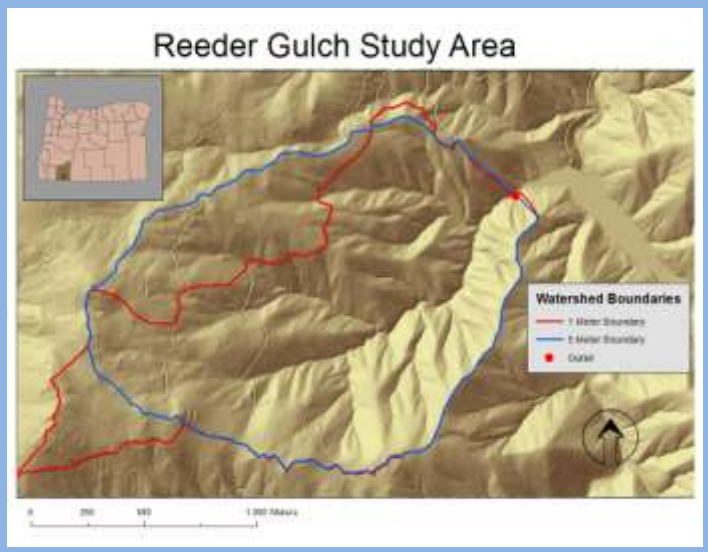
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR



Colin Beck | Ray Hennings | Digital Terrain Analysis | Fall 2011

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

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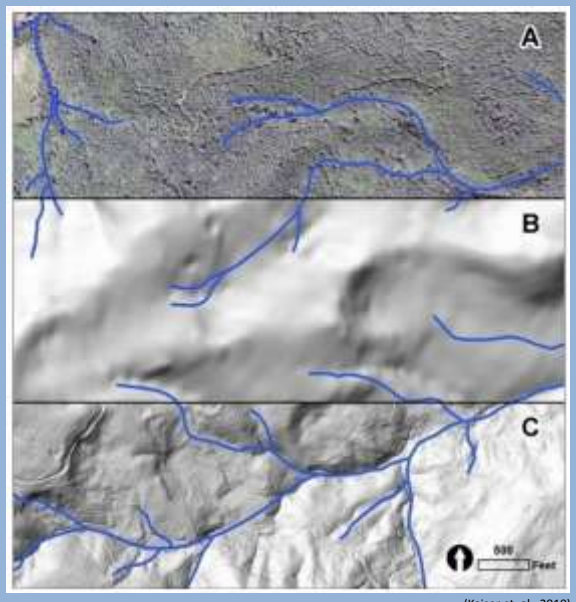


(Kaiser et. al., 2010)

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

Objectives:

1) Determine the optimal DEM resolution for delineating stream networks

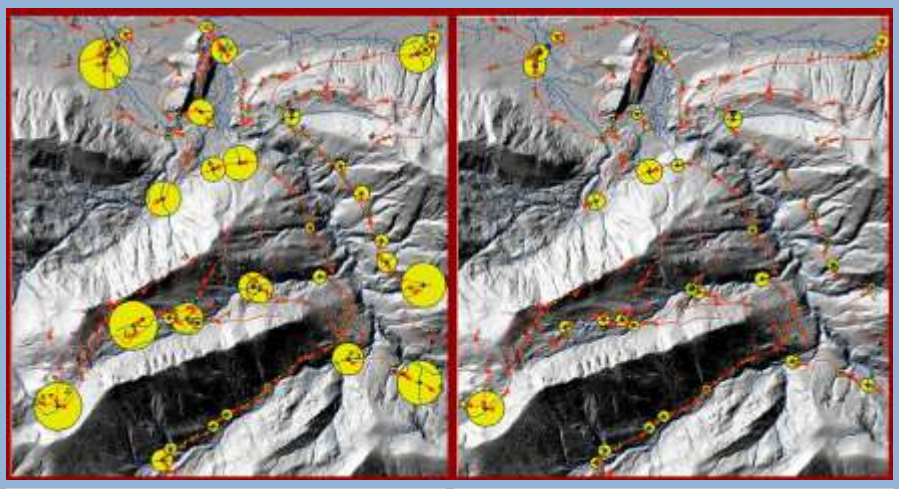
2) Determine whether culvert burning can be used to delineate an accurate stream network from a 1-m DEM

3) Determine whether the 1 meter DEM can be used to extract road features such construction type, tread width, gradient, and ditch relief features

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

All images from http://www.fs.fed.us/GRAIP

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

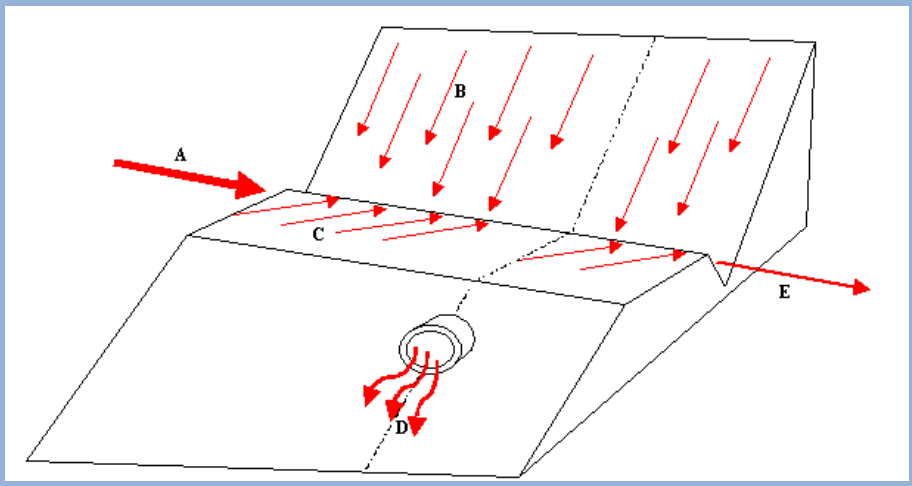


Initial sedimentation from East North Tahoma road network - **42.10 tons/yr**

Sediment delivery from East North Tahoma road network after redesigning the cross drain system - **13.12 tons/ year**

