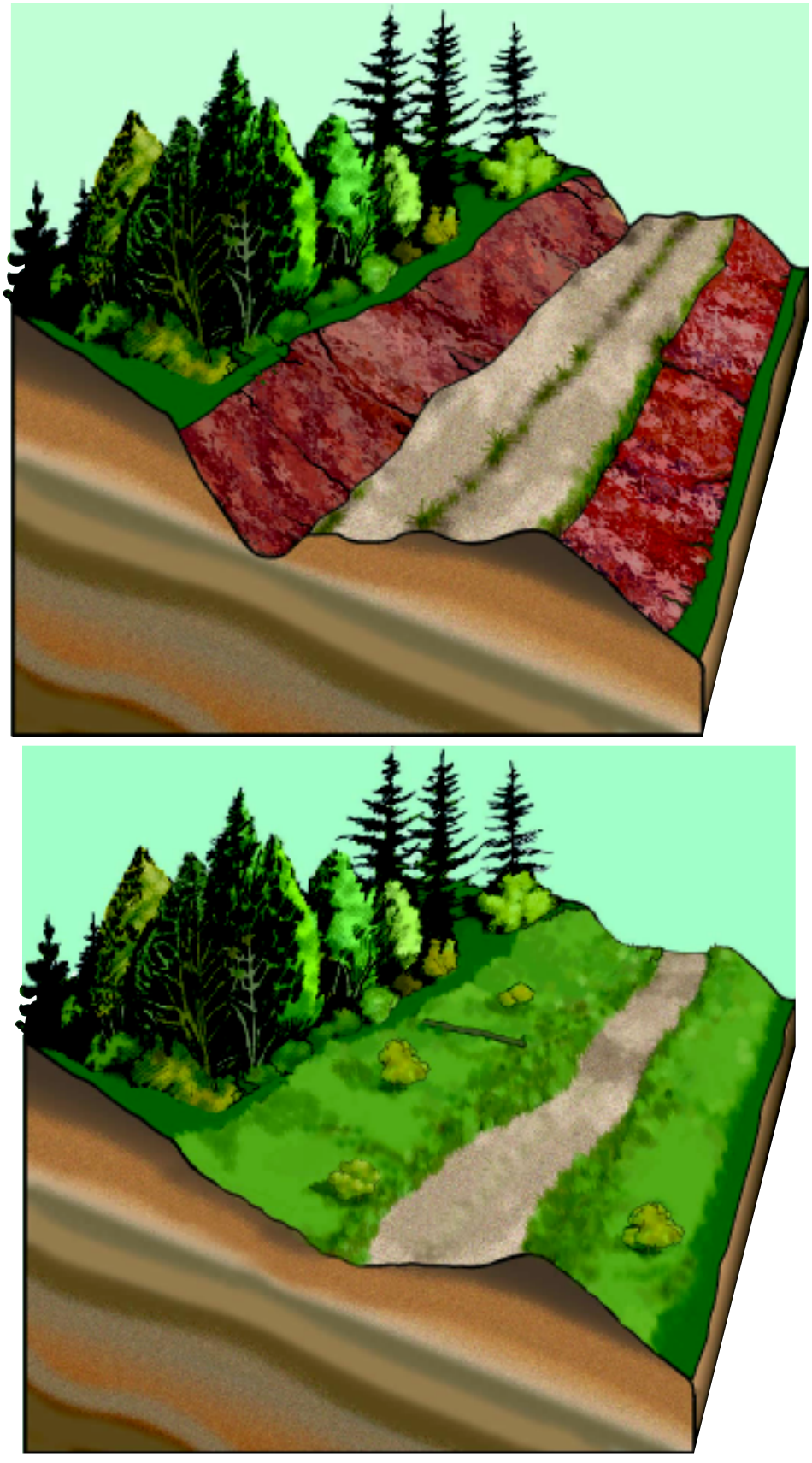
Before treatment

Road fill is sidecast downslope and steepens slope immediately below road. Outboard berms are common and are usually composed of fill and large woody debris (LWD). A layer of LWD is often present along the base of the fill.



After treatment

Road fill is recovered from the outboard fill and replaced into the cut bench. Topsoil is preserved and should be redistributed on finished surfaces above and below the trail. LWD (not shown) should be evenly scattered upslope and downslope of the trail bench.



Road before and after conversion. Notice the meander that can be incorporated into conversion design. Meandering can soften the appearance of long straight sections of road.