Presenting Data Effectively

Based on Materials by Geoff Dates
River Network

Elizabeth Herron
Volunteer Water Quality Monitoring
National Facilitation Project

USDA-CSREES National Water Conference, Sparks NV
February 6, 2008
Turning Data Into Information

1) Program and Study Design
2) Monitoring and Recording
3) Data Entry and Validation
4) Data Summary
5) Data Interpretation
6) Data Presentation
7) Action and/or Further Monitoring
What People Remember

- 59% Oral
- 32% Visual Alone
- 9% Visual & Oral
Design Basics

- Slide Layout
- Type Size and Style
- Color
- Images
The “Tree” starts to look like this:

Watershed vision
- Management goal 1 of N
  Monitoring objective

List of decision makers

Decisions to be made

Information needs
Information Needs Decision Tree

Management goal 1 of N

Monitoring objectives

A

B

C

Decision Makers

Decisions they Make

Information needs

Slide Layout

Avoid Clutter
Layout Supports Your Point

Design Basics

Type

**Typeface:** a collection of characters, letters and symbols that have a unique design: e.g. Arial.

**Font:** a specific typeface in a specific point size and style. e.g. Arial 24 pt.

*Used interchangeably*
Size Matters

Raise your hand if you can read this. (8 pt)

Raise your hand if you can read this. (10 pt)

Raise your hand if you can read this. (12 pt)

Raise your hand if you can read this. (16 pt)

Raise your hand if you can read this. (20 pt)

Raise your hand if you can read this. (24 pt)

Raise your hand if you can read this. (28 pt)
# Fonts Matter

## Which is easiest to read?

<table>
<thead>
<tr>
<th>Sans Serif</th>
<th>“Other”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arial</td>
<td>Curlz MT</td>
</tr>
<tr>
<td>Comic Sans</td>
<td>Edwardian Script</td>
</tr>
<tr>
<td>Helvetica</td>
<td>Lucida Handwriting</td>
</tr>
<tr>
<td>Trebuchet</td>
<td>Olive Oil</td>
</tr>
<tr>
<td>Verdana</td>
<td>STENCIL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Serif</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Courier</td>
<td>Book Antigua</td>
</tr>
<tr>
<td>Garamond</td>
<td>Goudy</td>
</tr>
<tr>
<td>Times New Roman</td>
<td></td>
</tr>
</tbody>
</table>
Approximately 10 million Americans have some degree of color-blindness...

Expert Color Choices for Presenting Data -
### Design Basics

**Color**

|---------------------------|------------------------|------------------------|------------------------|------------------------|
## Design Basics

### Color

**Contrast and Readability**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>--------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
</tr>
</tbody>
</table>
Design Basics

Color

<table>
<thead>
<tr>
<th>Contrast and Readability</th>
<th>Which Is Most Readable?</th>
<th>Which Is Most Readable?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which Is Most Readable?</td>
<td>Which Is Most Readable?</td>
<td>Which Is Most Readable?</td>
</tr>
<tr>
<td>Which Is Most Readable?</td>
<td>Which Is Most Readable?</td>
<td>Which Is Most Readable?</td>
</tr>
<tr>
<td>Which Is Most Readable?</td>
<td>Which Is Most Readable?</td>
<td>Which Is Most Readable?</td>
</tr>
</tbody>
</table>
Design Basics
Color

Contrast and Readability

Which Is Most Readable?
Which Is Most Readable?
Which Is Most Readable?
Which Is Most Readable?
### Design Basics: Color

## Contrast and Readability

<table>
<thead>
<tr>
<th>Which Is</th>
<th>Which Is</th>
<th>Which Is</th>
<th>Which Is</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most</td>
<td>Most</td>
<td>Most</td>
<td>Most</td>
</tr>
</tbody>
</table>

### Question:

Which is most readable?
Design Basics

Color

**Contrast and Readability**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrast and Readability</td>
<td>Which Is Most Readable?</td>
<td>Which Is Most Readable?</td>
<td>Which Is Most Readable?</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
</tr>
</tbody>
</table>
Color Use Guidelines for Mapping and Visualization

Cynthia Brewer

http://www.personal.psu.edu/cab38/ColorSch/Schemes.html

Color Scheme Types and Combinations: Overview

Select the color scheme of interest below to see examples of it in use.

