

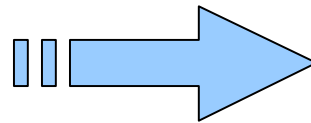
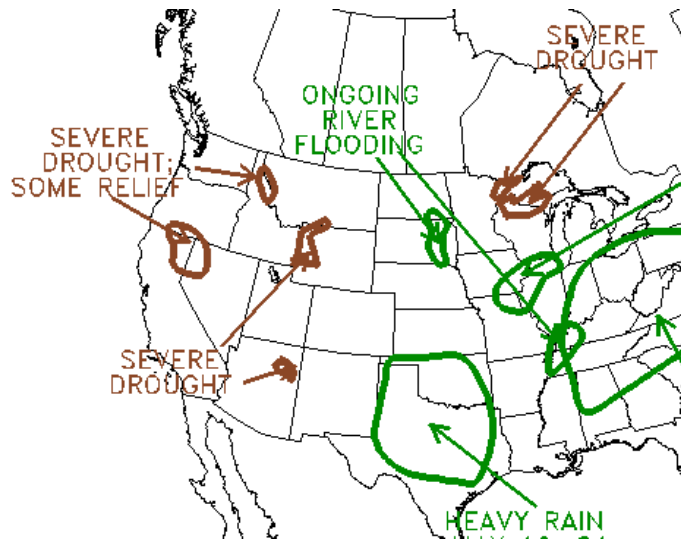
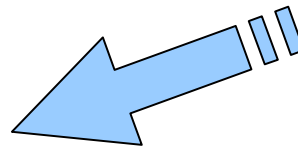
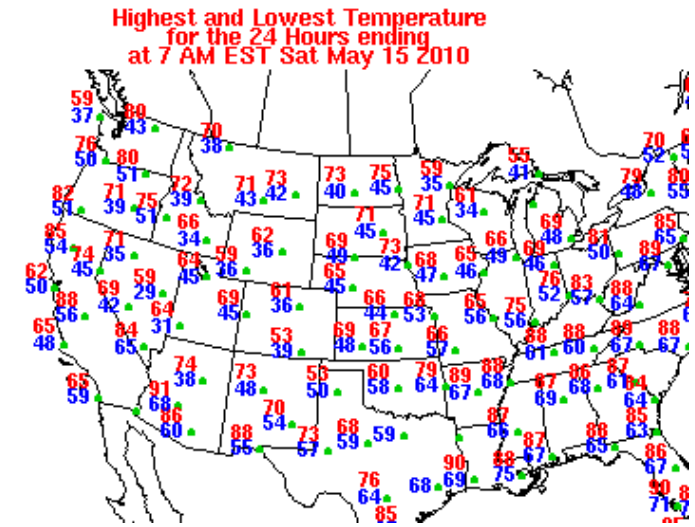
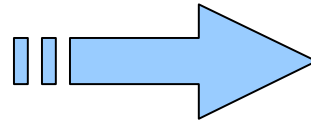
Creating Usable Data

