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Chapter 54

Pasture and Range Mapping Tools

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A photograph of a cow standing behind a wire fence in a field, with trees in the background. The image is overlaid with a blue gradient.

Chapter 54:

Pasture and Range Mapping Tools

Introduction

Accurate mapping is an integral component of any ranch management plan. Mapping provides the landowner or ranch manager a visual reference of the basic layouts of pastures, fences, gates, water, and other resources. In addition, mapping can help a landowner understand how, when, why, and where grazing, rest, or other management actions should occur - essentially painting a picture of the past, present, and future operational goals of the farm or ranch. While some producers may be intimidated with mapping due to a perceived lack of skills or equipment, mapping need not be a source of stress.

There are several options for mapping at the ranch level. Along with agency supplied maps, we will explore options for free do-it-yourself user friendly internet-based mapping products and services. While not a comprehensive tutorial on all mapping options, this chapter will introduce the reader to basic information on:

- Mapping Your Ranch or Pastures
- Paper-Based Mapping Resources
 - United States Department of Agriculture (USDA) maps
 - Other paper maps
- Free Internet-Based Mapping Tools
 - Natural Resources Conservation Service (NRCS) Web Soil Survey
 - Game, Fish & Parks (GF&P) Wildlife Inventory and Management Application (WILMA)
 - Google Earth™ and Google Earth Pro™

Mapping your Ranch or Pastures

Whether you have recently purchased your ranch or you are part of a multi-generation operation, accurate mapping is an essential component in today's land management arena. While the list of what can be mapped is infinite, most landowners find the following items helpful in planning and/or redesigning their

Key Points

- Accurate mapping is an essential component in today's land management arena.
- Well managed pasture and ranch mapping can improve infrastructure design, safety, and efficiency.
- Mapping need not be overly technical, but advanced options do exist that allow producers to take advantage of new and emerging technologies, many of which are free.
- Many resources exist that allow options for ranch mapping.

ranches (especially when working with agencies, inexperienced employees, or family members):

- Common map items
 - home
 - pasture or paddock designation (name or number)
 - crop and hay fields
 - fences
 - gates and access points
 - water sources
 - corrals and handling areas
 - water crossings
 - dangerous areas
 - monitoring plots
 - noxious or invasive weed areas
 - specific or unique vegetation
 - salt, mineral, and pest control sites

Paper-Based Mapping Resources

USDA Maps: For those who are not comfortable with computers or technology, paper options can still be effective for mapping ranch resources. One of the most common and easily accessible ways to obtain basic paper maps for your property is to visit your local US Department of Agriculture (USDA) Service Center. These offices can generally provide landowners with maps of their property at the level of one square mile per page. While these maps do not include a great deal of topographic detail, they do provide information on legal location (section, township, range) and often include field edges, fence or use lines, and roads (Figure 1).

Other Paper Maps: Historic paper mapping resources like the US Geological Survey 7.5 minute topographic maps, Gazetteers™, and county plat maps include a great deal of accuracy and information such as topographic lines, roads, township names, ownership, etc. (Figure 2). However, these maps require hand-drawing of personalized ranch detail and can become quickly out-of-date. Editing and making changes can also be cumbersome.

While these mapping resources offer excellent portability for in-the-field or vehicle use while scouting land or performing initial ‘scratch’ design, there are many improved internet-based options for accurate long-term map management.

Free Internet-Based Mapping Tools

NRCS WEB Soil Survey:

<http://websoilsurvey.nrcs.usda.gov>

The Natural Resources Conservation Service’s (NRCS) Web Soil Survey (WSS) is free and accessible to the general public. The program includes excellent tutorials and is fairly easy to use with practice. The basic concept of the WSS is to

