Chapter 2

Environmental Analysis

Involve all parties! Communicate, communicate, communicate!

Environmental analysis (the EA Process) is a systematic, interdisciplinary process used to identify the purpose of a proposed action, develop practical alternatives to the proposed action, and predict potential environmental effects of the action. A few examples of proposed actions are road construction, logging, tree clearing for disease control, reforestation, building a hydroelectric dam, or developing a quarry. *Figure 2.1* shows some of the trade-offs and environmental impacts of low versus high standard roads.

A couple of the principal environmental laws applied today are, the National Environmental Policy Act (NEPA), established in the United States in 1964, and the US Agency for International Development (USAID) 216 Regulations, which dictate the environmental analysis process for USAID funded projects worldwide. Many other countries and agencies have environmental laws, regulations, and procedures that pattern these fundamental documents.

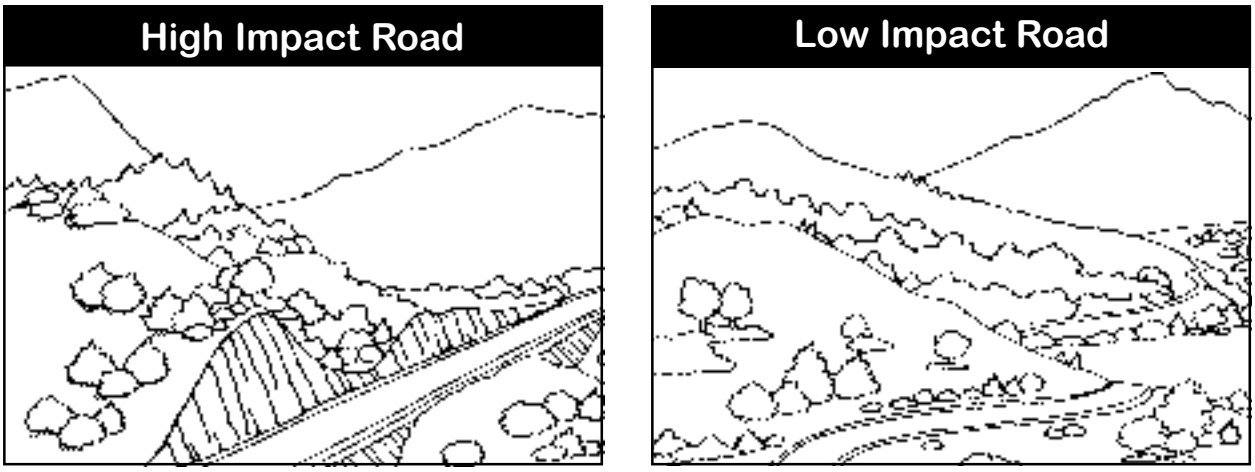

Figure 2.1 Low versus High Impact Roads: These figures show the reduced work and reduced environmental impacts from low standard roads that conform to the topography. The low standard road reduces cut and fill slope size, reduces earth work, visual impacts, and minimizes changes to natural drainage patterns. The high standard road can move a large volume of traffic rapidly and safely.

Photo 2.1 A well built road that helps serve the local population in a rural area, with minimum environmental damage.

An Environmental Analysis (EA) identifies problems, conflicts, or resource constraints that may affect the natural environment or the viability of a project. It also examines how a proposed action might affect people, their communities, and their livelihoods (*Photo 2.1*). The analysis should be conducted by an Interdisciplinary Team consisting of personnel with a range of skills and disciplines relevant to the project. Team members should include a team leader and may include engineers, geologists, biologists, archaeologists, and social workers. The EA process and findings are communicated to the various affected individuals and groups. At the same time, the interested public helps provide input and comment on the proposed project (*Photo 2.2*). The document produced as a result of the EA guides the decision maker toward a logical, rational, informed decision about the proposed action.

The EA process and Interdisciplinary Team studies can reveal sound environmental, social, or economic reasons for improving a project. After predicting potential issues, the EA identifies measures to minimize problems and outlines ways to improve the project's feasibility. *Figures 2.2 a, b, & c* show examples of environmental mitigations that a designer can use to avoid potential impacts on wildlife, such as use of animal underpasses and culvert requirements for fish passage (*Photo 2.3*).