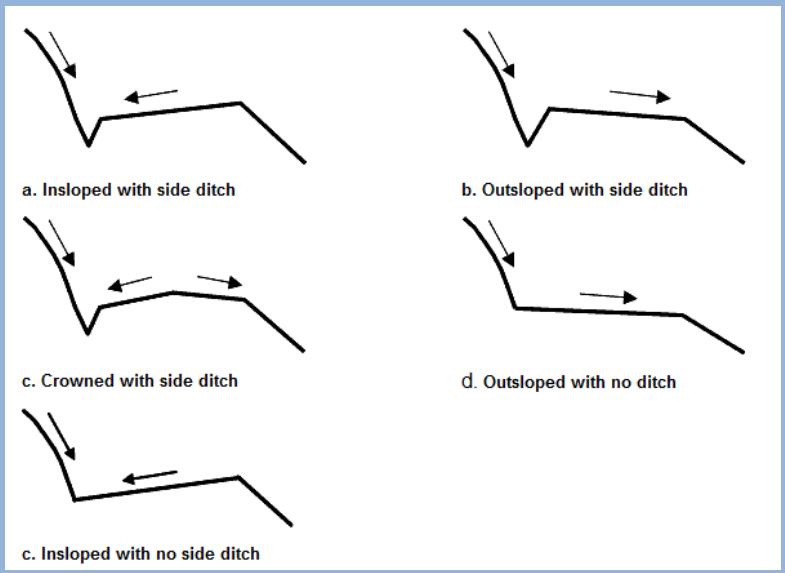
(http://www.ruraltech.org/tools/culsed/)

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR



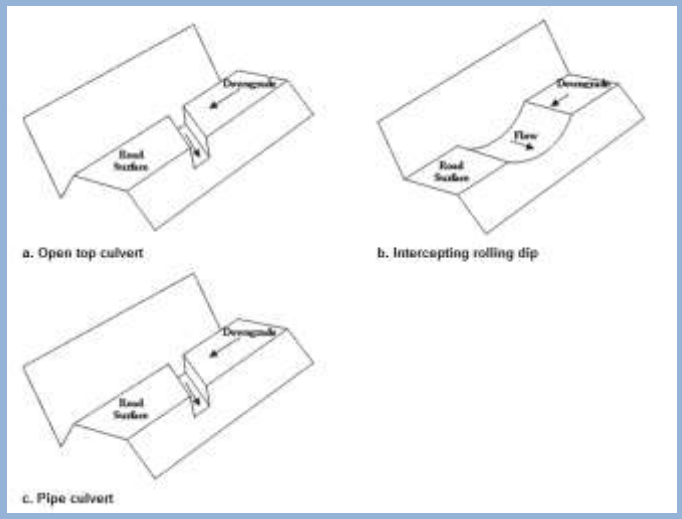
(Damian, 2003)

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR



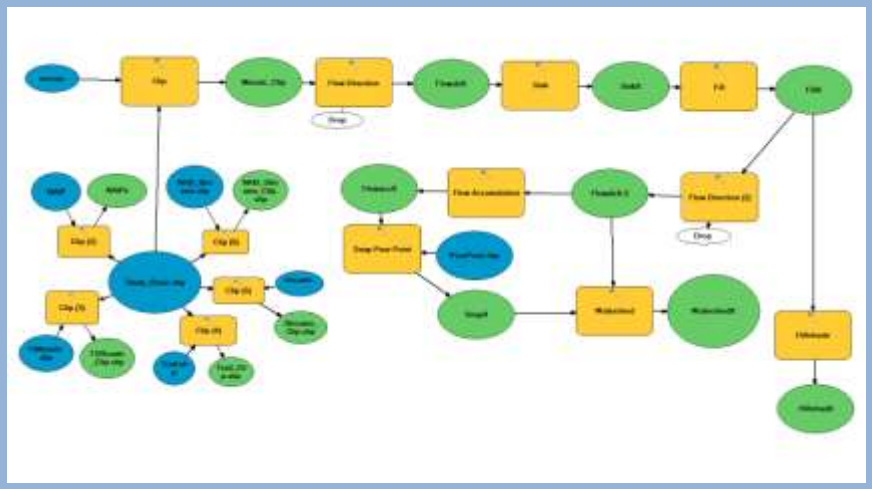
(Damian, 2003)

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

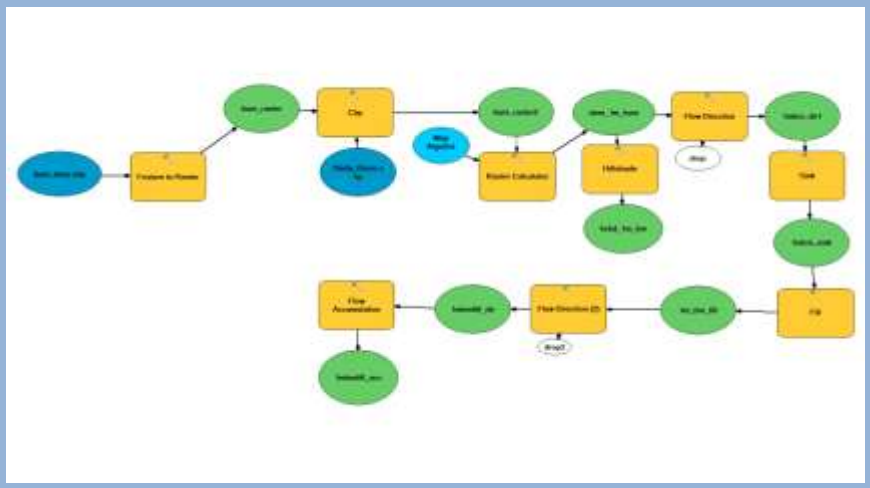


(Damian, 2003)

