



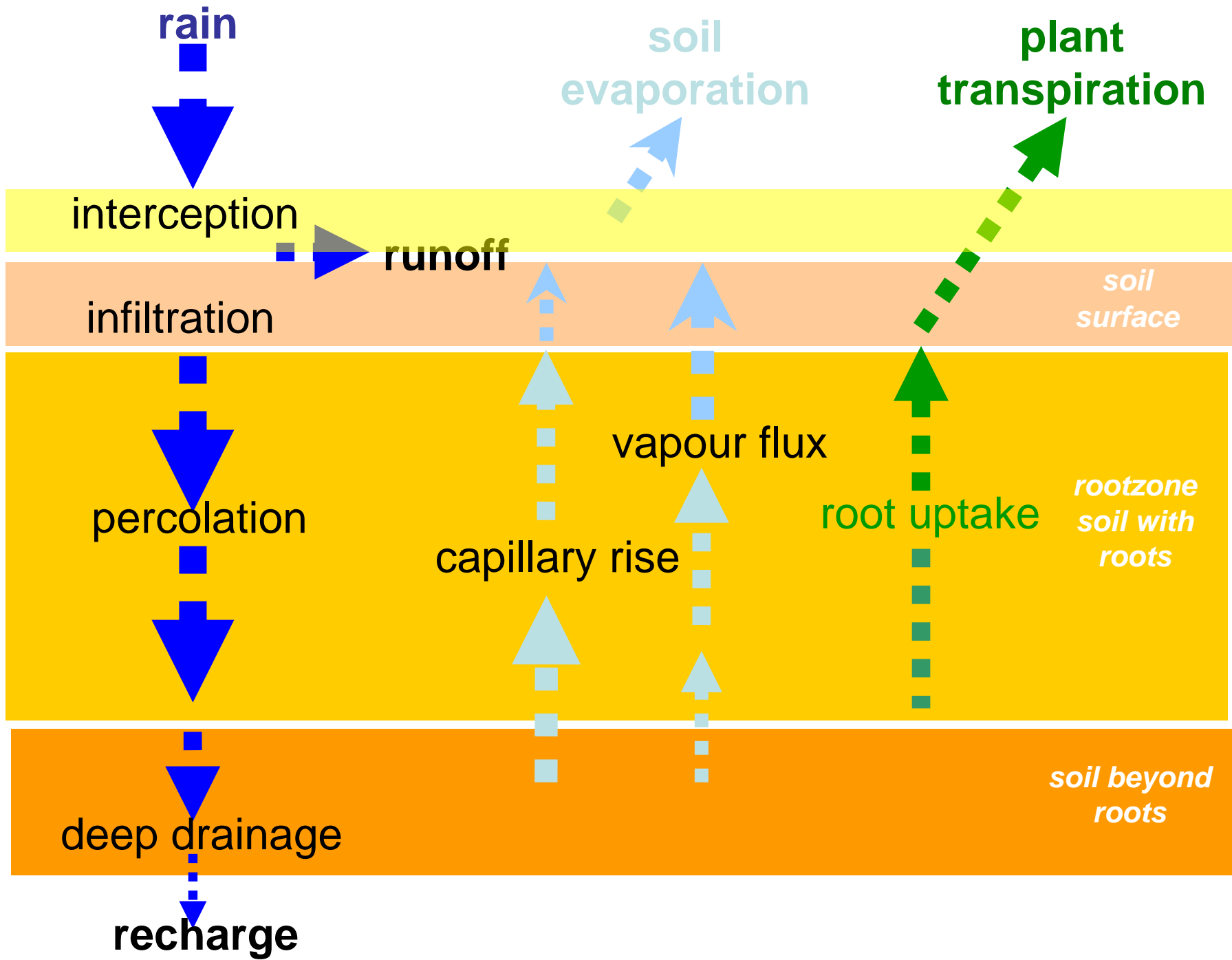
# Soil moisture storage over summer in different seasons and soil types

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NORTHAM WA



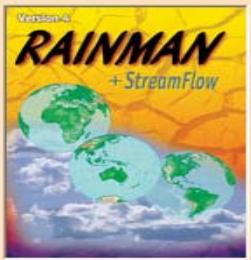
# Outline

- Timing and amount of rainfall events
- Benefits of storing soil water
- Objectives for crop land management over summer



# Data sources

- Climate data Bureau of Meteorology
- APSIM simulation model
- RAINMAN



**RAINMAN**  
*StreamFlow*

**RAINMAN**  
*StreamFlow*

**Rainfall and streamflow information for better management**

A program developed by:  
Department of Primary Industries Queensland  
Bureau of Meteorology  
Agriculture Western Australia  
New South Wales Agriculture  
Department of Natural Resources and Mines Queensland  
ICE Media

Financial support from:  
Land and Water Australia  
Australian Centre for International Agricultural Research  
Rural Industries Research and Development Corporation  
Initial support from Meat Research Corporation

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**Streamflow  
Professional  
Edition**

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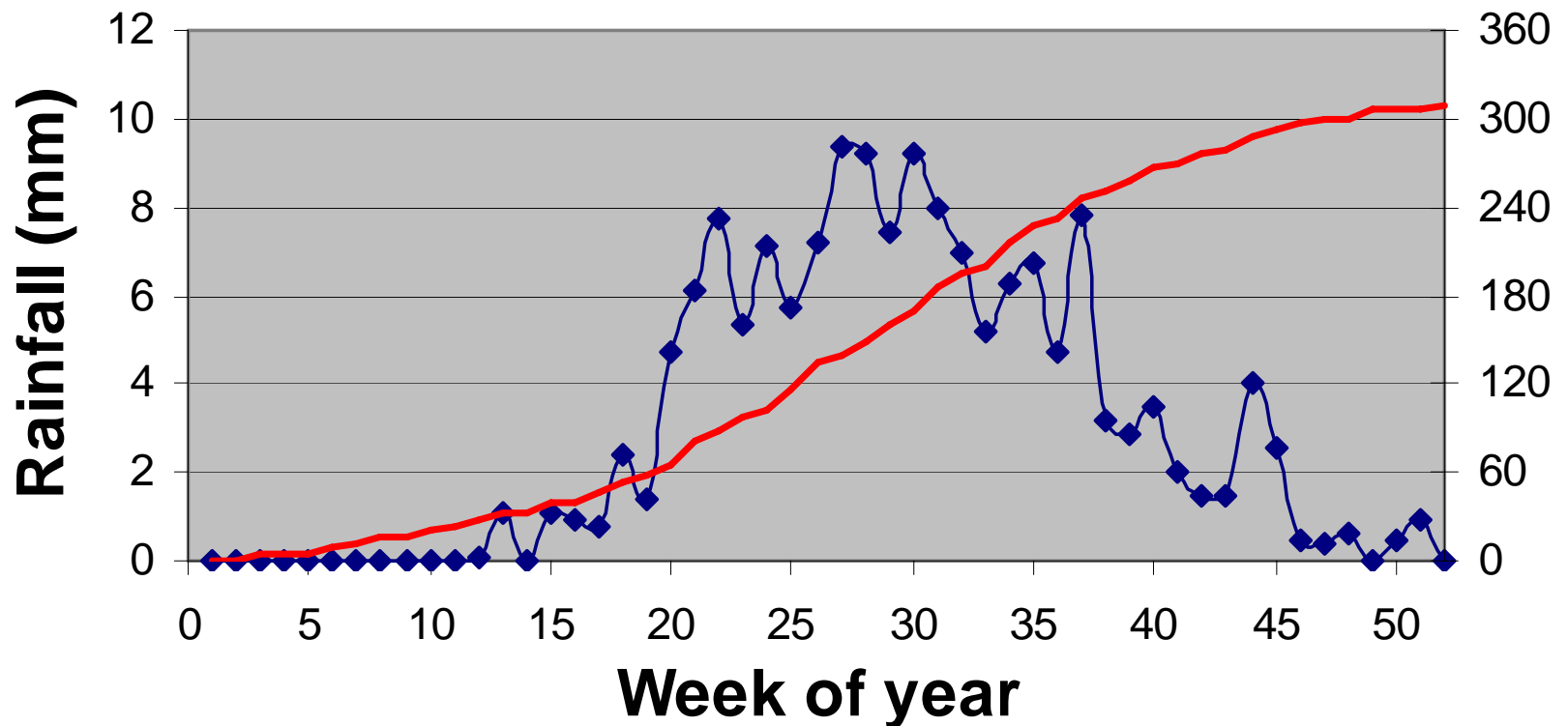
# Timing and amount of rainfall

- Weekly rainfall
- Seasonal rainfall
- Rainfall events



# Minnipa SA 1957-2008

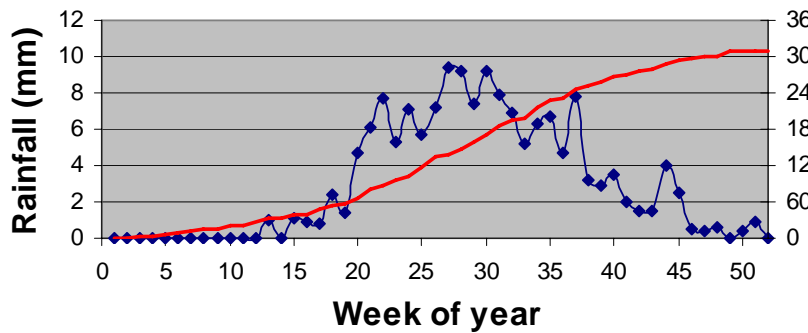
—◆— total — cumulative



week 10-5 March, week 15-9 April, week 20-14 May, week 25-18 June

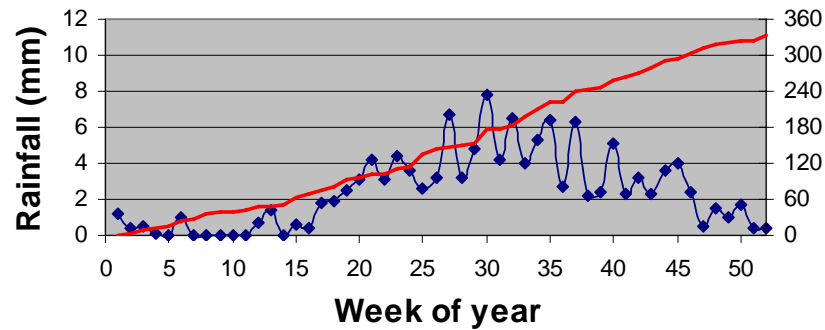
**Minnipa SA 1957-2008**

total cumulative



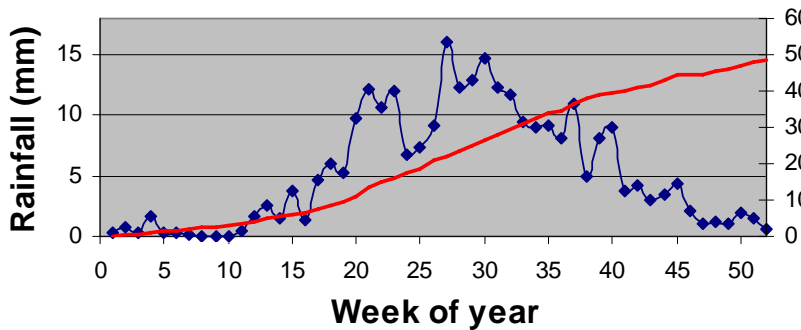
**Walpeup Vic 1957-2008**

total cumulative



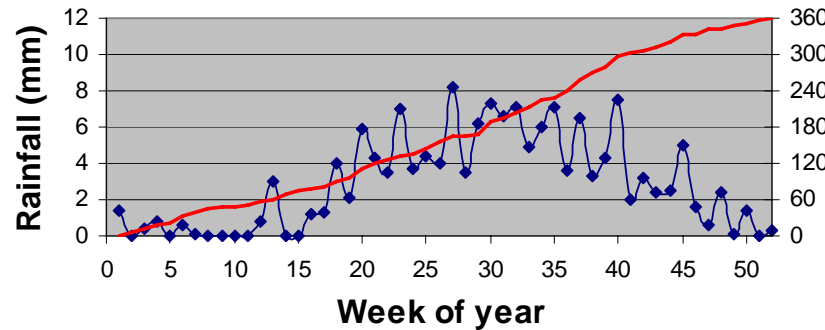
**Maitland SA 1957-2008**

total cumulative



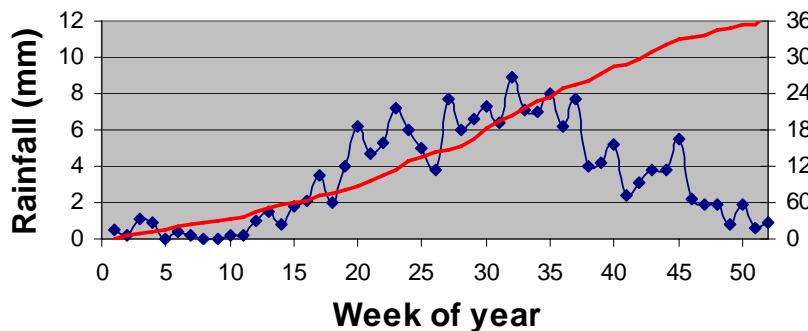
**Birchip Vic 1957-2008**

total cumulative



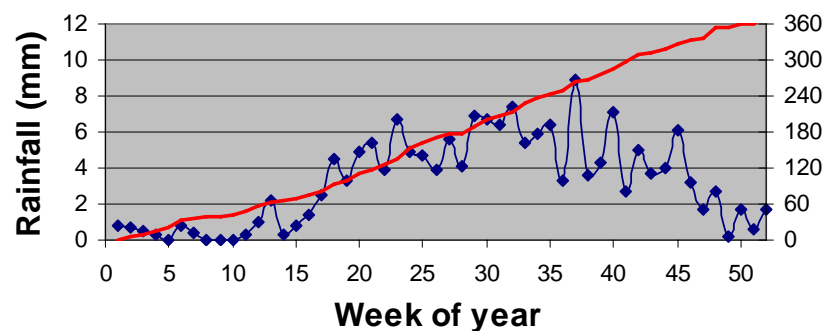
**Lameroo SA 1957-2008**

total cumulative

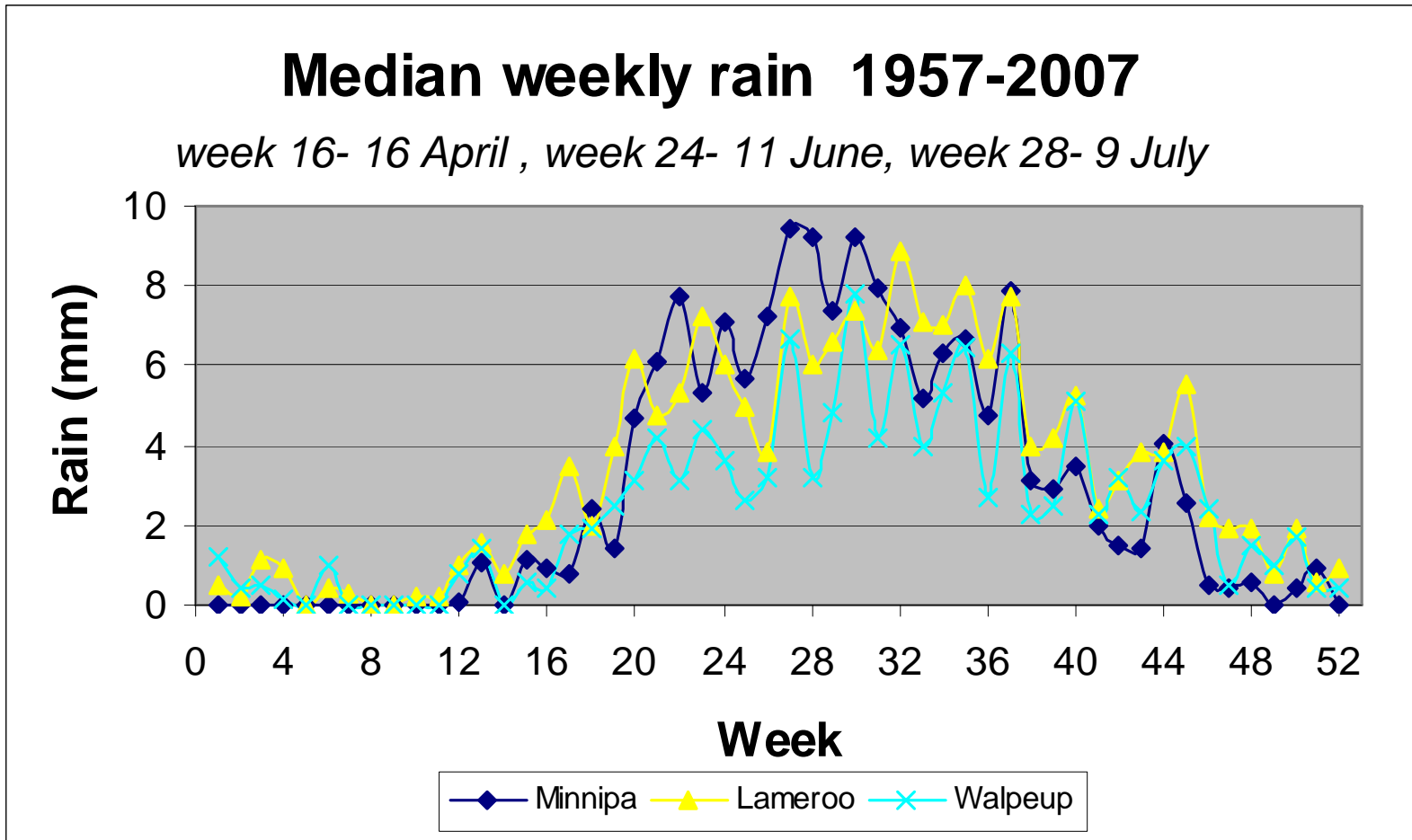


**Donald Vic 1957-2008**

total cumulative



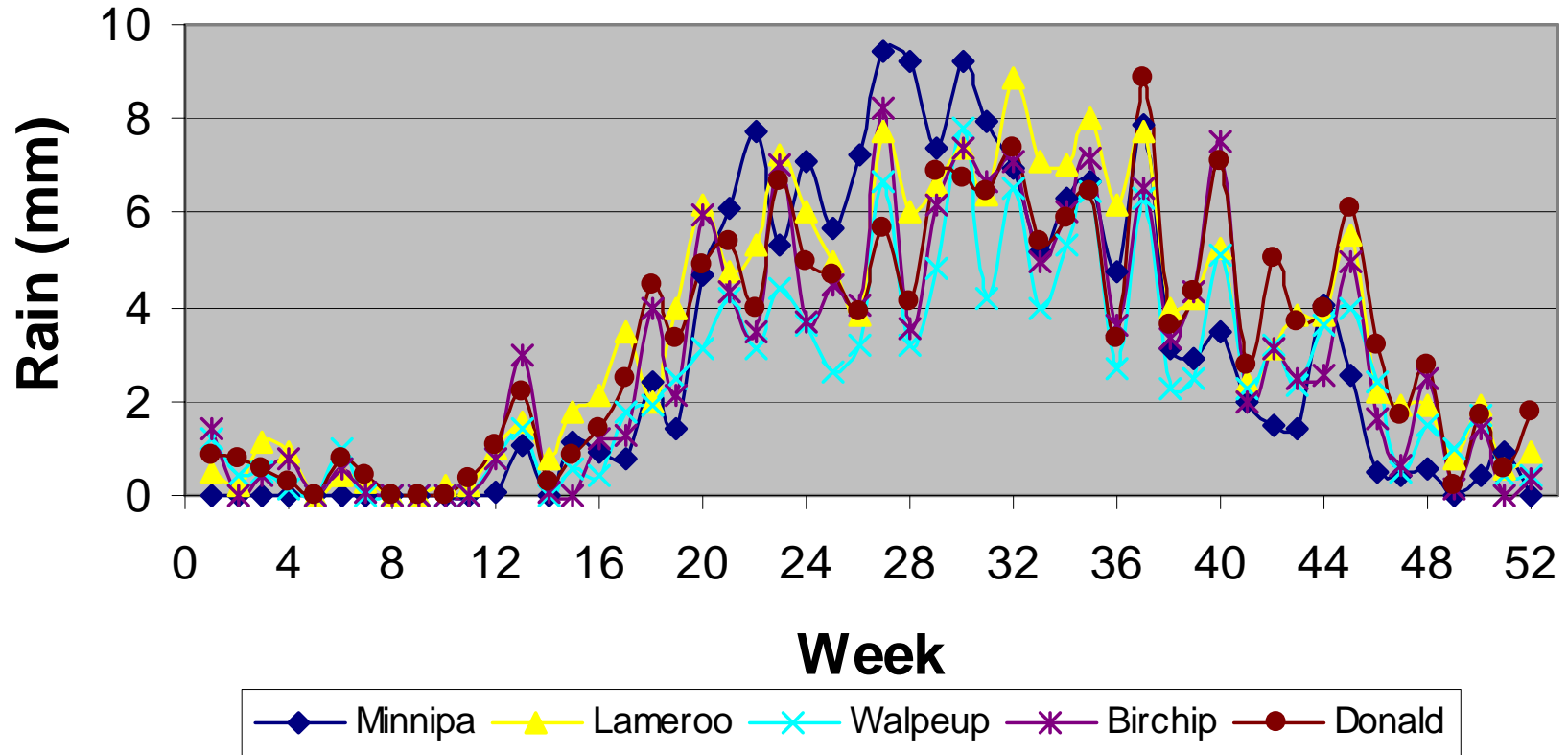
# Differences in rainfall pattern



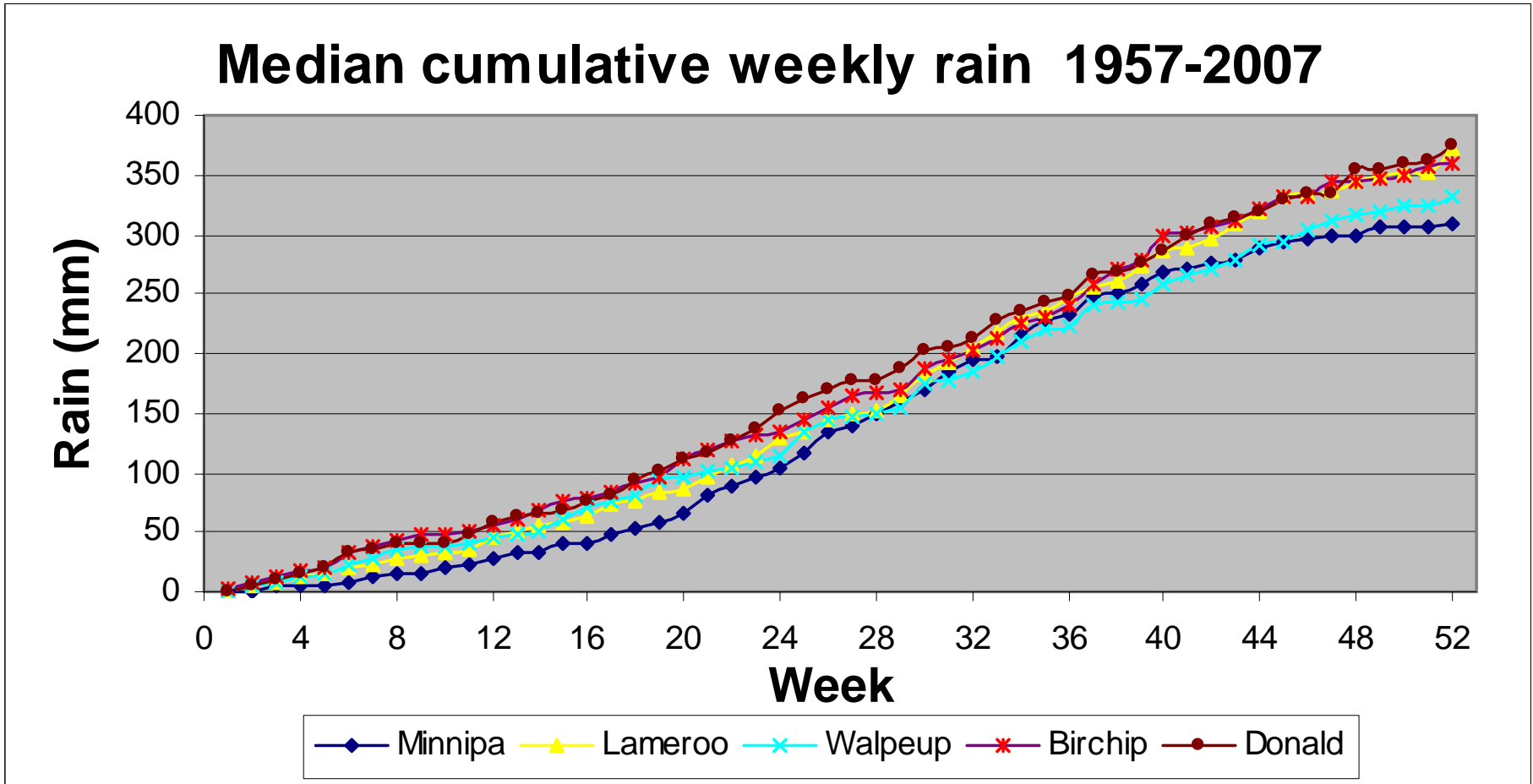
# Weekly rainfall

## Median weekly rain 1957-2007

*week 16- 16 April , week 24- 11 June, week 28- 9 July*

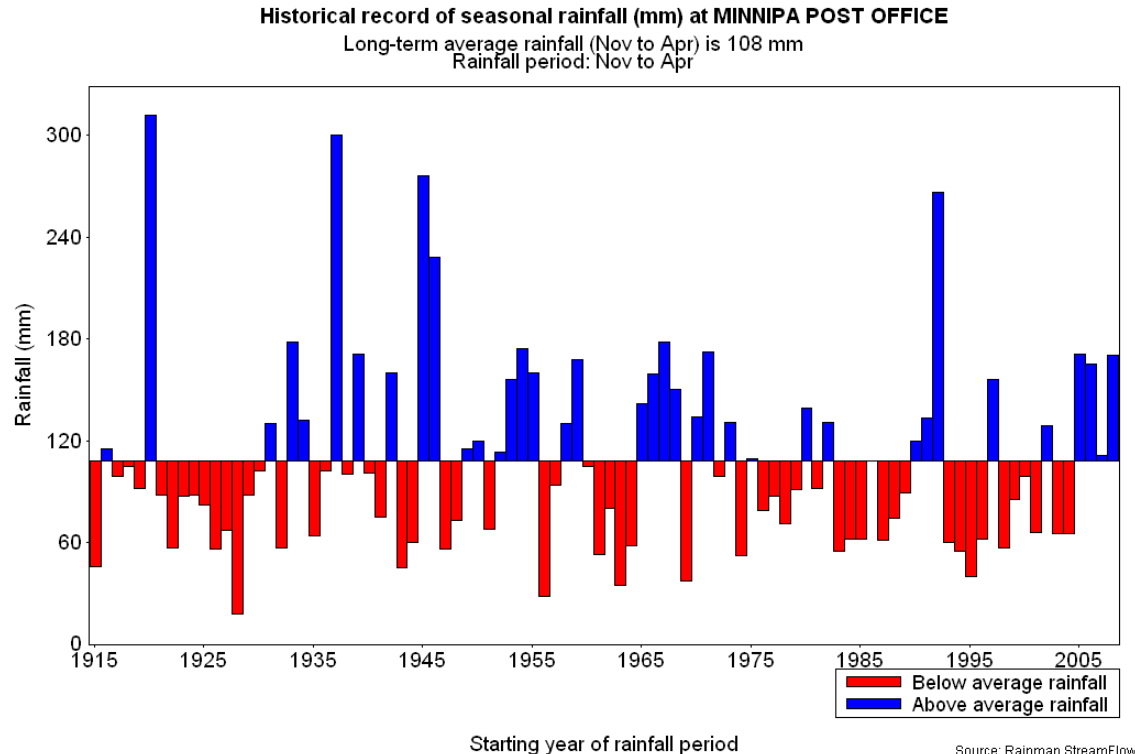


# Cumulative weekly rainfall



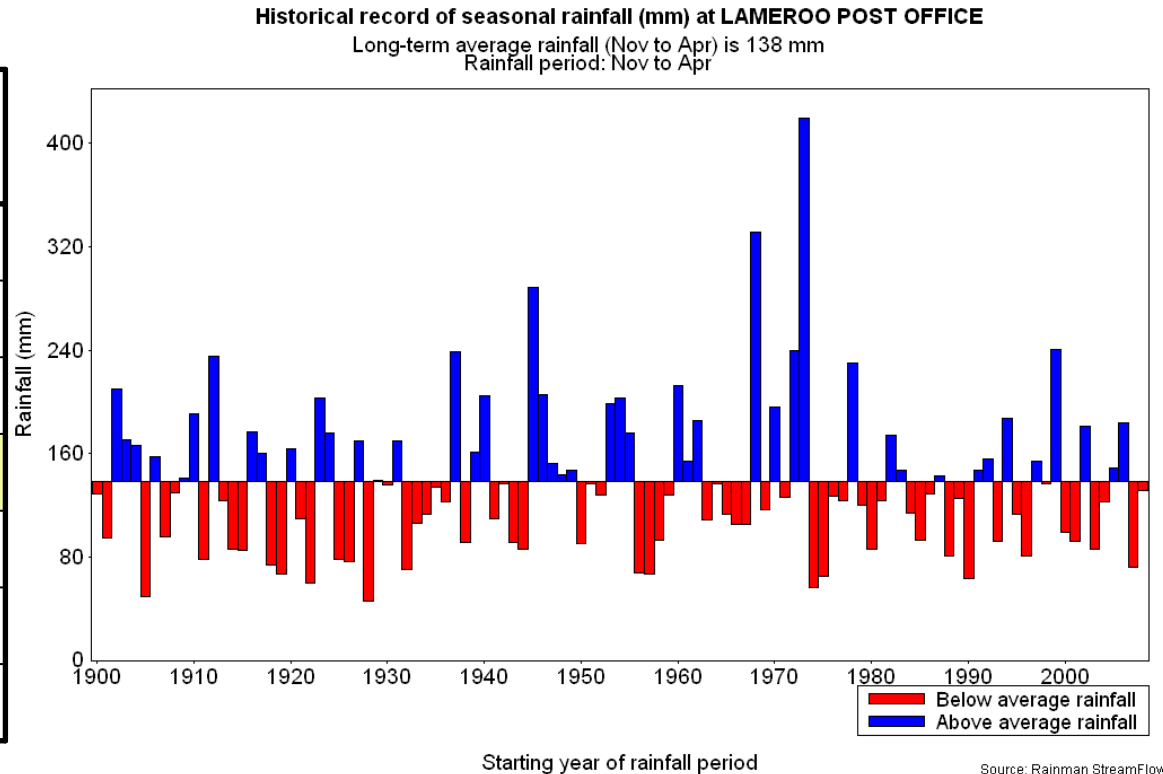
# Minnipa (1916-2005)

Minnipa 1915-2009	Rain 1 Nov-30 April
maximum	312
10% years >	171
30% years >	130
50% years >	97
70% years >	68
90% years >	55
minimum	18



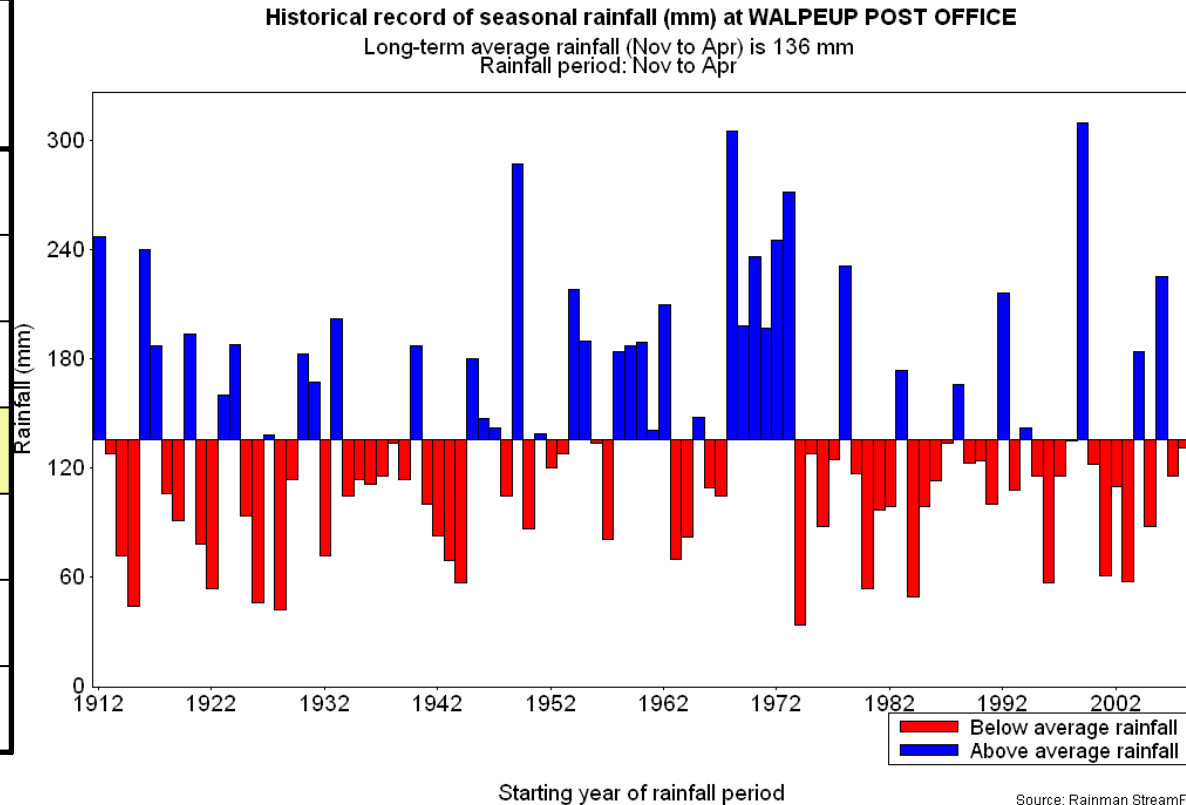
# Lameroo (1900-2007)

Lameroo 1900-2008	Rain 1 Nov-30 April
maximum	420
10% years >	205
30% years >	157
50% years >	129
70% years >	105
90% years >	74
minimum	46



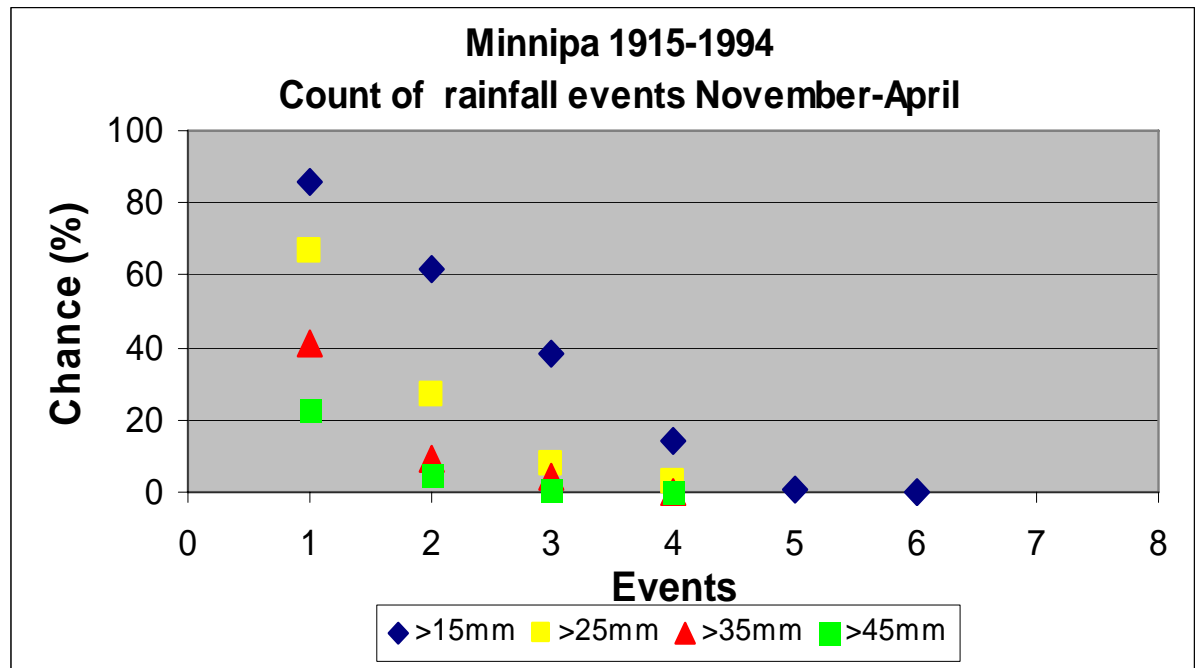
# Walpeup (1913-2008)

Walpeup 1915-2009	Rain 1 Nov-30 April
maximum	310
10% years >	221
30% years >	166
50% years >	123
70% years >	104
90% years >	60
minimum	34



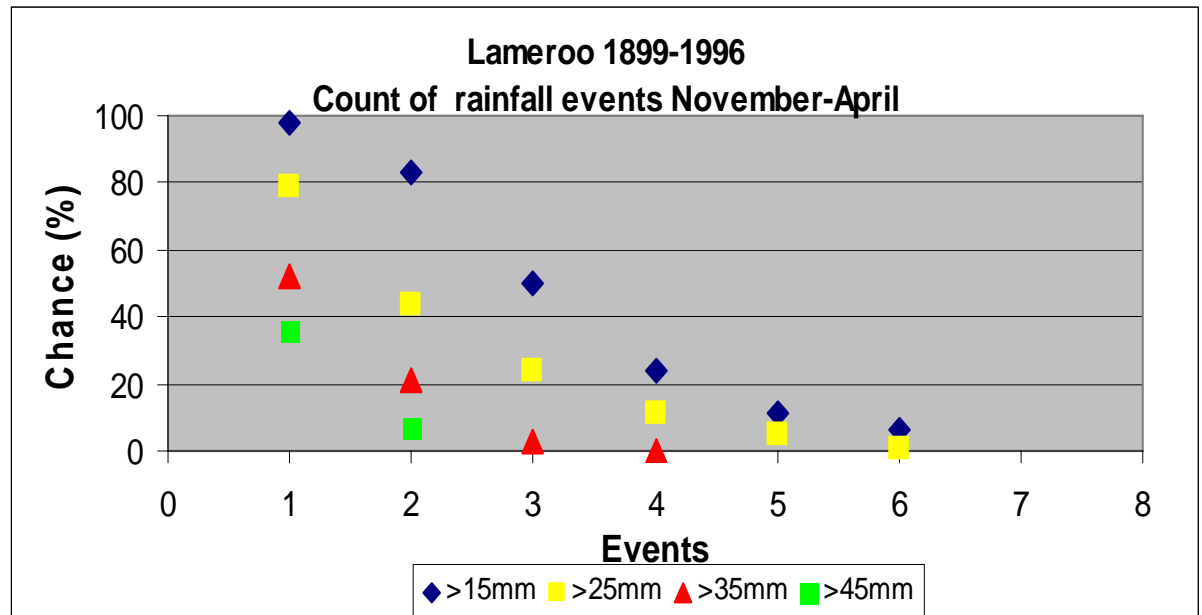
# Minnipa (1915-1994)

Minnipa 1915-1994	No events Nov-Apr
Amount	% years
>15mm	14
>25mm	33
>35mm	59
>45mm	77

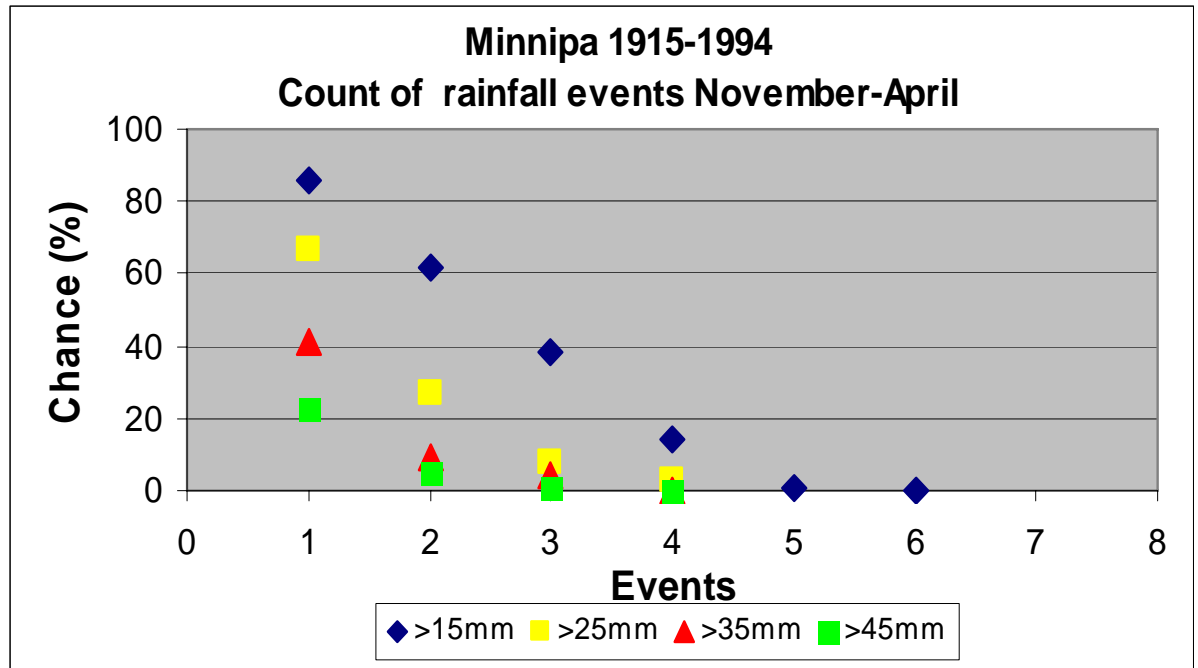


# Lameroo (1899-1996)

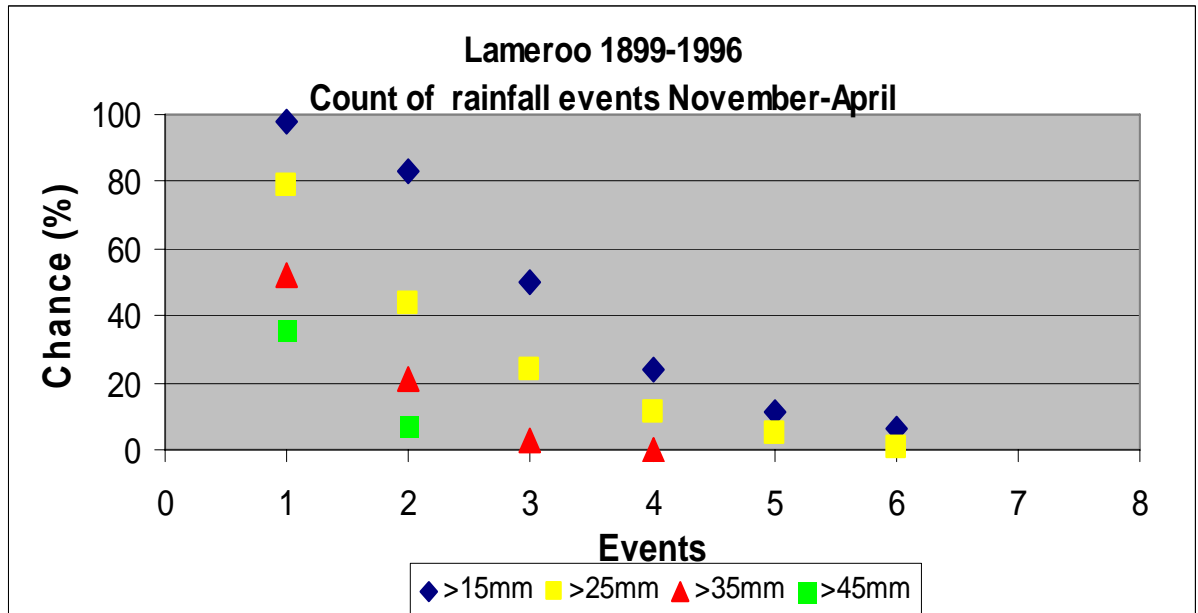
Lameroo 1899-1996	No events Nov-Apr
Amount	% years
>15mm	2
>25mm	21
>35mm	48
>45mm	64



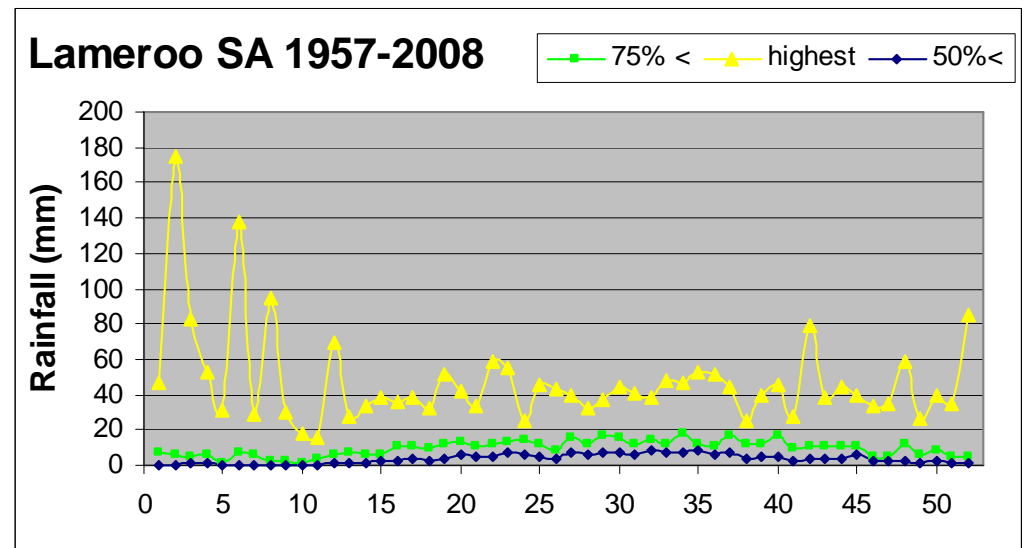
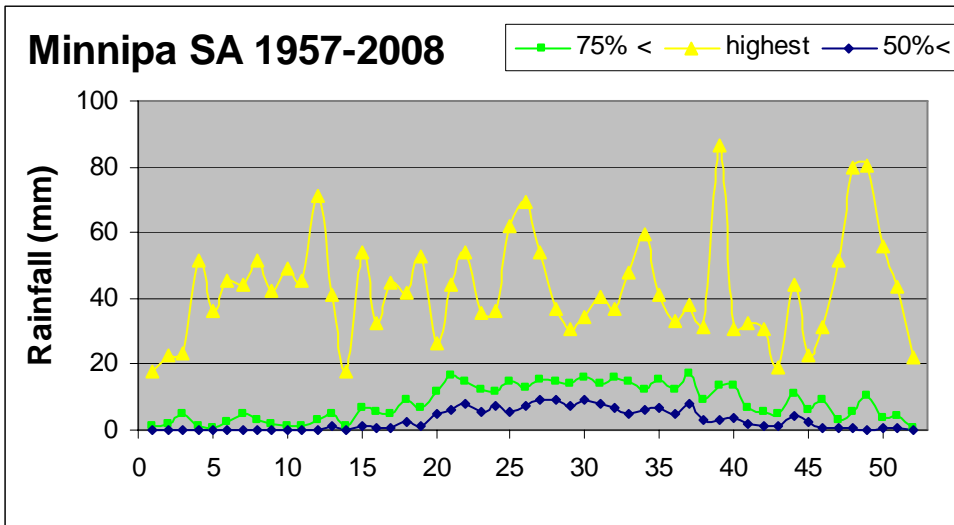
Minnipa 1915-1994	No events Nov-Apr
Amount	% years
>15mm	14
>25mm	33
>35mm	59
>45mm	77



Lameroo 1899-1996	No events Nov-Apr
Amount	% years
>15mm	2
>25mm	21
>35mm	48
>45mm	64

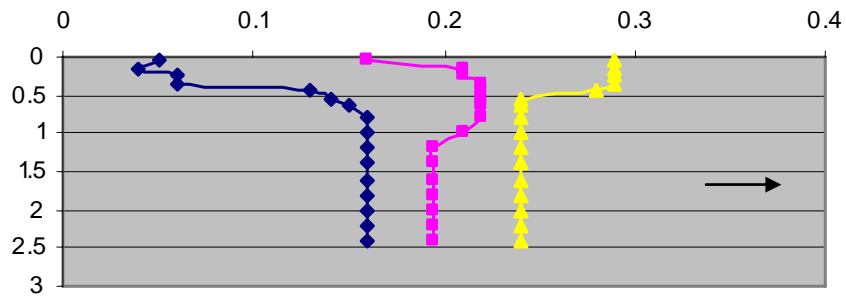


# Extreme weekly rainfall

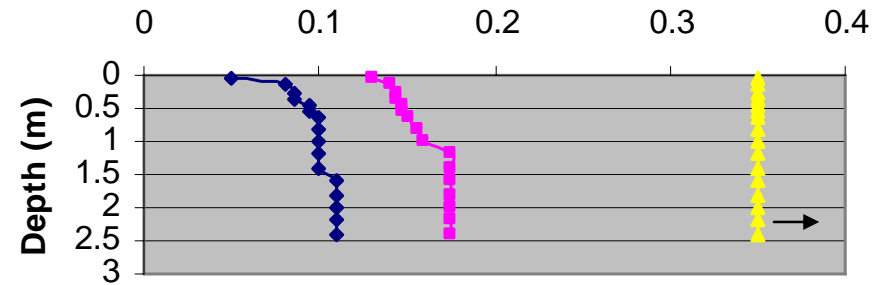


# Soil water parameters

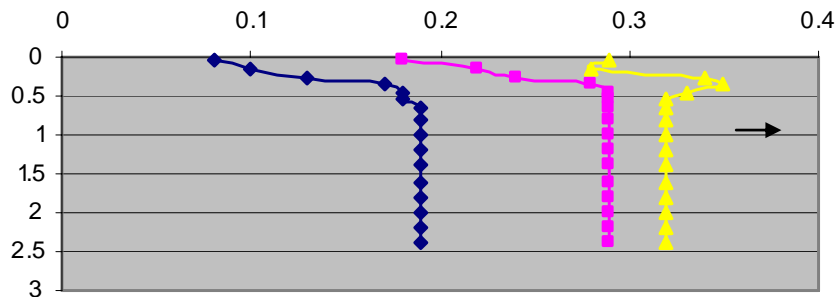
**Deep sandy duplex PASW=83**



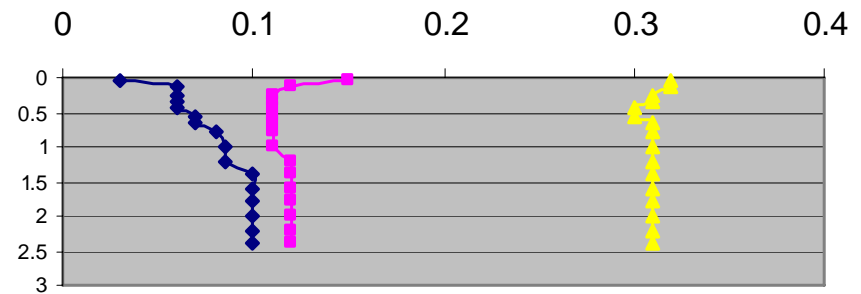
**Loamy sand PASW=146**



**Shallow loamy duplex PASW=76**



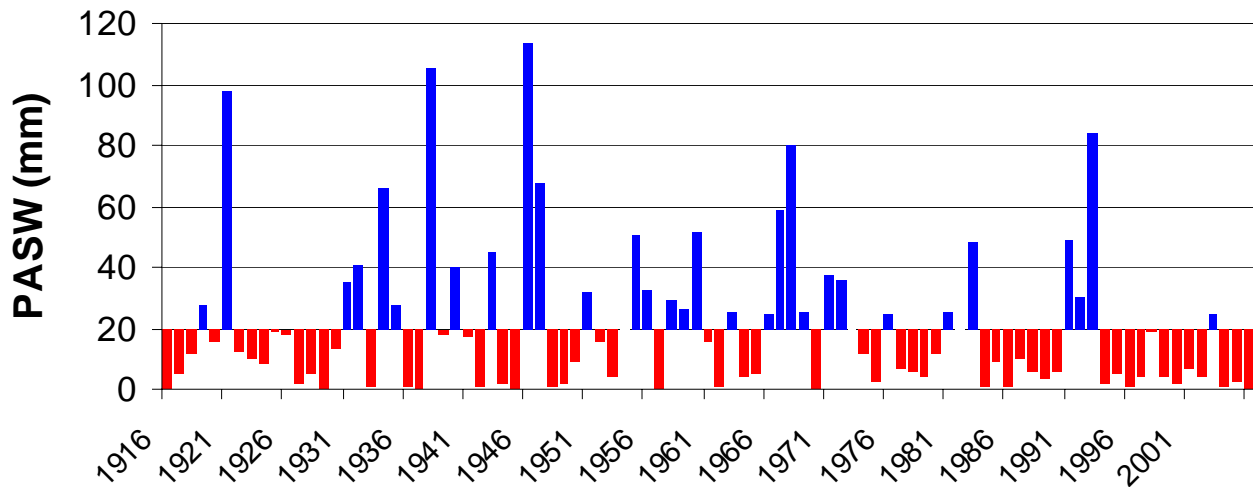
**Yellow deep sand PASW=63**



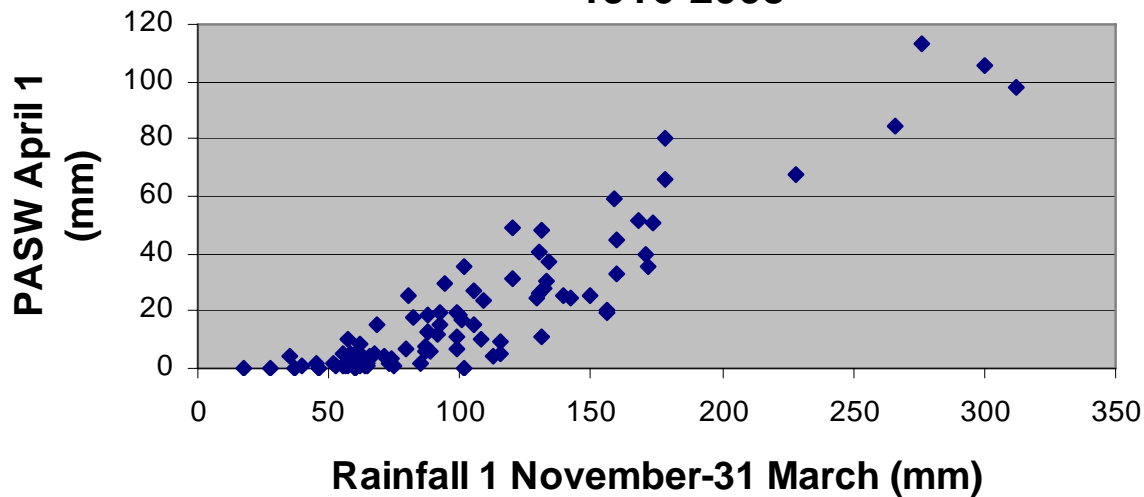
# Estimated stored soil water

- APSIM wheat
- Soil type assumptions

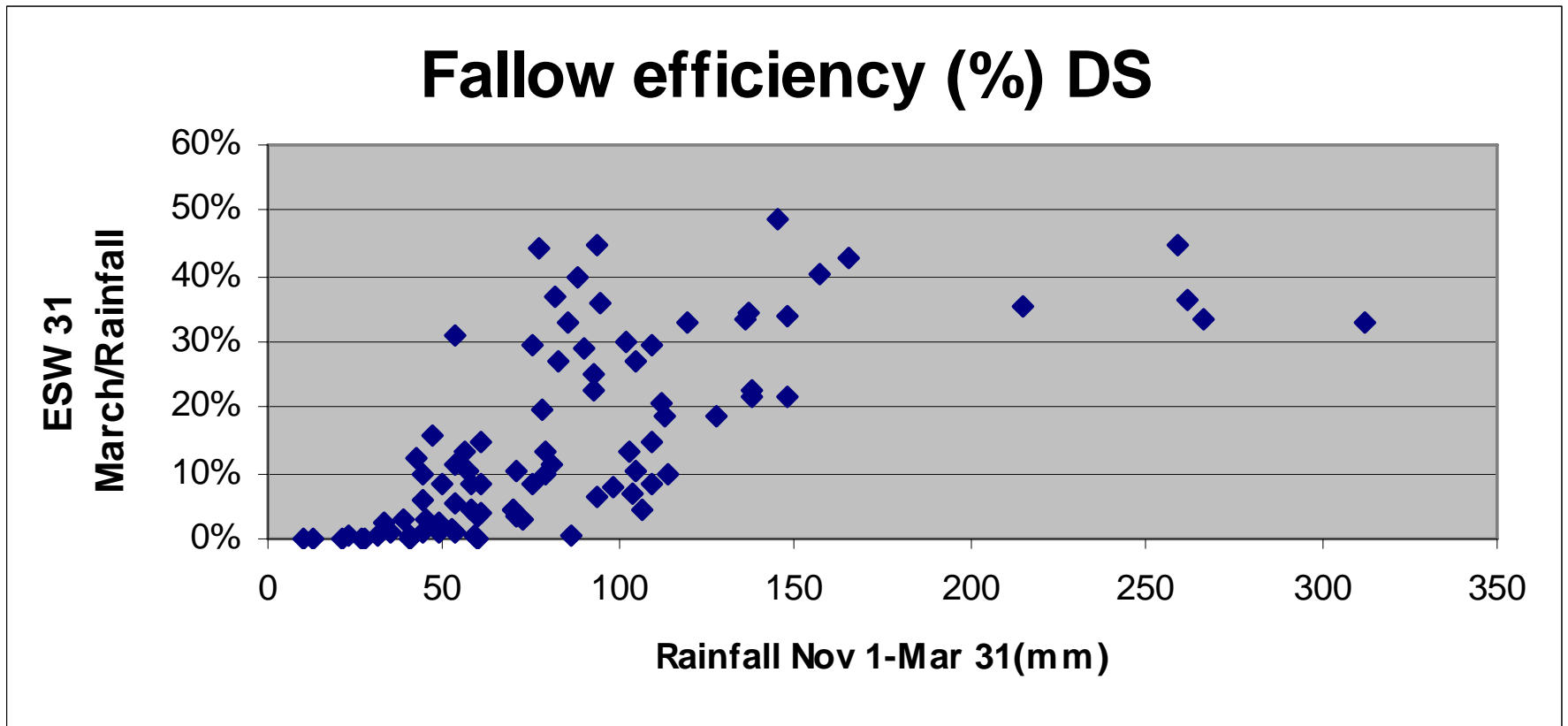
### Minnipa PASW Deep sandy duplex on May 1 bare soil fallow since 1 November



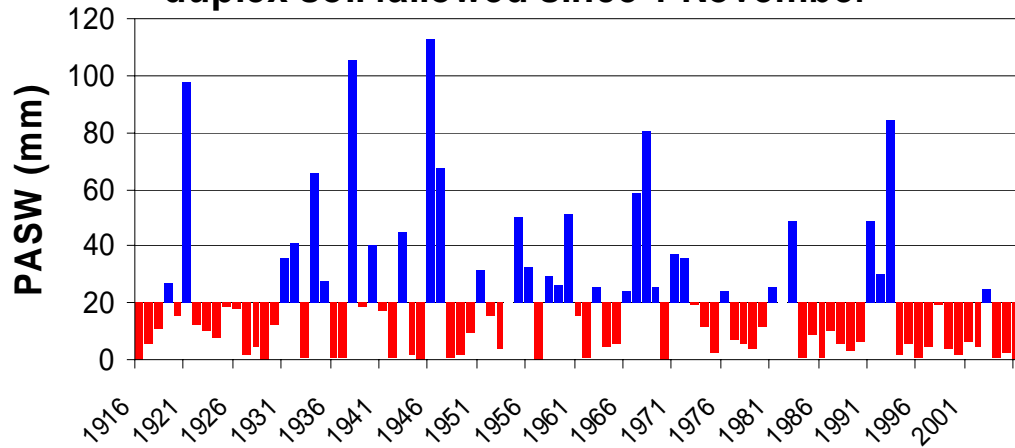
### Minnipa PASW May 1 vs seasonal rainfall 1916-2005



# Fallow efficiency Minnipa (1915-2008)

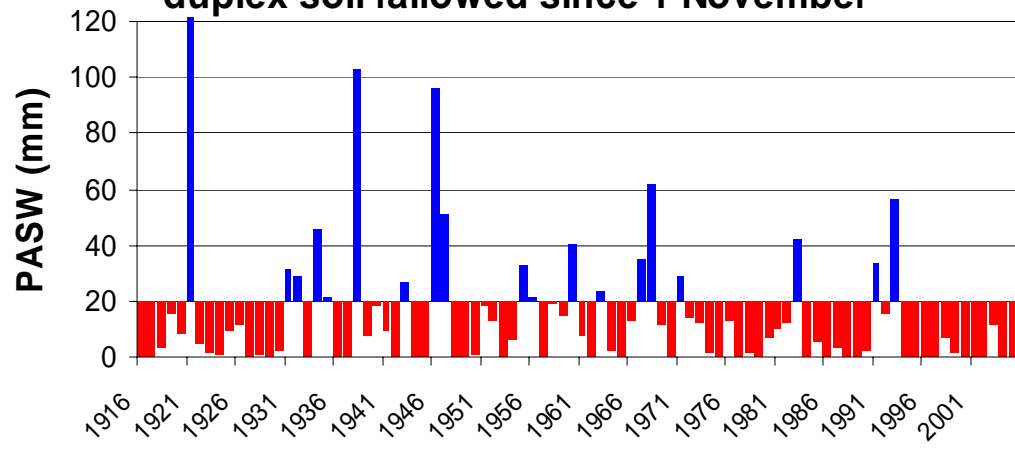


**Minnipa ESW on April 30 on deep sandy duplex soil fallowed since 1 November**



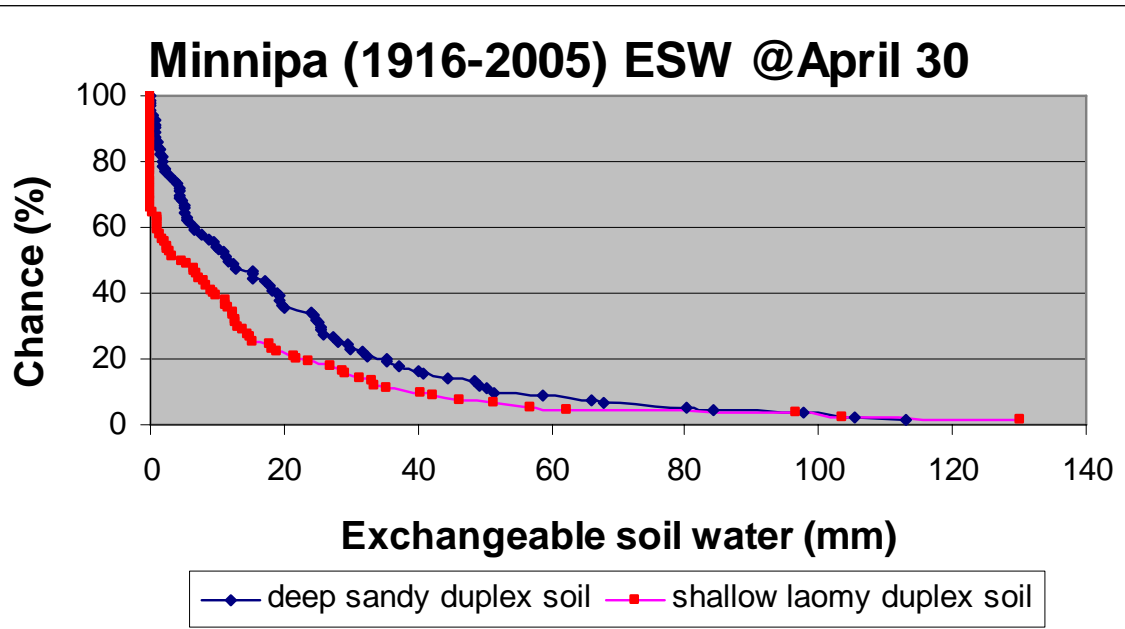
Minnipa 1916-2005	ESW <sup>d</sup> <sub>d</sub> April 30 mm
minimum	0
25% years<	3
50% years<	12
75% years<	28
maximum	113

**Minnipa ESW on April 30 on shallow loamy duplex soil fallowed since 1 November**



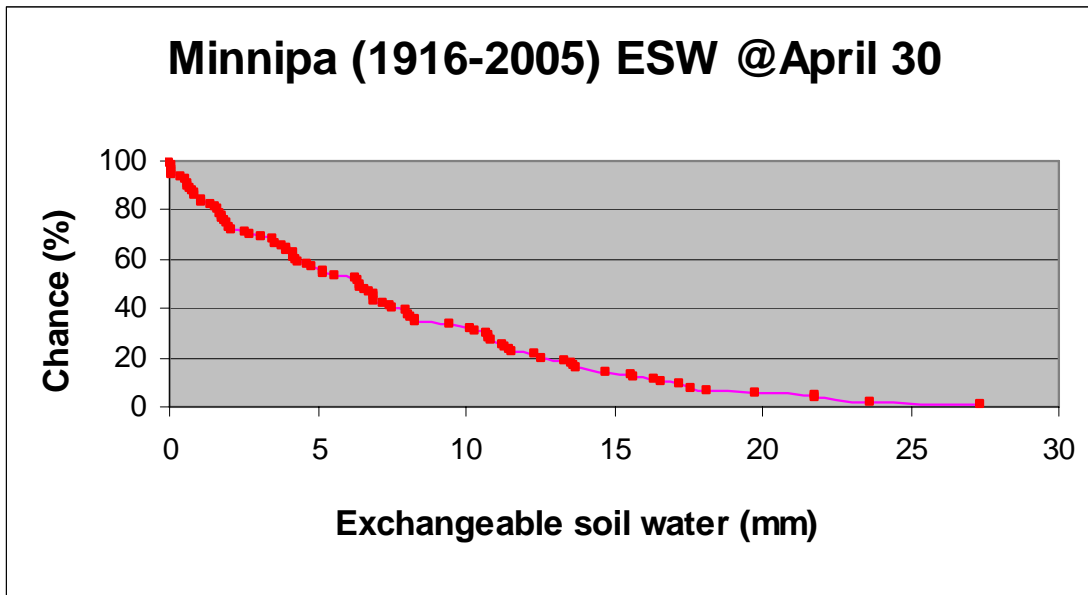
Minnipa 1916-2005	ESW <sup>l</sup> <sub>d</sub> April 30 mm
minimum	0
25% years<	0
50% years<	4
75% years<	15
maximum	130

# Cumulative Distribution Function (CDF) showing chance of exceeding ESW on 2 soils



Minnipa 1916-2005	ESW <sup>dsd</sup> (mm)	ESW <sup>ld</sup> (mm)
minimum	0	0
25% years<	3	0
50% years<	12	4
75% years<	28	15
maximum	113	130

# Difference in stored water on April 30 ( $ESW^{dspd} - ESW^{ld}$ )



Minnipa 1916-2005	Difference mm
minimum	-32
25% years<	2
50% years<	6
75% years<	11
maximum	27

# Distributions of rainfall and stored water Minnipa (1916-2005)

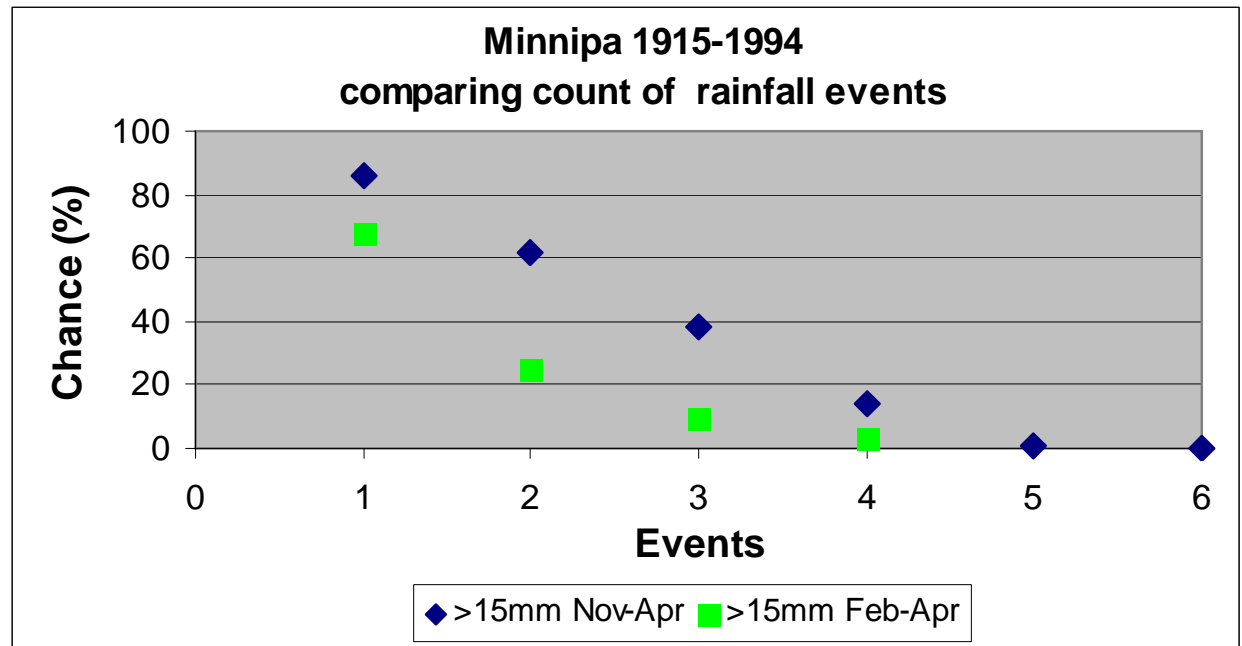
Minnipa 1915-2008	1 Nov-Apr 30 rain (mm)	Minnipa 1916-2005	ESW <sup>d</sup> (mm)	ESW <sup>ld</sup> (mm)
minimum	18	minimum	0	0
25% years<	64	25% years<	3	0
50% years<	97	50% years<	12	4
75% years<	133	75% years<	28	15
maximum	312	maximum	113	130

- Stored water from summer rain is elusive BUT it can happen and is significant in some years

# Opportunities for weed control

- Rainfall required to relieve stress on weeds, say at least 15mm over 7 days
- Not every year has opportunities (table)
- Opportunities are rare (figure)

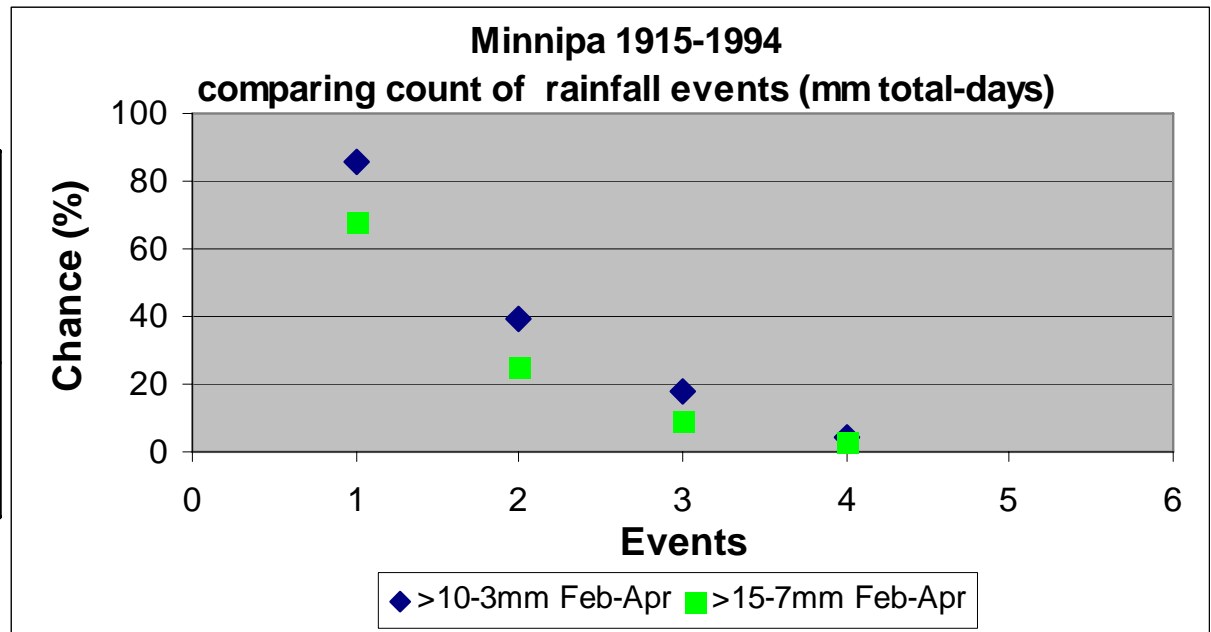
Minnipa 1915-1994	No events
Amount	% years
>15mm Nov-Apr	14
>15mm Feb-Apr	32



# Opportunities for weed control

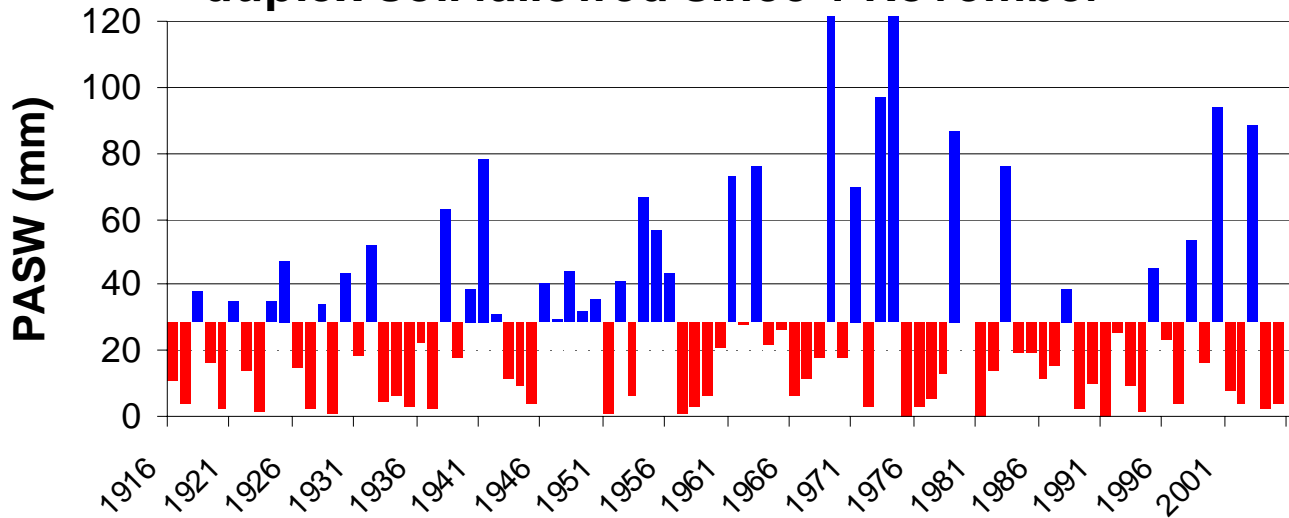
- Rainfall required to relieve stress on weeds
- compare >15mm over 7 days and 10mm over 3 days
- Not every year has opportunities (table)
- Opportunities are rare (figure)

Minnipa 1915-1994	No events Feb-Apr
Amount	% years
>10mm-3days	14
>15mm-7days	32

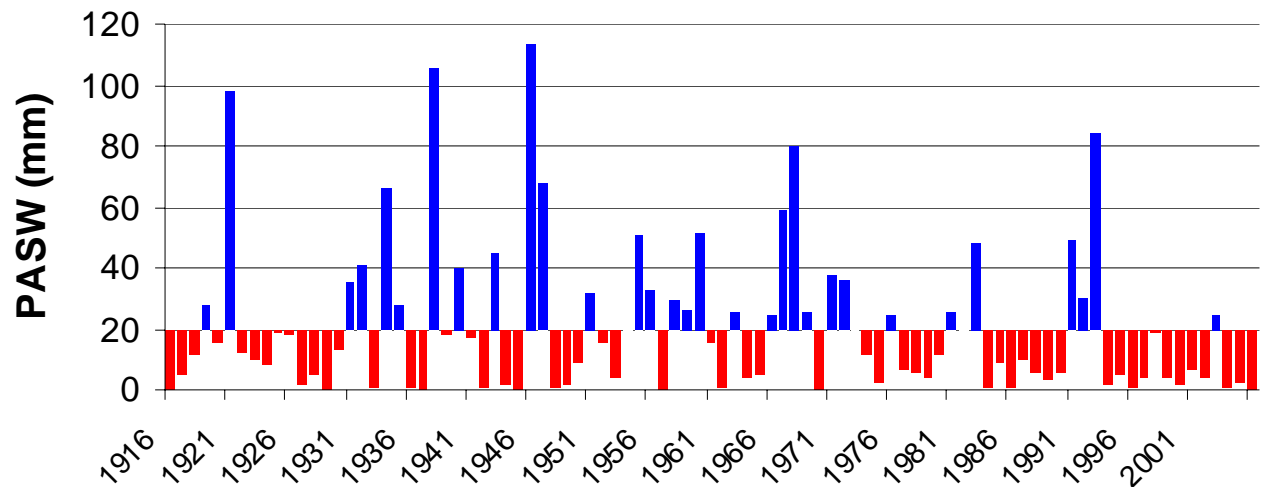


Lameroo stored soil water

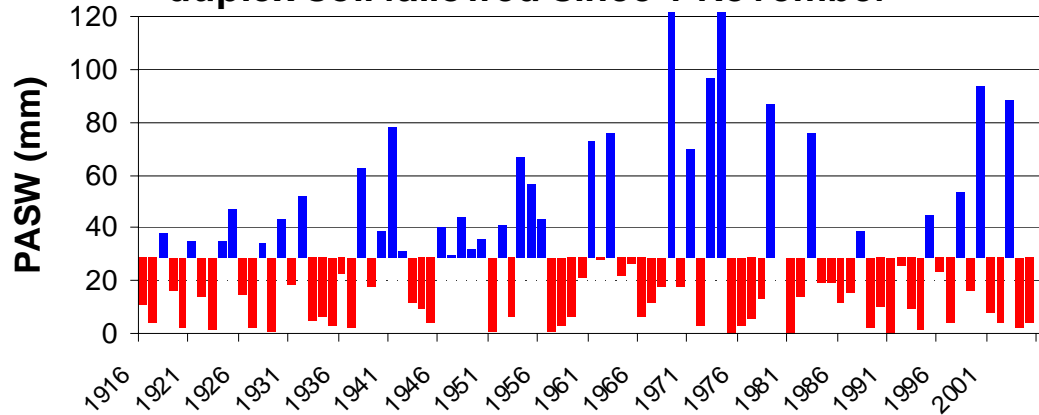
### Lameroo ESW on April 30 on deep sandy duplex soil fallowed since 1 November



### Minnipa PASW Deep sandy duplex on May 1 bare soil fallow since 1 November

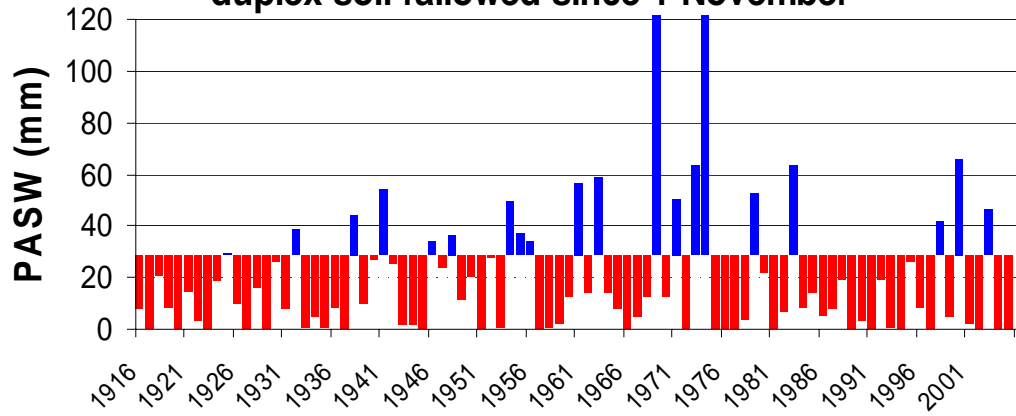


**Lameroo ESW on April 30 on deep sandy duplex soil fallowed since 1 November**



Lameroo 1916-2005	ESW <sup>d</sup> <sub>d</sub> April 30 mm
mininum	0
25% years<	5
50% years<	18
75% years<	40
maximum	152

**Lameroo ESW on April 30 on shallow loamy duplex soil fallowed since 1 November**

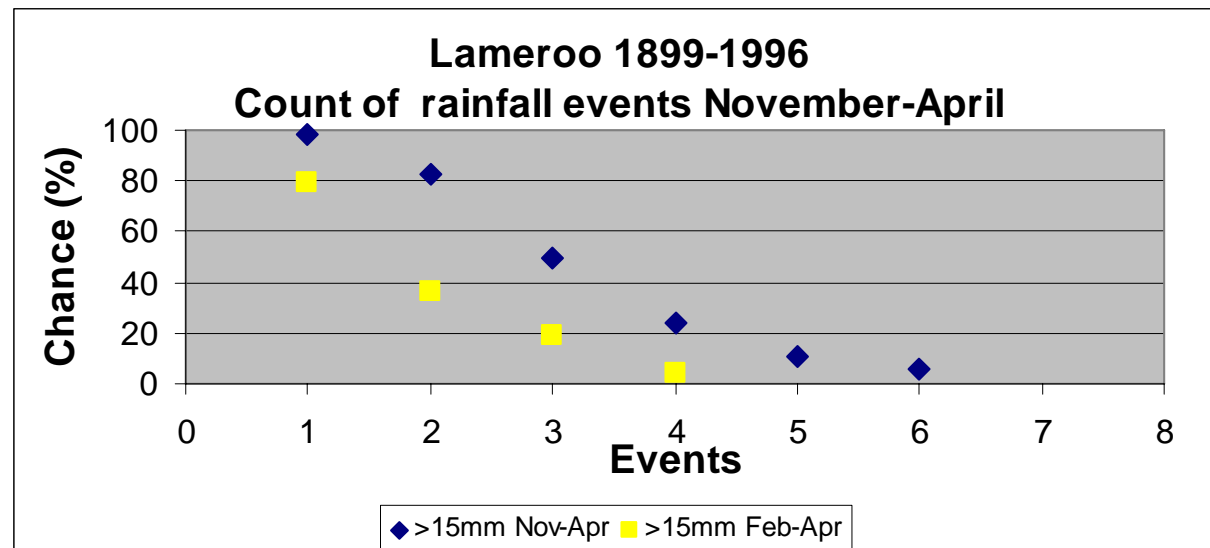


Lameroo 1916-2005	ESW <sup>l</sup> <sub>d</sub> April 30 mm
mininum	0
25% years<	0
50% years<	9
75% years<	27
maximum	200

# Opportunities for weed control

- Rainfall required to relieve stress on weeds, say at least 15mm over 7 days
- Not every year has opportunities (table)
- Opportunities are rare (figure)

Lameroo 1899-1994	No events
Amount	% years
>15mm Nov-Apr	2
>15mm Feb-Apr	21



# Fallow efficiency

=stored water/rain

## Getting rain in

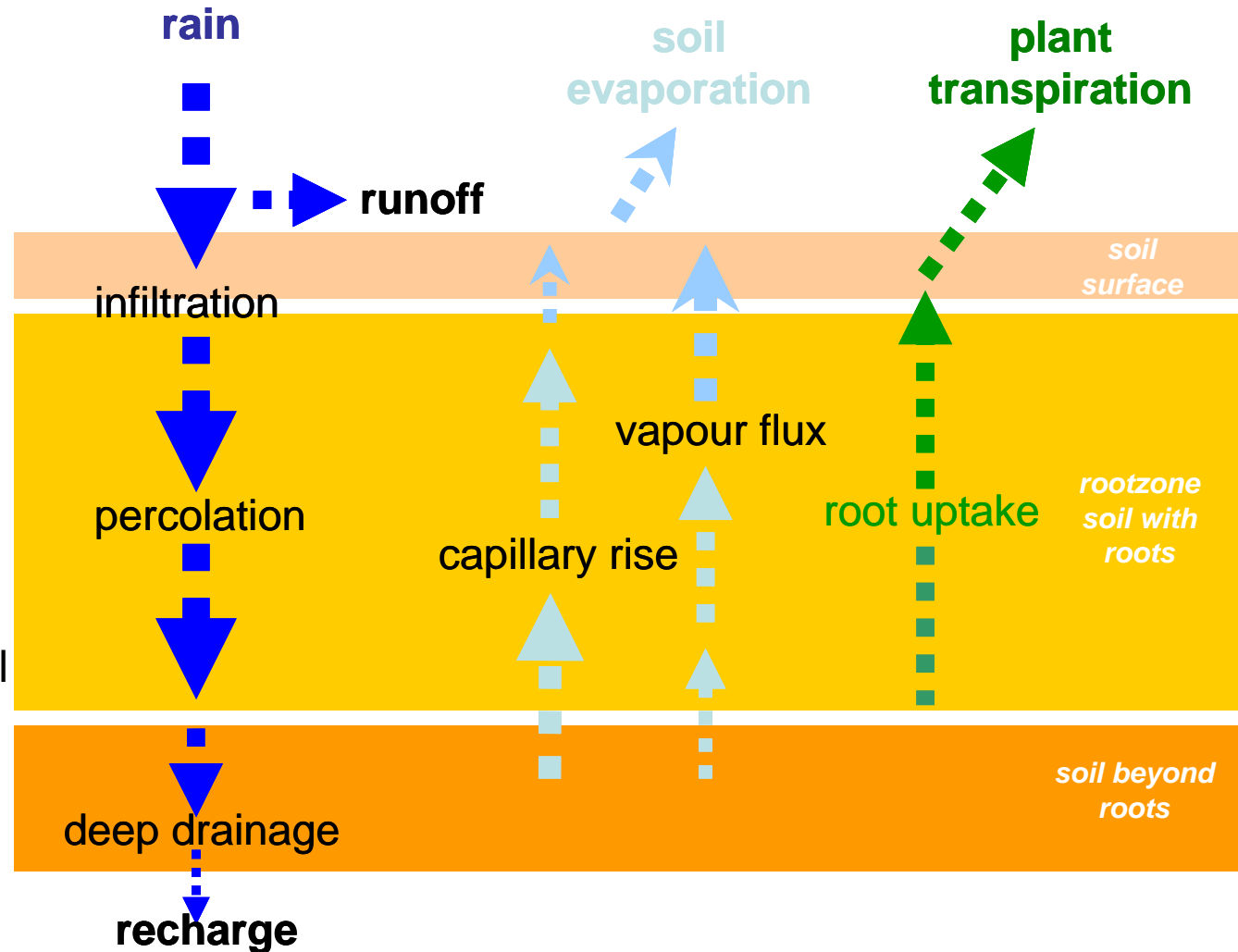
banks  
surface storage  
non wetting  
hard setting  
cultivation/ tillage  
grazing/ traffic  
surface cover

## Keeping water in

Cultivation/ tillage  
stubble retention  
summer weed control

## Getting water out

ripping/ compaction  
liming- low pH  
crop nutrition  
crop species  
time of sowing



# Objectives for management

- Store water if it rains?
- Water dependent processes eg mineralisation
- Weed control
  - alleopathy
  - disease
  - Insects
  - logistics/ operations



