

An introduction to forest watering

Edward R. d/s Stevens Weir 2,700 ML/d
Niemur R. @ Barham-Moulamein Rd Bridge 800 ML/d
Colligen Ck Offtake 450 ML/d
Wakool R. Offtake + Yallakool Ck Offtake 600 ML/d



350 ML/d

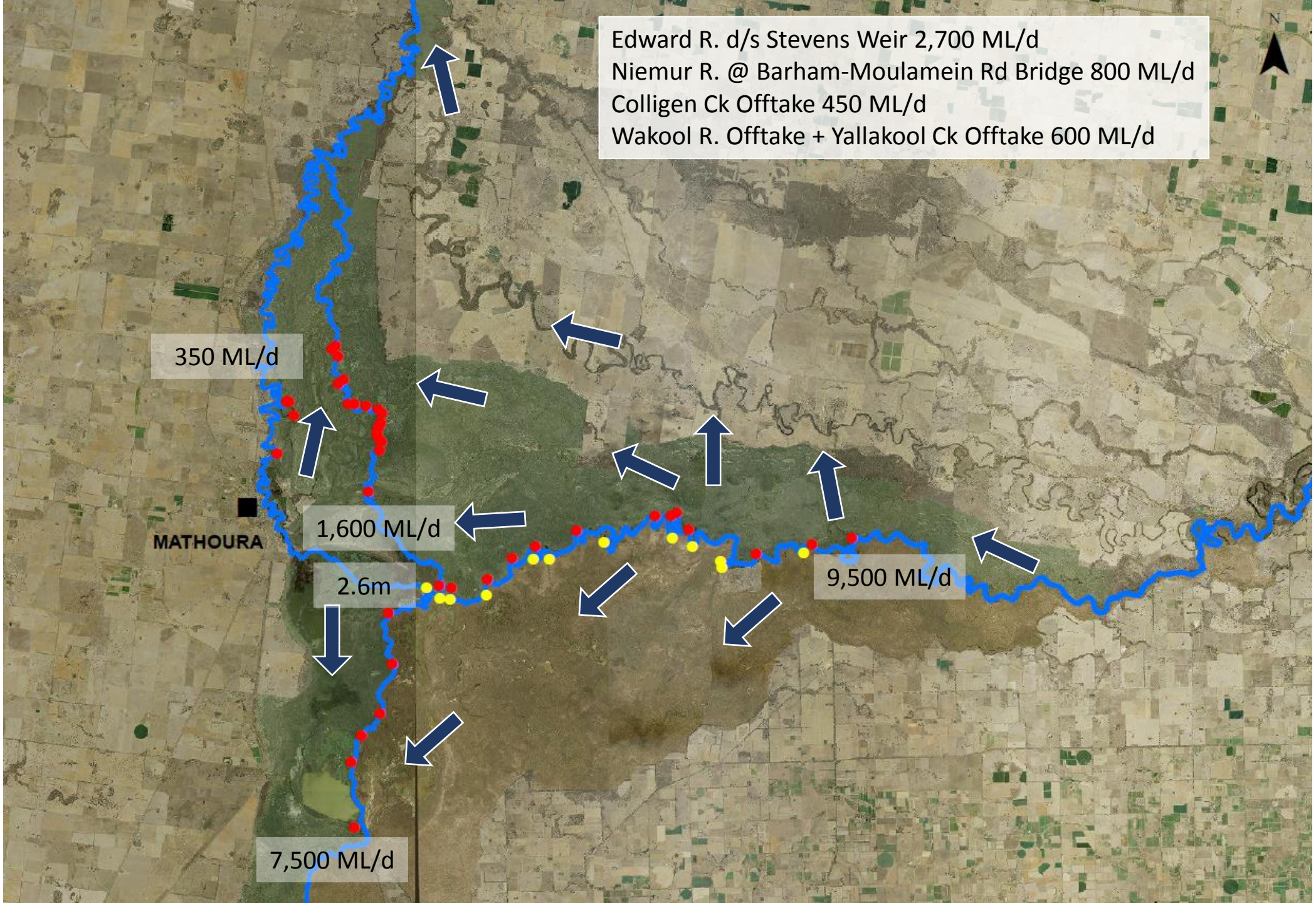
MATHOURA

1,600 ML/d

2.6m

9,500 ML/d

7,500 ML/d



Why it matters ...