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

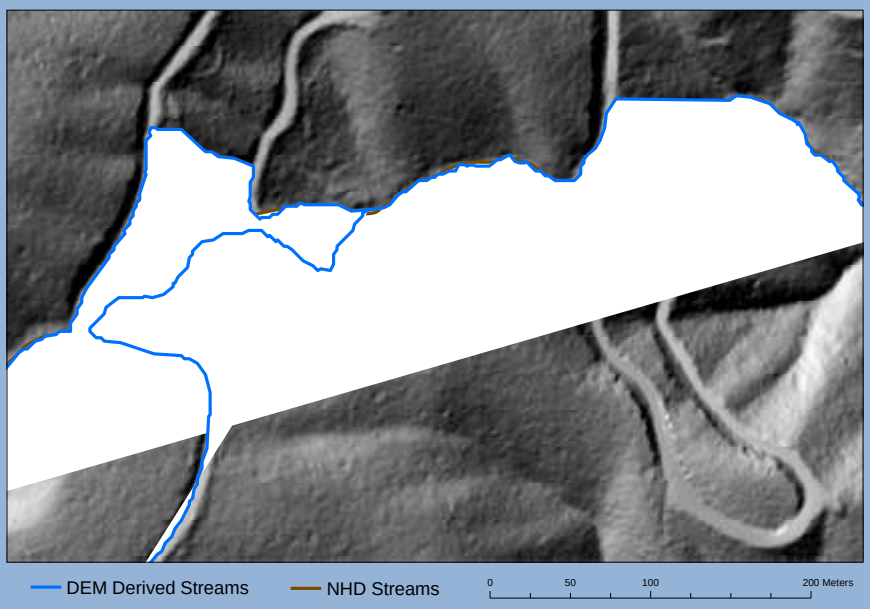


Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR



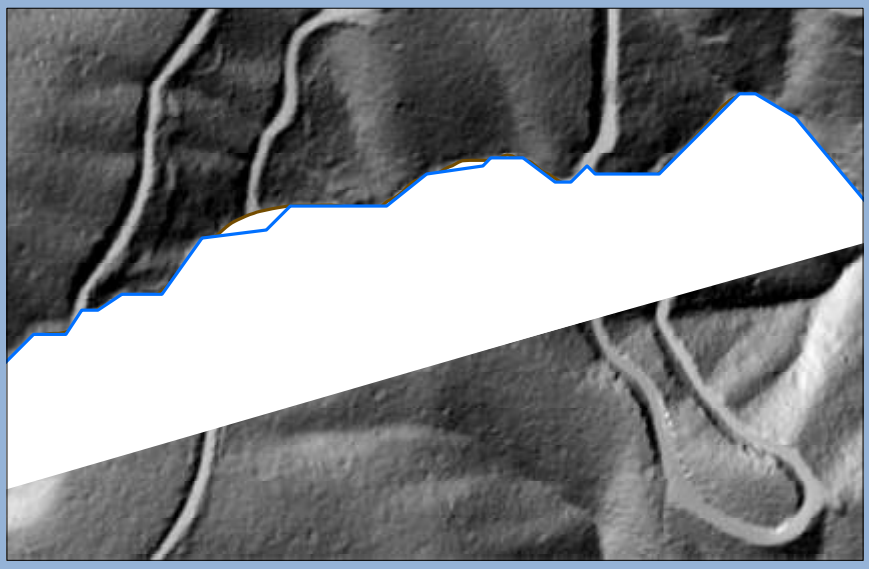
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

1M DEM Derived Stream Network



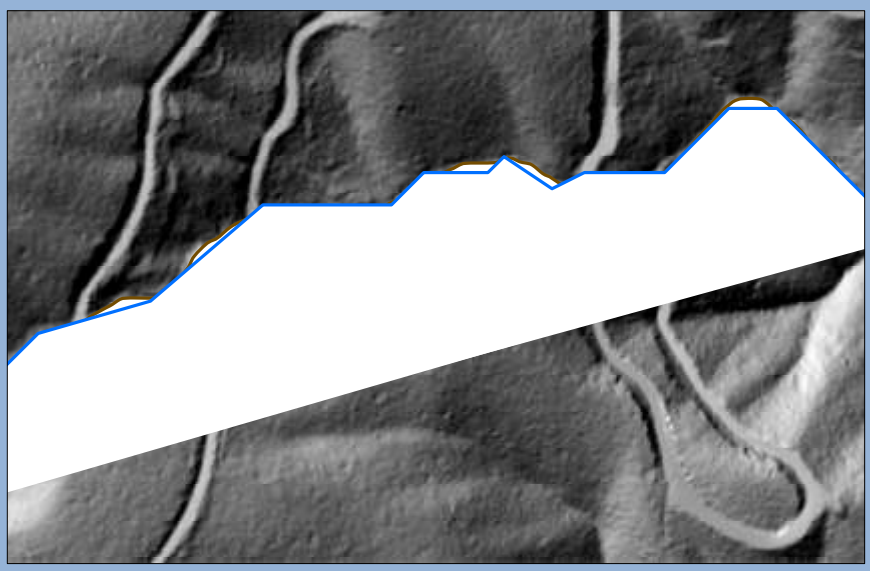
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

5M DEM Derived Stream Network



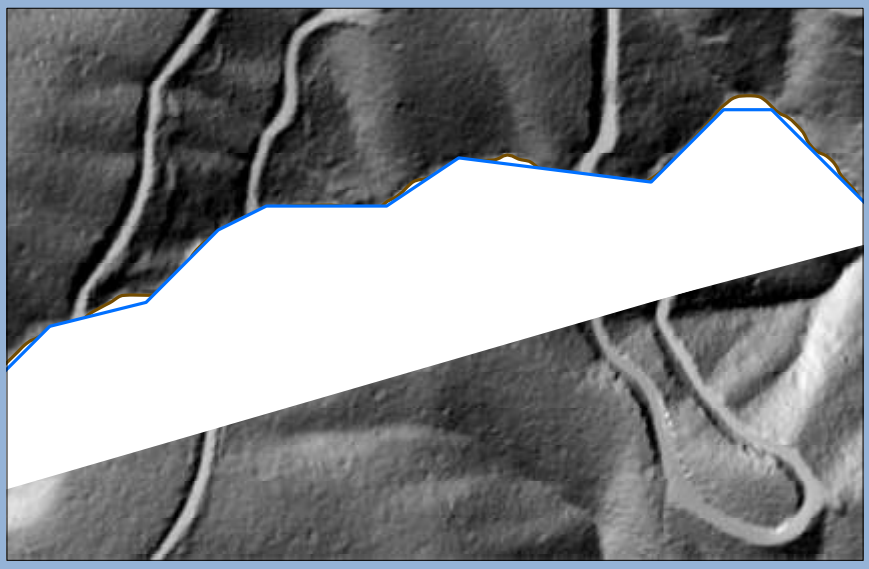
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

10M DEM Derived Stream Network



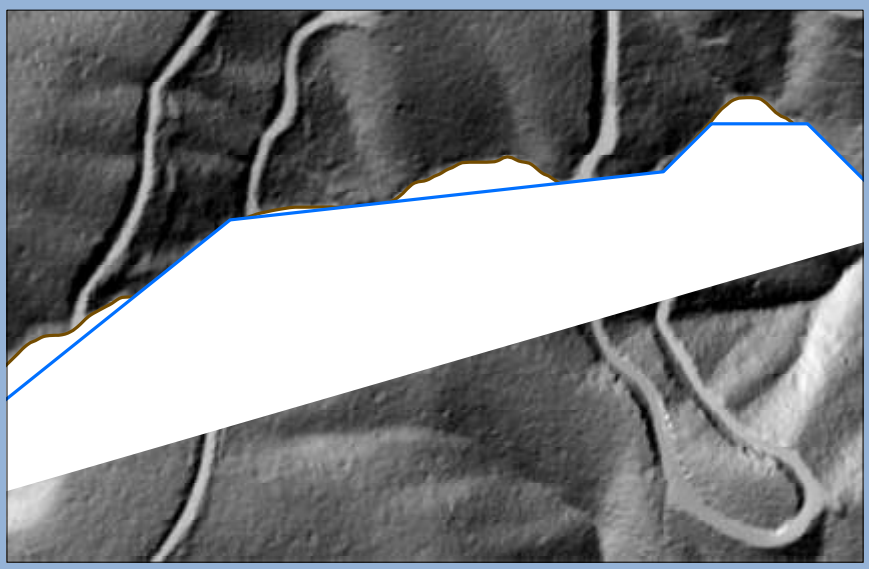
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

