Lion Mountain

Lecture 12: Introduction to Age Models

1. The importance of knowing time

2. Building an age model

- Markov chain Monte Carlo approaches
- constant sedimentation rates
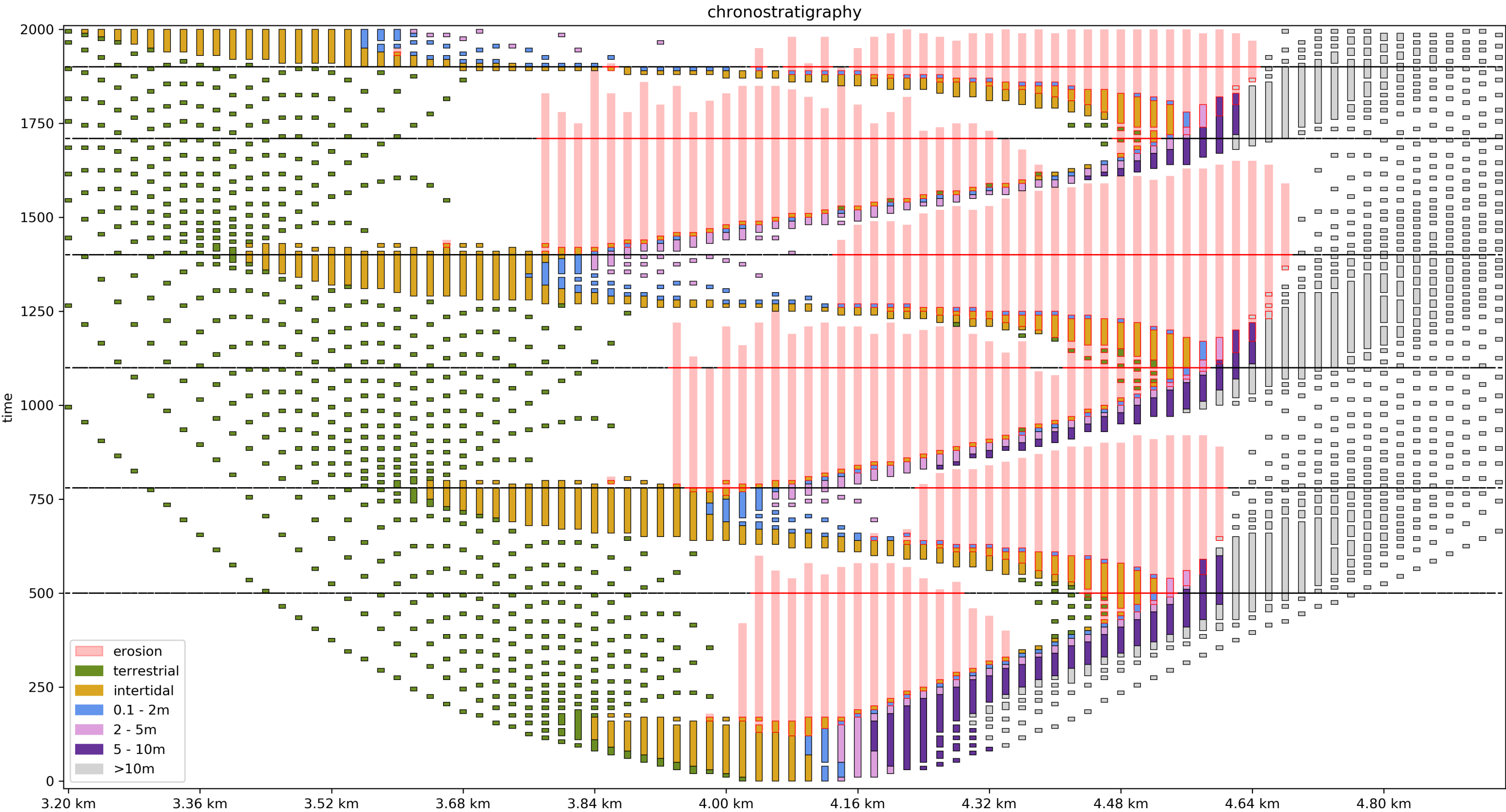- varying sedimentation rates

