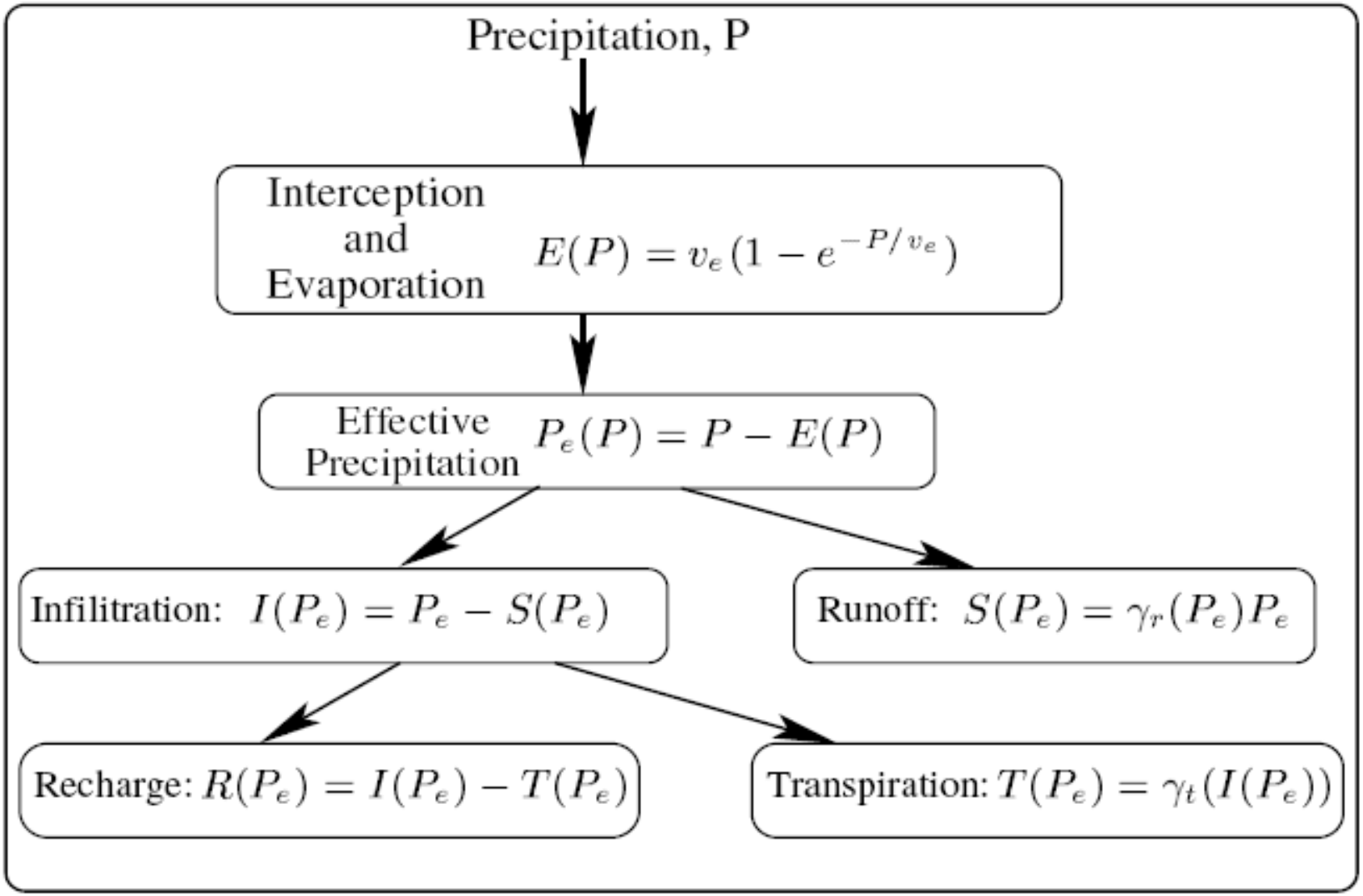
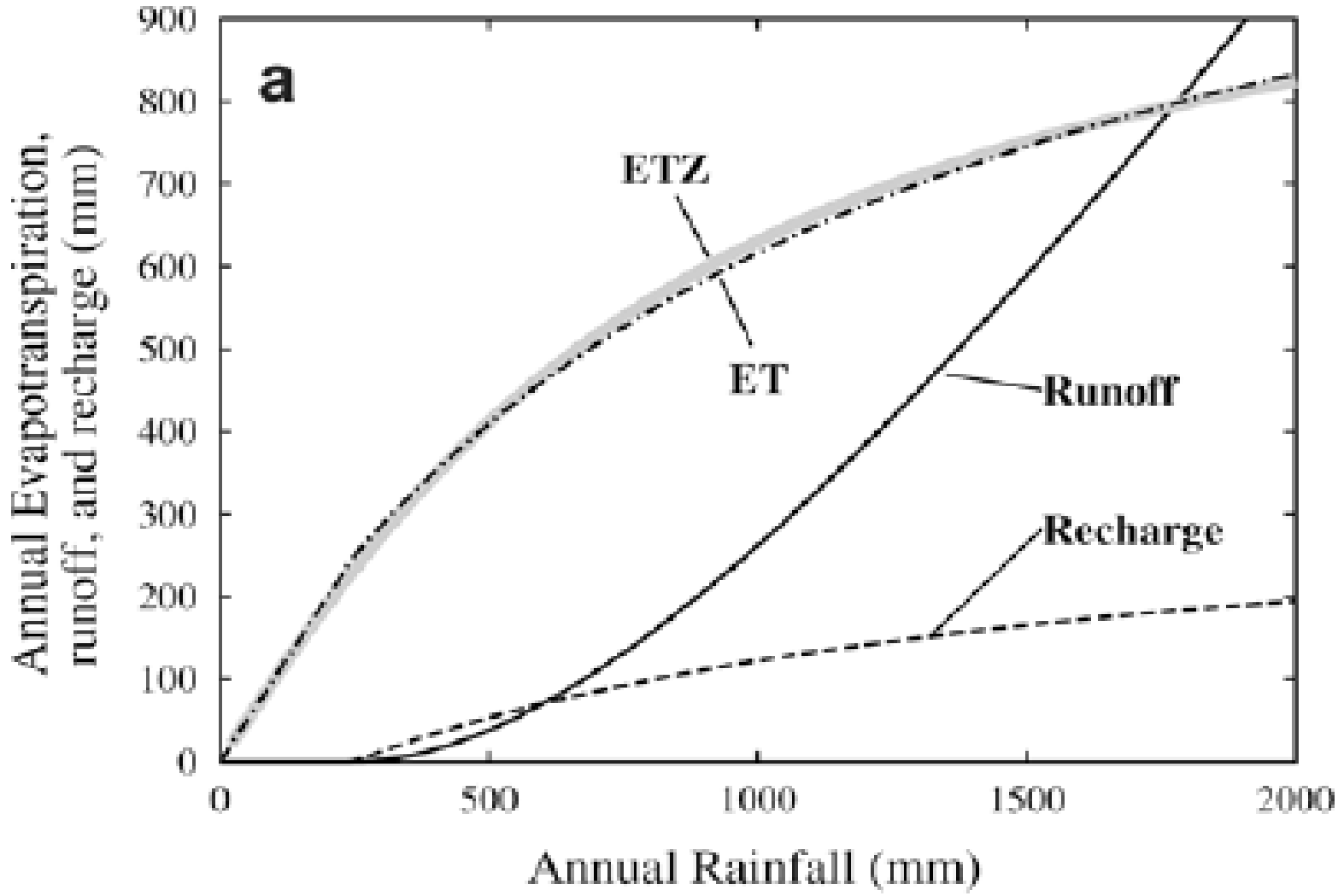
