

DIGITAL MAPPING TECHNIQUES 2024

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May 13 - 16, 2024

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The Zen of GeMS – Individual and Organizational Approaches

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In the 3½ years since the GeMS standard (NCGMP, 2020) was formally published it has become widely used at state surveys in a variety of projects including new STATEMAP mapping, data preservation of legacy maps, and customization of the standard for specialized workflows (e.g., enterprise GIS). As we see the variety of ways GeMS is implemented, this presentation asks GeMS creators to consider their individual and organizational approaches to GeMS creation and suggests how to think about organizing GeMS projects. Consciously or not, all GeMS creators are implementing the standard from their own unique perspectives since it is flexible by design. We support recognizing this and aiming for organizational consistency through identification of factors and goals influencing a GeMS project followed by discussion and documentation of internal GeMS standards. This presentation draws parallels between those attitudes toward GeMS and those of the characters in Robert Pirsig's *Zen and the Art of Motorcycle Maintenance* toward riding and caring for their motorcycles.

Cited reference

U.S. Geological Survey National Cooperative Geologic Mapping Program, 2020, GeMS (Geologic Map Schema)—A standard format for the digital publication of geologic maps: U.S. Geological Survey Techniques and Methods, book 11, chap. B10, 74 p.



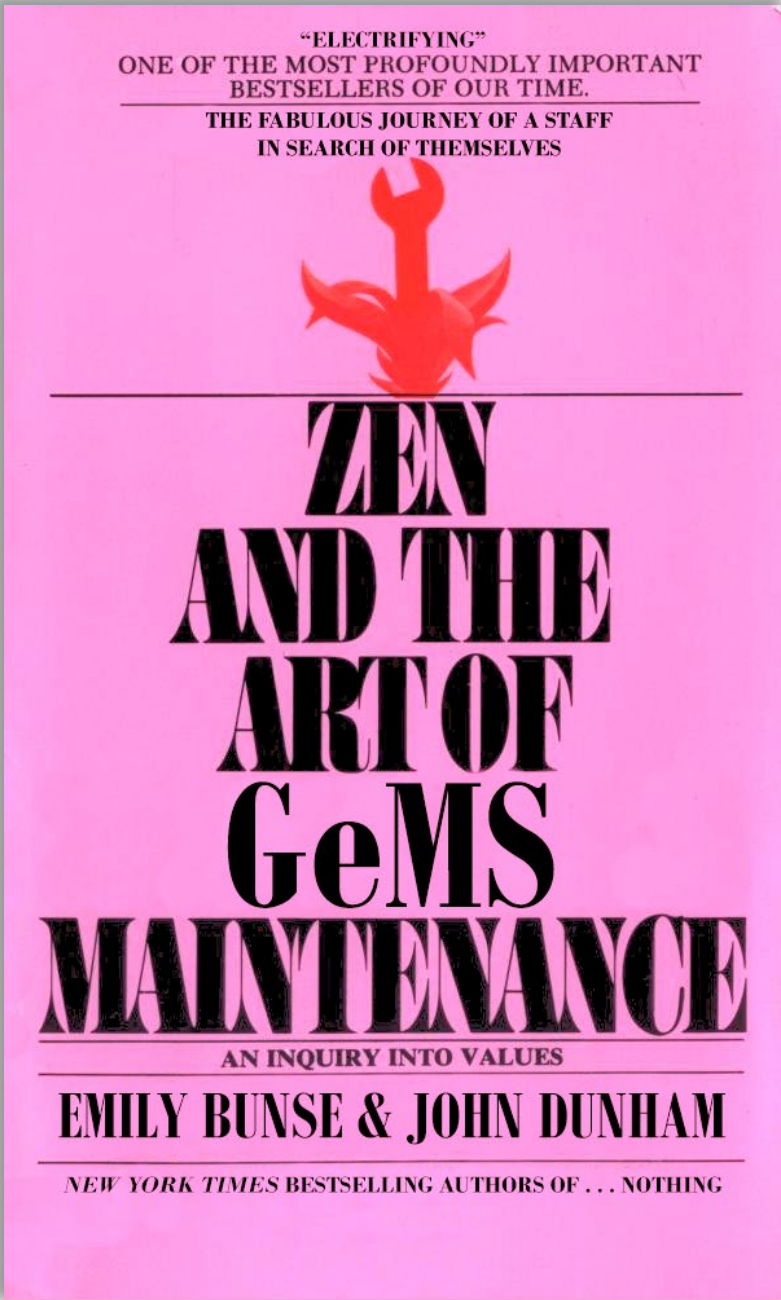
The Zen of GeMS

Individual and organizational
approaches

Emily Bunse and John Dunham, Kansas Geological Survey

Digital Mapping Techniques, 2024,

Bloomington-Normal, IL



Why zen?

(Merriam Webster)

(2) zen : a state of calm attentiveness in which one's actions are guided by **intuition** rather than by conscious effort.



