Water Sources for Irrigation

- Quantity needs
- Quality factors
- Surface water sources
- Groundwater sources
- Surface and groundwater combinations
- Certified well drillers and well code
- Conflict and competition for water

Quantity needed

- Irrigation water replaces the plant water use
- Water use is directly correlated to light interception
- 50% light interception results in 50% of the maximum water use
- Maximum water use mid-July early August, full light interception, highest temperatures and brightest days.

Quantity Needed

- Maximum water use for most crops is .27 - .32 in./day
- 3 gal/minute/acre pump capacity = 1”/week
- 5 gal/minute/acre pump capacity = .25 in./day
- 7 gal/minute/acre pump capacity =.33 in./day, 1”every 3 days
- 500 gal/minute pump can provide 1” every 4 days on 100 acres

Quantity Needed

In a hot 1st week August John's corn crop ET. was .30 in./day
John's field has a AWC of 3.0 in.

He started irrigating when the AWC was 1.0 in down

John's irrigation system can apply .20 in./day.

By the end of the week how far behind is John? (.30 -.20)x7=.70 in.

During 2nd week of August, ET. remains .30 in./day, John shuts down 2 day for repair. By week end how far behind is John?
(.7+.6)= 1.3in. 2.0 in. total

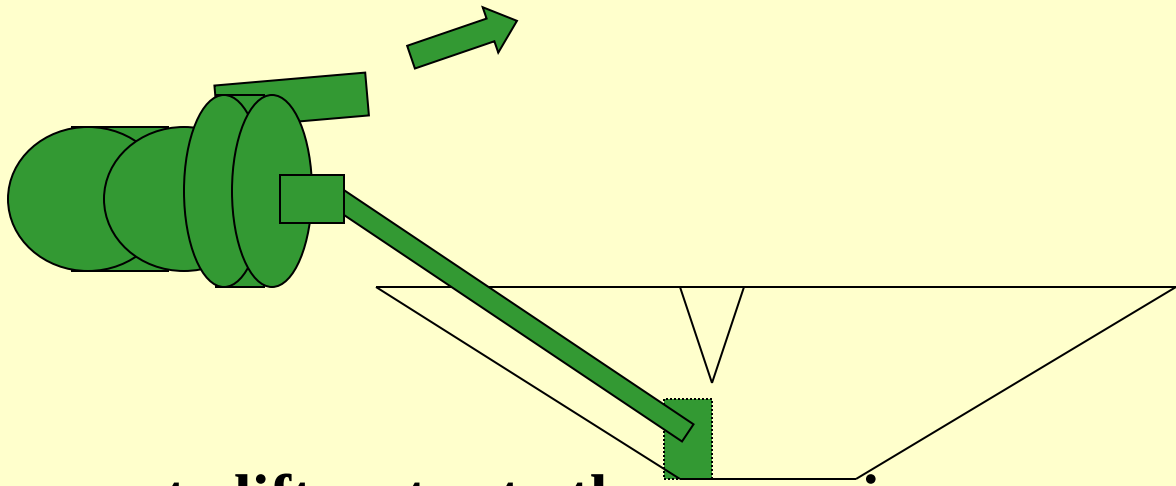
3rd. Week, no rain, Johns corn field is hurting.

Quality Factors

- Foreign material – clogs pumps, screen and nozzles-sand, algae, aquatic plants and fish/frogs
- Salt – salinity
- Calcium – and other elements that deposit in pipes
- Disease agents – waste treatment plants-warm water
- Aquatic weed treatment-lake algae milfoil treatment

Surface Water Sources

- Lakes
- Rivers
- Streams
- Drainage ditches
- Private ponds



Surface pump creates vacuum to lift water to the pump, issues:

- Plugged inlet- screens, rotary screens and wash systems, aquatic weed control
- Loss of vacuum, creates a vortex, maintain > 3’ of water over inlet, water guides/flow diverters

Solid pump base needed < 8’ from water surface for standard pump

Surface Water Sources

- Lakes
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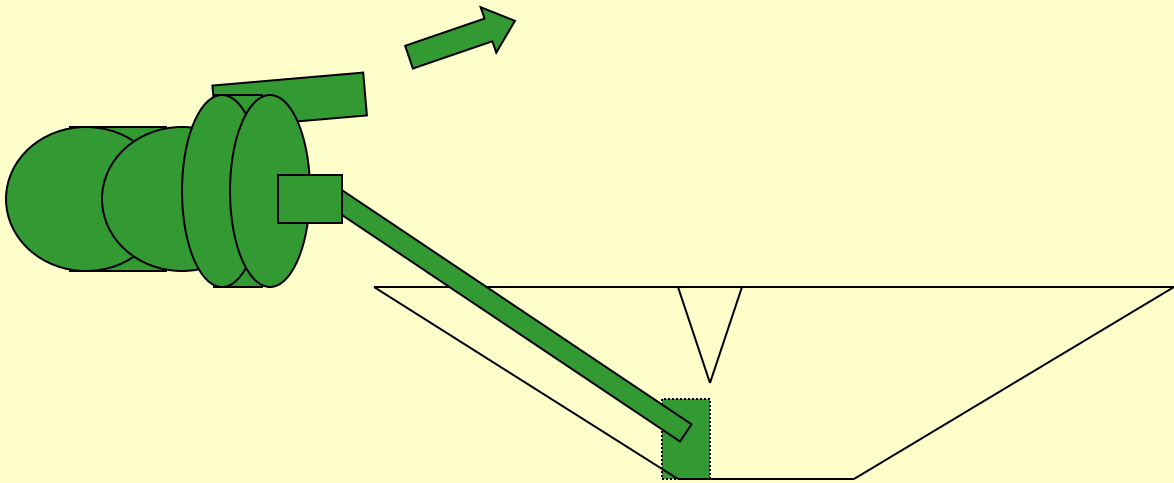
- Drainage ditches
- Private ponds



Surface water quality issues:

- Consider outlets from municipal treatment plants and other contamination sources
- Consider plant disease potential, warm or contaminated water
- Economics ---location is often not centered to water use

