4.4. SOUTH AUSTRALIAN CATCHMENTS

426522 Murray River @ Morgan shows a significant decrease in stream salinity trends with an EC trend of –6.8 ± 3.6 µS/cm/yr. The change in salt balance was minimal over the years from 1985 to 2000. The mean SO/SI ratio was 0.53 with yearly values ranging from 0.23 in 1985 and 1999 to 1.1 in 1993. The SO/SI ratio only exceeds one in 1989 and 1993.

4.4.1. Murray River Catchment

Table 35: Statistical summary of the data at River Murray @ Morgan (Flow statistics only from days where EC data has been recorded)

Station Name and Number		*Flow (ML/d)*	*EC (µS/cm)*	*Saltload (t/d)*
Murray River @ Morgan (426554)	**median**	7371	605	2761
	mean	17658	714	4567
	max	154900	1460	27972
	min	39	172	16
	80%ile	28850	830	7050
	95%ile	63800	1065	13700

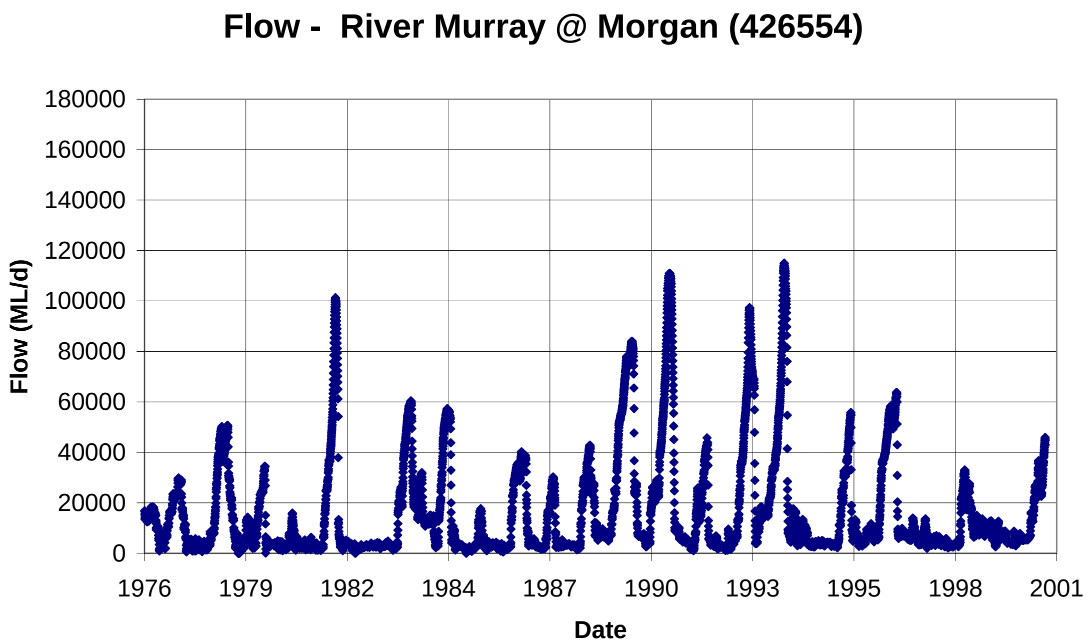

Figure 146: Flow at River Murray @ Morgan (Only on days where EC data has been recorded)