15M DEM Derived Stream Network



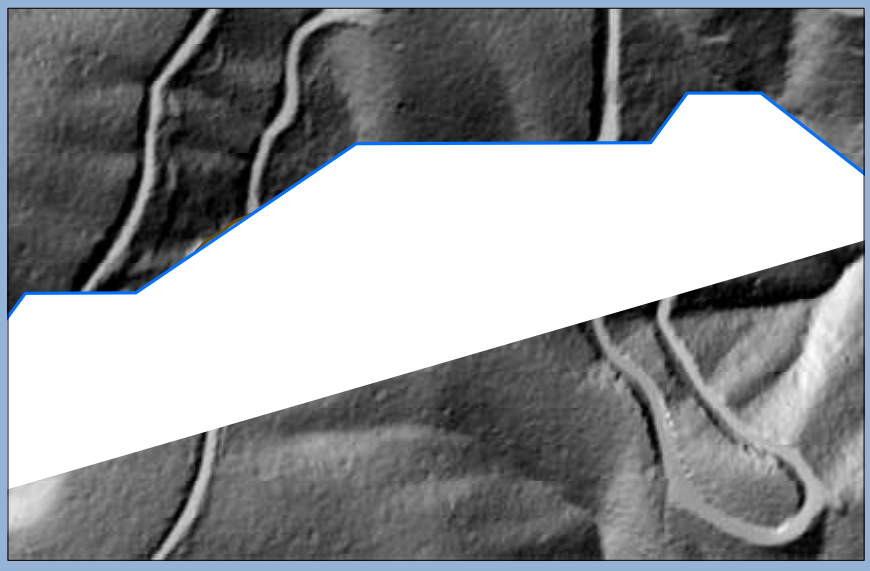
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

30M DEM Derived Stream Network



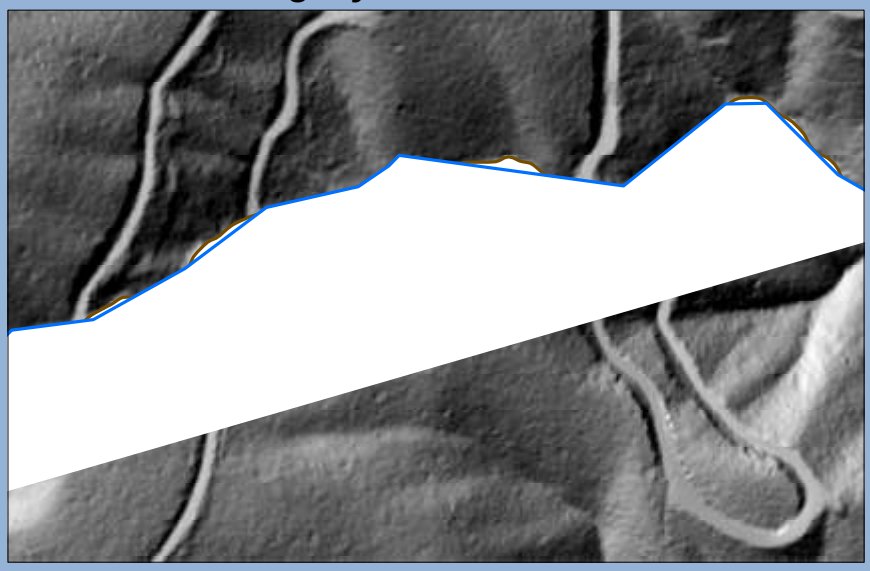
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

30M USGS/NED DEM Derived Stream Network



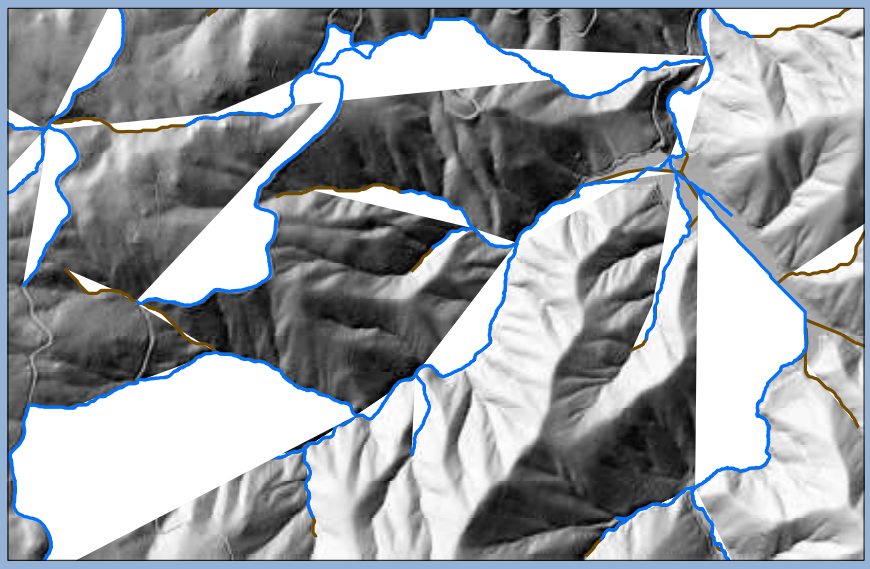
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

