Geoprocessing (overlay) exercise

Rabbit prediction map

Cutting Edge GIS workshop 2010

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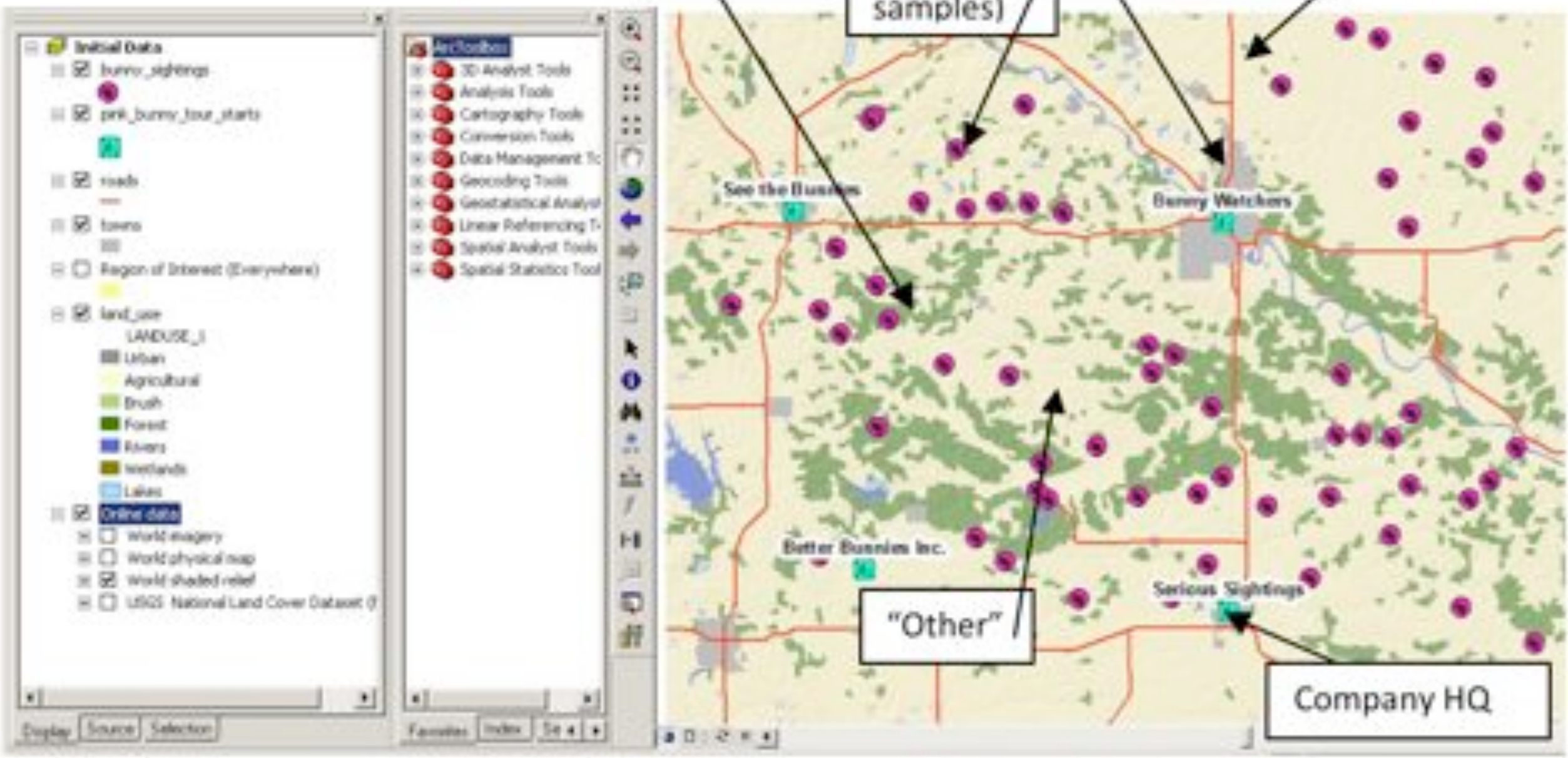
- Exercise Predict a (simple) spatial distribution via a (simple) set of spatial rules
- Here: habitat (spatial distribution) of a **fictitious** rabbit species from earlier sightings ("samples"), for "sightseeing business"
- Overlay Analysis (Geoprocessing) + Spatial Joins
- My setting: Senior + Grad student course, many backgrounds, exercise given during last 1/3 of course, 3 - 5 hrs total
- Textbook used: Mastering ArcGIS (M. Price)
- Not a "real" geoscience setting – but should be adaptable to e.g. prospecting or pollution prediction

