Curry County Soil and Water Conservation District
Post Office Box 666 - Gold Beach, OR 97444 - Phone (541)247-2755 - Fax (541)247-0408

January 20, 2015

Senator Richard Devlin, Natural Resources Ways and Means Subcommittee Co-Chair
Representative Dan Rayfield, Natural Resources Ways and Means Subcommittee Co-Chair
c/o Linda Gilbert, Legislative Fiscal Office
900 Court St. NE, Room H-178
Salem, OR 97301

Subject: A Letter in Support of the Department of Geology and Mineral Industries

I am writing on behalf of the Curry County Soil and Water Conservation District (Curry SWCD) Board of Directors to express support for the continued funding of the Oregon Department of Geology and Mineral Industries and the technical products that they produce. I am the Technology and Data Management Coordinator for the Curry SWCD and our district has benefited from several of the technical products that DOGAMI has produced, particularly the Lidar Data Imagery Series.

The South Coast publication area contains the coastal portion of Curry County inland to approximately the federal lands boundary. Our area was flown in 2008 and through an agreement with the Oregon Watershed Enhancement Board (OWEB) DOGAMI was able to provide the data set to Curry SWCD. This enabled us to obtain the lidar data for use in our restoration work, which has been invaluable to us in a variety of ways.

The Southern Oregon Coast is a rugged and densely vegetated landscape for which accurate spatial data and topographic representations have been lacking. DOGAMI's Lidar Data Imagery Series has filled a major gap in that regard. The data set has allowed our office to provide landowners with a higher level of technical assistance, saving numerous hours of field checking stream locations, road and stream crossing locations, and topographic gradient. Having access to this more accurate information allows us to design better and more efficient restoration projects on private agricultural and forestry lands that ultimately benefit native fish populations through sediment reduction and improvements to water quality.

Some of the derivatives of this data set that we use often are elevation contours, vegetation heights, slope gradient classification, and topographic hillshade model. Projects such as an off-stream watering system on grazing land allow ranchers to fence out livestock from streams and riparian areas. The accuracy of the elevation data contained within the lidar data set allows us to design the most effective and efficient system possible for a landowner given that in the past we had to estimate elevation gain/loss over large areas, thus leading to either overdesigned or undersigned systems that may cause a landowner to abandon it over time. This is only one example where the lidar data set has allowed us to address agricultural water quality issues that are the target of Senate Bill 1010, the Agricultural Water Quality Management Act. I have attached a copy of a document that goes into further detail about the ways we have used DOGAMI's Lidar Data Imagery Series.

We understand that funding choices can be difficult; however, the services that DOGAMI provides to Oregon are wide ranging and beneficial to many different users. From our uses to those of public safety DOGAMI is a valuable asset, and we hope that you will continue funding at a level that will allow DOGAMI to continue providing a high level of technical products for the benefit of all Oregonians and the natural resources that sustain our lives and livelihoods.

