Preliminary investigations

General considerations

Selecting a suitable site for your pond is important, and preliminary studies are needed before final design and construction. Analysis and selection of pond sites should be based on landscape structure and associated ecological functions and values. Relationship of the site to other ecological features within the landscape is critical to achieving planned objectives. If possible, consider more than one location and study each one to select the most ecologically appropriate, esthetic, and practical site. Weighing both onsite and offsite effects of constructing a pond is essential in site selection. Refer to figure 1 and the glossary to become familiar with the components of a pond and associated dam.

For economy, locate the pond where the largest storage volume can be obtained with the least amount of earthfill. A good site generally is one where a dam can be built across a narrow section of a valley, the side slopes are steep, and the slope of the valley floor permits a large area to be flooded. Such sites also minimize the area of shallow water. Avoid large areas of shallow water because of excessive evaporation and the growth of noxious aquatic plants.

If farm ponds are used for watering livestock, make a pond available in or near each pasture or grazing unit. Forcing livestock to travel long distances to water is detrimental to both the livestock and the grazing area. Space watering places so that livestock does not travel more than a quarter mile to reach a pond in rough, broken country or more than a mile in smooth, nearly level areas. Well-spaced watering places encourage uniform grazing and facilitate grassland management.

If pond water must be conveyed for use elsewhere, such as for irrigation or fire protection, locate the pond as close to the major water use as practicable. Conveying water is expensive and, if distance is excessive, the intended use of the water may not be practical.

Ponds for fishing, boating, swimming, or other forms of recreation must be reached easily by automobile, especially if the general public is charged a fee to use the pond. The success of an income-producing recreation enterprise often depends on accessibility.

Avoid pollution of pond water by selecting a location where drainage from farmsteads, feedlots, corrals, sewage lines, mine dumps, and similar areas does not reach the pond. Use permanent or temporary measures, such as diversions, to redirect runoff from these sources to an appropriate outlet until the areas can be treated.

Do not overlook the possibility of failure of the dam and the resulting damage from sudden release of water. Do not locate your pond where failure of the dam could cause loss of life; injury to persons or livestock; damage to homes, industrial buildings, railroads, or highways; or interrupted use of public utilities. If the only suitable pond site presents one or more of these hazards, hire a qualified person to investigate other potential sites to reduce the possibility of failure from improper design or construction.

Be sure that no buried pipelines or cables cross a proposed pond site. They could be broken or punctured by the excavating equipment, which can result not only in damage to the utility, but also in injury to the operator of the equipment. If a site crossed by pipelines or cable must be used, you must notify the utility company before starting construction and obtain permission to excavate.

Avoid sites under powerlines. The wires may be within reach of a fishing rod held by someone fishing from the top of the dam.

Area adequacy of the drainage

For ponds where surface runoff is the main source of water, the contributing drainage area must be large enough to maintain water in the pond during droughts. However, the drainage area should not be so large that expensive overflow structures are needed to bypass excess runoff during large storms.

The amount of runoff that can be expected annually from a given watershed depends on so many interrelated factors that no set rule can be given for its determination. The physical characteristics that directly affect the yield of water are relief, soil infiltration, plant cover, and surface storage. Storm characteris-

tics, such as amount, intensity, and duration of rainfall, also affect water yield. These characteristics vary widely throughout the United States. Each must be considered when evaluating the watershed area conditions for a particular pond site.

Figure 11 is a general guide for estimating the approximate size of drainage area needed for a desired water-storage capacity. For example, a pond located in west-central Kansas with a capacity of 5 acre-feet requires a drainage area of at least 175 acres under normal conditions. If reliable local runoff information is available, use it in preference to the guide.

