



# INTRODUCTION to: Transportation and Land Use Decision-Support Models

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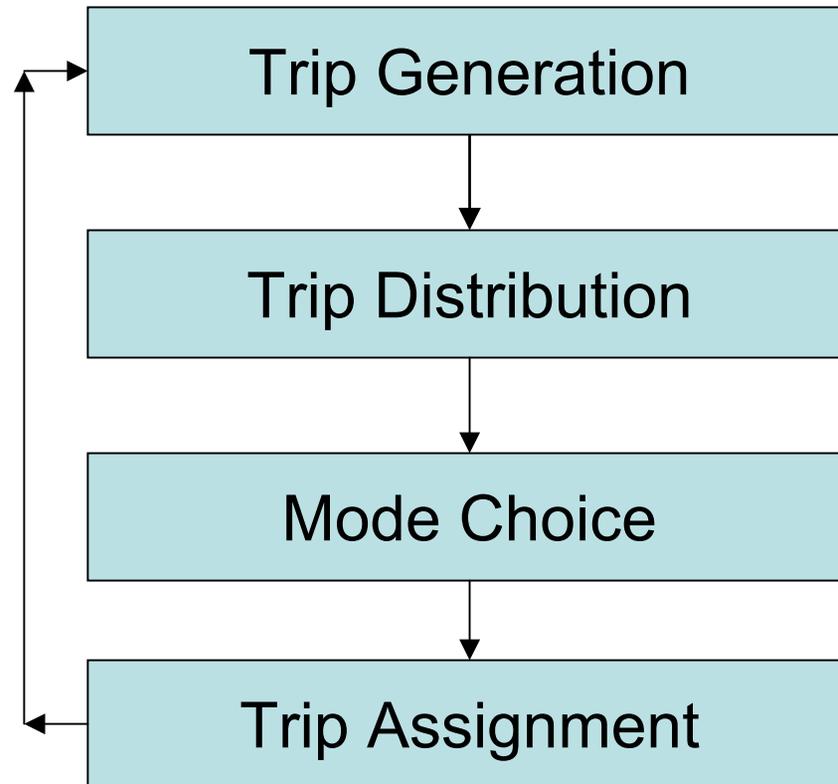
# Decision Support from Models

- *What is a basic travel demand model?*
- *What is a basic land use model?*
- *What can (and can't) they do?*



