

# Informing the Design of Climate Applications and Websites through User Research and Usability Studies

---

**Dave Michelson**  
Software Designer  
UNC Asheville's NEMAC  
dmichels@unca.edu



An aerial photograph of a large river system, likely the Tennessee River, showing a complex network of channels and tributaries. The water is dark blue, and the surrounding land is a mix of green and brown, indicating a mix of forest and agricultural or developed areas. The image is used as a background for the text.

We have **conducted over 250** usability studies and user interviews.

# What is usability?

- Someone acts out a scenario with your tool or site
- They narrate what they are doing aloud
- **You** watch, listen, and **DO NOT HELP!**
- Take notes and record the session

Follow up with open-ended questions



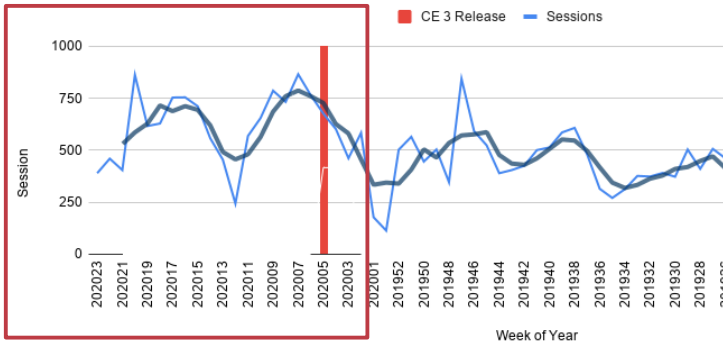
# What are User Interviews?

Series of **open-ended** questions designed to uncover:

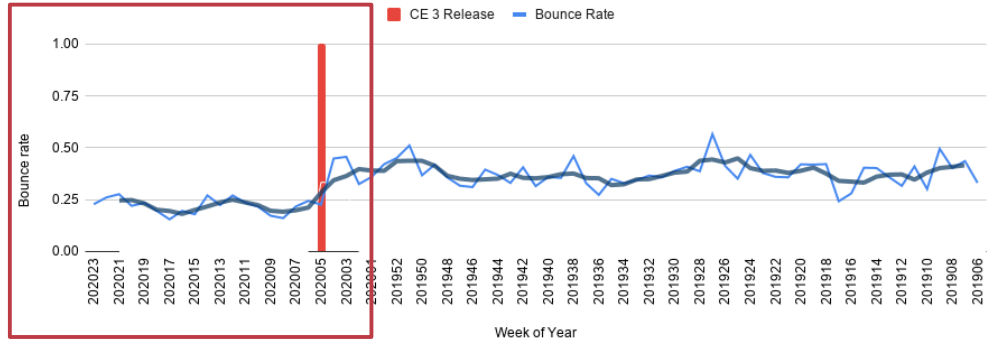
- Behaviors
- Needs & goals
- Problems

# Impacts

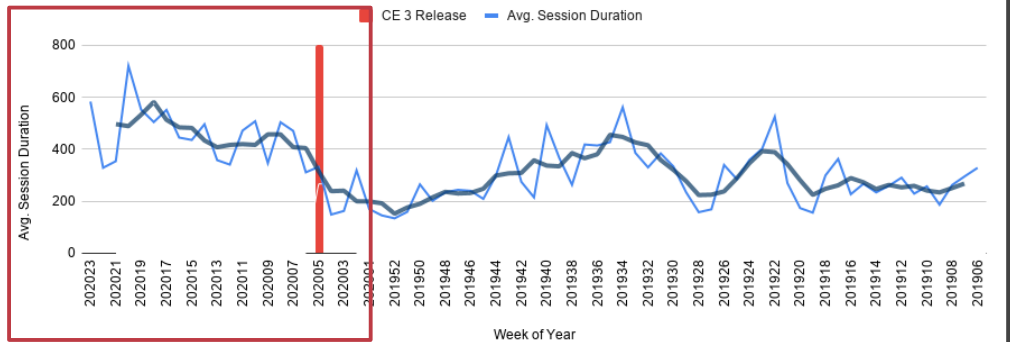
### Session vs. Week of Year



### Bounce rate



### Avg. Session Duration vs. Week of Year



# Biggest myth

I am sorry to inform you there is **no user**  
named **the general public**





People **scan websites** (tools) to  
determine **if it will help them**



# They are “scanning” for specific

- maps,
- charts,
- topics,
- text, etc.





