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OCTOBER, 1953

GOVERNOR'S COMMISSION ON ECONOMIC AND SOCIAL TRENDS IN IOWA

("Committee of One Hundred")

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Final Report of the Sub-Committee on

W A T E R

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To the man in the street, water is abundant and almost free. He knows that super-abundance has often caused heavy loss of property and human lives. His favorite fishing or boating area was probably provided by Nature and he may think no human effort or foresight was involved, or will be involved in the future.

To the man in the factory, water is the most important raw material. For almost every other raw material there is a substitute, but water is essential. Moreover, careless disposal or waste may bring punishment.

To the city health official, water is essential to satisfy the needs of citizens, to fight fires and to carry away wastes.

To the man on the land, water must be in abundant supply to insure crop growth and animal existence, although he may wish he had more water for certain years and for certain seasons -- and less when spring floods waste his soil.

Iowa water resources are at present abundant, although that abundance

is relative, in terms of regions of the state. Should the industrialist, the city official, or the farmer sharply increase his demands, would someone face a shortage? Might the sportsman find his favorite fishing spot reduced to a mud hole? Might wells that were reliable for years suddenly go dry?

The possible change in methods of operation in any of these classifications could greatly upset a delicate balance between supply and demand. And changes are certain to come. Perhaps most important and most certain is that Iowa population, and the per capita demand for water, both will increase. Double the present demand for our water resources seems likely by 1975.

This committee of citizens, mostly laymen in the water field, have soberly and conscientiously summoned experts and weighed the testimony. In the following chapters the committee will attempt to evaluate the situation with special consideration given to future trends. It is our sincere hope that our findings and suggestions may play a part in the great future of Iowa. Perhaps we shall be so fortunate as to awaken the public to the issues involved, to the public's responsibility in meeting them. We must think broadly of the future welfare of all Iowa, and not alone of our special interests.

SECTION I - Iowa's Water Supply

As a state, Iowa is blessed with an abundant supply of water. Sectionally, this is not true, and there are seasons and cycles of seasons when costly shortages occur.

It is equally true that devastating floods and seasons of excessive, continuous rainfall impose heavy economic burdens on Iowa citizens. In an early day, some sections of the state assumed heavy bonded indebtedness for drainage. In the subsections to follow, evidence presented to this committee will be reviewed in order that the average citizen may obtain a clearer picture of Iowa's most essential resource -- water.

Subsection A -- Present Supply

Major sources of water in Iowa are precipitation (rain and snow), ground water, and surface water of rivers, streams and lakes, including the border rivers -- the Mississippi and the Missouri-Big Sioux. The average precipitation is 32 inches, ranging from 34 inches or over in southeastern counties to 26 inches or less in the northwest. In 1955, only 23 inches fell in the state. In 1951, Iowa had 42 inches. The border rivers now furnish water to border cities and farms, and they provide transportation for industry. Vast upstream plans of other states and the federal government in the Missouri basin call for drawing huge amounts of water from that source.

More than 85 percent of the people of Iowa obtain their water from underground sources. From evidence presented it is clear that our information on ground water is inadequate. We cannot say with assurance where it is, or how much there is of it. Large southern areas of the state either have too little ground water, or the quality of it is too poor for use.

Precipitation goes underground, runs off, evaporates, or is transpired by the leaves of growing plants. Some 15,000,000 acre-feet of water is discharged into creeks and rivers each year.

Subsection B -- Potential Development

Is there a possibility of increasing the total supply of water in Iowa? Some quite promising new methods of de-mineralizing ground water were considered. Areas having well water high in iron, sulphur, or other minerals, yet abundant at reasonable depths, may soon be looking into such possibilities.

Rainmaking has the encouragement of some eminent scientists. Several Iowa communities have hired rainmakers in recent years. However, unless there is moisture in the air in the right condition, no known methods have even a speculative chance of producing rain or snow. Since the possibilities are so great under favorable conditions, efforts to put rainmaking on a prac-

tical basis will continue.

The likelihood of measures in the near future to increase the availability of our natural water resources seems greater than any hope for increasing the total amount. At least 20 percent of the water falling on Iowa soils each year runs down to the big border rivers, ^{sometimes} with great damage to farm land, public structures, municipalities and utilities. Few Iowa streams would flow during dry months if it were not for underground sources.

Storage of seasonal surplus water by various means seems certain to assume large dimensions as the years go by. Such storage would reduce the damage of floods, make water available for farm, municipal, recreational and industrial use, and maintain stream flow in dry seasons.