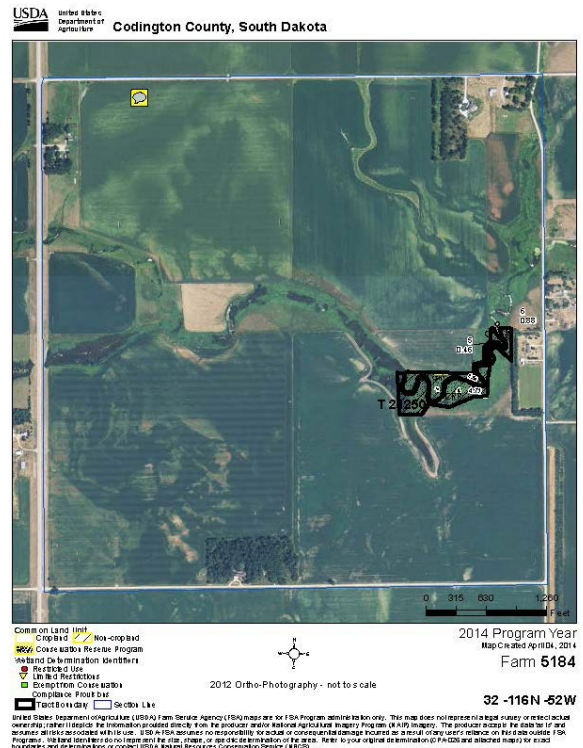


Figure 1: Example of a map available to landowners from local USDA service centers. While this map lacks topographical detail, it does provide a practical base for sketching pastures, gates, water sources, and fence lines. Such maps can be easily copied and work well for in-the-field planning.



Figure 2: Historic and popular mapping resources such as US Geological Survey 7.5 minute maps (left), Gazetteer (upper right), and county plat maps (lower right) offer practicality for in-the-field or vehicle use. However, long-term map management, editing, and updating can be problematic.

allow the user to draw an Area of Interest (AOI) in any desirable shape, up to 100,000 acres. While the program offers many advanced features that allow the user to develop maps and guidance for rangeland utilization, the basic mapping features are valuable in determining pasture size, major land resource areas (MLRAs), ecological sites, soils, vegetation composition, and basic production. When used in conjunction with the NRCS's more advanced rangeland planning tools, the WSS can serve an integral role in whole-ranch planning. It is beyond the scope of this section to detail all uses for the WSS, but we will describe how the basic mapping functions work.

The Web Soil Survey is designed for ease of use, beginning from the introductory page (Figure 3). When using the Web Soil Survey, the basic premise is to use the clickable program tabs to create an Area of Interest (AOI). This is accomplished utilizing the computer mouse and simply drawing the shape and size of the pasture to be evaluated. After the basic outline of the ranch or pasture is created, the program will report acreage of the shape (Figure 4) and the user can move on to additional tabs to obtain more specific information. Figure 5 highlights the basic information displayed when the user selects the Soil Map tab. When the user selects the Soil Data Explorer tab (Figure 6), several additional options become available, allowing the user to obtain information on soils, ecological sites, and view soil reports.



Figure 3: The NRCS's Web Soil Survey website offers excellent information and tutorials for learning advanced mapping and ranch planning tools. (Image source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at <http://websoilsurvey.nrcs.usda.gov/>. Accessed 5/1/2014.

The WSS is excellent for determining in-depth information on specific ranch resources such as soils, vegetation, and productivity, but it does not allow the user to map other ranch features such as fences, water, or building sites. The WSS is useful as a means of obtaining background information that will inform the whole ranch plan; including helping the user assess appropriate stocking rates and season of use. When used in conjunction with the Natural

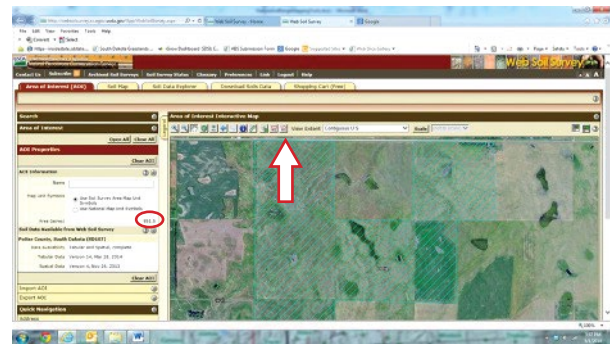


Figure 4: The WEB Soil Survey allows the user to draw a single pasture or the entire ranch using the polygon draw tool (red arrow), up to 100,000 acres. The program quickly reports basic information, such as acreage shown here (circled in red).

