

# **maintaining subsurface drains**



SOIL CONSERVATION SERVICE • U.S. DEPARTMENT OF AGRICULTURE • LEAFLET NO. 557

## MAINTAINING SUBSURFACE DRAINS

Soil Conservation Service, U.S. Department of Agriculture

If properly installed, subsurface drains should function well for many years. Most failures can be prevented by regular care. This leaflet describes common trouble spots, discusses maintenance of inlets, drains, outlets, and ditches, and suggests methods for mapping your drainage system.

### Trouble spots

Soil that washes into drains can block the line. Small animals or tree roots sometimes stop up drain lines, and trampling by livestock or use of heavy equipment may dislodge and break tile or tubing. Drainage ditches sometimes silt so badly that the drain outlet is completely blocked. If the outlet ditch is too shallow, water may be forced back into the drain and cause silting of the main line.

Washouts occur where gaps between tiles are too wide or where junctions are not properly made. Wet spots usually form where a line is blocked, and a hole or cave-in over a drain line generally indicates that a tile is broken or dislodged. Wet spots over drains made of corrugated plastic tubing usually are caused by a crushed spot or puncture in the tubing.

### Inspecting drains

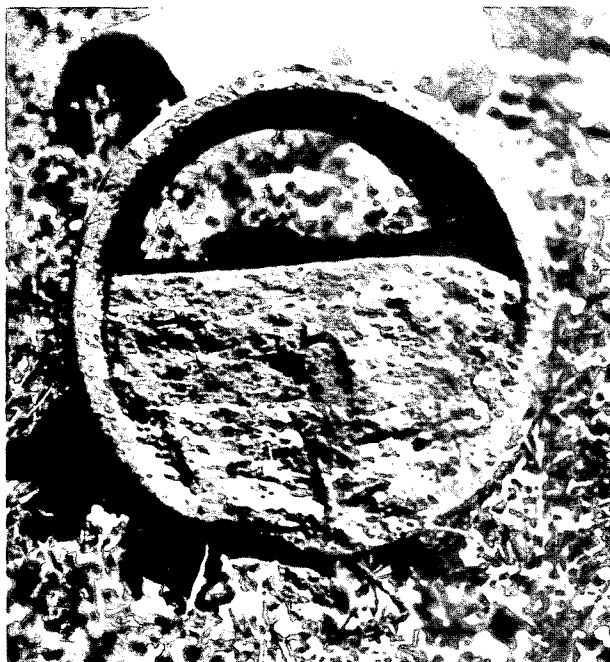
You know your subsurface drains are working if water remains on your field for only a short time after a heavy rain. If water stands in low areas for a few days, the drain is partly or completely blocked.

If your drainage system has inspection wells, silt wells, or manholes, watch them and the outlets after a heavy rain to check the amount and rate of flow.



A backhoe can be used to clean drainage ditches.

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**Sediment that accumulates in drains can block the line.**

A change in either indicates a stoppage somewhere in the line.

To check a long line, dig inspection pits every 100 to 250 feet. Pits can be dug at greater intervals if the water is flowing freely. To determine which segment of the line is blocked, first stop the flow of water from upstream. Then pour water into the drain and check the time it takes to flow downstream to the next opening. That segment of the line is blocked if the drain becomes more than half full and the water moves sluggishly. A mirror and flashlight or a torpedo-shaped probe attached to a plumber's snake can be used to find obstructions between pits along evenly graded lines.

### **Cleaning outlet ditches**

Many subsurface drainage systems fail because outlet ditches are blocked. If your outlet ditch is filled with sediment, a survey will help you find out how much cleaning is required.

To survey a small job, set up an engineer's level and take a reading at the end of the drainpipe. Then take readings every 100 feet downstream until you find a point low enough to insure satisfactory flow. A point 1 or 2 feet lower than the bottom of the drainpipe and within 400 feet of the drainpipe is usually low enough.

You will need engineering assistance to survey a large job. Representatives of your local soil and water conservation district may be able to provide this assistance.

After you have found out how much work is needed, choose a method of cleaning the ditch.

Dynamite is suitable for cleaning ditches in wet areas that are not readily accessible to earthmoving equipment. Charges should be placed close enough together so that the detonation of one automatically explodes the next until the entire series is set off. **The soil should be saturated. Blasting is dangerous and no one but a licensed blaster should ever attempt it. All local and state laws should be observed.**

A backhoe can be used to clean small ditches. The track-type backhoe is better suited for use on wet, soft sites.

