

Determination of Coverage from GPS Tracks

Don Ferguson, PhD

Mountaineer Area Rescue Group

A member of
Appalachian Search and Rescue Conference



Appalachian Search and Rescue
Conference

Mountaineer Area Rescue Group



Objective

- Use GPS tracks, operational team information and search segment/probability region details to calculate the ratio of area search to area of the segment or region.
- Coverage provide a more accurate description of how well the team performed than a Team Leader estimate of POD.
- Often times teams accidentally or purposefully search outside of their assigned search area. Using POD for their assignment does not credit the unassigned areas for being searched

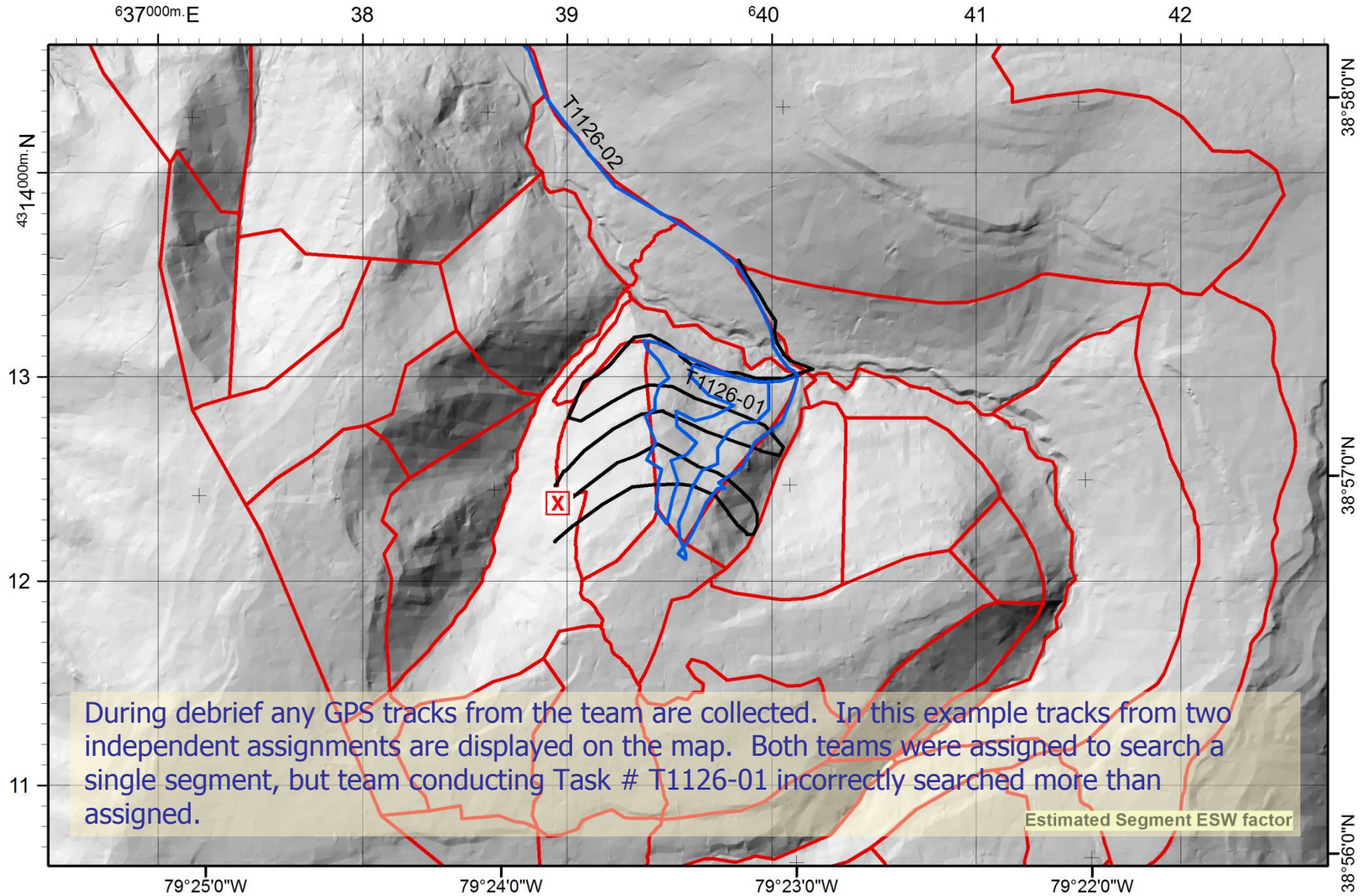


Map Name:

Mission Name: DollySods_Autistic
Mission Number: WV200810126A

Planning #:
Task #:

Date: 1/11/2012



ArcGIS provided by



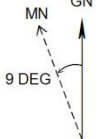
1:25,000
0 500 1,000 Meters
CONTOUR INTERVAL 20 FEET

GRID EXAMPLE
READ RIGHT THEN UP
UTM: 17N 060245 438963
USNG: 17S PD 0245 8963

US National Grid	Map Datum: WGS 1984
100,000-m Square ID	Grid Zone Designation
PD	17 S

TO CONVERT FROM MAP
TO COMPASS BEARING
ADD MN ANGLE.