Awareness of what's expected in a project

Insight to deliver



Unknown schedules, tasks, and end goals

Struggle 'til the end

Coalescing around what's important



Parallels with Robert Pirsig's *Zen and the Art of Motorcycle Maintenance*

The narrator/main character does as much of his own motorcycle work as he can, while the couple he and his son ride with prefer to leave it to professional mechanics.

- Do you want to immerse yourself in the GeMS process or leave all or most of the GeMS work to someone else? Are you embracing it or running away at every opportunity?

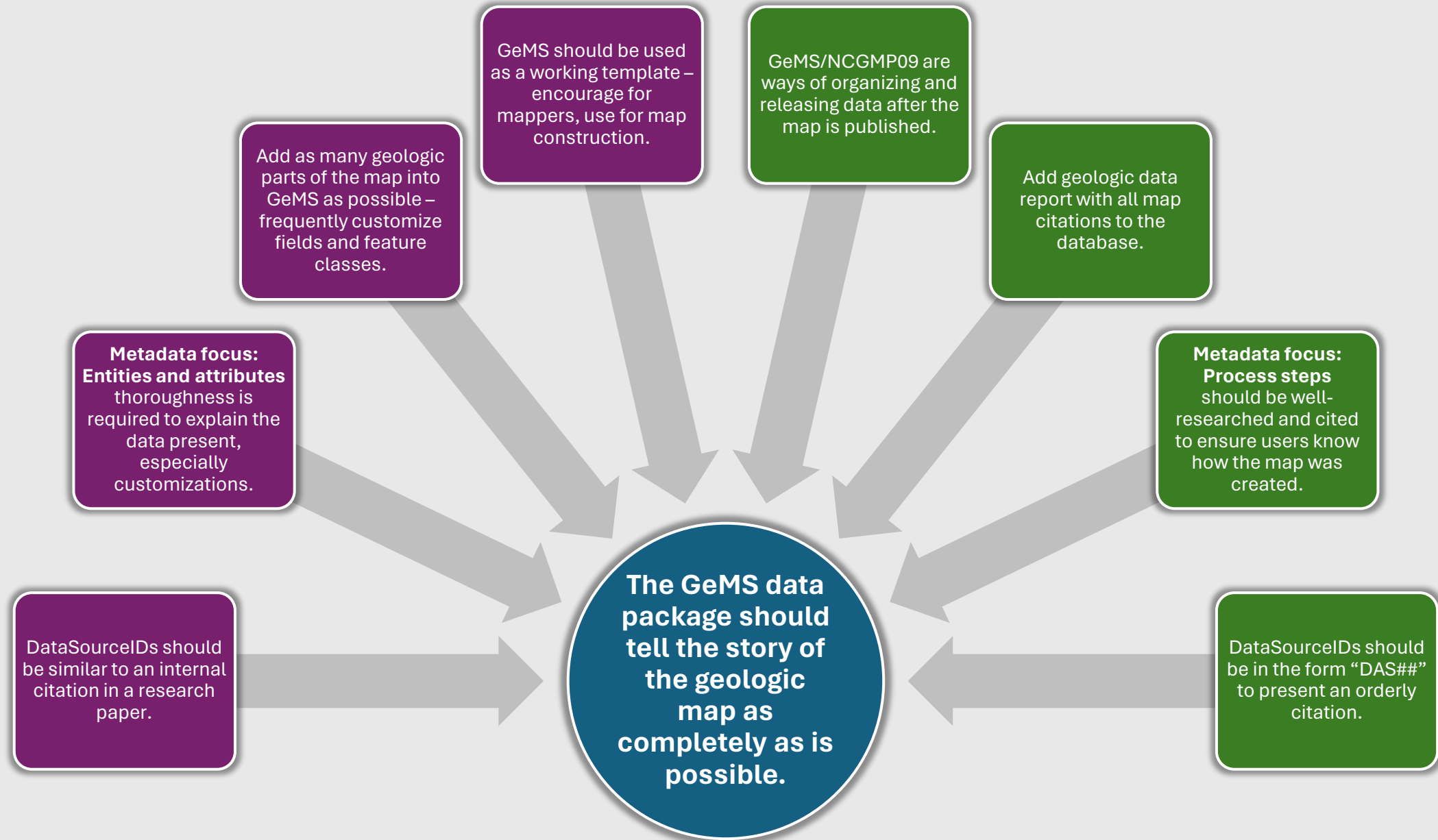
Later in the story, the narrator remarks that his friend's view of the motorcycle is "steel in various shapes...and turns off the whole thing" whereas the narrator sees ideas. His friend thinks he's working on parts where he sees concepts.

