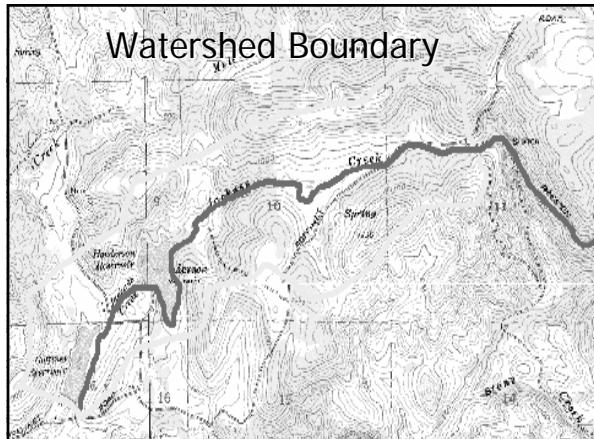


## Considerations for Location of Ponds

- Economics      Largest water storage volume that can be obtained with least amount of earthfill.
- Uses              Are the locations suitable 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 needed to construct the 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:  
[www.waterrights.ca.gov](http://www.waterrights.ca.gov)

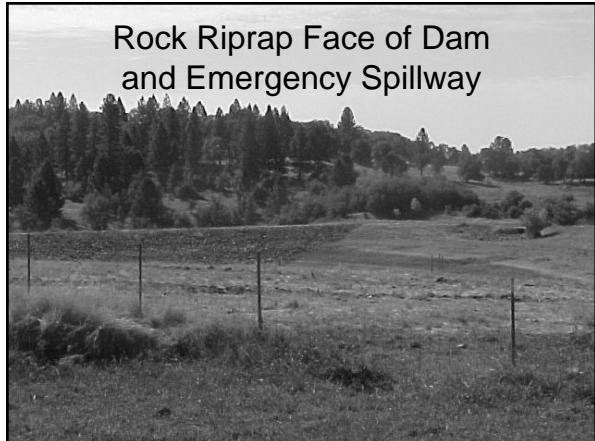
## Considerations for Location of Ponds

- 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.

## Rock Riprap Face of Dam and Emergency Spillway



## 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.



Drainpipe Headworks

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

## 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

Table-4 from Page 7 of NRCS Conservation Practice #378: Ponds

Drainage Minimum Area ac	Effective Height of Dam ft	Storage ac-ft	Frequency yr	Duration hr
20 or less	20 or less	<50	10	24
20 or less	>20	<50	25	24
>20	20 or less	<50	25	24
All others			50	24

## 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

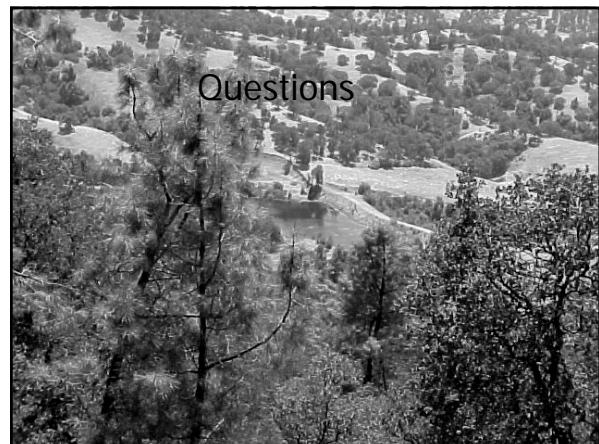
- County Ordinances
- Local Ordinances
- Permits
  - County Grading Permit
  - Fish and Game Permit
  - Regional Water Quality Control Board Clean Water Act
  - Water Rights
  - Army Corps of Engineers Clean Water Act

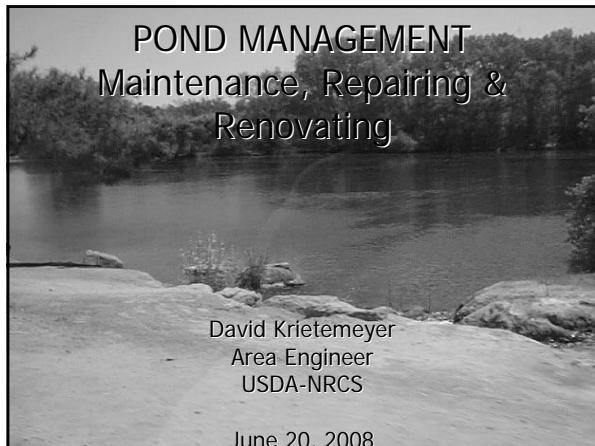
## References

Pond Conservation Practice Standard #378  
Section IV of USDA-NRCS  
Field Office Technical Guide  
Available at: [www.ca.nrcs.usda.gov/fotg/](http://www.ca.nrcs.usda.gov/fotg/)

