

CHAPTER XXII.

WATER CONSERVATION AND IRRIGATION.

§ 1. Artesian Water.

1. **General.**—In every country subject to droughts, the provision of adequate systems of water conservation is a matter of prime importance. Much has been done in Australia so far as the supply of water to centres of population is concerned, and a description of the principal water-works in each State will be found in Chapter XXIV. "Local Government".

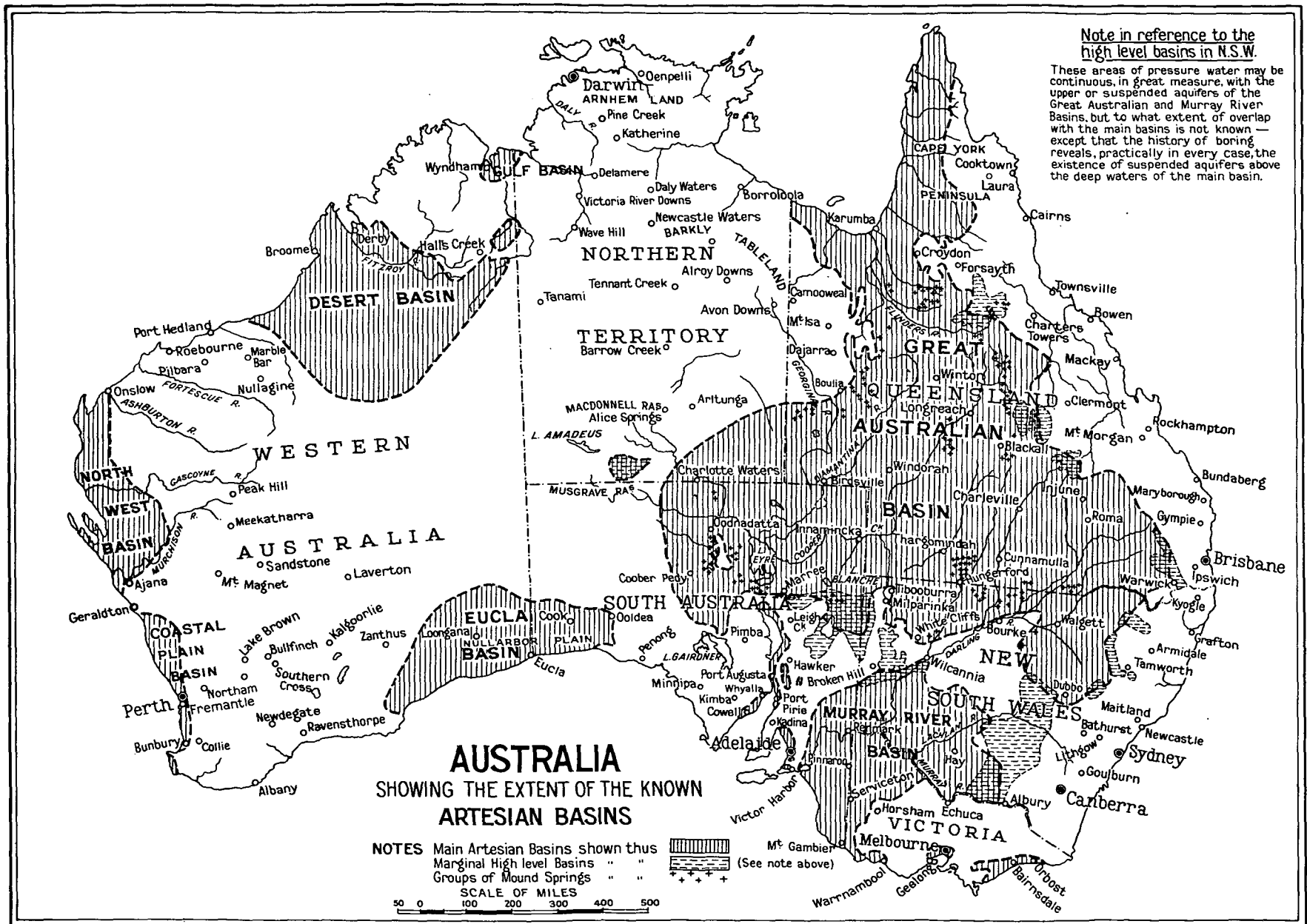
Interstate conferences on the subject of artesian water were held in 1912, 1914, 1921, 1924 and 1928, when combined Governmental action was agreed upon with reference to delimitation of the artesian basins, hydrographic surveys, reason for decrease in flow, analyses and utilization of artesian water, etc. A map showing the extent of the known artesian basins appears on pp. 633-4.

