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PEER-REVIEWED ARTICLE

Practical Geospatial Ethics: Concerns, Codes, and Cases

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This paper is one of a diverse set of contributions to a special issue of Cartographic Perspectives *focused on cartographic ethics. Throughout it situates cartography within a broader geospatial context and discusses ethics in relation to professional practice in that field. First the paper considers the nature of ethical concerns expressed within the industry, government, and academic sectors of the geospatial enterprise, and speculates on how those concerns have evolved since* CP *first addressed ethics in the early 1990s. Second, it considers the roles of professional ethics codes and how relevant codes and rules relate to evolving ethical concerns. Thirdly, the paper highlights characteristics of ethics case studies, and the utility of formal case study analysis. It suggests how practitioners' stories about ethical challenges can be adapted to "actionable" case studies that can be used to hone geospatial professionals' and organizations' ethical problem-solving abilities. The paper concludes that case studies may be key to elevating ethics within cartography and geospatial curricula in higher education, as well as in training large language model AIs to provide reasonable ethical advice to human mapmakers and users.*

Michael Davis—the philosopher whose work guided my approach to practical ethics education—begins his book *Profession, Code, and Ethics* with a droll observation: "Just as nobody likes a wiseguy, nobody likes a definition" (Davis 2002, 1). Be that as it may, I begin by defining what I mean by "geospatial ethics":

> "Ethics" refers here to questions of right and wrong that arise in applications of geospatial technology, data, and methods. "Ethical" geospatial professionals and organizations know how to respond to such questions with insight, empathy, and integrity.

The term "geospatial" establishes the definition's context: the family of technological disciplines—including cartography, geographic information systems, remote sensing, and land surveying, among others—that specialize in geographic data and information. The phrase "geospatial professionals and organizations" establishes that the paper is concerned with the special moral obligations that those individuals and groups are obliged to uphold, above and beyond the ordinary moral traditions people learn as children. Responding to "questions of right and wrong" with "insight, empathy, and integrity" implies that ethical judgment requires (1) deep understanding of the facts and factors in question; (2) a sensitivity to stakeholders' concerns about the issues; and (3) honesty, transparency, and a strong sense of duty to the ethical principles that characterize one's profession.

The definition thus claims that practical ethics is not just a matter of following a code of ethics or a set of rules of conduct, though such resources do provide useful guidance. Instead, it claims that practical ethics requires setting aside one's gut feelings while applying judgment to identify and choose among multiple options—the best of which may not be immediately obvious.

In their respected primer *The Elements of Moral Philosophy*, James and Stuart Rachels (2023) posit a "Minimum Conception of Morality"—a "core that every moral theory should accept, at least as a starting point" (1):

> Morality is, at the very least, the effort to guide one's conduct by reason—that is, to do what there are the best reasons for doing—while giving weight to the interests of each individual affected by one's action (13).

Ethical judgment of this sort is not an innate ability. It is a habit of mind that can be strengthened with practice. In this paper I consider what sorts of ethical concerns geospatial professionals have, how those concerns may be evolving, and what sorts of resources are available to help strengthen their ability to resolve ethical challenges satisfactorily: with insight, empathy, and integrity.

> It would certainly help . . . to have more documented facts about ethical issues in cartography. What are the motives and personal engagements of cartographers with the maps they make?
>
> Brian Harley (1991)

A systematic accounting of ethical concerns and challenges faced by cartographers and other geospatial professionals would be a worthwhile project. In this section I'll try to provide a step in that direction. I'll review several sources with which I have personal experience: articles in *Cartographic Perspectives* focused on ethical issues—including some of the articles appearing in this special issue—as well as select publications beyond *CP*. I'll compare concerns found there with issues identified by current and aspiring professionals enrolled a graduate ethics workshop I have conducted regularly for The Pennsylvania State University (Penn State) since 2009. I hope this explorative review will at least provide a hypothesis about the diverse, context-specific, and dynamic ethical concerns in cartography and the broader geospatial enterprise. I'll work my way up to the hypothesis by the end of Part 1.

CARTOGRAPHIC PERSPECTIVES, *1990s–2000s*

To begin, I'll discuss the earliest ethics-focused articles published in *CP*. The very first was "Ethical Problems in Cartography: A Roundtable Commentary" (McHaffie et al. 1990), which appeared in issue #7. That paper, which I pitched to the authors as the fledgling editor of the new journal, was designed to span perspectives from cartographers working in the government, private, and academic sectors. I'll retain that tripartite structure throughout this section.

Industry Sector Concerns

In the commentary, Michael Dobson (then Chief Technologist and Chief Cartographer at Rand McNally, the venerable map and atlas publisher) stated that "in my opinion, the single greatest ethical problem in our industry is one in which large commercial cartographers are victims rather than perpetrators: copyright infringement" (5).

Government Sector Concerns

The two anonymous government employees involved in the roundtable described "an ethical crisis in government mapping" caused by product liability lawsuits, "budget cutbacks in the face of mounting pressures to produce more, or to produce the status quo with fewer resources," and "automation activities that are not technically or economically feasible at this time" (6).

Academic Sector Concerns

Sona Karentz Andrews highlighted what she believed were oft-overlooked ethical implications of map design: "The kinds of questions we should teach [students] to ask are 'what are the consequences of what I have mapped? How do the decisions I make influence the decisions made by others?'" (9).

Patrick McHaffie wrapped up the roundtable by observing that "the discussion illustrates the personal, individual nature of ethical questions, even within the three major sectors." Yet, he continued, "there are obviously common themes running through this group commentary," primary among which is "the nature and validity of cartography's claim to truth" (10).

Two more ethics articles appeared during my editorship in issue #10. One was Mark Monmonier's "Ethics and Map Design: Six Strategies for Confronting the Traditional One-Map Solution" (1991). For Mark, it is unethical for cartographers to risk misleading map users, or to stand by while others mislead intentionally, when cartographers know how to do better and have the necessary technology. His six strategies—including sequencing of alternative views, interactive maps, professional standards (including a code of ethics, disclosure of experiments, and institutional structures such as a journal of cartographic criticism) aimed to increase transparency and overcome biases in mapmaking.

The second article published in issue #10 was Brian Harley's "Can There Be a Cartographic Ethics?" (1991). Harley praised the roundtable article as "pioneering . . . the first of its kind," but argued that it was "based . . . on a fundamental fallacy . . . the 'cartographers know best' fallacy" (9–10). "Cartography," he warned, "will be unable to engage in an ethical debate while it continues to appeal only to its own internal standards yet is morally blind to issues in the world outside" (11). "If we are truly concerned with the social consequences of what happens when we make a map," he argued, ". . . the debate must move beyond a narrow internalist formulation of what is ethical

in cartography . . . cartography is too important to be left entirely to cartographers" (12).

I suppose I'm partly to blame for the "cartographers know best" fallacy, since I was responsible for framing the roundtable discussion. But a flawed idea can still be useful. The distinction between "internalist" and "externalist" perspectives on cartographic ethics that Harley, and later Jeremy Crampton, articulated from the broader perspective of Critical GIS (Crampton 1995) has informed debates about ethics in both fields ever since.

Harley provided more than just an externalist critique. He also addressed his own question, "Can there be an ethically informed cartography and what should be its agenda?" (13). He shared an important insight about the distinction between moral theory and practical and professional ethics: "What cartographers most earnestly seek is probably not so much a theoretical as a practical ethics, a set of principles that can be used to clarify moral disagreements or conflicts with the goal of resolving them" (14).

Several other ethics-focused articles by authors representing the academic cartography community appeared in later editions of *Cartographic Perspectives*, including Matthew McGranaghan's (1999) "The Web, Cartography and Trust," Michael Peterson's (1999) "Maps on Stone: The Web and Ethics in Cartography," Tom Koch's (2006) "'False Truths': Ethics and Mapping as a Profession," and the 2008 dialogue between Mark Denil ("Manifestos") and Steven Holloway ("Response to Mark Denil's 'Manifestos'"). I'll consider the "manifesto" that sparked that dialog later in this paper. At this point I wish to focus on Koch's "False Truths."

Drawing from Harley and Denis Wood (1992), Koch warns cartographers about complicity in spreading "false truths"— "lies wrapped in the guise of fact" (5). Among several examples he presents a thematic map of long-lived smokers, which suggests the false truth of "equivalence between longevity and tobacco use that is unsupportable" (5). Koch argues that "cartographers bear responsibility for the maps they make, for their effect on society" (7). Invoking Peter Singer's (1993) notion of an "impartial spectator or ideal observer," Koch argues that for the cartographer, "the trick therefore is to understand . . . that ideal observer's judgment of the maps they create" (4). In a sense, this virtue ethics approach is consonant with the "externalist" perspective Harley advocated.

SUBSEQUENT PERSPECTIVES, 2010s–2020s

Here, I'll compare those ethical concerns expressed in *Cartographic Perspectives* in the early 1990s and mid-2000s to more recent perspectives.

Industry Sector Concerns

In its "**Statement on Ethics for the Map Industry**," the International Map Industry Association does mention "proper treatment of intellectual property" under one of its four "essential priorities and practices." My sense, though, is that the issue has become less an ethical concern than a legal one. Proprietary map and remotely sensed image data certainly do exist, often for defensible business reasons. But for many geospatial people who have come of age during an era of open data initiatives, the very concept of proprietary data has become morally questionable.

Kevin Pomfret, a leading voice in geospatial law and policy, counts intellectual property among the field's enduring legal issues (Pomfret 2024). Privacy, national security, data quality, and liability are others. For years, Kevin has advocated greater awareness of legal and policy issues among geospatial professionals, including educators. He criticizes geospatial education for what he sees as an over-emphasis on ethics and neglect of law and policy. I agree with his critique and am convinced that my own teaching should explore more deeply the interrelationships of ethics, law, and policy. I'm also aware, however, that while philosophers like Davis (2014) encourage non-philosophers like me to teach professional ethics, the same might not be true of law school faculty.

Meanwhile, the ethics of proprietary geospatial software is a serious concern for some. So much so that **two scholars proposed** that the American Association of Geographers cancel Esri's Platinum-level sponsorship of the AAG's Annual Meeting. For its part, while Esri maintains a vigilant legal department, its public-facing employees seem focused on garnering trust and good will through an emphasis on customer success and best practices in mapping, including a commitment to geospatial ethics.

Government Sector Concerns

Two papers in this special issue of *CP* present concerns of mapmakers working in government. In relation to the 1990 roundtable commentary in *CP*, neither are concerned with product liability lawsuits, management pressures to

produce more with less, or immature mapping technologies. Some ethical concerns are ephemeral.

In "Better than Good Enough for Government Work," **Leo Dillon** recounts "three episodes in the 34-year career of a cartographer at the US State Department [that] illustrate how ethics can inform, or intrude on, mapping for foreign policy" (2025, 76). Problems of boundary representation, national sovereignty, and geographic names are particular concerns. He also presents a thought-provoking case study in which he was directed to "outright lie on a map" (76). I'll consider that case later in this paper, in the section dealing with the "case method."

Daniel Coe, Graphics Editor at the State of Washington Geological Survey, reflects on ethical challenges arising from the agency's conversion of a popular "rockhounding location map into multiple interactive, variable-scale web maps." Challenges include the duty to discourage "collecting on privately-owned land without permission" while honoring "laws, regulations, and rules governing collecting on public lands" (2025, 64).

Meanwhile, beyond *CP,* new concerns about government mapping have accompanied emerging information and communication technologies. One example is de Jong and colleagues' (2019) discussion of the ethical challenges posed by "movement mapping" using location-aware mobile phones to help identify disease transmission hotspots. More recently, the Federal Communications Commission's **$200 million fine** against four major wireless carriers for illegally sharing access to customers' location data demonstrates the US government's concerns about location privacy.

Academic Sector Concerns

Several other cases provide perspectives different in kind from the three early ethics pieces in *CP.* Some of these are not only "internalist," but introspective to a degree not found in more academically styled articles. For instance, in "The 'AfterMap' of the February 2023 Earthquakes in Turkey," Professor **Seda Şalap-Ayça** of Brown University recounts her struggle to contribute cartographically from afar to disaster relief efforts in her homeland. Despite her technological savvy and significant related experience, Şalap-Ayça worried that her efforts might be counter-productive by only adding "another layer of noise" to the "vast data landscape" on social media (2025, 36). She resolved that humbly joining forces with the Humanitarian OpenStreetMap Team was the most helpful thing she could do under the circumstances.

In their research on how interstate migration impacts family networks, Professor **Caglar Koylu** of the University of Iowa and Professor Emerita **Alice Bee Kasakoff** of the University of South Carolina (2025) wrestle with "serious ethical concerns" caused by biases in population statistics that result in "significant underrepresentation of certain groups in the United States, notably Native American, Black, and Mexican persons . . ." (56) Their case discusses how they have taken significant steps towards fulfilling their ethical responsibilities as cartographers and historians by working with high schools to highlight the issue of representativeness, augmenting family tree and census data with the narratives of underrepresented groups.

In her "Ethical Dilemmas in Early Career: Reflections on a GIS Internship Experience and its Echo in Geospatial Teaching," Professor **Mairéad de Róiste** of Victoria University of Wellington shares a regret about her response to an ethical challenge years before as a city council intern in Ireland, where she was directed to delete features in aerial photography. Her experience led her to advocate forcefully for "the importance of practical ethics in geospatial education" (2025, 18).

Entries by three thought leaders in geospatial ethics in the second (online) edition of the *GIS&T Body of Knowledge* summarize academic sector concerns and ways of thinking about the subject in the late 2010s to early 2020s. James Thatcher (2018) reconsiders Harley's theoretical approach to understanding the power of maps and discusses newer participatory and counter-mapping practices. Jeremy Crampton (2018) argues that the power of maps is a threshold concept capable of changing the way students and practitioners think about mapping, and that critical ethics is a useful way to understand the "data politics" within which GIS is embedded. Finally, Nancy Obermeyer (2021) compares ethical guidelines of the Geographic Information Systems Certification Institute (GISCI) and the American Society for Photogrammetry and Remote Sensing (ASPRS), suggesting that "virtue ethics and practical wisdom" are useful resources when guidelines fall short of addressing specific ethical challenges. (My own 2017 entry in the *GIS&T Body of Knowledge* is an earlier and lighter treatment of some of the thoughts discussed in this paper.)

A recent article in the *Proceedings of the National Academy of Sciences* crystalizes insights gleaned from ethics initiatives across the disciplines of geography, geosciences, and geographic information science in relation to the "3Es": ethics, empathy, and equity. These, the authors argue, "are emerging as new drivers of research and disrupting established practices" in science (Nelson et al. 2022). In the article, the authors

> discuss ethical issues arising from locational privacy and cartographic integrity, how our ability to build knowledge that will lead to empathy can be curbed by data that lack representativeness and by inadvertent inferential error, and how GIScientists can lead toward equity by supporting social justice efforts and democratizing access to spatial science and its tools.

Empathy is one of the themes in this special issue as well. Independent cartographer **Daniel P. Huffman** shares a poignant reflection on the map critiques he published in his former blog *Cartastrophe*. He concludes that "a greater emphasis on empathy can guide us toward a way of critique that both teaches an audience and respects the cartographer" (2025, 15).

Taken together, all these recent perspectives suggest that some ethical concerns have endured, and others are emerging. I'll summarize these at the end of Part 1.

CURRENT AND ASPIRING PROFESSIONALS 2010s–2020s

So far, we have considered the *CP* special issue case studies, along with related references beyond *CP,* in relation to the ethics articles published in *CP's* early years. In this section I'll add a perspective gained from discussions about ethical issues in a graduate workshop I lead at Penn State.

Since 2009, I've led an ethics workshop that's required for graduate students in Penn State's online Master of GIS degree program and, since 2021, the Master of Science in Spatial Data Science. The 12-hour workshop—which we call "Responsible Scholarship and Professional Practice"—combines Collaborative Institutions Training Initiative (CITI) online training in the Responsible Conduct of Research with our own instruction in geospatial professional ethics. By my count, as of December 2024, 779 graduate students have passed the workshop since 2009.

One of three workshop assignments asks our online students to read ***A GIS Code of Ethics*** published by the Urban and Regional Information Systems Association (URISA) and then post comments in response to one of a short list of topics. The most popular topic option is this: "Explain what you believe to be the most important ethical challenge in the geospatial field, or an ethical challenge you have confronted in your professional practice." Across the three workshop offerings I led in 2023, 70 graduate students addressed this prompt. The students' median age was 31 years (ranged 24–54). About half of the students were working with mapping technology professionally during their studies—nearly all in full-time jobs—and almost 20 percent more worked in related fields.

Although the students identified a variety of topics they considered "most important," the most frequently cited issues were related to the commodification of personally identifiable geographic information (PIGI): privacy, confidentiality, informed consent, location tracking, and data ownership, among others. Responses like the following two accounted for slightly more than 50 percent of students' posts:

> One of the most significant ethical challenges in the geospatial field is balancing the benefits of GIS technology with the potential risks to privacy and security. GIS technology provides a powerful means of analyzing and visualizing data, but it can also collect and process sensitive information about individuals, such as their location and movement patterns. Ensuring that this information is collected, used, and shared in a way that protects individual privacy and security is a critical ethical challenge for GIS professionals.

> One principle of both the URISA and GISCI code of ethics for GIS professionals includes striving to avoid harm to individuals in society. With an increase in sensors and geospatial tracking abilities, there is a vast increase in the amount of data available and at a more individual level than ever before, which presents one of the largest ethical challenges in the geospatial field today.

Why was PIGI the predominant issue cited by graduate students, when it is scarcely mentioned at all in the early ethics articles in *Cartographic Perspectives*, or in the current special issue case studies? The early *CP* articles harken

from a time when PIGI was less pervasive than it is today. For the students, who had just completed the required five-hour CITI training on the Responsible Conduct of Research, the issue was top-of-mind. Yet, as the quotes above suggest, their concern is not limited to research contexts—it is a pervasive worry in many students' everyday lives. Perhaps this concern doesn't surface so much in the cases in this special issue because those authors were more strongly encouraged to introspect.

Other concerns identified by three or more workshop students were: analytical integrity, accessibility (open data, barriers to entry; skills gap), accuracy, workplace ethics, public understanding of geospatial technologies and methods, and cartographic integrity. The following two quotes are among the more incisive comments:

> In my work in political science and public policy research, the principles outlined in the Obligations to Society sections of URISA and GISCI's code of ethics often come up, especially the importance of accurately and appropriately analyzing and presenting data. Because the findings of think tanks, research institutions, and government agencies often influence policy that directly impacts communities, misrepresenting or misinterpreting data can have serious, adverse effects.

> Something I have come to realize as I learn more about spatial analysis and statistics is how much is up to the discretion of the analyst . . . decisions of scope, model type, and data can be designed to represent reality that is not actual. I have become daunted by the understanding of how easy it is to manipulate results unknowingly [by] simply not taking everything into consideration, recognizing distortions of aggregated data, or creating models in a vacuum.

Obviously, many factors account for differences between the ethical concerns expressed in *Cartographic Perspectives* and other publications, and those of the current and aspiring professionals in my ethics workshops. My purpose here is not to enumerate the differences, but rather to suggest that differences are to be expected. Outside of specialist communities, ethics is a multifaceted concept that tends to reflect the point of view of the person or group that's thinking about it. We should expect that different individual practitioners and groups within cartography and GIS will have different perspectives on ethics. If true, then the more practitioners and groups that are invited to reflect on ethics in cartography, the more kaleidoscopic the view is likely to become. The possibility that consensus may recede, rather than emerge, from inclusive conversations about ethics is something that the cartography community should keep in mind as it considers what should be done about ethics. More about that in Part 2: Codes.

Despite the diversity of perspectives considered in this section, I do think it's reasonable to generalize the trends in ethical concerns expressed. Given that this effort has been explorative, I'll offer the generalization as a hypothesis, perhaps to be tested in a more rigorous future study. Broadly speaking, I'll suggest that the most pervasive ethical concerns are of two types:

1. **Enduring concerns** about the social consequences of mapping, including associated concerns about cartographic (re)presentation, which have persisted since at least the early 1990s; and

2. **Emerging concerns** about the personal consequences of pervasive collection, commodification, and exploitation of individual location data, arising more recently—perhaps since the proliferation of personal mobile devices in the later 2000s.

In the following section I'll consider how these enduring and emerging concerns are addressed in the ethics codes and rules that geospatial organizations provide to help guide their constituents toward doing the right thing.

PART 2: CODES

Given the diversity and dynamism of ethical concerns discussed above, we might expect that the codes of ethics adopted by major geospatial professional associations will vary accordingly, depending perhaps on organizational culture and world view.

Blakemore & Longhorn conducted such an assessment in 2004. In preparation for a workshop on GIS ethics for the Association for Geographic Information (AGI), they developed a matrix by which workshop participants were to identify "commonalities" among eleven organizations'

codes or rules of conduct. They invited participants to compare the codes and rules in relation to nine "general moral code issues" (e.g., "contribute to society and human well-being," "avoid harm to others," "respect privacy of others," and "honour confidentiality of information") and eight "professional code issues" (such as "maintain and update professional competence," "respect the work of colleagues and other professionals," and "uphold the reputation of the profession in your own conduct" (21). I failed to find any record of workshop outcomes, unfortunately.

Here I'll take on the more modest task of assessing several geospatial codes in relation to the hypothetical "enduring" and "emerging" ethical concerns suggested above. I looked for evidence of those concerns in the codes of ethics of **ASPRS**, the **British Cartographic Society** (BCS), and **URISA**, as well as the rules of conduct published by the **GISCI** and the ***Locus Charter*** proposed by initiatives of the American Geographical Society (EthicalGEO) and UK Ordnance Survey (Geovation). What emerges from my assessment is two kinds of geospatial codes.

Tom Koch (2006) describes the first kind: "Professional associations are typically developed to define a craft or profession, to delineate its standards of conduct, and to set ethical parameters for its members. . . . Most [associations] are careful to limit the parameters of their ethical guidance in a manner that does not restrict either the client base or the services that can be rendered to those clients" (12). Codes of this sort, including those of ASPRS, BCS, and GISCI, are limited to permissible professional conduct, especially by certified or licensed practitioners. These codes remind me that I myself once defined "ethics" as "principles of conduct guiding the practices of an individual or professional group" when I framed the "Ethical Problems in Cartography" paper for *CP* in 1990. I had a lot to learn.

Michael Davis (2002) suggests a second kind of code. For Davis, codes of ethics are defining characteristics of professions: "It is impossible," he writes, "to satisfy the definition of a profession without (something like) a code of ethics, . . . and indeed impossible to understand professions without understanding them as bound by such a code" (1). For Davis, members of a profession "serve a certain moral ideal" (3) that is expressed or implied in their code, and that distinguishes the profession from others and from laypersons. For the sake of discussion here, honoring the so-called enduring and emerging ethical concerns above may stand in for a moral ideal for geospatial professionals. However, a more idealistic assertion of the potential for geospatial professionals to contribute to a more just and sustainable future for life on Earth remains to be considered.

Grounded in the moral theory of deontology, URISA's ***A GIS Code of Ethics*** emphasizes treating people with respect, not just means to an end (Craig 1993; URISA 2003). It consists of 45 "guidelines" organized under four headings: "Obligations to Society," "Obligations to Employers and Funders," "Obligations to Colleagues and the Profession," and "Obligations to Individuals in Society." (GISCI endorsed URISA's Code and adopted the same structure for its ***Rules of Conduct for Certified GIS Professionals (GISPs)***, though the latter does not align as well with the enduring and emerging concerns. Where URISA's code provides guidance about what professionals should do, the GISCI rules focus on what they shouldn't.)

In relation to the enduring concerns, URISA's code explains that "the GIS professional recognizes the impact of his or her work on society as a whole, on subgroups . . . including geographic or demographic minorities, [and] on future generations. . ." (2). Although issues of cartographic (re)presentation are not specifically addressed, URISA's code does advocate objectivity, being "aware of consequences, good and bad," and striving for "broad citizen involvement in problem definition, data identification, analysis, and decision-making." Regarding the emerging personal concerns, URISA emphasizes protecting "individual privacy," including special care for "new information discovered about an individual through GIS-based manipulations (such as geocoding) or the combination of two or more databases." Further, it advises to "allow individuals to withhold consent from being added to a database, correct information about themselves in a database, and remove themselves from a database" (5).

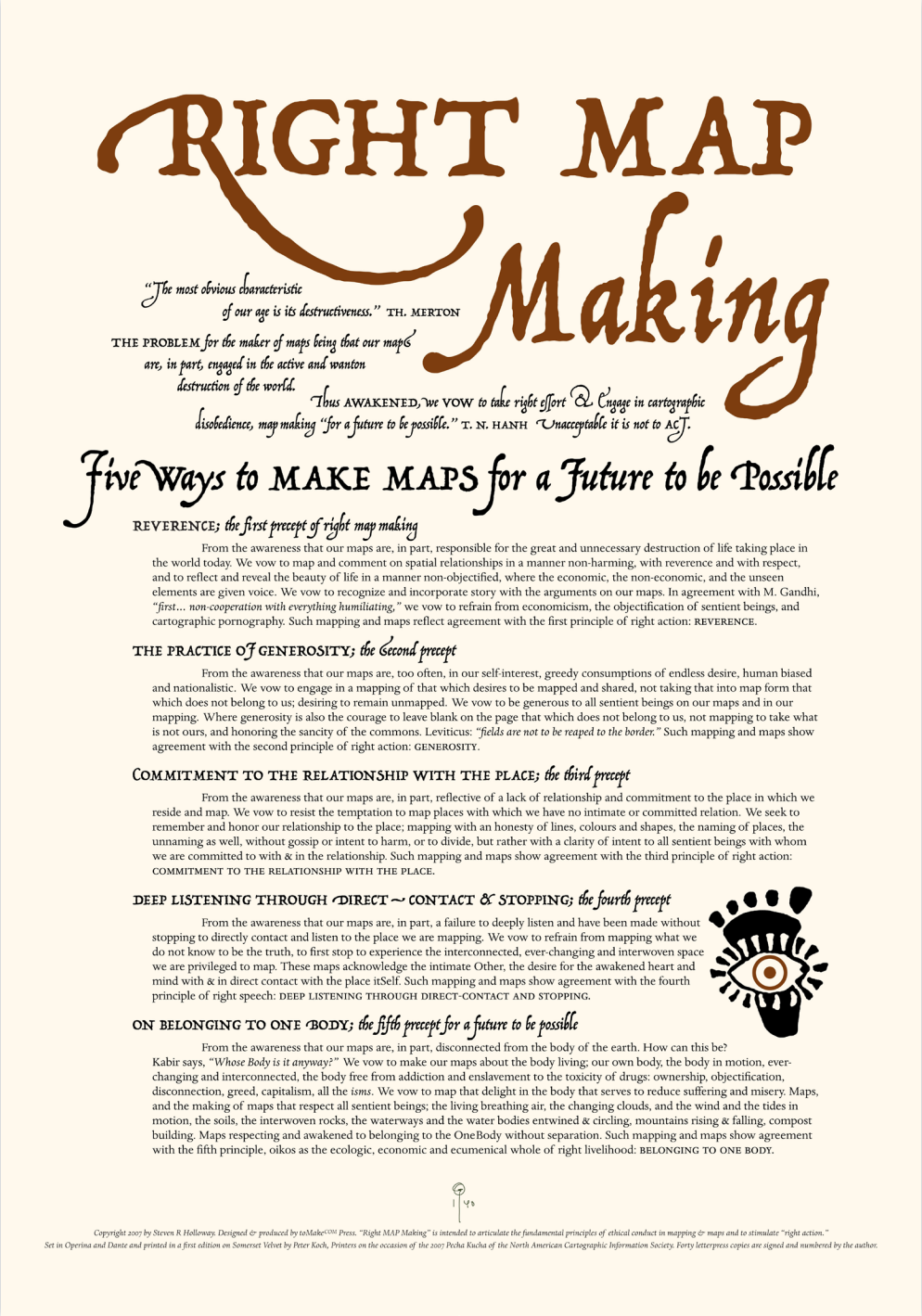
The *Locus Charter* (McKenzie and Hawes 2023) also aligns favorably with the enduring and emerging concerns, though it does so in less detail and specificity than URISA's code. It consists of ten founding principles, including

2. Understand Impacts: Users of location data have responsibility to understand the potential effects of their uses of data, including knowing who

(individuals and groups) and what could be affected, and how

5. Address Bias: Bias in the collection, use, and combination of location datasets can either remove affected groups from mapping that conveys rights or services, or amplify negative impacts of inclusion in a dataset

9. Prevent Identification of Individuals: As an individual's mobile location data is situated within more and more geospatial context data, [and] its anonymity erodes, measures should be put in place to prevent subsequent use of the data. . .