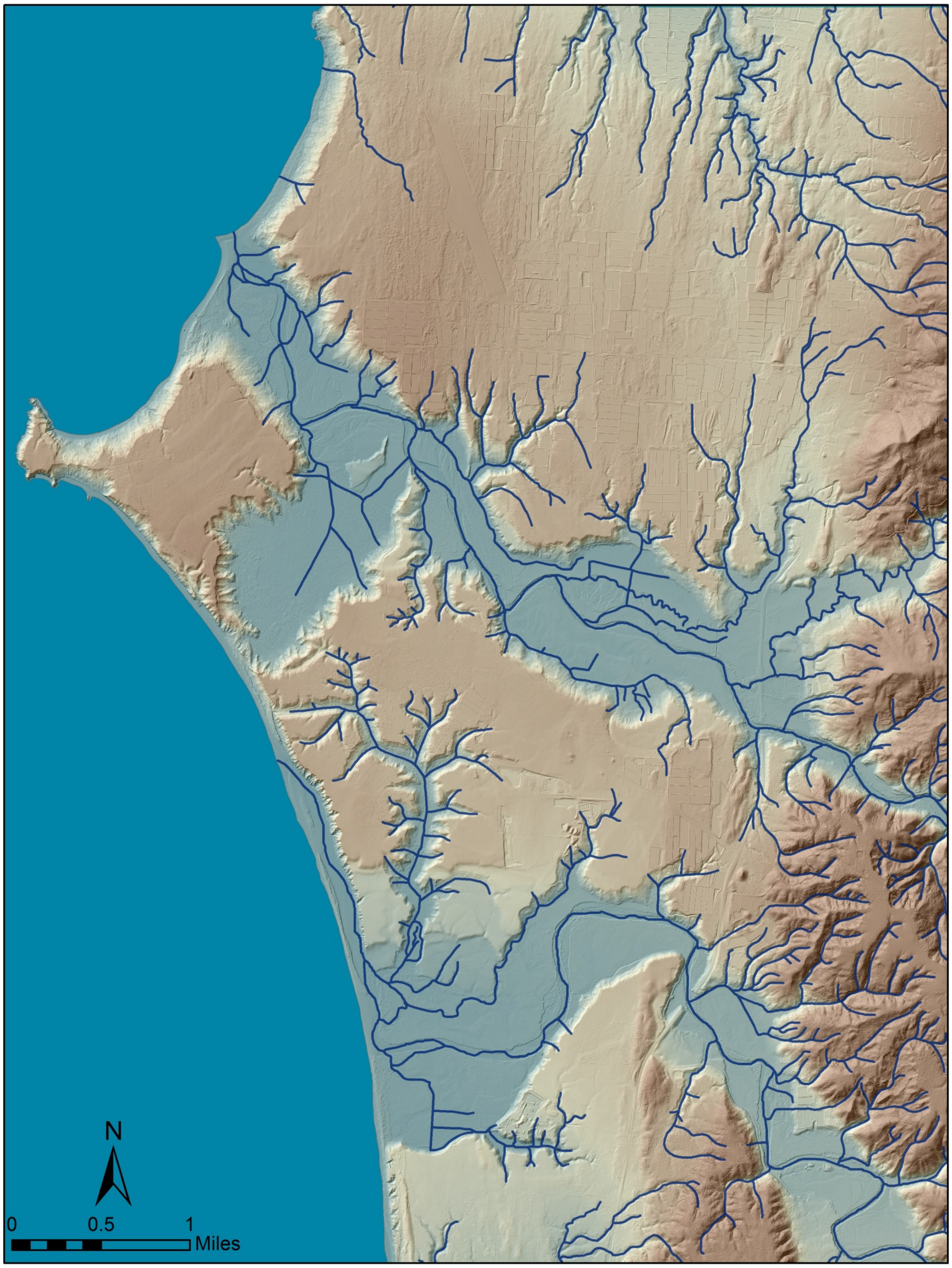
Thank you for your consideration and time.

Sincerely,

Erin Minster
Technology & Data Management Coordinator
Curry County Soil and Water Conservation District
29692 Ellensburg Avenue
Gold Beach, OR 97444
541-247-2755 ext3#

Steve Kalina
Chair
Curry County Soil and Water Conservation District
29692 Ellensburg Avenue
Gold Beach, OR 97444
541-247-2755

What Lidar Does For Us



Prepared by Erin Minster for the Curry County Soil and Water Conservation District

BACKGROUND

The Curry Soil and Water Conservation District (Curry SWCD) is tasked with assisting landowners and local governmental units with planning for and applying resource conservation measures in order to maintain and improve the quality of soil, water and related resources. The Curry SWCD sponsors and supports two local watershed councils, the South Coast Watershed Council (SCWC) and the Lower Rogue Watershed Council (LRWC), in order to represent the varied geographic and community interests of the Southern Oregon Coast.

Lidar was flown in the summer of 2008 in Curry County along a coastal strip that includes most of the private lands inland to the various federal lands boundaries. In 2011 the Oregon Department of Geology and Mineral Industries (DOGAMI) allowed distribution of available Lidar data to watershed councils through the Oregon Watershed Enhancement Board (OWEB).

