Fusing Computer Science and Geography: Research Advances and Opportunities in Geographic Information Science

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14th November, 2006

Outline

- Green Visions Plan for 21st Century Southern California
- GIST (Geography Information Science and Technology) Body of Knowledge
- Geography and Computer Science as fundamental building blocks for next generation geographic information science toolsets

The Green Visions Plan for 21st Century Southern California

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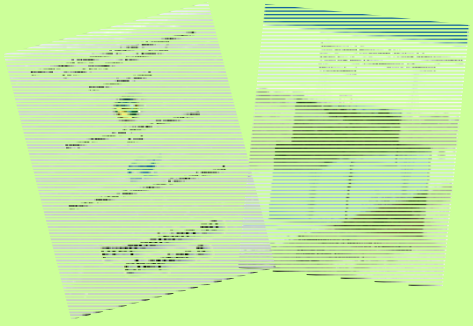
3rd October, 2006

Watershed management in Los Angeles is challenging

Granting agencies must prioritize competing proposals



Regional comparisons are difficult

The Green Visions Plan provides information about entire region

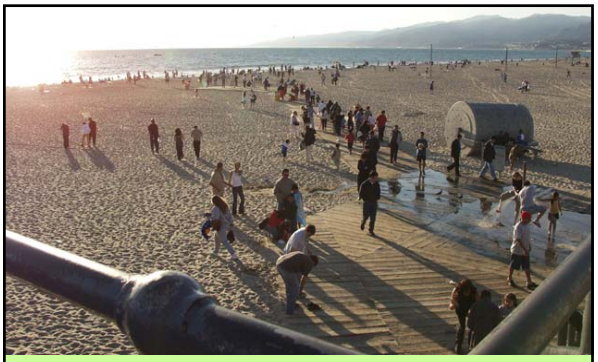
The Green Visions Plan online tools designed to support decisions

THE GREEN VISIONS PLAN
for 21st century southern california

Green Visions Plan balances habitat, watershed, and open space goals

Protect and restore native biodiversity

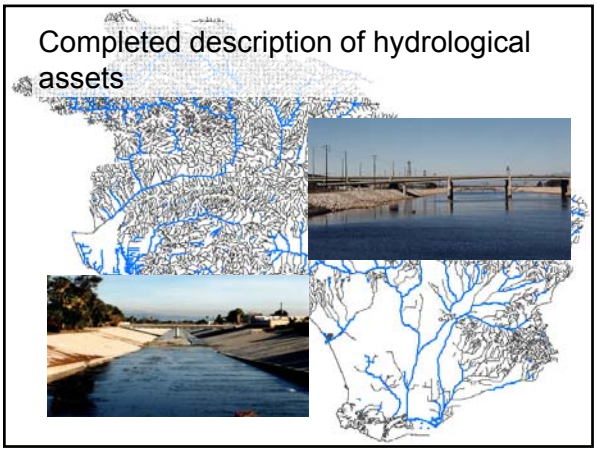
Improve watershed health



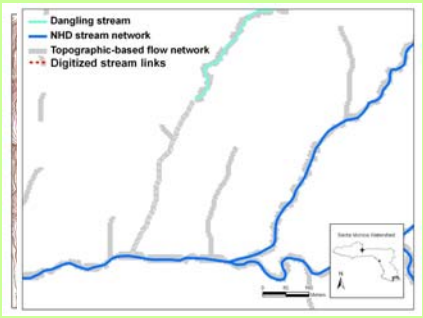
Increase access to recreational open space

Leverage funds with multiple use projects

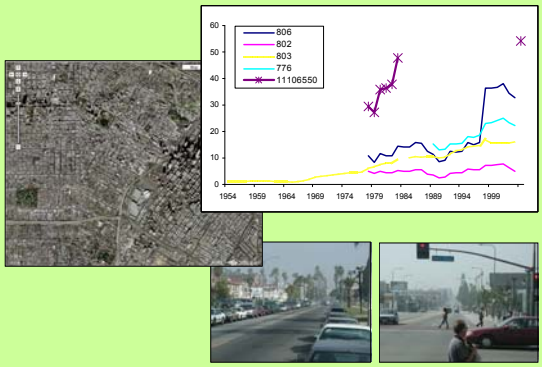
Completed description of hydrological assets

