

## Wetland Restorations with Drain Tile

### How to find if your project has tile:

**Ask the landowner:** The landowner would likely know if there was any tile. If it is a new landowner you may have to ask who the previous owner was or a older renter. Don't be afraid to talk to people and ask questions. Take a map of the property with you and have them draw their best idea of where tile lines were or better yet get them to go with you on site. If someone knows who did the tile installation you may be able to contact the contractor and get old copies of tile maps from when then put it in.

**Check county records:** Every county office will have a record of where county tile is. These maps will likely only show county tile main lines NOT private tile that attaches to it but if you have a county main that is very important to know. You will have to work with the county engineers or drainage board before you can make any modifications to the county tile.

**Look at Air Photos:** Look at as many different resources of aerial photos as you can from different years and seasons. Look for linear patterns that are unnatural such as in a plowed field you may have darker or lighter lines in the soil where tile runs or linear differences in vegetation color.

**Look for surface intakes:** Not all drain tile has surface intakes but if they do it is a good place to start. Mark all surface intakes and start tracing the tile with a probe or other methods to find the rest.

**Look for outlets:** All tile has to end somewhere. The two likely answers are either it empties into another tile such as a county main line which you can get maps for or it empties into an open ditch, lake, stream etc. If it outlets into an open waterway nearby you can walk along other waterways and look for the end of a drain pipe sticking out then trace it back.

**Look for tile blowouts:** Tile often requires maintenance, especially the old clay tile. When a piece breaks or gets clogged for various reasons the pressure in the tile like can cause it to rupture which often can be seen at the surface as a sinkhole or washout. Ruptured tile will continue to have the water flow through it so the broken section of pipe will allow the flowing water to wash the dirt away above that section of pipe and soon develop a hole all the way to the surface. If you find one of these blowouts, use that as a starting point and follow it up or down stream.

**Change is vegetation:** Old tile in grassland can be especially difficult, however plants can leave clues. Look for paths of vegetative change on suspected routes through the upland landscape. Plants such as thistle like water and you often see thistle growing thicker along wetland edges. On perforated or clay tile lines there is often extra moisture available in otherwise upland landscape and plants that do better with more water will grow in those areas. If you find a linear path of a different species of plants than what surrounds it, that may be a sign of tile. Also plant composition may be the same but plants along a tile may be more robust or taller. Look for any of these vegetative changes in a linear path. Due to seasons and stages of different plant species at different points in the season you may need to visit several times during the season to look of cues that maybe were not visibly a couple weeks earlier.

**Think like a tile:** If you are pretty sure there is tile but have no sign of where it is, look at the landscape and think of how you would drain it if you were laying new tile. Most tile follows the natural landscape. Water in the tile must follow the rules of gravity and flow downhill so start from the suspect wetland and follow the natural gravity path downhill. In order for a tile layer to not follow the natural contour they have to cut through hills which means digging deeper. Especially if it is old tile they hand dug so they wanted to move as little dirt as possible. Once you reach the most likely path where you would lay tile and find the most narrow point in that path you can do a transect across the suspected path.

**Tile exploration with a Tile Probe:** If you do much tile work you will get very familiar with a tile probe. Use the above “Think Like a Tile” section to determine a suspect area. Start a transect perpendicular to the suspected path of the tile and push the probe in every 4 to 6 inches. You will feel a solid thud when you hit clay or cement tile. It may sound hollow. Plastic tile will not be as solid but you should also feel a hollow thump. Before you go out, if you have some scrap pieces of various tile types, try tapping your probe on them to get the feel for it before trying it under the soil. Once you think you hit tile, mark it with a flag and attempt to find it again a few feet up or down stream. Once you find a linear path you can be fairly certain you are on a tile and not just a rock. The size of the tile can be determined by running a transect across the tile every inch or so and mark where you first hit it and last hit it and make sure you are driving your probe straight. Once you are on the tile you will likely need to trace the tile path to find it’s full extent. You can follow the tile from a known point by probing and tapping and flag each spot you hit it then move a few feet and repeat using your flags as a visual line to estimate where to probe next. The farther you go between probes the faster you go but it also makes it harder to line up with greater distance and you can miss the tile and have to do multiple probes before you find it. Other tips for probing include once you find the tile once and are trying to follow the tile, tie a string or put a piece of flagging or other marker on your probe at ground level when the probe is on the tile. This will tell you the depth of the tile which is useful in restoration planning. If you need elevation profiles you can get the ground elevation reading over the tile with laser level, GPS or whatever method you use then add the length of the probe in the ground. Also tile does not change depth fast so as you follow the line you know how far you need to push the probe in before you expect to hit it. This can save time and energy if you know the tile is only 2 feet in the ground you don’t have to push 5 feet of probe in before you know you missed it. Some tile can be deeper than a probe can reach so be aware that if it running a deep grade, just because you don’t hit it doesn’t mean it isn’t there.