Starting Situation

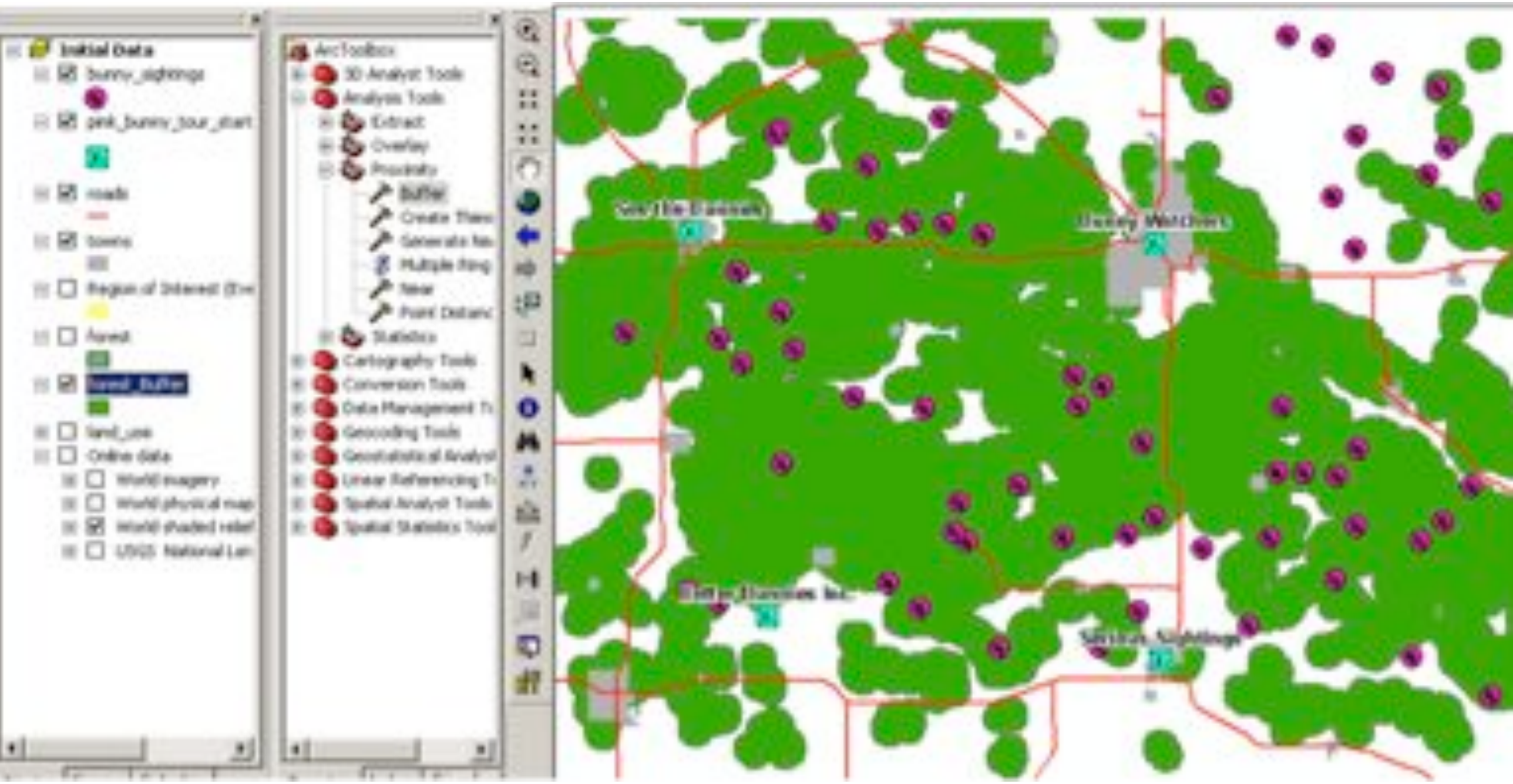


- Uses only vector data (shape files)
- Features only as givers of shape*
- Part1: Exercise for geoprocessing (map overlay) operations (buffer, clip, union)
- Part 2: different types of spatial joins
- Part 3: Create a final map in layout mode

- Dr. Hasenpfeffer's rules for predicting rabbits:
  - Rabbits live primarily inside forests (food/shelter) and venture at most 1000 m outside of it.
    Forest => Probability for finding rabbits is high.
  - Rabbits stay at least 500m away from roads and 2000 m away from cities (even if they are technically less than 1000 m away from of a forest).
    Road/Town => Probability for finding rabbits is 0.
  - (Everywhere else the probability of finding rabbits is considered low)
- see the rabbit_final.mxd in the instructor folder for a solved version of the exercise and Solutions.doc for more details

Part 1: Create the pieces, assemble the puzzle

- **Select** LANDUSE = Forest layer (actual polygons for forest land use)
- Make a 1000 m **buffer** around the forest, call result prob_high layer (green polygons)