Usable Data and “Actionable” Information

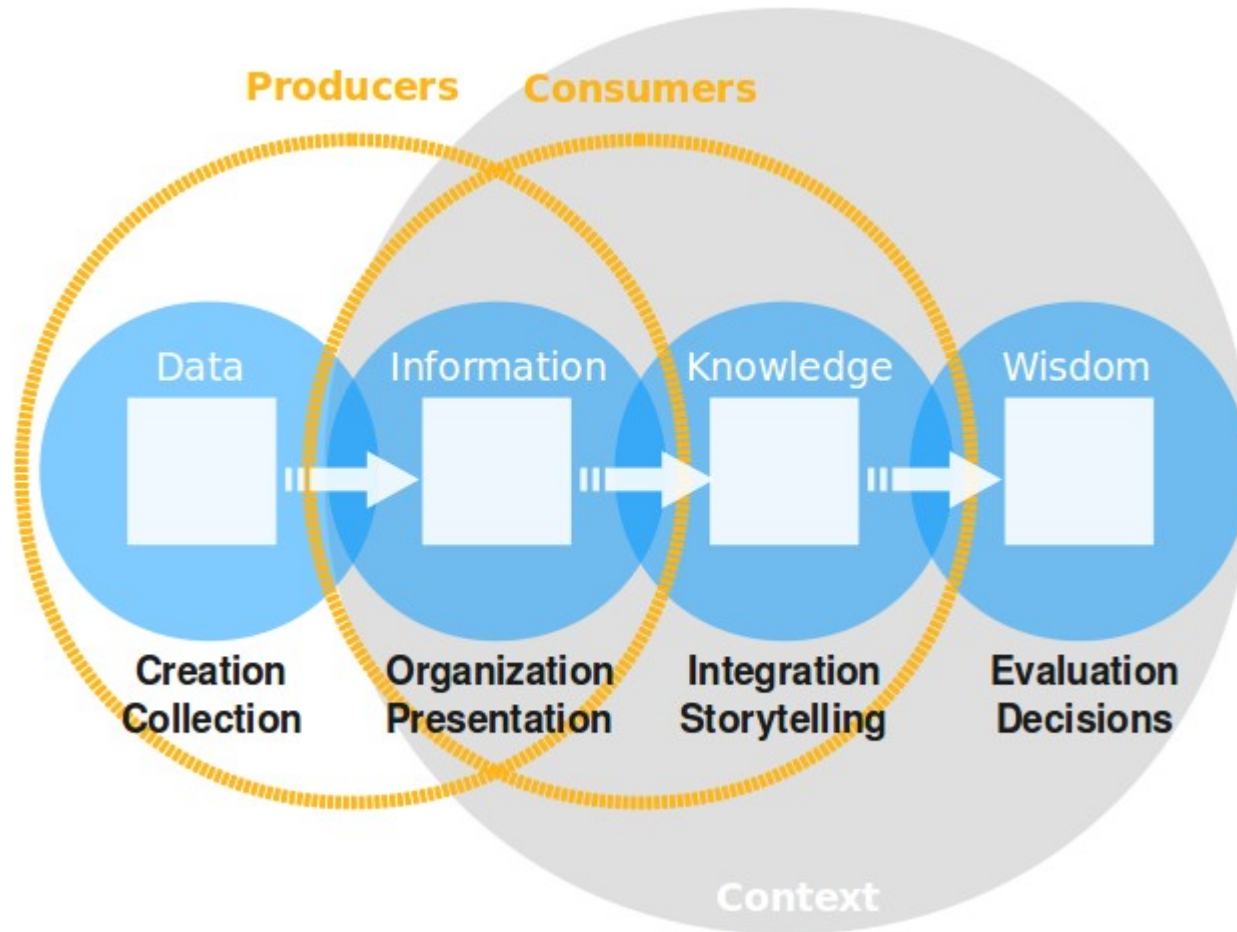
Jonathan Callahan
Mazama Science



From Data to Decision



Data – Information – Knowledge pathway



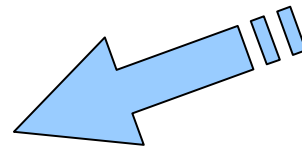
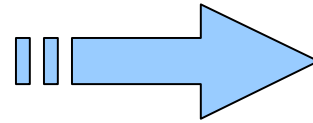
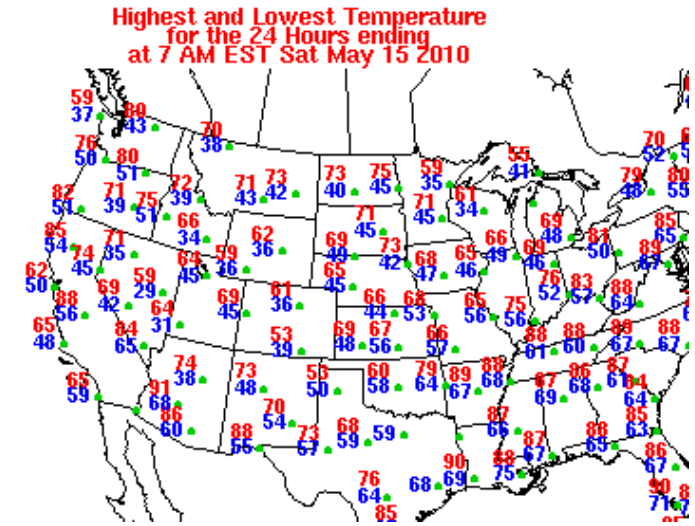
Graphic concept from nathan.com

From Data to Decision

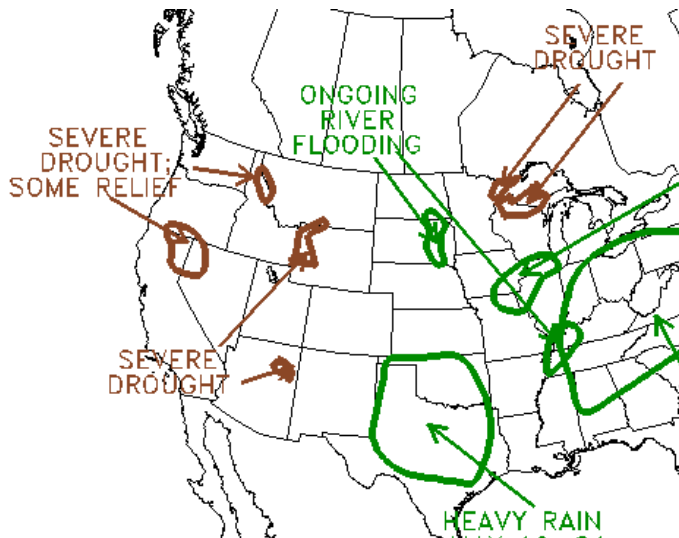
Data



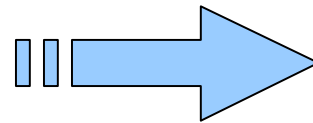
Information



Knowledge



“Actionable” Information



Data Providers, Managers & Consumers

- Scientists are Data Providers.
- Analysts and decision makers are Data Consumers.
- Providers and Consumers are connected by Data Management.
- Pathway from providers to consumers:
 - 1) Collect/validate/process data (providers)
 - 2) Organize & present data (providers & managers)
 - 3) Integrate data from various sources (managers & consumers)
 - 4) Evaluate and make decisions (consumers)

