Interview with a Celebrity Cartographer: Cindy Brewer

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FOREWORD

Results of the recent readership survey (Kessler and Griffin 2009), and the follow-up plenary session at the 2009 NACIS Annual Meeting, indicated that a significant number of *Cartographic Perspectives* readers would like to complement the featured, peer-review articles with a variety of more approachable, magazine-like entries. One goal of the two special digital issues of *CP* was to experiment with new article formats to meet this demand. Many of these pieces assist cartographers with the nuts and bolts of their work, providing new techniques or resources.

Here, we introduce a potential new format, tentatively titled *Interview with a Celebrity Cartographer*, designed to offer a broader look at the discipline, yet still presented in an accessible, informal manner. In each entry, we will ask one of the finest representatives of our profession a set of ten questions, some retrospective, some reflexive, and some humorous, but all of which designed to discuss his or her personal experiences, opinions, and perspectives, with an emphasis on NACIS and *CP*. The interviewee may edit the manuscript as he or she deems appropriate, but overall the burden of generating the content will be avoided greatly (a serious problem identified by the readership survey and emphasized in the 2009 plenary session).

The initial idea is to run this format as an annual, having the NACIS Student Board Member conduct the interview. This would provide the student with a richer experience in their capacity as Student Board Member, as they can gain access to a luminary in the field and become familiar with the process of contributing to *CP*. We hope to pair students with either academic or professional cartographers, depending on their own career interests. As the Student Board Member for 2009-2010, I (Rob) volunteered to take a first pass to determine the viability of the series. Cindy Brewer—the person who originally suggested the interview format in the 2009 plenary—graciously agreed to be the guinea pig celebrity cartographer.

Cindy & Rob, having fun during the interview

BIOGRAPHY

In this interview, we are afforded the opportunity to hear the experiences and opinions of renowned cartographer and former NACIS President Dr. Cynthia (Cindy) Brewer. Cindy received a BA (1983) from the University of Guelph and an MA (1986) & PhD (1991) from Michigan State University under the direction of Dr. Judy Olson. After teaching stops at UC-Santa Barbara (1986–1987) and San Diego State University (1991–1994), Cindy joined Penn State in 1994, where she currently is a Professor of Geography and the Director of the Gould Center and the National Mapping Expertise Exchange http://www.geog.psu.edu/gouldcenter/nationalmapping.html. She also holds an Affiliate Faculty appointment with the USGS Center of Excellence for Geospatial Information Science.

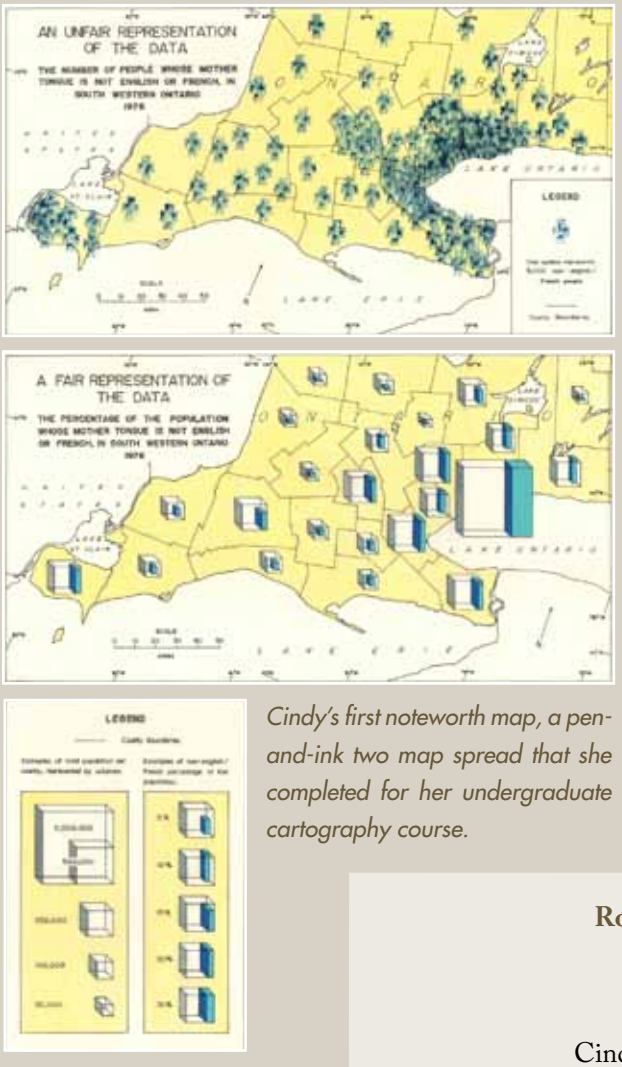
Cindy's body of work straddles the line between academic and professional cartography. She has produced approximately 75 journal articles, proceedings papers, and white papers on a variety of topics at the core of cartographic design, a half-dozen of which appearing in *Cartographic Perspectives*. She also has worked closely with professionals from the private and public sectors, penning two popular cartography books for GIS practitioners (*Designing Better Maps: A Guide for GIS Users* and *Designed Maps: A Sourcebook for*