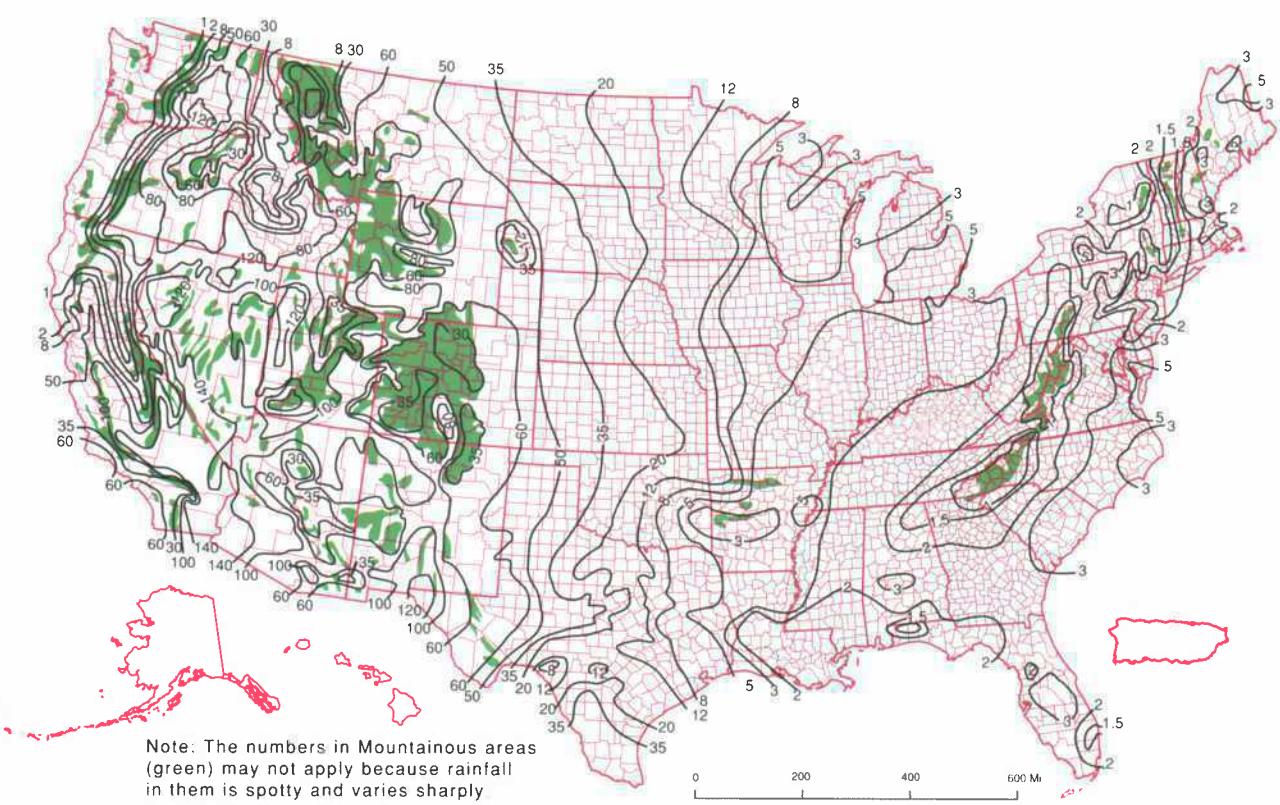
Average physical conditions in the area are assumed to be the normal runoff-producing characteristics for a drainage area, such as moderate slopes, normal soil infiltration, fair to good plant cover, and normal surface storage.

To apply the information given in figure 11, some adjustments may be necessary to meet local conditions. Modify the values in the figure for drainage areas having characteristics other than normal. Reduce the values by as much as 25 percent for drainage areas having extreme runoff-producing characteristics. Increase them by 50 percent or more for low runoff-producing characteristics.

Minimum pond depth

To ensure a permanent water supply, the water must be deep enough to meet the intended use requirements and to offset probable seepage and evaporation losses. These vary in different sections of the country and from year to year in any one section. Figure 12 shows the recommended minimum depth of water for ponds if seepage and evaporation losses are normal. Deeper ponds are needed where a permanent or year-round water supply is essential or where seepage losses exceed 3 inches per month.