We acknowledge and respect the ləkʷəŋən peoples on whose traditional territory the university stands and the Songhees, Esquimalt and W̱SÁNEĆ peoples whose historical relationships with the land continue to this day.
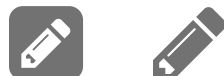
Importance of knowing time
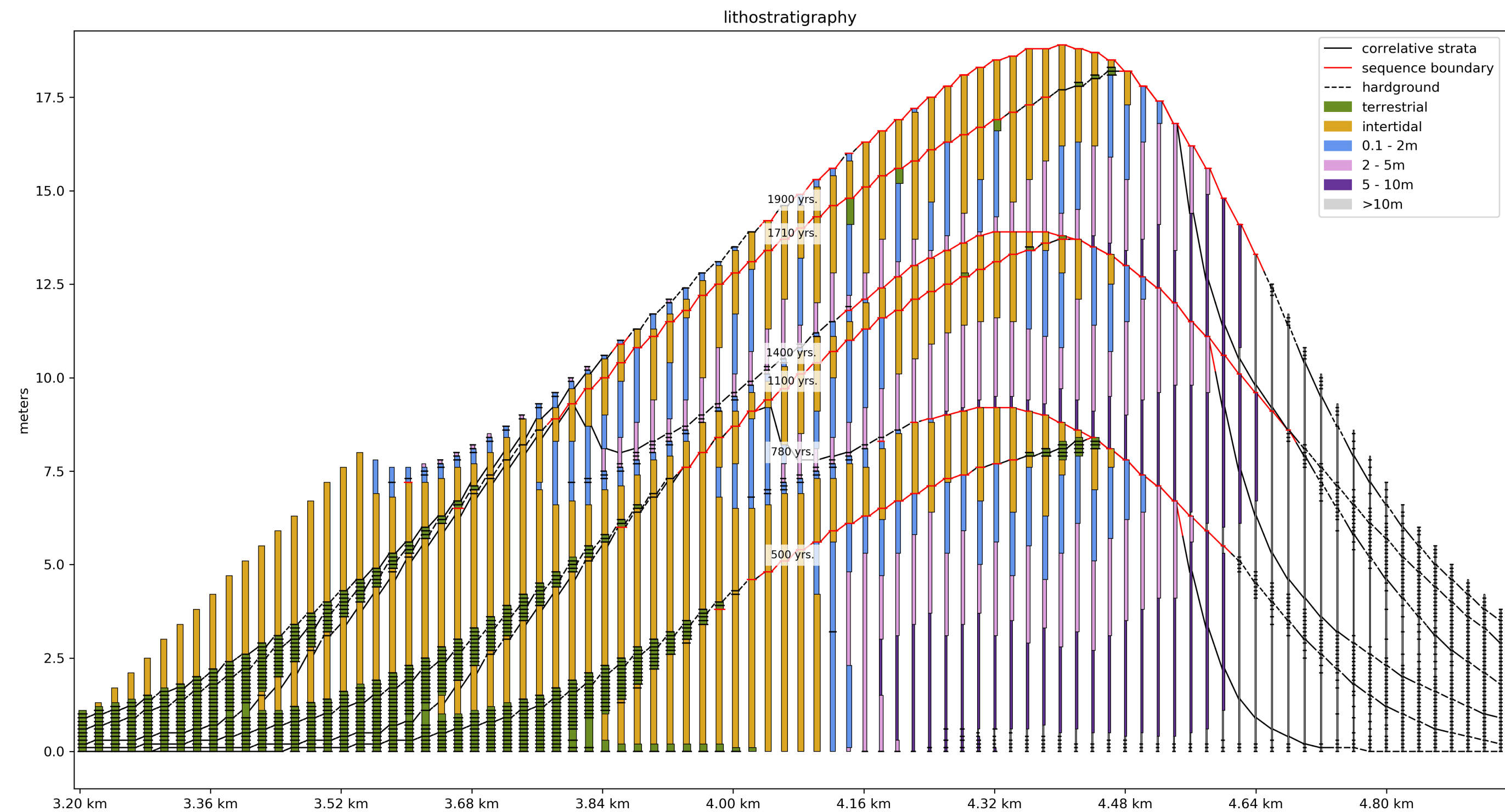
Importance of knowing time

Age models are important: how do we get them?

1. Cyclostratigraphy

2. Biostratigraphy

3. Absolute ages

   - U-Pb (volcanics), Ar-Ar (volcanics), Re-Os (sediments)

