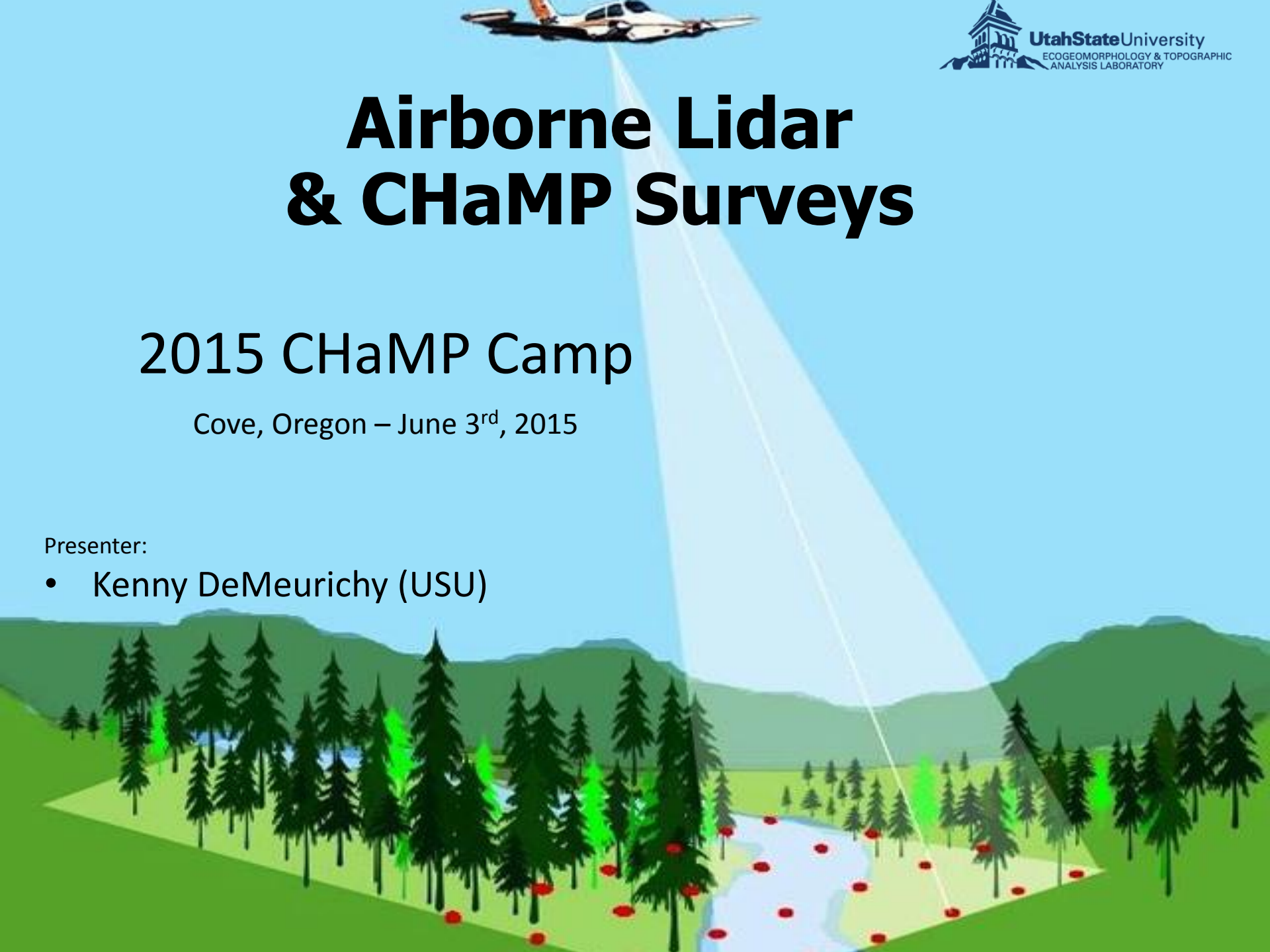


UtahStateUniversity
ECOGEOMORPHOLOGY & TOPOGRAPHIC ANALYSIS LABORATORY

Airborne Lidar & CHaMP Surveys

2015 CHaMP Camp

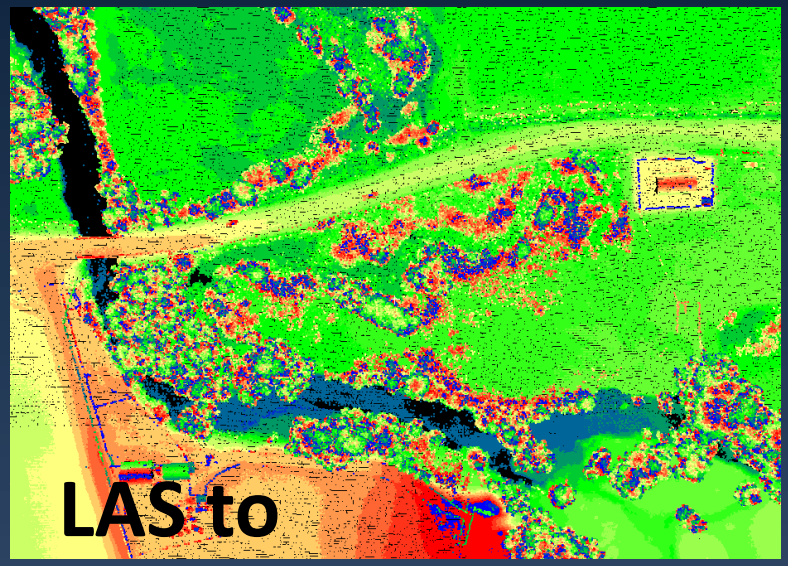
Cove, Oregon – June 3rd, 2015

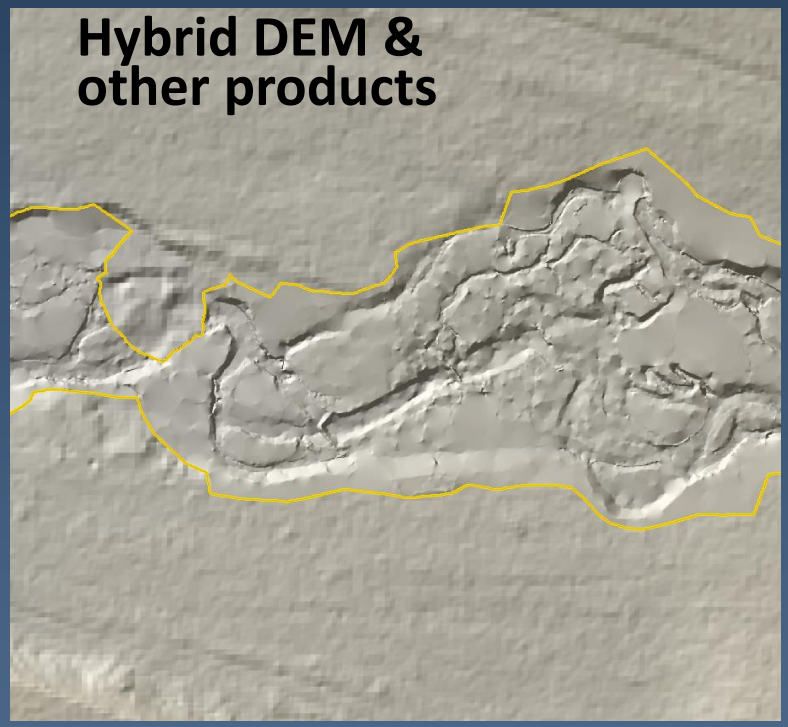
Presenter:

- Kenny DeMeurichy (USU)

MODULE PURPOSE

- An overview of the process required to Integrate airborne lidar data with Champ geodatabases
- LAS to Hybrid DEM





What is lidar?

