AEN-155

Cooperative Extension Service

The Importance of Water Source Layout in Farm Infrastructure

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Water source layout is a critical infrastructure component for cattle and cattle producers. Strategic water resource layout is a part of a farmstead plan that does not always get adequate attention, despite its critical importance. Nonetheless, when farm infrastructure planning incorporates the latest practices, rules, and knowledge, the resulting design can satisfy generations of users.

Water is an essential nutrient. It also is one of the most limiting factors in rotational grazing, which makes the location of water sources critical. Each watering source should be installed to develop infrastructure that satisfies the drinking water requirement for cattle and that also fits into the overall scheme of the farm. It should provide and/or increase producer efficiency. Developing a watering source that satisfies these two needs can be complicated. For example, once a watering source is established, it will not be easy or economical to move after installation. Therefore, the location, placement, and design of the watering source should be thoughtfully constructed based on the best standards available at the time.

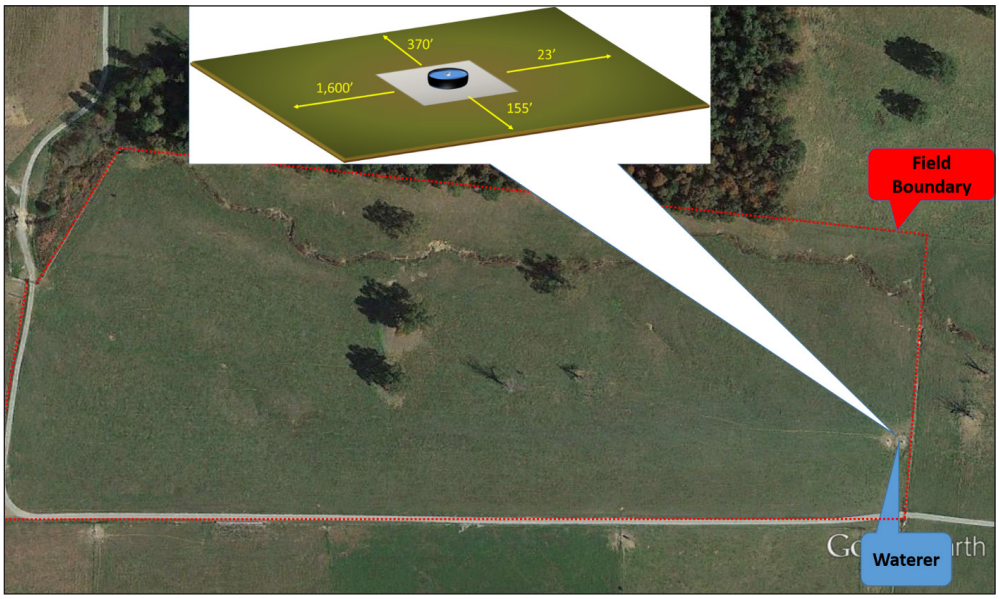

Figure 1. A 22-acre beef pasture with a water source serving just this field located on one end.

Efficient pasture-based infrastructure design maximizes profit by increasing production and reducing cost. Designing a successful water source requires meeting the needs of cattle. The location of a water source should be organized and designed for cattle, who, from a design point of view, are pedestrians. They should be able to access their production requirements without walking more than 800 feet away from any point of a pasture. Creating a positive animal environment should be the first goal, with improving producer efficiency a secondary goal.

Producers should become familiar with analyzing infrastructure projects to create beneficial infrastructure and lessen haphazard planning that requires changes to existing infrastructure. This publication uses illustrations and specific examples of design concepts. Planning methods from the perspective of cattle and the producer are presented using aerial imagery. Principles and dimensions are used to develop locations and layouts. Sketches and drawings illustrate design concepts and layouts. Animal preference to other aspects of the design and field attributes will be displayed by their behavior, which can be used as an evaluation tool to score designs and infrastructure improvements.