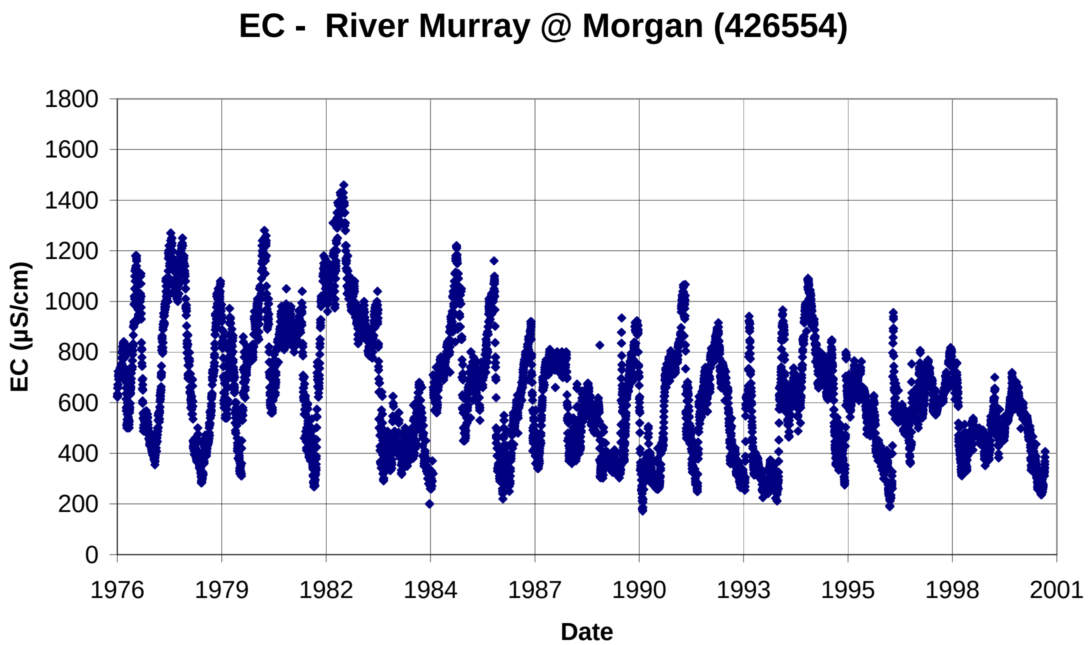

Figure 147: EC at River Murray @ Morgan

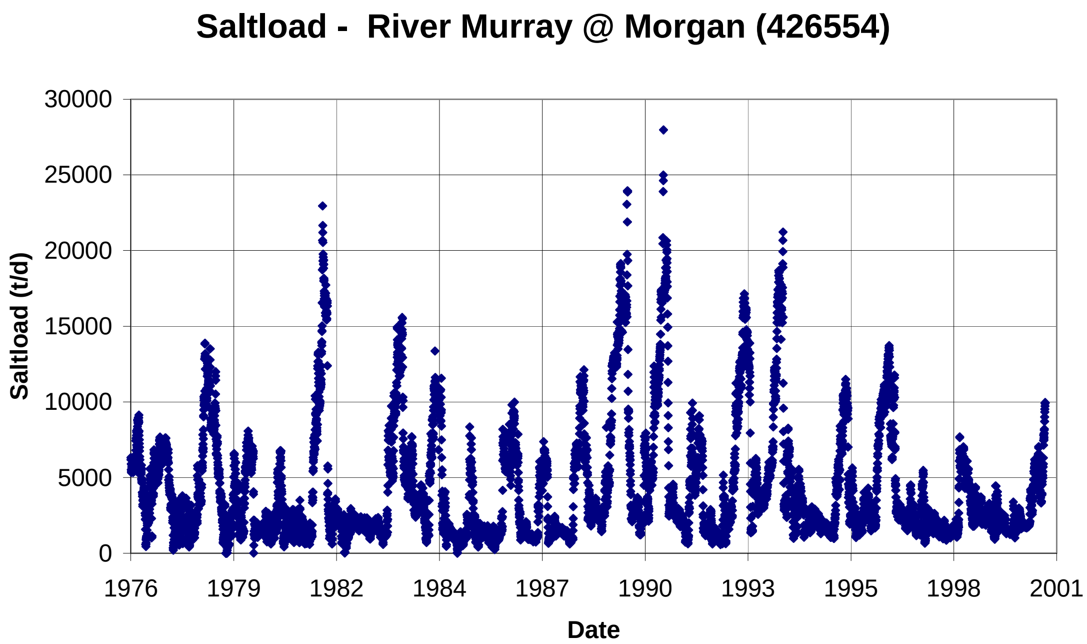

Figure 148: Saltloads at River Murray @ Morgan

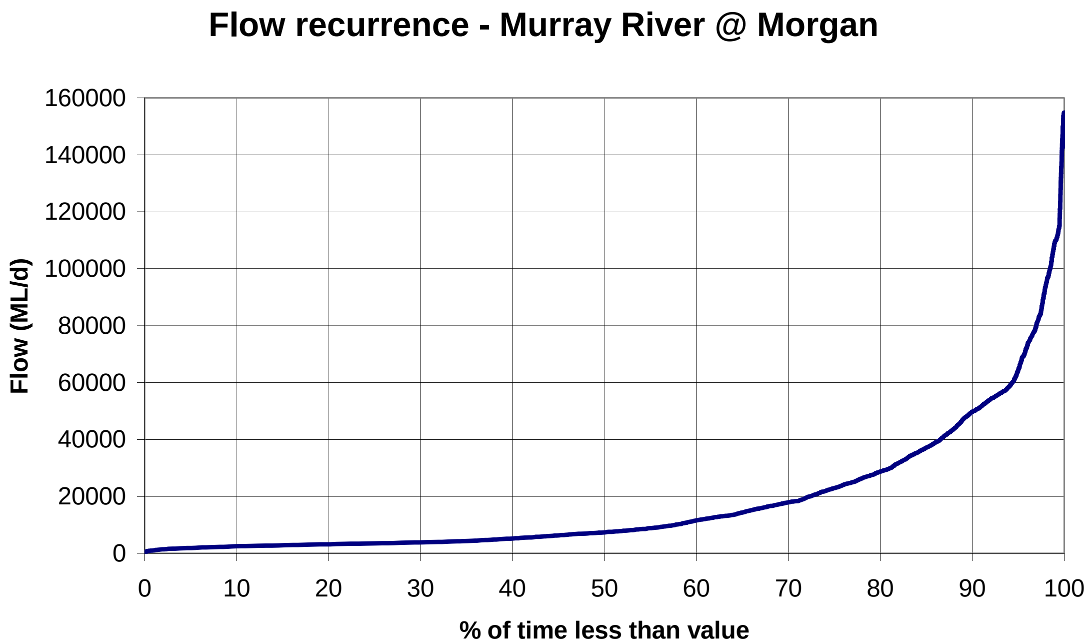

Figure 149: Flow exceedence curves at River Murray @ Morgan (Based on flows on days where EC has been recorded)