The EA process can provide many benefits to the road builder, local agencies, and the communities who will be affected by road construction and maintenance activities. The process and resulting reports are tools that road managers can use to guide their decisions, produce better road designs and maintenance plans, identify and avoid problems, and gain public support for their activities. An EA document can be long and complex for major, potentially high impact projects, or it may only be a few pages long for a simple road project. *Table 2.1* presents an eight-step process that is useful for doing Environmental Analysis.

Key benefits of EA for a road project can include the following:

- Reducing cost and time of project implementation;

Photo 2.2 A key aspect of the Environmental Analysis process is communications with the public and between Interdisciplinary Team members.

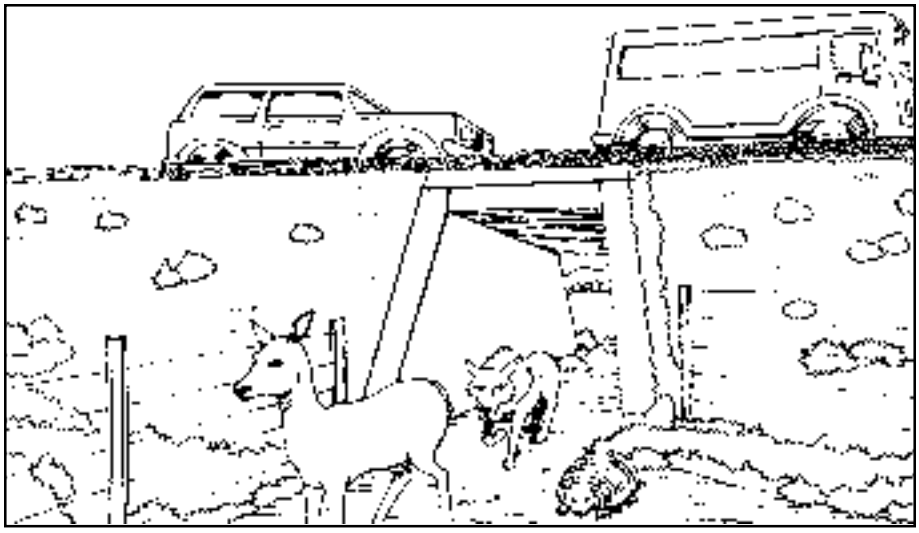

Figure 2.2a Example of an animal underpass used in road construction to minimize the impact of roads on wildlife migration. Underpasses allow for safe animal crossings and minimize road kill.

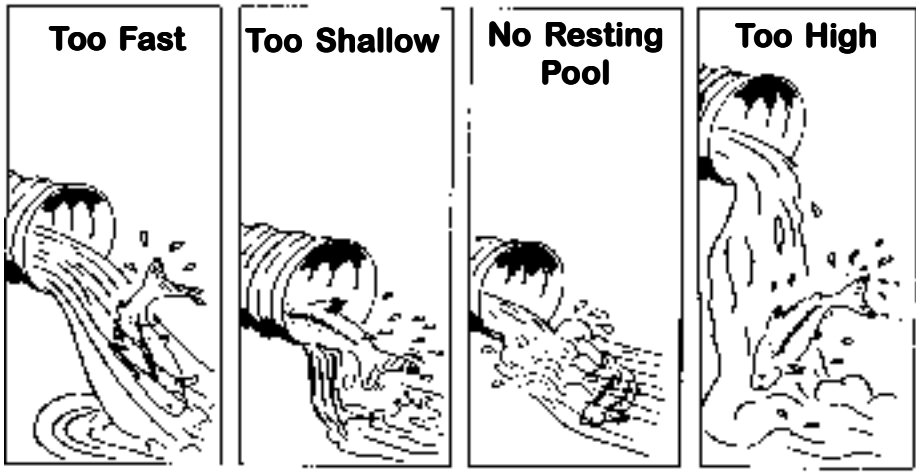

Figure 2.2b Poorly designed or installed culverts with "fish barriers" that prevent fish passage. *(Redrawn from Evans and Johnston 1980)*

Figure 2.2c A fish "friendly" culvert (pipe arch) with a natural stream channel bottom that promotes fish passage and is wide enough to avoid constricting the normal or "bankfull" flow.