Example 1:

One-way Waterer

There are generally accepted rules for providing water to cattle. Ideally, water is provided to cattle as they rotate from field to field. The source should be convenient for them to access and drink. Cattle should not have to walk more than 800 feet to obtain water when grazing. Figure 1 is a pasture outlined by the road on two sides and woods on another. The field dimensions are 1600' by 600', or approximately 22 acres. Poor drainage, running along the entire length, is an issue. A waterer, identified by the callout, is located on one end of the field. The maximum distance from the waterer to the furthest point requires cattle to walk over 1,600 feet to obtain water. Meanwhile, the other walking dimensions, from the other three sides of the watering source are 23, 155, and 370 feet (Figure 1 inset). This water source provides water to this pasture but

not very well. The maximum recommended walking distance is exceeded by twice the distance. The waterer could have been moved 23 feet and placed in the fence line to serve another pasture/group simultaneously or moved to the center of the field to reduce walking distance. This example shows a water source that is not integrated into the design of the field. An unfortunate lack of forethought about water has probably made water the most neglected nutrient in a beef ration.

Pasture infrastructure should not be constructed in isolation from the whole operation. Infrastructure for watering cattle should provide convenient access to abundant, clean water, while increasing producer efficiency by saving time, money, and labor.

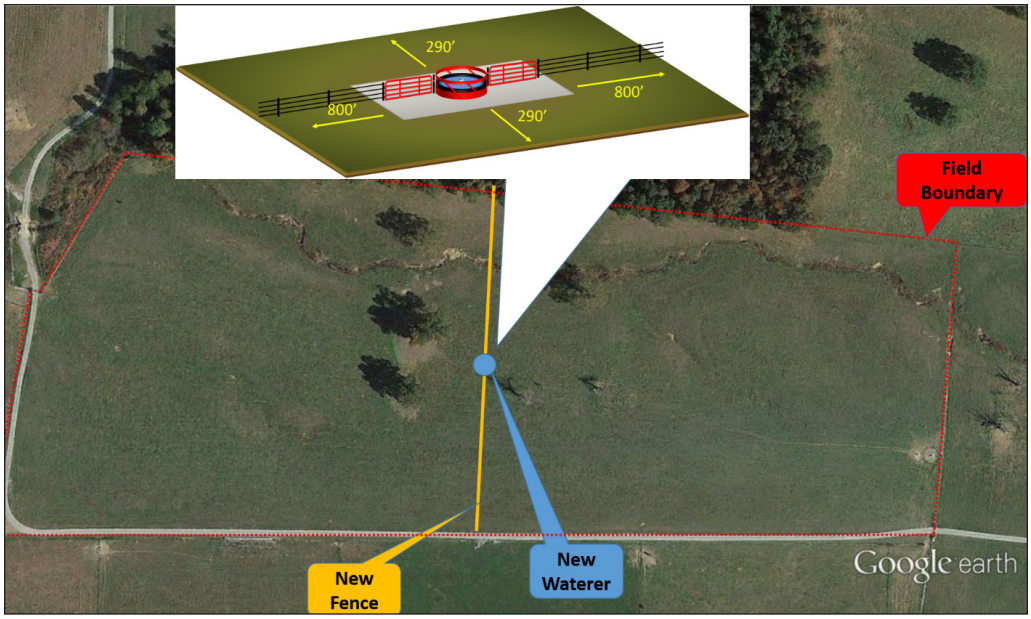

Figure 2. How the field should have been laid out.

Example 2:

Two-way Waterer

An illustration of the current watering source design is depicted in Figure 1. Figure 2 shows an illustration over an aerial image of how the field could be improved with a more efficient layout. Locating the water source to the center of the field and dividing the pasture with a cross-fence (permanent or temporary electric) would create two equal-size pastures served by one waterer. This would increase opportunities for rotational grazing without increasing watering costs.

The inset rendering in Figure 2 shows an example layout for a two-way watering source. The dimensions were determined by measuring the approximate distances using a mapping software (in this case, Google Earth Pro as described in AEN-141: *Maps for Farm Planning*). The design places the water source in the center of the field. Gates have been placed adjacent to the source. This location within the field may also be where cattle are accustomed to loafing, especially in pastures that do not have shade. Placing gates adjacent to the water source allows the producer to rotate cattle to the adjacent field through the gates mounted on either side. Access to gates also reduces the distance of moving mineral and makes it less burdensome. The illustration also shows a ring feeder placed around the circular waterer. Recycling an old hay ring feeder by placing it over a tire waterer is one of the better ways to exclude cattle from standing with their feet in the trough. Implementing this feature maintains water quality and reduces time needed to clean the waterer.

