

2.7 million people
660 L per Day per Person
\$1 per 1000 Liters



© 2008 Europa Technologies

Image © 2008 New York GIS

Streaming ||||| 100%

© 2007 Google™

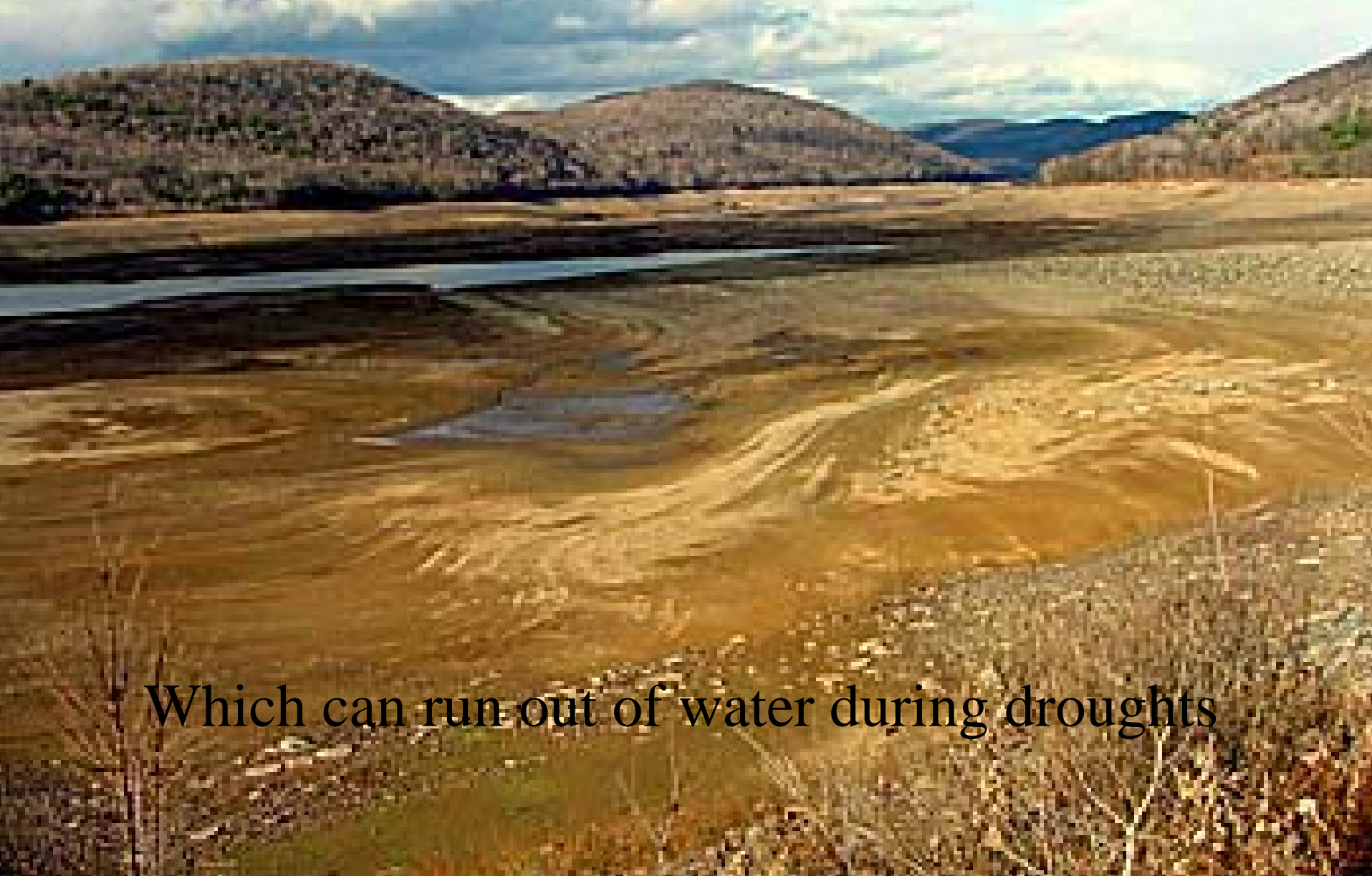
Pointer 40°51'42.57" N 73°21'50.16" W

