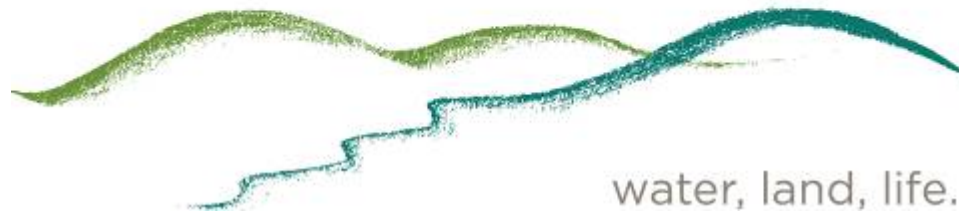

Western Pennsylvania
Conservancy



water, land, life.

Upper Ohio River GIS

A Novel Approach to
Bathymetry Mapping in a Large River System

Eli Long, GIS Specialist
Eric J. Chapman, Director of Aquatic Science

Significance of the Ohio River Basin

- One of the most diverse river ecosystems in the world: fish & mussels
 - Part of the Interior Basin (Mississippi)
 - Long river (Ohio River 981 miles + 321 mile Allegheny River) covering diverse geologic landscapes
- Recognized in “The Rivers of Life” publication (1998)
- Now the best remaining habitat for certain aquatic species – on Earth - both common and endangered
- Includes reaches and sub-basins of high quality as future source references and populations

Freshwater Mussels

At Pittsburgh,
historically
52 species

kidney shell, plain pocketbook, spike



Upper Ohio River System

Natural Resource – uses



- public water supply
- industrial water supply
- shipping
- aggregate mining
- recreational boating
- angling
- aesthetics – *regional signature*
- waste disposal
- wildlife habitat
- ecosystem services

Key Ecological Attributes: River Ecosystem

- Water Quality
- Volume
- Flow
- Depth
- Substrate
- Habitat types
and distribution
- Dispersal pathways
- Biodiversity



Allegheny River, Pool 4 – Brad Georgic Photo

Sedimentation Problems in the Allegheny River, Pool 8



Sports

Lifestyle

A&E

Photo Journal

AP Wire

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**Headlines
by E-mail**

Sex-crazed mayflies blanket Downtown

Friday, June 08, 2001

By Don Hohey, Post-Gazette Staff Writer

Workers in Downtown office buildings near the Allegheny River were greeted yesterday morning by thousands and thousands of big, wispy-winged mayflies, a common sight along your better trout streams but a rarity over the last 150 years in Pittsburgh.

That these aquatic insects have reappeared in this urban, once highly industrial city is a visible indication that water quality in the rivers is improving.

"It's great that they've emerged this year," said April Moore, an aquatic biologist with the state Department of Environmental Protection. "If they create a stir it's because they're unfamiliar. On the upper reaches of the river they are common."



