Teaching & Learning Ethics with Spatial Thinking & Geotech

Why | How

Joseph Kerski
11 April 2024

1. Equity, equality, and connections to education.

2 Tenets:

1. Teaching equity and ethics is important. I submit that given key social and technological forces, teaching these topics will be even more important than ever in the future.

2. Teaching equity and ethics can be powerfully and engagingly done using GIS and the geographic approach.

2. Definitions

Social equality is a state of affairs in which all people within a specific society or isolated group have the same status in certain respects, including civil rights, freedom of speech, property rights, and equal access to social goods and services.

Equity is the quality of being fair and impartial .

Social equity is impartiality, fairness and justice for all people as implemented in social policy. Social equity takes into account systemic inequalities to ensure everyone in a community has access to the same opportunities and outcomes. Equity acknowledges that inequalities exist and works to eliminate them.

As defined by the National Academy of Public Administration, **social equity** is "the fair, just and equitable management of all institutions serving the public directly or by contract; and the fair and equitable distribution of public services, and implementation of public policy; and the commitment to promote fairness, justice and equity in the formation of public policy."

Connection to Education:

Equity to me strikes close to home of what makes us **human** and also what inspired us to pursue a career in **education** in the first place:

1. We want to make a positive difference in the lives of people.

2. We believe that all students can thrive and that each student has a unique and valued contribution to make.

3. We seek to empower all students at all levels to be **change agents** in the world.

I also believe that GIS and spatial thinking are **disruptive** technologies and disruptive ways of thinking, respectively--at

its heart they break down disciplinary barriers.

With access to these tools, data sets, and ways of thinking, students will be wiser decision-makers in government, nonprofit, industry, and academia, building a more equitable, sustainable, and resilient world.

Beyond the benefits that GIS offers students, GIS also helps governments, nonprofit organizations, and others assess where a lack of access to resources exists, who is impacted, where to intervene, and enables people to take action.

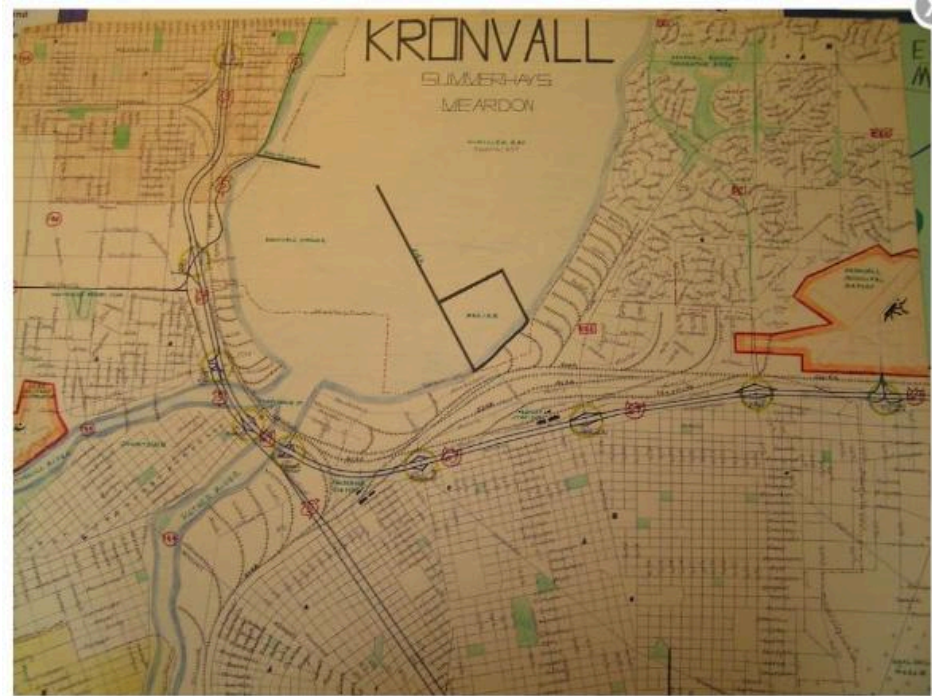## Reflecting on your own background: What unique strengths do you bring to your teaching and research?