Initial Data
bunny_sightings
pink_bunny_tour_start
roads
towns
Region of Interest (Ex
forest
forest_buffer
land_use
Online data
World imagery
World physical map
World shaded relief
USGS National Lan
ArcToolbox
3D Analyst Tools
Analysis Tools
Extract
Overlay
Proximity
Buffer
Create Thies
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Multiple Ring
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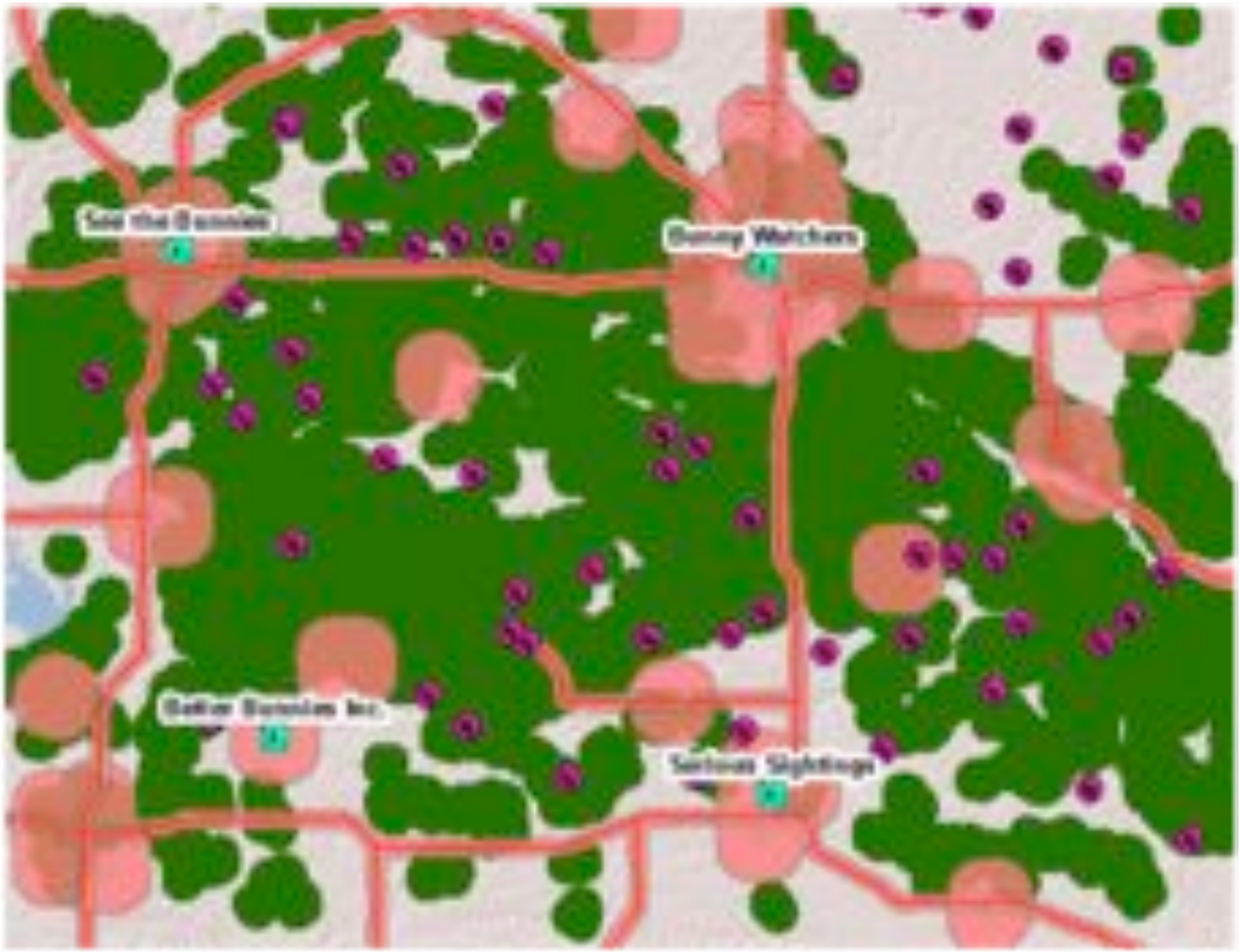
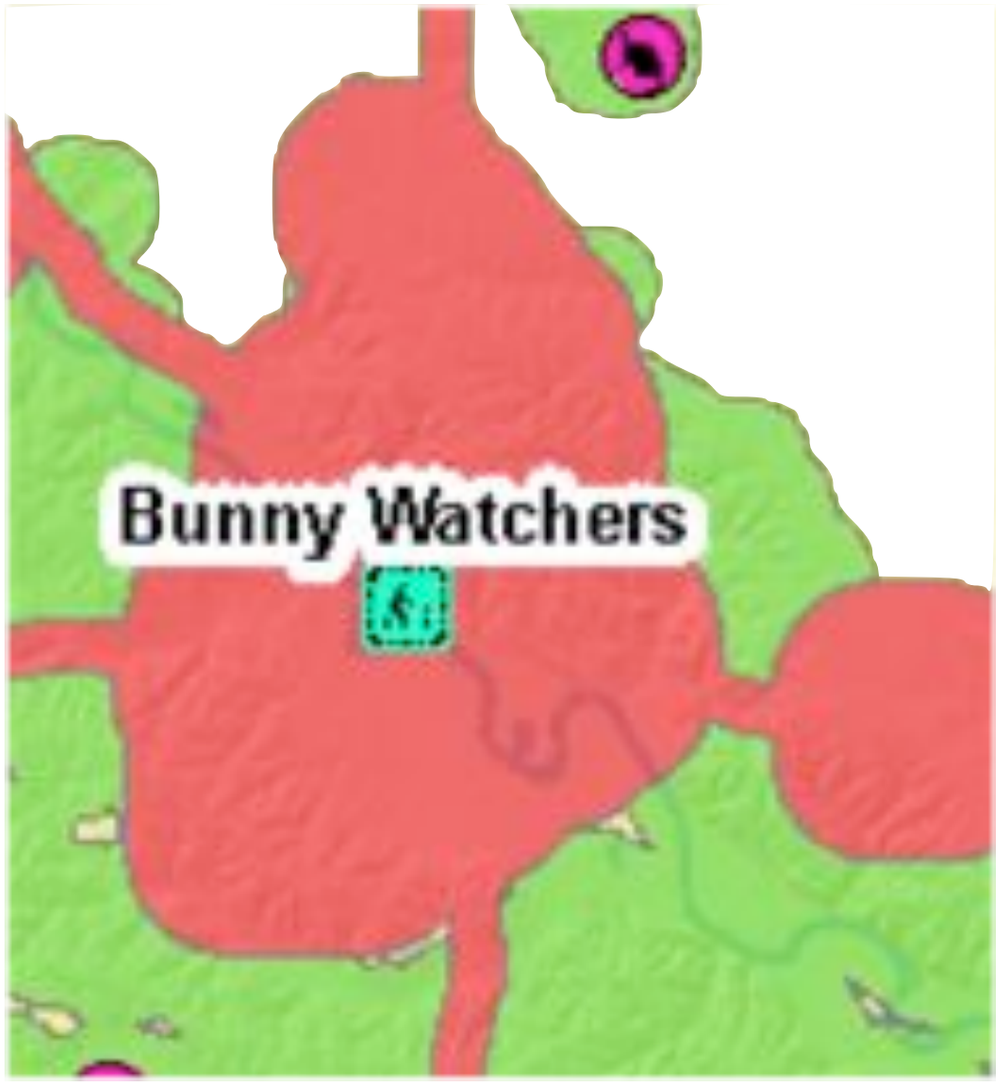
Point Distanc
Statistics
Cartography Tools
Conversion Tools
Data Management T
Geocoding Tools
Geostatistical Analyst
Linear Referencing T
Spatial Analyst Tools
Spatial Statistics Tool

