



# 95 ABW/EM



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*“Warriors Committed to Readiness and Quality Support”*



## Edwards Air Force Base Enterprise Geographic Information System (GIS)

**18 November 2008**

**U.S. AIR FORCE**

*Integrity - Service - Excellence*



# GIS Briefing Agenda



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- Edwards AFB Enterprise GIS
- Interrelated GIS processes
- Enterprise GIS architecture
- GIS Organization
- Interrelated GIS-based processes
- WebMap
- GIS Analysis Examples
  - ✓ Runway siting
  - ✓ Encroachment issues
  - ✓ Emergency response
  - ✓ Field Use
  - ✓ Remote-sensing
    - ✓ Image classification, Predictive habitat modeling, Hyperspectral, Surface flow analysis, 100-year floodplain revision



# Edwards AFB Enterprise GIS



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## □ True Enterprise Geographic Information System

- ✓ Used basewide
- ✓ Key enabling technology
- ✓ Supported by multiple organizations
  - Managed by GIS working group
  - Primary support by EM and CE
  - More recent support by 95 CG and 412 TW

## □ Supports GeoBase Initiative

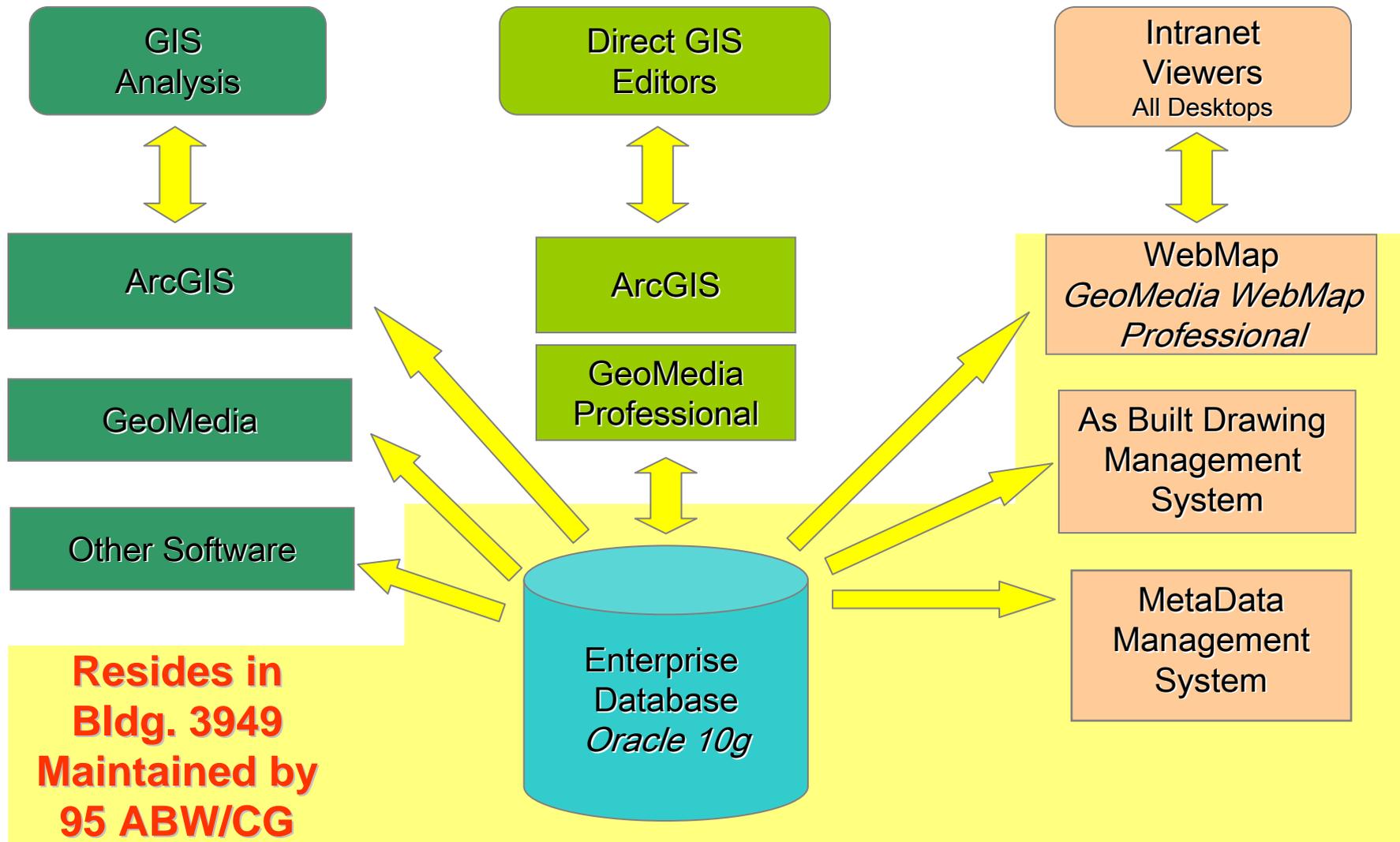
- ✓ One installation... One map
- ✓ One geospatial infostructure supports all requirements
- ✓ 38 features required in CIP (except where not applicable)
- ✓ Edwards Enterprise GIS has >400 features



