

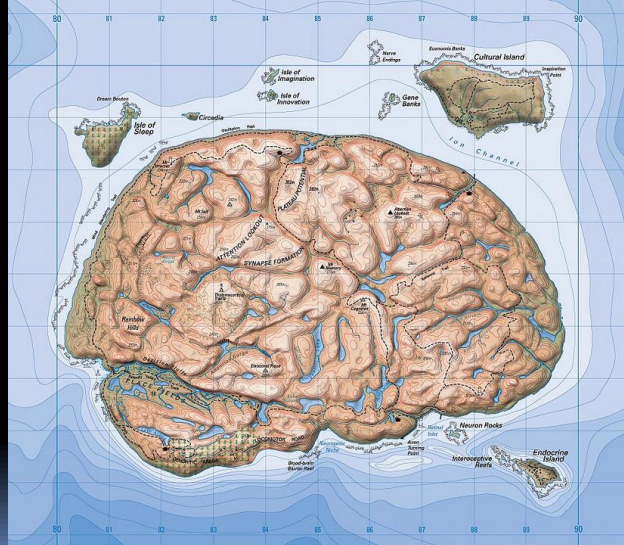
# WATS 4930/6920

Advanced Geographic Information Systems

## WEEK 6

- Lab 6/Lab 7  
DEMs
- No lab next week! (but lab 6 due anyway)

## This is your brain on GIS



20 meter DEM - currently best available for the Tongass

fs.fed.us

3 meter DEM generated from LiDAR

Different resolutions  
Different data sources

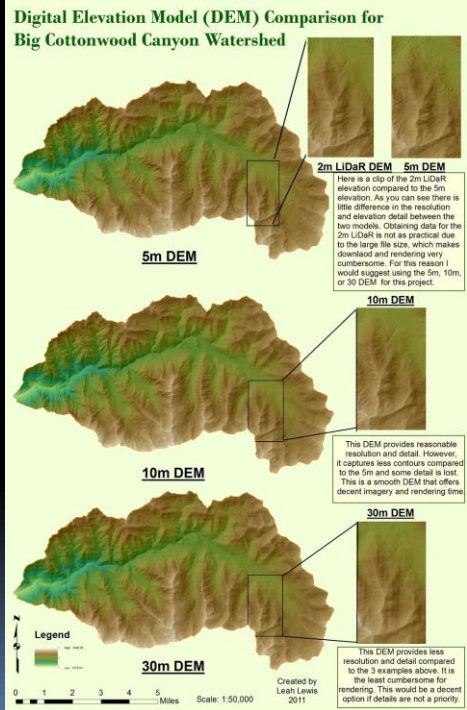
e-education.psu.edu

Different resolutions  
created from the same data source

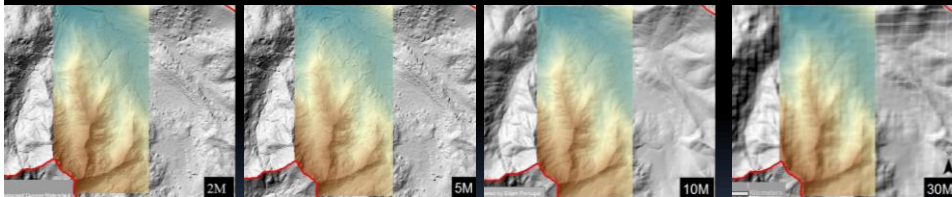
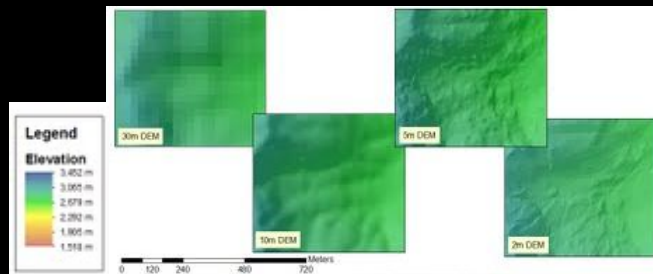
30 meters
10 meters
3 meters

## Lab 6

- Visually comparing DEM resolutions at watershed scale and larger scale
- Writeup:
  - Describe DEM data sets (Where are the cell values coming from and how accurate are they?)
  - How resolution impacts ability to resolve surface features, file size, etc.