USFS Legacy GIS Stream Network



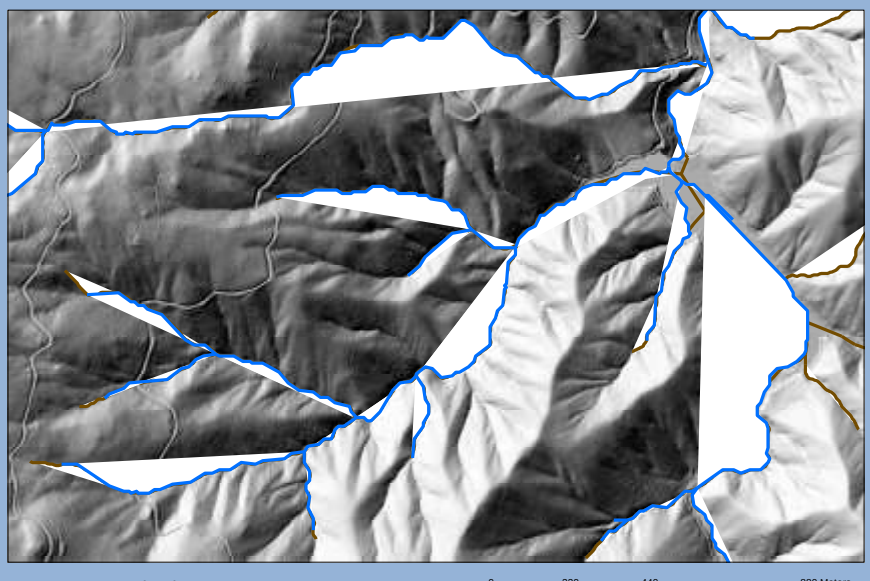
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

1M DEM Derived Stream Network



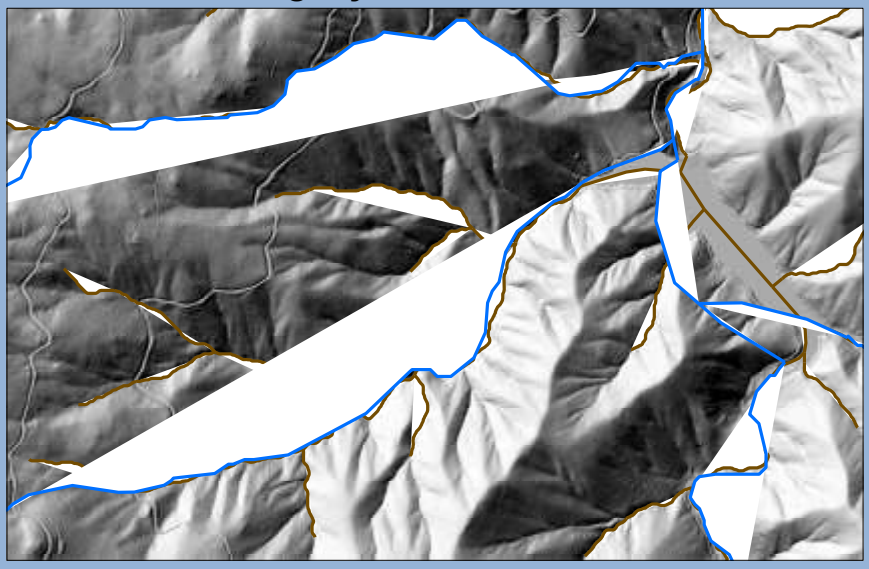
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

5M DEM Derived Stream Network



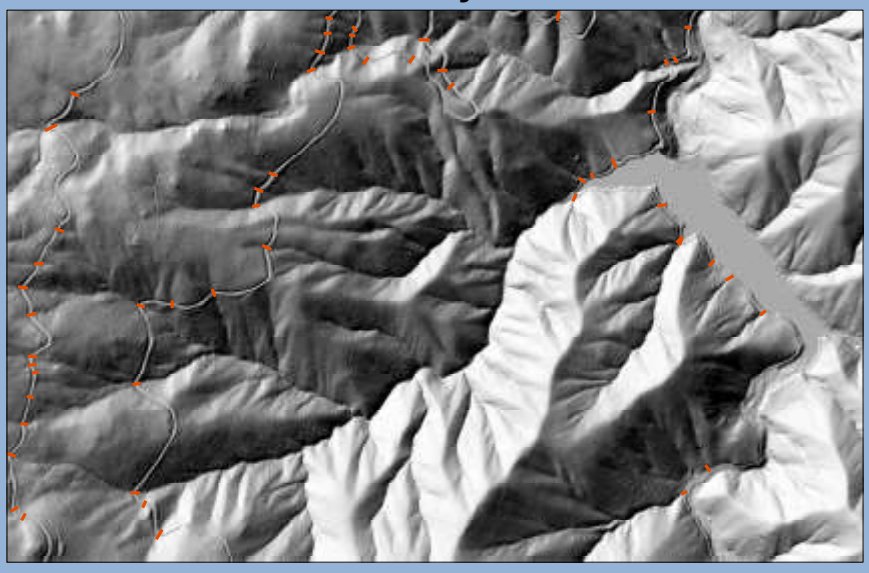
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

USFS Legacy GIS Stream Network



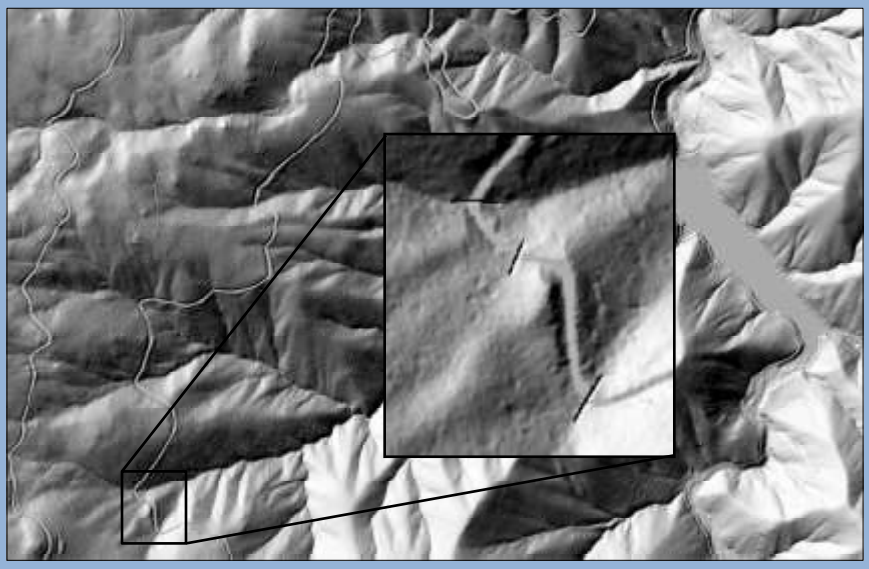
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

