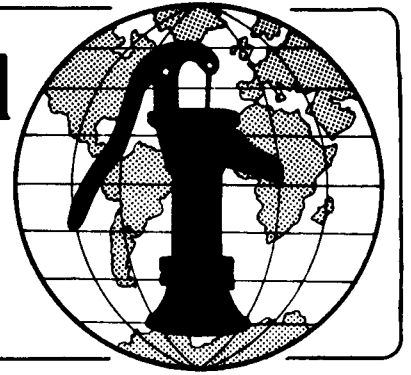


Water for the World



Maintaining Small Dams Technical Note No. RWS. 1.O.5

Proper dam maintenance is very important. It ensures that abundant, good quality water is available for a community supply. Maintenance is essential to protect people near a dam site. If a dam breaks, flooding occurs that may cause destruction of life, homes and crops over a large area. This technical note describes measures which should be taken to maintain a dam effectively. Use the suggestions for preventive dam maintenance.

Useful Definitions

BOOM - A barrier of floating logs that prevents waves from wearing away the embankment of a reservoir.

EROSION - The wearing away of soil, rock or other material by water or wind.

MALARIA - A disease transmitted to humans by the female anopheles mosquito.

RIP-RAP - Blanket foundation or wall made of large stones thrown together irregularly or loosely.

SCHISTOSOMIASIS - A parasitic disease transmitted from snails to man through contact with water containing infected snails.

SPILLWAY - A channel built to control the level of water in a dam reservoir; flood water is drained from a dam through spillways.

General Maintenance

Earth dams may fail because of poor site investigation, poor soils, poor design, poor construction and unusually heavy rainfall. The most common problem encountered in small earth dams

are leaks in the embankment; overtopping (the flow of water over the top of the dam), undermining (the flow of water under the structure), piping failure, erosion of the embankment, and slope failure. These conditions reduce the strength of the dam.

Other factors can affect the reservoir and the quality of water. Poor watershed management can cause contamination of water in the reservoir. Reservoirs may be breeding places for disease-carrying insects such as snails and mosquitoes which cause great harm to a community. For information on diseases associated with standing water, see "Means of Disease Transmission," DIS.1.M.1.

These problems will become serious without proper maintenance. All dams should be inspected every three months and after every heavy rain to determine if there is a need for repairs.

Check the dam for any seepage or cracks. If there is seepage through or under the dam, consult an engineer for advice on correcting the problem. Solve any seepage problems as quickly as possible to prevent conditions from getting worse.

Burrowing animals can cause great damage to a dam. If burrowing occurs in the embankment, the structure will be weakened and the dam could break. To prevent burrowing, place a thick layer of sand and gravel on the fill. As shown in Figure 1, chicken wire can also be placed on the embankment to stop animals from burrowing, but it will rust and need replacement periodically. If burrowing continues, a program to eliminate pests should be developed. See a local agricultural agent for advice.

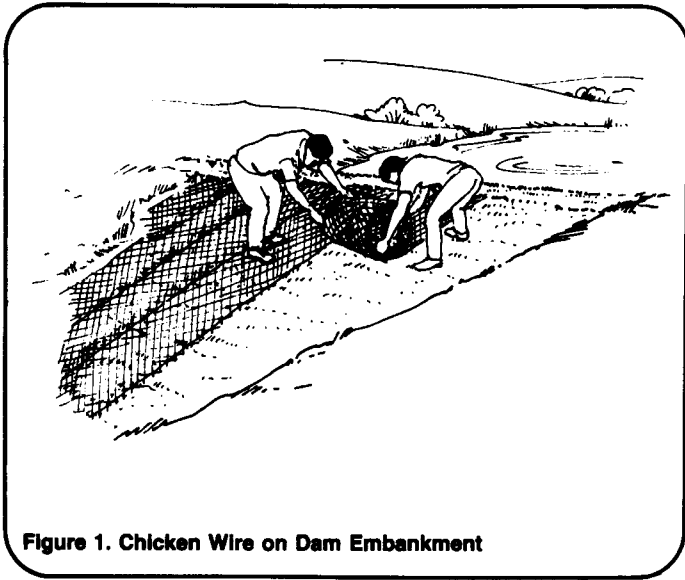


Figure 1. Chicken Wire on Dam Embankment

Prevention of Erosion

Erosion of the embankment caused by rain and wave action in the reservoir must be controlled. Erosion will cause the embankment to weaken and possibly fail.

If there are any small channels on the embankment, fill them with soil high in clay content and compact it. These areas should be replanted with grasses or other vegetative covering. Maintain the vegetative cover on the downslope side of the embankment by keeping the grass cut and fertilizing if needed. Proper cutting and care of the cover makes it more resistant to run-off. Plant only grass, not trees or bushes. Tree or bush roots will open channels in the embankment through which water can flow.

After any planting, keep people from walking up and down the grass slopes. Rainwater is caught by the footprints and flows down the slopes causing small channels to form. The embankment slowly washes away in these channels.

The top of the embankment should be blocked off so that vehicles do not use it for crossing the stream. Walking across the top of the dam will not cause damage but driving across it should be prohibited.

The upstream embankment must be protected from erosion caused by wave action in the reservoir. It should be paved with rough stone from 0.5m below

the low water level to 0.5-1.0m above the high water level as shown in Figure 2. Paving should reach as high as the height reached by waves. Check to be sure that the rip-rap is in place and that erosion is not a problem. If timber is available, a boom can be built to protect the face of the dam. A boom is a single or double line of logs chained together and securely anchored to each end of the dam as shown in Figure 3. The line should have enough slack to fluctuate with the water.