The direct benefits of dividing a water source with a cross-fence could include the following: It facilitates rotational grazing by increasing the number of pastures and increases managerial control; the water source serves twice as many fields; mineral transportation distance to an adjacent pasture is reduced; cattle walking distance is reduced; forages will be better utilized; and, pressure sensitive areas such as drainages and waterways can be reduced.

This type of design can also provide indirect benefits. The drainage way has become more of a ditch or gulley. Because calves can be lost to gullies, the erosion is a growing concern. There are structures (gully plugs, drop structures, and grade stabilization structures) that can be placed in gullies to control erosion, but implementation of these practices requires money, equipment, time, and labor. The cheapest and easiest means of addressing gully erosion is to manage pastures in a way that avoids erosion. Good management decisions, such as moving cattle often with rotational grazing, taking a field out of a rotation, or renovation of the pasture, are tactics to avoid erosion. The sound practices are more difficult to accomplish with a single water source in a large single field.

Example 3:

Three-way Waterer

Figure 3 is an aerial view showing a nine-acre pasture with a water source located in a corner. The inset image in Figure 3 provides the dimensions of the boundary relative to the water source for the small field. These dimensions are within parameters for cattle walking distance, but conjoining the three pastures would provide greater efficiency.

Figure 4 shows the intersection of the three pastures coming together and forming a Y-shaped node, with the corresponding acreages of each field. Figure 5 shows the location of a watering source located at the "Y." The inset image shows a more efficient design with the water source serving three pastures.

Water sources for multiple pastures require more complicated designs. The enhanced node, hub, or center (Figure 5) typically requires additional gates and considerations about the direction of their swing and space for vehicle maneuvering. Additional construction materials are also needed for rock, fabric, concrete, etc. This type of design costs more, but can be amortized over multiple pastures, and provides additional benefits. **However, hubs can improve the operation for cattle and management with a single integrated component of infrastructure, which serves multiple pastures.**

Installing a water source hub at the intersection or nodes of adjacent pastures can lead to improved management and circulation of cattle by facilitating rotational grazing. In this design, the hub becomes a common area serving cattle in three pastures and a permanent mineral feeder can be installed to serve three pastures rather

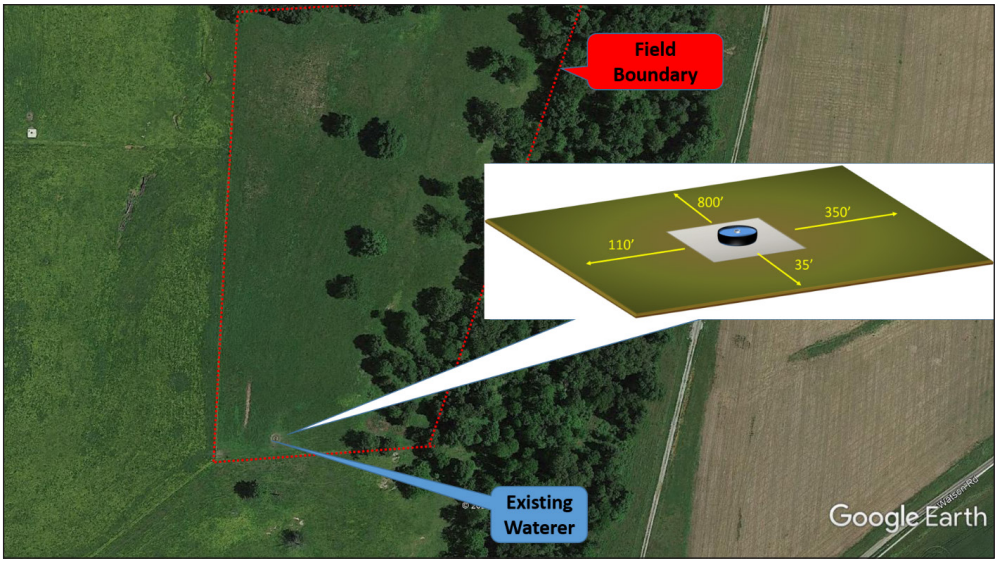

Figure 3. A nine-acre beef pasture with a watering source located in the corner.