Locations of Manually Burned Culverts



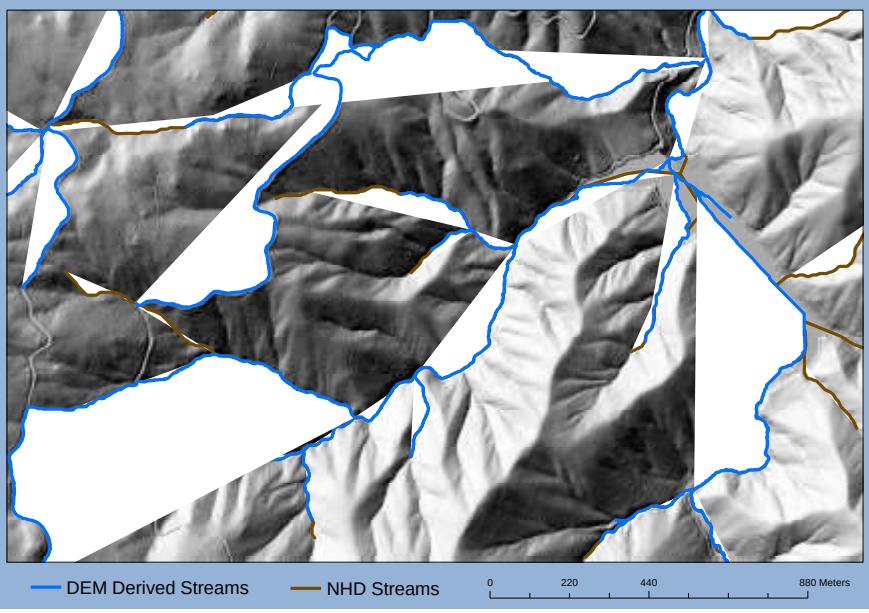
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

1M Hillshade w/ Burned Culverts



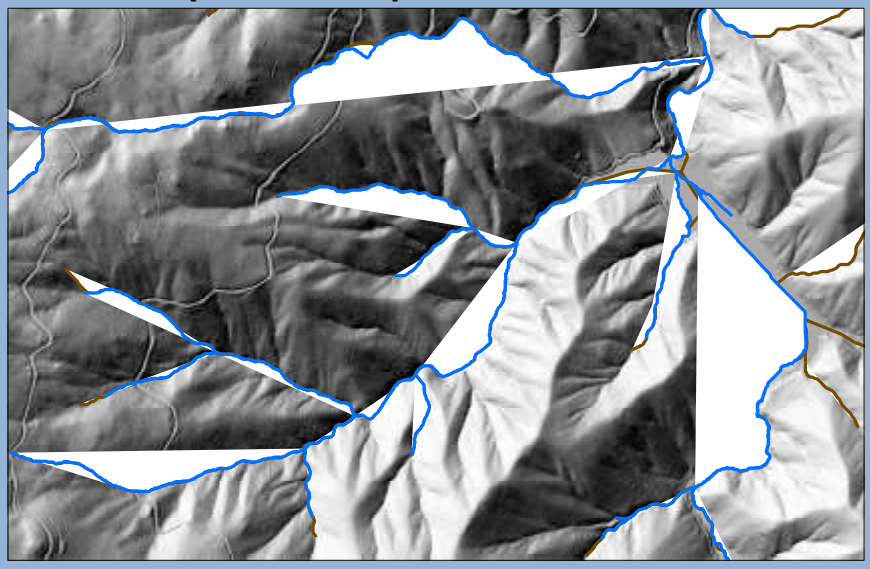
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

1M DEM Derived Stream Network



Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

1M DEM (w/ Culverts) Derived Stream Network



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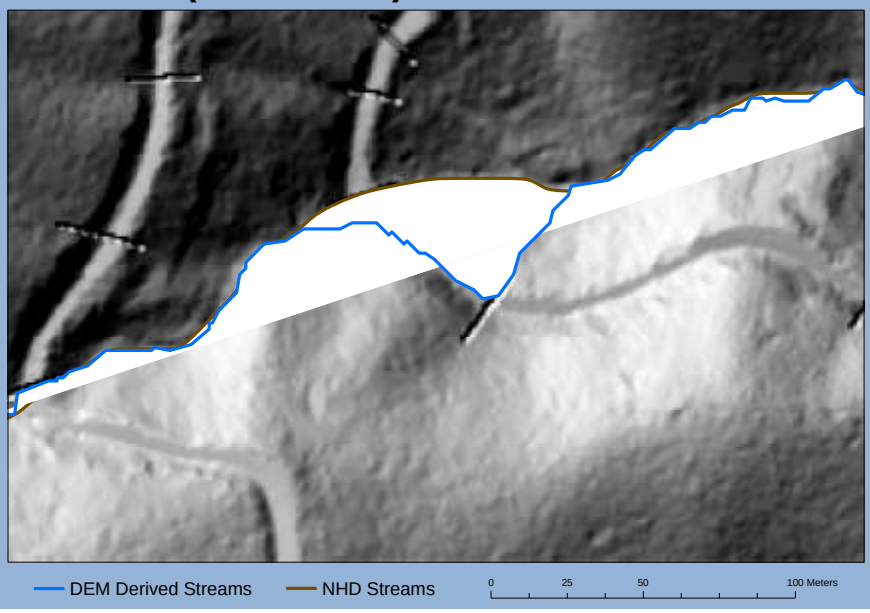
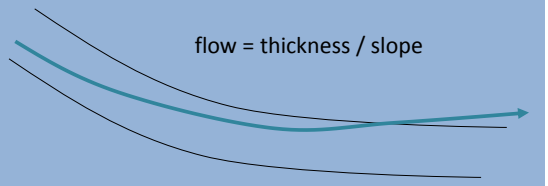
1M DEM (w/ Culverts) Derived Stream Network