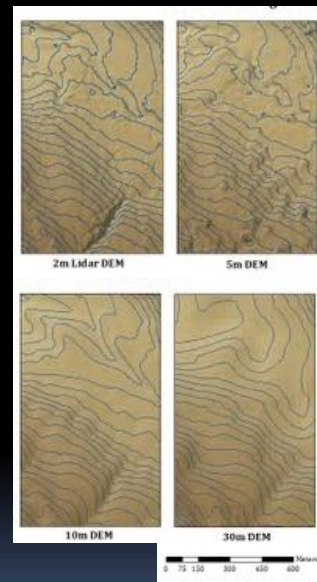


## Lab 6 –task 1

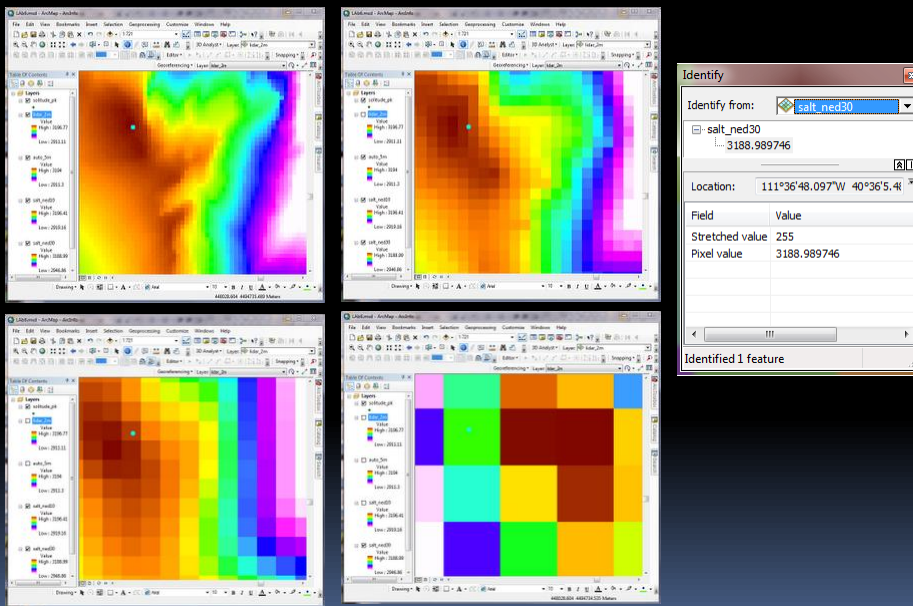


## Lab 6 –task 2

- Visually comparing DEM resolutions using contours
- Writeup:
  - List and discuss peak elevations and 'movement'
  - Most appropriate DEM for pulling peak elevation values