- It's just another tape measure
- But the tape measure is moving
- Light detection and ranging
- Uses a laser, light amplification by stimulated emission of radiation

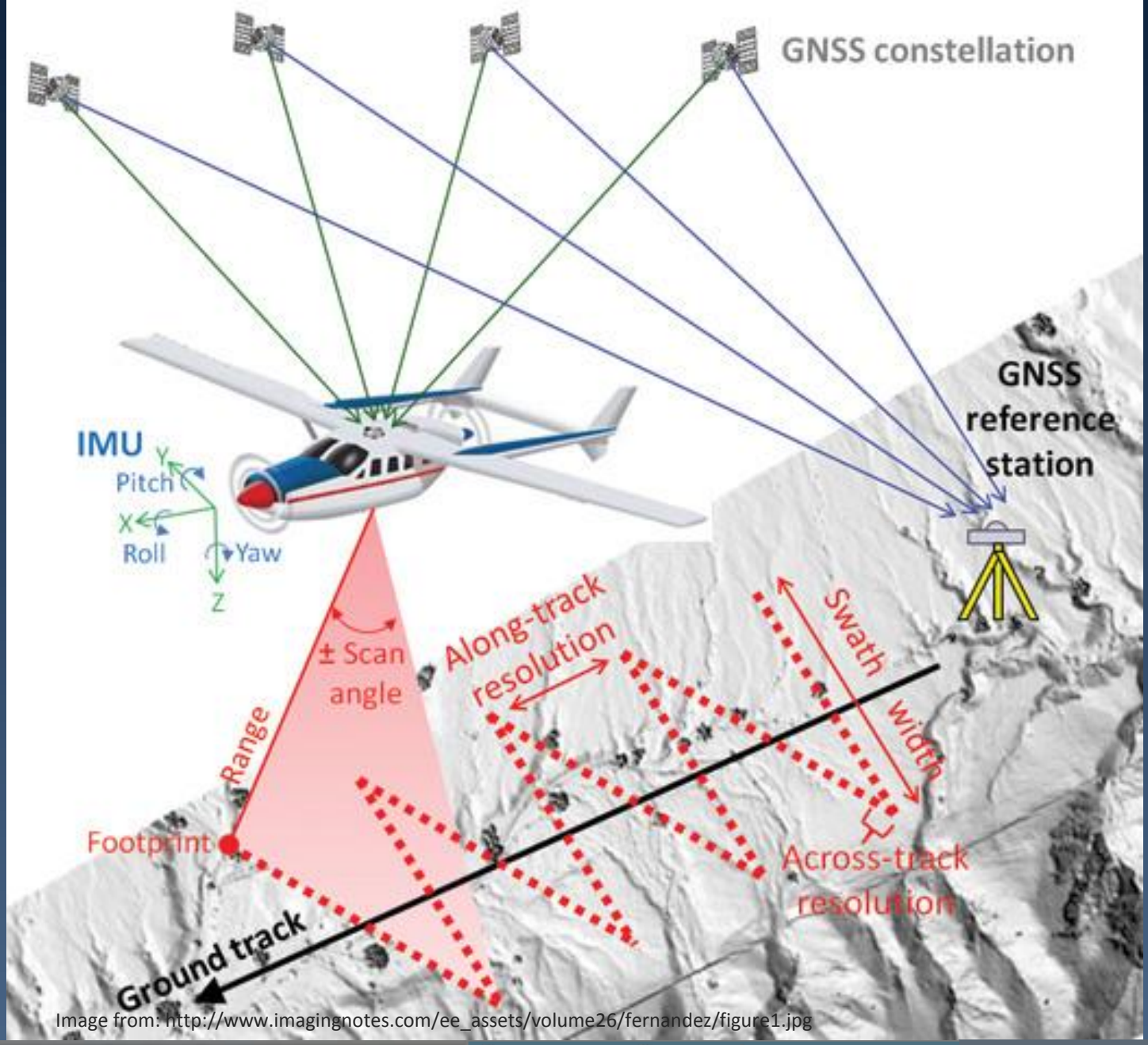


Image from: http://www.imagingnotes.com/ee_assets/volume26/fernandez/figure1.jpg

- Near Infrared wave length
  - The most common airborne terrestrial lidar system
  - 1064nm
- Blue-Green Wavelength
  - Used by all bathymetric systems
  - Frequency doubled
  - Penetrates water
  - Return dependent on vegetation, Water clarity

Why do we care?

- Champ topo crews have limits; time constraints.
- CHaMP survey: In vs Out of channel
- Main Channel may shift to another area not surveyed by crew; lateral
- Gives context to Champ Surveys
- Lidar data will have good coverage on terraces
- Provides data between each ChaMP reach
- Larger scale-River Styles-RS truthing
- Lidar data contains vegetation information

Is lidar currently available for your watershed?

Do your research:

- Open Topo
- NOAA; Digital Coast
- Oregon, Wash., Idaho, lidar Consortium
- Download the lidar extents polygon
- Intersect with site shape file or Survey Extent?
- The lidar report is a must have.

And……

How many Champ sites overlap?

Data Set Name/year	Watershed	Approx#Sites
USBR_UpperColumbiaRiverWest_2006	Wenatchee	23
USBR_UpperColumbiaRiverWest_2006	Entiat	57
USBR_UpperColumbiaRiverWest_2006	Methow	37
JohnDayDesolationCreek_2006	JohnDay	14
Lemhi_2010	Lemhi	34
SouthForkSalmonAndSecesh_2008	Salmon	5
GRB_LiDAR_Catherine_Wallowa_Report_2009	Upper Grand Ronde	11
LiDAR_Data_Report_Grande_Ronde_CRITFC_2009	Upper Grande Ronde	77
LiDAR_Report_GRB_Willow_Catherine_07	Upper Grande Ronde	8
SouthForkJohnDay_2005	JohnDay	16
LC West-Malhuer Nat Forest_2010	JohnDay	9
Umatilla	Upper Grande Ronde	10
Ochoco	JohnDay	4
GeologyAndMinerals_07-10	JohnDay-MF-CampCreek	39
		211

