

# Cellular Telemetry



Bridging the gap between cellular technologies and  
wildlife tracking applications

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# Its everywhere



# Facts and misconceptions

## ➤ Facts

- Cellular technology is currently used to track many different things (people, animals, objects)
- Cellular technology is limited by size and power
- Industry not responsive to customers needs

## ➤ Misconceptions

- Cellular technology is believed to be beyond its actual current state, but the industry is still in its infancy



# Theoretical application



#SERVINFO: 699,-64, "Cingular","310410",03,A426,02,1,,"II",01,6

Robinson, work in progress



# GSM Coverage



- Current situation

- PA essential for raptor migration
- PA high potential for development of wind power
- Study of interaction via satellite tracking of birds



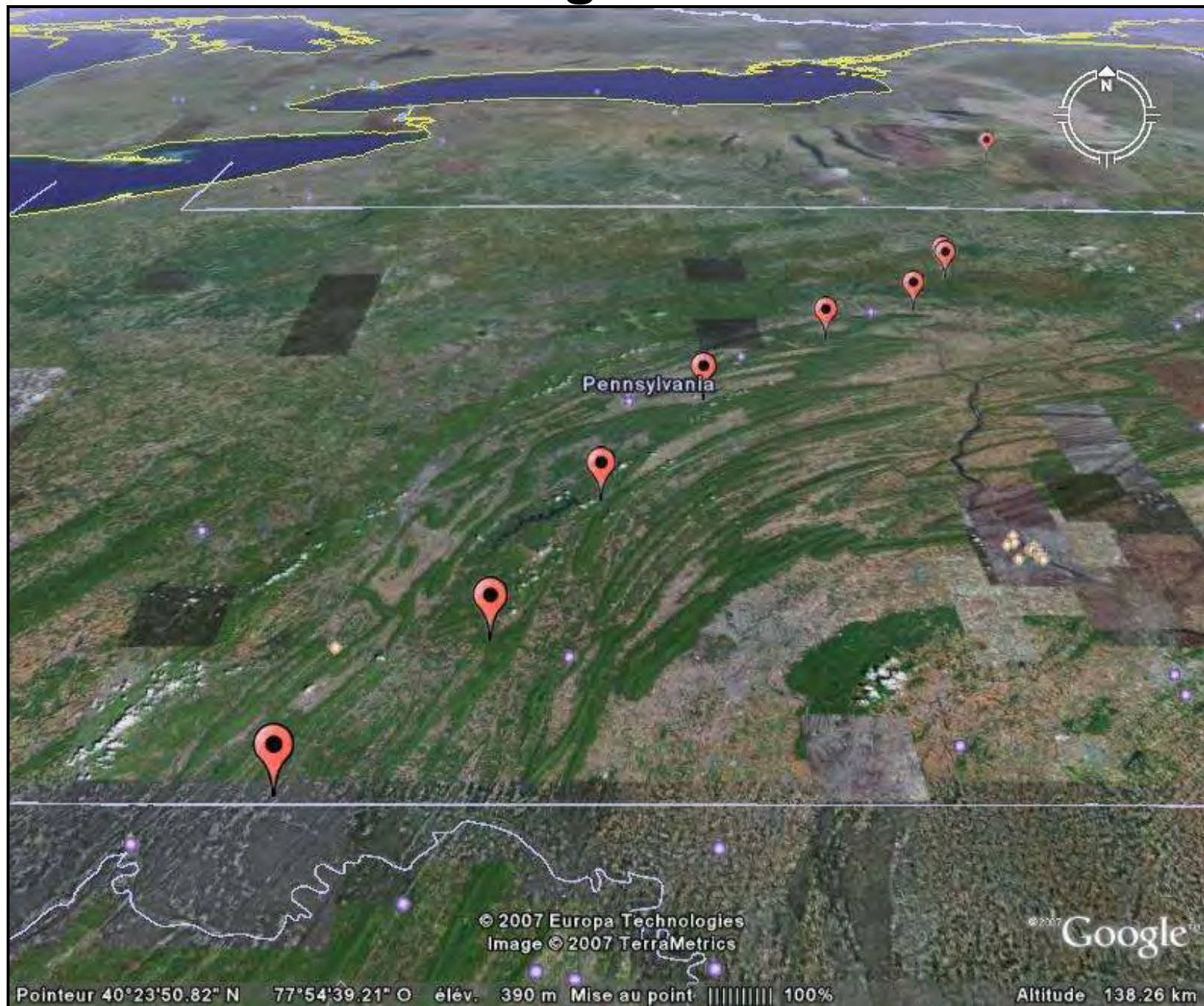


# Current State of the Art

- GPS data, transmitted via ARGOS satellite system
- One location/hour,  $\sim 13/\text{day}$ ; wt.  $\geq 30\text{g}$
- $\sim \$3\text{-}4,000$  per unit,  $\$1,000$  per year for data retrieval
- limited by power consumption, non-recoverable, non-interactive



