

ArcPad Mapping for Snow Avalanches and the Mechanized Ski Industry.

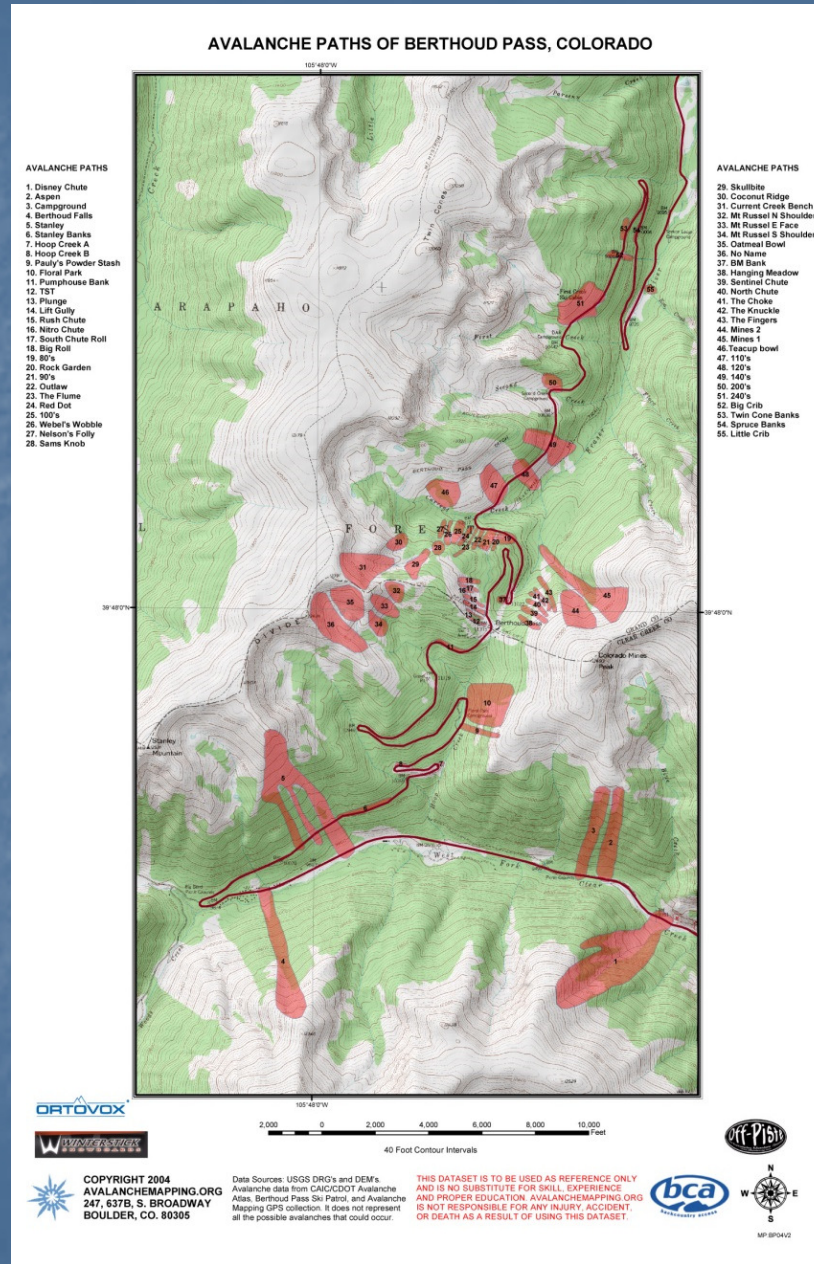


By Douglas D. Scott
AVALANCHE MAPPING

02.12.2010 12:29

- For many years the Swiss, Canadian and other snow scientists have been using GIS technologies to monitor and document avalanche occurrences, snow profiles, and weather.
- The United States has had limited GIS use for this discipline. Until the early 2000's almost all avalanche and snowpit data observations were recorded on hard copy and did not have a digital spatial component.
- In 2002 I started Avalanche Mapping to create digital GIS data to document historical snow avalanche data and create avalanche atlas maps.
- In addition to the avalanche atlas maps I created an ArcPad mobile application project that was to be used to collect weather and snow observations based on the after an avalanche occurrence or accident.
- This also led to the use of ArcPad mapping for the Helicopter and Snow Cat ski industry.