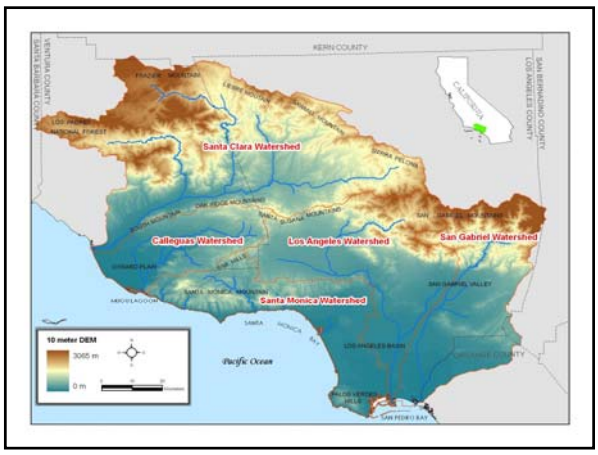


National Hydrography Dataset required significant cleaning

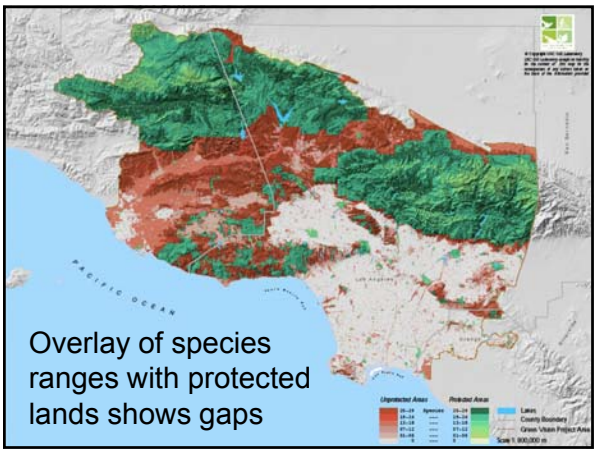


Assembled stream gauge histories

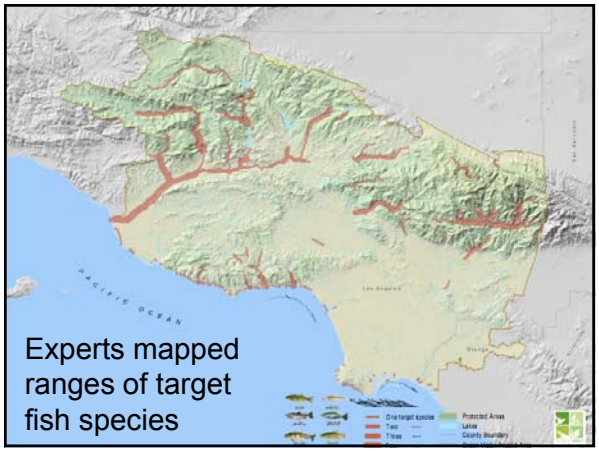




Implemented multiple species conservation approach



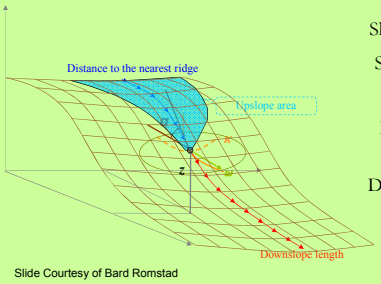
Overlay of species ranges with protected lands shows gaps