Water in some areas could be spread over the land to increase insoak. In some areas water is now being ^{diverted} down drainage wells from tile lines and other sources. This practice should, of course, be under strict supervision by state health authorities.

Farmers are the major users of Iowa water and must be concerned in retaining as much water as possible for crop use when seasonal rainfall is deficient. A good soil tilth adds greatly to the normal holding capacity of most soil types. Contour farming, terraces, and other methods now widely used in soil conservation districts keep water where it falls to be used later by crops or to raise the water level of farm wells. Excessively wet areas must seasonally drain off surplus water which may be held under more favorable conditions in downstream ponds; or where practicable it may be disposed of in drainage or storage wells.

Rapidly increasing demand for water in certain types of air conditioning necessitates recovery of water/ through installation of reuse equipment, insofar as possible. With rigid sanitary controls, it may be desirable to pump recovered water into return wells. Direct wastage must be prohibited. The cooling of livestock may bring rapid increase in farm water use, where evaporation will prevent much recovery.

"Pollution" is any change that reduces the acceptability of water for

further use. For certain industries, merely raising the temperature a few degrees may constitute pollution. Our biggest problem dealing with water supply is the pollution of water. Polluted water is almost as bad as no water at all. Raw sewage legally cannot be emptied into Iowa streams. Generally speaking municipal sewage treatment plants are designed to remove 85-90% of the pollution load. By further treatment, effluent (treated sewage plant liquids) may be useful in many ways. In recent years much progress has been made in the treatment processes and the handling of industrial wastes. Modern industries provide for the reclamation or the reuse of water within the plant or adequate treatment before it is released into the receiving streams to be used again for other purposes. As Iowa industry grows, close control to prevent industrial pollution of our waters must be practiced. Outstanding achievements in this respect have been demonstrated by numerous Iowa industries. We were told by a manufacturer's representative that 90% of the water used by Iowa industry is returned to streams for further use. Municipalities also return a high percentage of the water withdrawn for their water supply systems.

Silt from eroding farm land is a major source of Iowa stream pollution. Its complete elimination, even if practical, would not increase the available supply of water, however. Reduction of heavy silting nevertheless would prevent the filling up of costly dams and catch basins. The presence of silt greatly increases purification costs, both for municipalities and industry, and it is a major damaging agent in floods.

Subsection C -- Consumptive and Nonconsumptive Uses

Water drawn from a stream, passed through certain processes and released to the stream again, unimpaired in quantity and quality is available to other users. It is not consumed. The water used by cities whose major water takings are returned as clear sewage effluent is in this category, as well as 90% of industrial water, most of our recreational water supplies, and farm water needs other than irrigation. These are nonconsumptive uses.

Irrigation is a consumptive use of water. However, no data is available in Iowa to prove that all water so applied is used. Some doubtless es-

capas to streams and some to the subsoil below crop roots. Other evaporative uses are consumptive.

SECTION II - Iowa's Demand for Water

Subsection A -- The Nature of Demands

Farmers are the largest body of natural users of water. The annual water need of crops assumes astronomical proportions. Certainly the trend is toward a more intensive livestock program in Iowa. Some livestock farms today use more water than many small towns. Pure, safe drinking water is the major animal requirement from water resources. However, increasing amounts are needed for cleaning dairy barns, dairy utensils, cleaning feeding floors, and cooling animals in warm weather. The two latter uses promise to increase very rapidly. (Liquid manure saves labor and improves sanitary livestock conditions.)

Supplemental irrigation is available to only a few hundred farmers at this date. Its potential is so great that we believe pressures will mount to increase this use of water. The modern farm home equals any city home in its water requirements. That there will be fewer farmers in the future seems a certainty so this factor is unimportant in relationship to total water requirements of the state. The number of people who work in cities and towns but in the country dwell/ increase open country water needs, while relieving municipal demands.

The growth of large population centers points clearly to rapidly expanding needs for municipal water supplies. The usual needs of citizens are being ^{increased} by growing numbers of certain types of air conditioners, garbage disposals, more bathing facilities in the home, and the growing practice of watering lawns. Cities having adequate water at present are extending water mains to nearby small towns and villages. While this does not increase total demand, it tends to concentrate demand on stream or well sources. Thus, a critical local shortage may develop -- or intense competition for water.

While Iowa is dominantly a farm state, it seeks to encourage more in-

dustry. Our ability to attract industry rests upon our labor supply, tax rates, social amenities, transportation, and water supply. Industry actually consumes only about 10 percent of the water it uses. Therefore, the concern of the state must be in adequate supplies. Industry will need to avoid concentrating heavy water users in areas where local water shortages can be induced by heavy pumping. Care will also be needed in evaluating the possibilities and costs of building larger storage facilities for water.