# Wildlife Tracking Unit - current art





# Preliminary telemetry data analysis-migration

- Number of Points in Pennsylvania

Golden Eagle #	Number of Data Points in PA			Totals
	Fall 06	Spring 07	Fall 07	
GE39	13	88	101	101
GE40	15	40	97	97
GE41	-	10	58	58
GE60	-	-	80	80
GE62	-	-	49	49
GE69	-	-	102	102
BE61	-	-	16	16
BE65	-	-	117	117
Totals	28	138	454	620

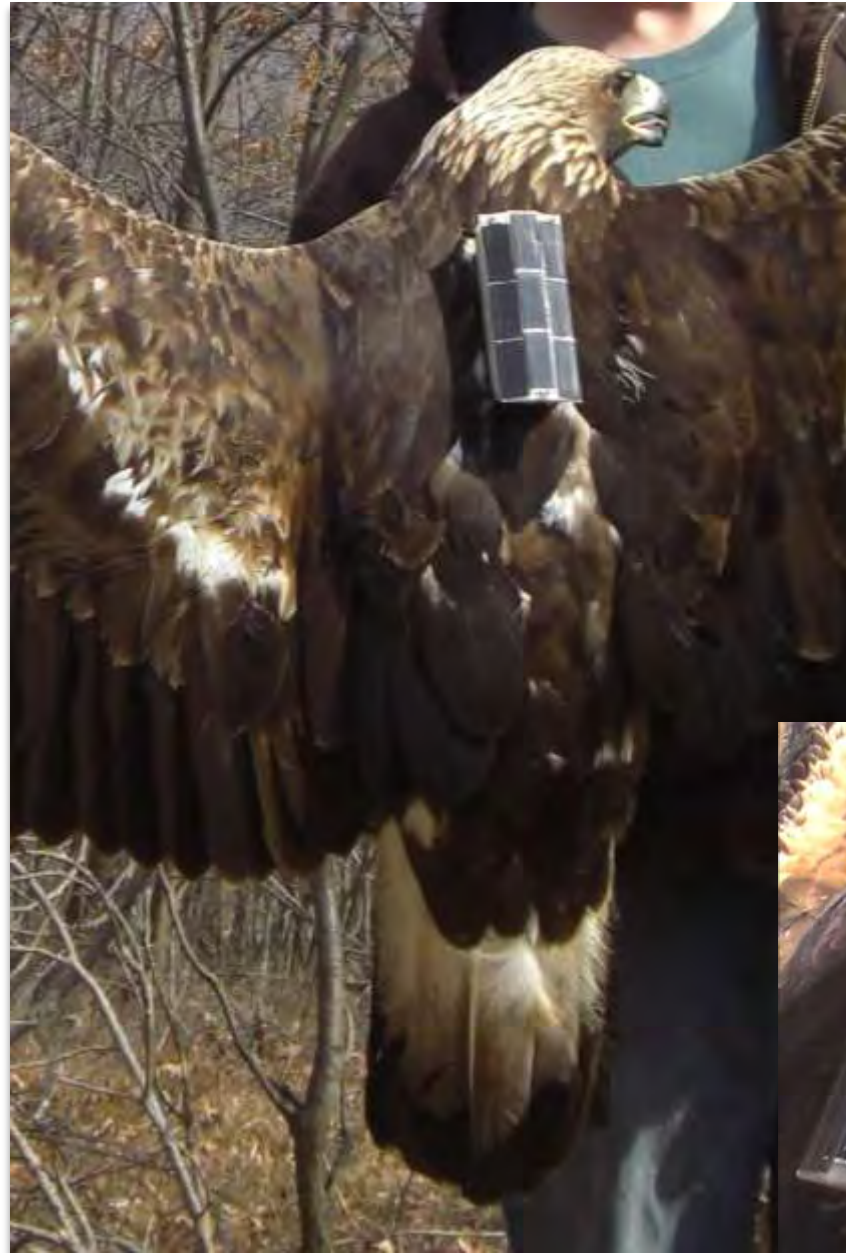
# **The problem - getting more data**

- Problem - not enough data points (8 birds, 3 yr, 620 data points)
- Solution - transmitter that provides more data points than commercially available devices
- Prototypes have been deployed with success
- Multiple innovations and improvements (beyond data production) over commercially available technology