GIS Users), collaborating with an all-star team of cartographers on the award-winning *Census Atlas of the United States*, and designing the popular ColorBrewer cartographic support tool (http://colorbrewer.org). Through her current research on design and generalization for federal multi-scale mapping, she participates in a research coalition of university, private, and public organizations to support the vision of *The National Map*.

INTERVIEW

Rob: Cindy, thank you for joining me today to participate in the first of perhaps a series of "Celebrity Cartographer" interviews printed in *Cartographic Perspectives*. I have with me a set of ten questions for which we think the *CP* readership will be interested in hearing your replies. To begin, let's go all the way back to the dawn of your cartographic existence. Can you please describe the first map you ever made? If you cannot remember your first map, what was the worst map you ever made?

Cindy: The first noteworthy map that I made was for my intro cartography class at the University of Guelph. For my final project, I made a dot map portraying the population of Southern Ontario that used an abstract person symbol to represent some number of real people. All the mapping we did at that time was pen and ink on paper or, if we were lucky, Mylar; it was really tough! I was a fine arts student only taking Geography classes as a minor, so I pulled from that skill set for the final project. I carved the shape of a person into the end of a square drafting eraser and then added the thematic information to the map by dipping the eraser into blue ink and stamping it onto the page. I think it looked pretty cool; it had an artistic look because the ink had a variable density. It was really a potato print approach to thematic mapping. An echo of this first project turns up in the *CP* article on varied graduate point symbols I wrote with Andrew Campbell. I also used carved erasers for experiments on 3D cubes as point symbols for my undergraduate thesis.



Cindy's first noteworth map, a pen-and-ink two map spread that she completed for her undergraduate cartography course.

As for the worst map I have made, there are definitely several bad maps in my past. One that I can remember was a map I made during a workshop given by Libby Wentz, a grad student at Penn State at the time and a current professor at Arizona State. She was giving the faculty a lesson in ArcView 3 I think. I made a tiny little map with a huge north arrow, scale bar, and legend. I think the title even says "This is a bad map." She kept that darn thing and she keeps threatening to mail it around. She would delight in corroborating that story, I am sure.

Rob: On the flip side, what is the single best map that you have made in your career? Not necessarily an atlas book or series of maps, but the one, individual map of which you are most proud?

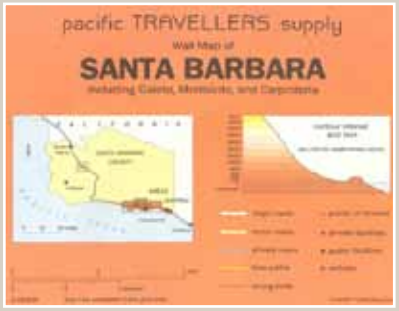
Cindy: Well, as a professor, you do not get to make very many maps; I am one of the few academics that has opportunities to take

some time out once in awhile and binge on mapmaking. I think my favorite is the reference map of Santa Barbara that I did. When I was teaching at UC-Santa Barbara as a grad, I invented a summer job for myself and several of my students at MapLink, which was run by Bill Hunt. At the time, the city didn't have a large, detailed map of this extended area along the coast. We started by tracing a US topo map, but we wound up driving many of the streets ourselves. My students and I drove all over the town, we looked up addresses in the phone book for places we knew at particular corners, and we dug into blueprints of new subdivision plans at the city office. I still have this weird effect when I visit, that I know Santa Barbara basically by heart, but I only lived there for one year, not even a whole year.