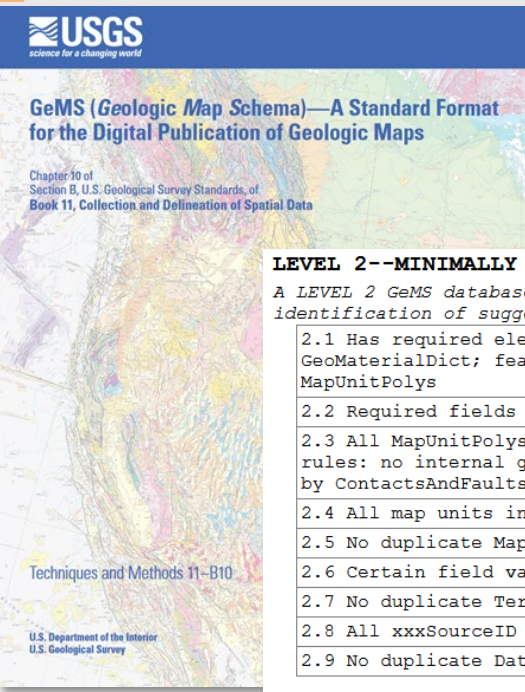
- Can you see each part of a GeMS data package as part of a system where each individual part has a function?

As the narrator performs fix which must be "just right", his friend asks, "How did you know how to do that?" "You just have to figure it out" the narrator replies. "I wouldn't know where to start" the friend says. "I think to myself, That's the problem, all right, where to start."

- We have a few ideas...

Identifying GeMS values and approach





We're all implementing GeMS from unique perspectives since the GeMS schema is flexible by design.

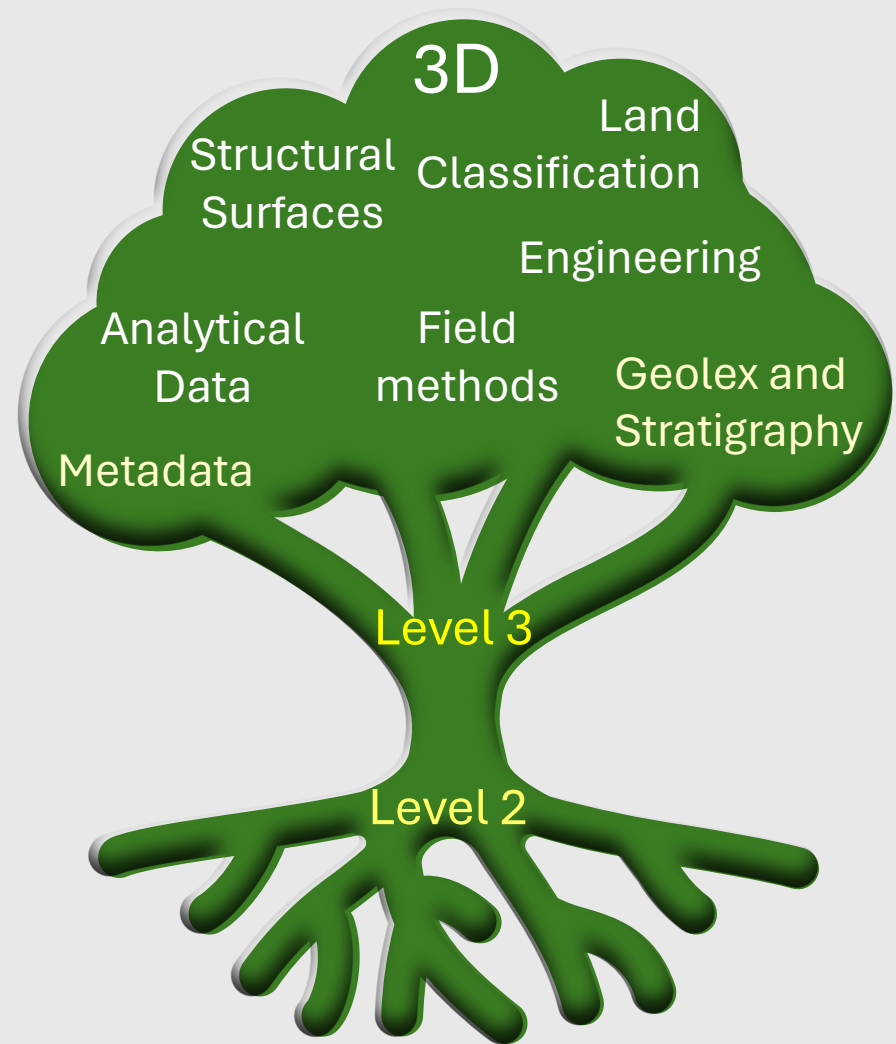
LEVEL 2--MINIMALLY COMPLIANT
 A LEVEL 2 GeMS database is accompanied by a peer-reviewed Geologic Names report, including identification of suggested modifications to Geolex, and meets the following criteria:

2.1 Has required elements: nonspatial tables DataSourcees, DescriptionOfMapUnits, GeoMaterialDict; feature dataset GeologicMap with feature classes ContactsAndFaults and MapUnitPolys	PASS
2.2 Required fields within required elements are present and correctly defined	PASS
2.3 All MapUnitPolys and ContactsAndFaults based feature classes obey Level 2 topology rules: no internal gaps or overlaps in MapUnitPolys, boundaries of MapUnitPolys are covered by ContactsAndFaults	PASS
2.4 All map units in MapUnitPolys have entries in DescriptionOfMapUnits table	PASS
2.5 No duplicate MapUnit values in DescriptionOfMapUnit table	PASS
2.6 Certain field values within required elements have entries in Glossary table	PASS
2.7 No duplicate Term values in Glossary table	PASS
2.8 All xxxSourceID values in required elements have entries in DataSourcees table	PASS
2.9 No duplicate DataSourcees_ID values in DataSourcees table	PASS

LEVEL 3--FULLY COMPLIANT
 A LEVEL 3 GeMS database meets these additional criteria:

3.1 Table and field definitions beyond Level 2 conform to GeMS schema	PASS
3.2 All MapUnitPolys and ContactsAndFaults based feature classes obey Level 3 topology rules: No ContactsAndFaults overlaps, self-overlaps, or self-intersections.	PASS
3.3 No missing required values	PASS
3.4 No missing terms in Glossary	PASS
3.5 No unnecessary terms in Glossary	PASS
3.6 No missing sources in DataSourcees	PASS
3.7 No unnecessary sources in DataSourcees	PASS
3.8 No map units without entries in DescriptionOfMapUnits	PASS
3.9 No unnecessary map units in DescriptionOfMapUnits	PASS
3.10 HierarchyKey values in DescriptionOfMapUnits are unique and well formed	PASS
3.11 All values of GeoMaterial are defined in GeoMaterialDict. GeoMaterialDict is as specified in the GeMS standard	PASS
3.12 No duplicate _ID values	PASS
3.13 No zero-length, whitespace-only, or bad null values	PASS

Entering a new era of GeMS development



GeMS standard publication and Validation tool results provide basic guidelines and rules for GeMS

Influences + Approach

Staff roles

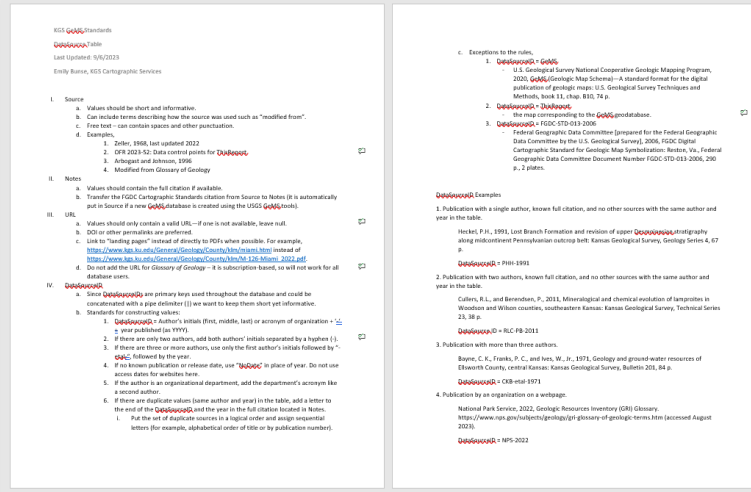
Staff experience

Project timeline

Map status

Collaborators

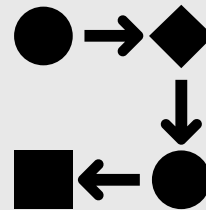
GeMS project needs and goals



Documenting standards

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Organizational consistency



Establishing a workflow with staff roles and products



What is the structure of GeMS maintenance in your organization?

“Go-to-experts”

Data creators bring non-GeMS formatted data to these ~1-2 GeMS experts who compile GeMS packages.

“DIY”

