

# ArcGIS Tracking Analyst

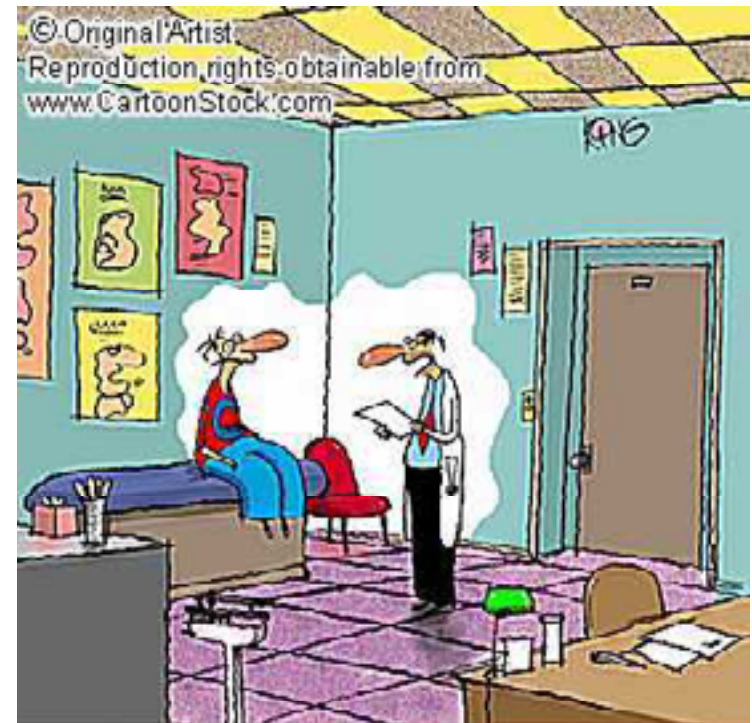
To Explore Locum Practice  
Location and Movement

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# Outline

- Introduction
- Time Geography
- Locum: Time/Space Activity
- GIS Methodology
- ArcGIS Tracking Analyst Results
- Limitations
- Importance
- Questions



*"Your doctor was given some great tickets to the football game, so I'll be standing in for him. Don't worry, I'm an actor who plays a doctor on TV."*

# Introduction

- In Alberta, Canada, increasing numbers of residency graduates engage in locum practice.
- The locum is an effective method to recruit physicians; yet, there is little literature available on the pattern of practice known as the “locum”.
- Locum tenens physicians (locums) have an important place in the work force, and current physician shortages make it even more critical to understand their role.
- High spatial and temporal variability are inherent to locum practice.

# Commonality?



# Answer

- Torsten Hägerstrand (father of time geography)
- DeLorean (time machine from 'Back to the Future' trilogy)
- Flux Capacitor (affects time/space continuum)

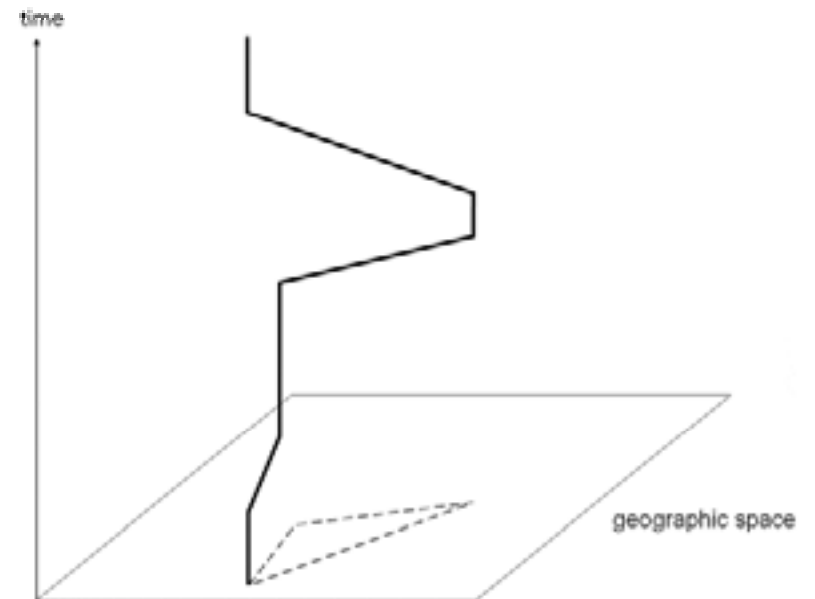
**Commonality = Time/Space Activity**

# Time Geography

- Time geography focuses on the interrelationships between activities in time and space.
- Swedish geographer Torsten Hägerstrand examined the spatial and temporal coordinates of human activity.
- Need to study the individual (not aggregate populations) in order to understand social and group practices.
- "Time has a critical importance when it comes to fitting people and things together for functioning in socio-economic systems"

# Time Geography

- Hägerstrand's basic idea was to create *space-time paths* in a 3D space.
- Horizontal axis represent geographic space.
- Vertical axis represents time.
- An example for a space-time path looks like this →
- Why is this important?



