

Designing Great Maps for **Print and Image**



Allen Carroll and Larry Orman

About Allen and Larry



Larry Orman, Exec. Dir., GreenInfo Network

- Magic marker map maker for years pre-GIS
- 19 years NGO advocacy and 19 geotech world
- Maps are a powerful lens for seeing the world



Allen Carroll, Esri Online Content Mgr.

- Family cartographer and navigator since age 5
- 27 years at National Geographic, 12 of them as Chief Cartographer
- Believer in the power of maps to inform and inspire



Why we're here



This?

... or this?



About this workshop series

#1: General Overview

#2: Print/image

#3: Web/mobile (1:30pm today)

What we'll cover in this session

- 1 Why good map design?
- 2 Visual perception
- 3 Content & story in design
- 4 Design process
- 5 Common pitfalls
- 6 What to remember

1



Why
Focus on
Good Map Design?

But first, a **quiz** for you





What We've Accomplished in *Martis Valley*

Over the past five years, Sierra Watch has created remarkable conservation outcomes for a valley that was once slated for massive development.

In 2011, Sierra Watch submitted comprehensive proposals for the Martis Valley. Since then, as the Martis Valley Commission studied the proposals, we've secured 30,000 acres of land to be used for wildlife, water quality, recreation, and open space — only 2,000 of which were protected.

Small farms, we have worked with conservation organizations, and worked closely to implement our conservation plan.

Through our regulatory strategy and other efforts, 8,000 acres are already protected under local management plans, conservation easements, and through purchase. And we've secured a grant of additional funding to support future acquisitions.

Looking ahead, Sierra Watch needs to secure contracts for remaining priority conservation lands, including the 7,000-acre Sierra Pacific Industries property, and to safeguard Martis Valley's irreplaceable natural resources for generations to come.



Sierra Watch
10000 Sierra Blvd, Suite 100, Reno, NV 89511
775.784.1111
www.sierra-watch.org



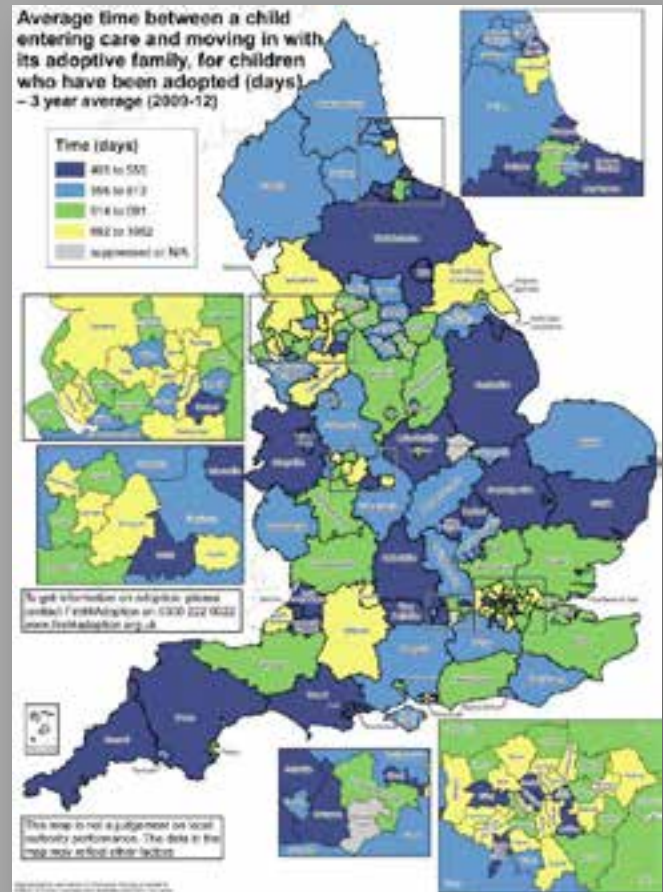
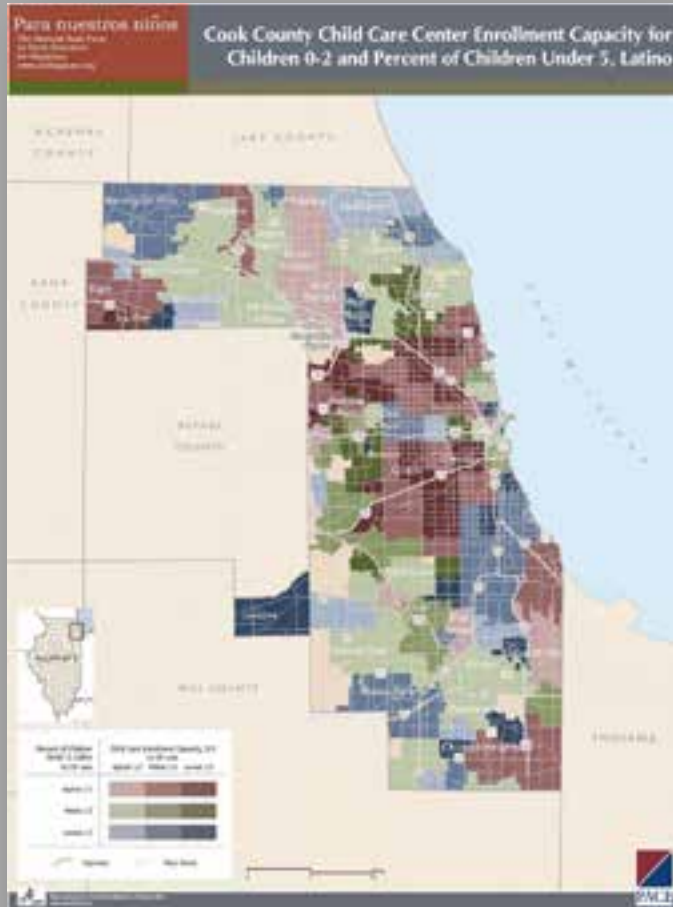
- Recently Protected Land
- Priority Conservation Area
- Priority Conservation Target
- Existing Protected Land
- Developed Area



1?

or

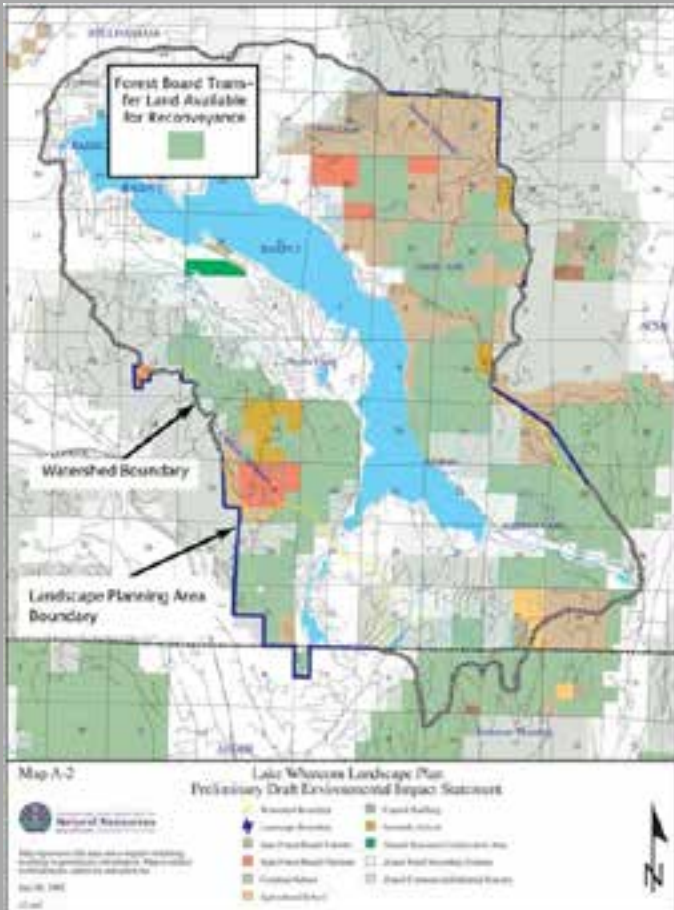
2?



3?

or

4?



5?

or

6?



Good Design Matters

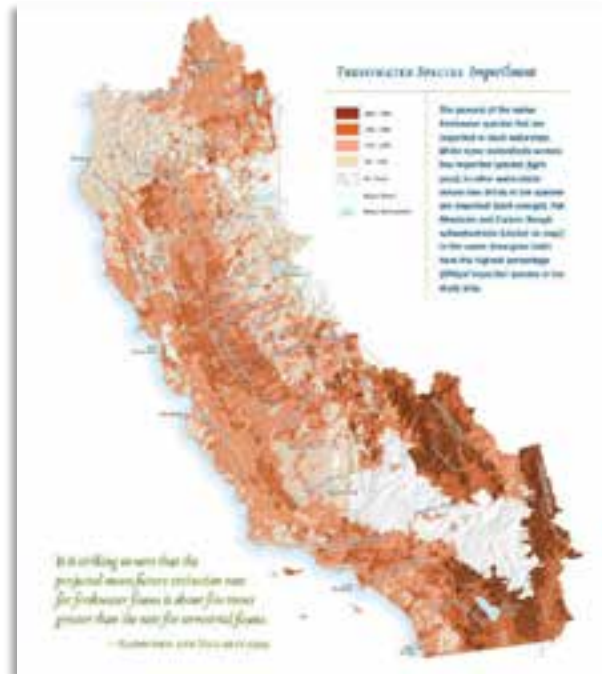


- Maps ARE **communication** – must persuade, inform
- Maps can take big **efforts** (\$, time)
- Maps are **hard** for people to understand
- Professional credibility from product **quality**
- **Competition** for attention nowadays



“We’re inundated with
data but starved
for **meaning**”

Goals for map design



Aha!

Inspire

Compel

Persuade

Inform

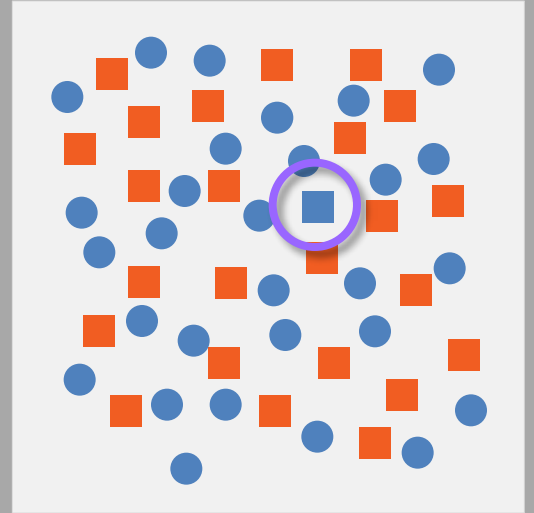
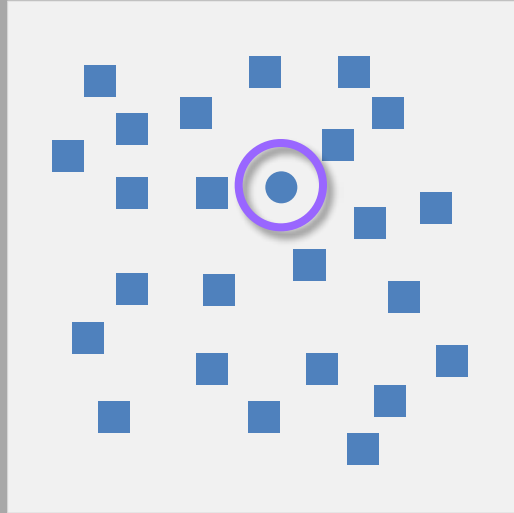
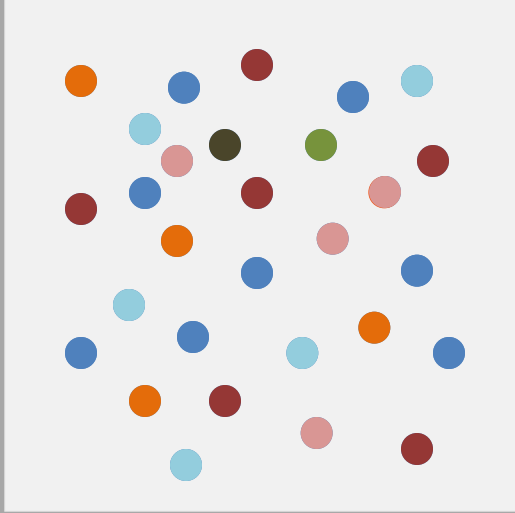
Adjudicate

2



How
Visual Perception
Works

2 6 6 9 3 8 7 2 1 4 8 0 9 5 6 7 9 1
1 5 4 7 8 2 6 0 9 1 2 7 8 9 1 3 4 5
0 4 1 9 8 7 2 4 5 1 3 9 0 1 6 2 9 2