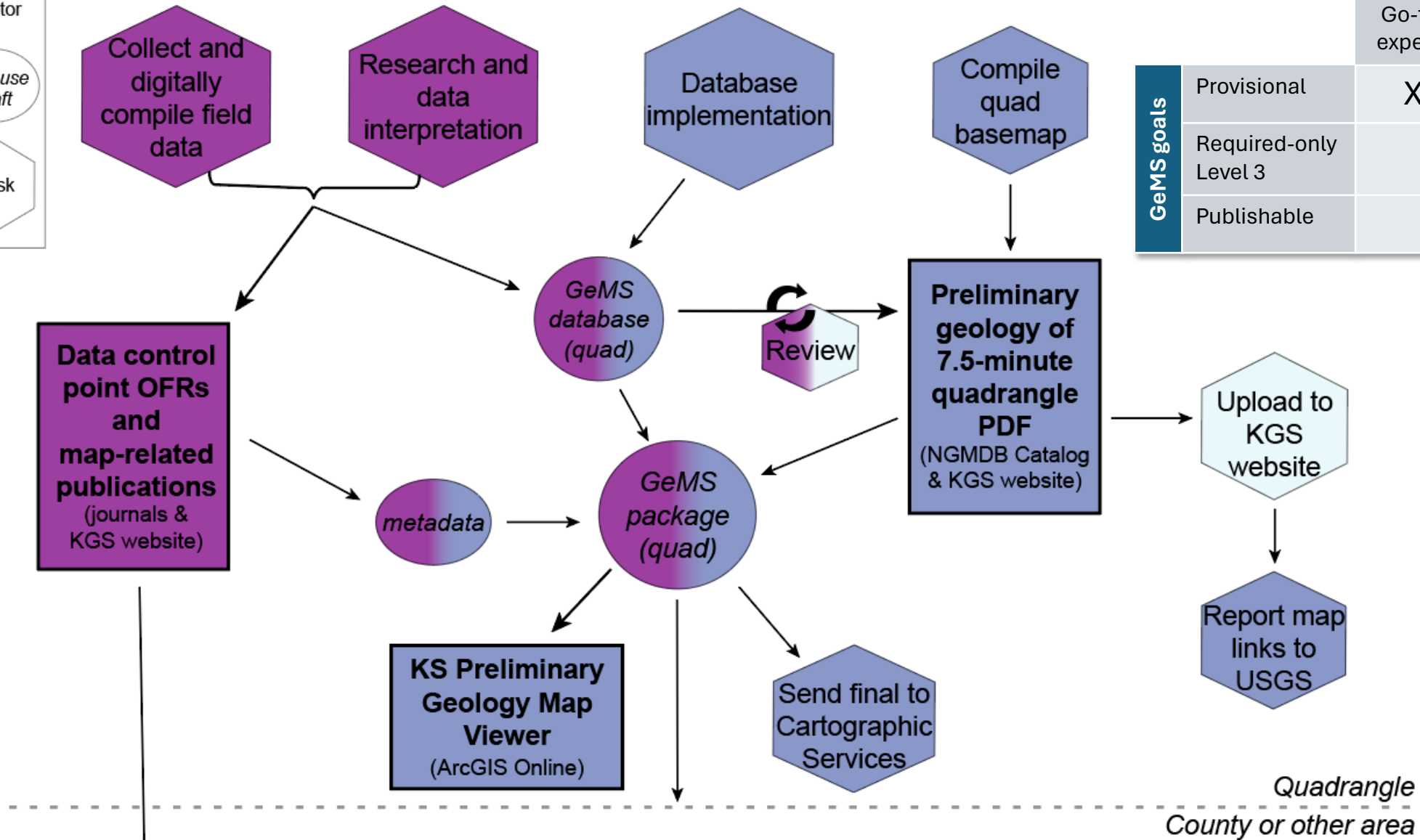
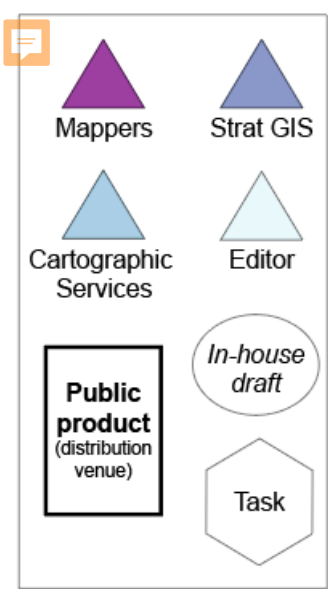
Data creators put their own data into GeMS.

“Teamwork”