Figure 11 A guide for estimating the approximate size of a drainage area (in acres) required for each acre-foot of storage in an embankment or excavated pond



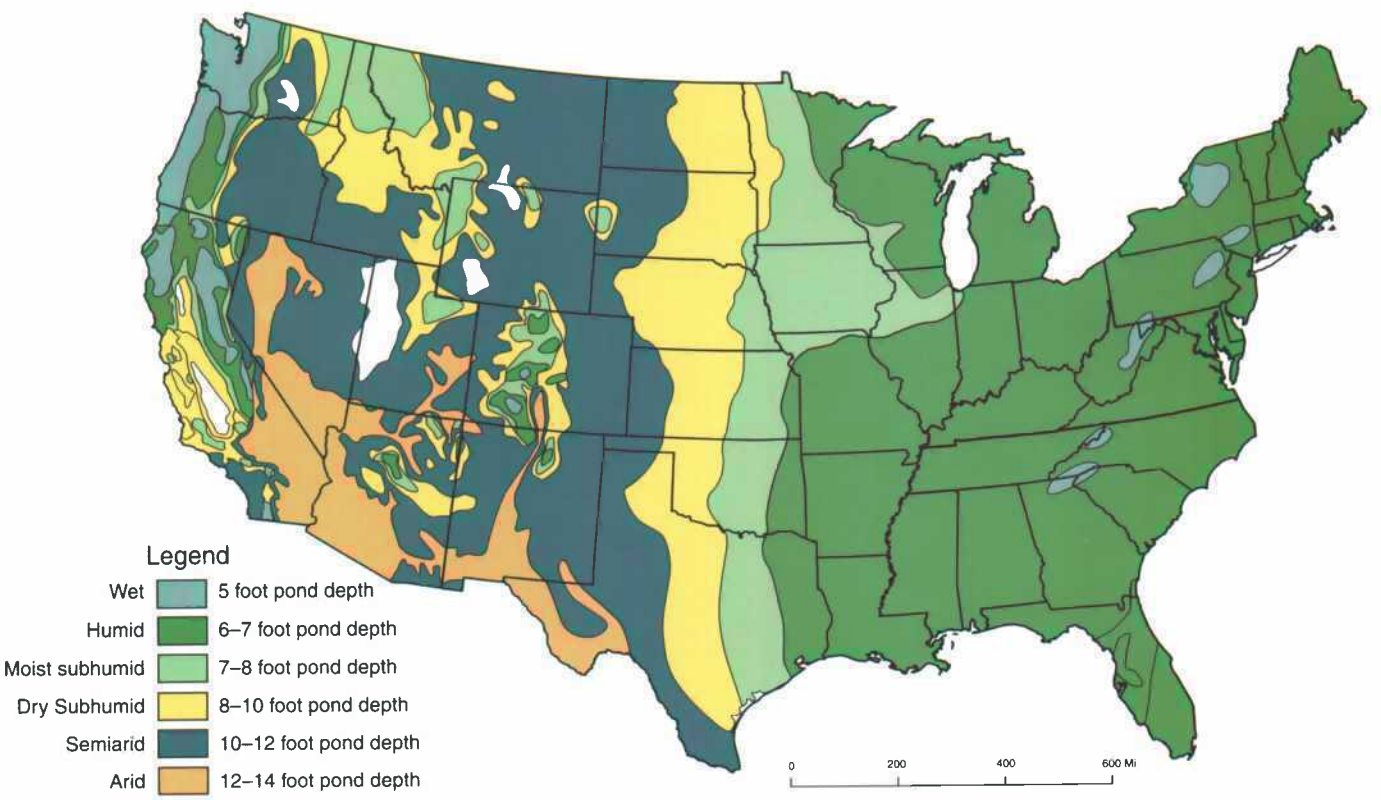
Drainage area protection

To maintain the required depth and capacity of a pond, the inflow must be reasonably free of silt from an eroding watershed. The best protection is adequate application and maintenance of erosion control practices on the contributing drainage area. Land under permanent cover of trees, grass, or forbs is the most desirable drainage area (fig. 13). Cultivated areas protected by conservation practices, such as terraces, conservation tillage, stripcropping, or conservation cropping systems, are the next best watershed conditions.

