State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RIGHTS

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October 15, 1991

Dear Water User:

On May 14, 1991, the State Engineer held public meetings in Salt Lake City, Provo and Heber City in which a preliminary proposal concerning the distribution of water rights within the Utah Lake Drainage Basin was presented. A document was handed out at these meetings summarizing the main issues in the distribution plan. It was requested that comments on the plan be submitted by July 1, 1991. The comments received gave us a great deal of insight into areas that were not as well understood by the water users as we hoped and pointed out several issues we had overlooked.

After responding specifically to the comments that were received, we went back and reworked the May 14, 1991 document on the proposed distribution plan in an attempt to clarify several issues and to incorporate the comments that were submitted. We now present a "revised" proposed distribution plan, based on the original document, with the comments and suggestions incorporated. This "revised" document is still preliminary however, and as before, you will have the opportunity to comment. Since we present several new "terms" in the distribution plan, for clarification purposes we have included a definition section. As requested, we have also included information on the distribution computer model and related technical methodology and information used in formulating the proposed distribution plan.

It is our intention, at this point, to continue to hold meetings with the water users to keep you apprised of the proposed distribution plan and solicit your input prior to finalization of the plan. The next meeting has been scheduled for Thursday, November 14, 1991, at 2:00 p.m. in the Department of Natural Resources Auditorium, 1636 West North Temple, Salt Lake City, Utah. The primary purpose of this meeting will be to answer your questions with regards to the proposed distribution plan. Therefore, we are mailing you the revised plan and related information, in order to ensure that you will have sufficient time to review the material prior to the scheduled meeting. We look forward to seeing you then. In the interim, if I or may staff can be of any assistance please do not hesitate to contact us.

Sincerely,

Robert L. Morgan

Robert L. Morgan, P.E.
State Engineer

RLM/wk
Enclosures

List of Enclosures
Utah Lake Distribution Plan
Letter to Water Users

1. Revised proposed distribution plan for the Utah Lake drainage basin.

2. Distribution model, graphs showing historical versus modeled conditions and basic data available.

3. Direct flow rights on the Jordan River which have a call on Utah Lake water.

4. Storage rights greater than or equal to 100 acre-feet, Utah Lake drainage.

REVISED DRAFT
October 15, 1991

DISTRIBUTION OF WATER WITHIN THE UTAH LAKE DRAINAGE BASIN

1.0 Introduction

Utah is experiencing significant growth in those counties located along the Wasatch Front. Associated with this growth we are seeing more demands being placed on our limited water resources, such as the conversion from irrigation to municipal water use.

With the projects currently under construction and those planned for the future, it would appear that Utah Lake and its major tributaries will be facing a number of changes in the manner in which these systems have historically been operated. This is not to imply that such changes will have a negative impact, rather with proper planning these changing water use practices can be handled and existing water rights protected. In addition, there are a number of major transbasin diversions into the Utah Lake drainage which need to be better regulated. Diversions between the basins or subbasins presently total over 300,000 acre-feet annually.

Within recent years, there have been a number of requests made of the State Engineer to make decisions on matters which significantly affect water distribution in the Utah Lake drainage basin. After reviewing this matter, it appears that some direction is needed to better clarify the relationship between water rights in the basin; particularly between storage rights in Utah Lake and storage rights on the upstream tributaries. The State Engineer believes that in order for the river commissioners to properly administer the numerous diversions, the extent of the rights and their relationship, one with another, needs to be fully understood by everyone involved. In simple terms, we need to begin to manage the water rights on the Provo River, Spanish Fork River, Utah Lake, Jordan River, and other sources in the basin as one system. The objective is not to remove local control or involvement in the management of the waters. Rather, the objective is to ensure the equitable distribution of water, according to the respective water rights, and to address problems from a more regional point of view.

The State Engineer is submitting this proposed distribution plan under authority of Sections 73-2-1, 73-5-1, -3, and -4, Utah Code Annotated 1953, to distribute the waters in the Utah Lake drainage basin. We realize that some of the issues which are presented in this document are beyond our administrative authority in distribution matters, and it is not our intent to resolve such issues in implementing this plan. Such items will be addressed and ultimately resolved in the court adjudication process as set forth under Chapter 4, Title 73, Utah Code Annotated.

This document is intended to establish a general framework within which the respective rights can be administered. The distribution guidelines follow the priority doctrine of "first in time, first in right"; and where rights are equal in priority, each of those rights receives a proportionate share of the total water available to divert under that priority. We realize that flexibility will be required as the plan is implemented, and many problems that arise will need to be handled on a case-by-case basis. We also note that there are many agreements between water users, and such agreements will be taken into account, when appropriate.

The many complex issues involved in the implementation of this distribution plan will require an understanding of the water rights and water supply conditions on a number of the major river systems in the State. The State Engineer is committed to spend the necessary time and resources to ensure that the water users have an opportunity to thoroughly understand and comment on the distribution plan before it is implemented.

The issues presented in this document have been divided into five subject areas:

- Water rights in Utah Lake
- Relationship between storage rights in Utah Lake and upstream reservoirs
- Direct flow water rights
- Other distribution issues
- Issues to be resolved through the general adjudication procedure

For each subject there is a background section and a distribution guidelines section. The background section is intended to give the reader some general information about the issue and some justification for the distribution guidelines. This proposal does not apply to those waters imported into the Utah Lake drainage. Transbasin diversions (imported water) into the Utah Lake drainage will be administered in accordance with their individual water rights.

2.0 DEFINITIONS OF TERMS USED IN PROPOSED DISTRIBUTION PLAN

Active Storage (Utah Lake): The storage capacity of Utah Lake between compromise elevation and 9.2 feet below compromise (the maximum active storage is 741,700 acre-feet).

Adjudication: The judicial process by which all water right claims in a given hydrologic area are evaluated, defined and then established by court decree pursuant to Chapter 4, Title 73, Utah Code Annotated.

Booth Decree: A 1909 court case: Salt Lake City Corp., Utah and Salt Lake Canal Co., East Jordan Irrigation Co., North Jordan Irrigation Co. and South Jordan Canal Co. (Plaintiffs) versus J. A. Gardner and A. J. Evans (Defendants). The Booth Decree covered water rights in Utah Lake and the Jordan River.