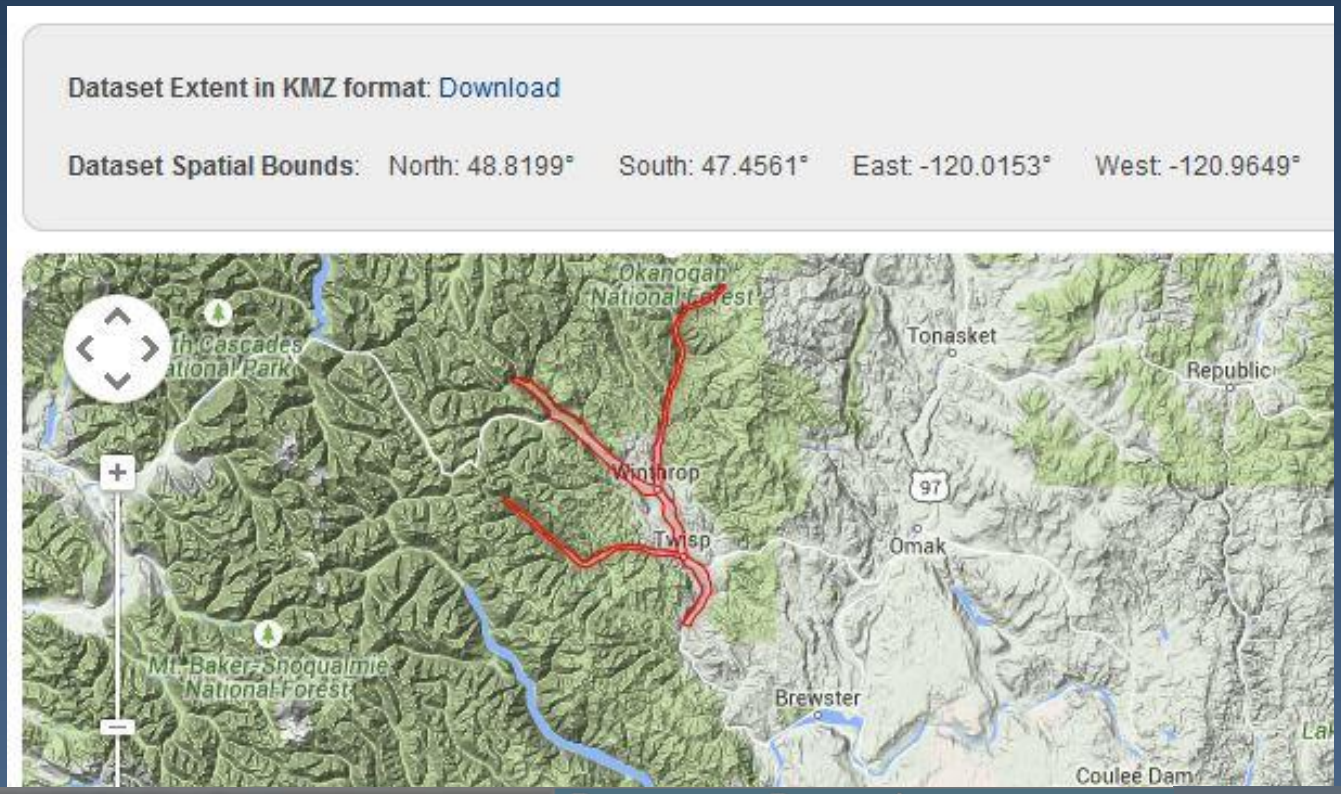
WARNING?

Coordinate system Issues are an Issue!

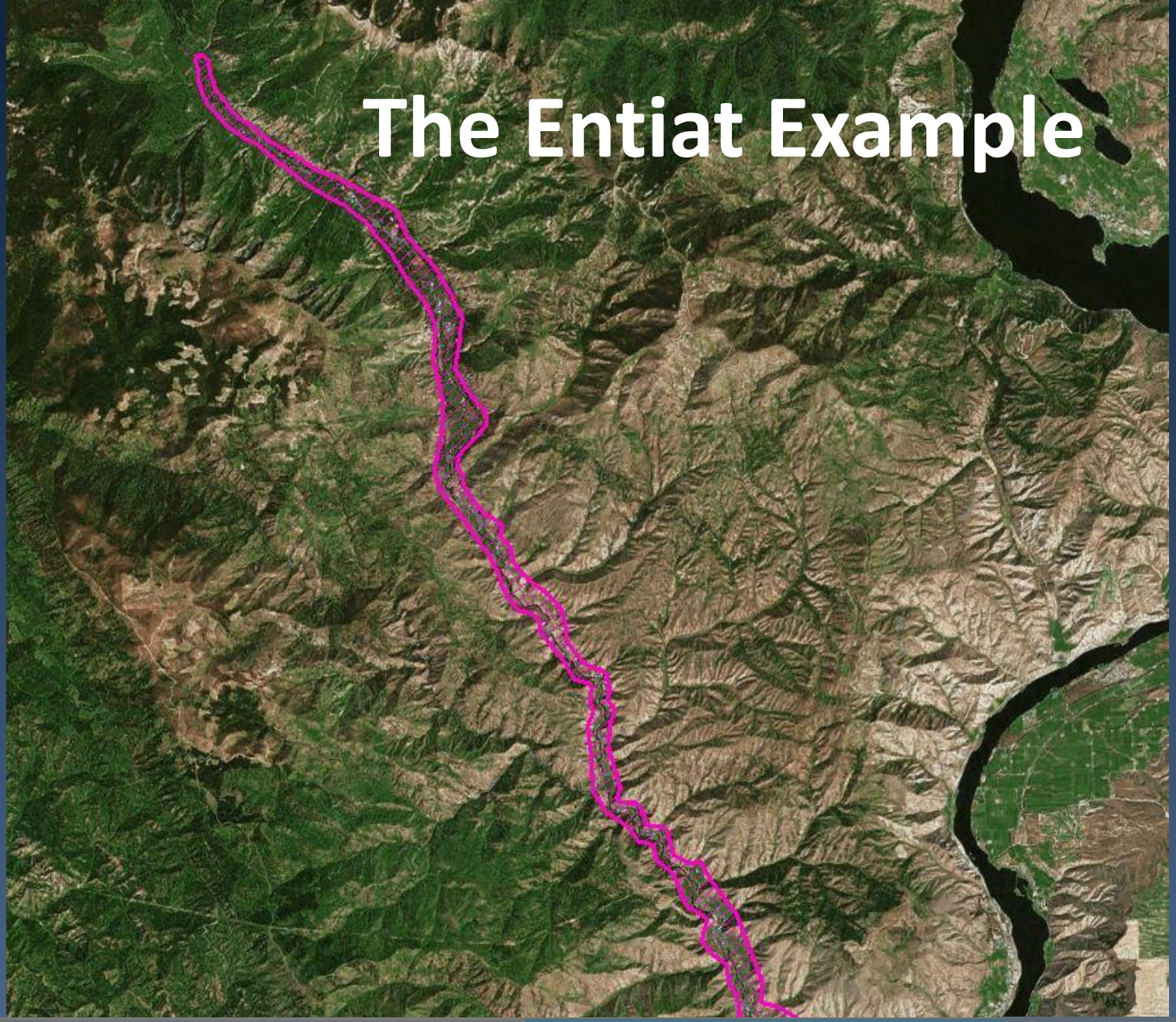
- Champ watersheds may not be in same coordinate system as the lidar data. 10 vs 11 vs 12.
- Multiple Flights over the same area may not be in the same coordinate system. 10 vs 11 vs 12.
- Multiple flights in the same area with same coordinate system may use a different coordinate for the same base point.