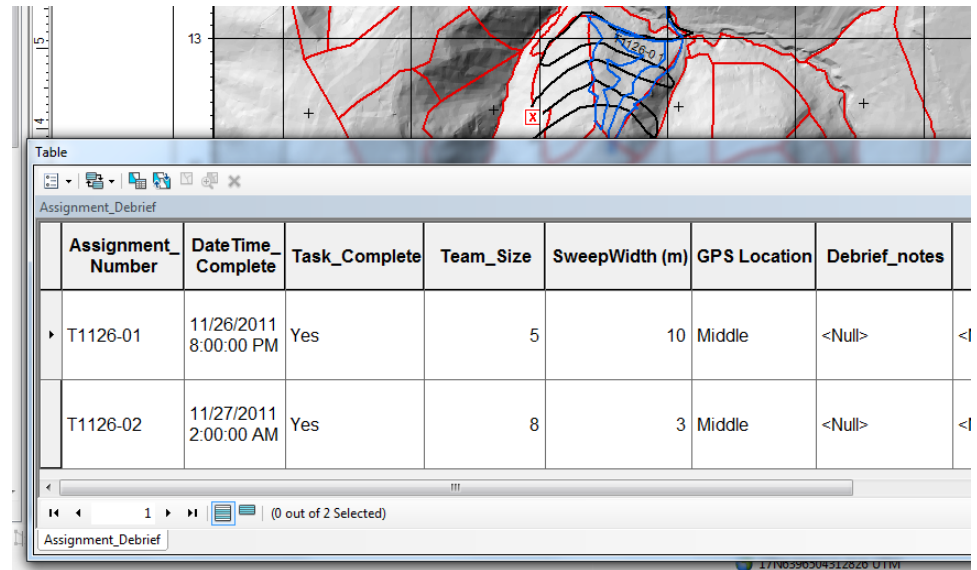
TO CONVERT A COMPASS
BEARING TO A MAP
SUBTRACT MN ANGLE.



Team Debrief

- During the debrief GPS tracks are downloaded and debrief information is collected.
- Data collected includes:
 - ⊕ Team Size
 - ⊕ Sweep Width (m)
- These data are used to create a buffer around the GPS track eventually used to calculate Coverage

$$\text{Coverage} = \frac{\text{Area Searched}}{\text{Segment Area}}$$



The screenshot shows a software interface with a map at the top displaying red and blue lines, likely representing GPS tracks. Below the map is a table titled "Assignment_Debrief".

Assignment Number	DateTime Complete	Task_Complete	Team_Size	SweepWidth (m)	GPS Location	Debrief_notes
T1126-01	11/26/2011 8:00:00 PM	Yes	5	10	Middle	<Null>
T1126-02	11/27/2011 2:00:00 AM	Yes	8	3	Middle	<Null>

Below the table, there is a status bar indicating "(0 out of 2 Selected)".



Coverage Tool

- Tool is located in the SAR_Toolbox under Operations
- Only input is “Workspace”
 - Uses the following as inputs
 - Routes_Line – GPS tracks, Debriefing, Search_Segments, Probability_Regions
 - Several other features are created during the process but deleted.
- During the running of the process the Assignment Numbers being process are displayed on screen.
- Next slides walk through the process performed by the Coverage Tool. The end-user will not see these individual steps only the end product.