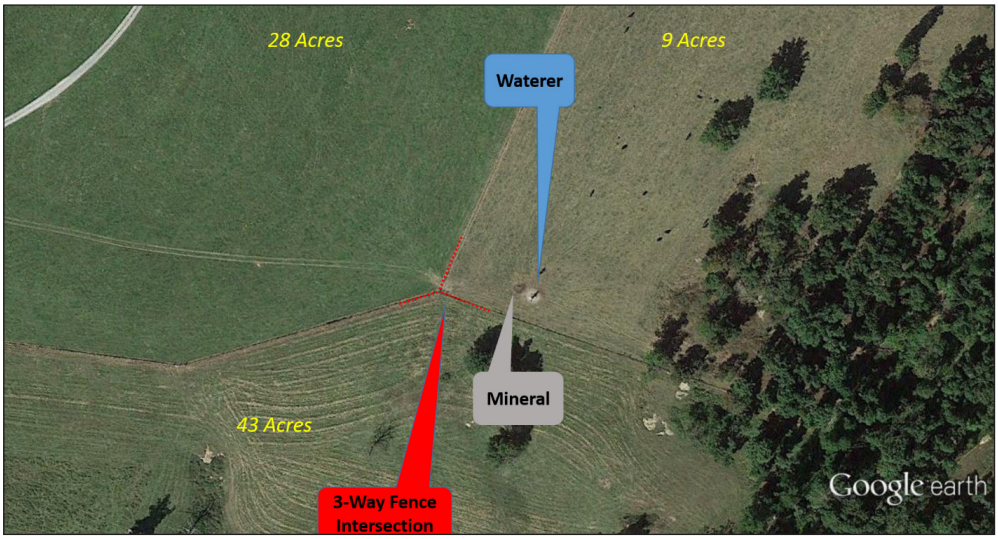

Figure 4. An aerial view of the intersection of three pastures.

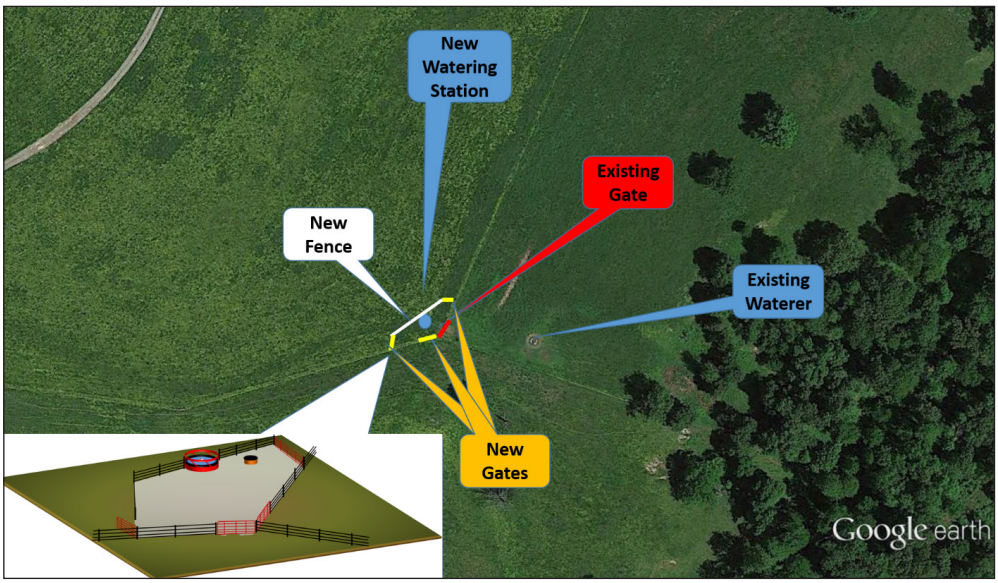

Figure 5. A design of a three-way watering hub.