Recreational facilities in Iowa are quite limited; our citizens spend thousands of dollars annually for the use of recreational water facilities in neighboring states. But thousands of citizens must seek their recreation within the state. Between April 1, 1957, and March 31, 1958, 229,476 resident fishing licenses were sold in Iowa. In 1956, 175,256 hunting licenses were sold -- and hunting possibilities are closely tied to water. There were 164,133 combination hunting and fishing licenses sold. About $2\frac{1}{2}$ times as many Iowa residents fished in Iowa in 1957 as fished in the state 10 years previously. It is estimated that 94,000 outboard motor boats were in use in 1957. While Iowa ranked 17th in boat motor sales that year, it ranked 35th in available water area. There has been a tremendous increase in the sale and use of motor boats in Iowa during the last 10 years.

State park attendance has more than doubled in the past 10 years. In 1957, park attendance was slightly under $6\frac{1}{2}$ million. (Our total state population is $2\frac{3}{4}$ million people.)

Navigation is an important transportation facility on our border rivers. Industry is now concentrated heavily along the Mississippi River, where low water rates apply. Slack water dams or other works that would make the Missouri River a reliable channel for commerce would attract more industry in Western Iowa. This problem should be studied and evaluated soon. Assurance of adequate stream flow must be obtained from states upstream from Iowa. Development of the Missouri River likewise offers great possibilities for irri-

gation.

The nature of Iowa streams and our seasonal rainfall precludes their extensive use for power generation. Early settlers used our streams for power by constructing small dams. Until fuels which are now relatively cheap become scarce, water power sources in Iowa offer small possibilities. (Water for cooling in steam generating plants will be needed in increasing volume.)

Flood control involves two issues -- unwise use of flood plains and the means to curb damage done when Nature swings off balance. Strong controversy marks any discussion of control methods. Large dams on main stem streams can cope with floods of disaster size but they cannot protect the area above the dam. Consequently, upstream works are ^{also} vital if we are to have an adequate flood control and water resources program.

Subsection B -- Future Demands

This area must remain largely speculative. However, Des Moines and other cities and towns have employed engineering firms to make detailed ^{studies} of future development, with special attention paid to water needs. Agriculture will continue to expand production, most directly through irrigation, -- a practice which requires vast water resources. Industry, too, is expected to expand markedly. Large water users will demand abundant supplies of good water. Recreation demands have doubled and trebled in a few years. All signs point to greater and greater demands. In all classifications of need, the unarguable prospect is INCREASE. How much increase is the question which leaves much room for argument. The impression gained by this committee is that our present water needs will double by 1975.

SECTION III - Relative Benefits from Various Uses

Subsection A -- Statement of the Problem

Iowa is the nation's leading agricultural state. From 1942 through 1955, Iowa's agricultural production has shown a steady growth. The current

adoption of improved techniques, including irrigation, has placed other states in a position to seriously challenge Iowa's agricultural leadership. All Iowans gain from the strength of their state's great farm production. Raw materials for industry, greater employment, and a rich farm market for Iowa's industries are among the gains. Huge exports of farm produce to other states brings a continuous flow of new money into Iowa. Iowa's farm income in recent years has been well above 2 billion dollars^{annually}/. It seems to this committee that there are vast undeveloped opportunities in Iowa agriculture. (To say that our agriculture has reached its peak and must remain relatively static in the future would be an insult to our great agricultural college and the men and women who operate our farms.)

But our traditional farm economy must not stand in the path of a potential giant Iowa industry. Industry in Iowa turned out products valued at more than 4 billion dollars in 1957. Payrolls amounted to 750 million dollars. Some 29 new industries were added and 32 industries expanded their establishments. There is abundant land area and resources for agriculture and industry to realize their full potentials, side by side, in the next 20 years. In fact, each will be richer and stronger for the presence of the other. Doubtless the best balanced state economy in the nation can be ours if we plan wisely.

The economic aspect of recreation as related to water was covered in Section II, Subsection A. Sales of motor boats, fishing and hunting licenses, fishing tackle, guns, and ammunition run into huge sums of money. Recreational facilities are of great importance to both agriculture and industry. At least two-thirds of Iowa's natural net increase in population leaves the state seeking opportunities elsewhere. Greater recreational resources, including water, would help induce some of this emigration to remain in the state, and to further develop our potential opportunities.