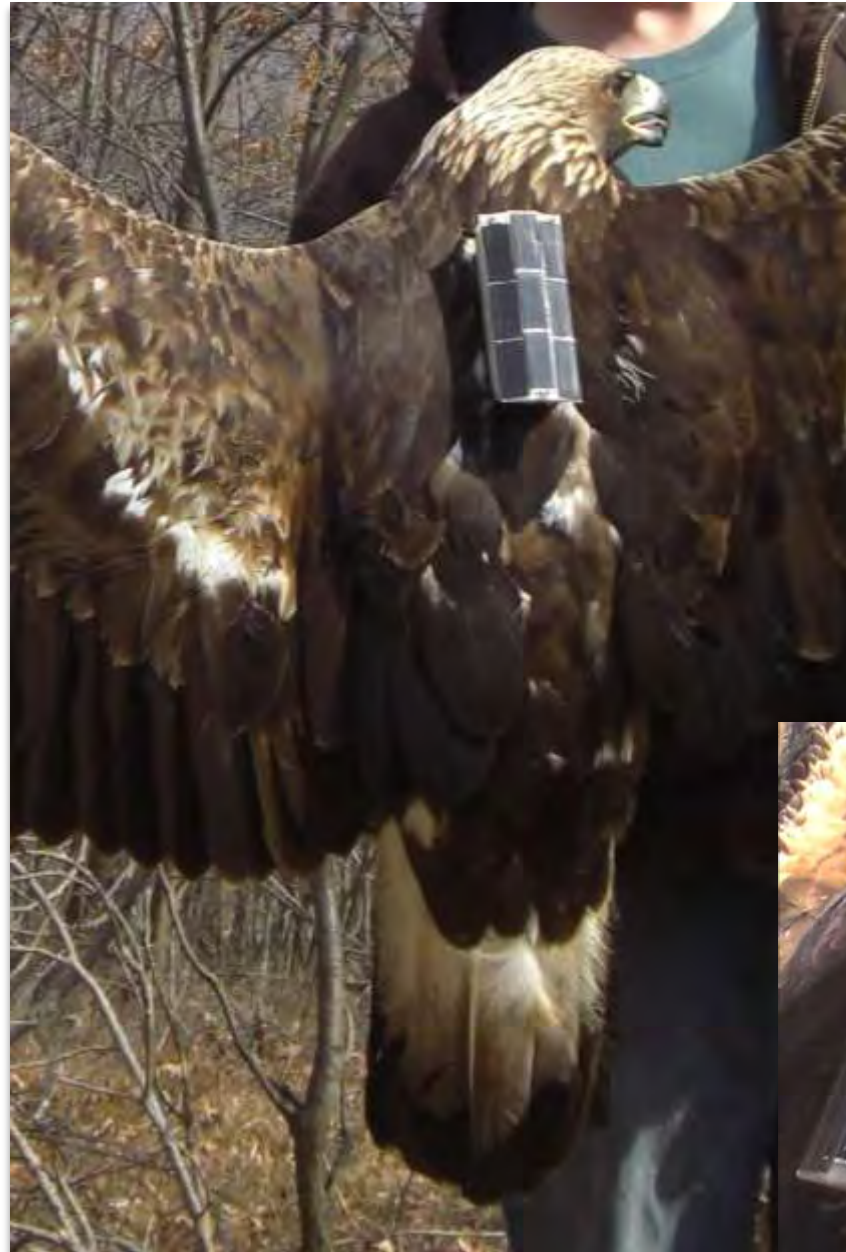
# Features and Improvements

- user-determined data collection
- improved power management system
- unique software developed for better hardware integration, power management, interactivity and data delivery
- miniaturized in most regards



