Integrating GIS with Search Management

Presented at the 2009 Mountain Rescue Summer Conference

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Points to be Discussed

- What is GIS?
- Using GIS Effectively in a Search.
- Examples of GIS use in SAR operations.
  - Hardyston Search (downed aircraft)
  - Indian Lake Search (missing hunter)
  - Real-time Resource Tracking (APRS or SPOT?)
- Where do we go from here?
  - SAR-GIS Technican (a proposal)
  - Remote Site Planning
- Summary
- Appendix

What is GIS?


S-13
S-16
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S-2
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S-18
Hardistonville
2045 ELT
Echo extraction
Echo location
2030 ELT
Echo track at 1455
Echo track at 1600
3- possible fuel smell
Strong ELT hit at 1644
C-2- foliage
possible sighting
C-1- bolt found
Crash Site
C-4- aircraft debris 6/23
transponder track

What is GIS?

Geographic Information System

1. Geographic- the map

The quinessential document by which ALL SAR operations are controlled from.

Can be in nearly any form:

- USGS Quad
- Aerial
- Multi-resolution Satellite Image Data (MrSID)
- Digital Photograph of a Trail Map or an area
- Hand drawn sketch of an area

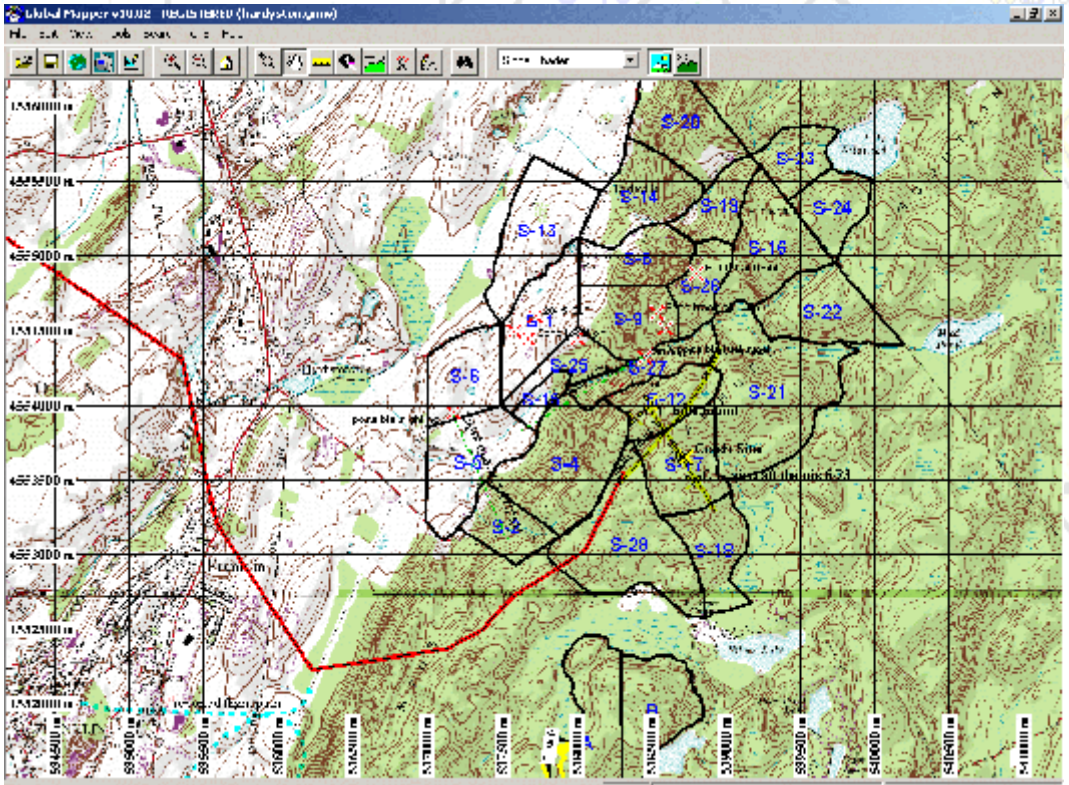
A Digital photograph of a wood burning map of Camp YawPaw.

If you do have digital photo capability, make sure you have the camera's download cable and proper software.

What is GIS?

Geographic Information System

2. Information- documentation such as PLS, LKP, Search Segments, etc., used throughout the course of a search. Spatial details such as Digital Elevation Models (DEM) are also considered as information.



GIS Attributes are bits on information that may be added (or Layered) onto a Search Map. These attributes may be Points, roads, trails, etc.

1	NAME	FEATURE	LONGITUDE	LATITUDE	COUNTY	USGS_QUAD	QUAD_ID	MAPTECH_PR
131	Dickerson Farm Mine	Mine	-74.7051077	40.7850307	Morris	Chester	40074-G6	40074G6.P24
132	Dickerson Mine	Mine	-74.6088387	40.8694377	Morris	Mendham	40074-G5	40074G5.P24
133	Dickinson Mine	Mine	-74.5649107	40.7818417	Morris	Chester	40074-G6	40074G6.P24
134	Dickinson's Mine	Mine	-74.8107797	40.8100797	Morris	Hackettstown	40074-G7	40074G7.P24
135	Dod Mine	Mine	-74.2162637	40.7809267	Essex	Orange	40074-G2	40074G2.P24
136	Dodge Mine	Mine	-74.5830627	41.0104637	Morris	Franklin	41079-D7	41079D7.P24
137	Dolan Mine	Mine	-74.5729677	40.9142877	Morris	Dover	40074-H5	40074H5.P24
138	Drake Mine	Mine	-74.7260157	40.8517877	Morris	Chester	40074-G6	40074G6.P24
139	Duckworth Farm Mine	Mine	-75.0843047	40.6118537	Hunterdon	Frenchtown	40075-E1	40075E1.P24
140	Duffee Mine	Mine	-74.5924757	41.0015187	Morris	Franklin	41079-D7	41079D7.P24
141	Dufford Mine	Mine	-74.8048687	40.8103557	Morris	Hackettstown	40074-G7	40074G7.P24
142	Edsall Mine	Mine	-74.5474347	41.1459777	Sussex	Hamburg	41074-B5	41074B5.P24
143	Edward's Prospect	Mine	-74.6395427	40.9537407	Sussex	Stanhope	40074-H6	40074H6.P24
144	Egbert Church Mine	Mine	-74.8975647	40.8309867	Warren	Washington	40074-G8	40074G8.P24
145	Emery Farm Exploration	Mine	-74.8675217	40.6670457	Hunterdon	Califon	40074-F7	40074F7.P24
146	Engleman Mine	Mine	-74.6787607	40.7558177	Morris	Chester	40074-G6	40074G6.P24
147	Erb Mine	Mine	-74.5915227	40.8967477	Morris	Dover	40074-H5	40074H5.P24
148	Eureka Mine	Mine	-74.7842467	40.9054117	Warren	Tranquility	40074-H7	40074H7.P24
149	Evers Mine	Mine	-74.6083997	40.8664997	Morris	Mendham	40074-G5	40074G5.P24
150	Excelsior Mine	Mine	-74.8075027	40.8859137	Warren	Tranquility	40074-H7	40074H7.P24
151	Fairview Mine	Mine	-74.4817677	40.9651357	Morris	Boonton	40074-H4	40074H4.P24
152	Feltville Mine	Mine	-74.4239477	40.6673857	Union	Chatham	40074-F4	40074F4.P24
153	Fisher Exploration	Mine	-74.8407047	40.7978227	Hunterdon	Gladstone	40074-F6	40074F6.P24
154	Fisher Mine	Mine	-74.7424937	40.7210867	Hunterdon	Gladstone	40074-F6	40074F6.P24
155	Fittz Mine	Mine	-75.0718797	40.7985077	Warren	Belvidere	40075-G1	40075G1.P24
156	Flemington Mine	Mine	-74.8698947	40.4970437	Hunterdon	Hopewell	40074-D7	40074D7.P24
157	Ford Mine	Mine	-74.5784447	41.0134717	Morris	Franklin	41079-D7	41079D7.P24
158	Foulon Mine	Mine	-74.6165037	40.8543947	Morris	Mendham	40074-G5	40074G5.P24
159	Fox Hill Mine	Mine	-74.7794247	40.7175327	Hunterdon	Califon	40074-F7	40074F7.P24
160	French Mine	Mine	-74.4492657	40.5012477	Middlesex	Plainfield	40074-E4	40074E4.P24
161	French's Mine	Mine	-74.7766427	40.9221107	Susses	Tranquility	40074-H7	40074H7.P24
162	Gaffney Mine	Mine	-74.6701097	40.9985007	Sussex	Stanhope	40074-H6	40074H6.P24

AT shelters | dams & dikes | **mines** | fire-rescue | hospitals | ½way shelters | churches | police | park rangers | SAR Teams | Cell Towers | Water Towers

We started a few years ago with some 96 mines in our database.
Today we have more than 450 and that is only for NJ.

What is GIS?

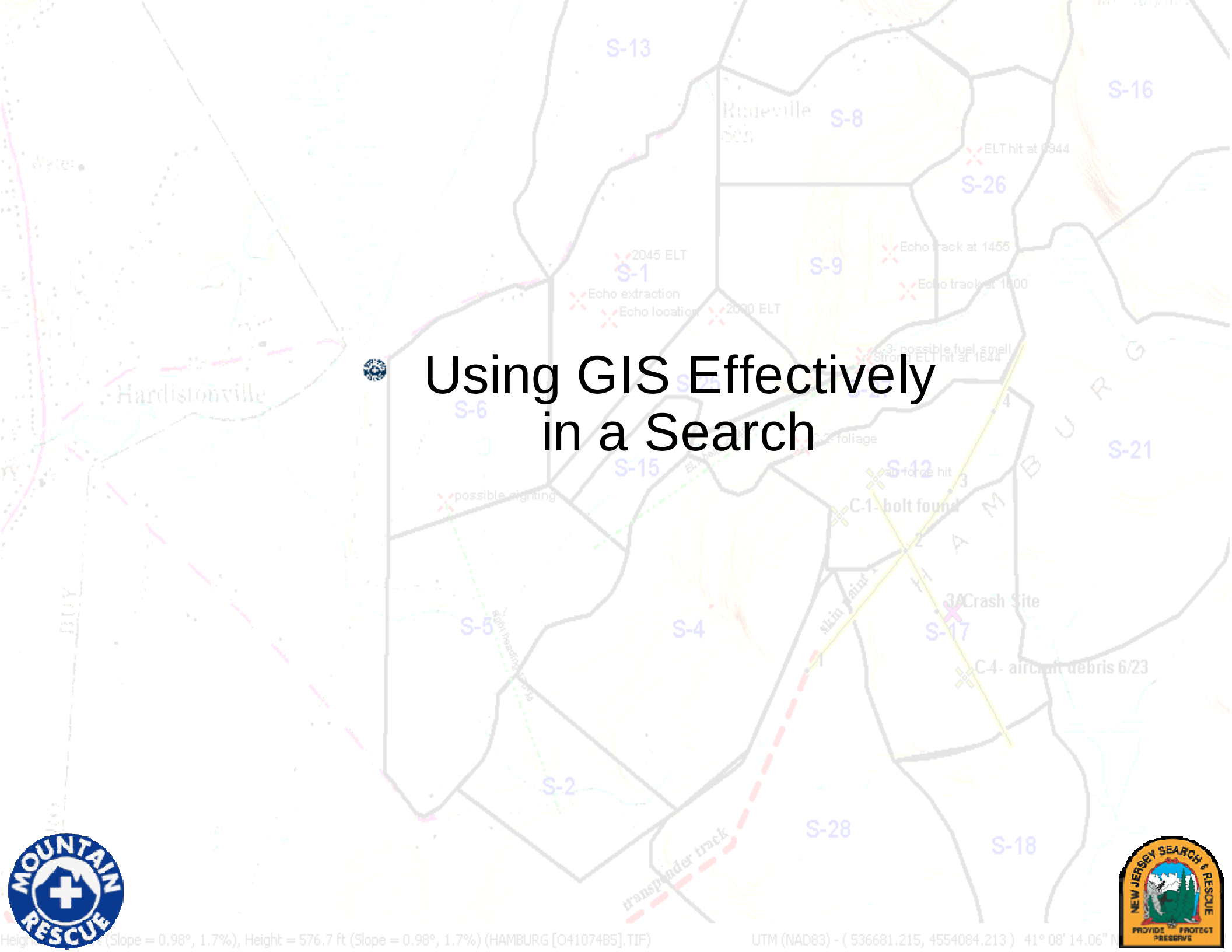
Geographic Information **S**ystem

3. System- a computer or similar device used to document and display the 'Information'.

OR

If you are looking into purchasing a new computer get one with as much RAM memory as you can (512mB Ram should be considered as minimal). Remember, you're in a search and **Time is Critical**.

Using GIS Effectively in a Search



Using GIS Effectively in a Search

GIS is most effective when used early in the planning stage of a search.

Remember, searches can be complex and are geospatial.

GIS generates metric data (data that can be analyzed statistically), not just images.

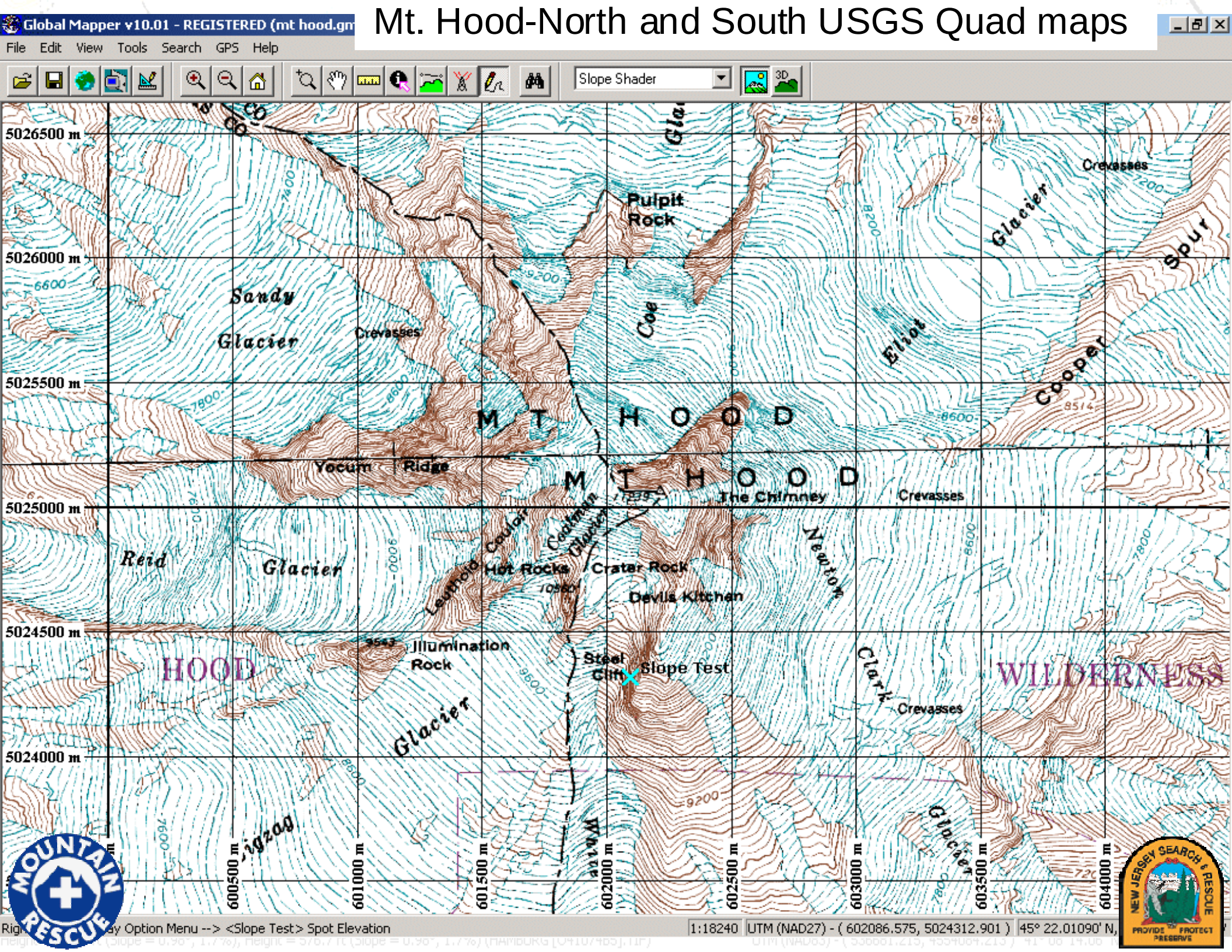
Search teams, families, and our search subjects deserve the best we can deliver. GIS helps ensure this concept.

MOST IMPORTANTLY:

"...GIS may enhance, but will never replace, institutional knowledge..."