A dragline may be required if much excavation and shaping of ditchbanks is needed to restore the outlet. Draglines used to clean drainage ditches generally range from three-eighths to 2½ cubic yards in size. In most areas they are owned and operated by contractors.

### **Drainage districts and maintenance agreements**

If stoppage is caused by an outlet that is not under your control, the first step is to find out who owns



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**Surface inlets remove ponded water but must be cleaned frequently.**

it. It may be part of a legally established water management or drainage district or controlled by agreement between several landowners.

If the outlet is part of such a district, maintenance laws will determine the methods of cleanout that can be used. These laws differ from state to state. Representatives of your local soil and water conservation district can tell you whether the outlet is in a special water management district and, if so, what cleanout methods to use.

If the outlet affects several landowners but is not part of a water management district, control can be established by a mutual written agreement. Such an agreement usually insures that all members of the group can have access to the outlet ditch should the owner neglect to clean it. The agreement also should specify the methods of cleanout that can be used, the amount and kind of work each member of the group is to perform, the time work is to be done, and the estimated annual cost to each member. It is wise to record right-of-way easements so that if land is sold, all parties will be sure maintenance can continue.

### **Clean surface inlets**

Poorly constructed surface inlets are subject to severe damage and require frequent repair. Inlet covers often become sealed with trash and should be checked frequently. Clean the covers after a heavy rain and replace them carefully. If a cover is left off and trash washes into the line, extensive work would be required to repair the system.

You can use a blind inlet to drain wet spots in a field. A blind inlet is made by filling a section of the drainage trench with crushed rock, gravel, corncobs, or other material that will not pack and that lets water through freely. The filled section should be in the lowest part of the wet spot and at least 16½ feet long. After several years this section may fill with silt and no longer let water pass to the tile line. It is then necessary to dig up the section and replace the porous material, or to dig a new blind inlet slightly upstream or downstream from the old inlet.

### **Repair blowouts**

Holes over subsurface drains should be repaired at once. Otherwise large amounts of soil may wash into the lines and block the entire system.

Holes sometimes form over poorly constructed drain junctions. To repair a junction, mix equal parts of sand and cement, spread the mixture around the drain, and cover all holes in the tile. Do not let any of the mortar seep into the drain because trash may snag on



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### **Sulphur dioxide gas and water remove mineral deposits from drains.**

the chunks of mortar and block the drain. You may prefer to replace a defective junction with a manufactured junction.

Holes also form where tile is broken or joints between tiles are too wide. If the tile is broken, replace it. If the joint is too wide, place tile bats (pieces of broken tile) over the joint to prevent soil from washing into the line. To repair crushed or punctured corrugated plastic tubing, cut the damaged segment from the line and replace it with new tubing using the manufacturer's couplers.

### **Remove sediment**

Sediment traps can be used for subsurface drains laid in fine sand or silty soils. If cleaned periodically, traps keep soil from filling the lines. Clean the traps every few days after the lines are laid because at first much fine soil will wash in through the joints between tiles or through perforations in plastic tubing. Later soil will wash in more slowly, and you need to check the traps only once or twice a year.

Inspection wells can be used as access points for flushing drainage lines. In irrigated areas, water from supply ditches can be used to flush lines by gravity

flow. A high-pressure water jet may be needed to clean some drains.

## Remove mineral deposits

Deposits of insoluble black or red minerals, mainly manganese or iron oxide, can block subsurface drains. Check outlets, junction boxes, and inspection wells to determine whether such deposits are in the line.

Sulphur dioxide gas, commercially available in tanks, is effective for removing some mineral deposits. First flush the lines with water or a high-pressure water jet. After blocking the outlet, inject water and sulphur dioxide gas at the upper end of the drainage system. Inject a pound of gas for every 6 gallons of water to maintain a 2-percent solution. The gas should be held in the line for 24 hours. This treatment can be used every 2 or 3 years to prevent accumulation of minerals in the drains. **Sulphur dioxide can irritate eyes, skin, and respiratory system and should be used with caution.**

## Protect drain outlets

Gullies commonly form at unprotected outlets of subsurface drains. Gullies may damage the field, silt up the drainage ditch, and reduce the flow of water from the subsurface drain.

Where both surface runoff water and the subsurface drain empty into the ditch at the same place, a drop structure is needed to prevent gullies.

