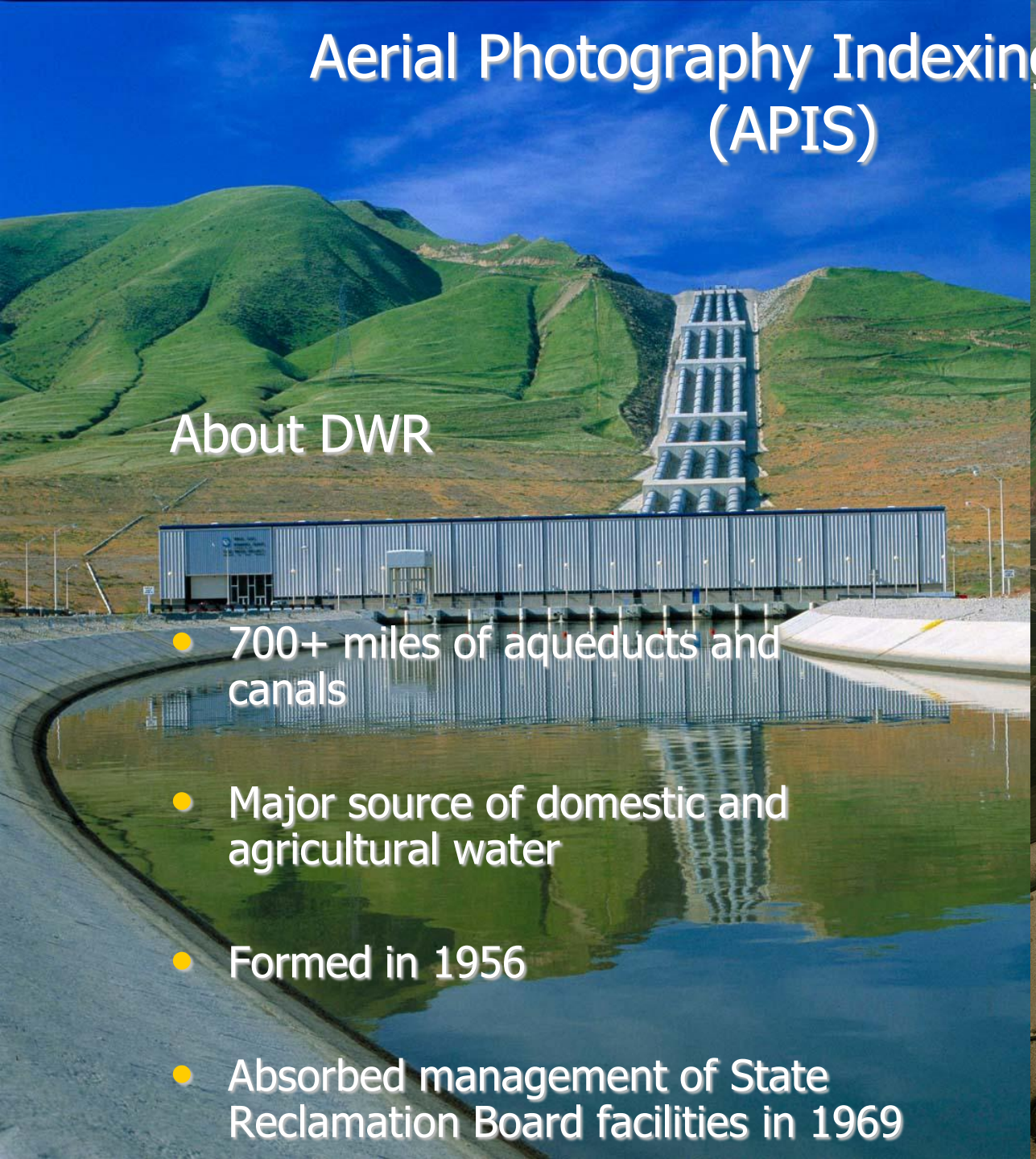
California Department of Water Resources

Aerial Photography Indexing System (APIS)

Presented by Ruppert Grauberger
Chief, Mapping & Photogrammetry Section

Aerial Photography Indexing System (APIS)



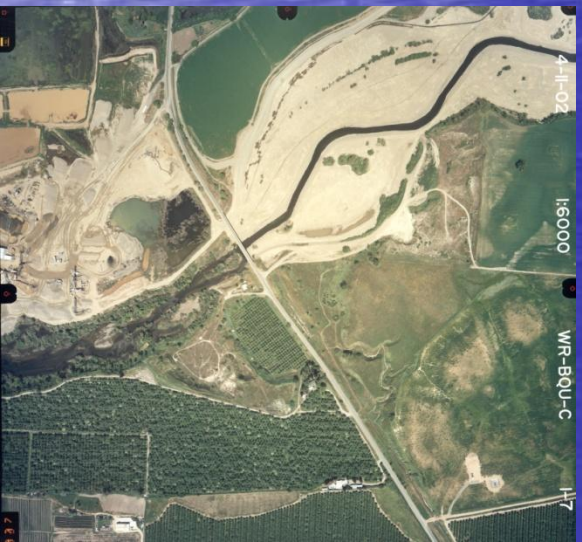
About DWR

- 700+ miles of aqueducts and canals
- Major source of domestic and agricultural water
- Formed in 1956
- Absorbed management of State Reclamation Board facilities in 1969

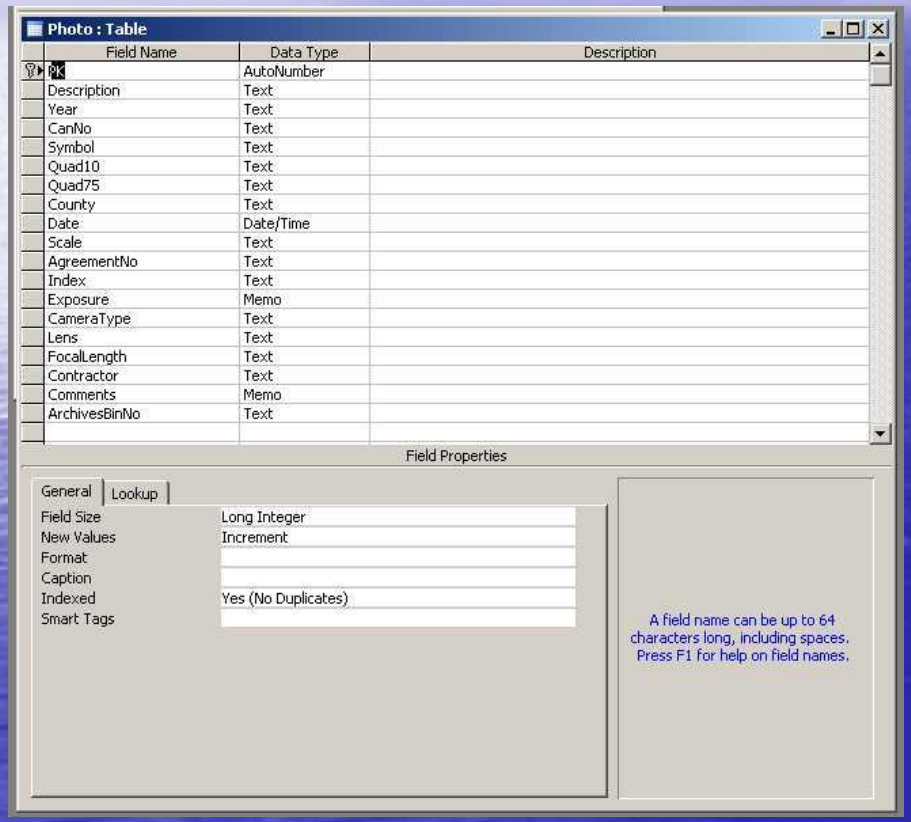
Aerial Photography Indexing System (APIS)

Mapping & Photogrammetry Section

- Division of Engineering, Geodetic Branch
- Full service photogrammetry lab
  - Pre-design topographic mapping and terrain models
  - Imagery for resource inventory, evaluation, and analysis
- Aerial photography archive
  - 1500+ cans of film
  - 1950's to present



APIS



Aerial Photography Archive

Search & retrieval

- MS Access database
  - Single table
  - Keyword descriptions
  - County
  - USGS quad map
- Non-exhaustive
  - Obscure project names
  - Over-generalized
- Erosion of institutional knowledge

