Tonight - 4 November

• Hand back homework and in-class writing assignment; go over homework
• Review for exam
• Topic: Surface Irrigation (60 minutes for lecture)
  – in-class writing assignment (20 minutes)
  – show video (20 minutes)
  – handout classnotes
Why do level basins require high flow rates?
Suitable Conditions for Surface Irrigation

- Level topography
- Uniform deep soils of medium texture
  - Why deep?
  - Why uniform?
  - Why medium texture?
- Large streams
- Experienced labor
  - How important is experience?
- Supply of water
Water Distribution

• Canals/Open-ditches
  – Lined vs. unlined
  – Weeds

• Underground pipe
  – concrete
  – PVC
  – pressurized

• Portable pipe
  – Gated pipe
Water control structures

- Devices to control water flow in irrigation ditches
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  - 
  - 
  - 
- Devices for water distribution from irrigation ditches to fields
  - spiles, gate turnouts, and siphon tubes
Example: Siphon tube calculations

• What is the flow through a 2-in siphon with 3-in head?
• What is the flow through a 1-in siphon tube with 6-in head?
• Why aren’t the flows equal?
Surface Irrigation Methods

- Flooding
- Borders
- Basins
- Furrows
Flooding

- Definition/Description

- Advantages
  - 
  - 

- Disadvantages
  - 
  -
Graded borders

- Covers entire surface
- Used for close-growing crops
- Slopes: 0.5% - 4%
  - What is wrong with a steeper slope?
- Strip widths ~ 30 to 60 ft
  - What is wrong with wide borders?
- Inflow cut off times
  - before the border is covered
  - advance and recession curves
- Ridges
GRANDED BORDER
Level borders and basins

- Covers entire surface (square areas are basins)
- Advantages?
- Typical flow rates
  - for 20 acre strip: 1 - 4 cfs (pretty high!!)
  - Boswell Ranch irrigates mile long borders with 3000 gpm or 7 cfs for very tight soils
- Efficiencies: 80 - 90%
- Are there problems with level basins?
**Furrows**

- **Furrow size**
  - deeper furrows used for row crops
  - small, shallow furrows (corrugations) used for?
- **Furrow lengths**
  - what is wrong with excessively long furrows?
- **Furrow flow rate**
  \[ Q = \frac{10}{S} \]
• Furrow slopes
  – When are zero furrow slopes a good practice?
• Efficiencies in the range of 40 to 60 %, why?
• Advantages?
What is the maximum recommended furrow flow rate for a 1% slope?
What is the maximum recommended furrow slope for erodible soils near Tucson, Arizona?

What is the maximum recommended furrow slope for less erodible soils in the same area?
Surge irrigation

- Surge systems
- Reasons
- Efficiencies: near 80%
Hydraulics of furrow irrigation

- size of stream
- rate of advance
- length of run and time involved
- depth of flow
- infiltration rate
- slope of land surface
- surface roughness
- erosion hazard
- shape of flow channel
- depth of water applied
- fluid characteristics (temperature)
Evaluation of existing systems

- Soil water penetration
- Water measurement
- Soil water content measurement
- Advance and recession measurement
- Infiltration measurement
Evaluation of Existing Systems

- Soil-water penetration
  - procedure
  - advantages
    -
    -
    -
  - disadvantages
    -
    -
    -
Evaluation of Existing Systems

- Water measurement
  - procedure
  - advantages
  - disadvantages
Evaluation of Existing Systems

- Soil-water content measurement
  - procedure
  - advantages
    -
    -
    -
  - disadvantages
    -
    -
    -
Evaluation of Existing Systems

• Advance and recession measurement
  – procedure
  – advantages
    •
    •
    •
  – disadvantages
    •
    •
    •
Evaluation of Existing Systems

- Infiltration measurement
  - procedure
  - advantages
    
  - disadvantages
    

True or False

- Surface Irrigation is less uniform than sprinkler or drip irrigation?
- Drip irrigation is better for plants.