A QUICK GUIDE TO DESIGNING MAPS

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This document is intended to provide a brief overview of how to design a good map in GIS, specifically a crime map. This document does not provide step-by-step instructions. Rather, it provides suggestions to creating professional, informative maps. Three general ideas are presented: communicating with a map, essential elements of every map, and types of maps/ deciding which is best. The following publications were consulted in compiling this guide: *An Introduction to Geographical Information Systems* by Ian Heywood, Sarah Cornelius, and Steve Carver, published by Prentice Hall, 1998; and *Mapping Crime: Principle and Practice* by Keith Harries, published by the National Institute of Justice, 1999.

COMMUNICATING WITH A MAP

Before mapping, decide:

- Who is the audience?
  - o The general public, the department of corrections, a meeting of service providers?
  - o The audience will guide what amount of detail and information to include.

- What is the purpose of the map?
  - o Is the purpose to see the distribution of released prisoners across a county? The precise locations of service providers? Or a summary of social/demographic data in a jurisdiction?
  - o Determining the purpose of the map ahead of time will prevent you from including unnecessary or irrelevant information, which can often result in a cluttered map.

- What information must be included?
  - o Do you need to include street information? Offense information? Demographics?
  - o This decision is guided by who the audience is and what the purpose of the map is.

- What amount of detail is needed?
  - o Do you need to show street-level information for an entire county area or will freeways suffice or none at all? Or do you only need to show street-level information for a small neighborhood?
  - o A map should only show what is necessary to get across the intended message.
    - Too much detail makes the map hard to read.
    - Too little detail allows you to lose essential information.

Is this map communicating effectively?
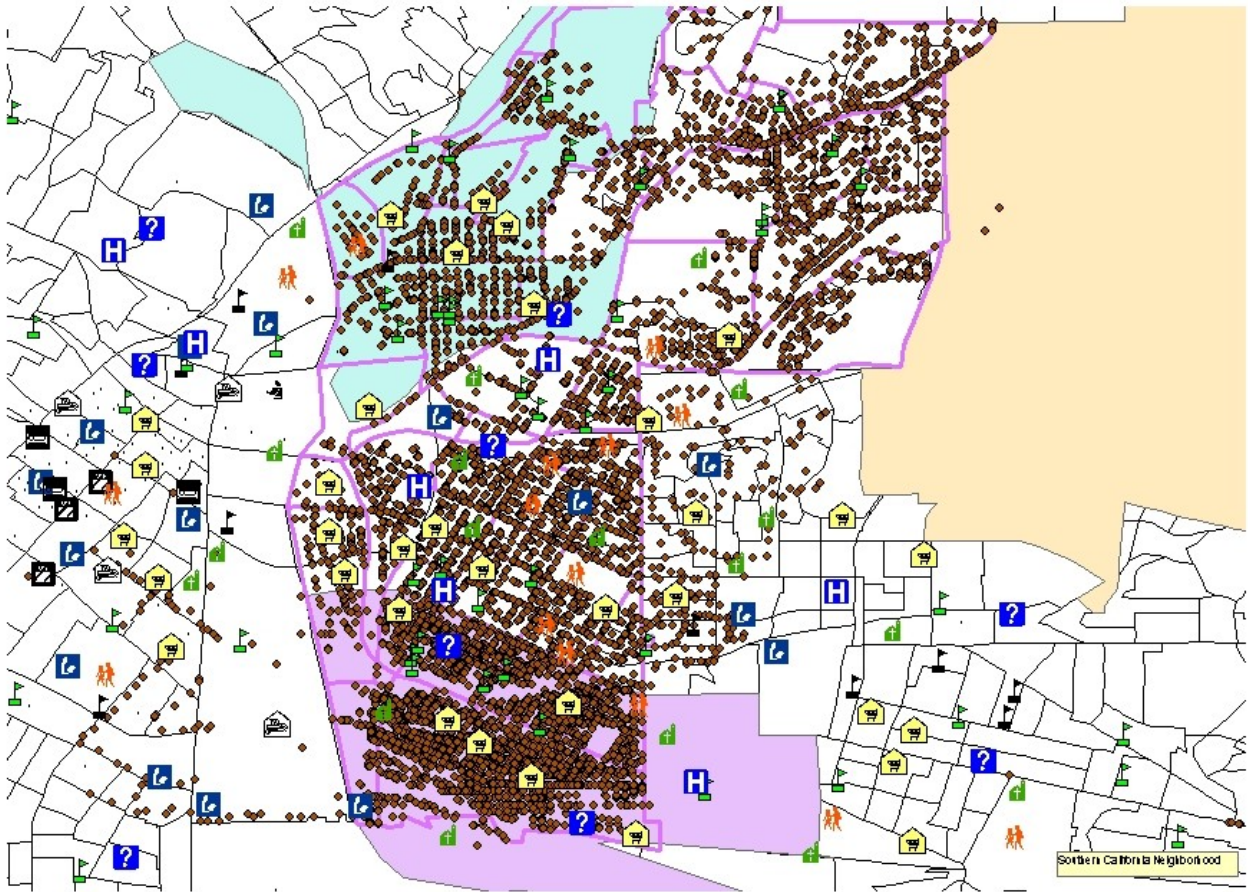
Why this map does *not* communicate effectively:

- ➢ The general purpose of this map is unclear since there is no title or legend.
- ➢ It is unclear what the points, other symbols, shaded areas, or lines symbolize.
- ➢ It is difficult to see all the symbols because there are so many points and overlapping symbols.
- ➢ The area displayed may not be appropriate for the use of a point map.
- ➢ The colors used are not very appealing and do not send a specific message.

TIPS:
- **Design a map as a stand-alone document.**
  - o The user should be able to understand the map without any accompanying text. This means the map should be created as a stand-alone document that can be modified slightly depending on the audience and context.

- **Be sure the map is in the most appropriate scale for the information displayed.**
  - o Scale affects how readable and detailed a map is. Viewing points at the level displayed in this map may not provide enough detail to be meaningful.

ESSENTIAL ELEMENTS OF EVERY MAP

The following seven items are essential for every map you create, especially for those distributed to other organizations during meetings, conferences, and the like. Maps in power point presentations can be modified to fit the screen better, however these elements are still important to include.
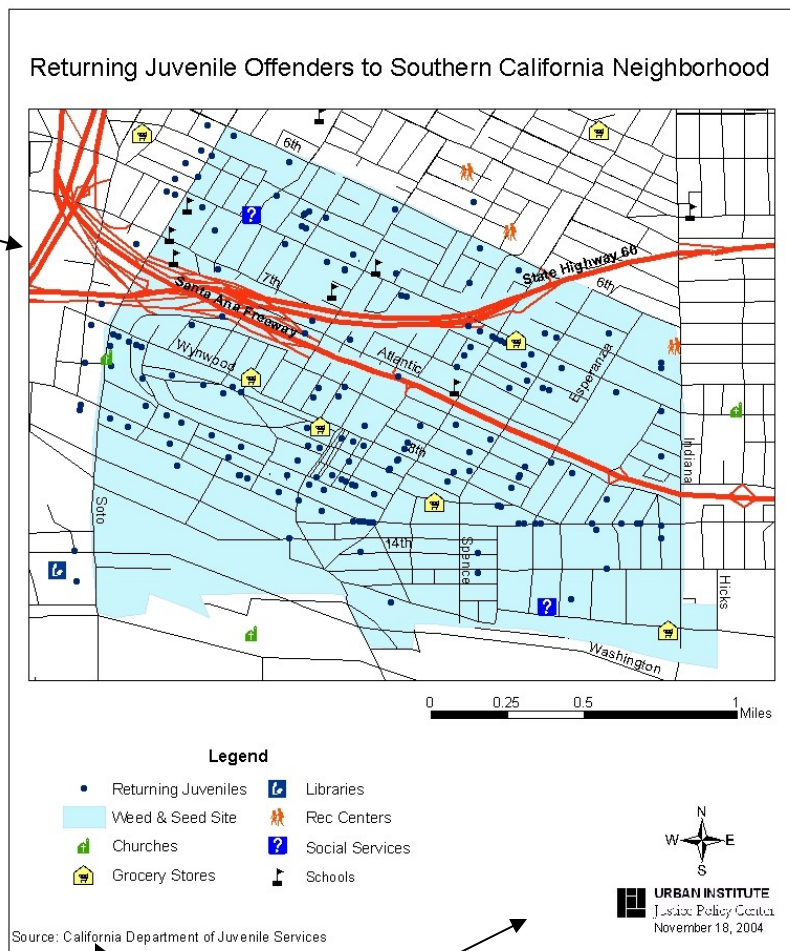
- ➢ Title
- ➢ Legend
- ➢ Scale Bar
- ➢ Date
- ➢ North Arrow
- ➢ Neat Lines
- ➢ Sources & Notes

Neat Lines

Draws user's attention to various elements of information.