APIS

Photogrammetry

File Edit Reports Tools Help

Photos | Photo Details | Topos | Topo Details

Description	Year	County	Can No	Symbol	Quad 7.5	Quad 100	Date	Contract Name	Contractor
Feather River	1968		341	WR-ABI			6/24/1968	756249	Western Aerial Photos, Inc.
Feather River	2001	Sutter, Yuba, Butte, Yolo	1415	WR-BQS-C	Knights Landing, Verona, Sutter C	Sacramento, Yuba City, Chico	10/31/2001	American Aerial	American Aerial Surveys, Inc.
Feather River	2001	Yuba, Sutter, Butte	1416	WR-BQS-C	Gridley, Sutter, Biggs, Yuba City, H	Yuba City, Chico	11/1/2001	American Aerial	American Aerial Surveys, Inc.
Feather River	1952		667	DWR-AAZ-2K			6/26/1952		
Feather River	1965		1091				4/22/1965	65-430	Western Aerial Photos, Inc.
Feather River : Mouth to River mi 60 (dredging)	1975	Sutter, Yuba , Butte	576	WR-ABM-9	BiggsIHoncutIVeronaIPalermoIN	Sacramento< Yuba City	5/6/1975	B-51492	Cartwright Aerial Surveys
Feather River : Thermalito to Verona	1956		1061				5/21/1956		Cartwright A.S.
Feather River and Yuba River: Junction at Marysville/ Yuba City	1937	Yuba, Sutter		ABA	Yuba City		8/30/1937		
Feather River and Yuba River: Junction at Marysville/Yuba City	1973	Yuba, Sutter		GS-VDHE	Yuba City		7/1/1973		
Feather River Area: Upper	1957		86				5/28/1957	57-SA-112	Delano Aerial Surveys
Feather River Area: Upper	1957		86				5/29/1957	57-SA-112	Delano Aerial Surveys
Feather River Area: Upper	1957		86				5/27/1957	57-SA-112	Delano Aerial Surveys
Feather River Flood	1965		1091				4/22/1965	65-430	Western Aerial Photos, Inc.
Feather River Flood	1973		1093						
Feather River Flood	1980		708	WR-AKB			1/18/1980	H-50096	American Aerial Surveys
Feather River Flood	1980		708	WR-AKB			1/18/1980	H-50096	American Aerial Surveys
Feather River Flood - Obliques	1997	Yolo, Sutter, Yuba, Butte	1252	WR-BIN	Grays Bend, Knights Landing, Sutt	Sacramento, Yuba City, Chico	1/3/1997	B-80681	American Aerial Surveys, Inc.
Feather River Flood: Bear River to Honcut (Areas East of Feather R	1997	Sutter, Yuba, Butte	1252	WR-BIN	Nicolaus, Olivehurst, Yuba City, H	Sacramento, Yuba City	1/3/1997	B-80681	American Aerial Surveys, Inc.
Feather River Flood: Gridley Bridge to Oroville Bridge	1986		986	WR-AQR-3-C			3/14/1986	B-55370	Greiner Aerial Surveys
Feather River Flood: Honcut Creek to Thermalito Diversion Dam	1986		986	WR-AQR-2			2/20/1986	American	American Aerial Surveys
Feather River Flood: Nicolaus	1980		716	WR-AKB-2			2/22/1980	B-53339	Western Aerial Photos, Inc.
Feather River Flood: Oroville Dam to Sacramento River	1997	Yolo, Sutter, Yuba, Butte	1251	WR-BIN	Grays Bend, Knights Landing, Sutt	Sacramento, Yuba City, Chico	1/3/1997	B-80681	American Aerial Surveys, Inc.
Feather River Flood: Oroville Dam to Sacramento River	1997	Sutter, Yuba, Butte	1252	WR-BIN	Nicolaus, Olivehurst, Yuba City, H	Sacramento, Yuba City, Chico	1/3/1997	B-80681	American Aerial Surveys, Inc.
Feather River Flood: Sacramento River to Honcut Creek	1986		980	WR-AQR			2/19/1986	American	American Aerial Surveys
Feather River Flood: Sacramento River to Honcut Creek	1986		986	WR-AQR-2			2/20/1986	American	American Aerial Surveys
Feather River Salmon Beds: Fish Barrier Dam to Honcut Creek	1998		1299	WR-BMX-2	Oroville, Palermo, Biggs, Honcut,		11/20/1998	B-81376	American A.S., No. Calif.
Feather River Salmon Beds: Fish Barrier Dam to Honcut Creek	1999	Butte	1338	WR-BOE	Biggs, Gridley, Oroville, Palermo,		9/29/1999	B-81376	American Aerial Surveys
Feather River Salmon Beds: Fish Barrier Dam to Honcut Creek	1999	Butte	1338	WR-BOE-2	Oroville, Biggs, Palermo, Gridley,		10/26/1999	B-81376	American Aerial Surveys, Inc.
Feather River Salmon Beds: Fish Barrier Dam to Verona	1998		1297	WR-BMX	Verona,Knights Landing,Nicolaus,		10/21/1998	B-81376	American Aerial Surveys, Inc.
Feather River Salmon Beds: Honcut Creek to Fish Barrier Dam	1995	Butte, Sutter, Yuba	1231	WR-BGV-C	Honcut, Gridley, Biggs, Palermo, (	Chico, Yuba City	11/29/1995	Geonex Vara Inc.	Geonex Vara, Inc.
Feather River Salmon Beds: Honcut Creek to Fish Barrier Dam	1995	Butte, Yuba, Sutter	1232	WR-BGW	Honcut, Gridley, Biggs, Palermo, (	Chico, Yuba City	12/26/1995	Geonex Vara Inc.	Geonex Vara, Inc.
Feather River Salmon Beds: Honcut Creek to Fish Barrier Dam	1996		1243	WR-BIE-CIR			10/14/1996	B-80681	American Aerial Surveys, Inc.
Feather River: (F.R. CIR)	1977		1408	F.R. (CIR)			6/14/1977	UNKNOWN	CH2MHILL
Feather River: (SE of Olivhurst) New Helvetia (River Mile 22) and Ste	1975	Sutter, Yuba	576	WR-AEI 2	Gilsizer Slough, Olivehurst	Yuba City	4/27/1975	Cartwright Aerial	Cartwright Aerial Surveys, Inc.
Feather River: (Upper) Swayne and Yellow Creeks	1957		91					8-212-S81	Petersen Aerial Photography
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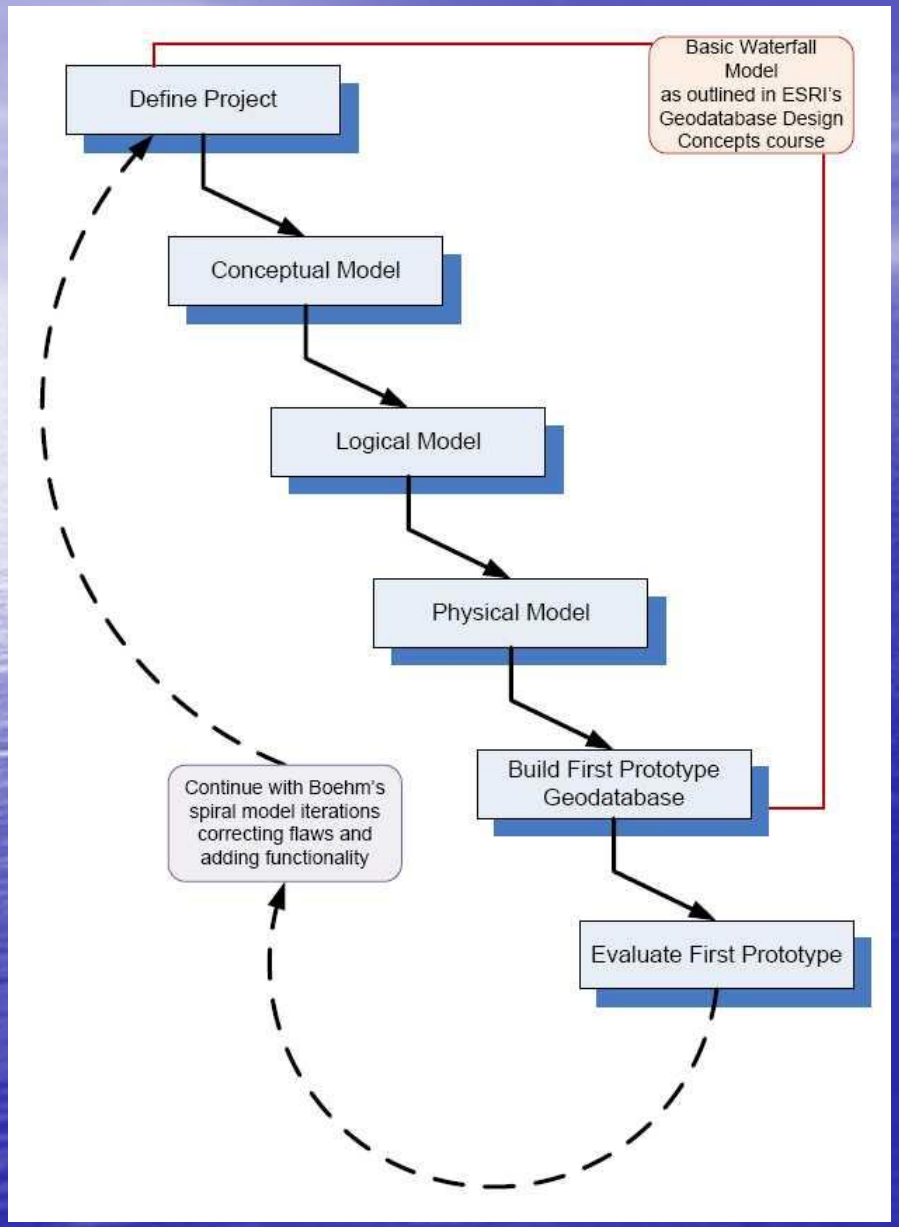
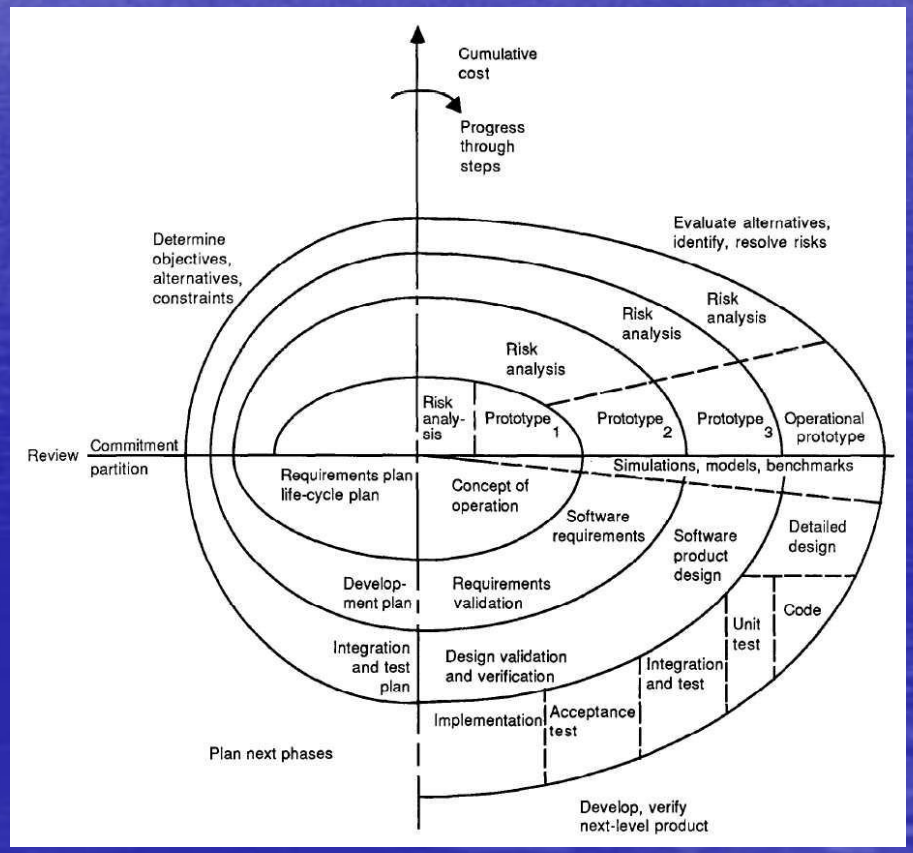
Feather River: (Upper) Swayne and Yellow Creeks	1957		91					8-212-S81	Petersen Aerial Photography