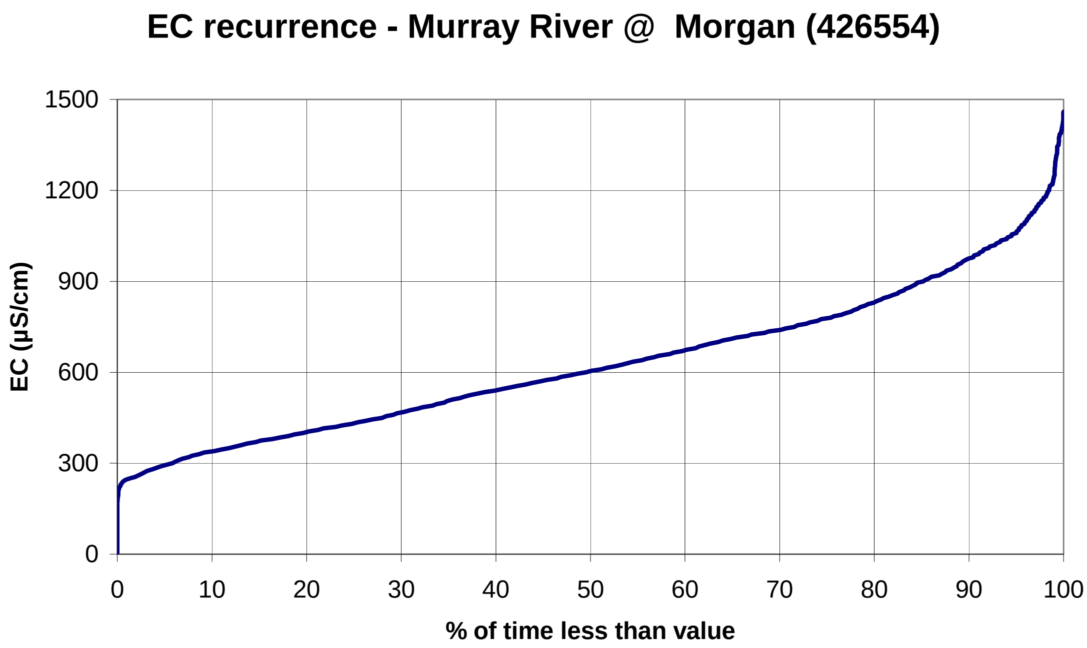

Figure 150: EC exceedence curves at River Murray @ Morgan

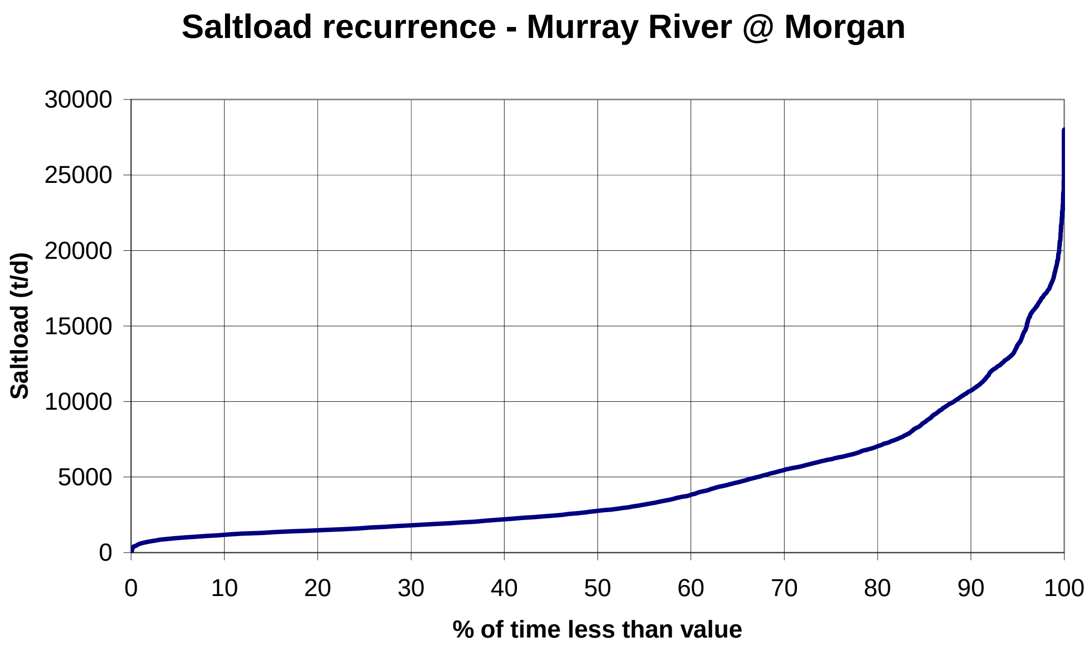

Figure 151: Saltload exceedence curves at River Murray @ Morgan

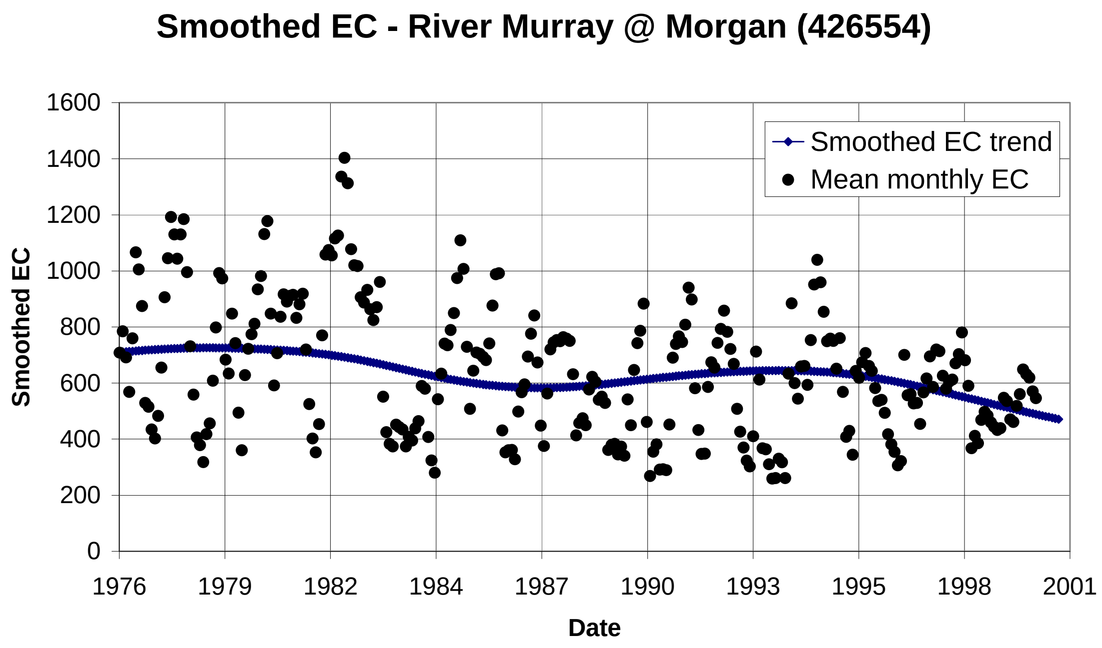

Figure 152: Mean monthly EC and smoothed EC trend corrected for flow and season at River Murray @ Morgan

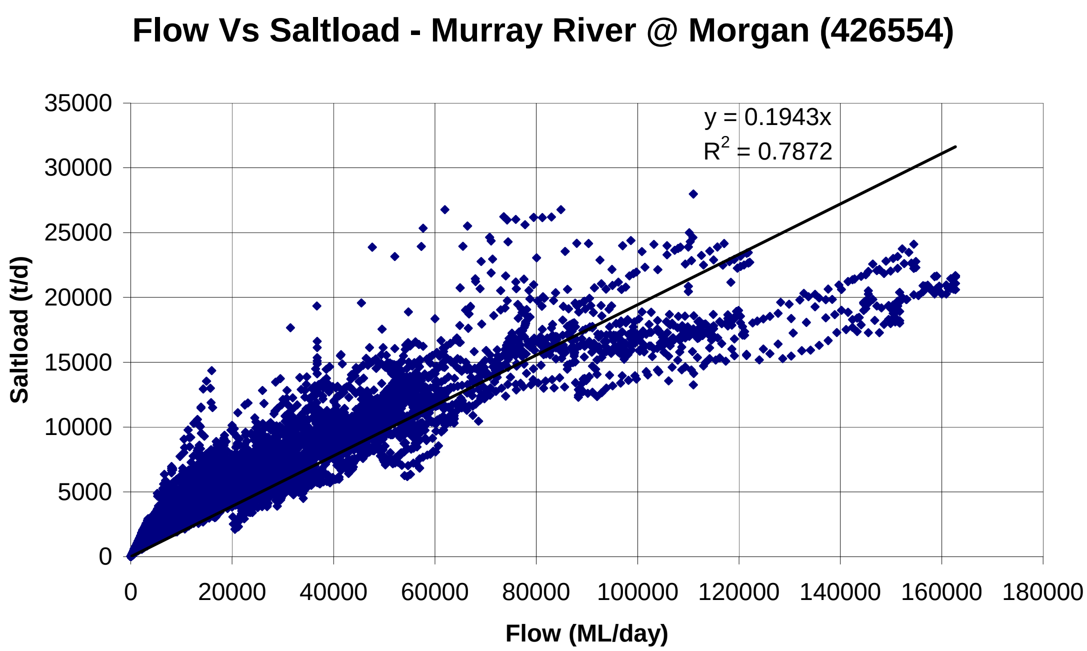

Figure 153: Flow Vs Saltload at River Murray @ Morgan

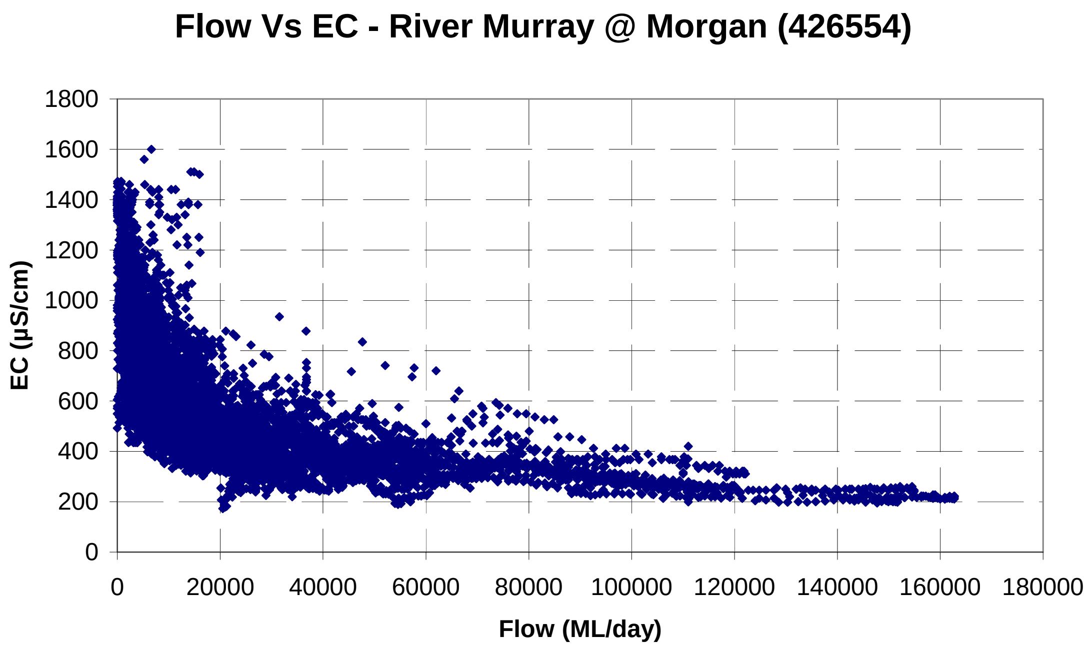

Figure 154: Flow Vs EC at River Murray @ Morgan

Table 36: Salt and water balances for River Murray @ Morgan

Salt and water balances for station 426554.

Drainage Division:	**Lower Murray River**	
Station:	**426554 (Murray River @ Morgan)**	
Contributing Area:	**898375**	**km2**
Saltfall Station:	**Deniliquin**	
Saltfall Concentration:	**6.0**	**mg/L**

Year	Rainfall (mm)	Rainfall Salt Input (tonnes)	Rainfall Water Input (ML)	Streamflow Salt Output (tonnes)	Streamflow Water Output (ML)	Total Salt Output (tonnes)	Total Water Output (ML)	Total SO/SI	Total WO/WI	Total Output/Area (tonnes/km2)	Comments
1985	488	2630442	438407000	609470	1530688	609470	1530688	0.23	0.00	0.68	
1986	443	2387881	397980125	1308848	5439054	1308848	5439054	0.55	0.01	1.46	
1987	521	2808320	468053375	800107	2741197	800107	2741197	0.28	0.01	0.89	
1988	617	3325784	554297375	1412990	4920239	1412990	4920239	0.42	0.01	1.57	
1989	580	3126345	521057500	3198935	13899216	3198935	13899216	1.02	0.03	3.56	
1990	599	3228760	538126625	2865703	13962457	2865703	13962457	0.89	0.03	3.19	
1991	473	2549588	424931375	1278149	4476679	1278149	4476679	0.50	0.01	1.42	
1992	515	2775979	462663125	1643680	6692684	1643680	6692684	0.59	0.01	1.83	
1993	503	2711296	451882625	2986035	15929128	2986035	15929128	1.10	0.04	3.32	
1994	348	1875807	312634500	1167691	3128448	1167691	3128448	0.62	0.01	1.30	
1995	526	2835272	472545250	1395401	5133589	1395401	5133589	0.49	0.01	1.55	
1996	629	3390467	565077875	2135179	9431407	2135179	9431407	0.63	0.02	2.38	
1997	529	2851442	475240375	798415	2369360	798415	2369360	0.28	0.00	0.89	
1998	680	3665370	610895000	927455	3410518	927455	3410518	0.25	0.01	1.03	
1999	653	3519833	586638875	834300	3044722	834300	3044722	0.24	0.01	0.93	
2000	638	3438980	573163250	1146758	5107940	1146758	5107940	0.33	0.01	1.28	
Mean	**546**	**2945098**	**490849641**	**1531820**	**6326083**	**1531820**	**6326083**	**0.53**	**0.01**	**1.71**	