The lidar report contains the coordinate system definition and control coordinates.

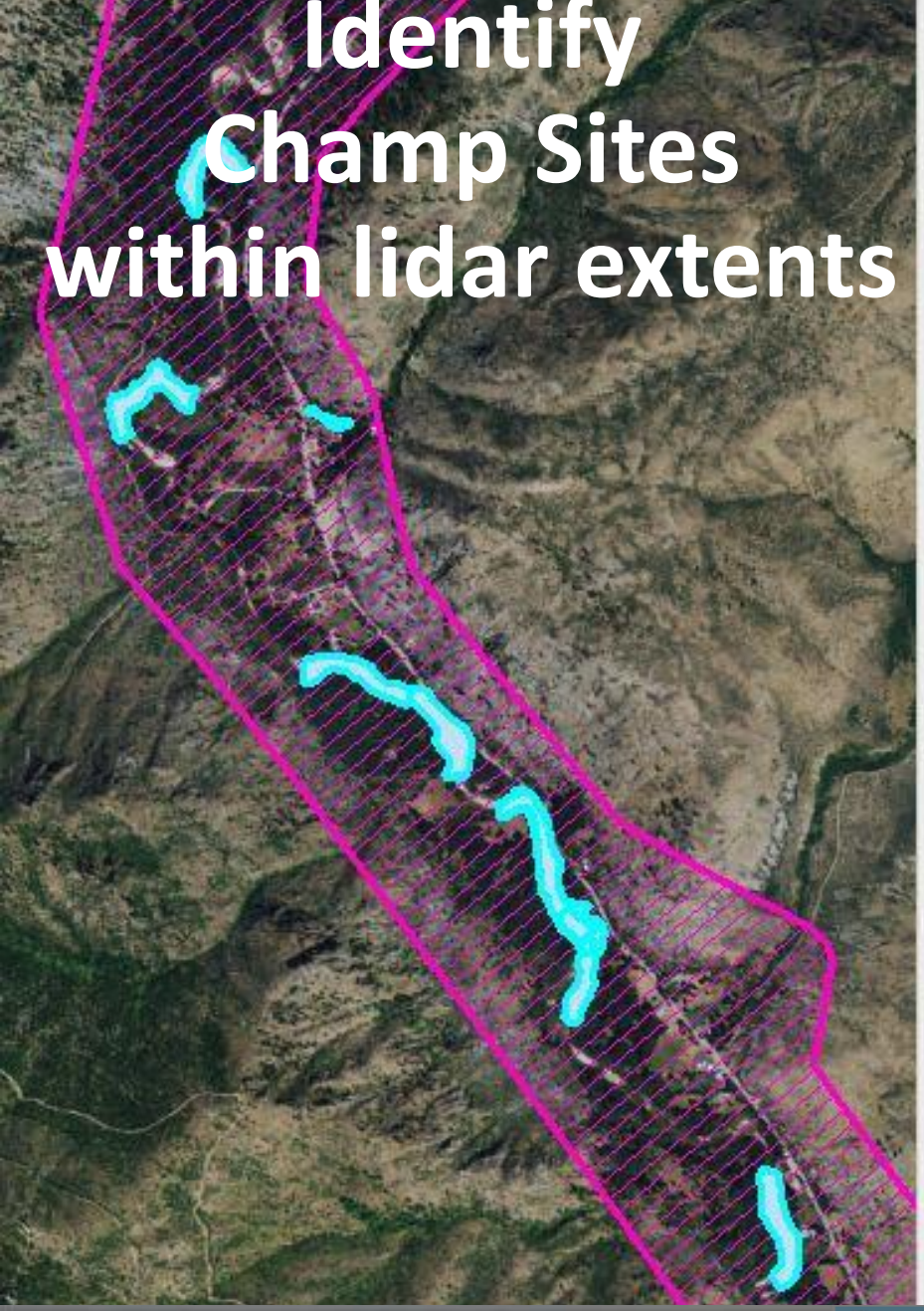
- Download the lidar extent polygon
- Gather All of the watershed site survey extent polygons



The Entiat Example



Identify Champ Sites within lidar extents



Select By Location

Select features from one or more target layers based on their location in relation to the features in the source layer.

Selection method:

select features from

Target layer(s):

- [ ] L22and21_WashLidar_Control
- [ ] AllChampSites2015
- [ ] WenatcheContol_12_14
- [ ] L22_Ent2012_Control_Points
- [ ] Baseline
- [ ] WenatcheSurveyExtent_12_14
- [x] Entiat_Survey_Extent
- [ ] L22_WenUCRW_2006_Sites
- [ ] L22_WenUCRW_2006_Extent
- [ ] wa2013_pslc_entiat_m2613_index

[ ] Only show selectable layers in this list

Source layer:

L22_WenUCRW_2006_Extent

[ ] Use selected features (0 features selected)

Spatial selection method for target layer feature(s):

intersect the source layer feature

[ ] Apply a search distance

40.000000 Feet

About select by location | OK | Apply | Close

CHaMP Columbia Habitat Monitoring Program

Bonneville Power Administration BPA

Utah State University ECOGEOMORPHOLOGY & TOPOGRAPHIC ANALYSIS LABORATORY

Look for sites with High capacity for lateral adjustment

Research to find all records of control available in project vicinity

- Lidar report.
- National Geodetic Survey (NGS) Data Sheets
- Local Networks may exist which will save us Time