ABORIGINAL FISHING CAMP ON THE RIVER MURRAY, NEAR LAKE MOIRA.—CAP. 28126

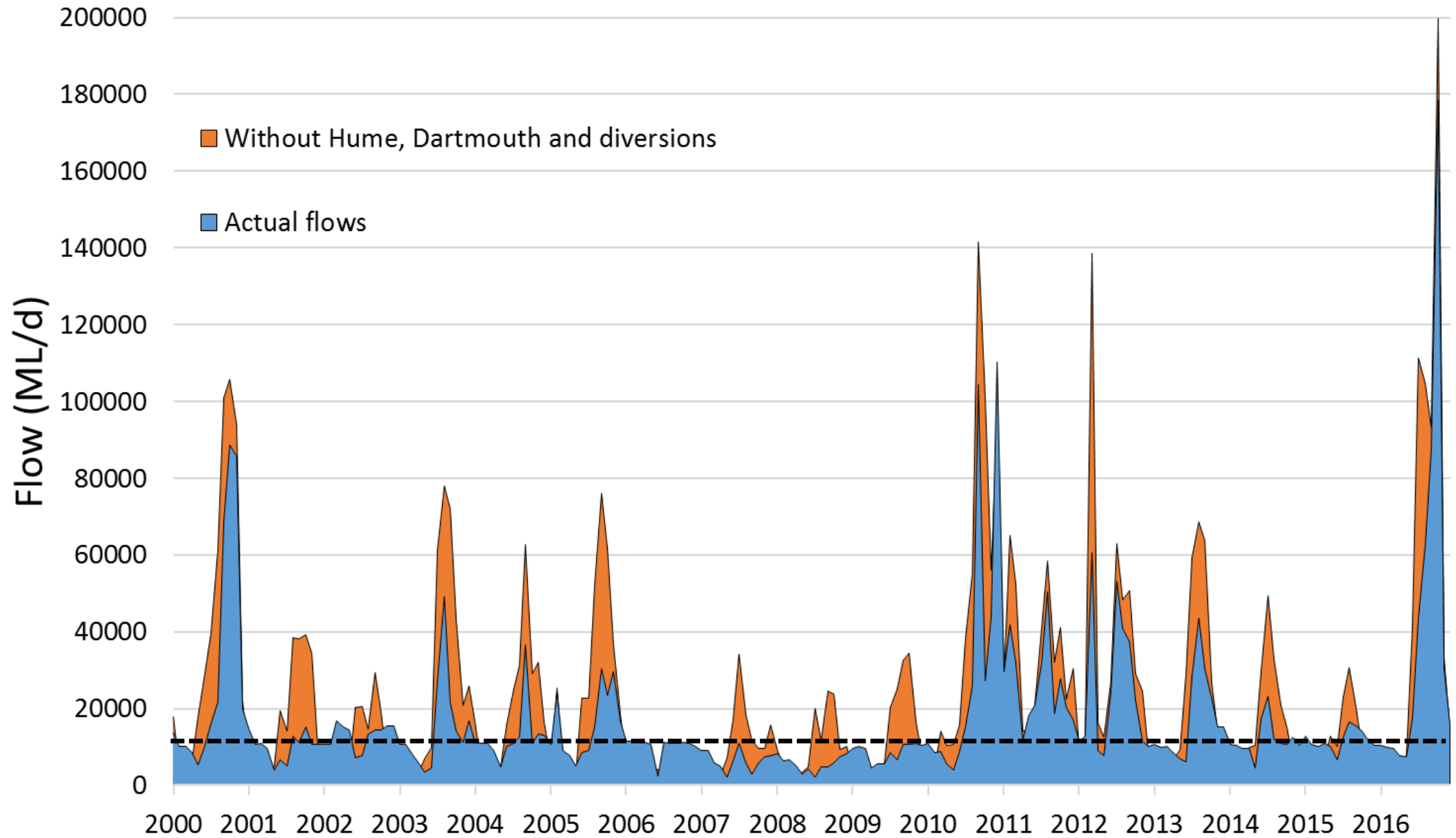