How **your brain** perceives



<1 second

PRE-ATTENTION



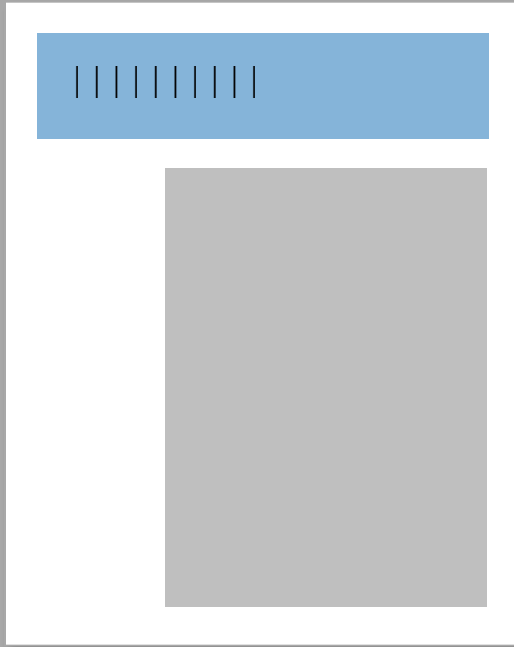
1-3 seconds

RECOGNITION

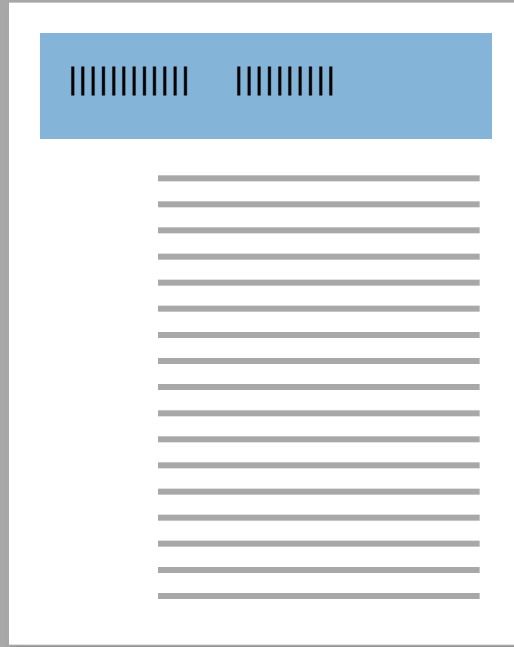


3-20 seconds +

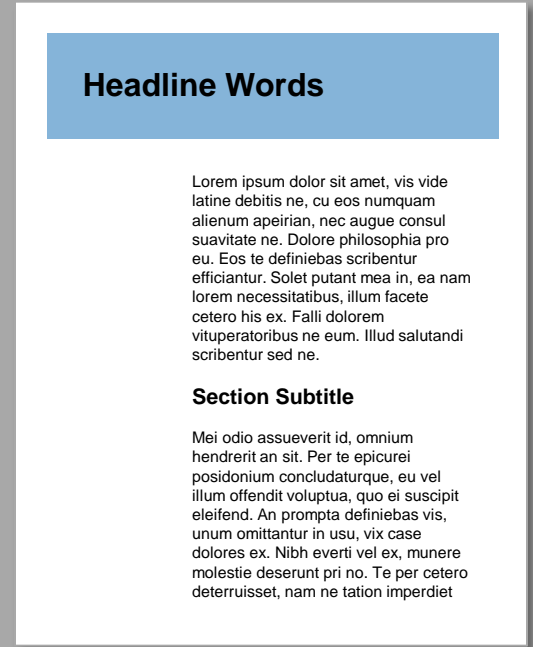
COGNITION



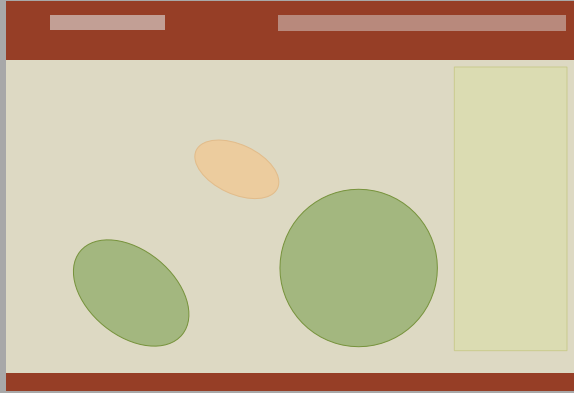
<1 second
Color, shapes, contrast



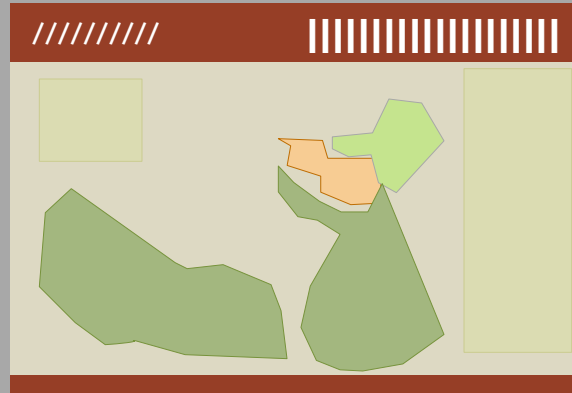
1-2 seconds
resolve objects



3+ seconds
engage content



<1 second



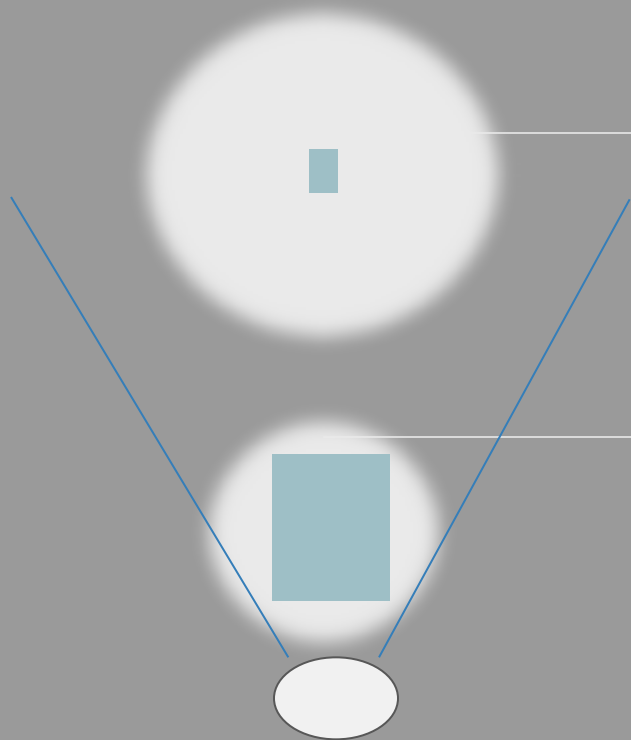
1-2 seconds



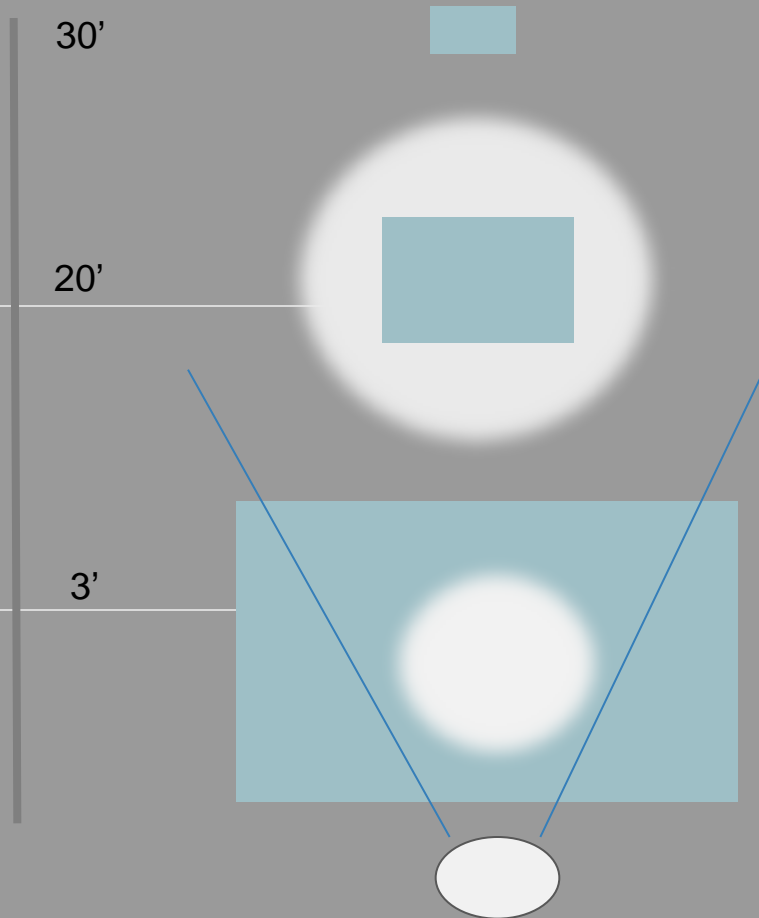
3+ seconds

First glimpse is critical for engagement

Field of vision



Page sized map/image



Poster sized map

Eye tracking, movement



Design for eye movement

Geography, class, and fate: Passengers on the Titanic

A century ago the Titanic collided with an iceberg in the North Atlantic and sank. Mapping travelers' hometowns reveals the immigrant status of most third-class passengers, who also suffered the highest fatality rates.

Filter a class: All Passengers First Class Second Class Third Class

Click on a class to view detailed info and travel details.

Click on locations for a passenger list and death count info.

Click a passenger for more information.

Survival Died

- Mr. Henry Anderson**
- Mrs. Charles Appleton**
- Colonel John Aker IV**
 - Hometown: New York City, New York, USA
 - Survived: No
 - Recorded All Chatterbox: No
 - Recorded Destinations: New York City, New York, USA
 - Age at Death: 70
 - Class: First
 - Outcome: Died
 - Photo: Not available
- Mr. Victor Bolduc**
- Mrs. Madeline Artur**
- Mrs. Rosalie Blais**
- Mrs. Caroline Doolan**

Hometown: New York City, New York, USA
(selected Destination: New York City, New York, USA)

Sunk the Titanic in Charleston

esri

VALLEY & STATE

Arizona's growing pains

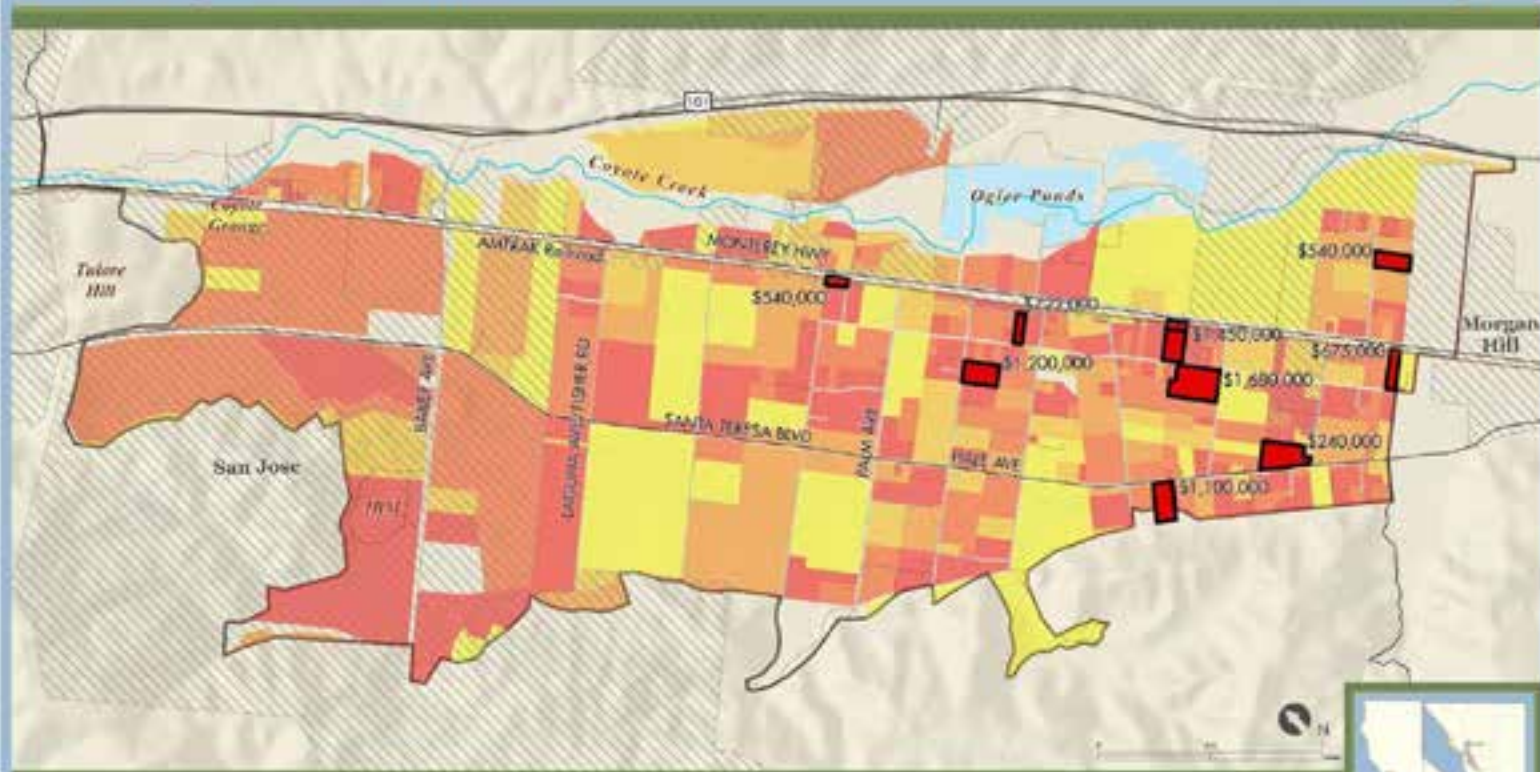
Environmental impacts of growth, weather changes impact on...