4. Signal matching

   - magnetostratigraphy
   - chemostratigraphy

5. Relative ages

   - Amino Acid Racemization

Biostratigraphy

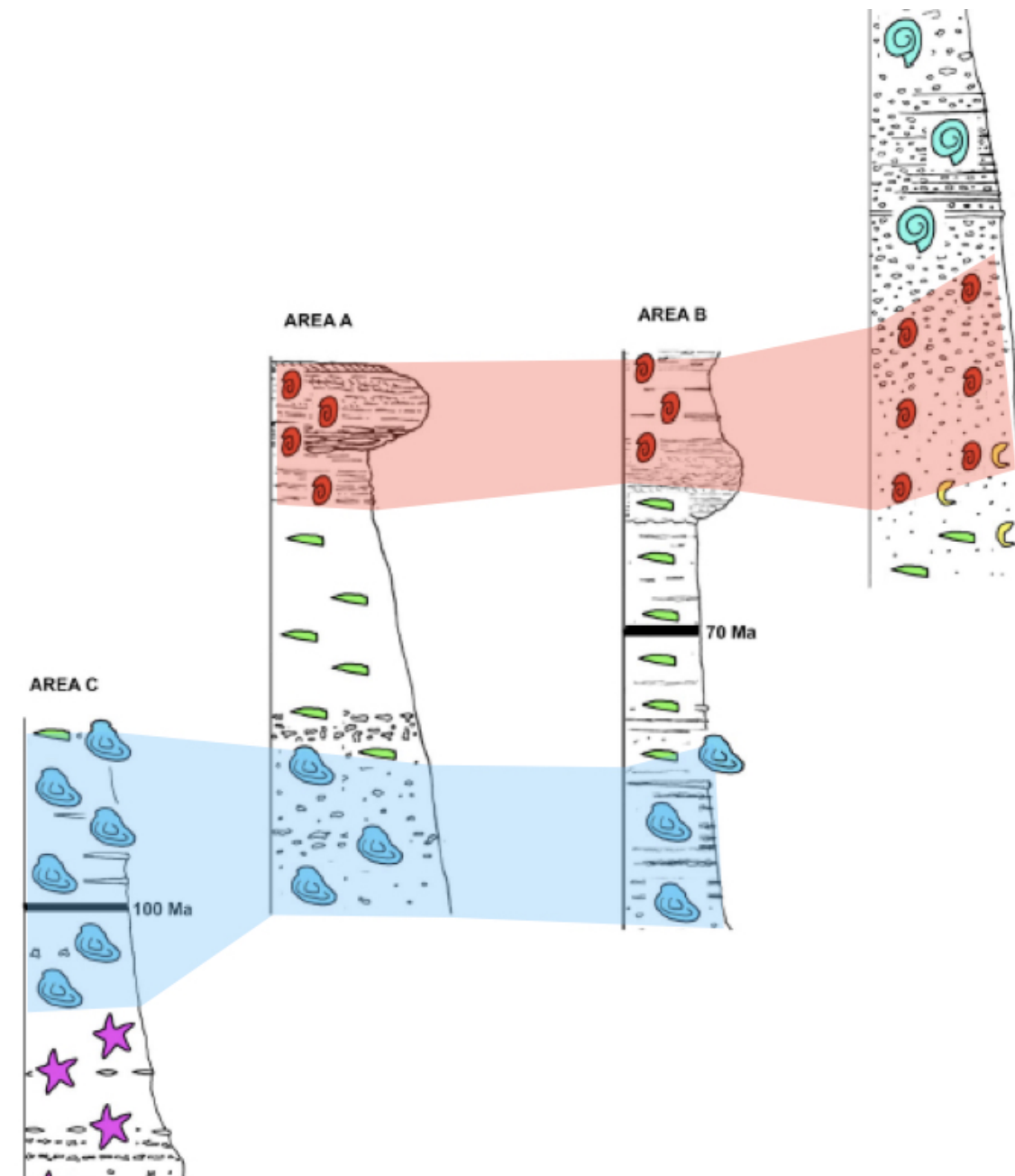- based on the unique, sequential, nonrepeating appearance of fossils through time
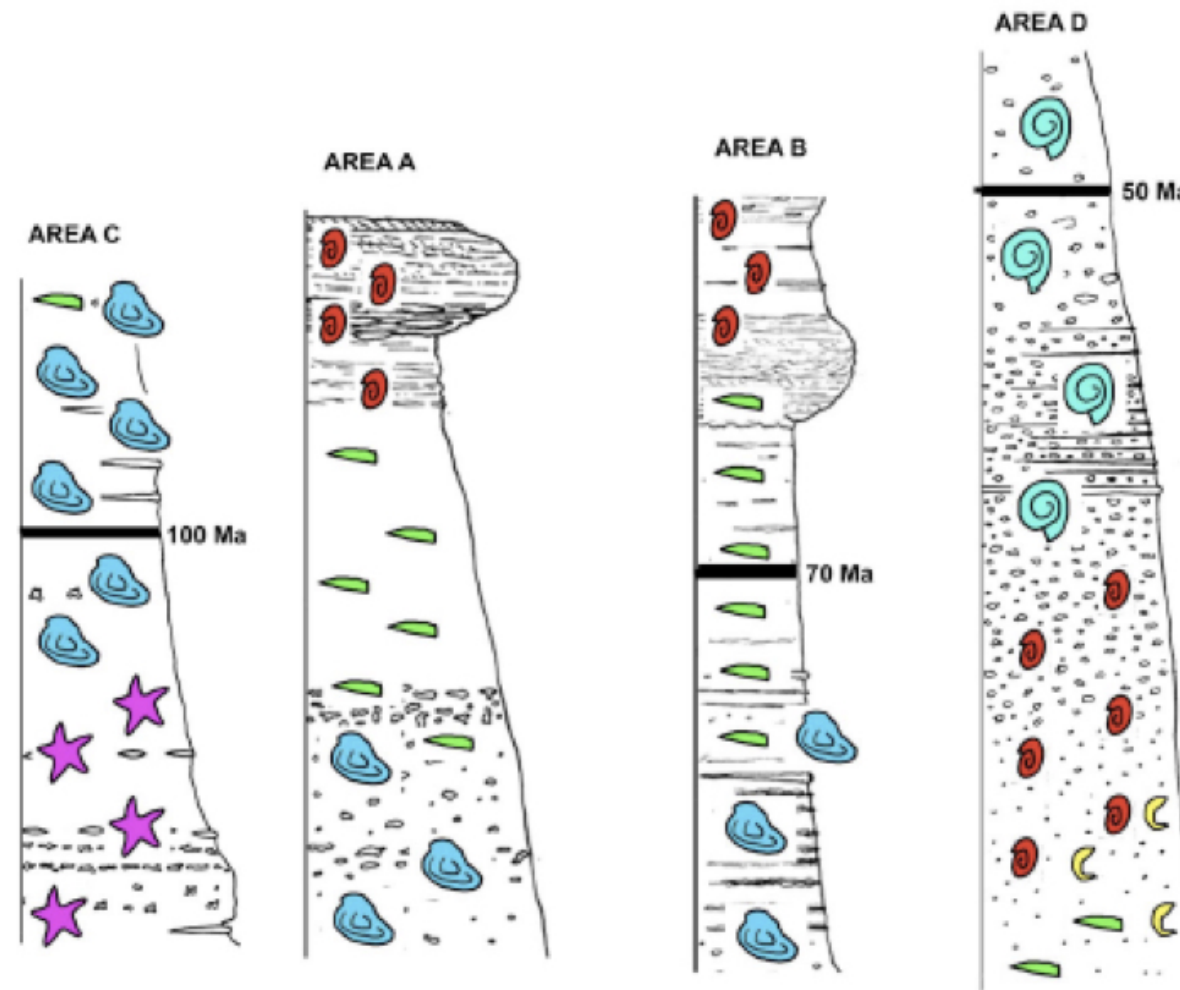
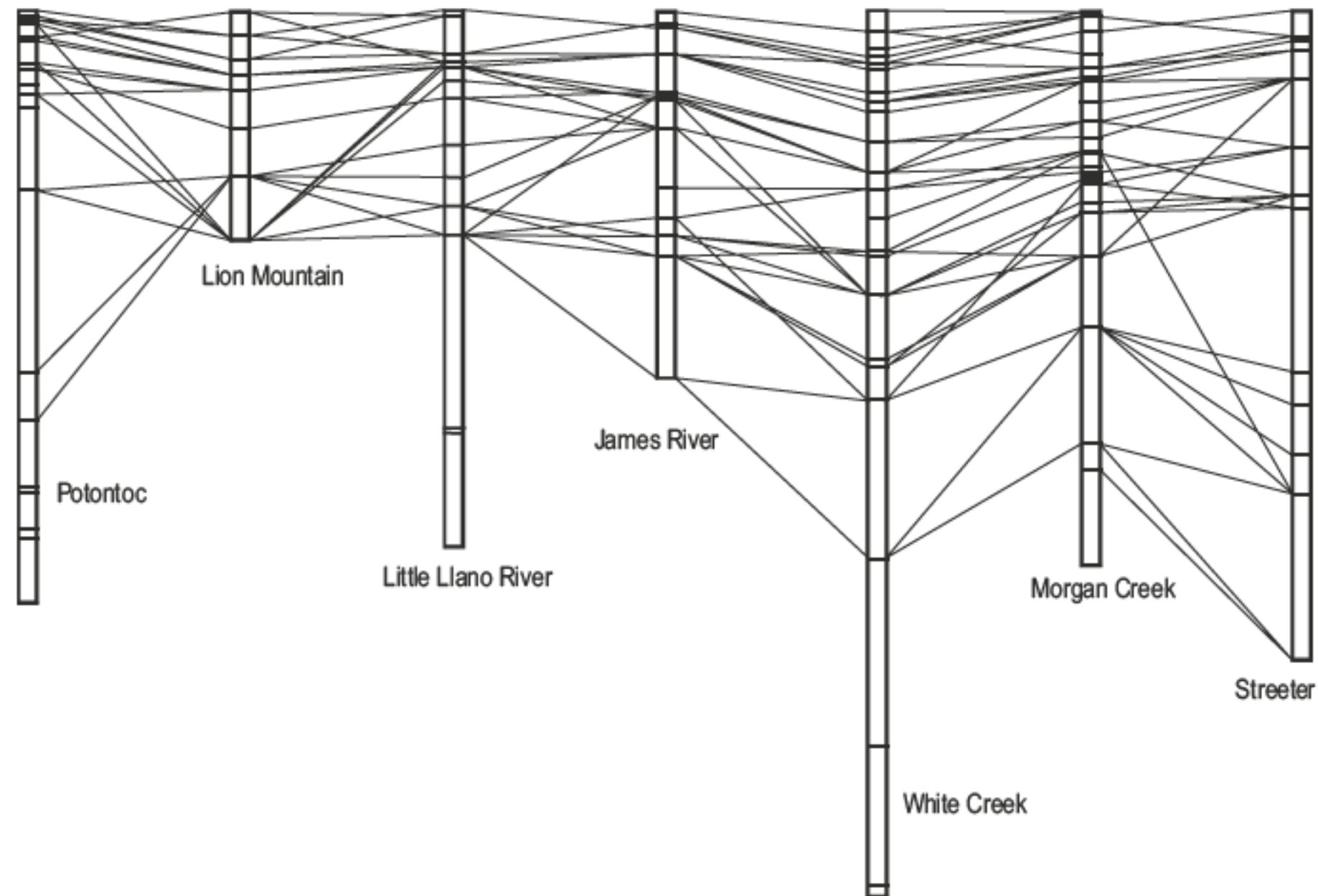http://www.labspaces.net/pictures/blog/4d497dd38d7031296661971_blog.jpg