Avalanche Atlas Map of Berthoud Pass Colorado.



- In 2004 the United States Snow and Avalanche Observational Guidelines were developed this is what Avalanche Mapping used as the template for the GIS geodatabase design. This was the first time the US has had any National standards.
- From this manual I developed a data dictionary and 3 GIS feature classes for observations. One for weather, one for the snow profile and one for the avalanche path. This geodatabase design was presented at the ESRI UC in 2007.

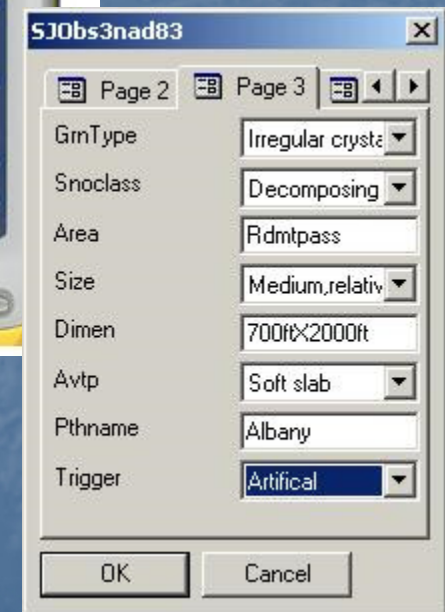


- From this geodatabase I was able to create ArcPad projects to do digital collection of the characteristics of the weather, snow profiles and avalanche paths to assess the level of danger rather than writing in paper field books as had always been done in the past.
- The use of subtypes and domains in this geodatabase possible to collect digital field data to the standard of the United States Snow and Avalanche Observational Guidelines that had been recently established.

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Avalanche Mapping
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- The use of mobile GIS/GPS technologies using the Arcpad program gives us the ability to have near real time updates and post them back to the database for validation and forecasting and modeling. This also allows us to document the observations of the weather and snow profile after avalanche occurrences. Also it could help with giving some spatial coordinates for our avalanche control blasting work and mark dud explosives for retrieval.

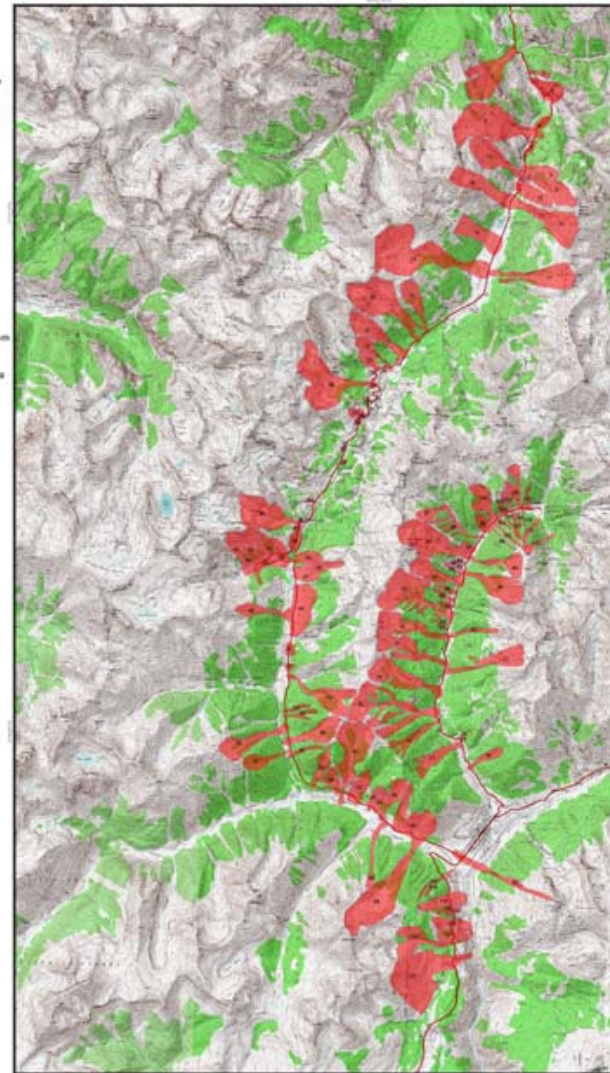


When the historical attributes of the avalanche paths of Red Mountain Pass, Colorado are loaded from the geodatabase to ArcPad we can collect the current observation information and then bring it back into the geodatabase with the this new information. US Highway 550, Red Mountain Pass is the most avalanche prone highway in the US.