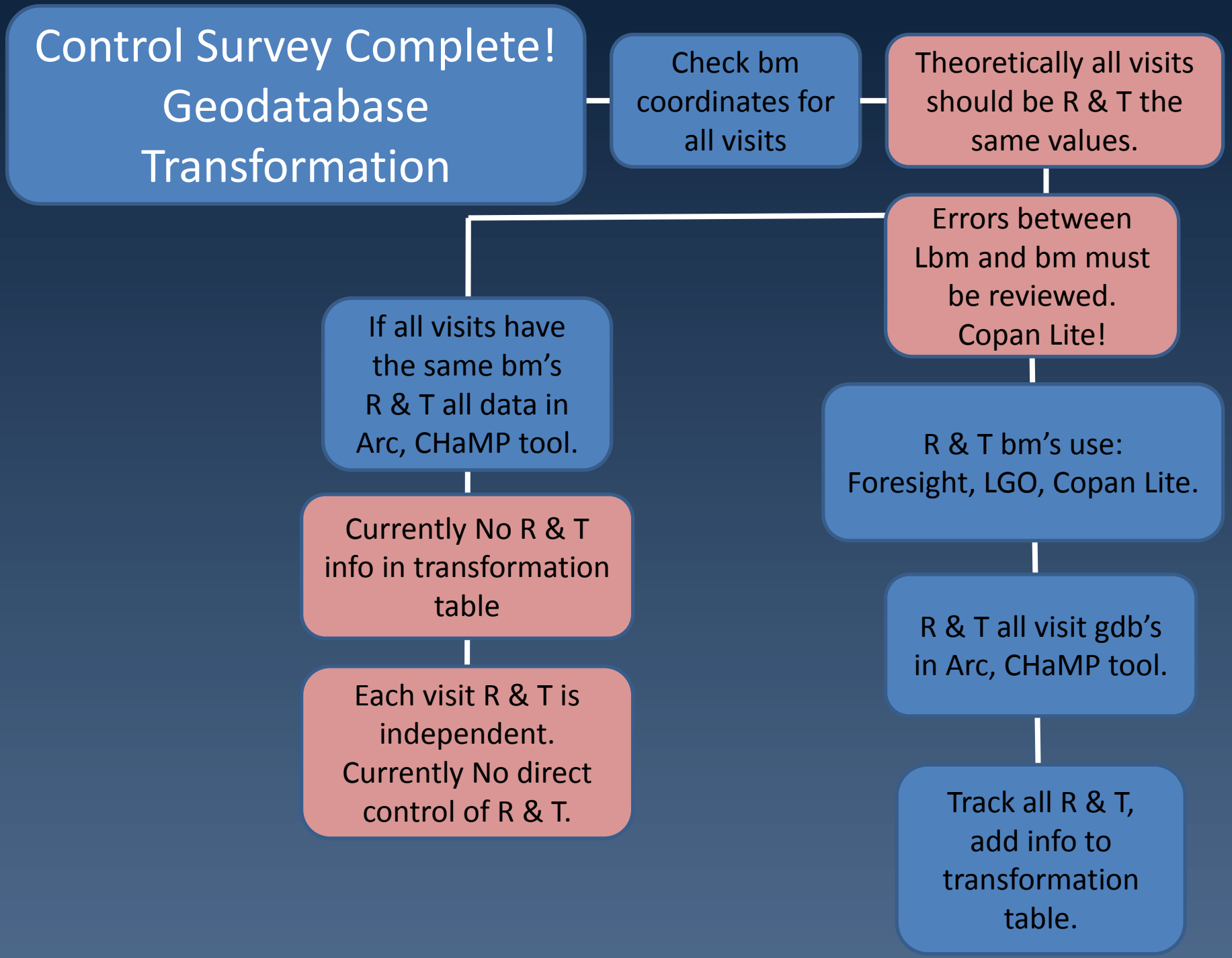
Control Survey Methods

- Survey as many benchmarks as possible at each site, even retired BM's
- RTK from the LC to at least two champ site BM's at each champ site.
- RTK from the LC to a location near the champ site and set control. The champ crew would then survey from the set control to at least two champ site BM's at each champ site.
- With the right equipment and software a static network might be more efficient. Watershed/Site dependent.

- Benchmark files can be fairly clean or very messy.
- Location in the field: we all know about the challenges!

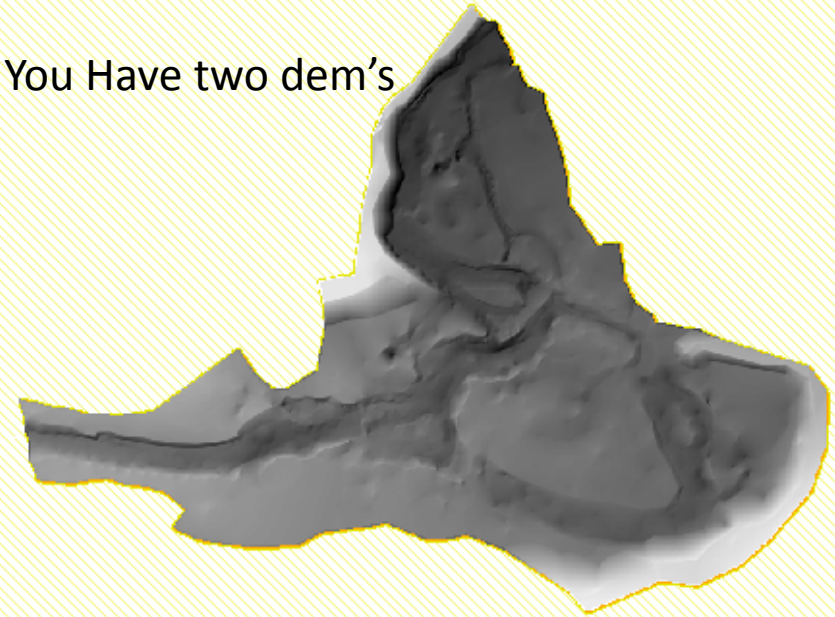
Crew				Kenny
Visit 1	Visit 2	Visit 3	Visit 4	lidar bm survey
bm1	bm1			
bm2	bm2	bm2		
bm3				
	bm201	bm201	bm201	bm201
		bm301	bm301	bm301
		bm302		
			bm401	bm401

Is Visit 1 a problem ?


Control Survey Complete! Geodatabase Transformation
Check bm coordinates for all visits
Theoretically all visits should be R & T the same values.
Errors between Lbm and bm must be reviewed. Copan Lite!
If all visits have the same bm's R & T all data in Arc, CHaMP tool.
R & T bm's use: Foresight, LGO, Copan Lite.
Currently No R & T info in transformation table
R & T all visit gdb's in Arc, CHaMP tool.
Each visit R & T is independent. Currently No direct control of R & T.
Track all R & T, add info to transformation table.