than transporting mineral as pastures are rotated. It places the waterer in the corner of fields which makes transfer from one field to another easier. Fly control can be incorporated as well. The enhanced hub provides a shared location for many tasks, increasing efficiency, sharing resources such as minerals, improving rotation and fly prevention. **This increases efficiency of the producer and cattle by saving time, money, and labor, while creating a better environment for the cattle. Hub watering stations are more complex but they deliver simplicity.**

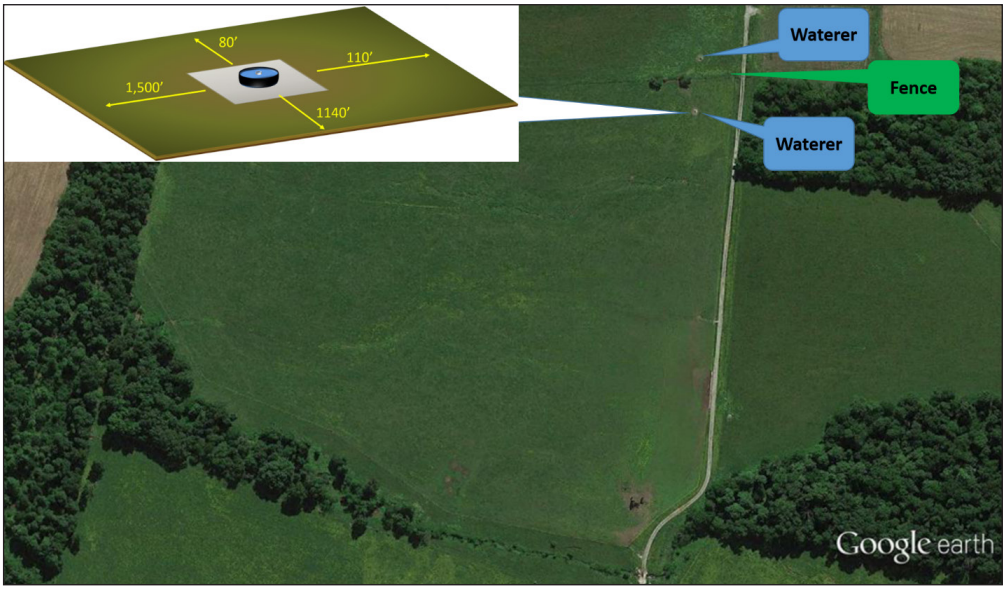

Figure 6. A 33-acre beef pasture with a watering source in the upper corner.

Example 4:

Four-way Waterer

Figure 6 is a 33-acre pasture 1,200' tall by 1,500' wide. The water source is located in the top right corner (identified by the callout) requiring cattle to walk 1,500 feet to obtain water. Again, by implementing the concept of a centralized location, a waterer in the center (Figure 7) divides the field into four 8-acre pastures measuring 600' by 750', with a watering source within 750 feet of the farthest distance (Figure 7, insert).

This example field also has a drainage area in the field that could be managed to exclude the cattle from it (Figure 8). The cattle are along a drainage way, which demonstrates their preference for this type of landscape feature. The implementation of the design concepts presented for this example would provide the producer with the ability to control and limit cattle activity and their behavior.