Allegheny River – Pool 6

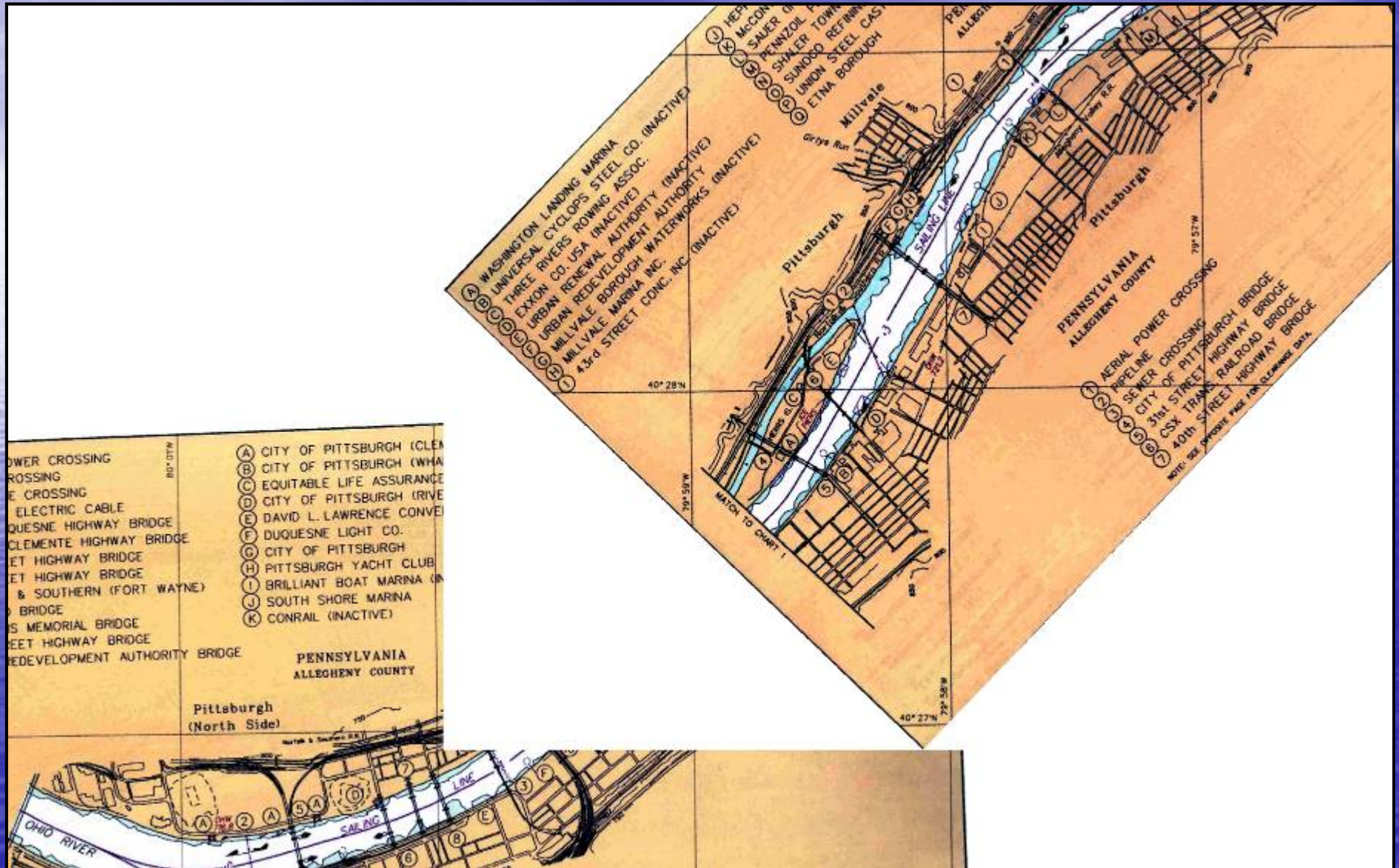


- Areas of heavily modified habitat
- Amount varies by pool
- Biotic communities fragmented



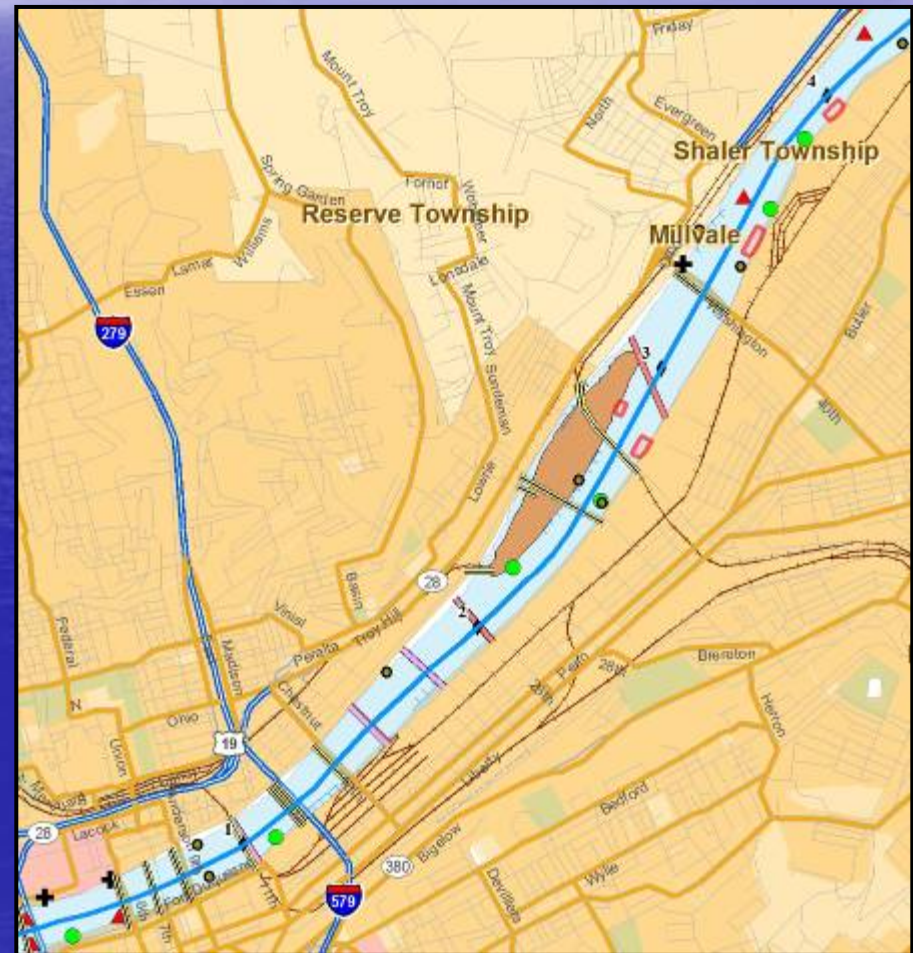
- Areas of high quality habitat
- Minimal anthropogenic disturbance
- Biotic communities appear stable