5 days Valley

THUR	FRI	SAT	SUN	MON
Arizona's growing pains	Arizona's growing pains	Arizona's growing pains	Arizona's growing pains	Arizona's growing pains
Arizona's growing pains	Arizona's growing pains	Arizona's growing pains	Arizona's growing pains	Arizona's growing pains
Arizona's growing pains	Arizona's growing pains	Arizona's growing pains	Arizona's growing pains	Arizona's growing pains
Arizona's growing pains	Arizona's growing pains	Arizona's growing pains	Arizona's growing pains	Arizona's growing pains

Land + Improvement Values

CONSERVING
COYOTE VALLEY
AGRICULTURE



Coyote Valley Boundary	Freeway	Assessed Land + Improvement Values Per Acre			Parcels sold since 2004 are outlined and labeled with sale price.
Incorporated Region	Roads	100K+	30-49.9K	0-14.9K	
AMTRAK Railroad		50-99.9K	15-29.9K	No Data	

Map Source:
County of Santa Clara
The Incorporated Counties
Map of Santa Clara
County
March 2, 2011



3



Content & Story in Design

communication design



Intent



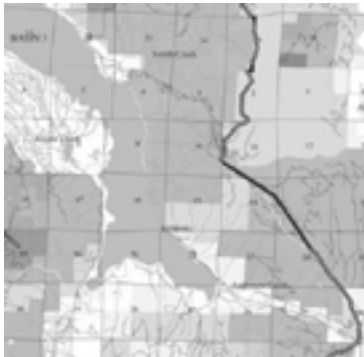
Audience



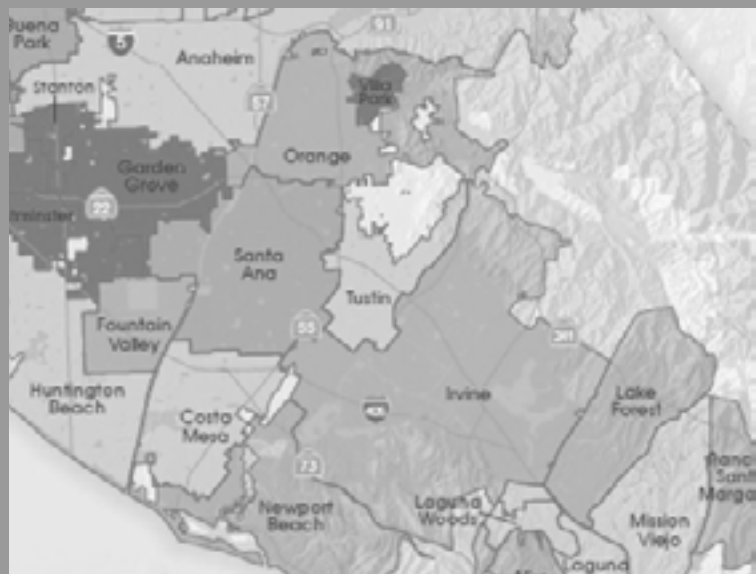
Strategy



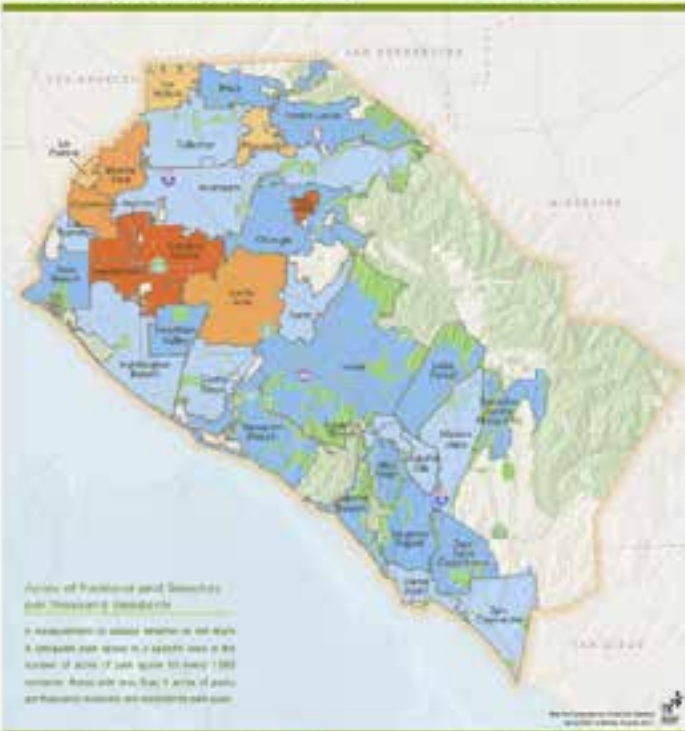
Format



map design = just cartography?



Park Score by City



Acres of Parkland and Beaches per Thousand Residents

A measurement to assess whether or not each city is providing park space to its residents based on the number of acres of park space for every 1,000 residents. Areas with less than 1 acre of park space per thousand residents are considered low park.

Acres of Parkland and Beaches per Thousand Residents

- 0 - 1 acre
- 1 - 2 acres
- 2 - 3 acres
- 0 - 10 acres
- More than 10 acres

Legend for map symbols:

- City Boundary
- Park Land
- County Unincorporated
- Highway
- County Line

Other Features

- City Boundary
- Park Land
- County Unincorporated
- Highway
- County Line



Who is your **audience**?

What is your **point**?



Your audience . . .

Willing to learn, but **busy**

Intelligent, but maybe **not map savvy**

i.e., Allen's mom..





Your point . . . ?

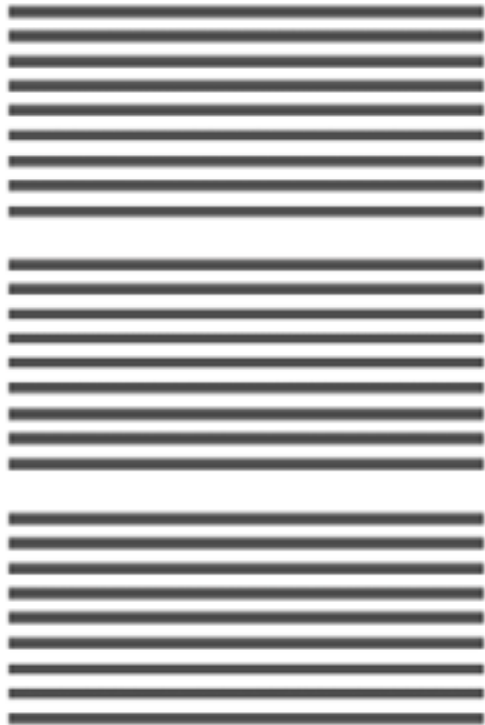


Make your point with storytelling

- A **message**
- A **sequence** of telling
- With **audience** in mind



From **raw data**



>

to **story**

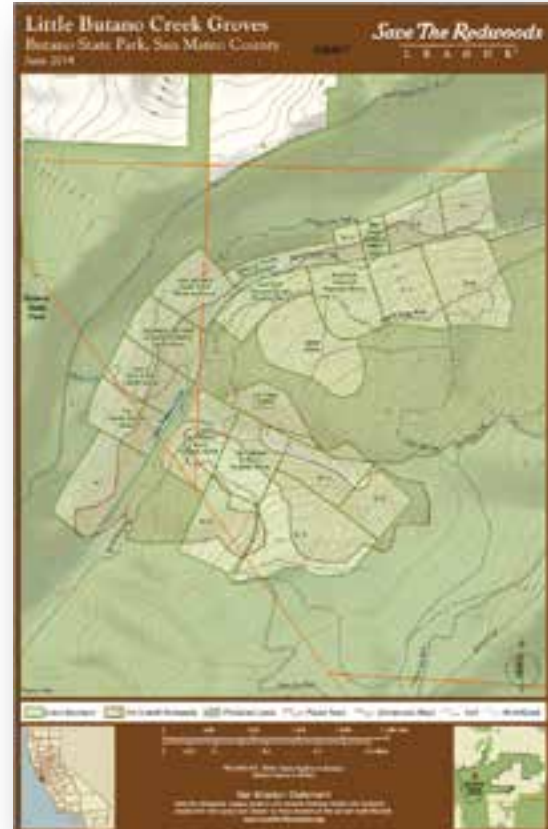


From raw data



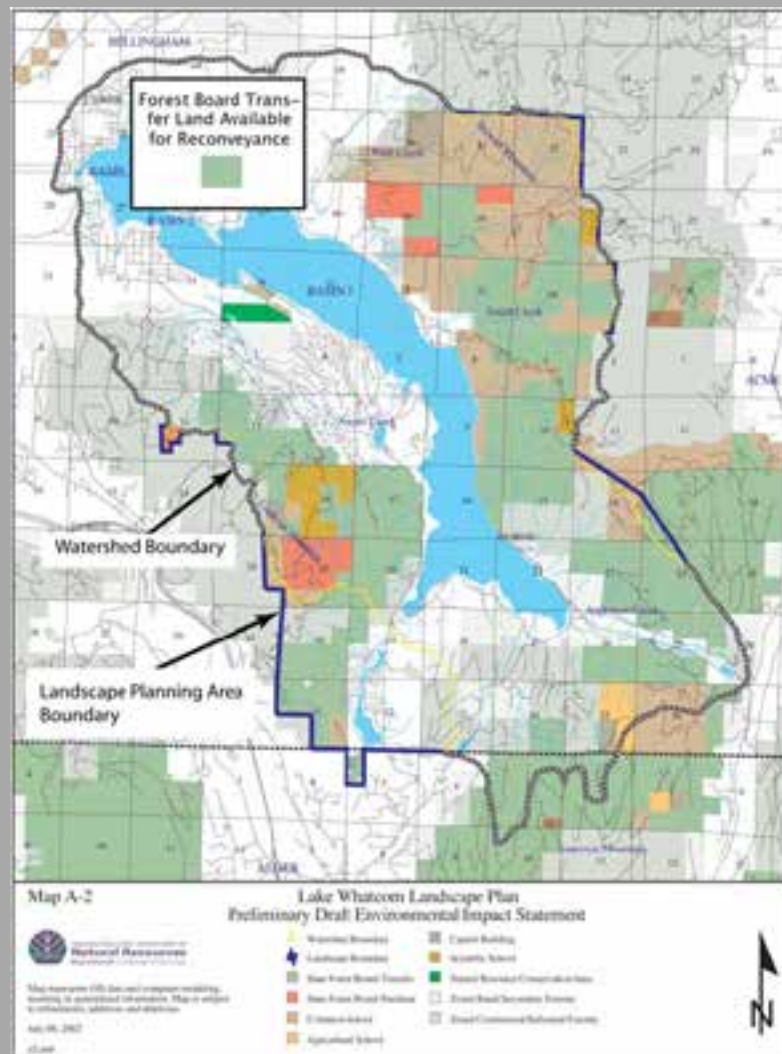
v

to story

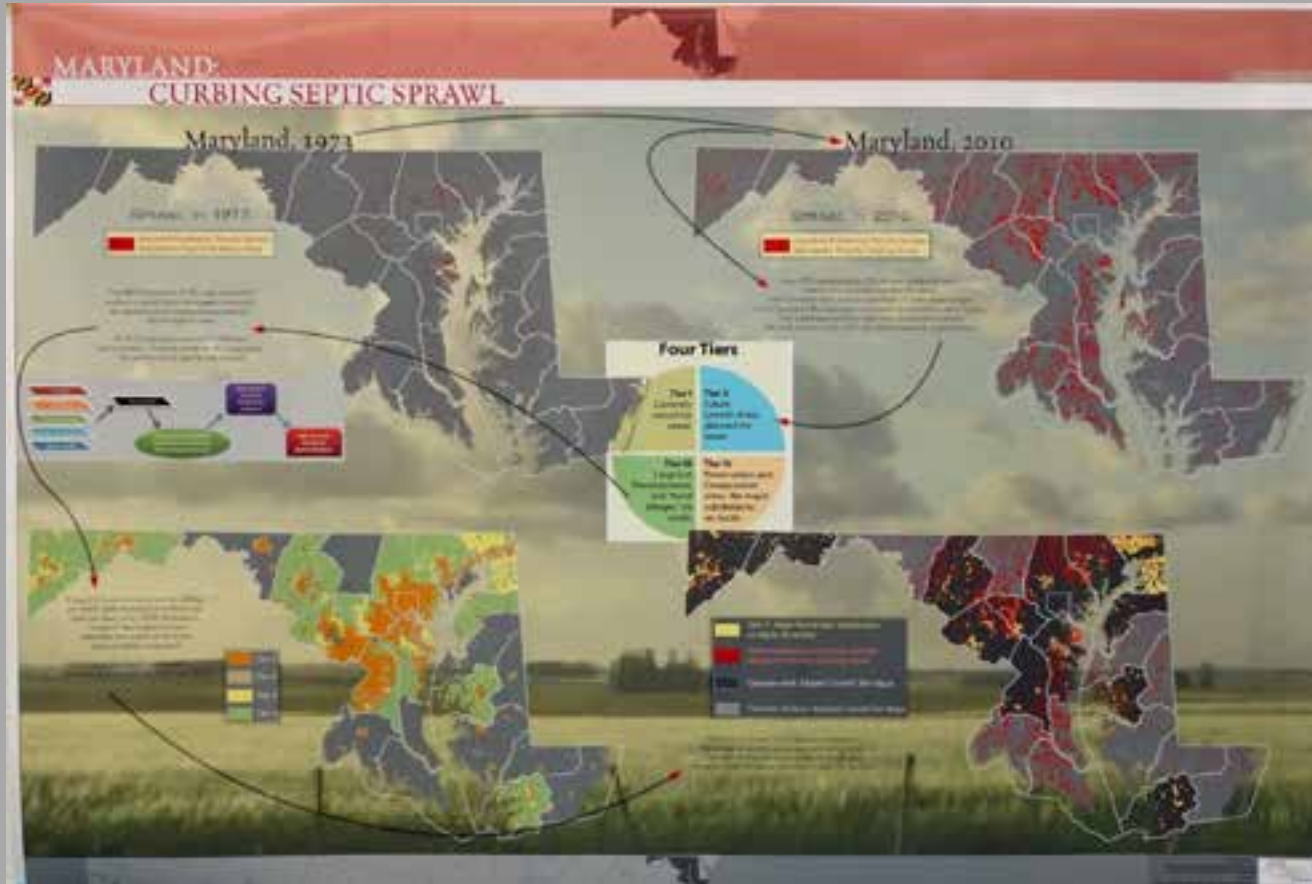


What's the
point?