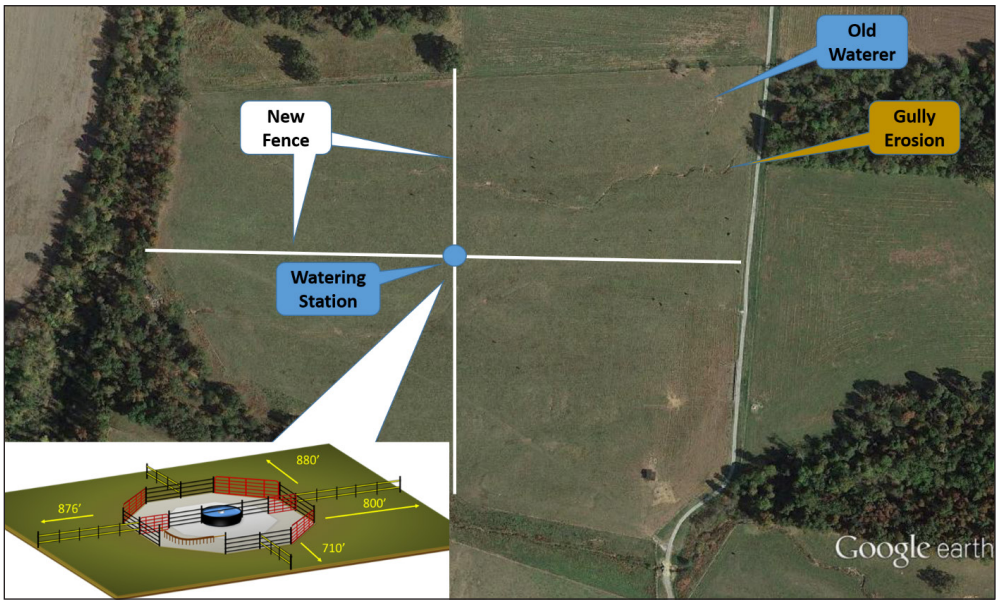

Figure 7. New design of 33-acre beef pasture with a four-way watering source.

Figure 8. Cattle with uncontrolled access to a drainage way.

Example 5:

Whole Farm

A water source is a component of infrastructure that should relate to the whole farm, the other services (i.e. gates, fences, structures, etc.), and enterprises that the producer uses to create a profit. No single component of farm infrastructure should be operated in isolation. Infrastructure is a means to create efficient pasture, but not an end in itself.

The example for this concept starts with Figure 9, which shows two water sources serving two different fields, which are 135 feet apart and are the same water sources presented in Figure 6 and is a mirror image as the field in example 4. An image of the two fields and their respective water sources is depicted in Figure 10. A design solution for this would be the exact same four-way design presented in Figure 7. The proposed layout for the two fields is depicted in Figure 11. The example field also has drainages that need to be and could be managed with the new configuration.

The objective of Example 5 is the demonstration of the importance of water source layout in farm infrastructure planning. All the examples presented in this publication were obtained from the same operation. This suggests the benefits of layout planning could have been applied to the entire operation, since its inception or as a renovation. Moreover, since infrastructure locations remain in the same place for generations, these benefits could have been achieving efficiency and reducing drudgery for the operator and cattle the entire time not to mention future operations. The amortization of these projects could have been spread out over many years. However, increased income could have also obtained from the fact that rotation graz-

Figure 9. The water source in the foreground is approximately 135 feet from the water source in the background.

