# *Comparison Of Water Sources*

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Any discussion of irrigation systems would be incomplete without a short discourse on water sources. Everyone is familiar with these, but some discussion should be given the merits and drawbacks of each source.

The major source of the national water supply is from streamflow of surface water in our rivers and creeks. Lakes and ponds may be considered streamflow in storage. Surface water is of major interest in areas of higher rainfall where irrigation is required only to supplement natural rainfall. Since there are many small permanent streams in the eastern portion of the United States, many golf courses have constructed dams to utilize this water as well as natural runoff of excess rainfall.

Eastern irrigation systems are basically supplemental. Many of them fail, however, because they were not designed for use during periods of maximum water stress. Prolonged drought periods, being usually accompanied by higher temperatures and evaporation rates, not only increase water usage but also decrease the supply. This introduces several points to be considered when contemplating the use of surface water as a source of irrigation.

First is the pattern of streamflow during both wet and dry years. Are there periods when streamflow is substantially reduced or has ceased? Are there periods when the stream rises rapidly to flood stage and could possibly damage the installation? The state engineer or the U. S. Geological Survey may have this information. Longtime residents of the area are a good source of general information.

The rate of streamflow is as important as its permanence. If collection reservoirs are required, it is necessary to know the time required to replenish the water supply after an irrigation period.

In many cases a legal problem arises. The right to use surface water may be challenged by another property owner along the stream. Local water use laws must be considered.

Water quality is a third major point to be considered when contemplating the use of surface water. On major rivers pollution by industrial wastes is always a possibility. The presence of injurious chemicals can be determined by analysis by a state or commercial laboratory.

Silt and trash content should also be considered. Some silts are abrasive and will cause excessive wear on irrigation equipment unless removed from the water. Trash and debris in stream water have an obvious effect on the system by clogging sprinklers and the intake pipe.

Problems associated with these three points have been solved in some instances by the construction of a reservoir alongside the stream. Water flows into the reservoir during periods of normal or above normal stream flow but does not interfere when the flow is reduced. In this way a source of water is provided when there is an ample supply of water and insurance is provided against dry periods.

Such a reservoir also acts as a desilting basin. By reducing the velocity of water, the silt settles to the bottom and is eliminated. Properly constructed screens on the intake channel will help eliminate debris with a minimum of cleaning required.

In some areas of the western states, streams continually pick up minerals as they flow. Concentration of these salts will vary with rate of flow. In such cases storage reservoirs should be filled during periods of high flow. Mixing stream water with well or spring water may also reduce the concentration.

Springs and seepage areas are sometimes developed into reliable sources of irrigation water. Blastings, proper drainage trenching and excavation may provide a constant source of water, but a geologist should be consulted before going to great expense.

Underground waters are a second major source for golf course irrigation. The advantages of this source include:

1. Close proximity to the place where the water is to be used.

2. A source of water where streamflow is already appropriated.

3. Less fluctuation in yield.

4. More uniform temperature and soluble minerals content, and generally free of turbidity and pollution.

Here, too, a legal problem may be encountered, since some areas require well permits. About 60 per cent of all ground water used is for irrigation purposes. Usually, however, first costs of well systems are higher than for surface sources. Well water may flow directly into the irrigation system, using one pump for both actions. A deep well of low capacity may require a storage reservoir. Such a system is widely used since pumping capacity from the well is not a direct limiting factor. Storage or equalizing reservoirs also enable the use of two pumps. A large pump will supply the entire requirements of the system. A small pump in addition to this will permit green and tee irrigation without using the large pump. Such an arrangement can reduce considerably the cost of pumping.

In the humid areas very shallow ground water may be successfully developed. Batteries of well points or cased wells can be used to tap drainage water where it is held up by an impervious layer underneath. This method is seldom used, however, due to the adverse effect of drought conditions on the water supply.

It may also be possible to buy water directly from an irrigation company or municipality.

In determining the source of water, daily irrigation requirements must be calculated so that an adequate amount of water is available. When the availability of water imposes limitations on continuous supply, reservoirs must be utilized. Reservoir construction requires careful consideration of the following points:

1. The amount of water required per irrigation period and the time required to refill the reservoir.

2. The storage capacity per foot of effective dam height.

3. The probable seepage and evaporation losses.

4. The probability of flooding as a determinant of spillway size.

5. The silt load of water entering the reservior. A high silt content would fill a small reservoir in a short time.

6. Water quality, since salt concentration will increase as the water level drops due to evaporation.

7. The area to be used must be able to hold water. Surprisingly, a number of lakes have been built which will not hold water. Gravel or similar substrata will allow rapid seepage.

8. The amount of permissible "drawdown" must be considered. A shallow pond which is lowered by as much as two feet may leave large areas of mud and these areas may be subject to weedy, unsightly growth.

Combination input for reservoirs has often been quite helpful. Surface water, groundwater and municipal supplies are all discharged into a reservoir from which the irrigation system is fed.

In choosing the most desirable source of water, reliability, cost and water quality must be balanced against each other. Cost is the most apparent factor, but unless the expenditure provides a reliable source of good water, it is obviously wasted. The primary requirement in an efficient irrigation system, then, is a thorough, point-by-point study of all phases of the system and weighing each factor entering into its operation.

## *Allen Joins Green Section Staff*

W. Wayne Allen has been appointed to the USGA Green Section staff as Southwestern Agronomist. Mr. Allen is a graduate of Texas A. & M. and recently completed work leading to the Master of Science degree in Agronomy. Mr. Allen's research during his graduate study dealt primarily with weed control.

Mr. Allen's appointment fills a vacancy created by the resignation of James M. Latham, Jr., as Southeastern Agronomist and his replacement by James B. Moncrief, formerly Southwestern Agronomist. Mr. Latham resigned to accept other employment but he will continue in the turfgrass field.

Mr. Moncrief, who will make his headquarters in Athens, Ga., is well acquainted with the problems of turf in the southern states and he should be very much at home in that region.