# Enterprise GIS Architecture



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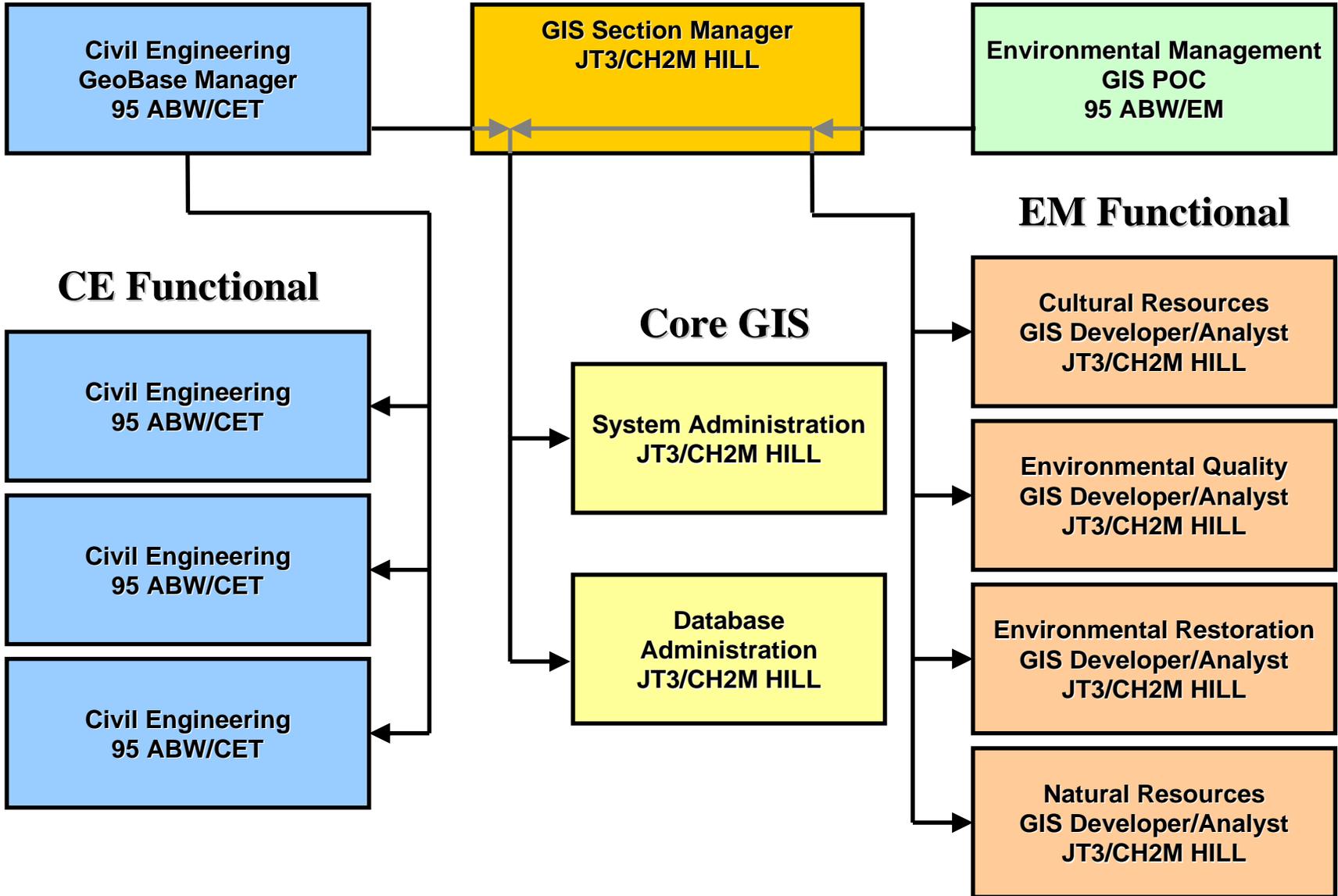




# GIS Organization



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# Interrelated GIS-based Processes



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# WebMap



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## ❑ Designed for End Users

- ✓ Easy to use
- ✓ Does not require GIS expertise

## ❑ Map Creation

- ✓ Creates maps containing features in GIS

## ❑ Queries

- ✓ Allows users to conduct standard spatial queries

## ❑ Emergency Response

- ✓ Allows real-time situation awareness
- ✓ Viewing/Input available on any networked computer (with appropriate permissions)

## ❑ Trip Routing

- ✓ Directions and distance to selected facilities & features



# WebMap



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IGI&S Home - You can reach the Support Center at 7-3444!

https://maps.edwards.af.mil/IGIS/index.aspx

IGI&S Home

Edwards Air Force Base  
Installation Geospatial Information and Services  
"One Air Force...One Map"

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**GIS Applications**

**WebMap**  
WebMap provides the capability to create interactive GIS maps from the desktop using a standard Internet browser. Maps are derived from the AFFTC GIS Database as well as other resources that cover Edwards AFB and the R2508 Airspace. WebMap includes tools such as Feature and Attribute Editing, Save Queries and Maps, Trip Routing, View ACES Data, and Load and Query Feature Datasets.

**Static Maps**  
Standard Base Maps of various areas on Edwards AFB in JPG and PDF formats.

**As-Built Drawing Viewer**  
Search from over 40,000 drawings and photos of structures at Edwards AFB.

**Historic Structures**  
Search the Historic Structures Database. Logon required.

**Aerial Photos**  
View Aerial Photography of Edwards AFB and Fresno, Inyo, Kern, Los Angeles, Orange, Riverside, San Bernadino, Tulare and Ventura counties in California. Requires PhotoMapper software.

**Google Earth Enterprise Client**  
Download and install the Google Earth Enterprise Client software for viewing Edwards AFB high resolution (3-inch) imagery, 3D buildings, etc.

**Edwards General Plan**  
The current Edwards General Plan is referred to as the EPIC, the Electronic Planning Information Center. This plan was developed in 2001 and is currently undergoing a major revision for content and format. Currently there are two approved sections and one Area Development Plan (ADP) available for viewing. As new sections are approved, they will be added here.

**R-2508 EBS**  
R-2508 Online Environmental Baseline Study.

**Fauna Reports**  
Enter, Update, and View Fauna and Mosquito Reports. Authorized personnel only.

**ERP Sites**  
Chemical and Well Information. Authorized personnel only.

**Cultural Resource Management**  
View or Update Sites, Isocats, etc. Authorized personnel only.

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**Customer Service**

**GIS Support**  
Enter information for GIS support, such as mapping requests, data exports, GIS software installation, etc. Your request will be directed to the appropriate GIS office.