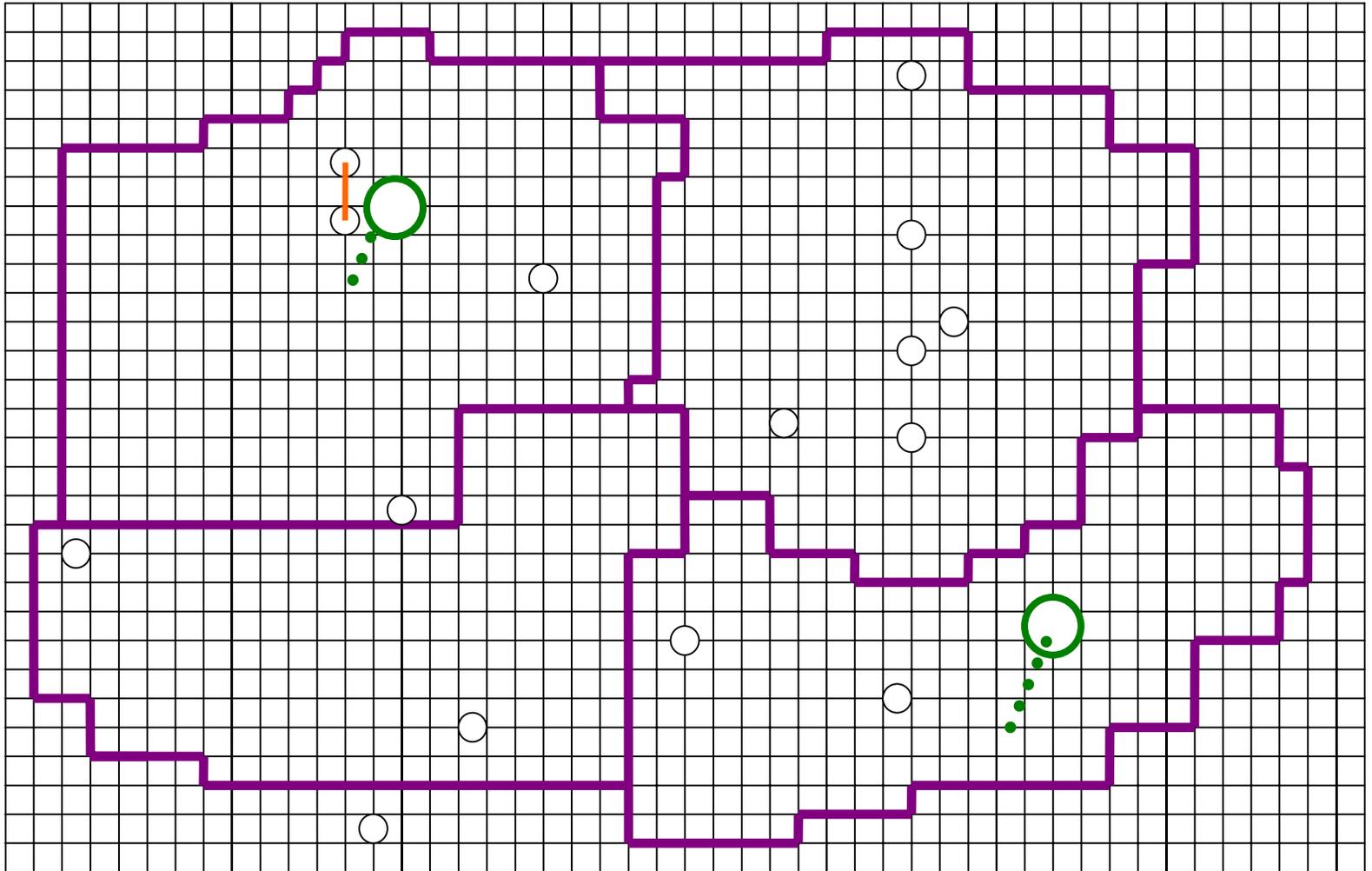


# Basic Travel Models: The Traditional 4-step Model



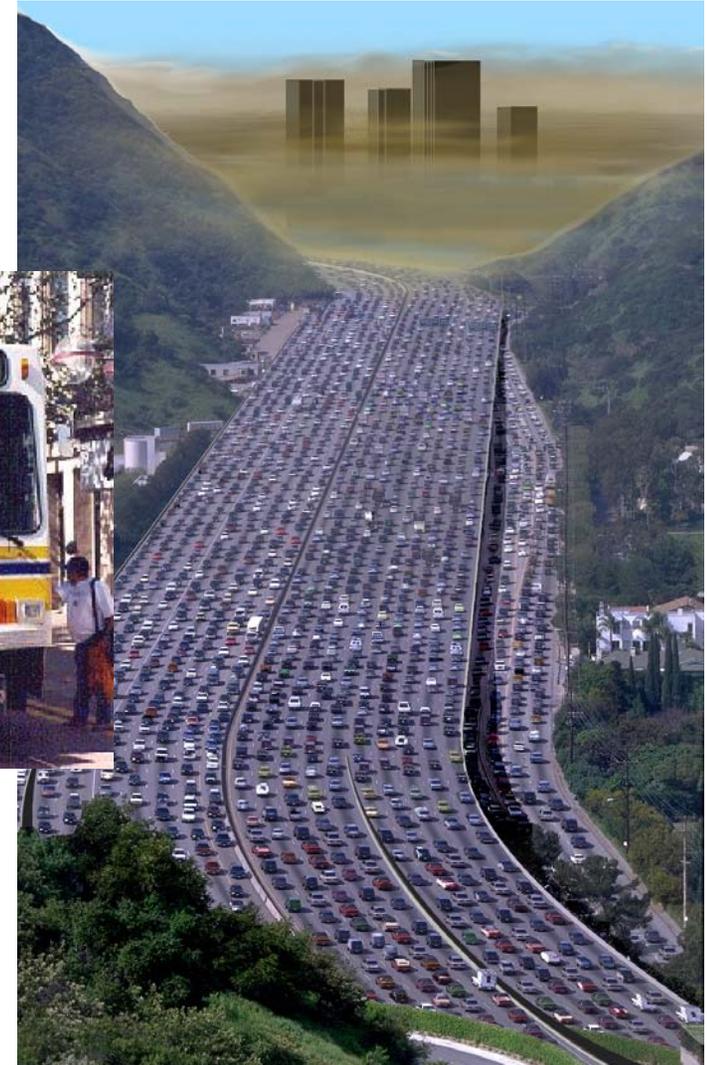


# Trip Distribution: Origins and Destinations



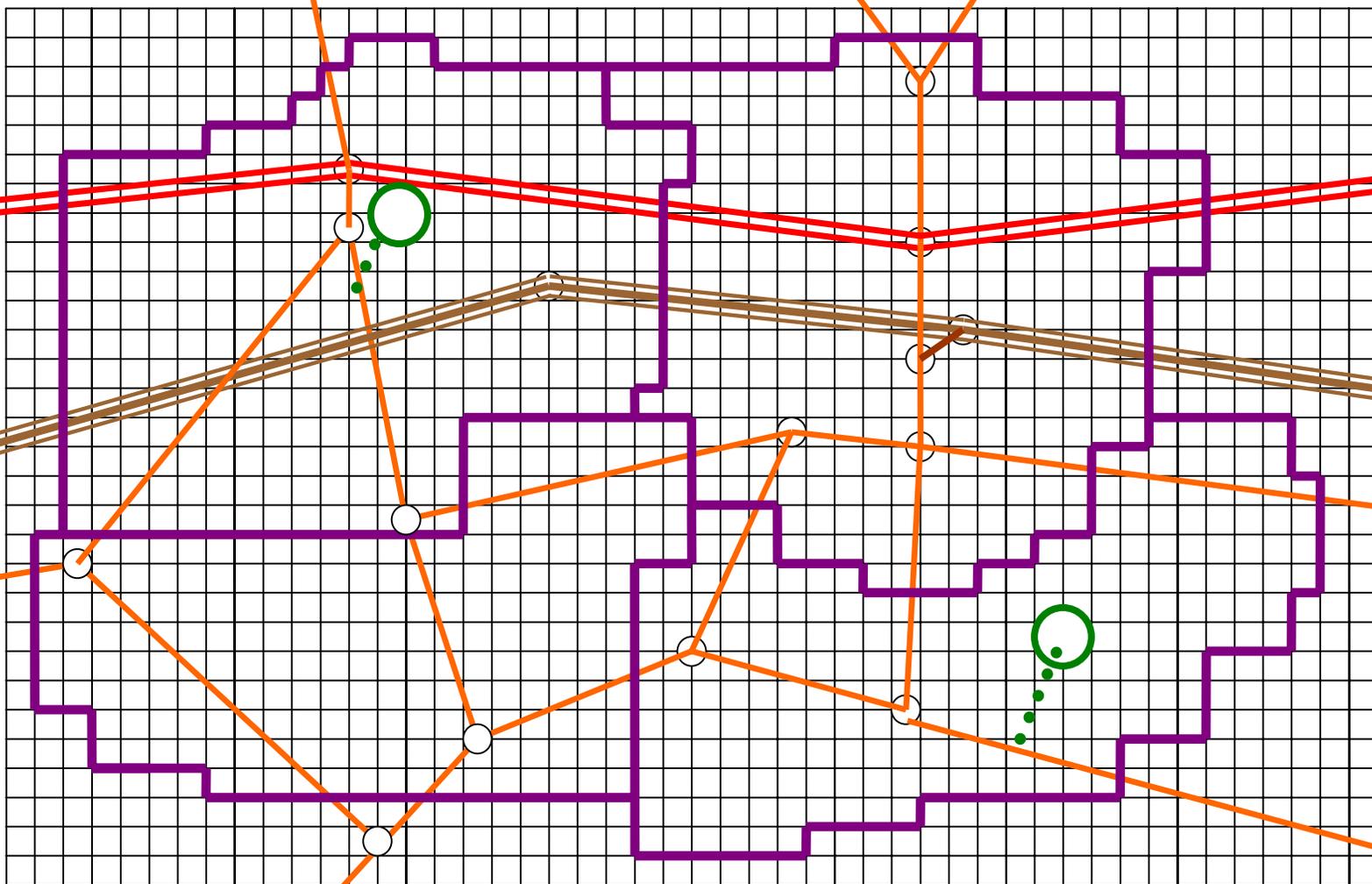


# Mode Choice





# Trip Assignment





# Land Use Affects Travel Demand and Travel Facilities Affect Land Use!

- 4 step travel model reflects demand generated by land use and its effects on a given network of travel facilities.
- Changing the travel facilities changes the time between zones, which creates demand for new or different land uses.
- *This is not reflected in the 4 step model*





# What is Land Use?

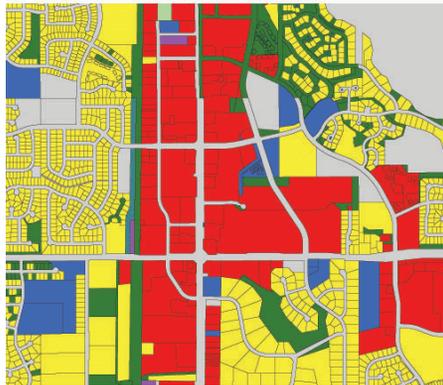
## LBCS

### Land-Based Classification Standards



#### LBCSActivity

- Residential activities
- Shopping, business or trade activities
- Industrial, manufacturing, and waste-related activities
- Social, institutional, or infrastructure-related activities
- Travel or movement activities
- Mass assembly of people
- Leisure activities
- Natural resource-related activities
- No human activity or unclassifiable activity



#### LBCSFunction

- Residence or accomodation functions
- General Sales or services
- Manufacturing and wholesale trade
- Transportation, communication, information, and utilities
- Arts, entertainment, and recreation
- Education, public amin., health care, other inst.
- Construction-related businesses
- Mining and extraction establishments
- Agriculture, forestry, fishing and hunting



# Types of Land Use Models

- **The main types are:**
  - Planning Models
  - Trend models
  - Accessibility Forecasting
  - **Rule based models**
  - **Micro-economic “integrated” land use (and transportation) models**





# Why are Land Use models important?

1. They allow us to test a wide variety of policy, planning, and investment alternatives.
2. They create a consistent set of rules and criteria to test various alternatives.
3. They respond to a wide variety of statutes requiring more accurate forecasts than in the past.





# UPlan 2.6 – A Simple “Rule Based Model”

- **Lets users choose:**
  - *Everything:*
    - Future population
    - General Plan Maps (current or speculative)
    - What attracts growth (roads, services...)
    - What discourages growth (or should)
    - Where growth absolutely can't go (e.g., the lake)

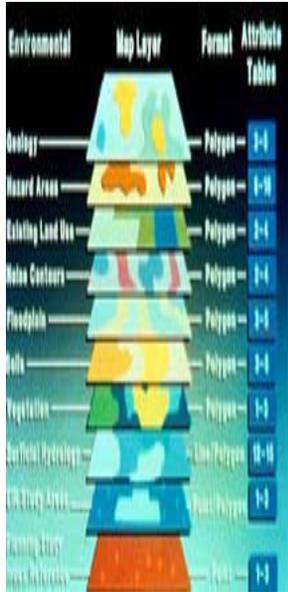


# UPlan 2.6 – A Simple “Rule Based Model”

- **Lets users test:**
  - Where Development Goes
    - Mapped by type, charted by amount by type
      - 13 types in current model
  - What Development Costs
    - Transportation and Services Infrastructure
    - Environmental Infrastructure
- ***Encourages groups to “try again”***