Part of ethics is to be able to evaluate the credentials and background of the speaker: To that end, I offer my own journey, below.

My pathway and focus.

Joseph Kerski: My pathway through 4 sectors of society--nonprofit, government, academia, and private industry.

One of Joseph's teenaged maps.

3. Why should you care about teaching with GIS?

1. Maps are widely used as effective means of communication.
2. Maps are increasingly used in a widening array of disciplines and topics.
3. GIS is the technology behind the creation of most modern, online, interactive maps.

4. Why do ethics matter in mapping and GIS?

Why and how can ethics be taught?

(1) Everyone is now a map producer.

Knowing that maps are powerful means of communication, you should take that responsibility as map author seriously.

With great capability comes great _____ responsibility.

(2) Growing concern for geotechnology's role in privacy, surveillance, and global conflicts.

(3) Growing concern about the replicability and reproducibility crisis in science in the face of "we have problems to solve!"

(4) Awareness of pitfalls in making inferences from geodata and GIS analysis.

Selected principles impacting inference:

The ecological fallacy: Ecological in the sense of dealing with aggregates. A correlation at the aggregate does not imply correlation at the individual level.   Example: Suppose COVID infection is correlated with % Asian at the Census Tract level. This does not imply that individual Asian-descendants are more susceptible to COVID infection, but implies only that areas with high proportions of Asians also have high rates of infection.

Correlation does not imply causation: It is necessary to avoid the use of causal language in reporting correlation: x impacts

y; x explains y.

(5) Maps have an *aura of authenticity*--they tend to be *believed*. Take that responsibility seriously, and do not intentionally or unintentionally mislead your audience.

A good map teaches you to ask a better question.

Maps are representations of reality.

"The map is not the territory" – Alfred Korzybski, 1933.

(6) GIS Users and Ethics.

 The dominant theme of the UX has been "caveat emptor" - the user is free to choose which functions to employ on which data, and is left to interpret the results. (Goodchild)

Today, ArcGIS Pro has thousands of functions, but the UX philosophy remains the same, and ethical behavior is largely the responsibility of the user.   Do they know about MAUP, the ecological fallacy, location privacy, and spatial dependence?
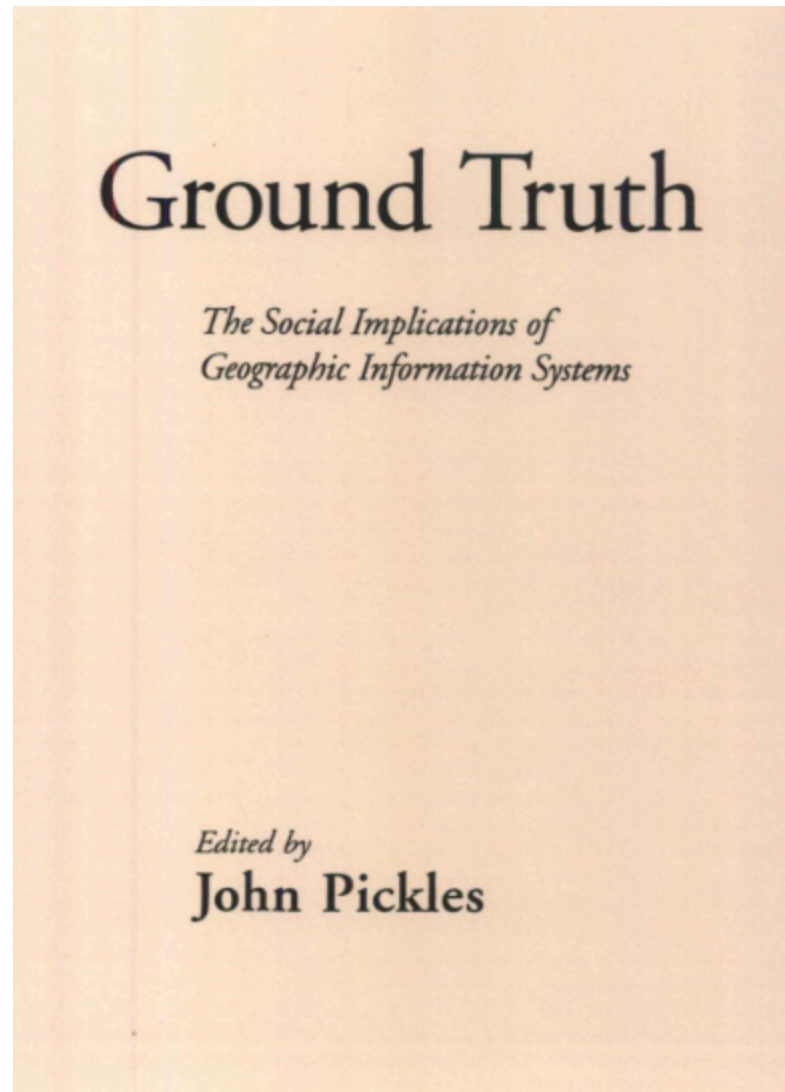
How could we build software tools that help the user make ethical decisions?   Warnings, popups, stored workflows, something else?

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5. Why teach ethics?

1. Rising geo-awareness and use of geotechnologies in society.

Ground Truth, by John Pickles. 1995.

Ground Truth

The Social Implications of Geographic Information Systems

Edited by

John Pickles

2. Rising concern about AI -- mapping -- education -- society.

3. New initiatives: Codes of ethics; mapmakers mantras.   American Geographical Society's Ethical

Geo Column, Esri's social science inclusion, AAG-Esri Geo-Ethics summit at UCSB.

Tenets of teaching ethics:

1. Ethics is too important to be relegated to the *end* of a course.

2. Ethics should be integrated into *any* course that asks "where" and where communication matters.

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6. Where can I effectively teach ethics through GIS?

1. In GIS courses.
2. In non-GIS courses throughout disciplines from A to Z.
3. In the workplace: Government, nonprofit, and industry.

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7. How can I effectively teach ethics through GIS?

In interesting, practical ways through examining data through hands-on activities, inquiry, reflections, discussions, and presentations.

Let's get personal: Location Privacy.

(1) How many of your phone's apps are sharing your location right now?

(2) When should you share your mapped data? Who should you share it with?

THINK: Is your map:
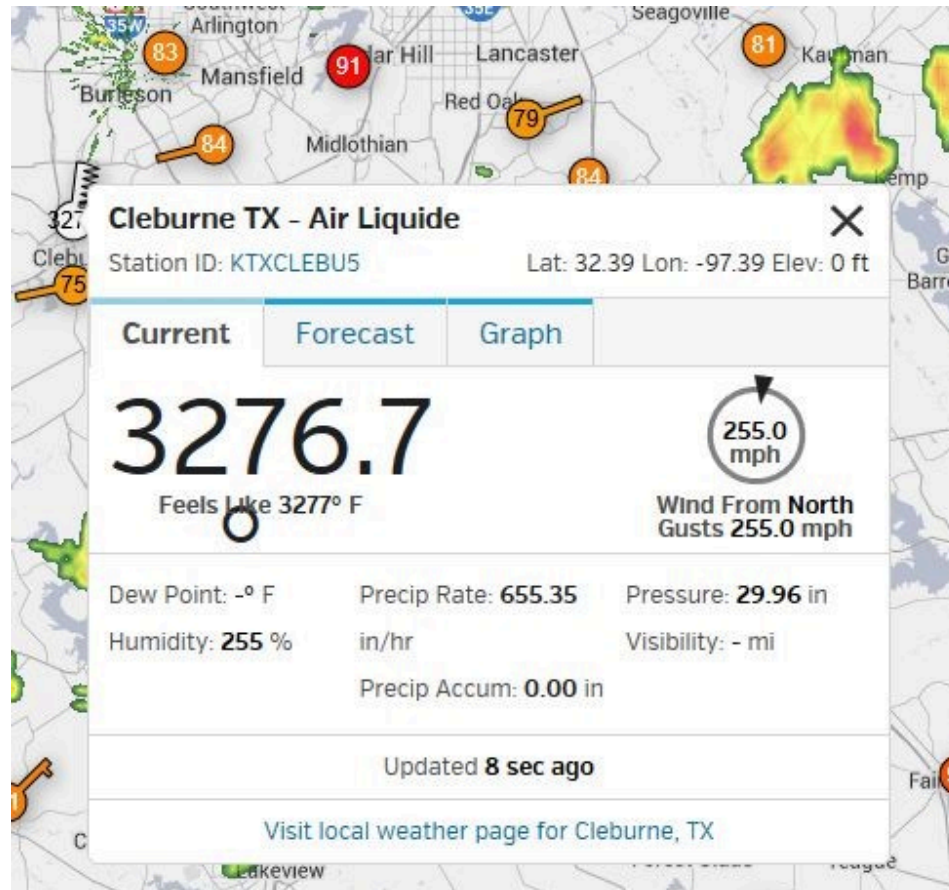
True,

Helpful,

Inspiring,

Necessary,

Kind?

1 effective technique: Show bad maps, such as my set here: Bad maps abound, and even live data feeds can be in error!

I know it gets hot in Texas, but ...

## The 4 C's of data quality:

1. Complete: Is everything here that's supposed to be here?

2. Coherent: Does all of the data "add up?"

3. Correct: Are these, in fact, the right values?

4. aCcountable: Can we trace the data?

Imagery must also be viewed critically—it could
be intentionally offset from vectors or selectively offset from
vectors or selectively remove items, such as moving vehicles.
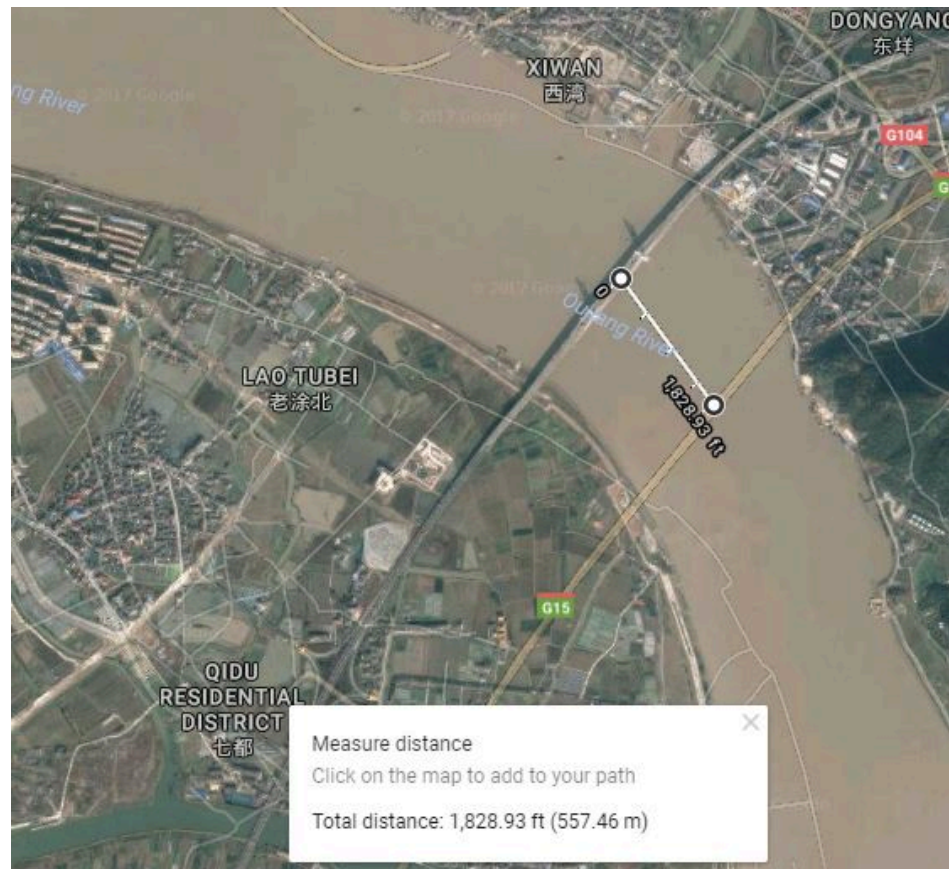
Example of offset imagery.
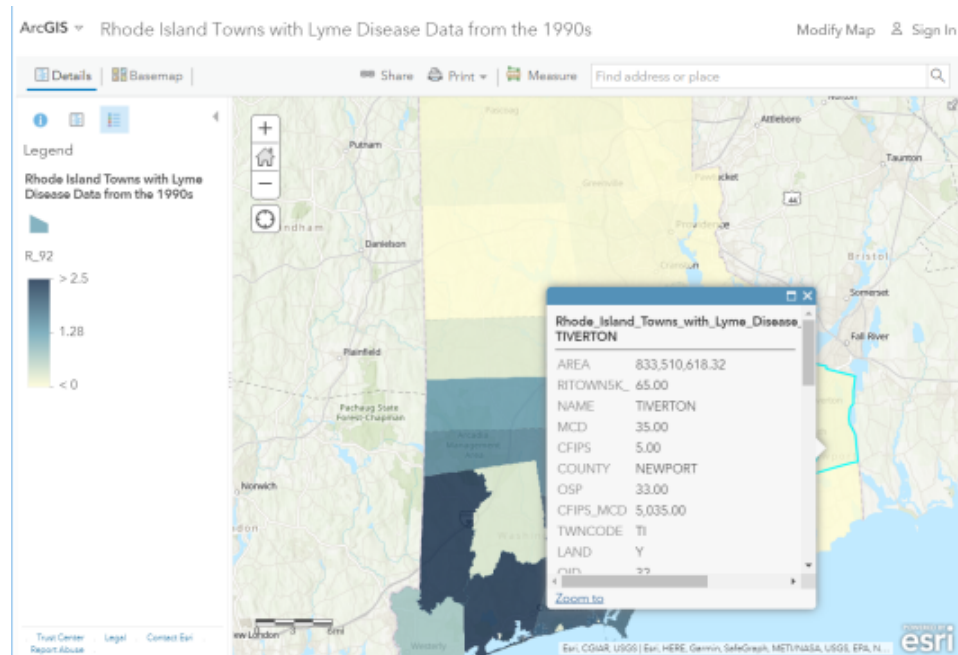
Data could even be intentionally faked.


Faked imagery example.

Is this real? Creating weather is possible in ArcGIS 3D Scenes. Redlands, California USA.

Key information may be left out of the metadata can only be resolved by talking to the data creator with an old-fashioned call as was the case when I was revising my Lyme disease map of Rhode Island.

Mapping Lyme disease in Rhode Island.

Another effective teaching technique: Make clear that even when you are mapping your **own** data, data quality and ethical decisions frequently arise, as I point out in these field examples.
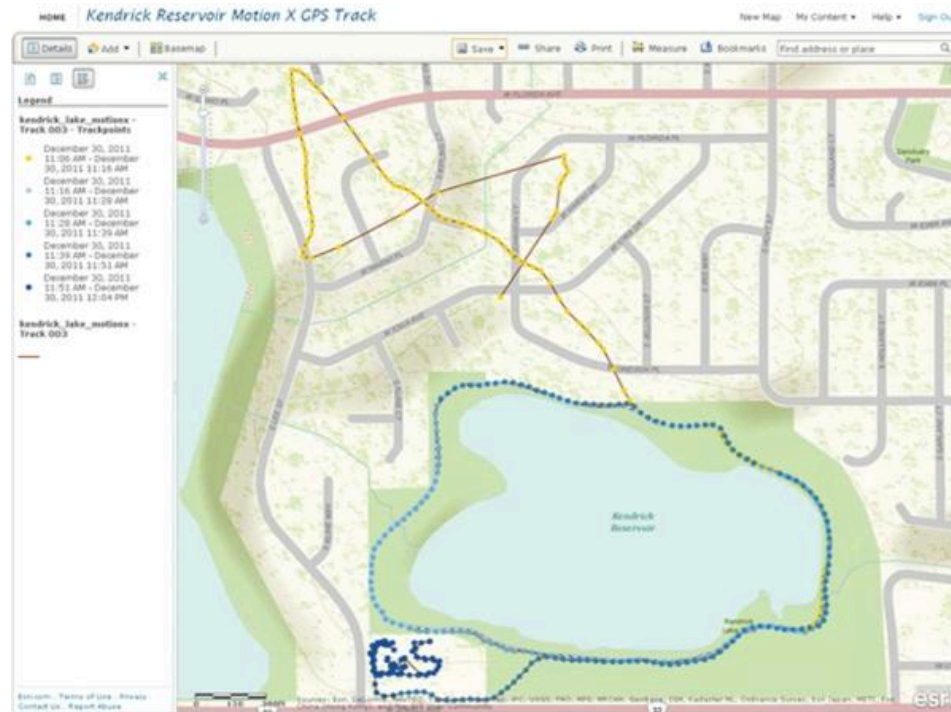
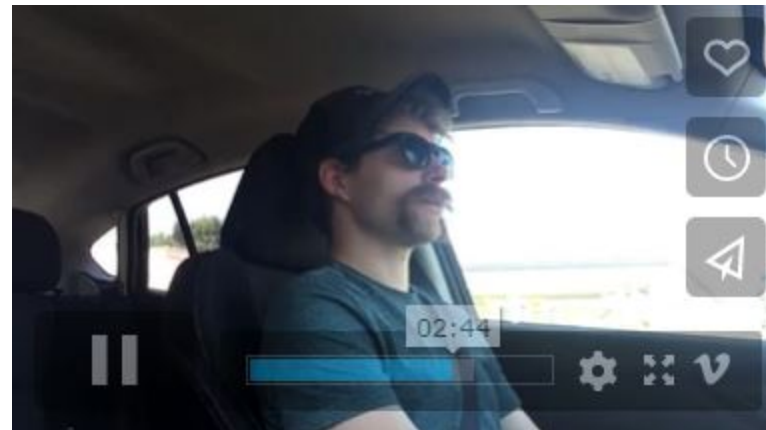*Be critical of the data - including when it is your OWN data!*

Use case studies in your ethics instruction. One set is from David DiBiase at Penn State.

GISEthics.org | Case Studies

Another set is an 8 part video series on geoprivacy from Dr Seidl in my own state of Colorado. Including REPO MAN!

Repo Man! Takes pictures of potential repossessed vehicles.

Another way to teach ethics are to examine these gigapan images. I included this image from this tower in China in
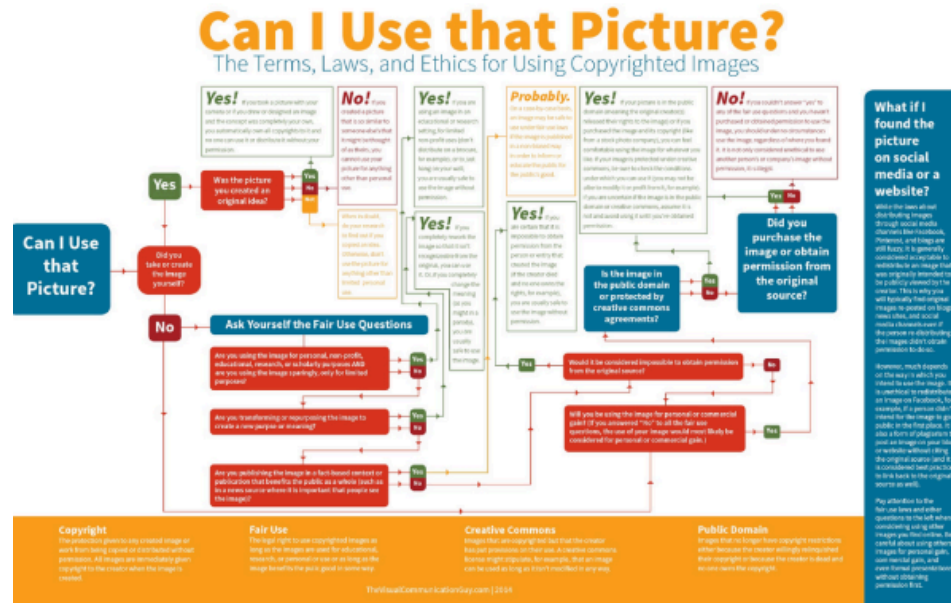
discussions in my course in modern GIS.