# Features and Improvements

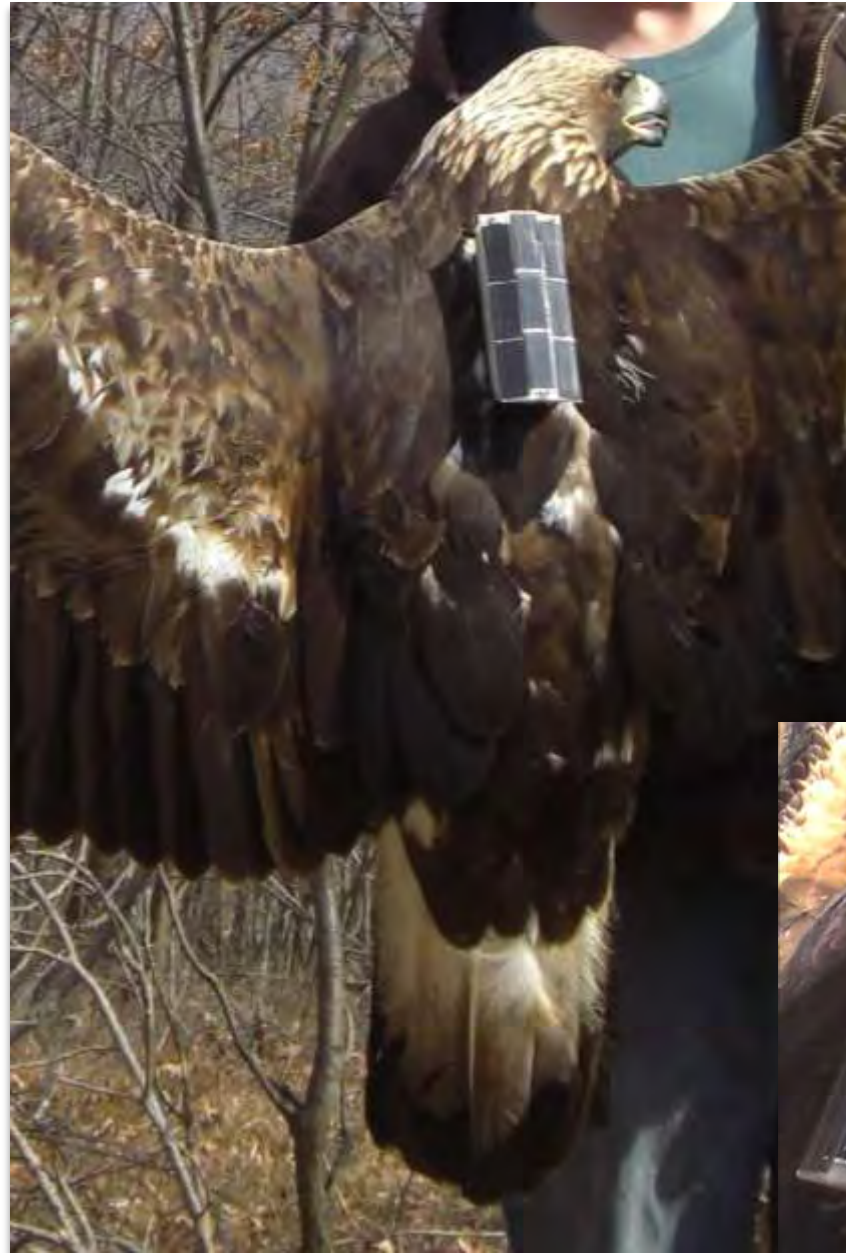
- capacity to transmit over multiple wireless platforms
- capacity to drop off an animal on-demand, to aid recovery
- capacity to incorporate multiple types of sensors
- uses only internal antennas; unlikely to fail or break
- Cheap options to consumer for data costs