Experts mapped ranges of target fish species

Future research will concentrate on historical vegetation cover

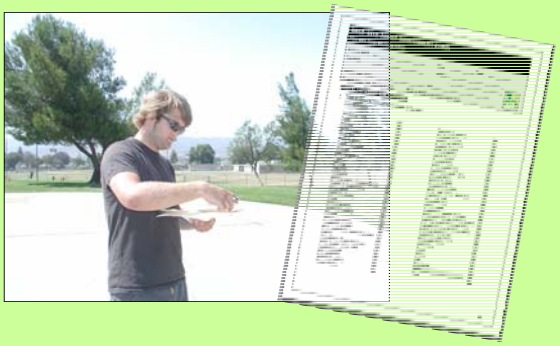
Topographic Attributes



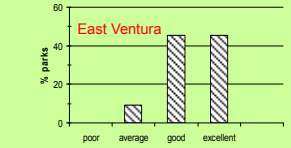
Slide Courtesy of Bard Romstad

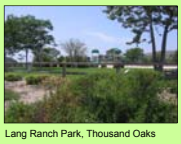
Elevation (**z**)
Slope gradient (**α**)
Slope aspect (**ω**)
Curvatures (**κ**)
Distance to the nearest ridge
Downslope length
Upslope area

Conducted extensive audit of recreational open space



First regional comparison of open space quality and quantity



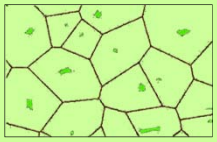


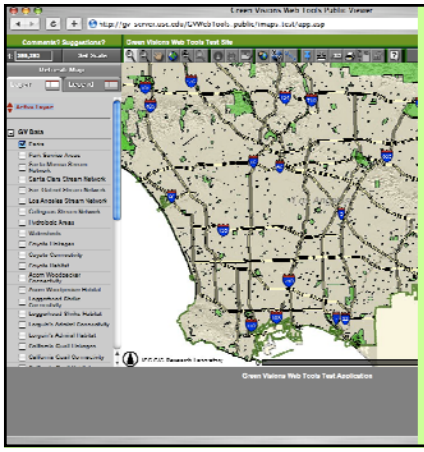
Lang Ranch Park, Thousand Oaks

Theresa Lindsay Park, Los Angeles

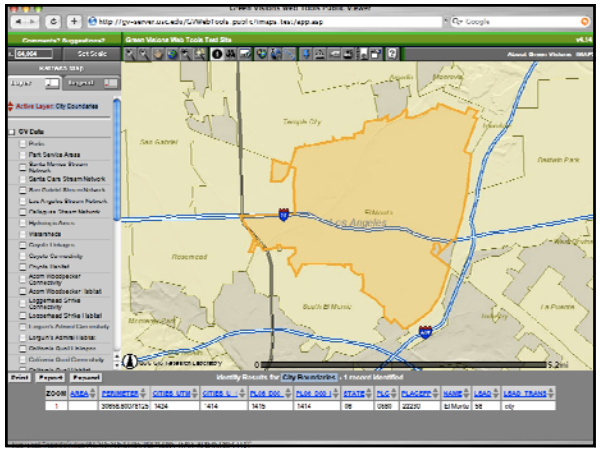
Calculated mismatch between park supply and park need

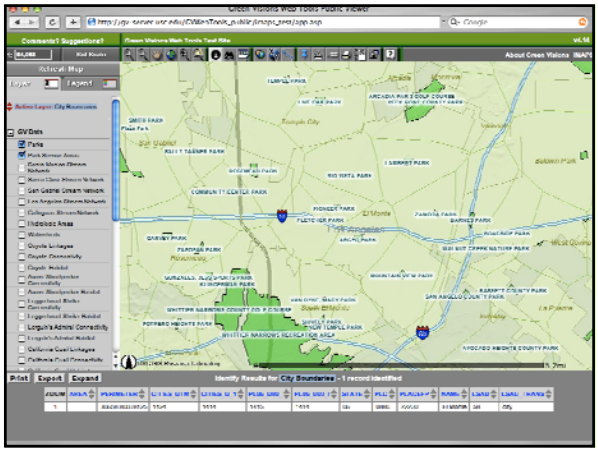
- Park congestion – demand for parks assuming everyone uses nearest park at some uniform rate
- Park service areas – network variant of map equity approach adopted by Wolch et al. (2005)

