DIP PONDS

State Forester Forum

Installing Ponds for Fire Control and Dust Abatement Relating to Forestry Practices

Though water is often available in forested areas it is seldom found in sufficient quantities needed for firefighting practices. The construction of a storage facility (pond) allows for a greater quantity of water to be accessed by water tenders or helicopters. To receive Hazard Offset Points (0-3 points deduction) the water source needs to supply a minimum of ten thousand (10,000) gallons during an operational period (roughly 0.03 acre-feet [or approximately 3' deep x 21'x 21']) and be within one mile for water tenders, or three miles for helicopter bucket use, of the forest practice area (Idaho Forestry Act - IDAPA 20.04.02.120.02). Most ponds filled by diverting surface water will require a water right permit from Idaho Department of Water Resources (IDWR), while excavated ponds filled from overland flow (snow melt/rain) do not require a permit. This overland flow usually comes from swales above the Class II streams where no bed and banks are observed. Please contact IDWR for more information and clarification. No permit is required to use water for fire fighting and dust abatement (see exemptions 42-201-3).

Site Selection

A pond should be designed to provide for the expected type(s) of use: engine, helicopter, or a combination. The presence of replacement inflow should be considered along with the possible number of uses per day (i.e. helicopter trips) when sizing the pond. For a helicopter dip pond, plan the pond depth for a typical helicopter bucket that requires at least 3 feet of water to fill. For safe helicopter operation clear trees around the pond a minimum of 1.5 times the rotor diameter of a helicopter that would use the pond to fill a bucket. Avoid locating ponds in ecologically sensitive areas.

Construction Techniques

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Proper construction techniques need to be applied to ponds and dams to protect habitat and downstream life and property. The main components of proper dam design are a cut-off trench, proper freeboard, and sufficiently sized emergency spillway. For the dam to function properly there are also construction techniques that need to be implemented along with the design features:

- Clear dam area of all top soil, and save; also remove boulders and vegetation debris; removal of tree root wads may require special attention (fill) to avoid piping.
- A cut-off trench should be excavated the length of the dam and be a minimum of 1 foot deep and 8 feet wide and may include an impervious liner (Figure 1).
- All dam material should be applied in shallow layers and compacted, including the cut-off trench, with heavy construction equipment. Do not use frozen fill material or place fill material on frozen foundations.
- The dam should be designed and built with slopes of at least 1:2 for the downstream face and 1:3 for the upstream face (Figure 1).
- The top width of the dam should be at least 6 feet. If the top of the dam is to be used for a roadway the top width should be increased, providing for a shoulder on each side of the roadway to accommodate the planned vehicle width.
- The freeboard (dam height above water surface) should be a minimum of 1 foot and should be over built to accommodate for settling after construction. The primary outlet/spillway elevation should be the control of the water elevation.
- The emergency spillway should be designed and built to pass the 50 year peak flow and may serve as the primary outlet for the pond (Figure 2). The spillway should be constructed in a manner to direct water away from the dam face and to avoid erosion of the spillway: use a gentle slope (approximately 1:12), line with geo-textile fabric and rock, or seed with grass soon after construction.
- The underwater contour of the pond should be steep to allow for more useable storage volume and less surface area for evaporation. Include a ramped section to allow for escape if an animal were to fall into the pond.
- The pond bottom and dam face may require clay or synthetic lining to increase water holding ability depending on the soil types.
- Use the saved top soil, from clearing for the dam, on the downstream face of the dam and grass seed soon after construction to avoid excessive erosion (Figure 1).

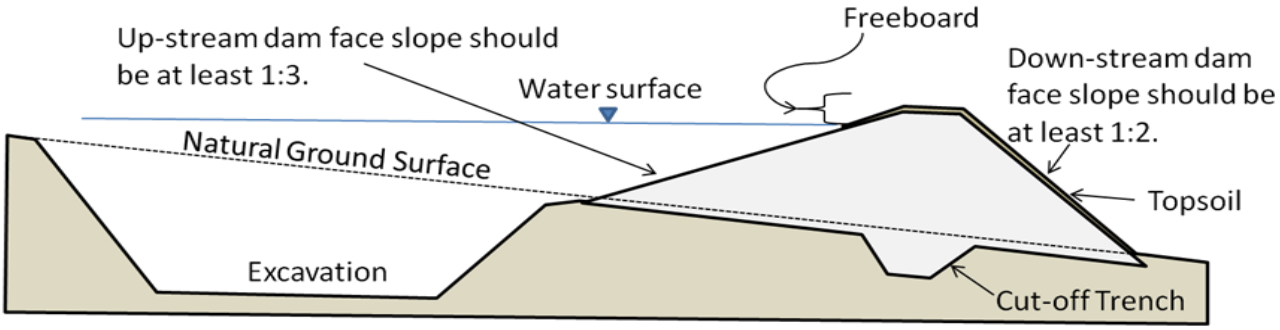

Figure 1. Example cut –away view of dam and pond excavation.

