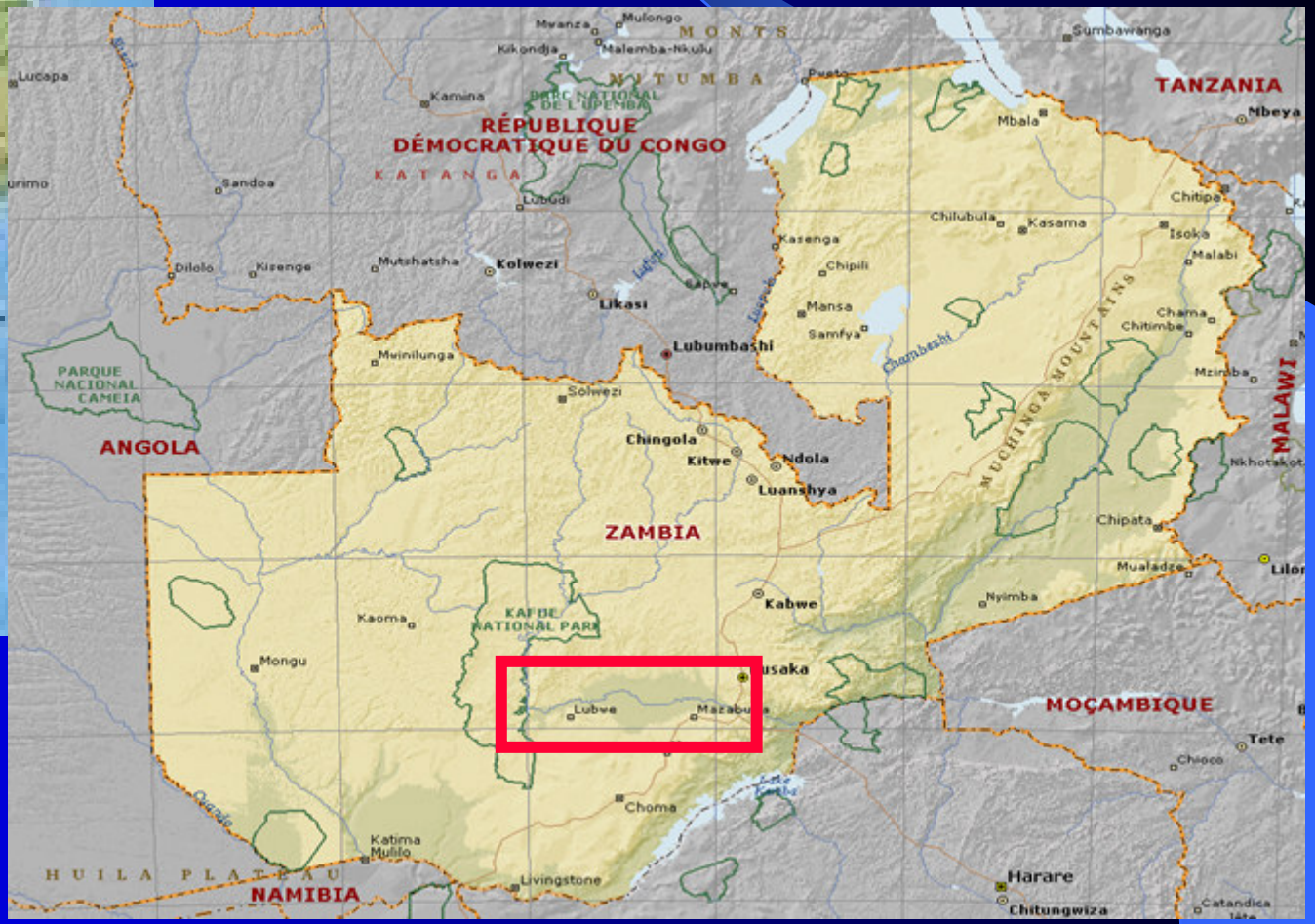
Managed flood releases

Kafue Flats, Zambia

Structure of the presentation

- Project description
- Area description
- Problem description
- Research questions
- Methodology
- Kafriba model
- Results
- Conclusion

Where are the Kafue Flats?