No story,
no point



There's a great *story* in here . . . somewhere



The Eastern Forests

Air, Water, Life Treasures Worth Protecting

These forests are home to a rich diversity of plants and animals. They are also a source of clean air and water. The forests are a natural resource that we must protect for the future.

The forests are a natural resource that we must protect for the future. They are a source of clean air and water. The forests are a natural resource that we must protect for the future.

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The map shows the distribution of forest types and critical areas at risk. The critical areas are highlighted in red on the map.

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Critical Areas At Risk



Water Quality
The forests are a natural resource that we must protect for the future. They are a source of clean air and water. The forests are a natural resource that we must protect for the future.



Wildlife
The forests are a natural resource that we must protect for the future. They are a source of clean air and water. The forests are a natural resource that we must protect for the future.



Recreation
The forests are a natural resource that we must protect for the future. They are a source of clean air and water. The forests are a natural resource that we must protect for the future.



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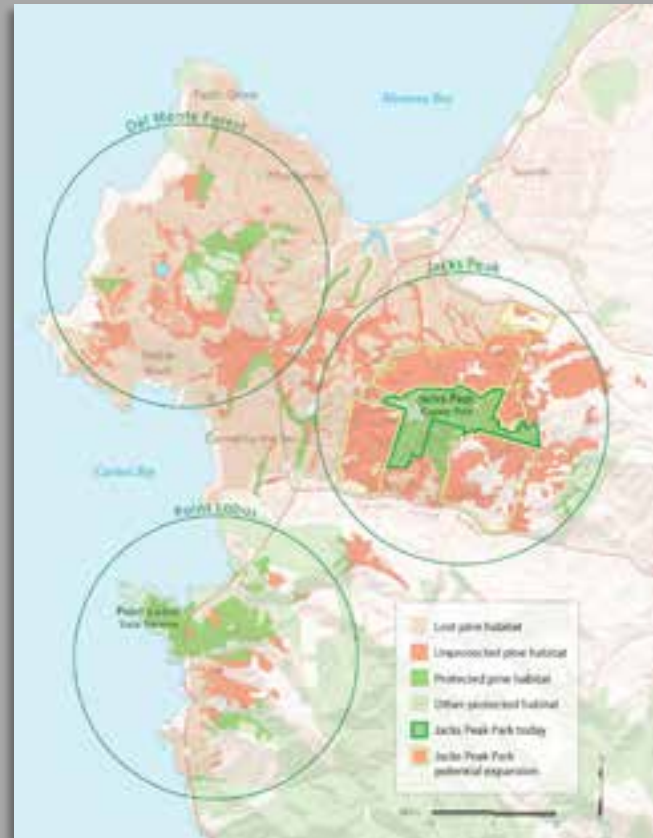
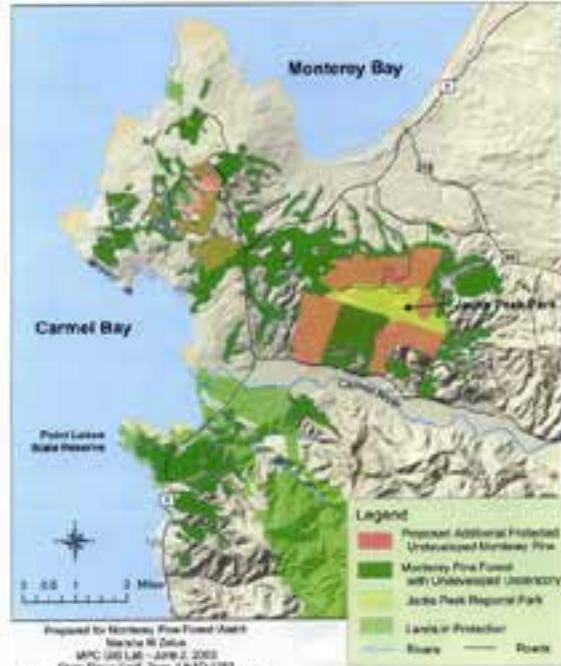


Wildlife
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Recreation
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Proposed Additional Protection for Undeveloped Monterey Pine Forest



“A little forest left, 1 big opportunity”



Intent



Audience



Strategy



Format



Where and how will your map be seen?



4



Design Process

Design gives **voice** to our information

So **HOW** do we *design* great maps?

Designing a map

(Assume story and audience)

1. Process
2. Concept
3. Branding
4. Composition
5. Layout
6. Cartography



1. PROCESS of Design

(depends on time/budget . . .)

- Concept + data test
- Composition sketch
- Draft frame
- Draft map content
- Full draft, test
- Refine, test
- Finalize



2. Concept

Sketch main
message and
key **elements**
for layout



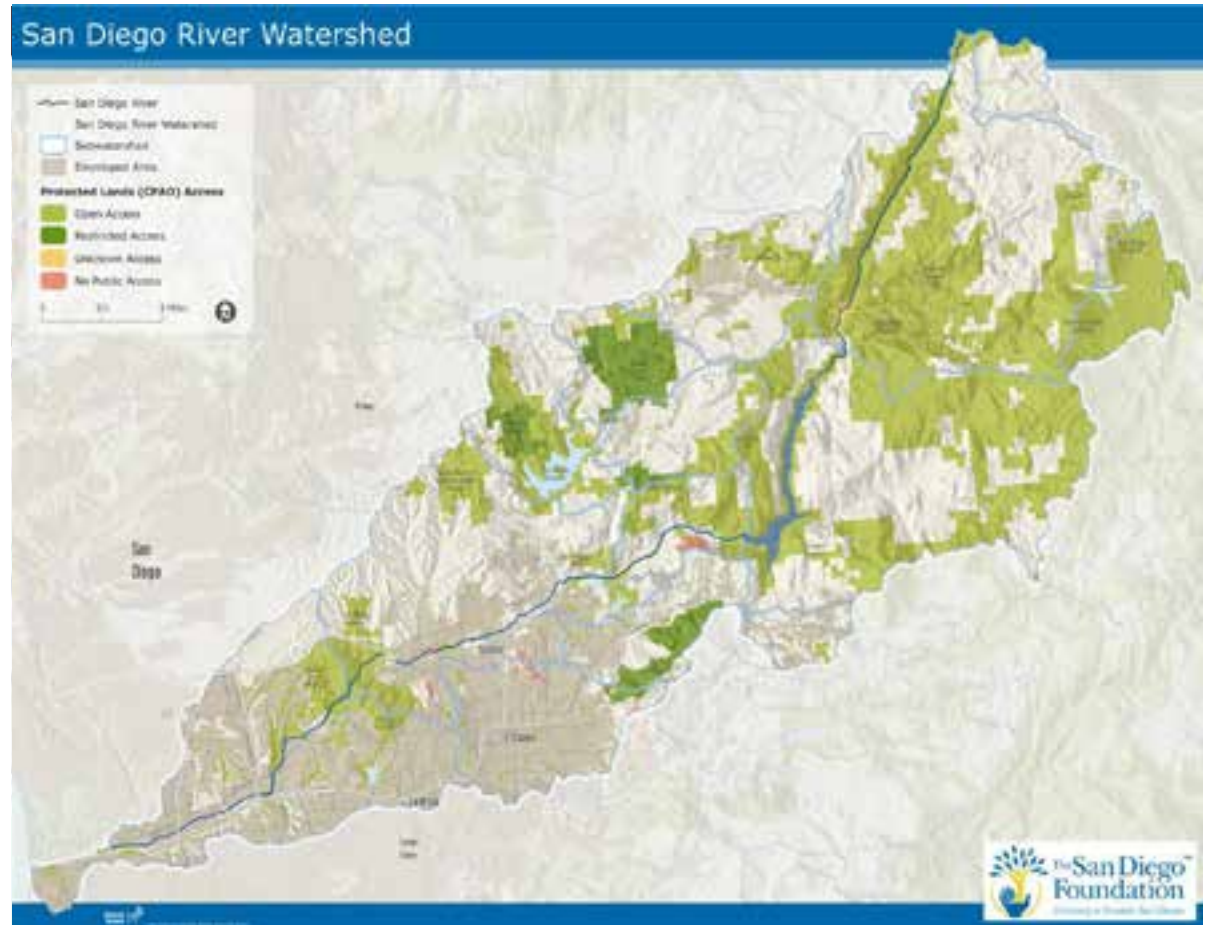
3. Branding

Look & feel

Color

Logo

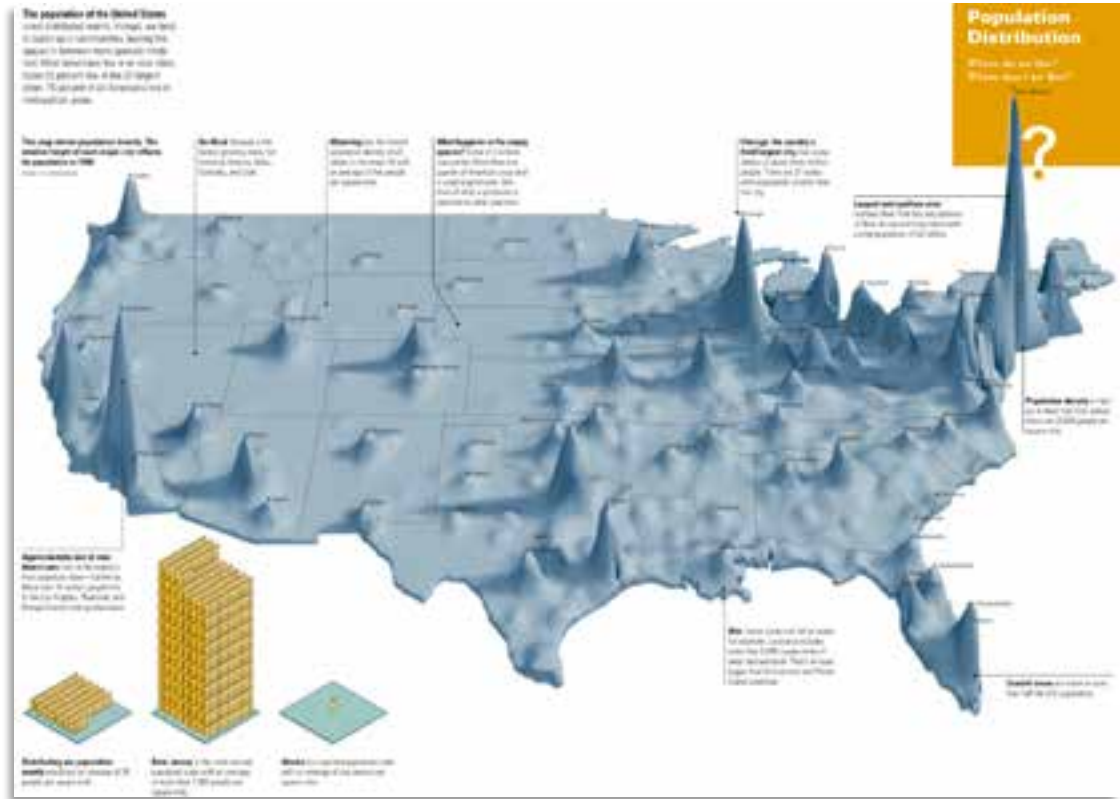
(fonts)



4. Composition . . .

How visual space works

- center
- balance
- negative space
- rule of thirds
- flow/eye movement



5. Layout

Grids:

- Align
- Apportion
- Balance



EMERALD NECKLACE

FEASIBILITY STUDY & IMPLEMENTATION PLAN - PHASE I

The Emerald Necklace is an extraordinary 17-mile loop of recreational trails connecting the San Gabriel River and the San Joaquin River. Phase I of the project will connect the regional recreational trails network and create access to hundreds of thousands of residents. Challenging others to think about trails in a new way, the feasibility study will continue to expand the system to include new trails, signage, and public art projects.

Westside Multi-Use Trail

A Trail for All User Groups

A multi-use trail connecting the Westside area to the regional trails network.

- 12 Multi-Use Trail at Foothill West Area, State Highway 99 to the County Center with Bikes, Joggers, etc.
- 13 Multi-Use Trail at Foothill West Area, State Highway 99 to the County Center with Bikes, Joggers, etc.
- 14 Westside Multi-Use Trail from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 15 Multi-Use Trail at Foothill West Area, State Highway 99 to the County Center with Bikes, Joggers, etc.
- 16 Multi-Use Trail at Foothill West Area, State Highway 99 to the County Center with Bikes, Joggers, etc.

