the
alliance for
public gardens gis

February 16, 2011
ABCD-GIS Meeting
Harvard University, Cambridge, MA

GIS for Public Gardens:
Tools & Techniques for
Collection Management & Research

Brian Morgan
Putnam Research Fellow
Arnold Arboretum of Harvard University

Curriculum Vitae

- **Education**
  - Ph.D. Candidate in Geography
  - BS in Landscape Architecture
  - AS in Computer Science

- **Research & Professional Experience**
  - Alliance for Public Gardens GIS
  - Arnold Arboretum
  - UC Davis Arboretum
  - UCD LASR Laboratory
  - UCD ICE
  - BRBNA
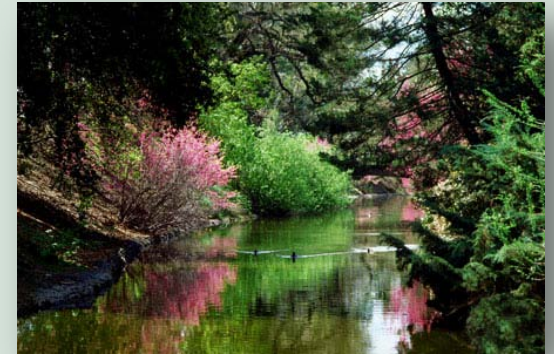
Living Plant Collection Mapping

UC Davis Arboretum

- Located on the University of California, Davis campus

- 100 acre botanical garden

- Living museum with over 30,000 specimens

- Used by students, staff, and faculty for research and education

Arboretum Waterway

Ruth Risdon Storer Garden

Why Map Plant Collections?

- Collection curation

- Teaching and research

- Planning and maintenance

- Visitor-based information and applications

- Biodiversity informatics

- Everyone loves maps!

Arboretum Tour

Student Botanist

Original Collection Maps

- Geo/Navigator maps created in 1989

- Collections mapped by students over five years

- Maps only contained relative locations

- Software company is now out-of-business
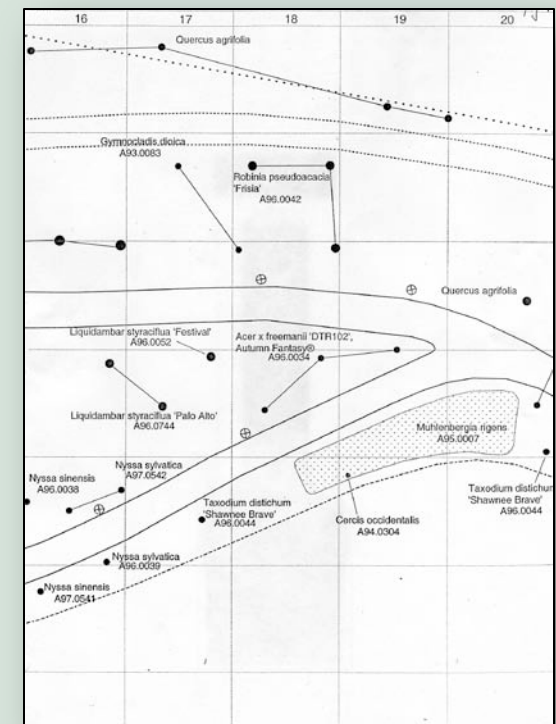
Geo/Navigator Collection Map

IMLS Museums for America Grant

- Plant records to BG-BASE

- Collection maps to Esri ArcGIS

- $150,000 over two years

- Student and staff salaries

- GPS and computer equipment
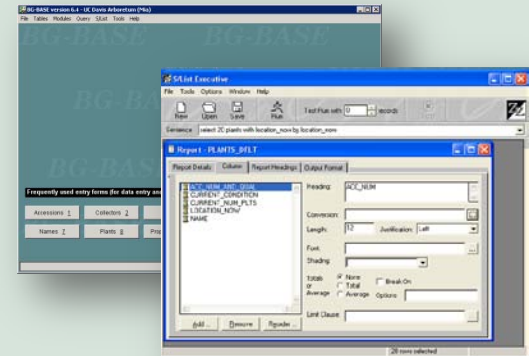
BG-BASE Software
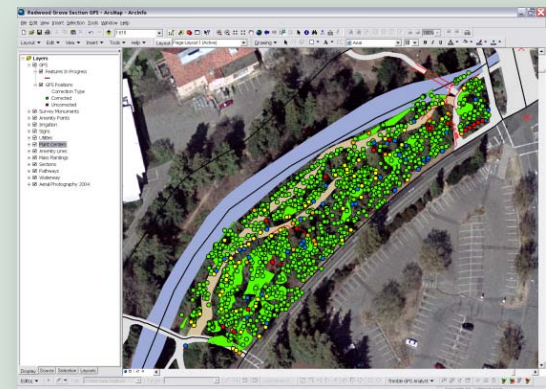
T. Elliot Weier Redwood Grove GIS

Equipment Considerations

- Volunteer and student labor

- Tree canopy, bridges, and buildings

- Measurement accuracy

- Operating time

- Purchase and maintenance costs

Trimble Data Collection Equipment

Equipment Configuration

- Started with Trimble Pathfinder ProXR GPS (sub-meter)

- Upgraded to Trimble Pathfinder ProXH GPS (sub-foot)

- LaserCraft XLRic laser rangefinder

- Trimble Nomad ruggedized PDA

- Tripod and reflector pole

Data Collection Equipment

Software Environment

- Esri ArcPad 10

- Trimble GPScorrect 3.14

- Esri ArcGIS Desktop (ArcInfo) 10

- Trimble GPS Analyst 2.3

- MapLogic Layout Manager 4

Esri & Trimble Software

Geodatabase Design

- Visited and discussed with other gardens and zoos

- No existing GIS standard

- Designed, tested, and revised based on institutional needs

- Groundwork for data model project
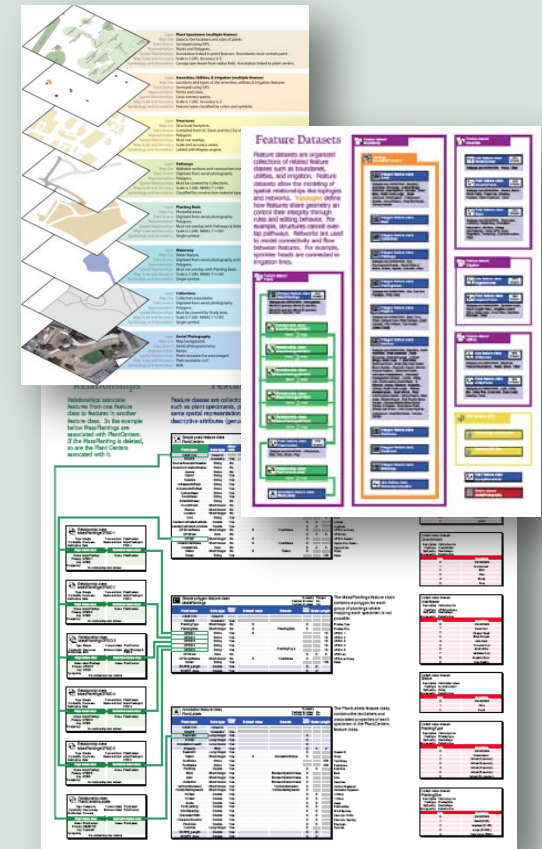
Geodatabase Diagrams

Field Mapping

- Two mapping teams of two students

- Equipment operator

- Map maintenance and prism holder

- Record plant center, accession number, taxonomy, growth habit, radius, and perimeter for masses

- Map amenities, irrigation, utilities, signs, etc.