Integrated Water Resources Management Project for the Kafue Flats

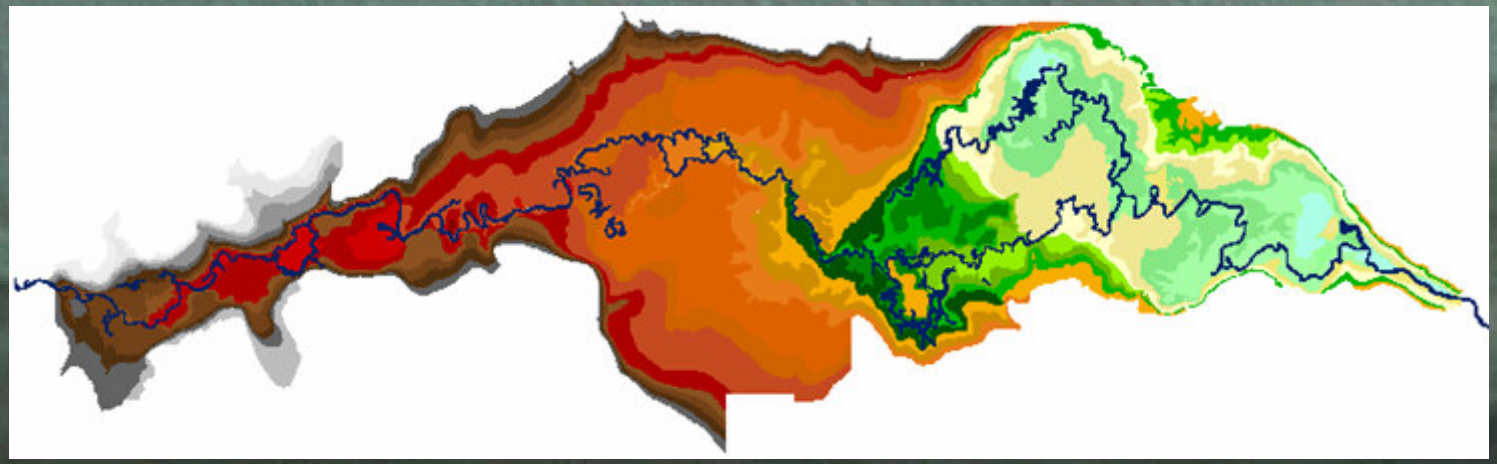
Dam Operation rules and Managed Floods

Goal of the project

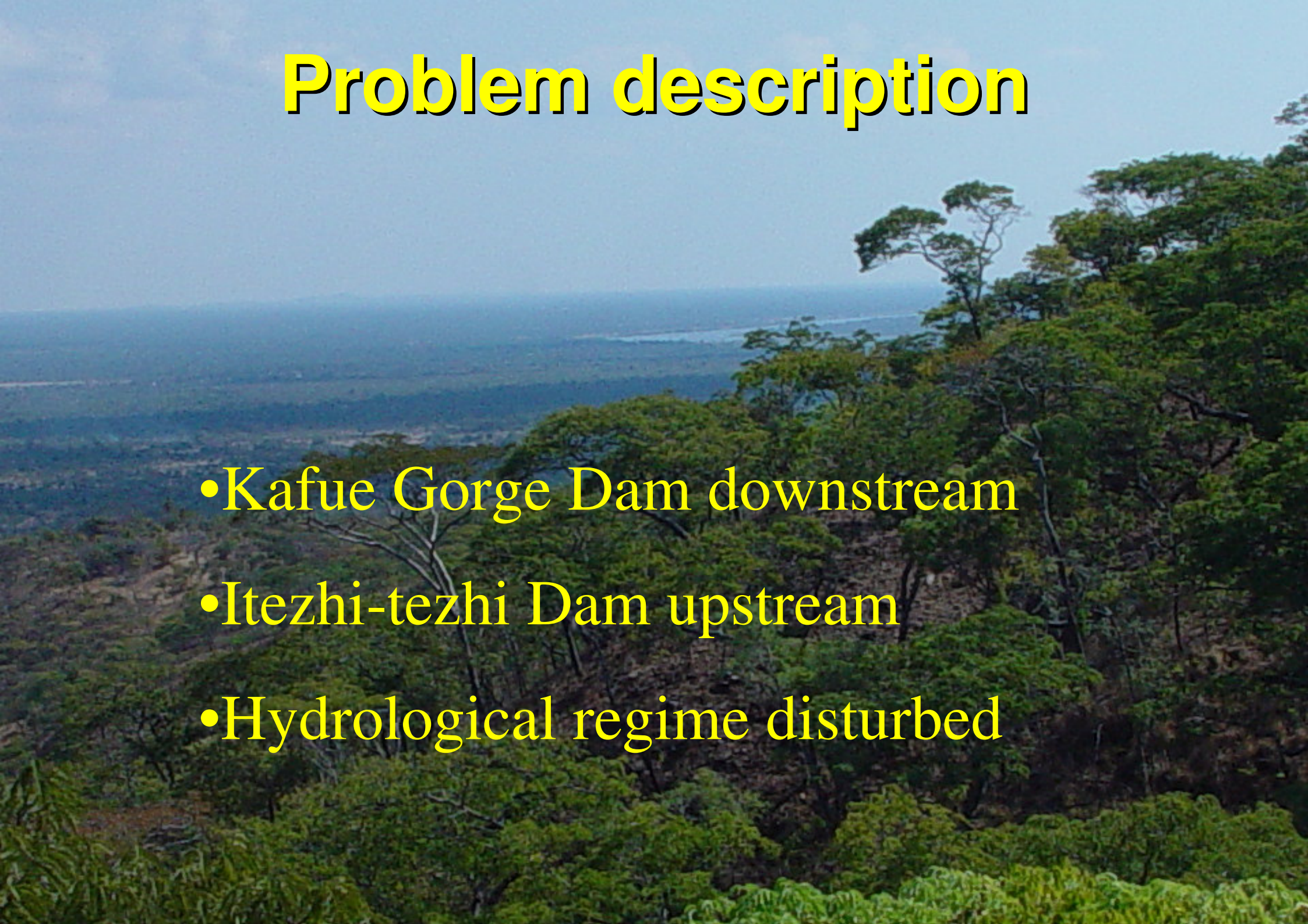
Review the dam operation rules in order to mimick to a certain the natural flooding pattern in the Kafue Flats without jeopardizing power generation

Area description

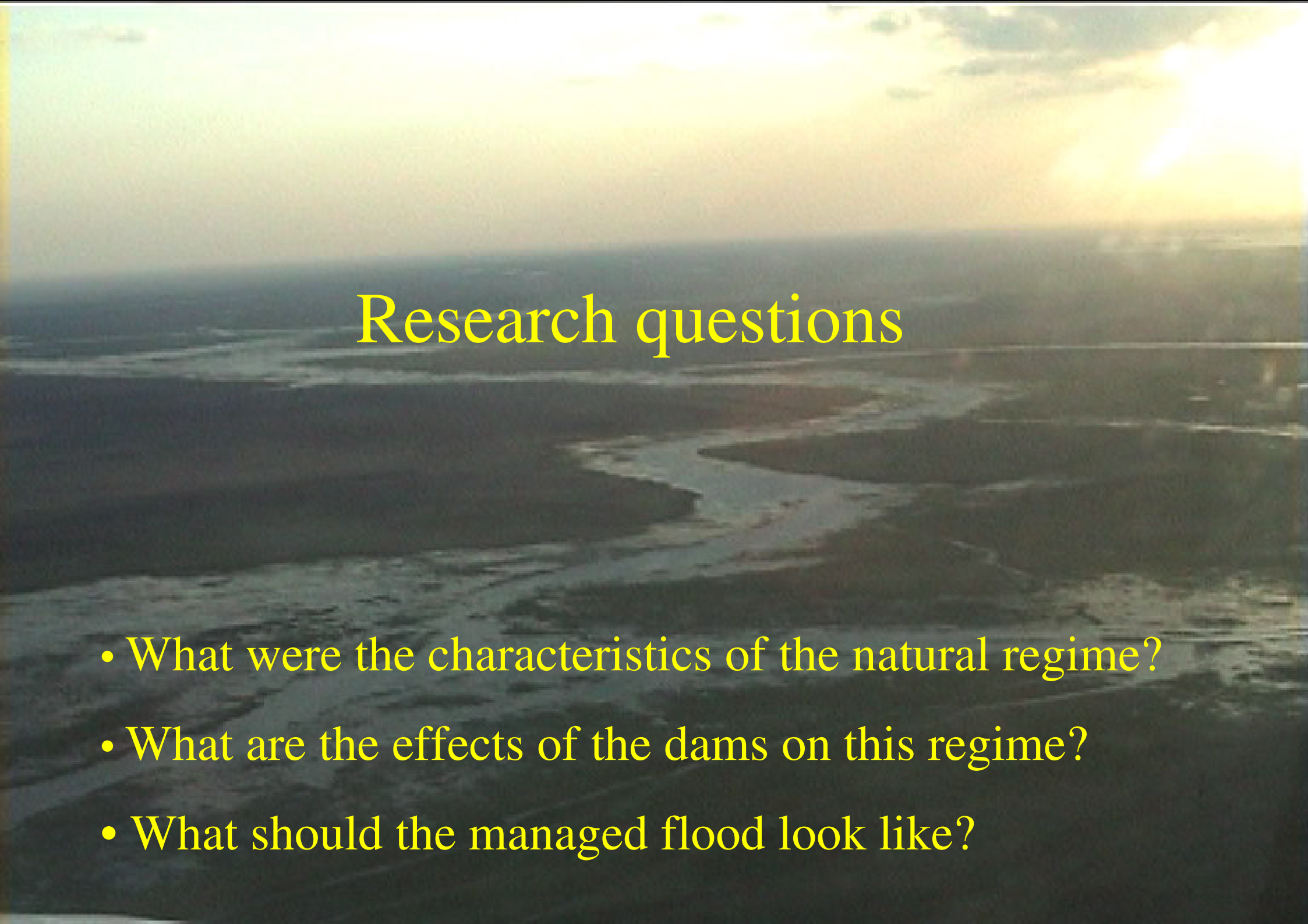
- 6500 km^2
- Very flat
- Valuable wetland ecosystem



Problem description



- Kafue Gorge Dam downstream
- Itezhi-tezhi Dam upstream
- Hydrological regime disturbed



Research questions

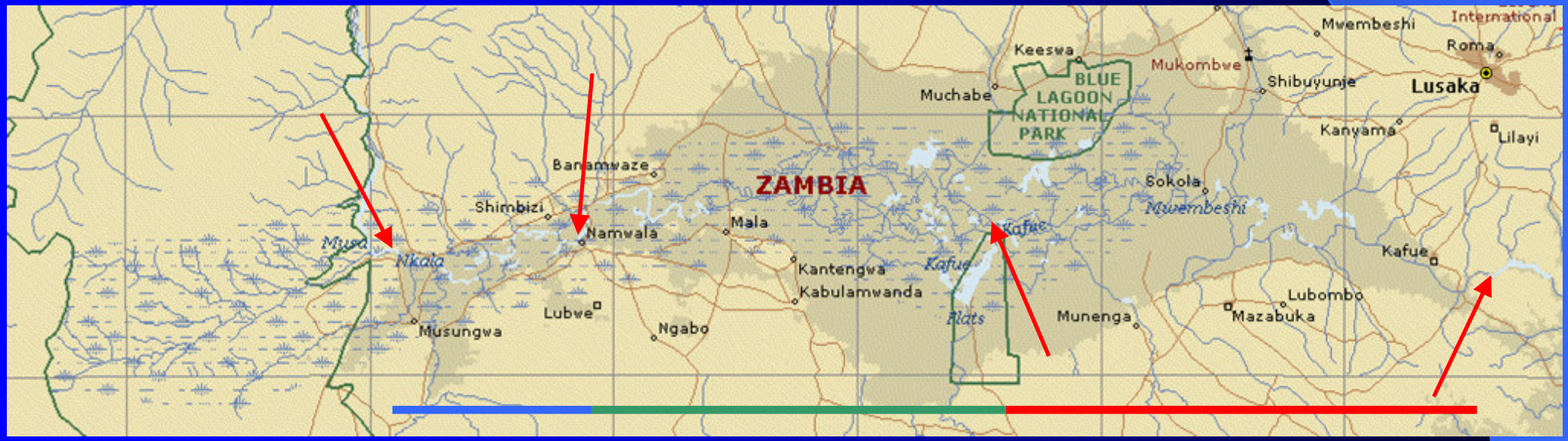
- What were the characteristics of the natural regime?
- What are the effects of the dams on this regime?
- What should the managed flood look like?

Methodology

- Model study
- Historical simulation years 1951-1978
- Natural situation ⟷ situation with dams
- Inundated areas
- Three sub-areas

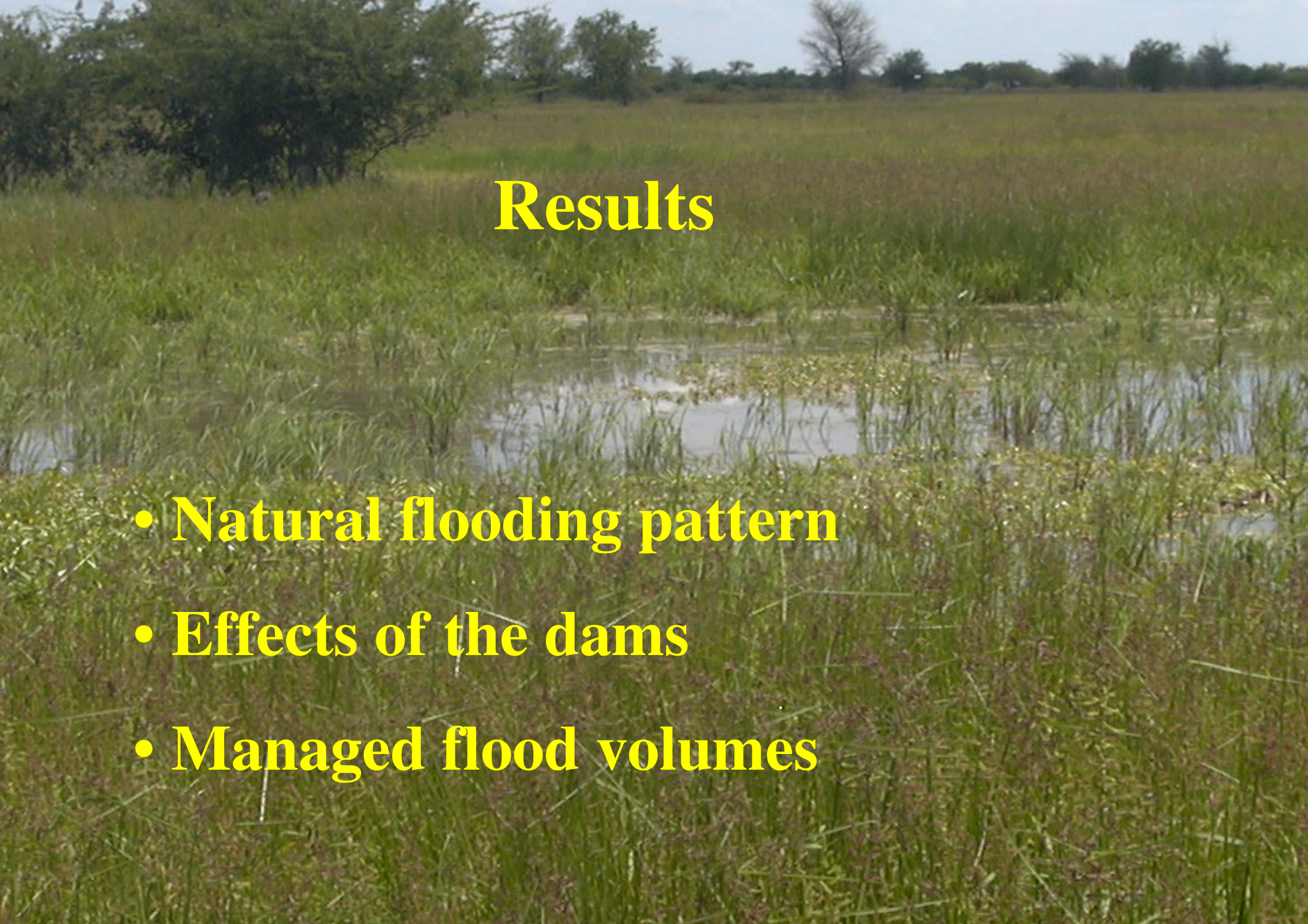
Division in three sub-areas

- Itezi-Itezi to Namwala
- Namwala to Nyimba
- Nyimba to Kafue Gorge



Kafriba model

- Flow model and waterbalance model combined
- 125 cells
- River and storage cells
- Waterbalance for each sub-area