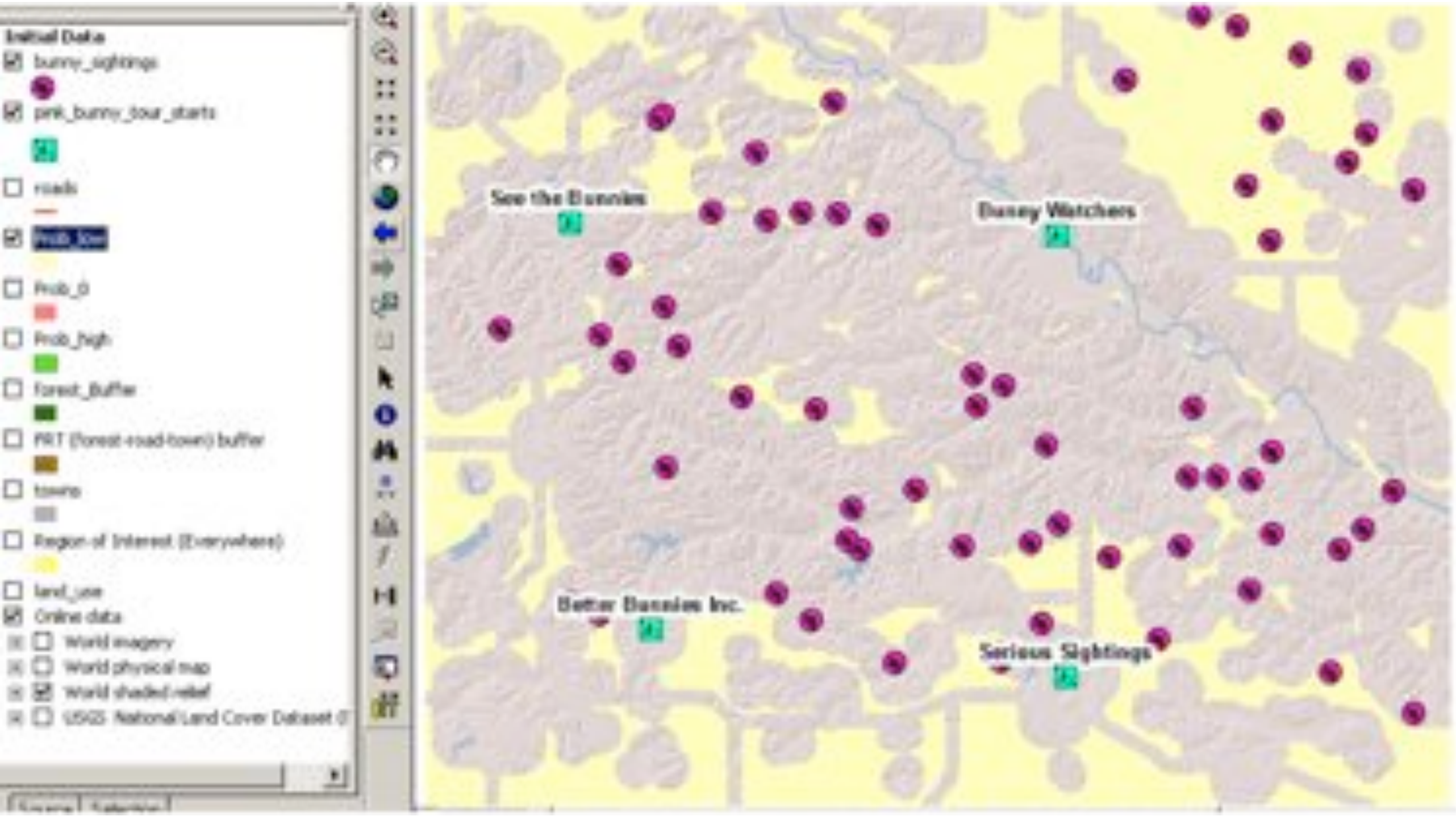
- Make 500m **buffer** around roads, merge (and dissolve) with 2000m **buffer** around towns and call result prob_0 red)