GPS and Laser Rangefinder

2005 Field Mapping Team

Post-Processing

- Import to geodatabase

- Differential correction

- Filter out inaccurate GPS positions

- Verify geometry and attributes

- Remap invalid features
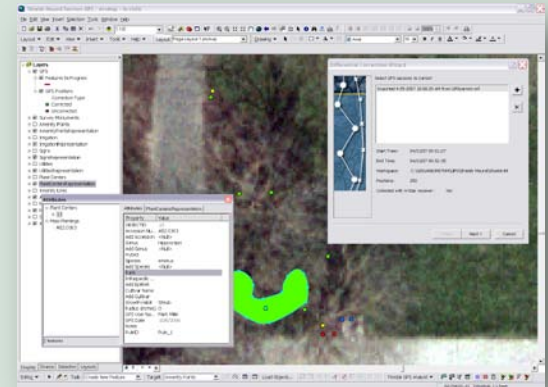
ArcGIS with GPS Analyst
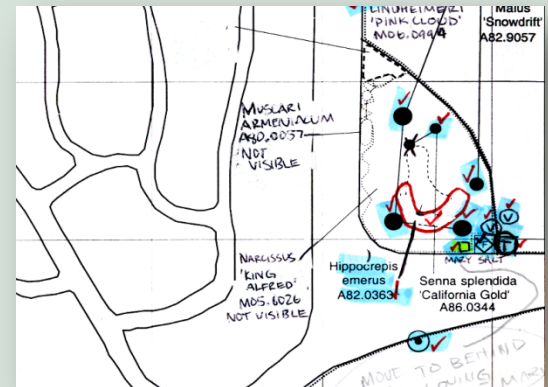
Field Map

Map Books

- Thomas Brother style map books

- Overview, detail maps, and index

- 1" = 20' scale with 20' grid

- Grayscale for reproduction

- Realistic landscape plan symbols
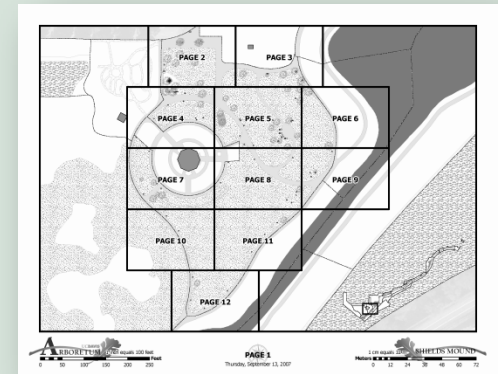
Shields Mound Section Overview
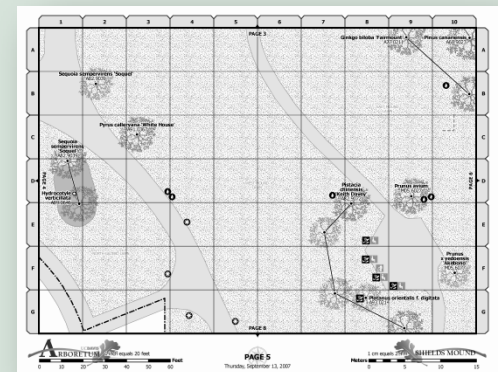
Shields Mound Section Detail

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

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PAGE 12

UC DAVIS
ARBORETUM 1 inch equals 100 feet

Feet

0   50   100   150   200   250

1 cm equals 12 m SHIELDS MOUND

Meters

0   12   24   36   48   60   72

Ginkgo biloba 'Fairmount'
A77.0211

Pinus canariensis
A68.9023

Sequoia sempervirens 'Soquel'
A82.9039

EAST MOUND LAWN

Pyrus calleryana 'White House'
A91.0367

Sequoia sempervirens 'Soquel'
A82.9039

WEST MOUND LAWN

Pistacia chinensis 'Keith Davey'
A82.9072

Prunus avium
M05.6027

Hydrocotyle verticillata
A89.0646

NORTH GAZEBO LAWN

Prunus x yedoensis 'Akebono'
M05.6077

Platanus orientalis f. digitata
A93.0214

UCDAVIS
ARBORETUM

1 inch equals 20 feet

Feet
0   10   20   30   40   50   60

PAGE 5
Thursday, September 13, 2007

1 cm equals 2.4 m

SHIELDS MOUND

Meters
0   5   10   15

Specimen Name	Page	Specimen Name	Page	Specimen Name	Page	Specimen Name	Page	Specimen Name	Page
Acacia karroo A64.0601	2 E-7	Carex comans A90.0131	5 C-2	Correa pulchella 'Port Lincoln' A96.0417	4 B-4	Grevillea 'Poorinda Constance' M02.0256	4 D-1	Hardenbergia violacea 'Happy Wanderer' M02.0159	3 A-10 4 B-2
Agonis flexuosa A92.0133	2 E-5	Casuarina glauca A67.0148	5 D-8	Correa pulchella A96.0712	4 D-1 4 E-1	Grevillea 'Poorinda Royal Mantle' M02.0260	4 C-2 4 C-3	Hardenbergia violacea 'Icide' A98.0143	5 D-5 5 D-6
Albizia kalkora A55.0006	3 E-5	Cercis griffithii A64.0842	3 E-7	**D**		Grevillea 'Poorinda Royal Mantle' M02.0261	4 C-3	Hardenbergia violacea 'Rosea' A96.0717	5 D-6
B		Cercis siliquastrum A64.0589	3 D-5 3 D-6 3 E-6	Dianella revoluta A95.0293	3 B-4				
Baeckea virgata UNKNOWN	3 E-9			Dianella revoluta A96.0671	3 B-5 3 B-7 3 B-8 3 B-9 4 B-1 4 B-2	Grevillea 'Poorinda Royal Mantle' M02.0262	4 C-2 4 C-3	Hardenbergia violacea UNKNOWN	2 E-9
Banksia elderana A65.0354	2 C-4	Cistus albidus UNKNOWN	2 C-5			Grevillea 'Red Glow' A96.0716	5 F-6	Hibbertia aspera A96.0636	4 C-2
Billardiera bicolor A66.0420	4 B-7	Cistus ladanifer T0251	2 C-5					**I**	
C		Cistus monspeliensis A73.0126	2 D-5	**E**		Grevillea robusta A55.0026	3 D-10	Isolepis nodosa A91.0031	2 B-3 2 C-3 2 C-4 3 A-9 3 B-6 4 B-1 4 B-3 4 B-4 4 B-5
Caesalpinia gilliesii A76.0210	2 B-7 2 C-6 2 C-7 2 C-8 2 C-9 2 D-9	Cistus sp. UNKNOWN	2 C-8 2 E-3	Eremophila maculata A95.0545	5 D-1 5 D-2 5 E-2	Grevillea 'Ruby Clusters' M02.0263	4 C-2 4 D-2 4 D-3		
		Cistus x pulverulentus A75.0176	2 C-9 2 D-5	Eremophila maculata A97.0220	5 C-7 5 D-7	Grevillea speciosa ssp. oleoides M02.0266	4 C-2		
		Cistus x purpureus T0250	2 D-5	Eucalyptus caesia 'Gungurra' M02.0358	5 D-7	Grevillea 'White Wings' A95.0222	2 F-4	**J**	
Caesalpinia spinosa A70.0961	2 D-9	Citharexylum montevidense A65.0636	4 D-10	**G**		**H**		Juncus effusus UNKNOWN	5 C-6 5 D-6
Callistemon 'Jeffersii' A96.0071	4 D-1	Colletia paradoxa A57.0151	5 E-2 5 F-2	Genista aetnensis A59.0029	3 E-5	Hakea leucoptera A64.0076	4 B-5 4 B-6 4 C-5	**K**	
Callistemon linearis A91.0683	5 F-2	Coprosma petriei 'Verde Vista' A93.0321	2 A-8	Genista maderensis UNKNOWN	5 D-6	Hakea polyanthema A64.0082	4 C-6 4 C-7	Koelreuteria elegans ssp. formosana A57.0146	4 E-7 4 E-9 4 F-9
Callistemon phoeniceus A70.0363	2 D-7 2 D-8 2 F-4 2 F-5 2 F-6 3 C-9	Correa 'Ivory Bells' A77.0175	5 D-7	Grevillea 'Masons Hybrid' M02.0124	3 B-8 4 B-1 4 B-4 4 B-5 4 B-6	Hakea scoparia A65.0320	2 D-8 2 D-9	**L**	
		Correa 'Ivory Bells' A96.0072	4 B-1 4 C-1			Hakea sp. A68.0423	5 F-3	Leptospermum brevipes, purple leaf form A93.0238	5 F-3
Callistemon phoeniceus A92.0142	3 C-4	Correa pulchella 'Orange Flame' A96.0712	3 B-6	Grevillea 'Masons Hybrid' M02.0259	3 B-10 4 C-1	Hardenbergia violacea 'Happy Wanderer' A78.0118	2 D-3 2 E-3 2 E-4 3 B-5 4 B-9	Ligustrum quihoui A64.0568	5 F-1
Callistemon viminalis 'Red Cascade' A91.0828	3 C-3			Grevillea 'Poorinda Constance' M02.0255	3 C-10 4 D-1				