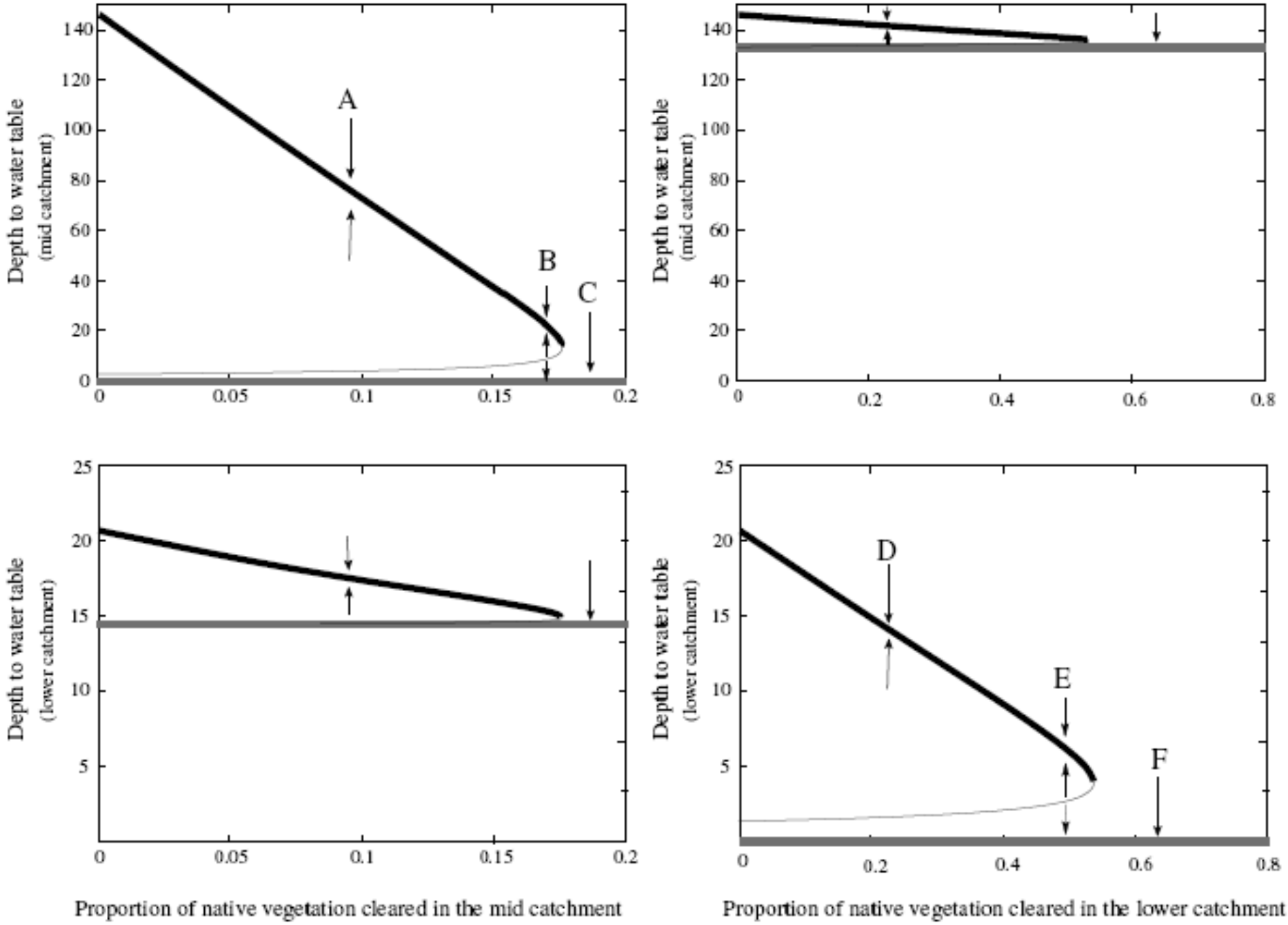
# Simple models for examining the Goulburn Broken options to climate change