Existing River Mapping: ACOE Navigation Charts



River Information System (RIS) Database Components

- Geo-rectified Navigation Charts
- Cross-river features
 - Pipelines, underwater cables, & bridges
- On-river features
 - Buoys, navigation channel, marinas, & water intakes
- Mussel diving transects
- Water quality information
- Aerial photography
- Roads and surrounding towns



WPC Boat Acquisition February 2007



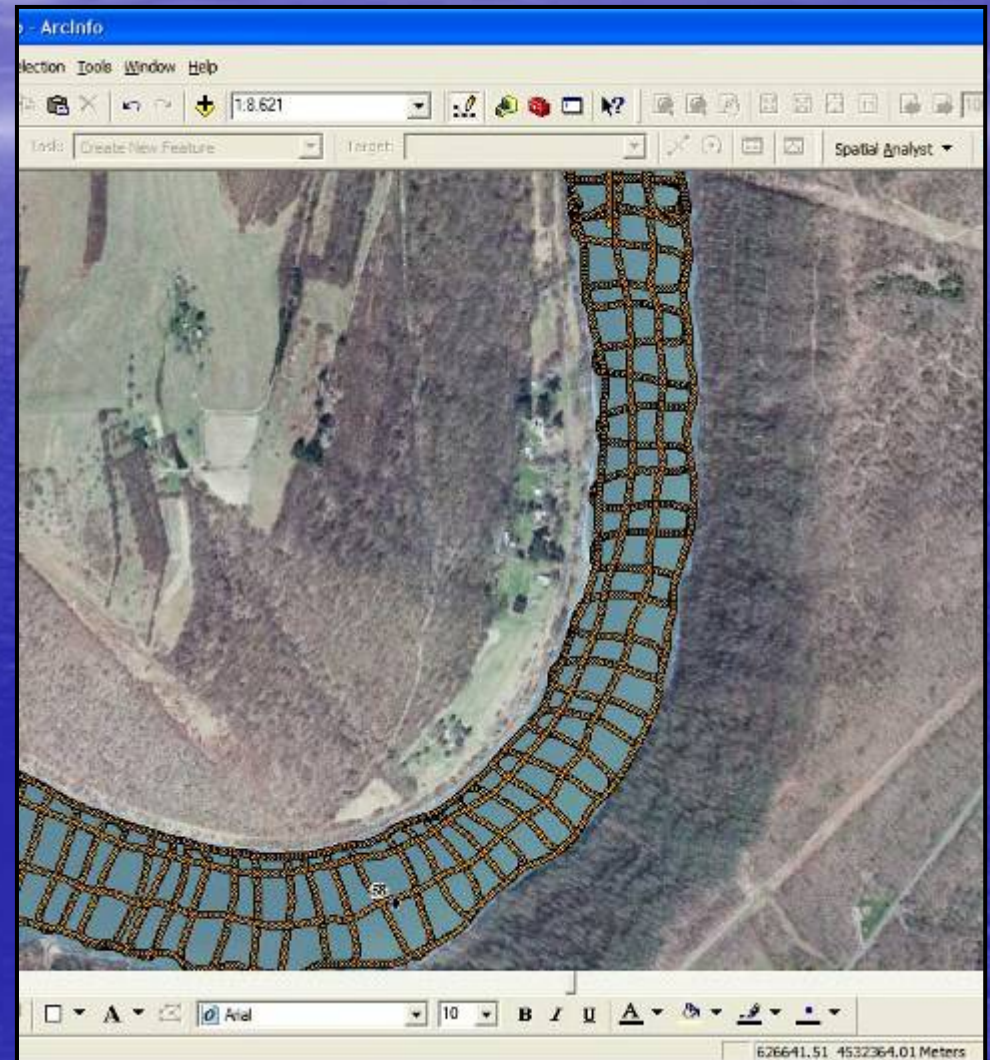
- 23 Foot War Eagle®
- 90 HP 4 Stroke Engine
- 10 Person Capacity
- Top Speed = 35 knots
- Shallow draft (< 2ft)

Progress To Date

- Pool 3 – 9.4 River miles
 - 100% mapped
 - (RM 14.5 – 23.9)
 - Pool 4 – 6.4 River miles
 - 100% mapped
 - (RM 24.0 – RM 30.4)
 - Pool 5 – 5.9 River miles
 - 100% mapped
 - (RM 30.4 – RM 36.3)
 - Pool 6 – 9.4 River miles
 - 100% mapped
 - (RM 36.3 – RM 45.5)
 - Pool 7 – 6.9 River miles
 - 100% mapped
 - (RM 45.5 – RM 52.5)
 - Pool 8 – 9.7 River miles
 - 100% mapped
 - (RM 52.5 – RM 62.2)
- Total progress – 47.5 RM in only 40 field days