THE THINGS WE DO

Together the district and the councils implement a wide range of restoration projects aimed at improving salmon rearing and spawning habitat, reducing erosion in the headwaters and enhancing riparian functions. Types of project include:

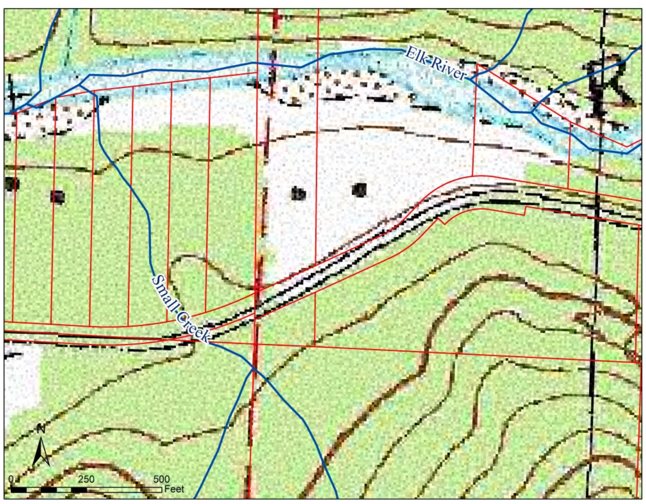
- Fish Passage Improvements—culvert replacement, removal and velocity reduction.
- Sediment Reduction —drainage improvements, stream crossing removal or re-siting, gully stabilization.
- Off-Stream Livestock Watering—removes pressure on streams from livestock.
- Riparian Planting—voluntary riparian setbacks planted and fenced, sometimes enrollment in CREP (Conservation Reserve Enhancement Program)

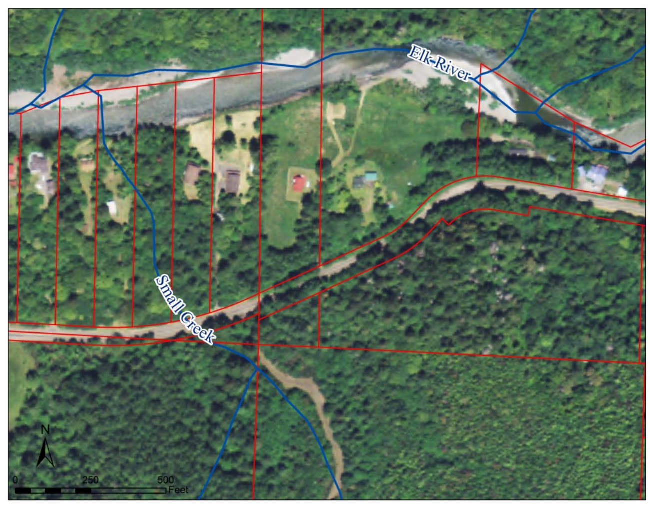
HOW LIDAR INFORMS THE PROCESS

Prior to the availability of lidar the spatial accuracy of mapping products specifically streamlines and watershed boundaries on Oregon's south coast was marginal. The extreme topography and intense vegetative cover made it difficult to obtain accurate locations for streams and other small landscape features. Given that lidar can "see through the trees" the benefit of such technology is apparent when compared with existing data sets. Additionally, the terrain and vegetation can make the use of GPS not practical, particularly in the smaller streams and incised valleys found throughout the South Coast watersheds. Often we use a lidar derived hillshade base map of the project area and are easily able to locate ourselves where GPS normally fails. Below are some examples of other ways we use lidar data and its derivative products.

STREAM LOCATIONS

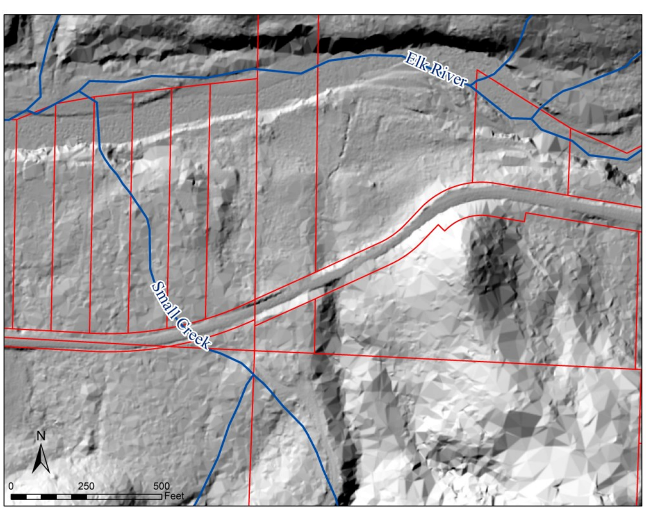
The National Hydrography Dataset (NHD) of which the Oregon Framework Hydrography is a subset was created from data at a rather coarse scale. Errors are common and while not critical for all applications, for us the exact location is critical when approaching a landowner about a creek that supposedly exists on their property. Below are a few examples of what was available before lidar and a lidar derived hillshade showing the more accurate stream location. Note the location of "Small Creek"