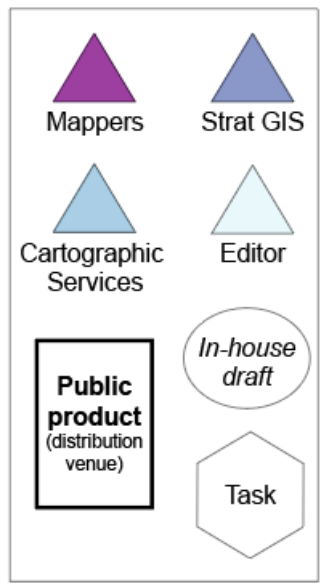
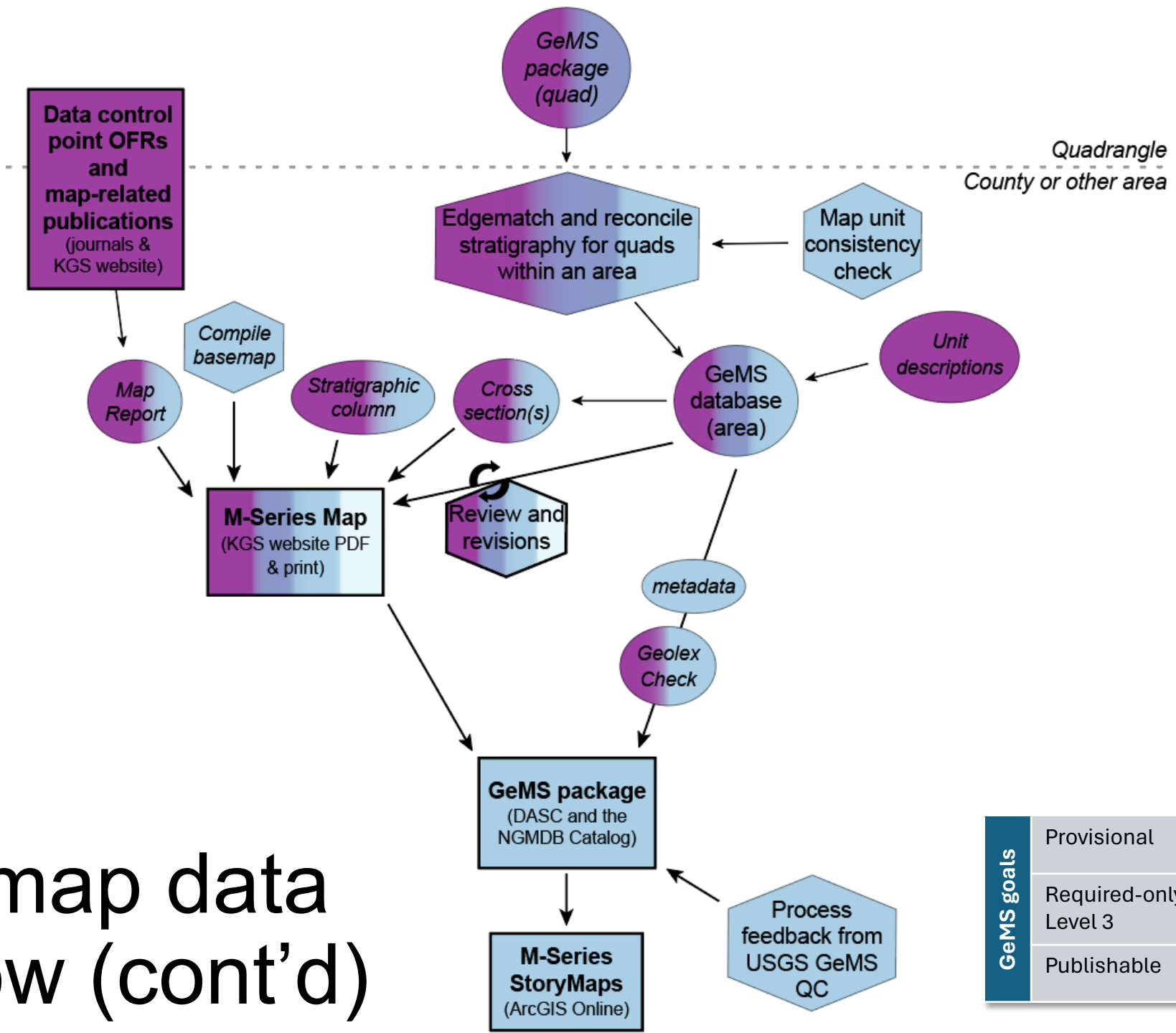
Several roles have knowledge of GeMS and contribute what they can to a GeMS project. This approach includes data creators (mappers), GIS analysts, and data managers.

		Staff needs		
		Go-to-experts	DIY	Teamwork
GeMS goals	Provisional: may include non-required and ancillary data			
	Required-only Level 3			
	Publishable: includes non-required and ancillary data, Level 3 compliant.			

KGS map data workflow



		Staff needs		
		Go-to-experts	DIY	Team work
GeMS goals	Provisional	X	X	
	Required-only Level 3			
	Publishable			



KGS map data workflow (cont'd)

		Staff needs		
		Go-to-experts	DIY	Team work
GeMS goals	Provisional			
	Required-only Level 3			
	Publishable			X



Documentation Example

Thinking through formatting DataSourceID values.

DataSourceIDs should be similar to an internal citation in a research paper.

DataSourceIDs should be in the form "DAS##" to present an orderly citation.

List what's important in developing your standard.

- GeMS: "Values must be unique in database. Null values not permitted."
- Emily: must be human-readable and show date like a short citation in a research paper.
- John: must be orderly (preferred the example GeMS values "DAS01", "DAS02", etc.)

Identify what to leave out

- Formula should produce terse values, especially since the values will likely be concatenated.
- Cannot include all authors.