Compromise Elevation: The maximum legal storage elevation in Utah Lake. Compromise elevation was first established in 1885, and was recently modified in 1985 to be 4489.045 feet above mean sea level. When the lake is at this elevation, the total storage capacity is approximately 870,000 acre-feet, of which 721,700 acre-feet is active storage capacity and 128,300 acre-feet is inactive storage capacity. Whenever the level of Utah Lake is above the compromise level, the lake control gates shall be fully opened. The exception to this rule occurs when fully opening the control gates would cause the Jordan River to exceed a maximum flow rate that is specified in the 1985 Compromise Agreement (Civil No. 64770)

Delivery Schedule: A schedule listing the allowable diversion rate in cubic feet per second per acre, for specific time periods during the irrigation season.

Direct Flow Right: A water right that diverts water from a surface source according to its respective priority date.

Distribution Plan: Guidelines for the distribution of water within a drainage basin or hydrologic system.

Diversion Requirement: The amount of water needed to satisfy the beneficial uses set forth under a water right.

Inactive Storage (Utah Lake): The portion of Utah Lake that is not accessible to the pumps, and therefore, cannot be diverted. The inactive storage is currently estimated to be 128,300 acre-feet (9.2 feet below compromise)

Irrigation Duty: The annual quantity of water in acre-feet per acre considered to be reasonably necessary to meet the beneficial use requirements of irrigated land. The irrigation duty takes into consideration the consumptive use requirements of crops, irrigation efficiency and conveyance losses.

Morse Decree: A 1901 decree resulting from a series of court cases: Case No. 2861 - Salt Lake City Corp. (Plaintiffs) versus Salt Lake City Water and Electrical Power Co. (Defendant); Case No. 3449 - J. Geoghegan (Plaintiff) versus Salt Lake City Corp.(Defendant); and Case No. 3459- J. Geoghegan (Plaintiff) versus Utah and Salt Lake Canal Co. (Defendant). This decree defined the water rights on the Jordan River with respect to each other.

Priority Storage: Legal storage under a water right. Such water stored is not subject to call by other right(s) and can be diverted and used in accordance with the right.

Primary Storage (Utah Lake): The first 125,000 acre-feet of active storage in Utah Lake which is set aside to satisfy the diversion requirement of the primary rights in Utah Lake in years of successive drought. See figure 1.

Primary Storage Rights (Utah Lake): The water rights defined in the Morse decree to have storage rights in Utah Lake.

Proposed Determination Book: The State Engineer's report and recommendation to the district court in general adjudication proceedings of all the water rights within the adjudication drainage area.

Provo River Decree: A 1921 decree resulting out of the court case: Provo Reservoir Company vs. Provo City (Case No. 2888). The Provo River decree defined certain water rights in the Provo River drainage.

Secondary Storage Rights (Utah Lake): The storage rights in Utah Lake established by applications to appropriate water and as confirmed by the Booth Decree.

Storage Right: The legal right to store water in accordance with a water right's respective priority date.

Subbasin: Individual drainage system within a larger drainage basin. For example, the Provo River system can be considered to be a subbasin within the larger Utah Lake drainage basin.

System Storage: Includes the total active storage waters in Utah Lake, excluding the primary storage, plus water stored in upstream reservoirs under later priority date water rights that is subject to call by Utah Lake rights. The maximum value of system storage is 616,700 acre-feet. See figure 1.

Real-time gages: A measuring device that allows instantaneous access to data.

Transbasin diversions: Imports or exports of water from one drainage basin or distribution system to another.

Welby-Jacob Memorandum Decisions: Seven memorandum decisions issued in 1989 by the State Engineer regarding change applications which provided for the transfer of high quality Provo River water from the Welby and Jacob districts of the Provo River Project for use by the Salt Lake County Water Conservancy District (SLCWCD). The water supply for the Welby and Jacob districts was replaced under both primary and secondary storage rights acquired in Utah Lake.

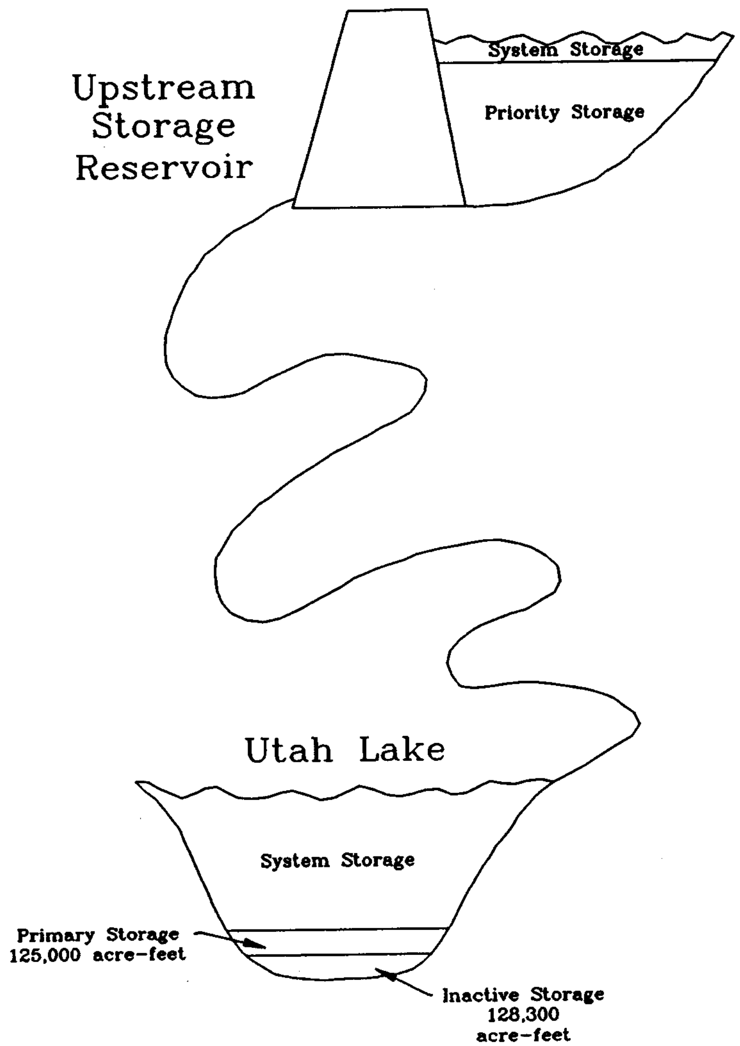


Figure 1 – Schematic drawing of various storage terms used in the Distribution Plan

3.0 Water Rights in Utah Lake

3.1 Background

There is not a clear understanding of how the uses of Utah Lake water relate to the quantity of storage in Utah Lake. The approach set forth in this document looks at the water rights served from Utah Lake in terms of beneficial use, which is referred to as the "annual diversion requirement." Water in Utah Lake is stored in order for the users to meet their diversion requirement. Thus, the storage capacity of Utah Lake does not define the water rights. Rather, it is the quantity of water necessary to satisfy the beneficial uses that is the limit and measure of the water rights.