# GIS Map Layers

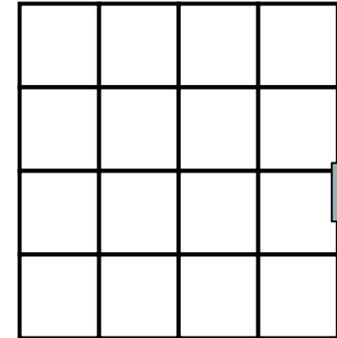
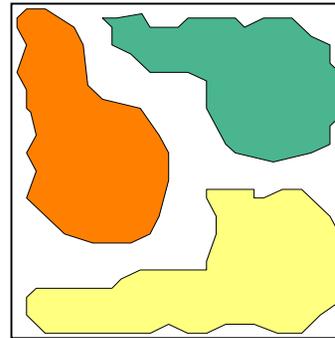


## Create 1 Acre Grid Layer

Single layer (Theme)

Three Conditions (Values)

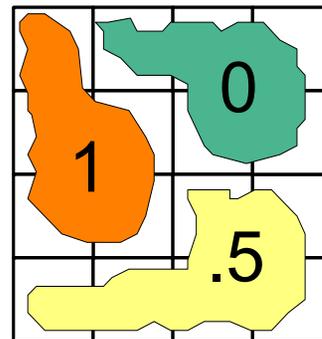
Grid layer



## Convert layer to grid

Apply Value Rule

Create Grid



|    |    |    |    |
|----|----|----|----|
| 1  | 0  | 0  | 0  |
| 1  | 1  | 0  | 0  |
| 1  | 1  | .5 | .5 |
| .5 | .5 | .5 | .5 |





# Weight Each Grid Layer

Multiply x Importance

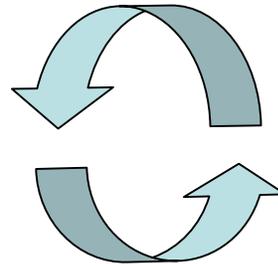
|    |    |    |    |
|----|----|----|----|
| 1  | 0  | 0  | 0  |
| 1  | 1  | 0  | 0  |
| 1  | 1  | .5 | .5 |
| .5 | .5 | .5 | .5 |

$$\times 4 =$$

Zero Values Drop Out

|   |   |   |   |
|---|---|---|---|
| 4 | 0 | 0 | 0 |
| 4 | 4 | 0 | 0 |
| 4 | 4 | 2 | 2 |
| 2 | 2 | 2 | 2 |

Repeat Process for Each GIS Map Layer





# Group and Add Weighted Grid Layers

## Growth Attractions Group

Urban Edge

|   |   |   |   |
|---|---|---|---|
| 4 | 4 | 4 | 4 |
| 4 | 4 | 4 | 4 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |

Amenity

|   |   |   |   |
|---|---|---|---|
| 0 | 3 | 0 | 0 |
| 0 | 0 | 3 | 3 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |

Major Arterial

|   |   |   |   |
|---|---|---|---|
| 0 | 4 | 0 | 0 |
| 0 | 4 | 0 | 0 |
| 0 | 4 | 0 | 0 |
| 0 | 4 | 0 | 0 |

Ramp Proximity

|   |   |   |   |
|---|---|---|---|
| 4 | 0 | 0 | 0 |
| 4 | 4 | 0 | 0 |
| 4 | 4 | 2 | 2 |
| 2 | 2 | 2 | 2 |



Combined Effect

|   |    |   |   |
|---|----|---|---|
| 8 | 11 | 4 | 4 |
| 8 | 12 | 7 | 7 |
| 4 | 8  | 2 | 2 |
| 2 | 6  | 2 | 2 |





# Uplan: Population and Land Use Settings – *examples:*

|  |           |
|--|-----------|
| 2000 population                                  | 3,320,096 |
| 2025 population                                  | 5,450,012 |
| % households in high density residential         | 19        |
| % households in medium density residential       | 76        |
| % households in low density residential          | 3         |
| % households in very low density residential     | 1         |
| Average lot size of high density residential     | 0.05      |
| Average lot size of medium density residential   | 0.25      |
| Average lot size of low density residential      | 5         |
| Average lot size of very low density residential | 20        |
| % employment in industrial                       | 13        |
| % employment in high density commercial          | 31        |
| % employment in low density commercial           | 55        |





# Uplan: “Attraction” Weights – e.g.

| Attractions         | Buffer distance | Weight |
|---------------------|-----------------|--------|
| Freeway ramps       | 0 - 500         | 20     |
|                     | 500 - 1000      | 15     |
|                     | 1000 - 3000     | 10     |
|                     | 3000 - 5000     | 5      |
|                     | 5000 - 8000     | 2      |
| Arterials           | 0 - 500         | 20     |
|                     | 500 - 1000      | 15     |
|                     | 1000 - 3000     | 10     |
|                     | 3000 - 5000     | 5      |
| Bay Area proximity  | 0 - 0           | 20     |
| Sphere of influence | 0 - 0           | 60     |
|                     | 0 - 500         | 50     |
|                     | 500 - 1000      | 40     |
|                     | 1000 - 3000     | 30     |
|                     | 3000 - 5000     | 20     |