AVAILANCHE PATHS OF HIGHWAY 550 OURAY TO SILVERTON AREA, SAN JUAN MOUNTAINS, COLORADO

AVAILANCHE PATHS:

1. Little Fry
2. Silver Point
3. Wolf's Head
4. Mather's Chim
5. Silver Gulch
6. Cliff
7. N. of Emergency phone
8. East Riverside Left
9. East Riverside
10. West Riverside Side
11. East Riverside Right
12. East Riverside South
13. Ripsey Jan
14. East Goodlake
15. West Goodlake
16. Iverson
17. Adams
18. Full Moon Gulch
19. Richmond
20. Montano Gulch
21. Gattina Lum
22. Gattina Gulch
23. King
24. Thompson's Dip
25. Comstock Basin
26. Barlowe
27. Menden
28. Willow Swamp
29. Blue Willow
30. Blue Point
31. Ironcliffe
32. Farnes
33. Red Mountain Pass
34. Runoff
35. Silver Lodge Mine North
36. Pinyon Gulch
37. Silver Lodge Mine
38. Pinewood
39. Second Train Crossing
40. Silver Lodge Mid
41. Penman
42. Eagle
43. Tolson
44. Mulhous
45. Mill Creek
46. First Train Crossing
47. Caribbery
48. Bonnyton
49. Ingersoll
50. Bonny Long
51. Blackburn
52. Ocho Road
53. Barber North
54. Barber South
55. Barbedge
56. Carhart FR
57. Oatman
58. Lower Carhart FR
59. Carth
60. Hoag
61. Zuck
62. Terry



AVAILANCHE PATHS:

63. FN
64. Old South Mineral Road
65. Pumpkin
66. North Star
67. North Star
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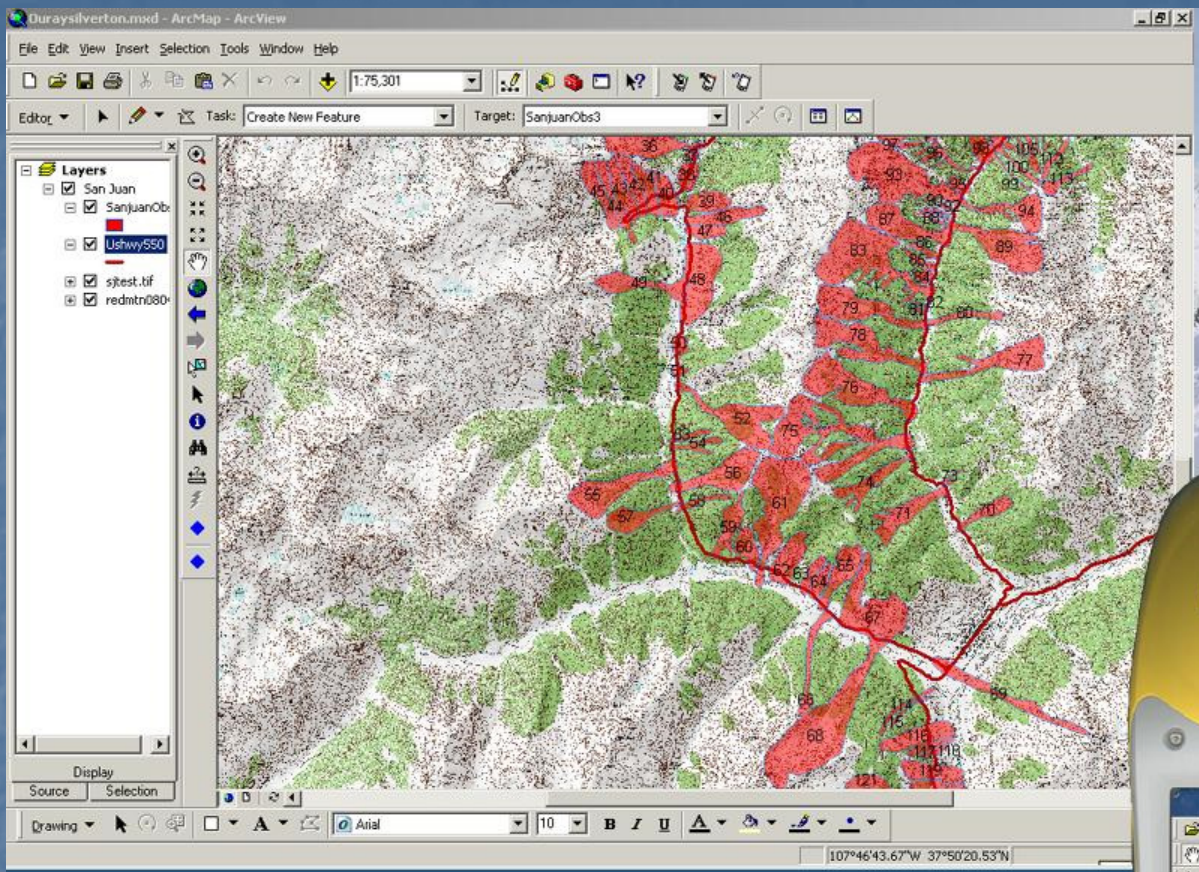
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Scale bar: 0, 8,000, 16,000, 24,000, 32,000, 36,000 Feet