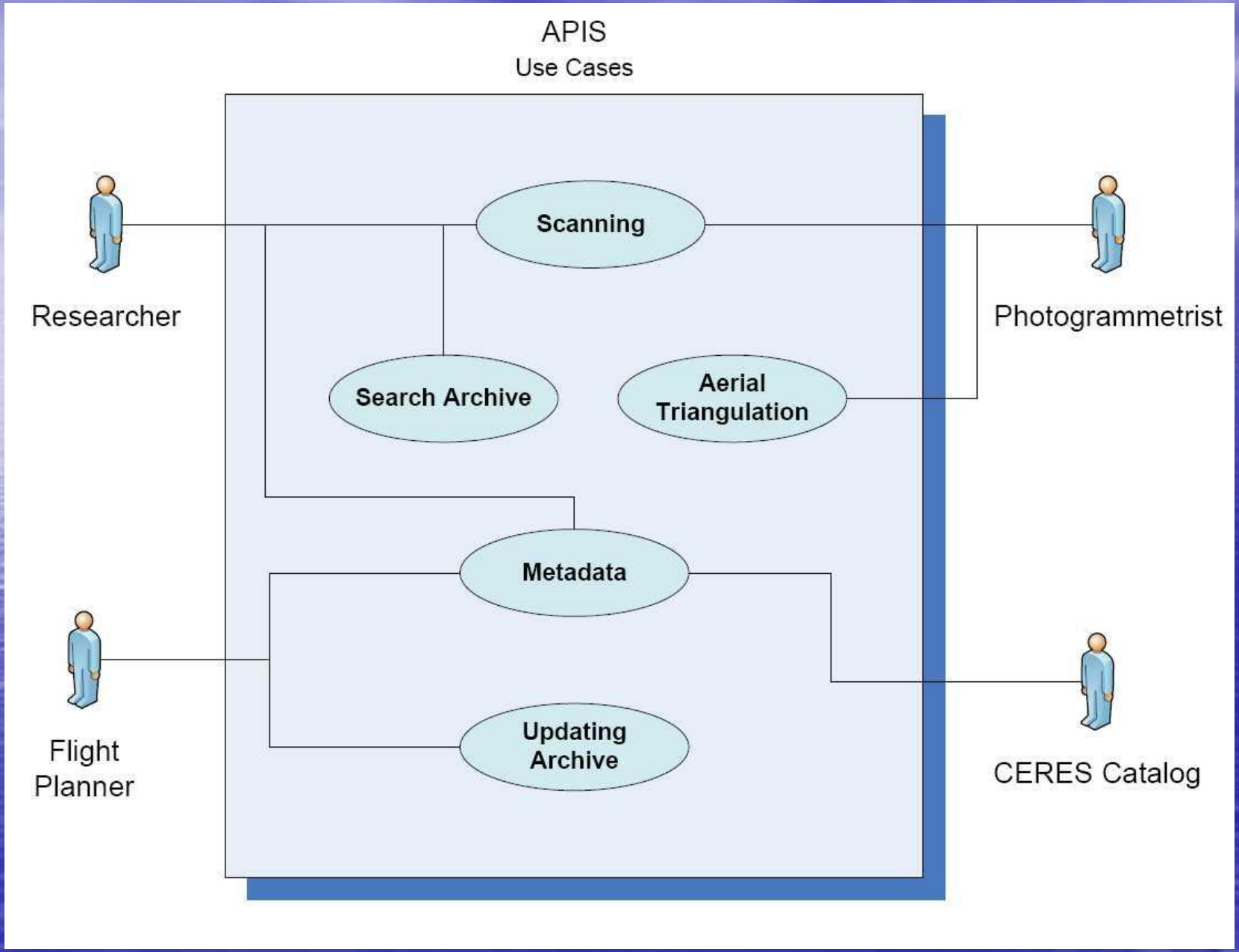
MS Access database table

APIS



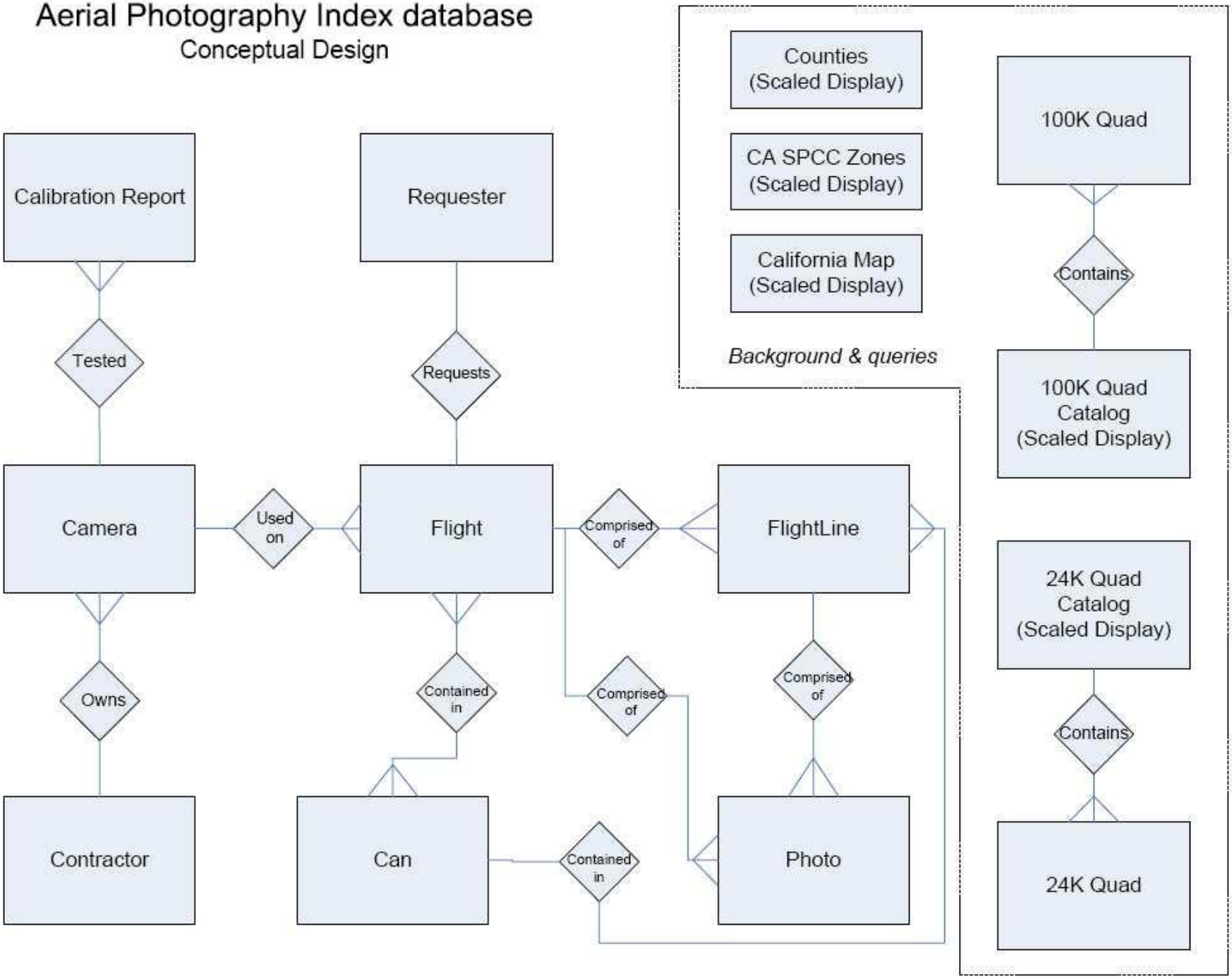
- Combined methodology
  - waterfall model
  - spiral model