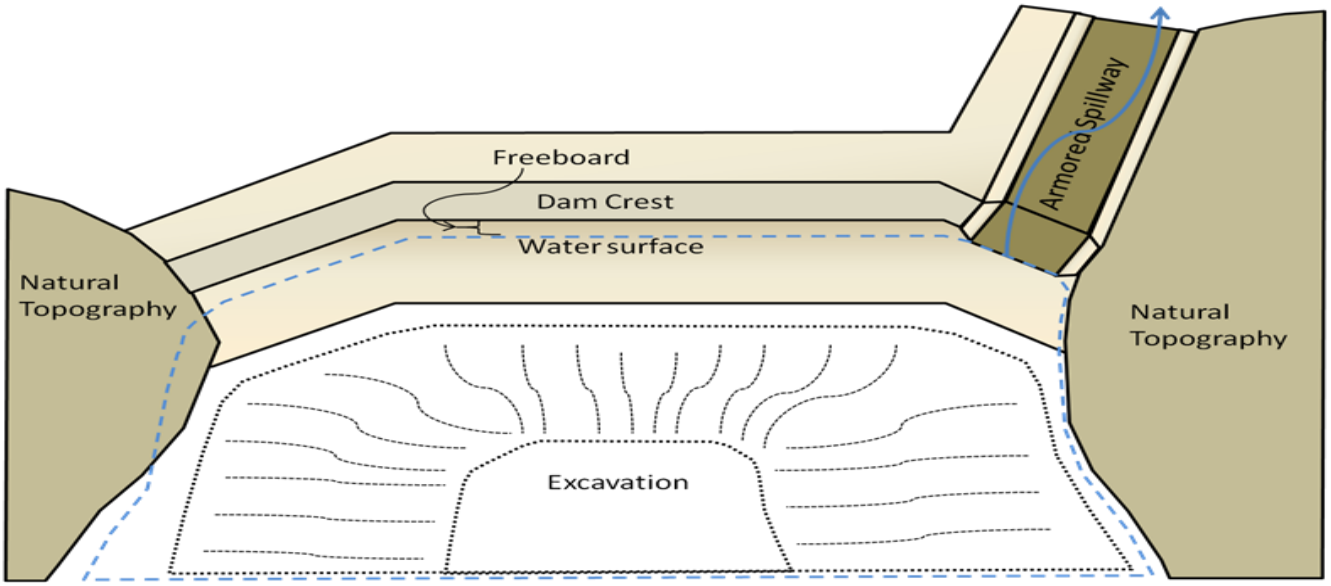

Figure 2. Example plan view of dam and pond excavation showing the spillway directing water away from the dam.

Construction Material

Proper construction techniques need to include using proper soil types for an effective and safe dam. Soils high in clay and silty clays are excellent for dam construction; sandy and gravelly clays are satisfactory. Coarse-textured sands and sand-gravel mixtures are highly pervious and therefore usually unsuitable for dam construction. The following soil characteristics are ideal: More than 10% clay, more than 20% silt, presence of sands and gravels in reasonable quantity to supply structural strength. Clay with moderate dispersion, some dispersion is necessary to have sufficient mobility to help seal pores without causing piping. Low shrink/swell capacity and negligible organic matter content.

Maintenance

Dam structures and ponds require maintenance to sustain their usefulness and safety over time. Keep the dam face clear of woody vegetation as the roots can create pathways for water. Do not allow trees to establish on the dam face as they are prone to wind throw and the failure of the root structure could cause catastrophic damage to the dam. If the pond silts in over time the bottom may require dredging to restore its storage capacity. Keep trees and rubbish out of the pond that might snag a helicopter bucket.

Installing Ponds That Require a Water Right

Acquiring a permit for in-channel ponds or diverting water for ponds can be difficult, adding to the financial and time consideration of the development. In-channel ponds pose design challenges such as higher flows and fish passage. In-channel ponds require dams and spillways to be designed and built to pass higher stream flows and their usable lifetime can be shortened by sedimentation behind the dam, reducing storage. Ponds that are in-channel on Class I streams must provide for fish passage over the dam usually requiring a fish ladder type structure. Off-channel ponds on Class I streams would be required to have fish friendly diversions to adhere to the permitting process. Examples of fish friendly structures include infiltration galleries and permanent screened diversions. Consult Idaho Fish and Game for information regarding fish passage over in-stream dams or for assistance installing fish friendly diversion structures.