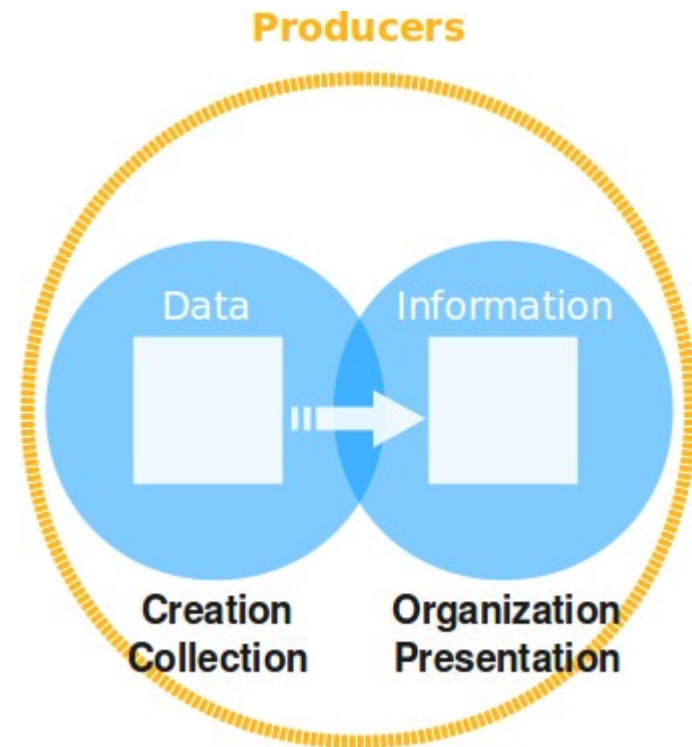
Types of environmental monitoring data

Five fundamental questions:

1. How is the resource doing? (**status**)
2. Is it changing? (**trends**)
3. Why is it changing? (**diagnostic monitoring**)
4. What can we do? Are we doing it? (**compliance monitoring**)
5. Did it work? (**effectiveness monitoring**)

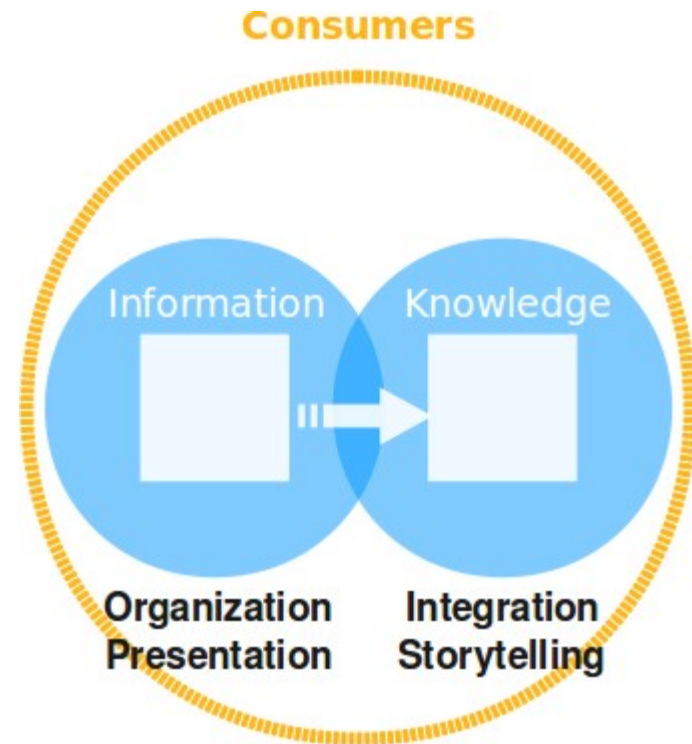
Working with data Providers (bottom up)

- Data are categorized by:
 - **Size**
 - **Update frequency**
 - **Structure**
 - **Processing level**
- Categories determine software tools.
- Categories determine presentation styles.
- Categories determine questions that can be asked.

