Grand Canyon Integrated Database Management System

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The Goal

Develop an accessible, multi-disciplinary, spatially referenced, relational database for GCMRC to consolidate, organize, document, store, and distribute scientific information related to the grand canyon ecosystem, in oracle.

Why Do This?

- To support scientific monitoring and research activities related to the Grand Canyon ecosystem
- To facilitate the adaptive management of Glen Canyon Dam by establishing the foundation of a decision support system, based on scientific information about the Grand Canyon ecosystem

Why Oracle

- Multi-user
- SDE capable

  ARC/INFO => ARC/ORACLE
- Tight integration of spatial and tabular data
- 80% of the DOI user base.

Key Challenges

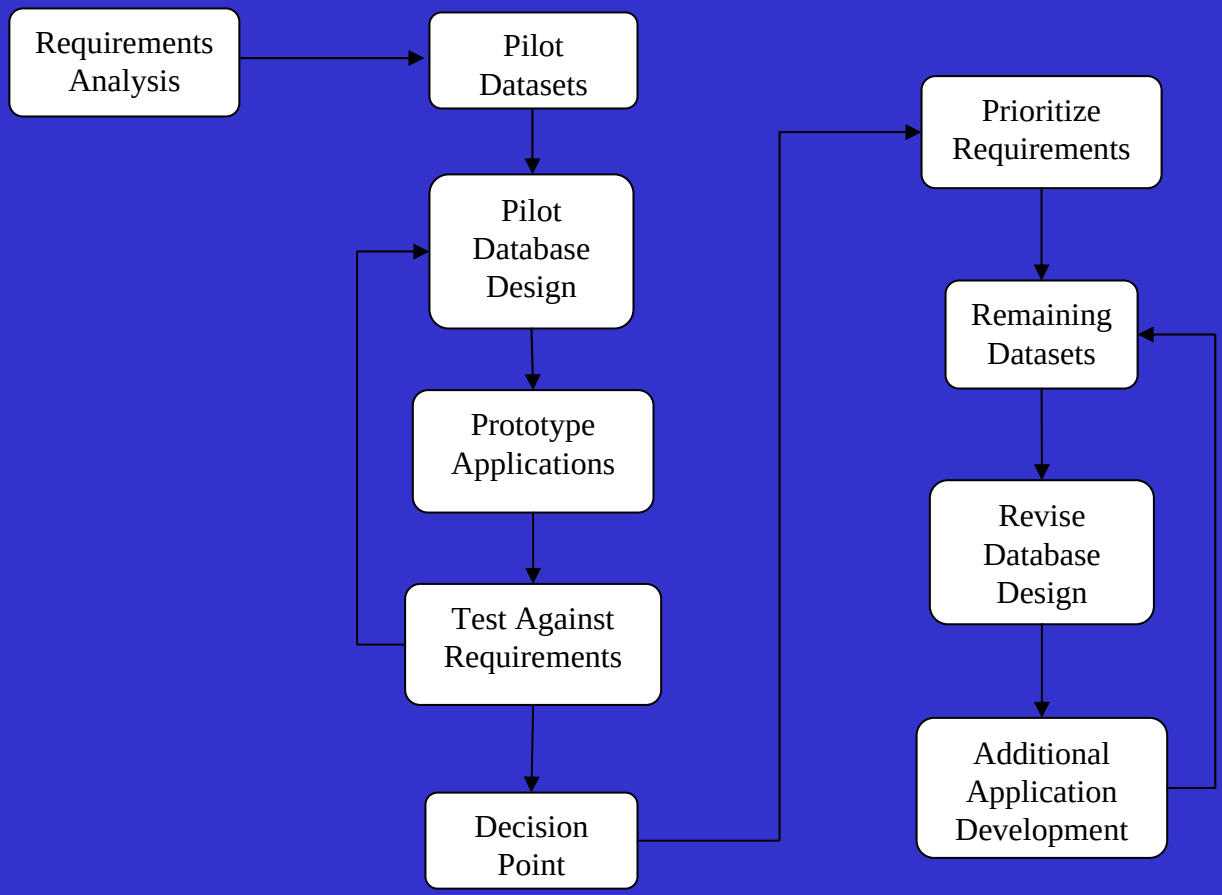
Storing data so that no original information is lost, while:

- Converting disparate data into a common spatial reference, and
- Organizing data so that it can be effectively displayed in both space and time, and
- Constructing queries to effectively analyze data in both space and time

The Relational Model

- Store related information together in distinct tables.
- Store it once, in one place, and avoid redundancy.
- Avoid “holes” or null values.
- Relate tables of information based on common attributes.

The Development Process



Status
Where Are We?

All pilot data sets are accessible from Oracle, at GCMRC including:

- Fish monitoring data, 1977 to present
- Discharge unit values, 1921 to present
- Lake Powell water quality, 1986 to present
- Sediment transport data, 1921 to present
- Water temperature, downstream

Additionally, the survey control point database

Database Organization

- Related data tables are organized by schemas
- Some tables are common to all schemas
- Data are stored in tables at the finest time and space granularity available
- Views are created which allow users to look at different parameters together, or at a coarser granularity in time or space

Views

- In a relational database, “Views” of data are based on SQL Queries that display information in a manner that is useful for analysis.
- Views can act on information from a single table, or information contained in many related tables.
- Views can be used to display or analyze information in any way.
- Views simplify how information is retrieved from a database.