UCDAVIS
ARBORETUM

SOUTH AUSTRALIAN

Collection Maps Online

- Esri ArcGIS Server 9.3.1

- Customized web application

- Plant searches and queries

- Customizable print pages

- Google Images and Scholar searches

- Detailed user guide

- **http://gis.ucdavis.edu/ucdacm.aspx**

Collection Maps Web Application

Collection Maps Web Application

http://gis.ucdavis.edu/UCDACM/default.aspx

Google

⭐ Favorites | 🌿 UC Davis Arboretum Collection Maps

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UC Davis Arboretum | UC Davis | PDF Map Download | User Guide | Report an Error

Plant Name Search | **Accession Number Query** | **Plant Finder** | **Print**
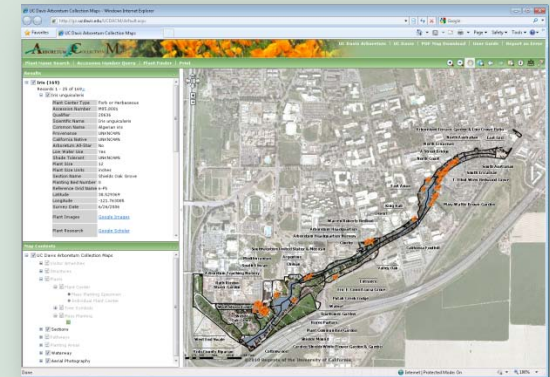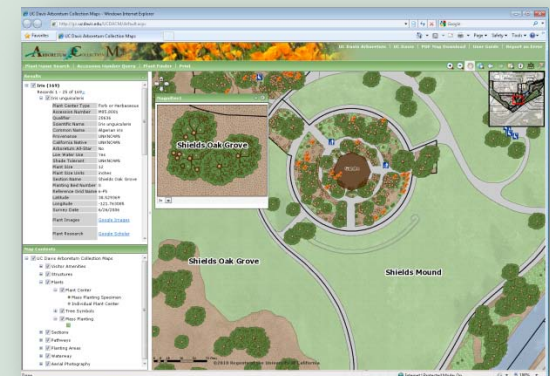
Results

☐ ☑ Iris (169)

Records 1 - 25 of 169>

☐ ☑ Iris unguicularis

Plant Center Type	Forb or Herbaceous
Accession Number	M05.8001
Qualifier	20636
Scientific Name	Iris unguicularis
Common Name	Algerian iris
Provenance	UNKNOWN
California Native	UNKNOWN
Arboretum All-Star	No
Low Water Use	Yes
Shade Tolerant	UNKNOWN
Plant Size	12
Plant Size Units	inches
Section Name	Shields Oak Grove
Planting Bed Number	0
Reference Grid Name	6-F5
Latitude	38.529369
Longitude	-121.763085
Survey Date	6/26/2006
Plant Images	Google Images
Plant Research	Google Scholar

Magnifier1

Shields Oak Grove

2x ▼

Gazebo

Shields Oak Grove

Shields Mound

Map Contents

☐ ☑ UC Davis Arboretum Collection Maps

☐ ☑ Visitor Amenities

☐ ☑ Structures

☐ ☑ Plants

☐ ☑ Plant Center

● Mass Planting Specimen

● Individual Plant Center

☐ ☑ Tree Symbols

☐ ☑ Mass Planting

☐ ☑ Sections

☐ ☑ Pathways

☐ ☑ Planting Areas

☐ ☑ Waterway

☐ ☑ Aerial Photography

0 9 18   36   54   72 Feet

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Done

Internet | Protected Mode: On

🔍 ▼ 🔍 100% ▼

Collection Maps Online

- Requires little GIS experience

- Reduces curation staff work load

- Provides staff quick answers

- Provides researchers powerful tools

- Little overhead to maintain

- Prototype for current web app project
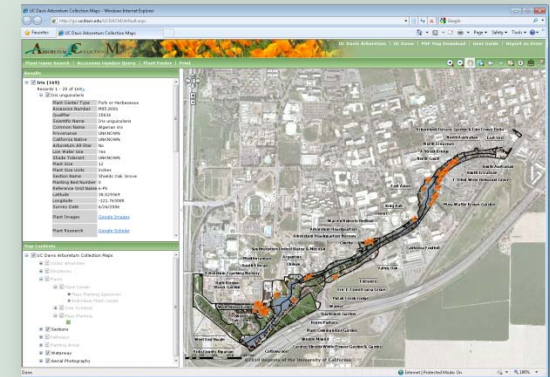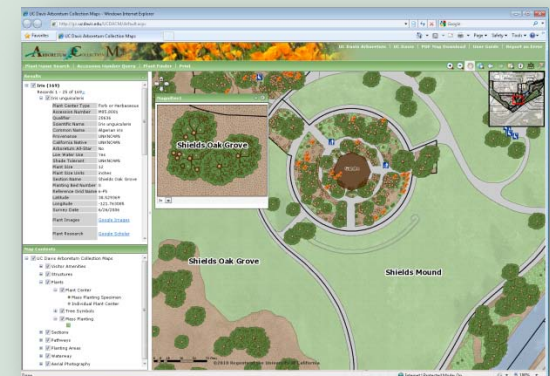
Collection Maps Web Application