- Another example of the historically observed Avalanche paths on Highway 550 in the San Juan Mountains, near the town of Ouray in Southwestern Colorado.





Using ArcGIS and ArcPad to map historic avalanche paths and collect realtime snow and avalanche data.

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AVALANCHE MAPPING
2005

Shooting an Avalanche on Highway 550



While this concept for for using ArcPad for collecting snow and avalanche data was not widely embraced I did get a number of followers in a few of the avalanche centers that had a background in collecting GPS data in their summer Forest Service jobs. And then from the exposure that I had gotten at the ISSW in 2004 I began to get contacted from some of the HeliSki operators to help with mapping their landing zones and other information.



The first client was Chugach powder Guides in Girdwood Alaska. They wanted to collect their Landing drop off and pick up locations and to see where they were flying in relation to areas that were closed to motorized equipment.



Another operator was Sun Valley Heliski in Idaho. They wanted to collect their Landing drop off and pick up locations. And to help map their areas know as "Zones" in relation to their Forest Service lease boundary.



They already had some of their information in a GIS project and wanted to further fine tune their datasets for submission to the Forest Service.



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Then I started to get
inquires from some of the
Snow cat ski operators.

This part of the
mechanized has
experience a boom in the
past 8 or so years. One of
the new operations was
Powder Addiction out of
Winter Park Colorado.



They were starting this company and had no mapping for their area yet. They needed provide data to the Forest Service for their lease area and ski zones, where the snow cat roads were cut, drop offs and pickups, and emergency evacuation spots in case of an accident or emergency.