Title

The largest type size on map. Located in visually pleasing and easily seen portion of page. Provides overview of what the map displays.

Returning Juvenile Offenders to Southern California Neighborhood

Scale Bar

Provides sense of distance for the user. Usually positioned near the bottom of the map.

Legend

Needs to be easily understandable. Positioned so it balances the rest of the elements.

Legend
- • Returning Juveniles
- Weed & Seed Site
- Churches
- Grocery Stores
- Libraries
- Rec Centers
- Social Services
- Schools

Source: California Department of Juvenile Services

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North Arrow

Provides orientation. It is especially important if North is not 'up'.

Sources & Notes

Acknowledge and/or reference any pertinent information about how the map was made and who made it.
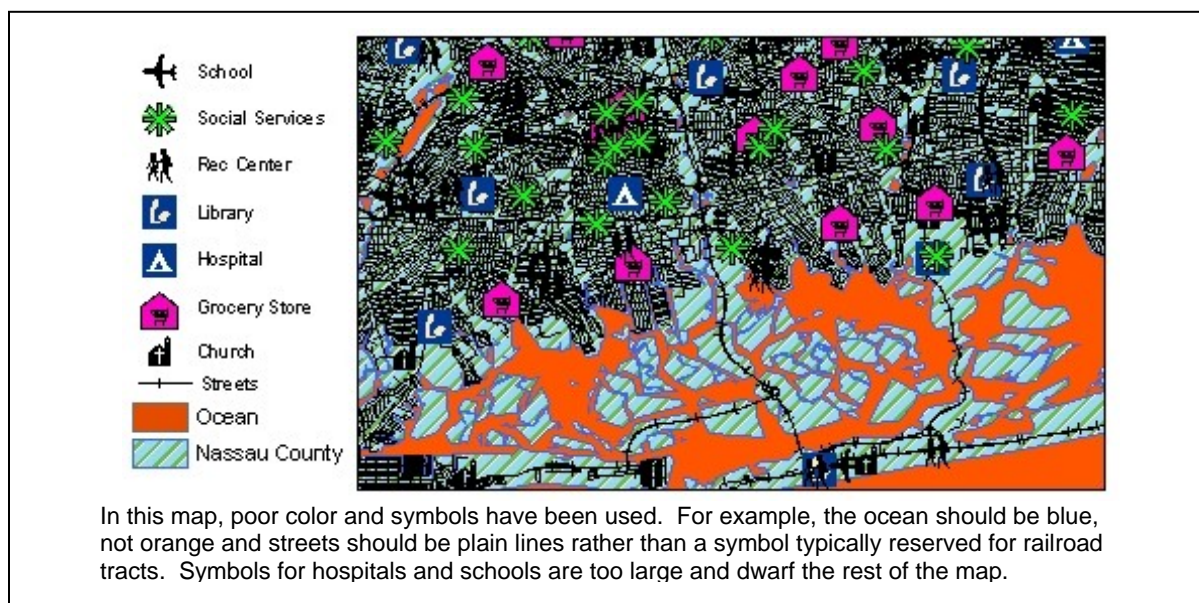
Date

Some data are time sensitive. The date helps determine if data can be trusted.

**ESSENTIAL ELEMENTS OF EVERY MAP,** *continued*

Other important decisions:

- **Color** – it influences the user's understanding of the map.

  o Typically, rivers are colored blue and forests are colored green. If a mapper colored rivers grey and forests red then the user could mistake the rivers for roads and forests for urban areas.

  o TIP: When mapping quantities, use darker colors or gray shades for more/higher values and use lighter colors for less/lower values.

  o Use colors that complement each other – that are not too jarring, but are clearly visible against one another. Consult www.colorbrewer.org for assistance in choosing the best color scheme for your maps.

In this map, poor color and symbols have been used. For example, the ocean should be blue, not orange and streets should be plain lines rather than a symbol typically reserved for railroad tracts. Symbols for hospitals and schools are too large and dwarf the rest of the map.