- Presented by Brian Walker and Nick Abel
- using information prepared by Marty Anderies

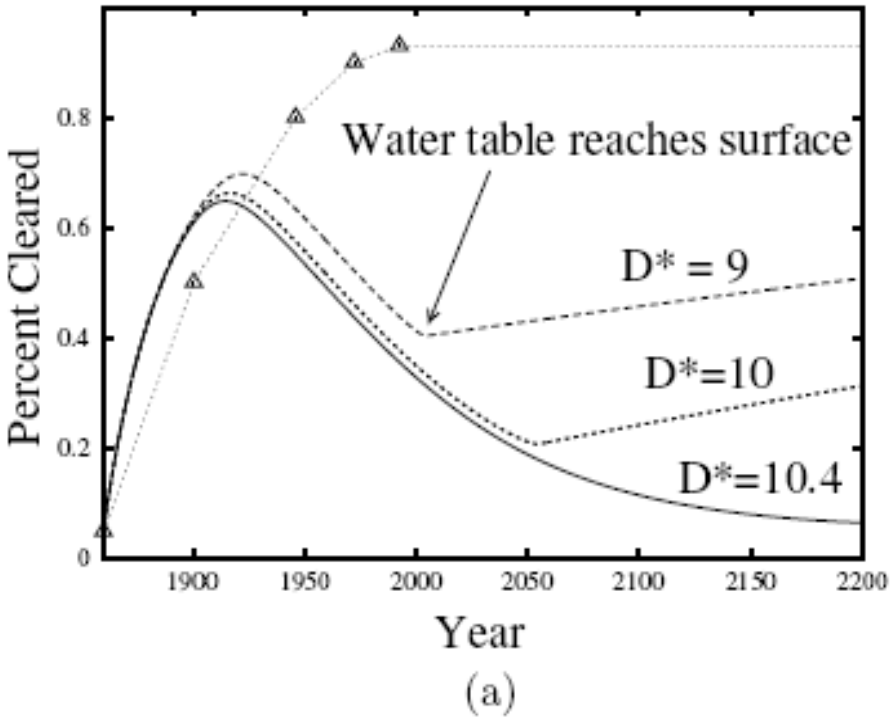

Precipitation, P
Interception and Evaporation
$E(P) = v_e(1 - e^{-P/v_e})$
Effective Precipitation
$P_e(P) = P - E(P)$
Infilitration: $I(P_e) = P_e - S(P_e)$
Runoff: $S(P_e) = \gamma_r(P_e)P_e$
Recharge: $R(P_e) = I(P_e) - T(P_e)$
Transpiration: $T(P_e) = \gamma_t(I(P_e))$