Binary

Qualitative

Diverging

Sequential
Qualitative Sequential Color Schemes

In qualitative/sequential schemes, the qualitative variable is represented with hues and the quantitative variable is represented with sequences of lightness steps within each hue. Binary/sequential schemes are a subset of qualitative/binary schemes with the binary variable represented by a hue difference and lightness differences reserved for the sequential variable. Population percentages (sequential) of varied dominant ethnic groups or religions (qualitative), for example, are well represented on a qualitative/sequential color scheme.

Qualitative Sequential Color Example

![Qualitative/Sequential Scheme](image)

...back to Color Scheme Types and Combinations: Overview

Go back to Cindy's page or PSU Geography or GeoVISTA

Dr. Cynthia Brewer / Department of Geography / The Pennsylvania State University
Sequential Color Examples

Sequential/Sequential Scheme

Percent of labor force employed in agriculture, 1900

Percent of labor force employed in industry, 1900

Sequential/Sequential Scheme

Percent of labor force employed in services, 1900

Percent of labor force employed in industry, 1900
Data Presentation

Summarize your data to tell your story

- Tailor to your audience
- Tailor to your audience
- Time
- Level of detail
- Visuals
- “Sound bites”
Data Presentation

Present your story

- Reports
- Posters
- Slide Presentations
- Video
- Web Site
# Data Presentation
## What Makes A Good Table?

- Readable, logical data placement
- Clear column and row headings
- A title at the top
- Reporting units

<table>
<thead>
<tr>
<th>E. Coli Bacteria (colonies per 100 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>------</td>
</tr>
<tr>
<td>MoB017</td>
</tr>
<tr>
<td>MoB016</td>
</tr>
<tr>
<td>MoB015</td>
</tr>
<tr>
<td>MoB014</td>
</tr>
<tr>
<td>MoB013</td>
</tr>
<tr>
<td>MoB001</td>
</tr>
</tbody>
</table>
Data Presentation
What's Wrong with This Table?

Table 7. Water chemistry data collected at Maryland Biological Stream Survey sites in Allegany County, 1994-1997.