Municipal needs must increase greatly in concentrated areas -- Des Moines, Cedar Rapids, Waterloo, and others.

Subsection B -- Guidelines for Solution

The foregoing generalizations are drawn to establish principles. They will not solve specific problems, such as conflicts in the demand for water among our greatest water-using groups. Our committee has attempted to think in terms of the welfare of the entire state. We realize that the state is responsible for the welfare of individual citizens. Through a general policy, well understood and supported, individuals and groups may be more easily satisfied. Iowa has now enacted a law declaring surface and underground waters to be the property of the people of the state. The application of that basic law must be positive, insofar as possible. Denying a citizen the use of water is negative. Therefore, we believe the major concern of the state must be to increase the availability of present water supplies.

Subsection C -- Procedures for Solution

The Iowa Natural Resources Council has excellent inventory studies of most major river basins in the state. Resources and problems are presented. This committee believes that one of the logical approaches to meeting Iowa's growing water needs (as well as achieving flood control) is: Work by river basins or watersheds. On main stem streams, we should construct big dams as needed. Our smaller streams may need less extensive storage facilities. Important to the whole system, however, should be the individual farm on which the rain falls. Soil conservation on farms will reduce runoff. In numerous areas of the state, farmers have joined ^{together and organized} ~~into~~ soil conservation watersheds in which flood ^{reduction} and water storage is accomplished on fairly large acreages (40 to 60 thousand acres). ^{Reduction} of floods, ^{and} erosion, ^{and} siltation, increased recreational facilities, and clearer and more steady stream flow are the aims to be achieved. We recommend the encouragement of such watershed development by various methods. Proper drainage is a partner of flood control; a saturated swamp cannot absorb much water, but tilled land can retain a great deal before sending surplus waters downstream.

Water storage on a vast scale is clearly the policy Iowa should fol-

low in the next 25 years. There are other steps which must be taken also. Zoning to prevent losses on natural flood plains is one of them. Nature must have escape valves for temporary surpluses of water. Flood plains storage must be further studied. The greater use of water from our border rivers will be necessary. Allocation of supplies from these sources is now imperative in some areas. The legal aspects of such allocations require study. These aspects will be clarified gradually by court decisions. (A maze of legal questions faces us now.)

The study of plans, building costs, and maintenance can be based upon solutions already worked out in small watersheds. Certainly fine cooperation by utilities and all parties involved has been achieved. Without question, such a program will cost huge sums of money and it is not expected that the job will all be finished in a few years. But a start can be made. Let's keep going. Applicants for irrigation permits or heavy future industrial needs may be dealt with more intelligently if increased availability of water is foreseeable, and if it is the subject of positive planning.

In conclusion, it is those 15,000,000 acre-feet of water annually poured into creeks and rivers leaving the state that must hold our attention along with evaporation, transpiration and other consumptive uses. Conservation of an appropriate part of this water would largely eliminate competition for water in the next 25 years. The cost will be large. We believe it to be a sound investment.

SECTION IV - Development of a Rational Water Policy

Subsection A -- Research Needs

Clearly impressed upon this committee was the need for more information regarding both surface and underground waters. There is almost a complete lack of gauging in our smaller streams. Without gauging information, it is impossible to determine the nature of a stream. There are relatively few siltation stations on any of our streams. No information could be found on the consumptive use of irrigation water on various soil types. Losses from evaporation, plus crop use, account for a large part of the total use. Does water

which settles below plant roots eventually reach streams, or does it increase or restore / the height of the water table? These are extremely important questions, for which Iowa does not yet have answers.

Does our Iowa underground water flow from adjoining states, and if so, how fast? Or is recharge largely within Iowa borders? Where is recharge naturally occurring? Can it be increased? What would the mining of our ground water in parts of Iowa mean? Since 85 percent of the people of Iowa get their water from underground sources, more complete information regarding it is of great importance.

There seems to be no reason for concern regarding the development of large population centers in most areas of Iowa. Water is abundant, although its future cost is likely to increase sharply, with added burdens placed on a basic water supply which has remained about the same for 50 years, while demand has doubled each 20 years. Southern Iowa areas must always be handicapped economically and recreationally unless bold measures to increase water availability there are applied. The great cost of such measures precludes the possibility of local solutions. State and federal aid will be necessary. No large watersheds exist exclusively in the area. However, land is relatively cheap and opportunities for low cost storage are large because of the rough nature of the area. The natural beauty of these southern counties could be a big asset to Iowa, and ^{they} could become one of Iowa's fine recreational areas, if water resources can be increased.

Subsection B -- Experimentation

We have no quarrel with the present water rights law or its administration. The law represents a start toward a state water policy, which had to be made. It is frankly a first step and must be amended as we gain experience. Study of other states will add to our own knowledge. The Natural Resources Council is doing pioneering work, and should be given time (rather than

more work) for the present. The Council must be adequately staffed and financed. Within the next 10 years it may be clear that a separate section or bureau in the Council may be needed for growing water problems. Indeed, it is conceivable that a separate body for that purpose may eventually be needed. We must move deliberately. Those who have made and are making heavy investments based on our present water supply must be protected. Others must be warned of the risks in making such investment until the state can assure them that their investments will be based on a reliable future water supply.

Agreements, so far as possible, must be made on a short-time basis. We believe each biennium should be marked by appropriations for experimentation with underground storage, irrigation on various types of soil, and methods of repayment by those benefited through the State's capital investment. Future water conservation projects should be self-liquidating to a large extent.

Subsection C -- Permanent Study Group

The fine service rendered the Legislature by the Iowa Legislative Water Rights and Drainage Law Study Committee convinces this committee that a permanent non-partisan lay group, with interests broader than those of the Iowa Natural Resources Council, is needed. It should be advisory to the Council, and serve as a public relations body. Its personnel would be drawn from the major fields of agriculture, industry, the municipalities, and the field of recreation. It should be representative of all the major watersheds. Concern with our border rivers would be a part of its responsibility. Public spirited citizens are required who possess some special ability. They would serve on an expenses basis only, and they would have funds available for study in neighboring states, and for the expenses of witnesses from Iowa and elsewhere.

Subsection D -- Keeping Citizens Informed

Communication channels to the Iowa public are numerous, and they are

eager for information of merit which has real readership value. The full cooperation of personnel of the public bodies which deal with water problems of the state is most important if the public is to be interested and informed. These busy people rarely possess the journalist's ability to recognize good story material, and to know where it would be accepted, and where it would be effective. Someone in the Natural Resources Council might have such qualifications, and might be designated for such duties as a part of his Council responsibility. Perhaps the Information Staff of Iowa State College could be increased, with responsibility for covering developments in Soil Conservation, and in the many similar state agencies which now are engaged in water use or conservation practices. The Iowa Development Commission is, doubtless, another possible agency for such an assignment.

In conclusion, we believe water storage is definitely needed in Iowa. It will reduce the damage done by spring surpluses; it will provide partial insurance against floods; it will help to maintain stream flow during periods of low precipitation, and it will reduce dry weather and drouth losses. Happily, no "emergency" exists. By the same token, it is therefore more difficult to get people to act. Persistent and intelligent efforts must continue, lest Iowa's future opportunities be limited by abundant but poorly managed water resources.

CONCLUSION

Within the limits of our time and authority, this committee has collected evidence and reached conclusions which follow:

1. Iowa's water resources have not increased in 50 years and are not expected to increase.
2. Iowa's uses of water double each 20 years -- will double again in 1975.
3. Over 85 percent of Iowa's people derive their water from underground sources. There is a serious lack of information regarding underground water supply in some areas.
4. Some 15,000,000 acre-feet of surface water are annually poured into creeks and streams. Great economic loss results from floods and seasonal high stream flow.
5. Stream flow throughout dry periods must be maintained and increased.
6. There is urgent need for more data on stream flow and water quality.
7. There is urgent need for a coordinated program of water storage by watersheds.
8. Financial aid by the state and nation is imperative in the development of Iowa's water resources.
9. Water storage projects, so far as feasible, should be self-liquidating.
10. Border river flow must be watched, lest upstream states handicap Iowa needs.
11. Experimentation, and a program to keep the public informed, are of vital importance.
12. A continuing advisory water committee of citizens, functioning as a public relations body and serving as a source of factual information to the various groups interested in the water problems of Iowa, is needed, to coordinate effort toward a sound water program.

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The foregoing discussion is scarcely more than a bare outline of the trends in water for Iowa. Space limitation in this report precludes complete coverage. Many volumes have been written on the subject. The following highly selective bibliography lists some of the most recent publications that present more details for the interested reader. References in them lead to additional books, articles, and reports on the subject of water at the local, state, regional, and national level.

In addition to the sources listed below, several state and federal agencies have voluminous references and data pertaining to water. They include the Iowa State Department of Health; the U. S. Weather Bureau, Department of Commerce; the Iowa State Conservation Commission; the Iowa Natural Resources Council; the U.S. and the Iowa Geological Surveys.

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