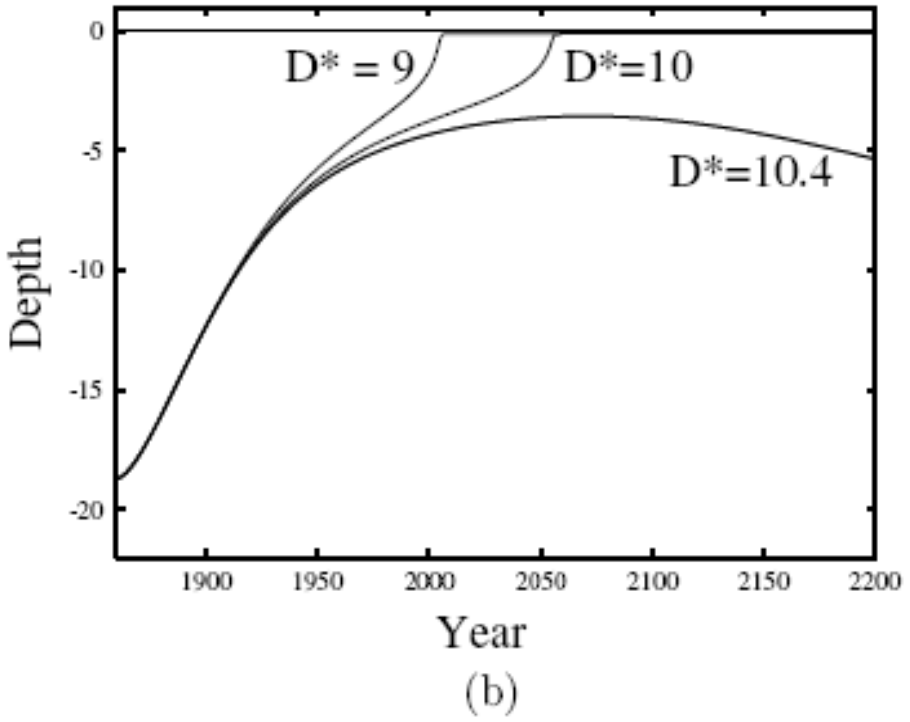



ETZ from Zhang et al model. ET from Anderies model

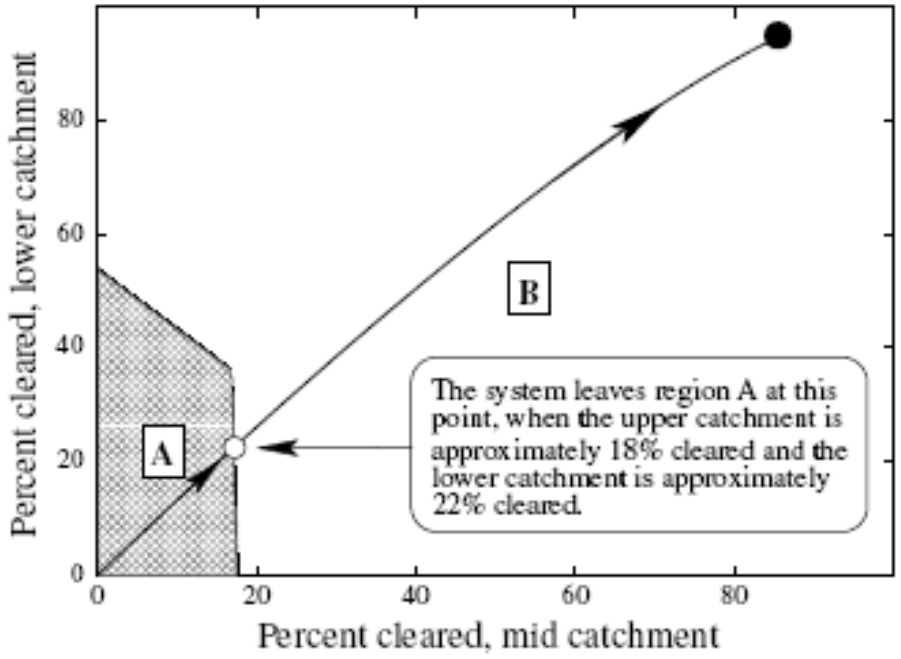

Depth to water table
(mid catchment)
A
B
C
Depth to water table
(lower catchment)
D
E
F
Proportion of native vegetation cleared in the mid catchment
Proportion of native vegetation cleared in the lower catchment

(a) (b)