References

Ponds: Planning, Design, Construction. 1982. Natural Resources Conservation Service. Agricultural Handbook No. 590. 51pp. http://www.in.nrcs.usda.gov/pdf%20files/PONDS.PDF

Cummings, D. 1999. Soil Materials for Farm Dam Construction. Landcare Note LC0069. ISSN 1329-833X.

Soils for Dam Construction

Contacts

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DIP PONDS

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FOR MORE INFORMATION CONTACT ANY IDAHO DEPARTMENT OF LANDS
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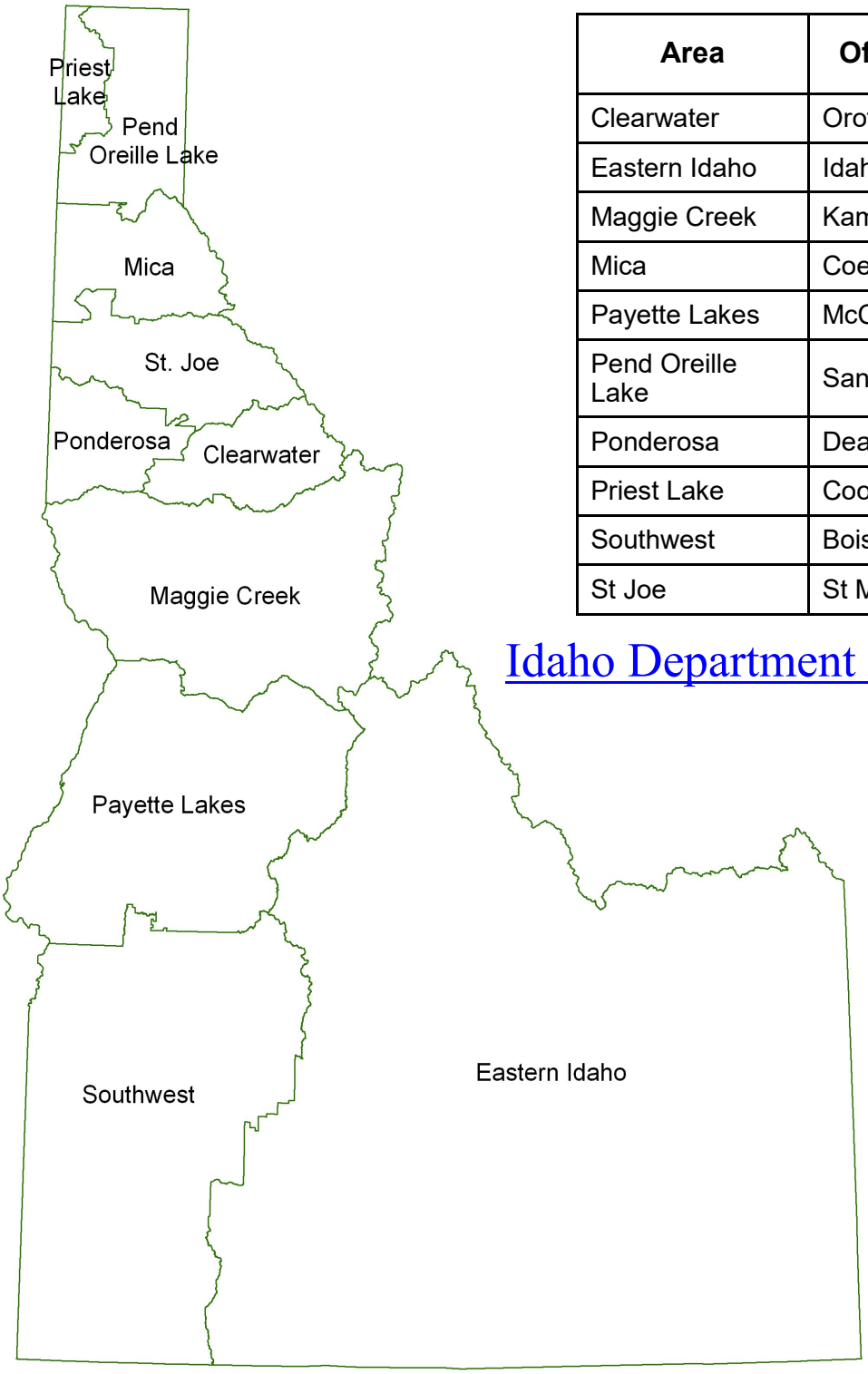

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