The relationship of one water right to another is also not generally understood. The water rights in Utah Lake were set forth in both the Morse (1901) and Booth (1908) decrees. The Morse decree identified two groups of water rights: 1) Direct flow rights on the Jordan River; and 2) Storage rights in Utah Lake. The Booth decree (1908) allowed for additional appropriations of water from Utah Lake and set a maximum limit on the diversions under the storage rights that were set forth in the Morse decree. This maximum limit was 185,000 acre-feet annually and in part is based upon a 3.0 acre-feet per acre duty. In this proposed distribution plan, we refer to the rights that were defined in the Morse decree as primary storage rights, and all subsequent rights established under applications to appropriate water and confirmed by the Booth decree as secondary storage rights.

In 1989, the State Engineer approved a number of change applications, in conjunction with the so-called Welby-Jacob exchange, to transfer the use of water under the primary and secondary storage rights in Utah Lake. In evaluating these change applications, the sole supply irrigated acreage for each water right was determined. For the purposes of this document, the same sole supply acreages as set forth in the respective memorandum decisions, will be used to calculate the allowable annual diversion requirement. The acreage amounts used in this plan, and in the Welby-Jacob Exchange Project, are subject to adjudication by the court. This distribution plan does not purport to adjudicate these acreage amounts.

In the "Proposed Determination of Water Rights in Utah Lake and Jordan River Drainage Area, Salt Lake County, West Division" (Proposed Determination), the State Engineer has recommended an irrigation duty of 5.0 acre-feet per acre. This duty also appears reasonable for those lands located east of the Jordan River. The proposed determination book covering the west side of the Jordan River indicates that potential conveyance losses for canals over one mile in length are not included in the irrigation duty. Such losses are to be determined in a supplemental report to the court in conjunction with the general adjudication proceedings. Since the potential conveyance losses have not been finalized, a diversion requirement of 5.0 acre-feet per acre is used to determine the total annual diversion requirement for the irrigation rights.

Before getting into the distribution guidelines, some basic information on Utah Lake may be helpful. The total storage capacity of Utah Lake at compromise elevation (4489.045 feet) is approximately 870,000 acre-feet. Of this, approximately 128,300 acre-feet is inactive storage (verbal communication, Brad Gardner, Utah Lake-Jordan River Commissioner). The inactive storage elevation is 9.20 feet below compromise elevation. The active storage capacity of Utah Lake is 741,700 acre-feet. The average annual inflow (1951-90) to Utah Lake from all sources is about 726,000 acre-feet. Of this, 346,000 acre-feet is discharged to the Jordan River and about 380,000 acre-feet is lost to evaporation.

3.2 <u>Distribution Guidelines</u>

In distributing the waters of Utah Lake among the primary and secondary storage rights in the Lake, the following guidelines will be followed:

3.2.1 The annual diversion requirement for the primary and secondary storage rights in Utah Lake are as set forth in Table 1.

3.2.2 The water users of Utah Lake are responsible to maintain the pumps and channels in Utah Lake to allow water to be withdrawn from the lake down to 9.20 feet below compromise elevation.

3.2.3 In order to protect the primary storage rights during consecutive years of drought, the first 125,000 acre-feet of active storage capacity in Utah Lake shall be dedicated solely for the use of the primary storage rights when all other active storage has been used. Such 125,000 acre-feet of storage is hereafter referred to as "primary storage".

3.2.4 The remaining 616,700 acre-feet of active storage in Utah Lake up to compromise level, which may be stored in Utah Lake or in upstream reservoirs (subject to call by Utah Lake water rights, as set forth under Section 4.2 of this document), shall be referred to as "system storage". System storage is to be used to supply the annual diversion requirements of both primary and secondary storage rights.

Table 1 - Annual diversion requirement for primary and secondary storage rights in Utah Lake. The quantities of water for the irrigation rights are based on the irrigated acreages (sole supply acreage) set forth in the Welby-Jacob memorandum decisions and an irrigation duty of 5.0 acre-feet per acre. For the municipal and industrial rights the allowable annual diversion as set forth under the water right(s) was used.

WR NUMBER	Primary Storage Rights (1870)	Irrigated Acreage	Acre-feet
59-3499	Utah and Salt Lake Canal Company	7,063.65	35,318
59-5269	SLCWCD[1] - Salt Lake County Water Conservancy District	2,071.01	10,355
59-3500	South Jordan Canal Company	4,850.05	24,250
59-5270	SLCWCD[1]	1,076.92	5,385
57-7637	East Jordan Irrigation Company	8,092.96	40,465
59-5268	SLCWCD[1]	1,587.04	7,935
59-3496	North Jordan Irrigation Company	1,069.99	5,350
57-5272	SLCWCD	2,099.72	10,499
5722	SLCWCD[1]		
57-7624	Salt Lake City	Municipal	11,000
59-7624	CUWCD	Municipal	25,000
59-3517	Kennecott Utah Copper Corporation	Ind	13,750
	Total for Primary Rights		189,307
	Secondary Storage Rights	Acreage	Acre-feet
59-13	Utah Lake Distributing Co. (1908)	7,945.37	39,727
59-5271	SLCWCD[1]	687.81	3,439
57-23	Draper Irr. Co. & Sandy Canal Co. (1908)	2,100	10,500
59-5273	SLCWCD	400	2,000
59-14, 15 & 20	Central Utah Water Conservancy Dist. (Kenn. Storage Rights 1912)[2]	Ind	57,073
	Total for Secondary Rights		112,739
	Overall Total		302,046

[1] Rights/shares held by respective irrigation companies in behalf of Salt Lake County Water Conservancy District by agreement dated September 19, 1988.