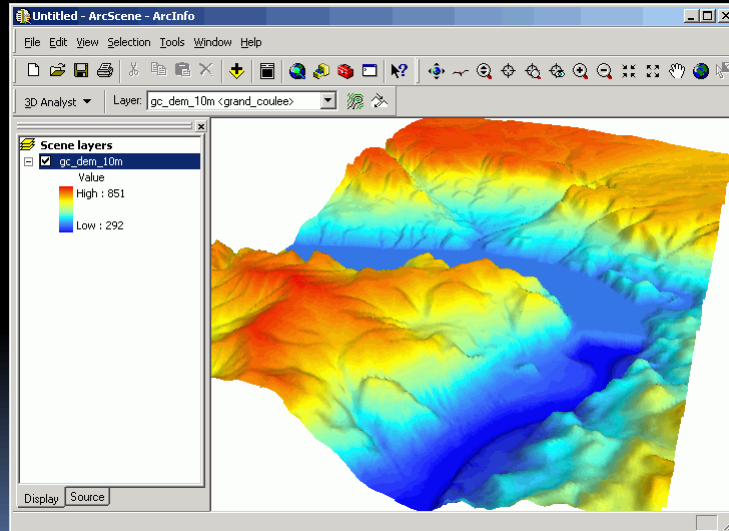


## Lab 6 –task 2



## Lab 6

### Arc Scene

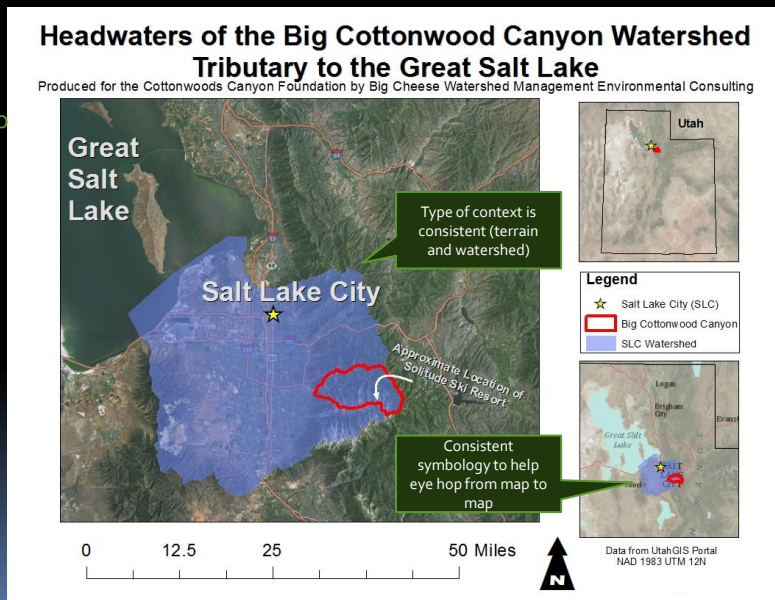


## Lab 6

Provide one map to establish spatial context for whole project?

Not the only  
(or best) way to  
provide spatial  
context.

Just an  
example!