John Dill (YOSAR)

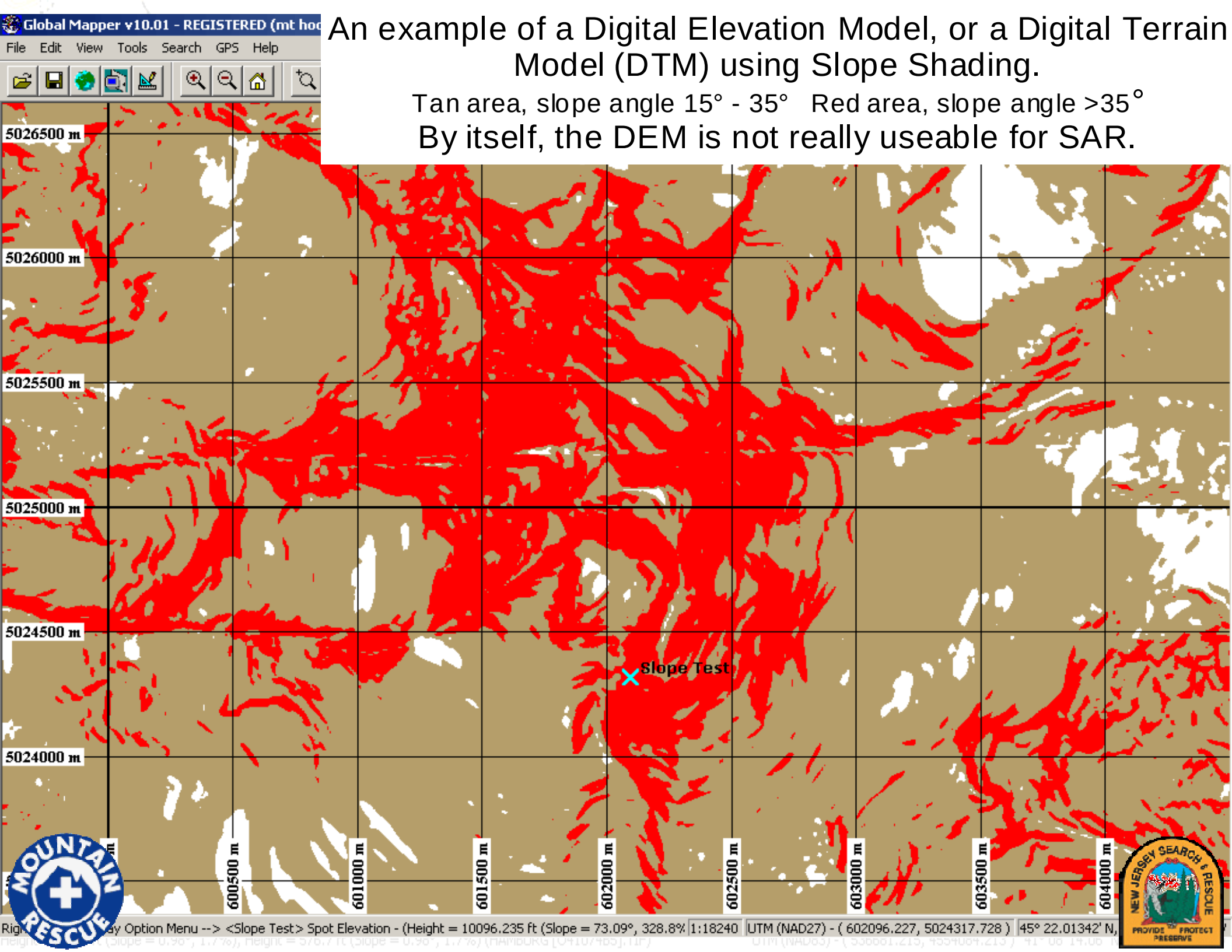
Mt. Hood-North and South USGS Quad maps



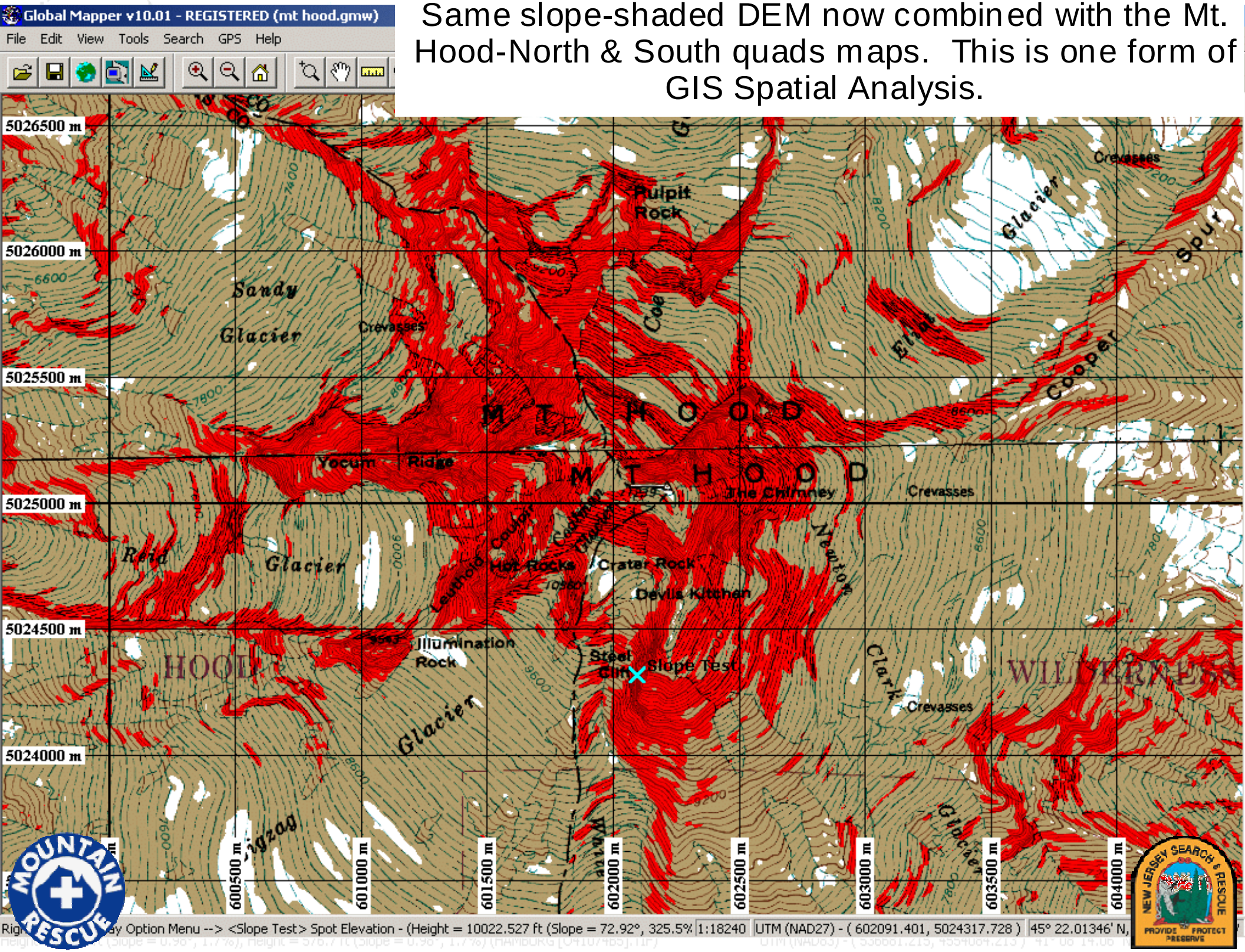
An example of a Digital Elevation Model, or a Digital Terrain Model (DTM) using Slope Shading.

Tan area, slope angle 15° - 35° Red area, slope angle >35°

By itself, the DEM is not really useable for SAR.



Same slope-shaded DEM now combined with the Mt. Hood-North & South quads maps. This is one form of GIS Spatial Analysis.



We can ‘call up’ the attributes, or information, about a Point of Interest and learn more detailed information about that point.

File Edit View Tools Search GPS

Modify Feature Info

Name: Edsall Mine

Feature Type

Mine — Create New Type...

Feature Layer

NJ-GNI (mines).dbf

Feature Style

- Use Default Style for Selected Feature Type
- Specify Style to Use When Rendering Feature

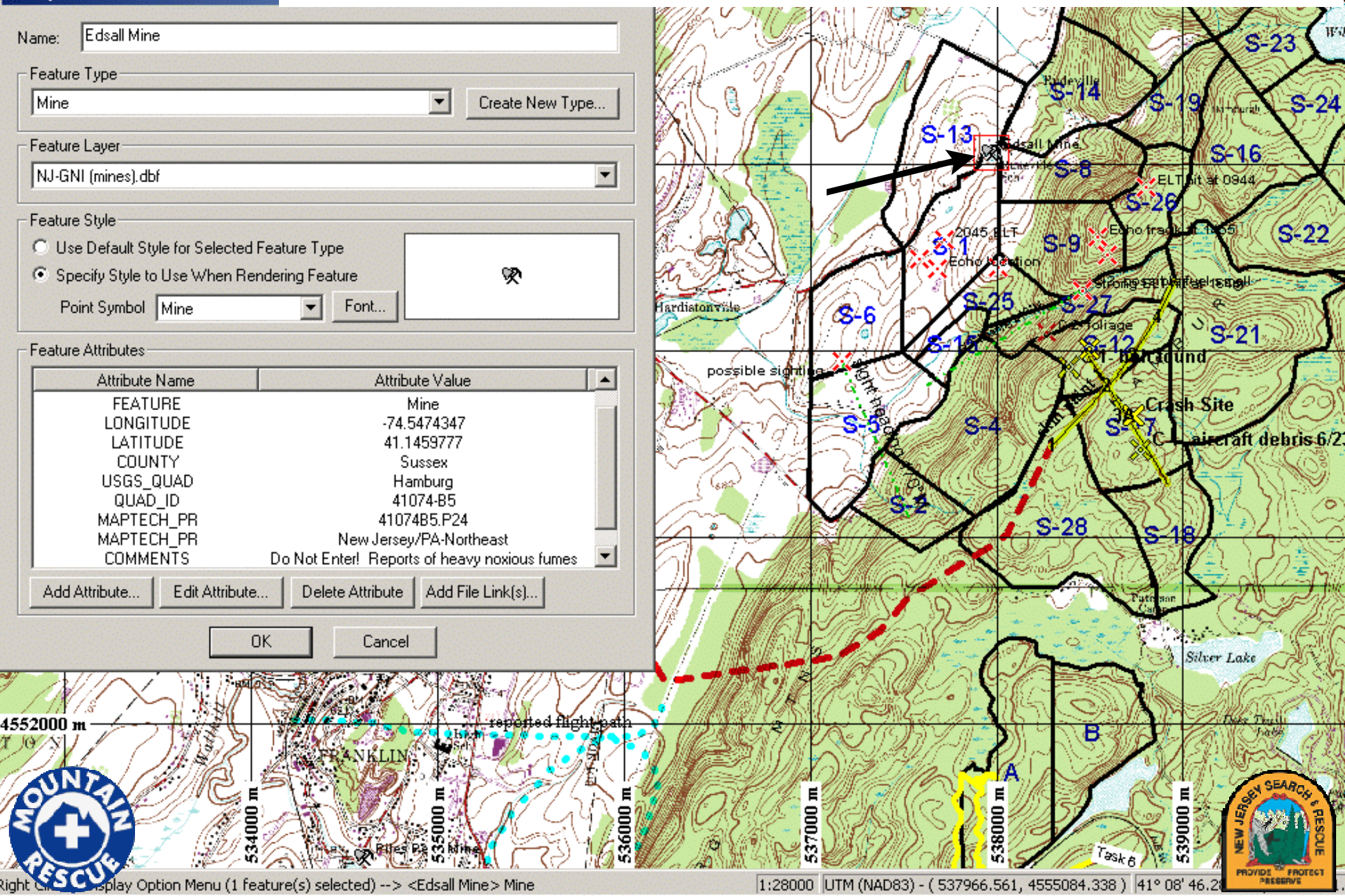
Point Symbol: Mine — Font...

Feature Attributes

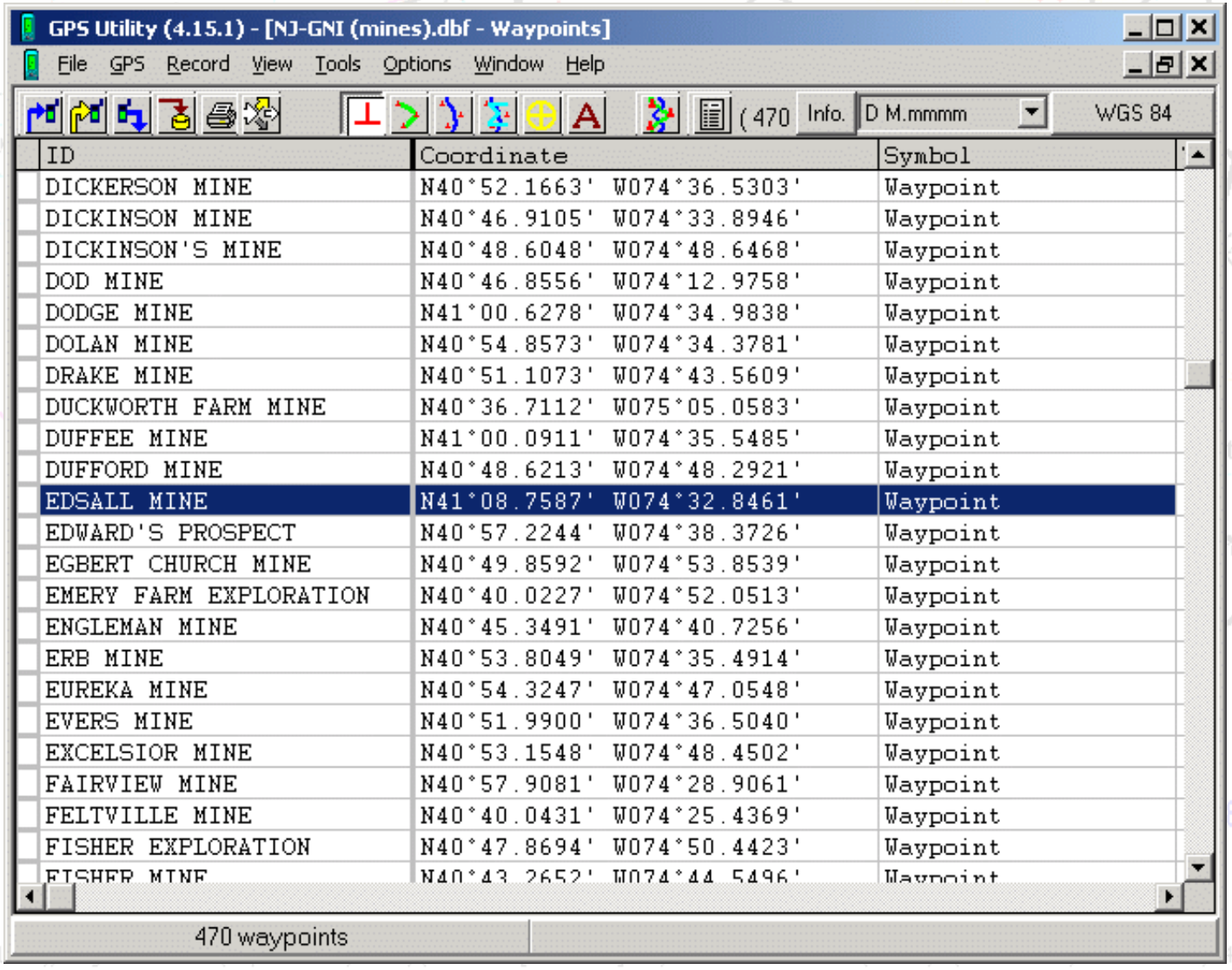
Attribute Name	Attribute Value
FEATURE	Mine
LONGITUDE	-74.5474347
LATITUDE	41.1459777
COUNTY	Sussex
USGS_QUAD	Hamburg
QUAD_ID	41074-B5
MAPTECH_PR	41074B5.P24
MAPTECH_PR	New Jersey/PA-Northeast
COMMENTS	Do Not Enter! Reports of heavy noxious fumes

Add Attribute... | Edit Attribute... | Delete Attribute | Add File Link(s)...