Collection Maps Web Application

ArcGIS Public Garden Data Model

Enterprise GIS
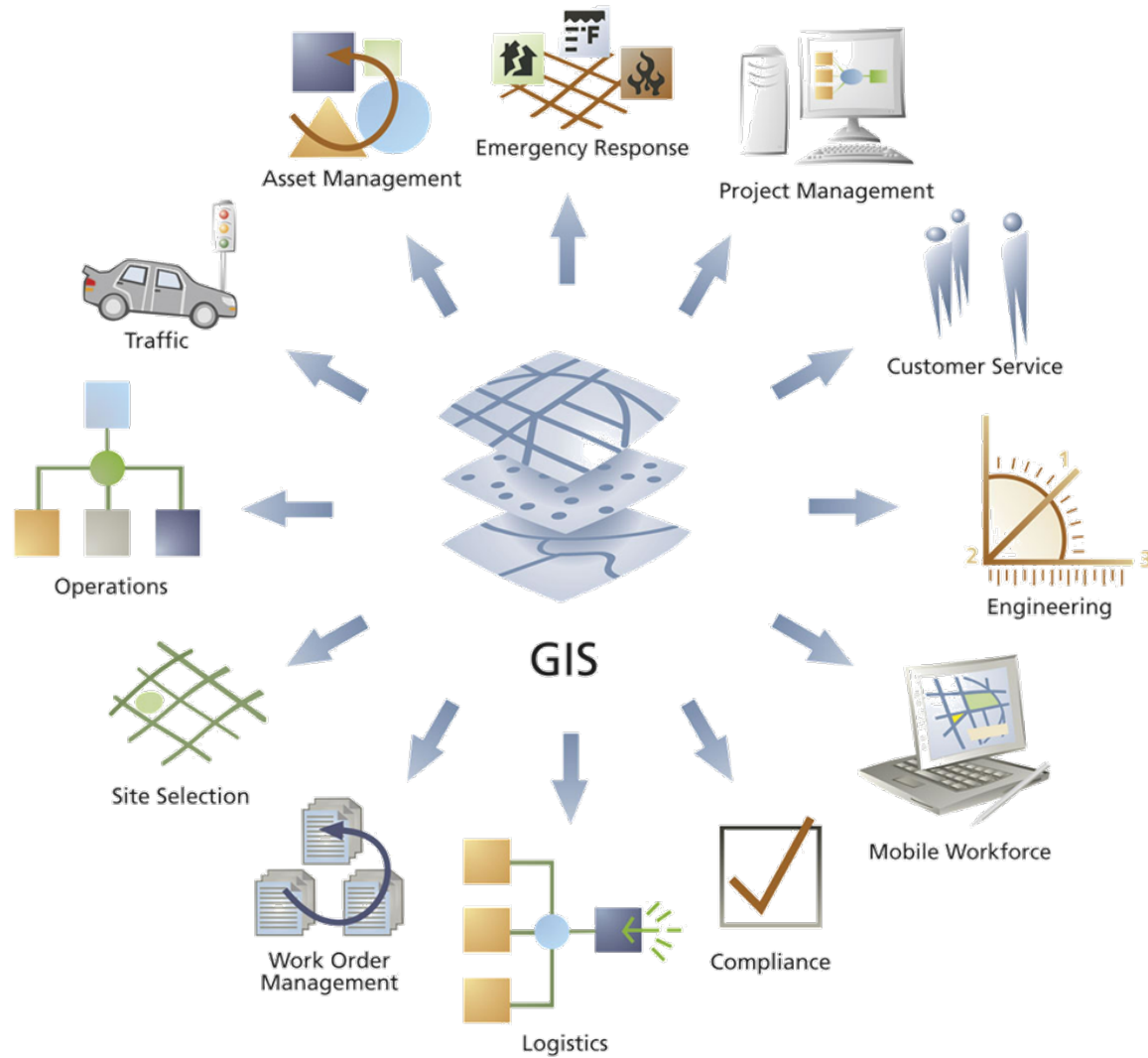
GIS at Public Gardens

- Mission to exhibit wildlife, educate visitors, conserve biodiversity, and perform scientific research

- Range in sizes and operating budgets

- GIS used to manage living collections, facilities, and perform research

- Without a industry data model each institution needs to design their own GIS

Living Collection Mapping

Animal Education

What is a Data Model?

- *"...a description of the rules by which data is defined, organized, queried, and updated within an information system."*

- Database schema

- Practical template and starting point for implementing GIS projects

- Over 30 industry models for ArcGIS
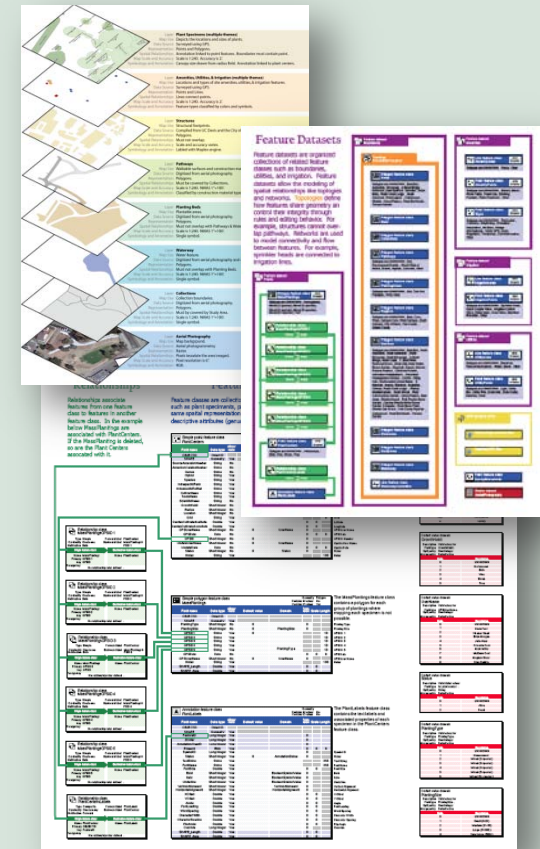
GIS Data Model Diagrams

IMLS Conservation Program Support Grant

- Design GIS standard for botanical gardens and zoos

- Community build process

- $230,000 over two years

- $390,000 match from Esri

- Salaries, travel, and software

Project Partners

Project Goals

- Create a free open source template with documentation for starting a GIS project

- Light, Medium, and Extra Strength

- Focused on features that provide the greatest benefit

- Designed to work with plant records systems, not replace them

Light, Medium, & Extra Strength
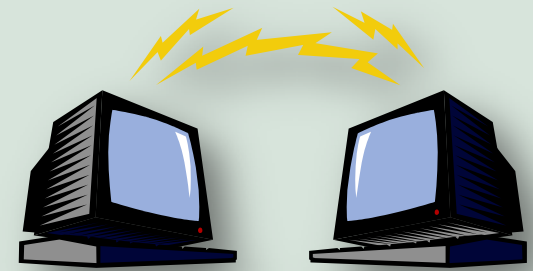
Linked Databases

Design Process

Research
- Problem Definition
- Priorities

Conceptual Design
- Information Products
- Thematic Layers

Logical Design
- Features
- Attributes
- Relationships

Physical Design
- Geodatabase
- Geoprocessing Tools
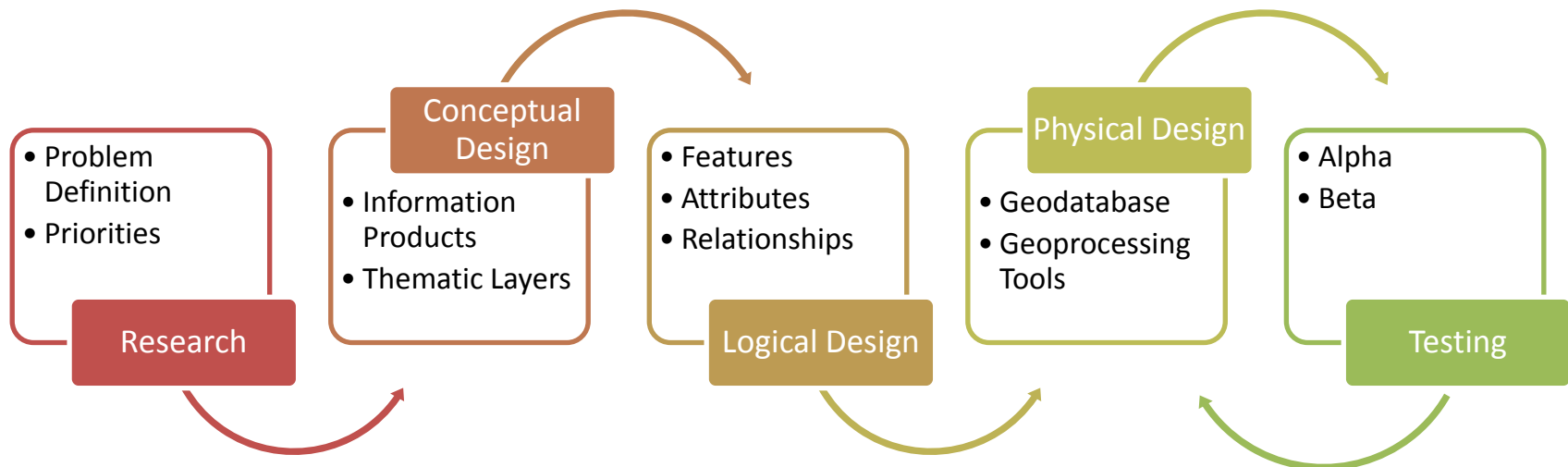
Testing
- Alpha
- Beta