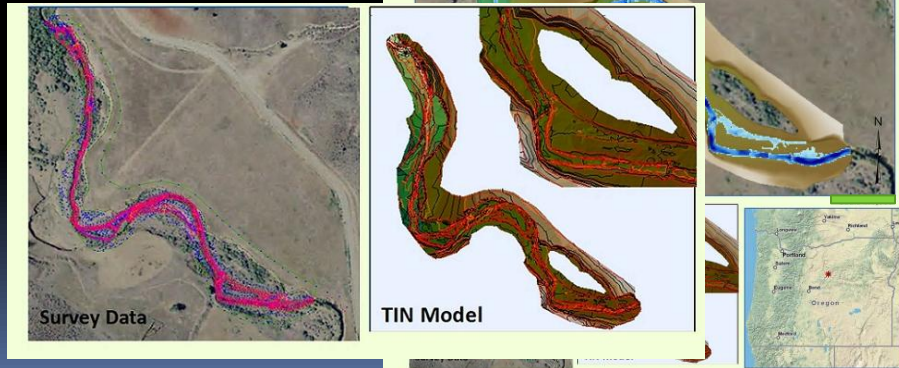


## Lab 7

### Pats Cabin reach of Bridge Creek

#### Task 1

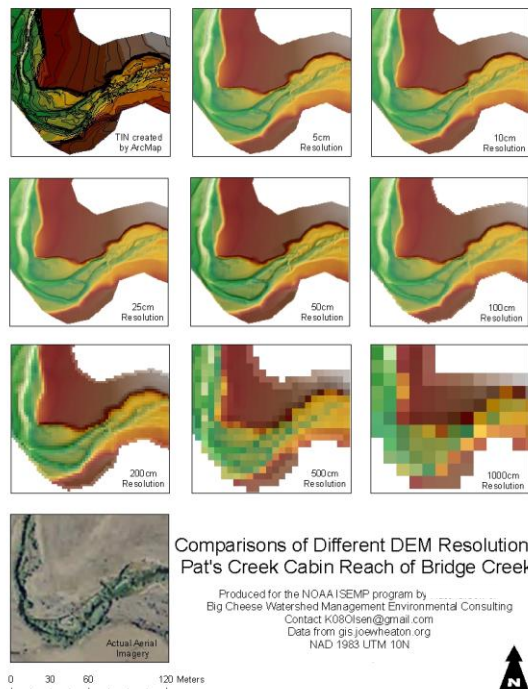
Building TIN surface from raw GPS survey data