Surface Water Sources

- Lakes
- Rivers
- Streams
- Drainage ditches
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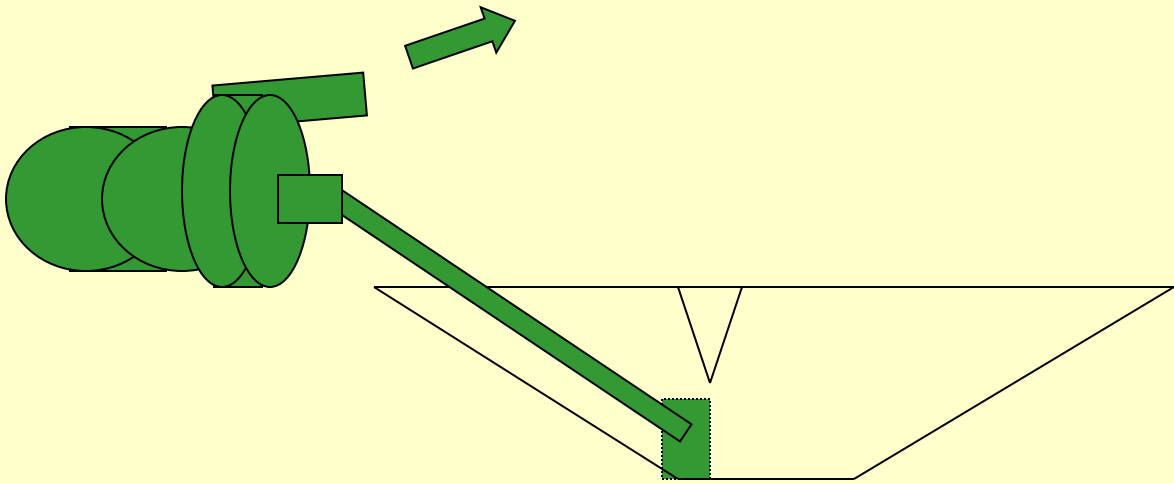


Advantages:

- Inexpensive: $5-8,000 for pump inlet and vacuum pump
- Investment “$$$”is more flexible in the future. “I can move the location.”
- Low pumping cost, lift is minimal

Surface Water Sources

See handout "Guide to Permits"

- Lakes
- Rivers
- Streams
- Public drain meeting the definition of a stream

"Public -Waters of the State"

1. Use is limited to the amount that does not negatively effect other riparian users.
2. Old English common law
3. Limited to land units that are riparian, adjacent to water.
4. Legally cannot interfere with others travel on the water.

Surface Water Sources

- Private ponds “ non-contiguous waters”
- Ditches

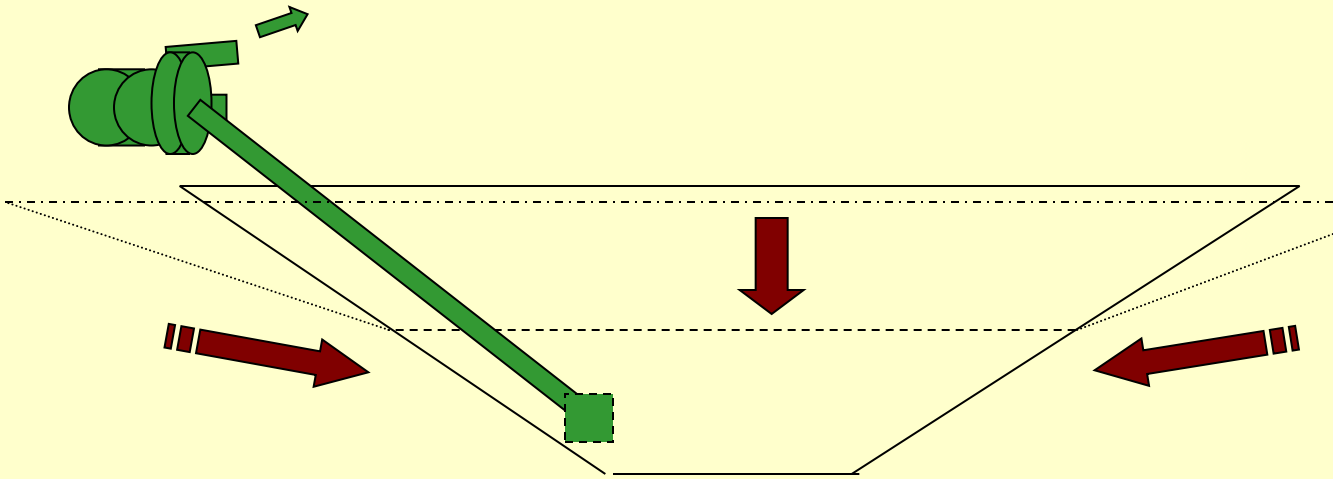
Not considered “Public - Waters of the State”

1. In most areas, use is limited only by your ability to pull the water
2. Common to have local conflict, legal gray area.
3. Structure and impediments to flow are regulated by drain commissioner on public drains (sediment).