Project Timeline

- Project planning meetings and community survey in Fall 2007

- Conceptual & logical design meetings in Spring 2008

- Physical design in Summer 2008

- Alpha testing and review through Summer 2010

- Beta testing and documentation in progress

Technology Seminar
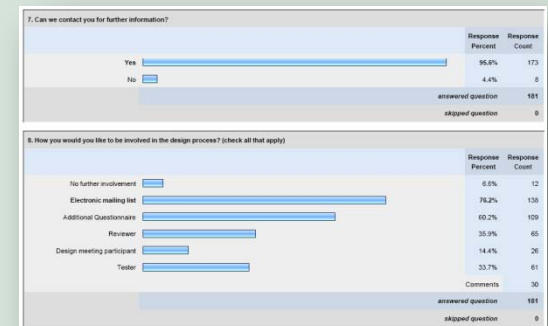
Online Survey

Data Model Design

- Similar to modeling an entire city

- Community survey indicated that plant records, base map, and facilities & infrastructure most important

- Created base map and facilities & infrastructure foundation with basic plant collections module

- Currently over 100 objects in model

Data Model Diagram

Transportation

Line feature class — PavementCenterline
Subtypes are Alley, Trail, Vehicle Ramp, Other, Arterial, Bridge, Collector, Highway, Local, Pathway, Pedestrian Ramp, Sidewalk.
Centerline representations of pavement segments for roads, pathways, sidewalks, bridges, etc.

Relationship class — PavementCenterlineHasPavementSegments
One to many

Relationship class — PavementSegmentHasPointOfContacts
One to many

Relationship class — PavementSegmentHasTrafficCalming
One to many

Line feature class — TrafficCalming
Subtypes are Dip, Speed Bump, Speed Hump, Speed Table, Other.
Linear traffic calming devices like speed bumps.

Relationship class — BollardHasPointOfContacts
One to many

Relationship class — PavementSegmentHasBollards
One to many

Point feature class — Bollard
Subtypes are Fixed, Removeable, Retractable, Temporary, Other.
Bollards.

Polygon feature class — PavementSegment
Subtypes are Bridge, Other, Deck or Pier, Parking, Patio or Terrace, Pedestrian Ramp, Road, Sidewalk, Walkway.
Area representations of pavement segments for roads, pathways, sidewalks, parking areas, bridges, etc.

Relationship class — PavementSegmentHasTrafficSigns
One to many

Point feature class — Traffic Sign
Subtypes are Regulatory, Warning, Guide, Other.
Traffic signs.

Relationship class — PavementSegmentsHaveCurbs
One to many

Line feature class — Curb
Subtypes are Rolled, Square, Other.
Curbs.

Relationship class — PeopleMoverHasPointOfContact
One to many

Polygon feature class — PeopleMover
Subtypes are Elevator, Escalator, Walkway, Other.
Outdoor people moving equipment like moving walkways, escalators, and elevators.

Relationship class — PeopleMoverHasEntranceExits
One to many

Relationship class — CurbHasPointOfContacts
One to many

Relationship class — TrafficSignHasPointOfContacts
One to many

Relationship class — TrailHasPointOfContacts
One to many

Polygon feature class — Trail
Subtypes are Pedestrian, Vehicle, Other.
Trails without pavement.

Relationship class — RailHasPointOfContacts
One to many

Line feature class — Rail
Subtypes are Soil, Track, Monorail, Other.
Transportation by Rail.

Natural Areas

Polygon feature class — BioclimaticZone
Areas of similar climate, plants, and animals.

Polygon feature class — Geology
Classification and characteristics of surficial geology.

Polygon feature class — Soil
Detailed soil association polygons.

Polygon feature class — Vegetation
Subtypes are Unknown, Forest, Woodland, Shrubland, Dwarf-Shrubland, Herbaceous, Nonvascular, Sparse Vegetation.
Vegetation for areas outside of managed collections using USNVC.

Line feature class — ElevationContour
Line features that represent elevation values on the surface of the earth.

Point feature class — ElevationPoint
Point features that represent elevation values on the surface of the earth.

Contact

Relationship class — PointOfContactIsOwner
One to many

Table — PointOfContacts
Table of contacts for individual organizational areas, buildings, etc.

Relationship class — PointOfContactsSecondaryContact
One to many

Relationship class — PointOfContactsPrimaryContact
One to many

Table — PointOfContactsInfo
Contact information based on Microsoft Outlook 2007.

Hydrology

Line feature class — HydroNetEdge
Subtypes are Flowline, Shoreline.
Geometric network of hydrographic lines, i.e. flowlines and shorelines.

Polygon feature class — HydroArea
Subtypes are Structure, Administrative Boundary, Other.
Significant hydrographic areas not classified as waterbodies.

Line feature class — HydroLine
Subtypes are Flowline, Shoreline, Other.
Monitoring points, springs, diversions, or other structures.

Relationship class — HydroNetJunctionHasCatchment
One to many

Polygon feature class — HydroCatchment
Significant drainage areas smaller than watersheds.

Relationship class — HydroNetJunctionHasMonitoringPoint
One to many

Point feature class — HydroPoint
Subtypes are Monitoring Point, Other Point.
Streams, shorelines, or other structures and boundaries.

Point feature class — HydroNetJunction
Junctions points on the flow network.

Relationship class — HydroNetJunctionHasWaterbody
One to many

Polygon feature class — HydroWaterbody
Significant ponds, lakes, bays, and rivers (represented as polygons).

Relationship class — HydroNetJunctionHasWatershed
One to many

Polygon feature class — HydroWatershed
Significant drainage areas.

Cartography

Polygon feature class — GeneralReferenceMap
Subtypes are Water, Lawn, Trees and shrubs, Paved, Unpaved, Structure.
Generalized base map used for basic mapping purposes and cartographic output.

Cultural

Polygon feature class — GuestExperience
Subtypes are Amusement Ride, Tour, Transportation, Other, Arcade, Gift Shop, Petting Zoo, Picnic Area, Playground, Restaurant, Restroom, Store.
Specialized areas for guests.

Relationship class — CulturalAreaHasPointOfContact
One to many

Polygon feature class — CulturalArea
Subtypes are Point of Interest, Cultural Resource.
Significant point of interest or cultural resource, such as a religious site or historical structure.

Relationship class — CulturalLineHasPointOfContact
One to many

Point feature class — CulturalLine
Subtypes are Point of Interest, Cultural Resource.
Significant point of interest or cultural resource, such as a religious site or historical structure.