Eye all 747 ft



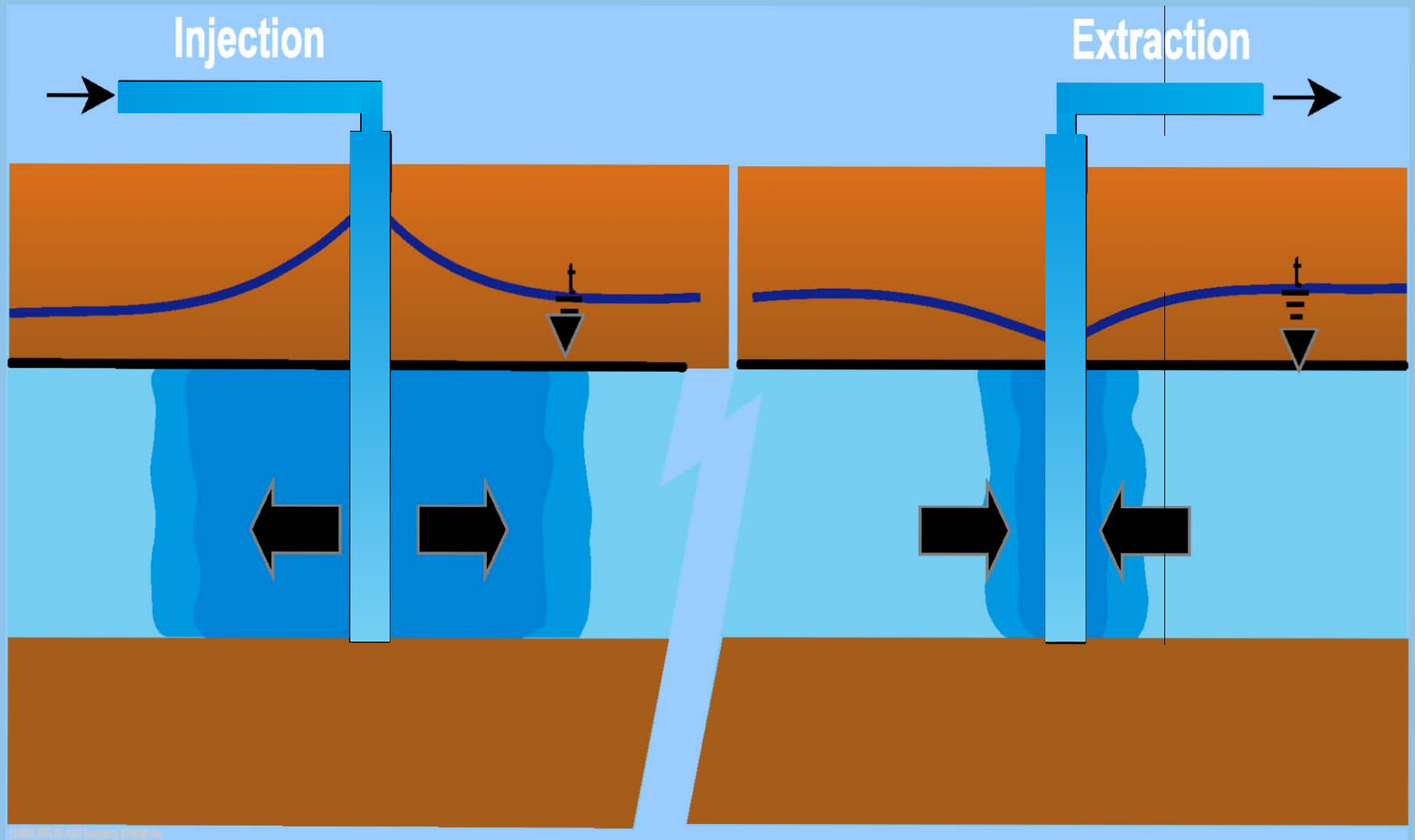
From: http://newsdesk.si.edu/photos/sites_earth_from_space.htm

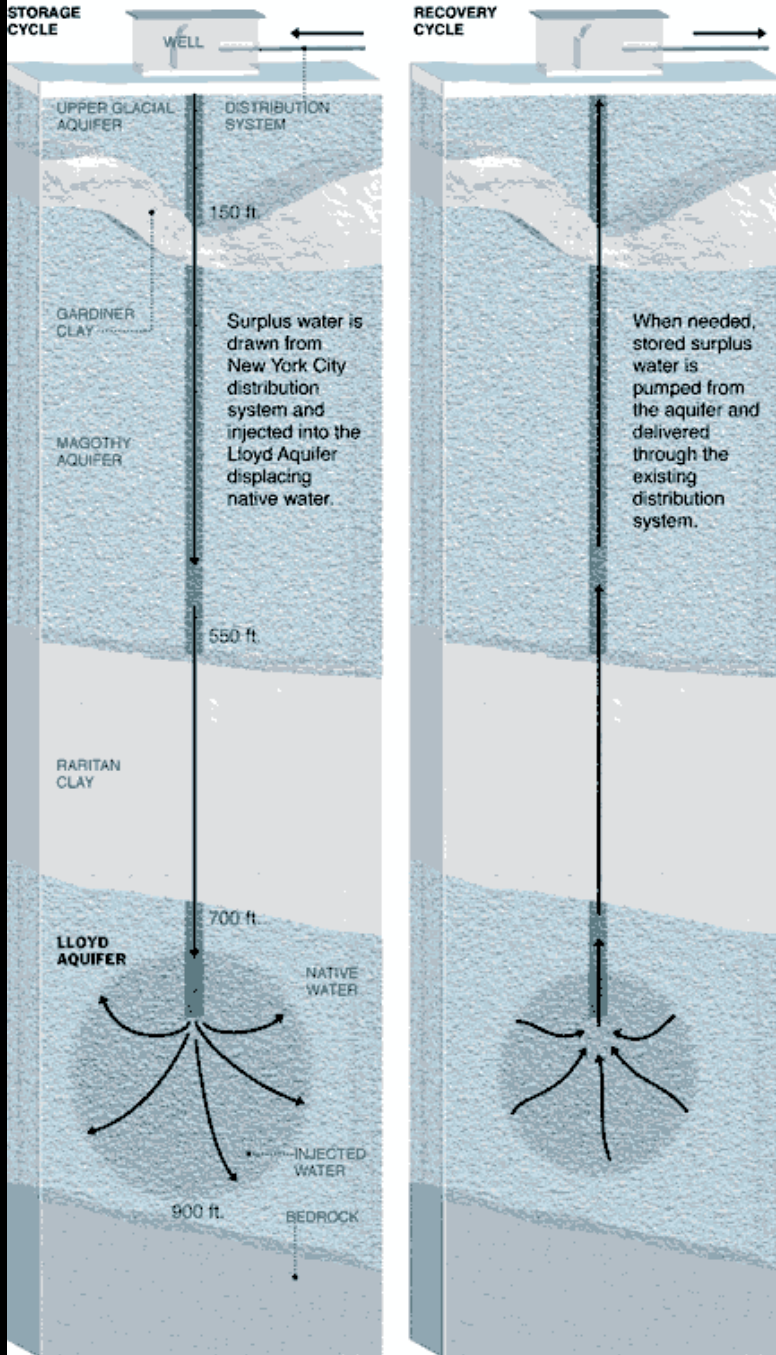
**New York City gets its drinking water
from open reservoirs upstate**