OK | Cancel

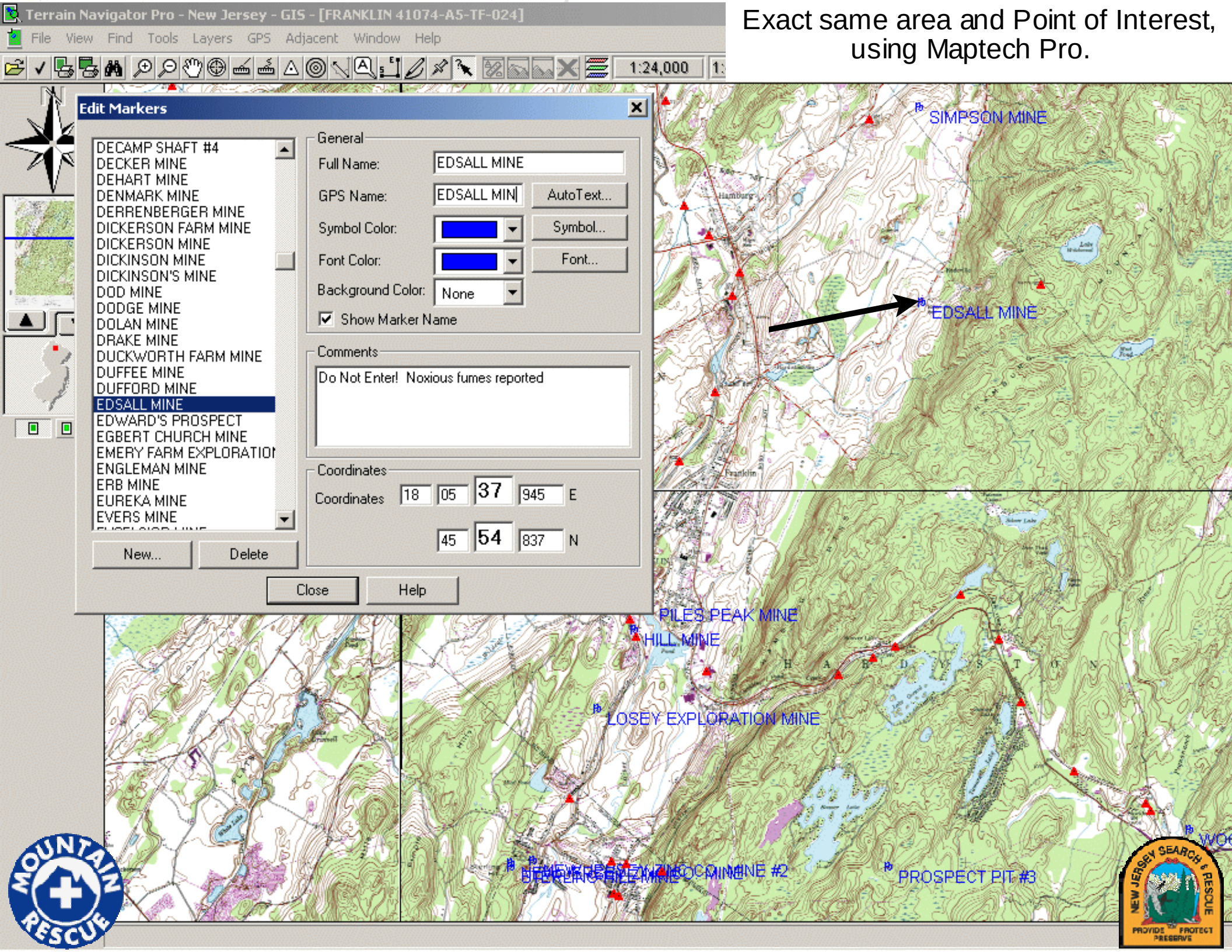


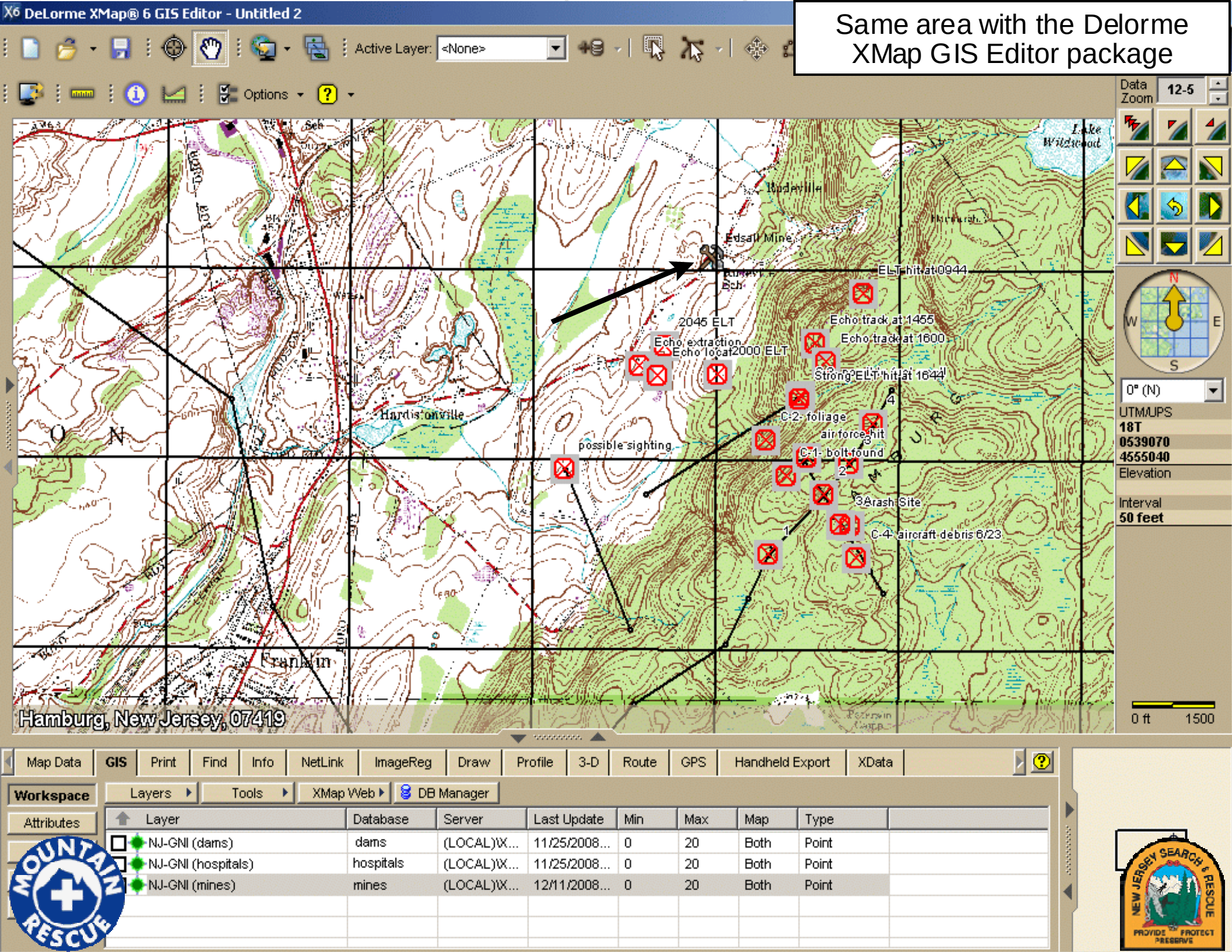
Maptech users can utilize GIS, but may require a file conversion program. One such program is called GPS Utility. This is a $40 UK-based Shareware program that can convert a variety of file formats into other formats. Here we converted NJSAR's Mines database (a *.dbf file) into a Maptech *.mxf file.



ID	Coordinate	Symbol
DICKERSON MINE	N40°52.1663' W074°36.5303'	Waypoint
DICKINSON MINE	N40°46.9105' W074°33.8946'	Waypoint
DICKINSON'S MINE	N40°48.6048' W074°48.6468'	Waypoint
DOD MINE	N40°46.8556' W074°12.9758'	Waypoint
DODGE MINE	N41°00.6278' W074°34.9838'	Waypoint
DOLAN MINE	N40°54.8573' W074°34.3781'	Waypoint
DRAKE MINE	N40°51.1073' W074°43.5609'	Waypoint
DUCKWORTH FARM MINE	N40°36.7112' W075°05.0583'	Waypoint
DUFFEE MINE	N41°00.0911' W074°35.5485'	Waypoint
DUFFORD MINE	N40°48.6213' W074°48.2921'	Waypoint
EDSALL MINE	N41°08.7587' W074°32.8461'	Waypoint
EDWARD'S PROSPECT	N40°57.2244' W074°38.3726'	Waypoint
EGBERT CHURCH MINE	N40°49.8592' W074°53.8539'	Waypoint
EMERY FARM EXPLORATION	N40°40.0227' W074°52.0513'	Waypoint
ENGLEMAN MINE	N40°45.3491' W074°40.7256'	Waypoint
ERB MINE	N40°53.8049' W074°35.4914'	Waypoint
EUREKA MINE	N40°54.3247' W074°47.0548'	Waypoint
EVERS MINE	N40°51.9900' W074°36.5040'	Waypoint
EXCELSIOR MINE	N40°53.1548' W074°48.4502'	Waypoint
FAIRVIEW MINE	N40°57.9081' W074°28.9061'	Waypoint
FELTVILLE MINE	N40°40.0431' W074°25.4369'	Waypoint
FISHER EXPLORATION	N40°47.8694' W074°50.4423'	Waypoint
FISHER MINE	N40°43.2652' W074°44.5496'	Waypoint

Exact same area and Point of Interest, using Maptech Pro.




DeLorme XMap® 6 GIS Editor - Untitled 2
Same area with the Delorme XMap GIS Editor package
Active Layer: <None>
Options
Data Zoom 12-5
Edsall Mine
ELT hit at 0944
Echo track at 1455
Echo track at 1600
2045 ELT
Echo extraction
Echo location
2000 ELT
Strong ELT hit at 1644
C-2- foliage
air force hit
possible sighting
C-1- bolt found
3Arash Site
C-4- aircraft debris 6/23
Hardistonville
Franklin
Hamburg, New Jersey, 07419
0° (N)
UTM/UPS
18T
0539070
4555040
Elevation
Interval
50 feet
0 ft
1500
Map Data
GIS
Print
Find
Info
NetLink
ImageReg
Draw
Profile
3-D
Route
GPS
Handheld Export
XData
Workspace
Layers
Tools
XMap Web
DB Manager
Attributes
Layer
Database
Server
Last Update
Min
Max
Map
Type
NJ-GNI (dams)
dams
(LOCAL)\X...
11/25/2008...
0
20
Both
Point
NJ-GNI (hospitals)
hospitals
(LOCAL)\X...
11/25/2008...
0
20
Both
Point
NJ-GNI (mines)
mines
(LOCAL)\X...
12/11/2008...
0
20
Both
Point
MOUNTAIN RESCUE
NEW JERSEY SEARCH & RESCUE
PROVIDE PROTECT PRESERVE

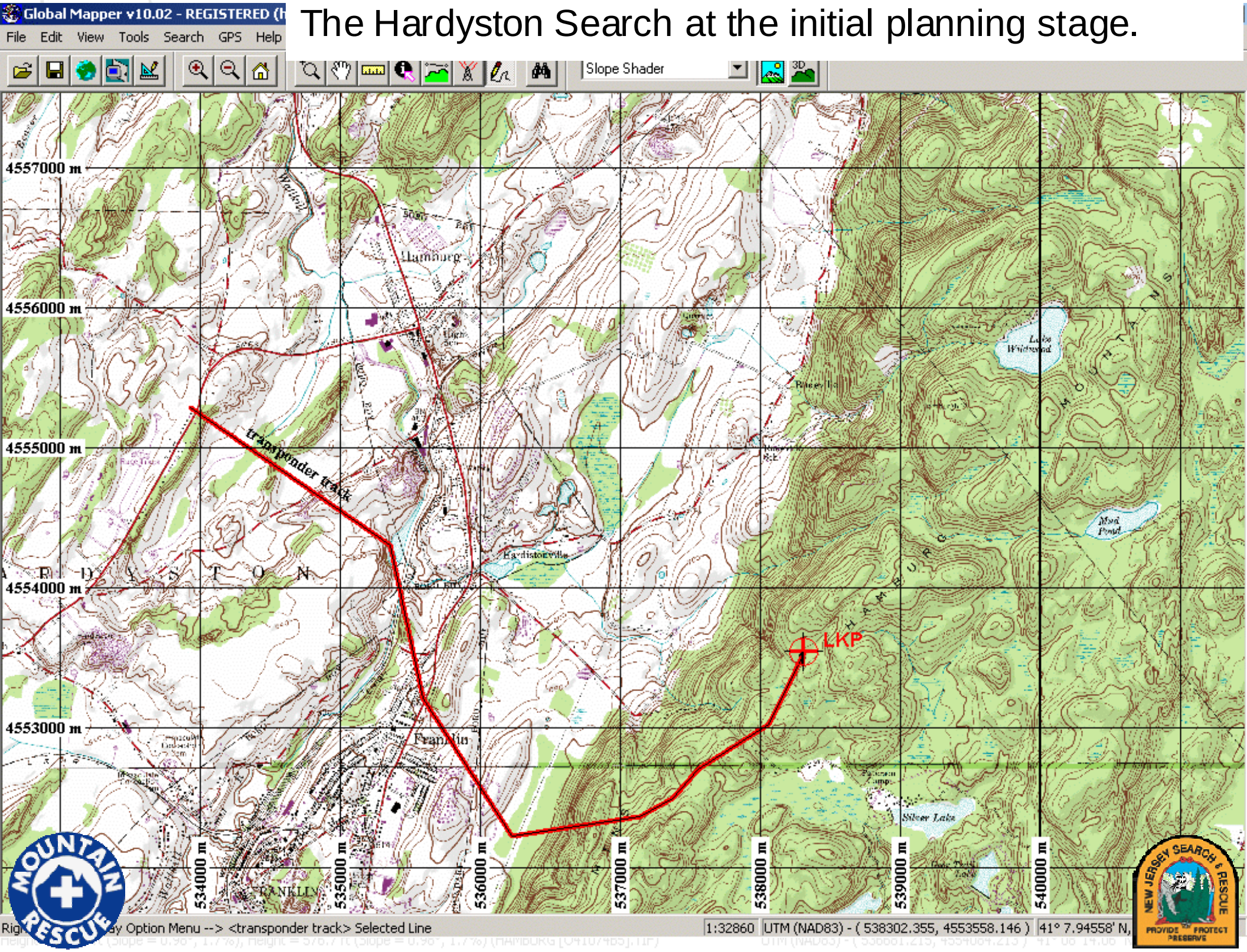
Using GIS in SAR Mission

The Hardyston Search; a multi-resource, multi-day search for a downed aircraft

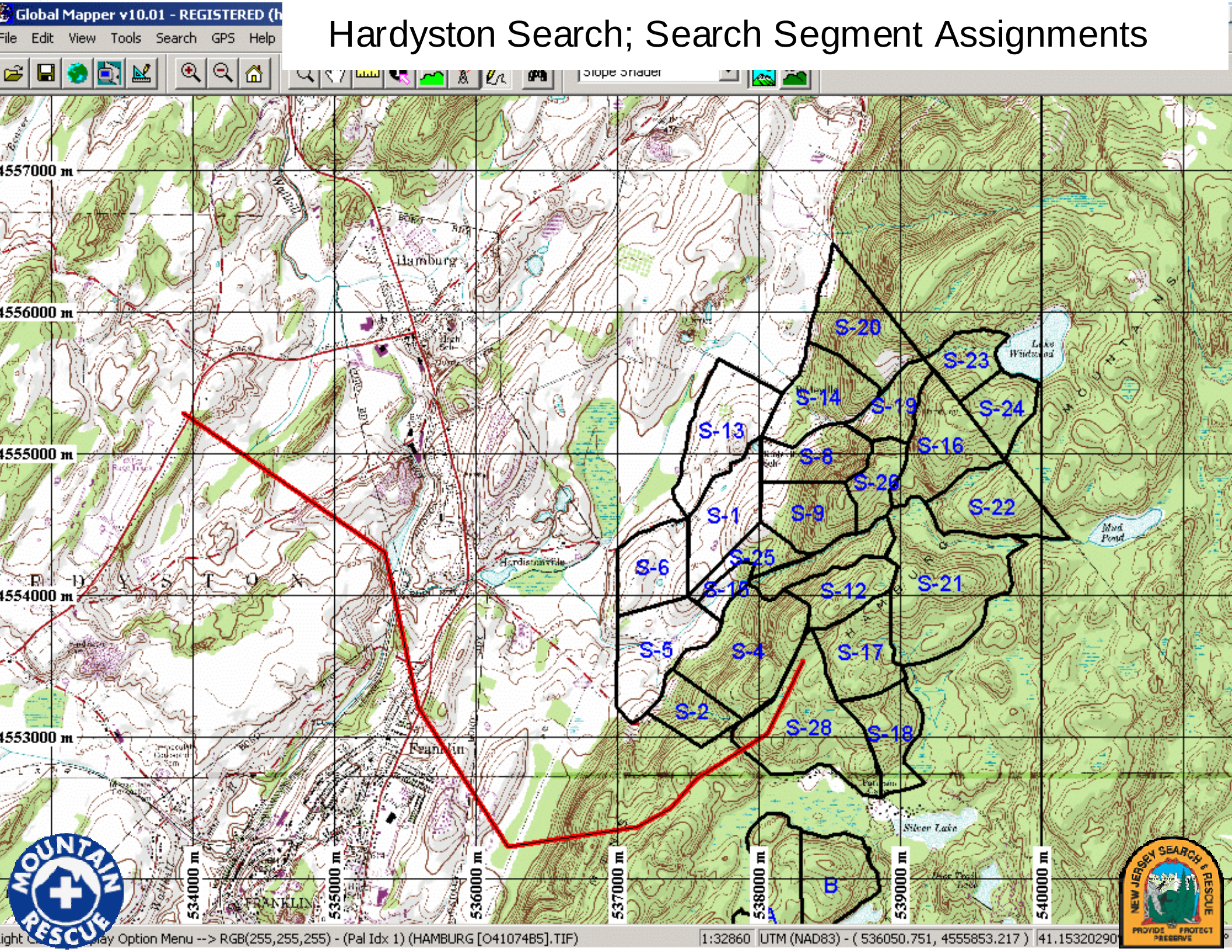
The Indian Lake Search; a multi-resource, multi-day search for a missing hunter

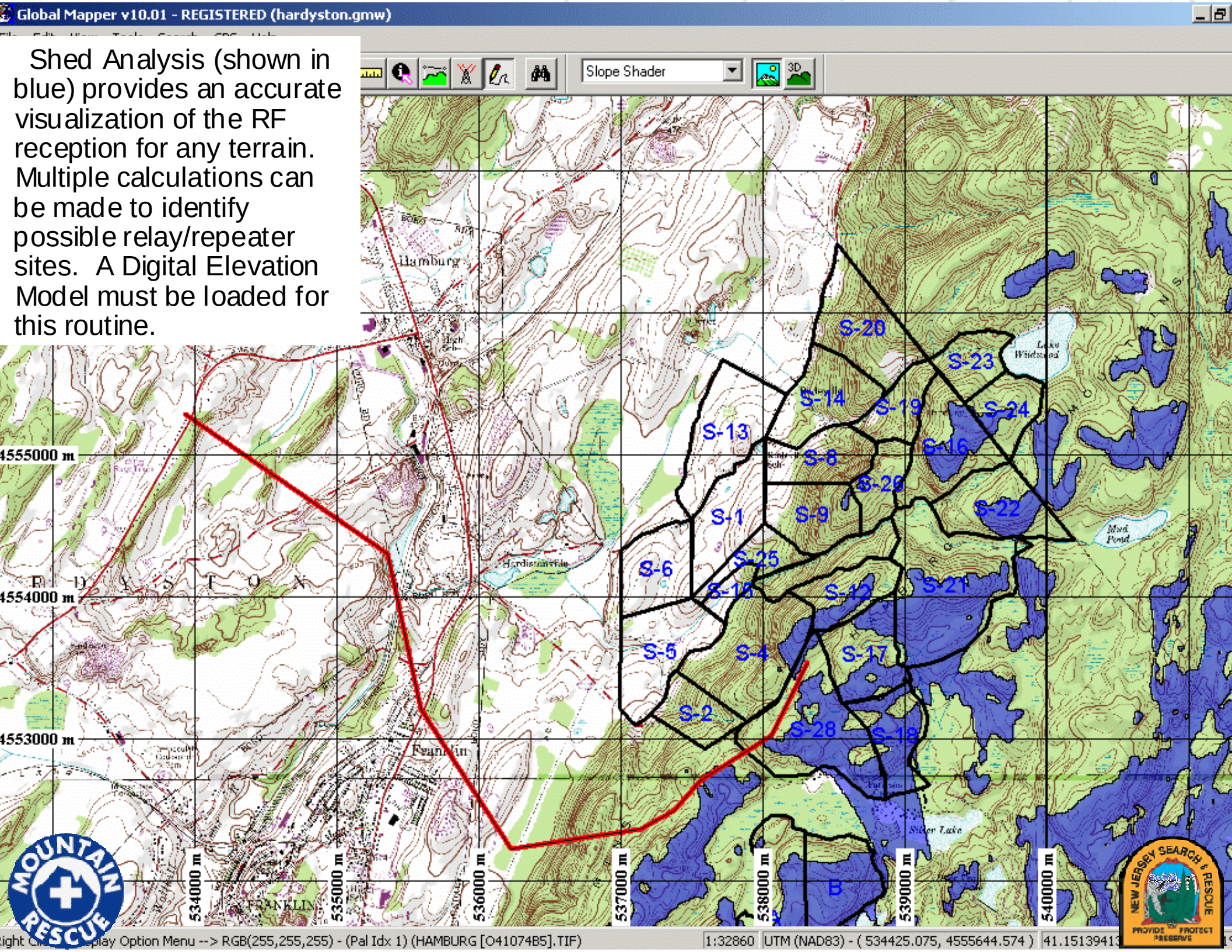
Real-time Resource Tracking

The Hardyston Search at the initial planning stage.