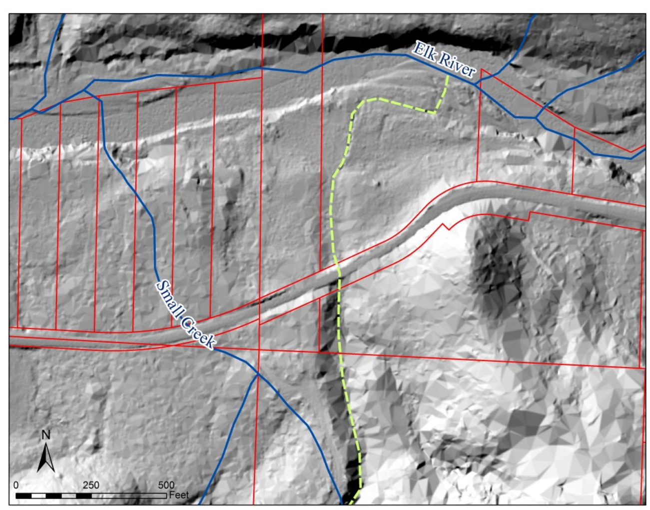




Above: USGS 7.5 minute with the NHD stream layer and parcels overlaid.
Below: NHD and parcels overlaid on the lidar hillshade.

Above: 2012 NAIP with the NHD stream layer and parcels overlaid.
Below: NHD and parcels overlaid on the lidar hillshade with the more appropriate location of Small Creek in yellow.

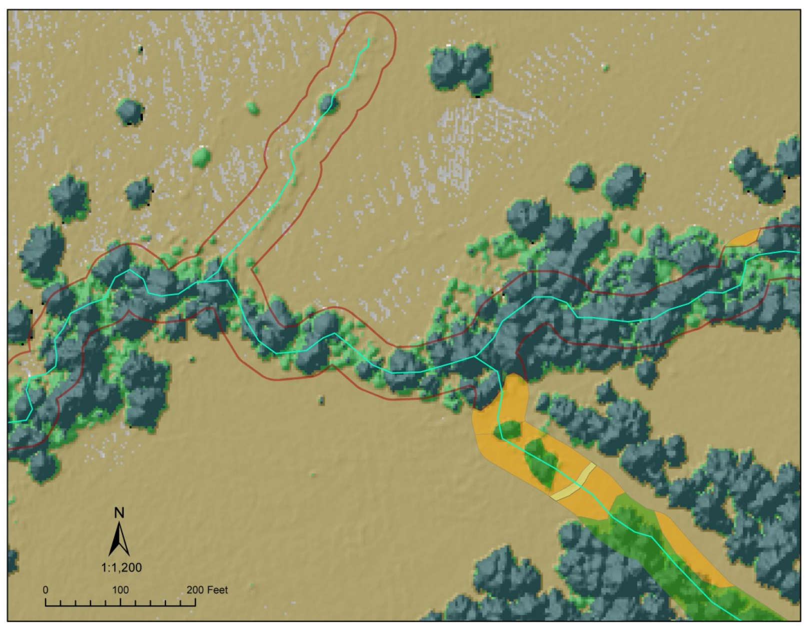




ASSESSMENT

2012 Aerial photo with SVA assessement polygon (red), stream centerline (teal) and the SVA mapping categories.

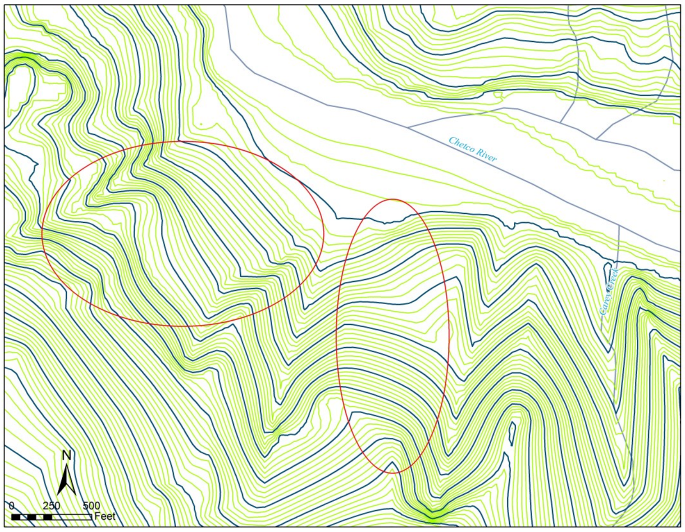
The Oregon Department of Agriculture has recently released an assessment tool, the Streamside Vegetation Assessment (SVA), to help them tell the story of how they are addressing agricultural impacts to water quality. As a District we are tasked with implementing the SVA. The first step is to correct errors in stream location using the National Hydrography Dataset (NHD) as a base. Spatial errors are known to exist in the NHD and we used lidar to better locate them.



