

## Chapter 1

# Introduction

*"Ideas are a dime a dozen. People who put them into action are priceless."*

*-A. Einstein*

**R**URAL, LOW-VOLUME, farm-to-market access roads, roads connecting communities, and roads for logging or mining are significant parts of any transportation system. They are necessary to serve the public in rural areas, to improve the flow of goods and services, to help promote development, public health and education, as well as to aid in land and resource management (*Photo 1.1*). At the same time, roads and disturbed areas can produce significant amounts of sediment (*Photo 1.2*). They can be one of the greatest adverse impacts on the local environment, on water quality, and on aquatic life. Roads can produce significant erosion, cause gullies, have an impact on groundwater, wildlife, and vegetation, impact social structure, degrade scenic values, waste limited funds, and take useful land out of production (*Photo 1.3*).

The basic objective of this guide is to help engineers, planners, environmental specialists, and road managers make good decisions, protect the environment, and build good low-volume roads. Key issues that should be addressed when planning a road project include changes or negative impacts to the area that a road can cause which may be significant, irreversible, or difficult to mitigate. The



**Photo 1.1** A minimum impact rural road that is well drained, has a stable driving surface, stable slopes, and is satisfactory for the user.



**Photo 1.2** A poorly drained road that has a rough driving surface for the users, it is a source of sediment, and it is relatively expensive to maintain.

long-term social, environmental, and fiscal cost effectiveness of a proposed road all need to be examined. Environmental analysis is a principal way to examine all aspects of a project, maximize its usefulness, and minimize problems. Emphasis should be placed on the use of an “Interdisciplinary Team” approach. Not all adverse impacts of roads can be avoided, but many can, and the negative and positive impacts of a road project should be weighed and evaluated.

Roads are necessary, but they must be constructed and maintained in such a way that negative environmental impacts are controlled or avoided. A well planned, located, designed, and constructed road will have minimum adverse impacts on the environment and will be cost effective in the long term with minimized maintenance and repair

costs. Controlling erosion and protecting water quality are essential to the quality of life, the health of the forest and woodland ecosystems, and to the long-term sustainability of rural resources. Vegetated areas such as woodlands and forests play a vital role in

producing, purifying, and maintaining clean water. Roads must protect water quality and the biotic environment that depends on it.

**Best Management Practices** or “BMPs” are those principals and engineering design practices that will protect water quality as well as the function of the road when properly applied. The Best Management Practices presented herein are a compilation of ideas and techniques that can be used in road management to reduce or eliminate many of the potential impacts from road operations and protect water quality. They represent good road design and construction practices that are cost effective in the long run by preventing failures, eliminating repair needs, and reducing maintenance.

The purpose of this manual is to present recommended practices for low-volume roads. A low-volume road is commonly defined as a road that has an average daily traffic



**Photo 1.3** A problematic road because of roadcut failures. Instability problems cause road user delays, and high maintenance or repair costs.

*The key objectives of*  
**BEST MANAGEMENT  
PRACTICES**

Best Management Practices are designed to accomplish the following:

- Produce a safe, cost effective, environmentally friendly, and practical road design that is supported by and meets the needs of the users;
- Protect water quality and reduce sediment loading into water bodies;
- Avoid conflicts with land use;
- Protect sensitive areas and reduce ecosystem impacts;
- Maintain natural channels, natural stream flow, and maintain passage for aquatic organisms;
- Minimize ground and drainage channel disturbance;
- Control surface water on the road and stabilize the roadbed driving surface (*Photo 1.4*);
- Control erosion and protect exposed soil areas;
- Implement needed slope stabilization measures and reduce mass wasting;
- Avoid problematic areas; and
- Stormproof and extend the useful life of the road.

(ADT) of less than 400 vehicles per day, and usually has design speeds less than 80 kph (50 mph). The information in this manual is applicable to rural roads, and most of the information is applicable to all types of roads, although high standard roads are not the emphasis of this manual. Soil and water quality issues related to temperature, nutrients, chemical pollution, debris, quantity of flow, and so on are also beyond the scope of this manual, although there are many varied benefits from the application of these practices.

Each topic in this manual contains a problem statement that presents concerns, advantages, and potential impacts for that issue. **RECOMMENDED PRACTICES** and information on the proper or most desirable way to plan, locate, design, construct, and maintain roads are presented, along with drawings and tables. Finally, **PRACTICES TO AVOID** are listed to discourage poor and undesirable practices.

This manual offers the Best Management Practices associated with many aspects of roads management. The information presented in this manual should become an integral part of transportation planning and rural road design. Key to its use is the need to **hire and retain good, well-trained, and experienced engineers** in road agencies to evaluate problems, consider local conditions and resources, and implement or adapt these practices as appropriate.

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Obviously, some significant differences exist in roads needs and design details in varying geographic areas. At times, unique solutions are needed. Mountainous regions typically have steep slopes and cold region conditions; deserts have little moisture to support vegetative erosion control measures but have brief, intense rainfall; jungles often have poor soils and drainage problems; high valley regions have dissected, steep terrain and difficult drainage crossings, and so on. However, the basic planning, location, design and maintenance

concepts, and select BMPs apply to any area. Good planning and road location are needed in any area. Roadway drainage must be controlled and drainage crossings must be carefully selected and properly designed. All roads need stable slopes, use of good materials, and appropriately applied erosion control measures. Only some design details vary with specific geographic and climatic regions. Thus local experience and knowledge are so important in rural roads.

These BMPs are applicable to road construction practices in most field situations. However, BMPs should be selected (and may be modified) for site-specific conditions, with guidance from experienced engineers, managers, or other resource professionals. They must consider local or national regulations. Modifications should be researched, designed, and documented before being used. They should be monitored, and they should provide for equal or greater water quality protection.



**Photo 1.4** A well designed, “minimum impact” road that has an appropriate standard for its use, and a stabilized cobblestone driving surface.