2023 DAM SAFETY WORKSHOP

NATURAL RESOURCES DIVISION

CONDUCTING AN EFFECTIVE DAM INSPECTION

Title VII

Arkansas Natural Resources Commission*

Rules Governing Design and Operation of Dams

Subtitle IX. Inspection

Section 709.1 Owner inspection.

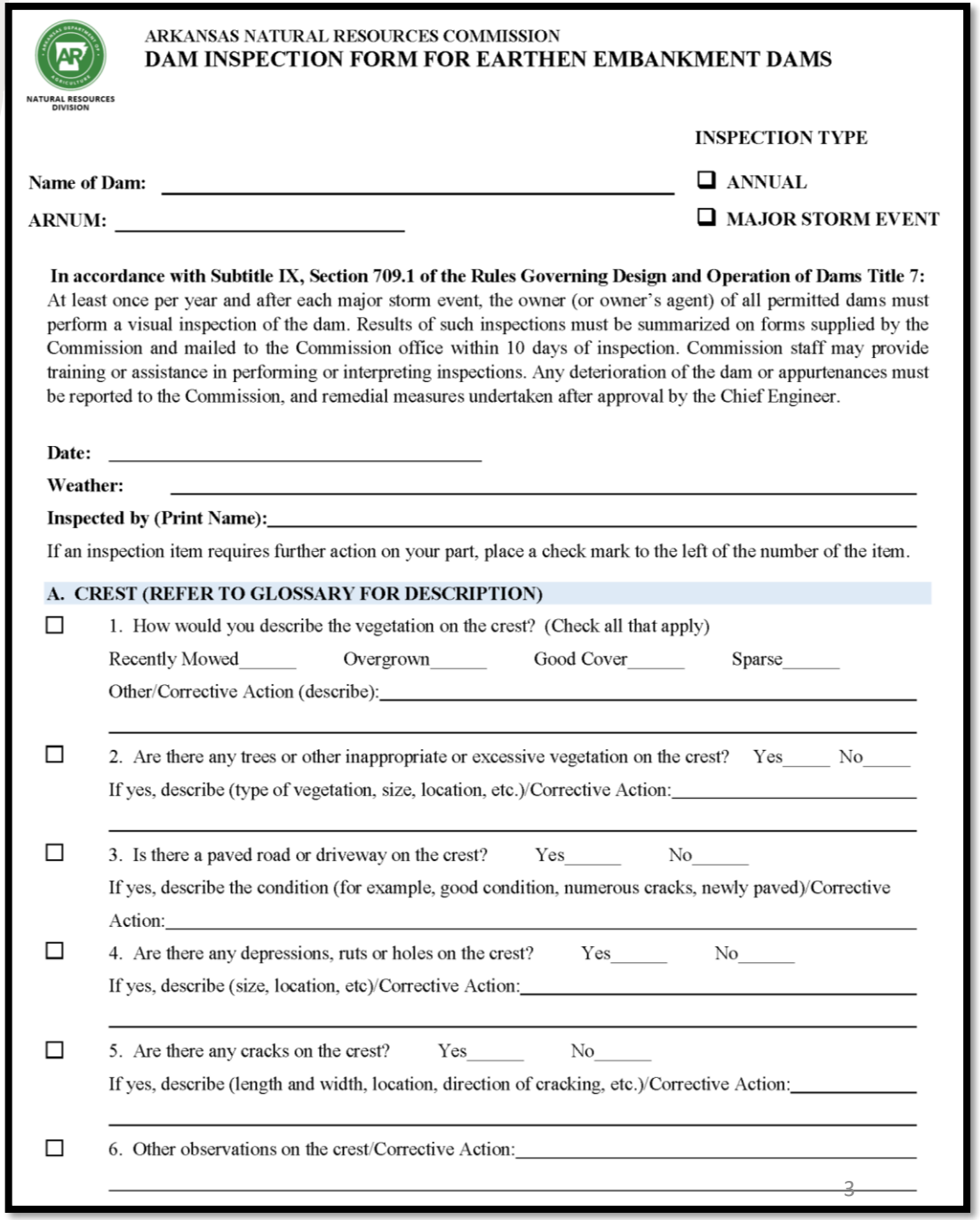
Section 709.2 Commission inspection.