- **Shape & Pattern of Symbolism** – can influence user's perceptions.

  o Symbols should bear some relation to the feature being represented.

  o There are many built-in symbols available in any mapping software, however, the use of them may take away from your map's purpose, rather than aid it.
    - In the map above, the symbols are too big for the size of the map and just crowd the screen without providing helpful information.
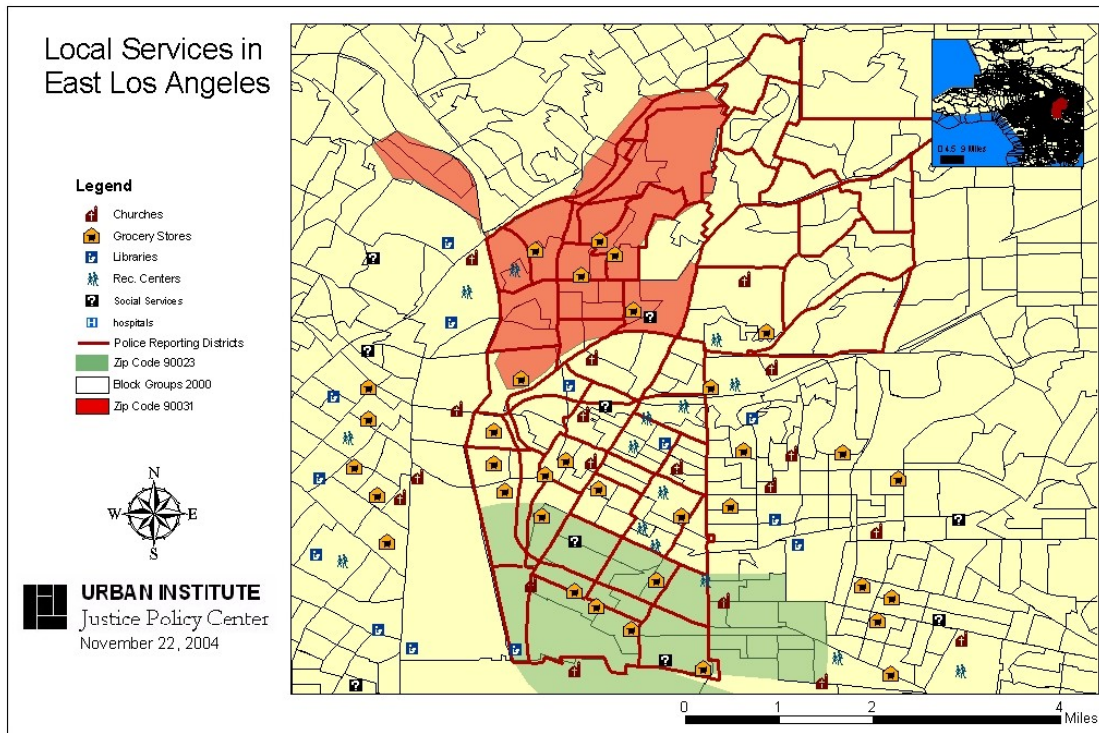
Can you make any suggestions to improve this map?
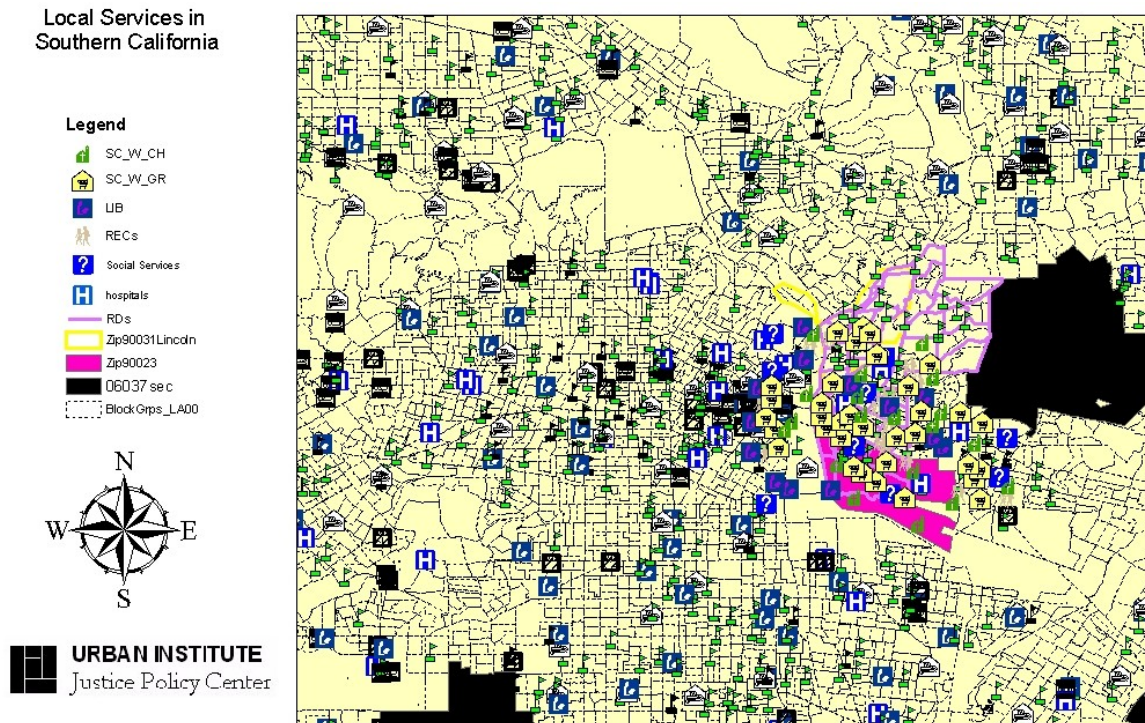
Praise for this map:
- ➢ There is a prominent title, although the type size could be larger.
- ➢ There is a legend, north arrow, and source information.
- ➢ The elements are balanced and presented in a fairly clean fashion.