Surface Water Sources

Ponds

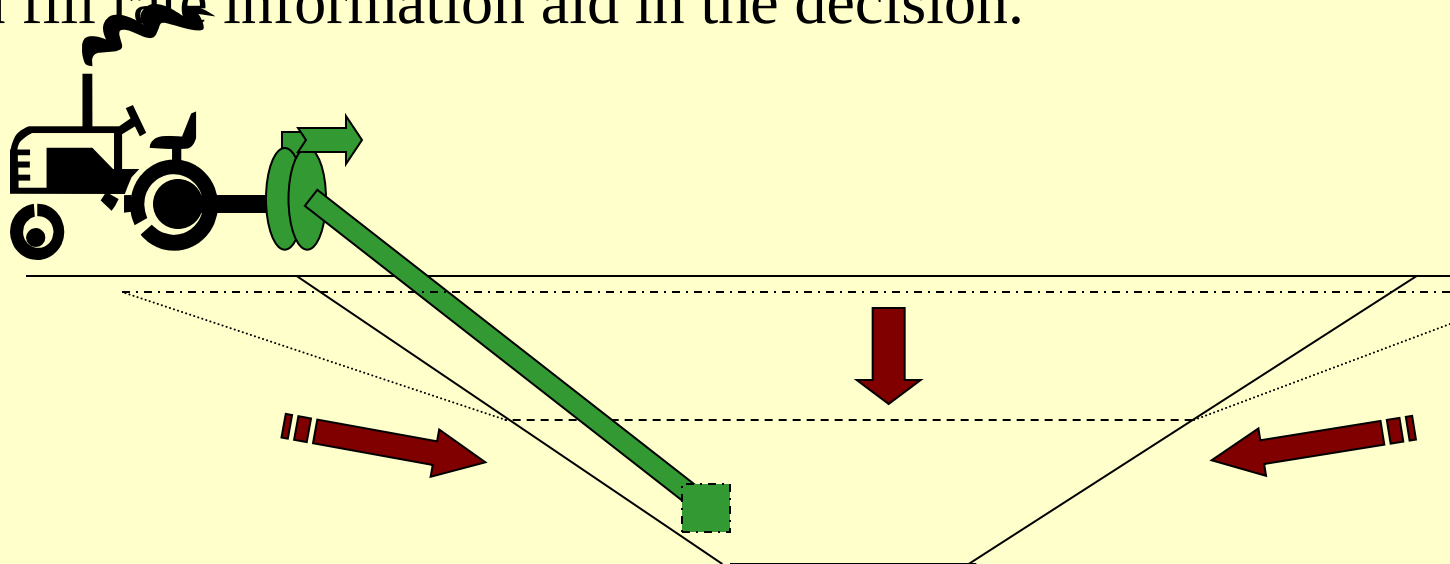
- Recharge capacity far more important than volume
- Volume indicates storage capacity allowing pumping rate higher than recharge
- Many natural ponds will have slow recharge



Surface Water Sources

Ponds- testing

- Pump test pond early in August, during a dry summer for 24 hrs or until intake problem arises - monitor time it took for level to recover.
- Recovery < 12 hours best, expect some draw down 8-12”
- Local NRCS office often has design services or information
- Perspective pond site best evaluated by local excavator with irrigation pond experience
- Test hole and fill rate information aid in the decision.



Surface Water Sources

Ditches

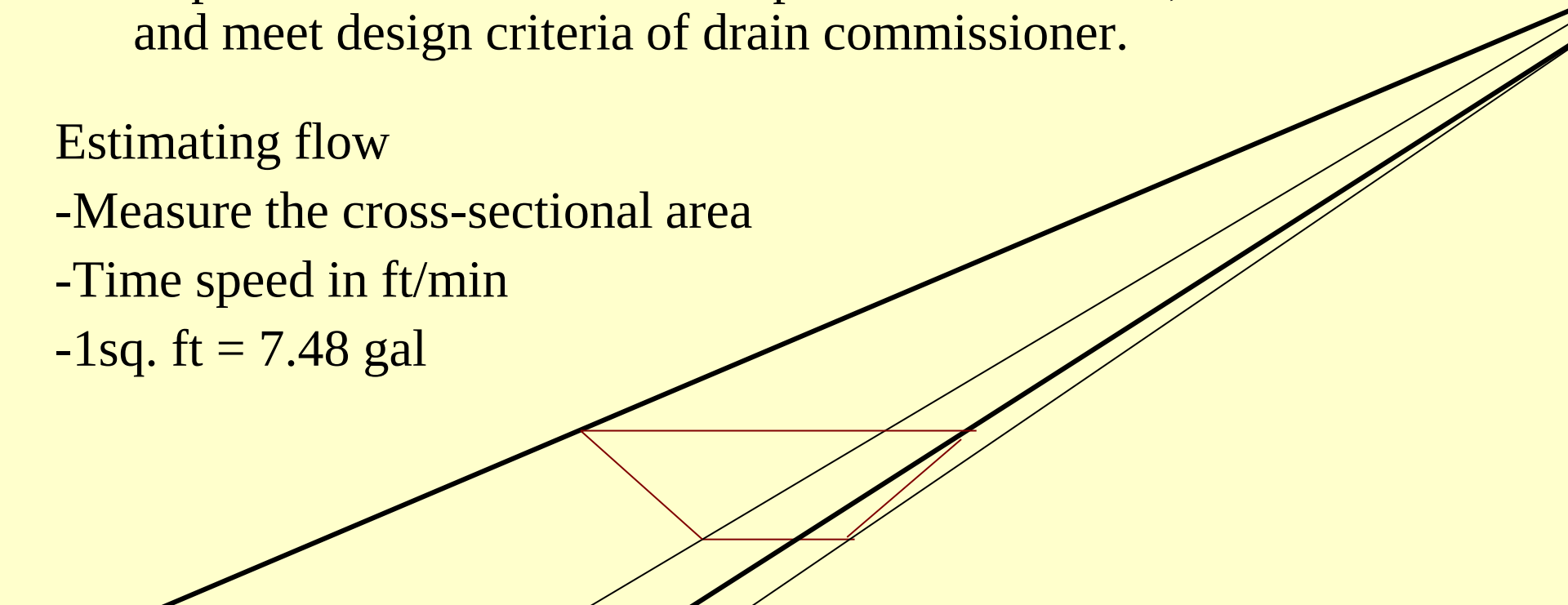
1. Monitor and estimate flow in August of a dry year
2. Flow should be > 3 times the needed pump capacity or an impoundment is needed
3. Impoundments need to have a protected overflow, and meet design criteria of drain commissioner.