RECOMMENDED PRACTICES

- Use the Environmental Analysis Process early during project planning and development.
- Open project information to public scrutiny.
- Involve all parties affected by the project, as well as key Interdisciplinary Team members.
- **Communicate, Communicate, Communicate!!!** Communications between all interested parties is the key to understanding the issues and problems and to finding solutions!

PRACTICES TO AVOID

- Waiting until a project is fully planned or problems develop before doing Environmental Analysis.
- Getting lost in the "process" of EA studies.

Table 2.1

An EIGHT Step Environmental Analysis Process and Its Associated Outputs

1. Identify the Project	Identify the purpose and need of the proposed action. Develop a goal to provide a framework for EA.
2. Scoping	Identify the issues, opportunities, and effects of implementing the proposed action.
3. Collect and Interpret Data	Collect data. Identify probable effects of project implementation.
4. Design of the Alternatives	Consider a reasonable range of alternatives. Usually at least three alternatives are considered. Include a No-Action Alternative. Consider the mitigation of negative impacts.
5. Evaluate Effects	Predict and describe the physical, biological, economic, and social effects of implementing each alternative. Address the three types of effects -- Direct, Indirect, and Cumulative.
6. Compare Alternatives	Measure the predicted effects of each alternative against evaluation criteria.
7. Decision Notice and Public Review	Select preferred alternative. Allow for review and comment by the affected and interested public.
8. Implementation and Monitoring	Record results. Implement selected alternative. Develop a monitoring plan. Insure that EA mitigations are being followed.

Photo 2.3 A bottomless arch pipe culvert that spans the active stream channel and doesn't constrict the flow, maintains a natural stream bottom, and helps promote fish passage. *(Photo provided by S. Wilson-Musser)*

- Avoiding costly modification during construction;
- Determining the proper balance between roads needs and environmental impacts (*Figure 2.1*);
- Increasing project acceptance by the public;
- Avoiding negative impacts and violations of laws and regulations (*Photo 2.4)*;
- Improving project design and performance (*Photo 2.5)*;
- Producing a healthier environment by avoiding or mitigating problems (*Figure 2.2, Photo 2.6*); and
- Minimizing conflicts over natural resource use.

Examples of typical environmental mitigation measures associated with roads projects that have been developed as a result of environmental analysis are:

- Additional road surface cross drainage structures to reduce water concentration and subsequent erosion problems;
- Relocation of a road to avoid a meadow or sensitive area;
- Addition of extra culvert pipes to keep flows spread out across a meadow and prevent gully formation from concentrated flows;

Photo 2.4 **Adverse environmental impact from road surface erosion caused by steep road grades and insufficient cross-drains. This road is also difficult to maintain.**

- Route location to avoid fragmentation of wildlife habitat or avoid sensitive species areas;
- Addition of wildlife crossings, such as overpasses or underpasses (*Photo 2.7*), or using reduced speed zones at animal migration routes to reduce the number of animals killed crossing highways;
- Increasing culvert pipe size, using bottomless arch culverts, or building a bridge to maintain a natural stream channel bottom, avoid channel disturbance and

Photo 2.5 **A well designed, "minimum impact" road that has an appropriate standard for its use, good drainage, and stable slopes.**

impacts on aquatic organisms, and promote fish passage;

- Adding aggregate or some form of paving to the road surface to reduce erosion, materials loss, and dust problems, as well as reduce maintenance frequency and improve rider comfort;

- Developing a project quarry using local materials, but located in a nonsensitive area, and reclaiming the site upon completion of the project; and

- Implementing specific revegetation and erosion control measures for a project, utilizing appropriate native species of vegetation and a local project nursery to provide adequate types of plants with fast growth, good ground cover, and deep roots (*Photo 2.8*).

Remember that Environmental Analysis is often required by law, but the process is intended to be a very useful planning tool to help make good decisions and improve projects.

Photo 2.6 Locate and manage roads to minimize degradation of water quality in local streams. Minimize the connectivity and amount of contact between roads and streams.

Photo 2.7 A road underpass constructed to allow animals to move safely from one side of the highway to the other.

Photo 2.8 Stream bank stabilization and revegetation work can be done in conjunction with road construction projects near a stream as an environmental mitigation measure.