**Tile exploration with a Backhoe:** As with the above method, if you narrow down a location where you suspect tile but are not sure you can use a backhoe to dig a shallow trench in a transect perpendicular to the direction you suspect the tile runs. The trench does not have to be as deep as the tile or even actually hit the tile. The trench just must be dug far enough to see a horizon change in the soil profile (color change) such as black about 18 inches over grey or yellow soil. Once the trench is dug, inspect the soil profile for a change that does not fit. When the original trench for the tile was dug the soil was removed but when it was replaced after installing the tile line it often is just pushed back in the hole and not necessarily in the exact matching soil profile. You may find a spot within your test trench about 1 foot wide that has mixed soil profiles or otherwise doesn’t match the surrounding color profile. Dig deeper or push a tile probe at that spot to find if that is a tile line.

**Subsurface scanner:** There are some new instruments on the market that can help locate buried pipelines. Most tile is clay, cement or plastic so metal detectors won’t work. Again you must have a general idea of where tile

might be to know where to start looking. Ground penetrating radar can be used but is expensive. New handheld scanners work like a stud finder. You swipe over the ground in a suspected area and a indicator light will come on if it detects a change in density of the soil profile. To determine if that change in density of the soil is a tile or just a rock or possibly a rodent burrow, mark the first point and try it again a few feet away up or down slope then repeat a few times. If you can consistently mark points with the scanner that result in a linear path it is likely a tile line.

### **Restoration Options**

**Tile Break:** Breaking tile in a small spot will likely just cause a blowout in that spot and create a sinkhole and water will still flow. When you break tile you should break at least 100ft length. In sandy soil or if there is a lot of pressure in the tile line due to a long fetch or head upstream in the tile you may want to break 150-200feet. The location to break is very important. You should break tile starting at the wetland edge where the tile leaves the wetland basin and continue into the upland. Tile breaking consists of excavating a trench along the tile and remove the tile from the hole or break and crush very well and mix with the surrounding substrate. Do not just crush in place or leave a path of broken tile in the trench or water will follow the path of broken tile just as if it were a gravel vein. To ensure the tile is sealed from future flow you can install a cement plug in the end of the tile break. After the section of broken tile pour cement into the end of the remaining upstream tile line with enough to fill a couple feet of line. Refill the trench as much as possible in the same soil layer order as the surrounding soil and compact to the same consistency.

**Tile Replacement with Non-perf:** In some cases flow is required to continue through the property but you want to remove drainage from the wetlands on the property such as an upstream neighbor must continue flow to a tile line running under your property. In such a case locate tile upstream and downstream of the wetland. Downstream conduct a standard tile break. Upstream start non-perforated tile at least 100ft before the wetland edge. If possible reroute the new path around the wetland so any future repairs or blowouts will not affect the restored wetland which may be difficult to work in once full. Continue non-perforated tile to at least 100ft past the downstream wetland edge. Give more length if in sand soils. If attaching non-perf to non-perf you must seal the couplings to be water tight. The best method to use is encase the join in cement at least 6 inches around all sides of the joint. If the new non-perf line is joining a perforated line or tile sections such as clay the join doesn't need to be water tight since the adjacent line isn't anyway. Be sure to maintain correct grade in the new line.

**Tile outlet and inlet:** As in the above situation where neighboring drainage must be maintained, if you have enough elevation/grade you can outlet the neighboring tile upstream into your restored wetland. Cut the neighboring tile as it comes downstream and install a culvert where it comes out at the surface. Be sure it outlets above you full pool elevation or it will affect flow of their tile. Downstream conduct a standard tile break. If your wetland requires a outlet use natural surface runoff path/spillway if possible. However if there is no other route for the water to go without negatively impacting neighbors downstream you can use the downstream tile line as your outlet. Install a standpipe type structure at desired spillway elevation and attach your rise pipe into the old tile line with non-perforated and water sealed joints until you are a minimum of 100feet from the wetland edge. Whenever using a tile as and outlet spillway, always design with as much head room/bounce as possible AND always have a secondary emergency spillway in a non-tile route in case the tile can not take the rain event.