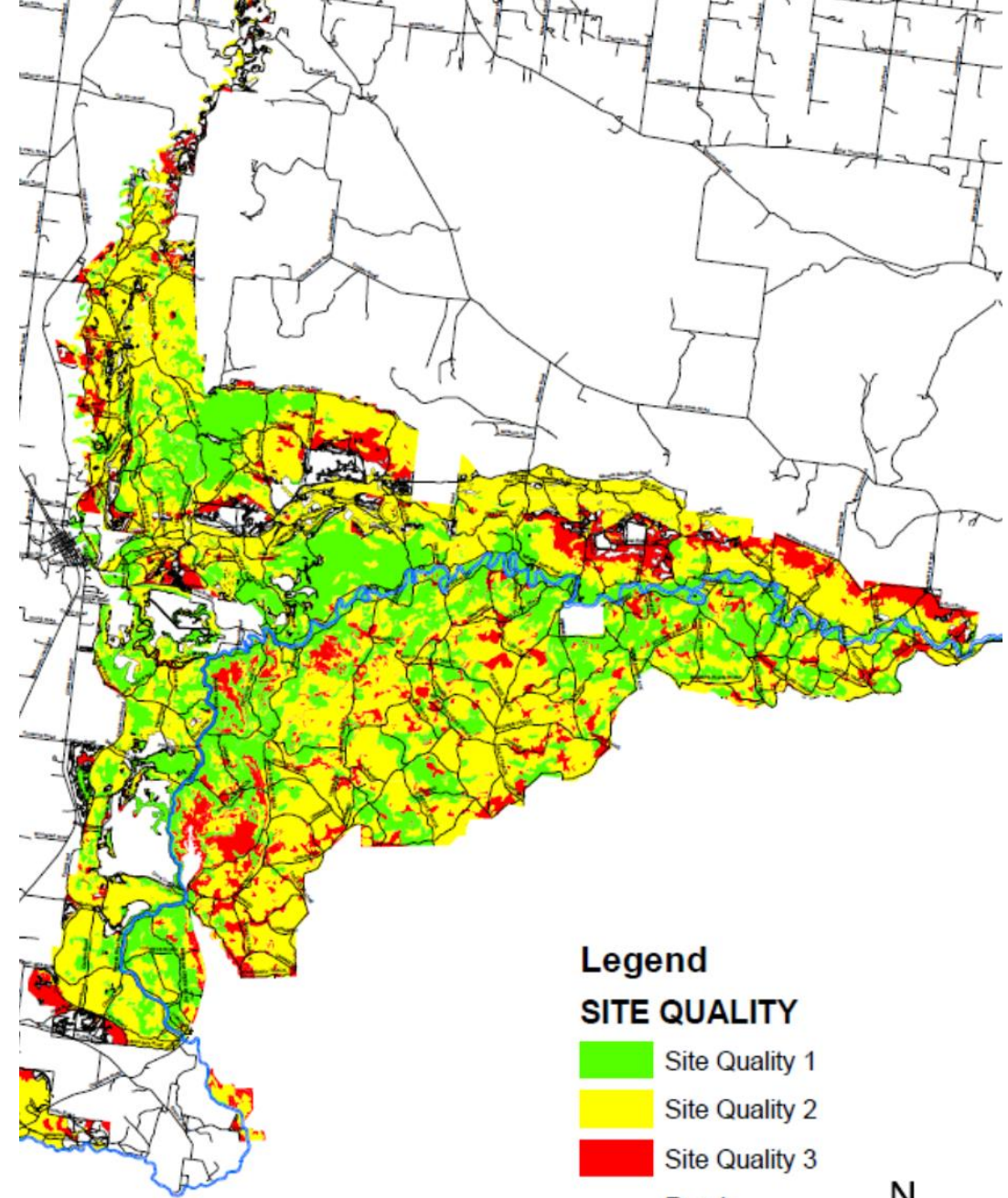
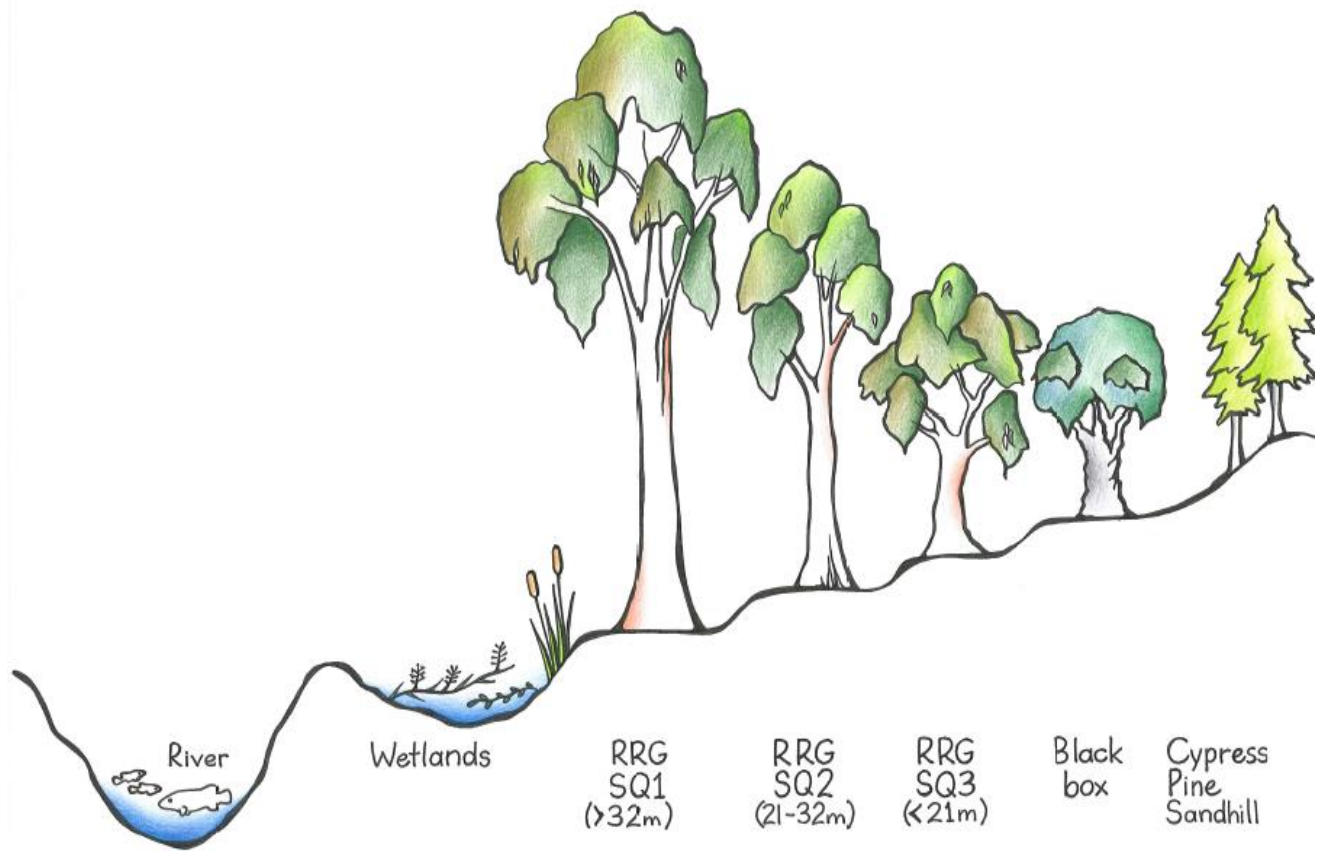
Photo: National Audubon Society