Section 709.3 Access.

Section 709.4 Assistance by owner.

At least once per year and after each major storm event, the owner (or owner's agent) of all permitted dams must perform a visual inspection of the dam. Results of such inspections must be summarized on forms supplied by the Commission and mailed to the Commission office within 10 days of inspection. Commission staff may provide training or assistance in performing or interpreting inspections. Any deterioration of the dam or appurtenances must be reported to the Commission, and remedial measures undertaken after approval by the Chief Engineer.

- ❑ Visual inspection of the dam
- ❑ Inspection results must be summarized on forms supplied by ANRC
- ❑ Mail results to ANRC/Dam Safety within 10 days of inspection
- ❑ Dam Safety staff may provide training or assistance in performing or interpreting inspections
- ❑ At least once per year
- ❑ After each major storm event



ARKANSAS NATURAL RESOURCES COMMISSION

DAM INSPECTION FORM FOR EARTHEN EMBANKMENT DAMS

NATURAL RESOURCES DIVISION

INSPECTION TYPE

Name of Dam: _____ ❑ **ANNUAL**

ARNUM: _____ ❑ **MAJOR STORM EVENT**

In accordance with Subtitle IX, Section 709.1 of the Rules Governing Design and Operation of Dams Title 7: At least once per year and after each major storm event, the owner (or owner's agent) of all permitted dams must perform a visual inspection of the dam. Results of such inspections must be summarized on forms supplied by the Commission and mailed to the Commission office within 10 days of inspection. Commission staff may provide training or assistance in performing or interpreting inspections. Any deterioration of the dam or appurtenances must be reported to the Commission, and remedial measures undertaken after approval by the Chief Engineer.

Date: _____

Weather: _____

Inspected by (Print Name): _____

If an inspection item requires further action on your part, place a check mark to the left of the number of the item.

A. CREST (REFER TO GLOSSARY FOR DESCRIPTION)

☐ 1. How would you describe the vegetation on the crest? (Check all that apply)
Recently Mowed_____ Overgrown_____ Good Cover_____ Sparse_____
Other/Corrective Action (describe):_____

☐ 2. Are there any trees or other inappropriate or excessive vegetation on the crest? Yes_____ No_____
If yes, describe (type of vegetation, size, location, etc.)/Corrective Action:_____

☐ 3. Is there a paved road or driveway on the crest? Yes_____ No_____
If yes, describe the condition (for example, good condition, numerous cracks, newly paved)/Corrective Action:_____

☐ 4. Are there any depressions, ruts or holes on the crest? Yes_____ No_____
If yes, describe (size, location, etc)/Corrective Action:_____

☐ 5. Are there any cracks on the crest? Yes_____ No_____
If yes, describe (length and width, location, direction of cracking, etc.)/Corrective Action:_____