Cindy and her students featured in the Santa Barbara Independent *for their work on the Santa Barbara reference map (republished with persmission)*

Looking at the map, I wouldn't say that it is the greatest cartography in the world, but the act of making it was wonderful. Bill is fun to work with and he knew his market. Bill was also good friends with Stuart Allan, so we did all the production and prepress work with Allan Cartography. Stuart knew the guy that ran Pikes Peak Litho, which was one of the few places at the time where you could print a large sheet with precision. We actually got bumped off the press one time because they had to print full size Michael Jordan posters for Nike. It was a unique publication route at the time and being able to work with Bill and meet Stuart—both of whom I have stayed good friends with—was a fantastic opportunity. I think I was paid a summer wage by Bill, but it was probably something less than 5 cents an hour after considering the amount of work we put into it. So, I don't know if it is the best map that I have made, but it was surely the most important map that I have made in terms of learning the trade, developing contacts, and working with students on large projects.

scans of the Santa Barbara reference map (republished with persmission)



Rob: Now let's talk about some of your early NACIS and *CP* memories. What was the first issue of *CP* that you received or remember reading? Which of the early articles really sticks in your mind?

Cindy: I think my first article on color chart use for map design is in *CP* #4, which was based on my master's work. I don't know that I received *CP* #1 in my mailbox, but I have all of them; I certainly would have received *CP* #4. This is actually a fun story. To publish in *CP* in the late 1980s, people would bring a manuscript to the conference for the editor to consider—the editor being David DiBiase (who later became my husband). So I met David through *CP*, by going up to him, as a new PhD student, at one of the annual conferences and asking him to consider my paper.

To answer your second question, one of the early *CP* articles that I have read and reread was *Mapping the Nation's Physiography by Computer* by Pike and Thelin. They had printed this terrain representation as a two-page page spread. As a person with an interest in geomorphology, it was wonderful for me to be able to look into the map and see the various landforms. The article was also really a nice one to assign to students because it is explicit about calculating illumination angles from the DEM. It took what was considered magic back then and made it easy to understand; it is a readable article.

Rob: This gets to my next question. It sounds like the Pike and Thelin piece is an early favorite— do you have an overall favorite *CP* article? Is there a particular article that stands out as the one that changed your thinking, or perhaps one that has been underappreciated?

Cindy: Another early article that affected me quite a bit was Monmonier's *Ethics in Map Design: Six Strategies for Confronting the Traditional One-Map Solution.* When I was a graduate student, most researchers were asking questions like "Let's get the absolute perfect Flannery power function for proportional symbols" or "Let's get the perfect classification routine so that we can make the perfect choropleth map." Mark was saying that one map was not the solution, that one map was not the best way to understand your data. This affects how you teach your students; I changed the labs in the computer cartography classes at San Diego State from having them create a single map to having them create a map series or multiple representations of a single variable. I was not doing dynamic mapping particularly, but I wanted to get students to think about looking at their data from multiple views in order to understand it better.

ONE OF THE EARLY CP ARTICLES THAT I HAVE READ AND REREAD WAS MAPPING THE NATION'S PSYSIOGRAPHY BY COMPUTER BY PIKE AND THELIN

A second article that was beloved in my family is a small review that David did. There used to be a "Fugitive Cartographic Literature" section in *CP* that discussed things about maps that were found in non-cartographic places. David did a music review of the album *Big Map Idea* by an artist that he likes, Steve Tibbetts. David dug around a bit to find his telephone number and when he called, Steve Tibbetts actually answered the phone. David was flabbergasted! He has some actual quotes from the musician in the article. David likened the music, which has a Tibetan theme, to Shiva descending from the heavens. So when David sent the finished article to Steve, Steve wrote David a little note on a postcard with Shiva's figure on it.

To ask me about *CP* is really to ask me about my relationship with David; the whole "doing" of *CP* was a huge presence in our early relationship. I would come visit David and he would be cramming to finish up an issue of *CP* or working to organize a special issue on something like ethics. So the individual articles are hard to pull apart, because finding people to submit articles, editing the

submissions, and organizing the content for print was all a big part of our family for a long time.