Photo: Chris Tzaros

Changed flow patterns ...

Flow at Yarrawonga





Legend
SITE QUALITY

- Site Quality 1
- Site Quality 2
- Site Quality 3
- Roads
- Murray River

1:160,000



Forest name	SQ I (Ha)	SQ II (Ha)	SQ III (Ha)	Total RRG (Ha)	Total Forest (Ha)	SQ I (%)	SQ II (%)	SQ III (%)
Millewa	5,017	9,229	2,671	16,917	20,457	24.5%	45.1%	13.1%
Gulpa Island	993	2,891	670	4,554	5,143	19.3%	56.2%	13.0%
Moira	2,460	4,107	637	7,204	9,996	24.6%	41.1%	6.4%
Millewa Group	8,470	16,227	3,978	28,675	35,596	23.8%	45.6%	11.2%
Perricoota	528	7,825	2,254	10,607	15,983	3.3%	49.0%	14.1%
Koondrook	1,307	9,301	3,534	14,142	15,167	8.6%	61.3%	23.3%
Campbells Island	1,181	1,552	446	3,179	3,867	30.5%	40.1%	11.5%
Weraï	713	4,846	3,141	8,700	11,234	6.3%	43.1%	28.0%

Barmah-Millewa Floodplain

Inundation Scenario

Steady 35,000ML/d, 30 days
All Regulators Open



0 2,000 4,000 6,000 8,000 10,000

Metres

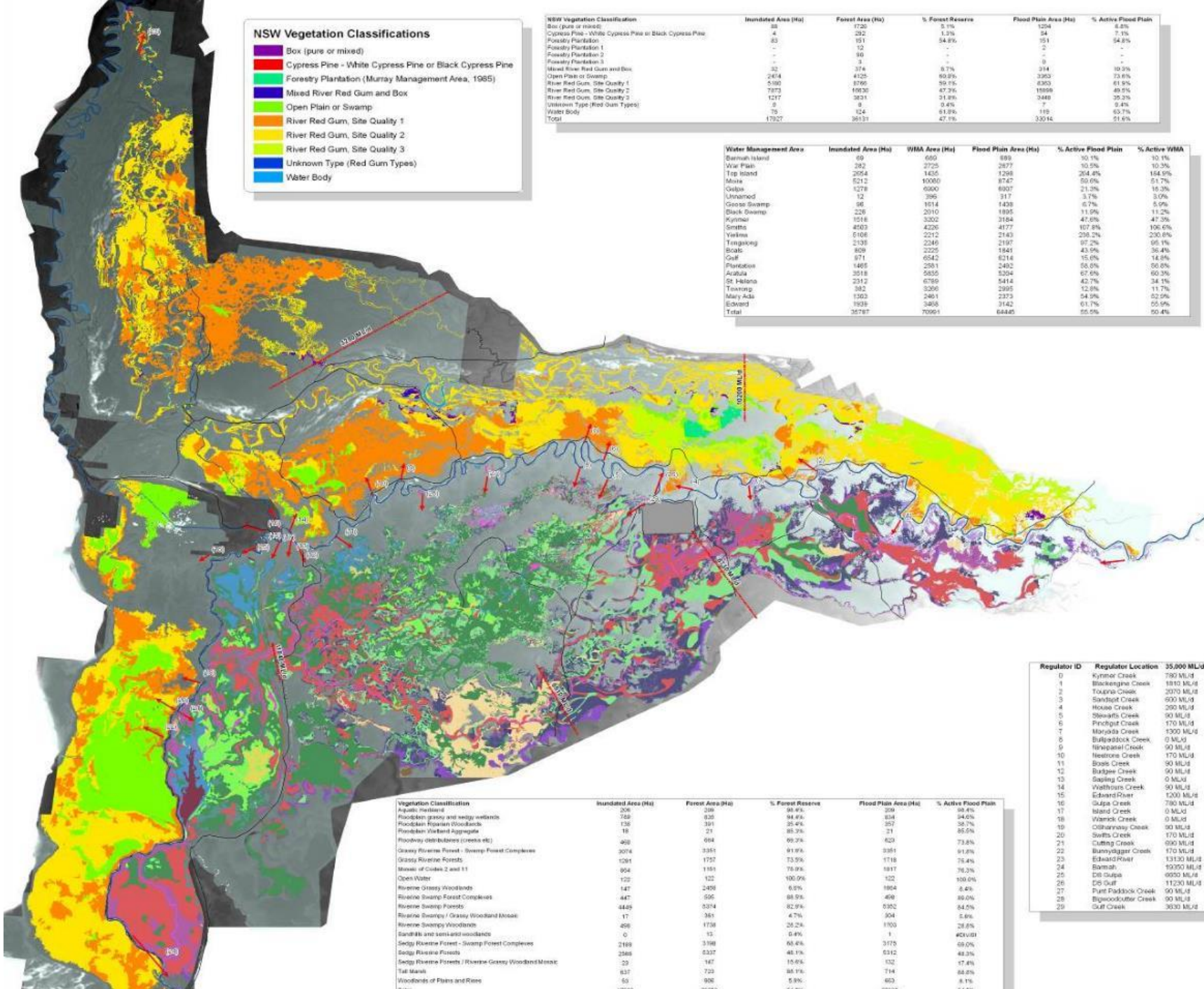


NSW Vegetation Classifications

- Box (pure or mixed)
- Cypress Pine - White Cypress Pine or Black Cypress Pine
- Forestry Plantation (Murray Management Area, 1985)
- Mixed River Red Gum and Box
- Open Plain or Swamp
- River Red Gum, Site Quality 1
- River Red Gum, Site Quality 2
- River Red Gum, Site Quality 3
- Unknown Type (Red Gum Types)
- Water Body

NSW Vegetation Classification	Inundated Area (Ha)	Forest Area (Ha)	% Forest Reserve	Flood Plain Area (Ha)	% Active Flood Plain
Box (pure or mixed)	88	1720	5.1%	1254	4.8%
Cypress Pine - White Cypress Pine or Black Cypress Pine	4	292	1.3%	54	1.1%
Forestry Plantation	43	151	54.8%	151	54.8%
Forestry Plantation 1	12	12	-	2	-
Forestry Plantation 2	-	80	-	-	-
Forestry Plantation 3	3	3	-	0	-
Mixed River Red Gum and Box	82	2314	8.7%	214	23.3%
Open Plain or Swamp	2474	4125	80.9%	3263	81.9%
River Red Gum, Site Quality 1	5190	8766	59.1%	6363	49.2%
River Red Gum, Site Quality 2	7973	19336	47.2%	10998	35.3%
River Red Gum, Site Quality 3	1217	3831	31.8%	3448	35.2%
Unknown Type (Red Gum Types)	9	9	0.4%	7	0.4%
Water Body	76	124	61.8%	119	63.7%
Total	17927	36131	47.1%	33514	51.4%

Water Management Area	Inundated Area (Ha)	WMA Area (Ha)	Flood Plain Area (Ha)	% Active Flood Plain	% Active WMA
Barmah Island	69	660	899	30.1%	10.1%
War Plain	382	3725	2977	30.5%	10.3%
Top Island	2054	1435	1298	264.4%	184.9%
Moore	5212	10080	8747	50.6%	51.7%
Oxley	1278	6060	6007	21.3%	18.3%
Unnamed	12	395	317	3.7%	3.0%
Goose Swamp	96	1614	1428	6.7%	5.9%
Black Swamp	226	2910	1895	11.9%	11.2%
Kynmar	1518	3002	3184	47.6%	47.3%
Smiths	4503	4226	4177	107.8%	106.6%
Varlewa	5106	2212	2143	238.2%	220.0%
Tengalong	2138	2246	2197	97.2%	95.1%
Boals	809	2225	1841	43.5%	36.4%
Gulf	671	6542	6214	15.0%	14.6%
Plantation	1465	2581	2492	58.6%	60.6%
Arakula	3518	5855	5304	67.6%	60.3%
St Helena	2312	6789	5414	42.7%	34.1%
Tanning	382	5295	2995	12.8%	11.7%
Mary Ann	1303	2461	2373	54.9%	52.9%
Edward	1939	3465	3142	61.7%	55.9%
Total	35787	70961	64440	62.9%	50.4%