# Importance of Time Geography

- Time geography is a very powerful way to visualize people's movement in space.
- Understanding the spatio-temporal web of human interaction is crucial for designing efficient, livable and sustainable cities.
- Using a public health lens – time is a significant factor in:
  - location of healthcare facilities,
  - emergency response routes,
  - access to diverse health-related services,
  - provision of culturally competent care, etc.

# Time Geography for Locum Activity

- Locums are a time/space activity.
- High spatial and temporal variability are inherent to locum practice and this activity, therefore, must be described with both spatial and temporal data: Tracking Analyst!
- Hypothesis generation: what are the processes, interactions and limitations operating that influence locum activity in Alberta?
- This knowledge is important for healthcare delivery policy and practice, and may also contribute to health workforce theory and development.

# The Locum Study

- Examine the degree to which Alberta family medicine graduates do locums after completing residency training.
- Exploration of locum practice, movement and duration in both the rural and urban context.
- ArcGIS Tracking Analyst extension traces Alberta family medicine graduate movement through Alberta and other Canadian provinces over time (2001 – 2007).

# Survey

- 377 family medicine graduates from the University of Alberta and University of Calgary who had completed the residency program during the years 2001-2005 inclusive.
- 242 graduates responded to the survey, yielding a 64.0% response rate.
- 2001 respondents (n=37) who provided complete locum data were extracted from the master dataset for exploratory purposes.
- 2001 respondents: 5-6 years of movement.

# Methodology

## Fields generated:

- Activity (rural/urban locum)
- Town/city
- Duration (months)

This time- and date-specific information for geographic locations enables us to track previously documented observations (historical playback):  
Locum time/space paths from 2001-2007.

**Clinical Practice After Family Medicine Residency**

B10. On the following table, please indicate the type(s) of clinical activities you have engaged in since graduating from the Family Medicine Residency Program, where you did that activity and the duration of time you were engaged in that activity. **Please select from the following list:**

**Activity Code**

1. Locum\* (convened to community)
2. Locum\* (lived in community)
3. Solo Practice
4. Group Practice
5. Walk-in Clinic
6. Physician Extender
7. Hospitalist
8. Solely office-based family practice
9. Full-service family practice (includes hospital privileges, house calls, etc)
10. Focused family practice (e.g. psychotherapy, sports medicine, palliative care, etc)
11. Speciality practice (Royal College)
12. Emergency Medicine
13. Other (specify): \_\_\_\_\_

\* Note - excludes weekend locum

Activity Order	Activity Code	Town/City	Duration (months)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

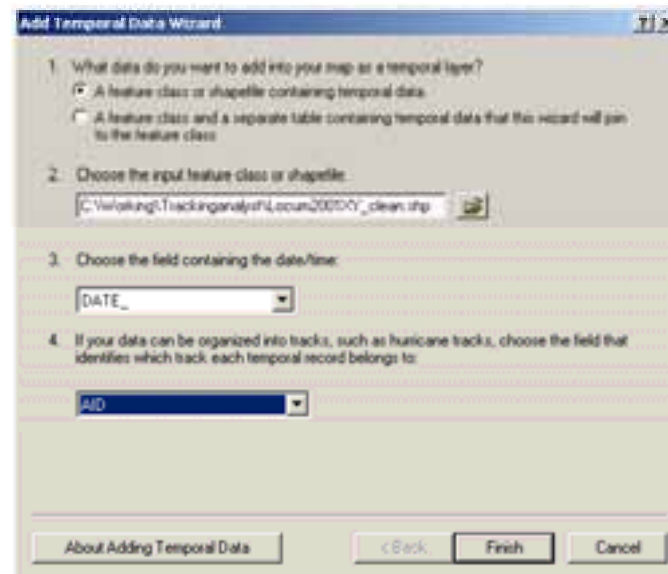
Month and year that you settled into a practice: \_\_\_ / \_\_\_ (mm / yyyy)  
OR  Have not yet settled into a practice