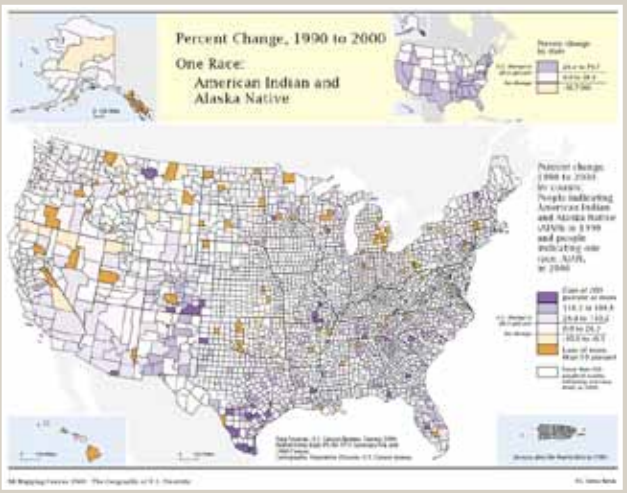
Rob: That's a wonderful reminder that *CP* has influenced its readership not only professionally, but also personally. Moving away from *CP*-related work, what is the most challenging project you have undertaken in your career and why? What about the most rewarding and why?

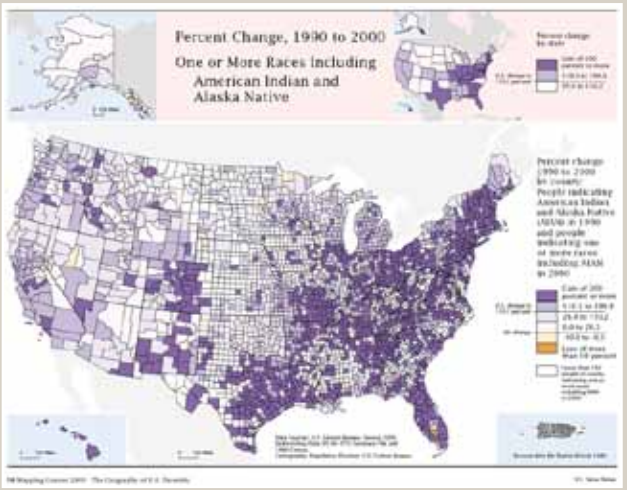
Cindy: My dissertation on simultaneous contrast in map color appearance is probably the one to pick as most difficult. The dissertation is a big, multi-discipline effort and I was trying to be really careful about my experimental design. I wound up having to ask such narrow questions for controlled experiments that I was no longer having the participants complete tasks relevant to actual map reading. I could look at the participants taking the test and see that they were adopting peculiar map reading strategies. If they were looking for a particular color or trying to compare two colors, I could see them blur their eyes or look away slightly so that they were viewing the map out of peripheral vision. They found strategies that worked for the experimental conditions, but these strategies were not what they would do when actually trying to use a map.

On top of this, I believe I observed what is called the fast-same effect in psychology. In these controlled experiments, people are able to say much faster that two things are the same than they are different. This effect wound up polluting my results, as there was a significant difference in response time when the color chips were different, but not one when the color chips were the same. When you are working at that very precise level of response time testing and measuring accuracy, and also plotting very tiny color differences onscreen, you are down in the weeds so deep, worried about things like the particular color model or the fast-same response affecting your results, that you are not learning much about actual map reading. Generally, I liked the results of the research, and I even received a Nystrom Award from the AAG, but the issues with applying highly-simplified, psychology-based perceptual testing to complex displays put me off from doing much more of that kind of research. The lesson is to try to test in realistic situations.

YOU ARE DOWN IN THE WEEDS SO DEEP...THAT YOU ARE NOT LEARNING MUCH ABOUT ACTUAL MAP READING

Another lesson from this research is to test a large number of maps. In my design work with federal agencies, like the Census Bureau, USGS, and NCI, by definition I was working with hundreds of maps (the *Census Atlas* has over 800 maps), never mind an experiment sample of 30. It does not do you any good to test one particular map, or one particular arrangement of colors, or a single dataset that has a single spatial distribution across the map. It makes me really skeptical of research conclusions I see that are based on one map or two maps or two color schemes. Because there are so many permutations of testing





One of Cindy's favorite professional projects was the Mapping Census 2000 atlas, a map series on which she collaborated with a team of talented geographers. The 2000 census was the first that allowed individuals to report more than one race in their census form. ***(Top)*** *A "one race" map.* ***(Bottom)*** *A "one or more races" map.*

conditions when considering the full body of possible maps, I stopped pulling design questions apart into their microscopic pieces that could be tested and instead have gone with a combination of intuition and trust that I have exposed myself to an awful lot of literature and practice in cartography. I start from there to make design recommendations. This is likely a reflection of stage in career and age, rather than how you should work.