Vegetation Classification	Inundated Area (Ha)	Forest Area (Ha)	% Forest Reserve	Flood Plain Area (Ha)	% Active Flood Plain
Aquatic Hermland	226	386	96.4%	359	94.4%
Floodplain grassy and sedgy wetlands	758	825	91.8%	834	94.0%
Floodplain Riparian Woodlands	136	391	35.4%	357	38.7%
Floodplain Wetland Aggregate	18	21	85.3%	21	85.5%
Floodway distributaries (creeks etc)	499	664	89.2%	623	73.8%
Grassy Riverine Forest - Swamp Forest Complexes	3074	3393	91.0%	3381	91.8%
Grassy Riverine Forests	1291	1752	73.5%	1718	75.4%
Mosaic of Codes 2 and 11	904	1151	78.9%	1817	76.2%
Open Water	122	122	100.0%	122	100.0%
Riverine Grassy Woodlands	147	2499	5.9%	1964	8.4%
Riverine Swamp Forest Complexes	447	595	88.9%	469	80.6%
Riverine Swamp Forests	4429	5374	82.9%	5352	84.0%
Riverine Swamps / Grassy Woodland Mosaic	17	361	4.7%	304	5.8%
Riverine Swampy Woodlands	498	1738	28.2%	1703	28.6%
Sandhills and semi-arid woodlands	0	13	0.4%	1	0.0%
Sedgy Riverine Forest - Swamp Forest Complexes	2189	3198	68.4%	3175	69.0%
Sedgy Riverine Forests	2386	5237	45.1%	5312	48.2%
Sedgy Riverine Forests / Riverine Grassy Woodland Mosaic	23	147	15.6%	132	17.4%
Tall Marsh	837	729	88.1%	714	88.0%
Woodlands of Plains and Rises	53	906	5.8%	463	8.1%
Total	17980	29253	61.5%	27825	64.5%

Regulator ID	Regulator Location	35,000 ML/d
0	Kynmar Creek	780 ML/d
1	Blochington Creek	1810 ML/d
2	Toupin Creek	2070 ML/d
3	Sandpot Creek	500 ML/d
4	House Creek	200 ML/d
5	Stewart Creek	90 ML/d
6	Pinchgut Creek	170 ML/d
7	Maryada Creek	1300 ML/d
8	Bulladook Creek	0 ML/d
9	Winapell Creek	90 ML/d
10	Healons Creek	170 ML/d
11	Boals Creek	90 ML/d
12	Budgie Creek	90 ML/d
13	Saping Creek	0 ML/d
14	Walhours Creek	90 ML/d
15	Edward River	1200 ML/d
16	Gulpa Creek	780 ML/d
17	Island Creek	0 ML/d
18	Warrok Creek	0 ML/d
19	O'Shannony Creek	90 ML/d
20	Swits Creek	170 ML/d
21	Cutting Creek	990 ML/d
22	Bunnydigger Creek	170 ML/d
23	Edward River	13130 ML/d
24	Barmah	10300 ML/d
25	ES Gulpa	9920 ML/d
26	ES Gulf	11230 ML/d
27	Punt Paddock Creek	90 ML/d
28	Bigwood/Cutter Creek	90 ML/d
29	Gulf Creek	3630 ML/d

VIC Vegetation Classifications

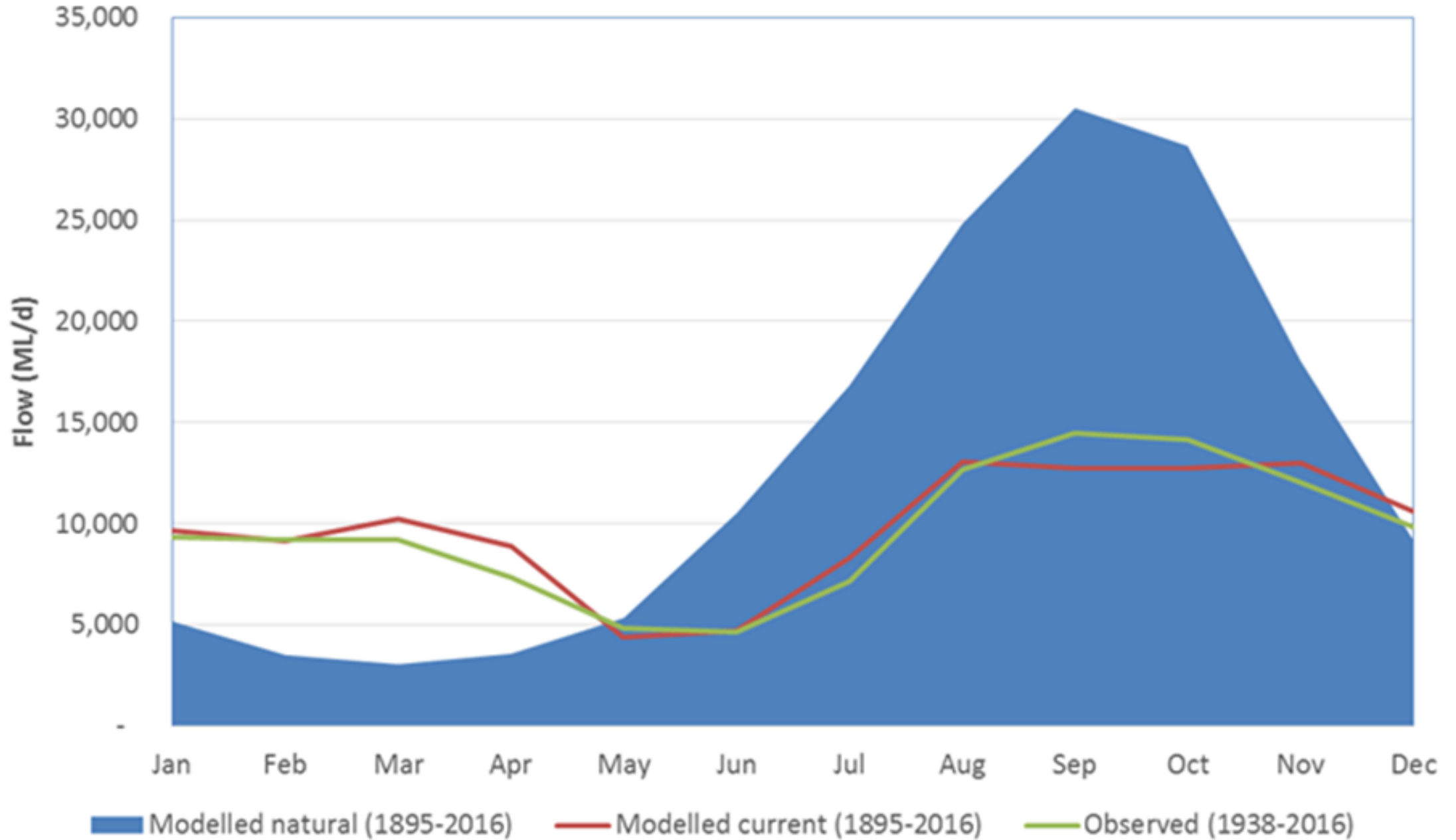
- Aquatic Hermland
- Floodplain Riparian Woodlands
- Floodplain Wetland Aggregate
- Floodplain grassy and sedgy wetlands
- Floodway distributaries (creeks etc)
- Grassy Riverine Forest - Swamp Forest Complexes
- Grassy Riverine Forests
- Mosaic of Codes 2 and 11
- Open Water
- Riverine Grassy Woodlands
- Riverine Swamp Forest Complexes
- Riverine Swamp Forests
- Riverine Swampy / Grassy Woodland Mosaic
- Riverine Swampy Woodlands
- Sandhills and semi-arid woodlands
- Sedgy Riverine Forest - Swamp Forest Complexes
- Sedgy Riverine Forests
- Sedgy Riverine Forests / Riverine Grassy Woodland Mosaic
- Tall Marsh
- Woodlands of Plains and Rises