Ponds - Planning, Design, Construction  
Agricultural Handbook #590 of USDA-NRCS  
Available at: [www.wcc.nrcs.usda.gov/water-quality/common/ponds.pdf](http://www.wcc.nrcs.usda.gov/water-quality/common/ponds.pdf)

## Questions





## Maintenance, Repairing & Renovating

- Maintenance of Ponds
- Maintenance of Dams
- References
- Examples
- Questions

### Maintaining the Pond

- Importance of Maintaining Vegetation
  - Erosion control
  - Climate control
  - Wildlife habitat

### Maintaining the Pond

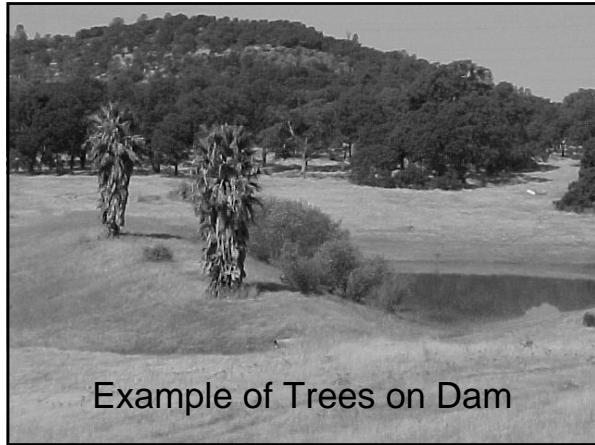
- Protecting Emergency Spillway Against Erosion
  - Apply seed or sod and fertilization for proper vegetation.
  - Use mulch on slopes that are difficult to vegetate.
  - Irrigate to insure proper germination and growth.

### Maintaining the Dam

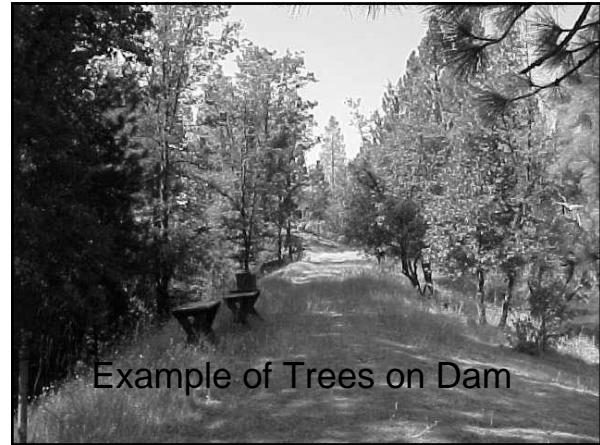
- Pipes Through the Dam
  - Trickle tube
  - Drainpipe
  - Water-Supply Pipes

### Maintaining the Dam

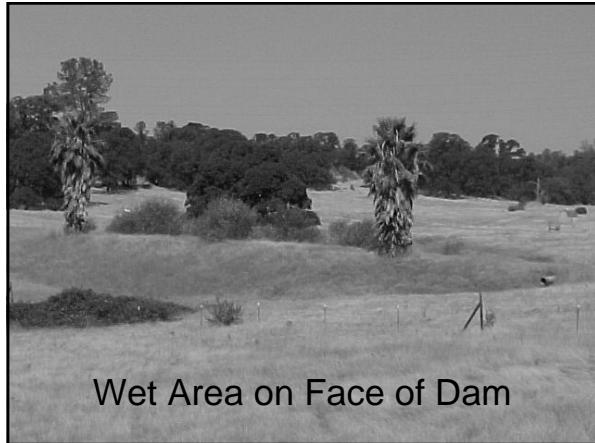
- Trees
  - Keep trees off and away from dam to prevent seepage through roots.
- Rodents
  - Rodents that burrow through the dam will create holes that allow seepage.



Example of Trees on Dam



Example of Trees on Dam



Wet Area on Face of Dam

Example of Dam Breach

Example of Rock Riprap Movement in Spillway

Example of Headcutting of Emergency Spillway

## Example of Poor Riprap

## Rodent Damage

- Depends on Extent of Damage
- Minor:
  - Fill with Bentonite, Fresh Concrete, or other similar material.
- Major:
  - Excavate area to at least 3" below damaged area at 1:1 or flatter slope and compact soil back into place.