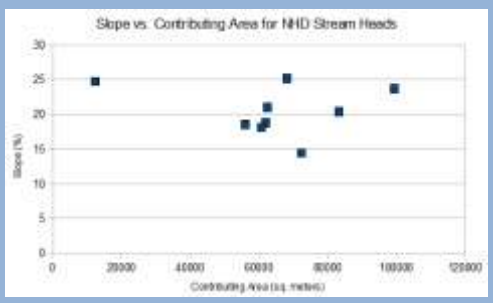


Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

Common Metrics for Determining Stream Head Location

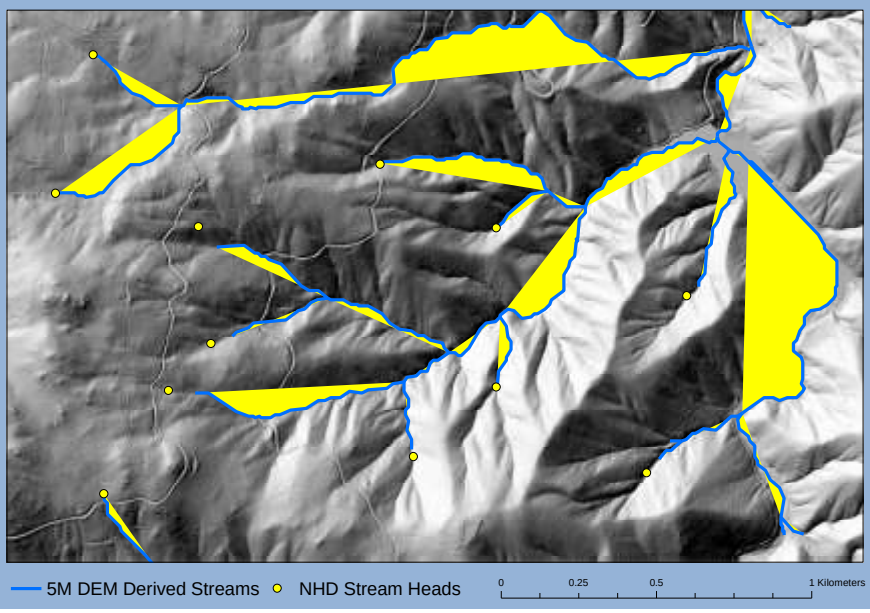
1) Contributing area
2) Slope
3) Curvature





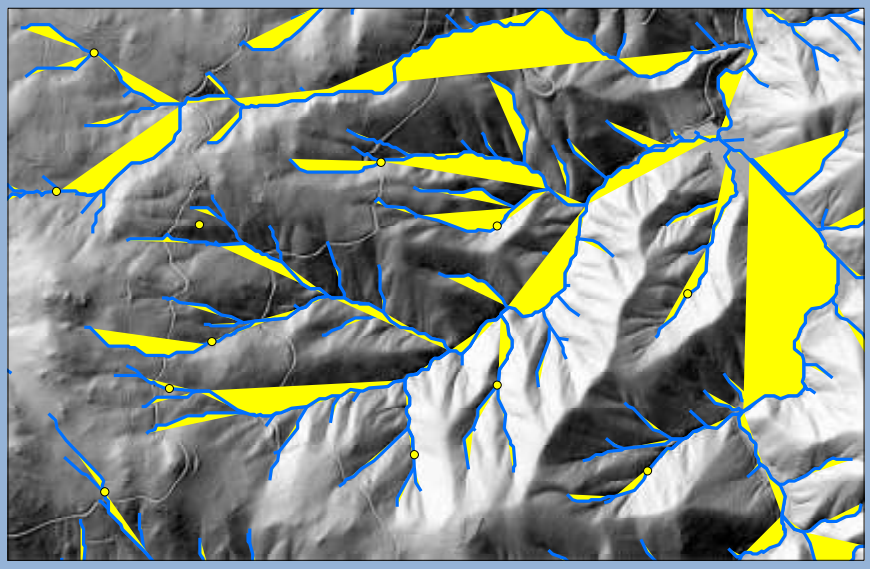
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

Stream Heads - 70,000 Sq. Meter Accumulation Threshold



Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

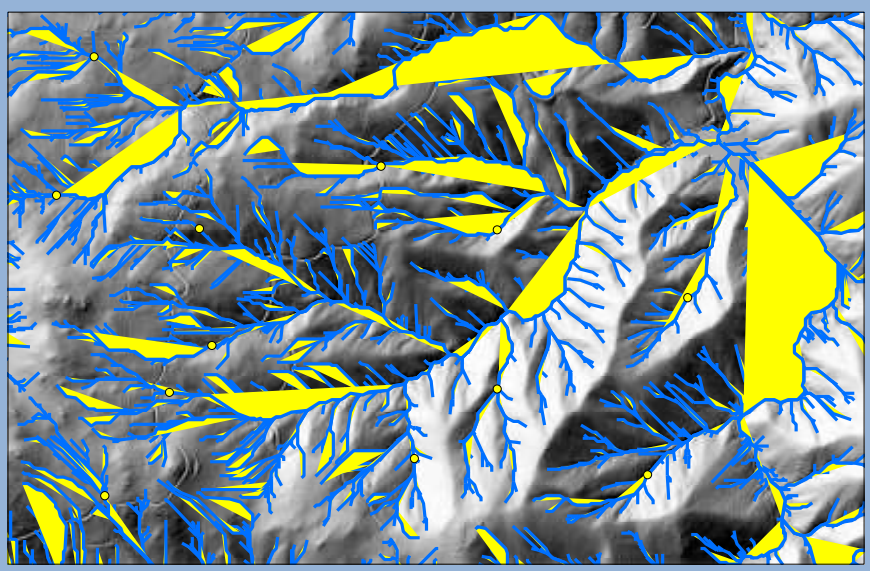
Stream Heads - 10,000 Sq. Meter Accumulation Threshold



5M DEM Derived Streams NHD Stream Heads 0 0.25 0.5 1 Kilometers

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

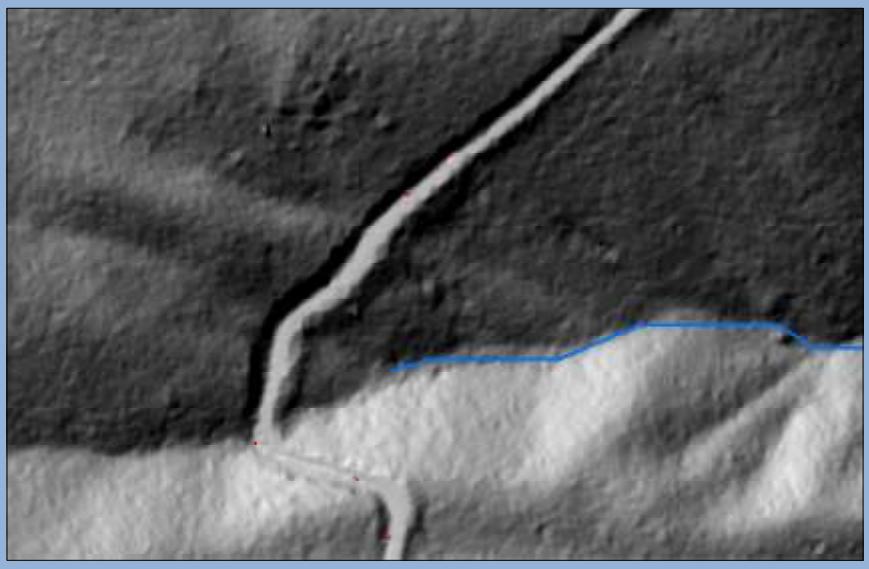
Stream Heads - 1,000 Sq. Meter Accumulation Threshold