[2] Does not include any storage which may be claimed/allowed under 59-23

3.2.5 All waters stored upstream and which is subject to call under the priority of the Utah Lake rights shall be delivered to Utah Lake, according to priority, when either the active storage in Utah Lake is at or below 125,000 acre-feet or the diversion requirements of earlier priority water rights in Utah Lake are not satisfied.

3.2.6 When all the system storage in Utah Lake and upstream reservoirs has been used, the secondary rights shall cease diversions. At such time, the active storage in Utah Lake shall be at or below 125,000 acre-feet.

3.2.7 After all of the system storage in Utah Lake and in upstream reservoirs has been used, and secondary rights have ceased diversions, the primary storage shall be allocated to the primary rights in the following percentages and will be available on demand within the constraints of the respective water rights:

Table 2 - The percentage of primary storage in Utah Lake allocated to each primary water right.

WATER RIGHT NUMBER(S)	OWNER	
59-3499	Utah and Salt Lake Canal Company	18.7%
59-3500	South Jordan Canal Company	12.8%
57-7637	East Jordan Irrigation Company	21.4%
59-3496	North Jordan Irrigation Company	2.8%
57-7624	Salt Lake City	5.8%
59-5268/5273, 5722	Salt Lake County Water Conservancy District	18.0%
57-7624	Central Utah Water Conservancy District	13.2%
59-3517	Kennecott Utah Copper Corporation	7.3%

4.0 Relationship of Storage Rights in Utah Lake and Upstream Reservoirs

4.1 Background

The relationship between upstream storage water rights and storage rights in Utah Lake must be clarified so all of the storage reservoirs within the Utah Lake drainage basin can be regulated in accordance with their respective priority dates. In reviewing the water rights in the basin it appears that the upstream storage reservoirs have a unique relationship with the Utah Lake storage rights. Therefore, this section addresses only the storage rights. Direct flow rights are addressed independently in Section 5.

The upstream storage rights are, in general, later in priority than the Utah Lake storage rights, with only a few exceptions.

However, in analyzing the storage rights within the basin, it appears that in most years, the existing storage reservoirs can divert and use water without impairing the prior rights in Utah Lake. Although during drought years, this may not be the case.

The State Engineer has studied the historical practices and water supply conditions in the basin. From these studies, it appears that adequate safeguards can be developed to allow upstream reservoirs to divert and store water during most periods of time without impairing prior water rights. However, these safeguards generally require that predictions of the total water supply be made early in the year. Predicting whether the rights in Utah Lake will receive their full annual diversion requirement is difficult early in the year. As the year progresses, and the water supply conditions become more apparent, these predictions can be made with a higher degree of confidence. In order to allow later priority upstream rights to store water, criteria are needed to determine when the rights in Utah Lake will likely be satisfied (see Section 4.2). Until the prior storage rights in Utah Lake are satisfied, water stored upstream will be held as system storage, subject to call by water rights in Utah Lake. Also, provisions to replace or exchange water to Utah Lake during drought periods to allow storage upstream will be considered.

Using the guidelines of Section 4.2 will ensure with a high degree of certainty that the rights in Utah Lake will be satisfied. These guidelines dictate when the upstream reservoirs can convert their system storage to what is referred to as priority storage. After the water is converted to priority storage, it is no longer subject to call and can then be diverted for use.

Under this proposal, storage waters will be accounted for based on a November through October period. The irrigation season in much of the Utah Lake drainage runs from about April through October, except in the higher elevations. During the non-irrigation season, the water demand is much lower than during the irrigation season and generally the storage season begins in November.

4.2 <u>Distribution Guidelines</u>

In order to maximize the beneficial use of the water and still protect prior rights, the State Engineer is proposing the following criteria to govern the distribution of water between storage rights in Utah Lake and reservoirs on upstream tributaries.

4.2.1 Upstream storage rights junior to Utah Lake water rights may store water under their respective priority dates relative to each other and subject to the conditions set forth in this section.

4.2.2 System storage is defined as the top 616,700 acre-feet of active storage capacity in Utah Lake and is used to satisfy the diversion requirement of both primary and secondary rights. Any portion of this 616,700 acre-feet stored upstream which is subject to call by Utah Lake, as provided for under paragraph 4.2.5, shall also be accounted for as system storage.

4.2.3 Priority storage is defined to be the legal storage under a reservoirs' water right and is not subject to call by any other water right.

4.2.4 Any water stored by junior appropriators before the total system storage in or available to Utah Lake exceeds the quantities set forth in Table 3, is subject to call by the rights served from Utah Lake.

4.2.5 System storage held in upstream reservoirs shall not be diverted for use and must be held in storage and available for release to Utah Lake, until such storage is converted to priority storage according to the criteria in Table 3 or replacement water is provided.

4.2.6 Whenever the total system storage exceeds the values set forth in Table 3, any excess system storage shall be converted to priority storage. Water is converted from system to priority storage according to the priority dates of the respective rights, and in accordance with any other restrictions applicable to a particular water right.

4.2.7 Once water has been converted to priority storage or is designated as priority storage by the river commissioner at the time it is stored, it can be released from the reservoir and used as provided for under the respective water right.

4.2.8 Any time the storage capacity in Utah Lake drops below the primary storage capacity (the first 125,000 acre-feet of active storage capacity), upstream storage rights with later priority dates will not be allowed to divert water to storage.

4.2.9 Any time the active storage capacity in Utah Lake drops below the primary storage level (125,000 acre-feet), the Utah Lake rights may call on the system storage water which has been held upstream by junior appropriators. The quantity subject to call will be limited to the lesser of either the quantity of upstream system storage or the amount needed to satisfy the diversion requirements and bring Utah Lake up to the primary storage level.

Table 3 - Quantity of total system storage required before junior priority upstream storage reservoirs can convert their system storage to priority storage.

Date	System storage in Utah Lake and/or Upstream Reservoirs (units: ac-ft)
November 1	616,700
December 15	616,700
January 15	616,700
February 15	616,700
March 15	615,000
April 15	575,000
May 15	475,000
June 15	400,000
July 15	350,000
August 15	250,000
September 15	200,000
October 31	125,000

NOTE: Values can be interpolated from the table to determine system storage on any particular day.

4.2.10 System storage in upstream reservoirs can be replaced in Utah Lake with waters from other sources or other rights. Once such replacement is made, a like quantity of system storage can be converted to priority storage and used. Such replacement or exchange of water shall have prior approval of the State Engineer.