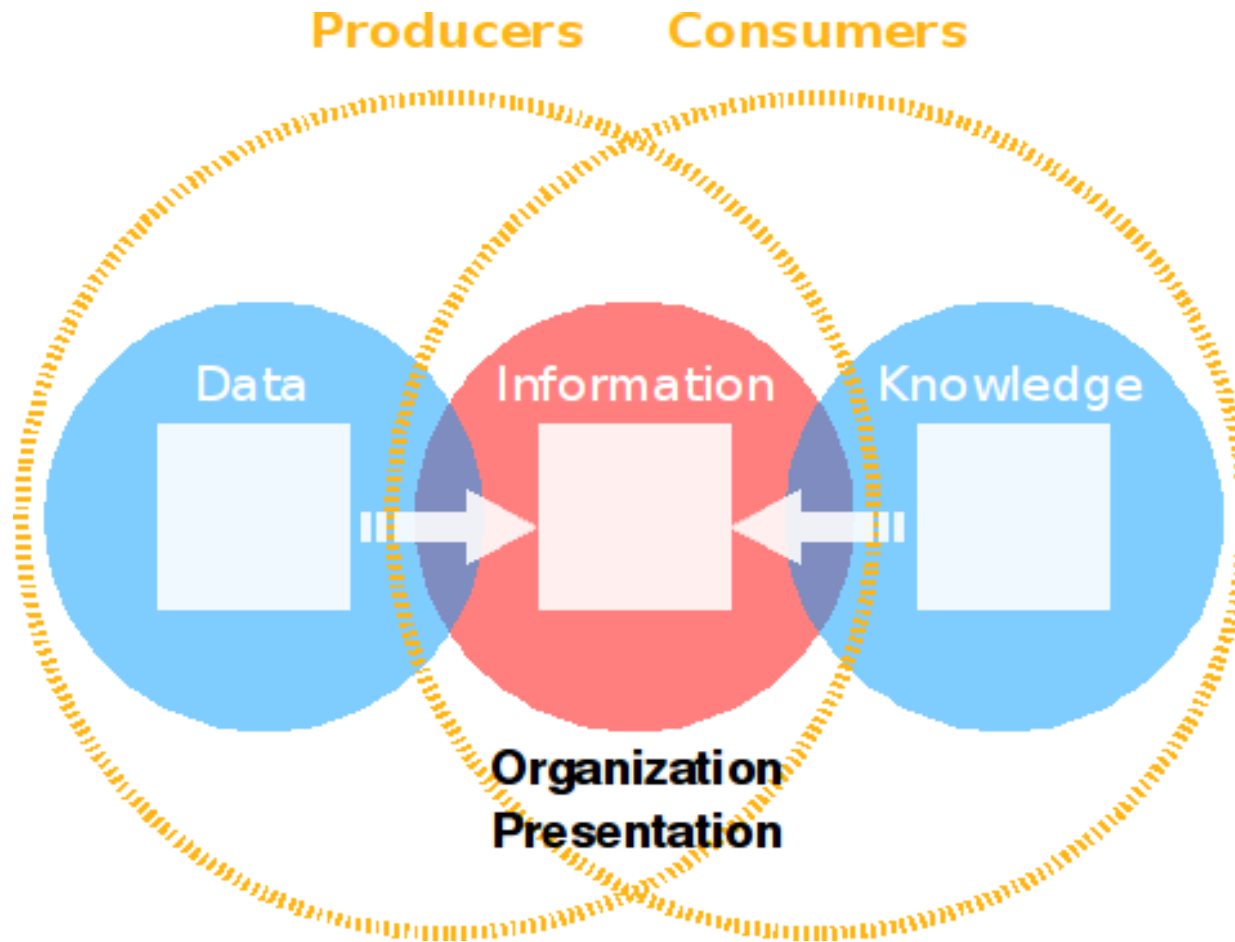


Working with data Consumers (top down)

- Presentation tools categorized by:
 - **Level of synthesis**
 - **UI Complexity**
 - **UI Flexibility**
 - **Exploratory / Explanatory**
- Categories determine visualization styles.
- Categories determine user interface design.
- ★ Categories determine underlying data structure.



Organizing & Presenting is the Hard Part!



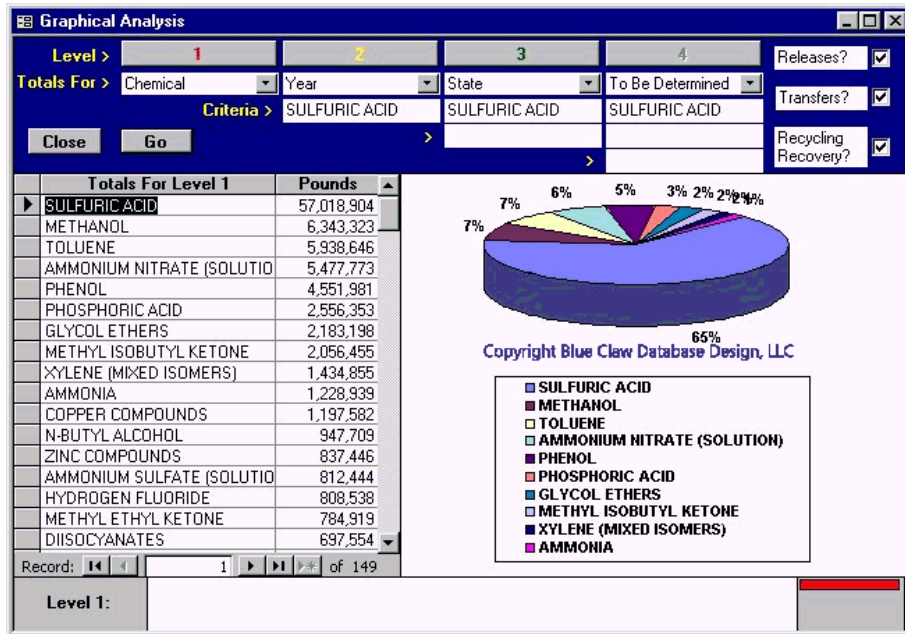
Connecting data producers with data consumers means understanding the needs of each.