The background of the slide is a dark, aerial-style map of a region with a complex network of waterways and landmasses. A faint grid of small squares is overlaid on the map, creating a textured, data-like appearance. The text is centered and rendered in a clean, white, sans-serif font.

# Visual Search & Gestalt Principles

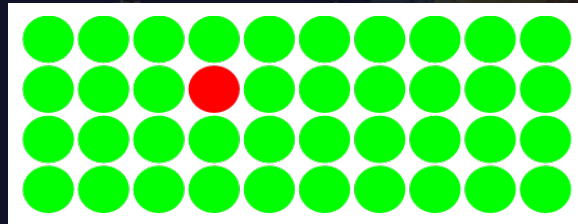
# Visual Search: The Basics

Target: the **red** circle

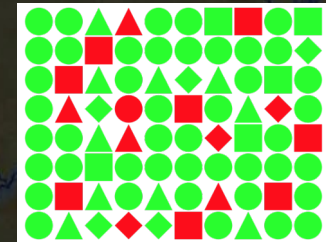
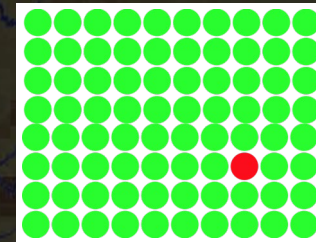
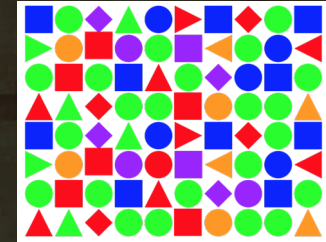
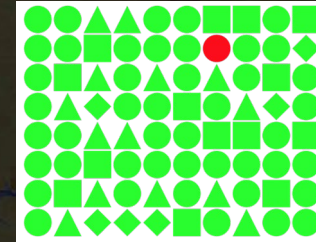
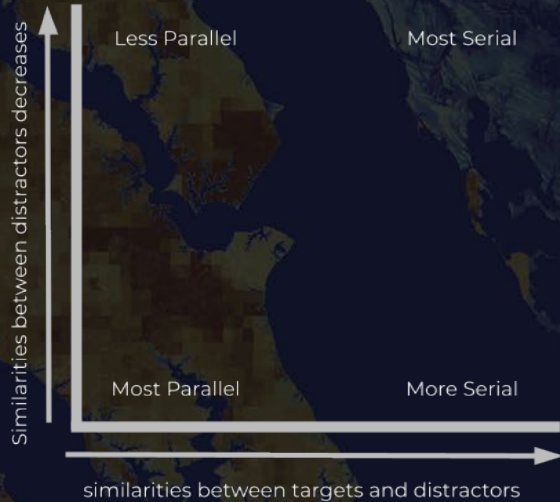
Distractors: the **green** circles

Reaction-time: time to find the **target**

Feature: color, orientation, shape, etc



# Visual Search: The Basics

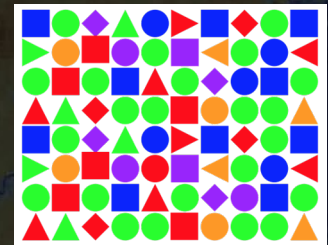
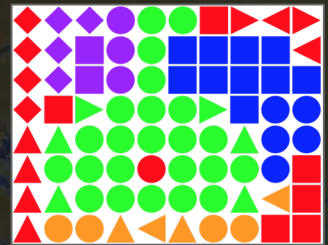






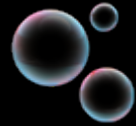
# Gestalt: The Basics

Psychological organization will always be as "good" as the prevailing conditions allow



# Gestalt: The Basics

Principle of proximity



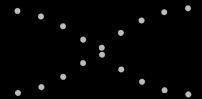
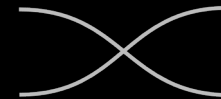
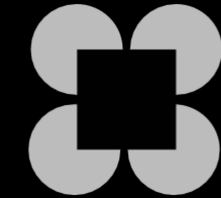
Principle of similarity