Data Collection Methodology

- Scan river at ~ 2.5 mph
- GPS auto logs data points every 3 seconds
- 6,000 points per field day
- Transects
 - ~ 70 m intervals perpendicular to flow
 - Four – five parallel to flow
- Captured 205,276 points
- Mapped 47.5 RM in Allegheny



Data Collection Methodology

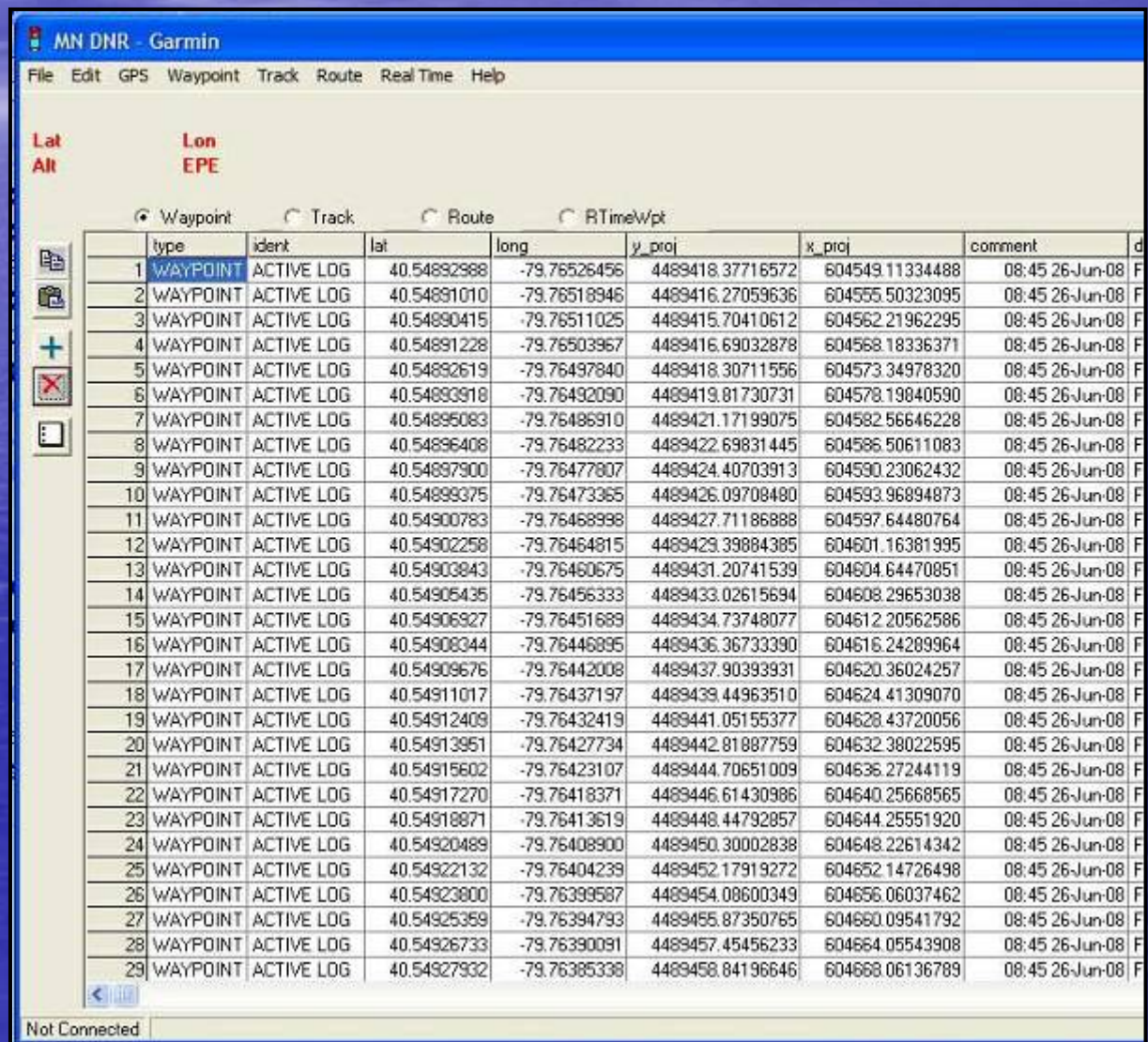
The screenshot shows the ArcMap interface with the following details:

- Window Title:** RiverCALU - ArcMap - ArcInfo
- Menu Bar:** File, Edit, View, Insert, Selection, Tools, Window, Help
- Toolbars:** Standard toolbar with icons for file operations, navigation, and editing. The scale is set to 1:205 and zoom is at 100%.
- Editor Toolbar:** Shows 'Task: Create New Feature' and 'Target:'. The 'Spatial Analyst' extension is active, and the current layer is 'Bathymetry'.
- Map View:** A dark map area containing several orange circular points representing data features.
- Identify Window:** A pop-up window titled 'Identify' showing the following information:
 - Identify from: <Top-most layer>
 - Track Log: (empty list)
 - Location: 627,463.610 4,531,664.64
 - Field Value Table:

Field	Value
FID	157400
Shape	Point
TYPE	TRACK
IDENT	ACTIVE LOG
LAT	40.926171
LONG	-79.48612
Y_PROJ	4531664.610591
X_PROJ	627463.727344
NEW_SEG	False
DISPLAY	False
COLOR	9
ALTITUDE	0
DEPTH	31.92
TIME	2007/10/24-12:49:04
MODEL	GPSmap 498
FILENAME	
Depth_Neg	-31.92
- Status Bar:** 'Identify geographic features by clicking a point or dragging a box' and coordinates '627429.26 4531663.29 Meters'.

Data Transfer: From GPS to GIS

- DNR Garmin freeware transfer program
- Import directly from GPS/Sonar unit
- Save as projected shapefile