Relationship class — CulturalPointHasPointOfContact
One to many

Line feature class — CulturalPoint
Subtypes are Point of Interest, Cultural Resource.
Significant point of interest or cultural resource, such as a religious site or historical structure.
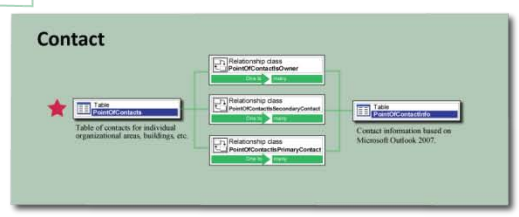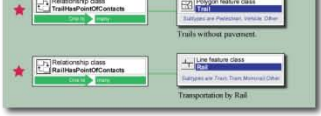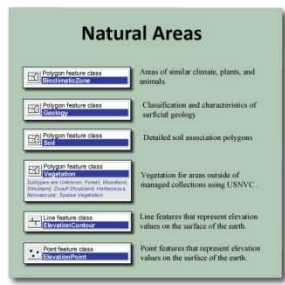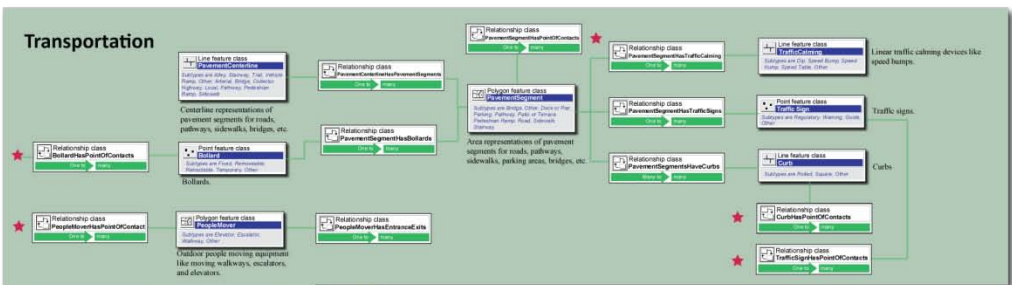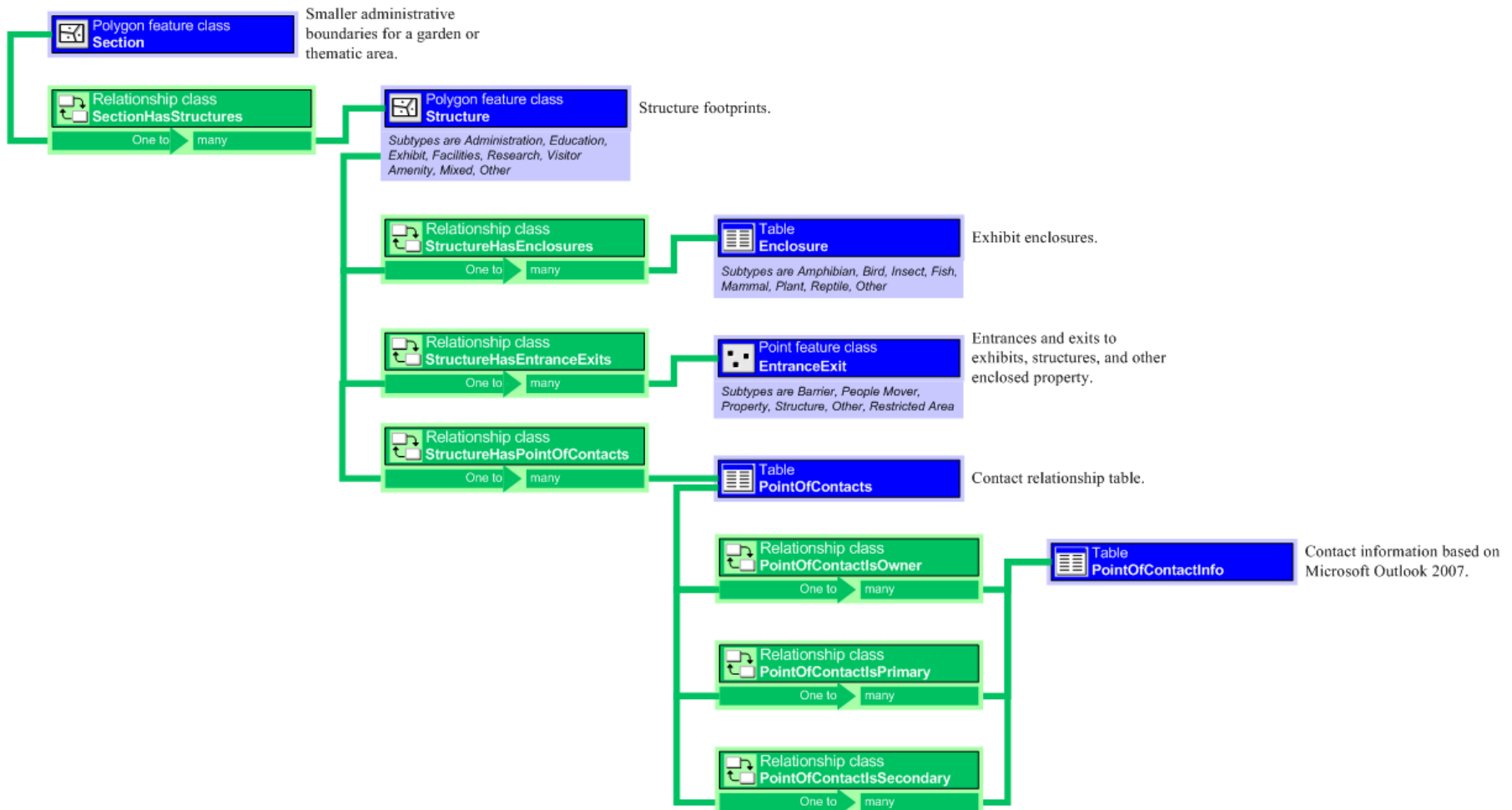
Polygon feature class — InterpretiveArea
Areas used for tours and self-guided interpretation.

Facilities

Polygon feature class — LandscapeStructure
Subtypes are Arbor or Pergola, Deck, Fountain, Gazebo, Ornamental Bridge, Rock Work, Stage, Trellis, Other.
Assorted landscape structures like fountains, arbors, and rock work.

Relationship class — LandscapeStructureHasPointOfContact
One to many

Line feature class — Barrier
Subtypes are Barrier, Fence, Moat, Retaining Wall, Seat Wall, Wall, Other.
Linear barriers like fences and walls.

Relationship class — BarrierHasEntranceExits
One to many

Point feature class — EntranceExit
Subtypes are Barrier, Restricted Area, People Mover, Property, Structure, Other.
Entrances and exits to exhibits, buildings, and other enclosed property.

Relationship class — EntranceExitHasPointOfContacts
One to many

Relationship class — PropertyHasEntranceExits
One to many

Polygon feature class — RestrictedArea
Subtypes are Construction, Equipment Yard, Hazardous Materials, Nursery, Quarantine, Staging Area, Undeveloped, Other.
Private areas with limited or no public access.

Relationship class — RestrictedAreaHasEntranceExit
One to many

Point feature class — WasteContainer
Subtypes are Compost, Cardboard Recycling, Metal Recycling, Paper Recycling, Plastic Recycling, Mixed Recycling, Trash, Other.
Containers for trash, recycling, and compost.

Relationship class — WasteContainerHasPointOfContact
One to many

Polygon feature class — Structure
Subtypes are Administration, Education, Exhibit, Facilities, Research, Visitor Amenity, Mixed, Other.
Structure footprints.

Relationship class — StructureHasEnclosures
One to many

Relationship class — StructureHasEntranceExits
One to many

Relationship class — StructureHasPointOfContacts
One to many

Point feature class — SurveyCorner
A legal location marking survey monuments.

Relationship class — SurveyCornerHasMonuments
One to many

Table — SurveyMonument
A point feature which marks the ends of record boundaries.

Administrative Areas

Polygon feature class — AreaOfInterest
Subtypes are Construction, Dataset Extent, Event, Relocation, Research, Other.
Boundaries of data set or project.

Relationship class — AreaOfInterestHasPointOfContacts
One to many

Polygon feature class — Property
Property boundary.

Relationship class — PropertyHasDistricts
One to many

Polygon feature class — District
Large administrative boundaries like east end or core.

Polygon feature class — ReferenceGrid
Map grid polygons as defined by the organization.

Relationship class — PropertyHasInstitution
One to many

Table — Institution
Institutional identification and statistics.

Polygon feature class — Collection
Boundary with few rules intended for plant collections like cycads. User configurable.

Polygon feature class — Section
Similar administrative boundaries for gardens and thematic areas.

Relationship class — SectionHasPlantedHardscape
One to many

Polygon feature class — PlantedHardscape
Subtypes are Container, Roof Garden, Other.
Plantable areas on top of hardscape features like roof gardens and containers.

Relationship class — SectionHasExhibits
One to many

Polygon feature class — Exhibit
Subtypes are Animal, Art, Botanical, Educational, Other.
Exhibit boundaries.

Relationship class — ExhibitHasEnclosures
One to many

Relationship class — SectionHasPlantingAreas
One to many

Polygon feature class — PlantingArea
Subtypes are Soil, Turf, Wild, Other.
Planting areas boundaries.

