# Using GIS/GPS to Eradicate Northern Pike From Lake Davis, CA

**Northern pike** (*Esox lucius*)

By Ken Devore & Will Patterson

# Lake Davis, CA

**History:**

**1965:** Lake Davis (reservoir) was created in 1965 as a unit of the California State Water Project (DWR)

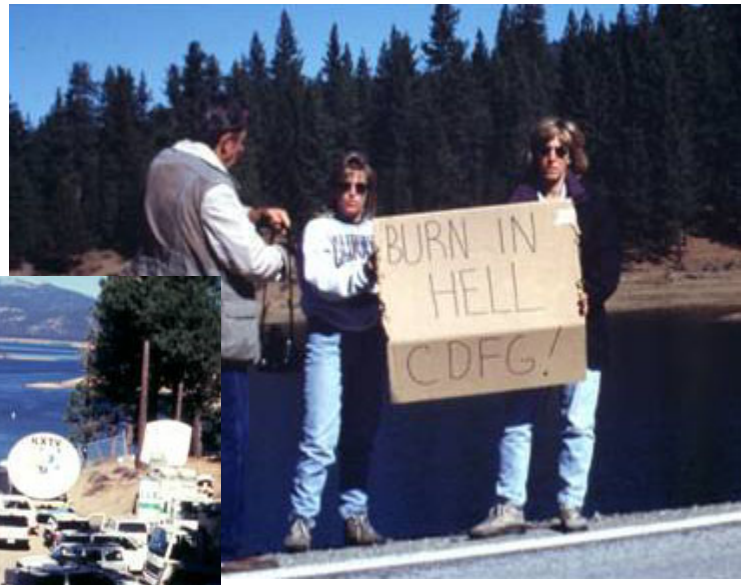
**1991:** Pike eradicated from nearby Frenchmen reservoir

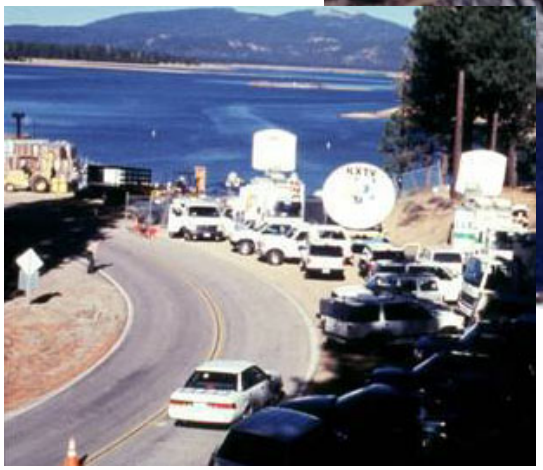
**1994:** Pike discovered in Lake Davis

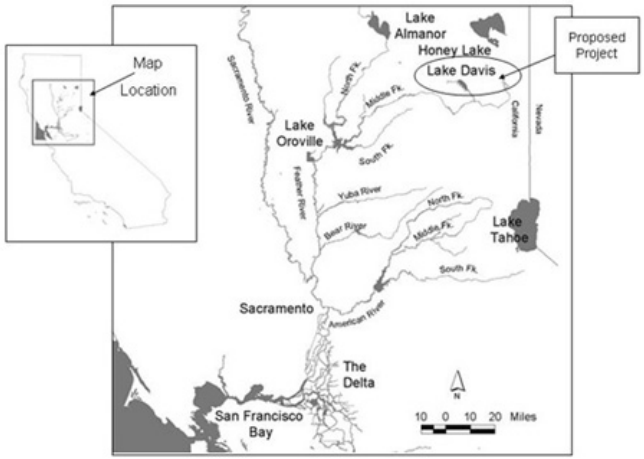
**1997:** DFG Treatment of Lake Davis

**1999:** Pike Rediscovered

**2007:** After extensive public outreach, and a joint environmental review process with the U.S. Forest Service, DFG treats Lake Davis and its tributaries with rotenone piscicide.