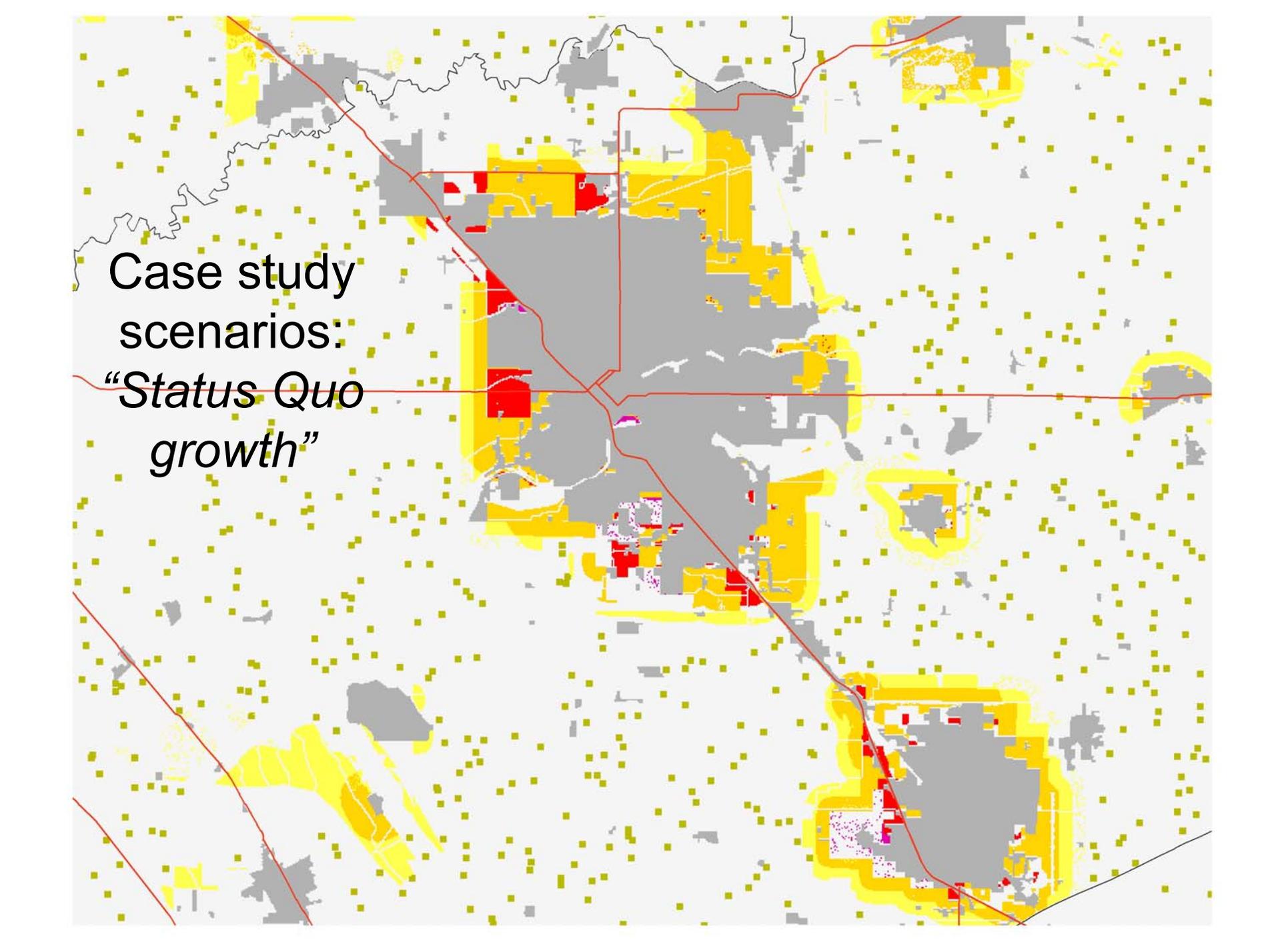


# Uplan: “Discouragement” Weights – *examples:*

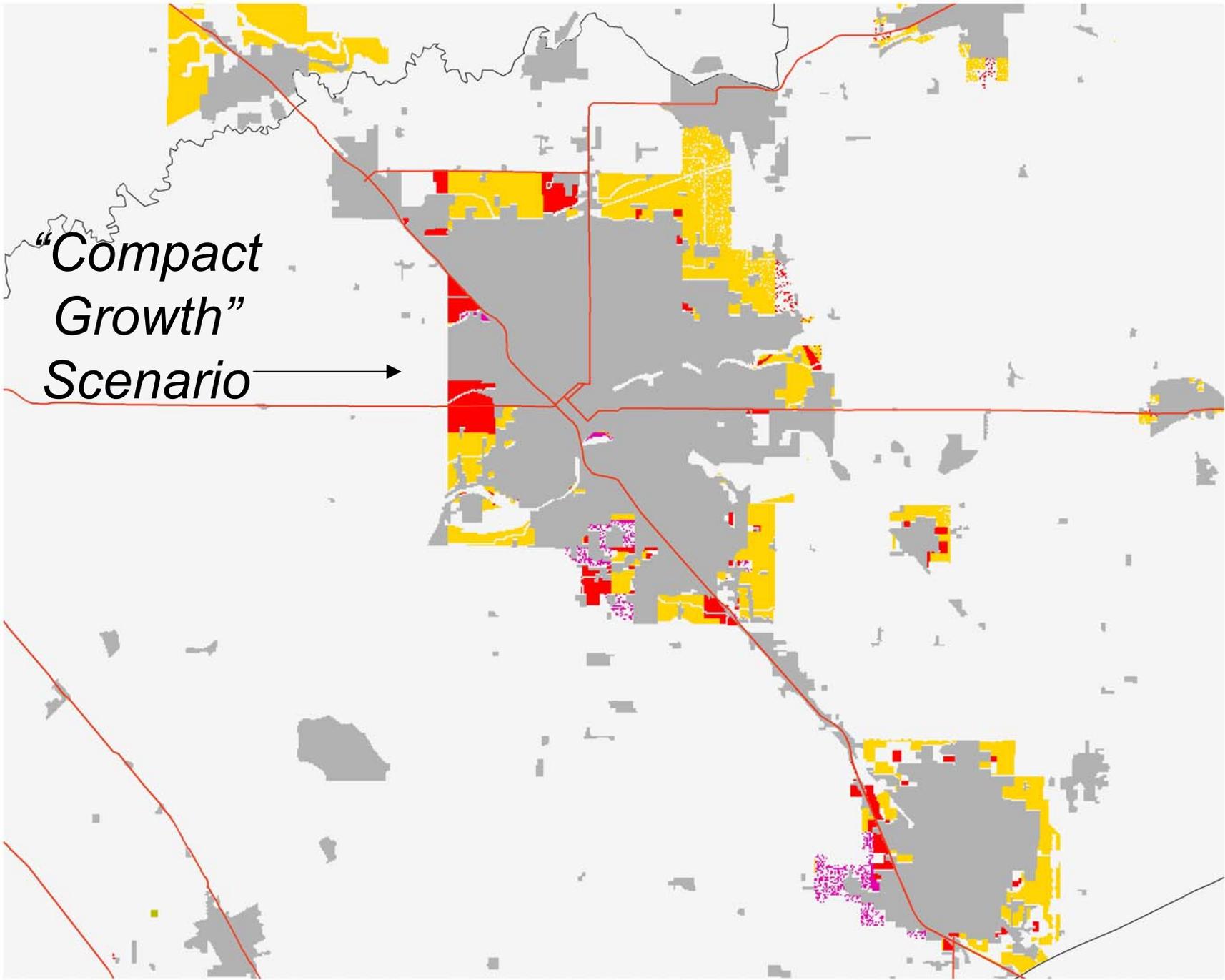
| Discouragements | Interval | Buffer distance | Weight |
|-----------------|----------|-----------------|--------|
| Wetlands        | 1        | 0               | 40     |
| NDDDB           | 1        | 0               | 40     |
| TNC             | 1        | 0               | 40     |
| Floodplain      | 1        | 0               | 10     |

| Masks          | Interval | Buffer distance |
|----------------|----------|-----------------|
| Lakes          | 1        | 50              |
| Rivers         | 1        | 50              |
| Public lands   | 1        | 0               |
| Existing urban | 1        | 0               |