Principle of closure



Principle of good continuation



# Scanning patterns

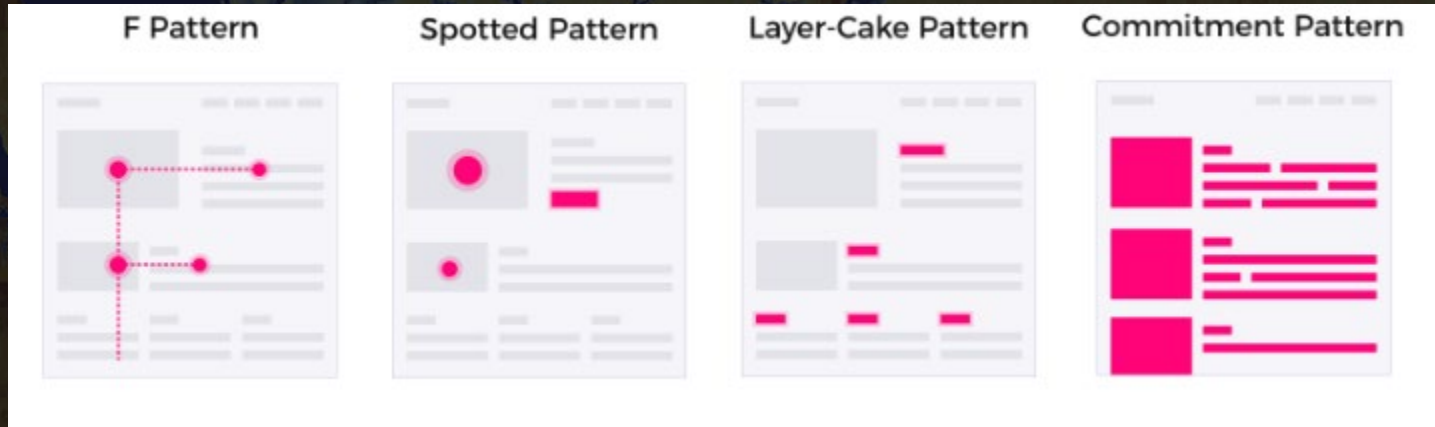


Image credit: <https://creativehandles.com/blog-posts/79/4-types-of-eye-tracking-patterns-how-people-don-t-read-on-web>  
Study credit: <https://www.nngroup.com/articles/text-scanning-patterns-eyetracking/>