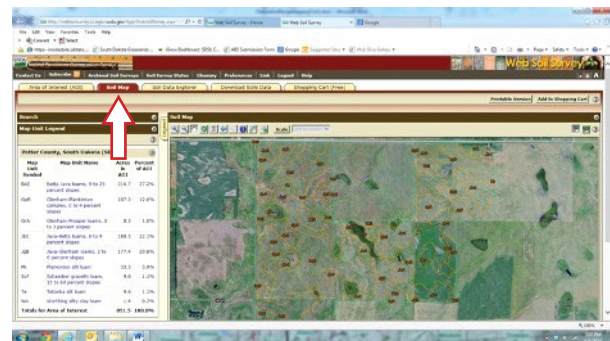


Figure 5: When the Soil Map tab is selected (red arrow), The WEB Soil Survey reports additional information on soil types and acreages.

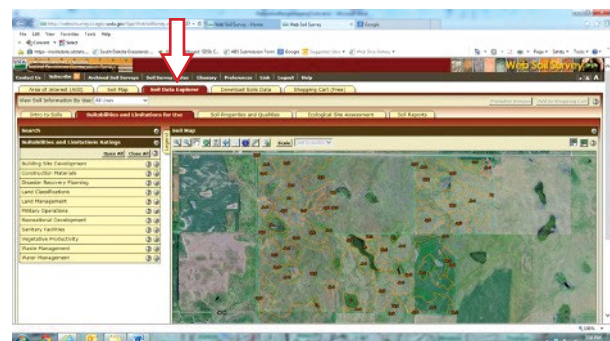


Figure 6: When the Soil Data Explorer tab is selected (red arrow), the WEB Soil Survey provides additional resource tabs with information on soil uses, properties, ecological sites, and reports.

Resource Conservation Service's range planning tools and other mapping tools, the WSS becomes an important resource for whole ranch planning.

GF&P WILMA:

<http://gfp.sd.gov/images/WebMaps/Viewer/WILMA/>

The South Dakota Department of Game, Fish, and Parks (SDGFP) maintains an excellent website for outdoor recreation. Within that site lies a mapping tool known as the Wildlife Inventory Land Management Application (WILMA). WILMA is an interactive mapping application designed to allow users to customize aerial and topographical maps to their needs. The WILMA application offers users the ability to select from a variety of base maps, zoom in/out, search for landmarks, draw lines and shapes, measure distances, create labels, and obtain longitude and latitude for a specific place. The WILMA tool is surprisingly useful for ranch and land use planning and contains color-coded land use information for any public land; allowing producers who hold allotments or leases on publicly-owned land to easily identify those pastures in the overall ranch operation.

To navigate to the WILMA tool, visit the SDGFP website at <http://gfp.sd.gov/> and click on the 'Public Hunting Maps' tab under the hunting section.

From there, select the MAPS heading and the link to the Interactive Map System (WILMA) <http://gfp.sd.gov/images/WebMaps/Viewer/WILMA/>.

The WILMA site also contains helpful tutorial videos that give specific instruction to the user in a step-by-step format. These videos can be accessed by simply clicking on the large black HELP? symbol in the lower left hand corner of the map, or by accessing the link at <http://gfp.sd.gov/hunting/areas/WILMAvideos.aspx> (Figure 7).

While on the WILMA page, the user can easily zoom in and out by simply rolling the center roller on the mouse or by utilizing the zoom toolbar located on the left hand side of the page. The top toolbar allows the user to find a specific address, search feature, print, or draw features. The legend can be turned off to so as not to take up limited screen space. The most valuable WILMA tool we will highlight here is the draw tool. When clicking

on the draw tool (pencil icon), the user can select a variety of shapes to utilize. The most common for pasture would be the polygon tool. Also, while in this window the user can pick from options to customize drawings such as line colors, fill colors, and various styles. The user can also choose to have the program show measurements and can pick from a variety of options for size and distances.