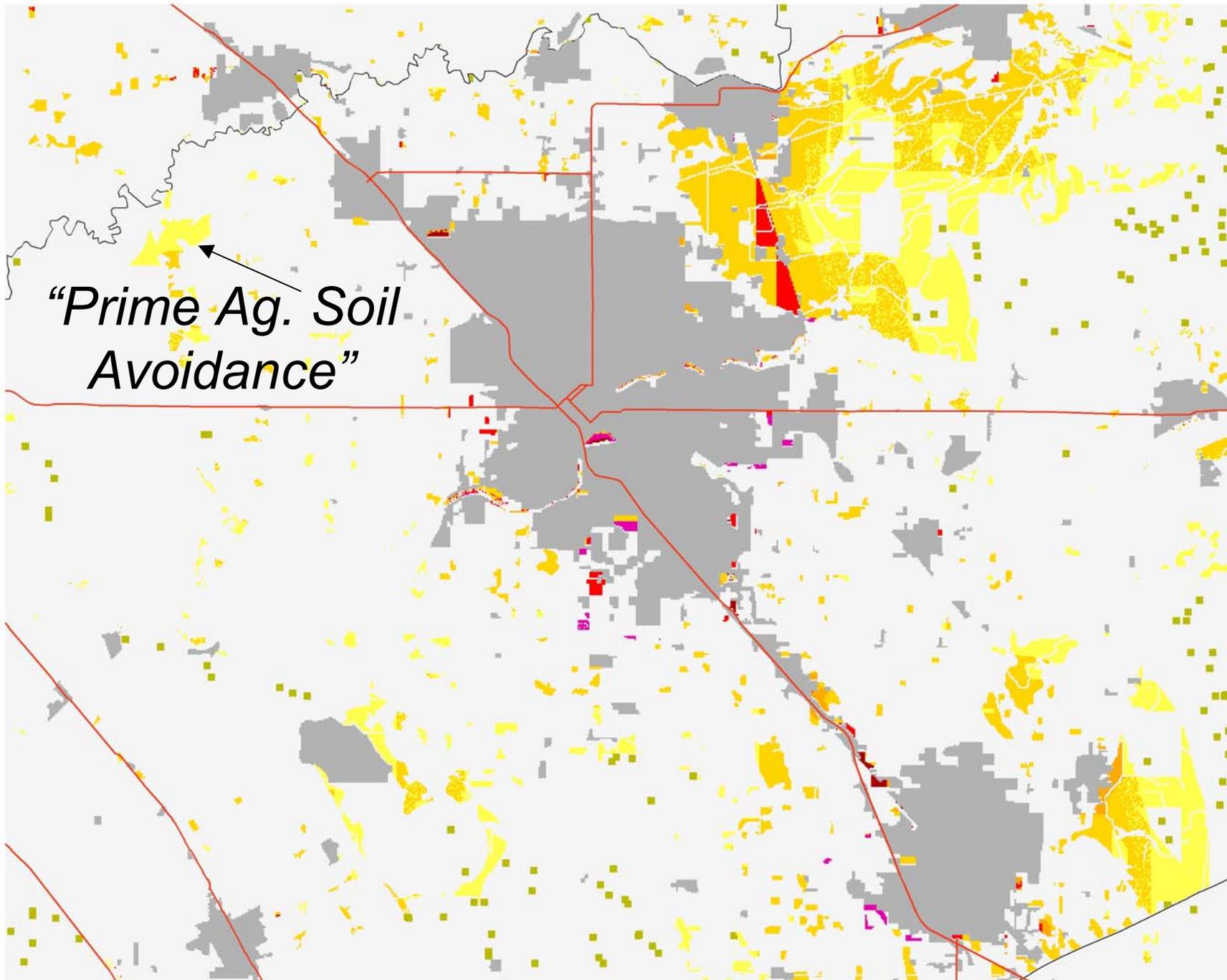




Case study  
scenarios:  
*“Status Quo  
growth”*

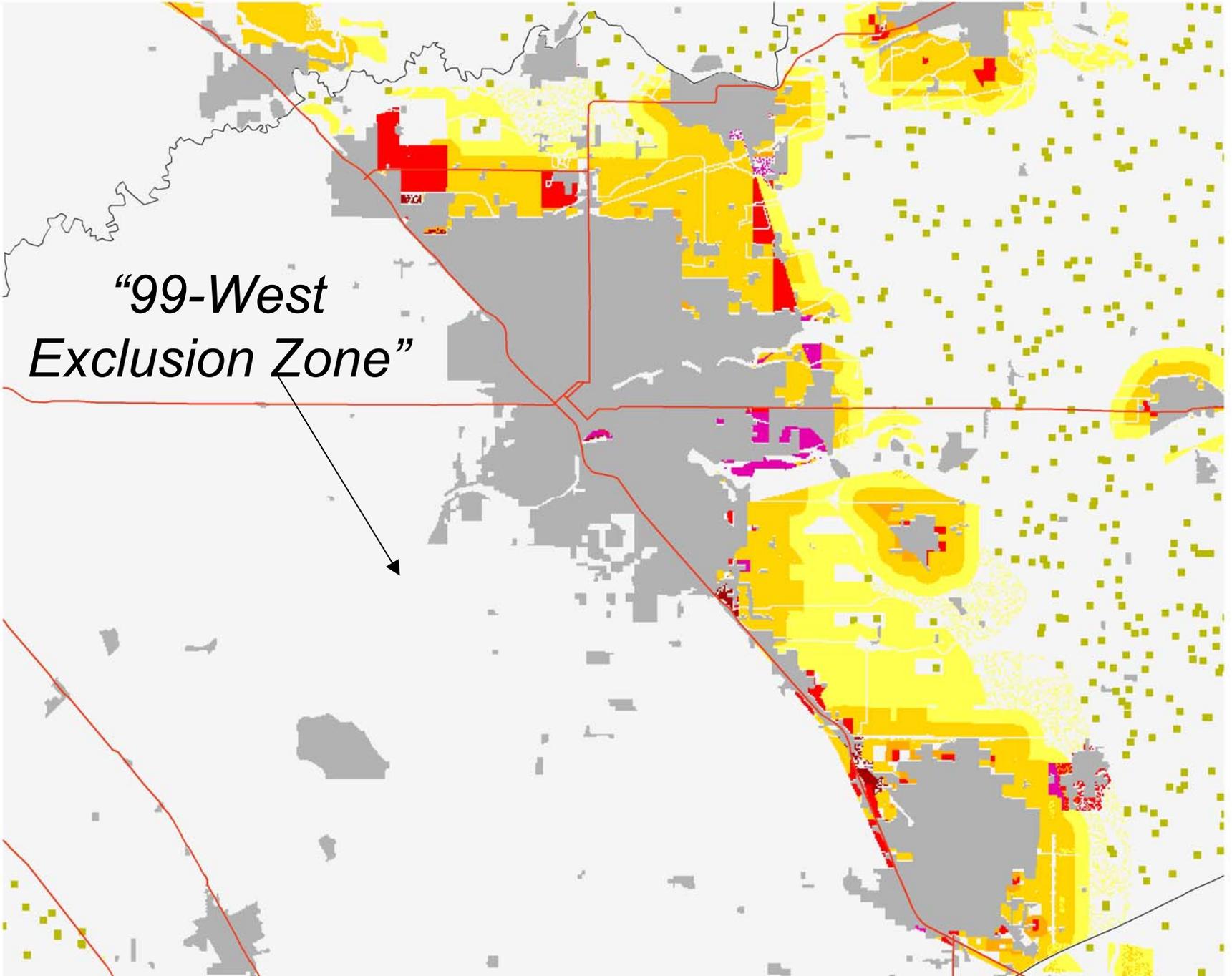
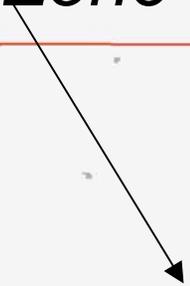


