

## Keyline Design Goals and Equipment

We do Keyline design, no till drill and land imprinting treatments and seeding of a mix of revegetation species, both annual and perennial, focusing on the uplands above critical areas. The sites that would benefit most from this type of treatment have a number of conditions in common with each other. The native grasses that are present there are producing seed. The terracettes and pedestals that are caused by wind and water erosion have removed the possibility for higher germination rates of the seed that holds the soils.

The keyline plowing and imprinting will break up the patterns where wind and water concentrate, and stimulate the grasses that are over rested, over grazed and in stasis. This treatment will increase the percolation of water into the soil by the implementation of keylines. This will create the environment for the grasses to germinate and re-establish which in turn creates filters of vegetation which reduce the ill effects of wind and water and create a beneficial perimeter.

### *Description of Tools and Techniques*

Keyline design and cultivation is a soil conservation system that utilizes a specialized plow implement known as a Keyline plow. Unlike a conventional plow, it does not turn the soil over. More like a sub-soiler, the Keyline plow uses a small triangular plow tip mounted at the base of a narrow twenty-six inch long shank that rips an approximately one inch wide slice through the soil and leaves a slightly wider trapezoidal opening at the bottom of the furrow below ground. The subtle, sub-surface opening of the soil can decrease the compaction of the soil, increase infiltration and water holding capacity, and increase soil carbon with minimal disturbance at the soil surface. Surface water can be gradually prevented from eroding sites, by aligning Keyline plow passes on contour key points, and parallel plowing slightly off contour between keypoints. By implementing this type of work we can change how water behaves on surfaces and redirect it into parallels, rather than fall lines, for infiltration which will benefit revegetation efforts and reduce soil loss. Changing how water behaves on keylined sites keeps water higher on the landscape longer. Keeping capillary activity charged longer benefits fragile crusts, root zones and increases germination rates of seed and better establishment of seedlings.

### History of Keyline

Keyline practices were first developed by Percival Yeomans in the early 1940s in Australia. His philosophy was that permanent agriculture must benefit the farmer, the land and the soil. Australian farm and rangeland is generally dry and Yeomans developed this practice to improve degraded, eroded lands and increase their ability to hold water.