Types of User Interface

- 1) Assessment. (evaluation)
- 2) Top level summary. (dashboard)
- 3) Explanatory tool for authors. (databrowser)
- 4) Exploratory tool for analysts. (databrowser)
- 5) Raw data access. (data access)

Example presentations for data Consumers

blueclaw-db



Expert User

raw data, complex,
exploratory

USFS



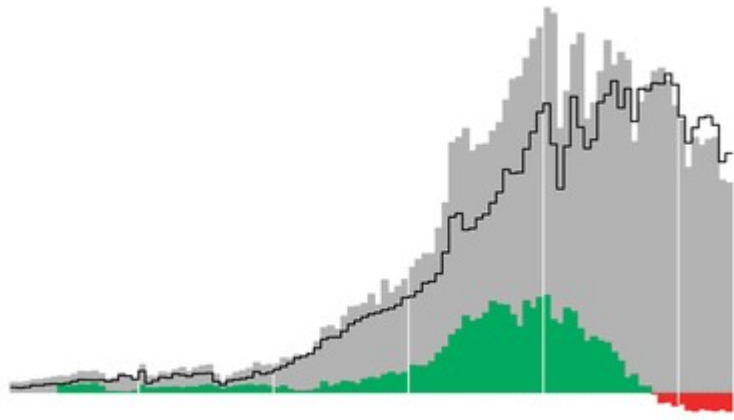
General Public

synthesized data, simple,
explanatory

Designing Data Presentation Tools

- What do we know about the data?
 - size, update frequency, inherent structure, processing level
- What type of monitoring can these data be part of?
 - status, trends, diagnostic, compliance, effectiveness
- What do we know about end user needs?
 - level of synthesis, complexity, flexibility, exploratory / explanatory
- What type of system should we provide?
 - data access, databrowser, dashboard, evaluation

The story behind this presentation.



**Number Crunchers
Pattern Recognizers
& Story Tellers**

Number Crunchers

- Fast
- Accurate
- Consistent
- > 50 years of evolution



Very good at what they do!

Pattern Recognizers

- Fast!
- Accurate ~
- Creative!!
- > 50K years of evolution



Awesome at what we do!

Pattern Recognition

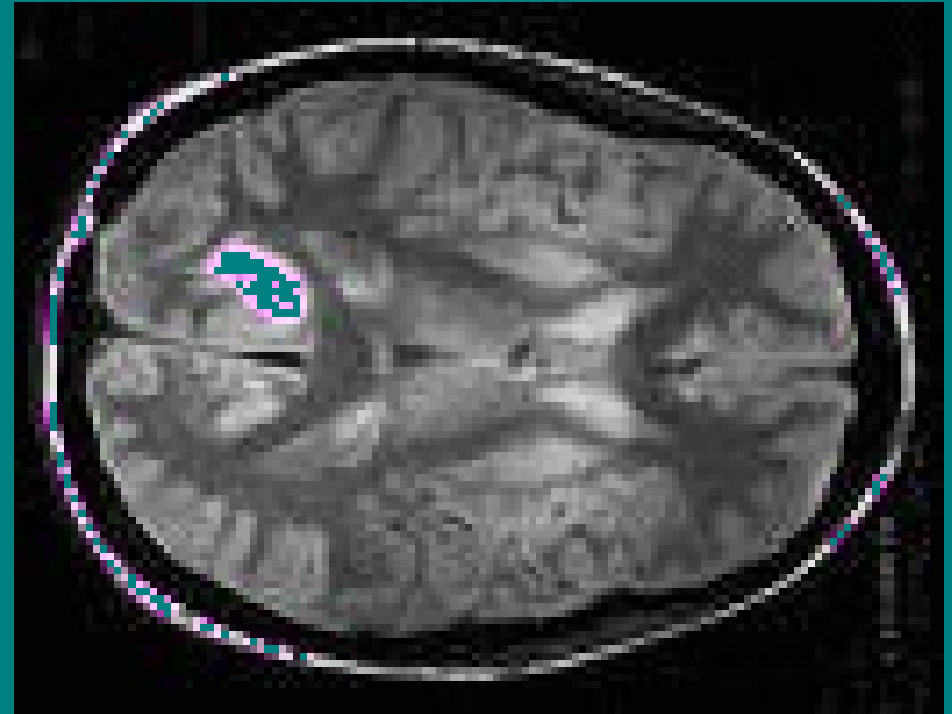
Humans are better than computers are recognizing patterns.



Pattern Recognition

Sensors can generate and computers can process millions of measurements.

When presented visually, humans recognize patterns instantly.



Pattern Recognition

- Humans communicate by telling stories.
- Familiar pictures help us tell those stories.