Lidar derived vegetation layer broken in to height categories by color; grass (tan), shrub (green), tree (blue) with SVA assessment polygon (red), stream centerline (teal) and the SVA mapping categories.

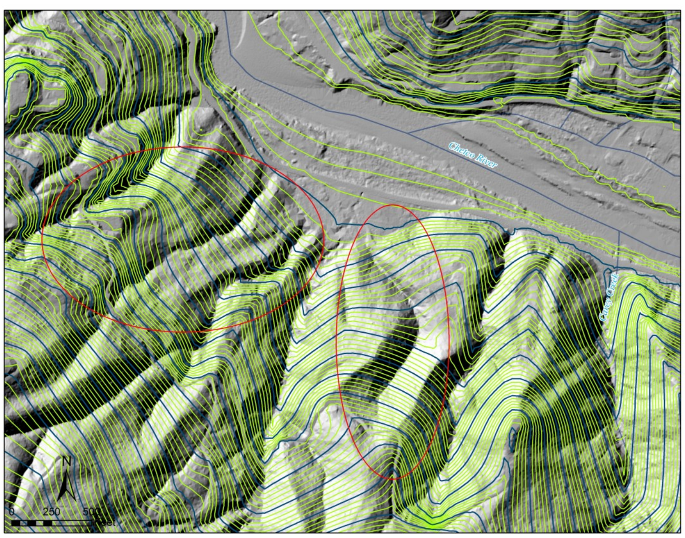
Once the streams are located accurately a 35 foot buffer is created on either side of the channel centerline that will serve as the assessment area. Given the small size of the assessment area it is important that the stream location be as accurate as possible. The assessment area is then broken into categories based on the underlying vegetation or lack thereof. Aerial photography is used to determine the underlying vegetation status. There are three basic vegetation categories; grass, shrub and tree which are further broken out as to whether the vegetation is an agricultural product or a more natural condition. The three categories are basically differentiated based on vegetation heights; grass < 3ft, shrub 3-5ft, tree > 15ft. The 2012 NAIP aerial photography is the most recent imagery available for this particular area and vegetation heights can be hard to determine. To help with the interpretation we created a vegetation layer from lidar DEMs (digital elevation model) by subtracting the bare earth DEM from the highest hits DEM thus leaving only the height of everything above the ground, i.e. vegetation. The resulting vegetation DEM was then used to create a hillshade model of the vegetation overlaid over the vegetation DEM with transparency. Vegetation height was color coded to represent the desired classes.

WHERE'S THE STREAM?

