Site surveys

Once you determine the probable location of the pond, conduct a site survey to plan and design the dam, spillways, and other features. Those unfamiliar with the use of surveying instruments should employ a licensed surveyor or other qualified professional.

Pond surveys generally consist of a profile of the centerline of the dam, a profile of the centerline of the earth spillway, and enough measurements to estimate pond capacity. A simple method of estimating pond capacity is described on page 12. For larger and more complex ponds, particularly those used for water supply or irrigation, you may need a complete topographic survey of the entire pond site.

Run a line of profile level surveys along the centerline of the proposed dam and up both sides of the valley well above the expected elevation of the top of the dam and well beyond the probable location of the auxiliary spillway. The profile should show the surface elevation at all significant changes in slope and at intervals of no more than 100 feet. This line of levels establishes the height of the dam and the location and elevation of the earth spillway and the principal spillway. It is also used to compute the volume of earthfill needed to build the dam.

Run a similar line of profile levels along the centerline of the auxiliary spillway. Start from a point on the upstream end that is well below the selected normal water surface elevation and continue to a point on the downstream end where water can be safely discharged without damage to the dam. This line serves as a basis for determining the slope and dimensions of the spillway.

All surveys made at a pond site should be tied to a reference called a bench mark. This may be a large spike driven into a tree, an iron rod driven flush with the ground, a point on the concrete headwall of a culvert, or any object that will remain undisturbed during and after construction of the dam.

Embankment ponds

Detailed soils investigation

Soils in the ponded area—Suitability of a pond site depends on the ability of the soils in the reservoir area to hold water. The soil should contain a layer of material that is impervious and thick enough to prevent excessive seepage. Clays and silty clays are excellent for this purpose; sandy and gravelly clays are usually satisfactory. Generally, soils with at least 20 percent passing the No. 200 sieve, a Plasticity Index of more than 10 percent, and an undisturbed thickness of at least 3 feet do not have excessive seepage when the water depth is less than 10 feet. Coarse-textured sands and sand-gravel mixtures are highly pervious and therefore usually unsuitable. The absence of a layer of impervious material over part of the ponded area does not necessarily mean that you must abandon the proposed site. You can treat these parts of the area by one of several methods described later in this handbook. Any of these methods can be expensive.

Some limestone areas are especially hazardous as pond sites. Crevices, sinks, or channels that are not visible from the surface may be in the limestone below the soil mantle. They may empty the pond in a short time. In addition, many soils in these areas are granular. Because the granules do not break down readily in water, the soils remain highly permeable. All the factors that may make a limestone site undesirable are not easily recognized without extensive investigations and laboratory tests. The best clue to the suitability of a site in one of these areas is the degree of success others have had with farm ponds in the immediate vicinity.

Unless you know that the soils are sufficiently impervious and that leakage will not be a problem, you should make soil borings at intervals over the area to be covered with water. Three or four borings per acre may be enough if the soils are uniform. More may be required if there are significant differences.

Foundation conditions—The foundation under a dam must ensure stable support for the structure and provide the necessary resistance to the passage of water.