## Lab 7

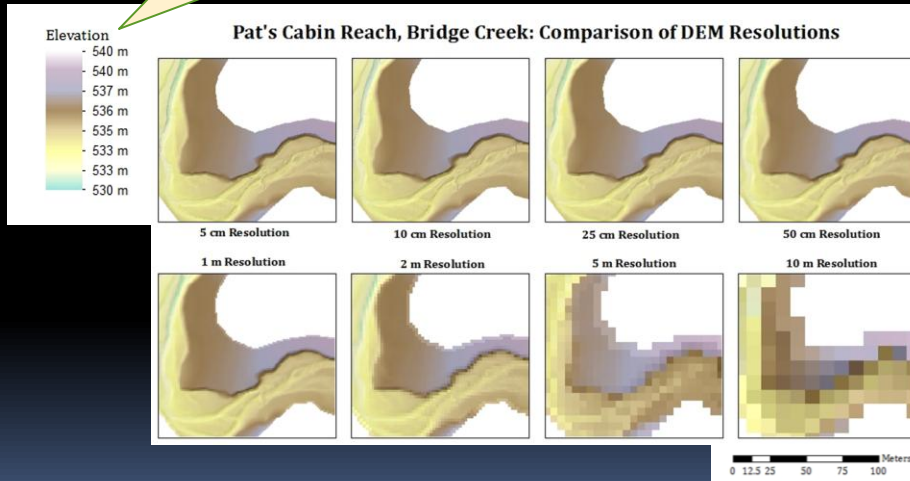
### Task 1: Build DEMs from TIN

Comparison figure

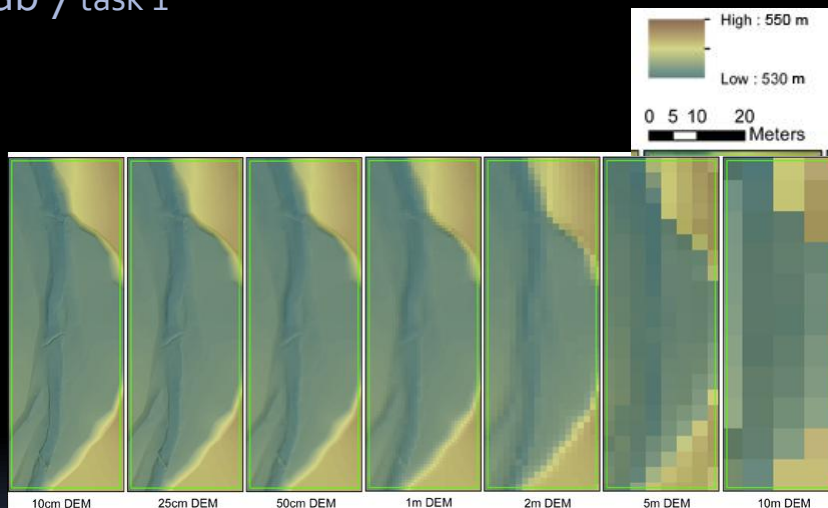


## Lab 7

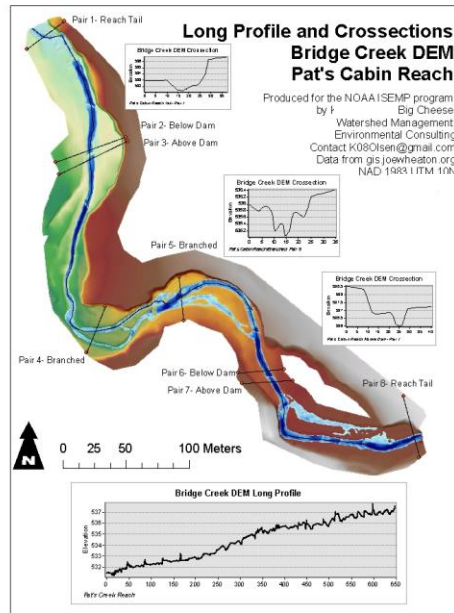
Great elevation legend  
(no extra text, rounded  
values, units)



## Lab 7 task 1



## Lab 7 task 1

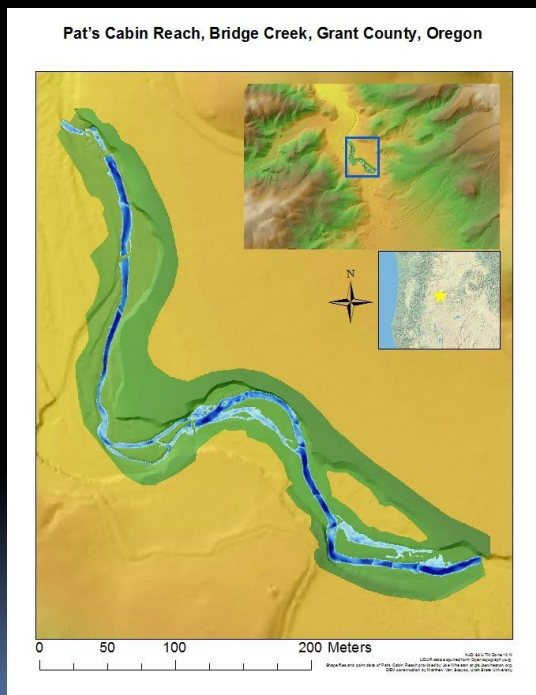


## Lab 7

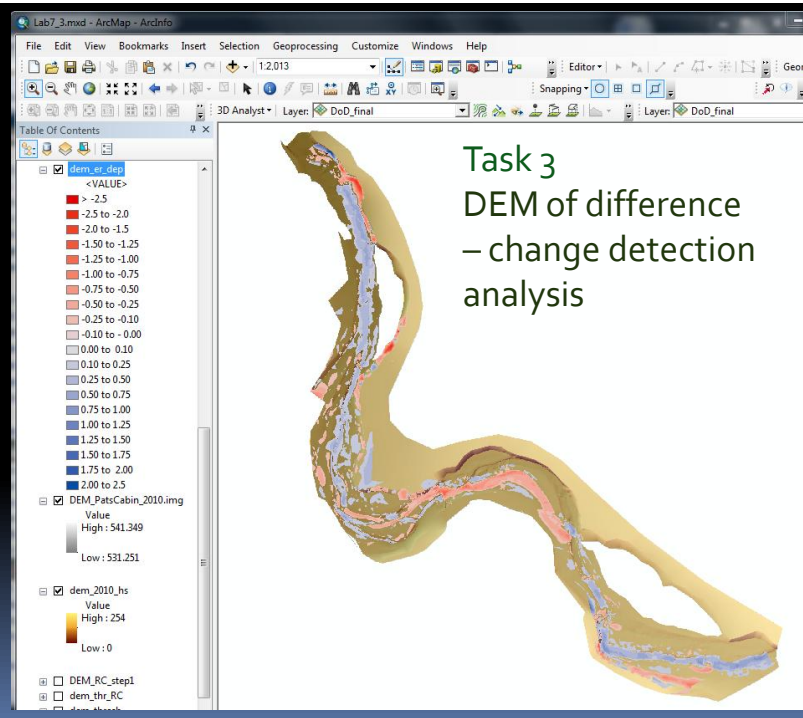
## Task 2

Building raster from  
LiDAR point data

Discussion:  
For channel change  
detection, pros and  
cons of working with  
raw survey data  
versus lidar.  
Costs  
Trade offs



## Lab 7



## Lab 7

## DEM DIFFERENCING

## RASTER CALCULATOR....

Simple method of quantifying spatial variations in change in storage terms of a sediment budget.