Hardyston Search; Search Segment Assignments




Global Mapper v10.01 - REGISTERED (hardyston.gmw)
Slope Shader
3D
Shed Analysis (shown in blue) provides an accurate visualization of the RF reception for any terrain. Multiple calculations can be made to identify possible relay/repeater sites. A Digital Elevation Model must be loaded for this routine.
S-20
S-23
S-14
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S-26
S-22
S-1
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S-6
S-25
S-15
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S-2
S-28
S-18
B
4555000 m
4554000 m
4553000 m
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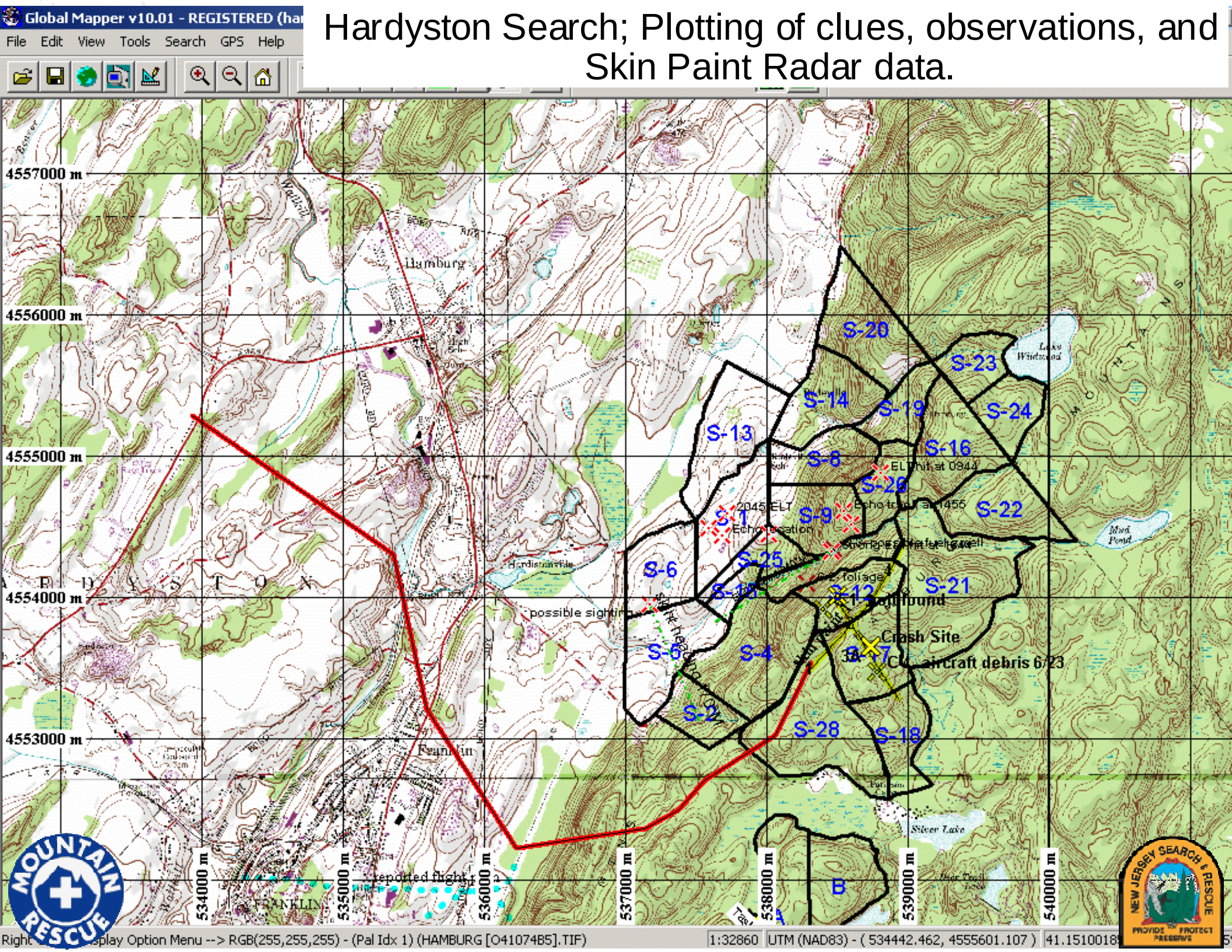
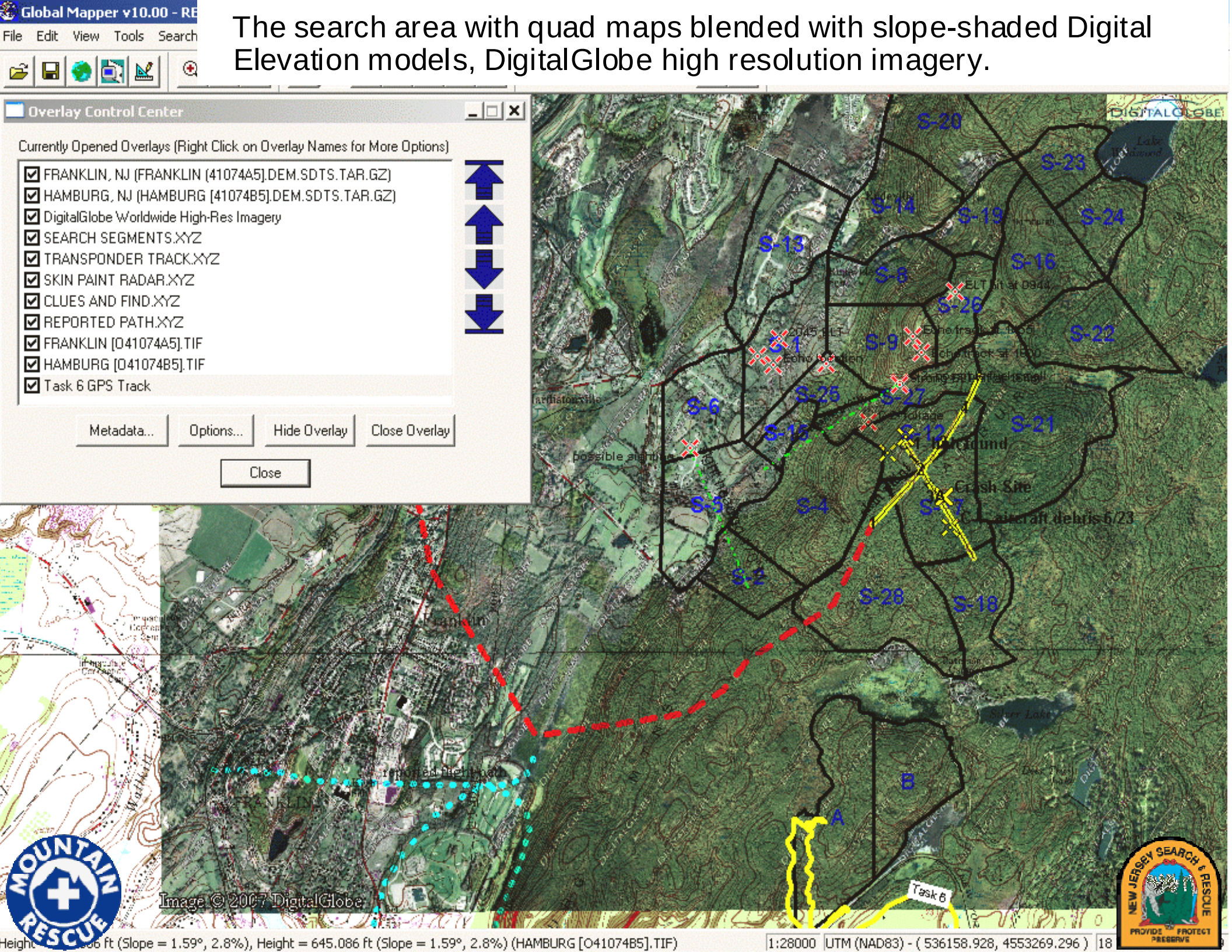
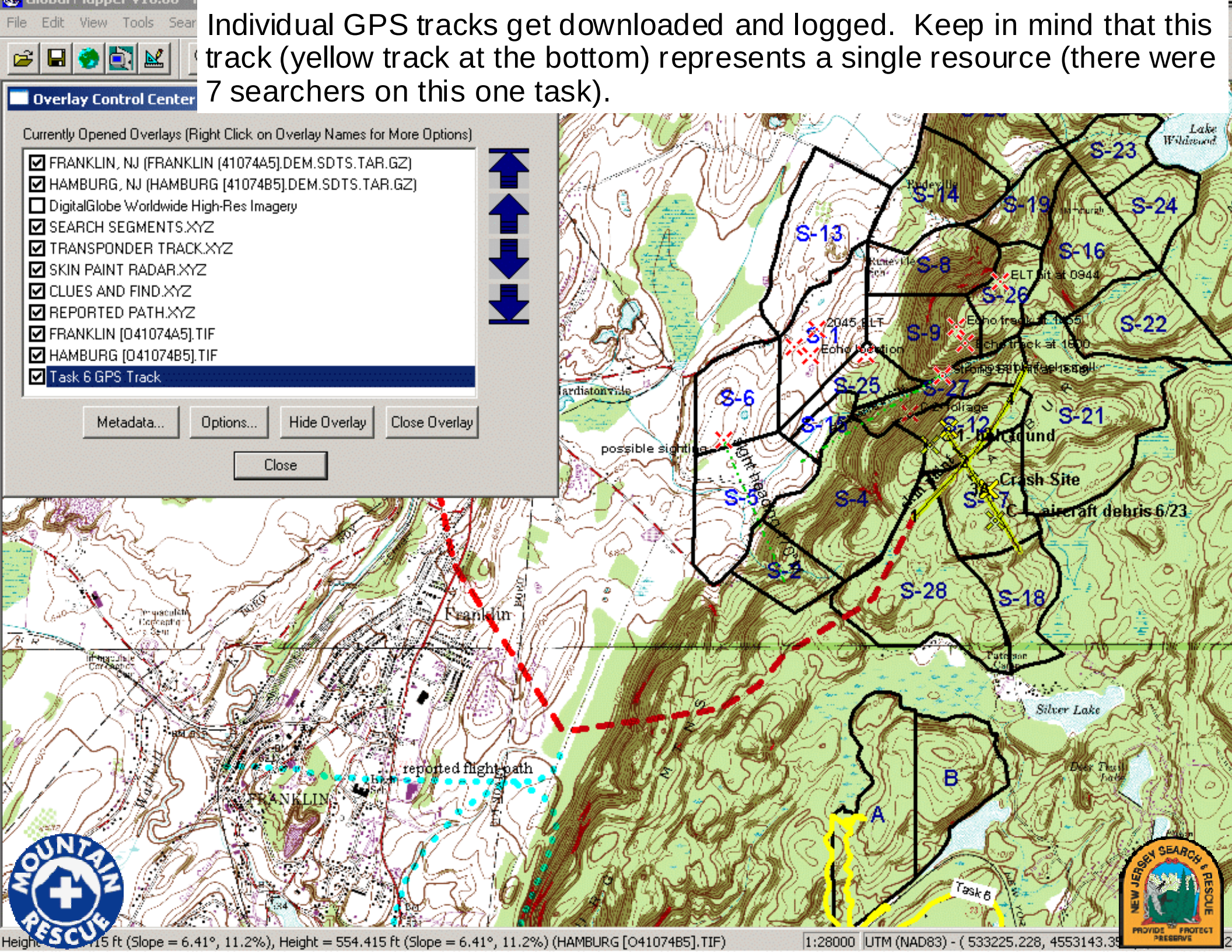
535000 m
536000 m
537000 m
538000 m
539000 m
540000 m
Hamburg
Franklin
FRANKLIN
Hardistonville
Mud Pond
Silver Lake
MOUNTAIN RESCUE
NEW JERSEY SEARCH & RESCUE
PROVIDE PROTECT PRESERVE
1:32860
UTM (NAD83) - (534425.075, 4555644.574)

Hardyston Search; Plotting of clues, observations, and Skin Paint Radar data.



The search area with quad maps blended with slope-shaded Digital Elevation models, DigitalGlobe high resolution imagery.