Table — Enclosure
Subtypes are Amphibian, Bird, Insect, Fish, Mammal, Plant, Reptile, Other.
Exhibit enclosures.

Relationship class — EnclosureHasPointOfContacts
One to many

Relationship class — SectionHasStructures
One to many

Relationship class — EnclosureHasBarriers
One to many

Polygon feature class — OperationalArea
Subtypes are Administrative, Curatorial, Horticulture, Facilities, Janitorial, Other.
Work team areas.

Relationship class — OperationalAreaHasPointOfContact
One to many

Relationship class — PlantingAreaHasPlantingBeds
One to many

Polygon feature class — PlantingBed
Subtypes are Level, Raised, Other.
Planting bed boundaries.

Geodatabase Structure

Polygon feature class — Section
Smaller administrative boundaries for a garden or thematic area.

Relationship class — SectionHasStructures
One to many

Polygon feature class — Structure
Structure footprints.
Subtypes are Administration, Education, Exhibit, Facilities, Research, Visitor Amenity, Mixed, Other

Relationship class — StructureHasEnclosures
One to many

Table — Enclosure
Exhibit enclosures.
Subtypes are Amphibian, Bird, Insect, Fish, Mammal, Plant, Reptile, Other

Relationship class — StructureHasEntranceExits
One to many

Point feature class — EntranceExit
Entrances and exits to exhibits, structures, and other enclosed property.
Subtypes are Barrier, People Mover, Property, Structure, Other, Restricted Area

Relationship class — StructureHasPointOfContacts
One to many

Table — PointOfContacts
Contact relationship table.

Relationship class — PointOfContactIsOwner
One to many

Table — PointOfContactInfo
Contact information based on Microsoft Outlook 2007.

Relationship class — PointOfContactIsPrimary
One to many

Relationship class — PointOfContactIsSecondary
One to many

Geodatabase Schema

Simple feature class
Structure

Geometry: *Polygon*
Contains M values: *No*
Contains Z values: *No*

Structure footprints.

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
StructureID	String	Yes					20
Type	Short integer	No	3		0		
Name	String	Yes					50
Address	String	Yes					100
ConstructionDate	Date	Yes			0	0	8
ConstructionLifeExpectancy	Short integer	Yes			0		
ConstructionDocumentURL	String	Yes					200
FloorLevels	Short integer	No	1		0		
UtilityWater	Short integer	Yes		YesNo	0		
UtilityGas	Short integer	Yes		YesNo	0		
UtilityTelephone	Short integer	Yes		YesNo	0		
UtilityData	Short integer	Yes		YesNo	0		
UtilitySanitarySewer	Short integer	Yes		YesNo	0		
UtilityStormSewer	Short integer	Yes		YesNo	0		
SystemsHeating	Short integer	Yes		YesNo	0		
SystemsCooling	Short integer	Yes		YesNo	0		
SystemsFireSuppression	Short integer	Yes		YesNo	0		
SystemsSecurity	Short integer	Yes		YesNo	0		
ADA	Short integer	Yes		YesNo	0		
Access	String	Yes					20
EnclosureCode	String	Yes					20
PointOfContactID	String	Yes					20
Comments	String	Yes					100
SectionID	String	Yes					20
SHAPE_Length	Double	Yes			0	0	
SHAPE_Area	Double	Yes			0	0	

Structure ID
Structure Type
Structure Name
Address
Construction Date
Life Expectancy (years)
Construction Document URL
Floor Levels
Utility Water
Utility Gas
Utility Telephone
Utility Data
Utility Sanitary Sewer
Utility Storm Sewer
Systems Heating
Systems Cooling
Systems Fire Suppression
Systems Security
ADA
Access
Enclosure Code
Point of Contact ID
Comments
Section ID

Coded value domain
YesNo

Description: *Valid values are Yes and No.*
Field type: *Short integer*
Split policy: *Default value*
Merge policy: *Default value*

Code	Description
0	No
1	Yes

Relationship class
StructureHasEnclosures

Type: *Simple*
Cardinality: *One to many*
Notification: *None*
Forward label: *Enclosure*
Backward label: *Structure*

Origin feature class	Destination table
Name *Structure*	Name *Enclosure*
Primary key *EnclosureCode*	
Foreign key *EnclosureCode*	

No relationship rules defined.
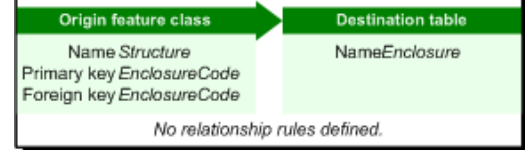
Relationship class
StructureHasEntranceExits

Type: *Composite*
Cardinality: *One to many*
Notification: *Forward*
Forward label: *EntranceExit*
Backward label: *Structure*

Origin feature class	Destination feature class
Name *Structure*	Name *EntranceExit*
Primary key *StructureID*	
Foreign key *StructureID*	

No relationship rules defined.
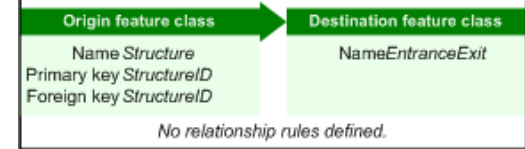
Current Development

- Geoprocessing tools for data loading and common analyses

- Beta Program to begin in March with five major institutional partners and numerous others

- IMLS 21st Century MP Grant for GIS Training ($302K)

- IMLS CPS Grant for Tree Assessment Module ($109K)

Tree Assessment
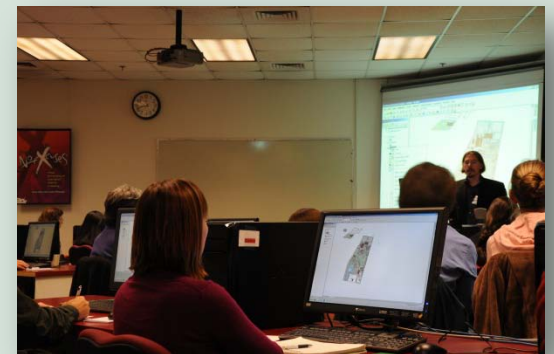
GIS Training Workshop

Tree Assessment Module

- Create GIS tools for health, hazard, and benefit assessment

- Based on i-Tree and Neighbourwoods

- Includes soil, water, and maintenance history data

- Links to i-Tree Eco, i-Tree Streets, and other analysis models

- Compatible with work order systems

Tree Assessment

Ecosystem Services

Project Partners

Arnold Arboretum of Harvard University

Chicago Botanic Garden

Missouri Botanical Garden

San Francisco Botanical Garden

Santa Barbara Botanical Garden

Smithsonian Gardens

Pukekura Park, New Zealand

UC Davis Arboretum

Zoological Society of San Diego

International Society of Arboriculture

USDA Forest Service

BG-BASE

the
alliance for
public gardens gis

GIS for Public Gardens

GIS Web Application for Living Plant Collection Research

Project Overview

- Develop a web-based mapping application for plant research

- Both in situ and ex situ

- Links Arboretum collections with herbaria, library, and internet biodiversity collections

- Useful to staff, visitors, and researchers
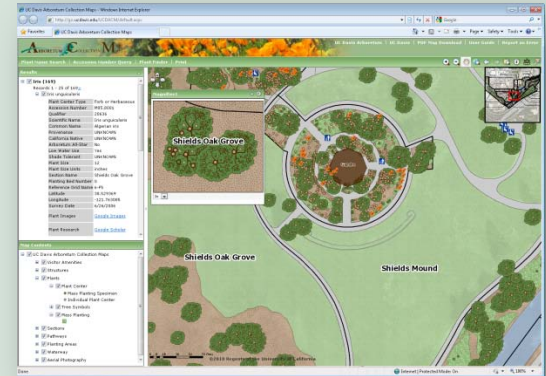
Prototype Web Application