GIS: How to make a hybrid DEM

- Assuming You Have two dem's



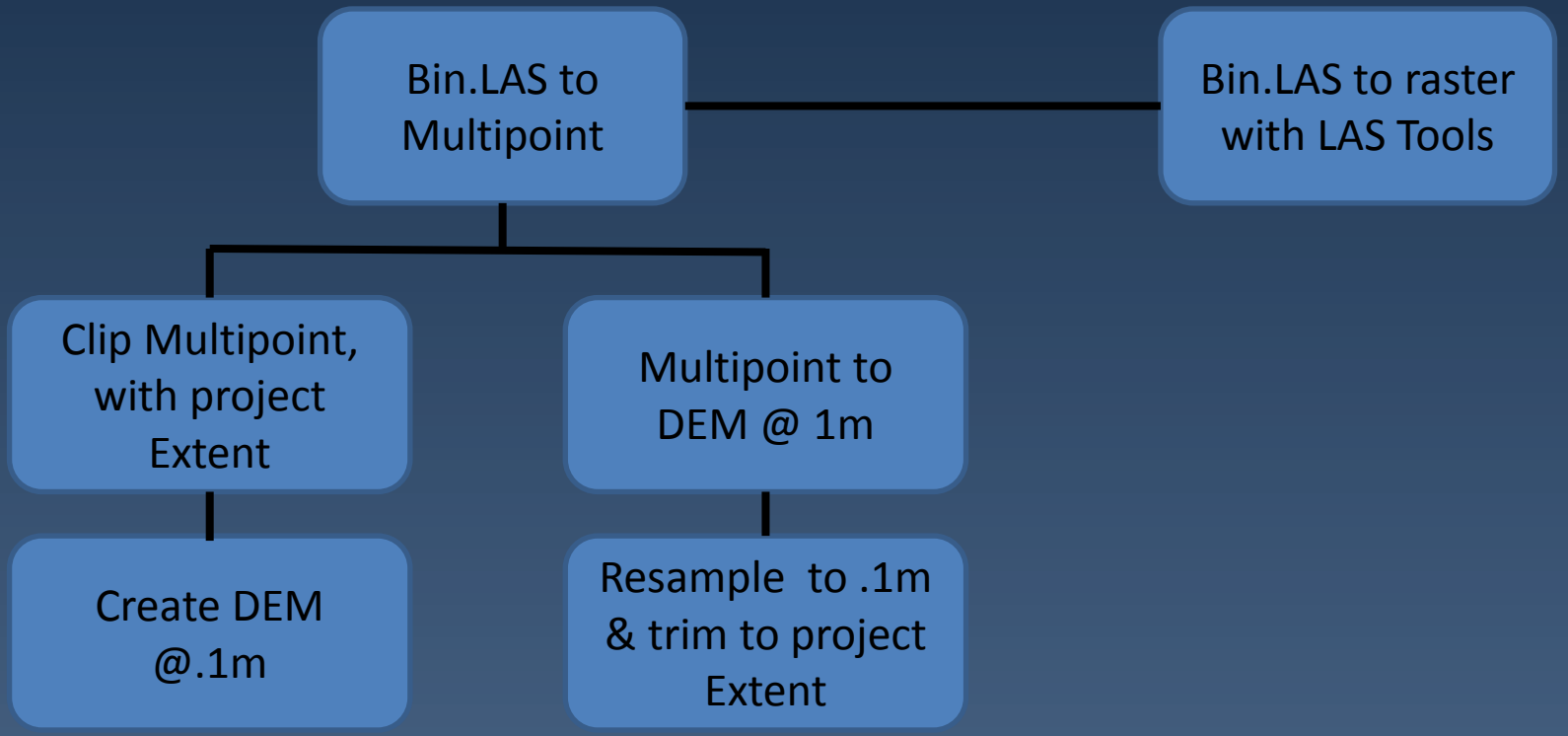
Extent Polygon

Edit Sketch Properties

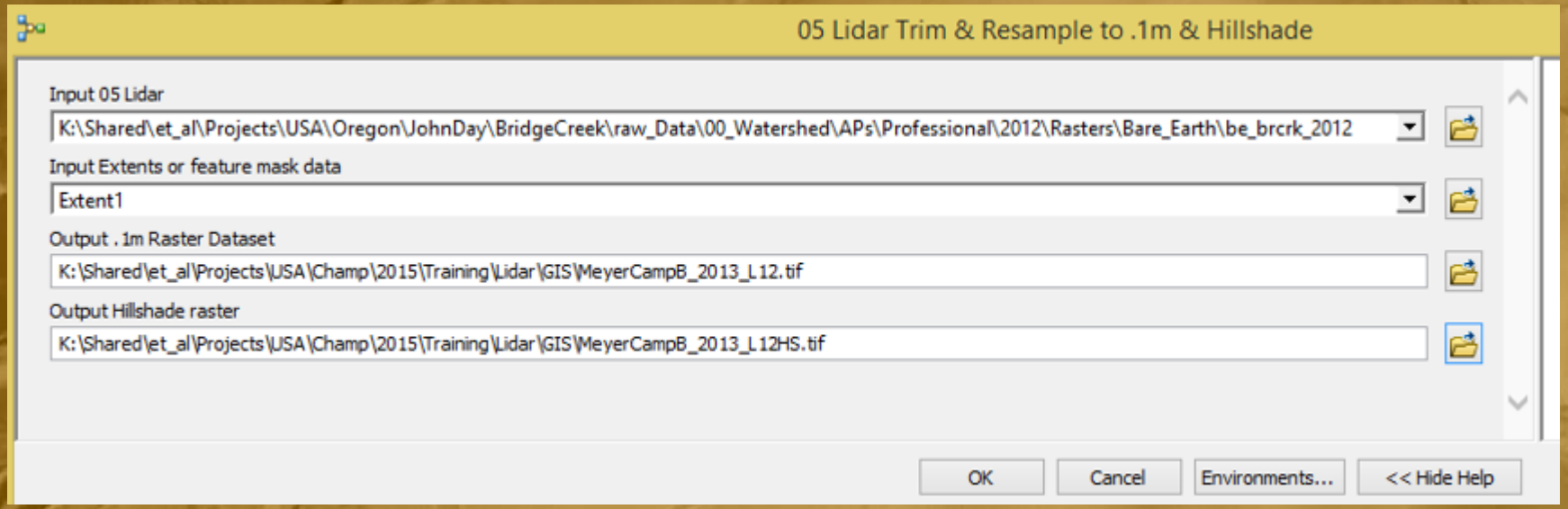
Finish Sketch

#	X	Y
0	720856.000	4943350.000
1	721053.000	4943350.000
2	721053.000	4943173.000
3	720856.000	4943173.000

Bin.LAS to DEM
1 m vs .1m

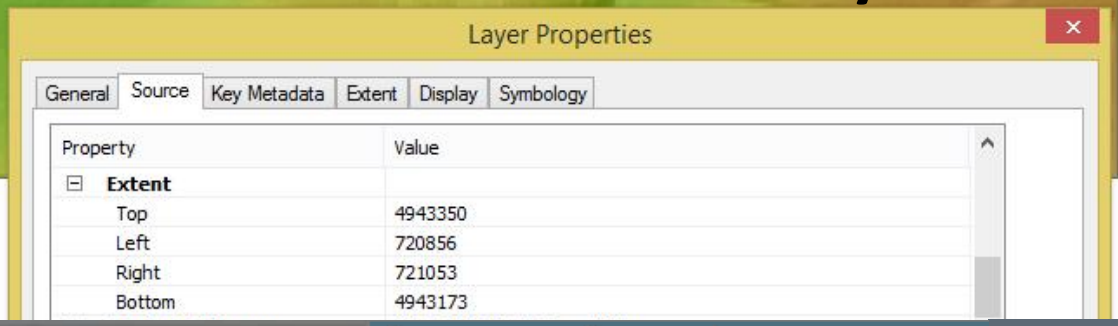


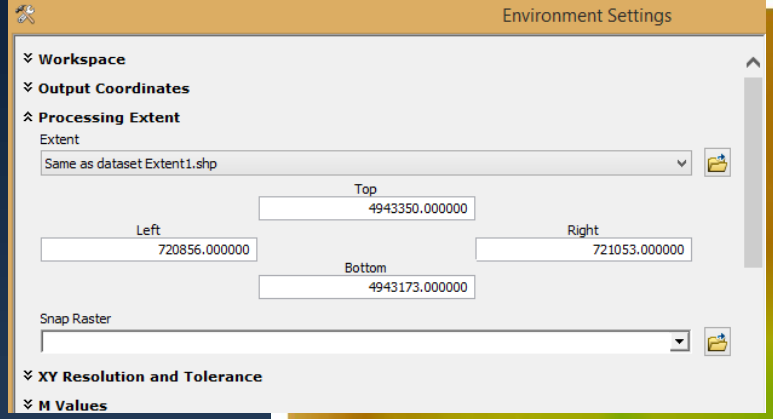
Trim the lidar DEM



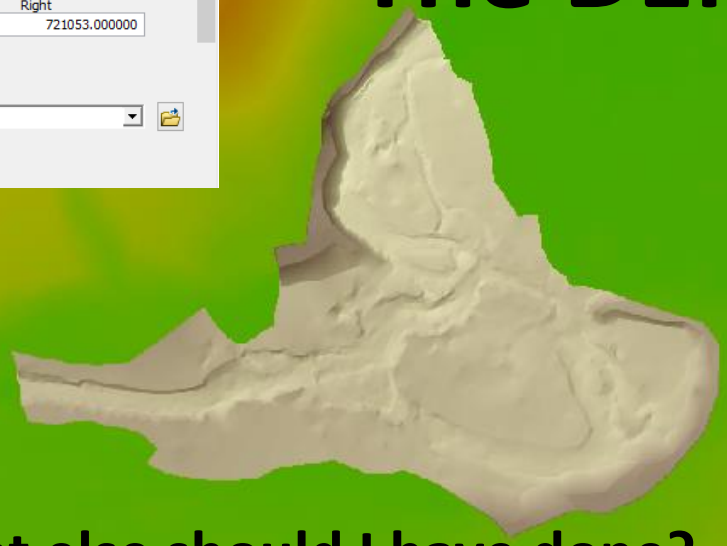