If an eroding or inadequately protected watershed must be used to supply pond water, delay pond construction until conservation practices are established. In any event, protection of the drainage area should be started as soon as you decide to build a pond.

Figure 13 Land with permanent vegetation makes the most desirable drainage area

Figure 12 Recommended minimum depth of water for ponds in the United States



Pond capacity

Estimate pond capacity to be sure that enough water is stored in the pond to satisfy the intended use requirements. A simple method follows:

- Establish the normal pond-full water elevation and stake the waterline at this elevation.
- Measure the width of the valley at this elevation at regular intervals and use these measurements to compute the pond-full surface area in acres.
- Multiply the surface area by 0.4 times the maximum water depth in feet measured at the dam.

For example, a pond with a surface area of 3.2 acres and a depth of 12.5 feet at the dam has an approximate capacity of 16 acre-feet (0.4 x 3.2 x 12.5 = 16 acre-feet) [1 acre-foot = 325,651 gallons].

Landscape evaluation

Alternative pond sites should be evaluated for potential visibility and compatibility with surrounding landscape characteristics and use patterns (fig. 14). Identify major viewpoints (points from which the site is viewed) and draw the important sight lines with cross sections, where needed, to determine visibility. If feasible, locate the pond so that the major sight line crosses the longest dimension of water surface. The pond should be placed so that a viewer will see the water first before noticing the dam, pipe inlet, or spillway. Often, minor changes in the dam alignment and spillway location can shift these elements out of view and reduce their prominence.

If possible, locate your pond so that some existing trees and shrubs remain along part of the shoreline. Vegetation adds aesthetic value by casting reflections on the water, provides shade on summer days, and helps blend the pond into the surrounding landscape. A pond can often be located and designed so that an island is created for recreation, wildlife habitat, or visual interest.

In addition to the more typical farm and residential sites, ponds can be located on poor quality landscapes to rehabilitate abandoned road borrow areas, dumping sites, abandoned rural mines, and other low production areas.

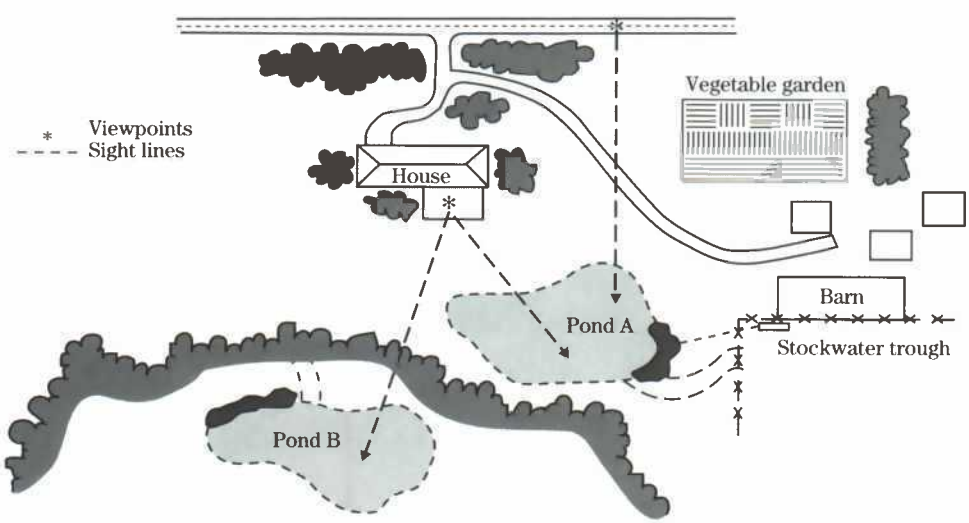



Figure 14 A preliminary study of two alternative sites for a pond to be used for livestock water, irrigation, and recreation