☐ 6. Other observations on the crest/Corrective Action:_____

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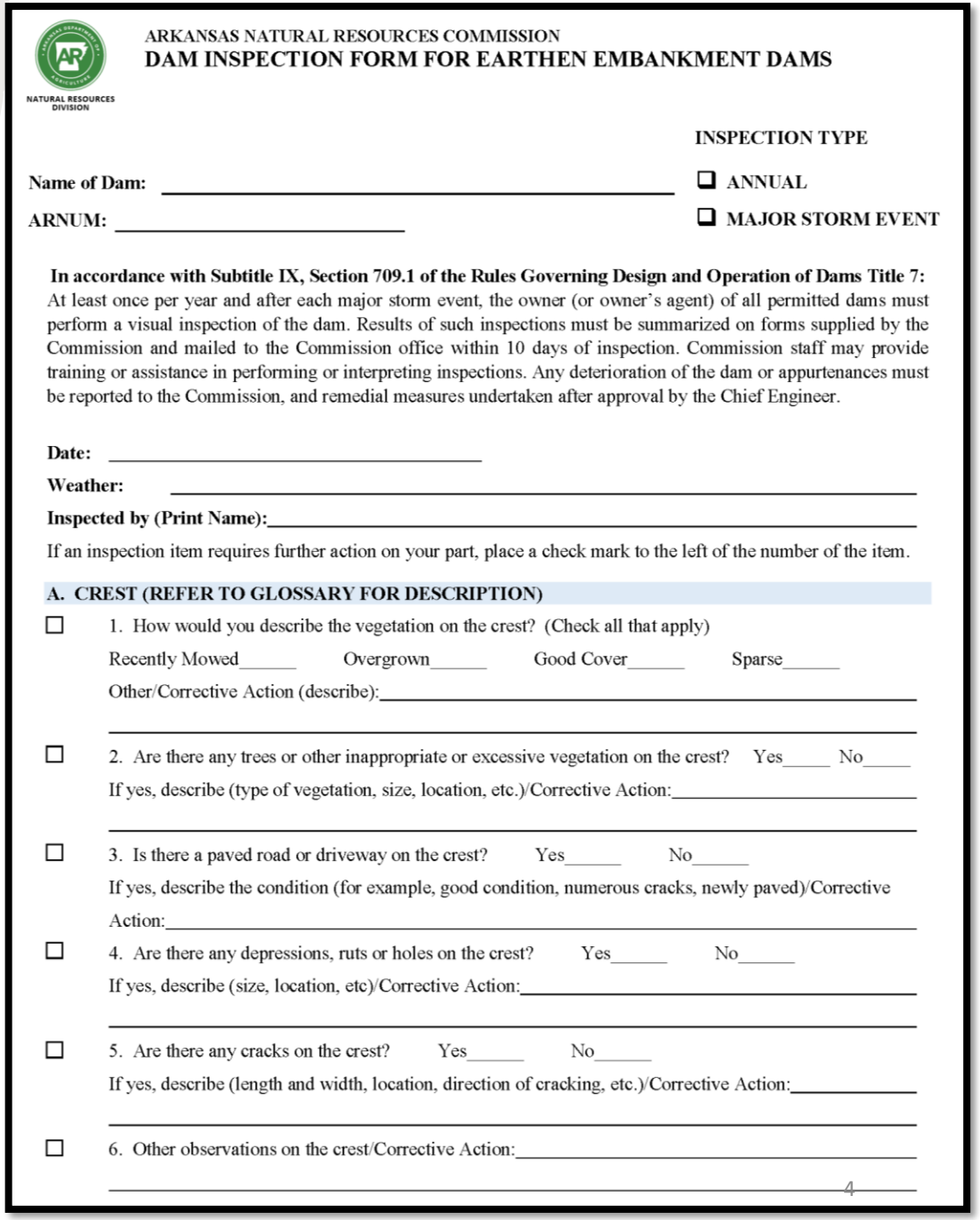