Estimating flow

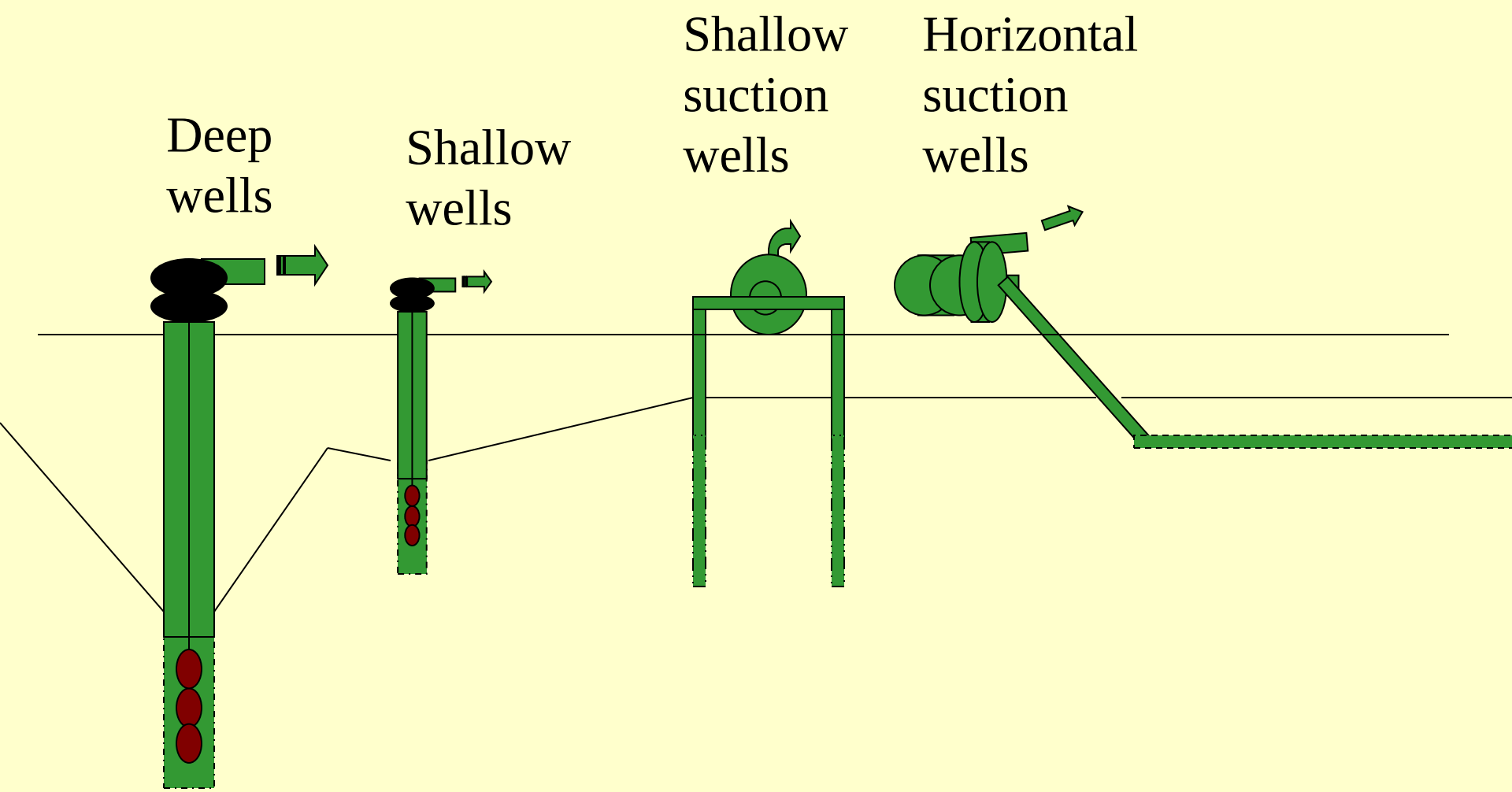
-Measure the cross-sectional area

-Time speed in ft/min

-1sq. ft = 7.48 gal

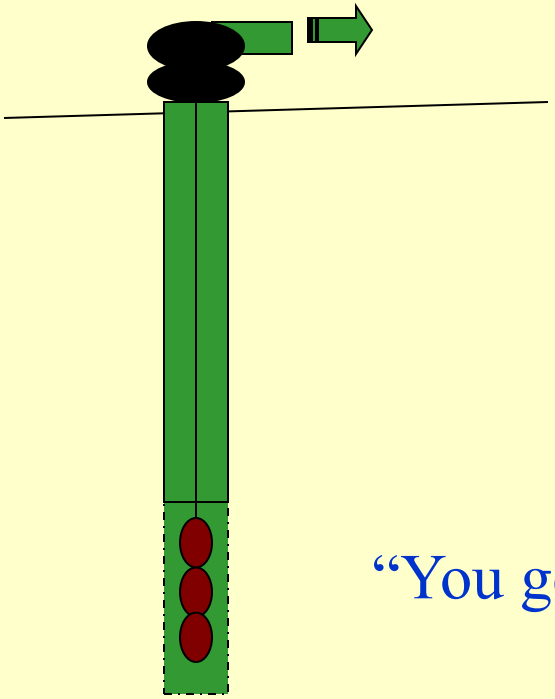


Groundwater Sources



Groundwater

Deep wells



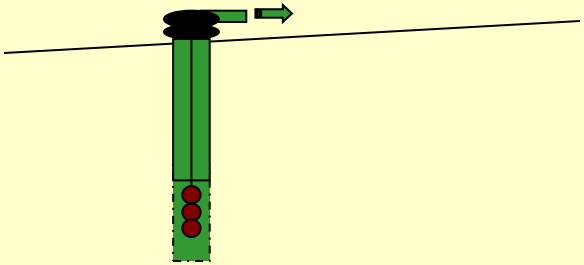
- Size-4,5,6,8 and 12”
- Depth- 20’ plus screen to 200’+
- Screens- stainless and plastic
- Pumps-shaft and turbine or submersible
- Flow 25 to 1600 gal/min
- Gravel pack or developed
- Cost $2,000 –70,000

-Test wells
-Monitoring wells
-Hydrology studies
-Screen matched to test hole samples