Lidar DEM Trimmed resampled to .1 m

Control location of every cell

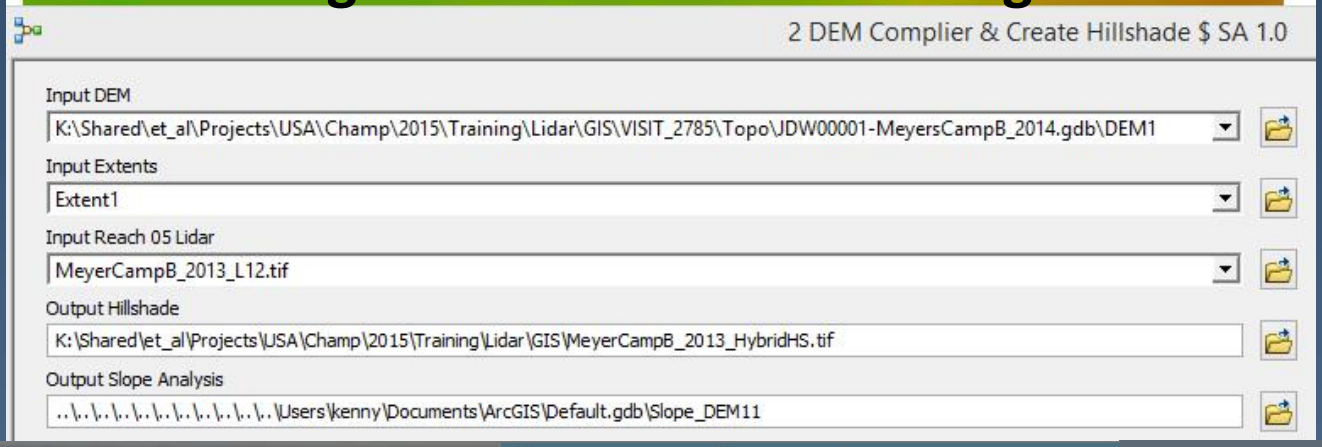




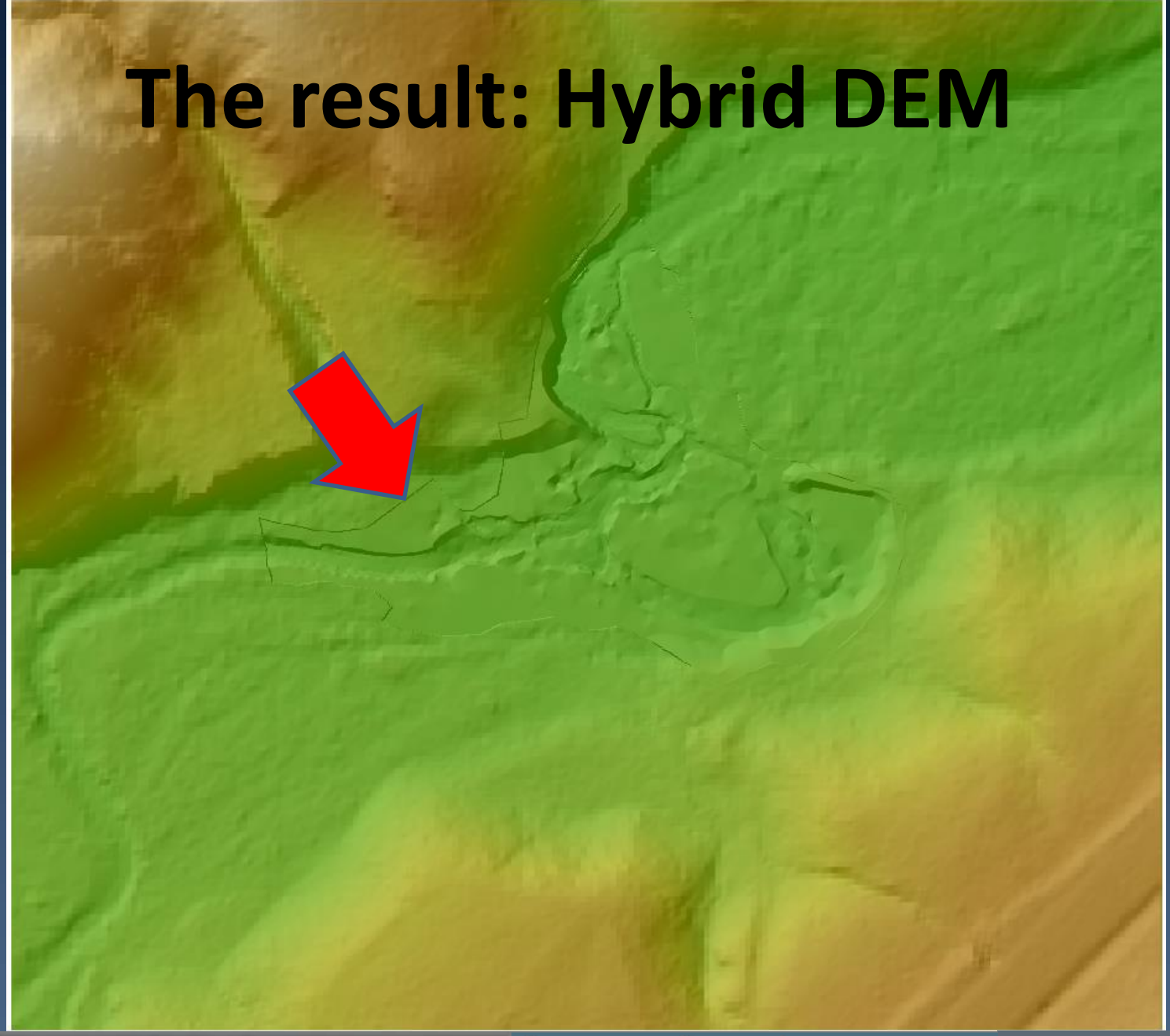
Combining The DEM's



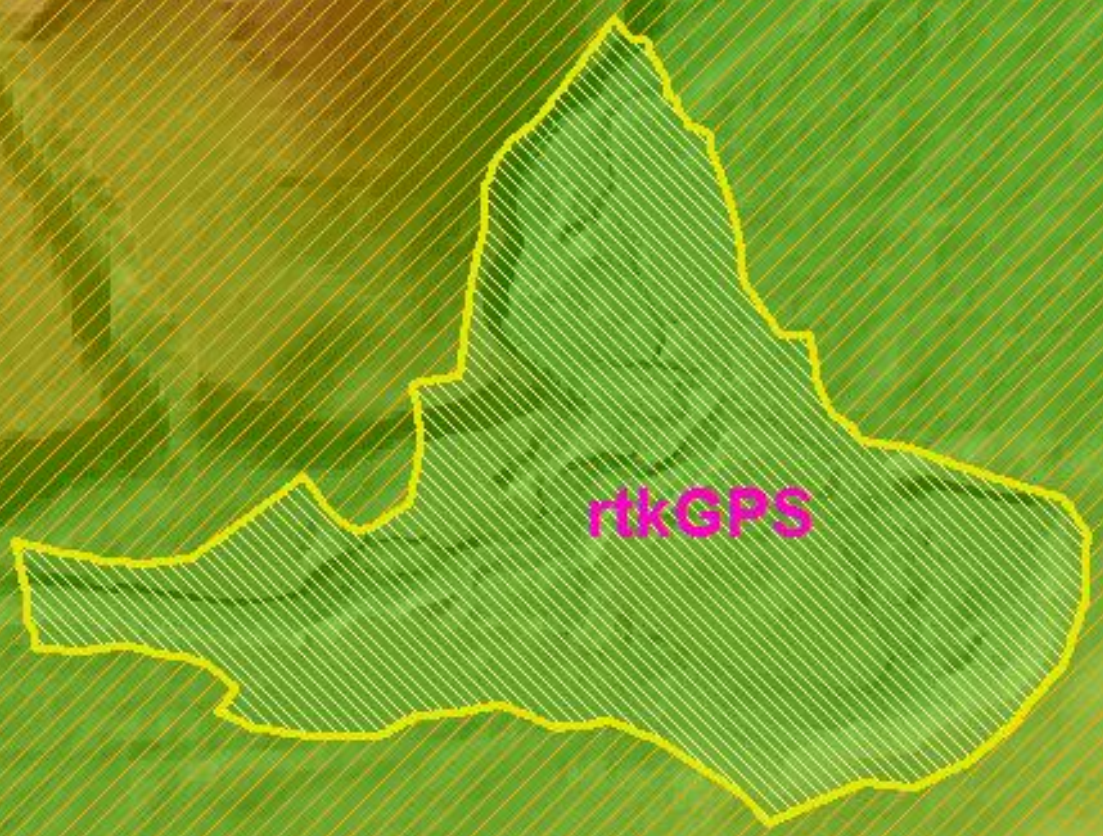
What else should I have done?
Is the ground based DEM Orthogonal?



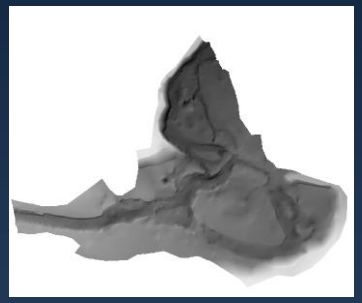
The result: Hybrid DEM



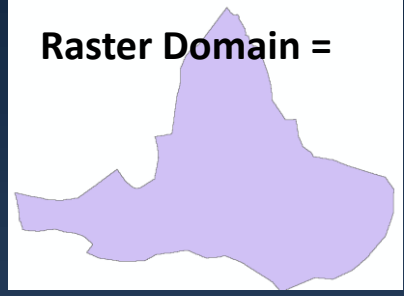
Budget Segregation Survey Method polygon



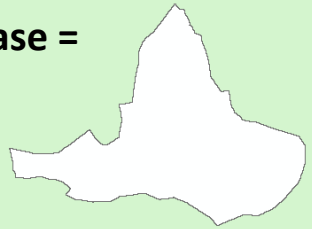