RIGHT MAP Making

"The most obvious characteristic of our age is its destructiveness." TH. MERTON

THE PROBLEM for the maker of maps being that our maps are, in part, engaged in the active and wanton destruction of the world.

Thus AWAKENED, we VOW to take right effort & Engage in cartographic disobedience, map making "for a future to be possible." T. N. HANH Unacceptable it is not to ACT.

Five Ways to MAKE MAPS for a Future to be Possible

REVERENCE; the first precept of right map making

From the awareness that our maps are, in part, responsible for the great and unnecessary destruction of life taking place in the world today. We vow to map and comment on spatial relationships in a manner non-harming, with reverence and with respect, and to reflect and reveal the beauty of life in a manner non-objectified, where the economic, the non-economic, and the unseen elements are given voice. We vow to recognize and incorporate story with the arguments on our maps. In agreement with M. Gandhi, *"first... non-cooperation with everything humiliating,"* we vow to refrain from economicism, the objectification of sentient beings, and cartographic pornography. Such mapping and maps reflect agreement with the first principle of right action: REVERENCE.

THE PRACTICE OF GENEROSITY; the second precept

From the awareness that our maps are, too often, in our self-interest, greedy consumptions of endless desire, human biased and nationalistic. We vow to engage in a mapping of that which desires to be mapped and shared, not taking that into map form that which does not belong to us; desiring to remain unmapped. We vow to be generous to all sentient beings on our maps and in our mapping. Where generosity is also the courage to leave blank on the page that which does not belong to us, not mapping to take what is not ours, and honoring the sancity of the commons. Leviticus: *"fields are not to be reaped to the border."* Such mapping and maps show agreement with the second principle of right action: GENEROSITY.

COMMITMENT TO THE RELATIONSHIP WITH THE PLACE; the third precept

From the awareness that our maps are, in part, reflective of a lack of relationship and commitment to the place in which we reside and map. We vow to resist the temptation to map places with which we have no intimate or committed relation. We seek to remember and honor our relationship to the place; mapping with an honesty of lines, colours and shapes, the naming of places, the unnaming as well, without gossip or intent to harm, or to divide, but rather with a clarity of intent to all sentient beings with whom we are committed to with & in the relationship. Such mapping and maps show agreement with the third principle of right action: COMMITMENT TO THE RELATIONSHIP WITH THE PLACE.

DEEP LISTENING THROUGH DIRECT ~ CONTACT & STOPPING; the fourth precept

From the awareness that our maps are, in part, a failure to deeply listen and have been made without stopping to directly contact and listen to the place we are mapping. We vow to refrain from mapping what we do not know to be the truth, to first stop to experience the interconnected, ever-changing and interwoven space we are privileged to map. These maps acknowledge the intimate Other, the desire for the awakened heart and mind with & in direct contact with the place itSelf. Such mapping and maps show agreement with the fourth principle of right speech: DEEP LISTENING THROUGH DIRECT-CONTACT AND STOPPING.

ON BELONGING TO ONE BODY; the fifth precept for a future to be possible

From the awareness that our maps are, in part, disconnected from the body of the earth. How can this be? Kabir says, *"Whose Body is it anyway?"* We vow to make our maps about the body living; our own body, the body in motion, ever-changing and interconnected, the body free from addiction and enslavement to the toxicity of drugs: ownership, objectification, disconnection, greed, capitalism, all the *isms*. We vow to map that delight in the body that serves to reduce suffering and misery. Maps, and the making of maps that respect all sentient beings; the living breathing air, the changing clouds, and the wind and the tides in motion, the soils, the interwoven rocks, the waterways and the water bodies entwined & circling, mountains rising & falling, compost building. Maps respecting and awakened to belonging to the OneBody without separation. Such mapping and maps show agreement with the fifth principle, oikos as the ecologic, economic and ecumenical whole of right livelihood: BELONGING TO ONE BODY.

Set in Operina and Dante and printed in a first edition on Somerset Velvet by Peter Koch, Printers on the occasion of the 2007 Pecha Kucha of the North American Cartographic Information Society. Forty letterpress copies are signed and numbered by the author.

Figure 1. A desiderata for mapmakers. Steven Holloway's 2007 broadside *Right MAP Making: Five Ways to Make Maps for a Future to be Possible*. Reproduced with author's permission.

Though there's apparently been much discussion within the North American Cartographic Information Society (NACIS) over the years, no consensus has crystalized around a code of cartographic ethics. Perhaps that's for the best. What's emerged instead resembles, to my mind, desiderata akin to Max Ehrmann's 1927 **prose poem** ("Go placidly amid the noise and the haste. . ."). In their 2022 post, "**The Mapmakers Mantra**," Aileen Buckley, Allen Carroll and Clint Brown propose four values to inspire cartographers to greater ethical behavior in mapping: "Be Honest and Accurate," "Be Transparent and Accountable," "Minimize Harm and Seek to Provide Value," and "Be Humble and Courageous." Steven Holloway's 2007 work *Right MAP Making: Five Ways to Make Maps for a Future to be Possible*, a "personal credo or set of principles addressing the intention of ethical conduct on the part of the mapmaker" (14), reads like—and in its striking visual presentation, looks like—a desideratum. I wonder if a heartfelt and artful statement along these lines might be more authentic and useful to the cartography community than a traditional code.

PART 3: CASES

> Codes of ethics and case studies need each other. . . . The best way to use these codes is to apply them to a variety of situations and see what results. It is from the back and forth evaluation of the codes and the cases that thoughtful moral judgments can best arise.

So wrote the Center for the Study of Ethics in the Professions at Illinois Institute of Technology **on its website** in 2012 (now archived). The Center was Michael Davis's academic home; he almost certainly authored the statement.

In this section I'll summarize Davis's definitive paper on the "case method" in ethics education. I'll review the characteristics of case studies in practical ethics, as well as a methodology for using cases, in conjunction with codes, to strengthen ethical judgment. I'll then consider how a couple of stories presented in this special ethics issue of *Cartographic Perspectives* can be transformed into actionable[1] case studies. Finally, I'll identify and comment upon several sources of case studies that may be useful to geospatial practitioners, educators, and students.

Davis's paper (1999) traces the origins of the case method to Harvard's law school in the 1870s—where "cases" were "published decisions of an appellate court" (143). Harvard's business school followed suit in 1908. Business cases, Davis reports, evolved from "a faculty member's war story, a company's annual report, . . . or even a wad of newspaper clippings" to "a specialty" involving "extensive research, often including on-site interview and detailed examination of public records" (145). Other Harvard programs soon adopted the method, and subsequent publication of "Harvard cases" influenced pedagogy at other universities.

Philosophers and theologians "seem to have developed their own 'case method' independently, as part of the fruitful exchange between philosophy and medicine that also produced the specialty we now know as 'medical ethics'" (Davis 1999, 145). Contrary to philosophers' long practice of using *examples* to illustrate or prove abstract points, the philosopher's *case* aimed "to provoke discussion

1. In common parlance, as used here, "actionable" means "able to be acted upon." For Natal (2022), actionable ethics refers to "techniques gleaned from neuroscience on how to make moral behavior habitual." For a critical perspective on "actionable" ethics in AI, see Gill (2022).

- **Long (and very long) vs. short (and very short)**: Davis considers a ten-page ethics case "quite long." "Mine," he writes, "are generally only a paragraph; few fill a single typewritten page."
- **Single perspective vs. several perspectives**: "Single perspective cases allow an instructor to go directly to the specific issues [they want] to discuss. A case with more than one perspective forces a preliminary discussion of what the problem might actually be. . ."
- **Narrative vs. dialogue**: "Dialogue is the easiest way to present a multiple-perspective case, each voice presenting its side. . . . Though narrative is a much more common case format than dialogue, many narratives might just as well have been dialogues."
- **Realistic (hypothetical) or real (actual):** "Cases . . . must be real or at least realistic. They must, that is, be enough like actual events to be treated as practical possibilities."
- **Stories vs. problems**: "A story has a beginning, a middle, and an end. . . . Problems may be thought of as stories that stop without ending. . . . Any story can be turned into a problem."
- **You (agent) vs. they (judge)**: "Cases . . . can be written with the reader [you] as a participant . . . or as an outside judge. . . .cases with the 'judge perspective' . . . allow students to treat ethics as, in effect, a spectator sport. . . . Second-guessing the actual decision maker is far easier than working out the details of a decision when it is your own. . ."
- **Would vs. should**: ". . . 'would' seems to ask for a prediction. Since I do not teach students how to predict their own behavior, but how to choose it," Davis writes, "I do not think it fair to ask them to make such predictions."
- **Top vs. bottom**: "Most cases in the news . . . involve decisions near the top of an organization. Our students will, however, graduate into jobs much closer to the bottom . . . First-job cases may . . . be better for enhancing judgment than top-level decisions. . .."
- **Single issue (poor) vs. multi-issue (rich):** "[Single issue] cases are better for a class where you want to focus on identifying, analyzing, and responding to a particular issue, not several."
- **Single stage vs. multi-stage**: "Multi-stage cases try to teach that, because no decision is necessarily 'final,' it pays to think about what new decisions this one might generate. . ."
- **Ordinary vs. technical language**: "The philosopher's case is . . . typically put in language allowing someone not trained in philosophy or any other particular discipline to reach the ethical issues. Cases can also be given the characteristic format of a particular discipline."

Table 1. Styles of practical ethics cases. Excerpted from Davis (1999, 149–158).

rather than to kill it. If a case had a right answer, it would not be immediately obvious or easy to demonstrate. Often there was (or at least seemed to be) no unique right answer, only several pretty good ones (and several pretty bad ones too)" (146).

Davis goes on to draw sixteen distinctions that illustrate the stylistic variety available to case study authors. A shortened list appears in Table 1.

Table 1 highlights the fact that there are many ways to write an ethics case study. It also provides a way of talking and thinking about cases. To ensure that a case study is as fruitful as possible as an exercise in moral reasoning, case study authors should be intentional about the stylistic decisions they make. In the following I'll use the distinctions to unpack some of the stylistic characteristics of effective ethics case studies.

The example shown in Figure 2 is a case from the collection at **GISEthics.org**. In relation to the sixteen distinctions outlined in Table 1, the "Low-level Radioactive Waste Siting Map" case is written as a "problem" rather than a "story." Its form is "short" and "narrative," and "realistic" in provenance (the ethical problem is based upon an actual low-level radioactive waste storage facility siting project in Pennsylvania). The protagonist is a low-level employee ("bottom" vs. "top") who must decide how to respond to a superior's directive that doesn't feel right. It is a "single issue," "single stage," "should"-style case that's written in slightly technical language familiar to geospatial professionals and students. The challenge it poses is fundamentally cartographic, but also raises questions of how to properly respond to a superior's directive. Several provisions of URISA's code of ethics (2003) are relevant, including:

- Practice integrity and not be unduly swayed by the demands of others (2);
- Provide full, clear, and accurate information (2);
- Identify risks and the potential means to reduce them (3);
- Define alternative strategies to reach employer/funder goals, if possible, and the implications of each (3);
- Accept decisions of employers and clients, unless they are illegal or unethical (3); and
- Strive to resolve differences (3).

THE CASE METHOD

To this point we've discussed characteristics of practical ethics cases in general and with an example. Next, let's consider Davis's (1999) advice about how cases can be used to strengthen ethical judgment in practice.

Practical ethics education takes various forms—as a formal course or seminar at a university, as a workshop offered at a professional meeting, as an informal training session conducted within a business or government agency, or even a competition among student teams (an "ethics bowl"). Whatever the setting, a "course" in professional ethics focuses on the particular moral obligations incumbent on members of a profession (often articulated in formal codes or rules) as opposed to the general morality people learn early in life. Such courses, Davis observes, can serve at least four purposes:

1. To enhance ethical *sensitivity*—the ability to recognize situations in which special professional standards may be relevant to a decision (164);

2. To increase ethical *knowledge*—to add to what students and practitioners know about the content, interpretation, and application of the special standards in question, as well the resources available to help them make decisions in practice (164);

3. To improve ethical *judgment*—the ability to recognize and choose wisely among multiple options to resolve a practical ethical challenge (164);

4. To enhance ethical *willpower*—the confidence and courage needed to do what one has reasons to believe is right (165).

In a special issue of the *URISA Journal* published over 20 years ago, former URISA presidents Bill Huxhold and Will Craig offered a rationale for relating URISA's newly proposed GIS code of ethics to the emergent GIS Certification Institute's procedures for certifying GIS professionals (Huxhold and Craig 2003). Near the conclusion of their article, they wrote:

> The last steps planned [by URISA's Certification Committee, the group that proposed GISCI] include adding resources to assist the GIS professional with ethical dilemmas. . . . The Committee

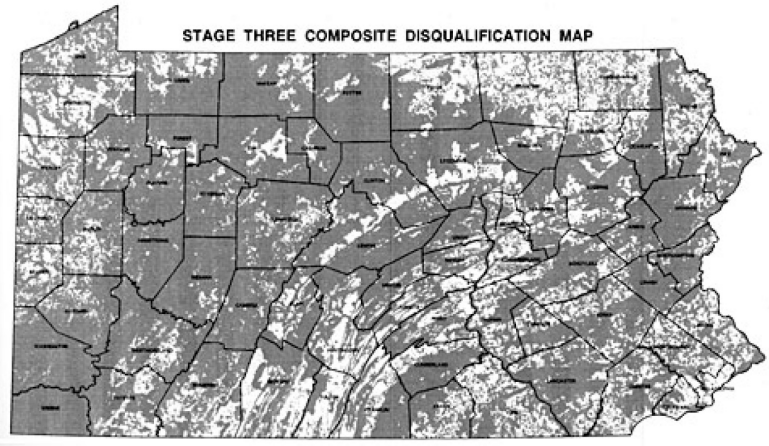
GIS Professional Ethics Project gisethics.org

Case study: Low-level Radioactive Waste Siting Map

The Pennsylvania Department of Environmental Protection (DEP) hires a contractor to identify potential sites for a 500-acre storage facility for low-level radioactive waste (LLRW). In collaboration with the DEP the contractor assembles a statewide GIS database that includes the geographic distributions of pertinent geological, hydrological and land use criteria. The contractor proposes to use overlay analysis to disqualify unsuitable areas. For example, areas characterized by any combination of permeable bedrock, excessive slope, or proximity to key water resources or protected lands (among other factors) will be deemed unsuitable.

The project involves three stages of screening for unsuitable areas: statewide, regional, and local. Each stage involves data fusion and analysis at larger map scales and greater detail. Public hearings are held at each stage to afford residents opportunities to ask questions about which areas have been disqualified, which are still in consideration, and why. The contractor produces reports for the hearings that explain the screening process and illustrate the geographic distributions of pertinent criteria and disqualified areas. By stage 3, three quarters of the state's land area are disqualified. The state agency hopes that communities in areas not yet disqualified will volunteer to host the facility in return for financial incentives. Most residents who attend the hearings, however, are determined to keep the proposed facilities as far as possible from their backyards.

A GIS analyst employed by the contractor is assigned by her supervisor to produce a statewide map showing areas disqualified after stage 3. A requirement is that the map be reproducible by black-and-white xerography (photocopy), and that it fit on a 11" x 17" page so that it can be folded into a page-size (8.5" x 11") report. The GIS analyst calculates that 1:1,500,000 is the maximum map scale at which the entire state can be shown on an 11" x 17" page. At this scale, some "islands" of potentially suitable areas surrounded by disqualified areas but large enough to contain a 500-acre facility will be too small to see. When the analyst explains this to her supervisor, he suggests that she include on the map a disclaimer stating that "it is possible that small areas of sufficient size for the LLRW disposal facility site may exist within regions that appear disqualified on the map. The detailed information for these small areas is retained within the GIS even though they are not visually illustrated." How should the analyst respond to this suggestion?



Areas (in gray) disqualified as potential sites for a low level radioactive waste storage facility. Disqualified areas depicted on a small scale map (original 1:1,500,000) mask small suitable areas large enough to contain the 500-acre facility (Chem-Nuclear Systems, Inc., 1994).

Figure 2. An example **case study** from GISEthics.org.

> plans to develop and link to a wide variety of case studies that present dilemmas faced by the GIS professional. Most ethicists agree that the best way to build ethical muscle is to take on tough problems, weigh them, and then see how others have responded (56).

A substantial, if incomplete collection of geospatial ethics case studies like what Huxhold and Craig (and others) envisioned exists today at **GISEthics.org**. What remains is a need for guidance on how practitioners and students should use the case studies to "build ethical muscle." Case studies that facilitate enhanced ethical sensitivity, knowledge, judgment, and willpower could be called "actionable" case studies, in the sense that they are "able to be acted upon" as discussed above.

Davis (1999) offers a methodology for acting upon case studies later in the case method chapter summarized above. In Table 2 is his "Seven-step Guide to Ethical Decision Making," a framework to help achieve the four purposes of practical ethics education by guiding analysis (and/or discussion) of problem-style cases in a methodical way.

A typical challenge arising from users' first attempts to apply the "Seven-step Guide" is an inadequate number and variety of options (Step 4). Those inclined to "go with their gut" may settle

1. **State problem** (e.g., "There's something about this decision that makes me uncomfortable" or "Do I have a conflict of interest?").
2. **Check facts** (many problems disappear upon closer examination of situation, while other change radically).
3. **Identify relevant factors** (e.g., persons involved, laws, professional code, other practical constraints).
4. **Develop list of** options (at least three; preferably four or more. Be imaginative, try to avoid simplistic "dilemmas"—not "yes" or "no" but who to go to, what to say).
5. **Test each option***
   a. **Harm test**: Does this option do less harm than alternatives?
   b. **Publicity test**: Would I want my choice of this option published in the newspaper?
   c. **Defensibility test**: Could I defend choice of option before Congressional committee or committee of peers?
   d. **Reversibility test**: Would I still think choice of this option good if I were adversely affected by it?
   e. **Colleague test**: What do my colleagues say when I describe my problem and suggest this option as my solution?
   f. **Professional test**: What might my profession's governing body or ethics committee say about this option?
   g. **Organization test**: What does the company's ethics officer or legal counsel say about this?
6. **Make a choice** based on steps 1–5.
7. **Review steps 1–6**: What could you do to make it less likely that you would have to make such a decision again? Any precautions [you can take as an individual] (announce your policy on question, change job, etc.)? Any way to have more support next time? Any way to change the organization (e.g., suggest policy change at next departmental meeting)?