“You get what you pay for” and “ Risk Management

Groundwater sources

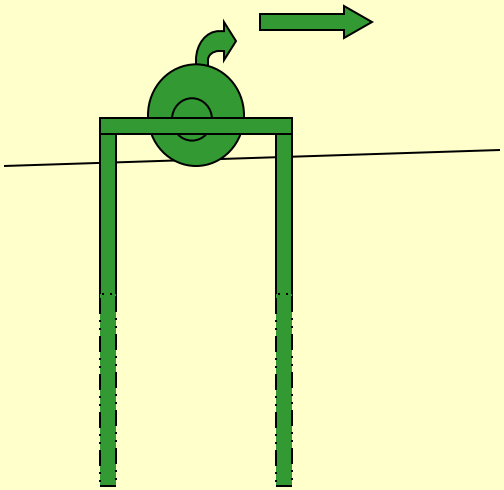
Shallow wells



- Size-4,5,6,8 and 12”
- Depth- 20’ plus screen to 40’
- Screens- stainless and plastic
- Pumps-shaft and turbine or submersible
- Flow 25 to 800 gal/min
- Developed
- Cost $2,000 –20,000

Groundwater sources

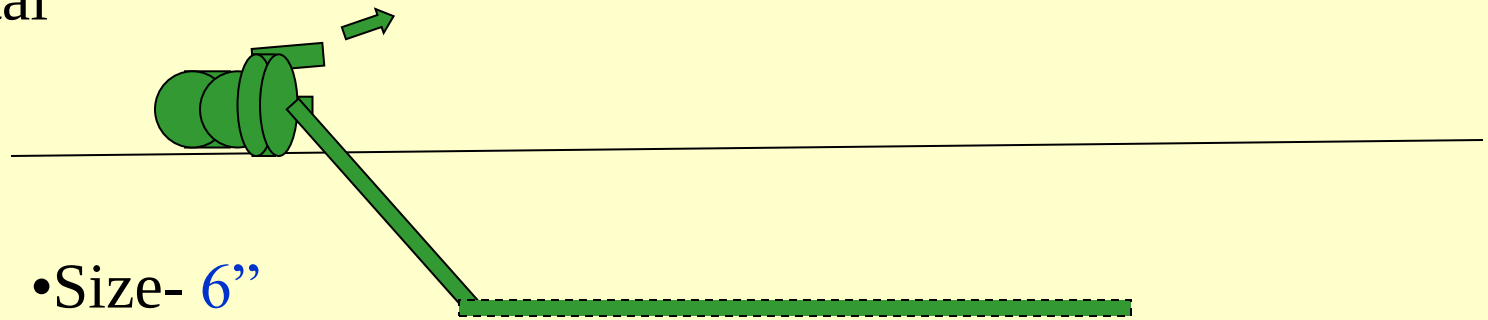
Shallow suction wells



- Size-4”,5”& 6”
- 1 2 or 3 wells tied together
- Depth- 20’ plus screen to 30- 40’
- Screens- stainless and plastic
- Pump-vacuum pump
- Flow 25 to 600 gal/min 150-200 per well
- Developed
- Cost $2,000 –20,000

Groundwater sources

Horizontal suction wells



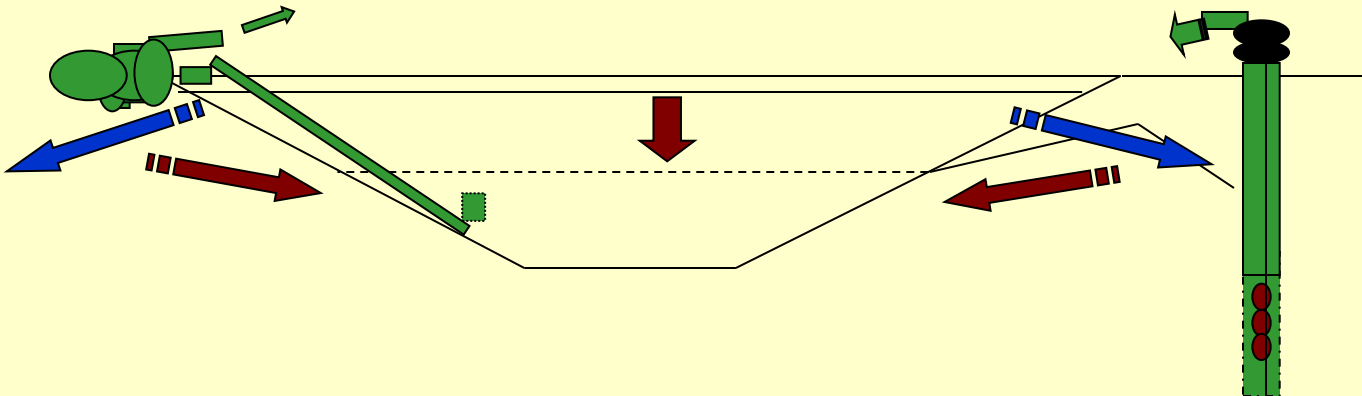
- Size- 6”
- 1or 2 tile with sock tied together
- Depth- 12-20’
- Screen- synthetic sock over perforated tile
- Pump-vacuum pump.
  -high vacuum pressures for high capacity
- Flow 200 to 600 gal/min
- Developed
- Cost $2,000 –20,000

Surface and Groundwater Combinations

- Pumping small well into pond as a reservoir
- Allows a smaller pump, pumping continuously to store water for larger pump to pump for shorter time
- Very inefficient