APIS
Use Cases
Researcher
Scanning
Photogrammetrist
Search Archive
Aerial Triangulation
Metadata
Flight Planner
Updating Archive
CERES Catalog

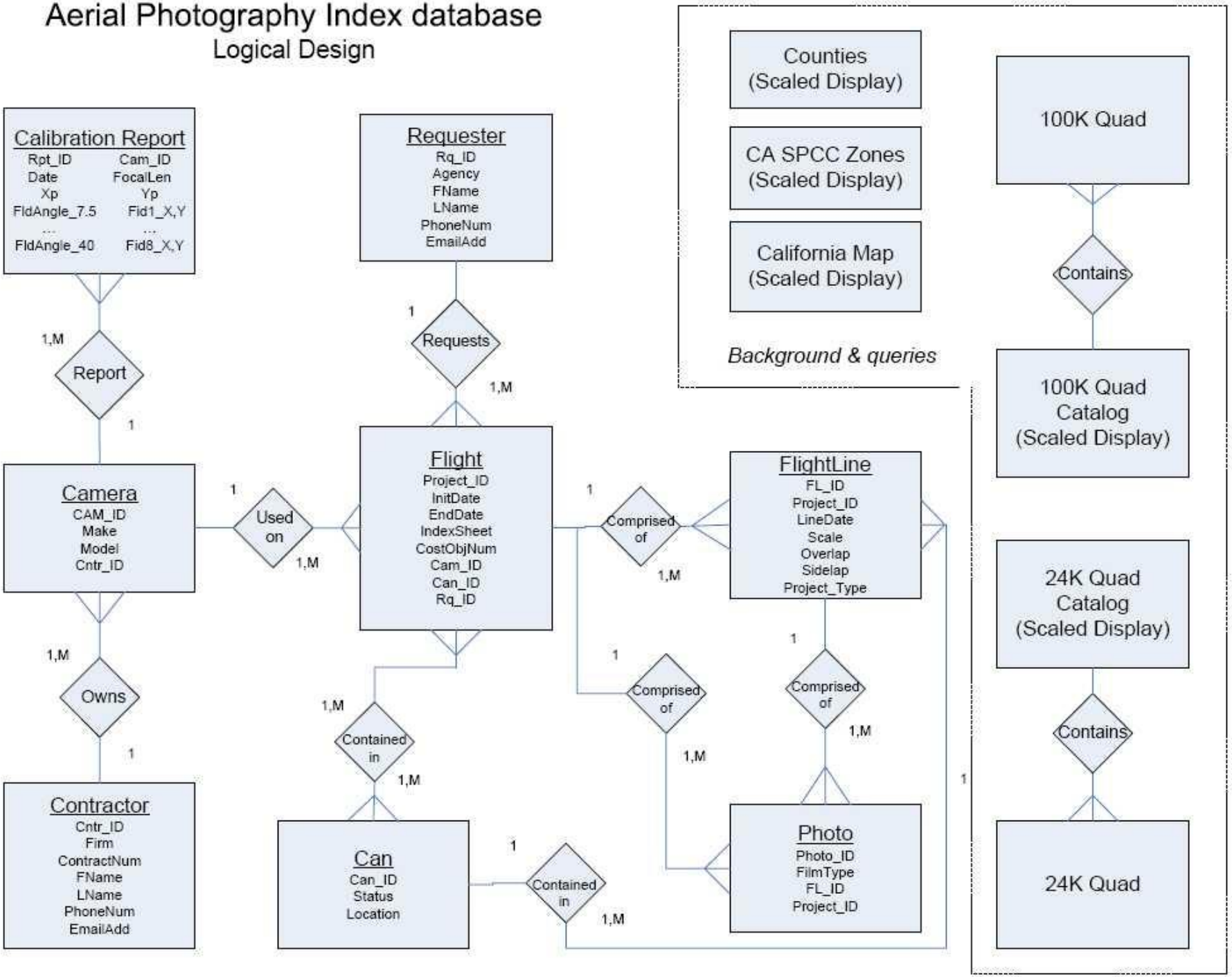
Aerial Photography Index database

Conceptual Design

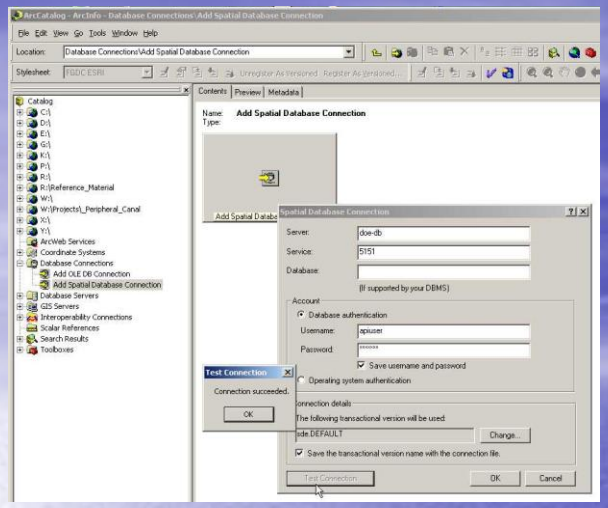


Aerial Photography Index database

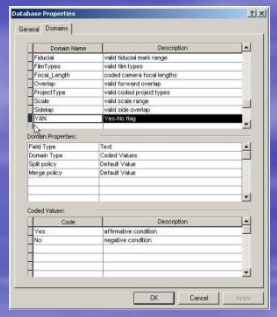
Logical Design

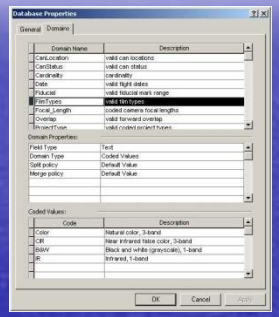


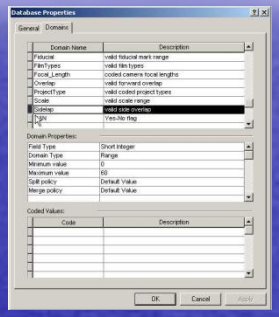
APIS

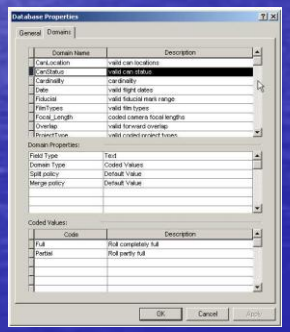


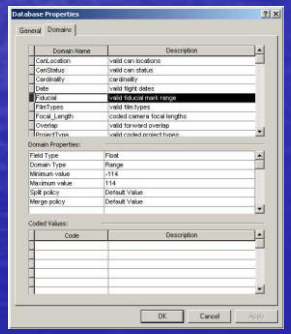
- Establish spatial database connection
- Create domains