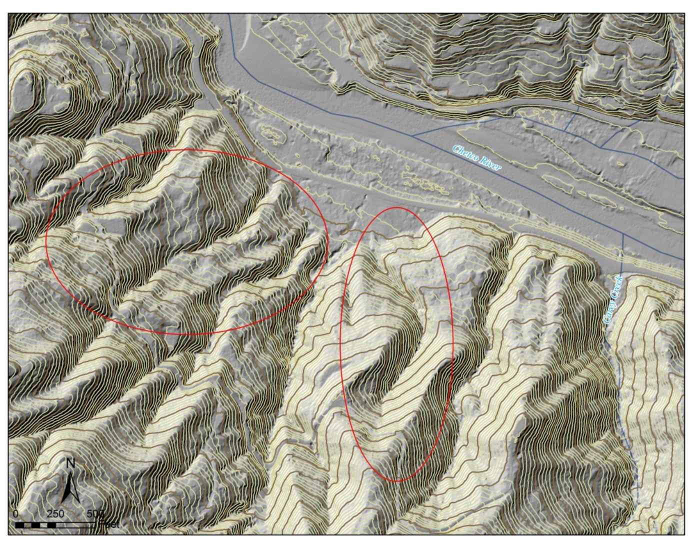


10 foot contour derived from a 10m DEM

When assessing sediment inputs within a watershed it is important to know where all of the possible sources are. Going out during a storm event is the best way to see where turbidity is coming from. However, once you are out there and you start seeing muddy water in the road ditch line it can take considerable time following it to the source. Sometimes your map will not have a drainage course where you think one should be. This can then lead to additional time spent either walking up the muddy drainage or driving multiple roads in an effort to figure out where it is coming from. Making a landowner contact in this case can take a lot of extra time. Since you don't really know how big the drainage is or where it ends you may contact the wrong landowners or create confusion among the landowners. These scenarios can lead to a lack of confidence for the landowner and often an unwillingness to work with people who appear to not know what is going on. The image at the top left shows the contour data available prior to the availability of lidar data. Note how the center of the two red ellipses show slopes that are relatively planar with no drainage course. Now look at the image on the left. Those are the same contours draped over the lidar hillshade. There are indeed drainage courses there that are not reflected in the original contours. While these small drainages may not be significant in terms of fish production or major contributors to flow in the larger watershed they often contain road crossings. Failing road crossings or unmaintained drainage ditches can be significant chronic sources of fine sediment which is then conveyed to the mainstem where impacts to fish can occur. Having accurate topographic data can save significant time when it comes to assessing where road crossings and potential diversions will occur. Additionally, such as the image to the right the ability to display the information accurately is powerful and necessary.

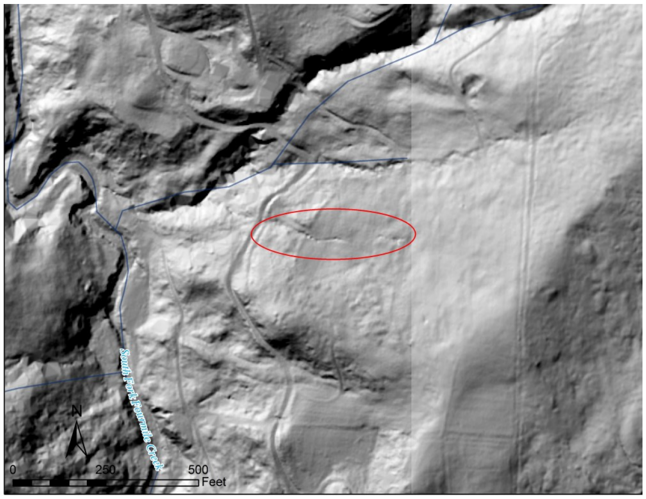


10 foot contour derived from a 10m DEM overlaid on the lidar derived hillshade



10 foot contour derived from lidar overlaid on the lidar derived hillshade

UPLAND GULLIES



Lidar derived hillshade of pasture gully, note the disconnected section at the far right of the red outline.

Upland gullies are a common feature on upland pastures on the Southern Oregon Coast. Pasture gullies manifest as unstable, raw ephemeral stream channels and disconnected gully holes. They generally occur in the upper reaches of a drainage and are the result of converting forestland into open pasture, thus increasing runoff rates and decreasing root structure. Sometimes there is no overland flow between the gully holes during storm events, instead the water and resultant eroded soils are transported underground in open "pipes" that connect the scars in the subsurface which is eventually connected to a more continuous gullied channel. When these gullies occur in moderate– high clay content soils significant amounts of fine sediment can be transported downslope to tributary and mainstem channels.

