

Environmental Assessment – Animal Habitat



Ground Penetrating Radar locates animal habitats below ground level prior to pipeline installation.

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Locating and delineating the extent of animal habitats is crucial to protecting the wildlife species found in the path of construction projects. Many animal habitats are visible and are above ground. There are many habitats that are not as visible and are located below the surface. The Prairie Rattlesnake found in south eastern Alberta makes its winter home (hibernacula) below the surface.

There are many activities that cause damage to animal habitats; road construction, logging, housing and pipeline installation are just a few. As we learn more about our environment and the impact that we have on the environment an understanding of the balance between humans and animals has become more important. We understand that we cannot just bulldoze through an area without first examining the area for animal inhabitants. New practises and methodology must be used in order to maintain the balance in nature.

Ground Penetrating Radar is a non-destructive testing (NDT) technology that is being used as a new practise and methodology in maintaining that balance. Ground Penetrating Radar (GPR) uses low power high frequency radio waves to determine differences in the electrical properties of the materials that the radio waves pass through. A GPR system uses a transmitter to send radio waves through the materials and a receiver to capture the reflected radio waves. The radio waves reflect off boundaries in the materials. The boundaries occur when there is a change in the electrical properties of the materials the radio wave is traveling through. The returned radio waves are interpreted by the system and displayed on a digital video logger.

Construction projects typically disturb large areas of ground. Pipeline installation can disturb the surface as well as below the surface. A pipeline being installed using horizontal boring techniques can disturb the ground above the bore for many meters. In a recent project where a horizontal bore across the South Saskatchewan River in south eastern Alberta was required, an endangered species was at risk. The Prairie Rattlesnake, a protected species, was known to inhabit the river bank on the north side of the river. The proposed path for the horizontal bore passed directly under an area that was suspected to be a Prairie Rattlesnake hibernacula. The location and depth of the hibernacula had to be determined without disturbing the rattlesnakes.



Figure 1: Prairie Rattlesnake

GPR was chosen as the technology. Global GPR was selected to conduct the geophysical survey. Using a Sensors & Software's Noggin 500 ground penetrating radar system, Global GPR collected data for the analysis. There was concern for the team collecting the data as well as for the rattlesnakes. It was decided that the best time to search for the hibernacula was during the hibernation period. The GPR survey was set during the cold winter months. The area was examined in the spring prior to the winter months. Several rookeries were discovered and their locations were noted. This was the starting point of the GPR survey.



Figure 2: Noggin 500 GPR survey

The Prairie Rattlesnake bears its young close to the winter hibernacula. The river banks exhibited slumping which creates excellent conditions for animal dens. Snakes do not dig in the ground to make their dens. Snakes will take over existing animal burrows. The task was to determine how many hibernacula were in this area and what the limit of their location was.

An area approximately 300 meters by 22 meters (985 ft by 72 ft) was defined. Three grid areas were then setup approximately 100 meters by 22 meters (328 ft by 72 ft), labelled G0, G1 and G2. Using a global positioning satellite (GPS) system the corners of the grid areas were located. The grid was setup with lines running east to west and north to south. The data was collected and saved and then interpreted using software, Sensors & Software's EKKO_Mapper, on a PC. The software generates a plan map of the area surveyed. The collected data was analysed and two voids were found that were most likely the hibernacula for the rattlesnakes.

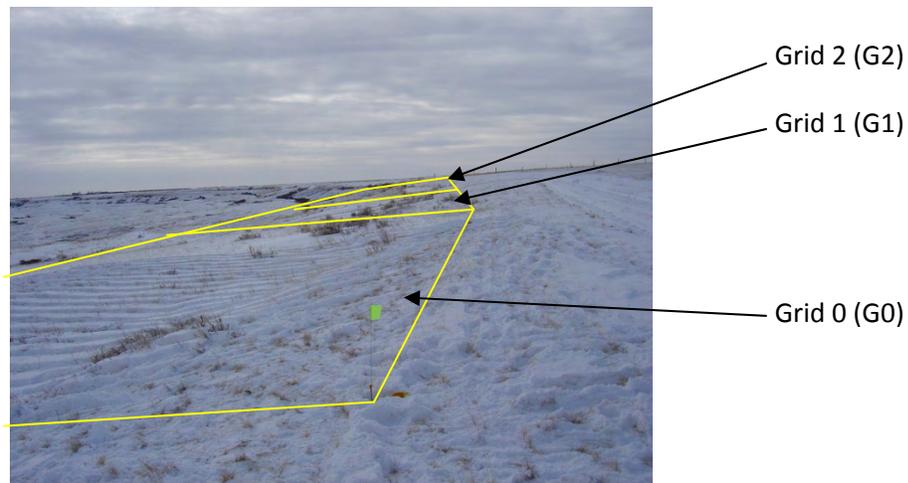


Figure 3: GPR survey area

The plan view map produced by the software produces different colour gradients based on the interpretation of the reflected signal. The map represents a horizontal slice through the survey area. The plan map can be viewed at different depth intervals. The image can be peeled back somewhat like peeling the layers of an onion. This allows the underground features to be exposed in the image view. A trained technician can interpret the various anomalies. Figure 4 is a plan view from Grid2. The depth slice is approximately 1.5 meters deep. The GPS coordinate is indicated at the top left of the image. The areas outlined are voids that would be typical of the Prairie Rattlesnake hibernacula. G2-A and G2-C are connected with a shallower borough that is not visible in this depth slice. G2-D is also connected with a borough to G1-C (Figure 5). There was evidence in the data that indicated remnants of old fence posts. This can be seen in Figure 4 as the red anomalies at approximately 50 feet and 78 feet along the survey on the top edge of the image.