* Step 4, "Test options," uses ideas from various moral theories (publicity, reversibility, and so on) to evaluate options. The tests are not necessarily decisive; they are supposed to call attention to relevant considerations. In this way, the core of most moral theories can be brought into decision-making in an uncontroversial form (that is, without the exclusiveness and technical paraphernalia of explicit moral theory)

Table 2. Seven-step Guide to Ethical Decision Making (Davis 1999, 166–167).

quickly on just two obvious options, thereby reducing the ethical challenge to a trivial dilemma. Students in Penn State's Geospatial Ethics Workshop are required to identify, and test, at least three options, and they are encouraged to consider even more. (A worked example of an exemplary case study analysis appears in DiBiase et al. 2012).

In relation to the case presented above, of the low-level radioactive waste (LLRW) siting map, students often identify "propose a larger map" and/or "go over the supervisor's head" as options. Others suggest replacing or supplementing the printed map with a multiscale web map—overlooking the fact that four percent of Pennsylvanians still lack adequate access to broadband internet, and that residents most vulnerable to LLRW facility sitings may be over-represented in that group. Students with a background in cartography are most likely to recognize that creative symbolization can serve map readers' interests while honoring the project scope. Specifically, eligible areas below a certain size threshold could be depicted as legible point symbols—even on a legal-size page—rather than true-to-scale areal symbols. This solution honors the URISA GIS code's principle of "defin[ing] alternative strategies to reach employer/funder goals. . ." (2003, 3).

TRANSFORMING "STORIES" ABOUT GEOSPATIAL ETHICS INTO "PROBLEMS"

As demonstrated in this special issue of *Cartographic Perspectives*, lots of practitioners have stories about ethical challenges they've encountered in their work. The corpus of actionable geospatial ethics case studies could be greatly expanded and diversified if stories could be transformed into problems in a straightforward way. This could help address the fact that existing geospatial ethics case study collections are inadequate in quantity and breadth—especially in relation to cartography.

On the right is an adaptation of a story included in Leo Dillon's article in this special issue, "Better than Good Enough for Government Work." The story involves an ethical challenge Dillon faced early in his career as a US State Department cartographer, when he was ordered to include a dubious, but potentially consequential, threat location on a map of US military targets. The adaptation omits the conclusion of Dillon's story and fictionalizes the bureau experts' accedence to the dubious request—leaving the junior cartographer alone to grapple with their misgivings. A problem with the adaptation is that the story is situated in a particular historical context, and younger readers may have trouble relating to it.

Like the LLRW disposal siting case in Figure 2, the "State Department Cartographer" case is written from the cartographer's single perspective. Rewriting it to include the perspective of the map requestor might make it more nuanced, and challenging.

A second example of a problem-style case adapted from a story is drawn from the "Interview with an Anonymous Graphics Reporter" in this special issue. The adaptation is again written from a single perspective, but in dialogue style rather than narrative.

The draft adaptation on the next page is a realistic derivative of an actual, non-trivial workplace challenge. My adaptation purposely conflates a couple of different cases discussed in the interview article. Some text is copied directly from the interview, some is edited, and some has been added to flesh out the scenario. Further fictionalization could add another layer of ethical complexity—X and Z might be ascribed Jewish and Arab-American ethnicities, for instance.

GEOSPATIAL CASE STUDY COLLECTIONS

Next, I'll consider some sources of ethics case studies in relation to the enduring and emerging ethical concerns of geospatial professionals. The curated collection at **GISEthics.org** is one, but it is not the only source of published ethics case studies that could be useful to cartographers and other geospatial practitioners.

As of this writing, 14 the 21 cases at GISEthics.org address one or another of the enduring and emerging concerns about geospatial ethics (Part 1 above). The relevant cases are described in Table 3.

CASE STUDY 1
STATE DEPARTMENT CARTOGRAPHER ORDERED TO MAP A DUBIOUS THREAT

Adapted from Leo Dillon (2024)

An early-career cartographer at the US Department of State faced an ethical challenge. It was the late 1980s. A Cold War mindset was strong within the US Government, and almost none of the best and brightest foreign policy experts could predict that the Soviet Union would soon disintegrate.

During this period, the cartographer receives a map request from one of the department's regional bureaus. The request includes a list of hypothetical locations of Soviet missile systems along with their effective ranges, and another list of real American or allied targets that these theoretically placed weapons could hit. The cartographer is assigned to make a map of these locations and ranges to support a briefing to a senior policymaker.

Upon measuring the range from one of the weapons systems—a missile launcher located conjecturally on the coast of a Soviet-allied country—the cartographer finds that it doesn't reach the target of interest. This target, a major US military base, is the most impactful facility shown on the map, and is located just outside the missile's maximum range. The cartographer reports the discrepancy to the staffer who requested the map and is told to leave the questionably located facility on the map.

Self-conscious about their junior status, the cartographer reaches out to experts in their bureau whose job is to know everything about these weapons. Looking at the map, they scoff at the idea of placing this type of launcher at that location, a coastal mangrove forest with no nearby infrastructure to support its construction. To them, it's a non-threat. The bureau experts meet with the requestor to vouch for the cartographer's concern, but they too are told it is close enough, and to leave it on the map. At this point, the bureau experts advise the cartographer to accede to the request and move on.

This is troubling. The map will be shown to someone whose influence shapes foreign policy. The information on the map is at best misleading, but really just plain wrong.

What are the cartographer's and the experts' ethical obligations at this point? What are the regional bureau staffer's motivations for insisting that the conjecturally-located missile launcher be included on the map? Should the cartographer trust the judgment of the senior decision maker to whom the map will be presented? What options are available address the cartographer's ethical concerns?

CASE STUDY 2

GRAPHICS REPORTER TROUBLED ABOUT UNVERIFIED BATTLE LOCATIONS.

Adapted from Anonymous (2024)

X and Y are both employed at a national newspaper in the US. X is a graphics reporter who specializes in cartography; Y is a news reporter. Both are junior employees, privately nervous about the ongoing contraction of the traditional newspaper industry.

X is working with Z, a more senior reporter, on an ongoing story about the war in Gaza. Z, who is on location in the Middle East, sends X a list of points to be mapped as battle zones. Z acquired the point data from a source known to have sometimes provided inaccurate information in the past; for this reason, X is worried that the purported battle zone locations may be misleading. X emails Z to express concerns, but Z doesn't reply. There's pressure to run the story with the map in tomorrow's paper, if possible.

X and Y meet for coffee. X shares their concerns. X confides, "I can't double check all these points. I don't speak Arabic. I can try to use Google Translate and OSM, which are pretty good, but I don't speak Arabic. I don't want to put twenty points of battle zones on a map if they're not actually there. But Z's not responding to any of my messages and the map has to run. Do I shut down the whole map, and slow down the whole article?'"

Y sympathizes. "What are you supposed to do, email ten different really high-level people and say, 'I'm sorry. I'm this random graphics reporter, this random twenty-something, and I'm going to put a stick in the works because I feel a little bit uncomfortable'? Don't do that. Don't say anything. Just keep your head down. Because what are the chances someone is going to say, 'That's wrong'?"

X replies, "You know, responsible behavior is not rewarded. Speed is rewarded, provided there aren't any first order screw-ups, like putting a label in the wrong place, or labeling the wrong city. Those are the errors that editors care about. It's the second order errors—the ones that are not so obvious—those are the ones where the ethics become really muddy, and they're the ones that I'm trying to think about."

Y: "But there's no time or space to think about them. And there's really no consequences unless someone notices and makes a comment. It's the same situation in prose reporting. The paper issues a correction when errors are discovered. That's true for maps too, right?"

X: "Yes, but we both know that a formal correction can impact your career."

Y: "Of course. But we also know that the newspaper is read by people high up in government, high up in the military, high up in the global economy. We're helping to write the first draft of history. Doesn't that knowledge make you feel responsible for drawing the line in situations like this?"

X: "I suppose it does, but I'm also aware that errors like the one I'm worried about may never be noticed."

Y: "So what are you going to do? And on what grounds are you going to justify it?"

Another source is the **EthicalGEO blog**. Posts include numerous stories that address contemporary issues related to geospatial ethics. Stories that seem ripe for adaptation to problem-style cases include:

- **Counter-Cartography: GIS and Anti-Eviction Resistance**
- **Water Management in Mexico City**: Ethics and Solutions to a Worsening Water Crisis
- **Geodata at the Intersection of Disease Control and Border Securitization**

Those whose interests include the intersection of geospatial practice with artificial intelligence and data science can find compelling case studies in the following collections, among others:

The Princeton Dialogues on AI and Ethics—"a research collaboration between Princeton's University Center for Human Values and the Center for Information Technology Policy," offers (as of this writing) a collection of six case studies designed as "intellectual reasoning tools to guide practitioners and policy makers, both current and future, in developing the ethical frameworks that will ultimately underpin their technical and legislative decisions." The Princeton cases are longer (5–10+ pages), realistic, story-style cases that include discussion questions and sidebars with explicit "ethical objections." The initiative's published case study methodology is based upon five "governing principles," including "Empirical foundations," "Broad accessibility," "Interactiveness," "Multiple viewpoints," and "Depth over brevity." One topic particularly germane to geospatial studies is "Public Sector Data Analysis," based loosely on the City of New Orleans' experience with predictive policing (Winston 2018).