<table>
<thead>
<tr>
<th>Site</th>
<th>pH</th>
<th>Conductivity (µS/cm)</th>
<th>Acid Neutralizing Capacity (meq/L)</th>
<th>Nitrate (mg/L)</th>
<th>Sulfate (mg/L)</th>
<th>Dissolved Oxygen (mg/L)</th>
<th>Dissolved Carbon (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL-A-007-304-96</td>
<td>7.46</td>
<td>0.246</td>
<td>515.90</td>
<td>1.177</td>
<td>73.513</td>
<td>7.70</td>
<td>1.20</td>
</tr>
<tr>
<td>AL-A-020-228-95</td>
<td>6.33</td>
<td>0.043</td>
<td>93.73</td>
<td>0.143</td>
<td>10.597</td>
<td>1.70</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-027-205-95</td>
<td>6.94</td>
<td>0.115</td>
<td>183.60</td>
<td>0.171</td>
<td>14.624</td>
<td>8.20</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-027-209-95</td>
<td>6.98</td>
<td>0.113</td>
<td>175.46</td>
<td>0.185</td>
<td>14.875</td>
<td>7.60</td>
<td>3.00</td>
</tr>
<tr>
<td>AL-A-033-314-95</td>
<td>7.07</td>
<td>0.047</td>
<td>182.15</td>
<td>0.323</td>
<td>10.027</td>
<td>8.20</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-054-320-96</td>
<td>7.21</td>
<td>0.632</td>
<td>654.80</td>
<td>0.859</td>
<td>235.872</td>
<td>8.10</td>
<td>1.10</td>
</tr>
<tr>
<td>AL-A-061-125-95</td>
<td>6.12</td>
<td>0.048</td>
<td>33.65</td>
<td>0.200</td>
<td>17.200</td>
<td>2.00</td>
<td>1.00</td>
</tr>
<tr>
<td>AL-A-069-102-95</td>
<td>5.94</td>
<td>0.032</td>
<td>73.24</td>
<td>0.293</td>
<td>10.269</td>
<td>9.30</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-143-226-95</td>
<td>6.84</td>
<td>0.066</td>
<td>138.19</td>
<td>0.577</td>
<td>15.442</td>
<td>9.20</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-146-301-95</td>
<td>6.89</td>
<td>0.048</td>
<td>177.81</td>
<td>0.293</td>
<td>10.269</td>
<td>9.30</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-148-201-96</td>
<td>7.85</td>
<td>0.202</td>
<td>1163.00</td>
<td>0.183</td>
<td>36.002</td>
<td>2.70</td>
<td>1.00</td>
</tr>
<tr>
<td>AL-A-167-230-95</td>
<td>6.91</td>
<td>0.047</td>
<td>131.04</td>
<td>0.159</td>
<td>11.097</td>
<td>5.70</td>
<td>1.00</td>
</tr>
<tr>
<td>AL-A-171-206-95</td>
<td>6.49</td>
<td>0.042</td>
<td>92.90</td>
<td>0.115</td>
<td>11.021</td>
<td>6.40</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-177-232-95</td>
<td>6.70</td>
<td>0.051</td>
<td>94.23</td>
<td>0.160</td>
<td>14.913</td>
<td>3.40</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-187-218-96</td>
<td>7.33</td>
<td>0.102</td>
<td>391.60</td>
<td>0.789</td>
<td>22.004</td>
<td>7.50</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-199-122-95</td>
<td>6.60</td>
<td>0.106</td>
<td>74.56</td>
<td>0.354</td>
<td>11.412</td>
<td>8.40</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-202-121-95</td>
<td>7.28</td>
<td>0.160</td>
<td>343.10</td>
<td>1.113</td>
<td>44.963</td>
<td>8.20</td>
<td>1.10</td>
</tr>
<tr>
<td>AL-A-207-307-95</td>
<td>6.91</td>
<td>0.055</td>
<td>172.95</td>
<td>0.256</td>
<td>10.337</td>
<td>7.40</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-215-112-95</td>
<td>6.99</td>
<td>0.053</td>
<td>231.11</td>
<td>0.144</td>
<td>11.985</td>
<td>6.80</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-221-107-96</td>
<td>4.98</td>
<td>0.981</td>
<td>3.40</td>
<td>1.211</td>
<td>520.266</td>
<td>9.30</td>
<td>1.00</td>
</tr>
<tr>
<td>AL-A-232-313-96</td>
<td>7.01</td>
<td>0.345</td>
<td>175.70</td>
<td>0.795</td>
<td>22.083</td>
<td>7.40</td>
<td>2.40</td>
</tr>
<tr>
<td>AL-A-233-601-96</td>
<td>8.23</td>
<td>0.692</td>
<td>3364.90</td>
<td>1.585</td>
<td>71.875</td>
<td>8.60</td>
<td>1.20</td>
</tr>
<tr>
<td>AL-A-244-227-95</td>
<td>6.77</td>
<td>0.054</td>
<td>144.01</td>
<td>0.120</td>
<td>14.358</td>
<td>3.80</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-248-213-95</td>
<td>6.69</td>
<td>0.084</td>
<td>291.05</td>
<td>0.135</td>
<td>21.552</td>
<td>7.50</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-248-234-95</td>
<td>7.20</td>
<td>0.114</td>
<td>400.21</td>
<td>0.507</td>
<td>17.050</td>
<td>6.50</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-254-326-96</td>
<td>7.97</td>
<td>0.861</td>
<td>308.70</td>
<td>0.594</td>
<td>346.426</td>
<td>10.10</td>
<td>0.80</td>
</tr>
<tr>
<td>AL-A-255-108-95</td>
<td>7.14</td>
<td>0.073</td>
<td>255.68</td>
<td>0.507</td>
<td>17.050</td>
<td>6.50</td>
<td>2.00</td>
</tr>
<tr>
<td>AL-A-268-221-96</td>
<td>7.24</td>
<td>0.130</td>
<td>475.20</td>
<td>0.303</td>
<td>28.983</td>
<td>6.00</td>
<td>3.30</td>
</tr>
</tbody>
</table>
Data Presentation

What Makes A Good Graph?