**Digging Permits**  
Submit Information for a Clearance Request. Enter and print out your Digging Permit form.

**GIS Working Group**  
Agenda, calendar, minutes, references, etc.

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**Admin**

**GIS Web Statistics**  
View monthly WebMap usage statistics.



# WebMap (Critical Habitat)



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WebMap - You can reach the Support Center at 7-3444!

https://maps.edwards.af.mil/GWM/Index.aspx

WebMap

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Menu Features Legend Attributes Messages Desert Tortoise Critical Habitat

Queries

- Infrastructure
- Utilities
- Environmental
  - Compliance
  - Cultural Resources
    - Cleared Areas
    - Cultural Cleared Roads
  - EIAP
  - Natural Resources
    - Habitat Disturbance
    - Vegetation Communities
    - Plants of Interest
    - Soil Types
    - Desert Tortoise Critical Habita
    - Biological Opinion
    - Query By Long,Lat
  - Restoration
  - Asbestos Inspections
  - Asbestos Abatement
- Recreation
- Airspace
- R-2508 EBS
- Aerial Photos

Desert Tortoise Critical Habitat

Select Area

Current View

CREATE MAP

Reset Map

Locate Building

xxxx

Trusted sites 100%



# WebMap (Soils)



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WebMap - You can reach the Support Center at 7-3444!

https://maps.edwards.af.mil/GWM/Index.aspx

WebMap

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Menu Features Legend Attributes Messages **Soil Types**

- Building (3035)
- Road - Main (418)
- Soil Type
  - Cajon Loamy Coarse Sand (5)
  - Cajon Loamy Fine Sand (8)
  - Cajon Loamy Sand (11)
  - Cajon-Challenger Complex (17)
  - Cajon-Machone Complex (2)
  - Cajon-Norob Complex (18)
  - Challenger Sand (1)
  - Challenger-Leuhman Complex (5)
  - DeStazo Complex (1)
  - Helendale Fine Sandy Loam (1)
  - Helendale Loamy Sand (18)
  - Helendale-Cajon Complex (6)
  - Helendale-Randsburg Complex (1)
  - Helendale-Sparkhule Complex (1)
  - Hi Vista Sandy Loam (9)
  - Hi Vista-Machone-Randsburg Co
  - Hi Vista-Rock Outcrop Complex (
  - Lavic-Norob Complex (4)
  - Leuhman Complex (9)
  - Leuhman Loamy Sand (3)
  - Leuhman-Cajon-Leuhman Eroded
  - Leuhman-Challenger Complex (1
  - Leuhman-Challenger-Cajon Comp
  - Machone-Randsburg Complex (5)
  - Machone-Randsburg-Hi Vista Co

Locate Building



# WebMap (Land Use Controls)



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**GeoBase** Edwards AFB **Web Map** [Web Map Home](#) | [GeoBase Home](#) | [Contact Us](#) | [Request Access](#) | [About Us](#) | [Web Map Help](#) | [Privacy Policy](#)

**Menu** | **Features** | **Legend** | **Attributes** | **Messages** | **Land Use Controls by Area**

**1**

### Land Use Controls

Site ID	
Other Site ID	31
OU	8
Description	Groundwater Contamination Plume
Contaminant [Concentration]	PHCJ (petroleum hydrocarbons as jet fuels) [ ]
Depth (feet bgs)	
Restrictions	No construction; No excavation; No well drilling
Duration	Interim
POC Name	Stephen Watts
POC Phone	661-277-1443
Remarks	
Last Modified	10/24/2007 1:15:43 PM
Disclaimer/Explanation	This is the <b>proposed</b> Land Use Control (LUC) for groundwater contamination on Edwards AFB. It reflects our current understanding and may be modified as necessary. These areas

Locate Building



# Runway Siting



- **PROBLEM:** Edwards must construct a runway to support the flight mission while the main runway is repaired.
  - Infrastructure costs, environmental concerns, airspace requirements, and other constraints impact siting decision
- **SOLUTION:** GIS technology provides decision makers visual/spatial analysis of multiple siting options
  - Optimize siting with full consideration of all constraints
  - Maximize cost-avoidance opportunities