Individual GPS tracks get downloaded and logged. Keep in mind that this track (yellow track at the bottom) represents a single resource (there were 7 searchers on this one task).
Overlay Control Center
Currently Opened Overlays (Right Click on Overlay Names for More Options)
FRANKLIN, NJ (FRANKLIN [41074A5].DEM.SDTS.TAR.GZ)
HAMBURG, NJ (HAMBURG [41074B5].DEM.SDTS.TAR.GZ)
DigitalGlobe Worldwide High-Res Imagery
SEARCH SEGMENTS.XYZ
TRANSPONDER TRACK.XYZ
SKIN PAINT RADAR.XYZ
CLUES AND FIND.XYZ
REPORTED PATH.XYZ
FRANKLIN [041074A5].TIF
HAMBURG [041074B5].TIF
Task 6 GPS Track
Metadata...
Options...
Hide Overlay
Close Overlay
Close
S-1
S-2
S-4
S-5
S-6
S-7
S-8
S-9
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S-13
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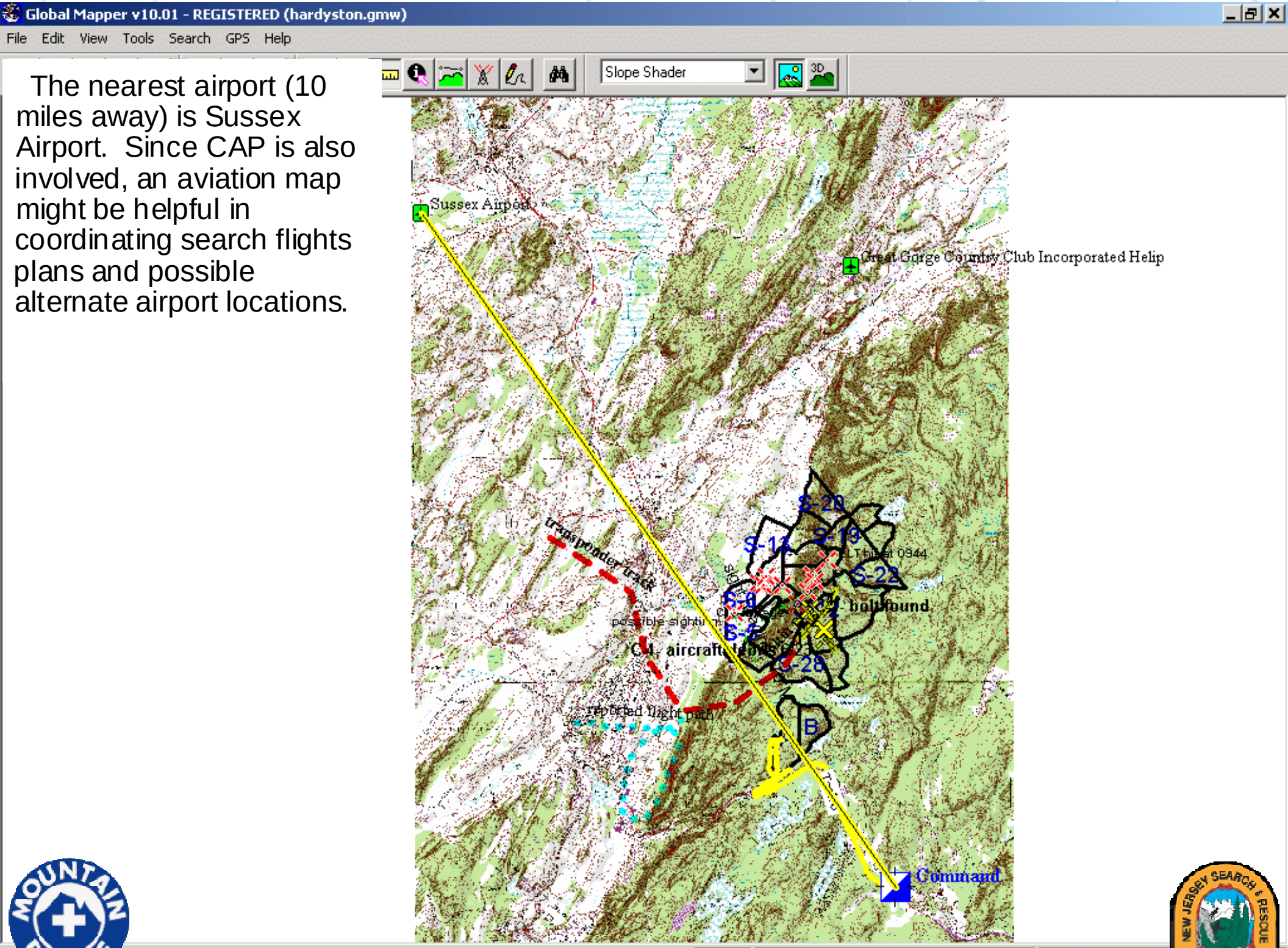
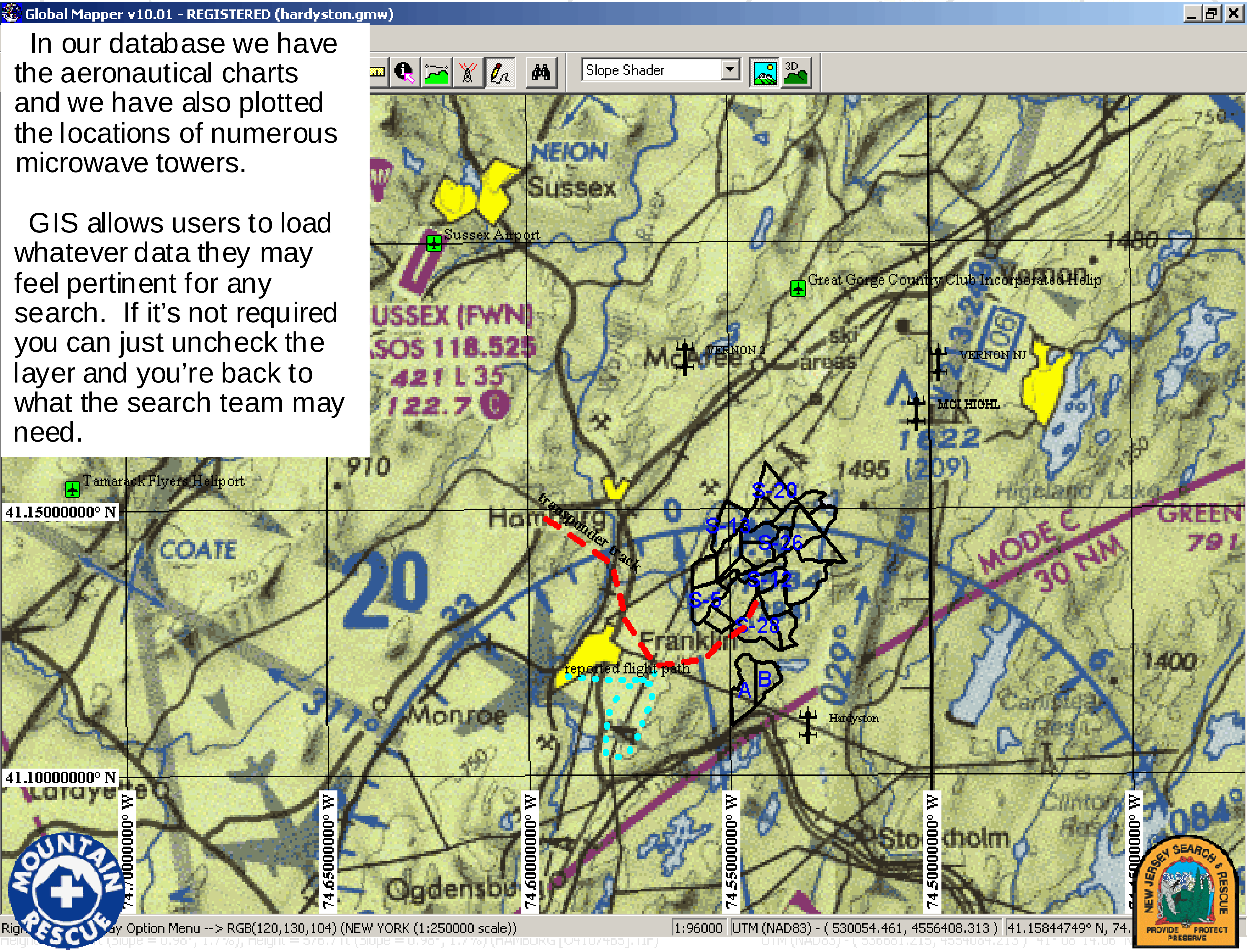
S-16
S-18
S-19
S-21
S-22
S-23
S-24
S-25
S-26
S-27
S-28
Crash Site
aircraft debris 6/23
reported flight path
Franklin
FRANKLIN
Silver Lake
A
B
Task 6
MOUNTAIN RESCUE
NEW JERSEY SEARCH & RESCUE
PROVIDE PROTECT PRESERVE
1:28000
UTM (NAD83) - (533225.228, 4553143.39

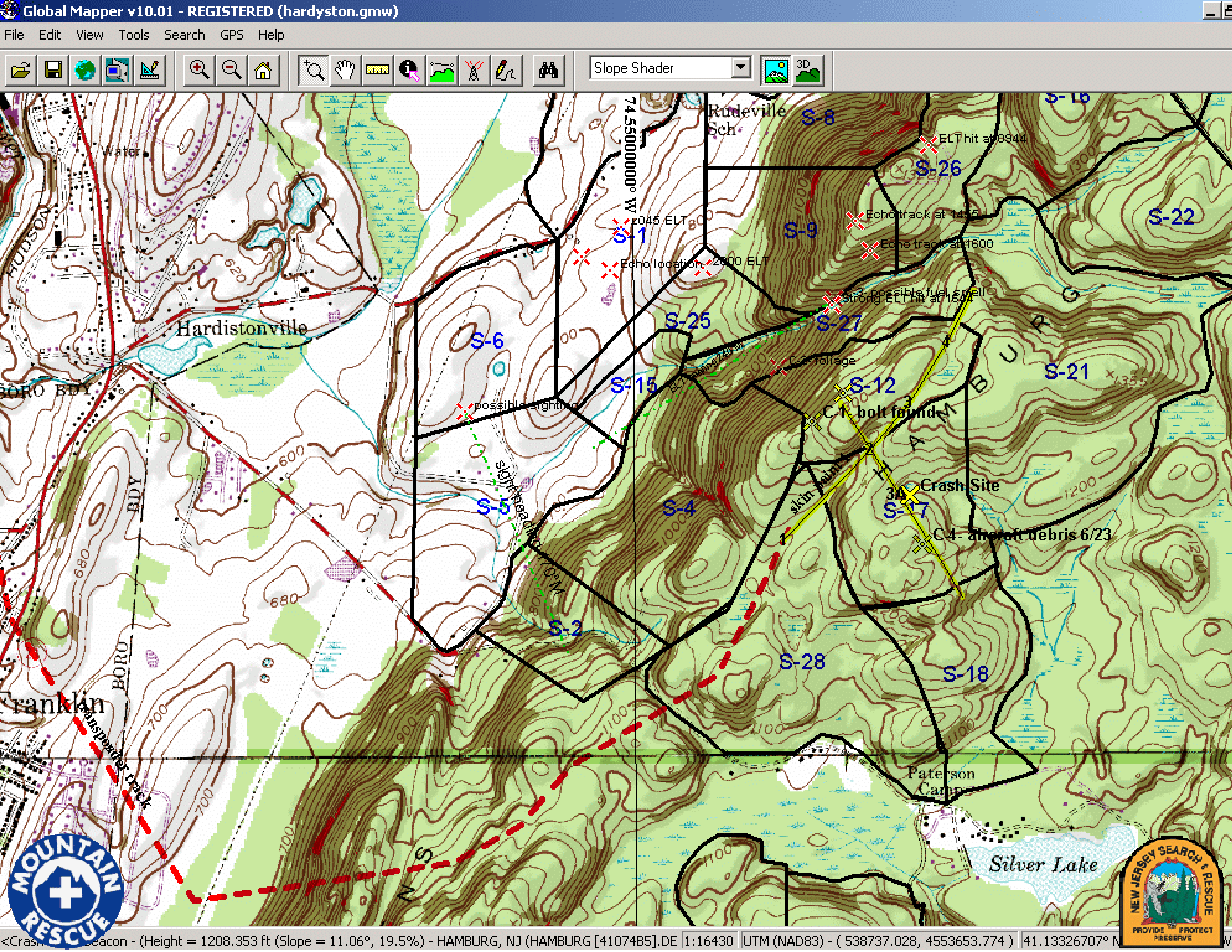
The nearest airport (10 miles away) is Sussex Airport. Since CAP is also involved, an aviation map might be helpful in coordinating search flights plans and possible alternate airport locations.



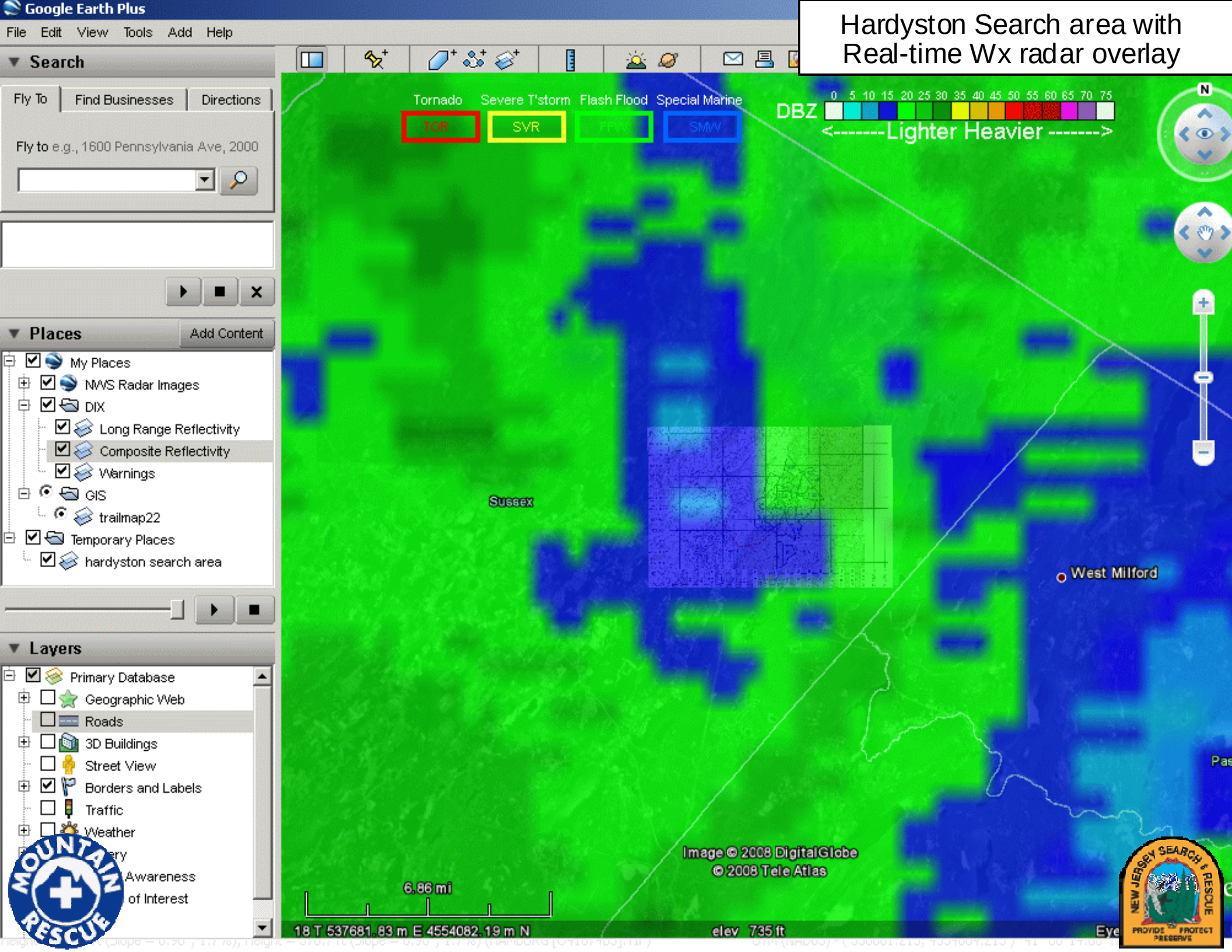
In our database we have the aeronautical charts and we have also plotted the locations of numerous microwave towers.

GIS allows users to load whatever data they may feel pertinent for any search. If it's not required you can just uncheck the layer and you're back to what the search team may need.

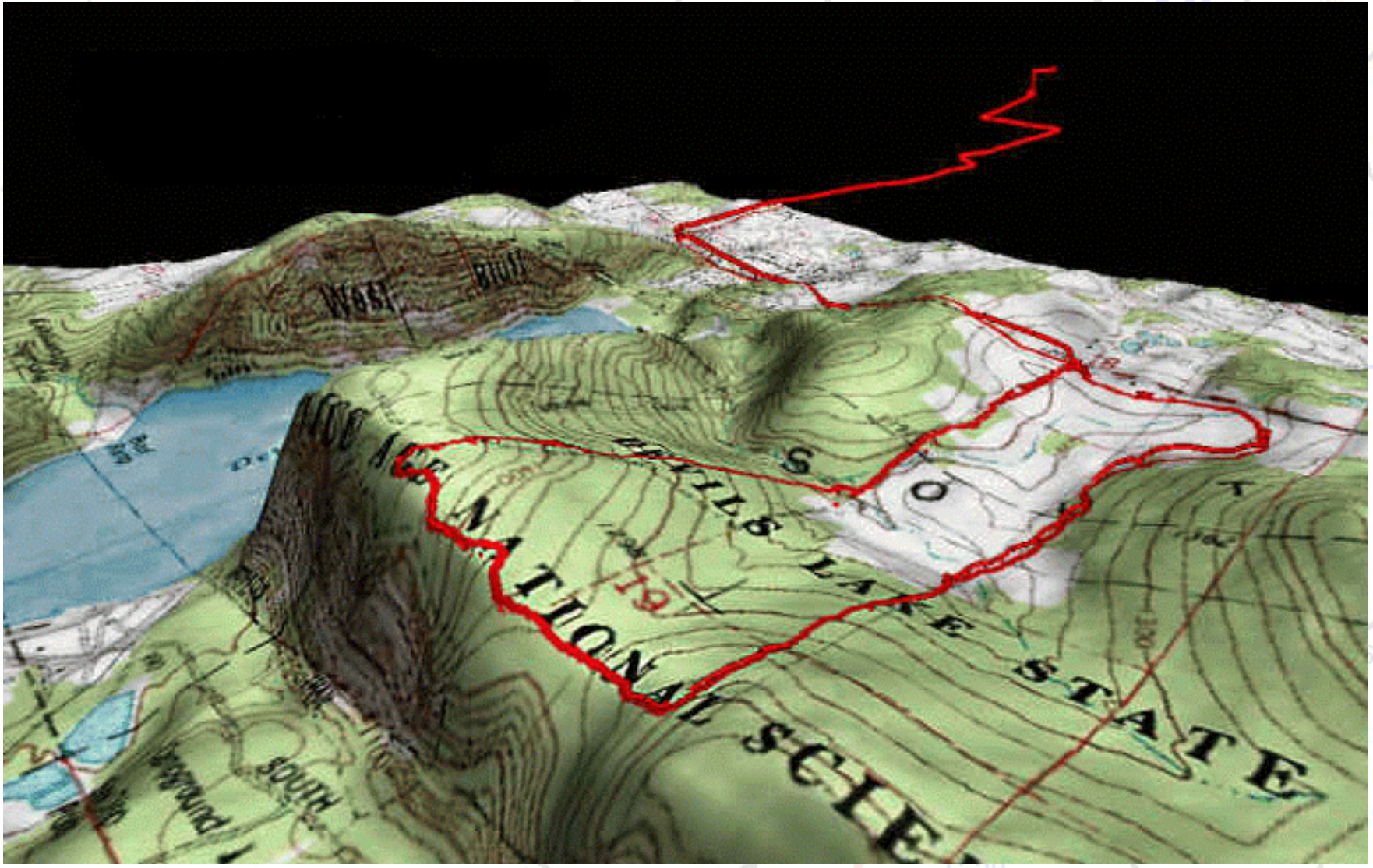

Global Mapper v10.01 - REGISTERED (hardyston.gmw)
Slope Shader
Sussex Airport
Great Gorge Country Club Incorporated Helip
VERNON 2
VERNON NJ
MCI HIGHL
Tamarack Flyers Heliport
41.15000000° N
41.10000000° N
transponder track
reported flight path
S-20
S-18
S-26
S-12
S-5
S-28
A
B
Hardyston
74.65000000° W
74.60000000° W
74.55000000° W
74.50000000° W
1:96000
UTM (NAD83) - (530054.461, 4556408.313)
41.15844749° N, 74.


Global Mapper v10.01 - REGISTERED (hardyston.gmw)
File Edit View Tools Search GPS Help
Slope Shader
Rudeville Sch
S-8
ELT hit at 8944
S-26
S-22
Water
74.5500000° W
2045 ELT
S-1
Echo track at 1455
Echo track at 1600
S-9
Echo location
2000 ELT
Hardistonville
possible fuel smell
Strong ELT hit at 1640
S-25
S-27
S-6
Cut foliage
S-21
S-15
S-12
possible sighting
C-1 bolt founder
Crash Site
S-5
S-4
S-17
C-4 - aircraft debris 6/23
S-2
S-28
S-18
Franklin
Paterson Camp
Silver Lake
MOUNTAIN RESCUE
NEW JERSEY SEARCH & RESCUE
PROVIDE PROTECT PRESERVE
<Crash Beacon - (Height = 1208.353 ft (Slope = 11.06°, 19.5%) - HAMBURG, NJ (HAMBURG [41074B5].DE 1:16430 UTM (NAD83) - (538737.028, 4553653.774) 41.13326707°

Hardyston Search area with Real-time Wx radar overlay



Just because you can load all sorts of data, don't assume everything is going to be perfect. Notice anything unusual in this image?



http://www1.nysgis.state.ny.us - Download - Microsoft Internet Explorer

The following orthoimagery is available for download for the area in the map window. The tiles are grouped by data set (date, film type, and resolution).