Proposed Adobe Flex API Interface

Project Details

- Build GIS based on ArcGIS Public Garden Data Model

- Link with plant records system in BG-BASE

- Design application interface and widgets using ArcGIS Adobe Flex API

- Esri support for plant records link and application interface coding

Project Deliverables

- Living plant collection GIS

- GIS web application

- Geoprocessing tools for collection analysis and research

- Plant collection research case study

- Web application template
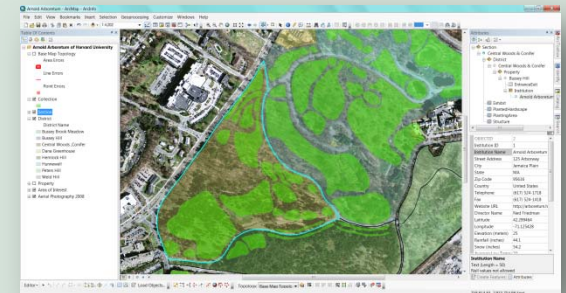
Living Plant Collection GIS
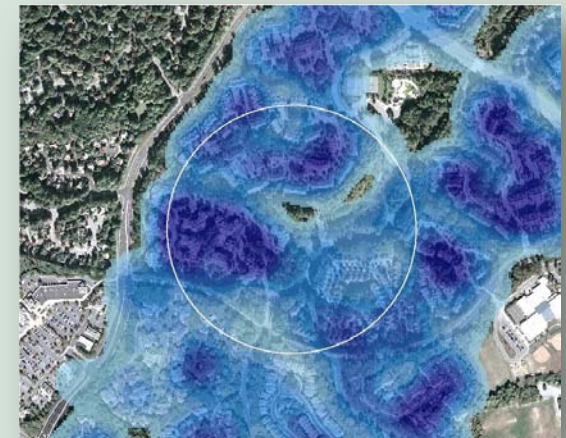
Geoprocessing Tool Result

Expected Results

- Well tested and revised data model

- ArcGIS – BG-Base connection

- Web app template will simplify process of providing collection access

- Ability to access multiple collections through one simple interface

- Invaluable to plant biodiversity conservation efforts
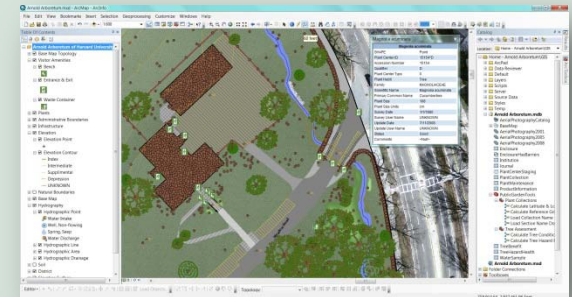
Arnold Arboretum GIS

Occurrences of Acer cappadocicum

Alliance for Public Gardens GIS

Alliance for Public Gardens GIS

GIS for Public Gardens

- Consortium of collection managers from gardens and zoos

- Promote and assist in the use of GIS for living collections management

- Website under development at **www.apgg.org**

- Google Group and LinkedIn group for community support

- Develop GIS training resources

APGG Website

APGG Google Group

Turn your Maps into an Information System

Download the ArcGIS Public Garden Data Model
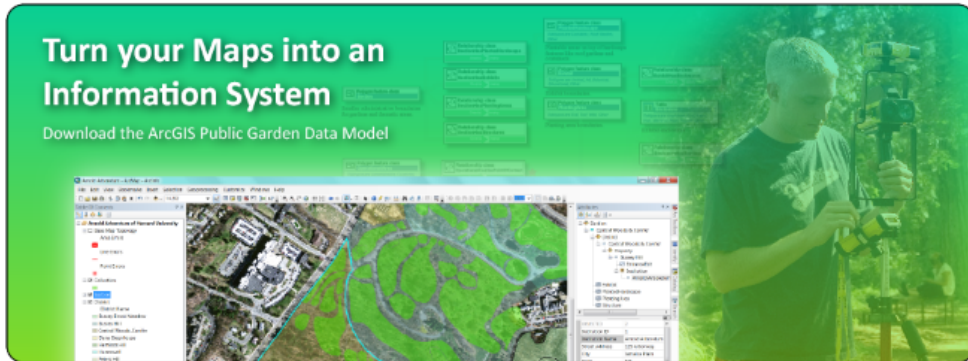
News

GIS Training Workshop Videos Available

Learn how to use the ArcGIS Public Garden Data Model to create a GIS for your garden.

Esri Announces Nonprofit Grant Program

Get Esri's ArcGIS software to start or continue your mapping project at no cost.

Public Gardens Grow Research Capability with GIS

Read about the UC Davis Arboretum's GIS web application.

Connect with APGG

Join the Alliance for Public Gardens GIS community.

APGG to Develop Training Resources

Read about the UC Davis Arboretum's IMLS grant to develop GIS training for museum professionals.

Read more news...

Resources

Get Funding

Esri Grant Programs | IMLS Grant Programs

Learn How to Use GIS

APGG Training | Events | Esri Training

Get Started

Products | Services | Community

Featured Video

Geospatial Revolution / Episode

00:00 /   Watch later   YouTube

Esri Grant Program

- APGA Members

- Esri ArcGIS, ArcPad, and extensions

- Online training, live training, and books

- Three years of software maintenance and support with renewal options
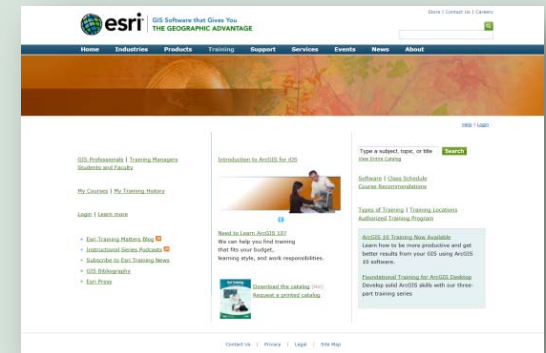
- Free user conference registration
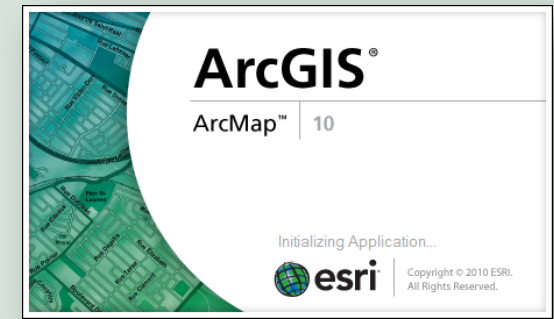
Esri ArcGIS

Esri Training Website

GIS Training for Museum Professionals

- Develop APGG website

- Social networking site

- Making the case for GIS materials

- Guide to GIS book

- Model volunteer program

- Professional services program

- Training videos

- Training workshop

APGG Summary

- Resources for getting funding

- Esri software, training, and support

- Data model, cartography, and web app templates

- Specialized instructor-led and self-study training
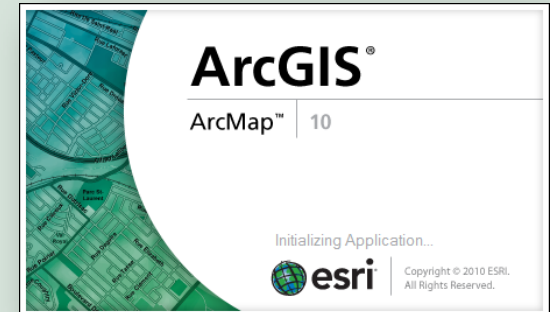
- Technical support and consulting services

arcgis
public garden data model

"The most powerful and efficient tool for creating a public garden GIS."

ArcGIS
ArcMap™ | 10

Initializing Application...

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GIS for Public Gardens:
Tools & Techniques for
Collection Management & Research

Brian Morgan
Putnam Research Fellow
Arnold Arboretum of Harvard University