Hydrodynamic Modelling and Mapping by



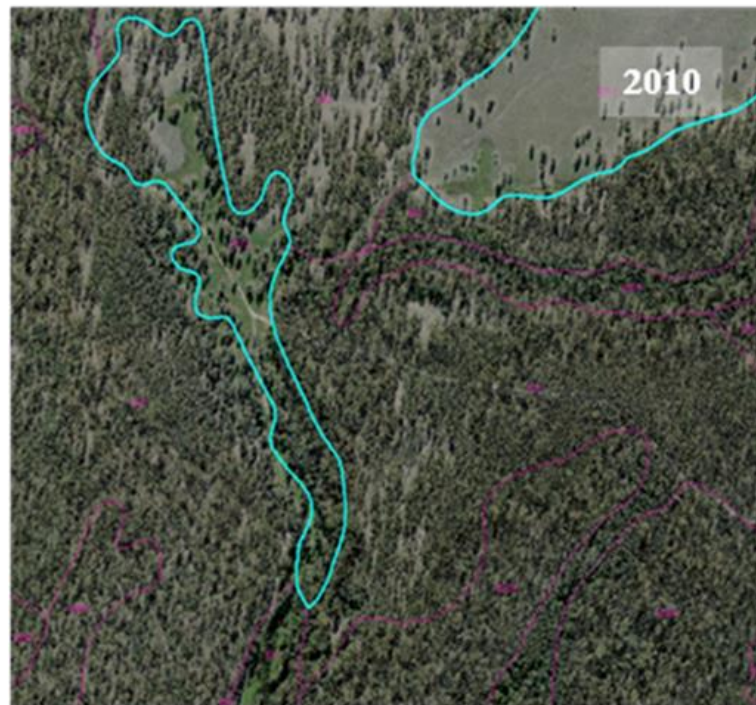
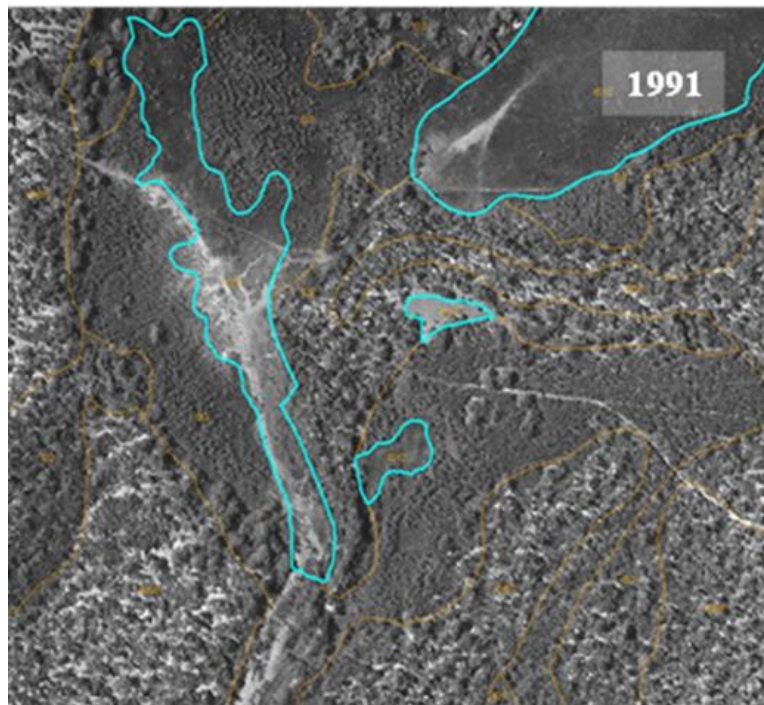
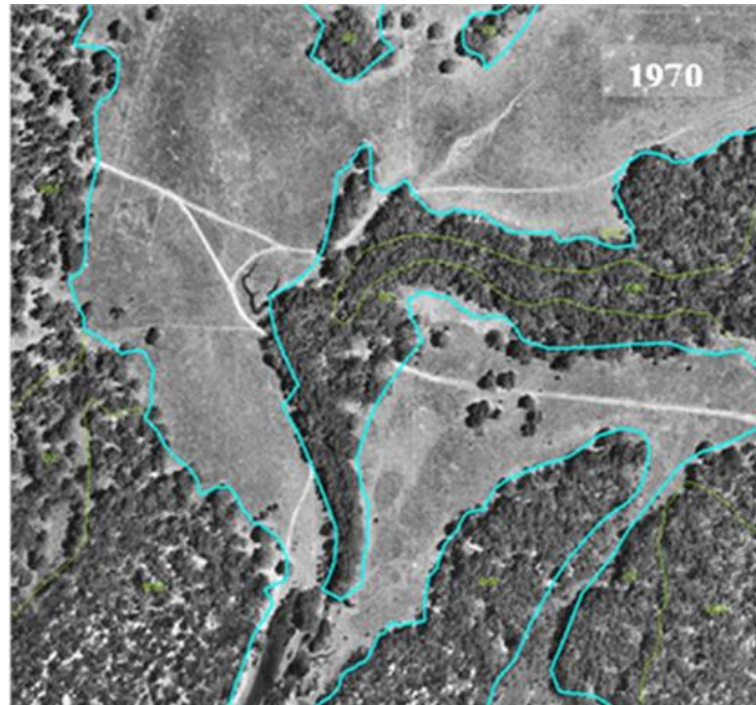
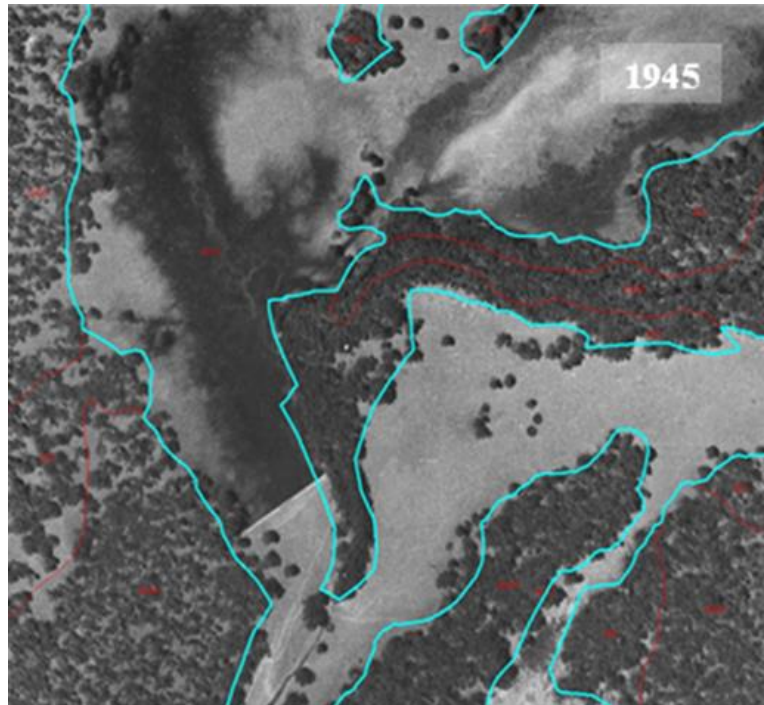
Years with flows > 18,000 ML day ⁻¹ for 45 days or more				Years with flows > 35,000 ML day ⁻¹ for 45 days or more			
Years	Natural	Regulated	Change	Years	Natural	Regulated	Change
1960 to 1979	18	11	39%	1960 to 1979	11	7	36%
1980 to 1999	17	11	35%	1980 to 1999	11	5	55%
2000 to 2013	10	5	50%	2000 to 2013	5	2	60%
1960 to 2013	45	27	40%	1960 to 2013	27	14	48%
Days above 18,000 ML day ⁻¹				Days above 35,000 ML day ⁻¹			
Years	Natural	Regulated	Change	Years	Natural	Regulated	Change
1960 to 1979	2,564	1,371	47%	1960 to 1979	1,125	797	29%
1980 to 1999	2,474	1,185	52%	1980 to 1999	1,143	662	42%
2000 to 2013	1,227	596	51%	2000 to 2013	445	155	65%
1960 to 2013	6,265	3,152	50%	1960 to 2013	2,713	1,614	41%

