Efficient Drip Irrigation Systems:

System delivery capacity v's crop water demand

Simon Knowles

Irrigation System Capacity – Drip Irrigation

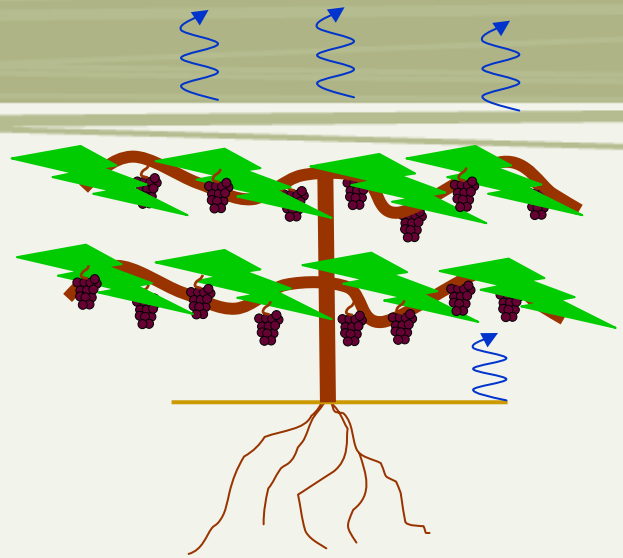
- Low application rates (≈ 1 - 2 mm/hr)
- Partial wetted area (typically ≈ ⅓ total area)
- ∴ more frequent and or long runtimes are required
- Risk of not meeting crop water demand if insufficient time is available
- QUESTION: What should the maximum daily application rate of an irrigation system be?

Calculating Crop Evapotranspiration using ETo and Crop Coefficients

x

A decimal fraction of ETo

=



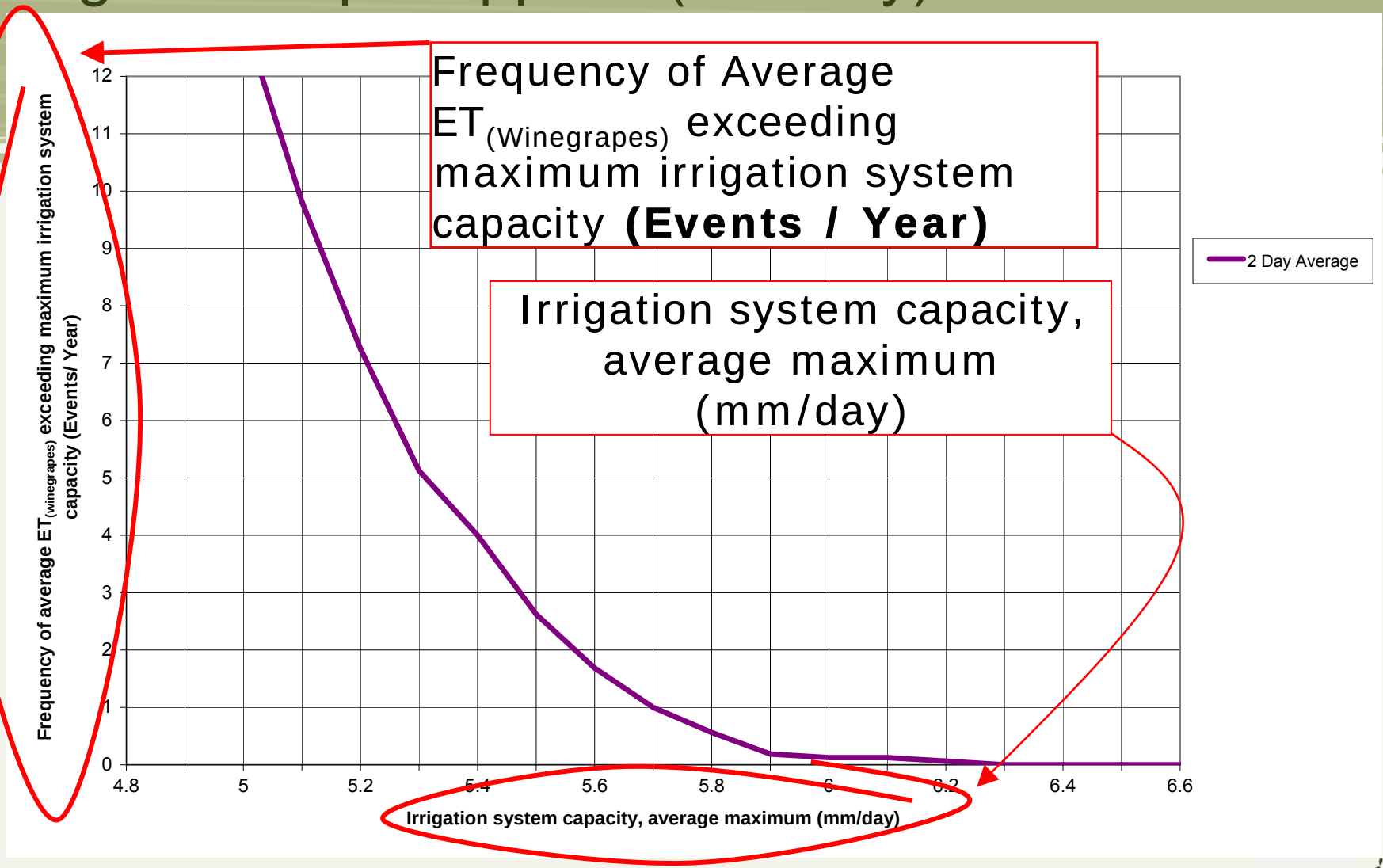
Reference Crop Evapotranspiration (mm) x Crop coefficient = Crop Evapotranspiration (mm)

ETo x **Kc** = **ET_c**

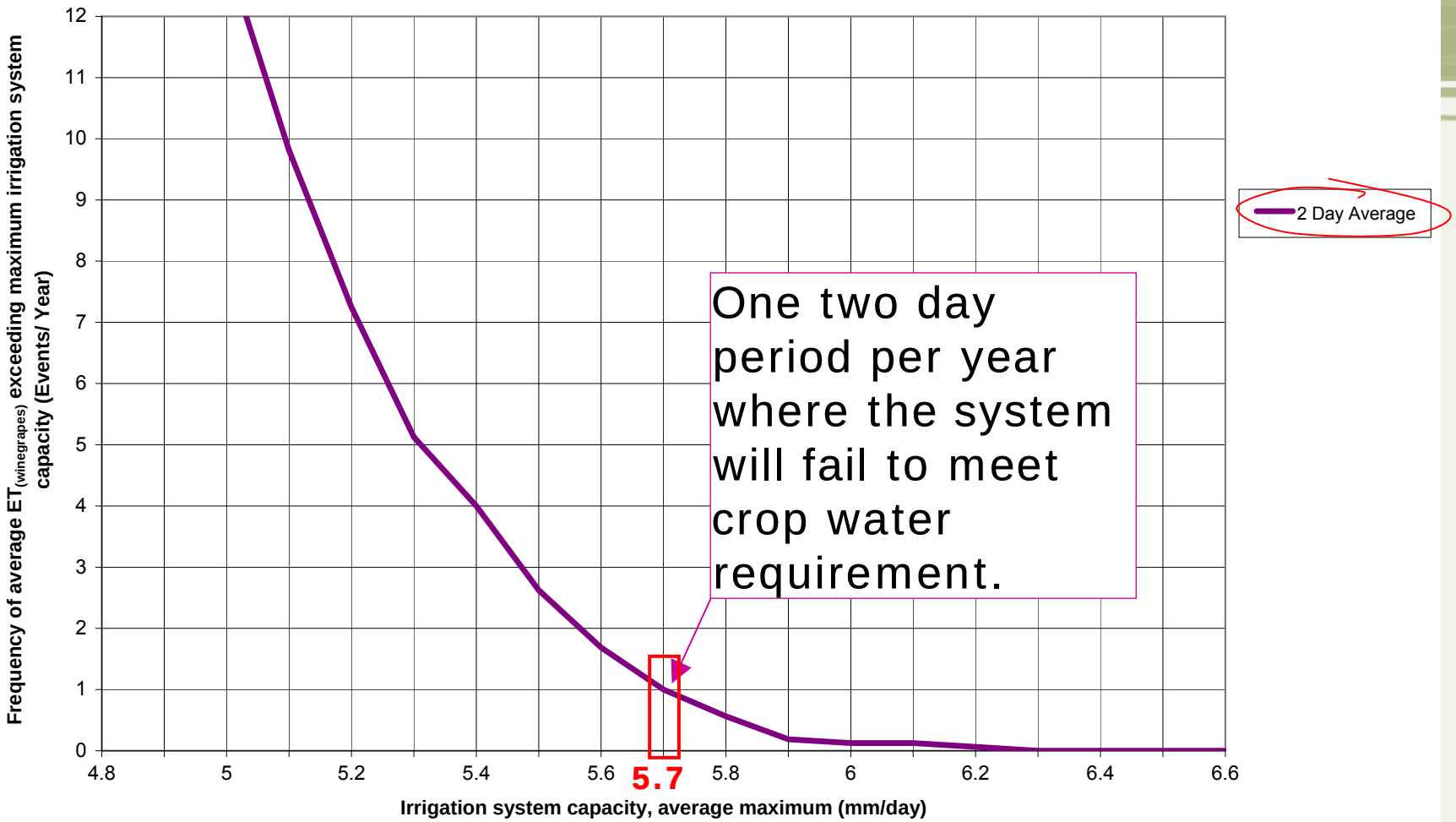
Example of ET_0 calculations

LRC	
1/01/2008	10.17
2/01/2008	9.17
3/01/2008	9.41
4/01/2008	8.79
5/01/2008	8.79
6/01/2008	7.61
7/01/2008	9.24
8/01/2008	8.25
9/01/2008	12.41
10/01/2008	7.46
11/01/2008	9.08
12/01/2008	9.06
13/01/2008	4.3
14/01/2008	8.57
15/01/2008	8.15

Frequency of average ET(winegrapes) exceeding irrigation depth applied (mm/day) - Riverland



Frequency of average ET(winegrapes) exceeding irrigation depth applied (mm/day) - Riverland



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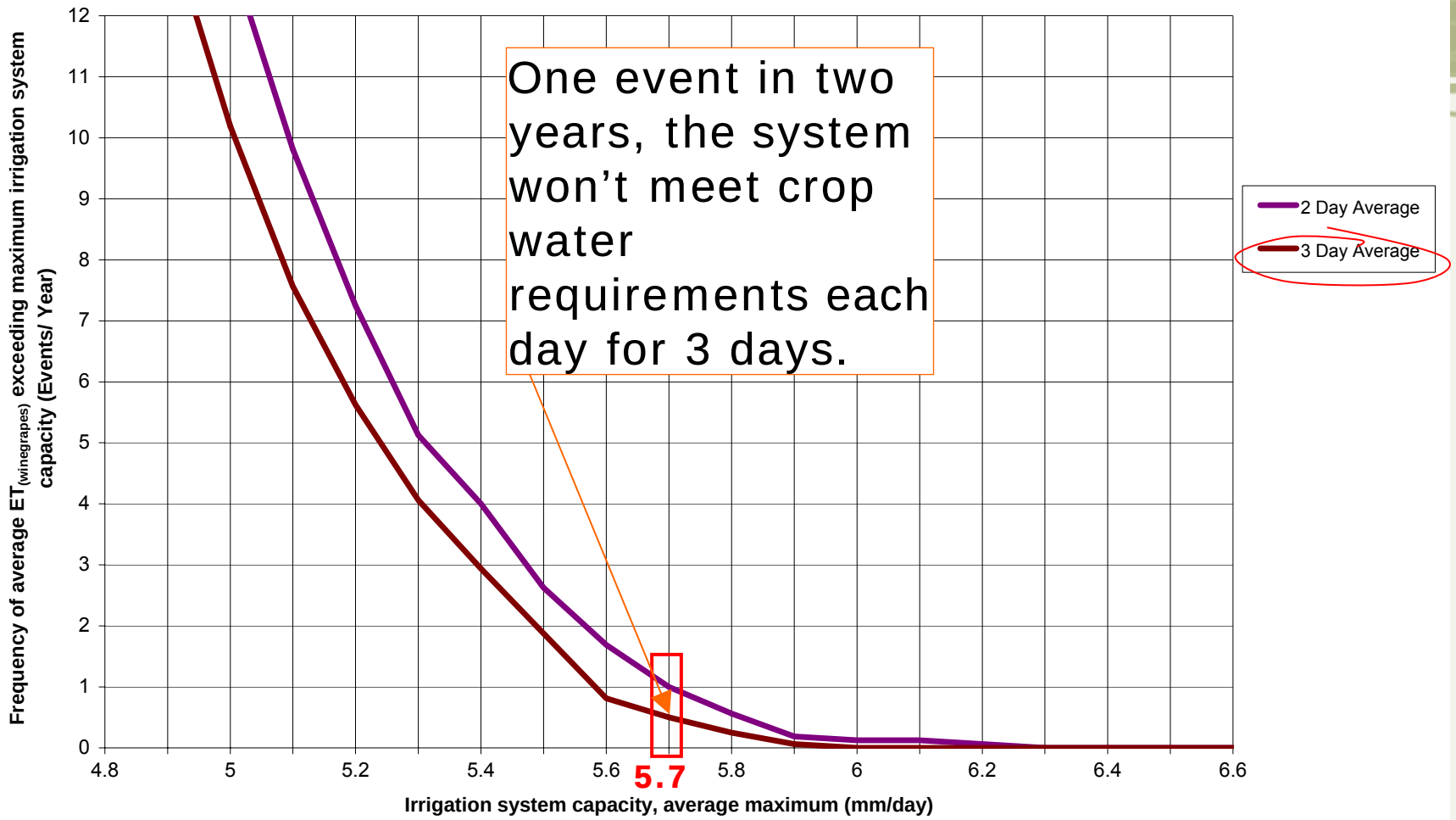

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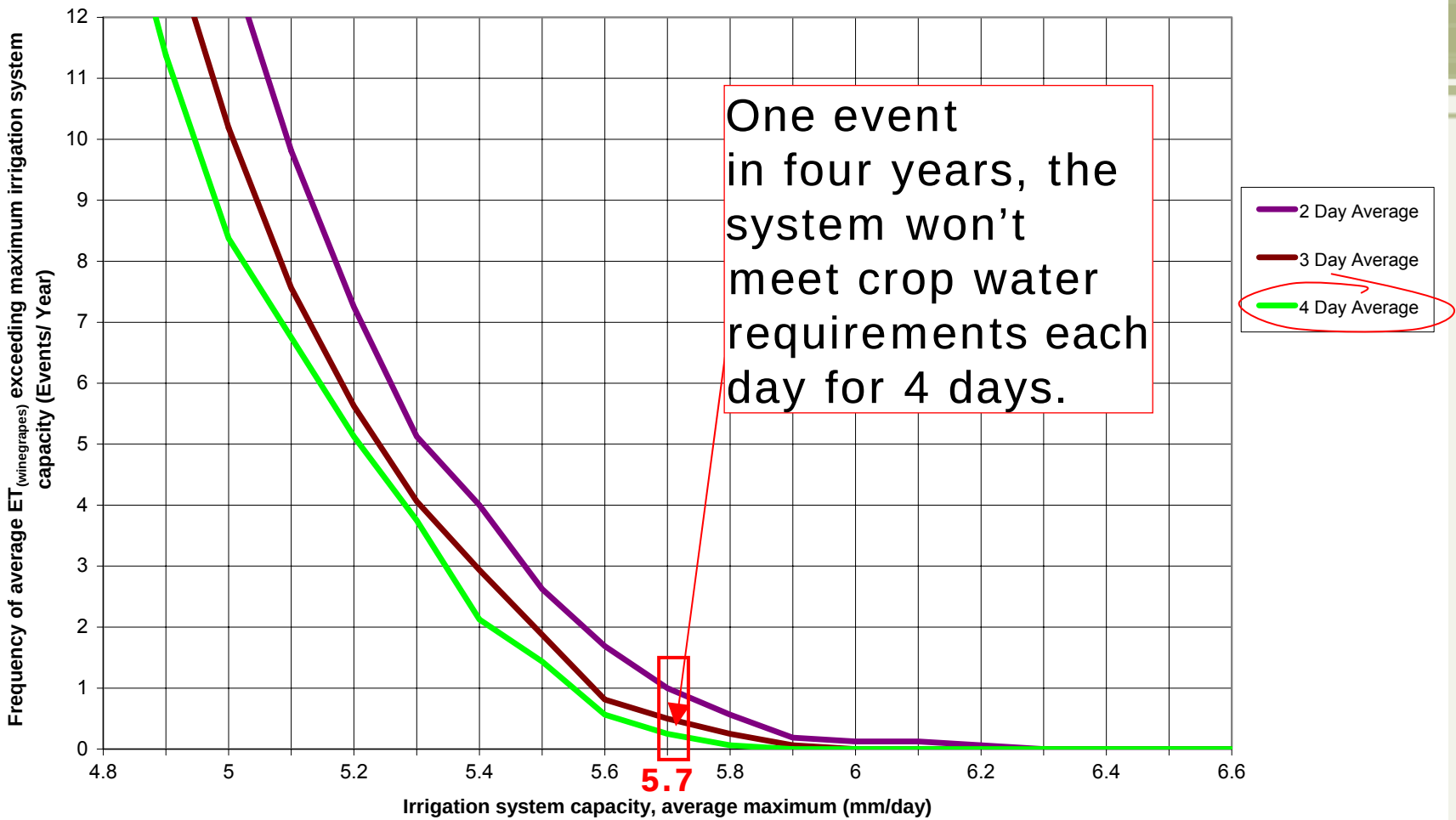
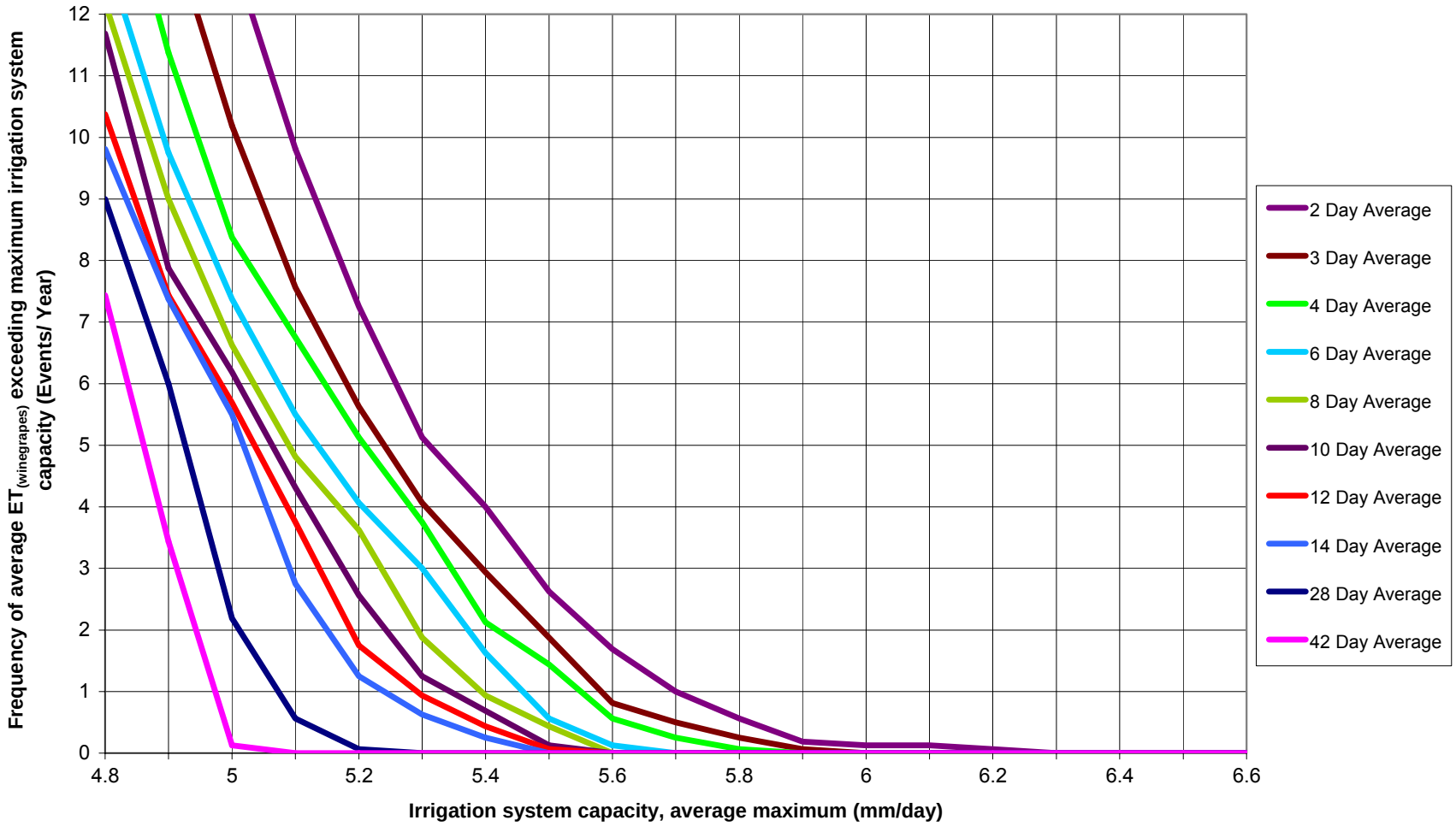
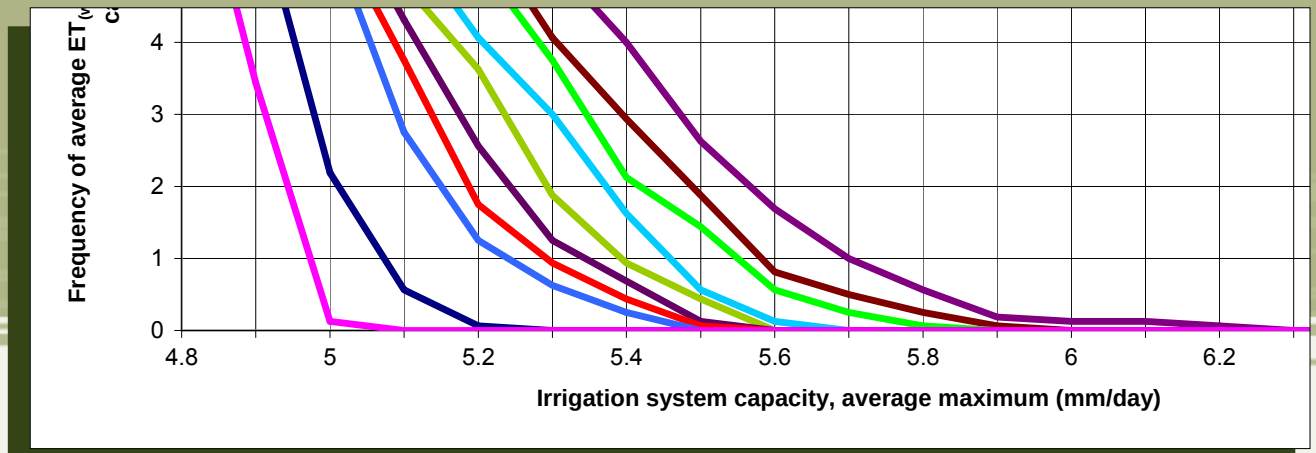


Frequency of average ET(winegrapes) exceeding irrigation depth applied (mm/day) - Riverland

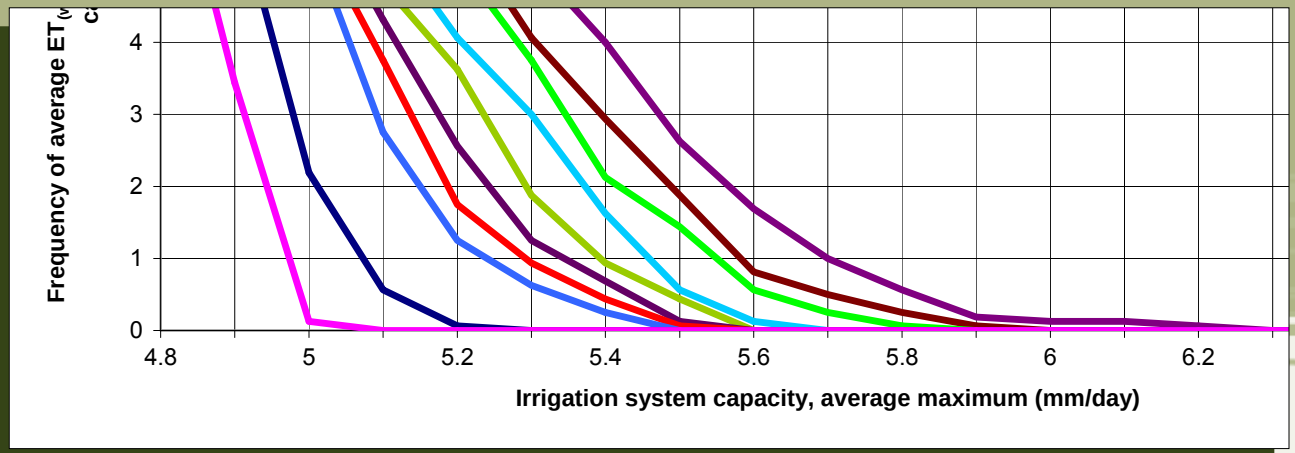


Assumptions:



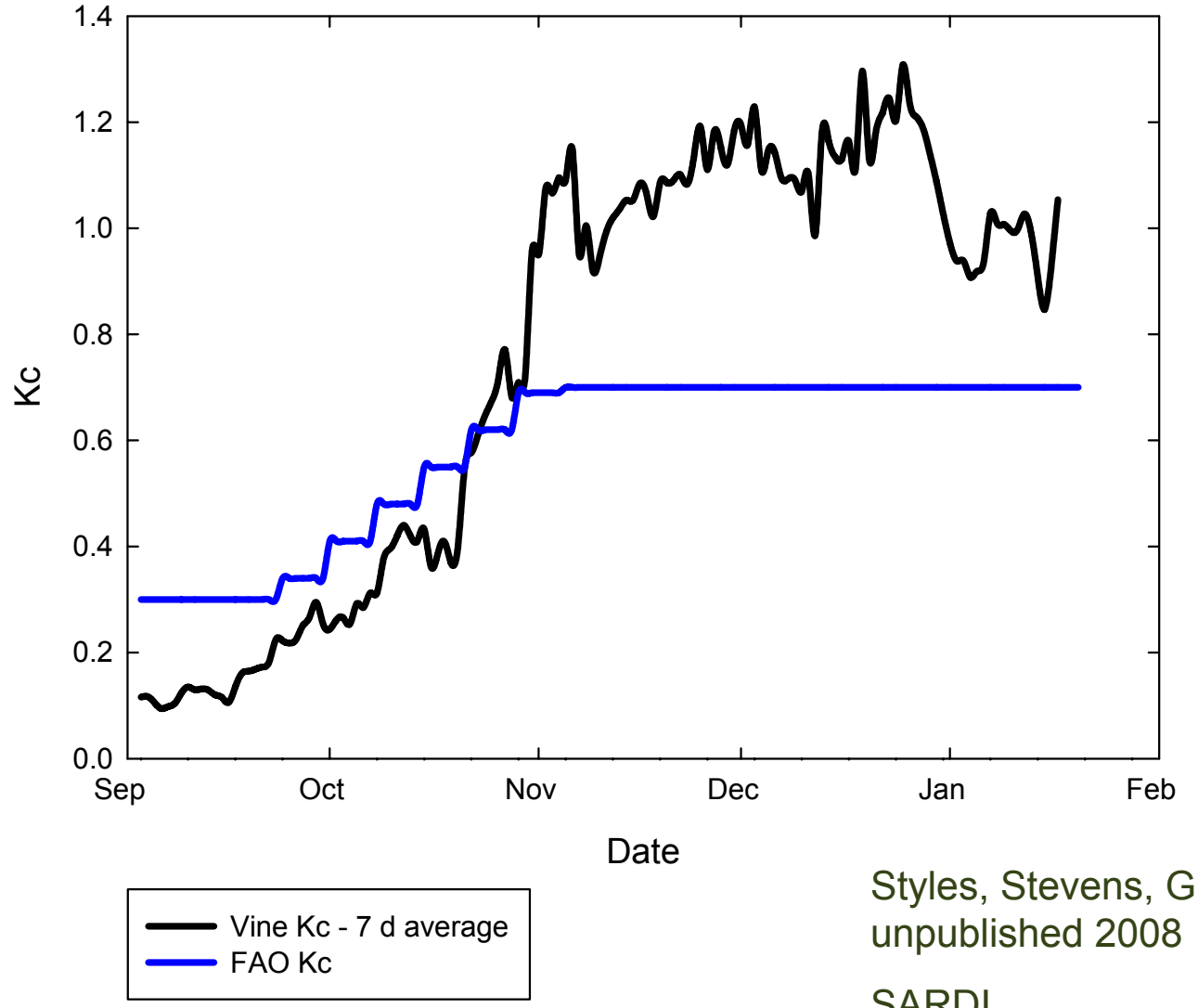
- That the maximum crop coefficient of 0.7 for Winegrapes is not exceeded,
- That no distribution loss or variation is occurring
- That the past seasons are representation of future climatic conditions for the region.

Key Points To Note:



- Small losses in system delivery capacity can sharply increase the risk of failing to meet peak crop water demand
- Modifying an existing irrigation system without considering average maximum capacity can expose significant risk of not meeting crop water requirements $\Rightarrow$ production loss $\Rightarrow$ $ loss

Kc – FAO 56 and Measured Kc



Styles, Stevens, Grigson & Cleugh, unpublished 2008

SARDI

Riverland Review of Drip Irrigation Systems - Summary

Target discharge variation ±5%

Valve	Brand	Type	Discharge L/h	Spacing, m	Application Rate mm/h	Pressure Variation, +/- %	Discharge Variation, +/- %	Flushing Velocity, m/s
101	Netafim	DM17/20 PC	2.3	0.50	1.63	69.6	13.3	0.44
102	Netafim	DM17/20 PC	2.3	0.50	1.58	41.9	9.16	0.45
103	Netafim	DM17/20 PC	2.3	0.50	1.57	23.8	6.4	0.64
104	Netafim	DM17/20 PC	2.3	0.50	1.58	20.5	7.2	0.69
201	Netafim	DM17 PC	2.3	0.60	1.57	33.3	4	0.91
202	Netafim	DM17 PC	2.3	0.60	1.58	36.4	8.9	1.04
203	Netafim	DM17 PC	2.3	0.60	1.61	16	8.9	1.36
204	Netafim	DM17 PC	2.3	0.60	1.53	15	6.3	1.30
205	Netafim	DM17 PC	2.3	0.60	1.64	10.4	8	2.35
206	Netafim	DM17 PC	2.3	0.60	1.65	13.4	2.9	1.87
301	Plastro	20 PC	2.2	0.45	1.22	22.2	8.7	0.57
302	Plastro	20 PC	2.2	0.45	1.23	24.1	6.4	0.50
303	Plastro	20 PC	2.2	0.45	1.24	31.9	6.7	0.59
401	Netafim	DL2025	1.8	0.60	0.88	20	7.4	0.90
402	Netafim	DL2025	1.8	0.60	0.92	22.6	9.2	na
403	Netafim	DL2025	1.8	0.60	0.81	18.6	8.3	0.50
501	Netafim	DL2025	1.8	0.60	0.97	9.6	7	0.41
502	Netafim	DL2025	1.8	0.60	1	6.4	3.05	0.43

Riverland Review of Drip Irrigation Systems - Summary

Target Flushing Velocity: 0.5m/s

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Conclusions

Acknowledgements

- Grape and Wine Research and Development Corporation
- SARDI South Australian Research & Development Institute

experts

experience

passionate

specialist

committed

visionary

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