# TEMPORARY RUNWAY LOCATION



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# Encroachment Issues



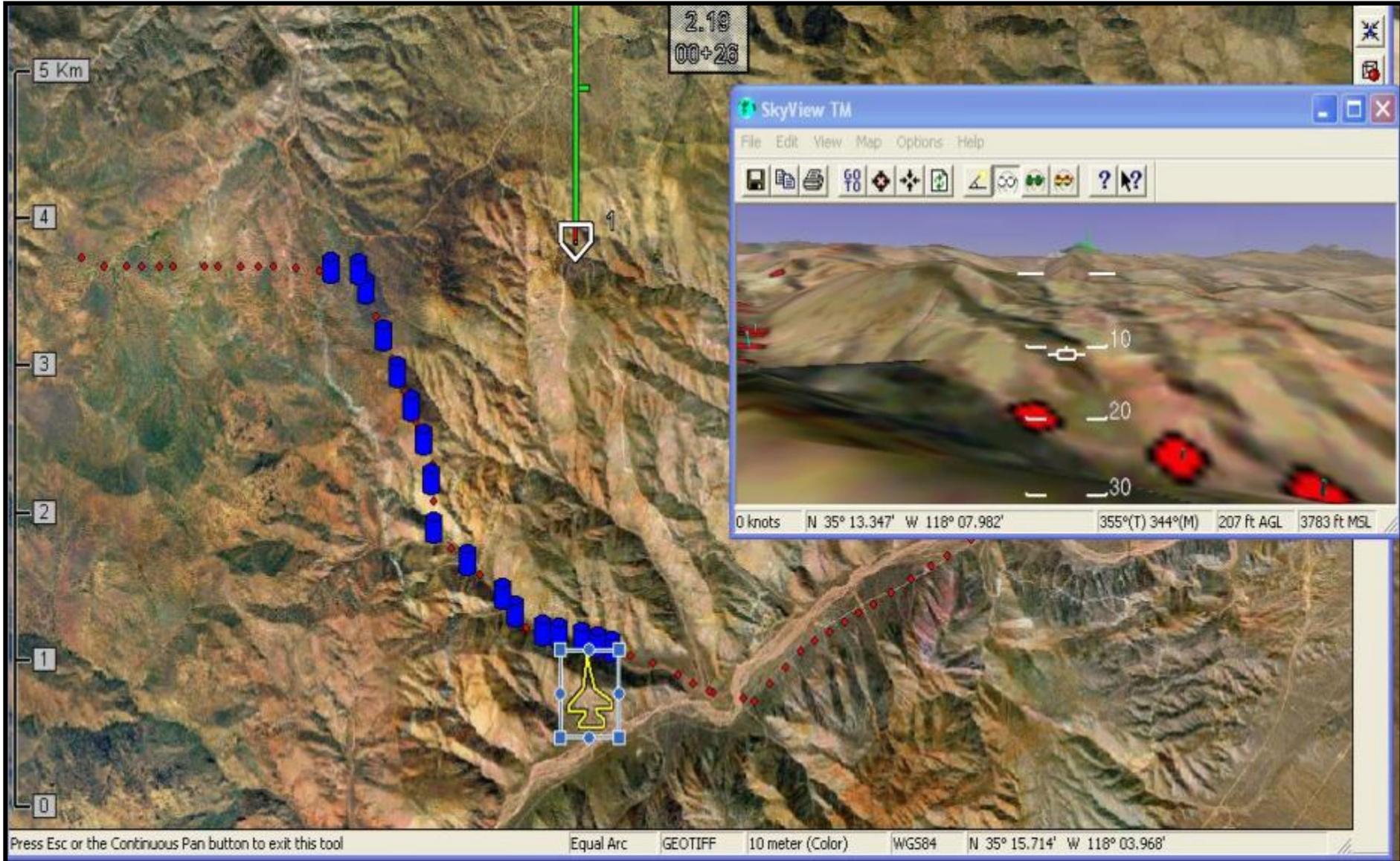
- **PROBLEM:** EAFB Flight Mission planners concerned that proposed utility line across Terrain Following Route posed a threat to test aircraft
  - Raised encroachment concerns
- **SOLUTION:** 3-D perspective GIS imagery used to assess possible conflict
  - Flight route integrity preserved
  - Costly field work avoided, better information to decision makers



# Falcon View using GIS Data



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# GIS for Emergency Response



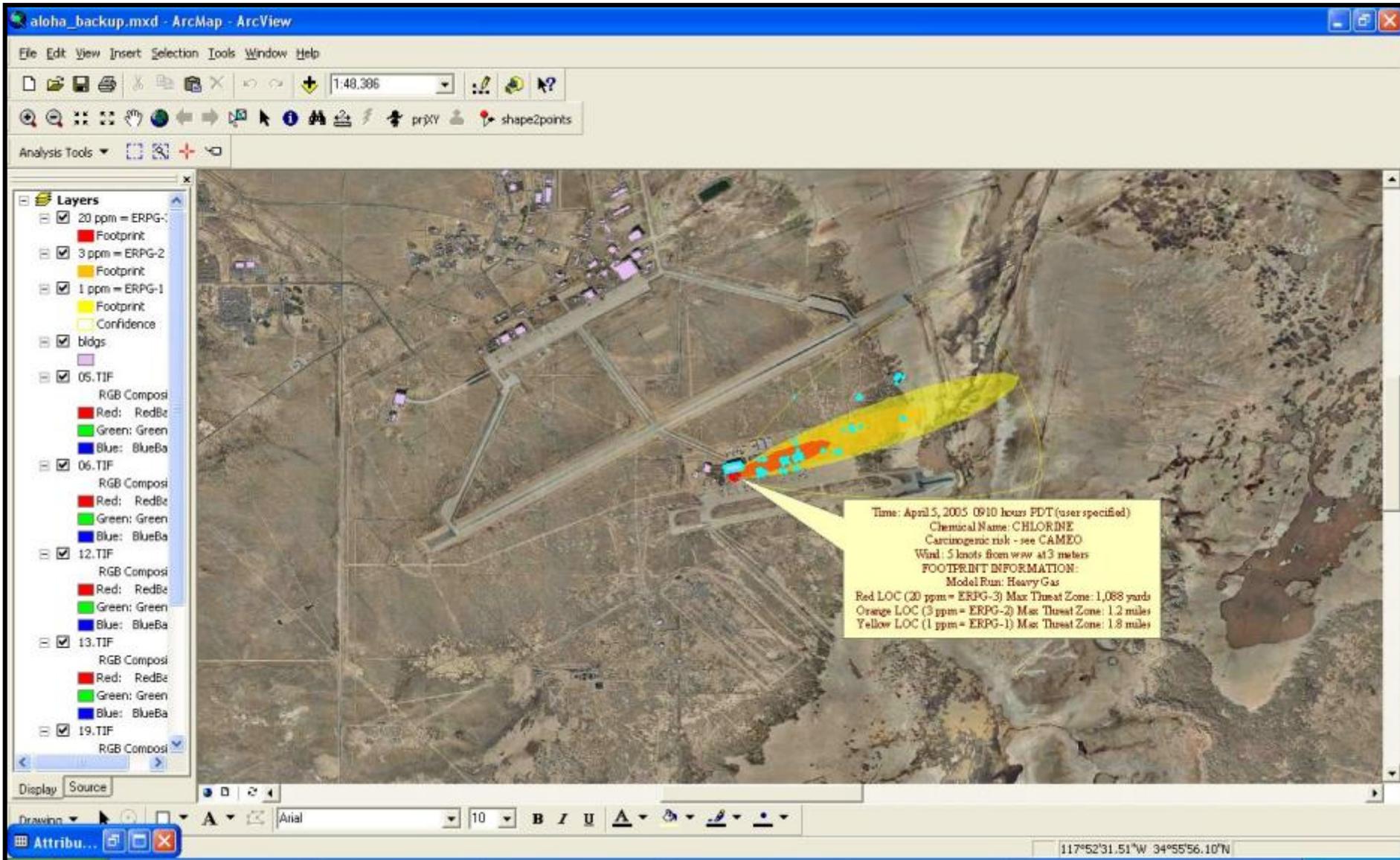
- **PROBLEM: EAFB Leadership requires rapid, accurate, and meaningful data to assess situations and implement solutions**
  - **Situation: Chlorine spill at ABL**
- **SOLUTION: Web-enabled ERM application provides On Scene Commanders and Battle Staff the necessary information to assess risk and order corrective actions**
  - **GIS professionals input data into database**
  - **Web application displays 'live' data**
  - **Automatically updates as situation changes**
  - **Order effective evacuations and other necessary emergency actions**