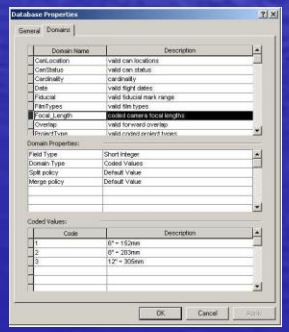


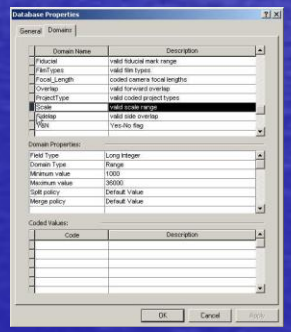


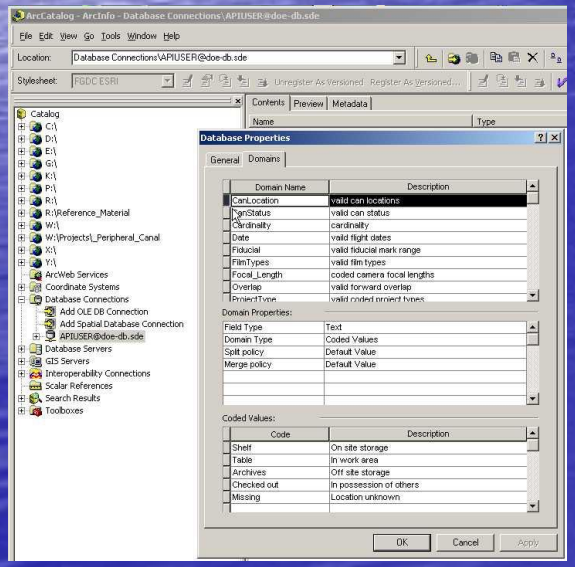


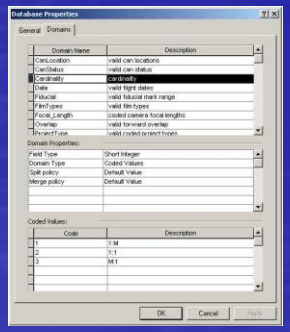


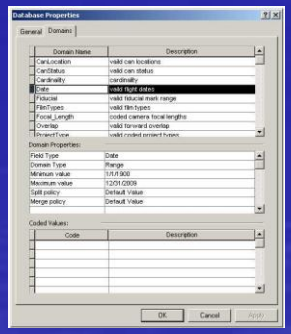


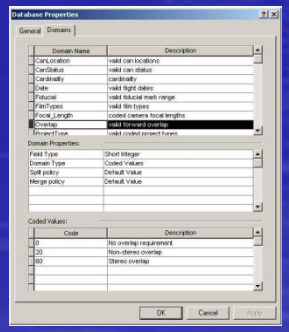


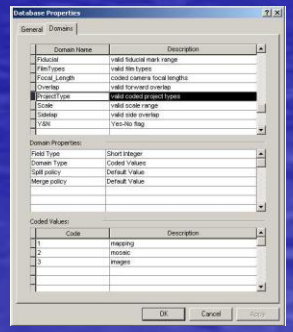




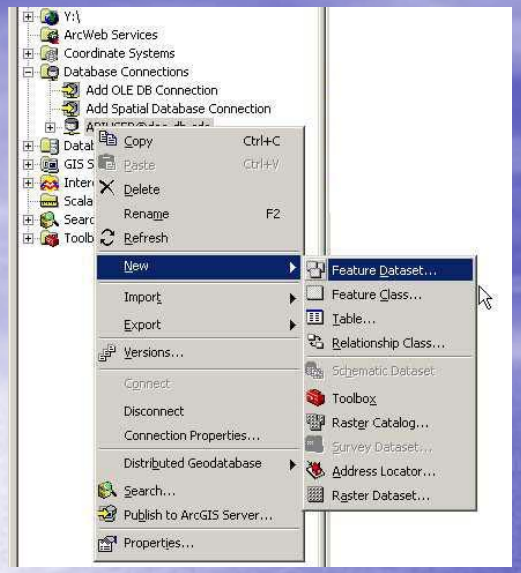


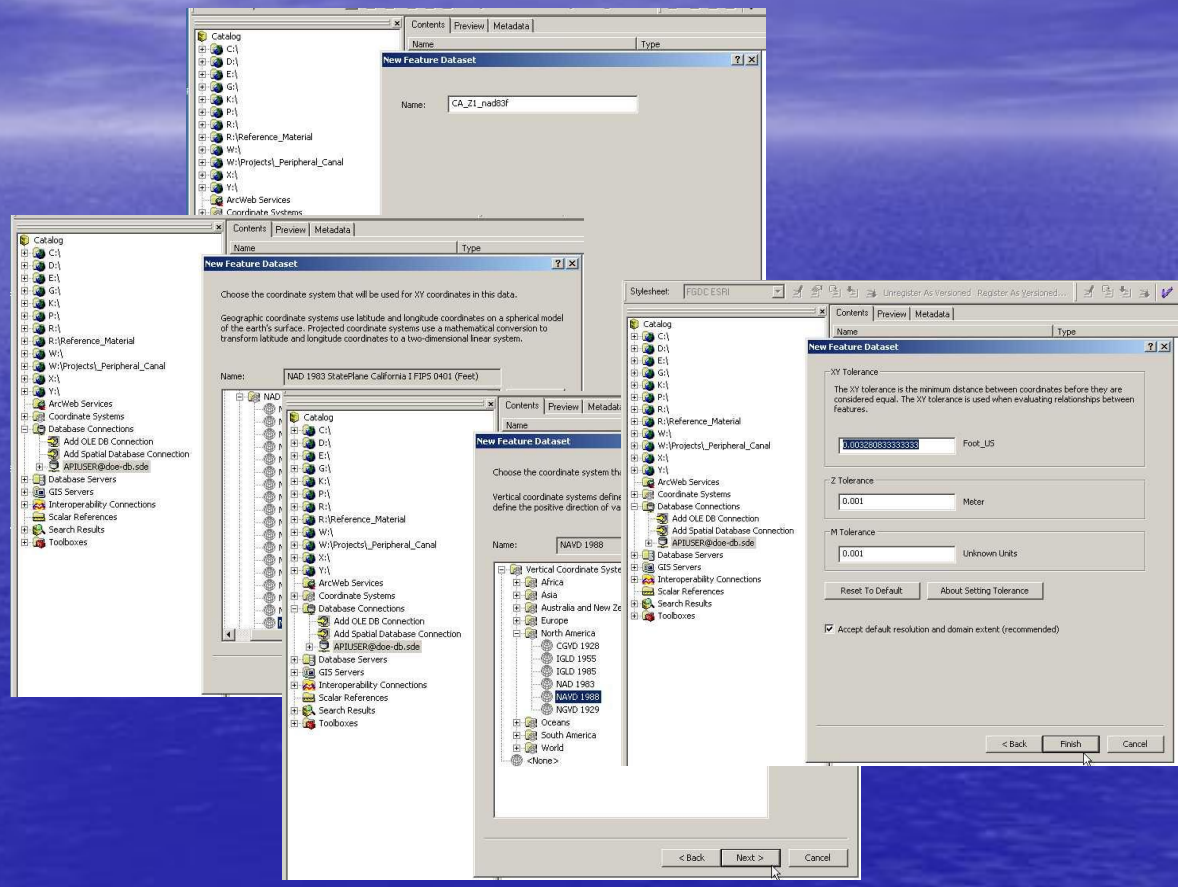






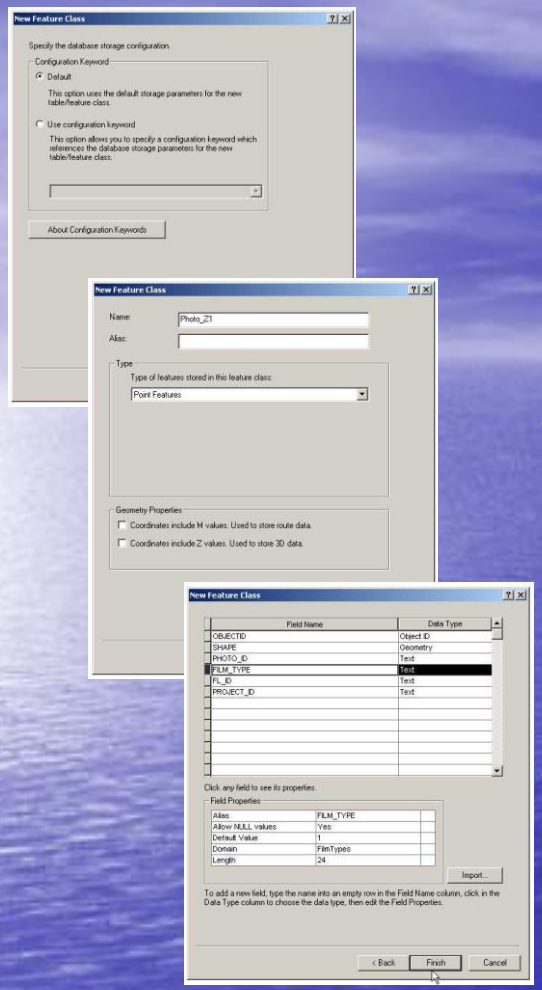
APIS

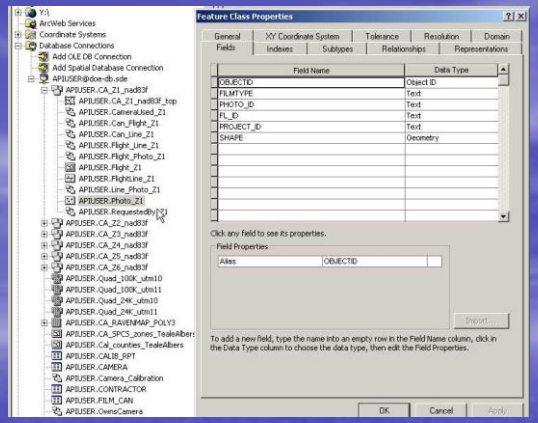


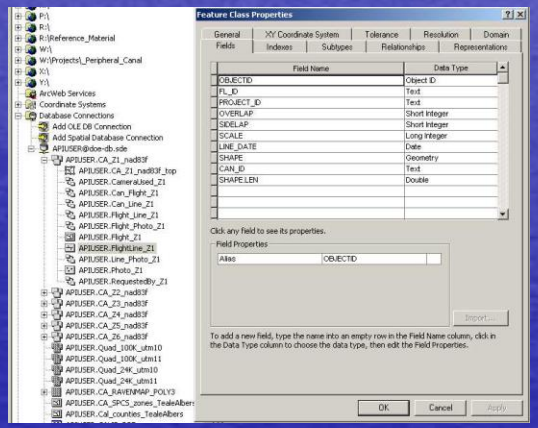


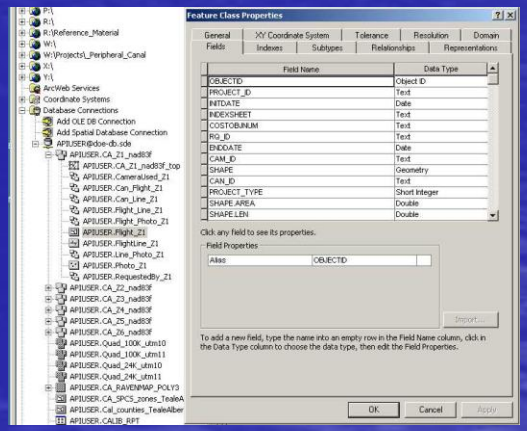
- Created 6 feature datasets
  - CA State Plane Zones
  - 3 feature classes
  - topology

APIS









- Set of 3 feature classes and 1 topology created in each of 6 feature datasets
  - Photos = points
  - Flightlines = polylines
  - Flights = polygon
- Each feature dataset references one of the California State Plane Coordinate System zones
- 2 topology rules
  - Photos must be on flightlines
  - Flights must contain at least one photo