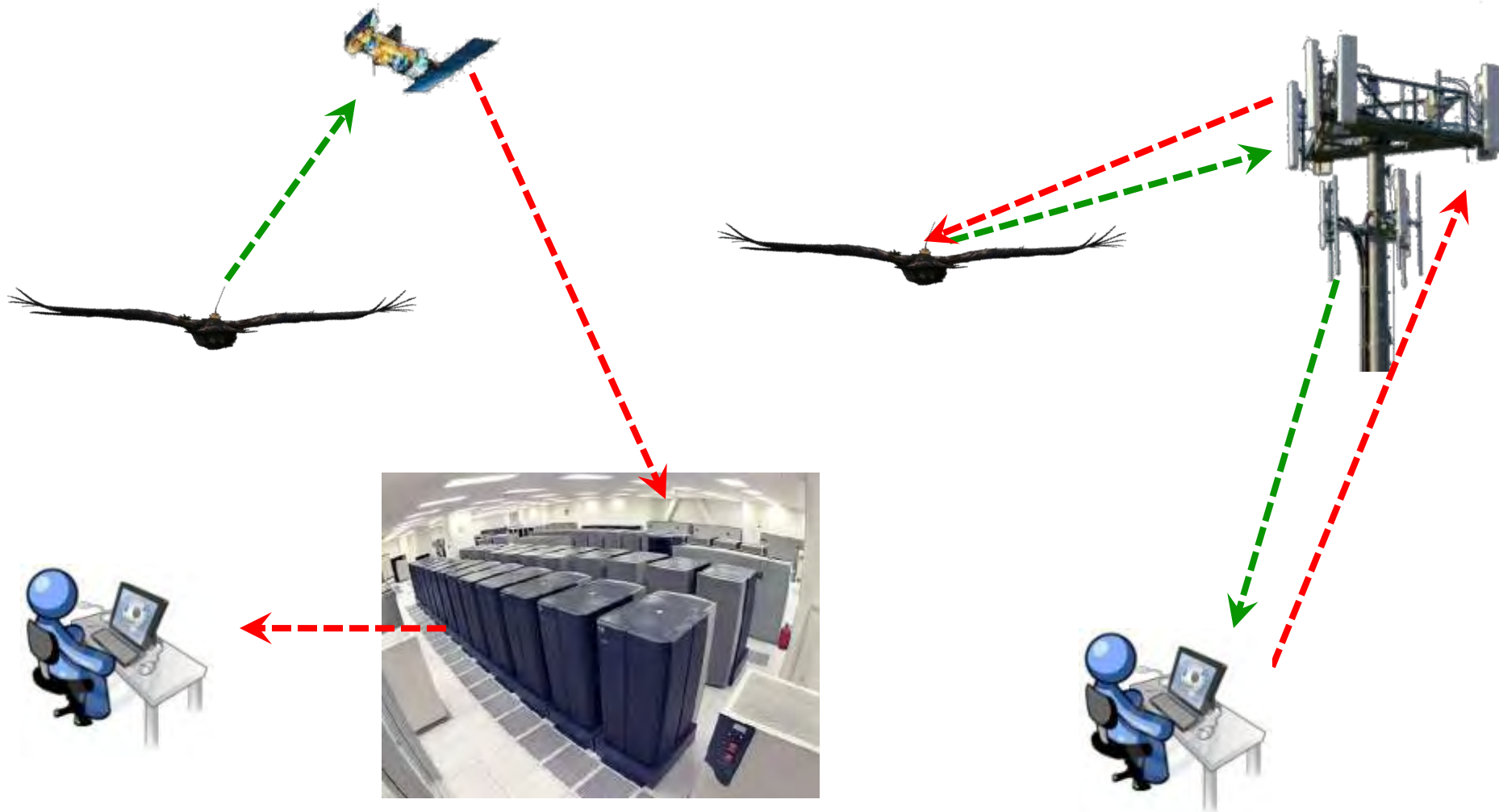


# Features and Improvements

- interactive, such that programming changes can be remotely uploaded
- interactive, such that instantaneous data can be sent in response to remote commands
- recharged through solar power
- stores more data than any other device on the market



# Basic Concept





# Updated telemetry data analysis - migration

- Number of Points in Pennsylvania

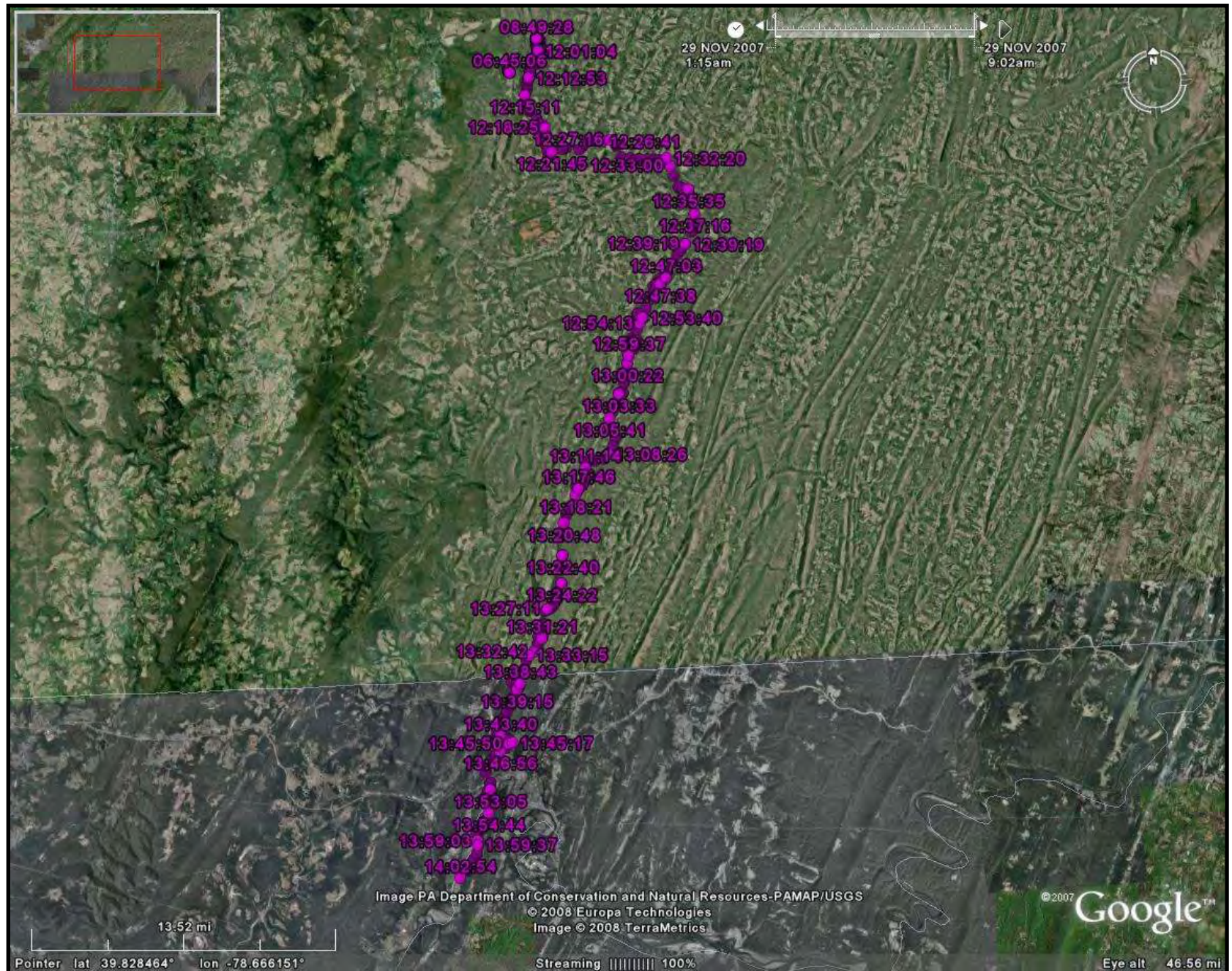
Golden Eagle #	Number of Data Points in PA			Totals
	Fall 06	Spring 07	Fall 07	
G 0	-	-	1809	
G 1	-	-	263	
G 2	-	-	615	
Totals (3 days)	-	-	2687	
All Others (~18 mo)	28	138	454	620