Which can run out of water during droughts

Aquifer Storage & Recovery "ASR"





Requirement
Confined aquifer

Advantages

No land lost

Protect quality

No evaporation

Avoid surface water pests

Cost

\$700,000,000



From
http://www.dep.state.fl.us/geology/geologictopics/asr4/presentations/thursday_15/ron_reese_agwt04.ppt#445,25, SunriseSpringtree ASR-1

Modified from:

http://www.dep.state.fl.us/geology/geologictopics/asr4/presentations/thursday_15/petekwiatkowski.ppt#412,20, Geochemical Reactions



Surficial Aquifer System

Hawthorn Group (Confining Layer)

POSSIBLE REACTIONS

- Dissolution of Aquifer
- Oxidation/Reduction
- Release of:
 - Trace Elements
 - Radionuclides
- Organic Carbon
- Ion-exchange
- Mercury methylation

Native Water

Mixing Zone



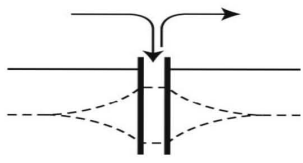
POSSIBLE REACTIONS

- Bio-fouling
- Suspended Solids
- Clogging

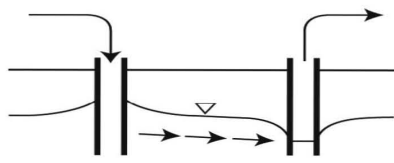
Mixing Zone

Floridan Aquifer

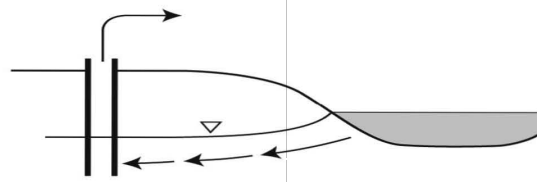
Native Water



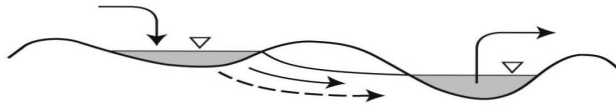
ASR



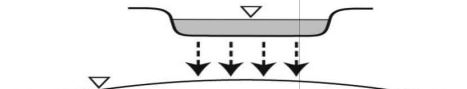
ASTR



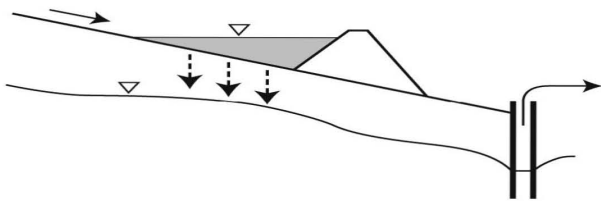
Bank Filtration



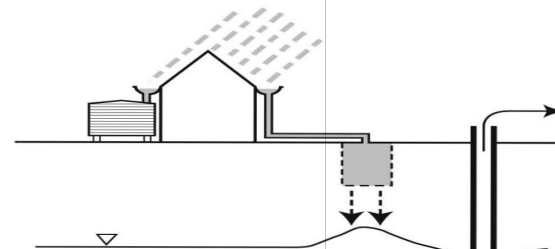
Dune Filtration



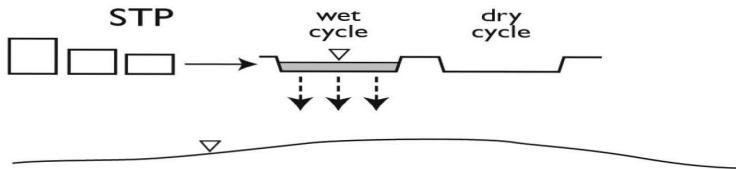
Infiltration Pond



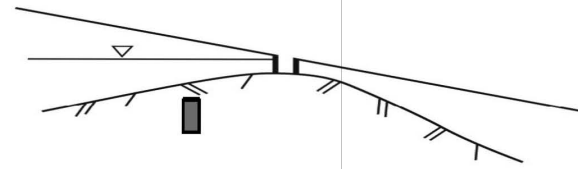
Percolation Tank