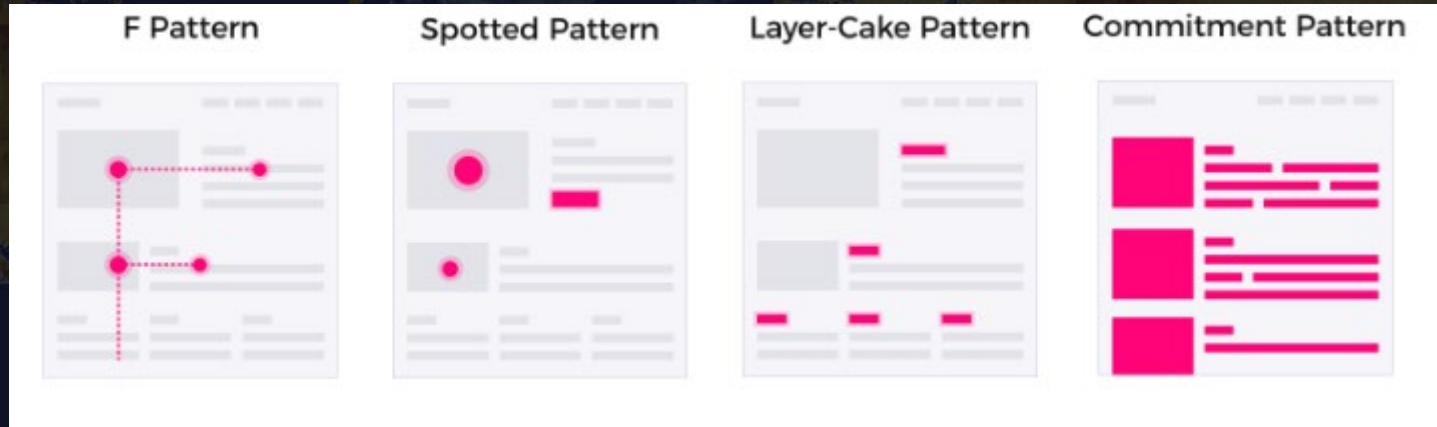




# What have we learned?

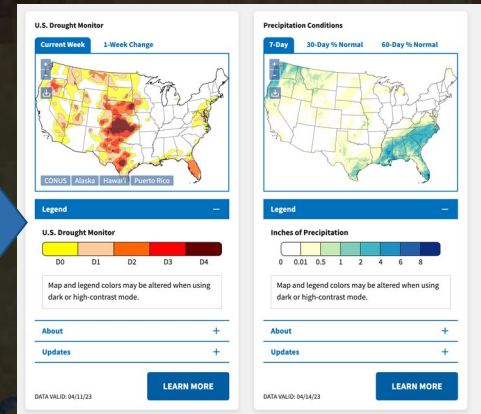
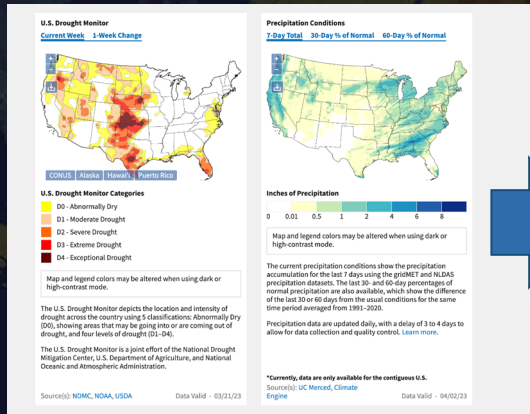
# What gets in the way of scanning

- Too much text/items (maps, charts, etc)
- Jargon (acronyms are jargon)



# Goal: Make everything scannable!

- Details in accordions or on separate pages
- Use UI cards

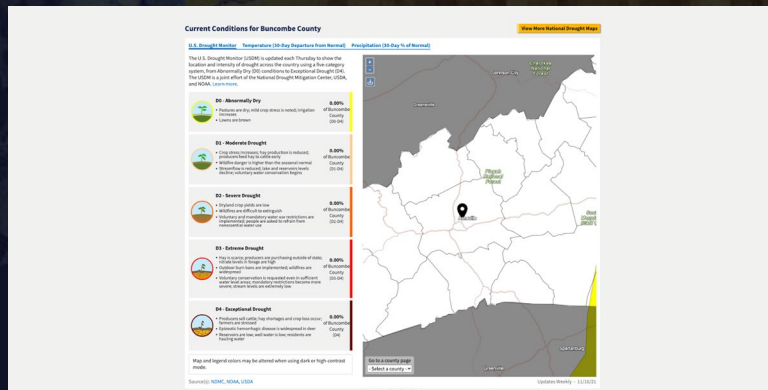
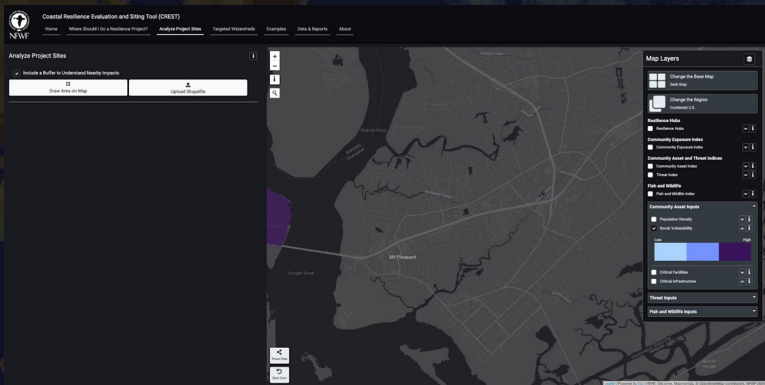