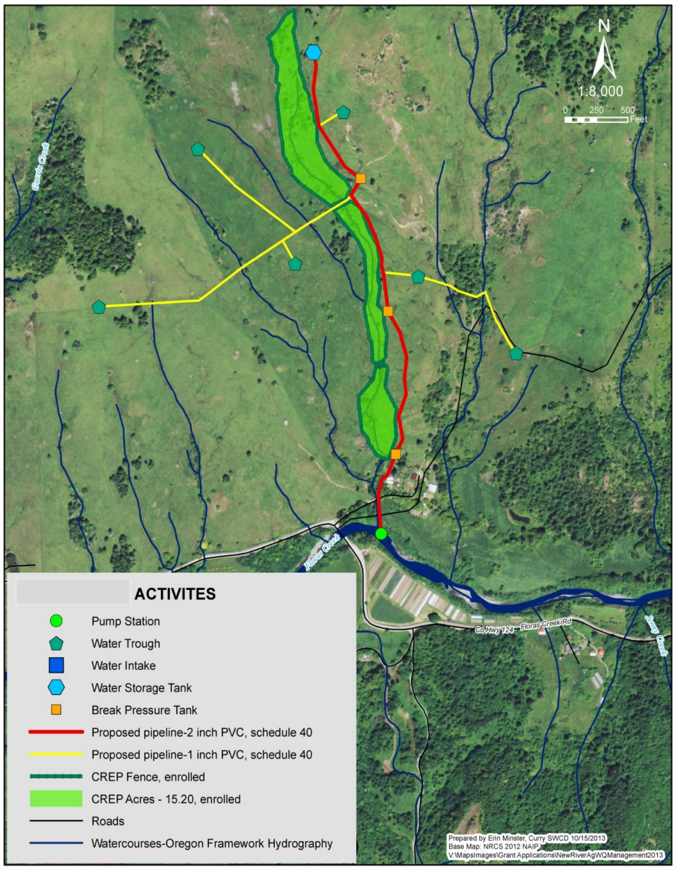
These gullies can be significant point sources of chronic sedimentation into the stream network. The Curry SWCD has successfully treated a number of these sites on several different ranches. The treatment involves filling the nick point, slope break or gully hole with coarse rock, dependent on gully size and gradient, and in some cases fencing and planting the channel. The coarse open rock allows the water to remain in the channel but it creates enough turbulence to cause the finer materials to settle out. This reduction in channel velocity also allows the reestablishment of vegetation. Prior to having the lidar data the process of locating and mapping the location and extent of these gullies was lengthy. As shown in the two pictures at the right these gullies can be hard to spot until you are right on top of them. This particular gully was found on a ranch with about 1,400 acres. Walking every inch of that can take unreasonable amounts of time and once found one must walk the channel/swale/topographic depression all the way to the ridge line in order to find the upper extent. Since the ranchers themselves don't always walk every bit of ground these features can be missed until they turn into a much larger feature. If left untreated they can enlarge significantly and in some cases undermine existing instabilities resulting in large scale mass wasting. Since acquiring the lidar data our efforts for finding and addressing gullies have become much more efficient. We have identified previously unobserved gullies and are able to accurately map their extent without spending any time in the field. This allows us to better estimate treatment costs, plan site access to avoid steep areas where typical heavy equipment can't access, and better represent the project to our grant funders. We have begun mapping these gullies into an inventory and are planning more of these types of projects. With the time and in turn money saved by using lidar to locate, identified, and quantify a larger number of gullies we are hoping that we can put more resources towards on the ground treatment.

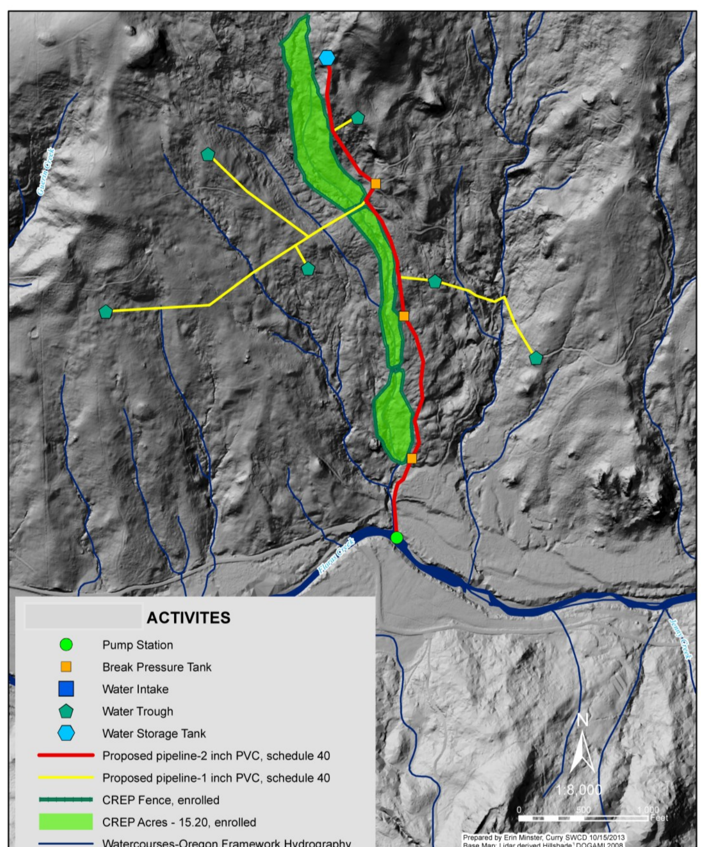
Before photos of the lidar identified pasture gully, in tall pasture grass these features can be hard to locate—careful don't fall in.