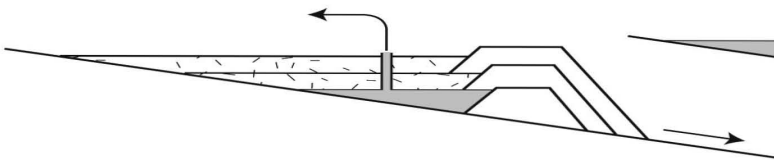
Rainwater Harvesting



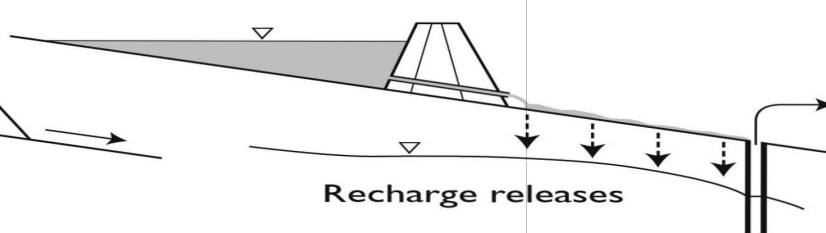
Soil Aquifer Treatment



Underground Dam

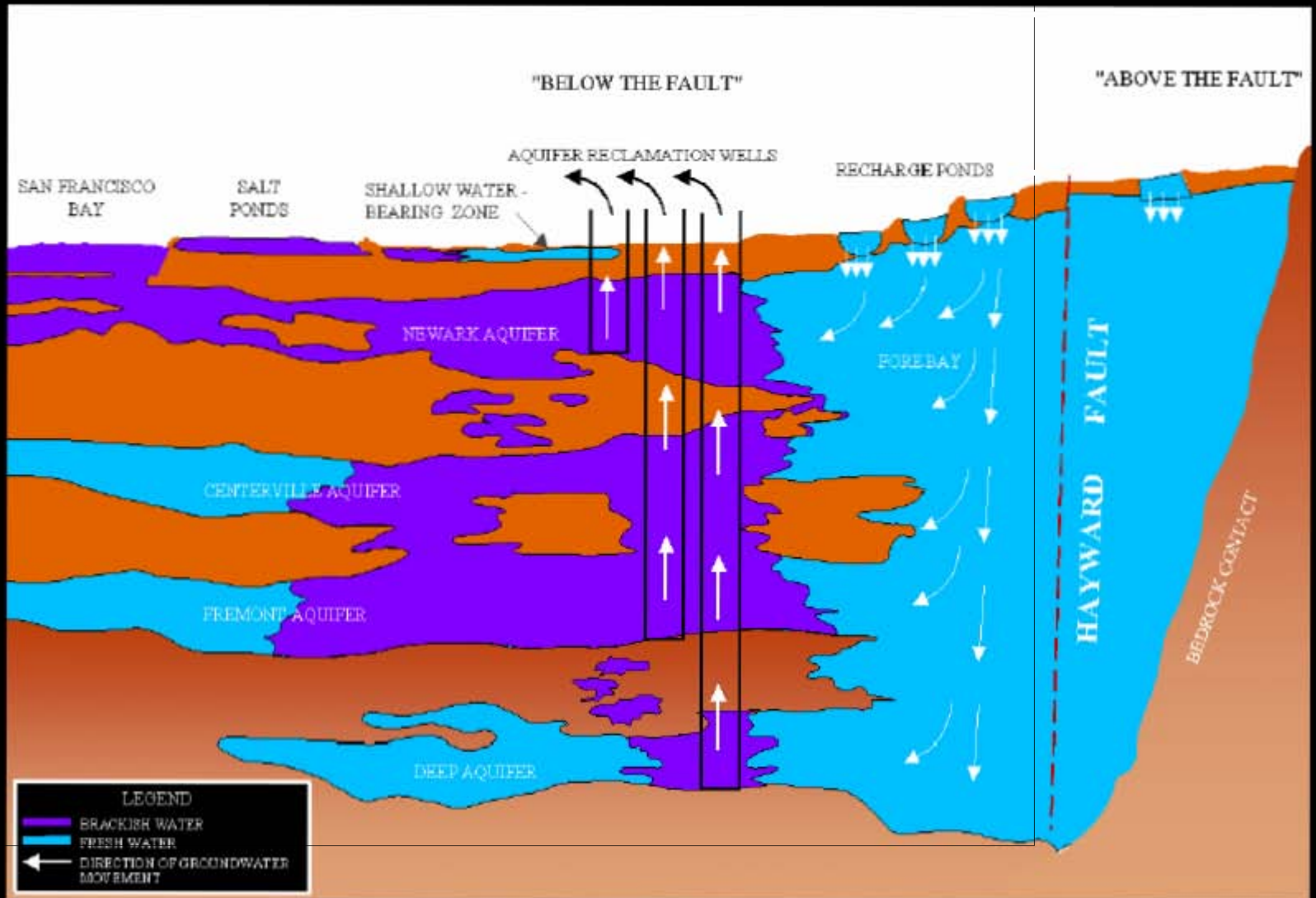


Sand dam

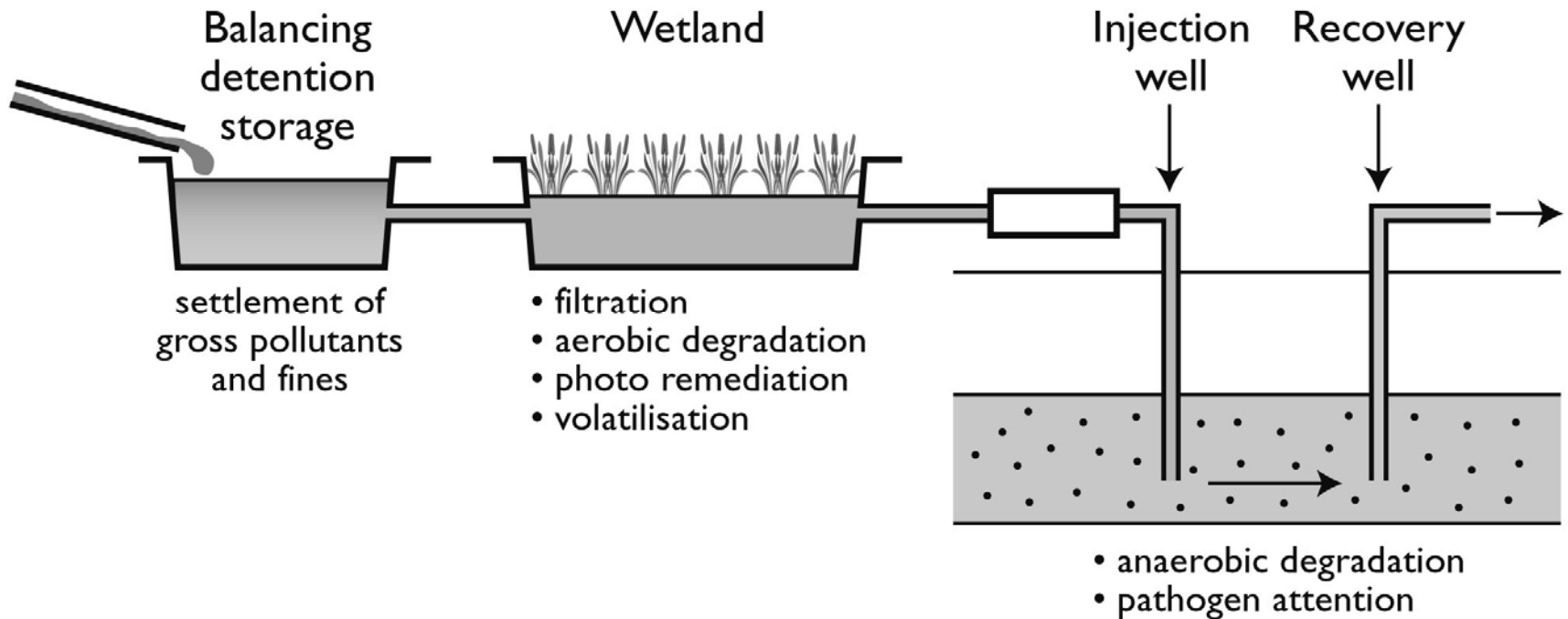


Recharge releases

California: Off-steam recharge basins

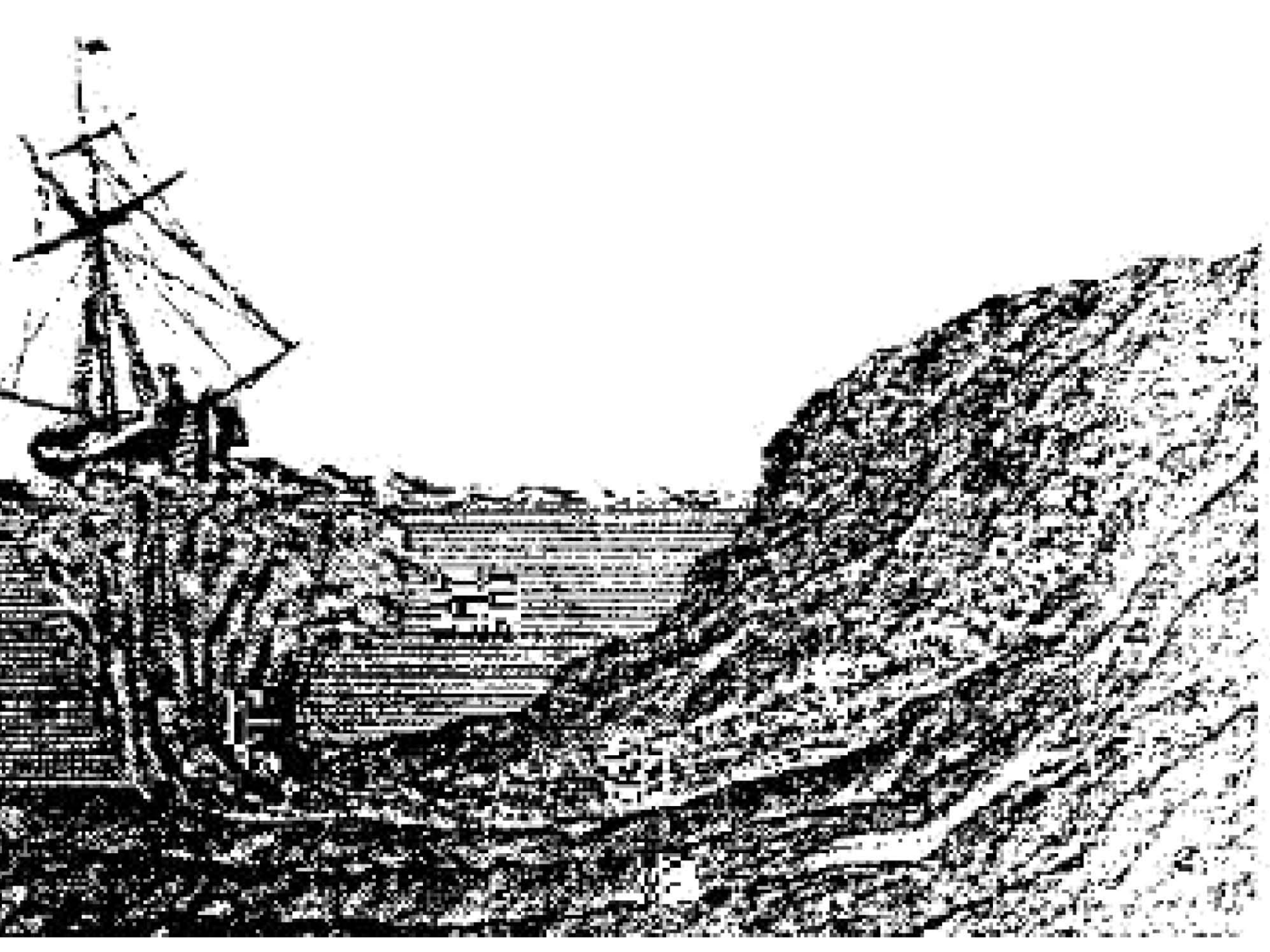


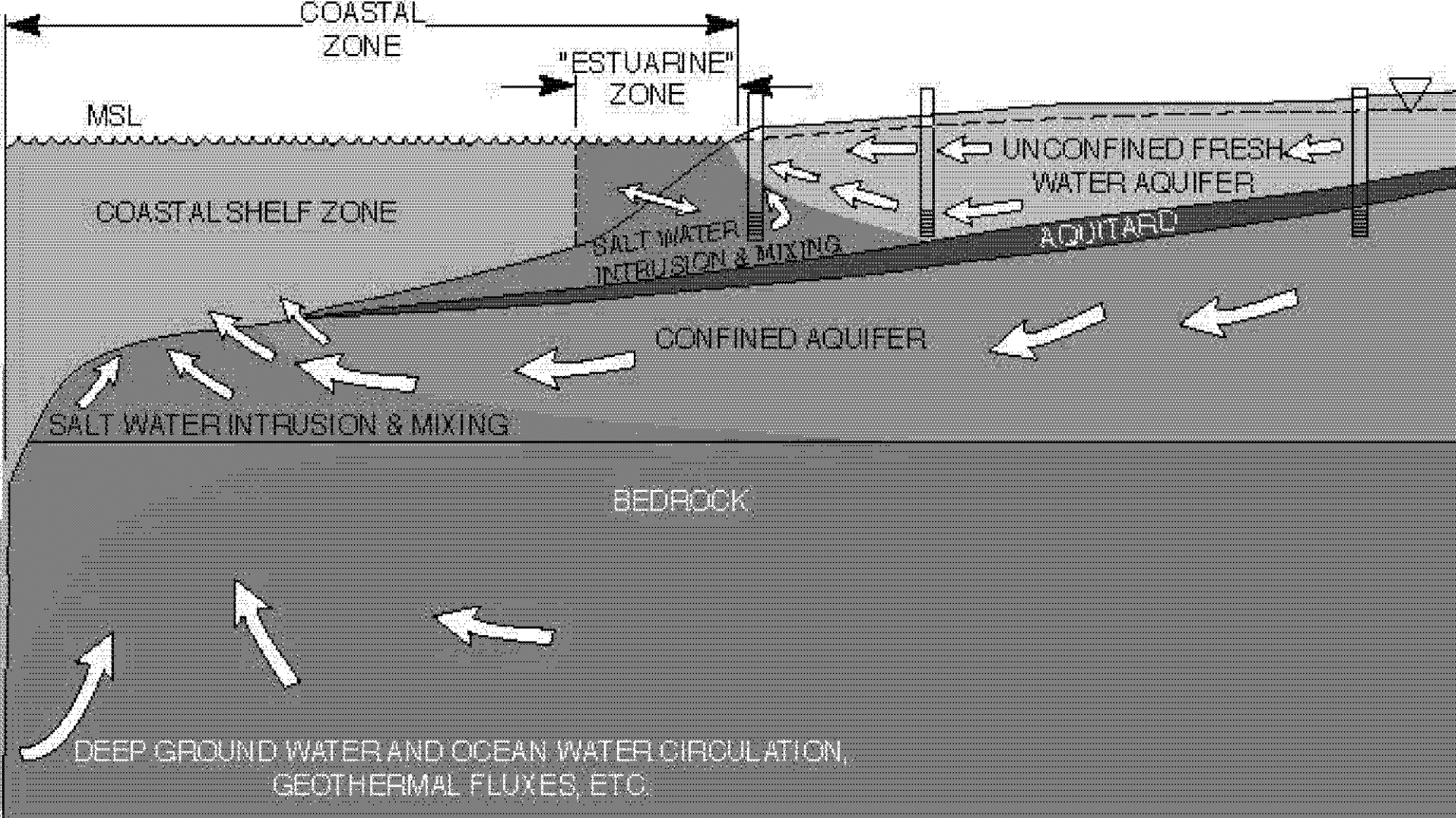
Wetland and ASTR Treatments are Complementary