# GIS using Aloha Data



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# Field Use



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- **PROBLEM:** Field teams need access to GIS data while working in the field. Hard copy maps shred easily by the wind or blow away.
- **SOLUTION: Portable GIS using Tablet Technology**
  - All computer applications available in the field
  - Navigation, GPS
  - Field verification
  - Data Entry





# Cutting-Edge Remote Sensing



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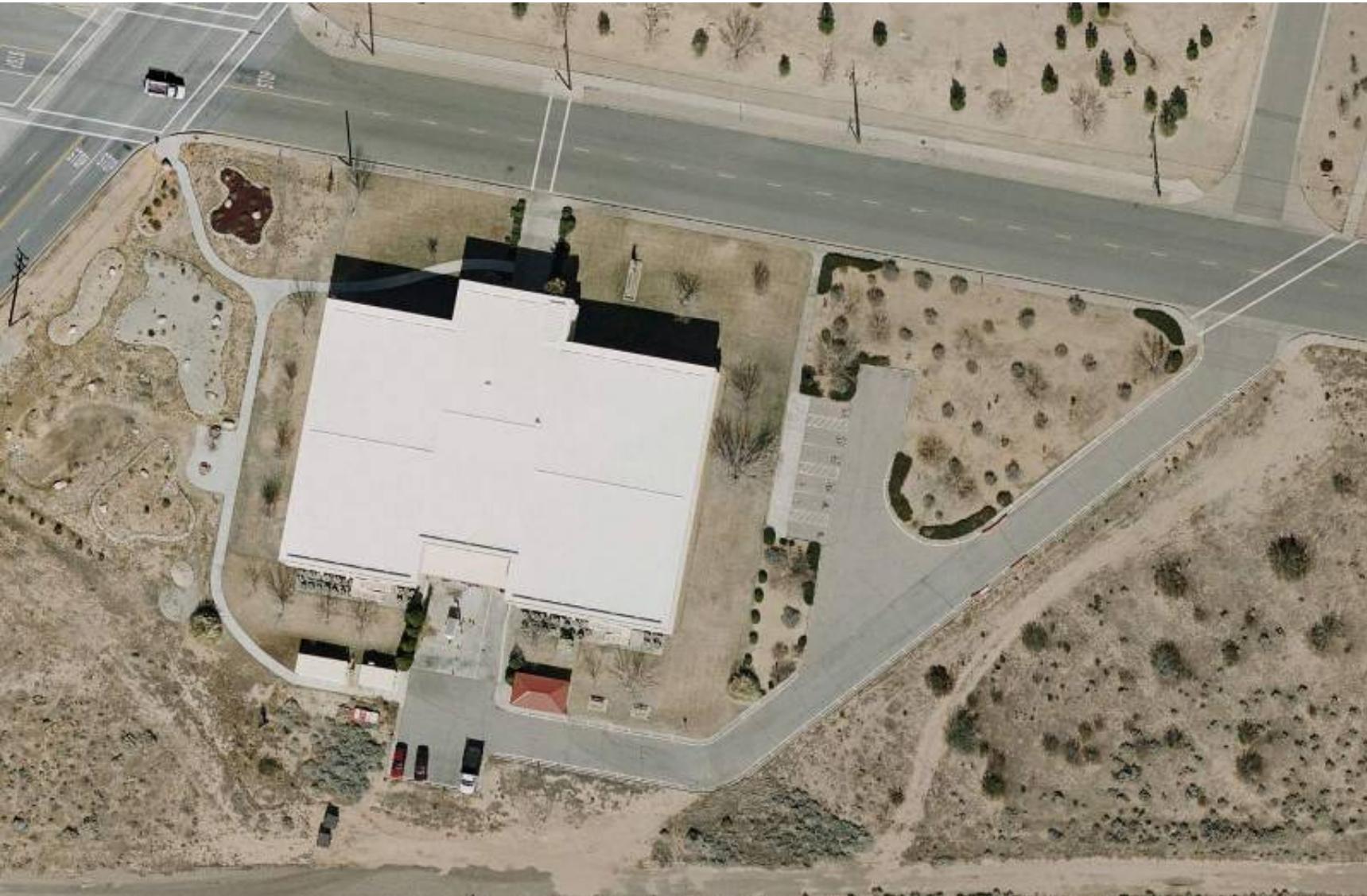
- **Aerial Photography**
  - Resolution: 3-inch entire base (2008)
  - Post processing in progress
- **Multispectral Imagery**
  - Landsat (satellite) imagery acquired in 2001 & 2003
  - 7 disjoint spectral bands
  - Resolution: 30m (pan-sharpened to 15m)
- **Hyperspectral Imagery**
  - >200 contiguous spectral bands allows imaging spectroscopy
  - Resolution: TBD; ~5m likely
  - On Contract
- **LiDAR (Light Detection And Ranging) – elevation data**
  - Data delivered
    - Stored as a terrain in a Geodatabase
  - Resolution: 1m horizontal
  - Accuracy: 6-inch vertical