The digital orthoimagery may be downloaded without going through the interactive mapping application. Use the Direct Download Directory web page to access orthoimagery via the direct download method.

Number of orthoimagery data sets available: 1

Orthoimagery Tiles to Download:

Name:	1994-1999 One Meter Color Infrared UTM Zone 18 Statewide
Date:	1994-1996
Film Type:	Color Infrared
Resolution:	1 Meter
Zone:	Utm 18

Name	File Size(kb)
Jersey_CityNE_tile1_sid.tab	1
Jersey_CityNE_tile1.sid	1111
Jersey_CityNE_tile1.sdw	1
Jersey_CityNE_tile1.aux	8
Jersey_CityNE_tile2_sid.tab	1
Jersey_CityNE_tile2.sid	1190
Jersey_CityNE_tile2.sdw	1
Jersey_CityNE_tile2.aux	8

MapInfo Table (file used by MapInfo to import the graphic image)

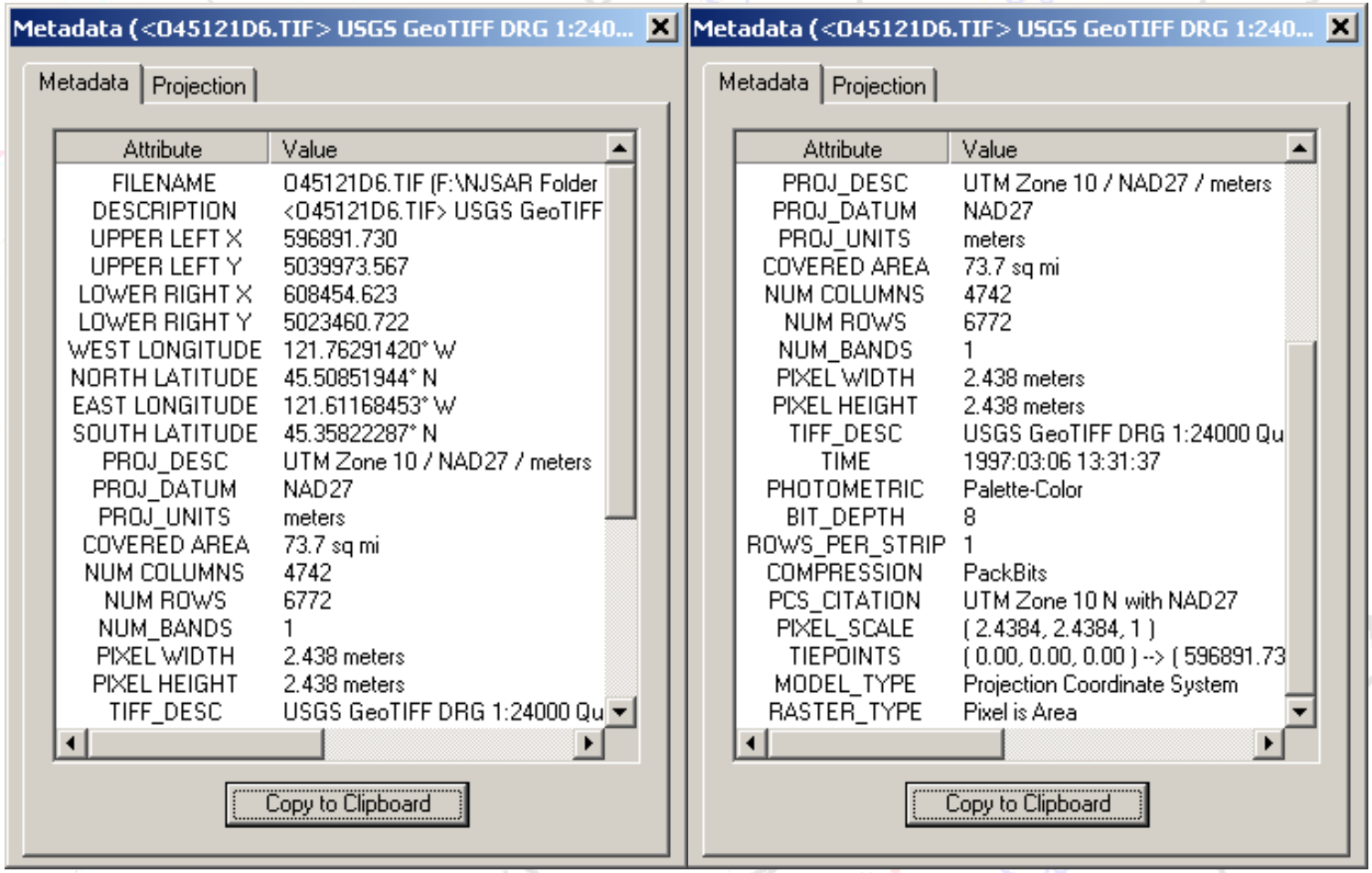
If you are going to download maps from the Internet, you first identify which map/image you want. In this case, we want Jersey_CityNE_tile1.sid. Once that file downloads (if you're doing this from a dial-up connection it will take awhile), you must ALSO Download the calibration file (the *.SDW, or *.TFW for Quad maps). The SDW file contains all the information needed to "calibrate" the image. If you don't download this file, you may be spending considerable time getting your image properly oriented.

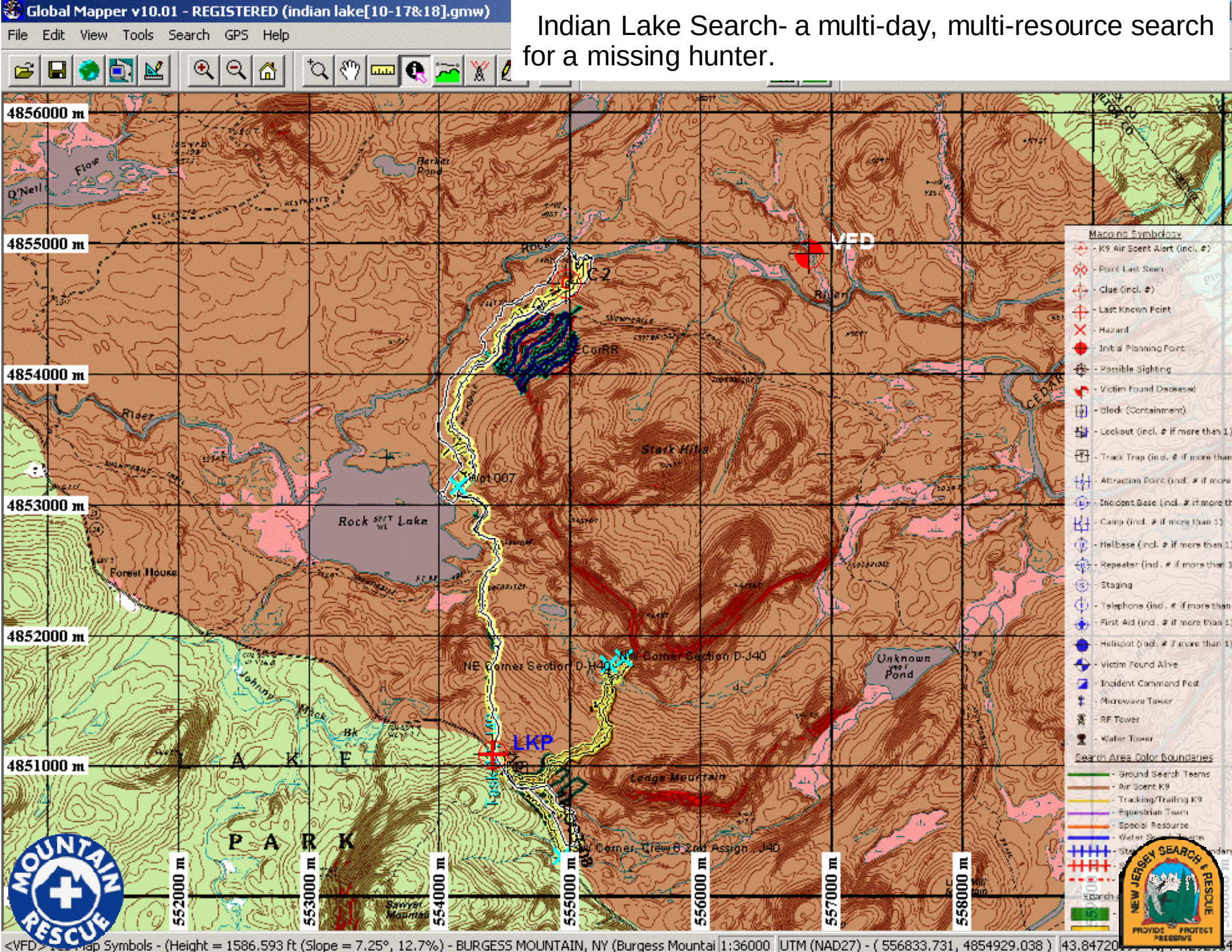
[Geocomm's *.zip files contain both the image and registration file]

Metadata file

Internet

Metadata: Commonly known as "data about data" it is the data describing context, content and structure of records and their management through time.




Global Mapper v10.01 - REGISTERED (indian lake[10-17&18].gmw)
File Edit View Tools Search GPS Help
Indian Lake Search- a multi-day, multi-resource search for a missing hunter.
4856000 m
4855000 m
4854000 m
4853000 m
4852000 m
4851000 m
552000 m
553000 m
554000 m
555000 m
556000 m
557000 m
558000 m
VFD
C2
CorRR
Stark Hills
Wpt 007
Rock Lake
Forest House
NE Corner Section D-J40
NW Corner Section D-J40
LKP
Ledge Mountain
Unknown Pond
Johnny Mack Brook
Sawyer Mountain
PARK
Mapping Symbology
K9 Air Scent Alert (incl. #)
Point Last Seen
Clue (incl. #)
Last Known Point
Hazard
Initial Planning Point
Possible Sighting
Victim Found Deceased
Block (Containment)
Lookout (incl. # if more than 1)
Track Trap (incl. # if more than
Attraction Point (incl. # if more
Incident Base (incl. # if more th
Camp (incl. # if more than 1)
Helibase (incl. # if more than 1)
Repeater (incl. # if more than 1
Staging
Telephone (incl. # if more than
First Aid (incl. # if more than 1)
Helispot (incl. # if more than 1)
Victim Found Alive
Incident Command Post
Microwave Tower
RF Tower
Water Tower
Search Area Color Boundaries
Ground Search Teams
Air Scent K9
Tracking/Trailing K9
Equestrian Team
Special Resource
MOUNTAIN RESCUE
NEW JERSEY SEARCH & RESCUE
PROVIDE PROTECT PRESERVE
<VFD> Map Symbols - (Height = 1586.593 ft (Slope = 7.25°, 12.7%) - BURGESS MOUNTAIN, NY (Burgess Mountai
1:36000
UTM (NAD27) - (556833.731, 4854929.038)
43.84720

APRS®

Automated Position Reporting System

Developed by Bob Bruniga back in the 1980's for the US Navy.

Takes the GPS position fix and transmits that data via RF to another station.

The receiving station decodes the message and can plot the information on a screen in real-time.

Primarily used by Ham operators, but more and more SAR teams are investigating it's use to plot their field teams in real-time.

Word of Caution! To legally transmit 'data' on a VHF/UHF analog channel, the user must be licensed for 'voice/data' transmissions. If in doubt, ask your local Ham operator- they're great folks to work with! Not legal to transmit non-voice data on FRS/GMRS frequencies.

The SPOT system operates in a similar manner, but uses a dedicated website for tracking. Therefore, you **MUST** have an Internet connection to view data in 'real-time'.

APRS- What Does It Cost?

Txmit (or Searcher Side)

Byonics TinyTracker+ ($27)

GPS & Radio Interface cables (typically about $19/set)

GPS Receiver* ($99+)

Packet Compatible Radio ($100*)

*make certain it can output a NMEA message

*depending on frequency

GPS -	$ 150	
Packet Interface -	$ 30	
Radio -	$ 200+	(need 2)
Interface Cables-	$ 40	(need 2)
TNC Modem -	$ 150	
TNC Compatible Software -	$ 20	
Mapping Software (I.e. Maptech) -	$ 50	
Laptop/Desktop Computer -	$ 500+	

TOTAL: $1140 (all components)
$ 240 (APRS only)

TNC Compatible Software
4-User Dmapper ($19.95)
8-User Dmapper ($39.95)

Packet Compatible Radio ($100)

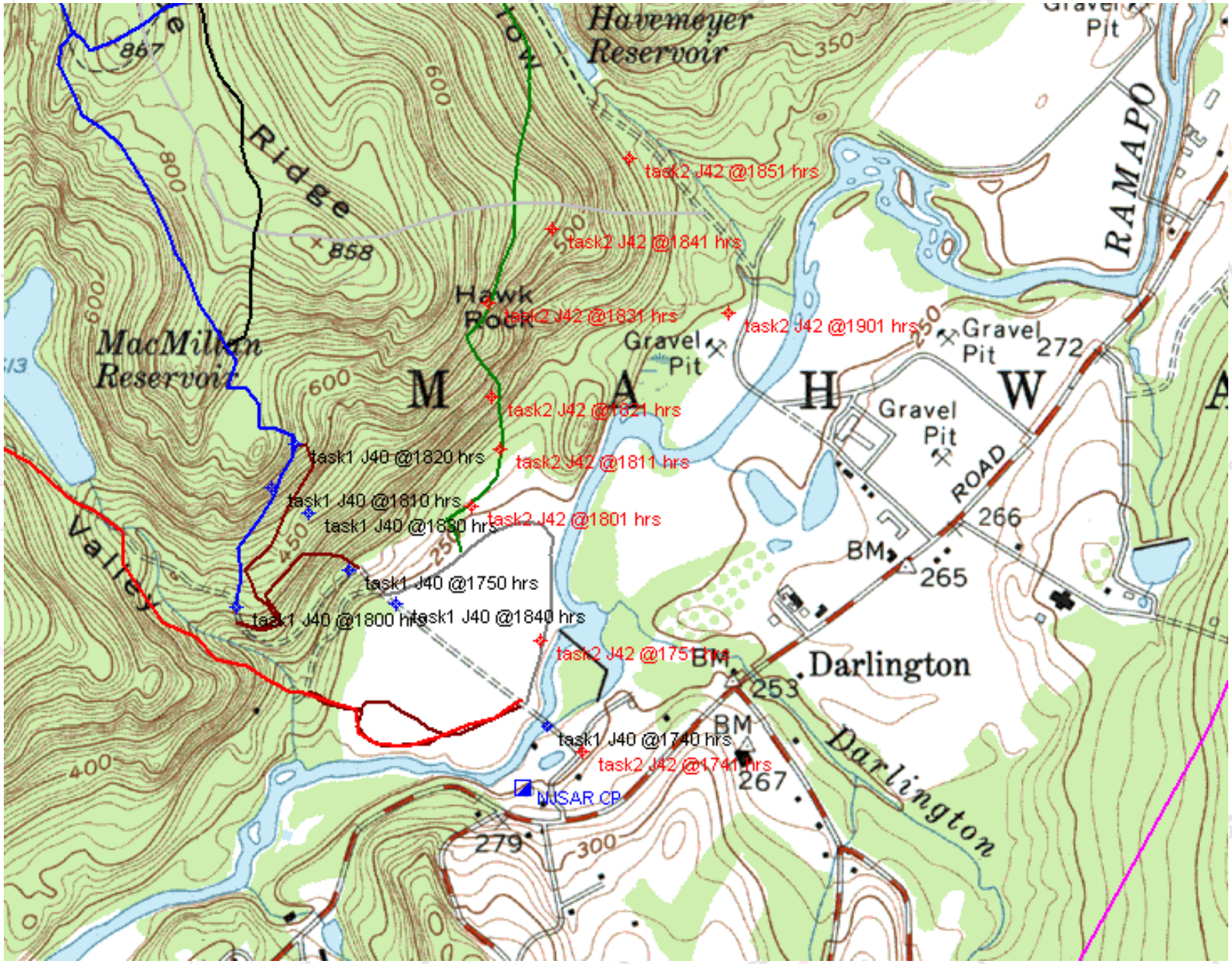
*depending on frequency

GPS & Radio Interface cables (typically about $19/set)

TNC Modem Interface ($150)
shown is the Kantronics KP3+

Maptech Software ($49.95)
Pro version ($299)

Receiver (or Command Post Side)



Sample plot of two tasks being tracked in real-time.

SPOT

Satellite Personal Tracker

(A little larger than a standard PDA)

How It Works:
Once activated, SPOT will acquire its exact coordinates from the GPS network, and send that location along with a distress message to a GEOS International Emergency Response Center every five minutes until cancelled. The Emergency Response Center notifies the appropriate emergency responders based on your location and personal information – which may include local police, highway patrol, the Coast Guard, our country's embassy or consulate, or other emergency response or search and rescue teams – as well as notifying your emergency contact person(s) about the receipt of a distress signal.