# Satellite Telemetry





# Prototype data (~30-45 second intervals)





# Comparison of Data Collected Using New GSM Technology and Satellite Technology







Birmingham

Tyrone

Tipton

Bellwood

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Image PA DCNR-PAMAP/USGS

Image © 2007 TerraMetrics  
Streaming ||||| 100%

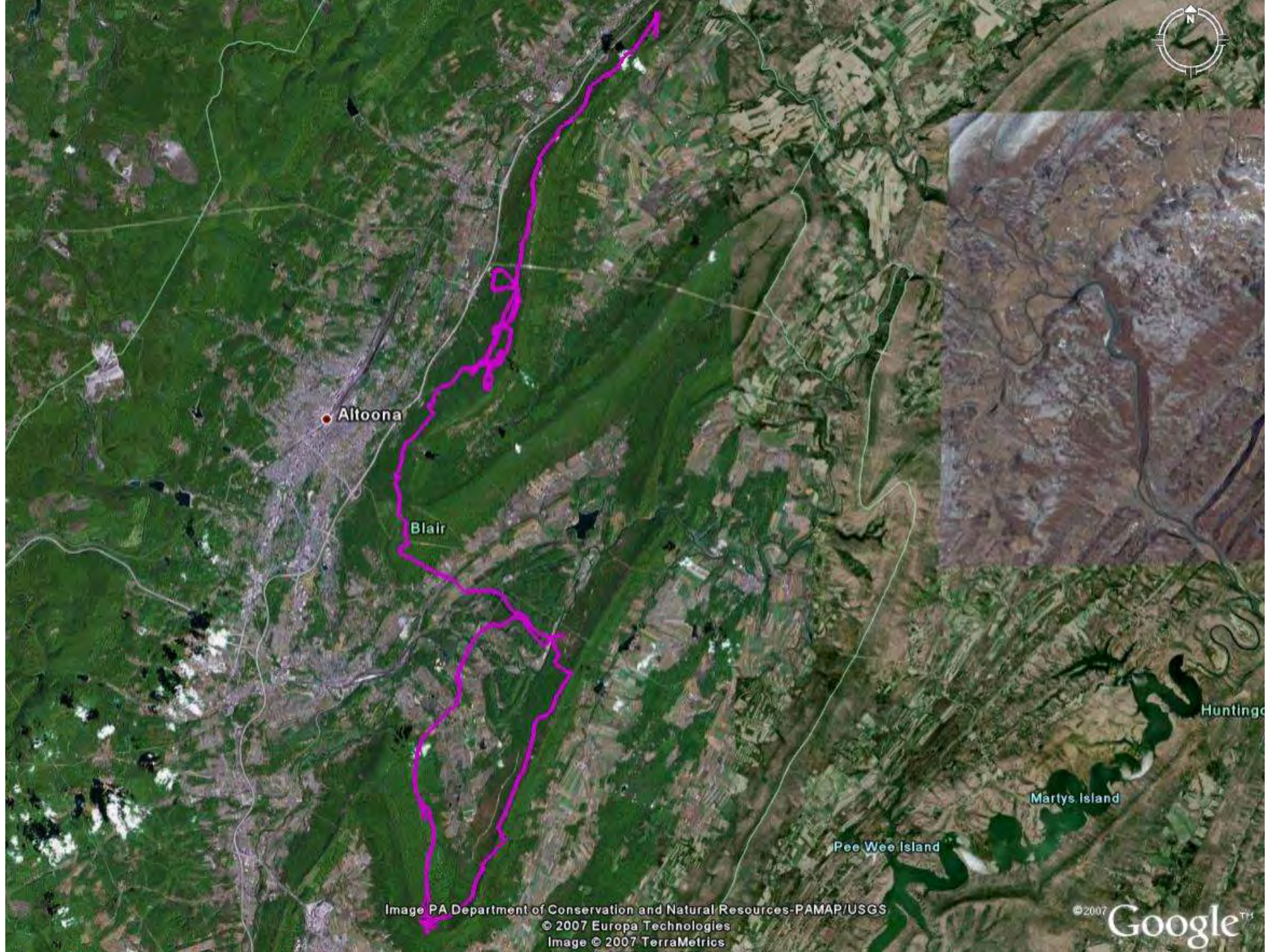
© 2005 Google™

Eye alt 16.98 km

4.75 km

Pointer 40°35'36.93" N 78°16'11.33" W elev 353 m





Altoona

Blair

Huntington

Martys Island

Pee Wee Island

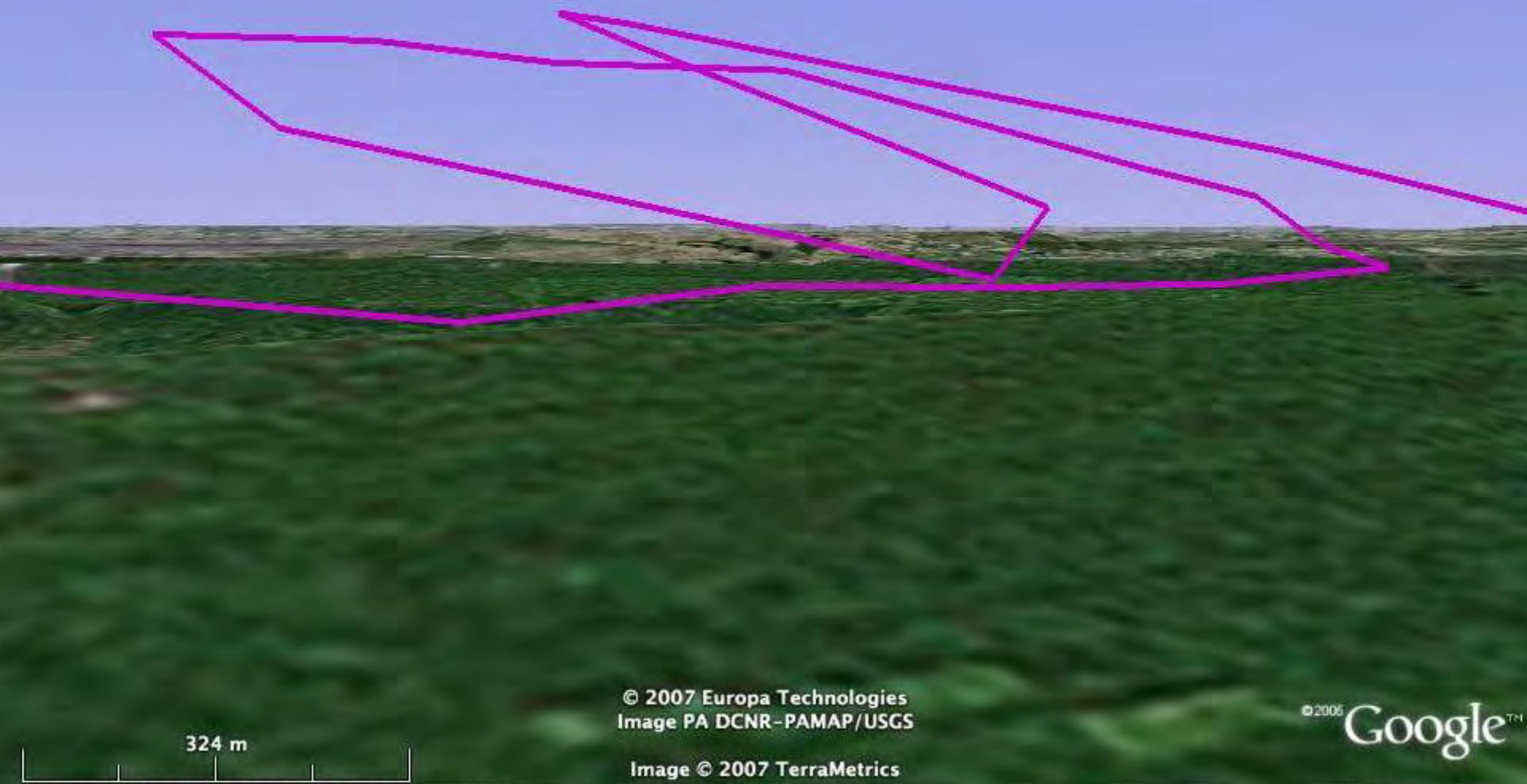
Image PA Department of Conservation and Natural Resources-PAMAP/USGS