- Clear title
- Simple clear axis labels
- Elements that allow the reader to get the point
- A legend explaining graph elements
- A scale appropriate to the data
- Clear reporting units
- Reveals a story
- Minimum of clutter
Data Presentation
What Makes A Good Graph?

Bacteria

<table>
<thead>
<tr>
<th>Sites</th>
<th>Colonies per 100 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>350</td>
</tr>
<tr>
<td>5</td>
<td>300</td>
</tr>
<tr>
<td>4</td>
<td>250</td>
</tr>
<tr>
<td>3</td>
<td>200</td>
</tr>
<tr>
<td>2</td>
<td>150</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>

Bacteria

<table>
<thead>
<tr>
<th>Sites</th>
<th>Colonies per 100 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>350</td>
</tr>
<tr>
<td>5</td>
<td>300</td>
</tr>
<tr>
<td>4</td>
<td>200</td>
</tr>
<tr>
<td>3</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
</tr>
</tbody>
</table>
Data Presentation
What Makes A Good Graph?

The Importance of Scale

E. coli Bacteria:
10/21/92

Colonies per 100 mL

Water Quality Standard

Site 6 5 4 3 2 1

E. coli Bacteria:
10/21/92

Colonies per 100 mL

Site 6 5 4 3 2 1
Data Presentation
What Makes A Good Graph?

The Importance of Scale

E. coli Results for 6/16/92

Colony Counts per 100 mL

Sample Sites

WQ Standard
Data Presentation
What Makes A Good Graph?

E. coli Results: 1992

Colonies per 100 mL

Sample Sites

Site 1
Site 2
Site 3
Site 4
Site 5
Site 6

5/27/92
5/27/92
6/16/92
8/3/92
8/3/92
8/20/92
8/20/92
9/23/92
9/23/92
10/7/92
10/7/92
10/21/92
10/21/92
Data Presentation
What Makes A Good Graph?

Geometric Mean of E. coli Results: 1992

Colonies per 100 mL

Site 6  Site 5  Site 4  Site 3  Site 2  Site 1
Data Presentation

What's Wrong With This?

Blue River Macroinvertebrate Population
October 10, 1999     Site BL1

Stoneflies          3%
Caddis Flies         43%
Midges               21%
Amphipods            0%
Isopods              3%
Decapods             0%
Odonota              1%
Other diptera        4%
Megaloptera          0%
Beetles              10%
Aquatic worms        1%
Other                0%
Mayflies             14%
Gastropoda           0%
Hirudinea            0%
Pelecypoda           0%
Amphipods            0%
Midge                21%
Caddis Flies         43%
Data Presentation
What's Wrong With This?

Secchi Dip In - Massachusetts 1998

Depth
- Swimming Standard
- SECCHI
- LAKE

Depth (m)

[Bar chart showing depth measurements for various locations in Massachusetts, with bars indicating swimming standards, SECCHI, and Lake levels.]
Welcome to the Chart Chooser

Use the filters to find the right chart type for your needs. Then download as Excel or PowerPoint templates and insert your data.

- Comparison
- Distribution
- Composition
- Trend
- Relationship
- Table

2 charts selected

www.chartchooser.com
The Power of Images

Watershed Management Goals

“75% reduction in TSS”
The Power of Images

And humor...
A Tier 1 Community

- Stoneflies
- Dragonflies, Damselflies
- Beetles
- Midges
- Mayflies
- Caddisflies

1 inch
A Tier 5-6 Community

- Scuds
- Snails
- Leeches
- Caddisflies
- Beetles
- Craneflies
- Midges
Data Summary

Flow and E. coli: 1993 and 1994

- Flow (cfs)
- E. coli

Graph showing flow in cubic feet per second and E. coli concentration over 1993 and 1994.
Summary

• Data should tell a story
• Tailor your presentation to your audience(s)
• Use multiple formats to help get your message to all types of learners
• Use images to help explain complex information
• See usawaterquality.org/volunteers and http://www.usawaterquality.org/NewEngland/Focus_Areas/volunteer/default.html