Comments: Rainfall data came from station 426200 (River Murray @ d/s Rufus River Junction)

5. DISCUSSION

A number of issues arose during this study, many of which are concerned with the poor data record at many of the End-of-Valley target stations. Issues such as the following will be addressed in this section:

- Confidence of the techniques used to determine the salt inputs and outputs for catchment salt balances.
- Confidence of the exceedence curves, where the data set contains sparsely sampled data.
- The exclusion of salt diversion effects for both salt trends and balances due to lack of data and time constraints.

Confidence in the techniques for determining catchment salt balances

For most of the stations there was large gaps in the salinity record, necessitating infilling of data to obtain daily saltloads. Infilling of missing saltload data is never completely accurate, no matter what technique is used. For consistency, we have adopted the methodology used in the previous study by Jolly *et al.* (2001), but recognise that there are other alternative approaches that may be equally suitable. To determine the accuracy of this technique, results for two stations that contained daily EC data for a length of their record were compared with those obtained from the regression approach.

The two stations selected for testing of the regression technique were 410130 (Murrumbidgee @ Balranald) and 402205 (Kiewa @ Bandiana). For the years where there were daily EC data, annual flow and saltloads were calculated from the data itself. For the same period of record, the regression (determined from the entire data set) was applied to calculate annual flow and saltloads. The saltloads where then compared to determine the discrepancy between the actual and estimated saltloads, the results of which are presented in Table 37.

Table 37: Comparison between saltloads calculated from daily EC data and by infilling using the regression technique.

ANNUAL FLOW SUMMARY
Station 410130 (Murrumbidgee @ Balranald)

Year	Flow ML	Saltload tonnes	Salinity mg/L
1995	846973	94267	111
1996	1041869	125889	121
1997	346944	31302	90
1998	399619	50378	126
1999	276554	40897	148
Mean	582392	68547	119

ANNUAL FLOW SUMMARY WITH REGRESSION
Station 410130 (Murrumbidgee @ Balranald)

Year	Flow ML	Saltload tonnes	Salinity mg/L	Error
1995	846973	104432	123	11%
1996	1041869	128462	123	2%
1997	346944	42778	123	37%
1998	399619	49273	123	2%
1999	276554	34099	123	17%
Mean	582392	71809	123	14%

ANNUAL FLOW SUMMARY
Station 402205 (Kiewa @ Bandiana)

Year	Flow ML	Saltload tonnes	Salinity mg/L
1991	641058	17106	27
1992	928477	28872	31
1993	918694	28977	32
1994	475724	14145	30
1995	837784	23144	28
1996	975825	27653	28
1997	309538	7687	25
1998	575686	13678	24
1999	503131	15060	30
Mean	685102	19592	28

ANNUAL FLOW SUMMARY WITH REGRESSION
Station 402205 (Kiewa @ Bandiana)

Year	Flow ML	Saltload tonnes	Salinity mg/L	Error
1991	641058	19039	30	11%
1992	928477	27576	30	4%
1993	918694	27285	30	6%
1994	475724	14129	30	0%
1995	837784	24882	30	8%
1996	975825	28982	30	5%
1997	309538	9193	30	20%
1998	575686	17098	30	25%
1999	503131	14943	30	1%
Mean	685102	20348	30	9%

As expected the regression technique employed in this study does introduce some error to the total saltloads. However, these values are reasonable and suggest that the method used is acceptable. It is interesting to note that the largest errors occur in very dry years. Rainfall for both of these stations was well below average in 1997 and you can see that the error in this dry year is significantly higher than that of the mean. This is due to the fact that the greatest scatter in the regressions occurs at the low flow end.

Another source of inaccuracy is that involving the rainfall salinity data used for the catchment salt inputs. We have used the most complete data set covering the MDB (Blackburn and McLeod, 1983) however there is still only a small number of stations covering a very large area. Moreover, this study was conducted during 1974-75, a period when rainfall was well above average in the eastern segments of the MDB, but as much as 20% below average elsewhere. Therefore, the rainfall salt concentrations may be biased to these particular conditions during this short sampling period, and not necessarily represent long-term average conditions.

Confidence in the exceedence curves

Since continuous data had been recorded at station 426554 (Murray River @ Morgan), it was decided to take the data and analyse a series of exceedence curves. The reason for this was two fold. Firstly, analysing a series of exceedence curves that were derived over different time periods would allow us to see the impact of climate variability (droughts and floods) and the introduction of salt interception schemes in the catchment. The results are seen in the Figures 155 to 157. Secondly, we were able to create a series of exceedence curves based on randomised weekly and monthly data sets to determine confidence levels in these graphs and therefore determine whether this method can be reliably used where continuous EC data may not exist for a station. The data set at station 426554 (Murray River @ Morgan) comprised of 13,117 days of continuous data. To reduce this to weekly data, 85.7% of the data was randomly removed, leaving 1874 days of data. Similarly, 96.7% of the data was removed to reduce it to a monthly interval, leaving 430 days of data. The results of this analysis are seen in Figures 158 and 159.