Whittier Narrows Connectivity

Linking Existing Trail Network

A multi-use trail connecting the Whittier Narrows area to the regional trails network.

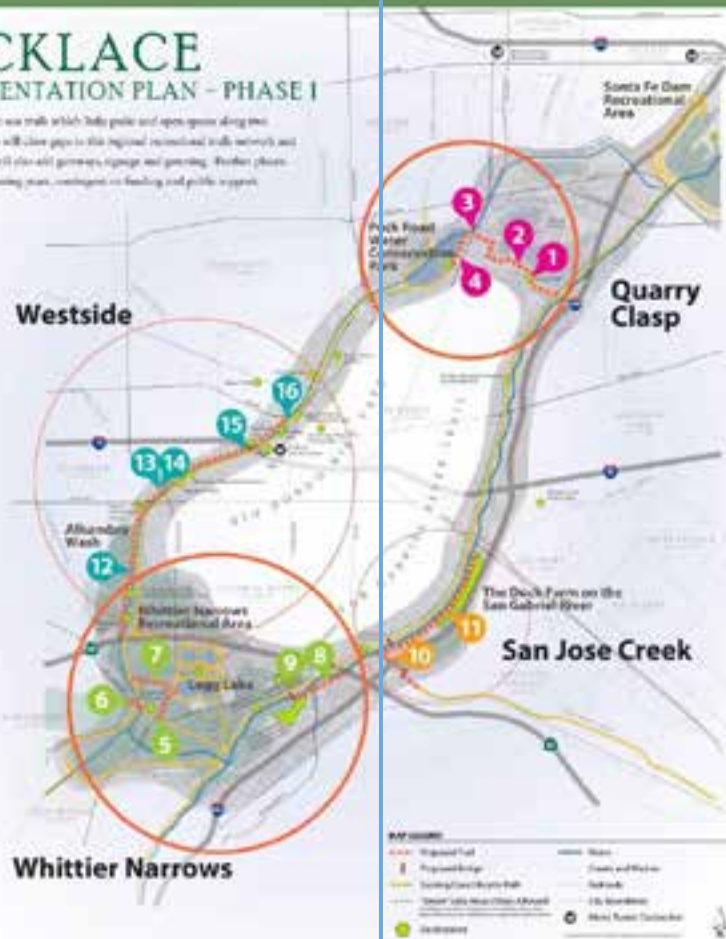
- 1 Clean Riparian Path on the Riverbank to the County Center
- 2 Clean Riparian Path from the County Center to the San Gabriel River
- 3 Clean Riparian Path from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 4 Multi-Use Path from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 5 Multi-Use Path from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 6 Clean Riparian Path from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 7 Clean Riparian Path from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 8 Multi-Use Path from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 9 Multi-Use Path from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 10 Multi-Use Path from the County Center to the San Gabriel River with Bikes, Joggers, etc.

PROJECT COMPONENTS



Westside

Whittier Narrows



Quarry Clasp

Completing the Loop

A multi-use trail connecting the Quarry Clasp area to the regional trails network.

- 1 Multi-Use Trail from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 2 Multi-Use Trail from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 3 Riparian Crossing at the County Center with Bikes, Joggers, etc.
- 4 Multi-Use Trail from the County Center to the San Gabriel River with Bikes, Joggers, etc.

San Jose Creek Regional Access

Connecting Communities

A multi-use trail connecting the San Jose Creek area to the regional trails network.

- 11 Multi-Use Trail from the County Center to the San Gabriel River with Bikes, Joggers, etc.
- 12 Multi-Use Trail from the County Center to the San Gabriel River with Bikes, Joggers, etc.

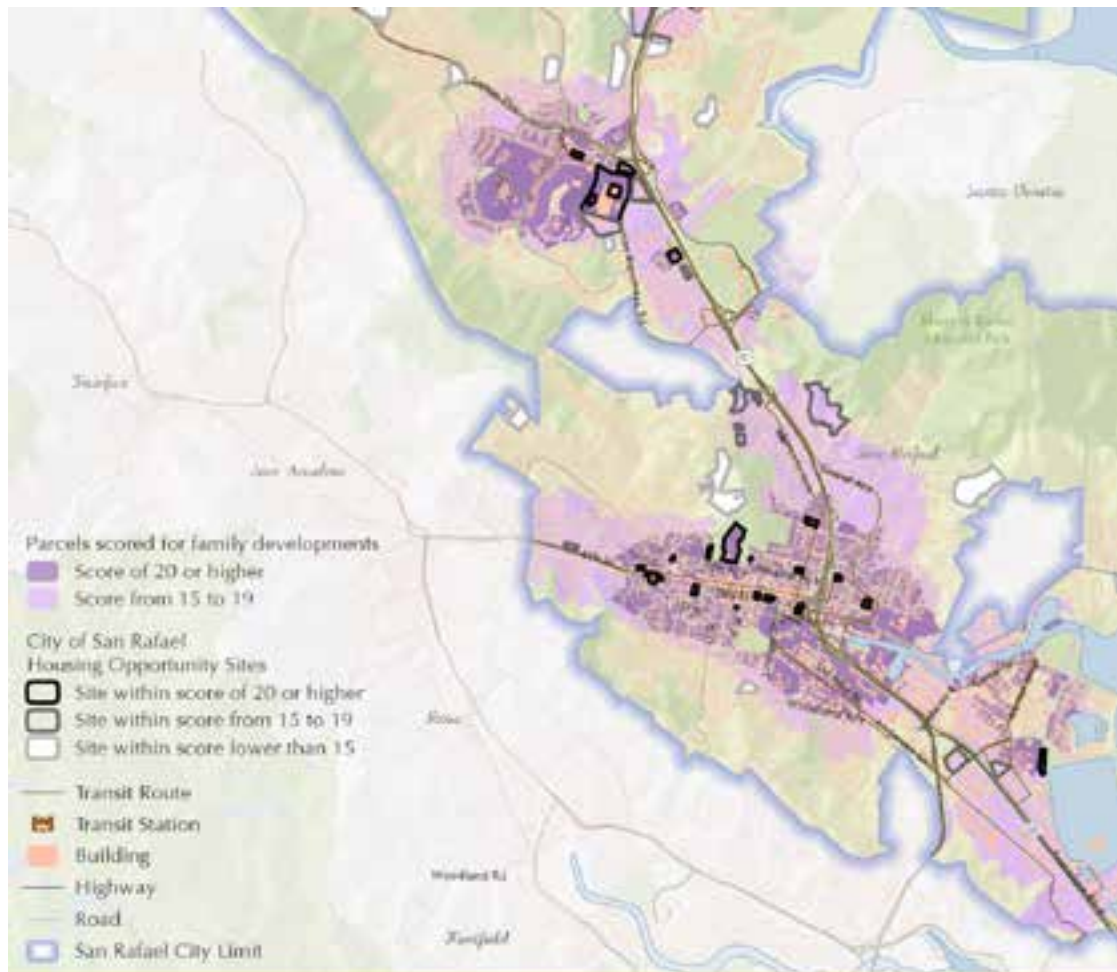


PROJECT PARTNERS



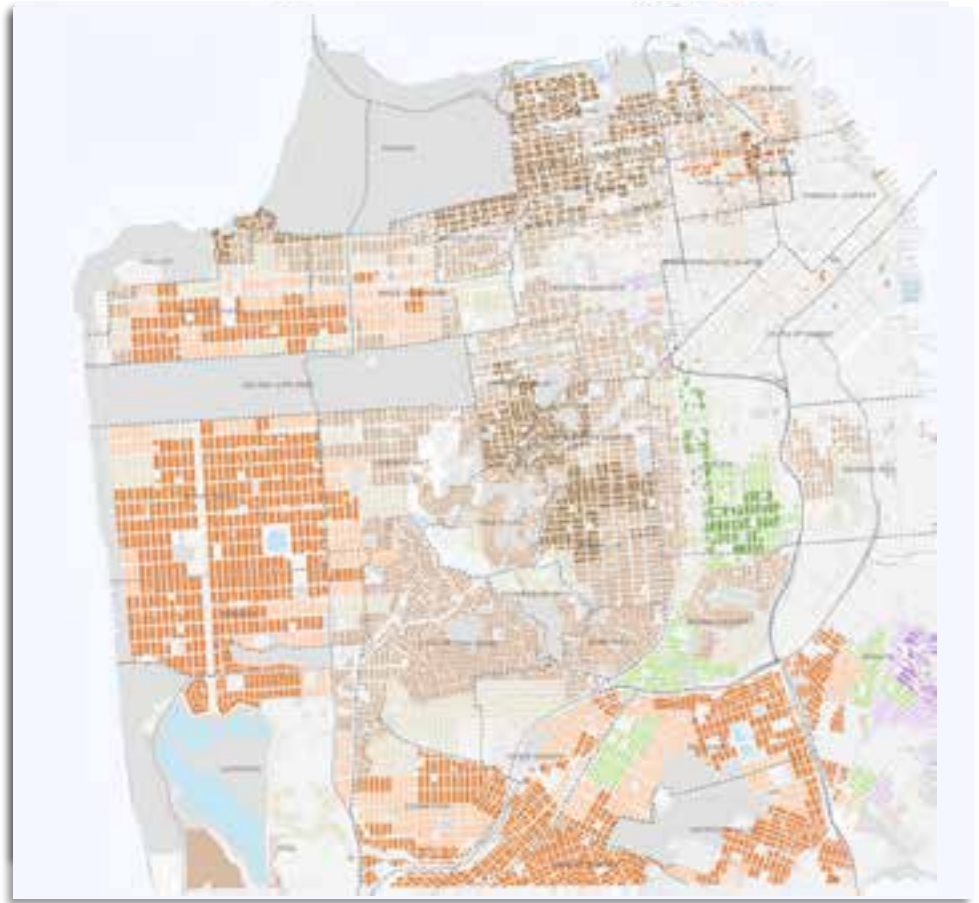
6. Cartography

Support
the story!



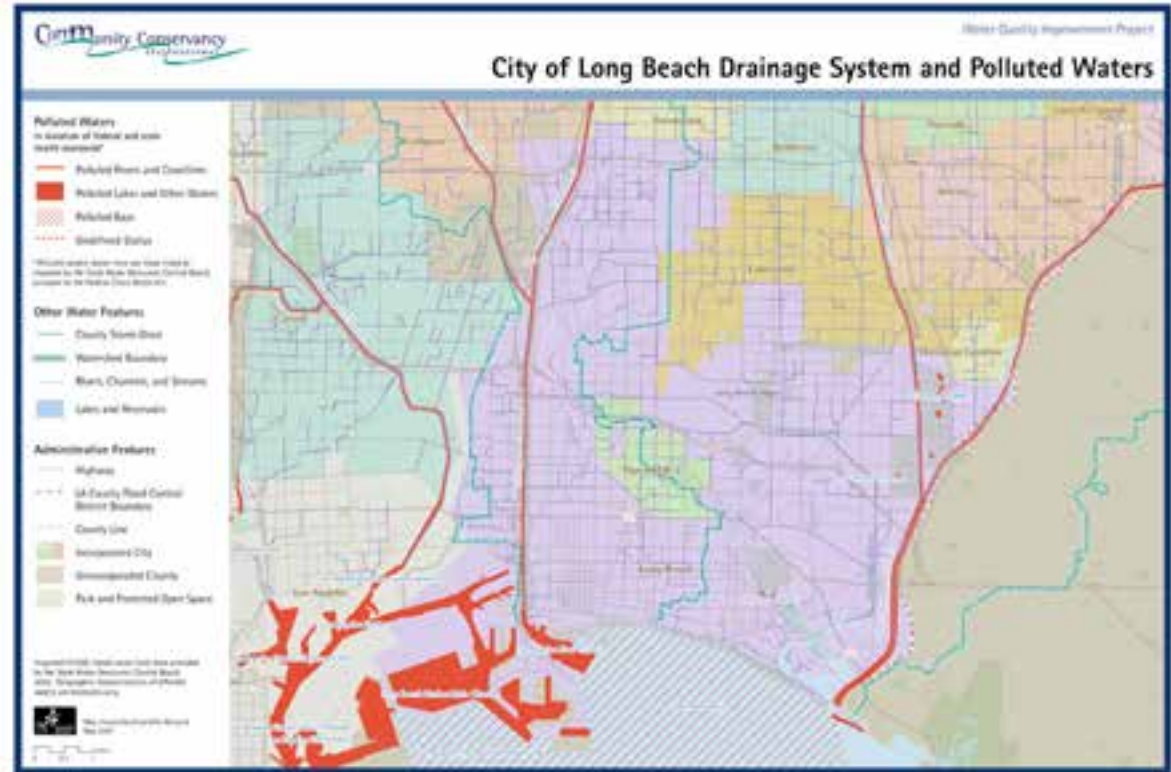
6. Cartography

Support
the story!