5.0 Direct Flow Rights

5.1 Background

One of the objectives of this proposed distribution plan is to administer the waters within the basin as one system. In so doing, we need to take into account what the effects of diversion and water use from a source may have on other rights in the basin. The distribution of water between all rights, except those rights specifically denoted in Sections 3.0 and 4.0 as among themselves, shall be done based upon priority. This approach distributes the water in accordance with the priority doctrine on a basin wide basis.

5.2 Distribution Guidelines

In distributing water among the water rights in the basin, except those rights addressed in Sections 3.0 and 4.0 as among themselves, the following guidelines will be used:

5.2.1 The direct flow water rights on all tributaries will be administered according to the respective priority dates. The affect that diversions from one source may have on diversions from another source will be taken into account.

5.2.2 The primary direct flow rights on the Jordan River as set forth in the Morse decree shall have call on water in Utah Lake water if the accretionary flows to the Jordan River are insufficient to satisfy their rights.

6.0 Other Distribution Issues

6.1 Background

The State Engineer believes that there are several other issues that should be considered when examining better ways to manage and distribute water in the basin.

Most of these issues are directly related to improving the record keeping of imported water and enhancing the communication between the five river commissioners who are affected by this plan. One issue that deserves special discussion is a proposed 5,000 acre-feet regulation pool in Jordanelle Reservoir (Section 6.2.4) to be used by the Provo River commissioner in distributing water. Based upon past experiences, calculating the natural flow of the Provo River from reservoir stage readings at Deer Creek Reservoir has presented numerous problems for the commissioners. It is important the river commissioner not waste his limited resources trying to distribute water by not having adequate resources. Because the direct flow rights on the Provo River are senior to the storage rights it is necessary for the commissioner to compute natural flow in the river. The precision of reservoir content measurements on Deer Creek, and presumably on Jordanelle, are inadequate for daily calculation of natural flow based on changes in reservoir content. Just .10 foot error in measurement when Deer Creek Reservoir is nearly full represents about 300 acre-feet. Thus, when the wind is blowing it can substantially affect the natural flow calculation. The result is a wide fluctuation in the natural flow available to the class A rights on the Lower Provo River. With Jordanelle Reservoir now being built, the natural flow computation for both Heber Valley rights and the Lower Provo River will be even more complicated. If the commissioner had a regulation pool he could smooth out the natural flow bypasses as they should be.

The administration of exchange applications is another important distribution issue. The basic purpose of exchange applications is to facilitate distribution. Under such an application a water user is required to measure the quantity of water released to a stream and then a like quantity can be diverted at another location. In regulating exchange applications, the State Engineer attempts to have releases and subsequent diversions occur as concurrently as possible to insure that other water rights are not adversely effected. Some exchange applications involve waters from more than one distribution system. In such cases, the State Engineer needs to establish lines of authority and/or coordination between the river commissioners.

Although not addressed in the distribution guidelines, the future water quality of Utah Lake is another important issue that must be considered. Currently there are many unknowns over what the future operation of Utah Lake and upstream storage reservoir will be. This makes it very difficult to predict the future salinity concentrations in the Lake. Under Utah water law, a water user is entitled to have his right protected as to both quantity and quality. We believe that the Central Utah Water Conservancy District and the Bureau of Reclamation could significantly affect the future salinity levels of Utah Lake by the decisions they will be making in the near future. It appears they are very aware of this problem and are looking at alternatives to control the salinity level of Utah Lake.

6.2 <u>Distribution Guidelines</u>

The State Engineer is proposing that the following recommendations be implemented to facilitate the distribution of water:

6.2.1 All exports of water from a river system shall be regulated by the duly appointed river commissioner for the system from which the export is made.

6.2.2. River commissioners shall report diversions on all systems on a water rights basis.

6.2.3 All transbasin diversions shall be equipped with real-time gages. Such data shall be accessible via a computer using a modem or other method as approved by the State Engineer.

6.2.4 The State Engineer is recommending that a 5,000 acre-foot regulation pool be established in Jordanelle Reservoir to be used by the commissioner for distribution system regulation. Such a regulation pool would be subject to space availability.

6.2.5 In regulating exchange applications, they will be administered as closely to a concurrent release and diversion basis as is feasible. Under no circumstances will deficits or credits be allowed to be carried over from year to year.

<u>7.0 Adjudication Issues</u>

7.1 <u>Background</u>

There are a number of issues that are beyond the scope of the distribution plan and will need to be addressed in the general adjudication. However, ultimately any actions taken in the adjudication will affect the distribution of water. Therefore, several adjudication issues are discussed in this document in order to apprise the water users of potential recommendations which may be made by the State Engineer to the court.

On the Provo River system there are no priority dates assigned to the class A rights on the Lower Provo River or class 1 through 17 on the Upper Provo River. The distribution of water has worked well under this system for over 70 years, and if conditions did not change we could continue to operate under the class system. However, we are beginning to see significant changes in the water use practices within the drainage basin, especially on the Provo River. To assess the potential impact as a result of a change in water use, and in order to properly administer the water rights on a basin-wide basis, it is imperative that the respective priority dates between the water rights be established. Therefore, as part of the general adjudication process, the State Engineer is proposing that priority dates for all water rights in the basin be determined.

Another issue that needs to be carefully analyzed and considered is the irrigation diversion requirement (duty) for irrigated lands in the basin. In conjunction with the proposed determination of water rights that the State Engineer must submit to the court for its consideration, an irrigation duty is recommended. In making this recommendation the State Engineer calculates the consumptive use requirements of the crops and considers the on-farm efficiency, canal losses and other related factors. The irrigation duty is expressed in terms of acre-feet per acre.

Related closely to the issue of duty is the issue of whether a delivery schedule should be implemented to specify an allowable diversion rate (Example - 1 cubic foot per second per 60 acres) during any period of the irrigation season. The total volume of water that can be diverted under the delivery schedule is the annual irrigation duty that is established.

7.2 <u>Recommendations for the Adjudication</u>

The State Engineer will consider making the following recommendations in his report to the court in the general adjudication:

7.2.1 All water rights within the basin shall have a priority date determined and assigned to it as part of the adjudication process.

7.2.2 An irrigation diversion requirement (duty) and delivery schedule shall be determined and submitted to the court for each subbasin or distribution system.

October 15, 1991

DISTRIBUTION MODEL
BASIC DATA

There is a substantial amount of data that is used by the distribution model which is not a part of this packet. If you would like to review the supporting data, please contact the Special Investigation Section of the Division. The data will be made available on 5¼ inch diskette. Following is a listing of historical diversion records, USGS and correlated stream flow records, weather data, elevation-capacity curves, and elevation-area curves for Utah Lake. Period of record 1950-88.

******* Diversions - Lower Provo River
Fort Field Canal
Geneva Steel
Lake Bottom Canal
Little Dry Creek
Murdock Canal (total flow)
Orem Golf Course
Park-Nuttal and Barton-Young ditches
Phillips Ditch
Provo Bench Canal
Provo Bench Canal (north opening)
Provo City Canal (City Race)
Provo City Canal (Factory Race)
Provo City Canal (Lower East Union)
Provo City Canal (Tanner Race)
Timpanogas Canal (Utah County)
Upper East Union
West Union Canal

******* Deer Creek Storage and Related Diversions
Deer Creek Reservoir (daily contents)
Duchesne Tunnel
Weber-Provo Canal
Salt Lake Aqueduct diversion

******* Heber Valley Diversions
Midway Irrigation Canal (river ditch)
Wasatch and Extension Irrigation Canal
Timpanogas Irrigation Canal (wasatch)
North Field Irrigation Canal
Island Ditch
Ontario Tunnel summary

******* Utah Lake Diversions
Utah Lake Distributing Canal

******* USGS Streamflow Records

Provo River at Provo	10163000
Provo River below Deer Creek	10159500
Provo River nr Hailstone	10155000
Jordan River at Narrows near Lehi	10167000

******* Area Capacity Tables
Utah Lake- Elevation vs. Capacity
Elevation vs. Area

******* Temp. Data to calulate evaporation
Mean daily temperature using data from the following stations:

Utah Lake nr Lehi	U8973005
Spanish Fork PH	N0811905
Provo-Radio KAYK	N0706805
Lower American Fork	N0521905
Provo-BYU	N0706405
Geneva-1	N0318205
Geneva-2	N0318305

UTAH LAKE DISTRIBUTION MODEL
FLOW DIAGRAM

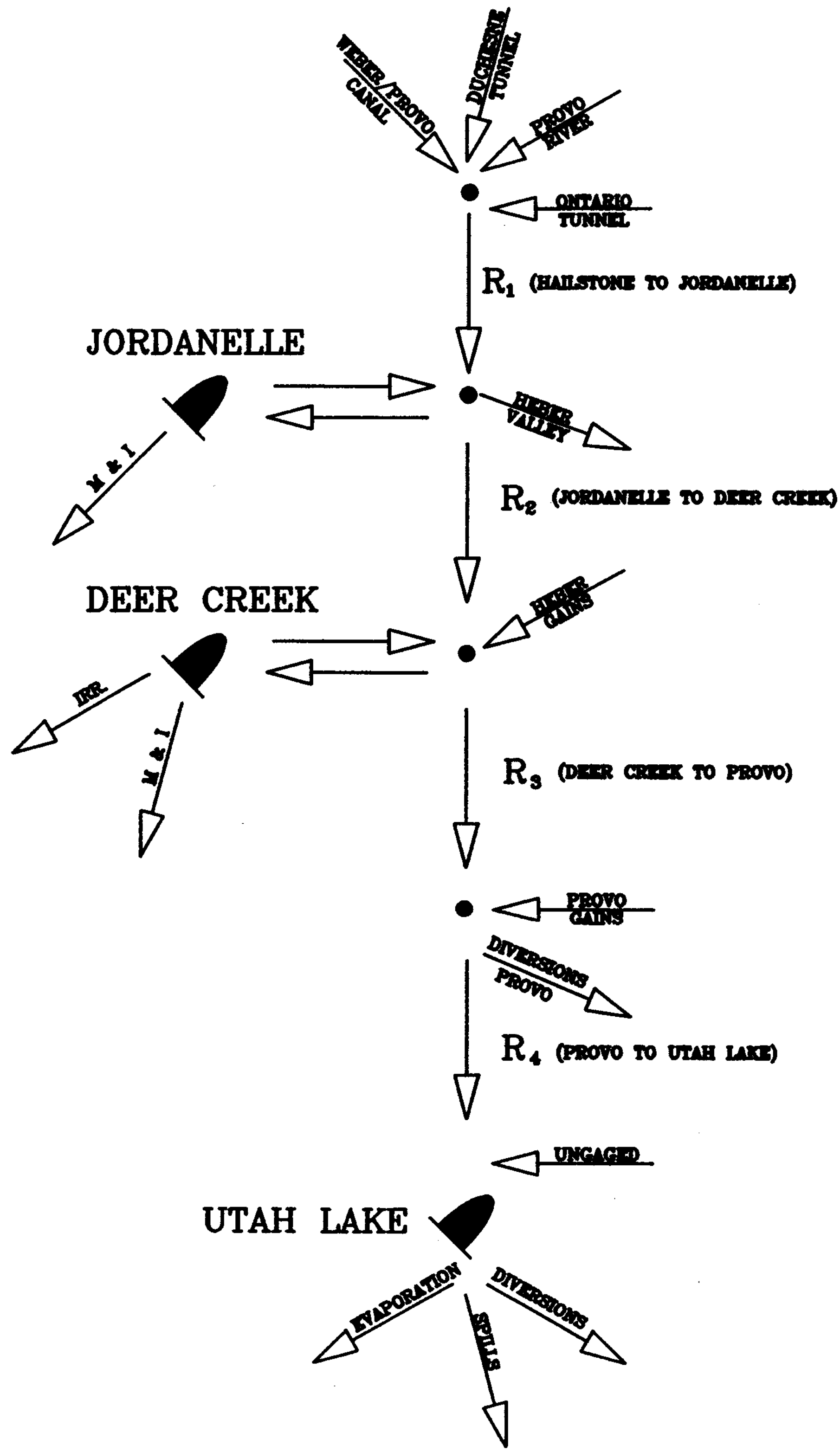


Figure M-1

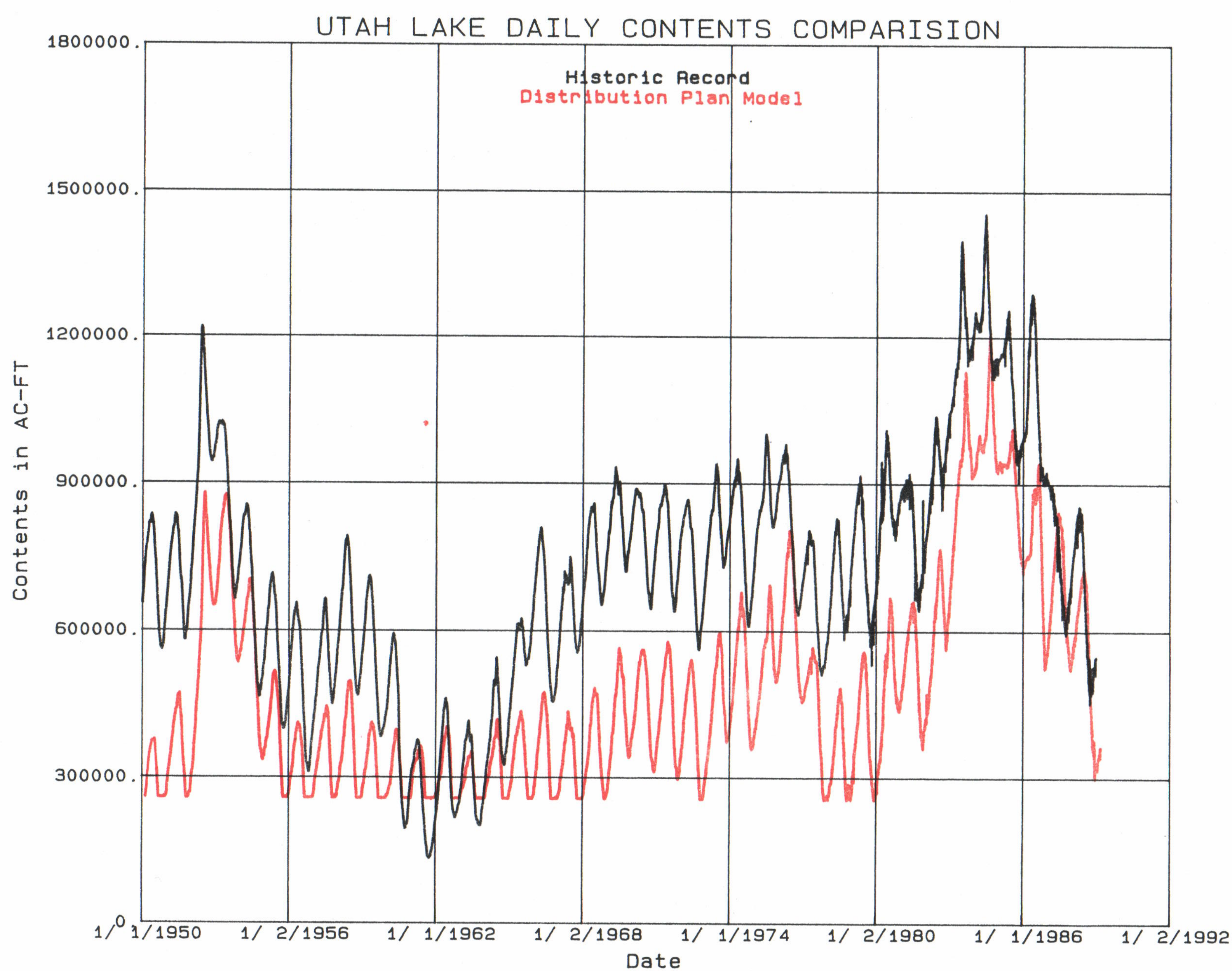
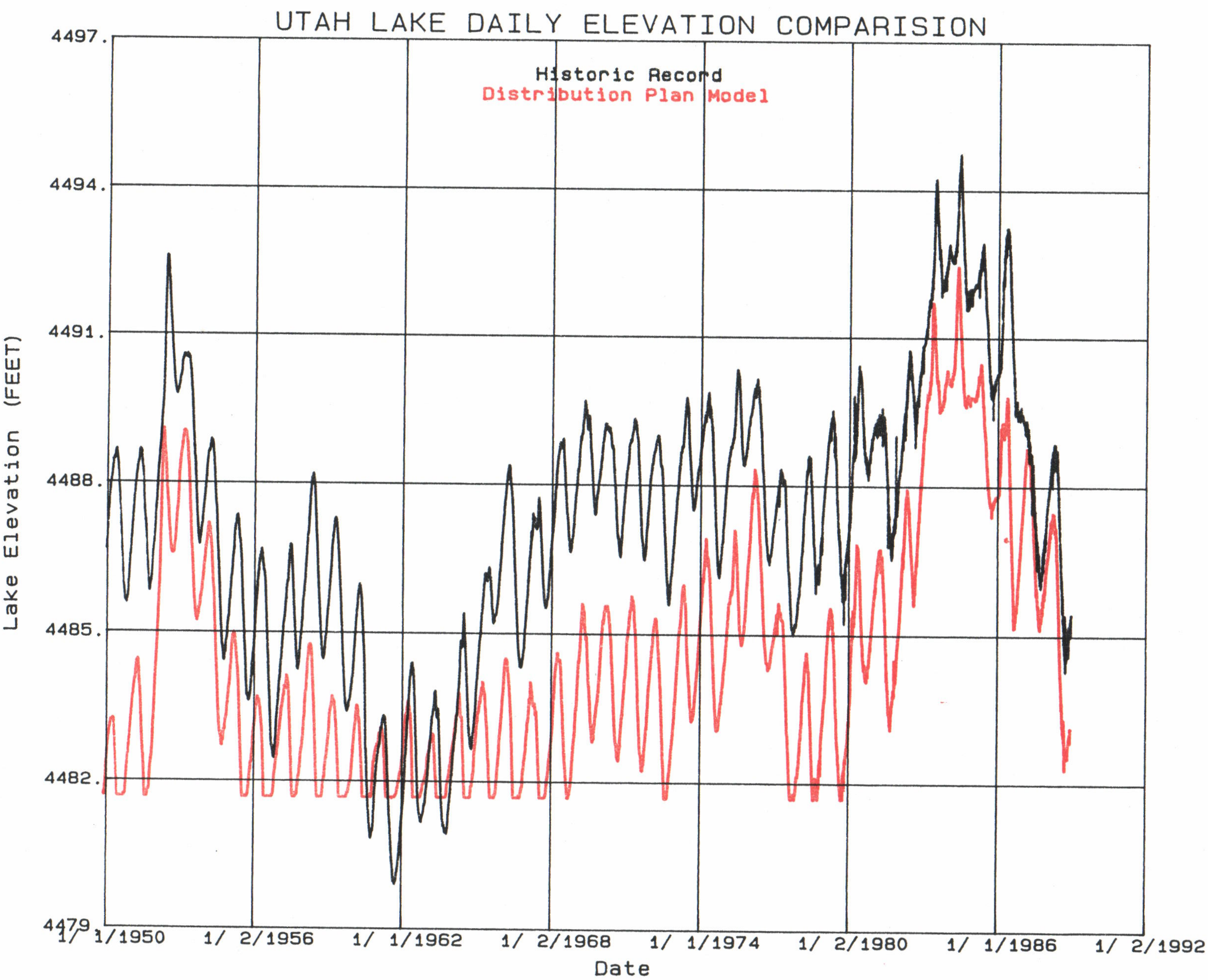