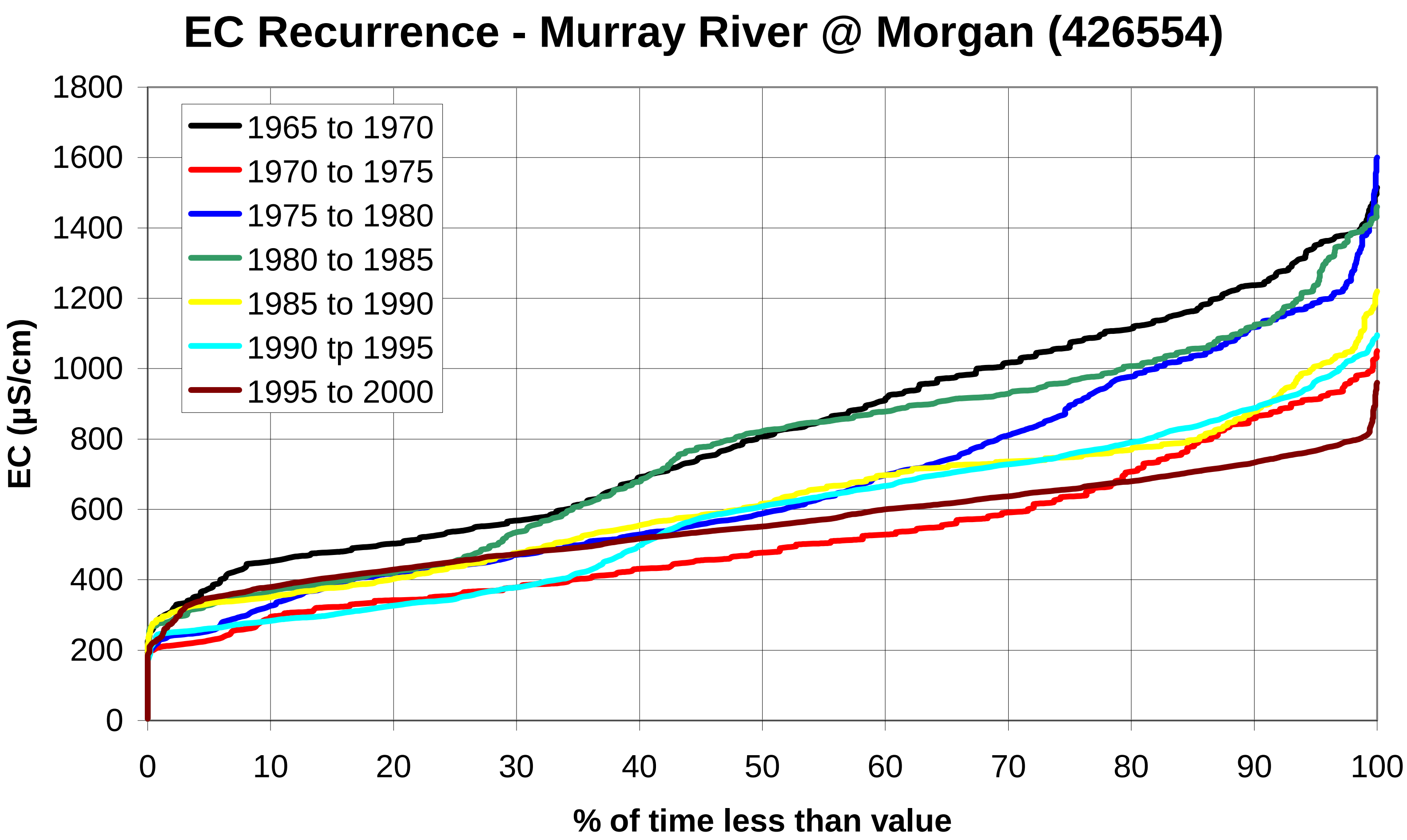

Figure 155: EC exceedence curves each over a 5 year interval at River Murray @ Morgan

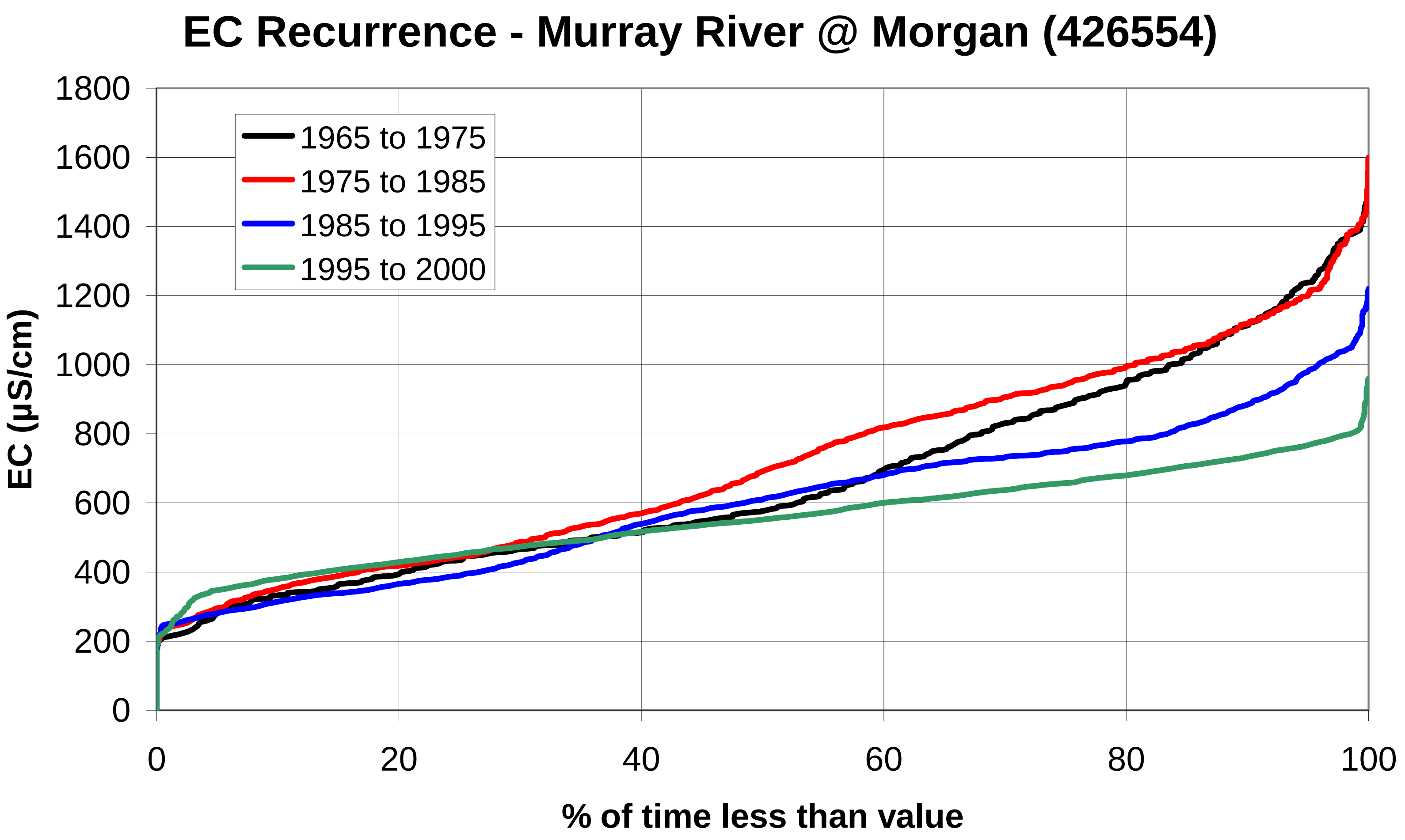

Figure 156: EC exceedence curves each over a 10 year interval (except last 5 years) at River Murray @ Morgan