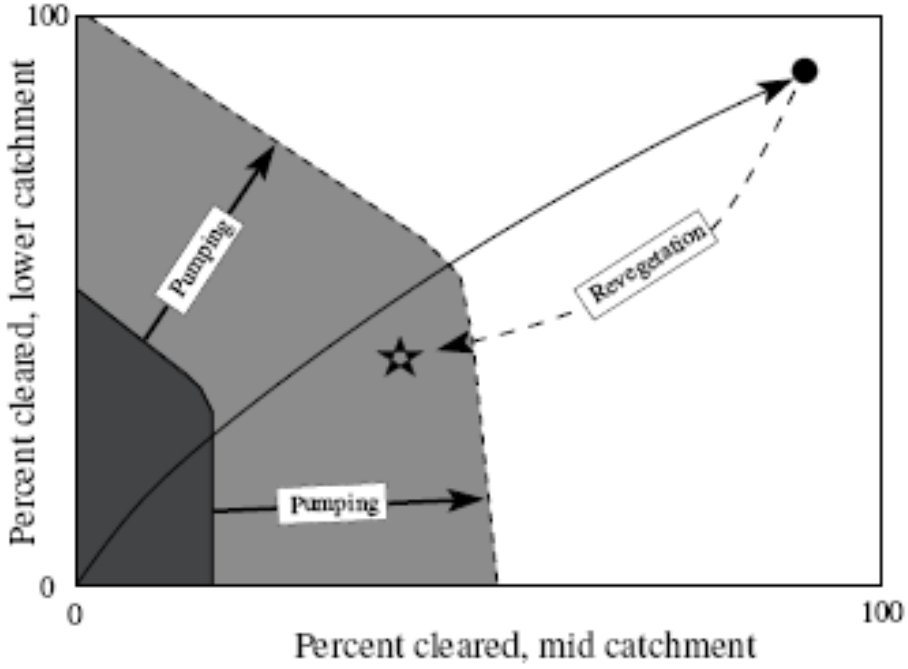


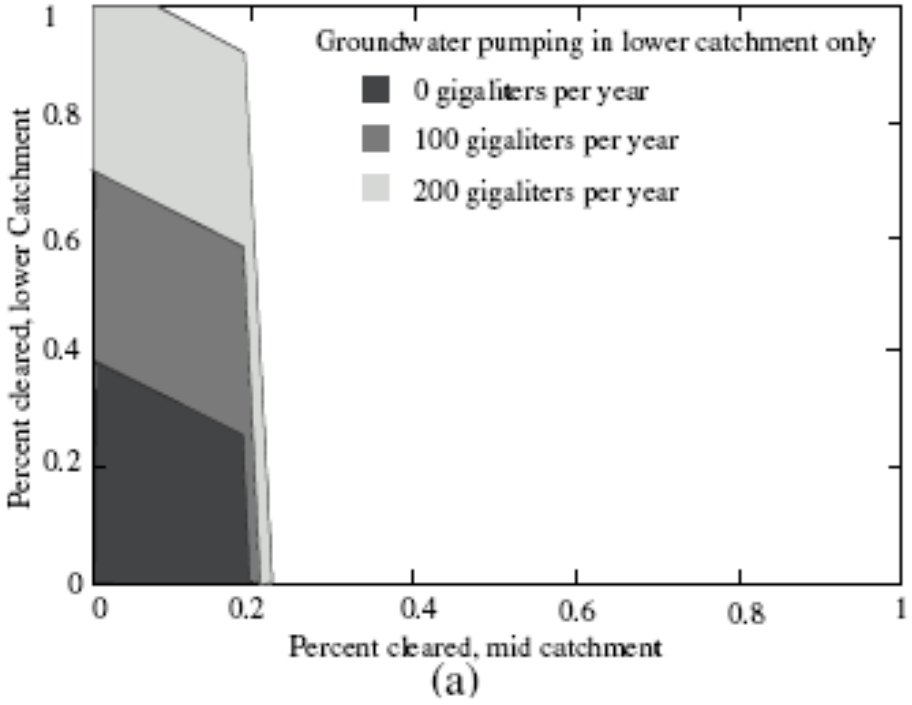

“Stop clearing” scenarios. Percentage cleared in the lower catchment overlain on the actual clearing history (estimated data points shown with triangles).
Labels D = depth of the water table when action is taken.
Corresponding dates are 1920, 1914, and 1912 for D = 9,D = 10 and D = 10.4, respectively.
Figure 7b shows the water table depth trajectories associated with each scenario.


Percent cleared, lower catchment
Percent cleared, mid catchment
0
20
40
60
80
A
B
The system leaves region A at this point, when the upper catchment is approximately 18% cleared and the lower catchment is approximately 22% cleared.

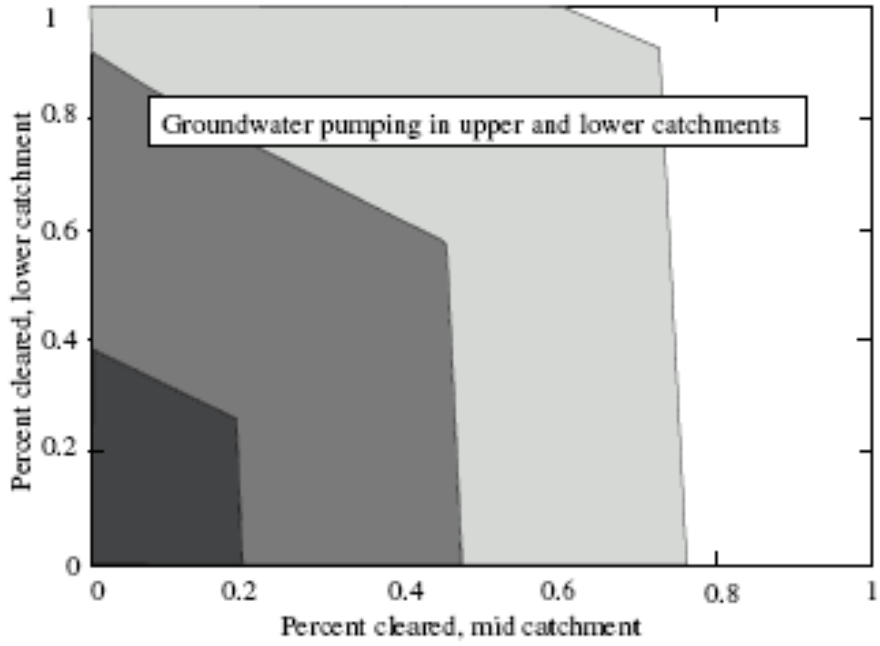
(a)


Percent cleared, lower catchment
Percent cleared, mid catchment
0
100
Pumping
Pumping
Revegetation

(b)