If surface runoff water enters the ditch at another location, a pipe outlet is the best and least expensive way to prevent gullies. Pipe outlets should be carefully built so that water from the drain does not wash under the pipe. The pipe can be slipped over the last section of tile or tubing. It should extend beyond the ditch-bank so that water will pour into the ditch without eroding the bank. Along large channels where ice or floating debris may damage the outlet, the cantilevered section of the pipe should be protected by indenting the bank of the channel and setting the pipe within the indented area. If this method is not acceptable,



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**Gullies form at unprotected tile outlets.**

you can set the pipe outlet flush with the bank and place rock below it to prevent scouring of the bank.

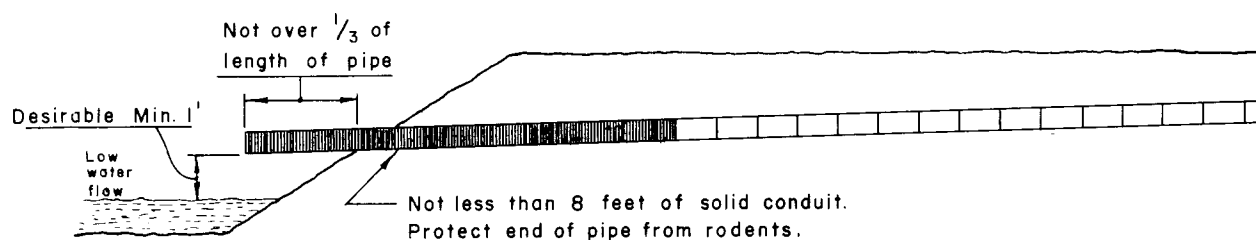
## Control rodents

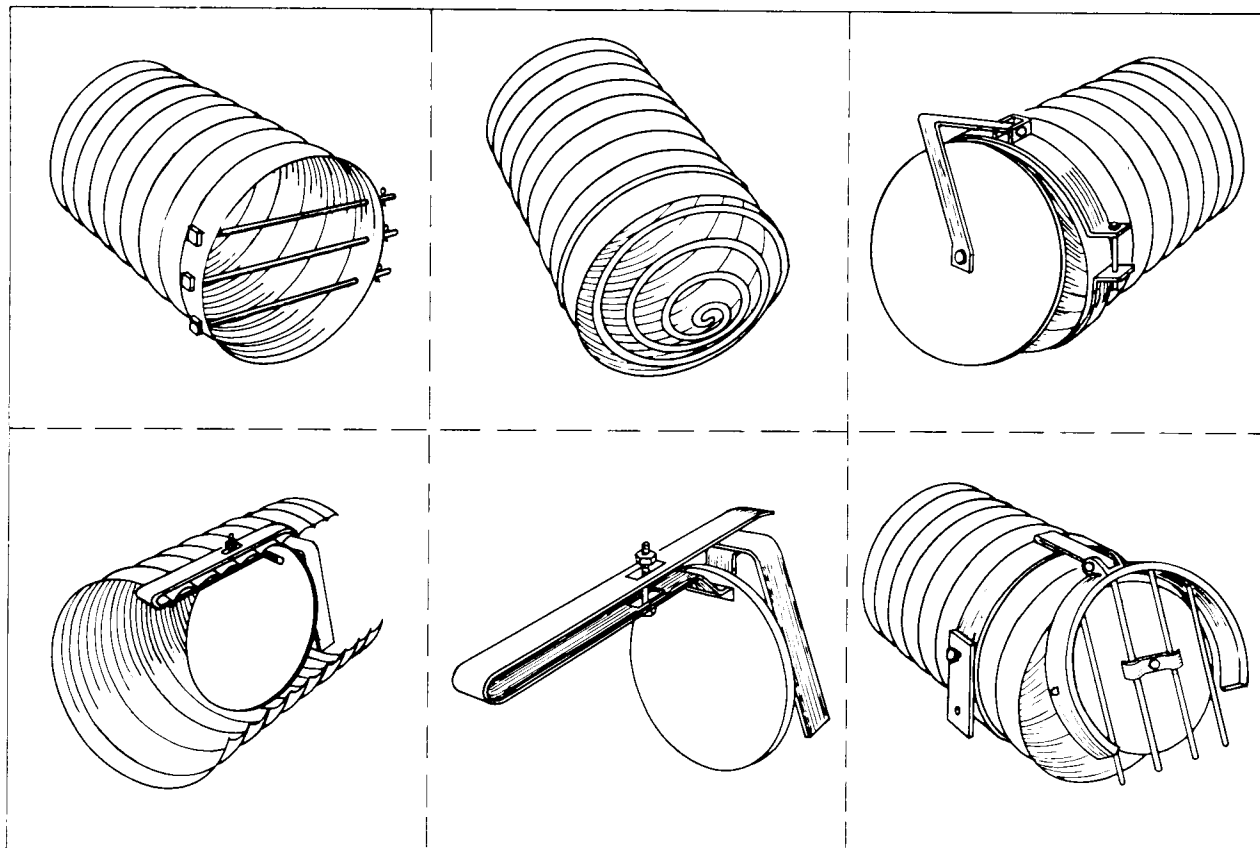
You can use a flap gate or fixed pin guard to prevent rodents and other small animals from entering and blocking outlets.