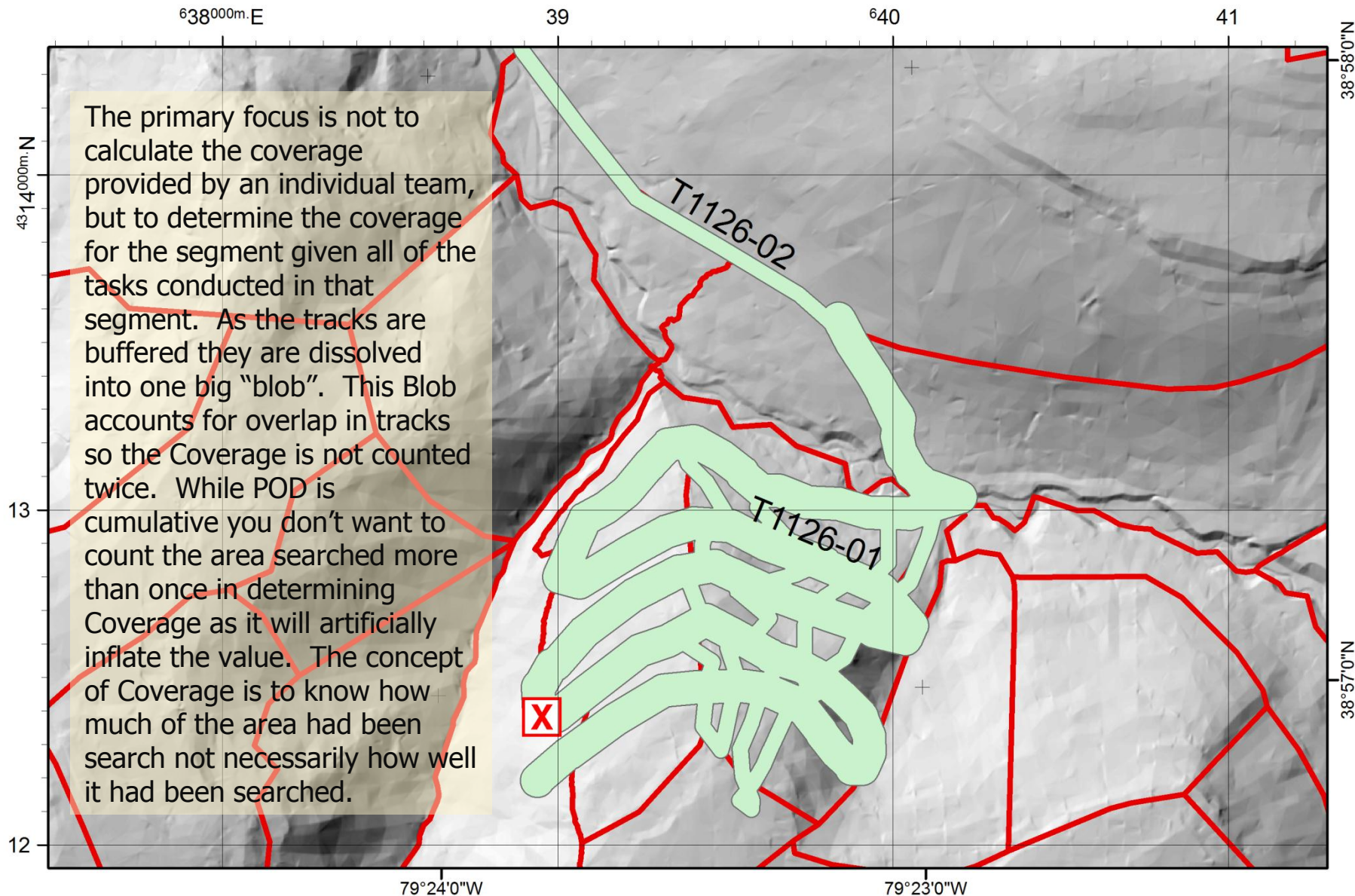


Map Name:

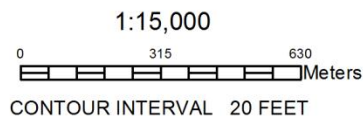
Mission Name: DollySods_Autistic
Mission Number: WV200810126A

Planning #:
Task #:

Date: 1/11/2012



ArcGIS provided by



GRID EXAMPLE
READ RIGHT THEN UP
UTM: 17N 060245 438963
USNG: 17S PD 0245 8963

US National Grid		Map Datum: WGS 1984	
100,000-m Square ID		Grid Zone Designation	
PD		17 S	

TO CONVERT FROM MAP
TO COMPASS BEARING
ADD MN ANGLE.

TO CONVERT A COMPASS
BEARING TO A MAP
SUBTRACT MN ANGLE.