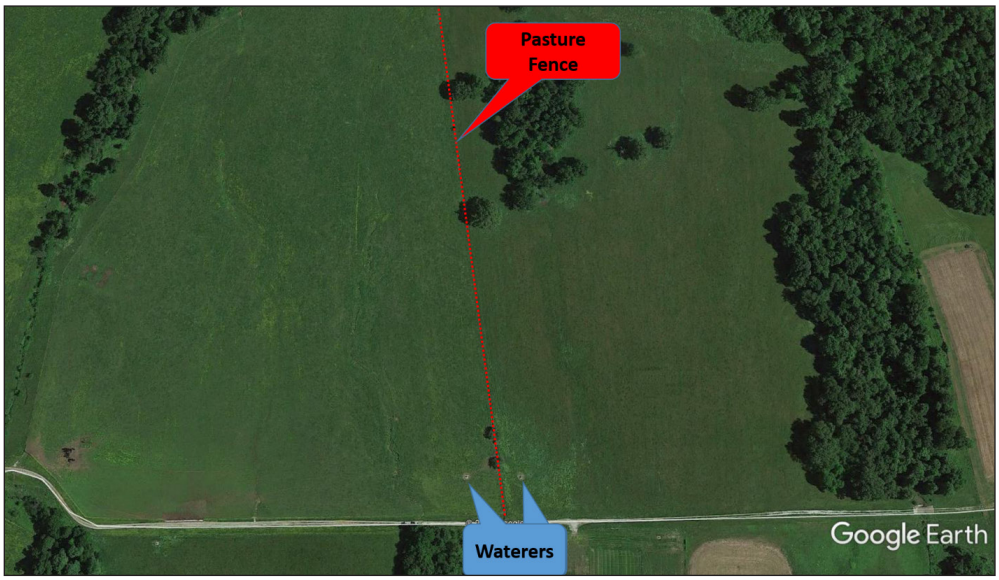

Figure 10. Aerial view of two pastures and the location of their water sources. To pasture to the left is the 33-acre field used for the four-way example. The pasture to the right is 28 acres.

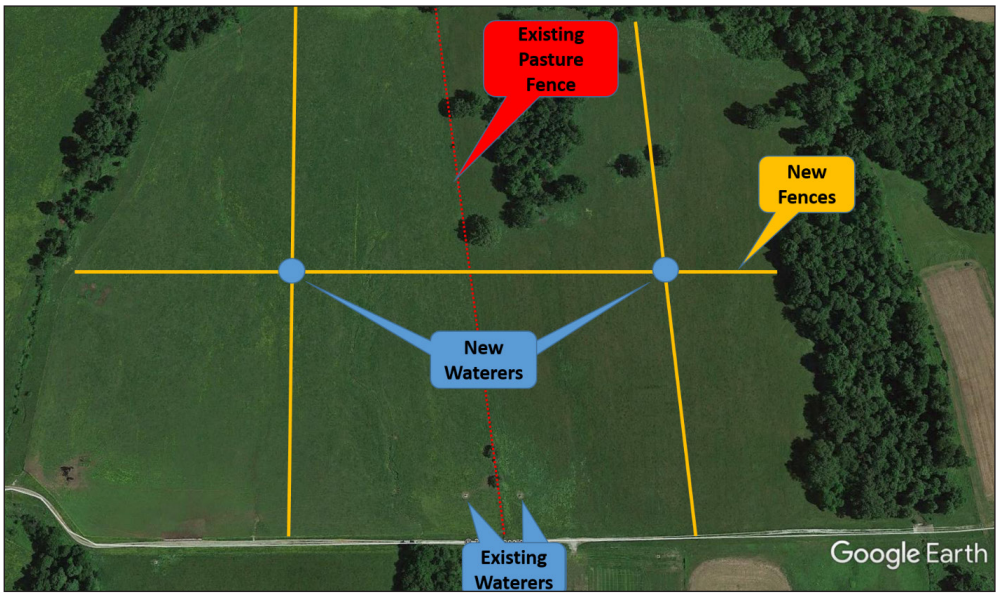

Figure 11. Potential layout of water sources and fences for two adjacent pastures.

ing offers opportunities to expand the herd/stocking density. This could only be possible if these concepts had been or were implemented.

Summary

Pasture infrastructure should not be constructed in isolation from the whole operation. Infrastructure for watering cattle should provide convenient access to abundant, clean water, while increasing producer efficiency by saving time, money, and labor. Farm infrastructure is improved when water sources and other fixed equipment are thoughtfully placed to accommodate animal needs, increase producer efficiency, and promote rotational grazing. **An adequate water supply is a fundamental requirement for maximum cattle gains, but water supply is often haphazardly placed or simply left where it has always been.**

Existing infrastructure may have been placed at a location for reasons that are no longer relevant. Producers that take advantage of the latest standards, whether technology, engineering, or understanding of animal behavior, may increase efficiency and reduce costs across the whole operation. Cost versus benefit of implementing projects is a determining factor for producers. Renovations and best practices can be implemented in incremental steps; they can be accomplished easier when based on a comprehensive plan. For instance, all the cross fence does not have to go in at the same time. The waterer can go in first, then one section of fence, then another. However, without a plan, the haphazard installation of projects may lead to structures impeding a subsequent new project. Planning the design using images, drawings, and sketches before implementation creates a roadmap for the future.

References

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