Suggestions for changes:
- ➢ **Smaller north arrow –** This essential map element should be a subtle addition, not an overwhelming presence.
- ➢ **Add a scale bar for reference.**
- ➢ **Change scale –** It seems that the map covers a larger area than some of the data. Zooming in on a smaller area would provide more detailed information for the user. One solution to this is to zoom in on the area of interest and provide a locator map of the larger surrounding area (see upper right-hand corner of improved map below).
- ➢ **Change colors –** These colors do not complement one another. The black is too dominant and the yellow outlined polygon is barely visible. The hot pink and purple could be improved too.
- ➢ **Date –** The date needs to be added.
- ➢ **Neat Line** – Add neat line border around all elements of the map.
- ➢ **Legend improvements** – Change the visible variable names to ones that anyone can understand. Do not use acronyms or other coding. Also, be sure to use appropriate symbols for each element in the map.
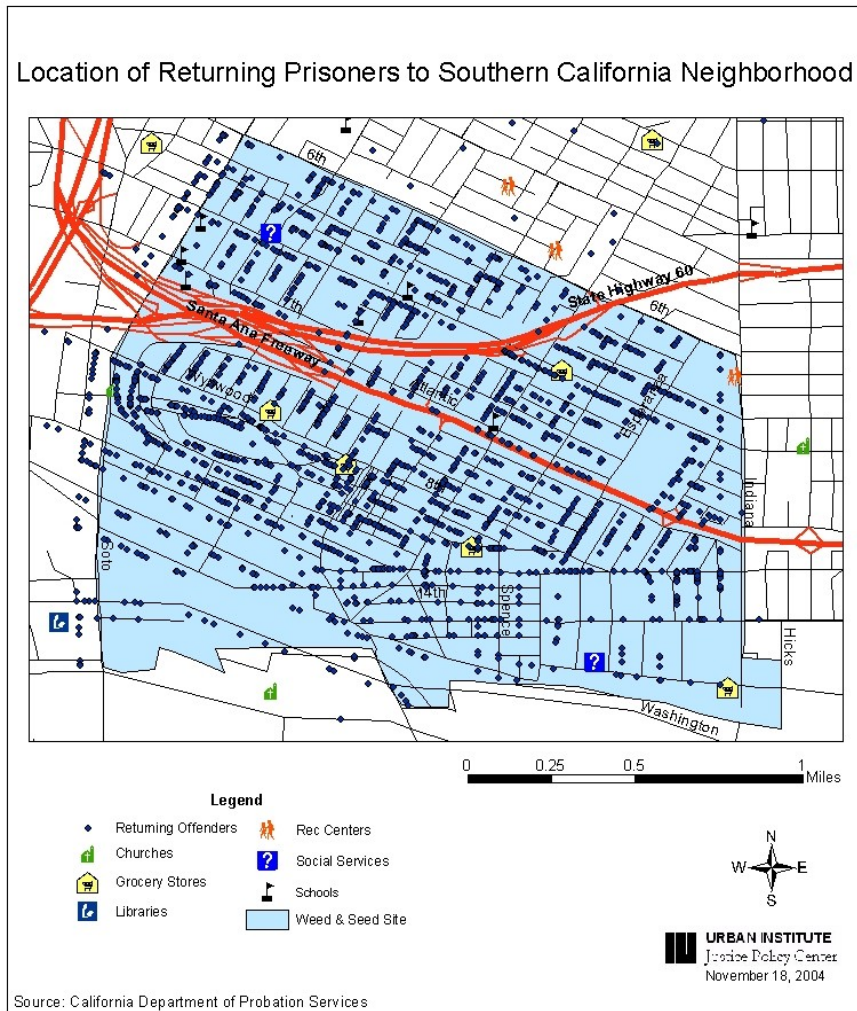
An improved version:

Implementing the suggestions to improve the previous map would result in this map.

Note the following changes:

➢ **Locator Map –** Found in the upper right corner provides general location of the site area within Los Angeles County.
➢ **Scale of Map –** Zoomed into a more specific target area allows for more detailed information to be presented and displayed more clearly.
➢ **Neat Line** – Added border around all elements of the map.
➢ **Scale Bar** – Located below the right bottom corner of the map lets user understand how large the area of interest is.
➢ **Title –** Larger text size.
➢ **Legend improvements –** Variable names can be understood by the user and the symbols are clearer.
➢ **North Arrow –** Decreased size.

TYPES OF MAPS & DECIDING WHICH IS BEST – a matter of scale & context

Point Map

Location of Returning Prisoners to Southern California Neighborhood

Source: California Department of Probation Services

Advantages:

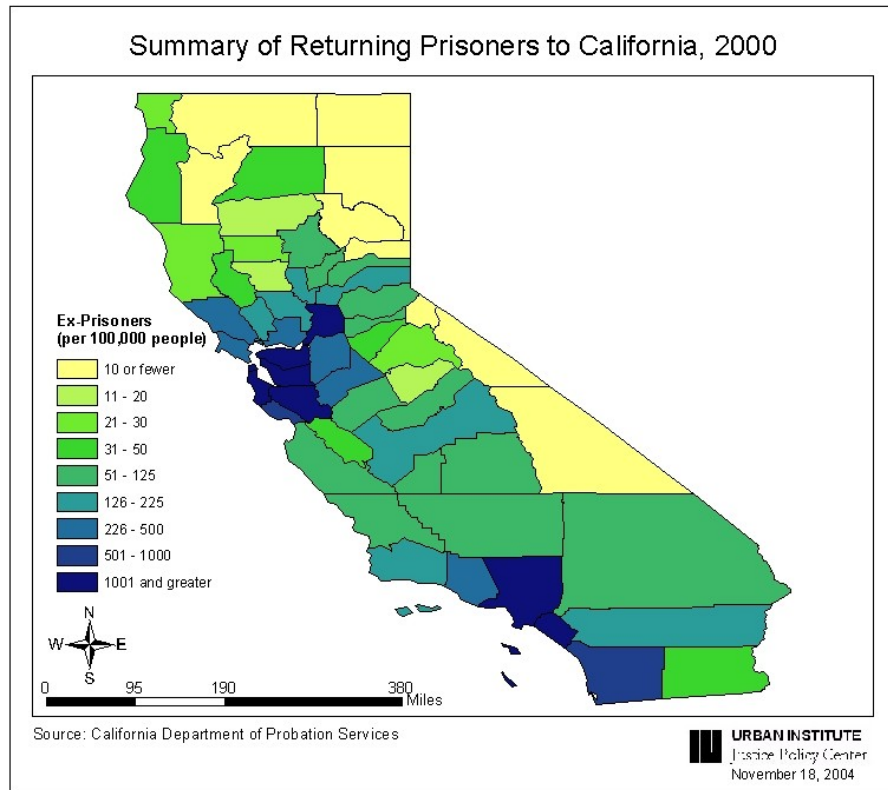• Provides very detailed, locational information.

• Can use to see the precise locations ex-offenders are returning to in a particular neighborhood.

Disadvantages:

• Cannot distinguish patterns/ concentrations in the points.