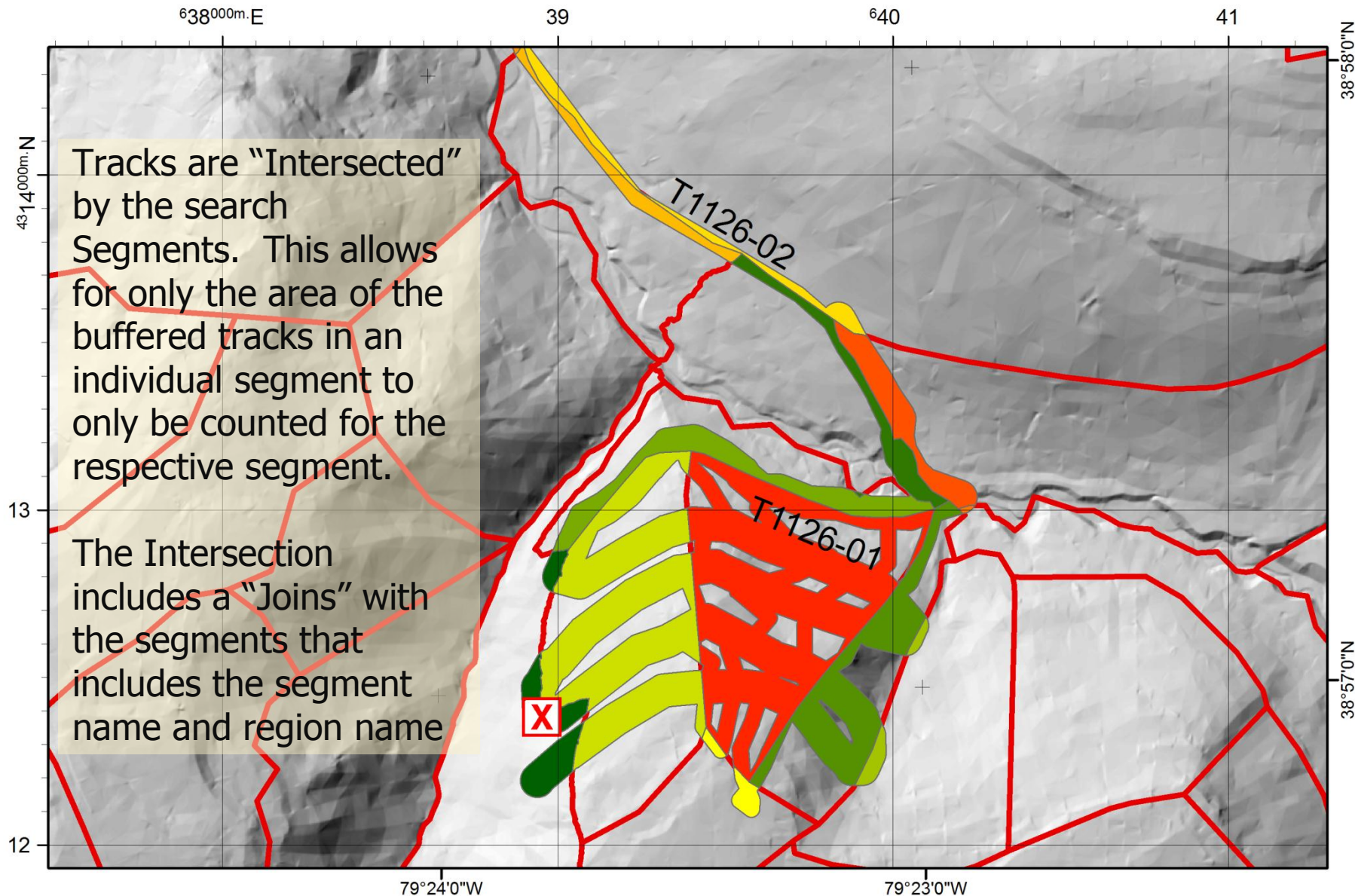


Map Name:

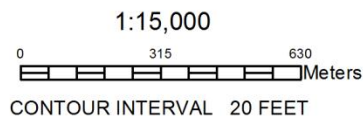
Mission Name: DollySods_Autistic
Mission Number: WV200810126A

Planning #:
Task #:

Date: 1/11/2012



ArcGIS provided by



GRID EXAMPLE
READ RIGHT THEN UP
UTM: 17N 060245 438963
USNG: 17S PD 0245 8963

US National Grid		Map Datum: WGS 1984	
100,000-m Square ID		Grid Zone Designation	
PD		17 S	

TO CONVERT FROM MAP
TO COMPASS BEARING
ADD MN ANGLE.

TO CONVERT A COMPASS
BEARING TO A MAP
SUBTRACT MN ANGLE.