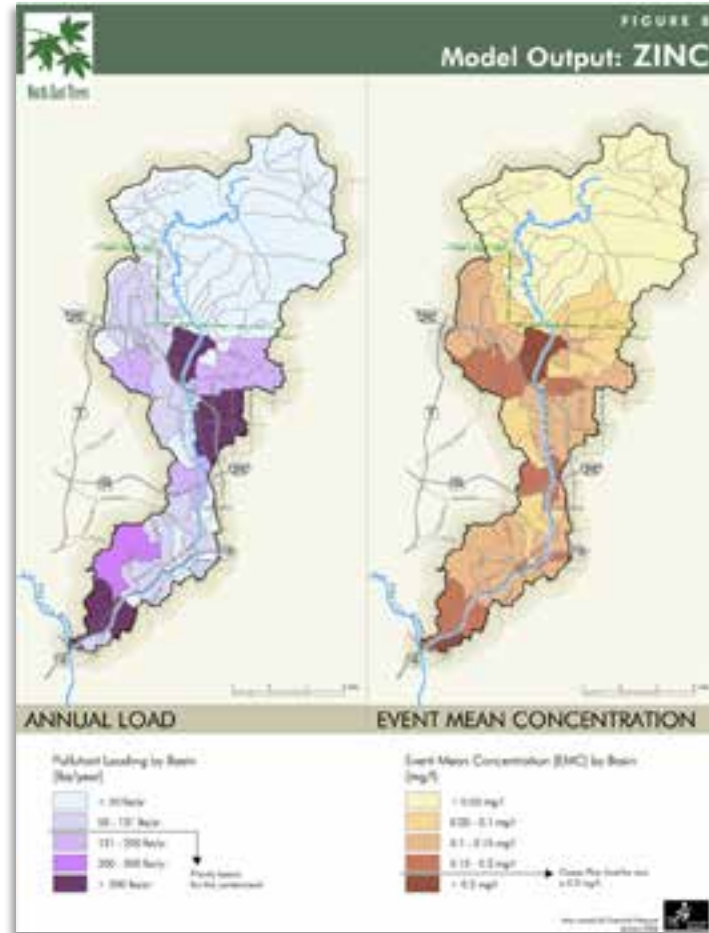
6. Cartography

Support
the story!



6. Cartography

Support
the story!



Techniques –

Map in Title Bar

- § Determine final **extent** of the map (changes require new shapefile)
- § Create a **shapefile of title bar** (create a graphic of your title bar and then convert to shapefile)
- § Use the **Erase tool on title bar**, inputting shapefile you want to extend into the title bar

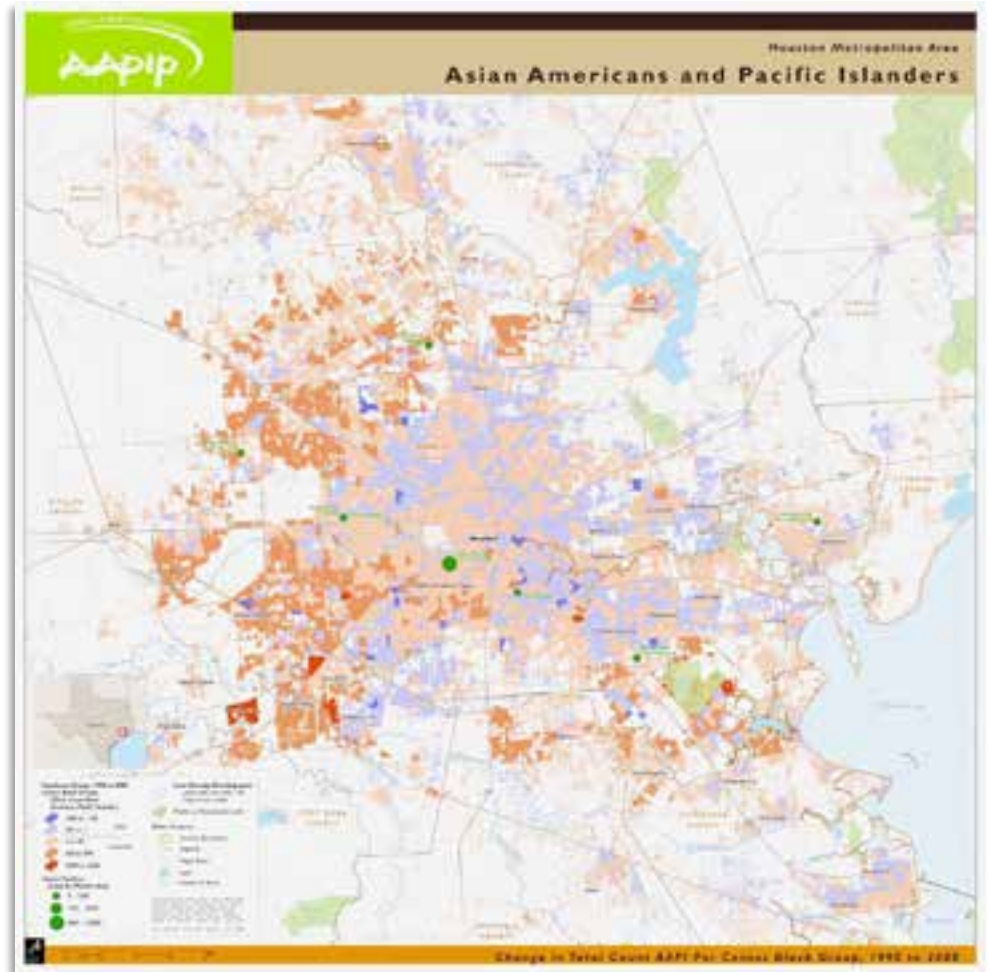


Techniques – Feather Boundary

1. **Buffer wizard** on outline feature – 10+ rings
2. Select **options for buffers** styles - coastal fades use the “Outside only” option.
3. **Add a field** for the transparency values – use **field calculator** to divide or multiply the buffer values, with most transparent as highest number (0-100), least transparent ring as lowest.
4. **Symbology tab** of the Layer Properties and select color.
5. Click Advanced Transparency - select the transparency values field. Each **ring of the buffer** will be displayed as the color you selected with that percent of transparency.

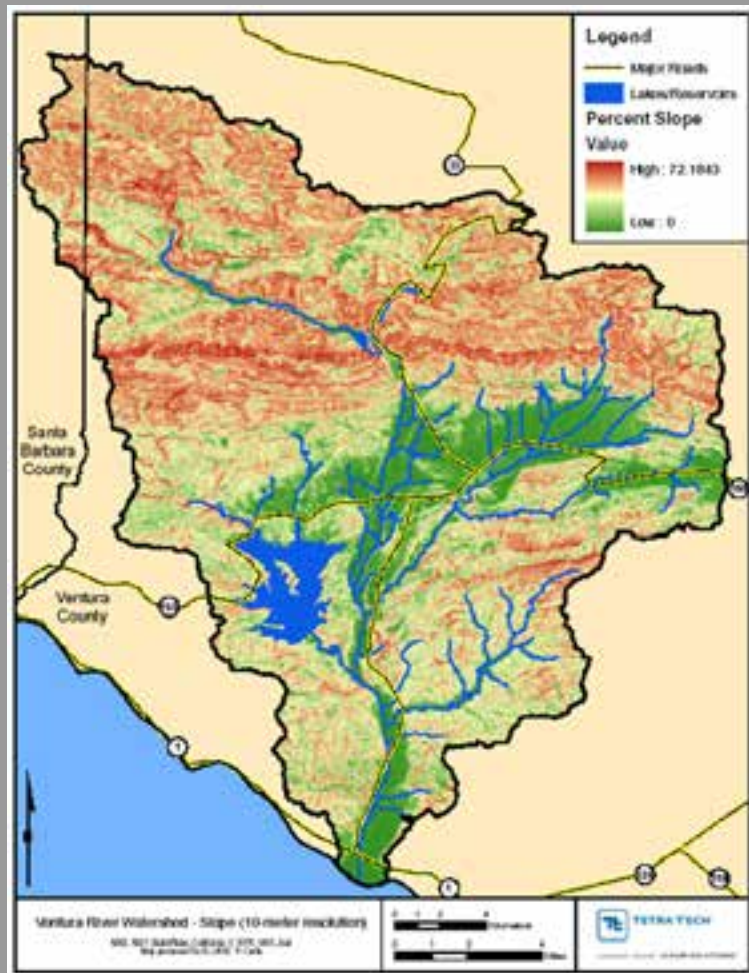


*If design doesn't feel
good in your **heart**,
what the **mind** thinks
doesn't matter*



Extreme Makeover

The GIS Edition





- Colts Valley Creek
- San Antonio Creek
- Ventura River Estuary
- Ventura River Reach 1, 2
- Ventura River Reach 4

Source: USGS
 Department of the Interior, Bureau of Reclamation
 Watershed Science Report for Santa Barbara County



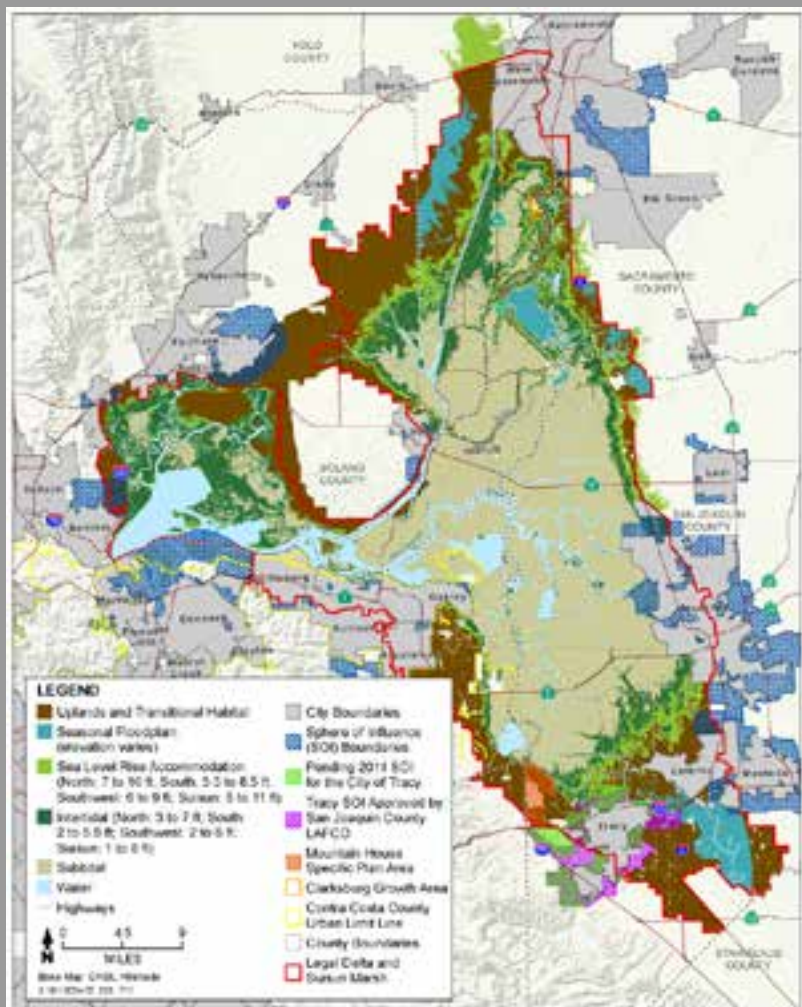
Water Quality Impairments

Ventura River Watershed

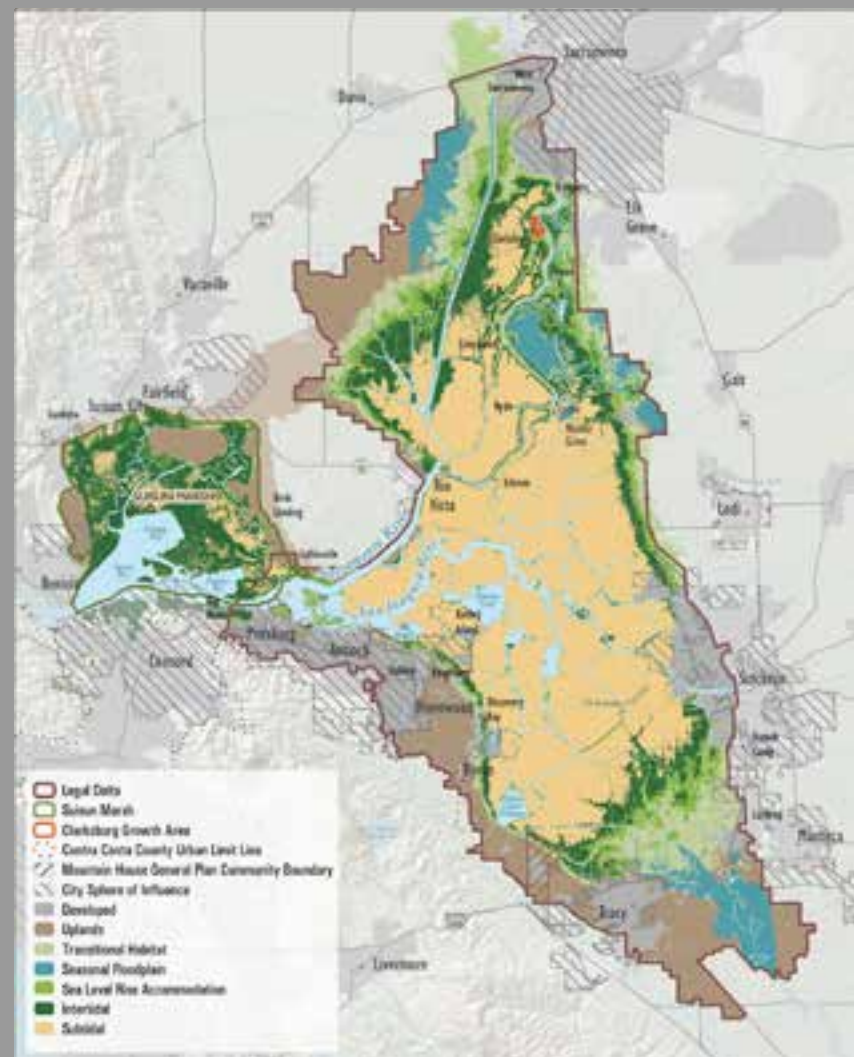
- Impaired Water Body Name**
- Ventura River Estuary
 - Ventura River Reach 1, 2
 - Ventura River Reach 3
 - Ventura River Reach 4
 - Colts Valley Creek
 - San Antonio Creek
 - Sala Creek
 - Mudflat Creek Reach 1, 2
 - Mudflat Reservoir