From:

http://www.dep.state.fl.us/geology/geologictopics/asr4/presentations/thursday_15/dillon_agwt_asr_tampa_keynote.ppt#356,57, Slide 57





Amount of
precipitation

Seasonality

Higher demand

Longer growing
season

Salt water intrusion
due to sea level rise
and storm surges

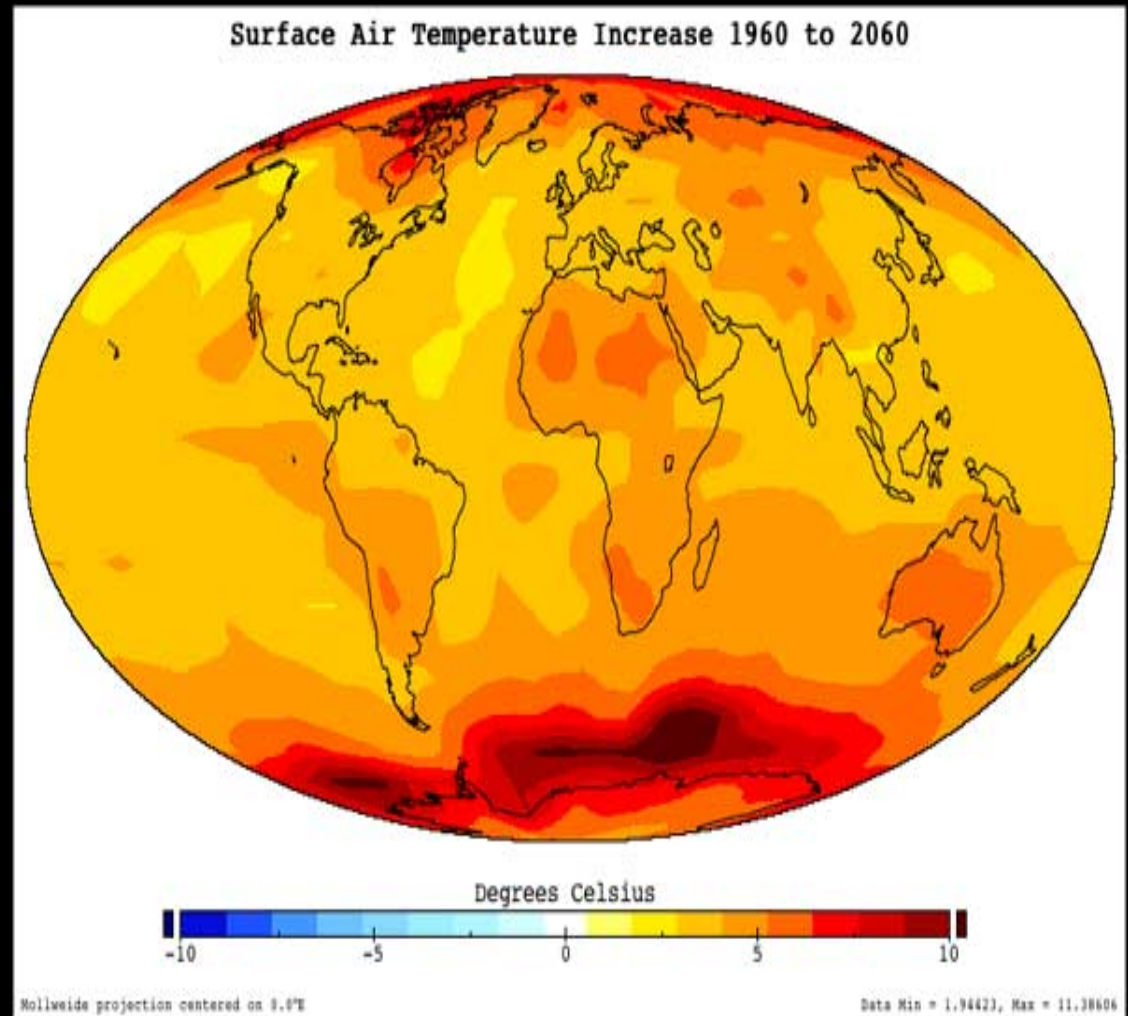