APIS

- Created 5 nonspatial tables
  - Requester
  - Film Can
  - Camera
  - Calibration report
  - Contractors

- Reside outside of the feature datasets

Table
APIUSER.Calib_Rpt

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
RPT_ID	String	Yes					16
RPT_DATE	Date	Yes			0	0	36
CAM_ID	String	Yes					24
FA_1	Short Integer	Yes	0		5		
FA_2	Short Integer	Yes	0		5		
FA_3	Short Integer	Yes	0		5		
FA_4	Short Integer	Yes	0		5		
FA_5	Short Integer	Yes	0		5		
FA_6	Short Integer	Yes	0		5		
X_P	Double	Yes	0		38	8	
Y_P	Double	Yes	0		38	8	
FM_1	Double	Yes	0		38	8	
FM_2	Double	Yes	0		38	8	
FM_3	Double	Yes	0		38	8	
FM_4	Double	Yes	0		38	8	
FM_5	Double	Yes	0		38	8	
FM_6	Double	Yes	0		38	8	
FM_7	Double	Yes	0		38	8	
FM_8	Double	Yes	0		38	8	
F_L	Double	Yes	0		38	8	

Table
APIUSER.Camera

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
MAKE	String	Yes					16
MODEL	String	Yes					16
CONTR_ID	String	Yes					16
CAM_ID	String	Yes					24
NOM_F_L	Short Integer	Yes	1	Focal_Length	5		

Table
APIUSER.Contractor

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
CONTR_ID	String	Yes					16
FIRM	String	Yes					50
CONTRACTNUM	String	Yes					24
FNAME	String	Yes					50
LNAME	String	Yes					50
PHONENUM	String	Yes					24
EMAIL	String	Yes					50

Table
APIUSER.Film_Can

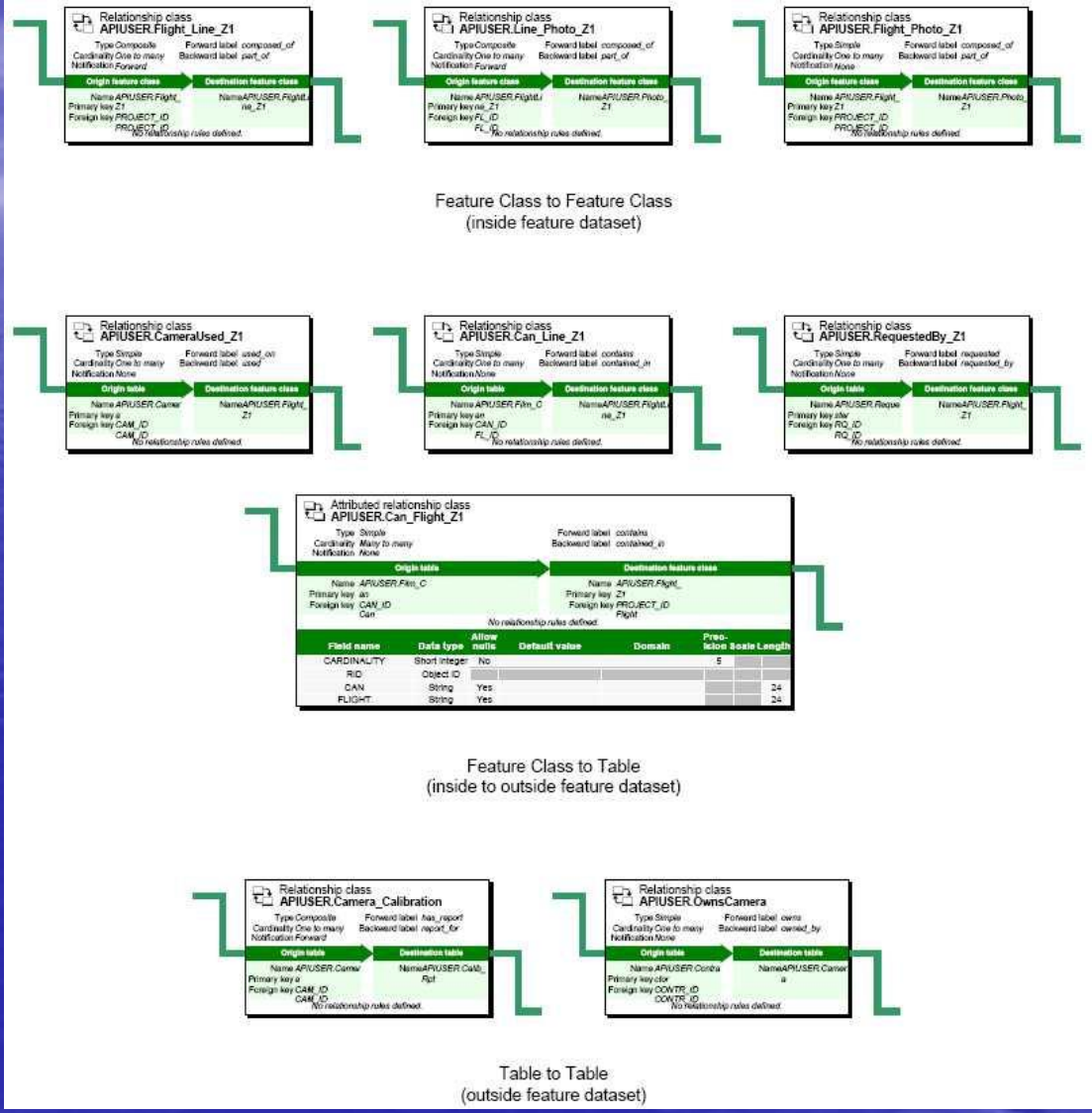
Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
STATUS	String	Yes	Partial	CanStatus			16
LOCATION	String	Yes	Shelf	CanLocation			24
CAN_ID	String	Yes					24

Table
APIUSER.Requester

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
AGENCY	String	Yes					50
FNAME	String	Yes					50
LNAME	String	Yes					50
PHONENUM	String	Yes					24
EMAIL	String	Yes					50
RQ_ID	String	Yes					24

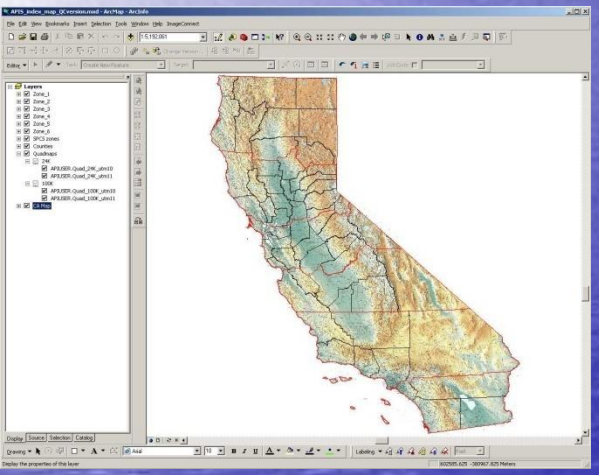
APIS

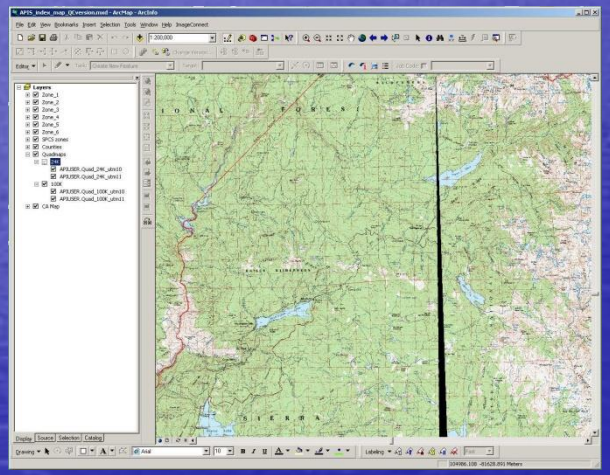
- 3 feature classes to feature class relationships
  - Flights to Flightlines
  - Flightlines to Photos
  - Flights to Photos
  - Inside feature dataset
- 4 feature class to table relationships
  - Film Can to Flight
  - Film Can to Flightline
  - Requester to Flight
  - Camera to Flight
  - Inside feature dataset
- 2 table to table relationships
  - Camera to Calibration Report
  - Contractor to Camera
  - Outside feature dataset