ENDURING CONCERNS: SOCIAL CONSEQUENCES OF MAPPING, INCLUDING ASSOCIATED CONCERNS ABOUT CARTOGRAPHIC (RE)PRESENTATION

- **Caribou Migration Routes**—A GIS analyst is asked to exclude pertinent data from maps prepared for a public hearing.
- **Collateral Damage Mapping**—A geospatial intelligence analyst predicts the civilian casualties likely to be caused by a pre-emptive missile attack.
- **Cutting Corners on Redistricting**—Election mapping consultants propose to omit data from GIS analyses to cut costs and win a contract with a newly formed Independent Election Commission.
- **Energy Production and Protected Whales**—Should new lease blocks for oil and gas wells be established in a rare whale's habitat in the Gulf of Mexico?
- **Environmental Justice Web Map**—A GIS programmer ponders a contract for a web map that overlays toxic industrial sites and at-risk communities.
- **Government Employee and the Press**—A member of the press asks a government employee to leak the results of a GIS analysis about a controversial wild land fire.
- **Low-level Radioactive Waste Siting Map**—A map masks potentially suitable sites for low-level radioactive waste storage facility.
- **Proprietary Software in an Emergency**—Too few software licenses are available in the aftermath of a tsunami.
- **Tidal Wetland Mapping—**A scope of work statement and established mapping procedures prevent a GIS analyst from adding wetlands to a conservation database.

EMERGING CONCERNS: PERSONAL CONSEQUENCES OF PERVASIVE COLLECTION, COMMODIFICATION, AND EXPLOITATION OF INDIVIDUAL LOCATION DATA

- **Bear Baiting**—Should precise locations of controversial hunting stations be public information?
- **Mapping Muslim Neighborhoods**—A police department's plan to map potential terrorist enclaves brings charges of racial profiling.
- **Privacy and Planning**—A GIS professional considers filing an ethics complaint about lax protection of the confidentiality of a sensitive database.
- **Social Trails and Border Security**—A student intern has misgivings about sharing location data about trails used by illegal immigrants with US Border Patrol.
- **Tracking Mobile Phones in Mobility Research**—Researchers track mobile phone users' movements to derive predictive models of human mobility.

Table 3. Case Studies at GISEthics.org related to enduring and emerging ethical concerns.

The **Council for Big Data, Ethics, and Society** (2016) provides another small, but rich, **case study collection** related to data ethics. The three cases there are relatively lengthy (7– 23 pages) stories based on real scenarios. Though none of the three cases—"The Ethics of Using Hacked Data," "A YouTube Engineers Decision to Alter Data," and "Ethical Questions for Web-based Censorship Measurement"—foreground geospatial technologies and methods, all support in-depth discussion of ethical challenges associated with modern data analytics.

A third interesting source related to AI and data science is the collection of **six case studies** produced by the **Ada Lovelace Institute** and Alan Turing Institute for a workshop held as part of the research that culminated in the report *Looking Before We Leap*. The cases "represent hypothetical submissions to a Research Ethics Committee." One of the six cases—"Tattoo ID to map gangs"—is directly applicable to geospatial studies. Intended users—including "students, researchers, members of research ethics committees, funders and other actors in the research ecosystem"—are asked to "Keep the following questions in mind:"

1. What potential harms does this project pose, both to participants but also to members of society who may be impacted by this work?

2. What measures should be put in place to mitigate against these risks?

3. What additional information do I need, and who should I speak with to find it?

Users are also advised that "There is no 'right' answer to a case study—rather, this is an exercise to encourage reflection and discussion with your research group and peers."

From the related disciplinary perspective of the geosciences, ***Geoethics: Ethical Challenges and Case Studies in Earth Sciences*** (Wyss and Peppoloni 2015) provides several well-known story-style cases, including the alleged negligence of scientists responsible for assessing risk associated with the 2009 L'Aquila earthquake; concerns about large-scale regulation of water bodies arising from the Three Gorges Dam in China; and concerns about the environmental and health risks associated with fracking.

The summary of relevant ethics case study collections above is representative, not exhaustive. The fact remains, however, that openly available problem-style case studies that specifically address the enduring and emerging ethical concerns of the geospatial field in general, and cartography in particular, are in short supply. I believe that more case studies are needed—especially considering the rapid evolution of geospatial technologies and methods. How this increase may be effected—and more generally, how practical ethics may become more prominent and better supported in university curricula and professional associations' offerings—is a possibility we'll consider in the next (last) section.

PART 4: CODA

In this concluding section, I suggest a few ways forward for practical ethics in cartography, and in the broader geospatial domain of which it is a central part. One is an assessment of the prevalence of explicit ethics (and related legal) instruction in geospatial education. Another is the possibility of an ethics-across-the-(geospatial)-curriculum initiative in higher education. Finally, I touch upon the potential benefits of the case method in geospatial artificial intelligence (GeoAI)—the fusion of AI techniques with geospatial data analytics.

ETHICS IN CARTOGRAPHY EDUCATION

Earlier we read **Mairéad de Róiste**'s call to action for "practical ethics in geospatial education" (2024, 18). Her advocacy resonates with me, as I'm sure it does with many other readers. Unfortunately, we still have a long way to go.

In the 1990 roundtable commentary in *CP*, Sona Karentz Andrews observed candidly that "The majority of information we [cartography teachers in higher education] impart to students . . . has little to do with ethics" (8). Harley (1991) questioned her statement at the time, but not on the grounds that ethical issues were or were not discussed explicitly. Instead, his point was that many of the topics discussed in cartography classrooms have important social, political, and ethical implications, whether they are discussed explicitly or not.

I don't know if today's cartography educators (or geospatial educators, for that matter) discuss ethical issues explicitly any more than their predecessors did 35 years ago. Probably no one does know. A survey of geospatial educators would be a useful research project. As an example, Anthony Robinson and I **presented an assessment** of the ethics content of 13 "Spatial," "Geospatial," and "Geographic" Data Science master's degree programs at the 2022 AutoCarto conference.

We do know something about the prevalence of explicit ethics instruction within Penn State's Online Geospatial Education programs. As part of his master's thesis research, graduate student researcher Robert Myers (2025) performed textual analyses of the syllabi of all 32 online geospatial courses offered by Penn State (not including the ethics workshop or the graduate seminar GEOG 581: Spatial Data Science Ethics), as well as the open-access course texts available for a subset of 18 online courses. Myers wrote scripts to search the syllabi and texts for the keywords "dishonest," "dishonesty," "ethical," "ethics," "honestly," "honesty," "immoral," "immorality," "moral,"

"morality," "morally," and "unethical". He found that just twelve course syllabi and/or texts included one or more ethics keywords, and only five courses exhibited more than ten keywords. Notwithstanding the Penn State Online Geospatial Programs' claim at its **"Ethics Expectations" web page** that "our program promotes ethics across the curriculum," Myers concludes that there are gaps in the incorporation of ethics in Penn State's online geospatial curricula. Considering the preliminary assessment of 13 masters programs noted above, it seems likely that such gaps are common.

Beyond Penn State, I have some colloquial evidence that more than a few educators use the case studies collected at GISEthics.org. Google Analytics reports that the site received 3,528 page views by 1,924 users from October 1, 2022, through January 6, 2024. Viewers were concentrated in the US, which accounted for 3,045 views (86%) during that period. There were 103 views were associated with IP addresses in the UK; the remaining long tail of 380 views were from 56 other countries. Unfortunately, views of the cases themselves—which are PDF files linked from the main HTML page—were not counted.

From time to time, I receive inquiries from educators who request supplementary information about one or more of the cases at GISEthics.org. Some mention how they use the cases in their teaching. For example, a college educator in Wisconsin wrote, "I'm interested in using the Proprietary Software in an Emergency Case Study to walk my students through a conversation and exploration of GIS Ethics, and this particular case study ties in with what we were discussing last week." Another, in Virginia, said, "I will break them into small groups and have them work through a case study and as a group, decide what the appropriate resolution is and why. One week later, the groups will all present their case studies." And a master's candidate at the University of the Witwatersrand, South Africa, reported that "I am tutoring third year GIS and Remote Sensing students. . . . The students have an exercise on identifying the ethical problems and ways in which these can be addressed using the different South African GIS Professional legislation and acts."

GISEthics.org grew out of a National Science Foundation-funded project (Award # 0734903) called "Collaborative Research: Graduate Ethics Education for Future Geospatial Technology Professionals." Dawn Wright, Francis Harvey, and I were co-PIs. Three specialists in ethics education—philosopher Michael Davis (noted above), social psychologist Chuck Huff (St. Olaf College), and educational psychologist Matthew Keefer (University of Southern Illinois) served as collaborators. At its inception in 2007, the project aimed to produce "model curricula" for graduate ethics seminars at Penn State, Oregon State University, and the University of Minnesota. By its official conclusion in 2009 the main deliverable turned out to be problem-style case studies.