- Adjust green prob_high layer where it coincides (overlaps) with prob_0
- if in doubt prob_0 (red) wins!



- Everywhere else (in between green and pink), fit in a yellow layer for low probability (use Erase tool)



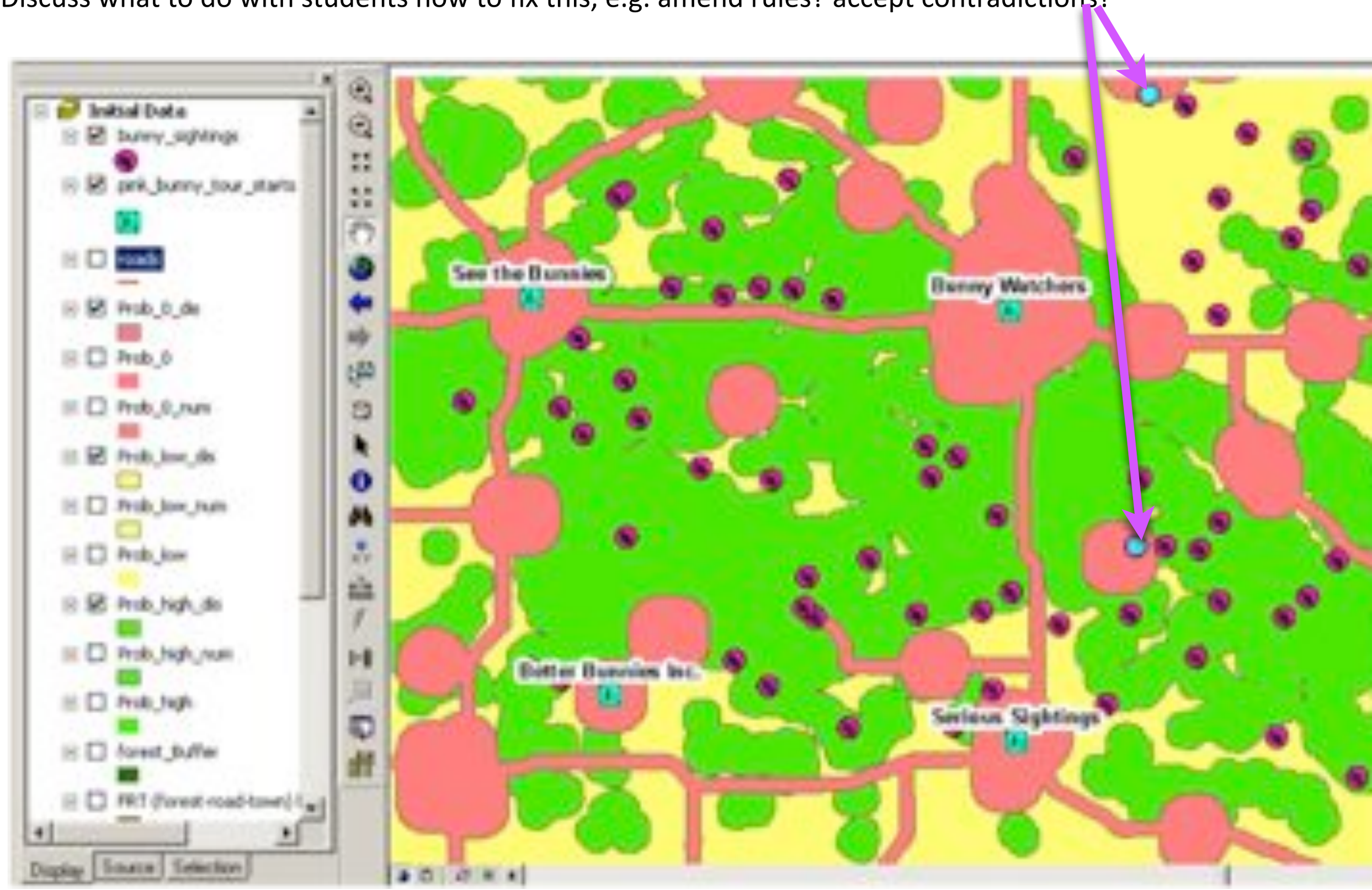
- At the end of part A, the three layers' "puzzle pieces" should fit together without gaps or overlaps:

Part 2:
Answering spatial questions

- Are there any contradictions to our rules?
- Spatial query to find rabbit sightings that lie within the red Prob_0 layer

Yes, there are two sightings in a red zone, violating Rule 1 (no rabbits within 500/1000 m of roads/towns

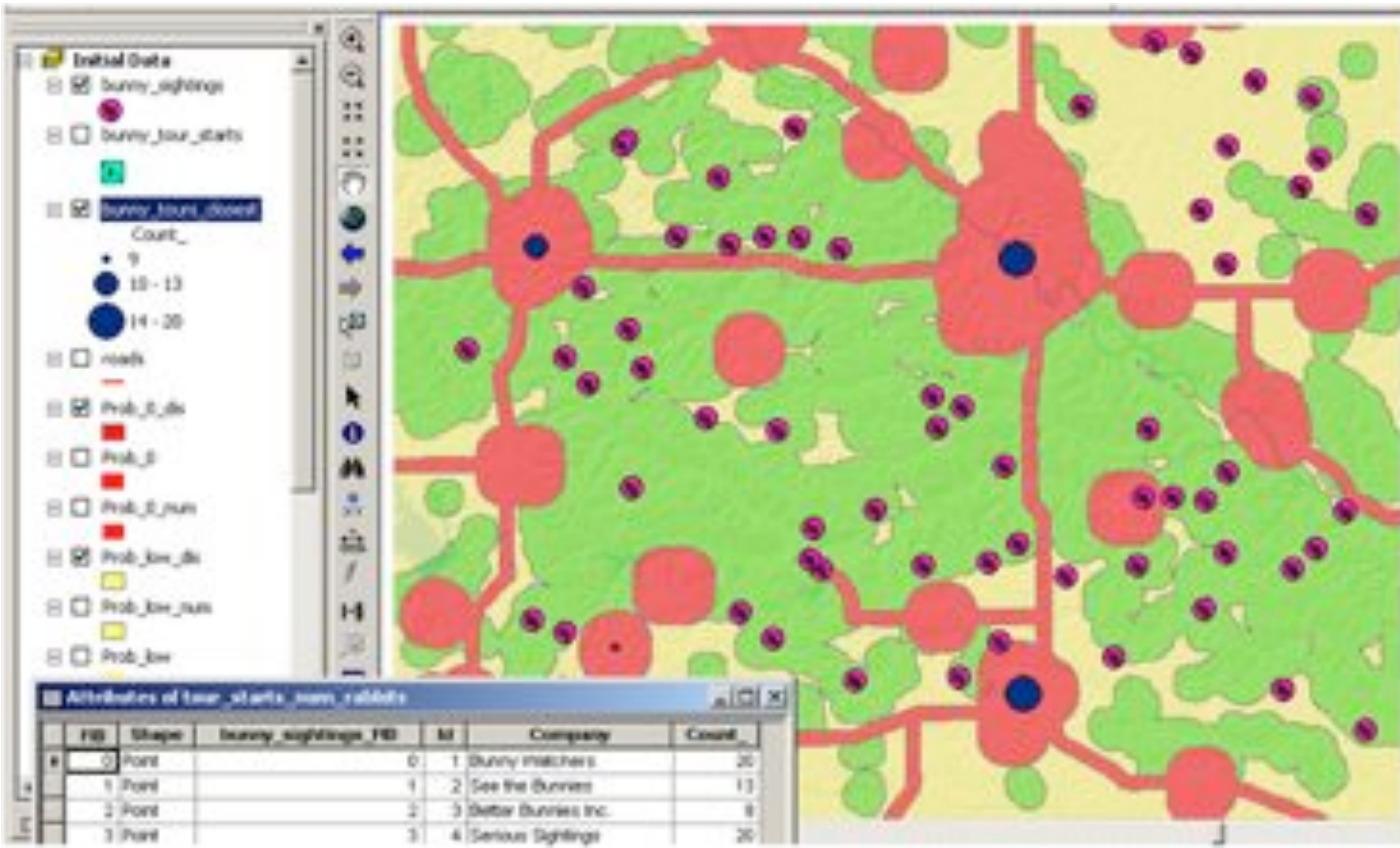
Discuss what to do with students how to fix this, e.g. amend rules? accept contradictions?