5M DEM Derived Streams NHD Stream Heads 0 0.25 0.5 1 Kilometers

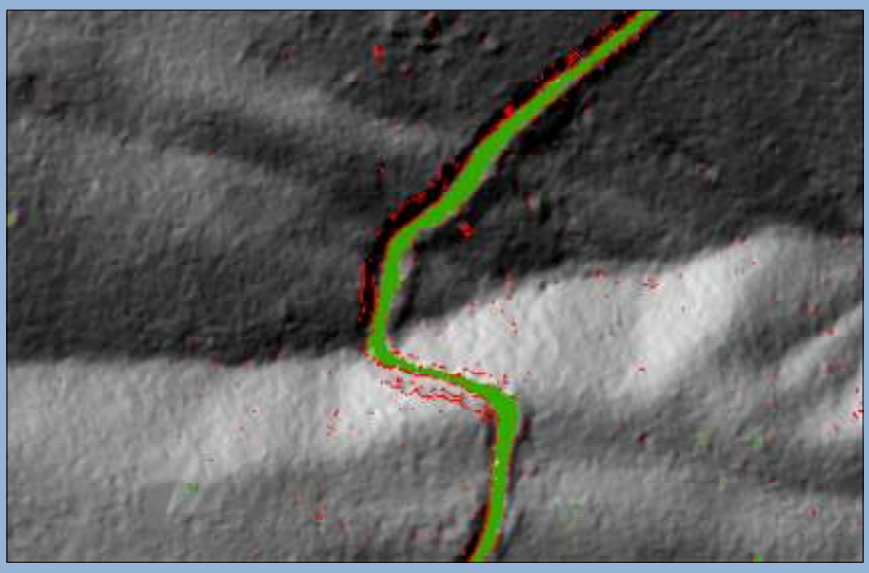
Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

Possible Culvert Locations: Sinks on the 1M DEM

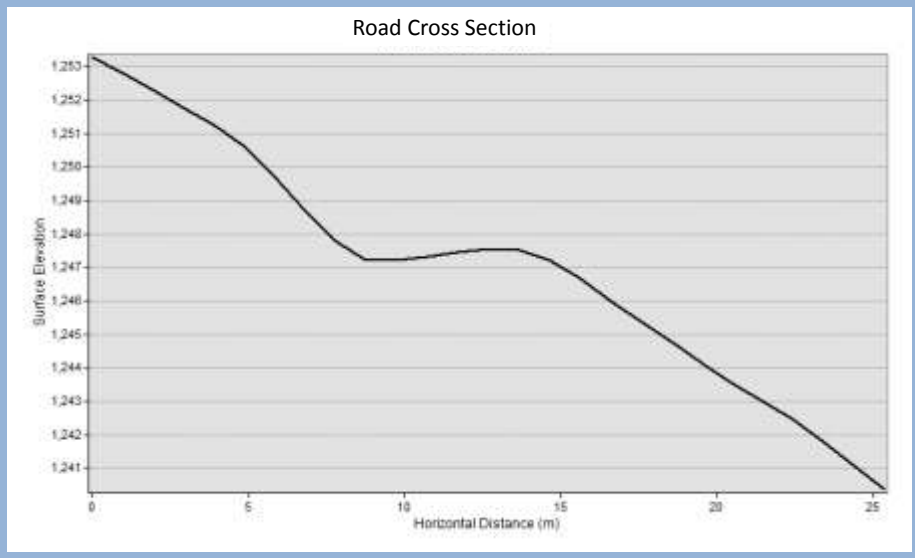


Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

Roads, Slope, and Curvature



Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR



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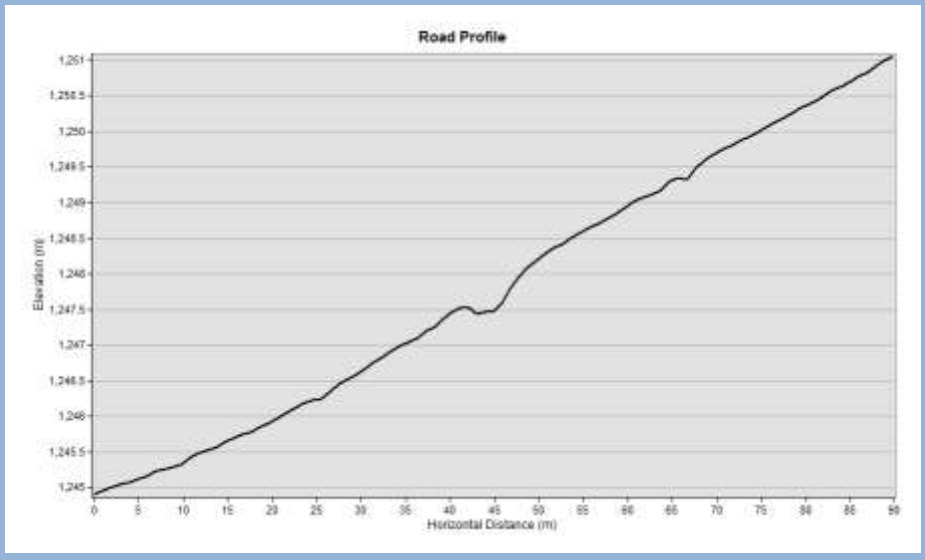

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

Conclusions

-5 m best for delineating stream networks & watershed delineation

-1m required manual processing to delineate network; may be useful for identifying potential problem areas (i.e., areas where culvert failure may result in stream rerouting

-Culverts & water bars were not readily apparent on the DEM

-May be possible to automate extraction of a road network based on slope & curvature

-NEED GROUND TRUTHING (esp. culvert location data)

Determining Stream Networks and Road Characteristics from a LiDAR-Derived DEM, Ashland Creek Watershed, Jackson County, OR

Data:
LiDAR 1 meter 2006(Watershed Sciences / Siskiyou National Forest)
National Hydrology Dataset (USGS)
Roads/Streams US Forest Service)
NAIP 1 meter Orthoimagery (2005)
Nation Elevation Dataset 30 Meter DEM

References:
Kaiser et. al., 2010
Tarolli et. al. 2009
Watershed sciences 2006
(http://www.ruraltech.org/tools/culsed/)
WA DNR, 2004
Damian, 2003
http://hydrology.usu.edu/taudem/