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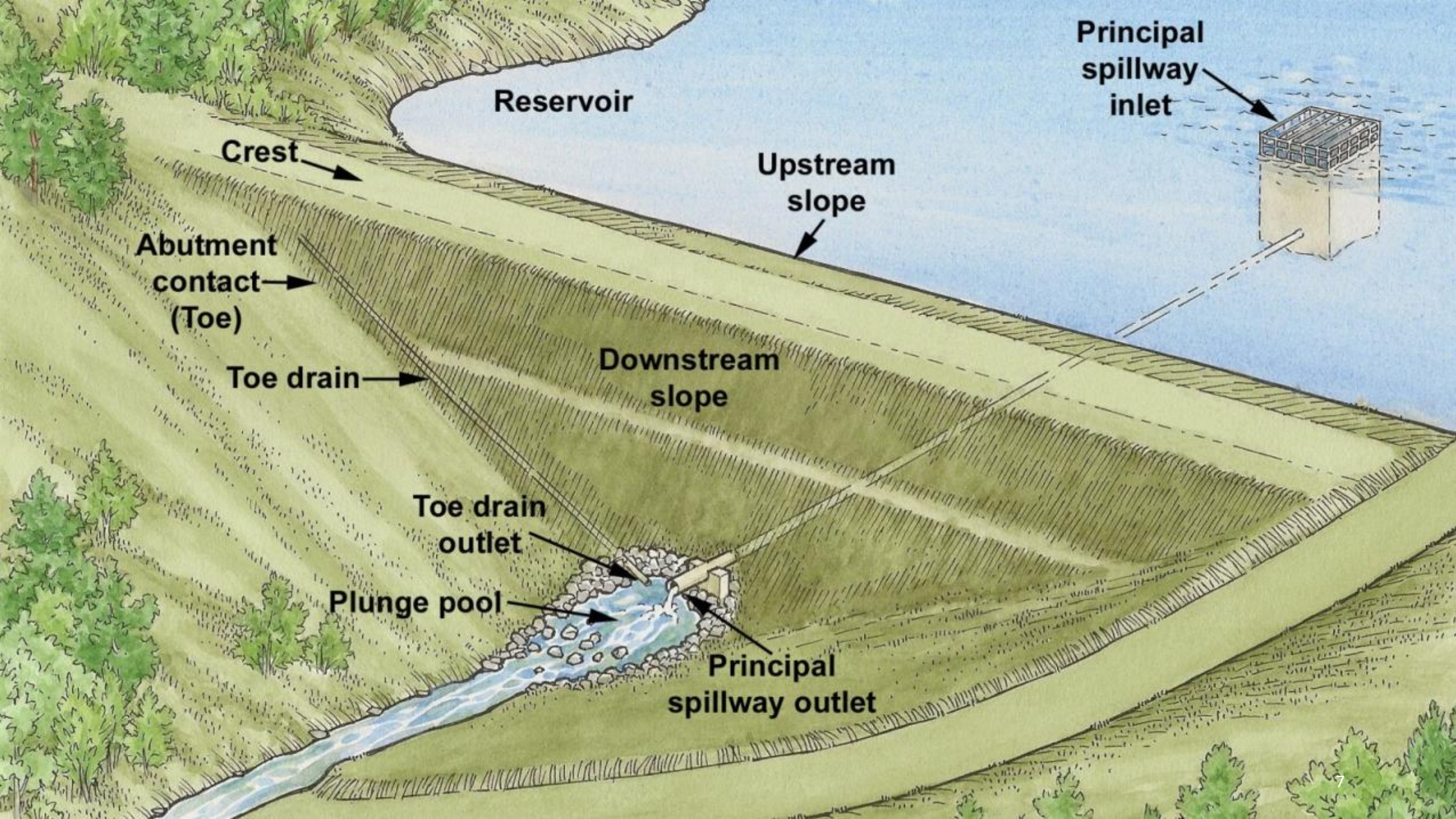
EFFECTIVE DAM INSPECTION