Biostratigraphy

- based on the unique, sequential, nonrepeating appearance of fossils through time
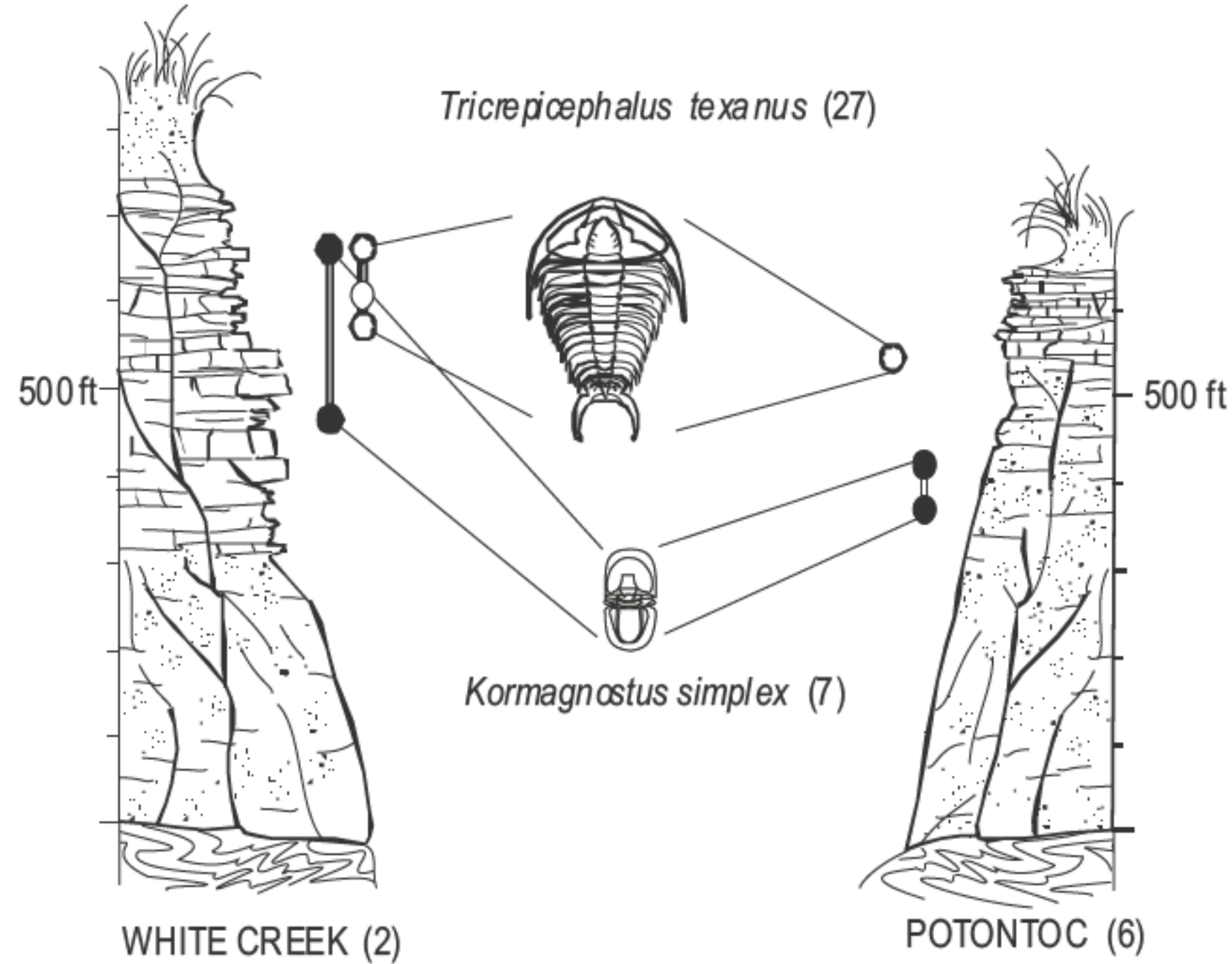- observations are: first appearance and last appearance per section