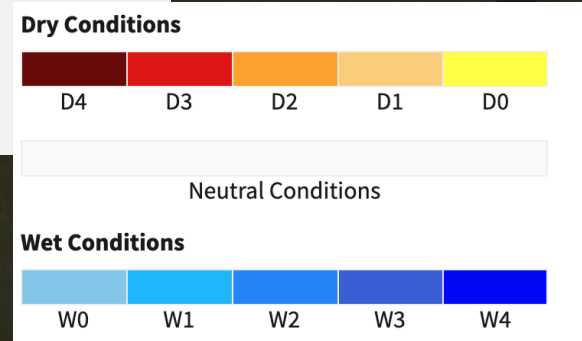
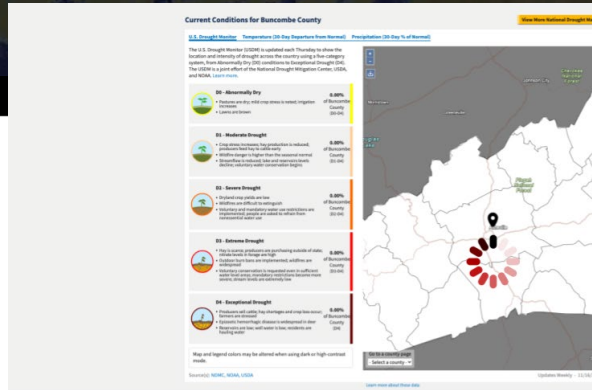
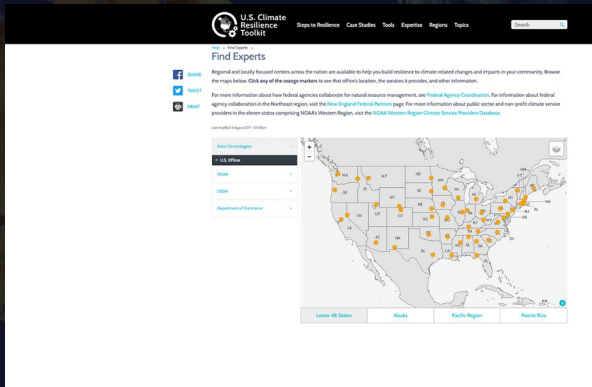
# Maps: Empty State

Even the *periphery of the map* will cause issues



Read more: <https://medium.com/nemac-blog/your-empty-maps-are-confusing-people-b957ed5dd3b5>

# Empty state with maps Fixes



Read more: <https://medium.com/nemac-blog/your-empty-maps-are-confusing-people-b957ed5dd3b5>



# Maps: Basemaps

Start with a *single color* base map!



### U.S. Drought Monitor

Current Week 1-Week Change

CONUS Alaska Hawaii Puerto Rico

**Legend**

U.S. Drought Monitor

D0 D1 D2 D3 D4

Map and legend colors may be altered when using dark or high-contrast mode.

About +

Updates +

DATA VALID: 04/25/23 [LEARN MORE](#)

### Precipitation Conditions

7-Day 30-Day % Normal 60-Day % Normal

**Legend**

Inches of Precipitation

0 0.01 0.5 1 2 4 6 8

Map and legend colors may be altered when using dark or high-contrast mode.

About +

Updates +

DATA VALID: 04/30/23 [LEARN MORE](#)

### Temperature Conditions

7-Day Avg 7-Day Anomaly 30-Day Anomaly

**Legend**

Maximum Temperature (°F)

60 70 80 90 100

Map and legend colors may be altered when using dark or high-contrast mode.

About +

Updates +

DATA VALID: 04/30/23 [LEARN MORE](#)

### Multi-Indicator Drought Index (MIDI) EXPERIMENTAL

Short-Term Long-Term

**Legend**

Dry Conditions

D4 D3 D2 D1 D0

Wet Conditions

W0 W1 W2 W3 W4

Map and legend colors may be altered when using dark or high-contrast mode.

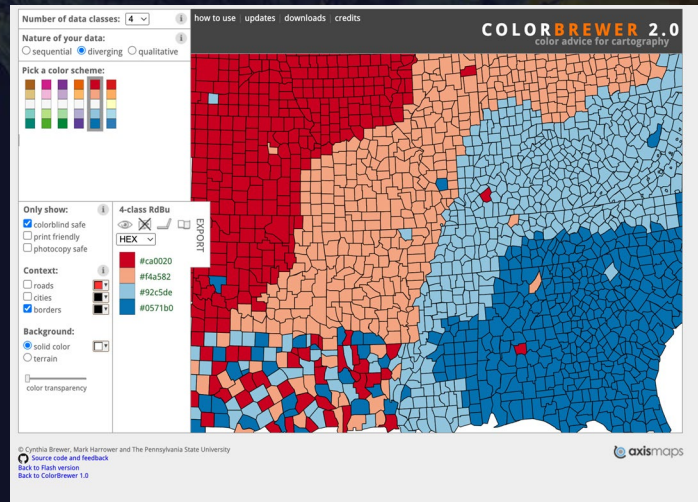
About +

Updates +

DATA VALID: 04/25/23 [LEARN MORE](#)

# Maps: Accessibility

- 8-10% of people are color-blind
- ~20-30% have impaired vision



Example: <https://colorbrewer2.org/#type=diverging&scheme=RdBu&n=4>

**Maps: Accessibility**



**User Bigger fonts**





# #1 Behavior:

**Copying and pasting** into presentations, reports, proposals, newsletters, blogs, and etc.

**Design for it!**



# #1 Need and Goal:

People are trying to **tell a story or narrative** and are looking for anything that might support it.