Another excellent feature of WILMA is the ability for the user to select from various base maps as a background when mapping pastures. Base maps can be changed at any time behind the drawing. In the example above (Figure 8), we are using a base map of 'imagery with labels'. Here we are showing a

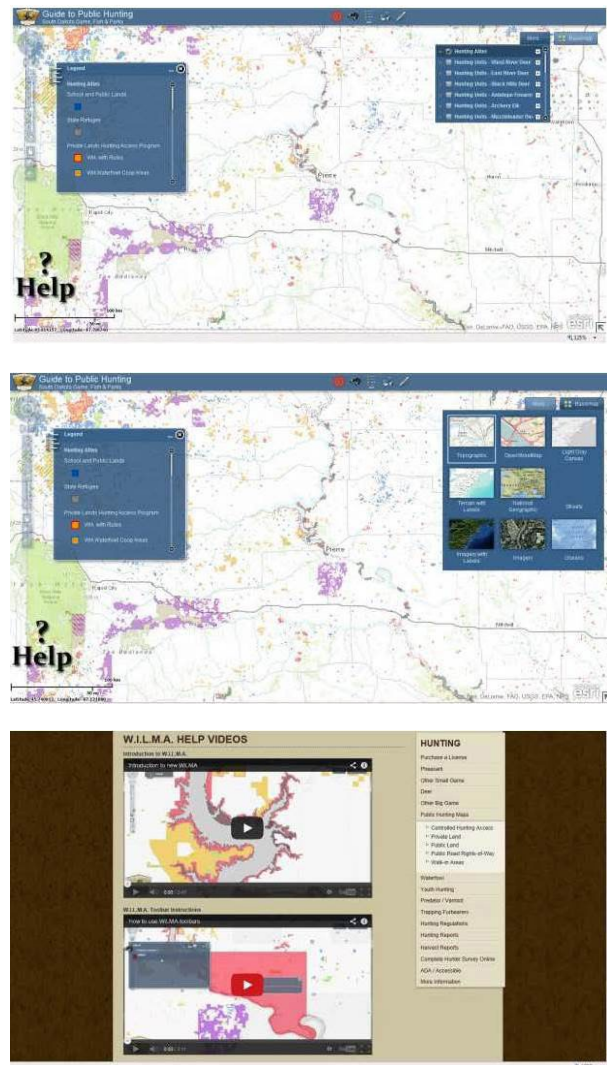


Figure 7: The SD GF&P WILMA mapping system allows producers to choose various background maps from simple drop down tabs (top and middle). The site also includes simple video tutorials that can be accessed by clicking the large black Help? symbol in the lower left hand corner (bottom).

hypothetical Harding County ranch that is enrolled in the GF&P Walk-in Area program and also holds leases on SD State School and Public Lands and US Forest Service Properties near the ranch. We also show a mythical Day County Ranch with various pastures and crop fields.

While the WILMA program offers a simple print icon for printing maps, perhaps the the greatest drawback to the program is that it does not allow the user to save maps in a way that they can be easily retrieved and edited. To save a WILMA map electronically, the user must take a screen shot of the map while in the program and then paste it into a standard document program. This allows the user to access and print the map at any time, but it does not allow for editing.