Lake Davis
Storage at Elevation: 5,775 feet
Full Capacity: 84,400 acre feet

# GIS and GPS in the Pike Eradication

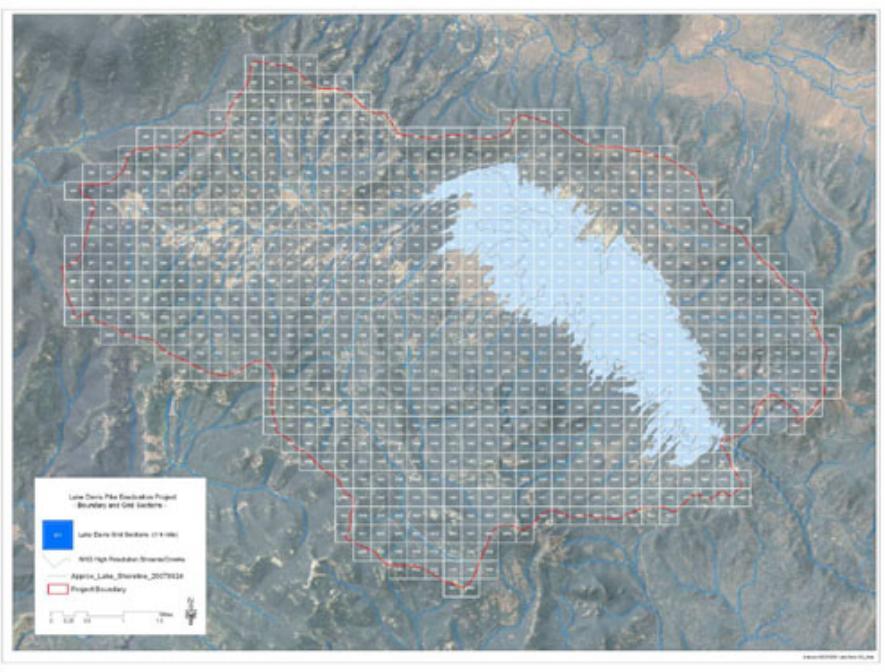
**Software/Equipment used:**

ArcGIS Desktop (both ArcInfo and ArcView), ArcGIS Explorer, ArcView 3.x, Three Trimble GeoXM units, 80 new Garmin GPSMAP 60Cx and GPSMAP 76Cx units, Several older Garmin units of various models were used for data collection.

## GIS and GPS were used for :

- **Grid referencing system creation**
- **GPS basemap development**
- **Aerial survey registration**
- **Interactive map viewing**
- **Map atlas creation**
- **Bathymetric data analysis**
- **Field surveys and navigation**
- **Treatment status maps**

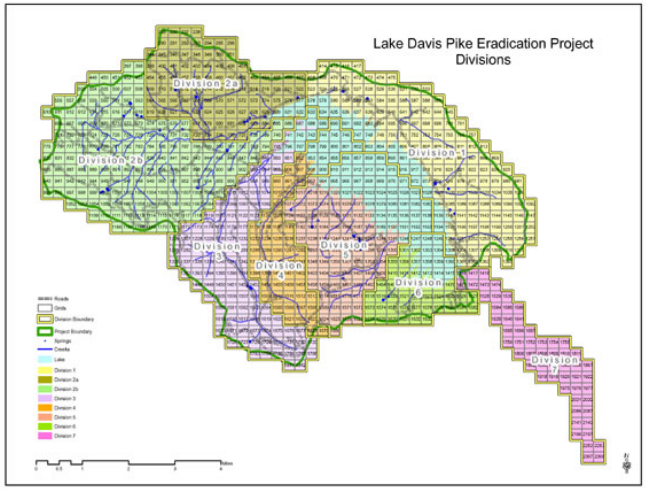
The project area boundary was defined using GIS. The 44-square-mile project area included the reservoir and the tributaries leading into it.



The California Interagency Watershed Map, a current and official California GIS layer for watershed boundaries, was used to represent the project boundary.

# Grid Referencing System

To geographically organize project resources, a grid* of quarter-mile square cells was created to cover the entire project area.




Each grid cell had a unique identification number. The grid was used for many spatial referencing aspects of project management including deployment of stream and reservoir treatment crews, chemical treatment calculations, communications, and emergency response.

**GPS Basemap**

• A project area basemap was developed using GIS shapefiles that were symbolized and loaded into the Garmin GPS units using Garmin's MapSource Product Creator software.

• GPS basemap included the same project area boundary, quarter-mile grid referencing system, and background layers including data that were used on other project maps.


* The grid was developed as a vector GIS layer using the ArcInfo Workstation Generate command with the Fishnet subcommand. (This operation can also be accomplished with ArcToolbox using the Create Fishnet tool in the Feature Class toolset in the Data Management tools.)

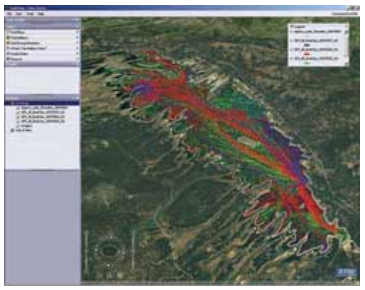
# Aerial Surveys, Interactive Map Viewer, Map Atlases and Bathymetric Data Analysis

### Aerial Surveys

DFG conducted digital aerial photography surveys of the project area at key times to evaluate the water levels and habitat conditions of the reservoir and its tributaries.