NEW DEM

OLD DEM

= DoD

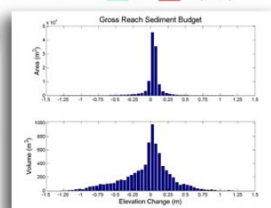
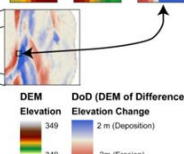
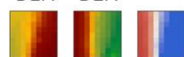
CONSERVATION OF MASS  
VOLUMETRIC

$$Q_{bi} - Q_{bo} = (1 - \eta) \frac{dV_b}{dt}$$

$Q_{bi}$  Volumetric rate of bed material transport  
 $Q_{bo}$  Volumetric rate of bed material transport  
 $\eta$  Porosity of bed material  
 $\frac{dV_b}{dt}$  Volumetric rate of bed material transport

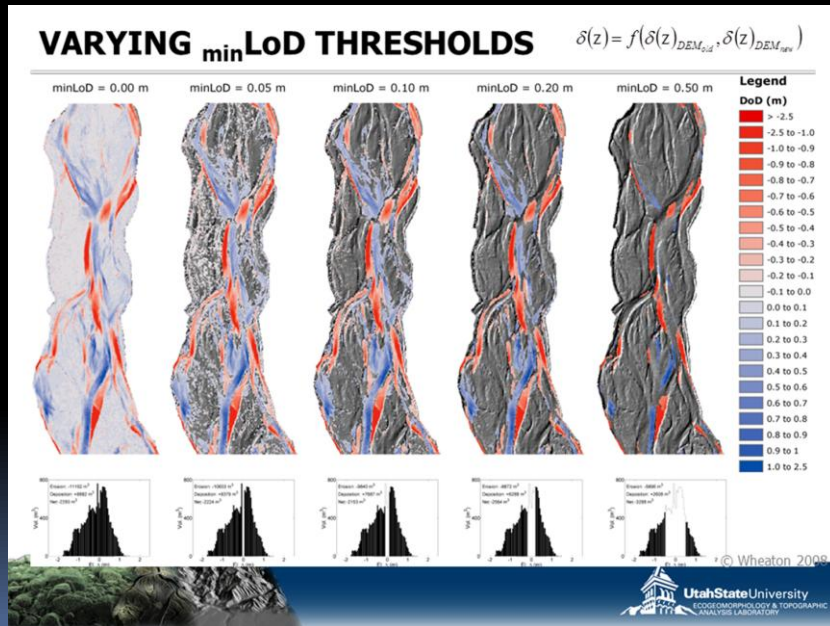
Mclean &amp; Church (1988) – Water Resources Research

$$\text{NEW DEM} - \text{OLD DEM} = \text{DoD}$$



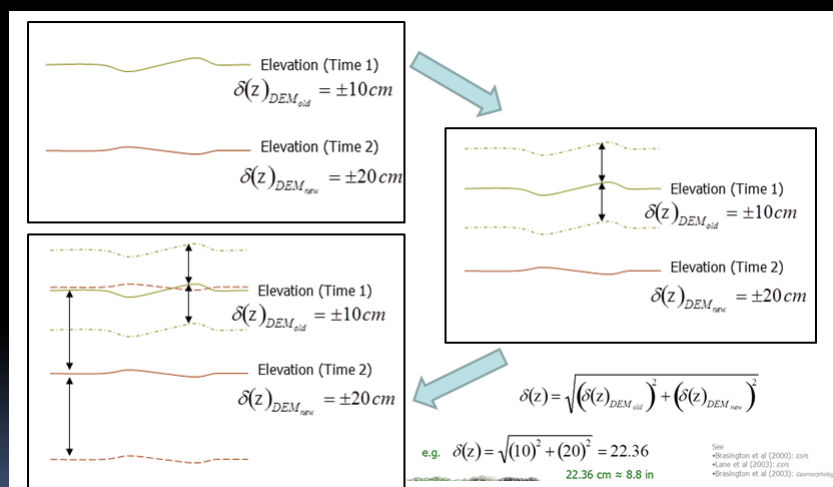
© Wheaton (2008)