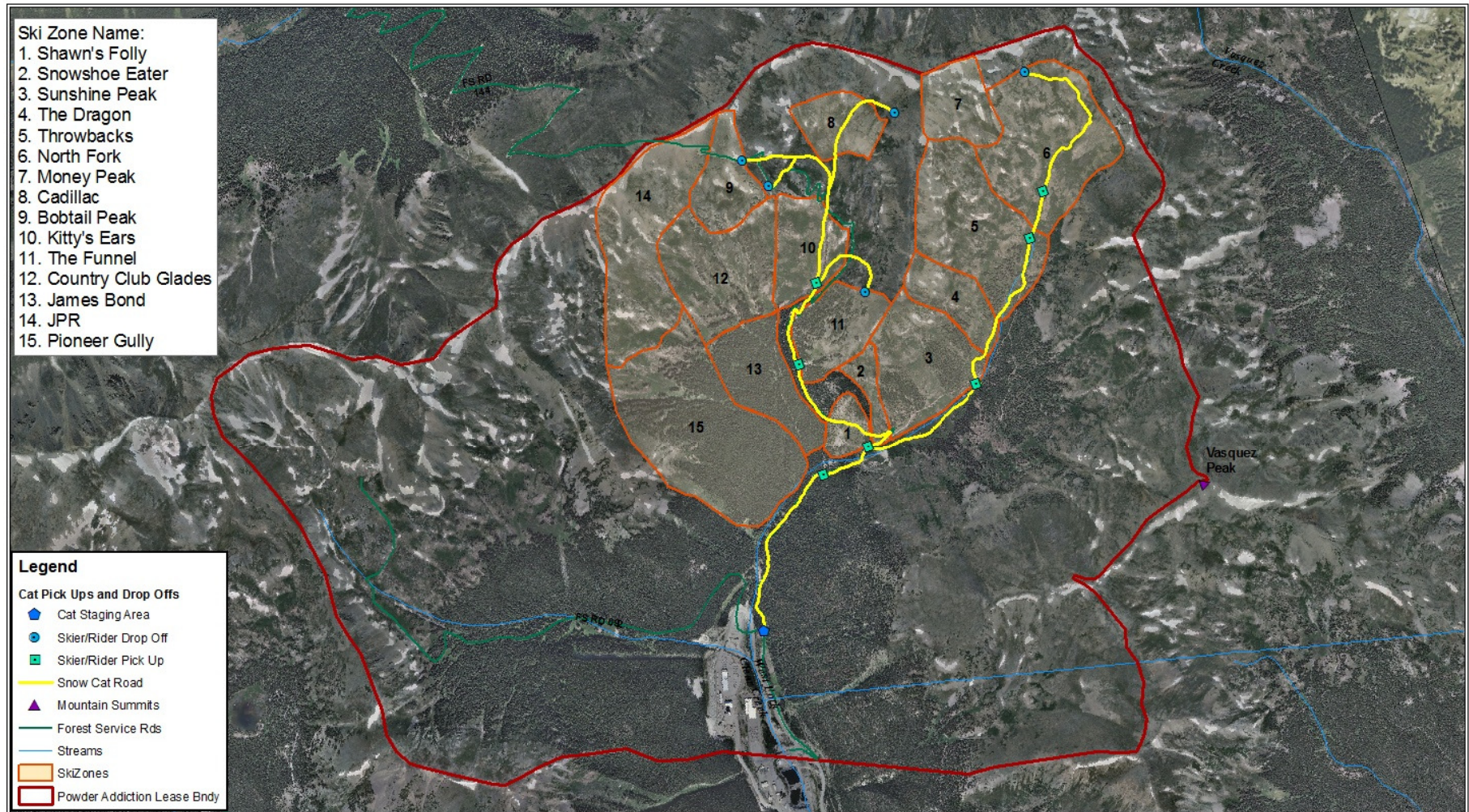


Powder Addiction's New Snow Cat in 2011.



Powder Addiction Map Products.

Powder Addiction Snow Cat Skiing and Riding at Jones Pass, Colorado



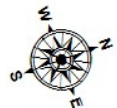
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Data Sources: NAIP Aerial Imagery or USGS DRG and
DEMs and Avalanche Mapping GPS collection.
NAD 1983 UTM Z13N.