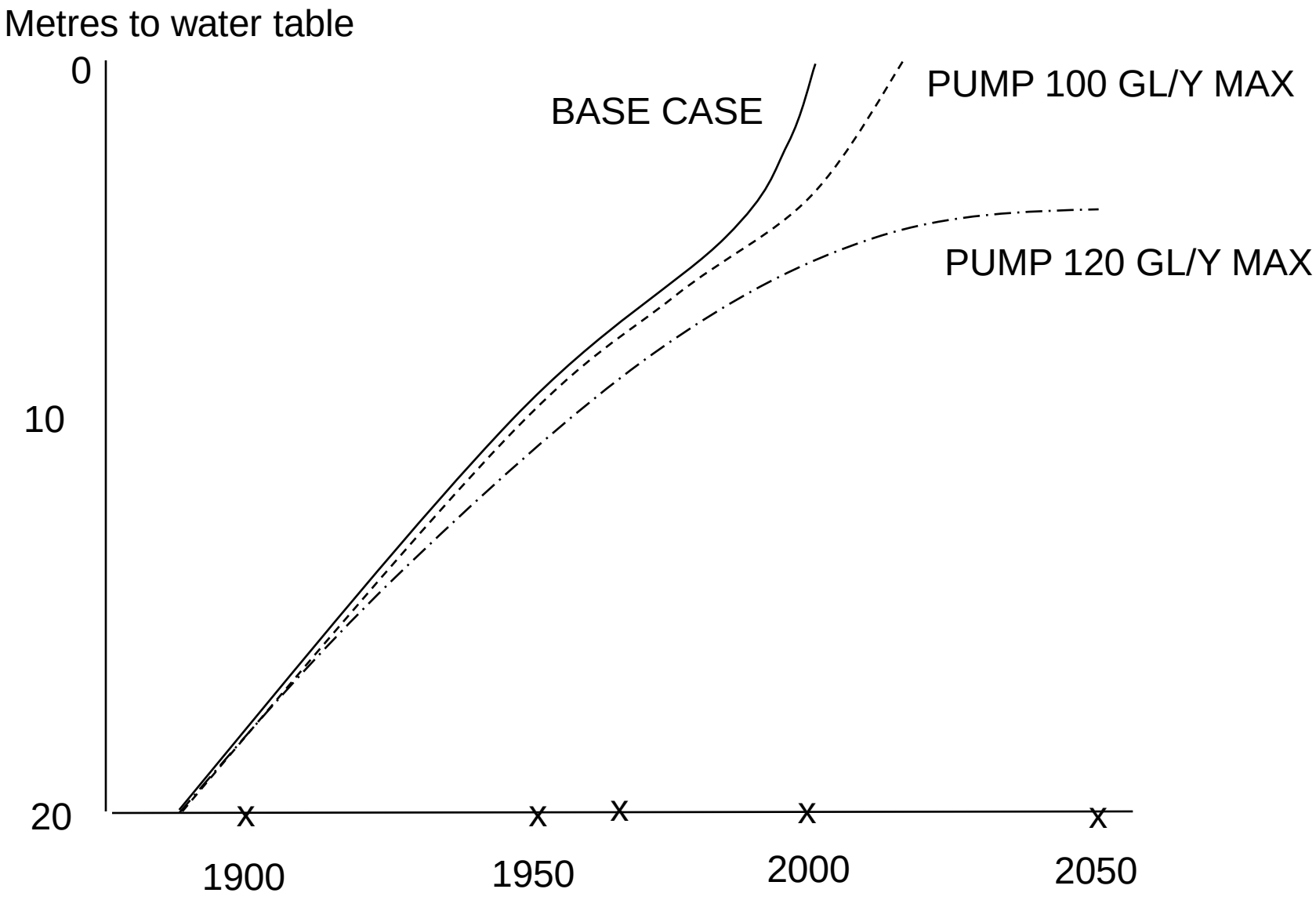

Groundwater pumping in lower catchment only
0 gigaliters per year
100 gigaliters per year
200 gigaliters per year
Percent cleared, lower Catchment
Percent cleared, mid catchment
0
0.2
0.4
0.6
0.8
1

(a)


Groundwater pumping in upper and lower catchments
Percent cleared, lower catchment
Percent cleared, mid catchment
0
0.2
0.4
0.6
0.8
1