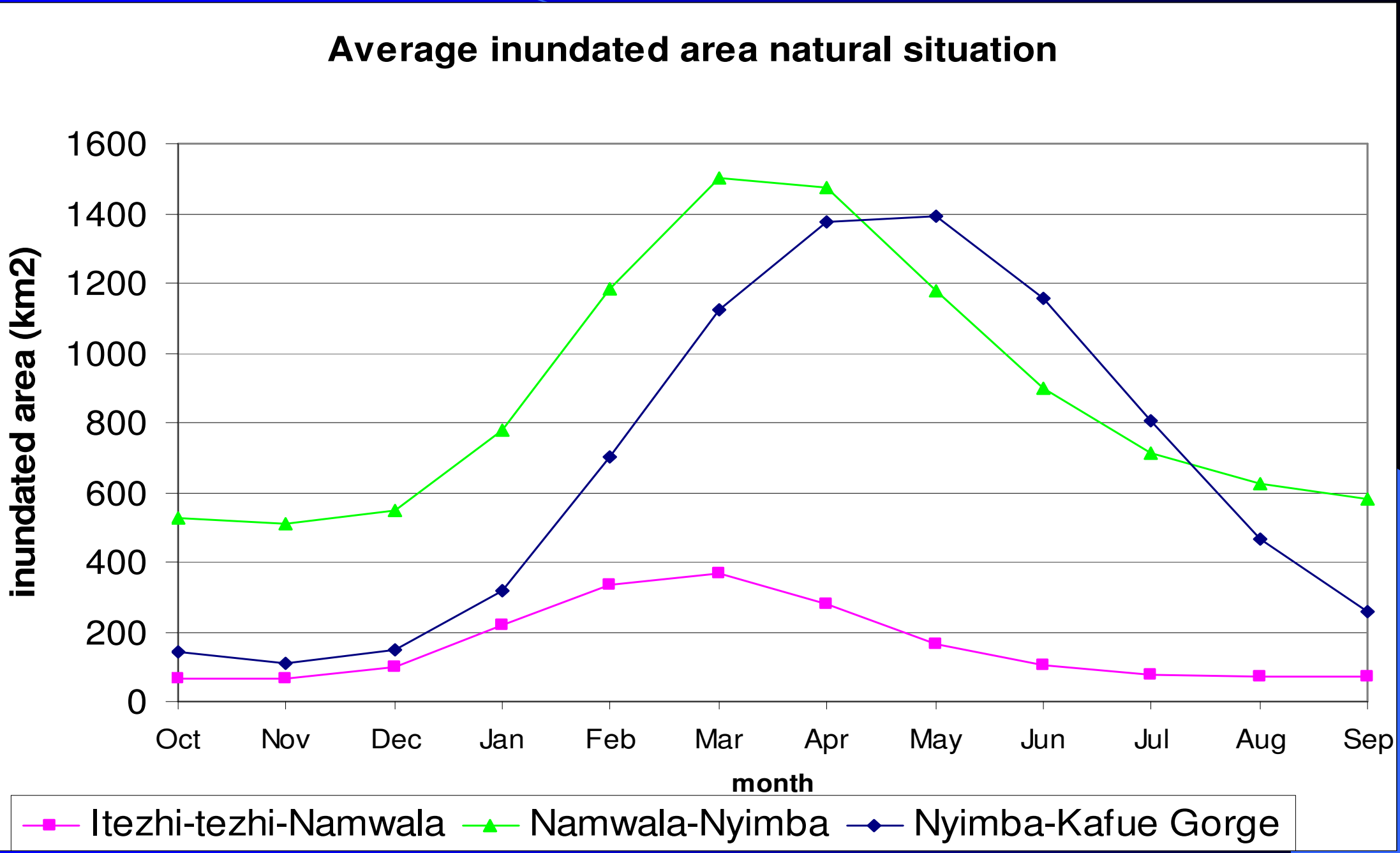


Results

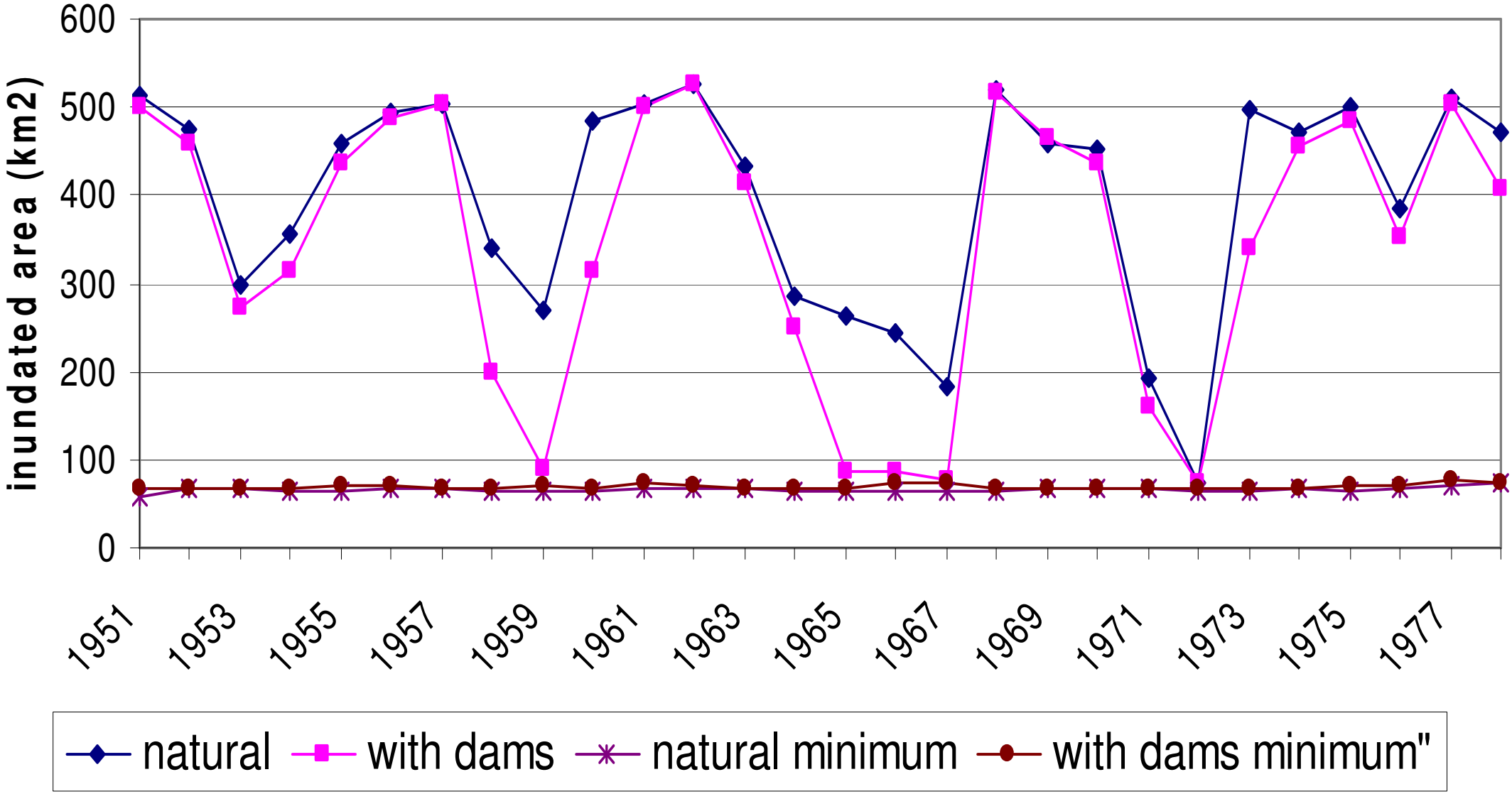
- Natural flooding pattern
- Effects of the dams
- Managed flood volumes

Natural situation

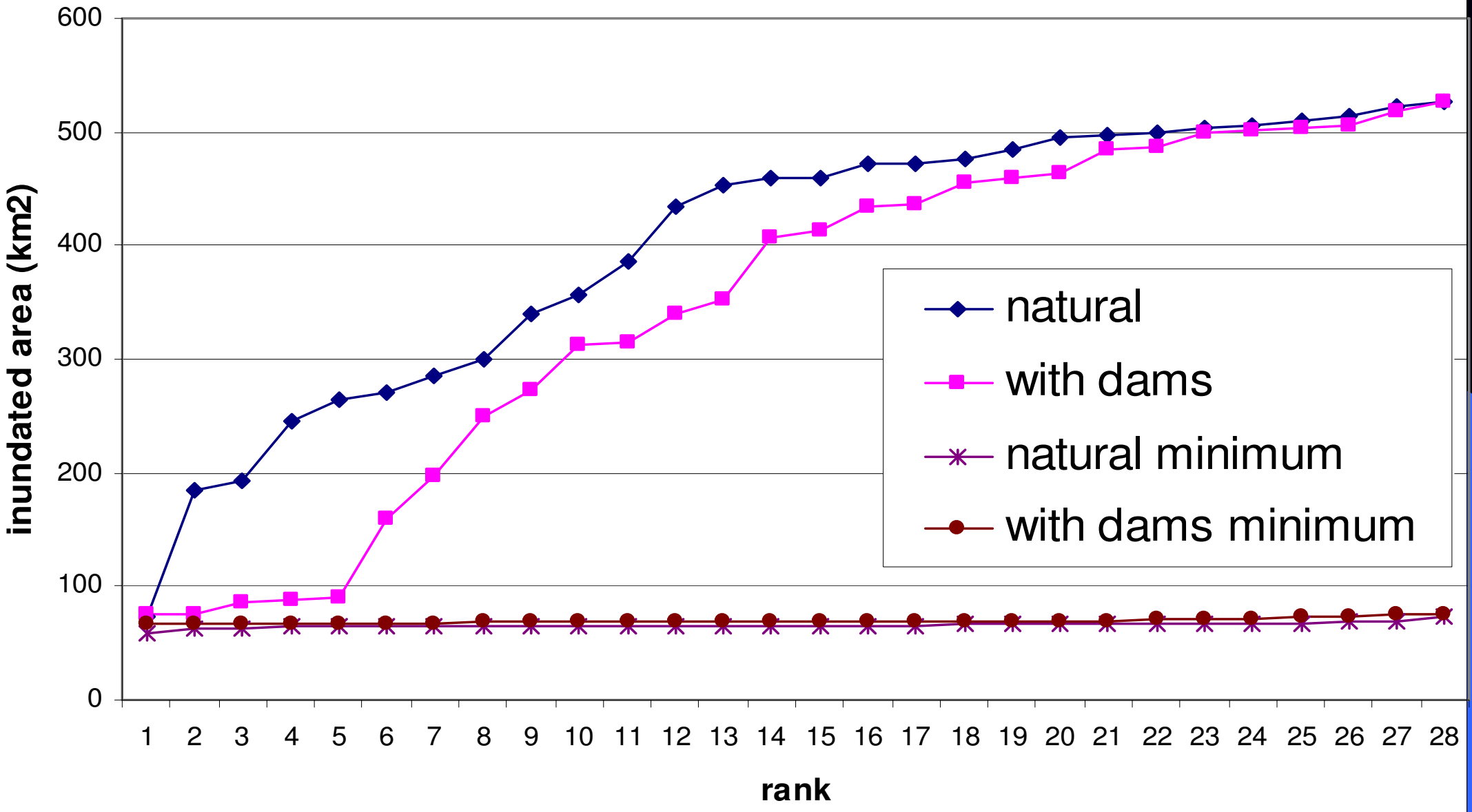
- Succession of peaks
- River water determines size of flooding
- Discharge in river 6 months smaller than 215 m^3/s
- In dry years managed flood not possible


Average inundated area natural situation
inundated area (km2)
1600
1400
1200
1000
800
600
400
200
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
month
Itezhi-tezhi-Namwala
Namwala-Nyimba
Nyimba-Kafue Gorge