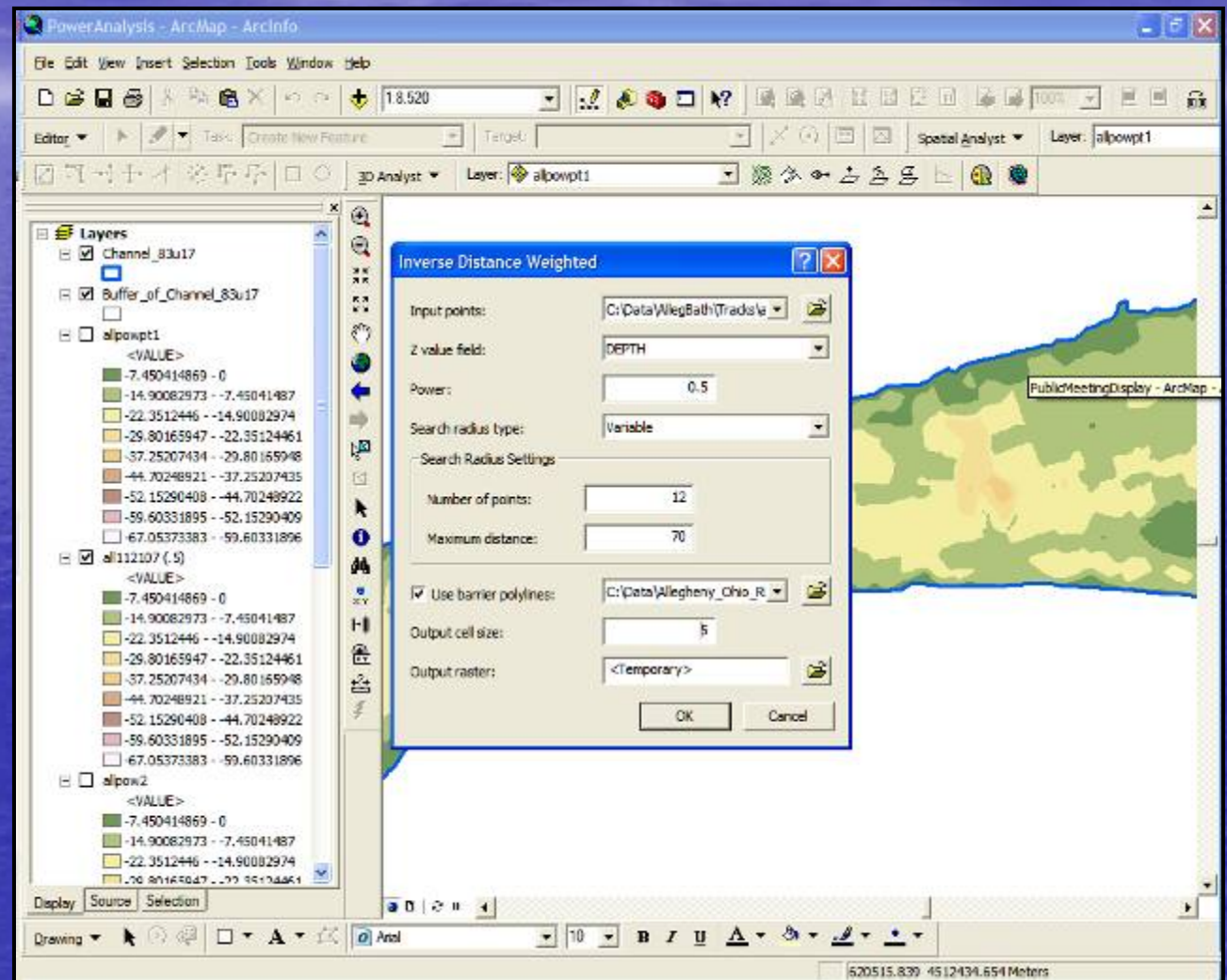


The screenshot shows the 'MN DNR - Garmin' software interface. The window title is 'MN DNR - Garmin'. The menu bar includes 'File', 'Edit', 'GPS', 'Waypoint', 'Track', 'Route', 'RealTime', and 'Help'. The main area displays a table of waypoints. The table has columns for 'type', 'ident', 'lat', 'long', 'y_proj', 'x_proj', 'comment', and 'd'. The 'type' column is set to 'WAYPOINT' and the 'ident' column is set to 'ACTIVE LOG'. The table contains 29 rows of data, each representing a waypoint with its coordinates and a timestamp of '08:45 26-Jun-08'. The status bar at the bottom indicates 'Not Connected'.

	type	ident	lat	long	y_proj	x_proj	comment	d
1	WAYPOINT	ACTIVE LOG	40.54892988	-79.76526456	4489418.37716572	604549.11334488	08:45 26-Jun-08	F
2	WAYPOINT	ACTIVE LOG	40.54891010	-79.76518946	4489416.27059636	604555.50323095	08:45 26-Jun-08	F
3	WAYPOINT	ACTIVE LOG	40.54890415	-79.76511025	4489415.70410612	604562.21962295	08:45 26-Jun-08	F
4	WAYPOINT	ACTIVE LOG	40.54891228	-79.76503967	4489416.69032878	604568.18336371	08:45 26-Jun-08	F
5	WAYPOINT	ACTIVE LOG	40.54892619	-79.76497840	4489418.30711556	604573.34978320	08:45 26-Jun-08	F
6	WAYPOINT	ACTIVE LOG	40.54893918	-79.76492090	4489419.81730731	604578.19840590	08:45 26-Jun-08	F
7	WAYPOINT	ACTIVE LOG	40.54895083	-79.76486910	4489421.17199075	604582.56646228	08:45 26-Jun-08	F
8	WAYPOINT	ACTIVE LOG	40.54896408	-79.76482233	4489422.69831445	604586.50611083	08:45 26-Jun-08	F
9	WAYPOINT	ACTIVE LOG	40.54897900	-79.76477807	4489424.40703913	604590.23062432	08:45 26-Jun-08	F
10	WAYPOINT	ACTIVE LOG	40.54899375	-79.76473365	4489426.09708480	604593.96894873	08:45 26-Jun-08	F
11	WAYPOINT	ACTIVE LOG	40.54900783	-79.76468998	4489427.71186888	604597.64480764	08:45 26-Jun-08	F
12	WAYPOINT	ACTIVE LOG	40.54902258	-79.76464815	4489429.39884385	604601.16381995	08:45 26-Jun-08	F
13	WAYPOINT	ACTIVE LOG	40.54903843	-79.76460675	4489431.20741539	604604.64470851	08:45 26-Jun-08	F
14	WAYPOINT	ACTIVE LOG	40.54905435	-79.76456333	4489433.02615694	604608.29653038	08:45 26-Jun-08	F
15	WAYPOINT	ACTIVE LOG	40.54906927	-79.76451689	4489434.73748077	604612.20562586	08:45 26-Jun-08	F
16	WAYPOINT	ACTIVE LOG	40.54908344	-79.76446895	4489436.36733390	604616.24289964	08:45 26-Jun-08	F
17	WAYPOINT	ACTIVE LOG	40.54909676	-79.76442008	4489437.90393931	604620.36024257	08:45 26-Jun-08	F
18	WAYPOINT	ACTIVE LOG	40.54911017	-79.76437197	4489439.44963510	604624.41309070	08:45 26-Jun-08	F
19	WAYPOINT	ACTIVE LOG	40.54912409	-79.76432419	4489441.05155377	604628.43720056	08:45 26-Jun-08	F
20	WAYPOINT	ACTIVE LOG	40.54913951	-79.76427734	4489442.81887759	604632.38022595	08:45 26-Jun-08	F
21	WAYPOINT	ACTIVE LOG	40.54915602	-79.76423107	4489444.70651009	604636.27244119	08:45 26-Jun-08	F
22	WAYPOINT	ACTIVE LOG	40.54917270	-79.76418371	4489446.61430986	604640.25668565	08:45 26-Jun-08	F
23	WAYPOINT	ACTIVE LOG	40.54918971	-79.76413619	4489448.44792857	604644.25551920	08:45 26-Jun-08	F
24	WAYPOINT	ACTIVE LOG	40.54920489	-79.76408900	4489450.30002838	604648.22614342	08:45 26-Jun-08	F
25	WAYPOINT	ACTIVE LOG	40.54922132	-79.76404239	4489452.17919272	604652.14726498	08:45 26-Jun-08	F
26	WAYPOINT	ACTIVE LOG	40.54923800	-79.76399587	4489454.08600349	604656.06037462	08:45 26-Jun-08	F
27	WAYPOINT	ACTIVE LOG	40.54925359	-79.76394793	4489455.87350765	604660.09541792	08:45 26-Jun-08	F
28	WAYPOINT	ACTIVE LOG	40.54926733	-79.76390091	4489457.45456233	604664.05543908	08:45 26-Jun-08	F
29	WAYPOINT	ACTIVE LOG	40.54927932	-79.76385338	4489458.84196646	604668.06136789	08:45 26-Jun-08	F