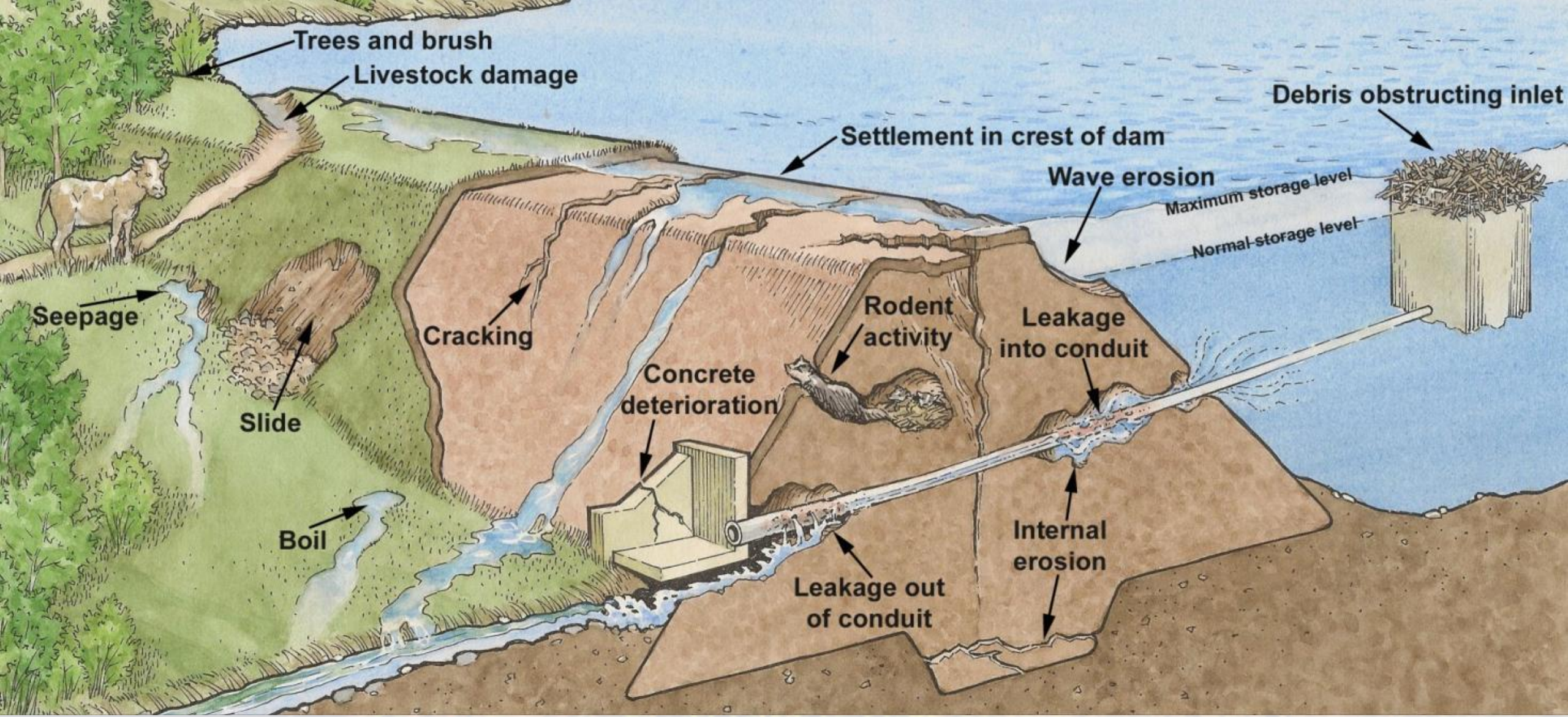
You should inspect your dam at least once a year and following any major rainfall to assure:

- ❑ Spillways are not plugged or obstructed
- ❑ Seepage from the dam has not emerged or increased
- ❑ Soil erosion has not developed
- ❑ Holes or cracks in the dam have not appeared

EFFECTIVE DAM INSPECTION

- ❑ Following each inspection, an inspection report is sent to the Dam Safety Office.
- ❑ Each report includes:
  - A checklist listing all the features that were inspected
  - Basic Information about the dam
  - A list of deficiencies requiring attention
  - *An overall condition assessment rating for the dam of satisfactory, fair, poor, or unsatisfactory*
  - Photos of the dam


Principal spillway inlet
Reservoir
Crest
Upstream slope
Abutment contact (Toe)
Toe drain
Downstream slope
Toe drain outlet
Plunge pool
Principal spillway outlet



COMMON INSPECTION AND MAINTENANCE ISSUES

RECENT HIGH-WATER MARKS

- Tree branches, crop residue, or other debris are left behind after heavy rainfall.
- By itself, high reservoir levels are not an indication of a problem at the dam, it is just an indication that the dam was tested by a flood event.
- Remove storm debris so it does not damage grass vegetation or become an obstruction to flow at the spillway inlet.