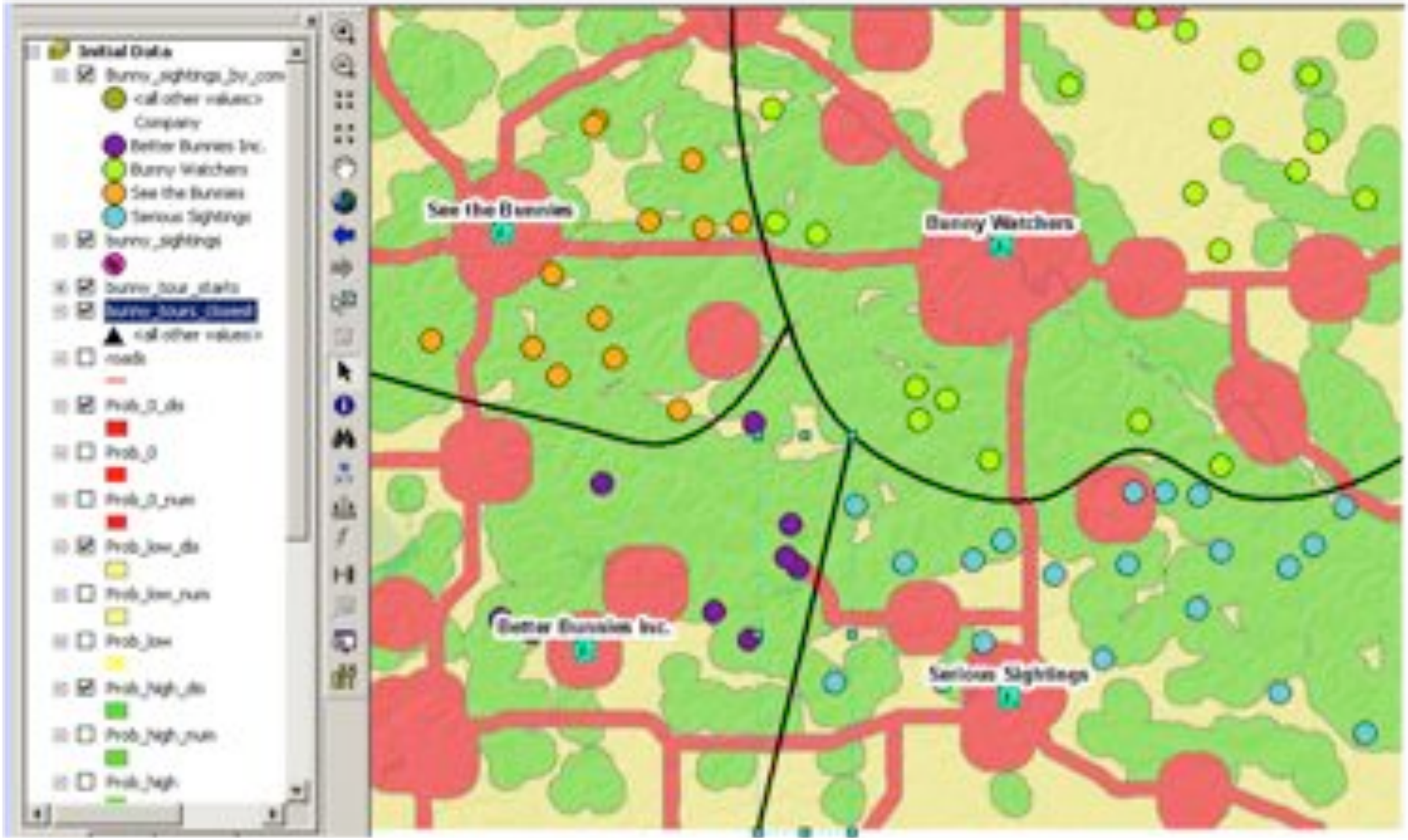
Part 2 - spatial joins

- Senario: Four companies for giving guided sightseeing tours want to smartly partition the area.
- Spatial joining (point-point) between the tour start locations of each company and the rabbit sightings
  - based on (straight line) Distance
  - “how many points are closest?” (summary)
  - “to which points is a point closest to?” (partition)