Graduate students in Penn State's required ethics workshop seem to agree that formal ethics instruction is a worthy component of their curricula. Of 42 students, 20 strongly agreed, 21 more agreed, and just 1 disagreed with the summative statement "This workshop was worthwhile" that I posed at the end of the three workshops conducted in 2023. I also asked students to explain their opinions. At the end of one of the 2023 workshops, one student wrote "The final ethics paper [the case study analysis exercise using Davis's Seven-step Guide] introduced me to a new way of thinking through ethical problems and gave a variety of scenarios to choose from. I will take what I learned in this workshop with me in future endeavors." Another observed, "Ethics is a complicated topic, and there might not always be a perfect answer, but background knowledge of ethical practices should be a must have." As if anticipating the conclusion of this article, a third student suggested "It would be interesting to integrate these ethical questions into other classes as well, and not just forget about them now that the workshop is over." The possibility of integrating ethical problems into other geospatial classes leads us to the "holy grail" of ethics education: ethics across the curriculum.

ETHICS ACROSS THE (CARTOGRAPHY) CURRICULUM

Michael Davis (2004) identifies five kinds of ethics across the curriculum: (1) *morality* across the curriculum; (2) *moral theory* across the curriculum; (3) *social ethics* across the curriculum; (4) ethics *from* across the curriculum; and (5) *professional* ethics across the curriculum. Here, and in my teaching, I focus on professional ethics. As discussed earlier, Davis defines professional ethics as the "special standards" that are incumbent upon members of a profession. (Whether cartography is or is not a profession is beside the point here. Cartography is at least an affinity group whose members certainly are concerned with standards of practice above and beyond what's expected of

non-cartographers—that's something all the contributions to this special issue have in common.) "Professional ethics across the cartography curriculum" means explicit attention to moral (and legal, ideally) implications of cartographic data, methods, technologies and products in every course that leads to an undergraduate or graduate degree in cartography or a cartography-related discipline. Or that every degree program includes an entire required course that focuses on ethical issues. Either way, that's a big ask.

Let's assume for the sake of discussion that every cartography educator is aware that ethical and legal issues are germane to their subject. Let's assume further that every cartography educator is willing, in principle, to include explicit consideration of relevant ethical issues in their courses. So, what's the hold up? Davis (2006, 717) observes that "the most common reason science and engineering faculty give for not including 'ethics' . . . in their technical classes is that 'there is no room.'" Davis developed a strategy he calls "micro-insertions" to address this concern. Micro-insertions "put ethics into technical courses without substantial change in the course and in a way students appreciate" (717). His 2006 article includes examples from thermodynamics and calculus, where Davis and colleagues at the Center for the Study of Ethics in the Professions consulted with educators in technical courses to integrate ethics into existing problems students encounter in the courses. Familiar examples of micro-insertions to which readers of this paper may relate include the geopolitical implications of Peters's equal-area map projection (within a discussion of projections), the potential for mixed messages in choropleth maps (in discussions of data classification and symbolization), and Donald Trump's infamous Sharpie intervention.

Whether used for guided discussion, individual analysis, or even student teams competing in "ethics bowls" that are popular in some disciplines, case studies are tailor-made for micro-insertions. As Davis (2006) writes, "Ethics need not be an add-on; it can work like an alloy, adding strength to the course without adding volume" (724). The story-style cases featured in this special issue, as well as the problem-style cases published at GISEthics.org, have the potential to sharpen and deepen discussions of ethics in cartography and other geospatial courses in higher education. Authoring more actionable case studies should therefore be a priority for ethics-across-the-cartography-curriculum advocates within and beyond academia. Other case study projects, notably "Ethics Unwrapped" at the University of Texas' McCombs School of Business, provide inspiring examples of how open educational resources can support ethics-across-the-curriculum initiatives in many disciplines.

Is there evidence that cartography educators, or geospatial educators more generally, are eager to infuse ethical implications into their teaching? Robert Myers (2025) explored this question by repeating his keyword search on the 244 entries that comprised the ***GIS&T Body of Knowledge*** at the time of his research. He found that only 15% (37 entries) included his ethics-related keywords. Five of those entries pertain to the "Cartography and Visualization" knowledge area (the "Big Data Visualization," "Cartography and Power," "Cartography and Science," "Collaborative Cartography," and "Statistical Mapping" entries). As of this writing, the "Cartography and Visualization" knowledge area currently includes 36 entries organized into six subtopics. Say what you will about the motives and legitimacy of the *Body of Knowledge* project; it remains the closest thing we have to a definitive, community-driven summation of the content of the geospatial domain. What does it say about cartography that, in this post-Harley age, only 5 of 36 Cartography and Visualization entries (14%) mention ethics-related keywords? Certainly, the count would be different if more search terms were included. "Privacy," for example, would surely produce more hits. Still, it's hard to escape the conclusion that ethics remains a peripheral issue for most of the cartography (and geospatial) educators and researchers who write entries for the *Body of Knowledge*. Sona Karentz Andrews's observation that "the majority of information we impart to [cartography] students . . . has little to do with ethics" (1990, 8) may be as accurate today as it was thirty-five years ago.

ENGAGEMENT WITH GEOAI ETHICS

If there was ever to be an issue that could bring ethics to the forefront of cartography education, it may be geospatial artificial intelligence.

Anthony Robinson and colleagues (2023) report that "Ethical Issues and Societal Implications" emerged as one of three research themes from discussions among thirty-five cartographers at an international workshop on Cartography and AI. In a separate content analysis and narrative synthesis of research studies integrating GeoAI and cartography, conducted in order to summarize current research and development trends, Kang, Gao and Roth

(2024) identify "five potential ethical challenges that need to be addressed in the integration of GeoAI for cartography: commodification, responsibility, privacy, bias, and (together) transparency, explainability, and provenance" (1).

In addition to research, related GeoAI development efforts are also underway. In 2023, the members of the GeoMachina project **announced on Twitter**:

> In a 2019 article, we speculated about a potential GeoAI moonshot to develop an autonomous GIS analyst that can perform simple spatial data science tasks entirely by itself . . . developing autonomous GI bots is not without risks, and the increasing tendency to connect ChatGPT-like systems to IoT devices is worrying. We believe the best next step for our spatial data science and GeoAI communities is to develop a benchmark and competition series that supports experiments and fruitful competition around developing autonomous GIS bots while at the same time being guided by strong ethical guidelines.

Following that announcement, GeoMachina collaborator Song Gao **invited chapter proposals** for a forthcoming open access book entitled *Geography According to ChatGPT*. The book's tentative subtitle speaks to the editors' aims: *Mutual Insights: Extracting Geographic Insights from Foundation Models while Refining their Representations of the World*. Pointing out that "biases in foundation models have a clear geo-spatial footprint (e.g., merely 3% of training data for images come from China and India combined)," the editors ask, "how can we learn from foundation models and what can we contribute in return to further improve these models"?[2]

Among the possible topics in consideration for *Geography According to ChatGPT* are "ethical concerns of using geographic foundation models," including biases, trust, philosophical foundations, and benchmarking. Mindful of the observation that "philosophical principles cannot be applied in any straightforward way to particular problems and policies" (Thompson 2007), I believe that practical ethics—specifically, a broad spectrum of ethics case studies and corresponding exemplary analyses of the problems they pose—must be included in the training sets employed for geographic foundation models. This need seems especially crucial for the models on which "autonomous GIS bots," such as those envisioned by the GeoMachina team, may be built.

To help build an ethical GeoAI, I believe a broad-based effort to assemble and publish actionable case studies that deal with ethical and associated legal and policy issues is needed. Such an effort should involve collaboration between educators and practitioners, as discussed in the section "Transforming 'Stories' about Geospatial Ethics into 'Problems'" above. AI itself may also help. In a 2024 instance of my seminar on Spatial Data Science Ethics, Penn State student Brian Eakin showed how ChatGPT can be trained to help generate new ethics case study scenarios. Problem-style cases, along with exemplary case analyses, seem likely to be effective vehicles to infuse ethical and legal reasoning in foundational model training sets. The same might be said for the education of current and aspiring geospatial professionals: their "training sets" should likewise include geospatial ethics, law and policy—a formidable challenge for educators to whom GeoAI may offer some help.

CLOSING

Is there a critical mass of concern that might justify the effort to realize the ideal of ethics across cartography (and broader geospatial) curricula? Despite the discouraging metrics discussed above, I remain hopeful. I know from long, firsthand experience that many students respond enthusiastically to ethics instruction (though some are skeptical at first). This special issue of *Cartographic Perspectives* demonstrates that practitioners in industry, government, and academia are eager to share their ethical concerns. And it's plain to see that GeoAI is amplifying concerns about social and personal impacts of geospatial technologies, data, and methods. If there was ever a time to prioritize ethics, it's now. So what can geospatial educators do to help humans—and perhaps AI models—learn to respond to ethical challenges with greater insight, empathy, and integrity? I close with few practical ideas in Table 4.

2. The White House's 2023 "Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence" (#14110) defines a foundation model as "an AI model that is trained on broad data; generally uses self-supervision; contains at least tens of billions of parameters; [and] is applicable across a wide range of contexts." ChatGPT is built upon several models, including the GPT-3.5 and GPT-4 families of foundation models.

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1. Survey ethical concerns of geospatial practitioners in industry, government, and academia.
2. Survey geospatial educators about the extent to which their students engage with ethical and legal topics and cases in their coursework, and their willingness to do more.
3. Identify and develop problem-based ethics case studies—perhaps in collaboration with large language models—that are relevant to the wide range of topics included in the *GIS&T Body of Knowledge*, or to particular curricula.
4. Assemble a corresponding collection of exemplary case study analyses (solutions).
5. Identify key topics in geospatial law and policy—and their relationships to ethical concerns—that should be included in geospatial education.
6. Organize teams to collaborate with GeoAI research and development initiatives.

Table 4. Some possibilities for advancing geospatial ethics.

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