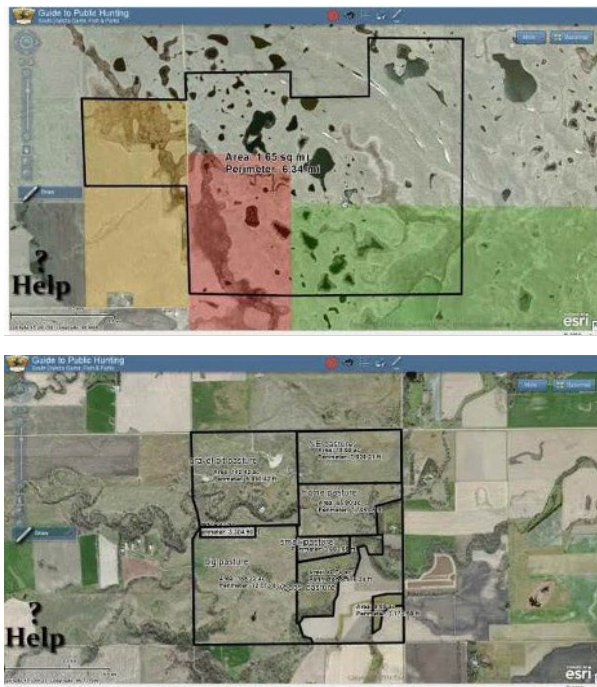


Figure 8: The SD GF&P WILMA mapping system includes base background maps. Top example is a hypothetical Harding County ranch that includes Walk-in Area, State Game Production Area, and Forest Service leases. Bottom example is a Day County farm that includes several pastures and crop fields.

Google Earth:

<http://www.google.com/earth/>

Google Earth Pro:

<http://earth.google.com/pro>

Perhaps the most user-friendly free mapping systems available for common use are Google Earth and Google Earth Pro. Both are now available as free downloadable software. To download the free version of either Google Earth or Google Earth Pro, simply visit <http://www.google.com/earth/> and follow the download instructions. Once installed, the user can easily access the familiar earth logo that will automatically show up on the computer's desktop. In cases where Google Earth was previously installed, upgrading to Google Earth Pro is very simple. The program automatically interacts with existing files Google Earth files and places them in Google Earth Pro. For general use, the Google Earth mapping programs have many user friendly tools. The user can select from a variety of basic background

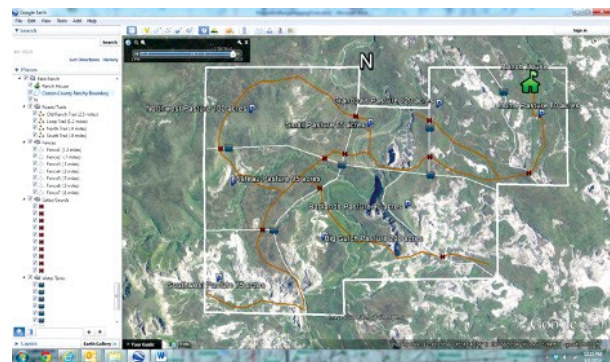


Figure 9: In this Google Earth 'Fake Ranch' example, we've organized our ranch into various folders along the left hand side, starting with the main ranch boundary and including several typical ranch features. Pasture acreage can be obtained by drawing the ranch or pastures in the Web Soil Survey, WILMA, or other sources.

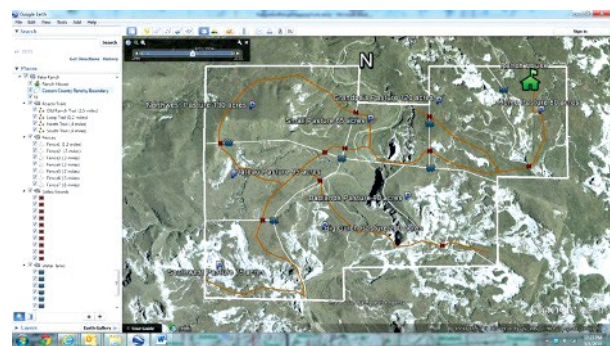


Figure 10: Selecting various years of background imagery can provide the user with historical information on land use for the ranch. This can be beneficial when acquiring new grazing property or evaluating the current ranch, especially when validating areas of historic disturbance, old fence lines, invasive species, or other historic ranch uses.

layers including roads, borders, photos, etc. The user can custom-build maps with a wide variety of options. Figure 9 shows what a typical working screen in Google Earth looks like to the user. In our hypothetical example, we've created a Corson County, SD ranch named Fake Ranch. Along the left hand side the user can arrange map items in an organized fashion. Under the Fake Ranch folder we've arranged our information as fence lines, gates, roads, water systems, and pastures. Categories are at the discretion of the user and are limitless.