Figure from: http://www.nasa.gov/vision/earth/everydaylife/climate_class.html



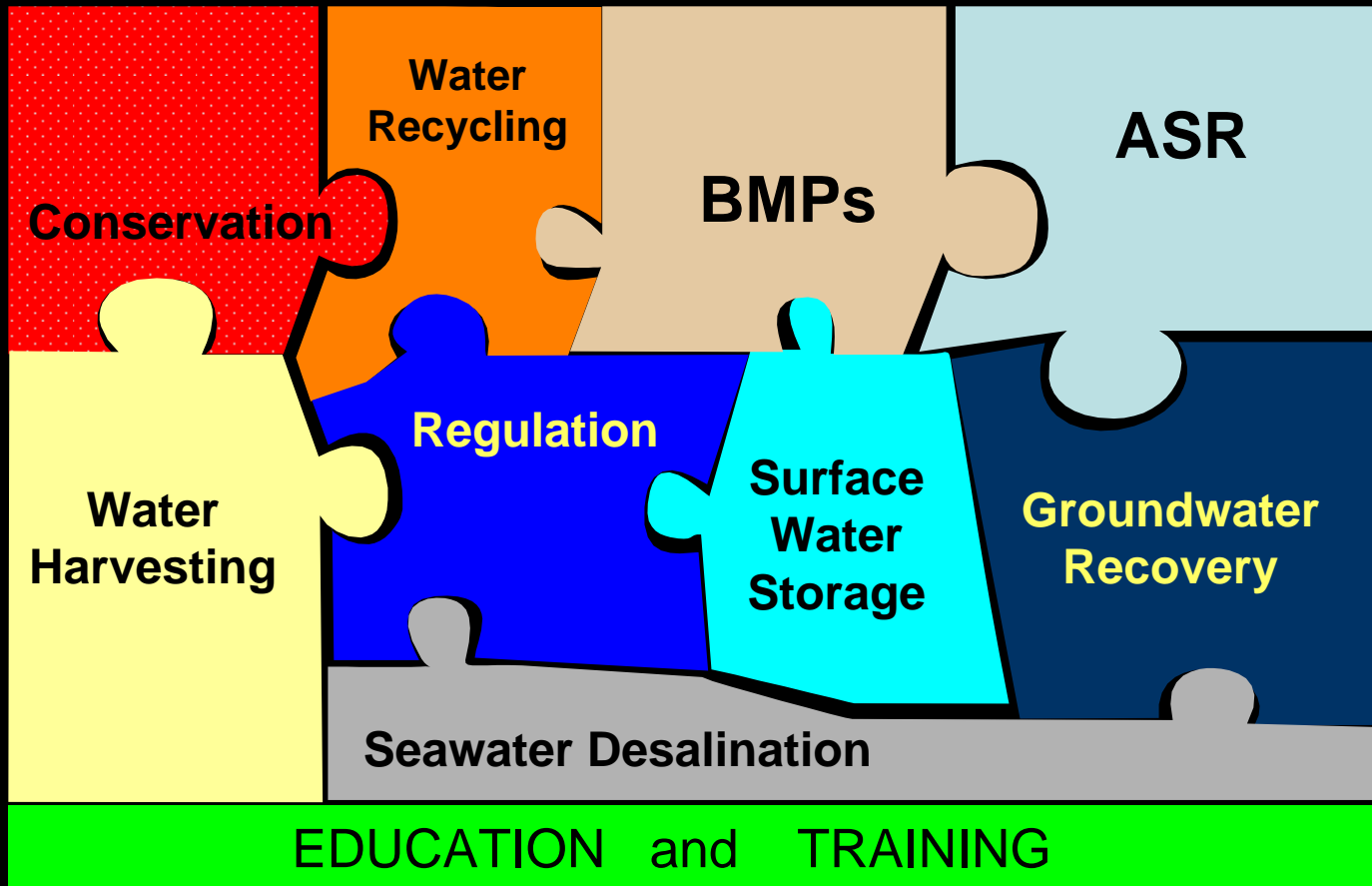
Barbados



Mallorca



Mauritius



Modified from:

http://www.dep.state.fl.us/geology/geologictopics/asr4/presentations/thursday_15/foreman_agwt4_15_04.ppt#1424,18,Slide 18