## Lab 7 task 3 Apply a confidence threshold

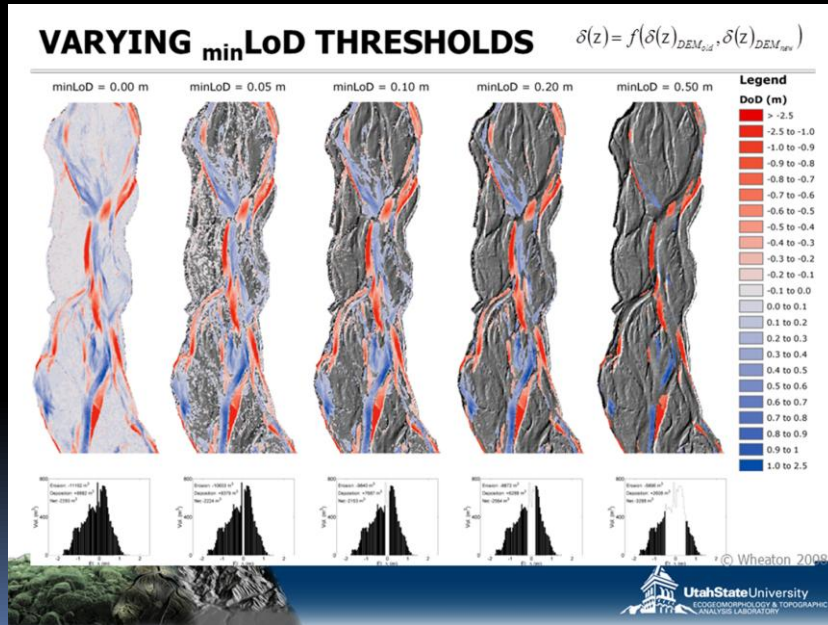


## Lab 7 task 3

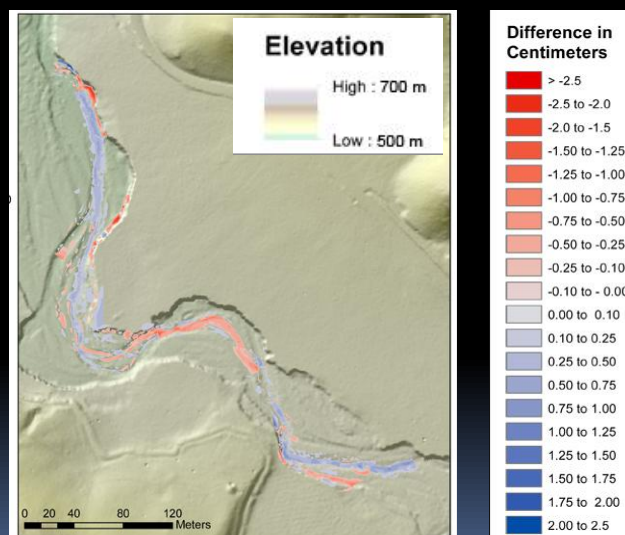
Take into consideration the margin of error for each surface