• Cannot detect multiple points at one address or coordinate, as the points stack on one another.

• Points can over-crowd a map and provide little additional information.

Choropleth Map

Summary of Returning Prisoners to California, 2000

Ex-Prisoners (per 100,000 people)

- 10 or fewer
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 125
- 126 - 225
- 226 - 500
- 501 - 1000
- 1001 and greater

0   95   190   380 Miles

Source: California Department of Probation Services

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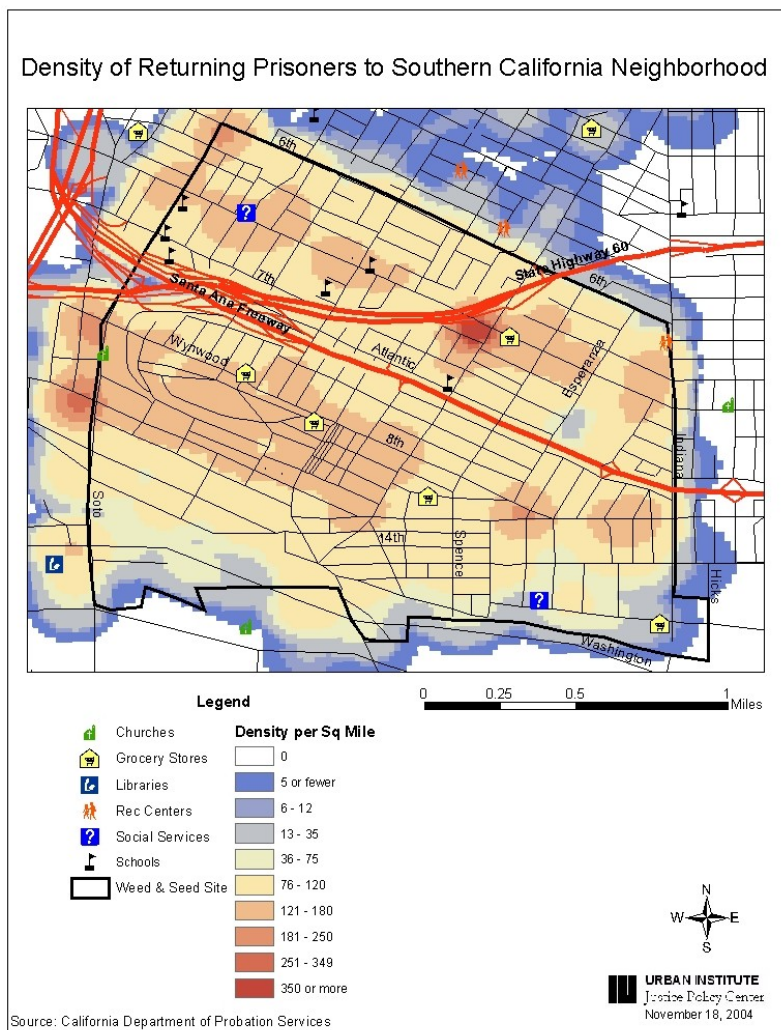Justice Policy Center
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Advantages

- Can provide information for large areas.

- Displays both quantitative and qualitative information using categories.

- Provides overview information such as a summary of the number of returning prisoners in a state, by county.

Disadvantages

- It is a summary of information for a particular area, so variations within each area are not displayed (i.e., hot spots within each area are masked).

- Value breaks (as shown in the legend) are arbitrary. Modifications in the value breaks can change the interpretation of the map.

Density Map

Density of Returning Prisoners to Southern California Neighborhood

Legend

		Density per Sq Mile
Churches		0
Grocery Stores		5 or fewer
Libraries		6 - 12
Rec Centers		13 - 35
Social Services		36 - 75
Schools		76 - 120
Weed & Seed Site		121 - 180
		181 - 250
		251 - 349
		350 or more

Source: California Department of Probation Services

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Advantages

- Enables users to detect clusters, sometimes referred to as "hot spots."

- Since it is derived from a point map, this map enables you to see multiple incidents at the same address.

- It is a cleaner display than the point map and also allows for layering of additional information.

Disadvantages

- Generated surface gives the impression that there are points in places where there are not.

- The user makes many underlying assumptions in generating this layer (e.g., choice of density function and bandwidth). Modifications to the assumptions can change the resulting surface.