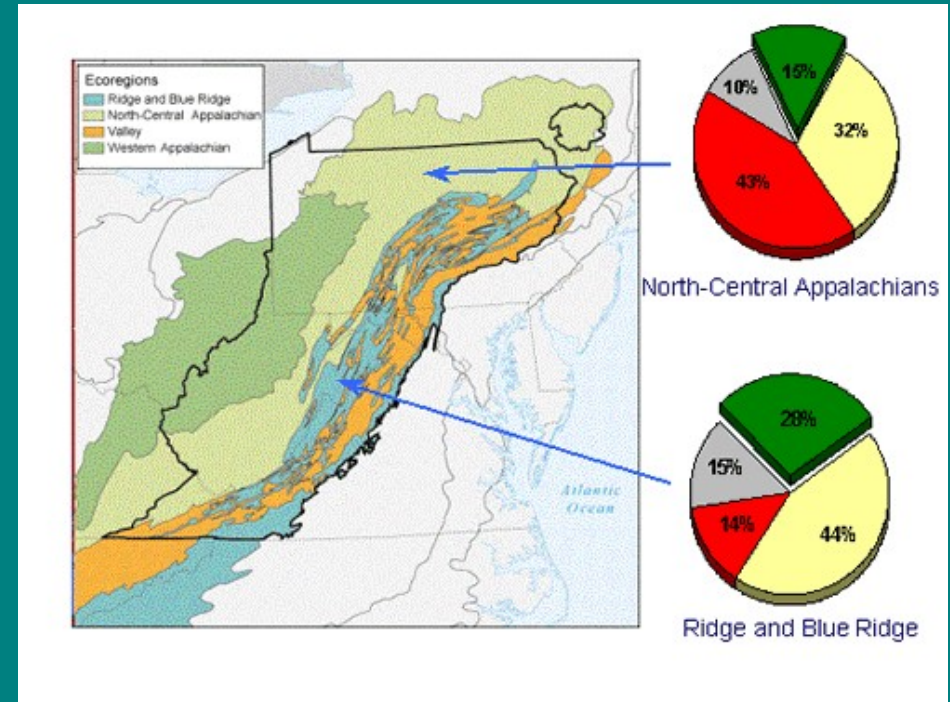
Cave painting, Lascaux, France, 15,000 to 10,000 B.C.

Pattern Recognition

When we want to tell stories with data we use graphics.

Including visualizations that map onto the real world.

And charts that are completely abstract.



Telling stories with data requires data visualization.

From Theory to Practice.

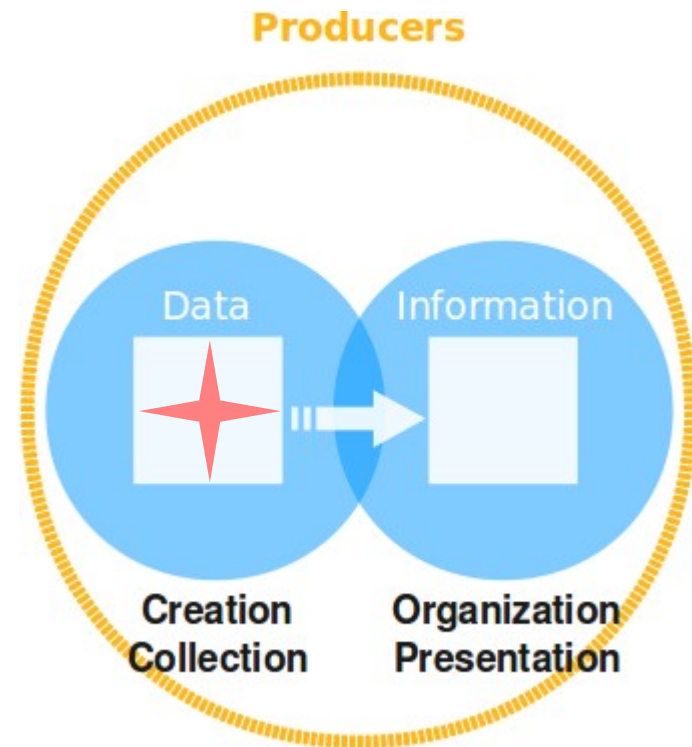
- “Data – Information – Knowledge” is the theory.
- Data files and software is the practice.
- How do data managers start creating “Usable Data”?
- How does this lead to “Actionable Information”?

For Usable Data – Identify Your Users!

- Do you want to support analysts?
(data only)
- Do you want to support authors?
(data summaries and charts)
- Do you want to engage local citizens?
(maps and local information)
- Do you want to support decision makers?
(integrated stories)

Support Analysts with Data.

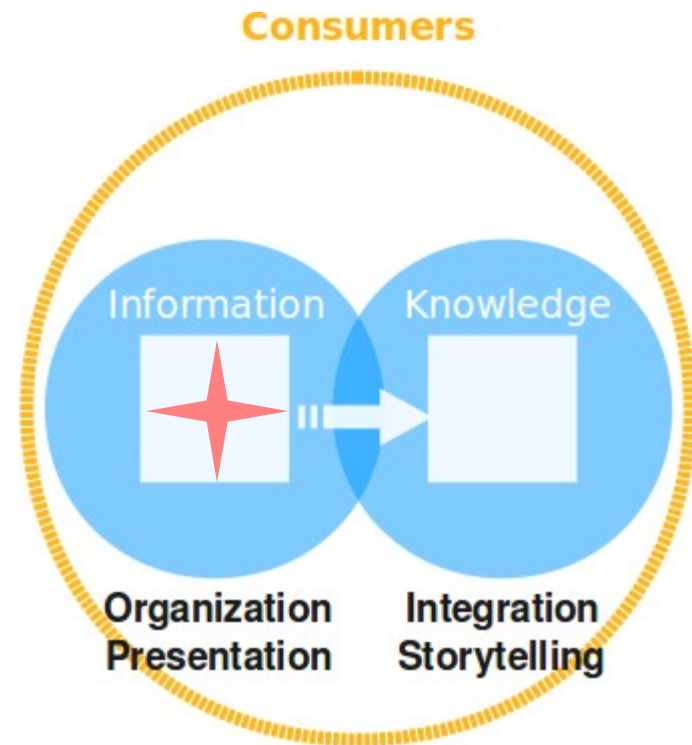
- Analysts want raw data.
- They want easy access.
- They know how to work with data.
- They have their own tools.