## Lab 7 task 3



## Lab 7 task 3

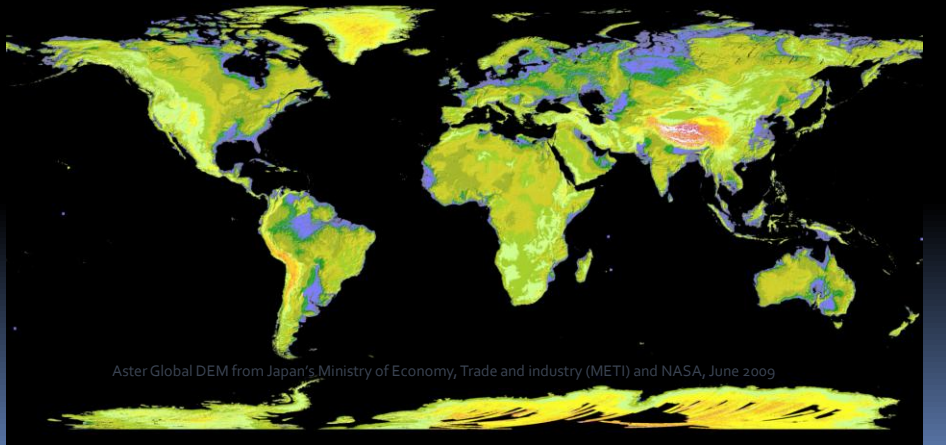
Pats Cabin Reach  
DEM Differences Between 2010 & 2011

# Questions?

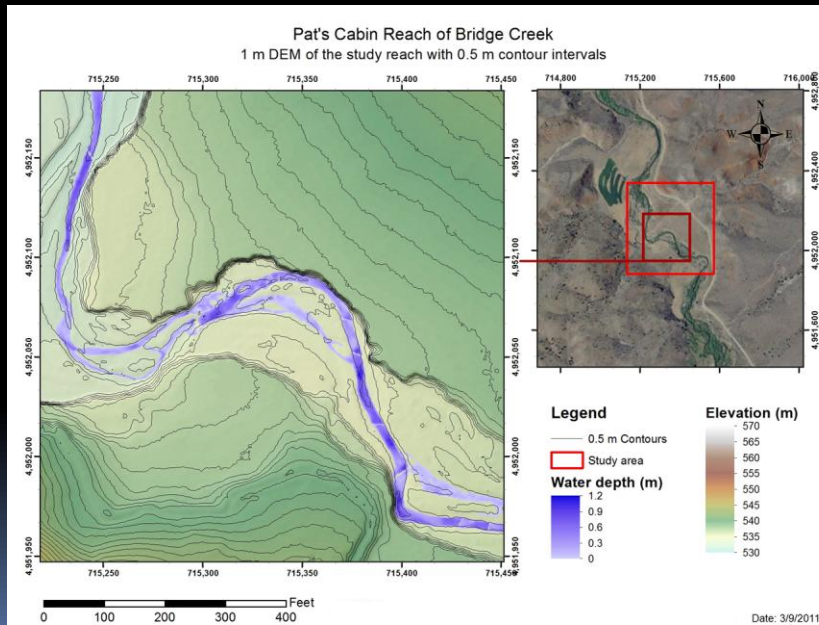
Upload URL to Canvas

Lab 6 due *next week*

Lab 7 due in 2 weeks



## Lab 7



## Labs 6 and 7

### What-to-submit write up hints (keep to minimum)

#### Lab 6 Task 1

- Where the data came from (source)
- DEM differences
  - Datasets
    - how the data is generated,
    - potential for inherent error and uncertainty,
    - general availability
  - Resolution
    - comparative file sizes,
    - details about resolvable surface features

#### Task 2

- elevations of the peak near Solitude Mountain Resort,
- Why are (or aren't) the elevations the same?,
- suggestion for the raster from which the elevation data should be taken

#### Lab 7

- Appropriate DEM resolution to model topography.
- Justification including
  - resolution of the raw survey data
  - raster creation processes
- Is airborne LiDAR more or less effective than survey DEM to detect changes in channel morphometry
  - compare airborne LiDAR and survey data DEMs
  - data extent,
  - resolution,
  - ability to resolve features