



PONDS

Planning, Design, & Management

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Ponds

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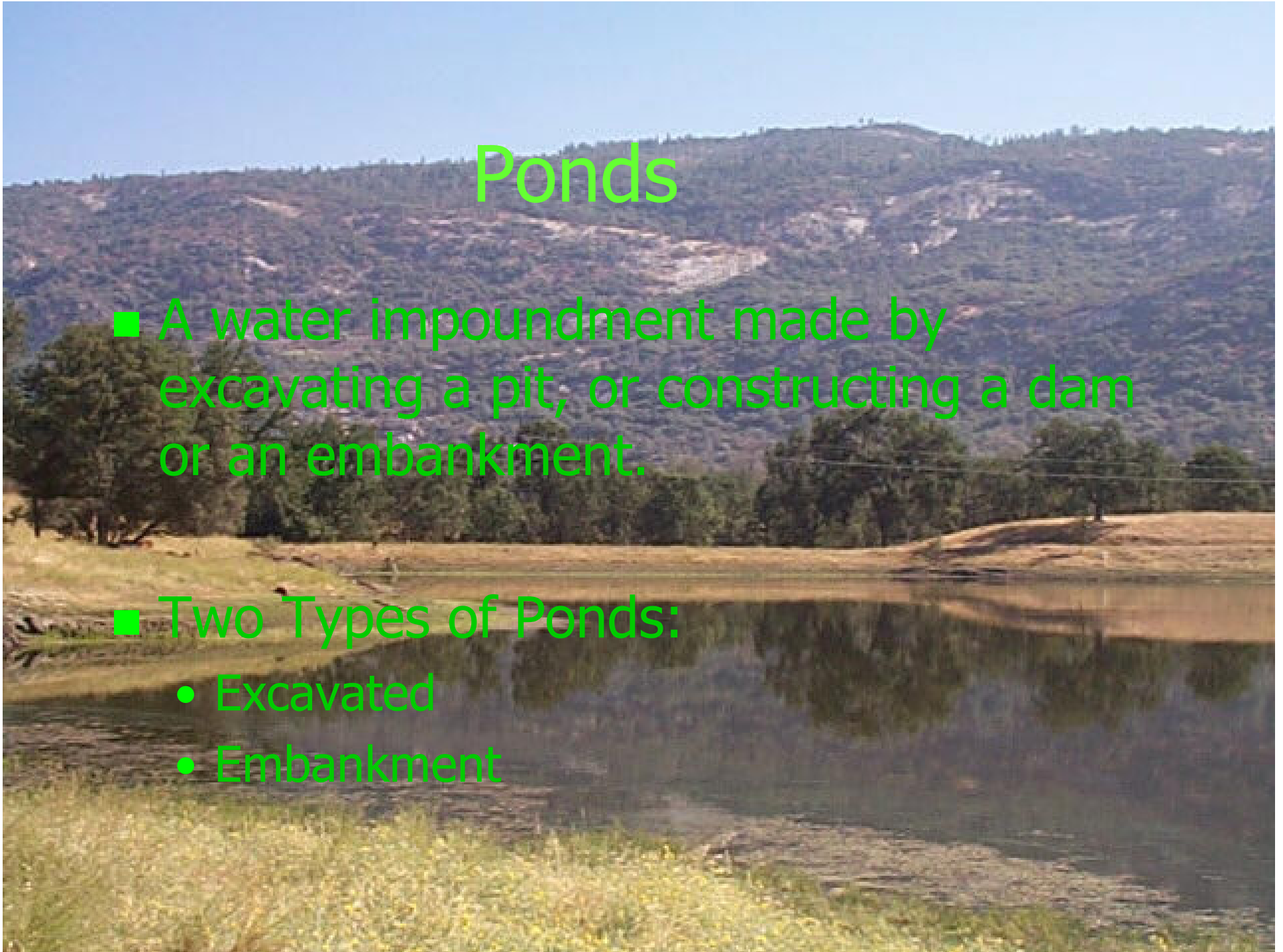


Ponds

- A water impoundment made by excavating a pit, or constructing a dam or an embankment.

- Two Types of Ponds:

- Excavated
- Embankment



Uses

- Livestock Water Supply
- Irrigation
- Fish Production
- Landscape Appearance
- Fire Protection
- Recreation
- Waterfowl and Other Wildlife
- Sediment Capture

Livestock Water Supply



Irrigation



6/21/1999

Fish Production



Landscape Appearance





Fire Protection

Recreation



Waterfowl and Other Wildlife



Sediment Capture



Considerations for Location of Ponds

- Economics

Largest water storage volume that can be obtained with least amount of earthfill.