- what is wrong with this picture?
- fence diagram (correlation) of the observed FADs and LAD between 7 sections that preserve 62 taxa of the Cambrian Riley Formation of Texas (data from Palmer, 1954; Shaw, 1964).
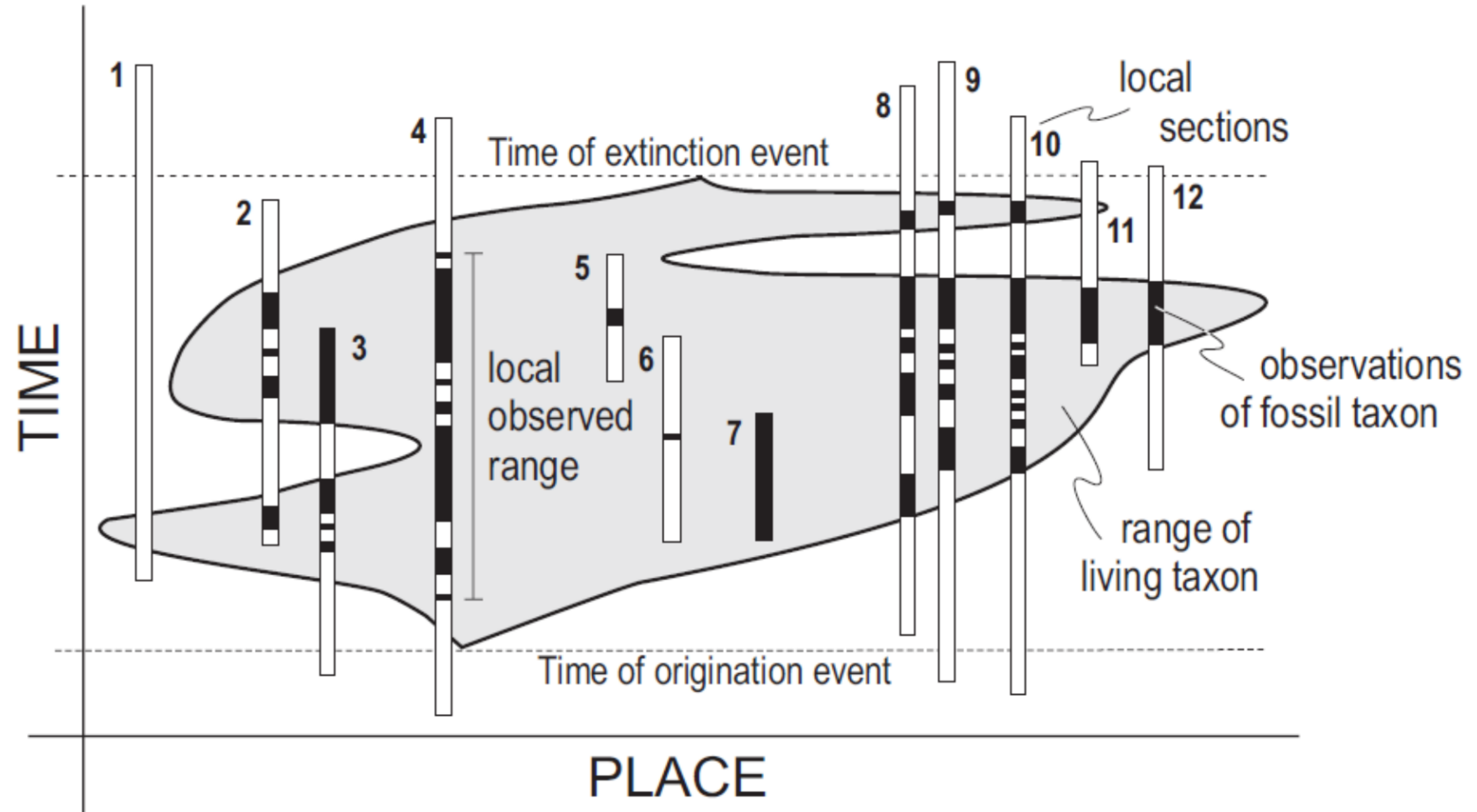- lines are meant to represent time lines, so equal time