Fixed pins are suitable for lines without surface inlets. The pins are inserted horizontally through the end of the pipe, not more than 1½ inches apart. The outlet must be checked frequently to be sure that roots and other debris carried through the drain do not block the openings between pins.

Flap gates should be used for lines that have surface inlets. Small material that continually washes through inlets into the line can plug a fixed pin guard. Flap gates should be made of noncorrosive material.

**Diagram of a pipe outlet.**





**Pin guards and flap gates keep rodents out of pipe outlets.**



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**A well installed pipe outlet.**

### **Control tree roots**

Roots of nearby trees may block subsurface drains. This is especially true of elms, willows, and cottonwoods. Roots of trees a hundred feet away may block a subsurface line. To protect the drain short of killing the trees, clear out the roots around the drain and lay continuous pipe in the part of the line likely to be affected.

### **Maintain grass waterways**

If you install a subsurface drain in or near a grass waterway, place it to one side of the center of the waterway. This practice reduces the hazard of damage to the drain that may be caused by erosion, by heavy equipment, and by silting in the waterway. Subsurface drains may be needed down both sides of a large waterway. Eroded parts of the waterway should be repaired promptly.

### **Map your drainage system**

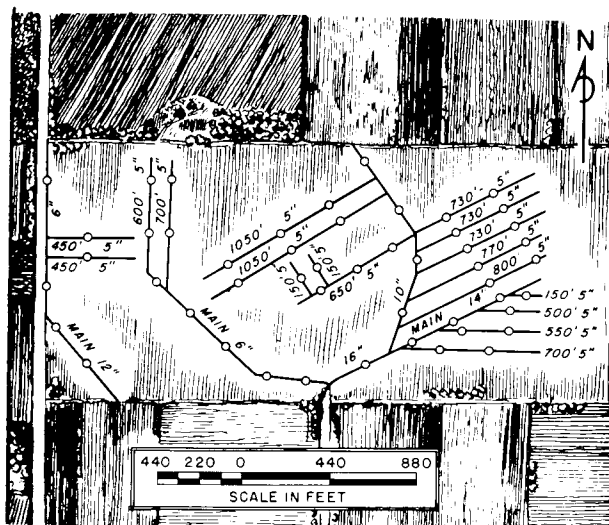
A map that shows the location of drains is indispensable to an effective maintenance program. If you

plan to buy a farm, be sure the owner shows you the location of all drains. If you decide to sell your farm, a map of the drainage system is evidence of capital investment and improves your chances of sale.

The location of newly installed drains can be marked on an aerial photograph. Aerial photographs of your field can be obtained through the local office of the Agricultural Stabilization and Conservation Service. If you arrange to have a special aerial photograph taken, it should be done just after the drains are installed and before you begin any tillage operations.