# 3" Resolution Aerial Photography



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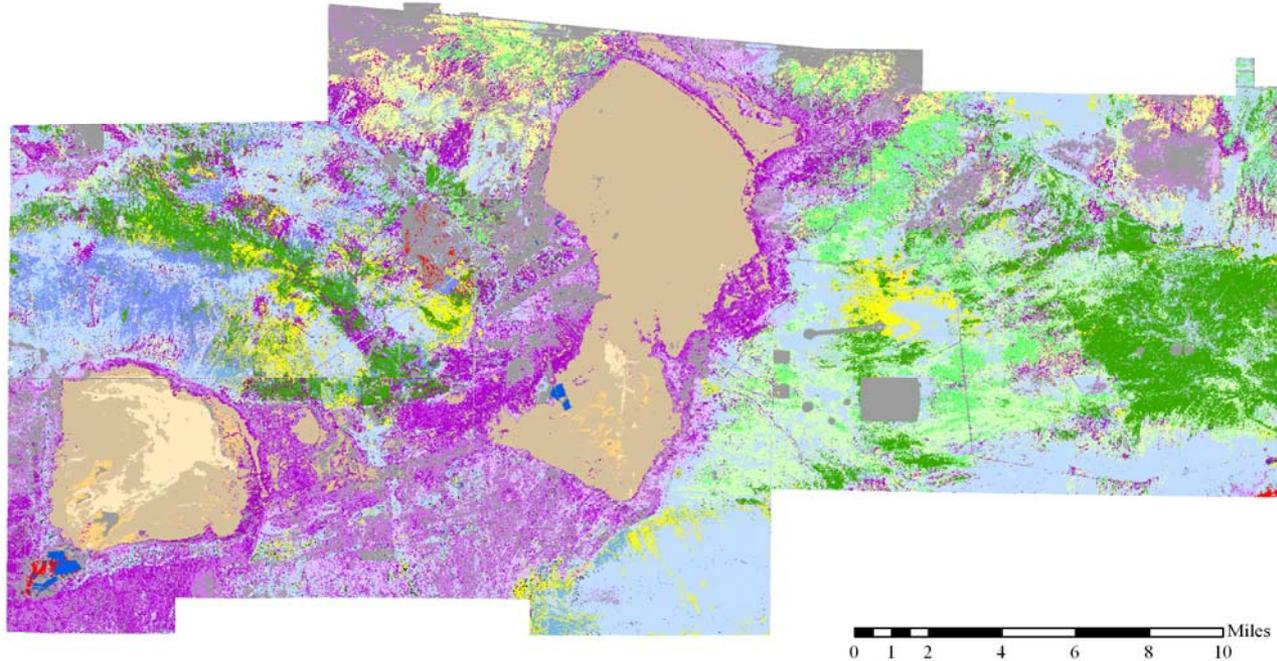
# Multispectral Image Classification



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## Supervised Classification for Major Vegetation Communities at Edwards Air Force Base, CA

Adapted from Technical Report on Multispectral Image Analysis, Edwards Air Force Base, CA, May 2004



### Legend

Creosote Bush	Joshua Tree - Creosote	Non-Vegetated to Sparsely - Vegetated
Creosote Bush - Halophytic	Joshua Tree - Xerophytic	Irrigated Vegetation / Unclassified
Creosote Bush - Xerophytic	Joshua Tree Woodland	Playa Outer
Halophytic Saltbush Scrub	Xerophytic - Halophytic Saltbush	Playa Inner
Halophytic Saltbush Scrub - Claypan	Xerophytic Saltbush Scrub	Playa Center
Halophytic Saltbush Scrub - Dune	Mesquite	Surface Water

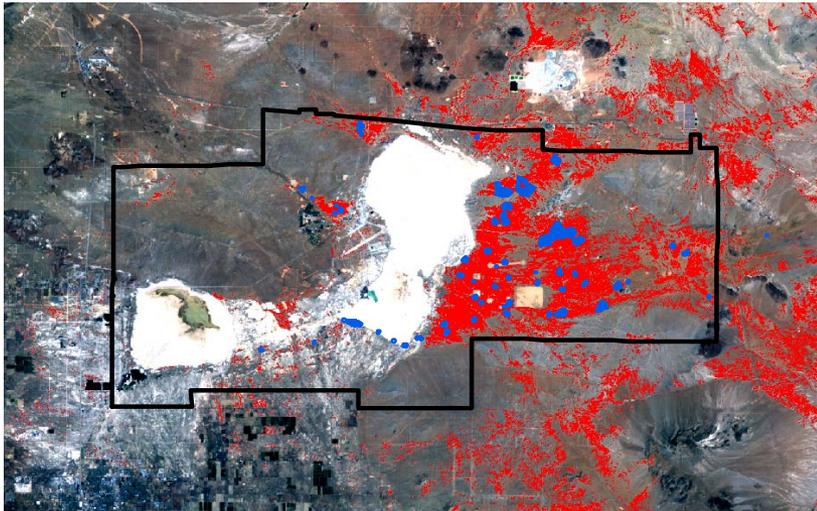
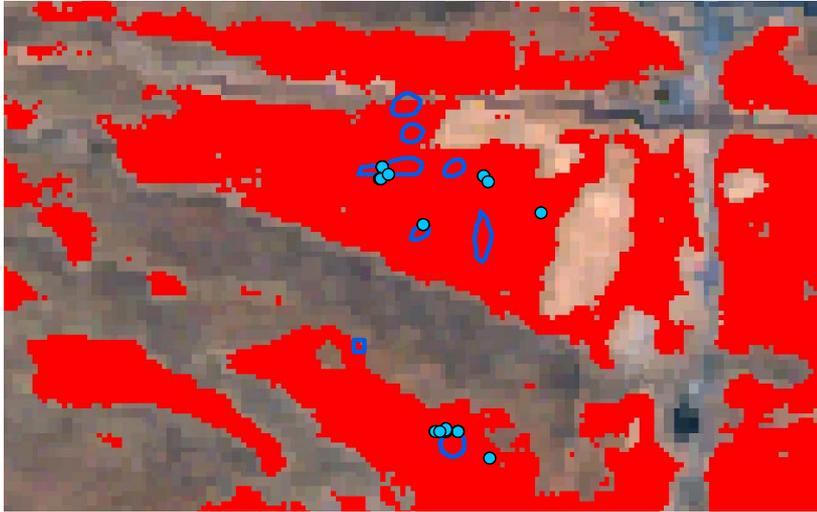