# Methodology

- Temporal Data Wizard

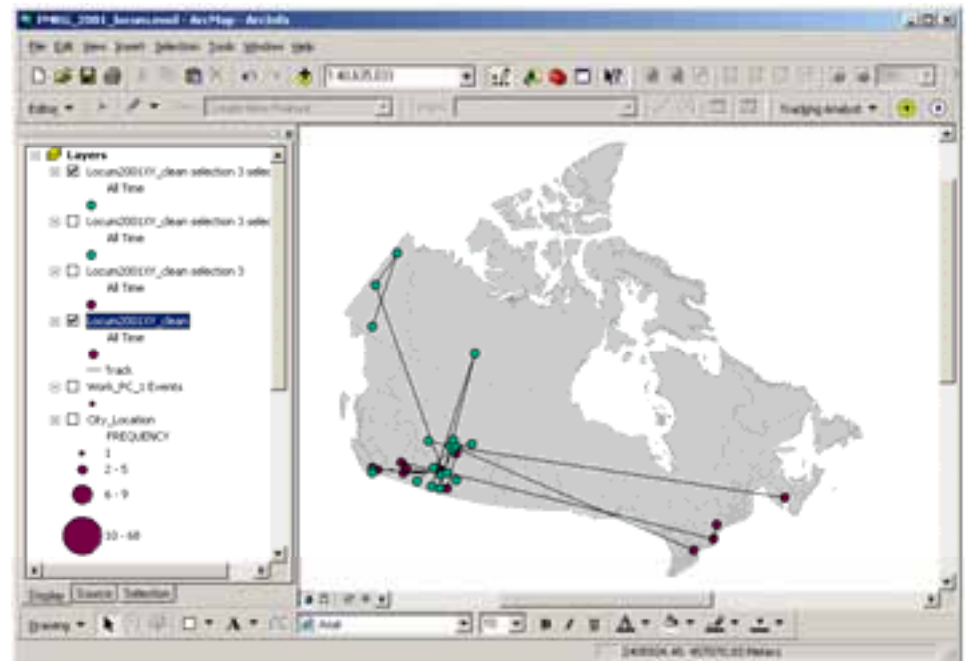
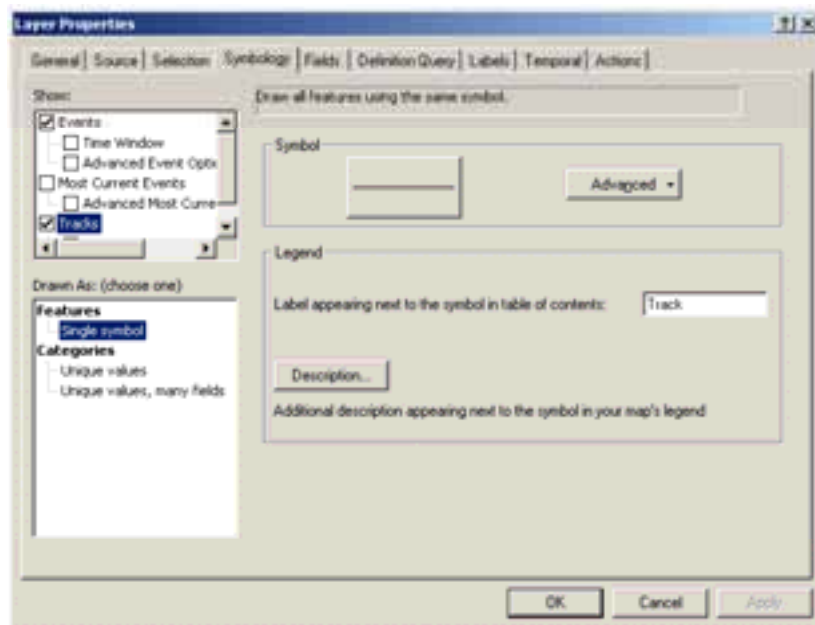


- Add shapefile (fields: Time 'DATE' [months doing locums], Event 'AID' [individual physicians])



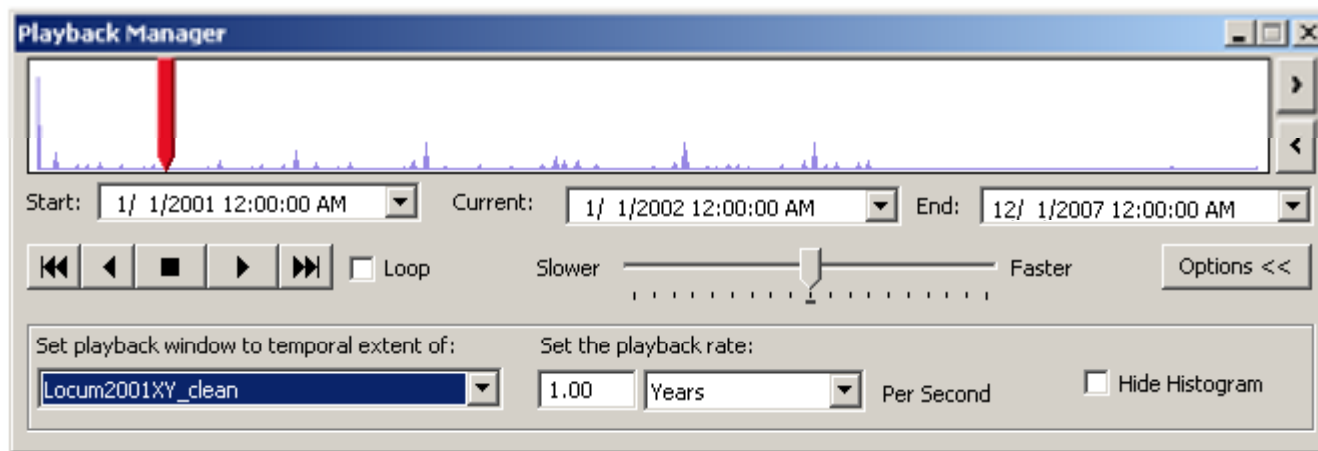
# Methodology

- Symbolize temporal data (extract rural/urban locums, assign colours, add tracks, show only current events, etc)