A project that was particularly rewarding, and that follows this transition in my career, was the census atlas prototype that I summarized in the *Reflections on Mapping Census 2000* article. The focus of the project was on diversity and required Trudy Suchan and I to map a series of variables across fourteen different racial groupings. Census 2000 was the first that allowed people to report multiple races, which was something we had to think about in our map series design; we had one version of the map for "one race"'and a second version for "one or more races." Given the number of map permutations, I couldn't just apply Jenks to every map. The supervisors and race experts at the Census Bureau were very particular about the classification breaks for each race. I would start with Jenks, round the breaks to numbers that were appealing, listen to the experts about which parts of the range were meaningful, and then finally try to make the maps comparable across the series. I didn't stop to conduct a controlled experiment to inform the design; I started working with the client and relied on my experience from there.

Rob: Moving from these primarily academic projects to mapmaking and map use generally, what, in your opinion, was the biggest development in Cartography in the past several years?

Cindy: Well, for me and my recent interests, it was getting good design tools in GIS software. The reality is that many people are doing cartography with national datasets. It was a challenge to bring national datasets into GIS software and to make a readable map while still keeping the data live. These national datasets are perpetually appended and improved, so it doesn't do us much good to use GIS software only to get the data into a format that could be exported to graphics software, and then complete the cartographic finishing there. We just cannot leave the environment where the data are changing when mapping the whole country at 1:20,000. It is not practical. It might work for some one-off maps, but not for most of the mapmaking happening at federal agencies.

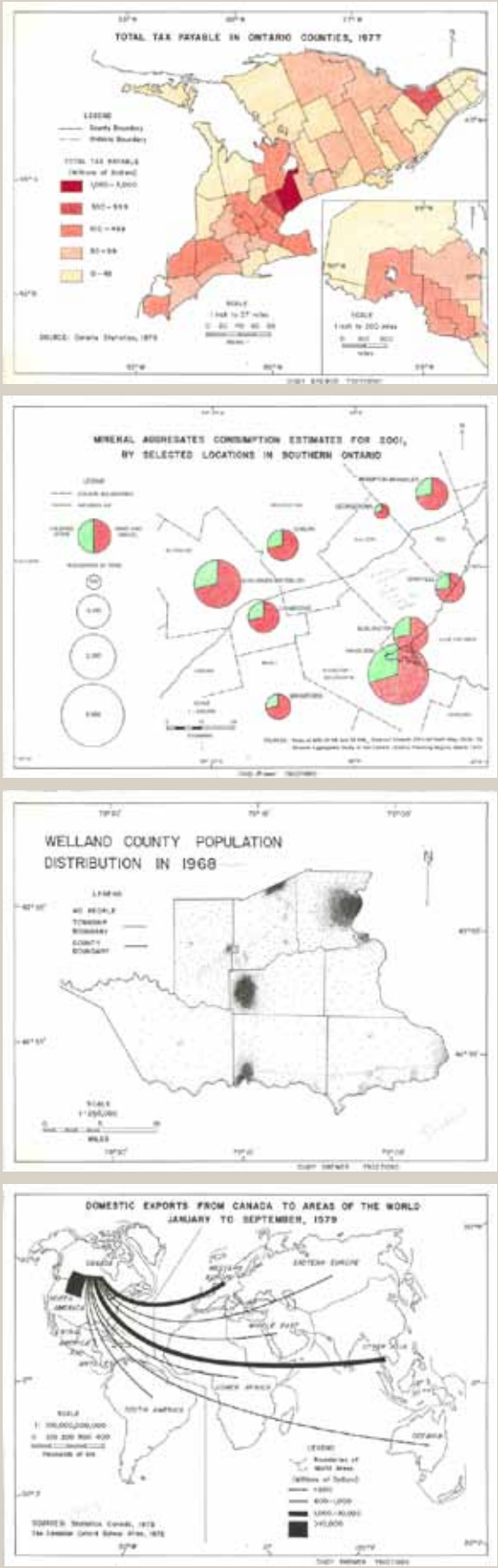
Rob: So you consider being able to design a good map while keeping the underlying data live as the biggest development in Cartography over the past several years. Looking into the future, what do you think is the biggest challenge for Cartography in the next several years?