# Predictive Habitat Modeling



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## Desert Cymopterus

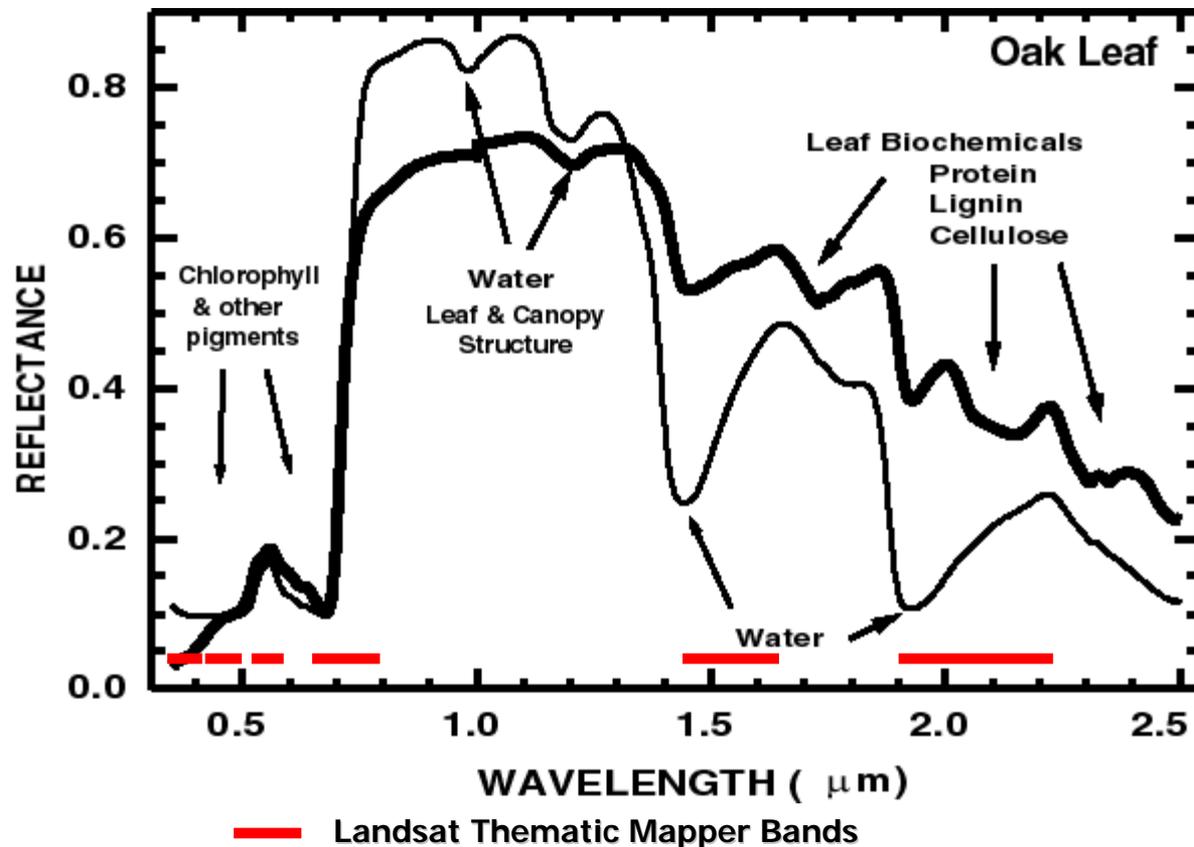
- Model predicts habitat based on evaluation of the spectral characteristics of multispectral satellite imagery (Landsat 7)
- Model instrumental in identifying new populations and preventing endangered species listing and critical habitat designation



# Hyperspectral Imagery



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- Large number of contiguous spectral bands in hyperspectral imagery allows imaging spectroscopy to better determine ground cover characteristics as compared with small number of discontinuous multispectral bands (Landsat)