  -Requires pumping water twice

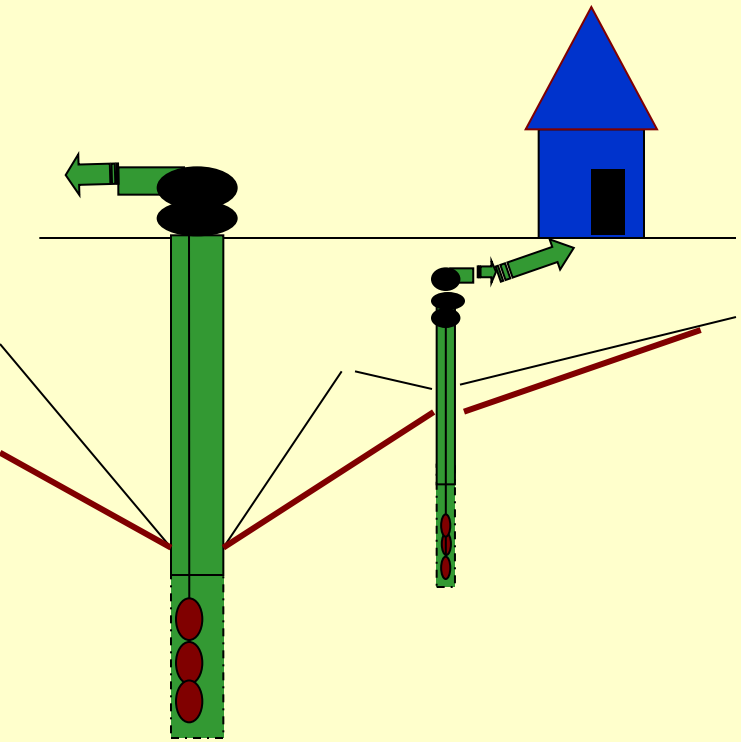
  -Ponds are very leaky reservoirs



Certified Well Drillers and Well Code

- Certified well drillers following the well code may construct fells and file well logs without inspection by the state.
- A list of certified well drillers are available at: http://www.deq.state.mi.us/documents/deq-dwrpd-gws-wcu-Reg-Contractors-By-County.pdf
- A copy of the well construction code is available at: http://www.michigan.gov/deq/0,1607,7-135-3313_3675_3694-9194--,00.html

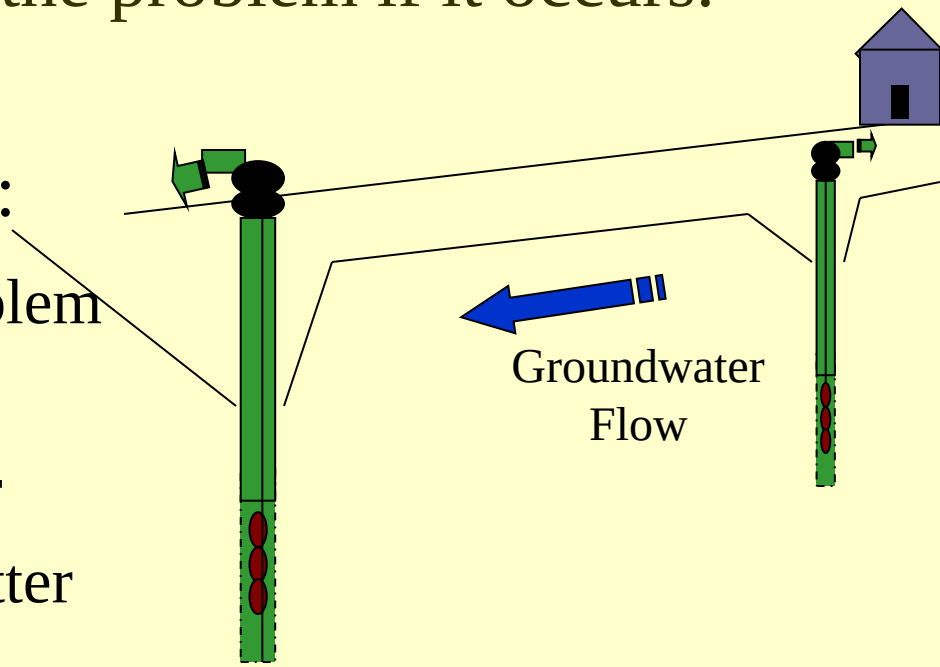
Conflict and Competition for Water



- Each well creates a cone of depression
- The irrigation well's cone of depression may interfere with other wells
- Investigate neighboring wells:

- depths - deeper less potential problem
- distance - further away the better
- groundwater flow, up hill is better

Identify the neighbor you may affect and lay out a plan of action to remedial the problem if it occurs.



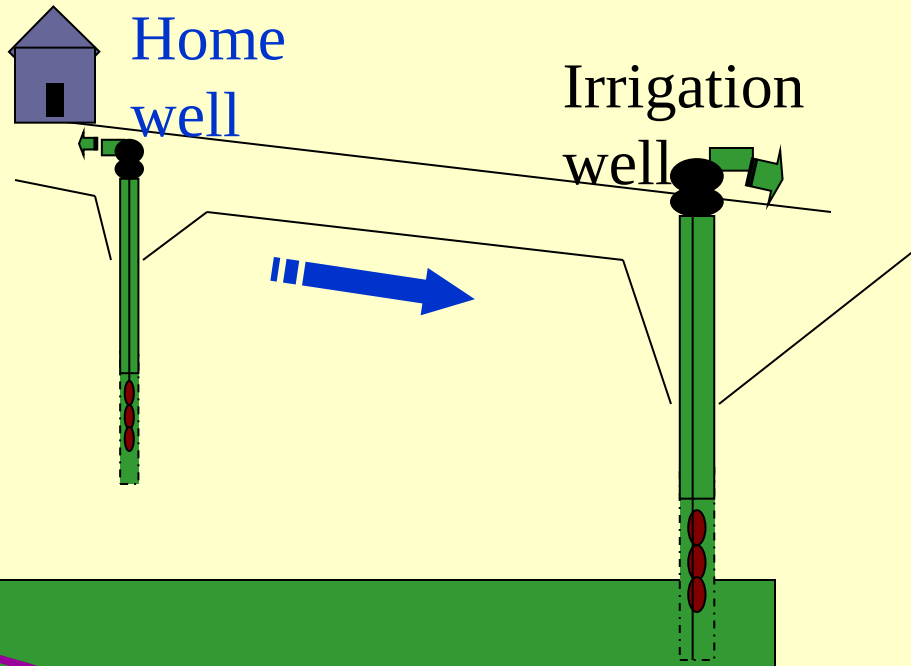
- Investigate neighboring wells:
  - -depths - deeper less potential problem
  - -distance - further away the better
  - -Groundwater flow-up hill is better
  - -Depth into aquifer - deeper the better