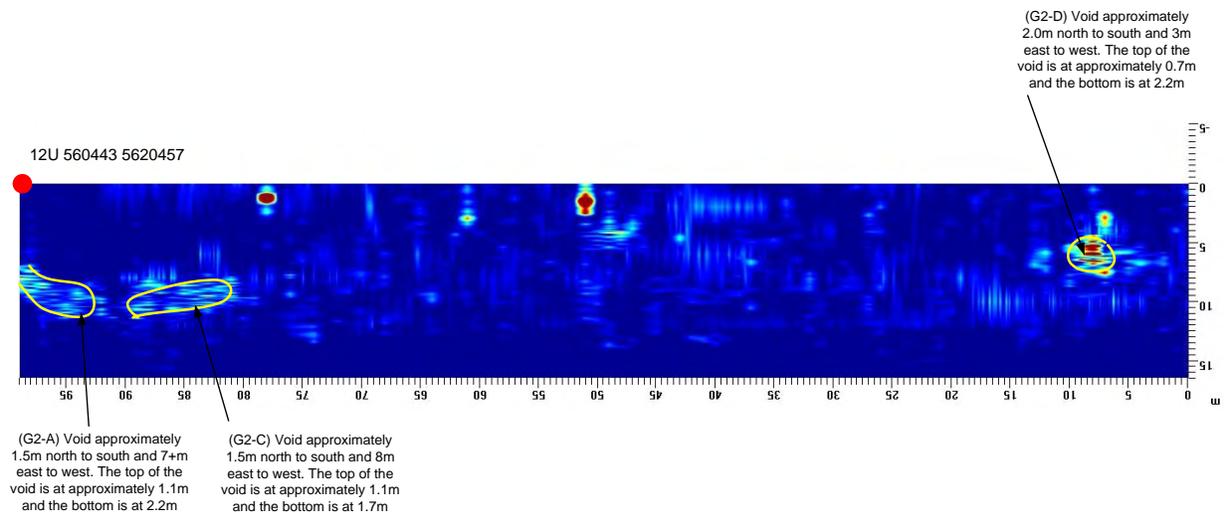


Figure 4: Depth Slice of grid 2 at 1.5 meters deep

Figure 5 is from Grid 1, a depth slice at 1.5 meters deep. The outlined area labelled G1-C is a void that would be typical of the Prairie Rattlesnake Hibernacula. There are several areas in the depth slices that exhibit similar characteristics to the areas identified as Rattlesnake hibernacula. The depth slices need to be examined throughout the entire data set to determine the actual size and location of the voids. The area surveyed was on the river bank and exhibited slumping of the bank. The areas identified as hibernacula also used visual data from the spring time when the snakes were coming out of hibernation and bearing their young.

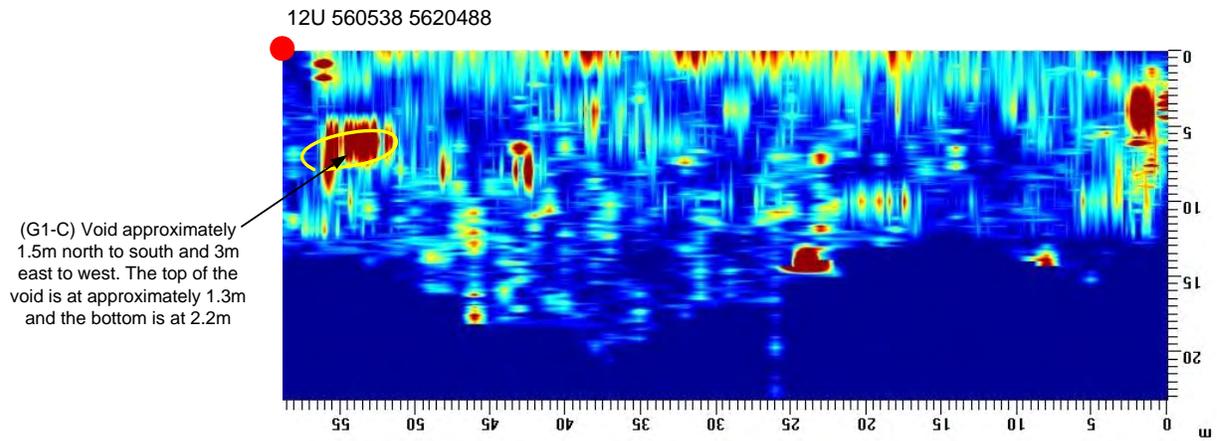


Figure 5: Depth Slice of Grid 1 at 1.5 meters deep

Global GPR, using ground penetrating radar was successful in identifying the size and location of the Prairie Rattlesnake hibernacula. The use of GPR as a non-destructive testing (NDT) technique to assist in locating subsurface animal habitats was proven to be effective with no harm to the environment or the habitat.