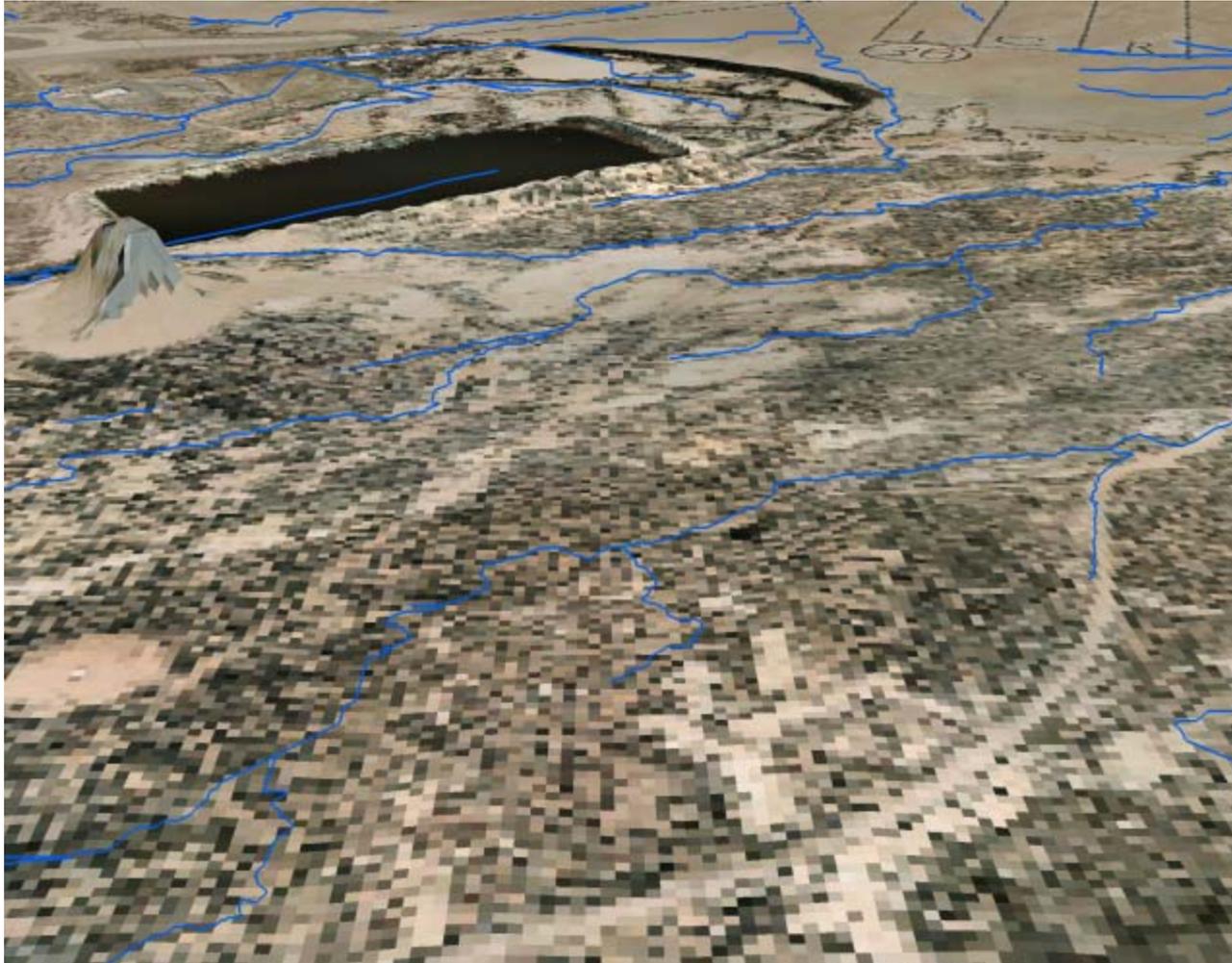
Adapted from: <http://speclab.cr.usgs.gov/national.parks/Yellowstone/ynppaper.html>



# Surface Flow Analysis Using LiDAR



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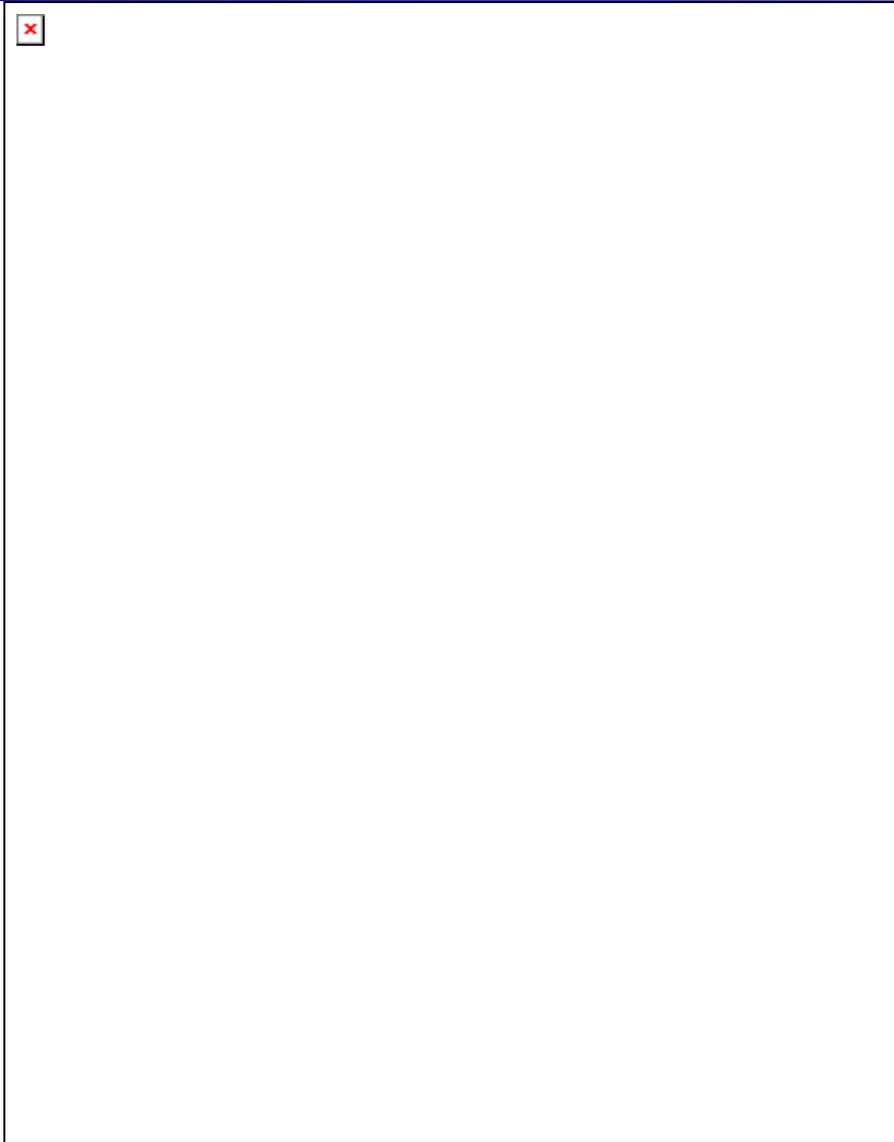
- **Used LiDAR elevation data to determine where surface water flows in the vicinity of stormwater retention pond if breached – contour data not sufficiently precise**
- **Image shows calculated surface water flow with aerial photography draped over elevation with relief exaggerated 5X**



# 100-Year Floodplain Revision using LiDAR



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- ❑ Original 100-Year Floodplain delineation used 1-5 ft. contour elevation data. Buildings and infrastructure along lakebed were shown within floodplain.
- ❑ Revised floodplain delineation using LiDAR elevation data shows floodplain within lakebed boundaries.



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# Questions?