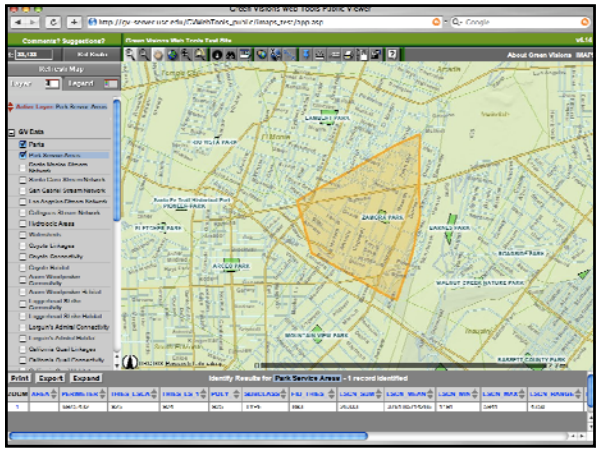


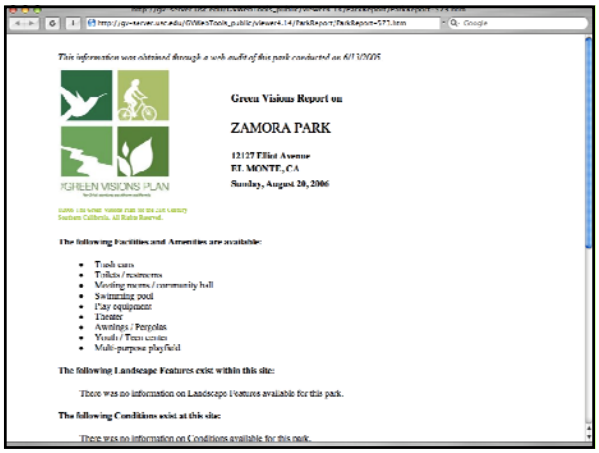


Developed set of online tools for decision support









This information was obtained through a web audit of this park conducted on 6/13/2006

Green Visions Report on

ZAMORA PARK

12127 Elliot Avenue
EL MONTE, CA
Sunday, August 20, 2006

The following Facilities and Amenities are available:

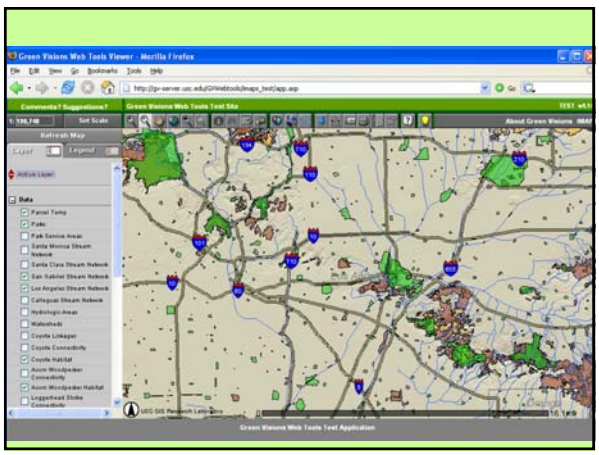
- Trash cans
- Toilets / restrooms
- Meeting rooms / community hall
- Swimming pool
- Play equipment
- Theater
- Awnings / Pergolas
- Youth / Teen center
- Multi-purpose playfield

The following Landscape Features exist within this site:

There was no information on Landscape Features available for this park.

The following Conditions exist at this site:

There was no information on Conditions available for this park.



Tools will predict suitability for water infiltration (Phase III)

- Impervious surface estimates show need
- Historic soils map gives permeability
- Topographic attributes help to determine likelihood of infiltration

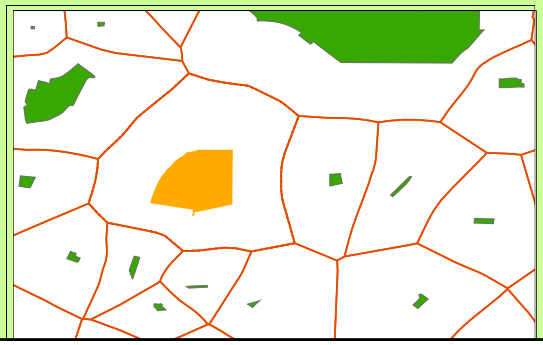
Tools will identify sites needing water quality improvements