Potontoc

Lion Mountain

Little Llano River

James River

White Creek

Morgan Creek

Streeter

Contradictory ranges
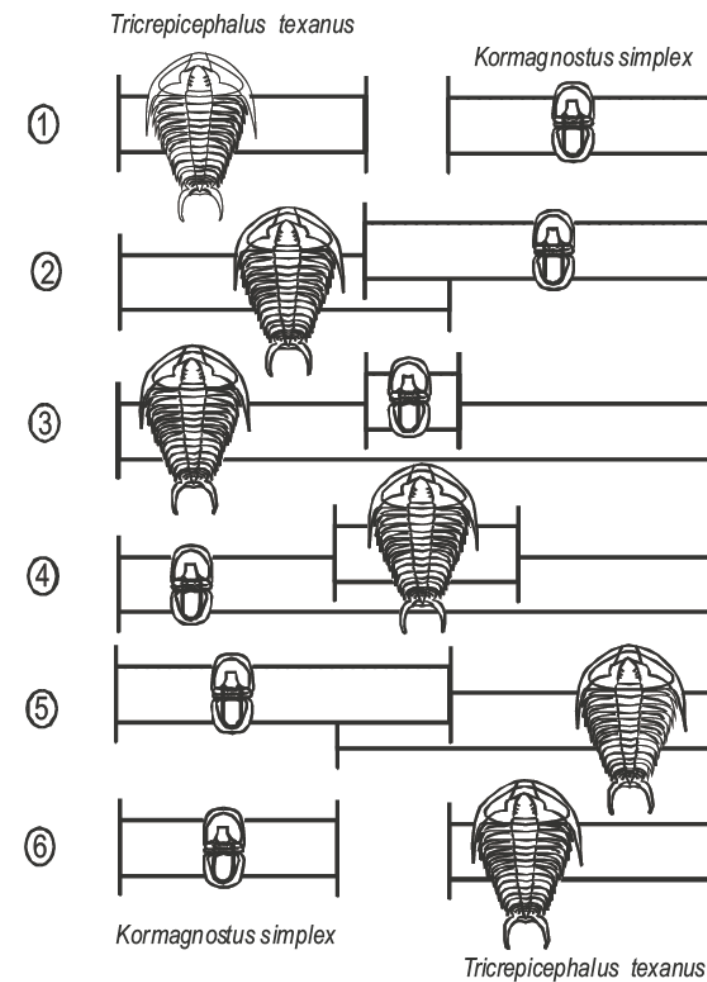
- what could be causing this?
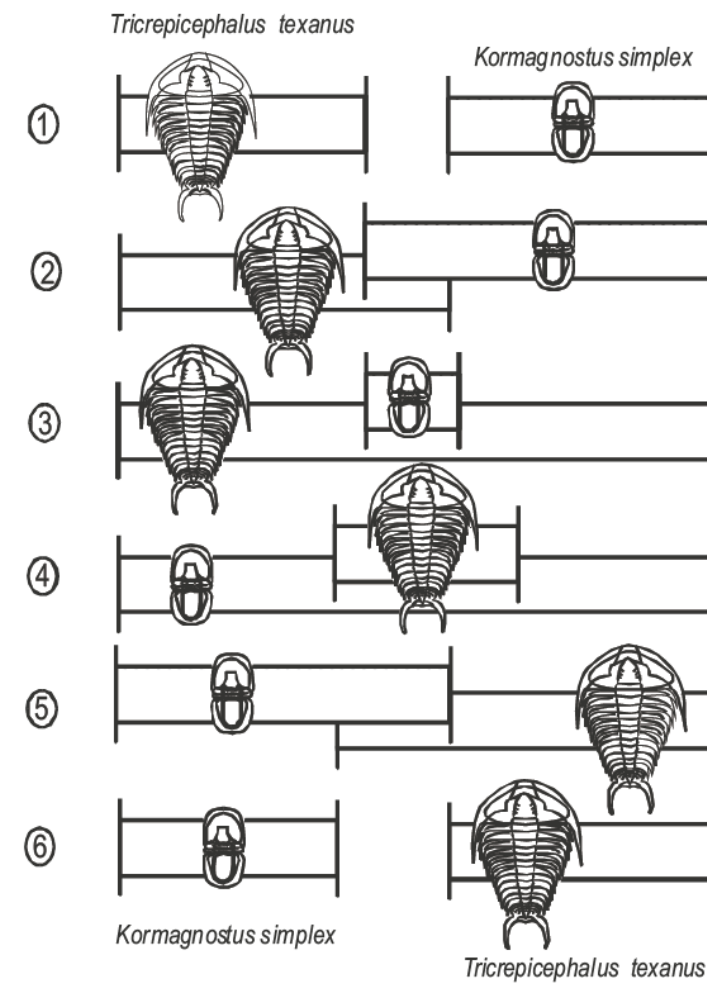
Contradictory ranges

Resolving contradictory ranges

- ranges of original data need modifcation to be consistent everywhere (time goes left to right)
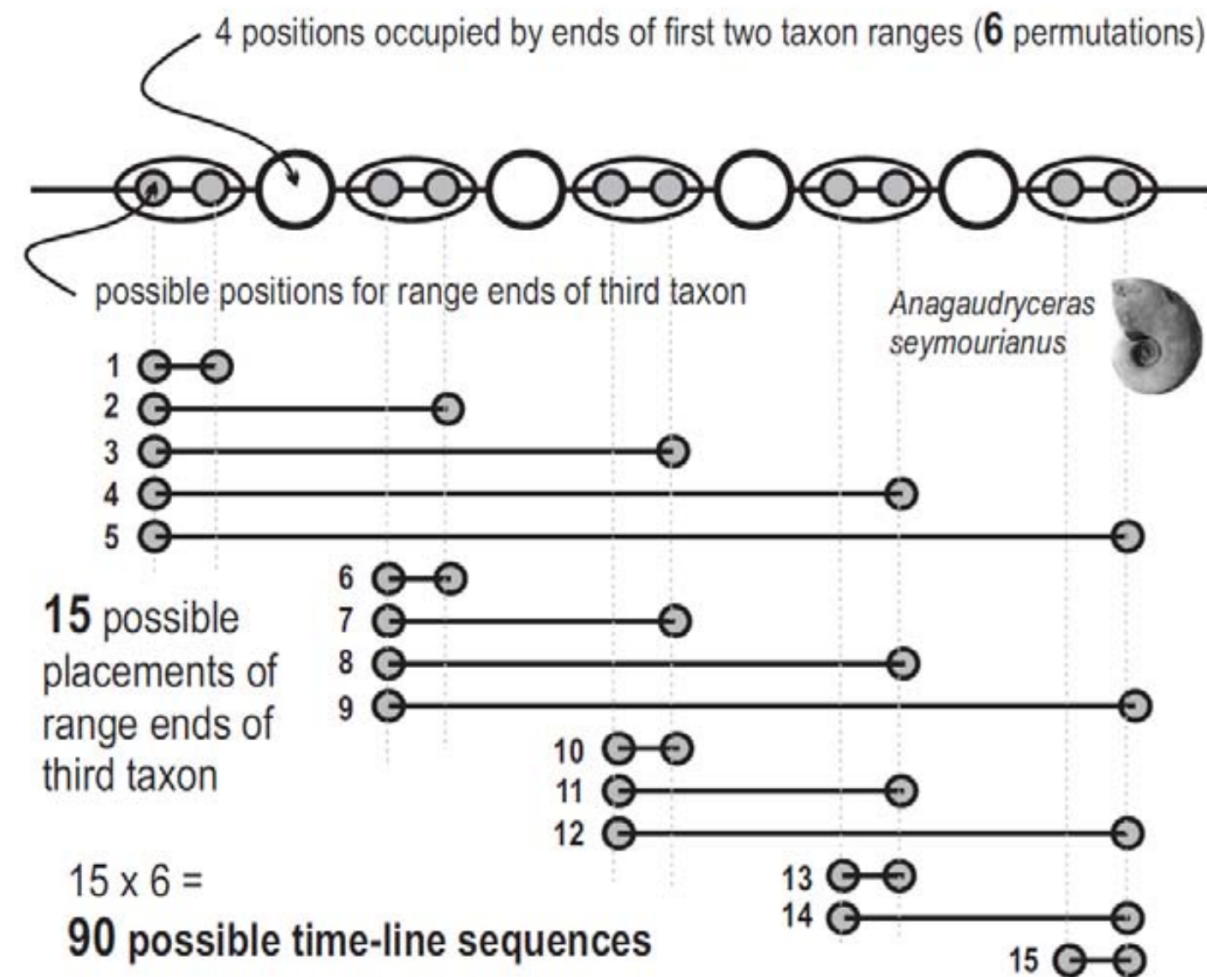
Resolving contradictory ranges

- can we rule any out? working out the possibilities not so hard with just two taxa..