LiDAR



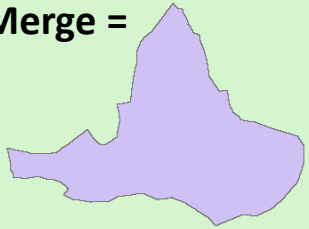
Raster Domain =



Erase =



Merge =

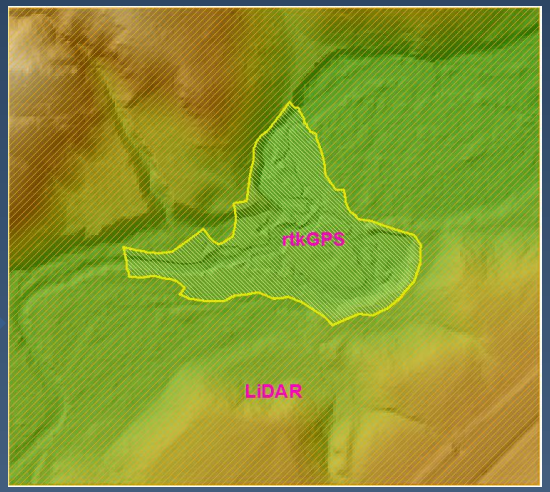


Add Method field, fill in Methods

Table

MeyersCamp13_SurveyType

FID	Shape *	Id	Method
0	Polygon ZM	0	LiDAR
1	Polygon ZM	0	rtkGPS



Resources

- Open Topo
- National Geodetic Survey
- NOAA Digital Coast
- Lidar Consortium: OR, ID, WA
- Email: kenny.demeurichy@usu.edu
- Phone: 435-554-8492
- http://geohydrodynamatics.blogspot.com


Thank You!