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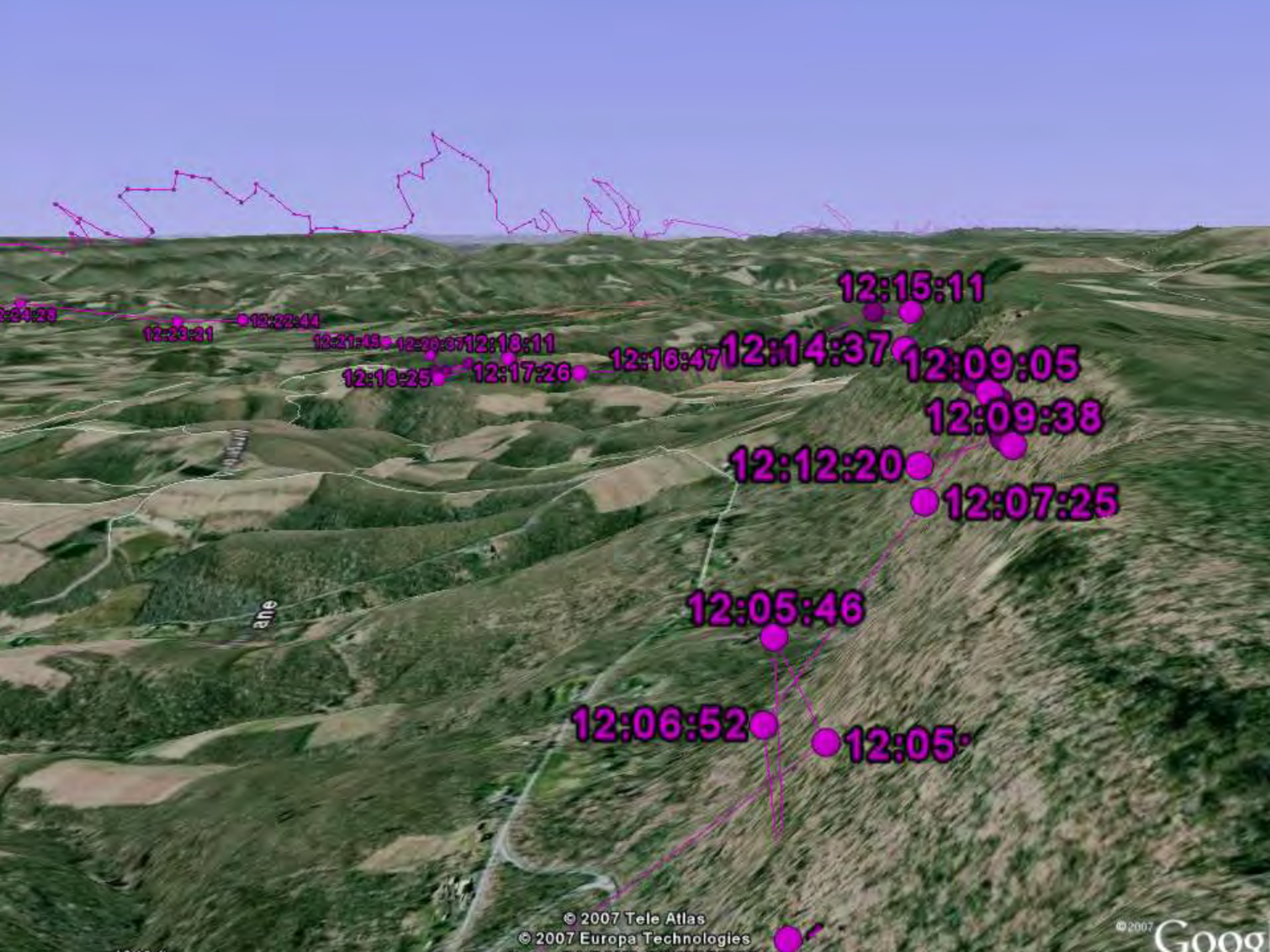
324 m  
Pointer 40°28'27.83" N 78°09'20.80" W elev 464 m

© 2007 Europa Technologies  
Image PA DCNR-PAMAP/USGS

Image © 2007 TerraMetrics  
Streaming ||||| 100%

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Eye alt 946 m



12:24:23

12:23:31

12:22:44

12:21:45

12:20:37

12:18:11

12:16:25

12:17:26

12:16:47

12:14:37

12:15:11

12:09:05

12:09:38

12:12:20

12:07:25

12:05:46

12:06:52

12:05:00

ane







Nov 28, 2007  
10:58pm

Nov 29, 2007  
7:02am

N



Corriganville

Image © 2008 TerraMetrics  
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Image PA Department of Conservation and Natural Resources-PAMAP/USGS

Google

Eye alt 1.31 km





Powdermill  
Nature  
Reserve

*Research  
Education  
Preservation*

# Thanks!!!

Cellular  
Tracking  
Technologies



Ressources naturelles  
et Faune

Québec



Carnegie  
Museum  
of Natural  
History®



One of the four  
Carnegie Museums  
of Pittsburgh



NATIONAL AVIARY



PENNSYLVANIA GAME COMMISSION

To manage all wild birds, mammals and their  
habitats for current and future generations

## USFWS State Wildlife Grants Program