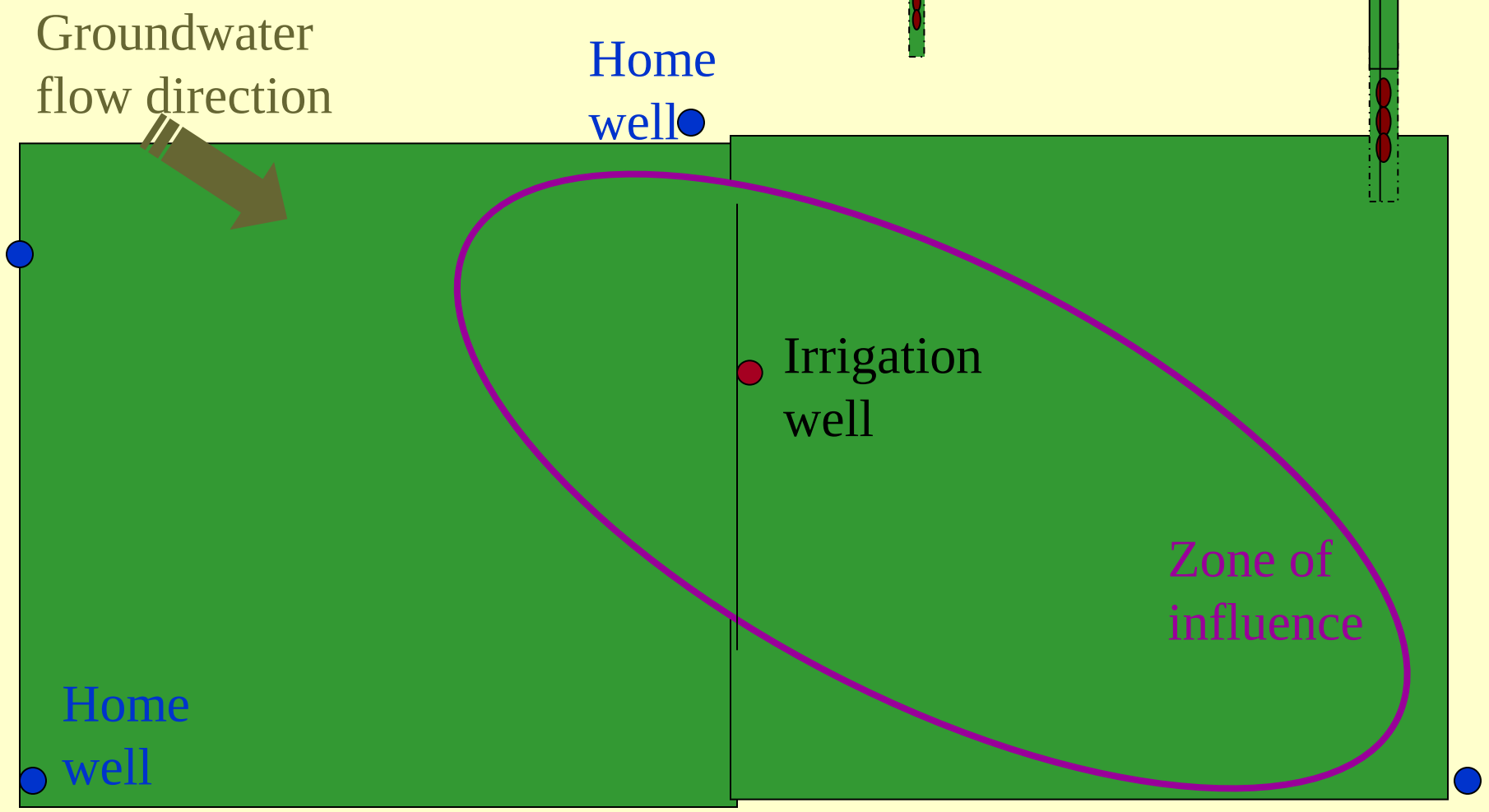
You can get scanned well logs off of the internet (1999 and older) by township and section #at: www.deq.state.mi.us/well-logs

Well logs that are 2000 and newer are available on WELLOGIC at:

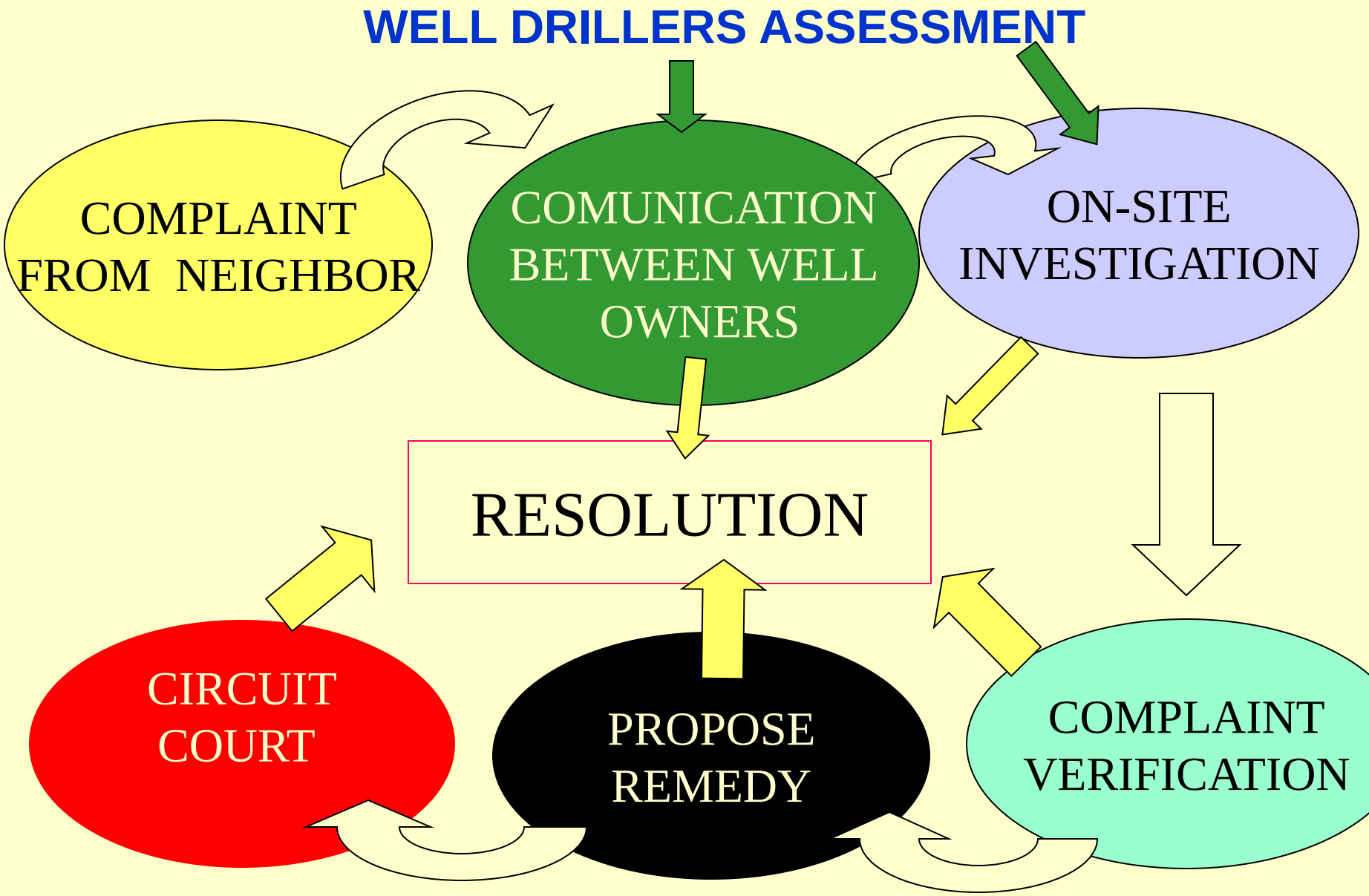
- http://dwrp.deq.state.mi.us/wellogic
- You need a username and password for wellogic, follow on screen instructions (available to licensed well driller)