*“Compact  
Growth”  
Scenario* →

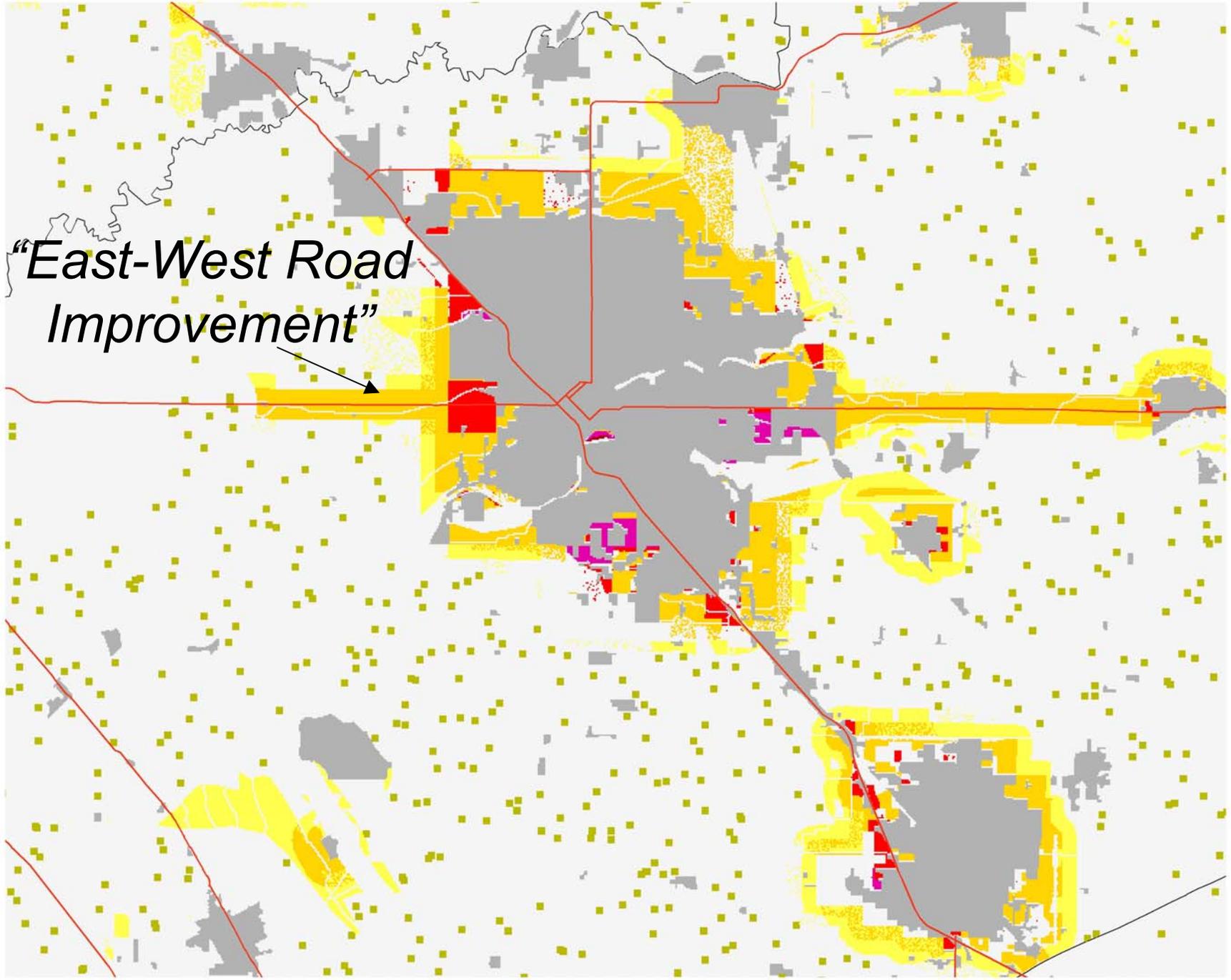


*“Prime Ag. Soil Avoidance”*

*“99-West  
Exclusion Zone”*



*“East-West Road  
Improvement”*



## ***Who's using Uplan in California?***

- **Merced County** – first to use Uplan in *Partnership for Integrated Planning*
- **18 counties are using Uplan in their Blueprint planning processes**, including:
  - San Joaquin Valley counties
  - North Valley: Shasta, Trinity, Tehama, Butte
  - San Luis Obispo
  - Amador, Calaveras, Alpine



# Land Use Affects Travel Demand & Travel Facilities Affect Land Use