Common Attributes

How much	→	Value
What	→	Parameter/Sample Type
How	→	Gear Type
Who	→	Trip ID/Agreement #
Where	→	Station ID
When	→	Sample Date and Time

Key Entities and Attributes Relative to Fish

Fish Samples Table

- A sample identifier
- Trip the sample was collected on
- Date
- Location
- Gear used
- Habitat
- Effort
- Source file

Fish Specimens Table

- A sample identifier
- An individual tag number
- Species caught
- Length and weight
- Condition of the fish at end of sample
- A sub-sample identifier
- Source file

Example of Entities and Attributes

Microsoft Access - [fish_samples : Table]

File Edit View Insert Format Records Tools Window Help

id	TRIP_ID	STATION_ID	STATION_TYPE	RUN#	RIVER	start_RKM	end_RKM	SIDE	GEAR	START_DATE	TOTAL_SECONDS
164048	LF20021015	COR2.75R	19	9	COR	2.55	2.75	R	EL	10/16/2002 8:00:00 PM	755
164049	LF20021015	AGF3	17	8	COR	1.75	1.9	R	EL	10/16/2002 7:25:00 PM	592
164050	LF20021015	COR6.15R	19	7	COR	5.95	6.15	R	EL	10/16/2002 6:35:00 PM	237
164051	LF20021015	COR12.85L	19	17	COR	12.7	12.85	L	EL	10/17/2002 10:45:00 PM	523
164052	LF20021015	AGF9	17	18	COR	13.85	14	L	EL	10/17/2002 11:30:00 PM	474
164053	LF20021015	COR8.15L	19	14	COR	8	8.15	L	EL	10/17/2002 7:00:00 PM	470
164054	LF20021015	COR7.75L	19	13	COR	7.6	7.75	L	EL	10/17/2002 6:30:00 PM	679
164055	LF20021015	COR9.35L	19	15	COR	9.15	9.35	L	EL	10/17/2002 7:50:00 PM	355

FishID	id	SPECIES	TL	WEIGHT	SEX	PIT_RECAP	PITTAG	DISPOSITION	SOURCE_FILE	STATUS	S
391836	164055	RBT	552	1783	U	N		RA	106	0	
391837	164055	RBT	327	313	U	N		RA	106	0	
391838	164055	RBT	284	205	U	N		RA	106	0	
391839	164055	RBT	275	163	U	N		RA	106	0	
391840	164055	RBT	316	255	U	N		RA	106	0	
391841	164055	RBT	225	124	U	N		RA	106	0	
391842	164055	RBT	378	480	U	N		RA	106	0	
391843	164055	RBT	277	180	U	N		RA	106	0	
391844	164055	RBT	244	144	U	N		RA	106	0	
391845	164055	RBT	271	129	U	N		RA	106	0	
391846	164055	RBT	338	416	U	N		RA	106	0	
391847	164055	RBT	293	250	U	N		RA	106	0	
391848	164055	RBT	268	177	U	N		RA	106	0	
391849	164055	RBT	308	243	U	N		RA	106	0	
391850	164055	RBT	211	96	U	N		RA	106	0	
391851	164055	RBT	136	29	U	N		RA	106	0	
391852	164055	RBT	316	297	U	N		RA	106	0	
391853	164055	RBT	58		U	N		RA	106	0	
391854	164055	RBT	213	87	U	N		RA	106	0	
391855	164055	RBT	77		U	N		RA	106	0	
391856	164055	RBT	100	12	U	N		RA	106	0	
391857	164055	FMS	448	967	M	N	4363706D07	RA	106	0	
toNumber)	164055									0	

id	TRIP_ID	STATION_ID	STATION_TYPE	RUN#	RIVER	start_RKM	end_RKM	SIDE	GEAR	START_DATE	TOTAL_SECONDS
164056	LF20021015	COR11.75L	19	16	COR	11.6	11.75	L	EL	10/17/2002 9:50:00 PM	791
164057	LF20021015	COR19.25R	19	18	COR	19.05	19.25	R	EL	10/17/2002 9:30:00 PM	648

Record: 22 of 22

Datasheet View

CAPS NUM

Start Ch... O:\... Mic... BW... qry... Mic... bw... Mic... gc... fis... 3:35 PM

How Will I Enter Data?

- Individual trip data can be entered by cooperators by using
  - MS Access forms
  - Web based forms
  - ASCII text files
- Trip data files then delivered to GCMRC for batch load to Oracle
- Source files are archived in original form on disk storage on the GCMRC server Unkar

How Will I Access Oracle On the USGS Campus?

- Oracle SQL Plus
- Oracle Discoverer, Forms and Reports
- Custom Web based query applications
- ArcGIS tools
- MS Access via ODBC
- Other ODBC enabled tools, such as SPSS or SAS (provided the user has the appropriate software license)

How Will I Access Oracle Outside the USGS Campus?