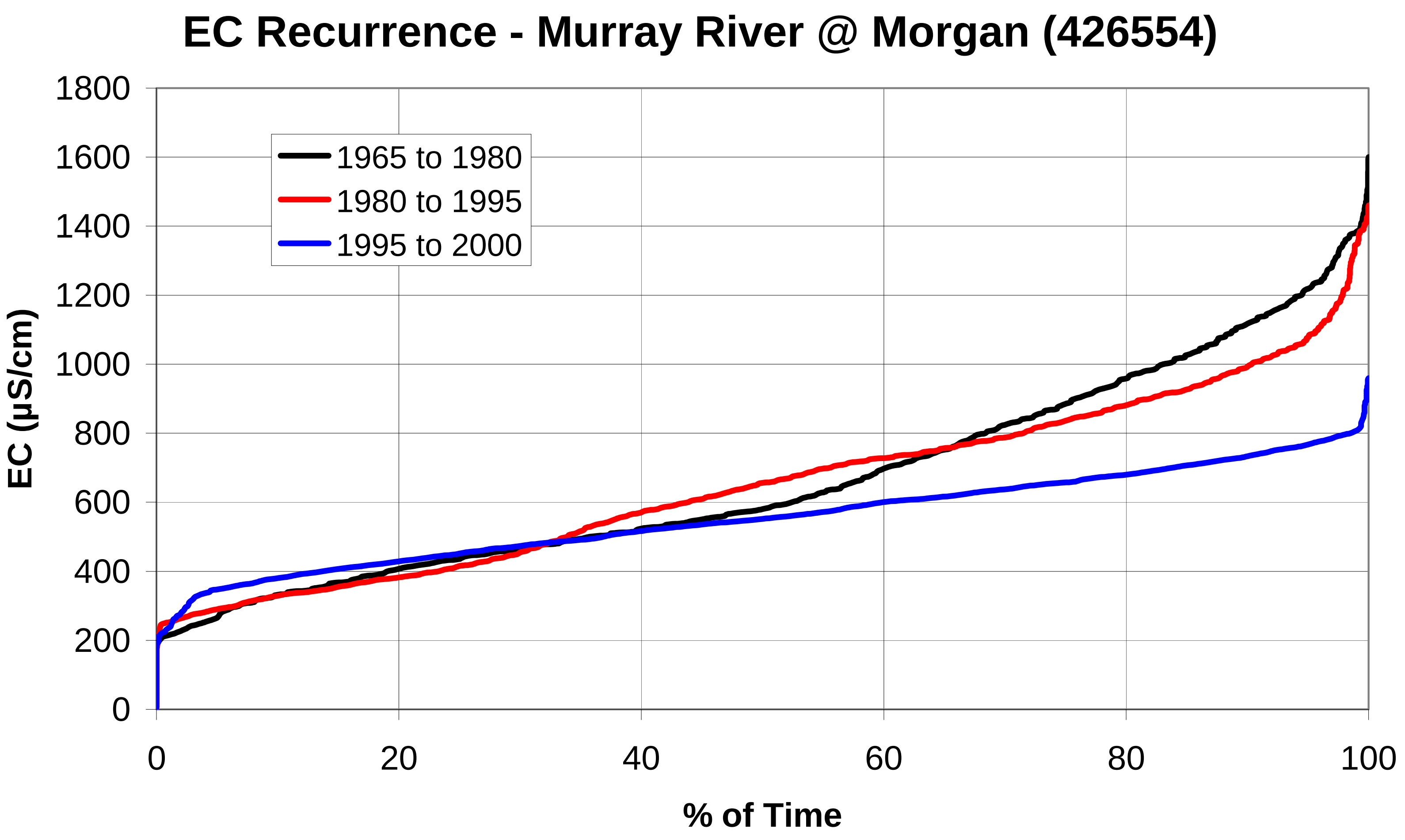

Figure 157: EC exceedence curves each over a 15 year interval (except last 5 years) at River Murray @ Morgan

It is clearly seen from Figure 155 that the exceedence curves produced over a five year period are greatly influenced by climatic factors such as droughts and flood events and therefore can give a false indication of the general trend of the exceedence curves. When the period is increased to ten years (Figure 156) the influence of climatic factors are reduced and the beneficial effects of the interceptions schemes that commenced in the 1980s become clearer. The impact of the interception schemes is clearly illustrated when 15 year periods of data are used (Figure 157). The 10 and 15 year analyses clearly show that greatest differences between the periods prior to and after commencement of interceptions schemes occurs at higher EC levels (i.e.> 500 µS/cm). A corollary of this is that higher percentile targets will be more sensitive to the length of record. At the 15 year record length it does not appear to make much difference whether the 80th, 90th or 95th percentile is used. In summary, it is concluded that in order to differentiate any impact of changes in land use or management from climatic variability at least 10 years of pre- and post-change data will be required.

In terms of the frequency of data required to produce robust exceedence curves, it can be seen from Figures 157 and 158 that there are no real discrepancies between the graphs produced from daily and weekly data. However, when data is reduced to monthly (Figure 159), discrepancies between the daily and monthly data occur. This suggests that exceedence curves based on monthly data should be used with caution, and it is certainly not recommended that this type of analysis be carried out on data recorded on a less frequent basis than monthly.

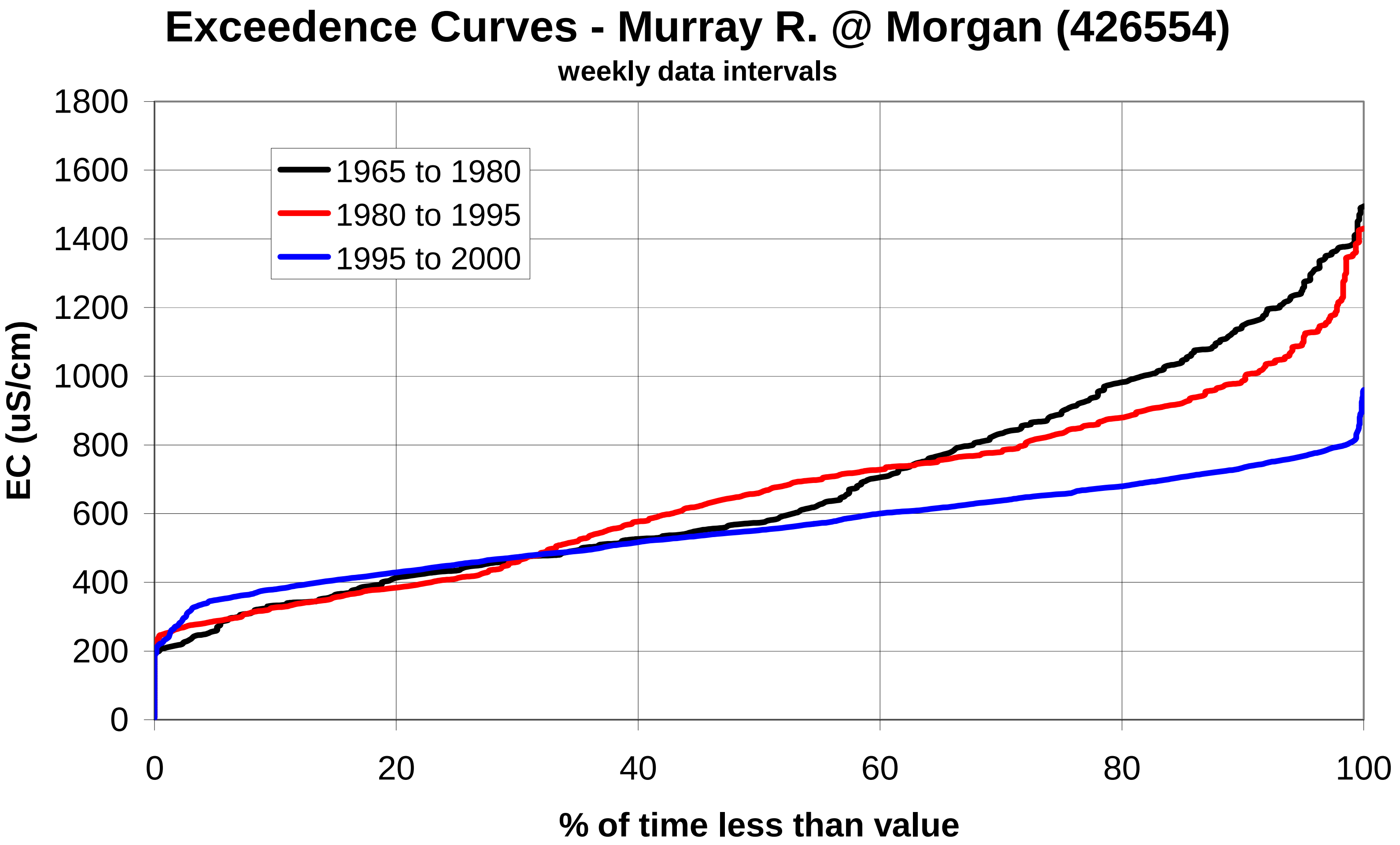

Figure 158: EC exceedence curves with a weekly based data set each over a 15 year interval (except last 5 years) at River Murray @ Morgan

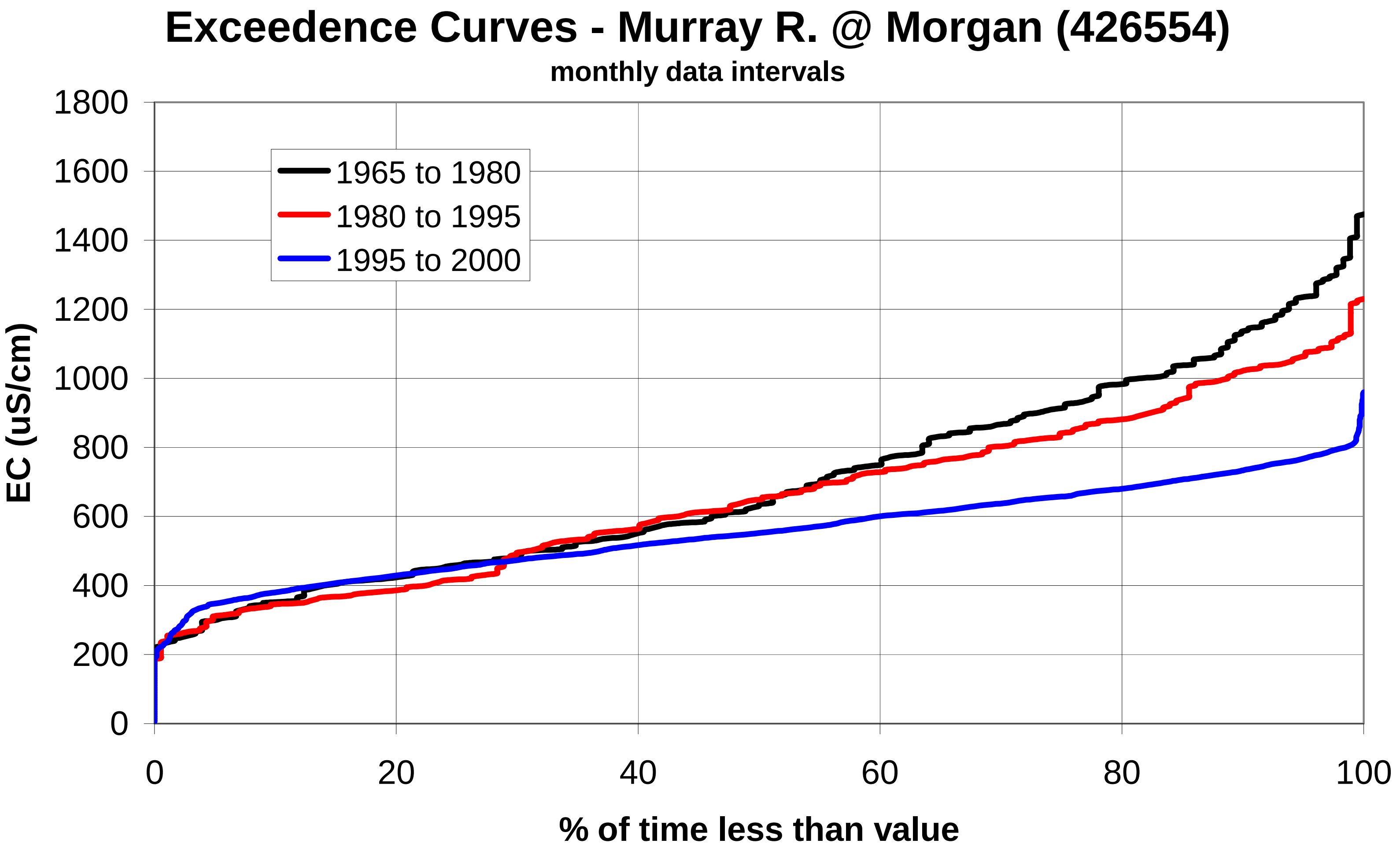

Figure 159: EC exceedence curves with a monthly based data set each over a 15 year interval (except last 5 years) at River Murray @ Morgan

Exclusion of Salt Diversions

Diversions remove water and salt from the river that are not accounted for in the stream flow measurement at the gauging station. Due to the complexities of the water supply systems, generally poor quality of the flow and salinity data sets and time constraints, the effect of diversions was not factored into this study.

To estimate the effect diversions may have on salt balances, previous work conducted by Jolly *et al.* (1997a) calculated salt balances with salt diversion data for the Murrumbidgee, Namoi, Loddon and Campaspe River Catchments from 1985 to 1994, and showed that the impact was significant.

It is expected that diversions would also impact on the stream salinity trends, however, at present the statistical technique does not account for them and therefore would require modification to describe the impacts.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

There was insufficient data in at least 50% of the MDBC End-of-Valley target stations to ascertain any statistical trends or balances with confidence. These stations have been identified in Table 37.

Table 38: End-of-Valley stations with insufficient data

Station Number	*Station Name*
NSW Catchments	
412045	Lachlan River @ Corrong
420020	Castlereagh River @ Gungalman Bridge
409016	Murray River @ Heywoods
414204	Murray River @ Redcliffs
QLD Catchments	
423005	Cuttuburra Channel @ Turra
423004	Warrego River @ Barringun No 2
417204a	Moonie River @ Fenton
422207a	Ballandool River @ Woolergilla-Hebel Rd
422209a	Bokhara River @ Hebel
422211a	Briarie Creek @ Woolergilla-Hebel Rd
424201a	Paroo River @ Caiwarro
VIC Catchments	
415200	Wimmera River @ Horsham Weir
408203	Avoca River @ Quambatook
405253	Goulburn River @ Goulburn Weir
404217	Broken River @ Casey's Weir
SA Catchments	
426510	Murray River @ Lock 6
426522	Murray River @ Murray Bridge

Table 39: Additional stations with sufficient data that could replace some of the stations in Table 37 in order to determine stream salinity tends and catchment salt balances at the end of these river valleys

ARWC No.	Description
405200	Goulburn River @ Murchison
407242	Loddon River @ Murray Valley Hwy Bridge
404210	Goulburn River @ McCoy Bridge

Testing with the good quality data at Morgan showed that climatic variability affected EC exceedence curves derived from 5 years of data more than land use or management change. This data also showed that 15 years of data were required to observe the impact of the major salt interception schemes under the Salinity and Drainage Strategy. This suggests that for the End-of-Valley targets for the drier major tributaries at least 15 years of data will be required to observe land use impact without the aid of modelling. At the 15 year record length there does not appear to be much difference between using the 80th, 90th or 95th percentile for a target.

The End-of-Valley targets will be strongly affected by the diversions of large volumes of water for irrigation as they remove large quantities of salt from the river. To detect the impacts of increasing dryland salinity and any measures to address it, the influence of the diversions must be removed. This was not carried out in this study due to time and budget constraints. These methodologies should be developed and applied to these stations. Alternatively, stations upstream of the major irrigation off-takes could be analysed to detect the influence of dryland salinity only.

A summary of the flow, EC and saltload statistics for each station is shown in Table 40. The mean (1985-2000) salt output to input ratios and stream salinity trends (1975-2000) for each station are shown in Table 41. It was also observed that catchment SO/SI ratios vary greatly for individual years, presumably due to climatic influences, diversions and other river and land management practices.

It should be noted that we are concerned that there are some problems with the SO/SI ratios for the Barwon River @ Mungindi (and the two supplementary stations used to account the entire saltload from the Border Rivers catchment - Boomi River @ Neeworra and Gil Gil Creek @ Weemalah). The data set contains very high values in 3 high flow years, and very low values for the rest of the years. The reasons for this are not completely clear, but could be related to the accuracy of the flow and EC data at high flows. Examination of the data supplied by DLWC, that derived from PINNEENA, and that supplied by DLWC for the previous study (Jolly *et al.*, 1997a, 2001) shows discrepancies which may be related to which rating curve was used to generate the daily flows. Results from the recent Hydrographic Review of the End-of-Valley stations (Ecowise, 2002) show that the latest rating curve has no gauged flows above about 10,000 ML/day, yet it is presumably used to generate flows in excess of 60,000 ML/day. Directly related to this is that the saltload infilling becomes very inaccurate as there is a lot of scatter in saltloads at the high flow end (see Figure 63), presumably due to a combination of the inaccuracies in the flows and problems obtaining representative EC values. Whilst this appears to be the only station affected by such behaviour in the current study, it is likely that similar problems may arise for the other stations, particularly those located in wide floodplain areas where flow and EC is hard to measure accurately during floods (ie. stations on the Condamine-Culgoa, Warrego, Paroo and Moonie River systems).

Lastly we are concerned with two periods of data recorded between 1993 and 1995 at stations 421023 Bogan River @ Gongolgon and 412004 Lachlan River @ Forbes. Even though the quality codes suggest this data to be satisfactory, the recorded flow appears to have very little variability during this period (see Figures 20 and 74).