- Region-wide predictive water quality model will
  - Identify those areas most in need of water quality improvements
  - Assess need for storm water capture and management

Storm drain coverage would (will) increase functionality

- "Pipes" for region currently being digitized
- Incorporation of these data would help
  - To better model storm water quantity and quality
  - Identify pollution control needs

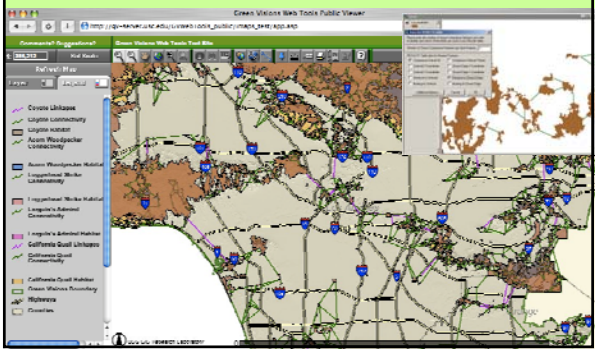
Tools assess need for recreation and public access



Park Analysis Results …

Parks	People per park hectare	
	Existing	New
New Park	2,000-7,000	233
Peck Rd County Park	213	165
Barnes Park	3,733	1,582
Roadside Park	6,606	4,213
Morgan Park	7,144	4,037
Santa Fe Dam Rec. Area	20	18
Lambert Park	15,250	2,839
Zamora Park	20,140	7,321
Bassett Lit. League Park	16,634	15,997

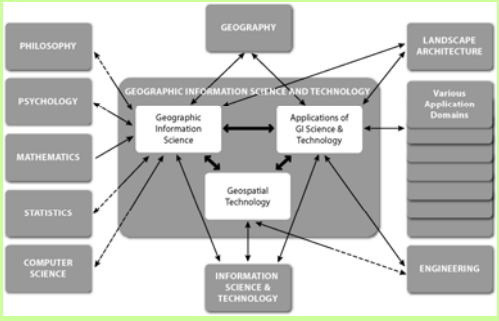
Tools show need for ecosystem management strategies



Tools show environmentally sensitive habitat areas

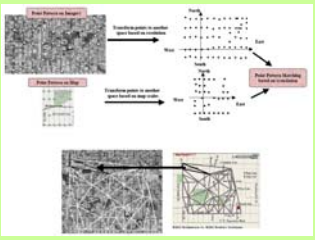
- Projects should *reduce pollution in environmentally sensitive habitat* areas
  - Tools map these areas based on modeled presence of target species (both terrestrial and aquatic)

GIST Body of Knowledge



Data Integration

- Slide shows some of Jason Chen's work
- Automated and locally optimal matching of multiple data themes (sources)
- Not ready for primetime yet



Geocoding Tools

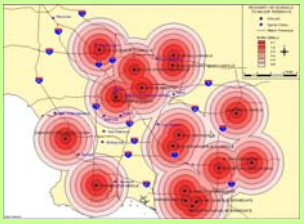
- Current solutions use lists of street addresses and a street reference file
- Generate numerous problems
- New tools use parcel databases to improve precision and accuracy

Gazetteer Databases & Services

- Turns vernacular place names into formal spatial referencing systems used by computers
- Take a "bottom up" approach
- Offers better coverage, precision, accuracy, etc.

Maps and More!

- Much of my talk focused on maps
- Maps are important visualization tools
- We need in future to focus on queries – particularly those that are important and yet difficult to accommodate with today's GISystems



Collaborators

- Faculty – Joseph Devinny, Craig Knoblock, Travis Longcore, Cyrus Shahabi, Jennifer Swift, Zaria Tatalovich, and Jennifer Wolch
- Graduate Students – Parisa Ghaemi, Daniel Goldberg, Christine Lam, Thao Nguyen, Jingfen Sheng, and Chona Sister

Web Links / Questions …

GREEN VISIONS PLAN

http://uscgislab.net

http://greenvisionsplan.net

http://gv-server.usc.edu/GVWebTools_public/imaps_test/app.asp