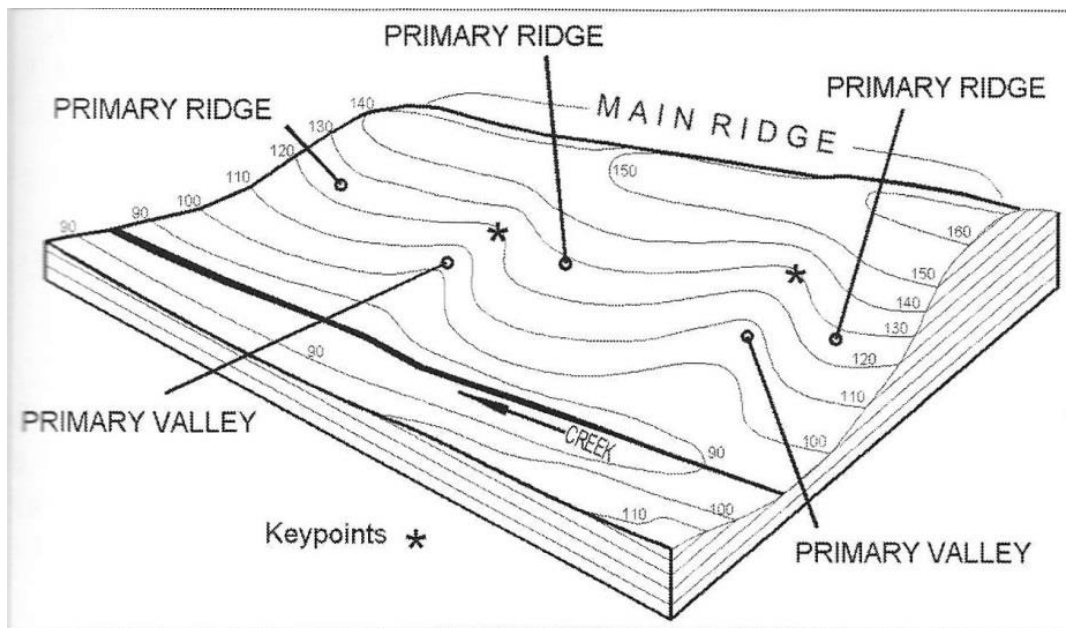
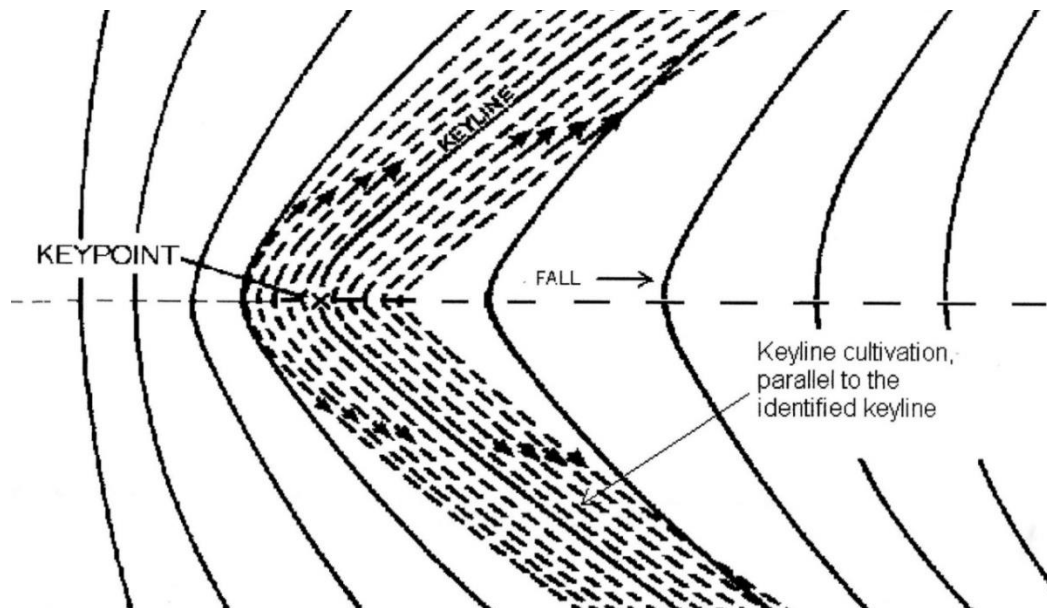
The goal of keyline design is to increase the productivity of the soil to levels greater than were present before the land was worked.

The emphasis is placed on improving soil biology and increasing soil organic matter by deep non-inversion tillage combined with cyclic grazing or mowing.

### Keyline Planning

The keyline design is unique to each property and will be formulated from evaluation of water movements over the land, with the idea of controlling and making use of this resource in the management of the land.

The keypoint occurs at the base of the steepest part of the slope in the center line of a valley. This is the fall line path that water currently follows.



*Drawings excerpted from "Water for Every Farm" by P. A. Yeomans and Ken Yeomans*

The keyline of a valley is a contour line that runs through the keypoint. The ends of the keyline are where the contour changes direction from the valley to the ridge.

Water movement over the land and the land's features are directly related to each other, and water resources can only be used if they can be controlled.

Other factors such as climate, geology and rainfall patterns historically determined the land's topography. Controlling water is the main focus in keyline planning as this is one variable which can be manipulated.

### Keyline Cultivation

Once the keypoints and keylines have been identified, the control of water movement over the land can be achieved through a keyline pattern of cultivation.