Does your well affect neighbors?

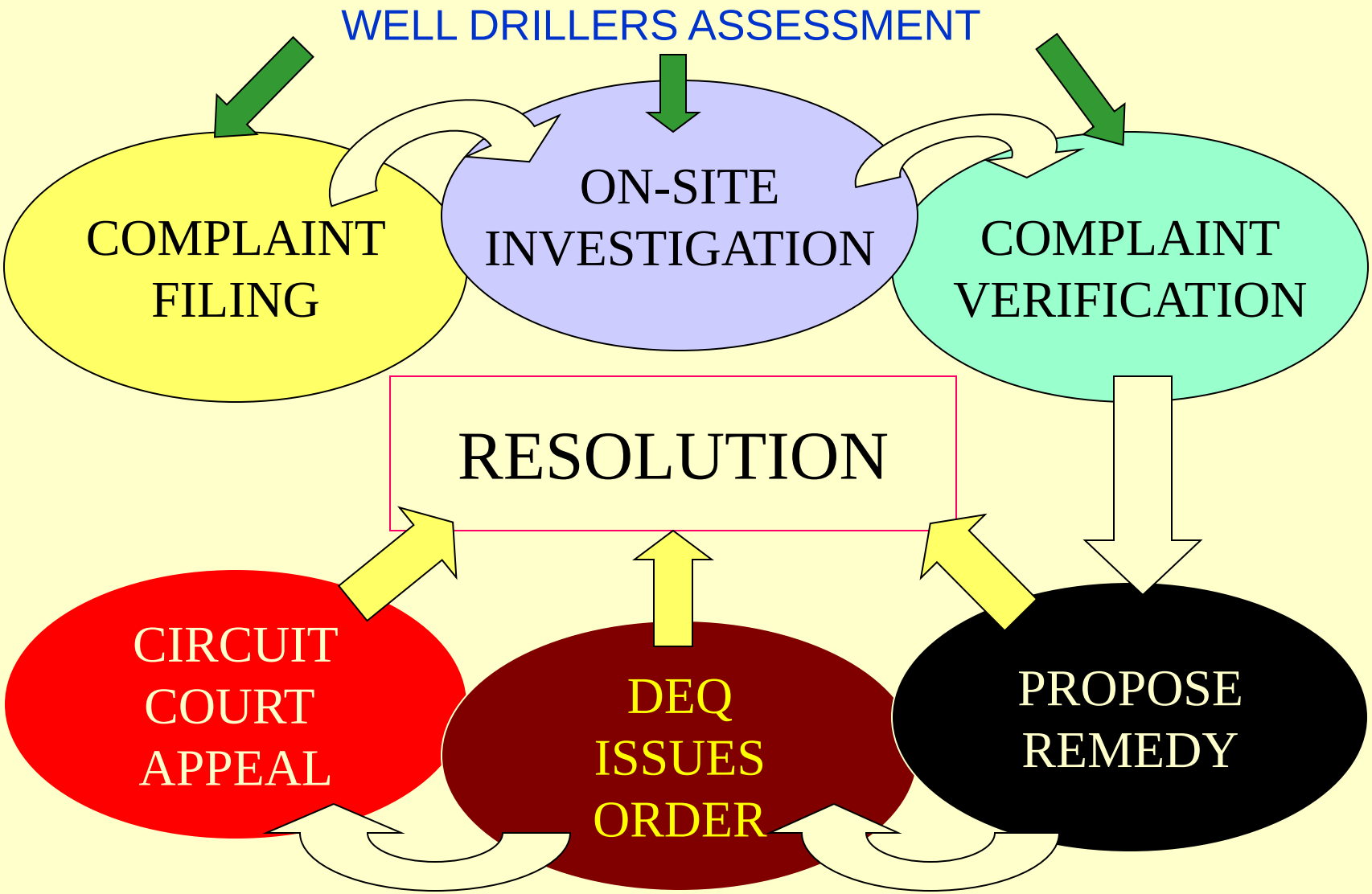




Ground Water Dispute Resolution Prior to PA. 177



GW DISPUTE RESOLUTION PROCESS: PA. 177



PROACTIVE GROUNDWATER DISPUTE RESOLUTION