Pricing:

Basic Service: $99.99/year/unit

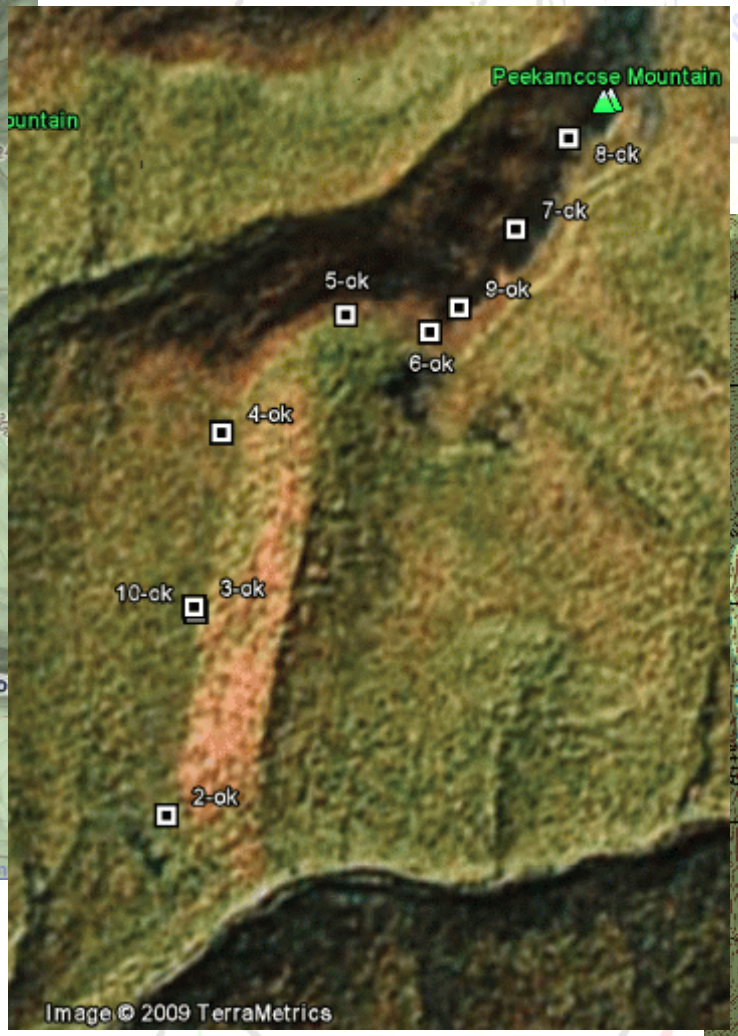
Additional fees:

GEOS Search & Rescue: $7.95/year/unit (does not have real-time tracking)

Tracking: $49.99/year/unit (does provide for real-time plots (Google Earth)), but only for a single unit.

SPOT Terrain Plot

(must be connected to the Internet to view and can only track one SPOT at a time)

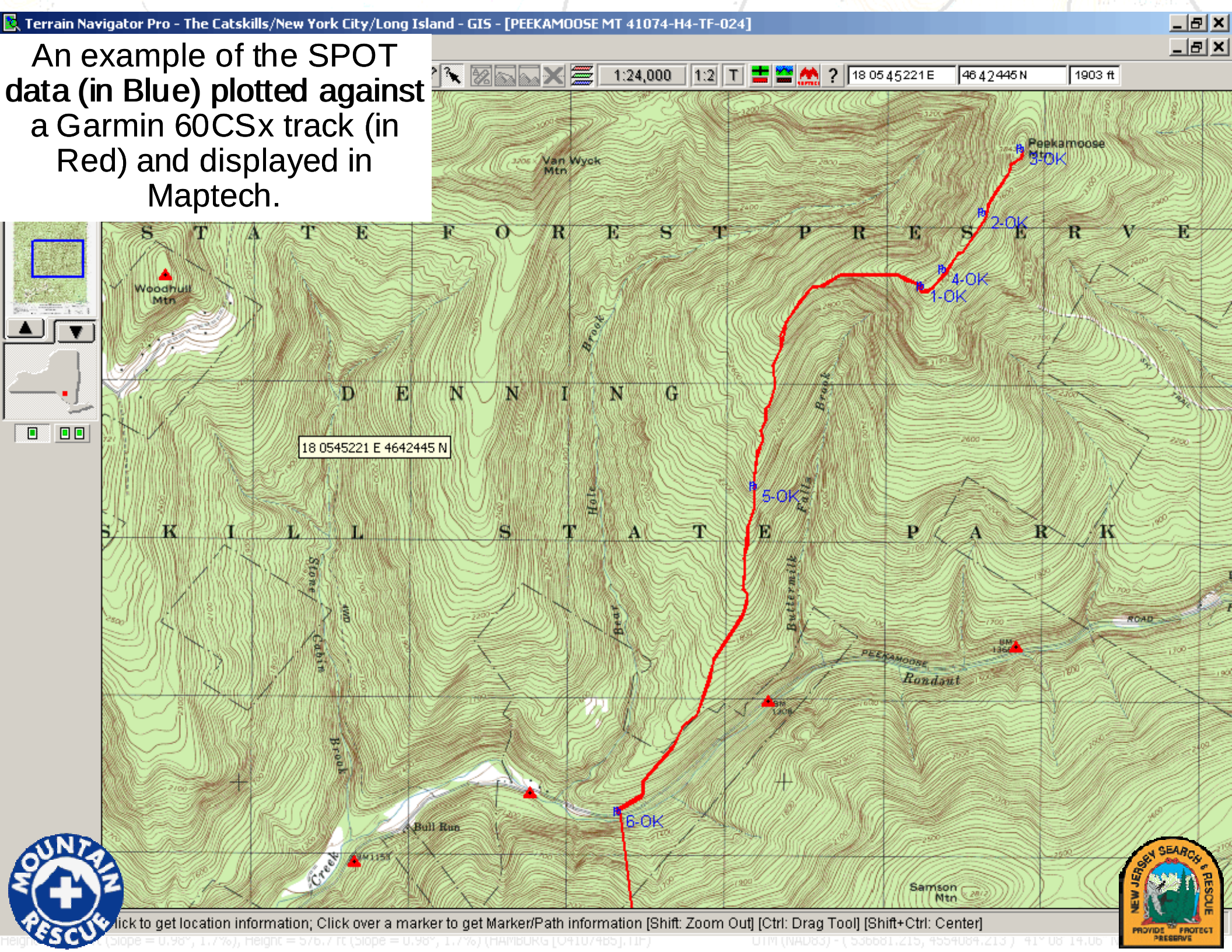


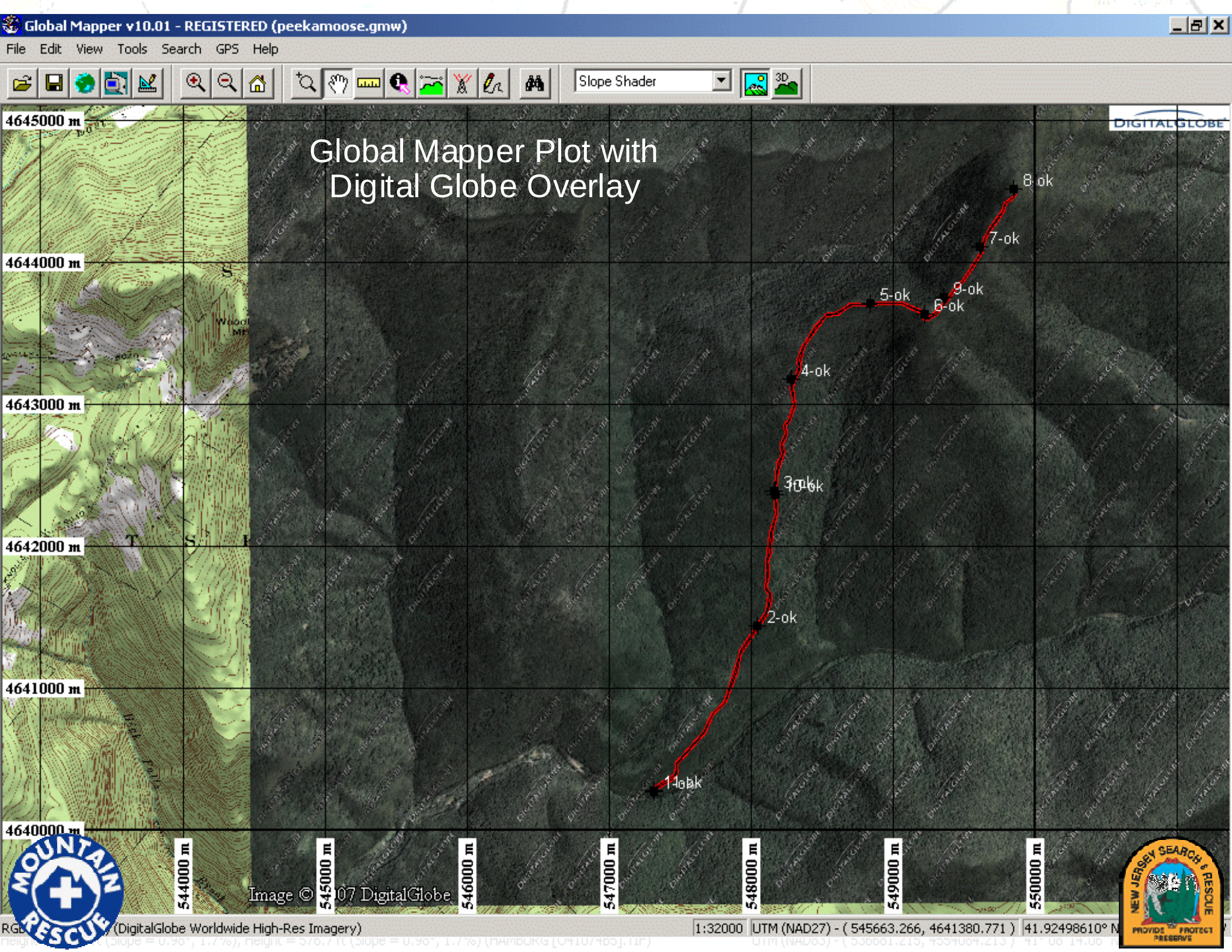
Google Earth Plot

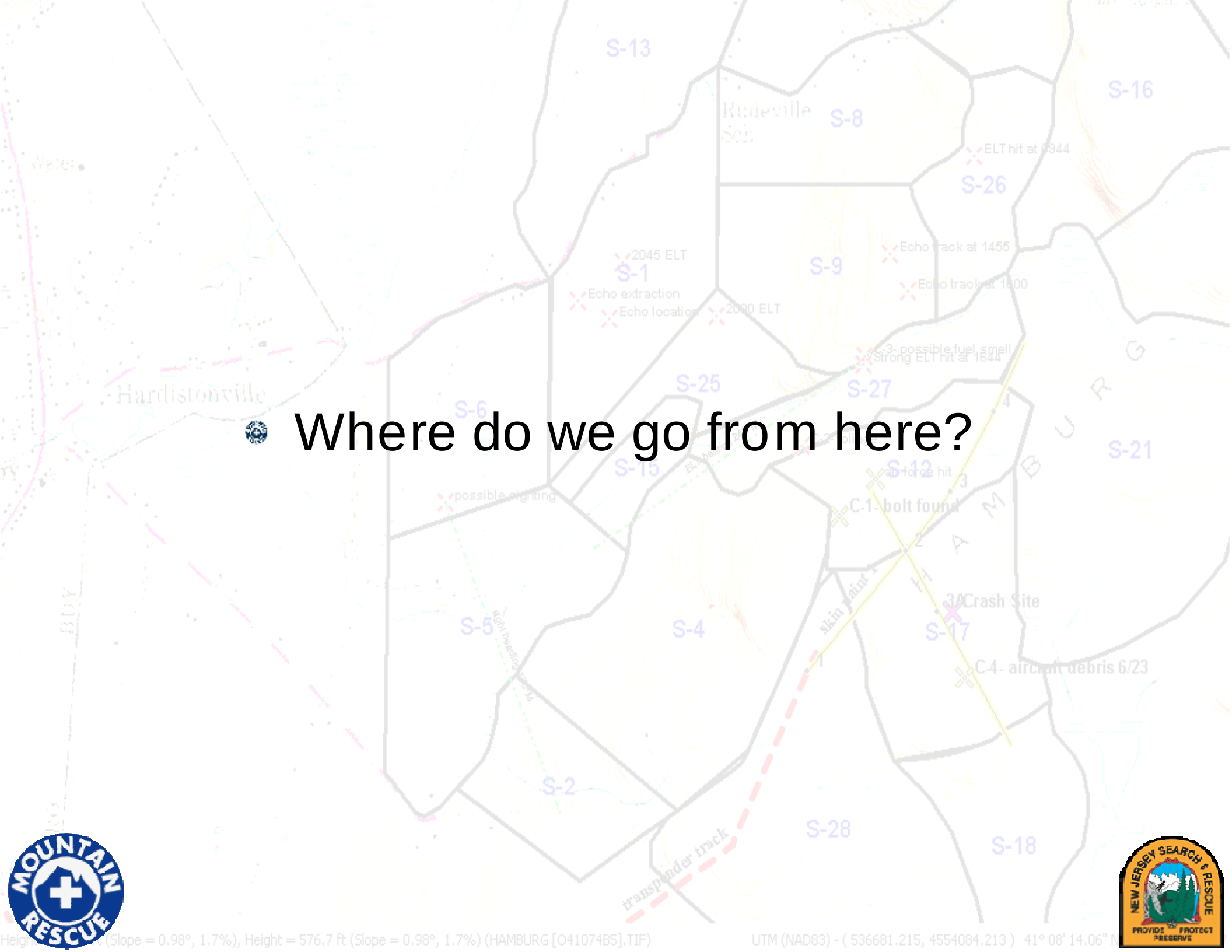
(does this look correct?)

Global Mapper Plot

(with the GPS track)


Terrain Navigator Pro - The Catskills/New York City/Long Island - GIS - [PEEKAMOOSE MT 41074-H4-TF-024]
An example of the SPOT data (in Blue) plotted against a Garmin 60CSx track (in Red) and displayed in Maptech.
1:24,000
18 0545221 E
4642445 N
1903 ft
Peekamoose Mtn
Van Wyck Mtn
Woodhull Mtn
STATE FOREST PRESERVE
DENNING
SKILL STATE PARK
18 0545221 E 4642445 N
1-OK
2-OK
3-OK
4-OK
5-OK
6-OK
Bull Run
Samson Mtn
Click to get location information; Click over a marker to get Marker/Path information [Shift: Zoom Out] [Ctrl: Drag Tool] [Shift+Ctrl: Center]


Global Mapper v10.01 - REGISTERED (peekamoose.gmw)
File Edit View Tools Search GPS Help
Slope Shader
3D
Global Mapper Plot with
Digital Globe Overlay
DIGITALGLOBE
8-ok
7-ok
9-ok
6-ok
5-ok
4-ok
3-ok
2-ok
1-ok
4645000 m
4644000 m
4643000 m
4642000 m
4641000 m
4640000 m
544000 m
545000 m
546000 m
547000 m
548000 m
549000 m
550000 m
Image © 07 DigitalGlobe
MOUNTAIN RESCUE
NEW JERSEY SEARCH & RESCUE
PROVIDE PROTECT PRESERVE
(DigitalGlobe Worldwide High-Res Imagery)
1:32000
UTM (NAD27) - (545663.266, 4641380.771)
41.92498610° N



- Where do we go from here?

SAR-GIS Technician

Proposed Certification Levels:

Level III; Can operate a computerized digital mapping system (i.e. Maptech)
- Can plot search areas, GPS points, and print these data to an available printer
- Can up/download a GPS receiver with routes, waypoints, and/or tracks
- Understands datum/projection issues.
- Can save ALL displayed information at any time
- Can print search area maps with pertinent information regarding date/time of print, scale, datum, and magnetic declination (if required).
- Has Managing Lost Person Incident certification
- Knows and uses standard ICS symbology

Level II; As above, plus
- Can integrate multiple map images onto a single display
- Can geo-reference any graphical map image
- Can import/export databases with differing file types (i.e. *.xls, *.dbf, etc.)
- Can utilize Internet mapping (i.e. Google Earth) and implement multi-image overlays
- Instructs and Certifies individuals at Level III SAR-GIS Technician
- ICS-300, and NIMS-700/800 certifications

Level I; As Above, plus
- Can initialize and operate APRS-based GPS units (including SPOT™)
- Can troubleshoot computers and peripheral devices
- Has the ability to install & operate in a networked environment
- Instructs and certifies Level III or Level II candidates

Proposed Map Symbology

- Air Scent- Alert (if more than 1, indicate #)
- Clue (if more than 1, indicate #)
- Initial Planning Point [IPP]
- Last Known Point [LKP]
- Point Last Seen [PLS]
- Possible Sighting (if more than 1, indicate #)

- Attraction
- Bumpline or Block
- Camp
- Cellular Tower
- First Aid
- Helibase
- Helispot
- Incident Command Post
- Incident Base
- Lookout
- Repeater
- RF Tower

- Hazard
- Staging
- Telephone
- Track Trap
- Victim Found-Alive [VFA]
- Victim Found-Deceased [VFD]
- Water Tower

Search Area Segments-POD's

- POD > 75%
- POD 35% - 74%
- POD < 34%
- Open or Not Searched

Search Area or Task Boundary Styles

- Ground Search Teams
- K9 Teams
- Tracking K9
- Equestrian Teams
- Special Resource Teams
- Water Search Teams
- Statistical Search Boundary
- Search Boundary
- Air Search Boundary

MOUNTAIN RESCUE

NEW JERSEY SEARCH & RESCUE
PROVIDE PROTECT PRESERVE

Remote Search Planning

Imagine, for a moment, having the ability to transmit your Lost Person Questionnaire (via fax or email) to some location and receive back a map with search segments and probability zones.

Benefit: reduces individual team overhead costs (Won't need a Cray computer)

reduce initial planning support needs.

constructs a SAR Missing Person Database that is constantly being refined based on S.M.A.R.T. map and eventual Find location. Sort of an Artifical Intelligent system.

Summary

GIS is most effective when used early on in the search planning phase.