Resolve conflicting opinions and come to a solution

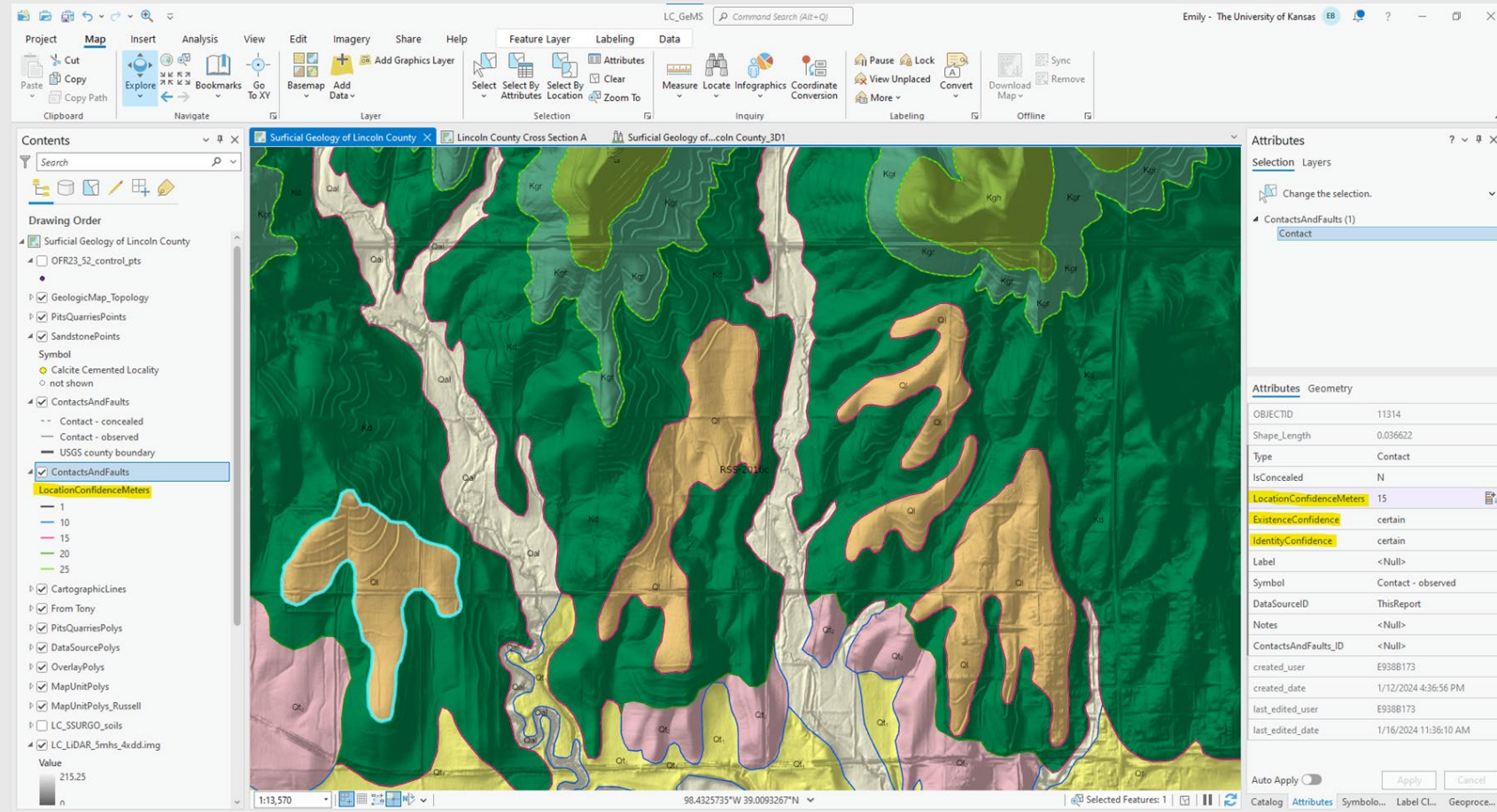
- DataSourceID = Author or Organization initials + "-" + YYYY
- Use "etal" when more than 2 authors.

Document with examples.

No detail is too small for starting standards development

GeMS is beneficial for mappers

- The GeMS schema is proven to catch not only GIS/data organization errors, but also influence the mapping process.

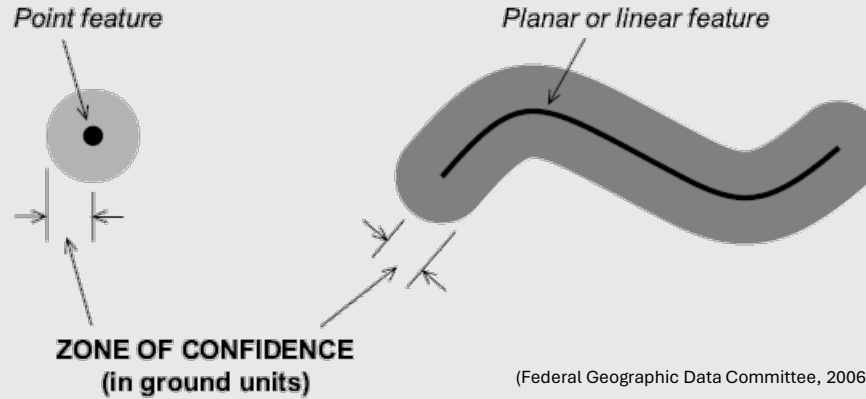


Filling in LocationConfidenceMeters values for KGS M-127 helped one mapper fine-tune mapping of Quaternary units.