Gigapixel image.

Turn issues of copyright, such as "**can** I use that picture in my story map" into short effective instructional moments in ethics. This fosters discussion about best practice aided by my favorite decision-making graphic on this topic.

Decision-making tree: Can I use that picture?

Next, ask, "**Should** I use that picture?" Potential harm can occur to natural spaces, for example, from geotagged photographs resulting in a place being "over-loved" to rare and endangered species.

ILLUSTRATION BY ERIC NYQUIST

Unnatural Surveillance: How Online Data Is Putting Species at Risk

The rapid growth of digital data has been a boon to researchers and conservationists. But experts are warning of a dark side: Poachers can use computers and smartphones to pinpoint the locations of rare and endangered species and then go nab them.

Another way of teaching ethics: Foster a debate using the GIS Certification Institute's Code of Ethics. Pose scenarios and ask students, "when does the obligation to society outweigh the obligation to the employer, funder, or colleagues?"

GISCI Code of Ethics.

Model good metadata strategies!   First, examine the metadata. Then: Teach: (1) Truth in Labeling (TIL); (2) Fitness for Use (FFU).

When students ask: "Is my map *right*?"   Respond:
1. "Does it aid in your understanding of the issue?
2. Can you justify the choices you made in creating the map?"

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8. Major Ethical Initiatives:

1. An AAG paper is out for review on locational privacy and the public interest.

A White Paper on Locational Information and the Public Interest

September 2022

AAG Organizing Committee on Locational Information and the Public Interest

2. The Map Makers Mantra:

https://www.esri.com/arcgis-blog/products/arcgis-online/mapping/mapmakers-mantra/

- **Be Honest and Accurate:** The highest objective and primary obligation of ethical mapmakers is to communicate information in the most accurate and understandable way.

They strive for veracity and verifiability in all aspects of their mapmaking.

- **Be Transparent and Accountable:** Ethical mapmakers take responsibility for their work and are open and transparent about their sources and decisions. They accept that neither speed nor format forgive accountability.
- **Minimize Harm and Seek to Provide Value:** Ethical mapmakers treat sources, subjects, colleagues, and members of the public with respect; they promote equity, inclusion, and empathy. They strive to make maps of value to increase understanding and provide insights.
- **Be Humble and Courageous.** Ethical mapmakers humbly admit when they get it wrong and gently point out when others get it wrong. They have the courage to admit when they do not know something and call on others when their own skills or knowledge are insufficient.

3. Data Equity:
https://spatialreserves.wordpress.com/2023/10/02/reflections-on-data-equity/   Reflections from the Equitable Data Working Group.

4.   The International Science Council CODATA Working Group on Data Ethics.   "The growing application of big data and artificial intelligence in scientific research raises ethical and normative challenges, particularly in relation to openness, privacy, transparency, accountability, equity and responsibility. The Data Ethics Working group of CODATA is

working with global scholars to collaboratively establish a basic consensus for further activities and research on data ethics principles and a data ethics framework covering the whole data life cycle. This will help CODATA to advance its mission in championing global open data exchange and applications in alignment with the UNESCO Recommendation on Open Science."

As part of the SciDataCon [scidatacon.org] side of International Data Week [internationaldataweek.org], a session organised by the CODATA WG on Data Ethics, looking at four aspects of data ethics relevant to the UNESCO Recommendation on Open Science: Data Ethics and the UNESCO Recommendation on Open Science [scidatacon.org]

5. The African Association of Universities (AAU), the University of Nottingham, and the Ethical Data Initiative launched the Campaign for Data Ethics in Education during 2023.   The Campaign aims to highlight the importance of educating researchers and aspiring data practitioners about the ethical considerations involved in collecting, using, reusing, and storing data during their training.   Details can be found here: https://ethicaldatainitiative.org/campaign-for-data-ethics-in-education/ [ethicaldatainitiative.org] and here: https://ethicaldatainitiative.org/news/

9. Ethics are appearing more frequently in "mainstream" texts

Conservation Social Science:

https://www.wiley.com/en-us/Conservation+Social+Science%3A+Understanding+People%2C+Conserving+Biodiversity-p-9781444337570

Conservation Social Science: Understand...