- VPN dialup to GCMRC Intranet, where you can run any of the internal GCMRC applications (To Be Arranged)
- Internet Web browser access to selected data sets, including ArcIMS
- Exported MS Access “snapshots” of portions of the database on CD ROM

Structured Query Language (SQL and PL/SQL)

- Used to manage a database (create, backup, recover, secure)
- Create users, tables, views, reports and forms
- Import information into a database
- Export information from a database
- Query a database for information
- Perform calculations on data within a database

Select

- Select – A set of records
- From – A table or set of tables
- Where – Certain attribute conditions are met
- Group By – One or more attributes
- Order By – One or more attributes (sort)

SQL Queries

1) select NUM_OF_SAMPLES, TRIP_ID
   from MV_SAMPLES_PERTRIP;

2) select STATION_ID, START_DATE, DISCHARGE_FT3
   from MV_ALL_DISCHARGE_UNITS
   where STATION_ID = 'COR000.000' and START_DATE
   > to_date('20030501000000','YYYYMMDDHH24MISS');

Microsoft Access - [Electrofishing_Samples]

File Edit View Insert Format Records Tools Window Help

MS Sans Serif 8

ID: 164061 Sample Type: 4 TripID: LF20021015 Gear: EL Station ID: COR13.7R

River: COR Crew: PW, DS, AM Clipboard: B

RUN#: 14 Start Date and Time: 10/17/2002 6:59:00 PM

Start RM: End RM: Side: R Depletion#:

Shoreline Hab: TA Hydraulic Unit: RU Substrate: 8 Cover Type: B

Start Waypoint#: End Waypoint#: GPS Unit#:

Volts: 450 Amps: 15 Total Seconds: 570

Water Temp: Turbidity: L Total Catch: 22

Comments: DEEP WATER

Fish Specimens Subform

ID	Type	Fish ID	Spec	TL	FL	Wt.	Gape Vert	Gape Lat	Sex	Cond	Sex Char	Par Typ	Par#	Clip1 Rec	Clip1	Clip2 Rec	Clip2	Pit Lot	PIT Rec	PITTAG	TAG2 Rec	TAG2	Disp	Bo
164061	4	4E+05	RBT	256		174			U	N				N					N				RA	
164061	4	4E+05	RBT	187		71			U	N				N					N				RA	
164061	4	4E+05	RBT	282		200			U	N				N					N				RA	
164061	4	4E+05	RBT	315		304			U	N				N					N				RA	
164061	4	4E+05	RBT	230		85			U	N				N					N				RA	
164061	4	4E+05	RBT	236		121			U	N				N					N				RA	
164061	4	4E+05	RBT	281		181			U	N				N					N				RA	

Record: 1 of 22

First Sample | Last Sample | Next Sample | Previous Sample | New Sample | Delete Sample | Close Form

Record: 7407 of 7581

Sample ID, unique for each sample type

NUM

rvey Input/Update - Microsoft Internet Explorer provided by GCMRC

Edit View Favorites Tools Help

Back Search Favorites Media

ss http://gcmrc-svr4/SURVEY/survey_insert_v3.asp?SID=xduqtr.xduqtr Go Lin

Point Name (Designation): GL-15392L

Point Alias: 28022,

Side Shot: No

Station Mile: -15.392 Field Area: Traverse: No

Station River Offset: 73.36 State: AZ Hydro: No

River Side: Left GPS: No

Accuracy Convention:

USGS 15 Quad: PAGE SW

Navigation

First Prev Next Last A

|< < > >|

Record Number 1 of

Designation Name Alias

Select Select One... Select One...

Or Type

Search Show All

Use % as a wild card. (Exp. MC% or %R)

ordinate

Northing Meters: 657875.108 N Latitude (dd mm ss.ss): 36 55 50.71

Easting Meters: 252280.135 W Longitude (dd mm ss.ss): 111 28 47.18

Ellipsoid Ht. (m): 936.254 N Latitude (dd.ddddd): 36.930752777777

Orthometric Ht. (m): 958.3623 W Longitude (dd.ddddd): 111.47977222222

Orthometric Ht. Datum: 90

Hydro Azimuth:

lapping Plane Scale Factor: .9999187 Combined Grid Factor: .9977558

llipsoid (Elv.) Scale Factor: .9998569 Convergence:

State Plane 202

Horizontal

Datum NAD 83 (1983)

Method

Calc By GCES

Calc Date 7/1/1994

Network Relationship Network

curacy

Ellipsoid Ht. Error (m): Northing Error: Latitude Error:

Method

GEOID2002

GEOID1999 WINTG.exe

GEOID1996

GEOID1990 GEOID90.exe

Survey Control Points

Internal web page available on the Flagstaff Field Center

http://gcmrc-svr4/SURVEY/LOGIN.ASP

CDI's Web Applications

Internal web page available on the Flagstaff Field Center

http://gcmrc-svr4:9122

Questions / Comments

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