State Water Resources Control Board
 Regional Water Quality Control Board for Ventura
 1000 Ventura Avenue, Suite 100, Ventura, CA 93001
 Phone: 805.233.1234

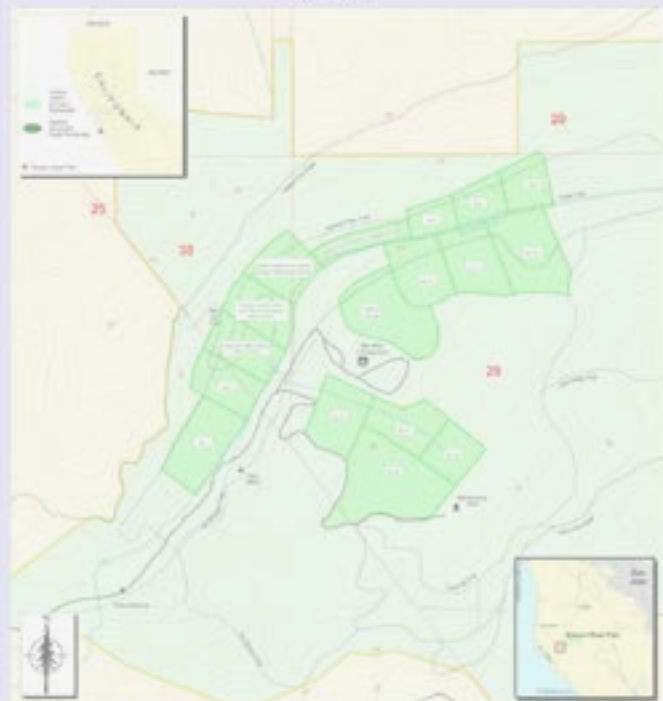


Source: EFG 2011; Central Coast County 2010; SACOG 2009; San Joaquin County 2008a; San Joaquin County 2008b; City of Stockton 2011; City of Tracy 2011; Sutter County 2007; Yuba County 2011



Little Butano Creek Memorial Groves

Butano State Park, San Mateo County
October 2003



100 500 1000 1500 2000 Feet

Save-the-Redwoods League

2110 Canyon Blvd., Suite 400
San Francisco, CA 94118
415.774.1500
www.save-the-redwoods.org

Forest Road Stream Trail Stream Bank
 Redwood Grove Boundary Stream Boundary Stream Bank Boundary

Redwood Grove Stream Trail Stream Bank
 Redwood Grove Boundary Stream Boundary Stream Bank Boundary

Little Butano Creek Groves

Butano State Park, San Mateo County
May 2014

Save The Redwoods
LEAGUE




Green Boundary Red Wood Boundary Stream Bank Trail Stream Bank Boundary Forest Road Stream Stream Bank

Green Boundary Red Wood Boundary Stream Bank Trail Stream Bank Boundary Forest Road Stream Stream Bank

Red Hill

Land Ownership

 Conservation Lands

 Parcels

Transportation

 Primary Route

 Secondary Route

 Local Roads

 Trails

Water Features

 Wetlands or Bog

 Lake or Pond

 Stream

 Intermittent Stream

 Town Boundaries

contour interval 40feet

data source:
USGS 7.5 minute digital elevation model for terrain

USGS digital line graph for roads and trails and water features

Acquired using the LRF1 GNSS system, 2000



Map created by Cheryl E. Peterson
using GIS software, September 2003

www.pvt03.org

1:38,000 

How do you know a design is good?

- 3 second test
- Formal critiques
- Pay attention over time
- Compare yours to others'



5



Map Design Pitfalls

Pitfalls in Map Design

1. Undefined overall message
2. Everything at once - no hierarchy
3. Passive titles
4. Disorganized grid
5. Poor color choices
6. Overdefined elements (boxes..)
7. Element-size relationships
8. Fonts, label hierarchies

Pitfalls:

Undefined message



Figure 2. The nine-county San Francisco Bay region.

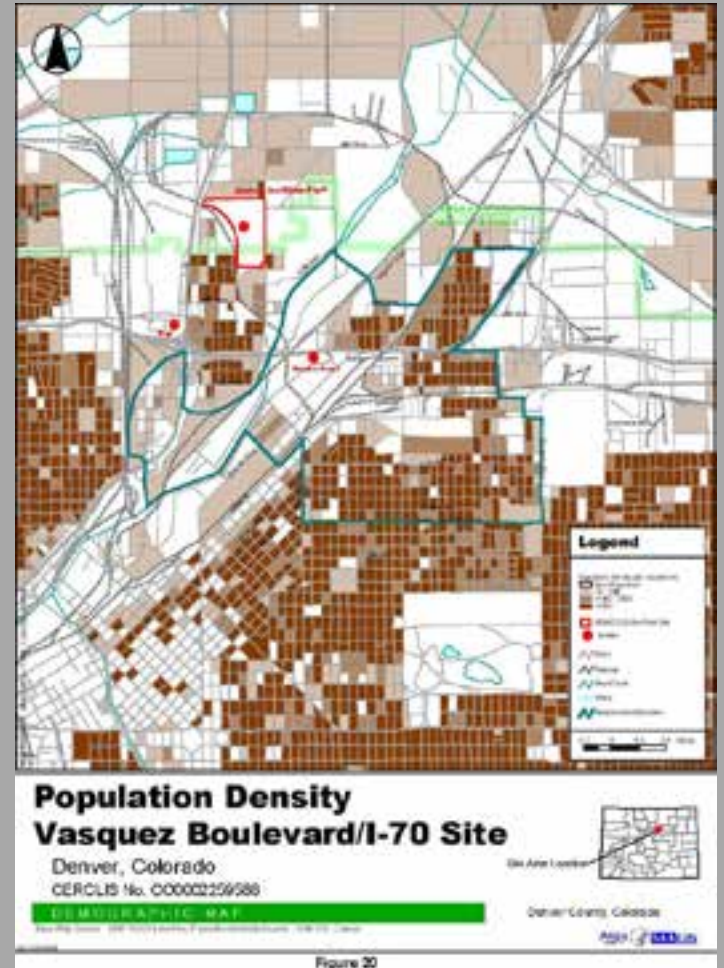
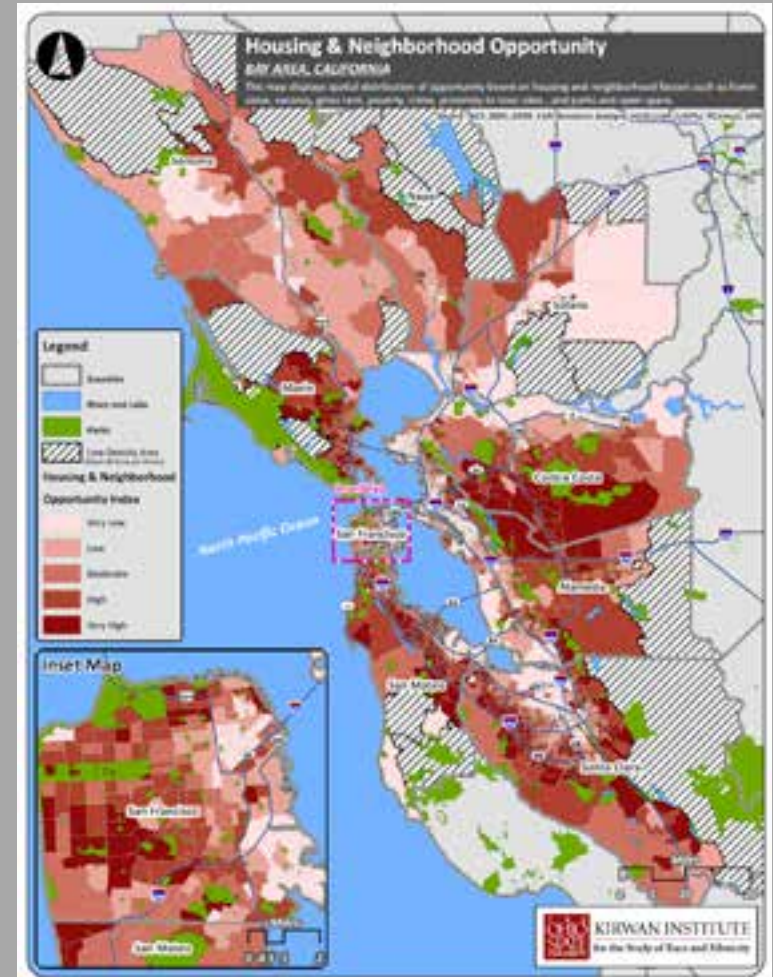
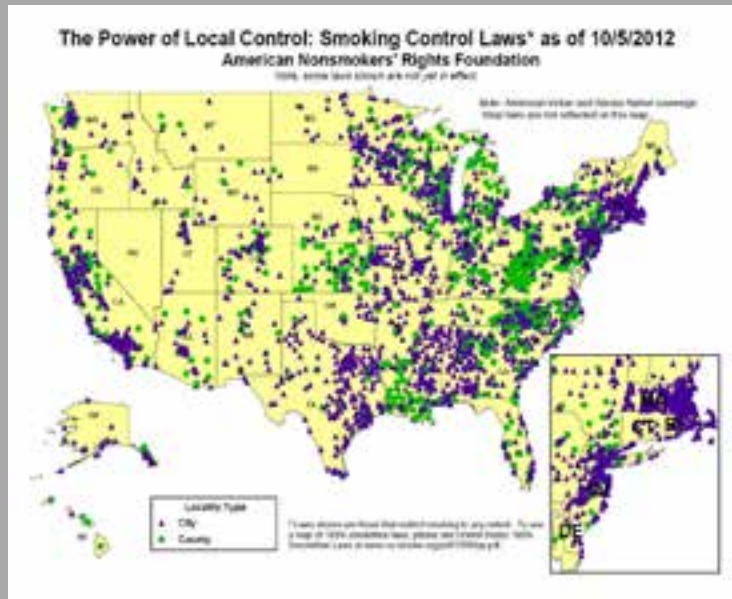


Figure 20

Pitfalls:

Everything at once
(no hierarchy)



Pitfalls:

Passive &
extended titles

e.g.,

What We've Accomplished

Areas Needing Protection

etc.



Pitfalls:

Disorganized grid

The Turner Endangered Species Fund: A Private Effort to Conserve Biological Diversity

Status of: **National Campaigns**

Current projects

The grid is composed of several columns and rows of content:

- Top Left:** A large text block with a yellow background, likely an introduction or overview.
- Top Right:** A flowchart showing 'National Campaigns' leading to 'Current projects'.
- Center:** A map of the United States with various regions highlighted in different colors (green, purple, blue). Lines connect these regions to text boxes.
- Left Side:** A vertical column of text boxes, some with small images of animals.
- Right Side:** A vertical column of text boxes, some with small images of animals.
- Bottom:** A row of text boxes, some with small images of animals.

The overall layout is highly fragmented and lacks a clear, organized structure, illustrating the 'Disorganized grid' mentioned in the text.