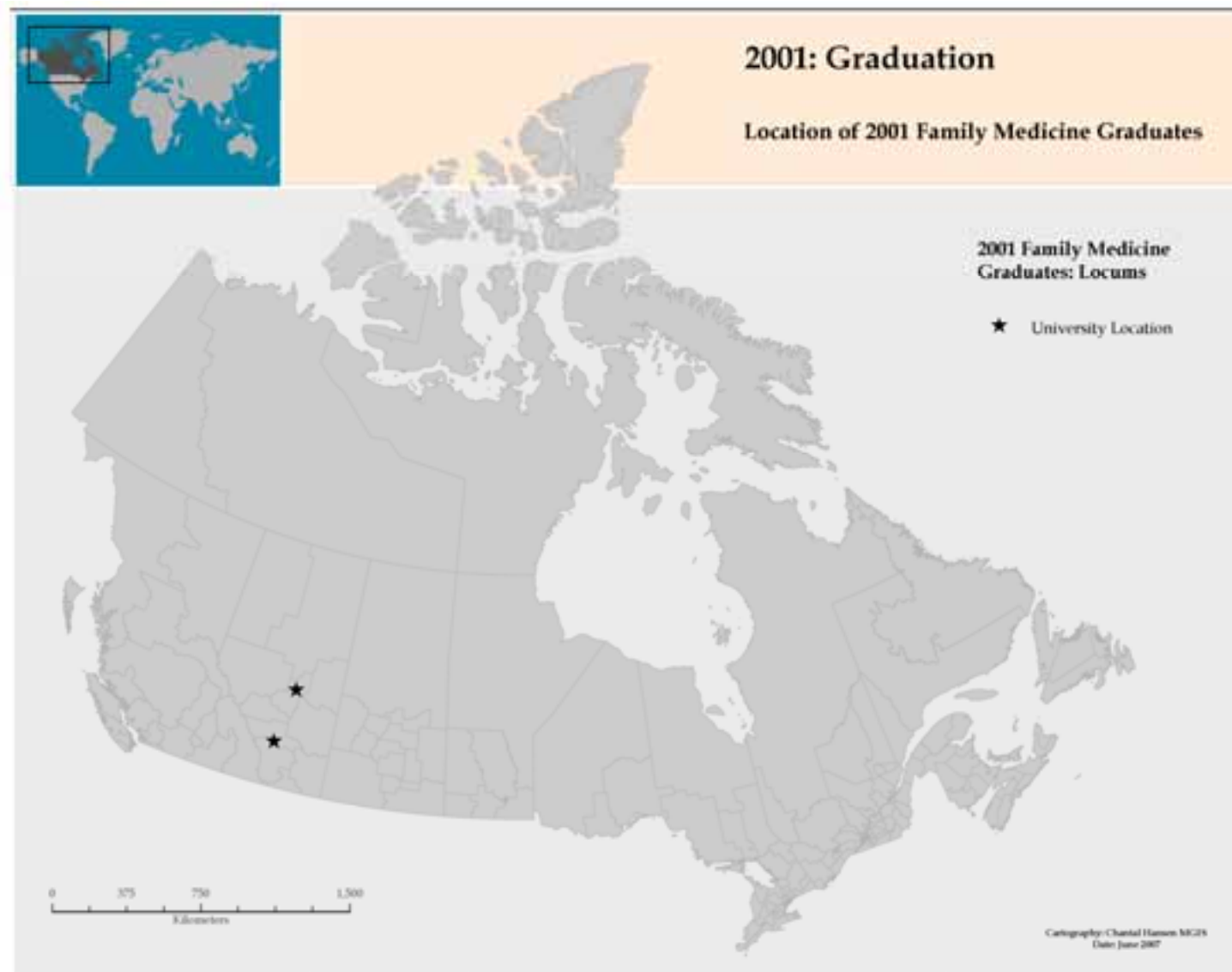


# Methodology

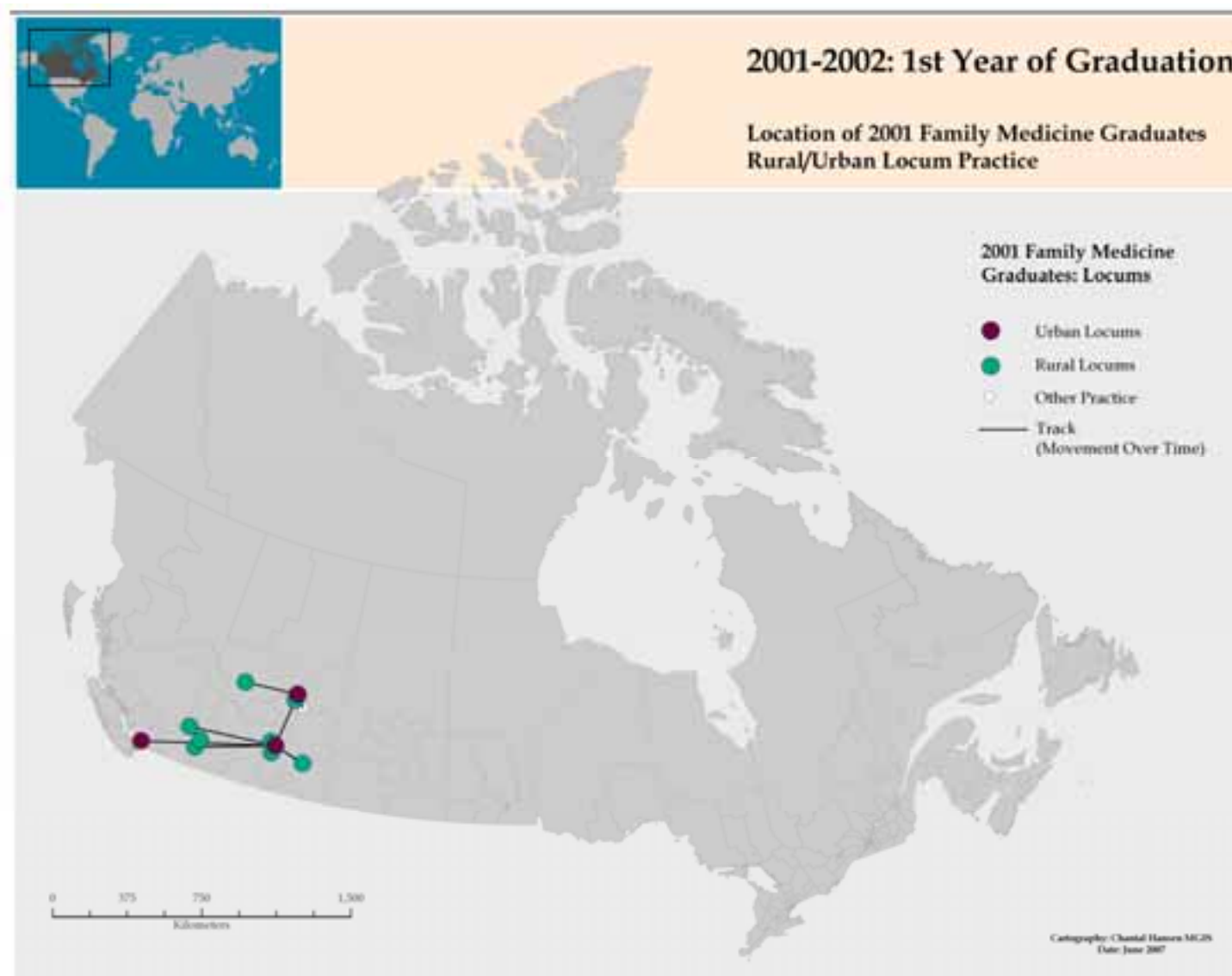
- Playback Manager replays the data as it occurred.
- In the Playback Manager, you can set start and end times, the playback window of data to replay, the speed of the playback, and whether you want the data to replay in a continuous loop.



