

## The Challenge

### 1. Describe in words three scenarios that best represent the interests of the agriculture stakeholder group.

- Scenario 1 - Crop Selection. Choose the most lucrative crop, and make assumptions about water usage that are beneficial to us (i.e. assume a low water usage rate).
- Scenario 2 - Rebuttal Fuel. Do an analysis of the negative impacts the city has on the stream/enviro to use as rebuttal for their rebukes of our own planned uses. AKA you're no angel either, town!
- Scenario 3 - Staying in Compliance. The ag would want to assure they can remain in business by staying within the lines of compliance as laid out by the environmental agencies, plus would want to avoid any costly cleanup or rerouting/reclaiming work later on. In this way, the environmental analysis would also be of interest (aka avoiding contamination of groundwater and stream or town well)

### 2. For each scenario, show all the lines of code that you would have to change (and how to change them)

- Scenario 1 - Crop Selection
  - First, we would want to select the most profitable crop (analysis for this would include costs to cultivate versus return on investment)
    - Pistachios appear to be profitable right now because people like them and they are pricey. However, pistachios are very difficult to cultivate. A pistachio tree takes about five years from the day it is planted before it starts producing fruits. Not only that, it's about 15-20 years later when the tree reaches mass production.
    - Based on recent agricultural data, cotton is more profitable per acre than wheat (Cotton \$125 / acre vs. Wheat \$87 / acre). BUT, cotton is also a higher-water-use crop according to the code.

```
crop_demands = [0.004, 0.006, 0.008] # water use (m/day) for each crop [wheat, pistachios, cotton]
```

- We would want also to change other design parameters to our benefit, such as farm\_efficiency and farm\_excess. I think we would want to increase farm\_efficiency and decrease farm\_excess. Can we change fixed values in the code, or only parameters that provide a range of options?

```
#Farm:
farm_landuse = 0.125 # fraction of total farm area in active use at any time
farm_efficiency = 0.7 # fraction of pumped water actually delivered
farm_excess = 0.2 # fraction of crop demand to be added to prevent salinization
crop_demands = [0.004, 0.006, 0.008] # water use (m/day) for each crop [wheat, pistachios, cotton]
```

- Scenario 2 - Rebuttal Fuel (NTNA vs. YTNA)
  - We would want to compare the differences between no town, no ag and yes town, no ag to isolate what the impact the town has on the stream/environment. This would give a comparison as to the magnitude of the ag effects versus the town effects and maybe offer some rebuttal fuel if the argument is made that the ag has too large of an effect. Could potentially model the impacts of increasing population in the town too using the parameters for growth rate and town consumption.

```
#Anthropogenic stresses:
#Town:
Qw10 = 1000.           # initial pump rate when well 1 is turned on at beginning of post development period
rate = 0.0405          # exponential growth rate of town's pumping
town_efficiency = 0.8   # fraction of pumped water actually delivered to town
town_consumption = 0.5  # fraction of delivered water that is consumed, not reclaimed
well1_loc=[2,20,37]     # location of town well
```

- Scenario 3 - Environmental Compliance
  - We would want to do our own due diligence to make sure we are complying with all environmental standards so we don't get shut down. We would want to model the extent of our field irrigation to make sure it did not reach groundwater or flow to the stream or town well. Could do this by looking at different locations for the ag field and do particle tracking to the town well.

```
farm_nw_row=[20, 34, 10, 20, 38]   # north-western corner row of farm
farm_nw_col=[19, 19, 19, 10, 10]   # north-western corner column of farm
```