To prevent erosion in dry areas where rock and timber are not available and vegetation is scarce, the front slope of the embankment may have to be flattened or a layer of coarse sand and gravel applied to it at a ten to one (10:1) slope.

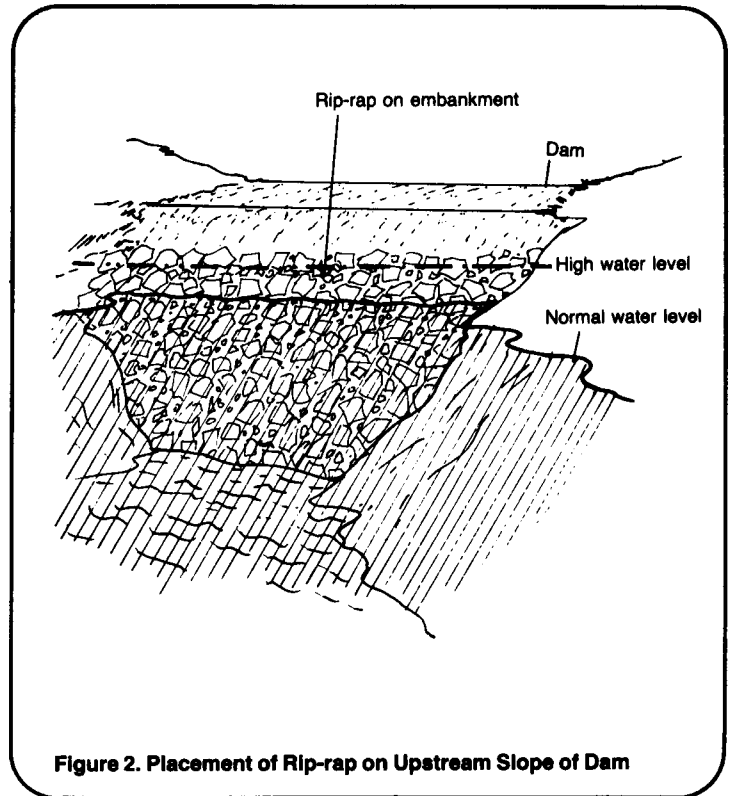


Figure 2. Placement of Rip-rap on Upstream Slope of Dam

Prevention of Overtopping

Water should never be allowed to flow over the top of an earth dam. Overtopping, as this is called, will cause dam failure. Spillways are installed to prevent overtopping and their maintenance is very important. Spillways are installed on either side of the dam to remove water if the

reservoir height rises above the normal high water level due to heavy rains or flooding. Spillways move the wastes downstream around the embankment.

Check the condition of the spillways. If there is any sign of erosion, repair the washed out areas with soil and either plant grass or

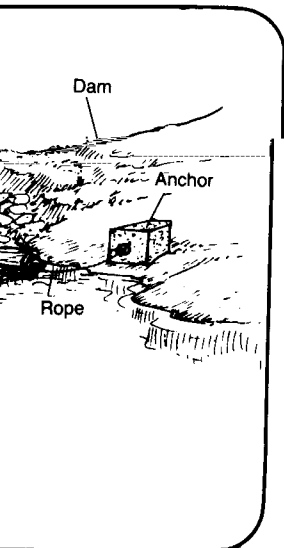
stone. All spillways should be lined with

keep the fence well repaired:

make sure that the channels. Any debris removed from the water from backing and destroying

Prevent erosion on the slopes of the watershed by preserving existing vegetation. If erosion is already occurring, plant trees or grass or take other measures such as terracing to prevent large quantities of sediment from flowing into the reservoir. Sediment colors the water, fills the reservoir basin quickly, and may contaminate the water.

Reservoirs can be breeding places for mosquitoes and snails. Mosquitoes that carry malaria and snails that carry schistosomiasis must not be allowed to breed. To prevent mosquitoes and snails from breeding, steepen the edges of the reservoir about 1m. Breeding of mosquitoes and snails generally takes place in shallow water and deep pond edges should discourage their breeding. The deeper edges will also discourage growth of vegetation in the pond. Where malaria is a problem, aquatic growth and shoreline vegetation should not be permitted. When caring for the reservoir, see a local health official to discuss ways to keep the reservoir from being a source of disease.



Watershed Management and Sanitation

The quality of the water in the reservoir is protected by simple watershed management and sanitation practices. Keep livestock and other domestic animals away from both the reservoir and the watershed. Wherever possible, fence the watershed area and

line the spillways with stone. Spillway channels should be lined with either grass or stone.

After heavy rains, nothing is blocking the spillways to prevent water from backing up during a heavy rain.

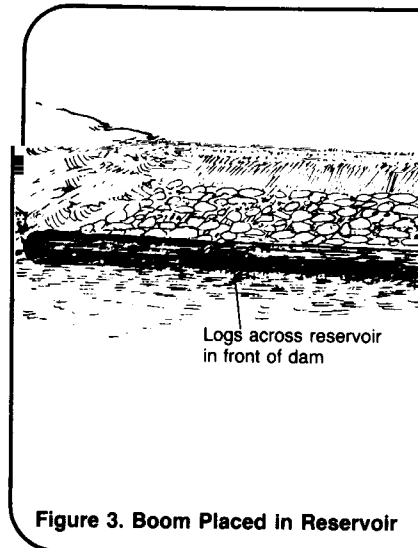


Figure 3. Boom Placed in Reservoir