7. Control of Road Drainage (PRACTICE: 2-7)

a. Objective: To minimize the erosive effects of water concentrated by road drainage features; to disperse runoff from disturbances within the road clearing limits; to lessen the sediment yield from roaded areas; to minimize erosion of the road prism by runoff from road surfaces and from uphill areas.

b. Explanation: The intended purpose of a road, and management thereof, includes consideration of the vehicles expected and allowed to utilize the road. The resultant design of the road is based on the expectations that: occupants of design vehicles can safely maneuver on the road to access the intended resource or destination, forest resources are not negatively impacted, the road can be constructed within budget, and maintained to protect its capital investment. The protection of capital investment is most effectively achieved through proper design and use of drainage methods to control runoff from both the road surface itself, and area upslope. All are balanced to achieve the best possible scenario; one objective is not met at the expense of another. Mitigation measures are incorporated when impacts are expected to occur.

Although this practice was originally intended to be utilized for new road construction, it can serve as a guide for subsequent road reconstruction and maintenance. The practice of forest road location and design requires a careful examination of all road site properties, including but not limited to: soil characteristics above, at, and below the road; grade of road; surface composition; side slope(s); quantity and quality of vegetation above and below the road; proximity of road to waterways, TES habitat, private property, and cultural resources. An interdisciplinary team (IDT) approach confirms the presence or absence of relevant resources. For roads scheduled to undergo reconstruction or maintenance, a smaller IDT can be effective in confirming site properties above, while identifying methods that have contributed negatively to water quality. The designer and hydrologist review location, design criteria, and jointly recommend mitigation measures for Forest Engineer and Line Officer review and approval. Line Officers are informed of all costs associated with drainage controls that protect water quality, in addition to protecting the road investment. Only approved drainage features are incorporated into the project plan.

c. Implementation: Use project level science-based travel analysis to identify necessary road construction, or to inform priorities for roads to be reconstructed or maintained. For projects or plans that have identified roads requiring improved drainage controls for protection of water quality, consider methods that differ from in-place methods: ie. outslope prism with graded dips in lieu of berms, and insloped prism with ditches and culverts. As in road location and design, all site properties are considered, as there is no one method that meets all needs.

A number of treatments can be used, alone or in combination, to control unacceptable effects of road drainage. Methods used to reduce erosion include but are not limited to such controls as construction of properly spaced cross drains, water bars, or rolling dips; installing energy dissipaters, apron, downspouts, gabions, flumes, overside trains and debris racks; armoring of ditches, drain inlets, and outlets and removing or adding berms to control runoff. Accomplish dispersal of runoff on the road surface by such means as rolling the grade, outsloping or crowning. Installing water spreading ditches or contour

trenching can disperse road water after the water leaves the road surface. Wherever possible, locate dispersed drainage to take advantage of the absorptive benefit of down slope vegetative ground cover.

In some circumstances, hardening the road surface can reduce surface erosion, but results in more concentrated runoff flows. Reduce sediment loads from road surfaces by adding aggregate or paving surfaces or by installing such controls as: sediment filters, settling ponds, and contour trenches. Soil stabilization can reduce sedimentation by lessening erosion on borrow and waste areas, on cut and fill slopes, and on road shoulders.

The hydrologist works constructively with the engineer to seek more effective yet feasible method(s) when they determine that road reconstruction and/or maintenance requires a modification from existing drainage methods, Design of road drainage features supports land management plans and overlaying amendments for proximity to waterways or locations in specific soil zones and terrain. The road drainage features provide the greatest benefit within available funding limits.

During activity, and after completion, the work is monitored and evaluated for effectiveness. Project crew leaders and supervisors are responsible for ensuring that force account projects meet construction specifications, and project criteria. Contracted projects are implemented by the contractor, or operator. Compliance with plans, specifications, and operating plans is ensured by the COR, ER, or FSR.

Proper construction and installation of drainage features is crucial to success in reducing impacts to water quality. Training may be required to educate construction and maintenance personnel who will be involved in the modified drainage controls implementation.

Installation of permanent drainage controls is addressed in several sections of the current edition of FHWA Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects.