**Model Formulation for 7.1 (Homework #5)**

**Portions of the model formulation discussed in class Weds September 30.**

**Dimensions**

* Location = res [reservoir] or pump
* T = time in season (season1, season6)
* Size = size of infrastructure project (none, s1, s2)

**Decision Variables**

* I”res”,size = binary decision to build reservoir of size size (1=yes, 0=no)
* Area = irrigated acreage

**Objective Function**

Maximize net benefits. Net benefits are the benefits from irrigating acreage in both time steps minus capital and operating costs.

**Constraints**

* Reservoir storage less than or equal to built capacity

X”res”,t <= sum(sizes, Capsize I”res”,size) for all t

* Mass balance at reservoir in each time step.

Zero initial storage in Time step one: X”res”,”1” = Inflow”1” + 0 – X”river\_release”,”1” – X”farm\_delivery”,”1”

In time step #2: X”res”,”2” = Inflow1 + X”res”,”1” – X”river\_release”,2 – X”farm\_delivery”,”2”

* Area irrigated by water supplies

Area <= (X”farm\_delivery”,t + X”pump”,t) / demandt, [acre-feet]/[acre-feet/acre] = acres, for all t

Area <= 100 (season 1)

Area <= 80 (season 2)

* Non-negative flow and storage variables
* Mass balance on flow in river for each season

X”pump”,t <= X”river\_release”,t + Groundwater, for all t

* Only build one reservoir

1 = sum(size,I”res”,size)

* Pump use within pump capacity for all time steps

X”pump”,t <= PumpCapacity I”pump”