After photo one year after treatment (same as above), note the vegetation reestablishing within the rock plug

OFF-STREAM WATERING

When a landowner chooses to fence off a stream either on their own or voluntarily through an assistance program such as Conservation Reserve Enhancement Program (CREP) a need for off-stream livestock watering is created. The Curry SWCD has designed and implemented many of these systems throughout the years, but since acquiring lidar data from DOGAMI we have been able to design more cost effective and efficient systems. In the example at left and below the landowner faces several challenges regarding siting and design of the system. If you just look at the image on the left these challenges are not apparent but once you see what the ground really looks like in the lidar derived image below the challenges become more apparent. Much of this landowners pasture is affected by landslide processes. Having the lidar imagery allowed our staff to try numerous options all while being able to place components such as water troughs and pressure tanks on more stable areas that are buttressed by rock outcrops (bumps in the otherwise rumpled terrain). The other advantage was a more accurate determination of elevation which is critical for design of pump specifications and whether extension lines can be gravity fed or not. Without the lidar this process would consume considerable staff time with the need for multiple site visits just to assess a design option. In some cases where the elevation change is slight the option of a more simplified gravity system may not have been pursued due to the uncertainty of the elevation difference and thus higher risk that the system would not function as designed. With the lidar data we are better able to get the most out of limited funding by streamlining the design process through the reduction of the number of site visits needed, and by having more accurate elevation information choose more appropriate pump and pipe sizes instead of overcompensating for uncertainty in elevation information. Additionally, being able to better site the components to avoid more active areas of large landslide features we can extend the life of the system and reduce maintenance and repairs costs to the landowner.





CONCLUSIONS

Here at the Curry SWCD there is no doubt about the values of the lidar data generated by DOGAMI in 2008. It literally allows us to see the very ground we strive to help landowners preserve and make as productive as possible. Having more accurate topographic data allows us to more efficiently assess, prioritize and plan restoration activities. The ability to accurately display stream locations and restoration needs and activities with regard to landownership is priceless. Effort and time are saved by knowing the real location of topographic and hydrographic features. Being able to show our concerns to a landowner on a map that actually looks like the ground that they know well creates a better sense of trust and understanding. By not having to explain to them the inaccuracies of previously available data sets the conversation can focus more on helping them address the land use issue they are facing. When landowners are given quality information they tend to have more respect for the proposed solutions and those proposing it. Having this level of trust and respect has allowed the Curry SWCD and the South Coast & Lower Rogue Watershed Councils to effectively implement restoration projects in an area that is known for a firm belief in private property rights and a distrust of agencies, government and similar organizations. While there are many benefits to having this data it is only a snapshot in time and with each passing day it becomes outdated. Successive flights would allow for more options when it comes to assessing land use and vegetation changes. The greatest value is that quality data such as this can literally save days of field work which translates to thousands of dollars over time. It can also highlight previously unknown concerns as well as making planning activities much more effective. Lidar continues to enable us to have a richer relationship with the landowners of Curry County in regards to natural resource conservation and restoration—besides it is really cool.

ACKNOWLEDGEMENTS

The Curry SWCD and the South Coast & Lower Rogue Watershed Councils would like to thank OWEB, DOGAMI and The Oregon Lidar Consortium for providing us with the lidar data. We would also like to thank the USDA-NRCS Oregon State Office for providing us with the ArcGIS Desktop software needed for viewing and working with the data.

DATA SOURCES

- 2008 South Coast Lidar Flight: DOGAMI
- 2012 NAIP aerial photography: USDA-FSA
- Parcels: Curry County
- 7.5 Topographic Image: USDA-NRCS, The Land Information Technology Company, Ltd., of Aurora, CO & the USGS
- Field photographs: Erin Minster, Curry SWCD
- Oregon Framework Hydrography Dataset: Pacific Northwest Hydrography Framework group
- NHD: USGS et al
- 10ft contours from 10m DEM: Curry County