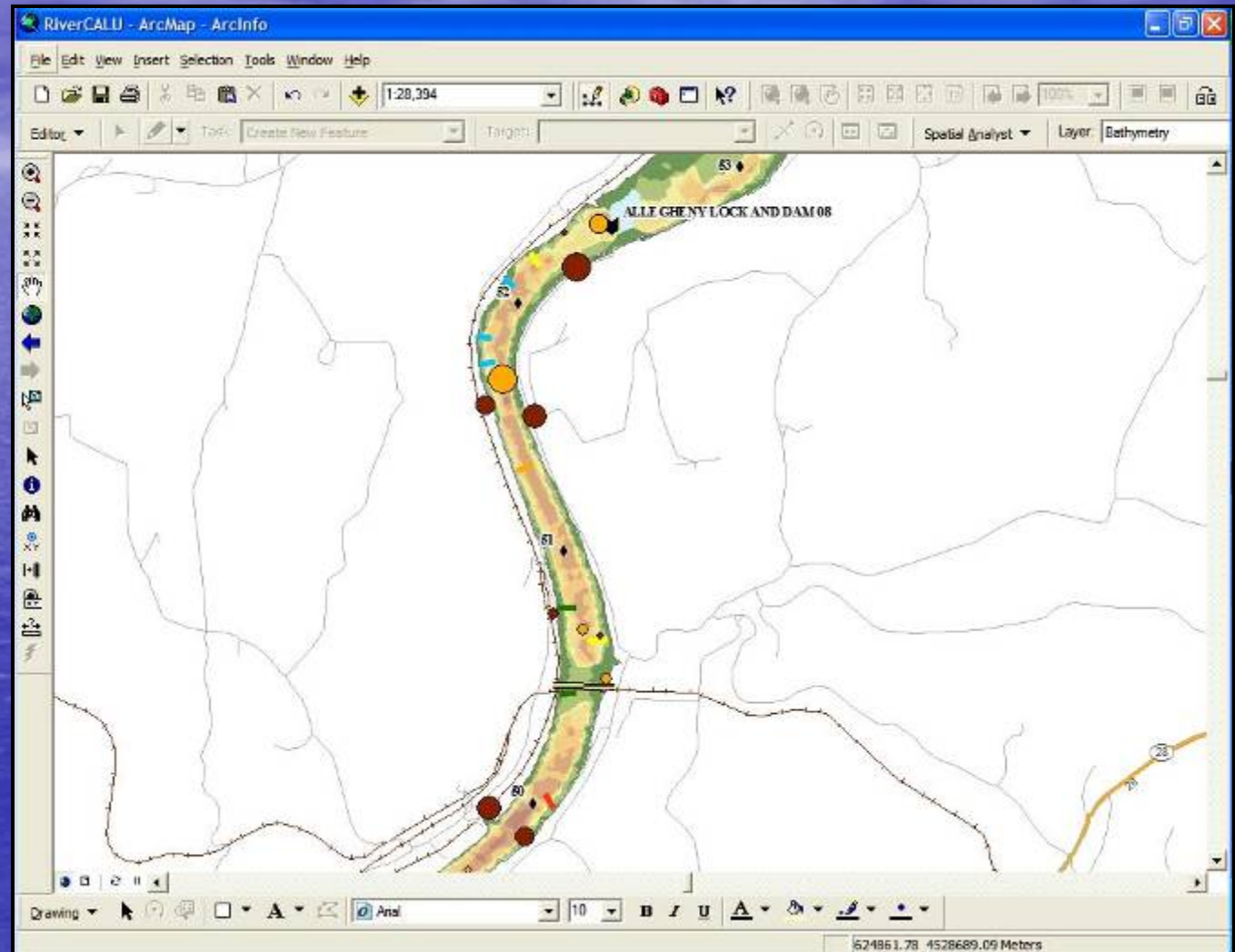
Generating Bathymetry Data

- Spatial Analyst
- Interpolate to Raster → Inverse Distance Weighting
- Barrier Polylines Contain Data Analysis
- Contour Generation