- Uses

Are the locations in suitable spots for the intended use?

Considerations for Location of Ponds

- Watershed
Runoff

Is the drainage area adequate to maintain the water level of the pond, yet not so large as to cause excessive overflow?

Considerations for Location of Ponds

- Topography

Look for the largest volume of water stored per cubic yard of soil moved.

- Soils

Proximity to source material for building dam.

Considerations for Location of Ponds

■ Geology

- Depth to impervious layer.
- Ability of foundation to withstand load of the fill in the dam.
- Potential for seepage through foundation and abutments.

Considerations for Location of Ponds

- Estimated Minimum Pond Depth:

*Requirements vary by state

- Northern California ----- 7'-10'
- Northern Coast ----- 5'-7'
- Sierra Mountains ----- 5'-7'
- Central Valley ----- 10'-14'
- Central & Southern Coast ----- 10'-12'
- Desert ----- 12'-14'

Considerations for Location of Ponds

- Water Rights

Are water rights available?

Is the water in the watershed fully allocated?

Information on water rights can be found at:

<http://www.waterboards.ca.gov/waterrights>

Considerations for Location of Ponds

- Emergency and recreational vehicle access.
- If pond were to over-flow, consideration must be made to the surrounding area and downstream areas.
- Dam failure hazard.

Commonly Used Terms

- **Principle Spillway:** A pipe or vegetated outlet channel to carry **daily flows** safely past earth embankments. May also serve as an emergency spillway where space is limited.
- **Emergency Spillway:** A rock, concrete, or vegetated outlet channel to carry **flood flows** safely past earth embankments.

Commonly Used Terms

- **Trickle tube:** A small pipe to allow water to pass through the dam, and protect the vegetation in the earth spillway against saturation.
- **Drainpipe:** Allows drainage of pond without having to remove fill, use a siphon, pump or other devices.
- **Water-Supply Pipe:** Used to fill orchard sprayers, stockwater troughs and to pump water for irrigation. Usually in addition to the trickle tube.

Design Considerations

- Average Annual Rainfall For Design Storm
 - Rainfall amounts and expected frequency
 - Hydrologic groupings of soils
 - Runoff curve numbers
 - Peak discharge rate
 - Estimate volume of storm runoff

Design Considerations

■ Topography

- Acquire enough survey data to plan the dam, spillway, and other features.

■ Watershed Area

- From USGS Quad Sheet.

■ Watershed Slope

- From USGS Quad Sheet.

Design Considerations

■ Stability of Dam

- Downstream channel stability
- Stability of side slopes of the dam
- Stability of spillway(s)
- Proximity to active faults

■ Composition of Dam

- Optimum soil for dam should be a mixture of coarse and fine textured soils
- Volume of soil available

Design Considerations

- Recommended 3:1 Slope on Upstream Side of Dam

- Slope will attenuate erosion by wave action from the pond.

- Recommended 2:1 Slope on Downstream Side of Dam

- Slope should be flat enough to be stable, yet steep enough to minimize amount of fill required.

Design Considerations

- The combined upstream and downstream side slopes of embankments shall not be less than 5 horizontal to 1 vertical.
- All slopes must be designed to be stable, even if flatter side slopes are required.

Design Considerations

- Type of Soil in Pond Area
 - Soil should have a high enough clay content to prevent seepage.
- Hazard Class of the Dam
 - Used to quantify hazard potential in the event of failure.
- Depth Required For Intended Uses

Design Considerations

- Emergency Spillway Location
 - Topography
 - Soil
 - Discharge Flow Rate
 - Velocity
 - Stable outlet

Design Considerations

■ Minimum Spillway Capacity

Page 6 of NRCS Conservation Practice Standard #378: Ponds

- Outflow from 50 year 24 hour storm (credit can be given for other pipes through the dam and detention of flows).
- Minimum bottom width is 5 feet for dams < 20 feet tall
- Minimum bottom width is 10 feet for dams > 20 feet tall
- For closed emergency spillways (culverts, etc.) outflow from 100 year 24 hour storm (credit can be given for other pipes through the dam and detention of flows).

Design Considerations

■ Criteria for State Size Dam

- Over 25 feet high and 15 or more acre feet of storage.
- Over 6 feet high and 50 or more acre feet of storage.

Other Considerations

- County Ordinances
- Local Ordinances
- Permits
 - County Grading Permit
 - Fish and Game Permit
 - Regional Water Quality Control Board
Clean Water Act
 - Water Rights
 - Army Corps of Engineers - Clean Water Act

<http://carcd.org/Watershed/guidetowatershed.pdf>

Maintaining the Pond

■ Importance of Maintaining Vegetation

- Erosion control
- Climate control
- Wildlife habitat



Maintaining the Pond

- Protecting Emergency Spillway Against Erosion
 - Apply seed or sod and fertilization for proper vegetation.
 - Use mulch on slopes that are difficult to vegetate.
 - Irrigate to insure proper germination and growth.