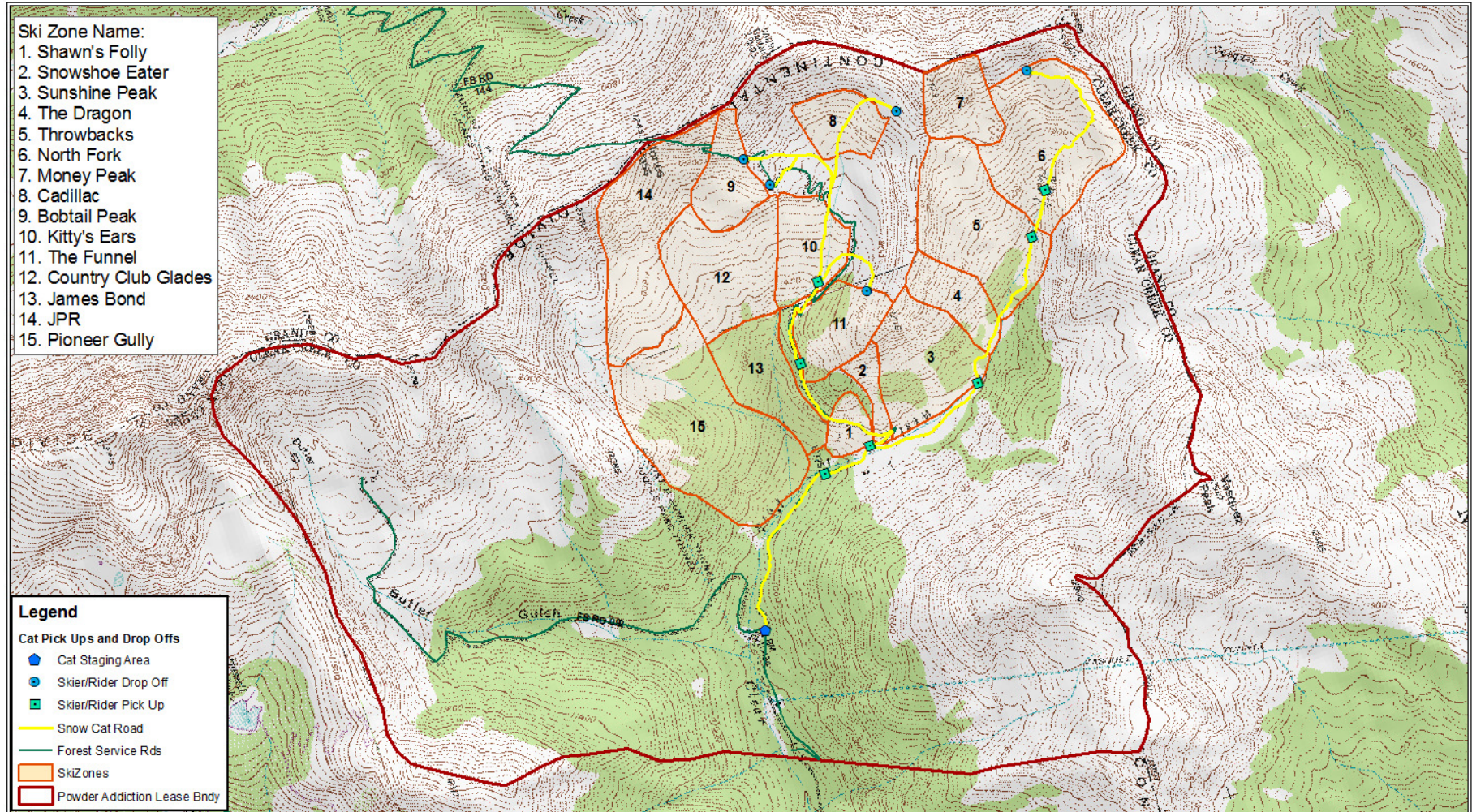
powder addiction.



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Powder Addiction Map Products.

Powder Addiction Snow Cat Skiing and Riding at Jones Pass, Colorado



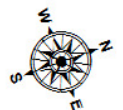
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powder addiction.



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Dropping off at a top of a run.



Skiing at an area know as the Cat's Ears.



The guide point out the line of a run.



01.08.2011 11:19

Skiing one of the lines.



01.08.2011 11:28

View from near the top of Jones Pass.



Waiting for a pick up to do another run.



01.29.2011 15:16

Biography:

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Currently I work as the GIS and Mapping manager for CH2M Hill and am the Owner/Director of Avalanche Mapping. I was formerly a ski patrolman and helicopter ski guide with a Level II American Avalanche School certificate and 38 years of winter mountaineering experience in North America and Europe. I am an Certified/Authorized ESRI Instructor and have completed the Statewide Avalanche Paths GIS project for the Colorado Avalanche Information Center and Colorado Geologic Survey in 2007 the project is now in update mode with additional data added every year.