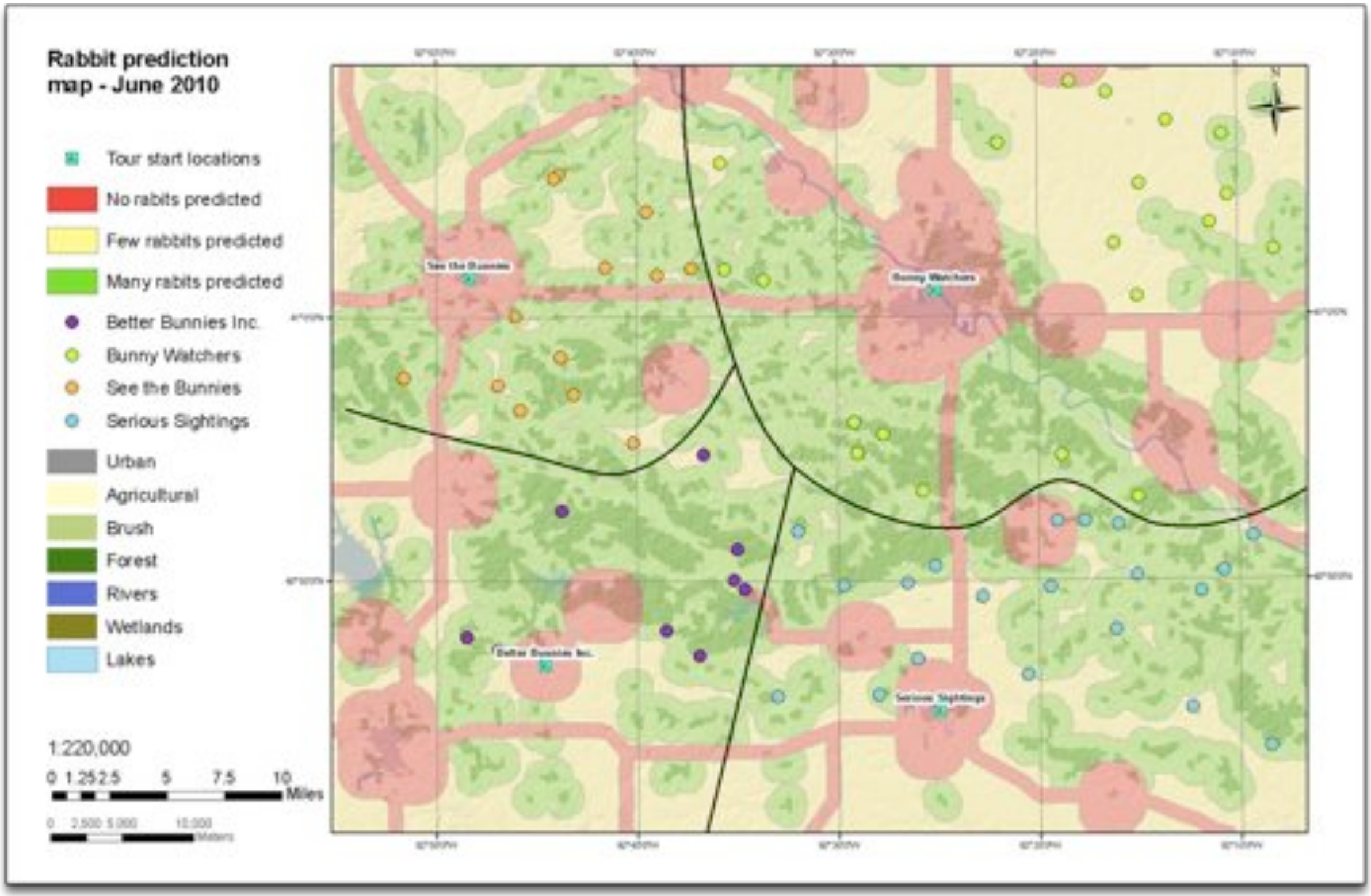
- **How** many sightings are the closest to each of the four tour starts (companies)?
- Implies partitioning that is then summarized, see table (how many? -> Count_)



- For each sighting, to **which** business is it closest (and hence could be considered to belong to this business)?
- Partitioning indicated via point coloring and drawn by hand



- Part 3: make a prediction map (layout mode)



Feedback from students

- Fictitious-ness of setup is not a problem
- Spatial "habitat" rules are clear and easy enough to make sense to non-biologists
- sparse instruction (with pictures) force students to find their own set of analysis steps
- Some students seem to enjoy laying out a (somewhat) complex map as final product

Questions?