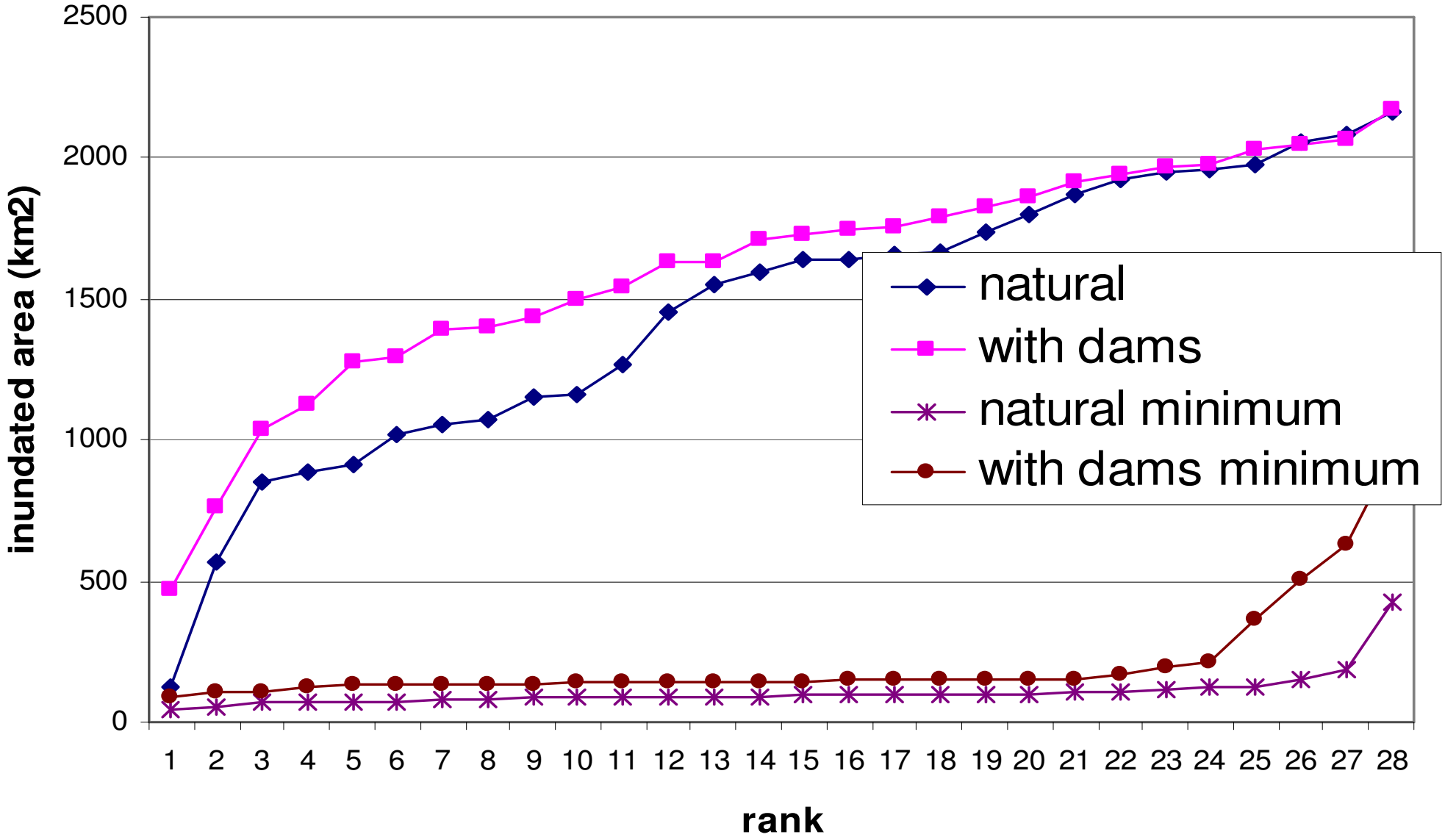
Maximum monthly inundated area ITT-Namwala