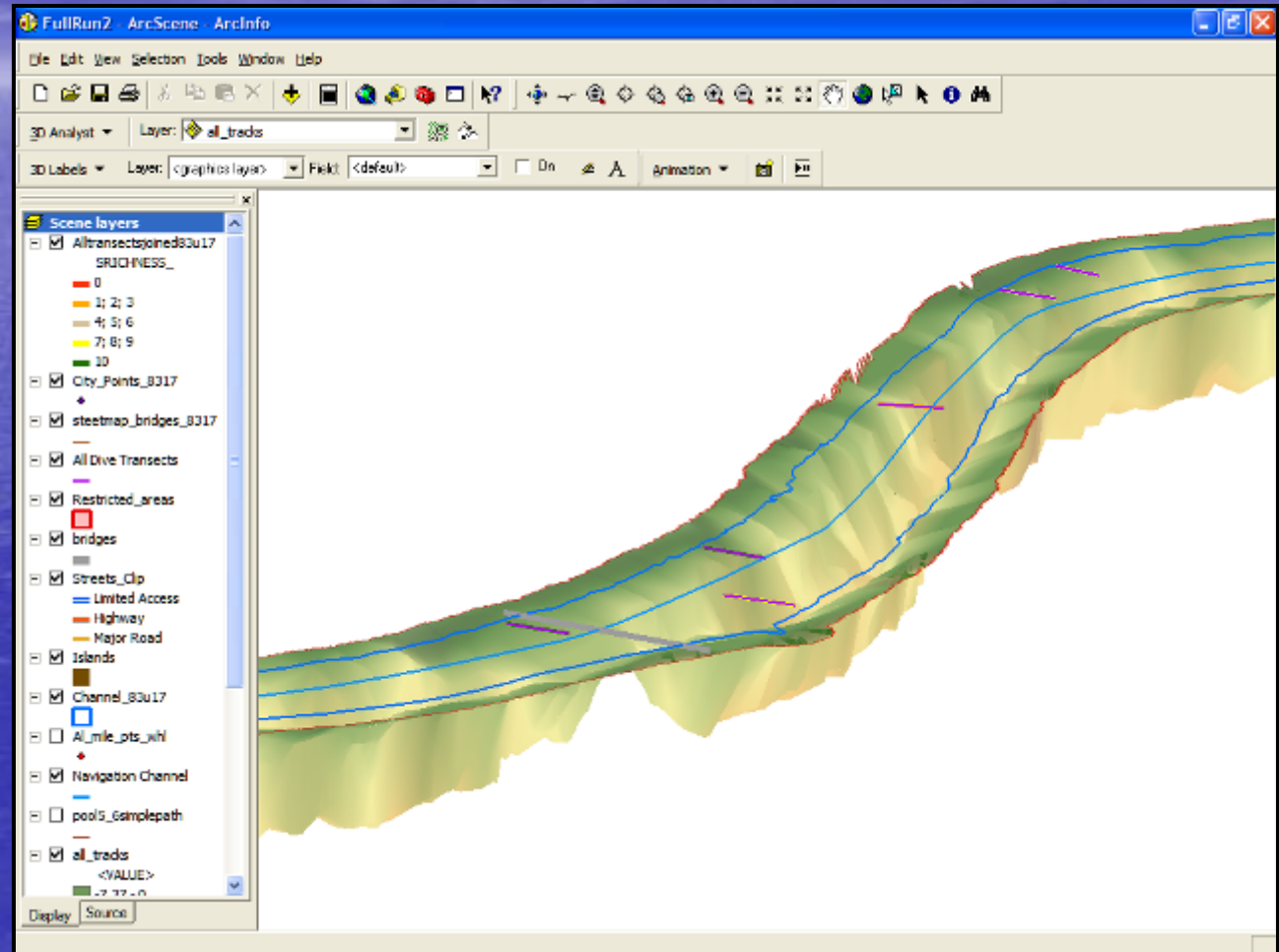
Enhancing Scientific Study

- Mussel Dives
- Fish Surveys
- Hydrologic Analysis



Putting the Data to Work

- Adding to the RIS
- ArcScene 3-D View and Flyover Video



Current Collaborators

Army Corps of Engineers
California University of Pennsylvania
Carnegie Science Center
Department of Environmental Protection
Indiana University of Pennsylvania
Pennsylvania Fish & Boat Commission
Port of Pittsburgh
United States Fish and Wildlife Service
United States Geological Survey
University of Pittsburgh