Exploring a long-term fish dataset with ArcGIS animation tools

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Overview

• Suisun Marsh Study
• Example animations
• How-to
Fishes of Suisun Marsh

• Diverse
• Numerous
• An estuarine habitat important for inland and marine fisheries
staghorn sculpin
Sacramento suckers
white catfish
striped bass
sturgeon

Black crappie

carp

Starry flounder

Yellowfin goby
Suisun Marsh Fish and Invertebrate Study

- Founded by Peter Moyle in 1979
- Where are fish, and why?
- Monthly trawls, seines, and water quality
- Among best long-term records for fishes
35 years of monthly data is awesome! . . . and difficult . . .

- 21 sites x 12 months x 35 years = > 8,000 sample events
- 30 common fishes; WQ; invertebrates
- Relational database
Data storage schema

...like a net full of catfish!
You could try and get a feel for the data with charts...

Water temp at 21 sites over 6 years
Maps are more intuitive:
Water temp at 21 sites over 6 years
Water temp animation
Unforseen benefits

• Error checking – finding a few errors in a big dataset is difficult

• Animations make them very obvious
  – When temp is recorded as ⁰F instead of ⁰ C
Intuitiveness: Species distribution

- Biogeographic data: inherently spatiotemporal

- Animations are intuitive
  - Explore combinations
  - Generate new ideas
  - Communicate to non-specialists
Splittail distribution

Oct 1982

Catch fish/hr

- No sample
- Sample site

- 1
- 10
- 50
- 100
- 1,000

Temperature (Celsius)

- 0 - 3
- 4 - 6
- 7 - 9
- 10 - 12
- 13 - 15
- 16 - 18
- 19 - 21
- 22 - 24
- 25 - 27
- 28 - 30
- 31 - 33

Splittail

- YOY
- Age 1
- Age 2+
Splittail 2010 – 2013
animation
Animations aid data exploration

• Diversity
  – All young-of-the-year
  – Diversity indices

• Predator-prey spatial overlap

• Native and alien recruitment timing
  (Meng and Matern 2001)

• Trophic relay hypothesis (Kneib 1997)
Native vs. alien recruitment
Native vs. Alien YOY animation
Less fishy examples

- Terrestrial species range response to temp
- Individual animal movement
- Patterns in cultural / urban change
ESRI Animation tools – How to

1. Layer Properties > Time
ESRI Animation tools

1. Layer Properties > Time
2. Tools toolbar > Time Slider
Data formatting tips

• To achieve one record per frame; adding and averaging is done externally
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• Time increments < animation rate must match – e.g., for monthly animation, all days must be same day number
Data formatting tips

• To achieve one record per frame; adding and averaging is done externally

• Time increments < animation rate must match

• Including x, y streamlines import
Spatial Join

• Transfer stack of point values to stack of polygons
• One polygon overlapping each sample point
• A spatial join will transfer point data to poly
• Other join types don’t work
TOC set-up

- Complex symbology may require data proliferation

- I made a separate layer for each fish-year-class to support proportional symbols

- I don’t use tracks
Benefits of data animation

• Intuitive
• Flexible
• Generates new ideas
• Communicates to non-specialist audience
Go visit the Marsh!

Join the Moyle lab for monthly fish sampling

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Thank you!

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