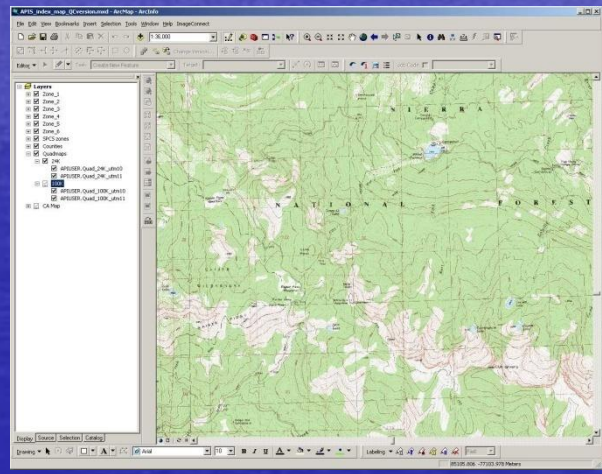


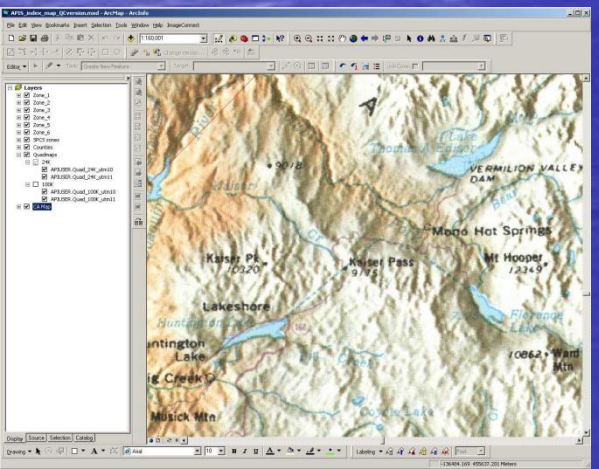
APIS

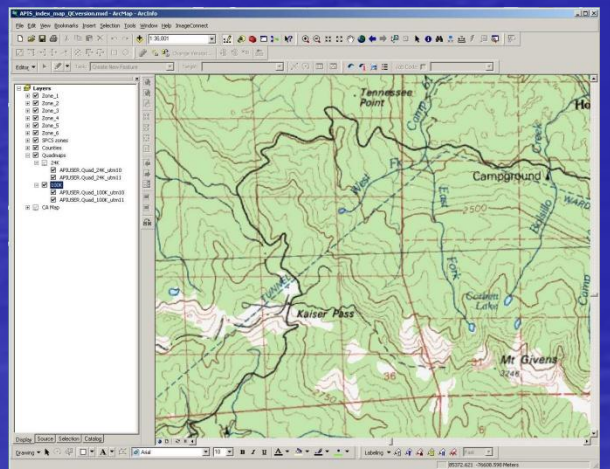
- Raven map
  - state extent
  - 1:200K zoom
- USGS 100K quad
  - 1:200K zoom
  - 1:36K zoom
- USGS 24K quad
  - 1:36K zoom
  - 1:5K zoom

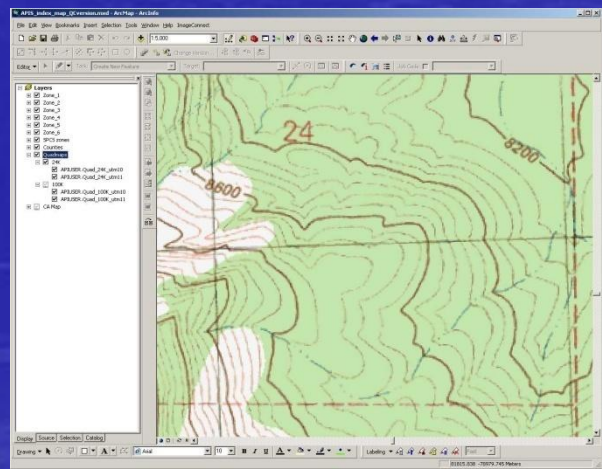








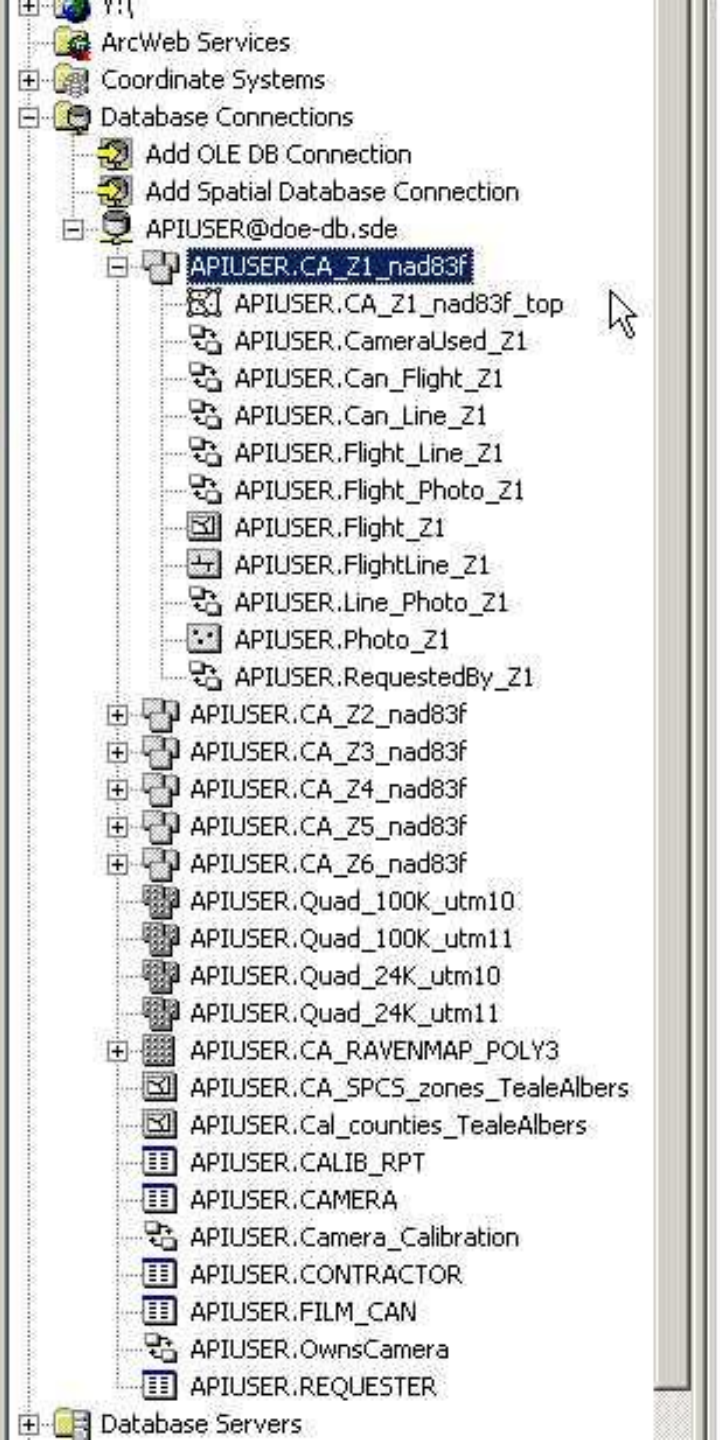




APIS

ArcCatalog view

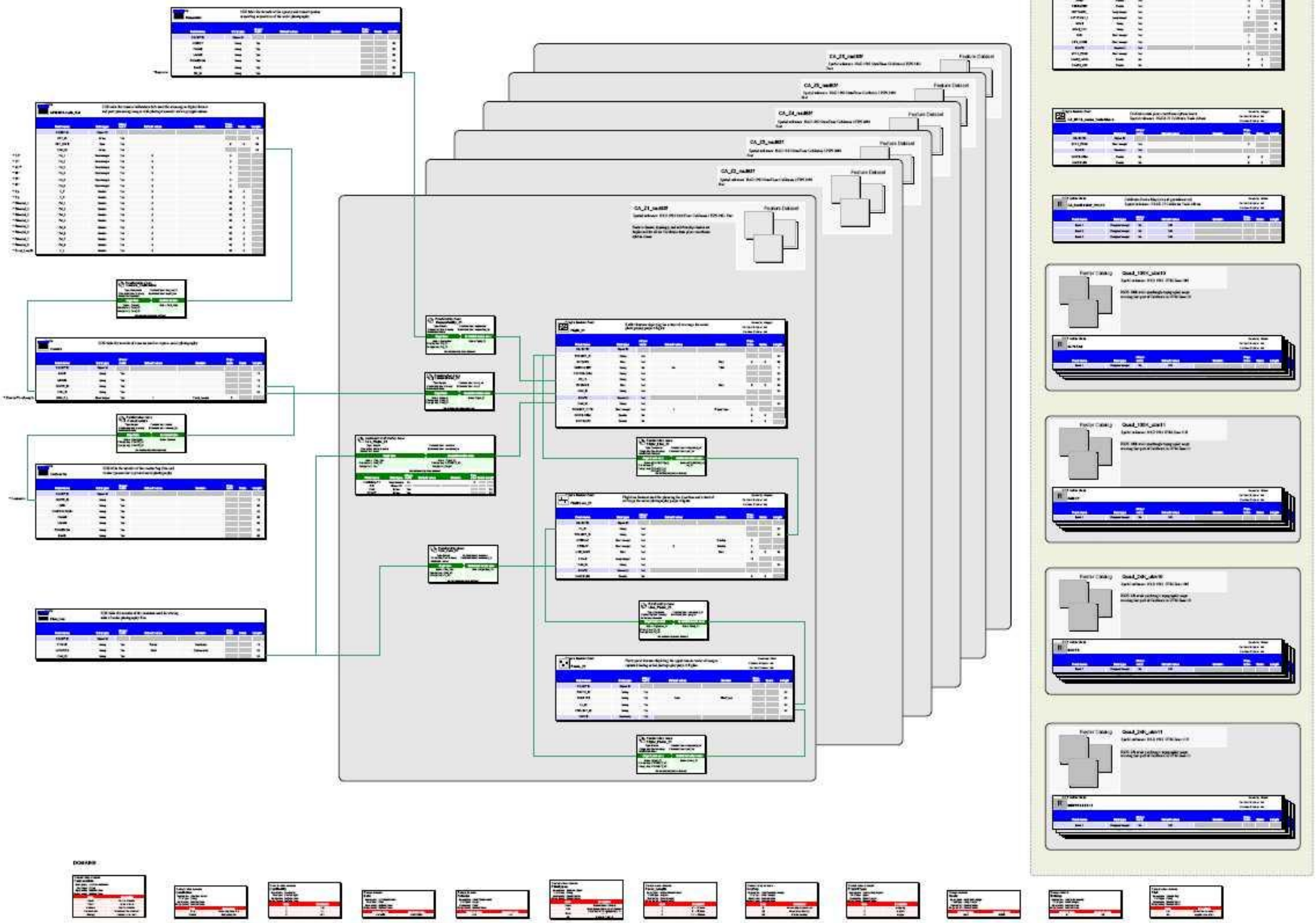
- Feature Datasets for each of the 6 state plane zones
  - 3 feature classes
  - Topology
  - 7 relationship classes
- 5 tables
- 2 relationship classes external to feature datasets
- CA counties feature class
- CA State Plane zones feature class
- CA state map raster
- 4 raster catalogs
  - 100K USGS quad maps
    - UTM zones 10 & 11
  - 24K USGS quad maps
    - UTM zones 10 & 11