Coverage Tool

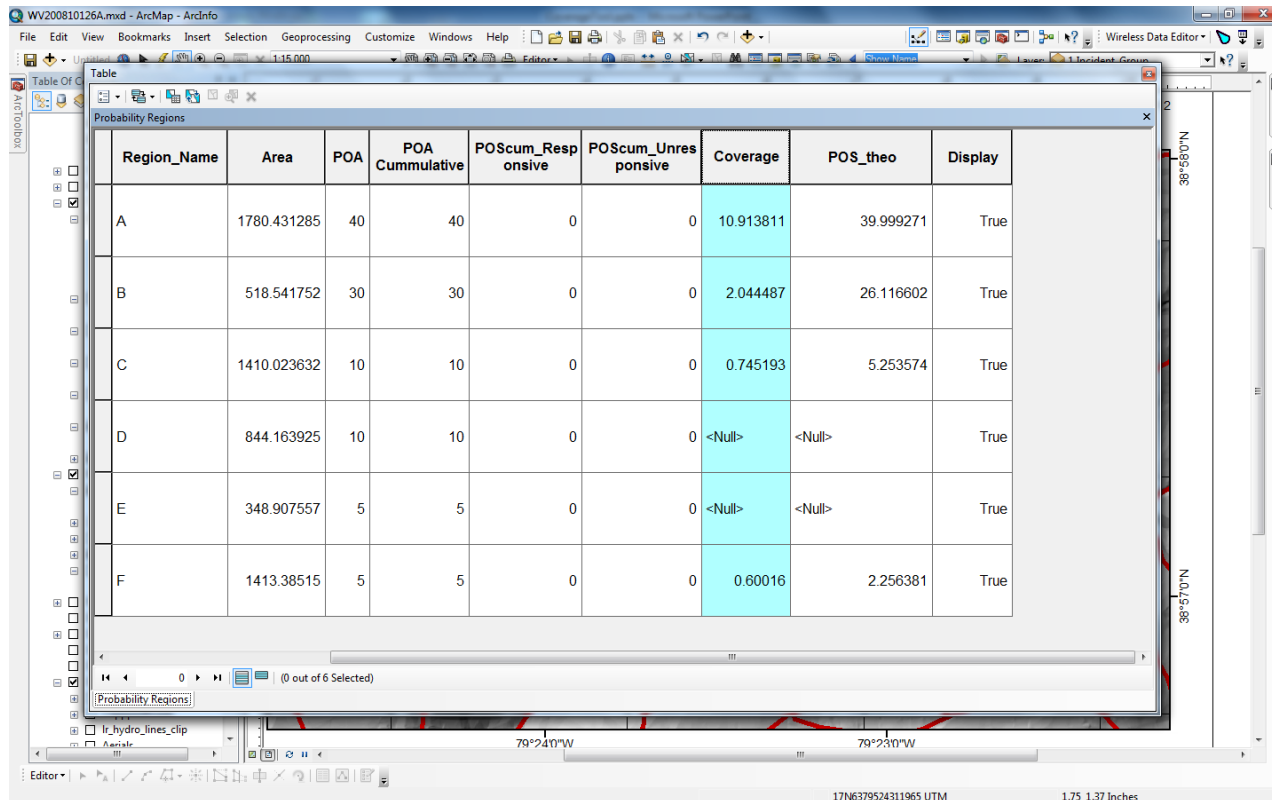
- The area of the Intersected-Buffered tracks is calculated and recorded in the Search_Segment feature class.
- POD is only provided by the team for the segment assigned but Coverage is calculated for any segment they entered
- The intermediate layers created during processing are deleted.

POA Cumulative	POScum_Responsive	POScum_Unresponsive	Area_Name	Coverage	POS_theo	Resource_Type_PSR	Search Time (hr)
5	0	0	F01	0.60016	2.26	<Null>	0
32	16	8	A16	57.908733	32	<Null>	0
40	0	0	A17	4.14328	39.37	<Null>	0
36	14	4	A02	77.303177	36	<Null>	0
40	0	0	A03	55.048275	40	<Null>	0
40	0	0	A04	2.781504	37.52	<Null>	0



Coverage for Probability Regions

- The process continues to calculate the Coverage for the Probability Regions



The screenshot shows the ArcMap interface with a table titled "Probability Regions" open. The table contains the following data:

Region_Name	Area	POA	POA Cumulative	POScum_Respon	POScum_Unrespon	Coverage	POS_theo	Display
A	1780.431285	40	40	0	0	10.913811	39.999271	True
B	518.541752	30	30	0	0	2.044487	26.116602	True
C	1410.023632	10	10	0	0	0.745193	5.253574	True
D	844.163925	10	10	0	0	<Null>	<Null>	True
E	348.907557	5	5	0	0	<Null>	<Null>	True
F	1413.38515	5	5	0	0	0.60016	2.256381	True

The table is displayed within the ArcMap window, which also shows a map of the region with various layers and a scale bar at the bottom.