GeMS is beneficial for mappers

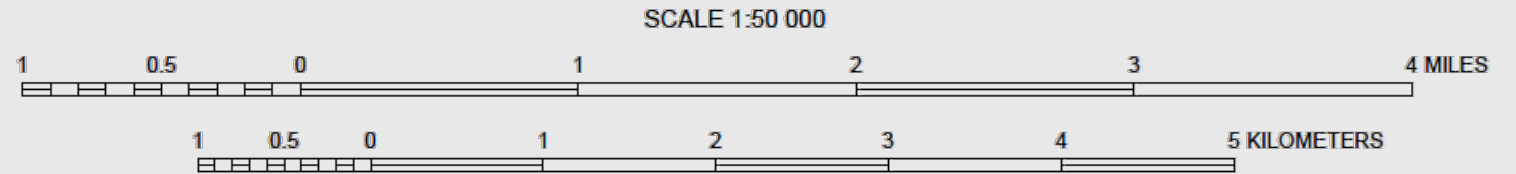
- The GeMS schema is proven to catch not only GIS/data organization errors, but also influence the mapping process.
- Includes data that is difficult to convey cartographically



Multiple opportunities to express uncertainty



Ancillary data (lab, field)

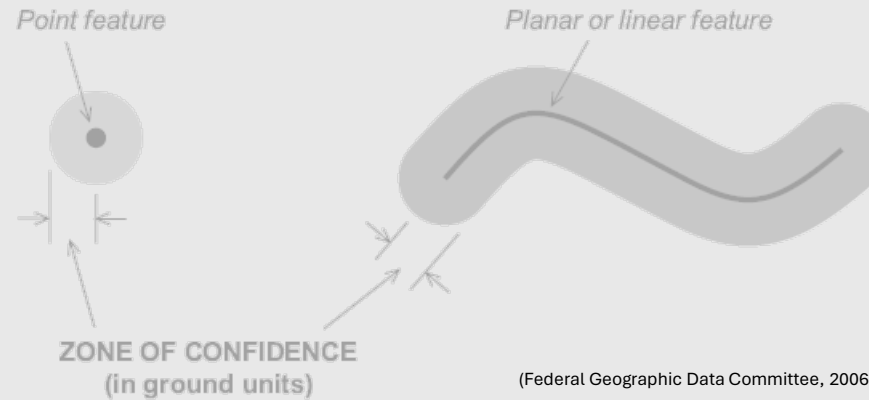


Interpretations inappropriate for map scale



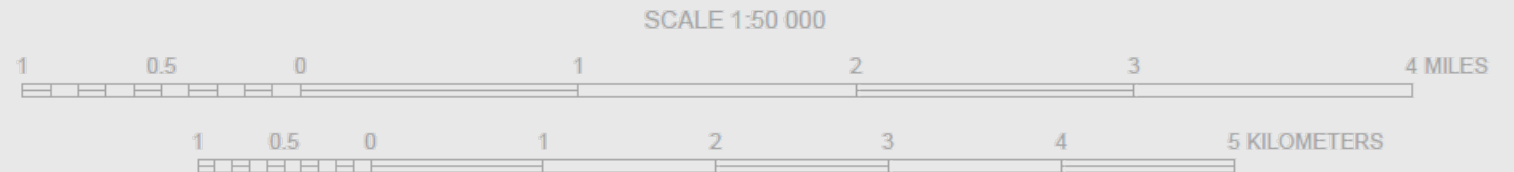
GeMS is beneficial for mappers

- The GeMS schema is proven to catch not only GIS/data organization errors, but also influence the mapping process.
- Includes data that is difficult to convey cartographically
- Use of GeMS early in a mapping project ensures data that will be needed later on is collected.
- Data published in GeMS will be reusable.



Multiple opportunities to express uncertainty

Ancillary data (lab, field)



Interpretations inappropriate for map scale



Discussion?

References

- Federal Geographic Data Committee [prepared for the Federal Geographic Data Committee by the U.S. Geological Survey], 2006, FGDC Digital Cartographic Standard for Geologic Map Symbolization: Reston, Va., Federal Geographic Data Committee Document Number FGDC-STD-013-2006, 290 p., 2 plates.
- Pirsig, Robert M., 1974, *Zen and the Art of Motorcycle Maintenance*: Bantam Books, New York.
- U.S. Geological Survey National Cooperative Geologic Mapping Program, 2020, GeMS (Geologic Map Schema)—A standard format for the digital publication of geologic maps: U.S. Geological Survey Techniques and Methods, book 11, chap. B10, 74 p., <https://doi.org/10.3133/tm11B10>.