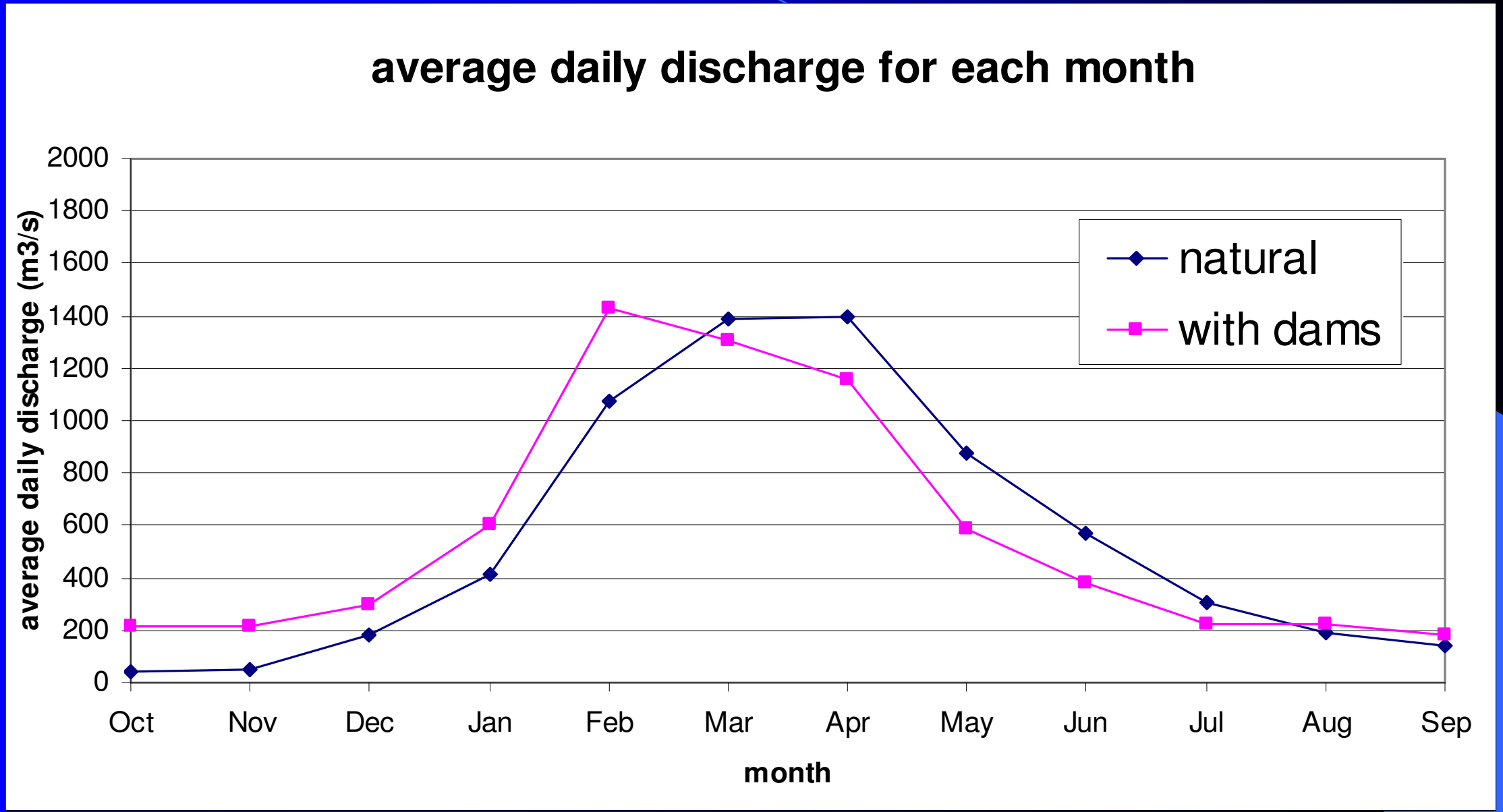
Ranked inundated area ITT-Namwala



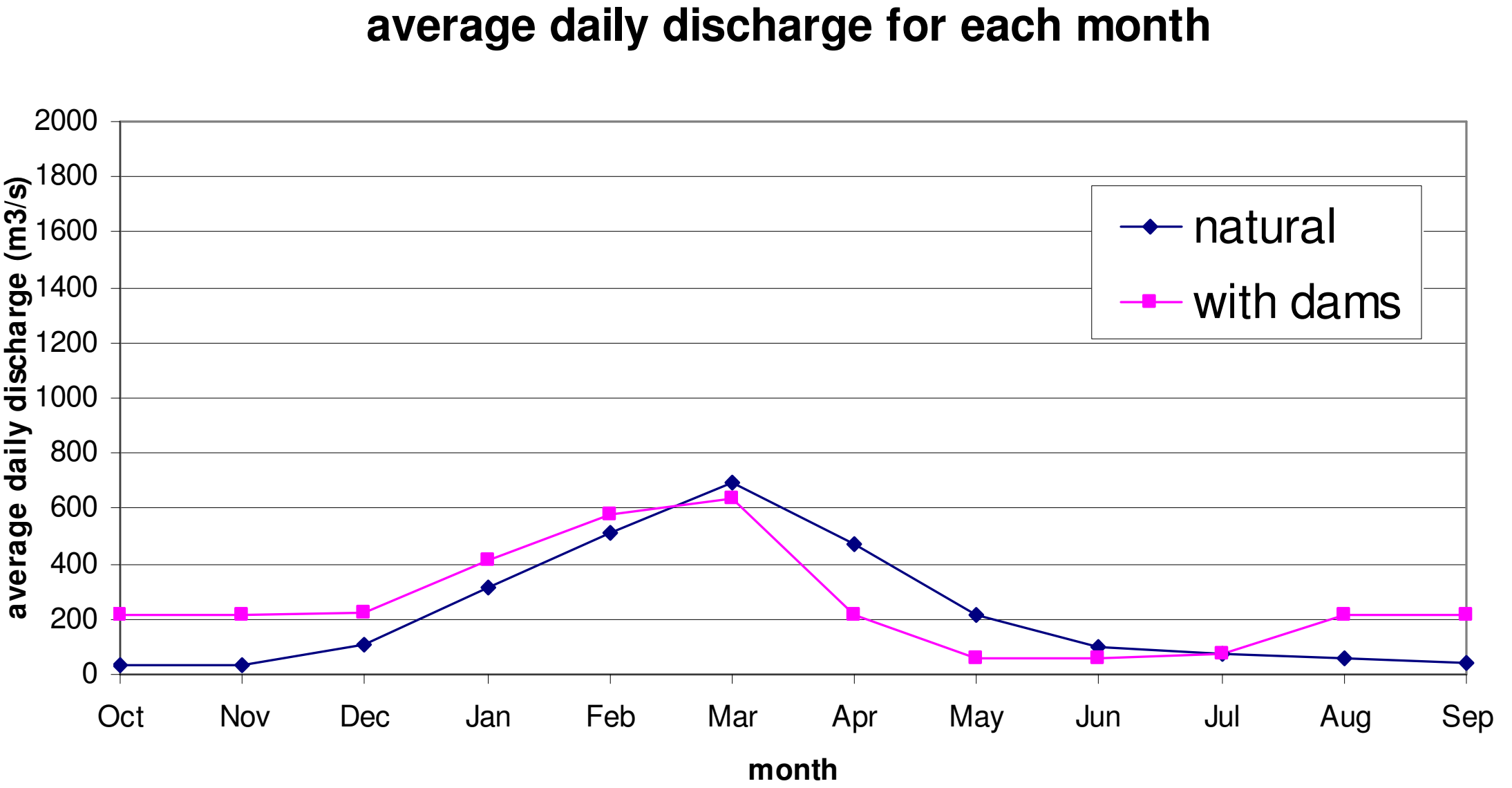
Ranked inundated area Nyimba-KG



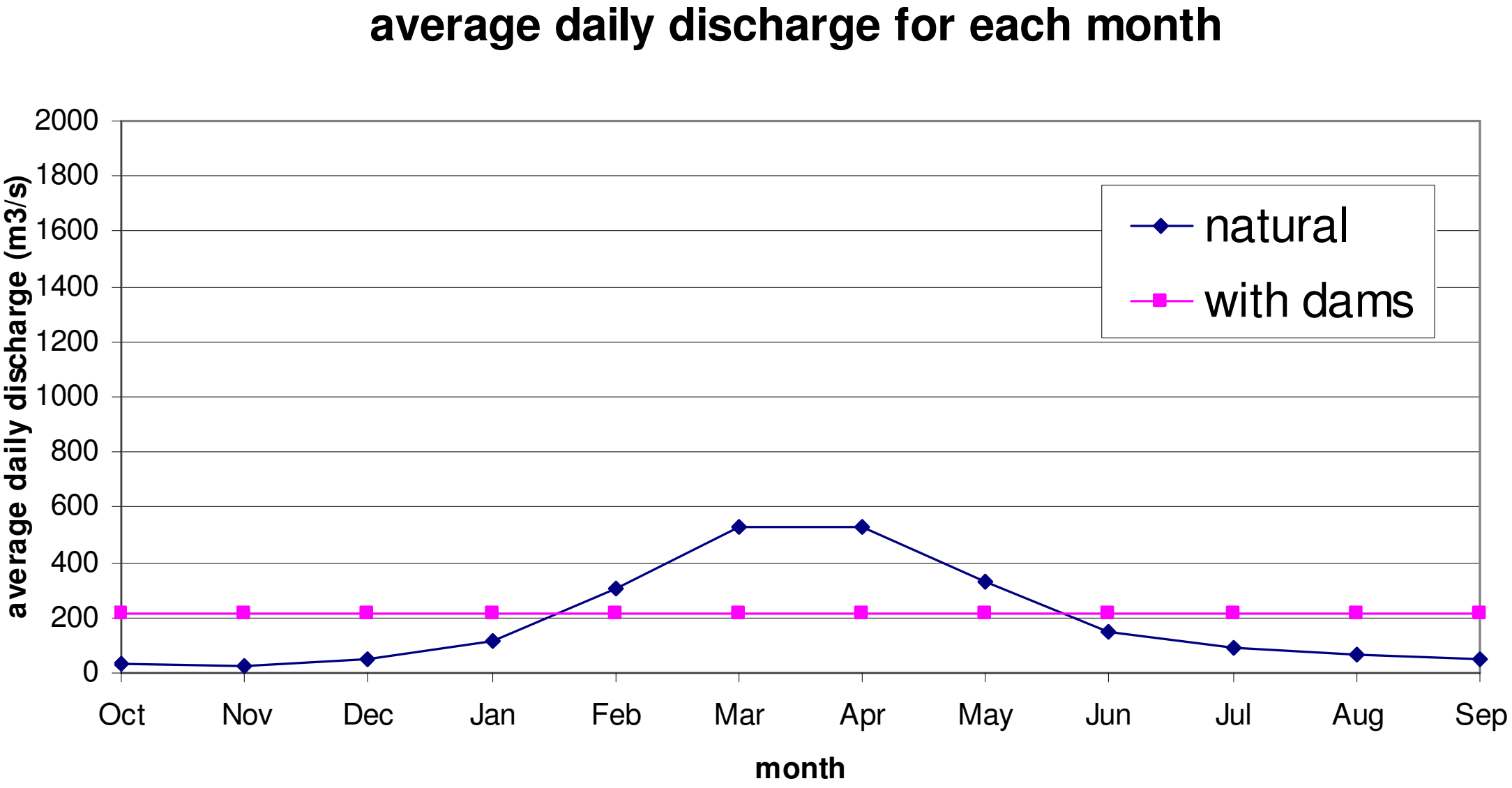
Effect on discharge in a wet year



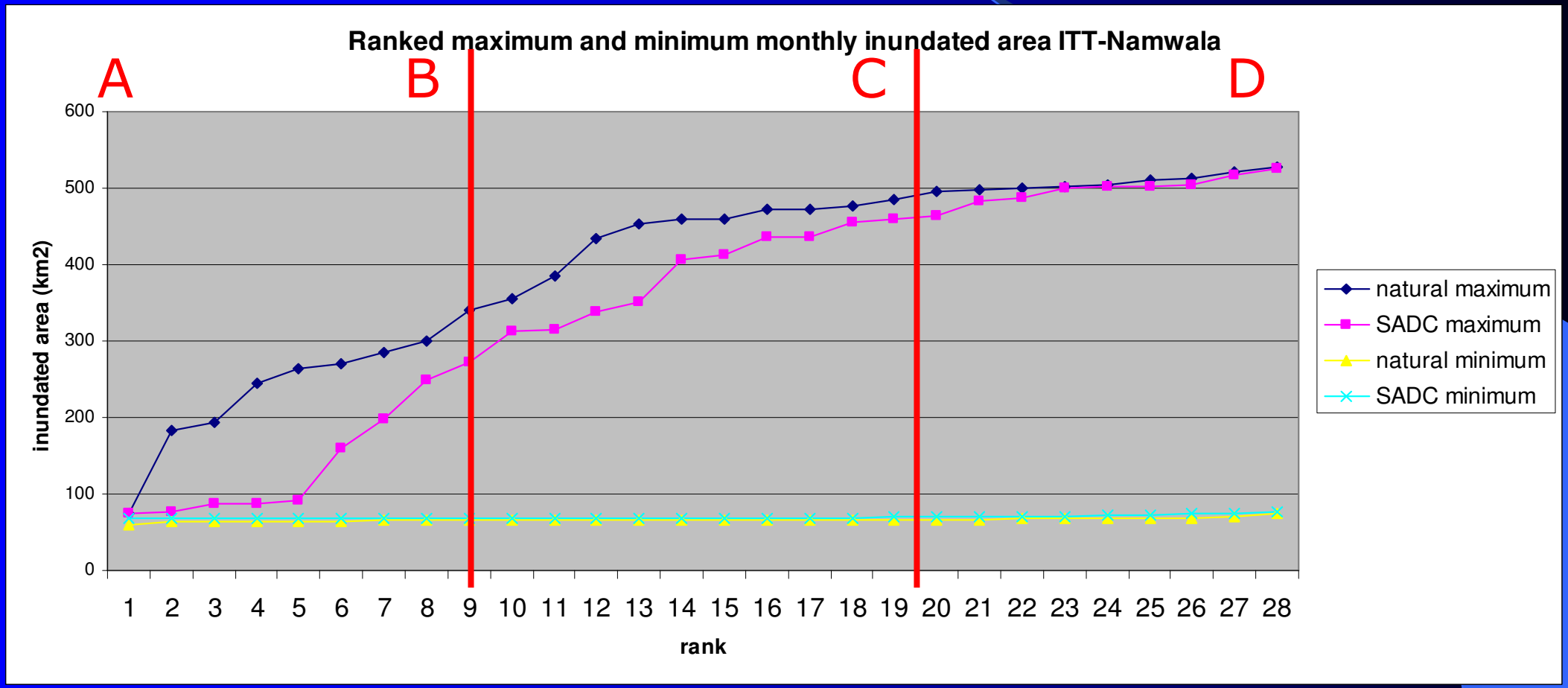
Effect on discharge in average year



Effect on discharge in dry year



Selection representative years



Managed flood volumes

	Low rainfall & tributary flow	Average rainfall & tributary flow	High rainfall & tributary flow
Small river flow	1650	2020	3130
Average river flow	4050	6450	7000
Large river flow	9610	12430	18950

Conclusions

- Kafue River flow determines size of maximum inundated area
- Especially in dry years large effect of dams
- Larger effect of dams on duration of the flooding than on the maximum inundated area
- Managed flood is possible, but limited in dry years
- Volume varies alot


Questions?