- **Give them big CSV files.**

Support Authors with Tables and Charts.

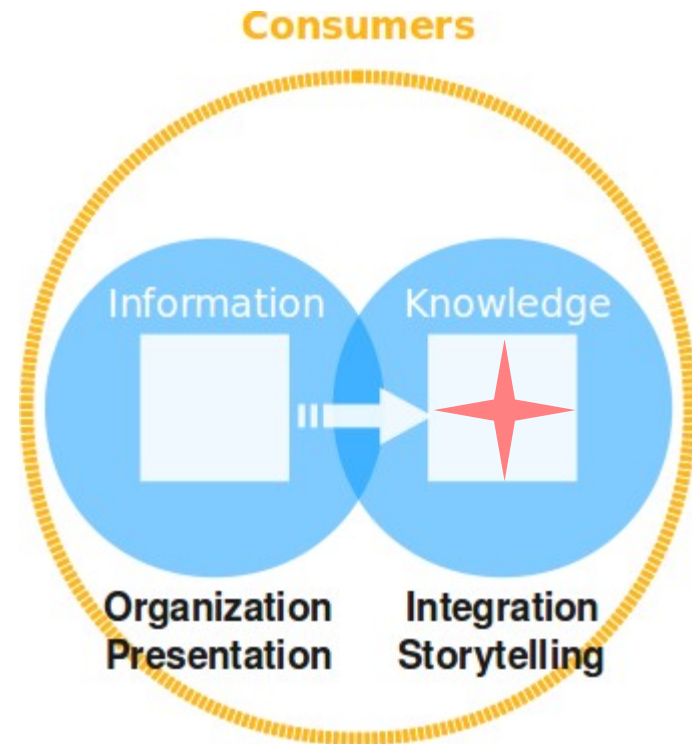
- Authors want data summaries.
- They want to tell stories.
- They don't have great data skills.
- They will publish on the web.



- **Give them summary tables and good data graphics. (.png)**

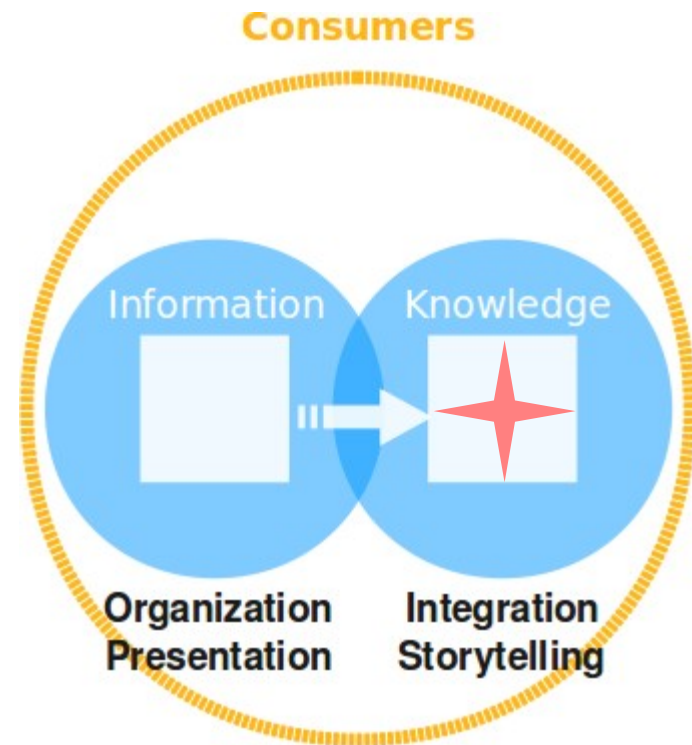
Engage Citizens with Maps & Local Info.

- Citizens want to know what is going on near them.
 - They want maps.
 - They want simple explanations.
 - They will influence decision makers.
-
- **Give them web pages with text, maps and charts.**



Support Decision Makers with Stories.

- Decision Makers want “Actionable Information”.
- They want integrated stories.
- They don't have expert knowledge.
- They need well informed citizens to back them up.
- **Give them compelling stories.**



Keep It Simple – Data and Charts

- Data
 - ASCII CSV files on a web site
 - Text files (.txt, .pdf) with metadata describing the data
- Data summaries and charts
 - Summarize important results in tables.
 - Study other sites for excellent chart examples.
 - Are your charts easy to understand?
 - Do they tell a story?
 - Are they beautiful?
 - Provide charts that can be copied. (.png)
 - Build a simple web presentation with html and javascript.