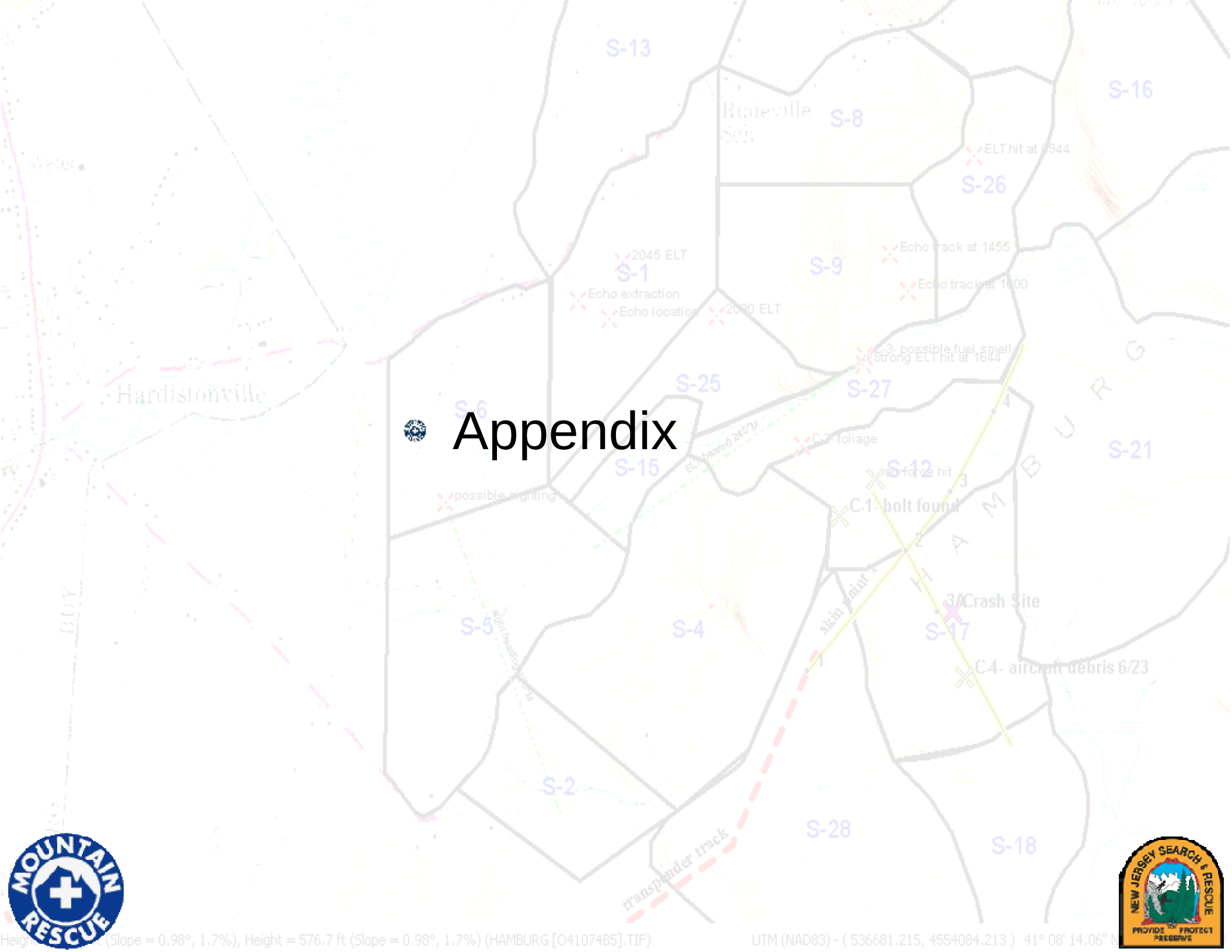
Ability to plot searcher tracks increases the accuracy of the POD value.

Every state has it's own GIS Warehouse. The data within these warehouses is public domain and therefore free.

Programs like Maptech Pro can be used in a GIS environment, but may require support programs such as GPS Utility.

"...GIS can enhance, but will not replace, institutional knowledge..."

John Dill, YOSAR


S-13
S-16
S-8
S-26
ELT hit at 0344
2045 ELT
S-1
Echo extraction
Echo location
2030 ELT
Echo track at 1455
S-9
Echo track at 1600
3- possible fuel smell
Strong ELT hit at 1644
S-25
S-27
S-6
S-15
S-12
possible sighting
C-1- bolt found
S-21
S-5
S-4
S-17
3 Crash Site
C-4- aircraft debris 6/23
S-2
S-28
S-18
transponder track

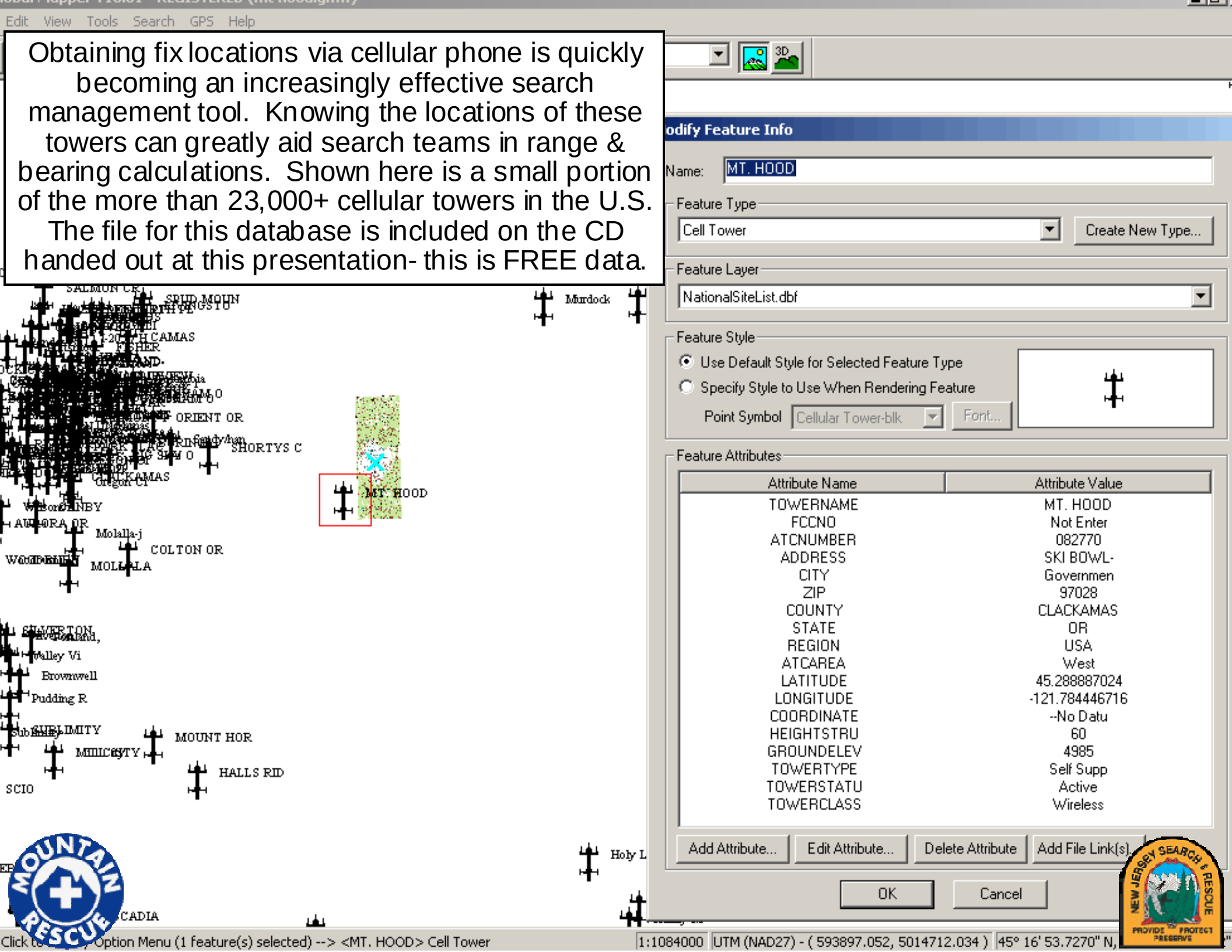
- Appendix

Short Comparison on Popular Mapping Programs

	TOPO!	Google Earth Pro	Delorme Xmap GIS	Maptech	Maptech Pro	ArcGIS	Global Mapper
Import jpg, tif, bmp	NO	YES	YES	NO	NO	YES	YES
Import Aerials	NO	YES (must be on-line)	YES	NO	YES (download from Maptech)	YES	YES
Import infrared/satellite	NO	YES (must be on-line)	YES	NO	NO	YES	YES
Supplied with USGS maps	YES	NO	NO	YES	YES	NO	NO
Imports *.shp, *.dbf, or *.dxf files	NO	YES (Pro version only)	YES	NO	NO	YES	YES
3-D Views	YES	YES	YES	YES	YES	YES	YES
Ease of Use (1- easy / 5-mapping knowledge req'd)	1	2	3+	1	1	5+	4
Range Rings	NO	NO	NO	NO	YES	YES	YES
APRS Compatible	NO	YES	NO	YES	YES	Not Directly	Not Directly
Layering	NO	YES	YES	NO	NO	NO	YES
Approx. Cost	$69	$400/year	$749	$100	$299	$1,595	$299

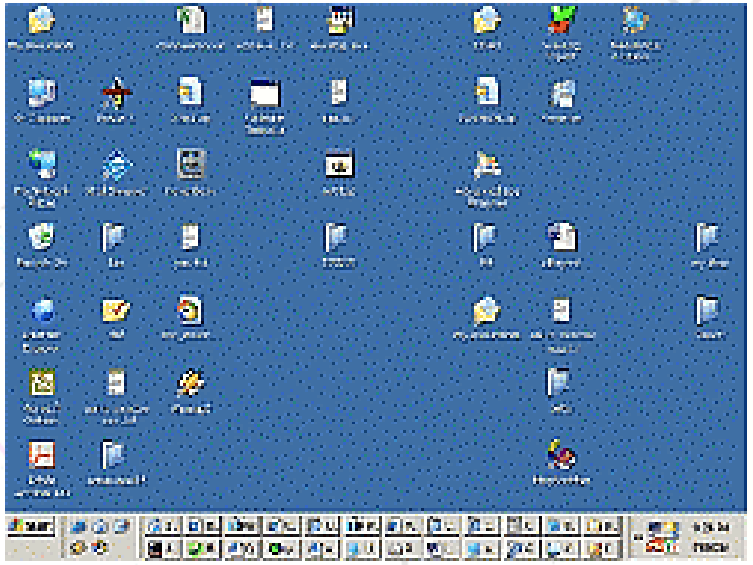
*Notes: There are no attempts to feature one program over another.
Of these programs, only Delorme Xmap will upload a map to a GPS receiver (must be Earthmate PN-20 or 40)
ALL of these programs (except Google Earth Plus) will load Waypoints, Tracks, Routes.

Obtaining fix locations via cellular phone is quickly becoming an increasingly effective search management tool. Knowing the locations of these towers can greatly aid search teams in range & bearing calculations. Shown here is a small portion of the more than 23,000+ cellular towers in the U.S. The file for this database is included on the CD handed out at this presentation- this is FREE data.



The Desktop screen:

As we begin to collect more and more programs, many users love to ‘Save shortcut to Desktop’. Sometimes they’ll even save files directly to the desktop screen.



Don’t. The more icons/shortcuts you place on your desktop, the longer the computer will take to ‘boot up’. Additionally, it may take longer to find a particular program or file. In trying to create a ‘standard’ screen for NJSAR we came up with a different approach.

SAR Software Database - [SAR Ops Database : Form]

File Edit View Insert Format Records Tools Window Help

Type a question for help

New Jersey Search and Rescue Software Application Program

System Started At: Thursday, December 11, 2008 2:12:43 PM

Hours Mins.

00:36

Search Mission Timer

Stop Res

Search Sequence Checklist (Click on Box When Completed)

- [x] Initiate Response
- [x] Obtain/Complete Initial Response
- [x] Establish CP-Comms-Staging-Rehab
- [x] Obtain/Complete Subject Profile
- [x] Determine Search Urgency
- [x] Locate LKP/PLS/IPP
- [x] Determine Strategies/Objectives
- [x] Create/Modify Search Segment Map
- [ ] Complete Incident Action Plan [min. ICS-201, 202, 204-207]
- [x] Briefand Deploy Resources
- [ ] Prepare Transition to Rescue (EVAC on Std-By)
- [ ] Establish Demob Plan
- [ ] Debrief Tasks
- [ ] Re-assess IAP
- [ ] Order Resources
- [ ] Prepare for Next Operational Period
- [ ] Suspend Search
- [ ] Demob

Application Links

Start VOX Recording

Start APRS

Enable Speech Recognition

Internet

Global Mapper

Maptech Pro

Google Earth Pro

Geographic Name Index

Equipment Safety Software (Petzl)

Mission- Final Report and Statistics

Mission- NJ SAR Council Report [Fillable PDF]

Mission- NY FEDSAR Report [Fillable PDF]

Tools/Utilities

STOP

Stop and Exit Program
*Note: This will Stop All Timers and Reminders

Magnetic Declination

Coordinate Conversion

GPS Track Utility

Calculator

WordPad

Windows Explorer

Search Management

- Lost Person Behavior Statistics
- Lost Person Report- Checklist
- Search Urgency Worksheet
- Footprint Card
- Cumulative POD Calculator
- (unassigned)
- (unassigned)
- (unassigned)
- (unassigned)

Help Manuals

- VOX Recording
- APRS
- Global Mapper
- Maptech
- Google Earth Pro
- (unassigned)
- (unassigned)
- (unassigned)
- (unassigned)

ICS FORMS

[Forms in Orange should be part of IAP]

*Note: ICS-201, not required for drills/exercises

- ICS-201 [Incident Briefing]
- ICS-201A [Resource Status]
- ICS-202 [Incident Objectives]
- ICS-203 Organizational List]
- ICS-204 [Team Assignment]
- ICS-204A [Team Assignment- Debrief]
- ICS-205 [Communications Plan]
- ICS-206 [Medical Plan]
- ICS-207 [Search Organization Chart]
- ICS-209 [Incident Status Summary]
- ICS-211 [Resource Check-In]
- ICS-213 [General Message]
- ICS-214 [Unit Log]
- ICS-215 [Operations Plan]
- ICS-215A- Operations Plan, worksheet]
- ICS-220 [Air Operations]
- ICS-221 [Demob Plan]
- ICS-301 [Incident Report]
- ICS-302 [Missing Persons Questionnaire
- ICS-303 [Equipment Inventory]
- ICS-304 [Expense Claim]
- ICS-305 [Safety Plan]
- ICS-306 [Press Release]
- ICS-307 [Tansportation Plan]
- ICS-308 [Food Shelter Plan]
- ICS-309 [Communications Log]

- Medical Release Form
- Callout List (pdf)
- NJSAR Sign-In Sheet (pdf)
- Accessing NJSAR Pagers or Callout

(ALL Forms are MSWord unless otherwise stipulated)

This program has been designed exclusively for the New Jersey Search and Rescue Inc. Mobile Operations Command computer system and cannot be copied or operated on any other computer system.

Useful Websites

Sites shown with ⚙ offer their software for Free.

http://www.gpsu.co.uk- an excellent GPS file conversion utiility program (Shareware, about $40).

http://data.geocomm.com/- a premier website for downloading DEMS, topos, aerials, etc. (Subscription based).

⚙ http://www.sarstatistics.org- This site is designed to provide critical and potentially life saving data 24 hours a day, seven days a week.

http://www.spatialhydrology.com/gisdata.html- A one stop search menu for GIS data.

⚙ http://crunch.tec.army.mil/software/corpscon/corpscon.html- US Army Corps of Engineers coordinate conversion utility program.

⚙ http://www.gpsvisualizer.com/gpsbabel- can be done from an online service ,or downloadable, and has an extensive Conversion listings available.

**Every State has it's own GIS warehouse and this is all public domain data- so it's free. Other valuable database sources include many universities and colleges.

A Few Mapping File Extensions

A more complete listing may be found at : http://spatialnews.geocomm.com/education/av_fileextensions.html

***.bmp**- Bitmap Format

***.dbf**- Database file (usually can be opened with Excel)

***.dem**- Digital Elevation Model (usualy listed the same as the USGS Quad number (i.e. 467581B))

***.drg**- Digital Raster Graphics (i.e. usgs quads maps, which can also be listed as a *.tif file).

***.gmw**- Global Mapper workspace file (can be viewed in Wordpad)

***.gpx**- GPS Exchange File (most common format for handling GPS data)

***.jpg**- Joint Photo Graphics Expert format

***.log**- Magellan Track log file

***.mxf**- Maptech Marker file

***.rxf**- Maptech route file

***.shp**- Shapefile (typically used for defining boundaries)

***.tfw**- Text World File, this is an important file when downloading USGS quads in *.tif format. This is the registration file needed to properly align the map.

***.tif**- Tagged Image Format

***.tpo**- National Geographic Topo track file

***.txf**- Maptech track file

These are just a few file extensions. There are literally hundreds of them. If you're uncertain about a particular file extension, just type in the file extension you're interested and you'll probably gets hundreds of Internet websites to visit.

About the Author

David Clarke is a Captain with the New Jersey Search & Rescue Team. He has been with this team since 1999 and has been instrumental at developing the team's GPS and Digital Mapping capabilities. He has designed and taught courses in both technologies for NJSAR, other area SAR teams, OEM organizations, and a few area police departments. He has been a repeat speaker at the national SAR conference for the several years.

A member of NJSAR's High Angle/MRU Team and the Mountain Rescue Assoc. Honor Guard. He also sits on the Geospatial Information Technology Assoc. (GITA) national subcommittee for Emergency Response. He has served as a member of the US Hydrographic Council, and is an American Congress of Surveying & Mapping certified Hydrographer. During 9/11 he provided technical support to the USACE-New York district and also worked at the Staten Island Recovery Site as part of the K-9 Recovery Task Force.

While not performing SAR missions, David maintains the high-resolution GPS and sonar systems for all of the US Army Corps of Engineers- New York survey vessels and their Emergency Operations Group as their Cartographic Systems Technician.

David served for 15 years as an Operations Chief on-board numerous offshore oil exploration vessels serving all over the world, including Arctic winter operations. He continued to develop his GPS and Sonar skills by working for several different equipment manufacturers, some of whom are now industry leaders as a result of his efforts. David has a Bachelor's of Technology degree in Oceanographic Technology from the Florida Institute of Technology, Jensen Beach, FL (1975).