California Department of Water Resources

Aerial Photography Indexing System

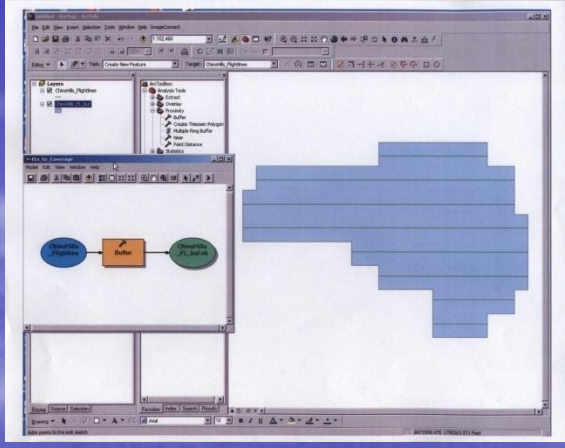
Geodatabase Schema Diagram:

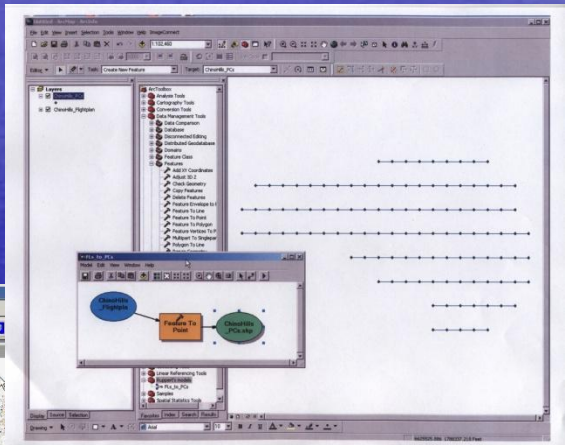


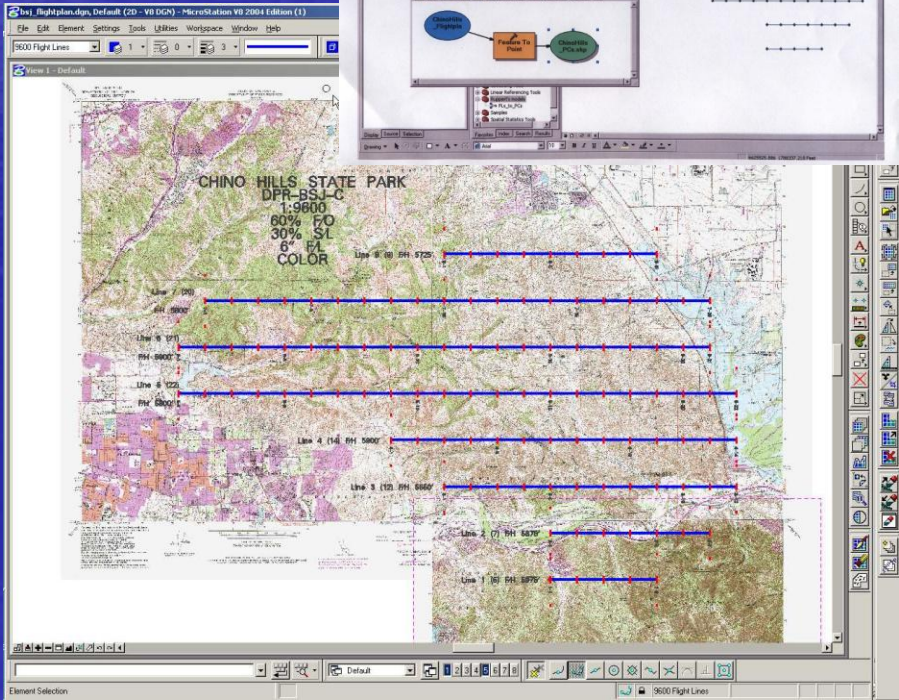
APIS

Legacy Data

- CAD files flight plans
  - archived since 2003
  - Microstation files
- Photo points
  - model converts intersection of tick marks and flightlines
  - appended to Photo feature class
- Flight coverage
  - model buffers flightlines according to photo scale
  - appended to Flight feature class





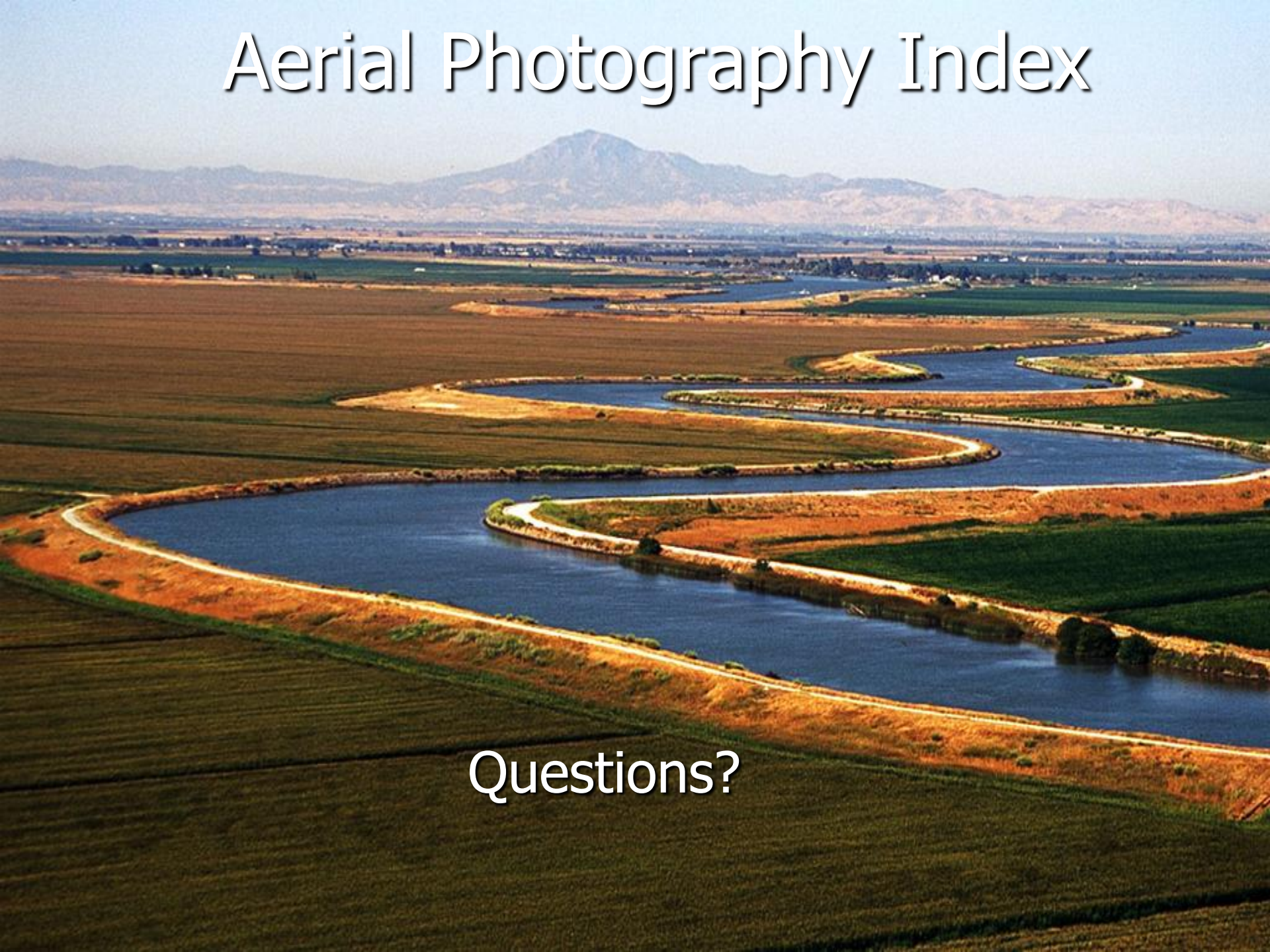


APIS

Continue prototype development

- Populate test data
  - select small geographic extent
  - input data for several overlapping flights
  - author metadata with EME
- Explore methods to aid CAD to GIS transition
- Heads-up digitizing
  - scan hardcopy flight plans
  - georeference raster
- As data becomes populated, development of query models will follow
- Moving onto to the next iteration of the spiral development model

Aerial Photography Index



Questions?