Typical ranches may also include labels for such features as weeds, monitoring points, old fields, irrigators, etc. into organized folders. Across the top of the page are the tool icons that the user can select from for drawing lines, shapes, placing markers, shading, or selecting from various historic aerial background photos. When a tool is selected for drawing, the program affords the user several options for line weight, color, text size, or other modifications. If the map becomes too cluttered, simply checking the boxes in the left hand files will turn that portion of the drawing on or off, allowing the user full control of the map.

Google Earth programs also have several features that allow for additional evaluation of the ranch landscape, including the ability to choose from several base photo options. In Figure 9, the slide rule at the top of the map indicates that an aerial photo from 2010 was selected as the base map. In Figure 10, we've changed the base map to a 2004 aerial image simply by sliding the selector arrow to the left on the timeline (white arrow).

Figure 11 also shows the ability of the user to easily change the angle of projection and increase/decrease the elevation of the view in order to get a sense of the topographical relief of the ranch. Simply by moving the cursor across the screen, the user can obtain a constant reading of latitude, longitude, and elevation at the point of the cursor. This information is reported in the lower right hand information bar on the screen.

Once drawn, the map or image can be saved to Google Earth simply by selective SAVE under the file tab in the far upper right portion of the screen. The maps and images can also be save, copied,

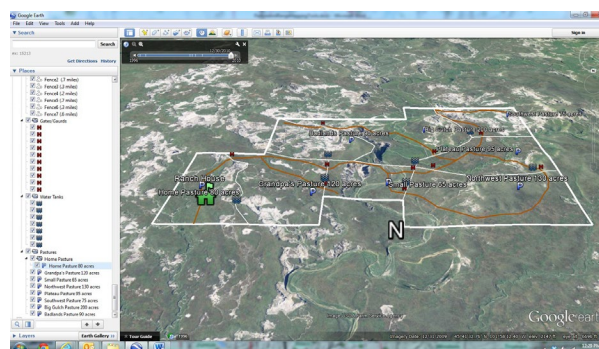


Figure 11: Google Earth provides the user to easily change the view. In this example, we've changed our point of view to looking at Fake Ranch from the north. We've also chosen to change our view from top-down (as in Figure 10) to a more horizontal view that shows topography. The yellow box in the lower right hand portion of the screen constantly reports latitude, longitude and elevation as the user moves the cursor across the screen.

printed or stored through simple windows similar to any other type of file. One of the fundamental advantages Google Earth provides is the opportunity for the use to save his or her project and then return to the project at a later date to update, edit, or otherwise modify the map; allowing for accurate accounting of new pasture areas or improvements/changes to

The zoom function of the program allows the user to focus on certain areas with more detail. This feature is helpful on large ranches with multiple pastures or paddocks, and is especially valuable in situations where a great deal of information may need to be labeled in a relatively small area. In Figure 12, we focus on the northeast portion of Fake Ranch, detailing more information than could be included on the whole-ranch map.

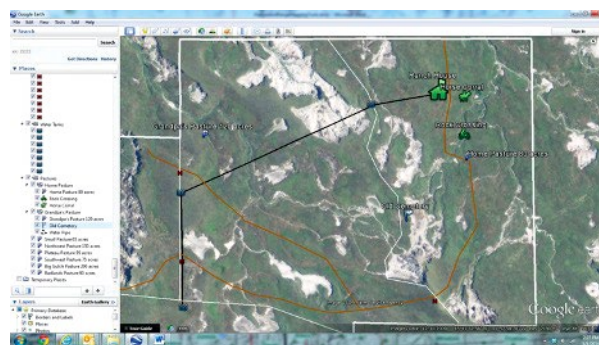


Figure 12: The zoom function of the Google Earth program allows the user to focus on certain areas in more detail. In this example we are focusing on the northeast portion of Fake Ranch. The zoom allows us to highlight additional map features such as Rock Crossing, Old Cemetery, Horse Corral, and Water Pipes.