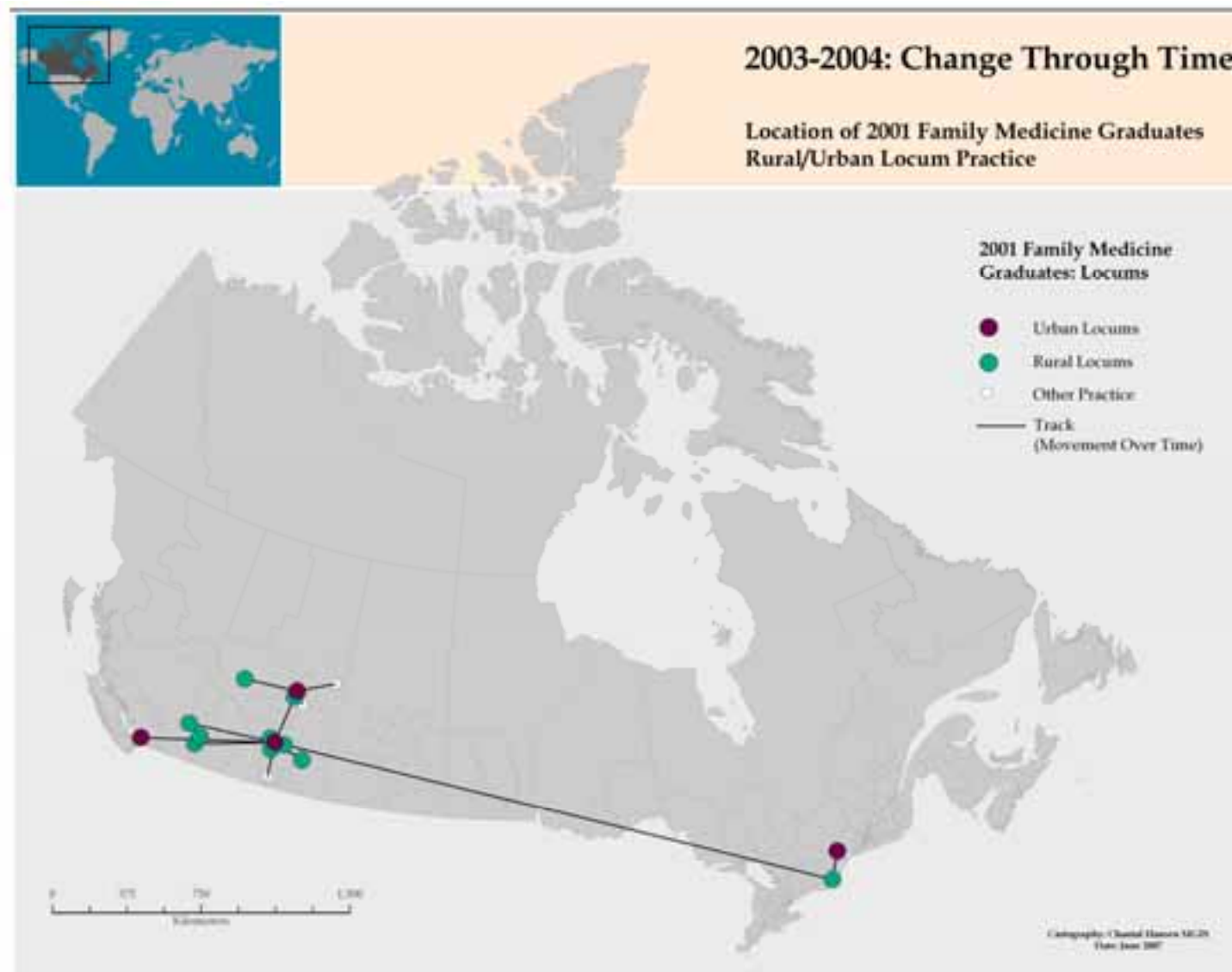
# Results



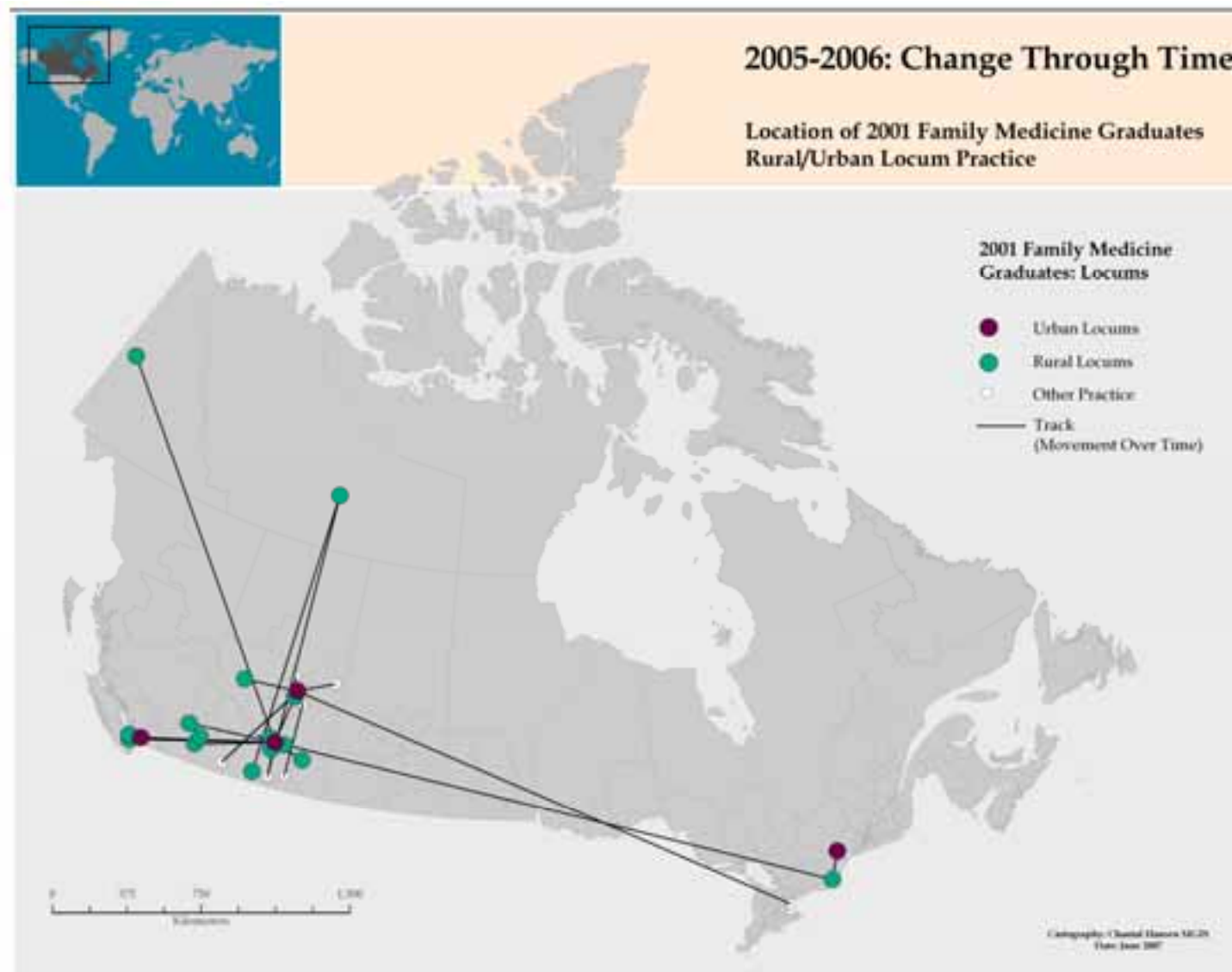
# Results



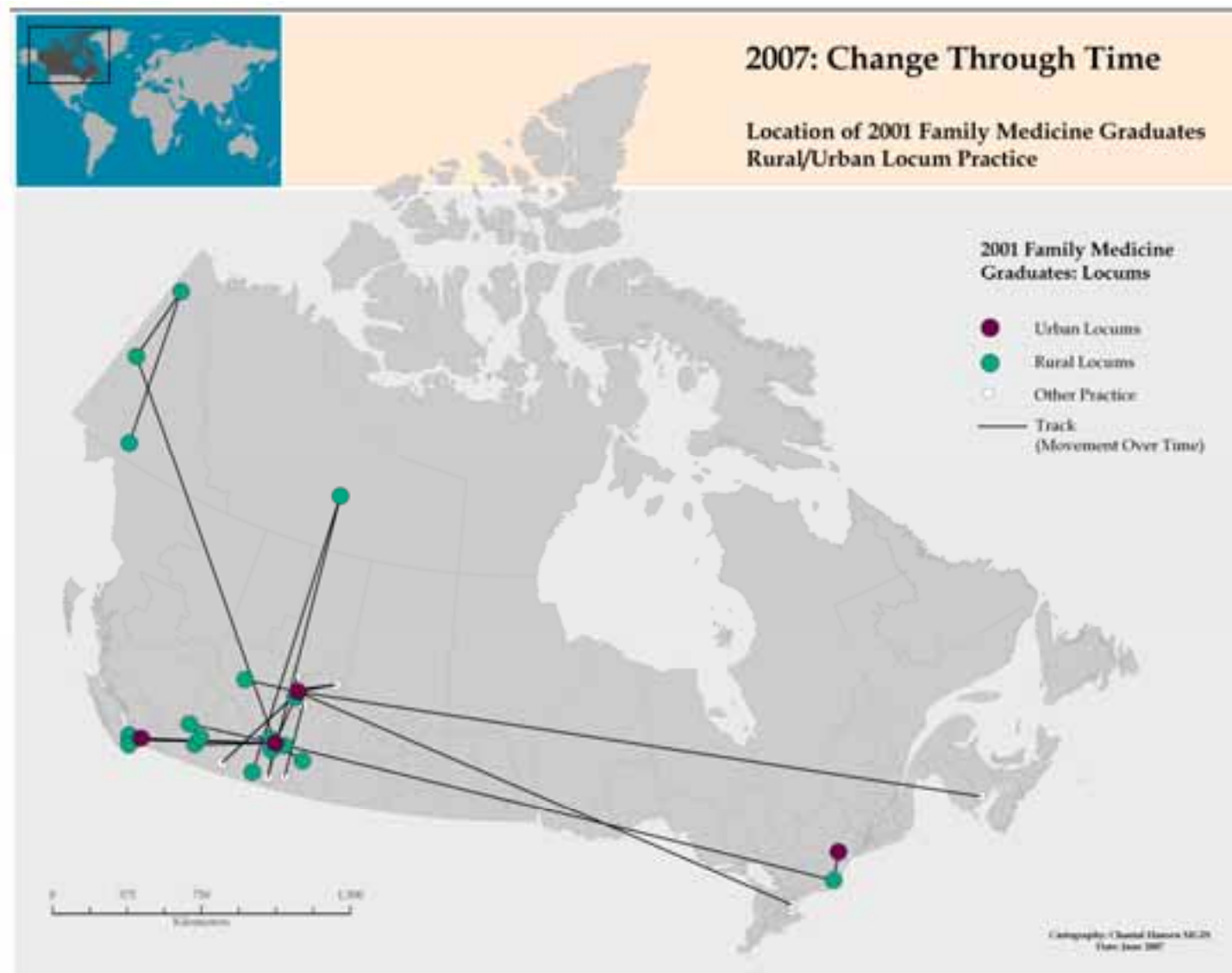
# Results



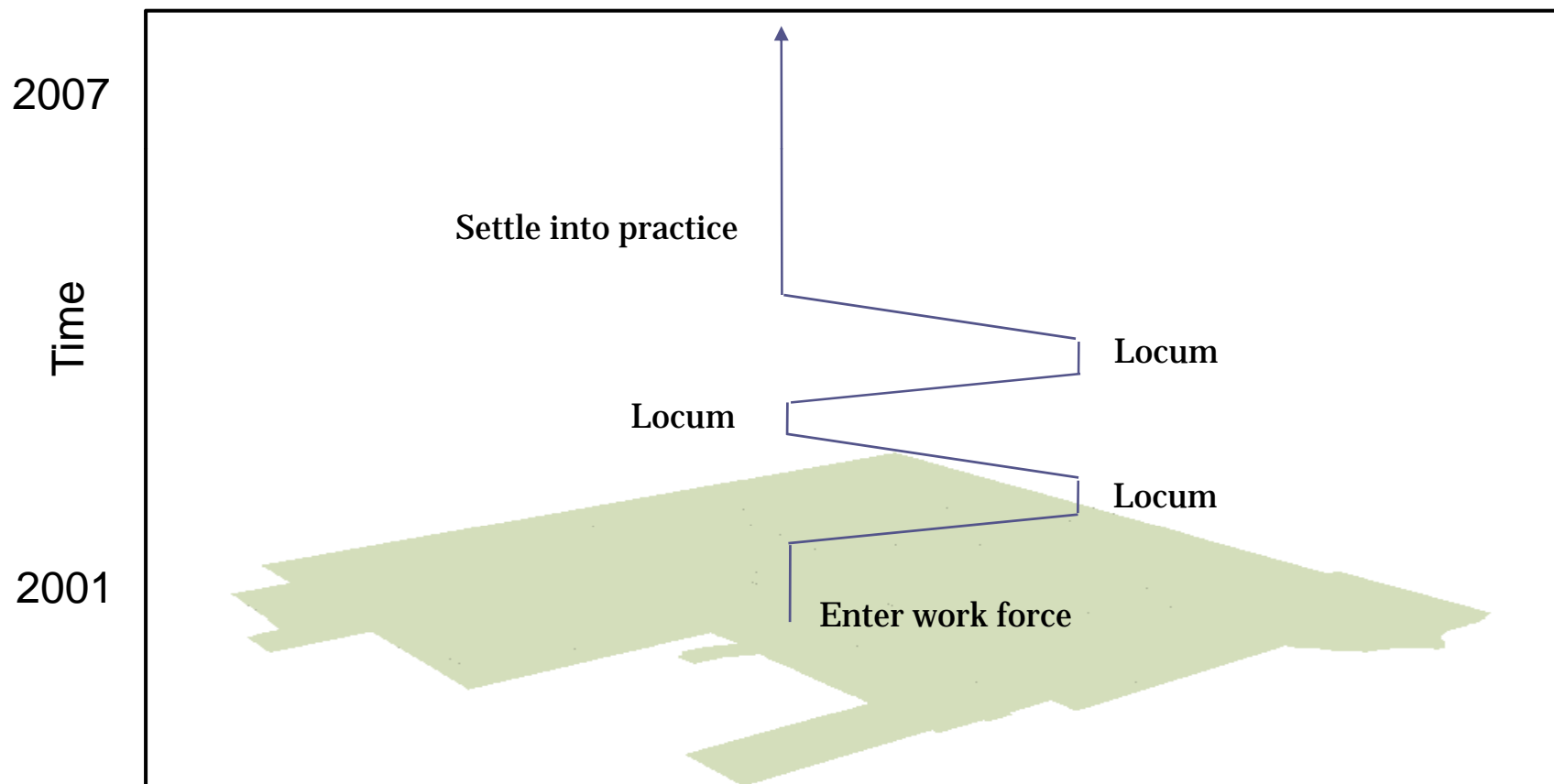
# Results



# Results



# General Locum Time/Space Path



Space: Urban area (greater than 25,000 in population)

# Significance

- Identify specific time and area of locum activity.
- Visualize movement over time – not done before with locum data.
- Provides context and conveys perspective.
- Generates discussion - the appeal of an intriguing and innovative display cannot be underestimated.
- Hypothesis generation.
- Informs physician workforce planning and provides information for consideration by Family Medicine residency programs.

# Other Findings

- We are able to “replay history” and observe that initially over half (54.1%) of the 2001 graduates did locums within 2 years of graduating.
- The majority of locums were undertaken in Alberta (75.5%).
- 27.3% did a locum in a rural community (pop. 25,000 or less): of these, 60.0% were female.
- 72.7% did a locum in an urban community (pop. greater than 25,000): of these 70.5% were female.

# Limitations

- The city location of locum activity is not at a fine enough spatial resolution, although the level is adequate for these exploratory purposes.
- Future work – postal code location of locum practice.

# Conclusion

- A substantial proportion of family medicine graduates do locums after residency training.
- Urban areas = high need for locum docs.
- Many docs are still doing locums 5 years after graduating.
- Tracking Analyst = innovative display of locum movement.
- The findings inform postgraduate residency programs on program outcomes, workforce realities upon graduation, and aid health workforce planning.

# Questions?

Google Earth Image  
Bicton, Perth, Western Australia

DeLorean