Groundbreaking book that examines the essential contribution of the social sciences to understandin...

https://www.wiley.com/en-us/Conservation+Social+Science%3A+Understanding+People%2C+Conserving+Biodiversity-p-9781444337570

Handbook of Geospatial Technologies:

https://www.routledge.com/The-Routledge-Handbook-of-Geospatial-Technologies-and-Society/Kent-Specht/p/book/9780367428877   includes social constructivism and more.

The Routledge Handbook of Geospatial ...

The Routledge Handbook of Geospatial Technologies
and Society provides a relevant and comprehensiv...

https://www.routledge.com/The-Routledge-Handbook-of-Geosp
atial-Technologies-and-Society/Kent-Specht/p/book/9780367428
877

Digital Earth: Yesterday, today, and tomorrow: *International
Journal of Digital Earth:*

https://www.tandfonline.com/doi/full/10.1080/17538947.2023.2
187467

Digital Earth

The concept of Digital Earth (DE) was formalized by Al Gore in
1998. At that time the technologies needed for its implementation...

https://www.tandfonline.com/doi/full/10.1080/17538947.2023.2187467

10. To dig deeper:
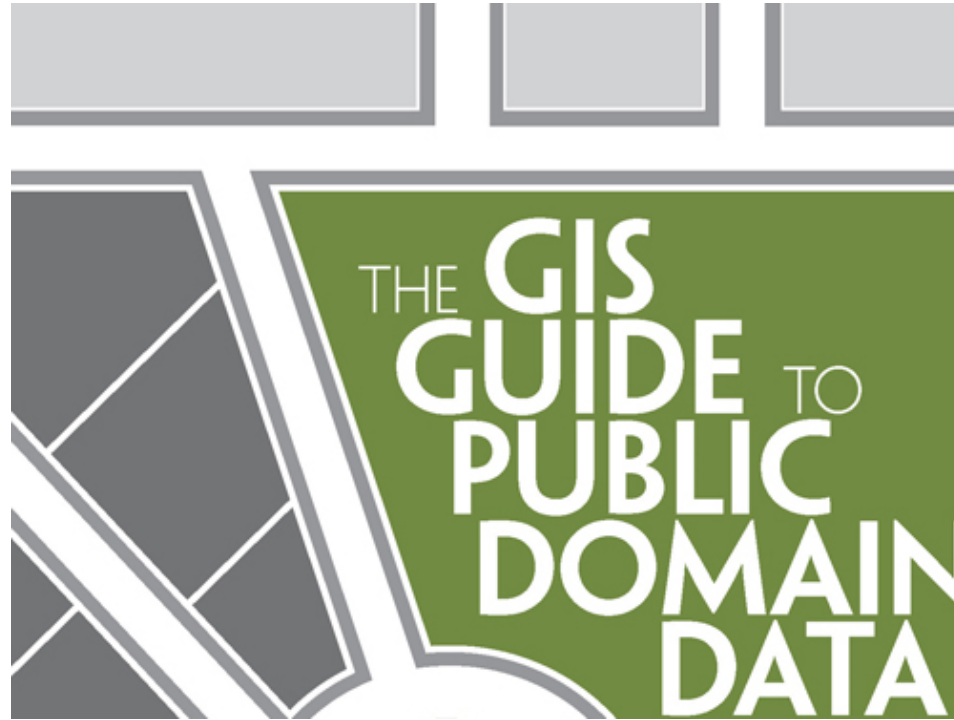
1. My Ethical Geo essay for the American Geographical
Society.

Ethical Geo essay.

2. My ethics essays on the Spatial Reserves data blog.

3. My location privacy chapter in the UCGIS GIS&T Body of Knowledge and other chapters.

Guess where?

Credits

All content	Joseph Kerski and sources identified in the Spatial Reserves blog and elsewhere.