Keep It Simple – Maps and Stories

- Maps
 - Don't require the use of interactive maps.
 - Provide static versions of maps. (.png)
 - Provide KML files.
- Integrated Stories
 - Tell compelling stories!
 - Who are the actors?
 - What is at stake?
 - What do we know?
 - Use web pages to integrate information.
 - Have “data consumers” write the stories.

Mazama Science Databrowsers

Explanatory – for decision makers

<http://www.airfire.org/data/arctic-transport-forecast/>

Exploratory – for authors

<http://mazamascience.com/OilExport/>

Exploratory – for scientists

<http://earthsystems.net/WatershedExplorer/>

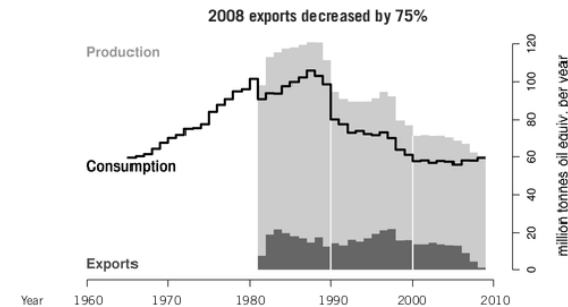
Examples of an 'engaged public'.

2. THE USE OF COAL-MINING SUBSIDIES IN POLAND

Subsidies for coal mining were widespread in Europe until the mid-1990s when the coal industry faced increasing competitiveness from imports. Many arguments were used to justify these subsidies—mainly energy security, social stability and the dependence of related sectors on the continuance of coal mining (Fronzel, Kambeck & Schmidt, 2007).² In poorer or transitional countries, where electricity generated from fossil fuels represented a substantial share of total energy production, subsidies that frequently took the form of low coal prices³ were justified as a way to moderate inflationary pressures. However, as an anti-inflationary policy it was poorly targeted; a 10 per cent increase in coal prices would lead to a 5 per cent increase in the cost of producing electricity in a coal-fired power station and a much smaller cost increase passed on to the consumer.⁴

Poland is one of only a few countries in the world with a coal-based energy economy. Hard coal and lignite provide more than 55 per cent of Poland's primary energy supply, and 95 per cent of its electricity is generated from these fuels. Poland has a large domestic endowment of coal, but its heavy dependence on coal also has historical roots. During the period when its economy was centrally planned (1945–1989) in particular, Poland had limited foreign exchange earnings with which it could import oil and natural gas. But because coal mining was considered one of the country's most important sectors, it was subsidized and coal prices were regulated to keep them affordable. The table below provides further information about Poland's coal sector.

FIGURE 1. POLAND COAL PRODUCTION



Date BP Statistical Review 2009
Graphic provided by Mazama Sciences: <http://mazamascience.com/OilExport/>

² In 1994 there was a special session of SNS Energy Stockholm devoted to various aspects of coal subsidies. Papers can be found in *Energy Policy*, vol. 23, 1996, No. 6.

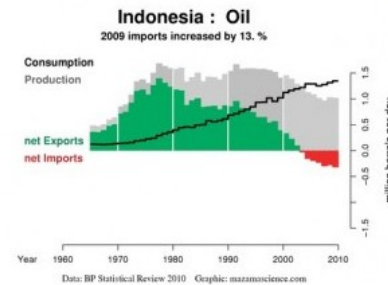
³ Coal costs are balanced by governmental subsidies, such as is the case in Ukraine.

⁴ The electricity price for the final consumer consists of the energy price as well as capital recovery and the cost of transmission and distribution fees, which together constitute a substantial share of total costs.



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Qualcuno sta usando il nostro petrolio



Mi arrivano continue segnalazioni per una breve news pubblicata venerdì dal *Sole 24 Ore*: il Fondo Monetario Internazionale avrebbe lanciato un allarme sulla prossima **“crescente scarsità” di petrolio**. Questo significa forse che l'economia, dopo la geologia, si è resa conto del picco di produzione ormai raggiunto. *“Allarme dell’Fmi sull’offerta”*, titola significativamente il *Sole*. Così, sono andata a verificare di persona.

Il documento, una sintesi di un capitolo del *World Economic Outlook* di prossima uscita, [si trova qui](#). Il

punto che mi preme sottolineare è il seguente: i mercati mondiali del petrolio si trovano in un periodo di crescente scarsità, che riflette la **rapida crescita nella domanda** di petrolio delle economie emergenti e un **calo nella crescita dell’offerta**.

Si fa naturalmente riferimento all’inesausta e mai abbastanza discussa questione della gigantesca domanda petrolifera cinese, indiana e di tutti gli altri Paesi manifatturieri. Ma l’ultima frase è quella più indicativa: **non si parla di produzione, ma di offerta**. Si tratta forse di una censura involontaria verso il problema del piccolo produttivo, quell’elefante nella stanza che si fa tanta fatica a vedere? Non ne sarei tanto sicura.