Maintaining the Dam

■ Pipes Through the Dam

- Trickle tube
- Drainpipe
- Water-Supply Pipes

Maintaining the Dam

A photograph of a dam in a rural landscape. The dam is a long, low structure made of earth and stone, stretching across the middle ground. In the foreground, there is a field of tall, dry grasses and a utility pole with a single wire. The background is filled with a dense line of trees under a clear sky.

■ Trees

- Keep trees off and away from dam to prevent seepage through roots.

■ Rodents

- Rodents that burrow through the dam will create holes that allow seepage.

References

Pond Conservation Practice Standard #378

Section IV of USDA-NRCS

Field Office Technical Guide

<http://efotg.nrcs.usda.gov/references/public/CA/378STD-8-06.pdf>

Ponds - Planning, Design, Construction

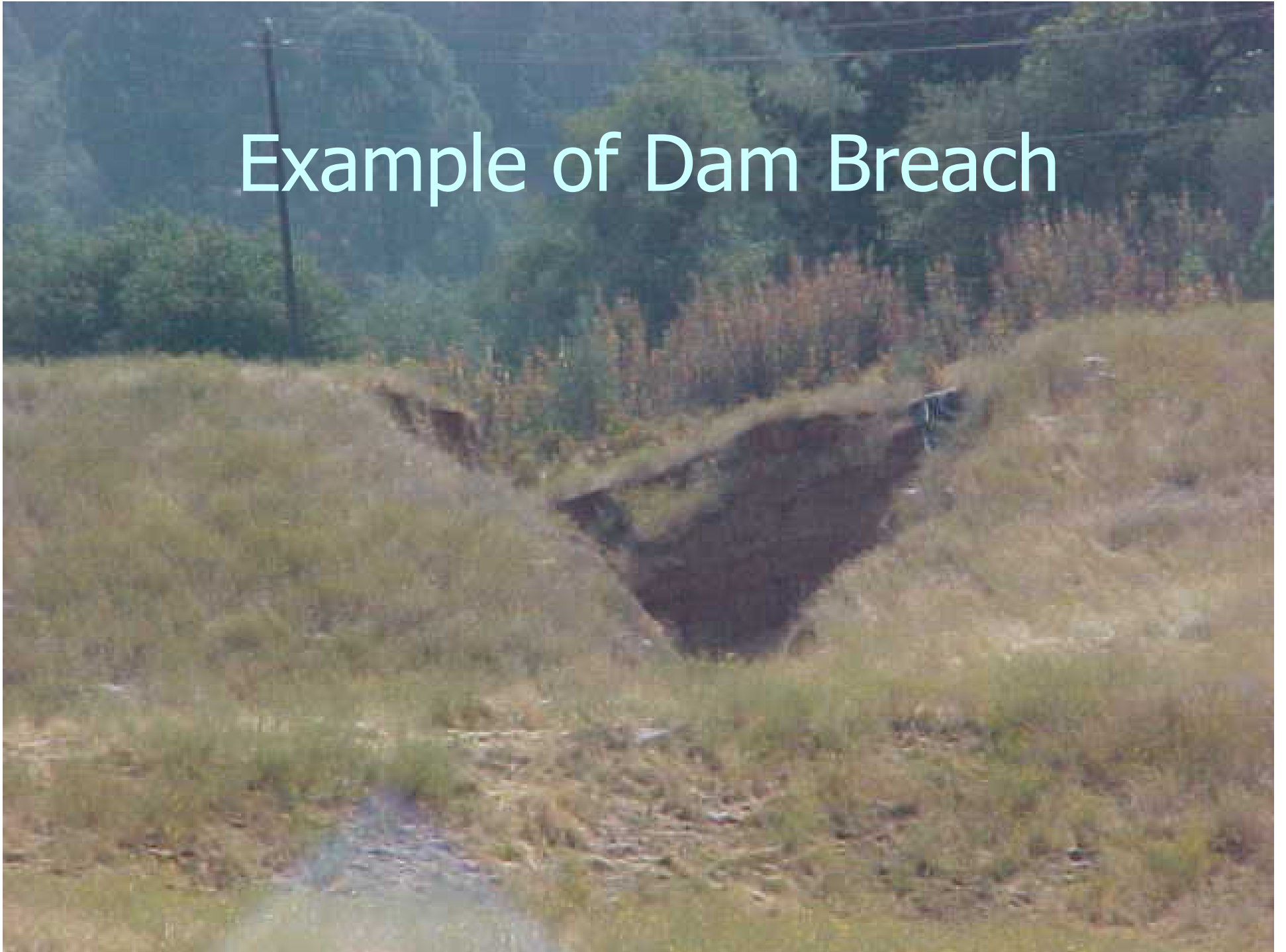
Agricultural Handbook #590 of USDA-NRCS

www.in.nrcs.usda.gov/pdf%20files/PONDS.PDF

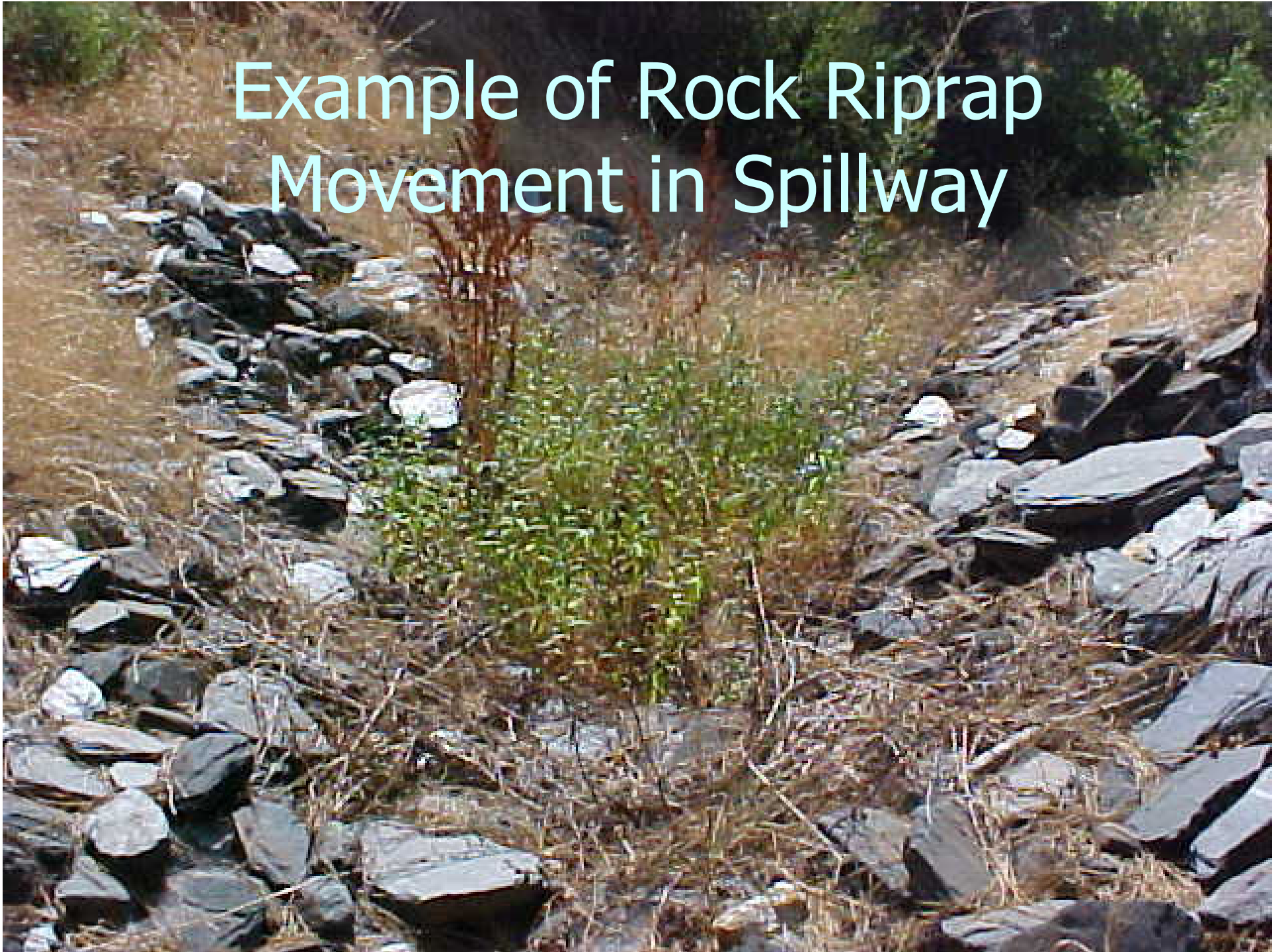


Example of Trees on Dam

Example of Dam Breach



Example of Rock Riprap Movement in Spillway





Example of Headcutting of Emergency Spillway

Example of Poor Riprap



Questions