Cindy: While GIS environments are starting to allow good quality cartography, there are still bottlenecks in the datasets. Many times, there just are not any attributes that allow you to apply appropriate cartographic symbolization. This is less a challenge within Cartography and more a plea to the data collectors that cartographers cannot be an afterthought. The data needs to be constructed from the beginning to allow it to be represented. The tools are now there to get the data on the map pretty quickly and in a sophisticated manner, so the attributes needed for good cartography can no longer be ignored during data creation.

Looking forward for academia, I've switched my approach in the introductory cartography course from an emphasis on thematic mapping to an even split between thematic and reference mapping. Reference mapping is where the big competition in "look" is happening. Just look at the sophisticated reference maps that are provided by Google, Yahoo!, and Bing; they are jockeying for number of users based on functionality in part, but also a lot based on look. So, the look of reference maps is really prominent in the way Cartography is viewed currently. This also shows up in federal mapping, like the US topo maps and the National Parks maps. I think, as academics, we really put ourselves in a backwater solely trying to find the next perfect thematic symbol, because there is a lot less of that going on in proprietary and government mapping. My current work on multi-scale mapping, compared to my past work on color, is a good example of my shift from thematic to reference map research.

Rob: So this is the last of my hard questions, and it may relate to the last two questions that I asked you. If you had the world's attention for five minutes to tell them about maps, mapmaking, and Cartography, what would you say? What would be your message?

Cindy: Good design is transparent, but that does not mean it was effortless. If you have a map that works really well, it is because someone worked really hard to design that information. They stripped away gobs of detail that would distract you from the message and put just the



Cindy completed four pen-and-ink thematic maps in her undergraduate cartography course prior to her final project. She now recommends a more even split between reference and thematic mapping labs when teaching Cartography at the university level.

right information on the map for its purpose. That takes a lot of skill; it is not something that the GIS does for you. The GIS gives you lots of data and lets you manipulate this data, but it does not help you select the appropriate data for the map, select the correct map scale and generalize the data accordingly, and come up with symbols that are legible and that stand out—it doesn't do any of that for you.

I think cartographers do not yet know how to demand that design be a priority, or frankly to get paid for doing it, because the final result looks like it was easy to produce. That good design is effortless is just not true. It is not easy. It takes a lot of skill. Periodically, a student will come to me with a freelance opportunity and ask what rate they should charge. I always push them, "You know how to do a lot of stuff. You have a lot of skills. You know how to use computers, you know GIS, you know graphic design software. Charge for it! Charge $35 an hour!" They usually look at me like I am out of my mind. Cartographers just generally undervalue their skills, and again I think it is partly because when you do it right, it looks effortless. I want cartographers to recognize that their design skills have value. In the end, I think that good design will out-compete bad design, regardless of the reality of cost.

GOOD DESIGN IS TRANSPARENT, BUT THAT DOES NOT MEAN IT WAS EFFORTLESS

Rob: Let's end with two easy, fun questions. First, what do you think is the most commonly violated cartographic convention or guideline? To put it another way, which guideline would make the biggest improvement in the complete body of maps if everyone followed it?

Cindy: Definitely establishing an appropriate visual hierarchy. This is a guideline that is violated on really a majority of maps, particularly those generated with GIS software. It is so important to push some or most of the content into the background, allowing the key content to rise to the foreground. It is also important to know when to remove items from the map, but I think establishing a good visual hierarchy is equally as important.

Rob: Last question: if you had to choose, would you choose conformal or equivalent?

Cindy: Equivalent of course! So many people map statistical data with a projection that severely distorts areas. When you are trying to have people understand a distribution, but show it on geographic areas that get bigger as you go farther north, or stretch east-west because you haven't bothered to select a projection, then you are misinforming the reader even if your data are accurate.

Rob: Thanks Cindy. I have enjoyed our conversation, and I suspect the CP readership will be interested in your experiences and opinions.

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