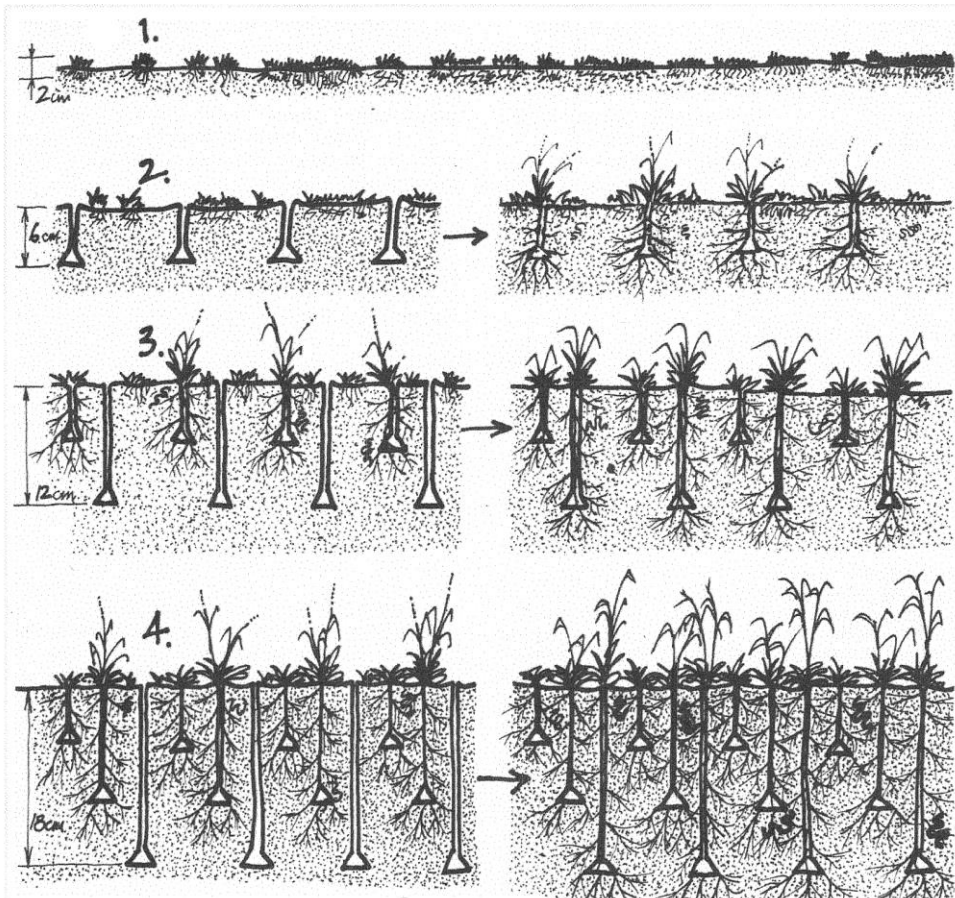


Figure 1. Soil development – mechanical method (Illustration adapted from the *Permaculture; A Designers' Manual*).

The first shallow rip with the Keyline Plow allows roots to break through the first compaction layer. Second season, the pass goes deeper again and the roots follow. The final pass is to a depth of approximately 24 inches (600 mm). Grasses can now start to work with soil bacteria and fungi to access deep minerals, which are essential for grazing animals. Over three to four passes with the Yeomans Keyline Plow, and using Keyline Design, we can de-compact soil, increase soil carbon, build soil, increase water-holding capacity, increase soil life in the soil food web, and even drought-proof our land.

By cultivating parallel to identified keylines, both above and below the line, a cultivation pattern is developed which spreads the runoff evenly across the uplands and does not allow the water to follow its natural path and concentrate in the valleys. This aids in the stabilization of the valley and increases its ability to resist erosion.





### The Long Term Benefits of Keyline Design

- Build resiliency into permanent landscapes
- Improve infiltration of precipitation
- Increase moisture retention
- Support habitat by increasing diversity
- Improve perimeters
- Break up hard pan and compaction
- Improve root zone and capillary activity
- Encourage soil building and reduce loss through wind and water erosion
- Reduce salinity problems
- Increase soil productivity by increasing soil biology. Biologically fertile soil has better structure and reduces runoff
- Stabilize soils and perimeters









Yeoman's shanks



Land Imprinter with seeder





Shanks at depth



Dixon Land Imprinter with shank pot seeders and cyclone seeder