While Google Earth allows the user to measure distances and create labels accordingly, it does not provide a tool for measuring area. However, the addition of the area measure tool is now available with the free version of Google Earth Pro. In addition to the area measuring tool, Google Earth Pro also offers the option to import shape files. What this means for the rancher is that shape files such as field edges, pastures, and features can be created in a more traditional GIS system and transferred into the Google Earth Pro program. For example, if an agency staffer creates a map of a ranch, the files can be imported into the producer's own Google Earth Pro files.

Finally, The University of California Davis' California Soil Resource Lab offers SoilWeb, a free tool that interfaces with the free version of Google Earth and Google Earth Pro for determining soil

types based on the Natural Resources Conservation Service's soil maps (similar to the Web Soil Survey). This application can be accessed by visiting the California Soil Resource Lab website at <http://casoilresource.lawr.ucdavis.edu/soilweb-apps/>. Users can click on the Soil Web Earth link in the website. By downloading this information, the user can overlay soils maps on the ranch within the Google Earth mapping programs (see Figures 13 & 14).

Acknowledgements: Information on the WILMA mapping tool was provided in part by Chelsea Kruause, Division Staff Specialist – GIS Coordinator, SD Department of Game, Fish, and Parks. 523 E. Capitol Ave, Pierre, SD 57501.

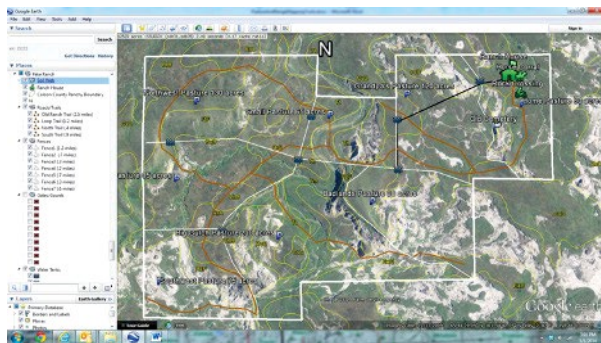


Figure 13: The California Soil Resource Lab offers SoilWeb, a free feature that can interface with the Google Earth program allowing the user to overlay soils data on the Google Earth map.

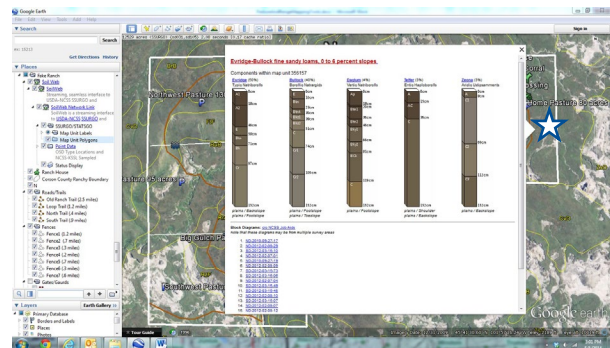


Figure 14: When the SoilWeb feature is turned on in Google Earth, the user can simply click on any point of the ranch and receive information on that particular soil (as indicated by the arrow on right hand side of the soil information box near the white star).

References

California Soil Resources Lab: <http://casoilresource.lawr.ucdavis.edu/soilweb-apps/>

Google Earth: <http://www.google.com/earth/>

Google Earth Pro: <http://earth.google.com/pro>

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at <http://websoilsurvey.nrcs.usda.gov/>. Accessed 5/1/2014. <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

South Dakota Department of Game, Fish and Parks: <http://gfp.sd.gov/>

South Dakota Department of Game, Fish, and Parks. Wildlife Inventory Land Management Application (WILMA): <http://gfp.sd.gov/images/WebMaps/Viewer/WILMA/>