DEVELOPMENT IN DOWNSTREAM FLOODPLAIN

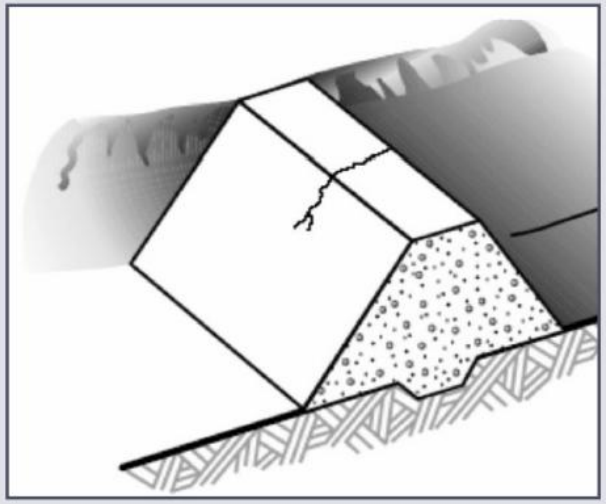
- ❑ Note downstream buildings and infrastructure that may be damaged if the dam were to fail.
- ❑ New development downstream of a dam may result in a change of a dam's hazard class.
- ❑ May lead to upgrade in dam design to meet higher design standards.

INADEQUATE VEGETATIVE COVER

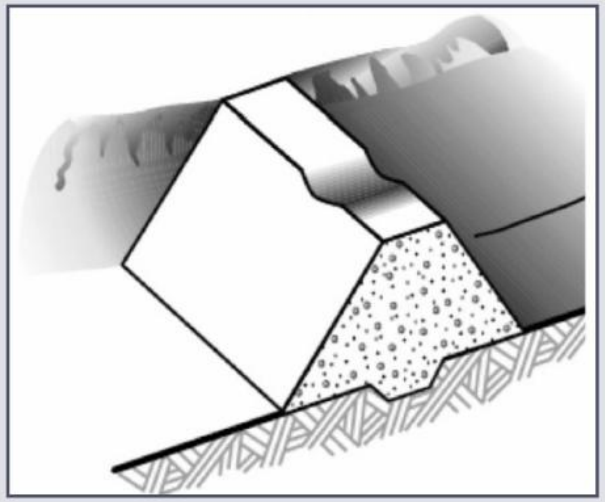
- Overgrazing, poor weed control, and wave erosion are all common causes for poor vegetative cover on a dam
- Areas with bare soil or sparse vegetative cover are especially susceptible to damage and erosion
- Heavy rainfall, high winds, and flood events can cause extensive damage and costly repairs to unvegetated areas
- Areas of sparse vegetation should be reseeded with perennial grasses each spring or fall
- Control weeds by mowing or application of herbicides

SETTLEMENTS OR CRACKS IN CREST

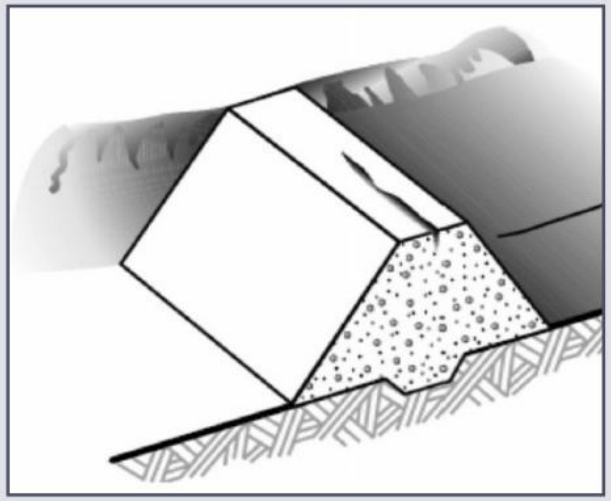
- Uneven movement between adjacent segments of the dam embankment may cause settlements and/or transverse cracking
- Cracks and settlements create a point for water to flow through or flow over the dam. When reservoir levels reach the crack or settlement, it can lead to erosion and rapid failure of the dam.
- Embankment slopes that are too steep or saturated soils can cause longitudinal cracking and slides to develop causing serious damage to large sections of a dam
- Deep or reoccurring settlements and cracks or large slides should be evaluated by a qualified engineer