Median flows at Yarrawonga



The impacts ...

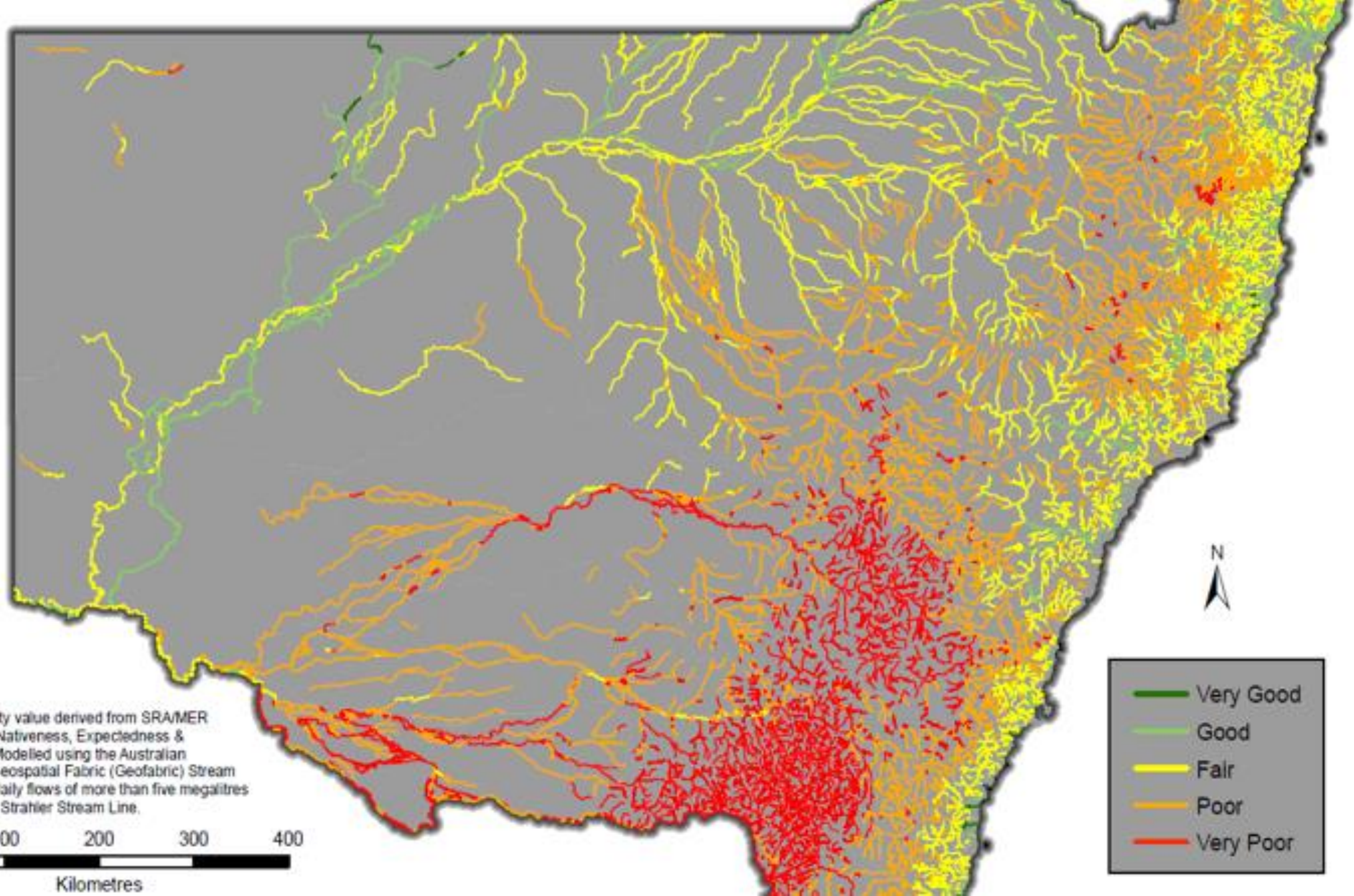




Fish Community value derived from SRAMER metrics using Nativeness, Expectedness & Recruitment. Modelled using the Australian Hydrological Geospatial Fabric (Geofabric) Stream Network with daily flows of more than five megalitres and applied to Strahler Stream Line.

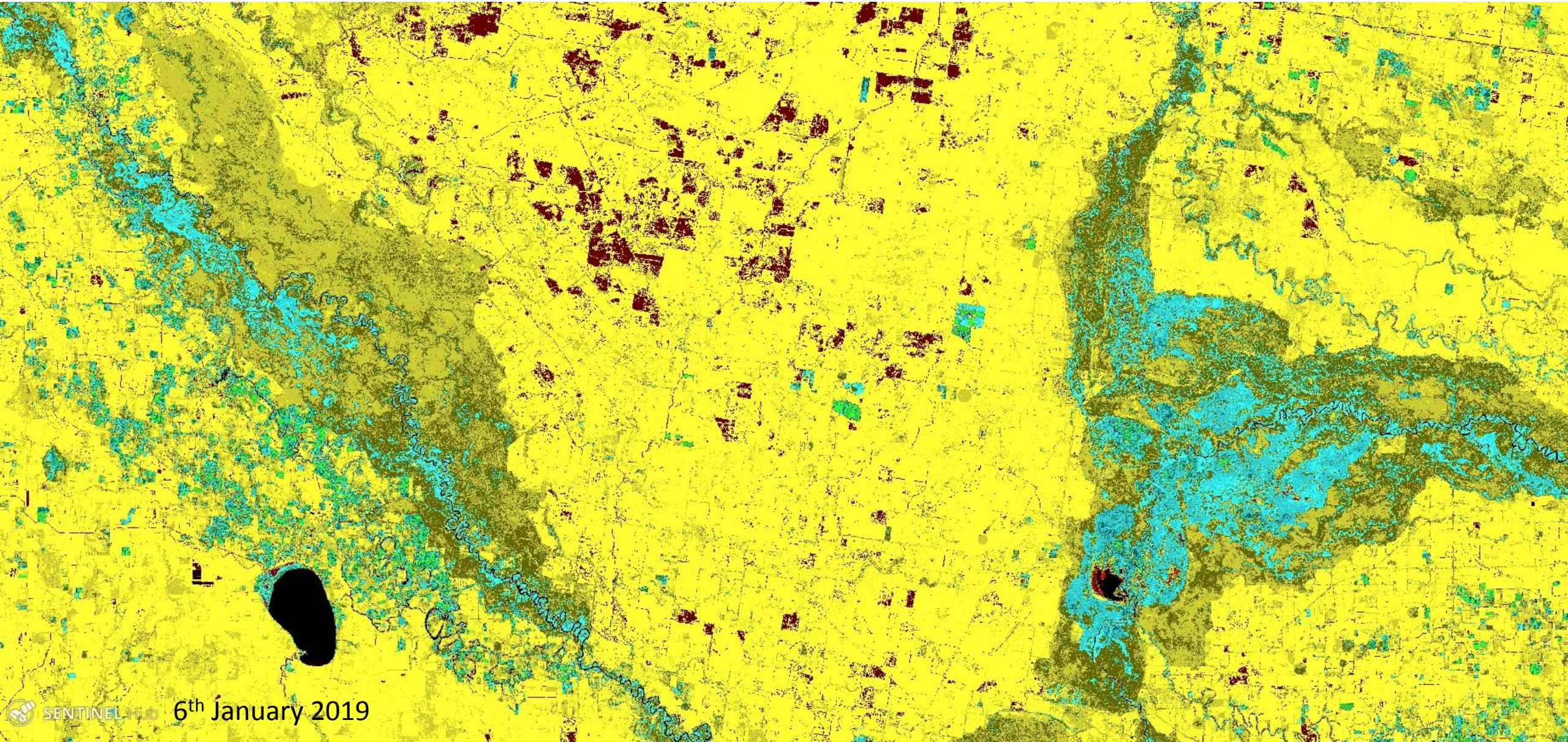
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Kilometres





Central Murray RRG Forests – Vegetation Index



4 years



9 years



Relative Height on the flood plain based on flood height (ML/day)	Number of sites	Mean calculated litter load (g/m ²)	Standard error (g/m ²)	Probable Lower Load (95% confidence interval) (g/m ²)	Probable Upper Load (95% confidence interval) (g/m ²)
15 000 ML/d	49	272	33	228	372
30 000 ML/d	55	458	49	422	567
50 000 ML/d	71	500	39	446	615

Source: Baldwin in prep. 2019

Site name	Dissolved Oxygen (mg/litre)	Dissolved Organic Carbon (mg/litre)
Murray River @ Picnic Point	9.0	
Edward River @ Toonalook	3.2	
Edward River @ Deniliquin	2.8	9
Niemur River @ Mallan School	0.7	
Wakool River @ Gee Gee Bridge	0.7	21
Barbers (outflows from KP SF)	0.1	26

We can achieve ...



**We can't solve problems by using
the same kind of thinking we used
when we created them.**

Albert Einstein