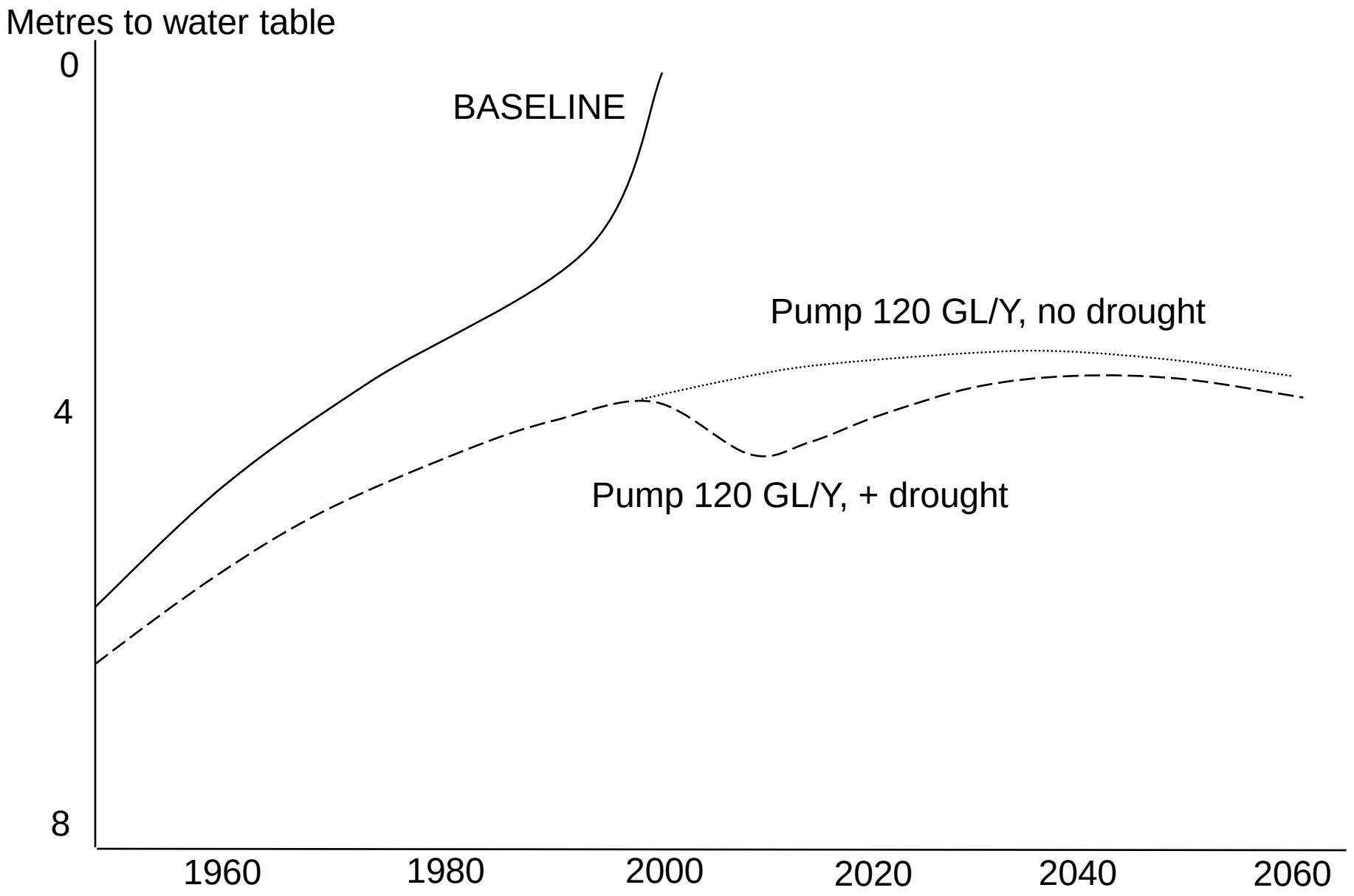
(b)

# pumping scenarios, past climate



# DROUGHT SCENARIOS, WITH PUMPING

- RAINFALL DECLINES 20%, IRRIGATION USE DOWN 40%



WET SCENARIOS, WITH PUMPING

- RAINFALL DECLINES 20%, IRRIGATION USE DOWN 40%