**Design for it!**

# #1 Issue or Problem:

If they **question their ability to explain**  
any part of your data or information  
they **will NOT use it**

**Design for it!**



**Other behaviors:**

Looking for **contact information** to get  
**more details**

**Design for it!**



An aerial photograph of a river network, likely a reservoir or a large river system, with a complex, branching pattern. The water is dark blue, and the surrounding land is a mix of brown and green, indicating a mix of forest and open land. The text is overlaid on the left side of the image.

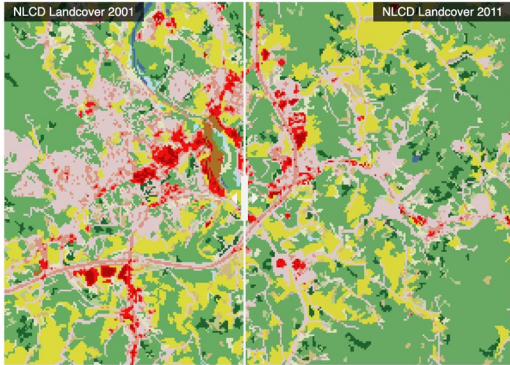
**Other behaviors:**

**Compare two or more places**

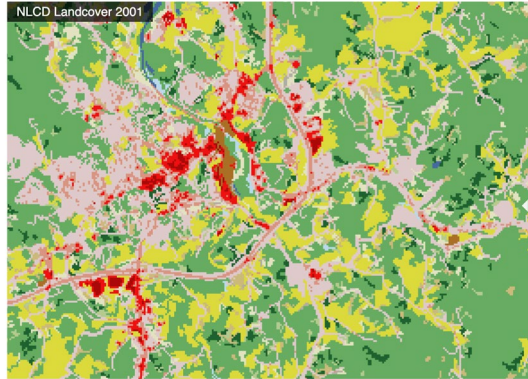
**Design for it!**

# Sliders vs. Side-by-Side Maps

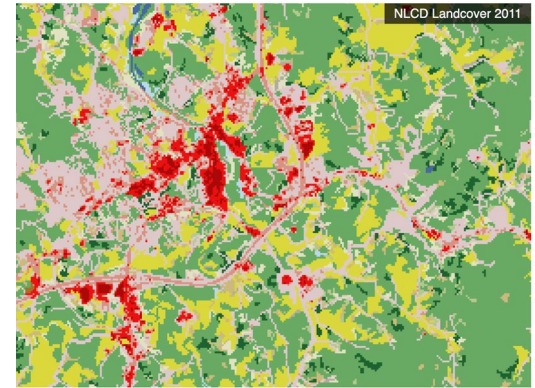
Parallel (side-by-side) maps are better if comparing two things



Example of a slider in action to explore the difference between 2001 and 2011 NLCD landcover.



Example of a slider in action to explore the difference between 2001 and 2011 NLCD landcover.



Example of a slider in action to explore the difference between 2001 and 2011 NLCD landcover.





## Tips:

Search by location - people will always check their home first.

When things **don't match what they think they know**, there will be trust issues





**Tips:**

Enable people **to tell their story.**

Don't take this literally and build them a story map.



**Tips:**  
Use more white space; less is more



**Tips:**

Design needs to be informed **by users,**  
**not stakeholders**





**Tips:**  
Learn what stories your users are  
trying to tell and **help them do it.**

# Ultimate Tip:

Please, please **don't ask people what they want.** Instead **ask what they do.** Then, do a usability study to find out if your site/tool helps them do it.

# Thanks!

# Questions?

**Dave Michelson**  
Software Designer  
UNC Asheville's NEMAC  
[dmichels@unca.edu](mailto:dmichels@unca.edu)