Resolving contradictory ranges

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4 positions occupied by ends of first two taxon ranges (**6** permutations)

possible positions for range ends of third taxon

Anagaudryceras seymourianus

15 possible placements of range ends of third taxon
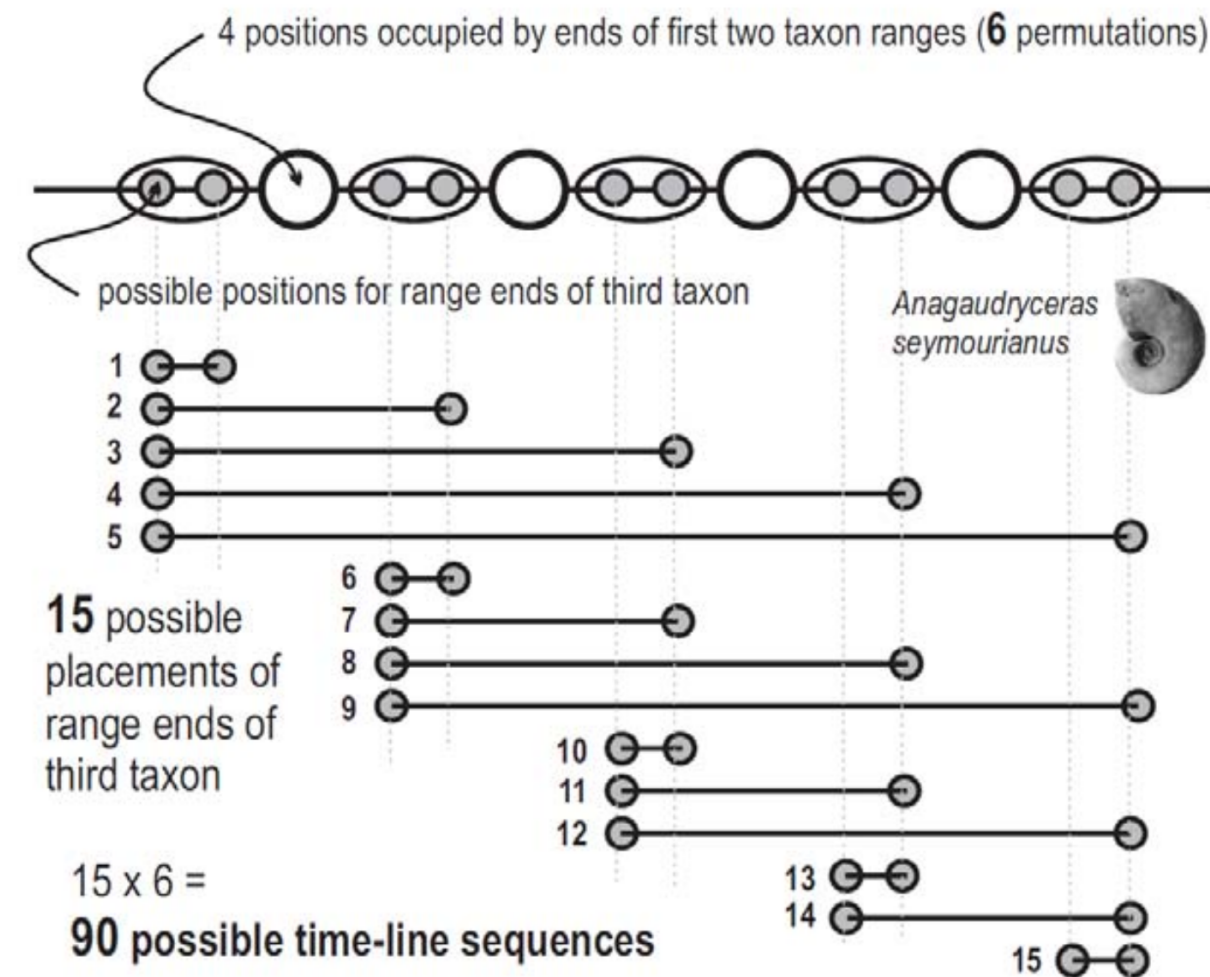
15 x 6 =
90 possible time-line sequences