2. **The Great Australian Artesian Basin.**—The area known as the "Great Australian Artesian Basin," includes (a) considerably more than one-half of Queensland, taking in practically all that State lying west of the Great Dividing Range, except an area in the north-west contiguous to the Northern Territory; (b) a considerable strip of New South Wales along its northern boundary and west of the Great Dividing Range; and (c) the north-eastern part of South Australia, together with the extreme south-east corner of the Northern Territory. This basin (shown approximately by the map pp. 633-4) is said to be the largest yet discovered, and measures about 600,000 square miles, of which 376,000 are in Queensland, 118,000 in South Australia, 80,000 in New South Wales, and 25,000 in the Northern Territory. The area of the intake beds is estimated at 60,010 square miles, comprising 50,000 in Queensland and 10,010 in New South Wales. A description of the basin and its geological formation appears in previous issues of the Official Year Book (see No. 6, p. 569).

3. **The Western Australian Basins.**—The Western Australian Basins fall naturally within five distinct groups, namely, the Eucla Basin, in the extreme south-east of the State, extending well into South Australia along the shores of the Great Australian Bight; the Coastal Plain Basin, west of the Darling Range; the North-West Basin, between the Murchison and Ashburton Rivers; the Gulf Basin, between Cambridge Gulf and Queen's Channel; and the Desert Basin, between the De Grey and Fitzroy Rivers.

The Recent and Tertiary strata which enter Western Australia at its eastern border, and which have a prevailing dip towards the Great Australian Bight, form the Eucla artesian water area. Where boring operations have been undertaken, the water has been found to be salt or brackish, and there are other conditions affecting the supply, such as local variation in the thickness of the beds, their relative porosity, and the unevenness of the floor upon which they rest, which so far, have not been examined with sufficient thoroughness to enable many particulars to be given in regard to this basin.

In the Coastal Plain Basin to the west of the Darling Ranges, artesian boring has; on the other hand, been carried on successfully for many years.



This map was re-drawn from that published in the Report of the Fifth Interstate Conference on Artesian Water, Sydney, 1928.

4. **The Murray River Basin.**—The Murray River Basin extends over south-western New South Wales, north-western Victoria, and south-eastern South Australia. It is bounded on the west by the azoic and palæozoic rocks of the Mount Lofty and other ranges extending northwards from near the mouth of the Murray to the Barrier Range, and on the east and north-east by the ranges of Victoria and New South Wales. This tertiary water-basin is occupied by a succession of sedimentary formations, both porous and impervious. The waters of the Murray River are partly supplied by influx from the water-bearing beds of this basin; this is proved by the fact that, at low water, springs are observed at certain places flowing into the river bed from beneath the limestone cliffs from Pyap Bend downwards. Similar springs exist along the courses of other branches of the River Murray system, where they cut through the tertiary formation. On the Victorian side, bores have been put down, and water has been struck at various levels.

5. **Plutonic or Meteoric Waters.**—In previous issues of the Official Year Book will be found a statement of the theory of Professor Gregory* as to the origin of the water in the Australian artesian basins, together with the objections held thereto by a former Government Geologist of New South Wales† (see Official Year Book No. 6, p 570).

6. **Artesian and Sub-Artesian Bores.**—(i) *General.* The following table gives particulars regarding artesian and sub-artesian bores in each State and in the Northern Territory:—

ARTESIAN AND SUB-ARTESIAN BORES, 1939-40.

Particulars.	N.S.W.	Vic.	Q'land.	S. Aust. (a)	W. Aust.	N. Terr.	Australia. (b)
Bores existing .. No.	763	330	6,514	162	284	191	8,244
Total depth of existing bores .. '000 feet	(c) 1,167	11	3,099	116	231	63	4,687
Daily flow .. '000 gals.	(d) 68,653	3,000	260,000	12,972	(e)	7,723	352,348
Depth at which artesian water was struck—							
Maximum .. feet	4,338	3,000	6,000	4,851	4,006	1,760	6,000
Minimum .. "	100	50	10	233	30	42	10
Temperature of flow—							
Maximum .. °Fahr.	141	160	212	208	(e)	(e)	212
Minimum .. "	75	10	78	82	(e)	(e)	10

(a) Government bores only. (b) Incomplete. (c) Total depth of all bores. (d) Flowing bores only. (e) Not available.

(ii) *Details for States.*—Considerations of space preclude the insertion of separate particulars of operations in the States during 1939-40. Details for earlier years, appear in issues of the Official Year Book prior to No. 23, 1930.

§ 2. Irrigation.

1. **General.**—Australia's first experiments in irrigation were made with the object of bringing under cultivation areas in which an inadequate rainfall rendered agricultural and even pastoral occupations precarious and intermittent, and, although these original settlements have generally proved fairly successful, most of the States, instead of promoting new settlement in unoccupied regions, are adopting the policy of making existing settlements closer, by repurchasing large estates, sub-dividing them into holdings of suitable sizes for cultivation, and selling the land upon easy terms of payments. It is in connexion with this Closer Settlement policy that the special value of irrigation is recognized. Information regarding the various irrigation schemes in operation is given in some detail in preceding issues of the Official Year Book (see No. 23, pp. 637-61).

* See J. W. Gregory, F.R.S., D.Sc.: "The Dead Heart of Australia," London, John Murray, 1906; and "The Flowing Wells of Central Australia," Geogr. Journal, July and August, 1911.

† E. F. Pittman, A.R.S.M., formerly Government Geologist of New South Wales: "Problems of the Artesian Water Supply of Australia, with special reference to Professor Gregory's Theory." (Clarke Memorial Lecture, delivered before the Royal Society of New South Wales, 31st October, 1907); "The Great Australian Artesian Basin," Sydney, 1914; and "The Composition and Porosity of the Intake Beds of the Great Australian Artesian Basin," Sydney, 1915.

2. **Areas Irrigated.**—The following table gives the areas irrigated in each State during the years 1929-30 to 1939-40. The area shown for New South Wales refers only to crops irrigated. It does not include pasture land and fallow land which may have been irrigated and consequently the area is not strictly comparable with that shown for other States.

IRRIGATION : AREAS IRRIGATED.

Season.	N.S.W. (a)	Victoria.	Queensland.	S. Aust.	W. Aust.	Tasmania.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1929-30 ..	126,321	566,577	26,282	40,002	4,943	6,693	770,818
1930-31 ..	135,121	463,098	26,947	43,538	5,661	6,488	680,853
1931-32 ..	114,777	418,415	28,414	42,813	6,104	7,768	618,291
1932-33 ..	130,977	474,716	31,409	42,556	6,434	7,605	693,697
1933-34 ..	131,772	435,324	29,363	42,898	7,640	9,194	656,191
1934-35 ..	125,423	494,226	34,138	39,594	8,861	7,786	(b) 710,054
1935-36 ..	138,016	495,835	44,283	42,672	11,396	8,987	(b) 741,312
1936-37 ..	151,683	518,827	44,509	42,292	13,295	9,987	(b) 780,663
1937-38 ..	170,719	590,113	49,154	44,250	14,284	8,428	(b) 876,953
1938-39 ..	183,518	515,357	48,953	43,602	14,278	8,599	(b) 814,357
1939-40 ..	120,753	517,903	55,153	44,470	15,443	8,656	(b) 762,641

(a) Excluding pasture and fallow lands.

(b) Including Australian Capital Territory, 1934-35, 26 acres; 1935-36, 123 acres; 1936-37, 70 acres; 1937-38, 6 acres; 1938-39, 50 acres; 1939-40, 263 acres.

3. **Crops on Irrigated Areas.**—A classification of the crops grown on irrigated areas in each State during 1939-40, will be found in the table below. Lucerne, grasses and green forage accounted for 31 per cent., cereals for 21 per cent., orchards and vineyards for 32 per cent., and root crops, market-gardens, etc., for 16 per cent. of the total area of crops under irrigation in 1939-40. The area in Victoria does not include 310,504 acres of pasture land and 5,417 acres of fallow land which were irrigated in 1939-40. Likewise 4,039 acres of pasture land are also omitted from the Tasmanian figures for the same year.

IRRIGATION : CROPS ON IRRIGATED AREAS, 1939-40.

Crop.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Cereals ..	61,218	33,207	426	94,851
Lucerne, Grasses and Green Forage ..	22,220	89,081	5,563	(a) 10,040	10,345	91	137,340
Orchards and Vineyards ..	26,781	72,969	9,118	28,520	2,698	1,688	141,774
Root Crops, Market-gardens and other Crops ..	10,534	6,725	(b) 40,046	5,910	2,400	(c) 2,838	(d) 68,716
Total ..	120,753	201,982	55,153	44,470	15,443	4,617	442,681

(a) Including pasture land.

(b) Including Sugar-cane, 38,612 acres; Cotton, 298 acres; and Tobacco, 1,111 acres.

(c) Including Hops, 946 acres.

(d) Includes 263 acres Australian Capital Territory as follows:—Cereals, 9 acres; Lucerne, etc., 182 acres; and Market-gardens, 72 acres.