Table 40. Statistical summary for the MDB E-O-V target stations. Note: Flow data is only reported where EC data were available

Sites	Salinity			Flow			Approximate Saltload		
	Mean	Median	80%ile	Mean	Median	80%ile	Mean	Median	80%ile
410130 - Murrumbidgee @ Balranald	187	175	250	2117	672	2900	253	66	360
412045 - Lachlan @ Corrong	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
421023 - Bogan @ Gongolgong	339	348	470	349	446	585	126	57	170
421012 - Macquarie @ Carinda	457	444	540	292	183	370	69	51	90
420020 - Castlereagh @ Gungalman Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
419026 - Namoi @ Goangra	406	396	525	1240	204	925	282	60	395
418058 - Mehi @ Bronte	344	313	500	252	95	330	46	17	50
416001 - Barwon @ Mungindi	250	253	320	2586	310	2100	284	57	305
425008 - Darling @ Wilcannia Mn Ch	415	343	555	9351	2706	20350	1623	682	3070
421004 - Lachlan River @ Forbes	450	414	550	6383	1830	10150	1634	433	2010
423005 - Cuttuburra Ch @ Turra	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
423004 - Warrego River @ Barringun No. 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
422015 - Culgoa River @ Brenda	216	198	280	1629	277	2625	172	38	285
422012 - Narran River @ New Angledool	197	170	230	1797	1223	2525	209	81	350
417204a - Moonie River @ Fenton	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

422211a - Ballandool River @ Woolergilla-Hebel Rd	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
422209a - Bohkara River @ Hebel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Briarie Creek @ Woolergilla-Hebel Rd	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
424201a - Paroo river @ Caiwarro	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
415200 - Wimmera river @ Horsham Weir	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
408203 - Avoca @ Quambatook	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
407203 - Loddon @ Laanecoorie	1054	850	1560	424	263	765	188	143	275
406202 - Campaspe @ Pumps	861	760	1210	509	42	225	151	22	88
405253 - Goulburn @ Goulburn Weir	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
404217 - Broken @ Casey's Weir	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
403241 - Ovens @ Peechelba-East	80	72	97	4679	1822	6550	154	78	255
402205 - Kiewa @ Bandiana	48	47	55	1804	1141	2920	52	30	95
409204 - Murray @ Swan Hill	285	260	365	9262	5721	18050	1697	886	2800
426510 - Murray @ Lock 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
426514 - Murray @ Lock 4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
426522 - Murray @ Murray Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
426554 - Murray @ Morgan	714	605	830	17658	7371	28850	4567	2761	7050

Table 41. Table B. Mean (1985-2000) salt output to salt input (SO/SI) of the MDB E-O-V target stations as a ratio and a category, defined by Low, Medium and High (Low < 2, Medium < 4 and > 2 and High > 4). Overall stream EC trend (1975-2000) of the MDB E-O-V target stations and status denoted as "significantly" rising or falling, or if the trend is "not significant" statistically, denoted by (-).

Sites	SO/SI		Trend	
	Ratio	Category	Value (μS/cm/yr)	Status
410130 - Murrumbidgee @ Balranald	0.07	Low	0.3 ± 2.0	-
412045 - Lachlan @ Corrong	N/A	N/A	N/A	N/A
421023 - Bogan @ Gongolgong	0.94	Low	5.5 ± 3.1	Rising
421012 - Macquarie @ Carinda	0.99	Low	2.4 ± 1.9	Rising
420020 - Castlereagh @ Gungalman Bridge	N/A	N/A	N/A	N/A
419026 - Namoi @ Goangra	1.59	Low	-3.7 ± 2.8	Falling
418058 - Mehi @ Bronte	0.19	Low	0.8 ± 5.5	-
416001 - Barwon @ Mungindi	7.69	High	0.0 ± 1.1	-
425008 - Darling @ Wilcannia Mn Ch	0.23	Low	-2.0 ± 2.5	-
421004 - Lachlan River @ Forbes	3.43	Medium	8.7 ± 1.8	Rising
423005 - Cuttuburra Ch @ Turra	N/A	N/A	N/A	N/A
423004 - Warrego River @ Barringun No. 2	N/A	N/A	N/A	N/A
422015 - Culgoa River @ Brenda	0.28	Low	-4.9 ± 2.4	Falling
422012 - Narran River @ New Angledool	0.13	Low	-6.1 ± 3.6	Falling
417204a - Moonie River @ Fenton	N/A	N/A	N/A	N/A
422211a - Ballandool River @ Woolergilla-Hebel Rd	N/A	N/A	N/A	N/A
422209a - Bohkara River @ Hebel	N/A	N/A	N/A	N/A
Briarie Creek @ Woolergilla-Hebel Rd	N/A	N/A	N/A	N/A
424201a - Paroo river @ Caiwarro	N/A	N/A	N/A	N/A
415200 - Wimmera river @ Horsham Weir	N/A	N/A	N/A	N/A

408203 - Avoca @ Quambatook	N/A	N/A	N/A	N/A
407203 - Loddon @ Laanecoorie	4.51	High	5.1 ± 9.7	-
406202 - Campaspe @ Pumps	2.99	Medium	0.4 ± 0.3	Rising
405253 - Goulburn @ Goulburn Weir	N/A	N/A	N/A	N/A
404217 - Broken @ Casey's Weir	N/A	N/A	N/A	N/A
403241 - Ovens @ Peechelba-East	0.98	Low	0.4 ± 0.3	Rising
402205 - Kiewa @ Bandiana	2.34	Medium	0.0 ± 0.2	-
409204 - Murray @ Swan Hill	1.9	Low	-1.8 ± 2.0	-
426510 - Murray @ Lock 6	N/A	N/A	N/A	N/A
426514 - Murray @ Lock 4	N/A	N/A	N/A	N/A
426522 - Murray @ Murray Bridge	N/A	N/A	N/A	N/A
426554 - Murray @ Morgan	0.53	Low	-6.8 ± 3.6	Falling

Using the mean saltloads (in tonnes/day) for the period 1985-2000 (shown in Figure 10), the major contributors of saltload to the Murray River at Morgan were the Murray River upstream of Swan Hill (42%), Darling River (22%) and the Murrumbidgee River (3%). Note that these only account for 67% of the total salt output that is observed at Morgan. Factors such as: (i) diversions; (ii) the locations of some of the End-of-Valley target stations were not at the end of the river valleys; and (iii) groundwater inputs at the lower end of the Murray River have not been accounted for, could account for the other 33%.

Finally, on the basis of our range of analyses we have some concerns as to whether just the End-of-Valley target stations are sufficient to detect the impacts of land-use change in specific areas of their catchments. This is because the tributary catchments are so large, and the rainfall so variable, that the data collected from End-of-Valley target stations are generally insensitive to the scale of land use change that may be feasible within the 15 year period of the

BSM Strategy. This may be overcome to some degree by analysing data from gauging stations within each river valley.

6.2. Recommendations

1. Methodologies should be developed to include the impacts of diversions on the salinity trends and salt balances and the data from End-of-Valley target stations should be re-analysed using the revised methodology.
2. Some work be undertaken to ascertain whether modelling together with good hydrological data over a 5 year period can differentiate the influence of land use change from rainfall variability.
3. Further data investigations should be carried out on the Border Rivers End-of-Valley site (416001 Barwon River @ Mungindi) and the associated stations used to establish catchment salt balances (416028 Boomi River @ Neeworra and 416027 Gil Gil Creek @ Weemalah) to determine the reasons for the very high SO/SI ratios in high flow years and low SO/SI ratios in most other years. These appear to be related to flow inaccuracies during floods and/or the saltload infilling procedure, but further investigation needs to take place. This issue could also be a problem in the future for other stations located in floodplain areas where extensive overbank flooding makes accurate flow and EC measurement difficult. It should also be noted that that there were possible problems with the flow data for 1993 to 1995 for stations 421023 Bogan River @ Gongolgon and 412004 Lachlan River @ Forbes, even though the quality codes indicated that the data were satisfactory.
4. Consideration shall be given to carrying out the same analysis at an interpretive station immediately upstream of the major irrigation off-takes in each of the catchments. This would better identify the dryland impacts on river salinity in these catchments.

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