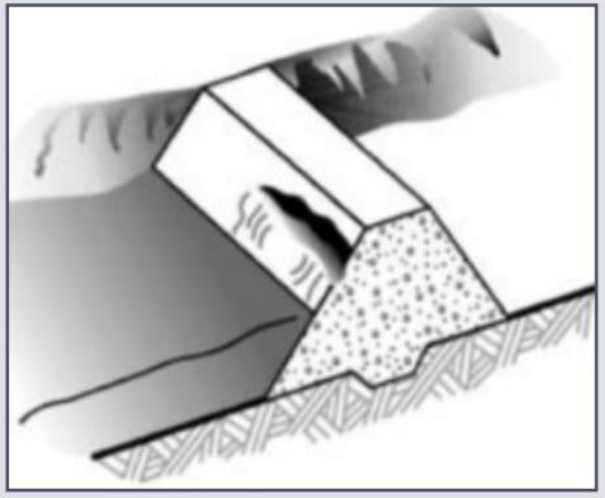
Transverse Cracking



Settlement



Longitudinal Crack



Slide

EROSION IN CREST

- Lack of grass cover, livestock trails, concentrated runoff, waves, and dam overtopping can all lead to erosion of the dam
- Erosion can lead to deterioration and eventual failure of the dam, especially if the dam is overtopped during an extreme flood event.

TREES ON CREST

- Trees and other brush obscure visual inspection of the dam
- Large tree roots can create seepage paths through earthen dams
- Large trees can blow over during a storm and damage the dam, which may cause the dam to fail
- Trees and other brush provide attractive habitat for burrowing animals.

SETTLEMENTS, SLIDES, OR CRACKS IN UPSTREAM SLOPE

- Large slide extending into dam crest.
- Possible causes: saturated soil conditions, rapid draining of reservoir

- Transverse crack.
- Poorly compacted soil in dam or foundation

SPALLING, CRACKING, OR SCALING OF PRINCIPAL SPILLWAY

FICTION	FACT
“Dams are like roads and bridges; the government takes care of them.”	Most dams in Arkansas are privately owned. Dam owners are responsible for maintenance and operation.
“That dam has been here for years; it’s not going anywhere.”	Advancing age can make dams more susceptible to failure. As dams get older, deterioration increases, and repair costs rise. Some common problems of older dams are: ❑ Deteriorating metal and concrete – after 40 years, metal rusts and fails – concrete cracks and breaks. ❑ Undersized spillways – the spillways at many older dams were not designed to modern standards ❑ Years of neglect can leave dams riddled with rodent holes, rotting tree roots, and severe surface erosion.

FICTION	FACT
"Trees are good for dams; they help reinforce the soil."	❑ Trees have extensive root systems that penetrate deep into the soil. ❑ In an earthen dam, tree roots can extend entirely through the dam, providing seepage paths for water. ❑ After a tree dies, the tree roots will decay, leaving a hole for water to flow through the dam.
"The State will repair a dam in poor condition."	❑ Repair of dams is the responsibility of the dam owner. ❑ If the owner is unwilling or unable to make the repairs, the State may breach the dam. ❑ The State will help identify loans and – if available – grants for repair. ❑ There are no 100% grant programs.

Hazard-Potential Classification	Risk Involved with Dam Failure	Inspection Frequency
High	probable loss of human life	annually, by a registered professional engineer
Significant	no probable loss of human life but can cause economic loss or disruption of lifeline facilities	every three years by a registered professional engineer
Low	no probable loss of human life and low economic loss	every five years


We're
here to
help


During construction
After failures
During repairs
Post repairs
Poor condition assessment
Training and assistance


ASSOCIATION OF STATE DAM SAFETY OFFICIALS
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QUESTIONS?
COMMENTS?