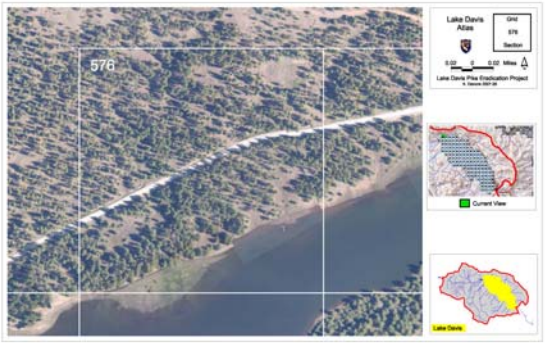
### Interactive Map Viewer

Using ArcIMS and DFG's map viewer template (IMAP'S), an online interactive Lake Davis map viewer was set up for project staff and the public..



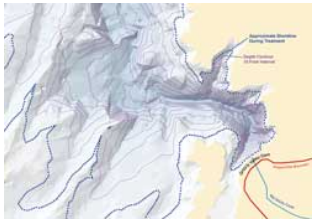
### Map Atlases

Separate reservoir and tributary stream map atlases were produced in hard-copy format and given to field crews ahead of time so they could become familiar with areas they were assigned to treat.




### Bathymetric Data Analysis

Bathymetric (water depth) contour data for Lake Davis was provided by the California Department of Water Resources (DWR) in CAD format and DFG converted into a GIS product.



# **Field Surveys, Navigation** and **Status Maps**

## Field Surveys and Navigation

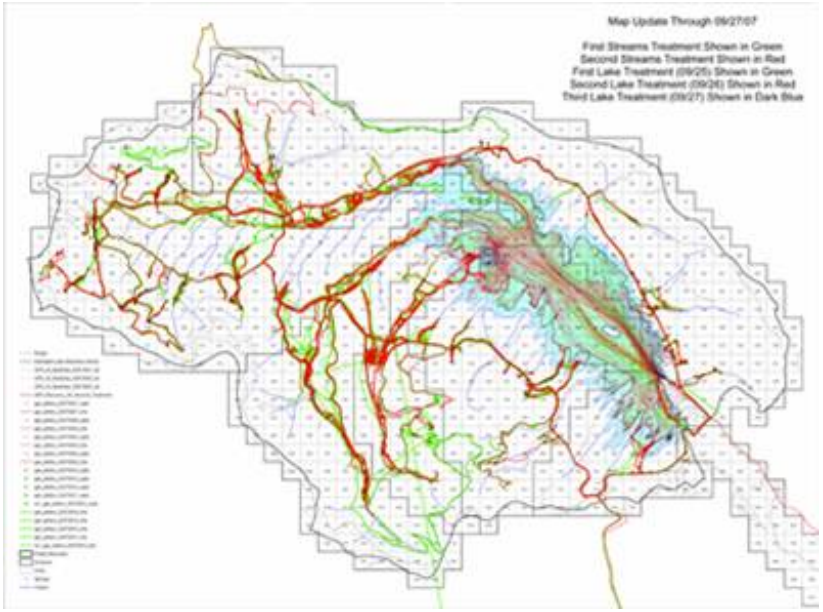
For several years prior to the 2007 project, GPS units were used by stream field crews to survey their assigned areas and map existing and potential locations (wet areas) to be revisited for treatment.

## Treatment Status Maps

During the chemical treatments, stream and reservoir treatment teams carried GPS units that recorded daily travels as track logs. At the end of each day, the teams turned in their GPS units for processing.

GIS staff downloaded the track logs from the units and converted them to shapefiles using DNR Garmin software (developed by the Minnesota Department of Natural Resources [DNR]).

Using ArcMap and ArcGIS Explorer, status maps were produced using the GPS track log shapefiles to show how the treatment was progressing. Project managers used the maps to determine if all target areas had been visited and to adjust the deployment of treatment crews as necessary.



# Conclusion

**Looking Back**

• GIS and GPS proved to be powerful tools critical to the successful implementation of a project of this scope and complexity.

• GIS provided the means to create needed map-reference products and facilitate geographic analyses.

• GPS provided necessary tools for surveys, navigation, and tracking.

• Both technologies were utilized to produce status maps that were invaluable in conducting the 2007 treatment.


Questions?

**Special thanks to:**

Greg Ewing, Lora Konde, and Isaac Oshima for their generous GIS and GPS assistance on this project. Thanks also go to the project field teams for incorporating GIS and GPS into their work.