Pitfalls:

Poor color choices



Pitfalls:

Overdefined
elements
(esp. boxes)



Pitfalls:

Confusing font
hierarchies



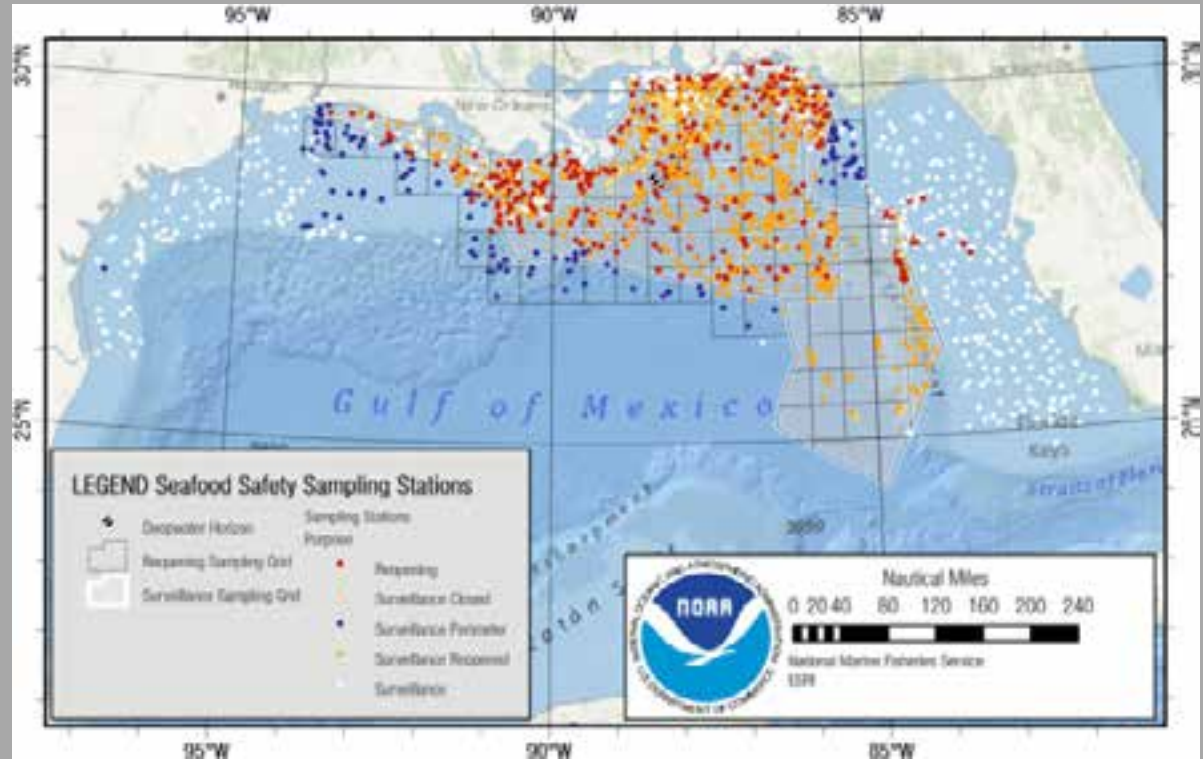
Pitfalls:

Element – size relationships

Legend

Scale

North arrow



Pitfalls:

Not showcasing good design

The Parts of a Map: Map Elements





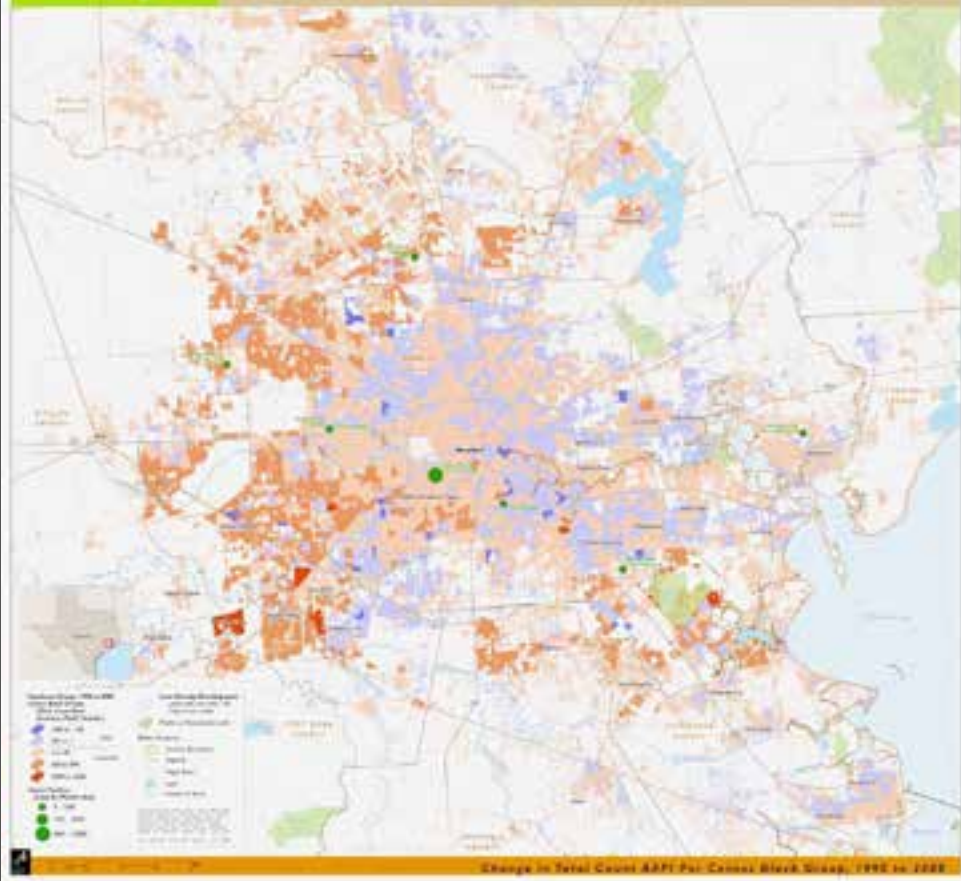
6



What to Remember



- Maps are **stories** that unfold in **layers** of perception
- See through **audience** eyes, from the beginning
- **Direct the eye** through your map story
- Remove and **simplify**
- Always grow **your** design skills



Open Discussion

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Thank you...

Please fill out the session survey:

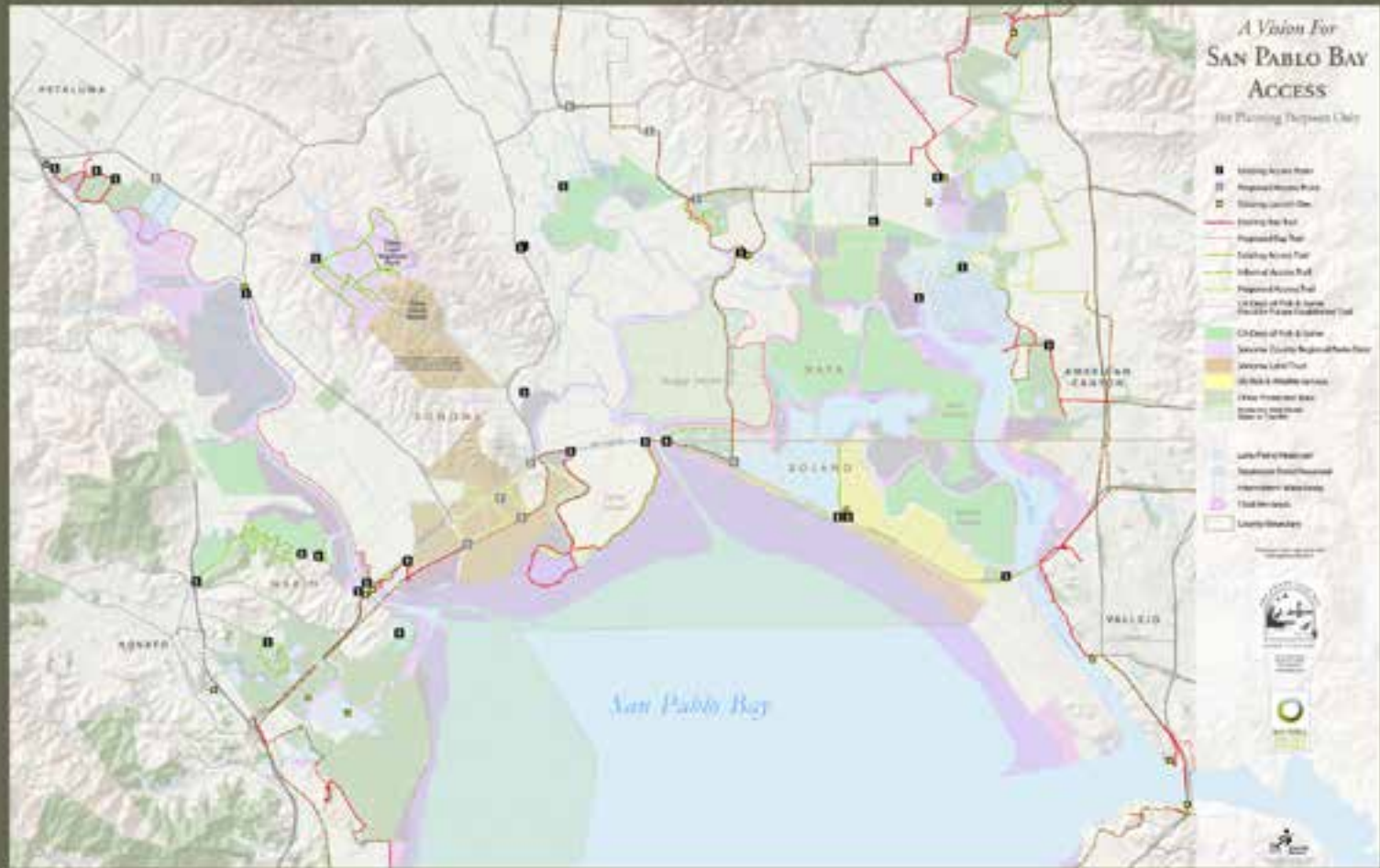
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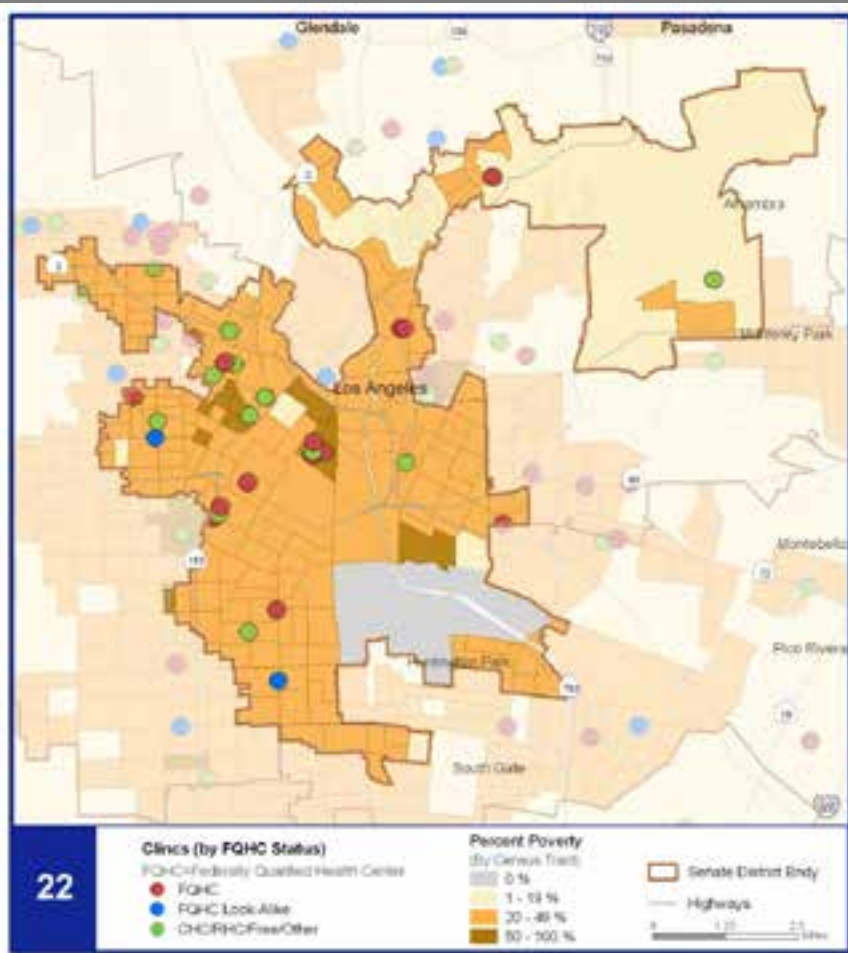
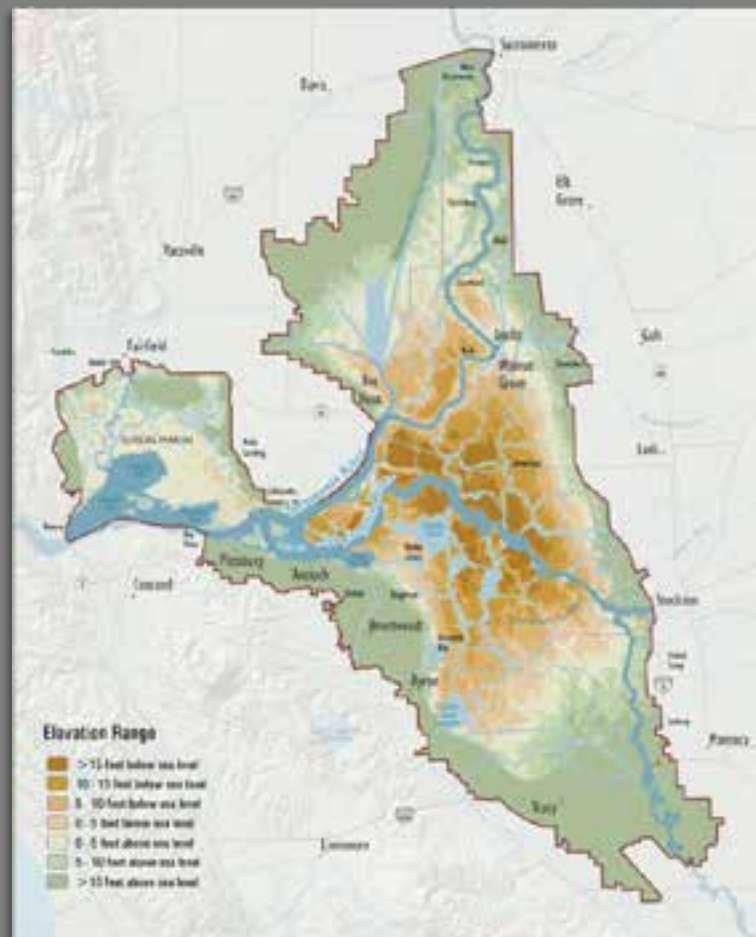
Online – www.esri.com/ucsessionsurveys

Paper – pick up and put in drop box

A Vision For
SAN PABLO BAY
ACCESS

for Planning Decision-Makers





Colors

Colors