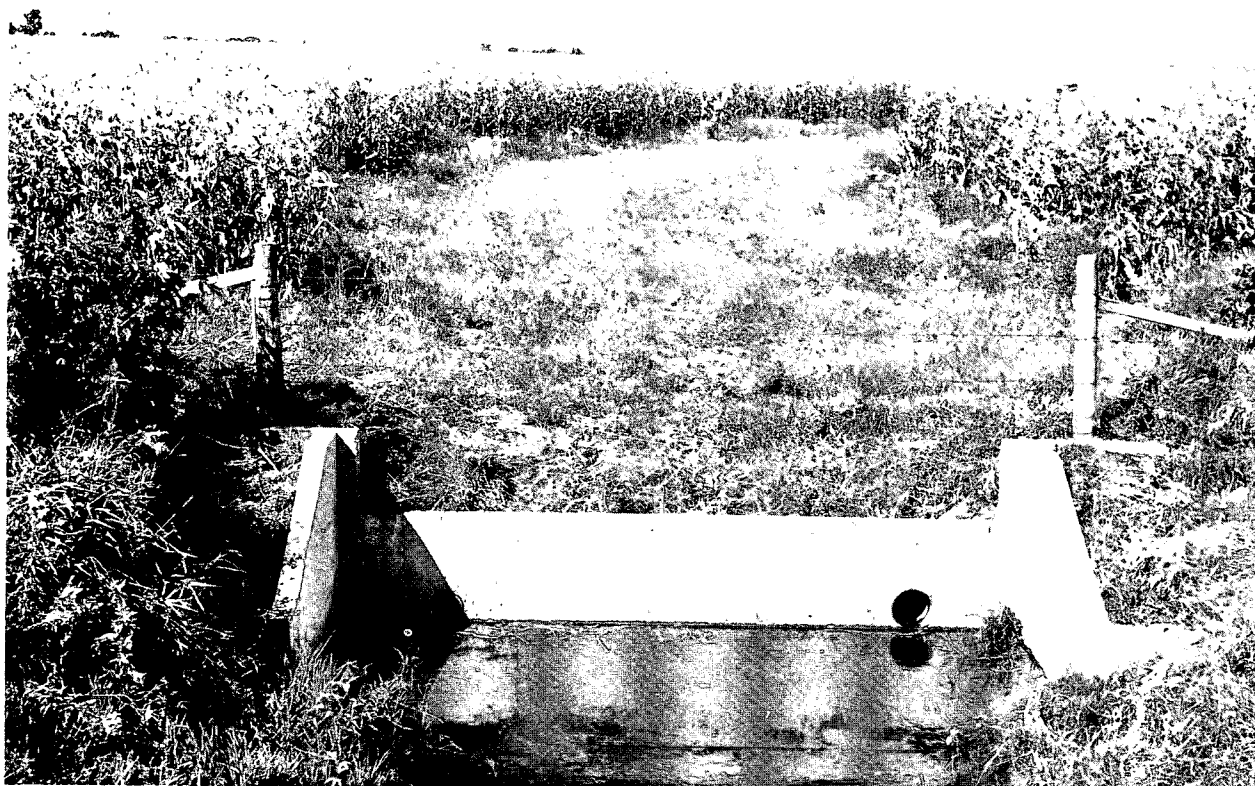
If you do not know the location of existing drains, a probe or soil augur can be used to find them. The probe is difficult to use in soils that have a hardpan or contain gravel. Be careful when probing for drains made of plastic tubing.

If there is a marked difference between the color of the subsoil and that of the surface soil, the location of drains can be detected by watching the plow furrow as you plow the field. The location of trenches will usually be evident because the backfill material was a mixture of subsoil and surface soil. The difference in color often will show up in the bottom of the plow furrow.



**You can record the location of drains on an aerial photograph.**

A further aid in finding drains is to watch grain crops at ripening time. Grain over drain lines sometimes stays green a day or two longer. You can also examine the ground of a bare field after a rain, just as it begins



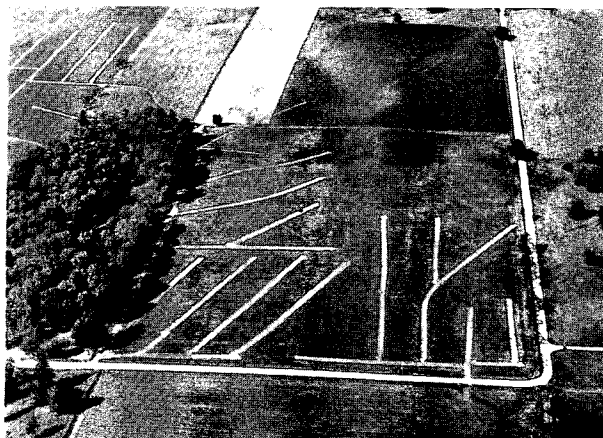
**Two drain outlets along a grass waterway.**

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to dry. The soil directly over the drains will dry out first and outline the drainage lines.

Aerial photography can also be used to locate existing subsurface drains because surface colors or tones over drain lines often differ from those of nearby soil or vegetation. A 35-mm camera with infrared, color, or black-and-white film can be used. The best time to photograph is when the fields are bare, soil moisture content is high, and differential soil drying is most prominent and widespread. In many parts of the country these conditions occur most often in spring.

It may take several years and a combination of methods to find all the subsurface lines. As the lines are found, their position can be recorded on a map. If possible, note the diameter of pipe, the kind of pipe, the depth to pipe, the position of inlets, junctions, and outlets, and the length of lines.



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**Aerial photograph of recently installed  
subsurface drains.**

This leaflet supersedes Leaflet No. 347, Keep Your Tile Drains Working.

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