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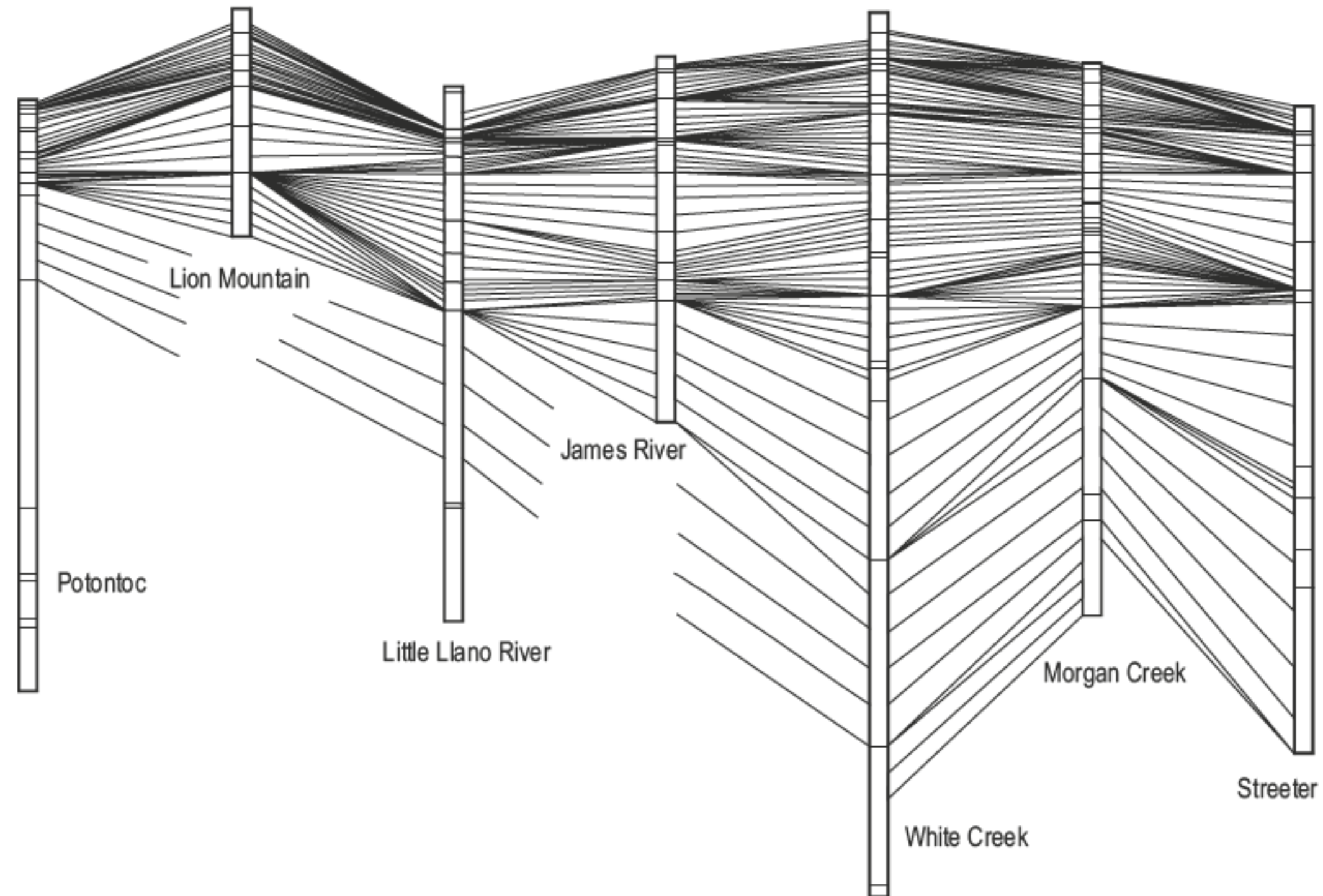**90 possible time-line sequences**

Number of possible sequences

- requires constrained optimization (CONOP9; Sadler and Cooper, 2008)
- number of atoms in universe = 10^{82}
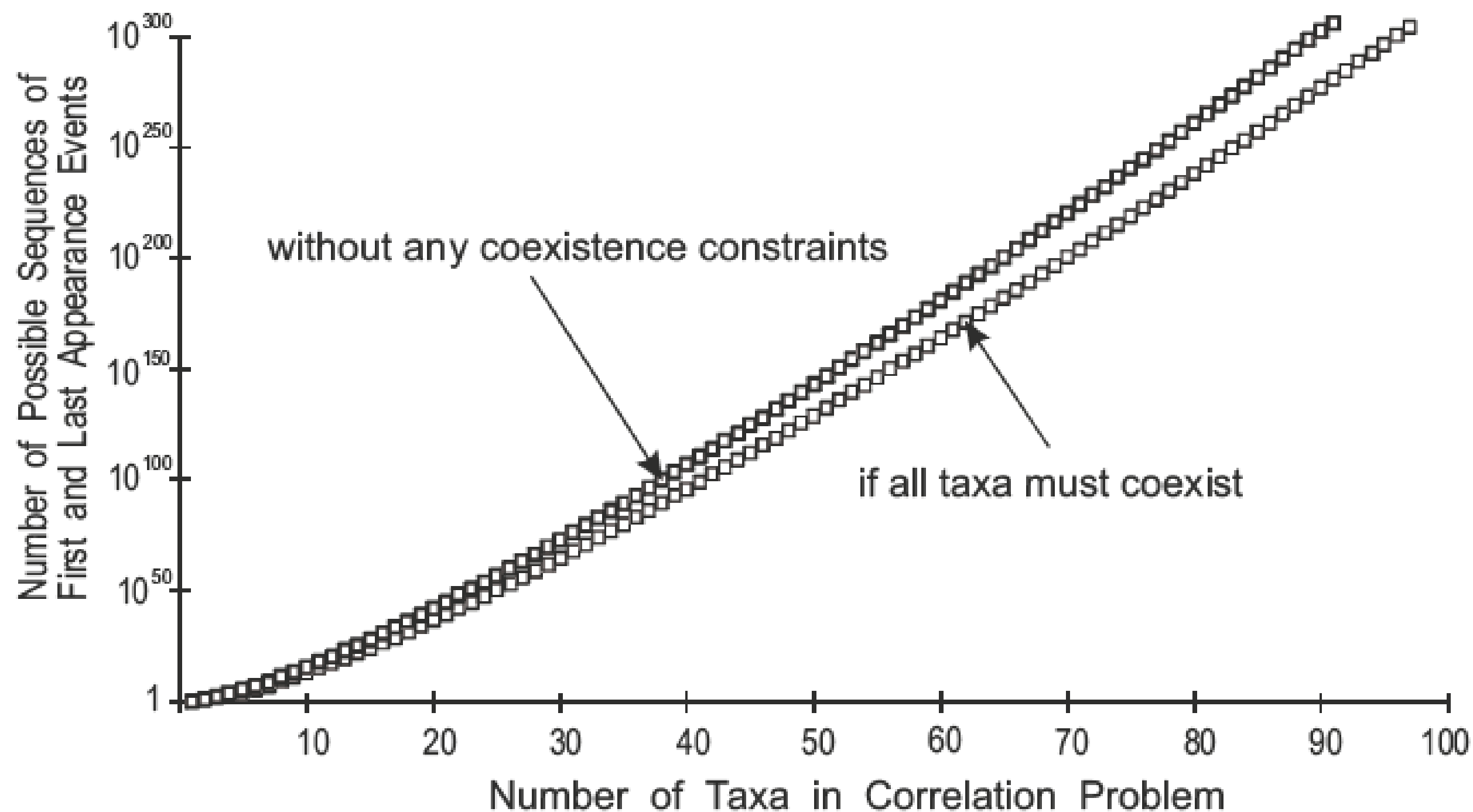
Best-fit solution

- what are some features of this that look familiar to our model outputs?

Building an age model

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