UTAH LAKE DAILY CONTENTS COMPARISION
Historic Record
Distribution Plan Model
1800000.
1500000.
1200000.
900000.
600000.
300000.
0
Contents in AC-FT
1/ 1/1950
1/ 2/1956
1/ 1/1962
1/ 2/1968
1/ 1/1974
1/ 2/1980
1/ 1/1986
1/ 2/1992
Date

Figure M-2



UTAH LAKE DAILY ELEVATION COMPARISION
Historic Record
Distribution Plan Model
Lake Elevation (FEET)
4497.
4494.
4491.
4488.
4485.
4482.
4479.
1/ 1/1950
1/ 2/1956
1/ 1/1962
1/ 2/1968
1/ 1/1974
1/ 2/1980
1/ 1/1986
1/ 2/1992
Date

Figure M-3

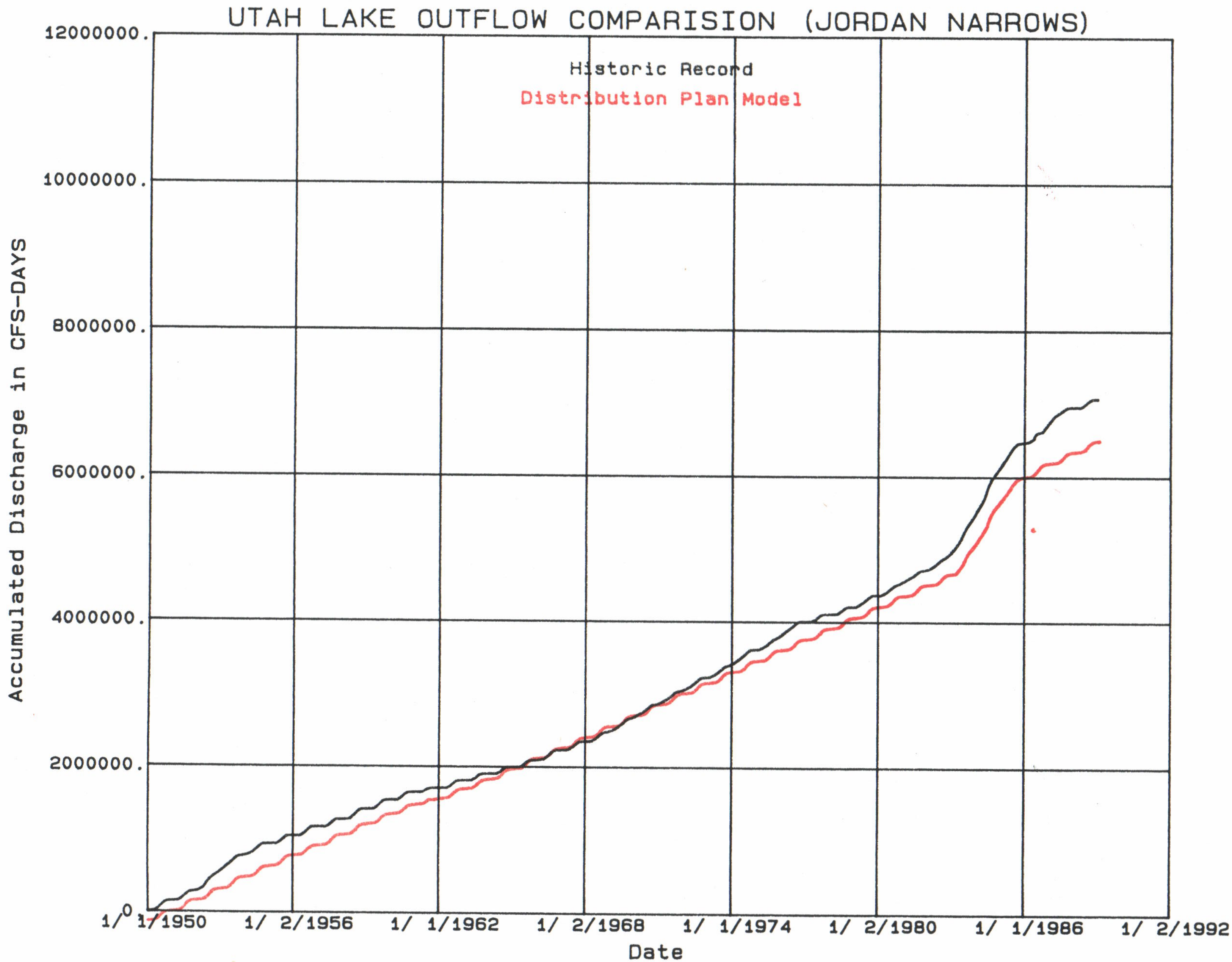

UTAH LAKE OUTFLOW COMPARISION (JORDAN NARROWS)
Historic Record
Distribution Plan Model
12000000.
10000000.
8000000.
6000000.
4000000.
2000000.
0
Accumulated Discharge in CFS-DAYS
1/ 1/1950
1/ 2/1956
1/ 1/1962
1/ 2/1968
1/ 1/1974
1/ 2/1980
1/ 1/1986
1/ 2/1992
Date

Figure M-4

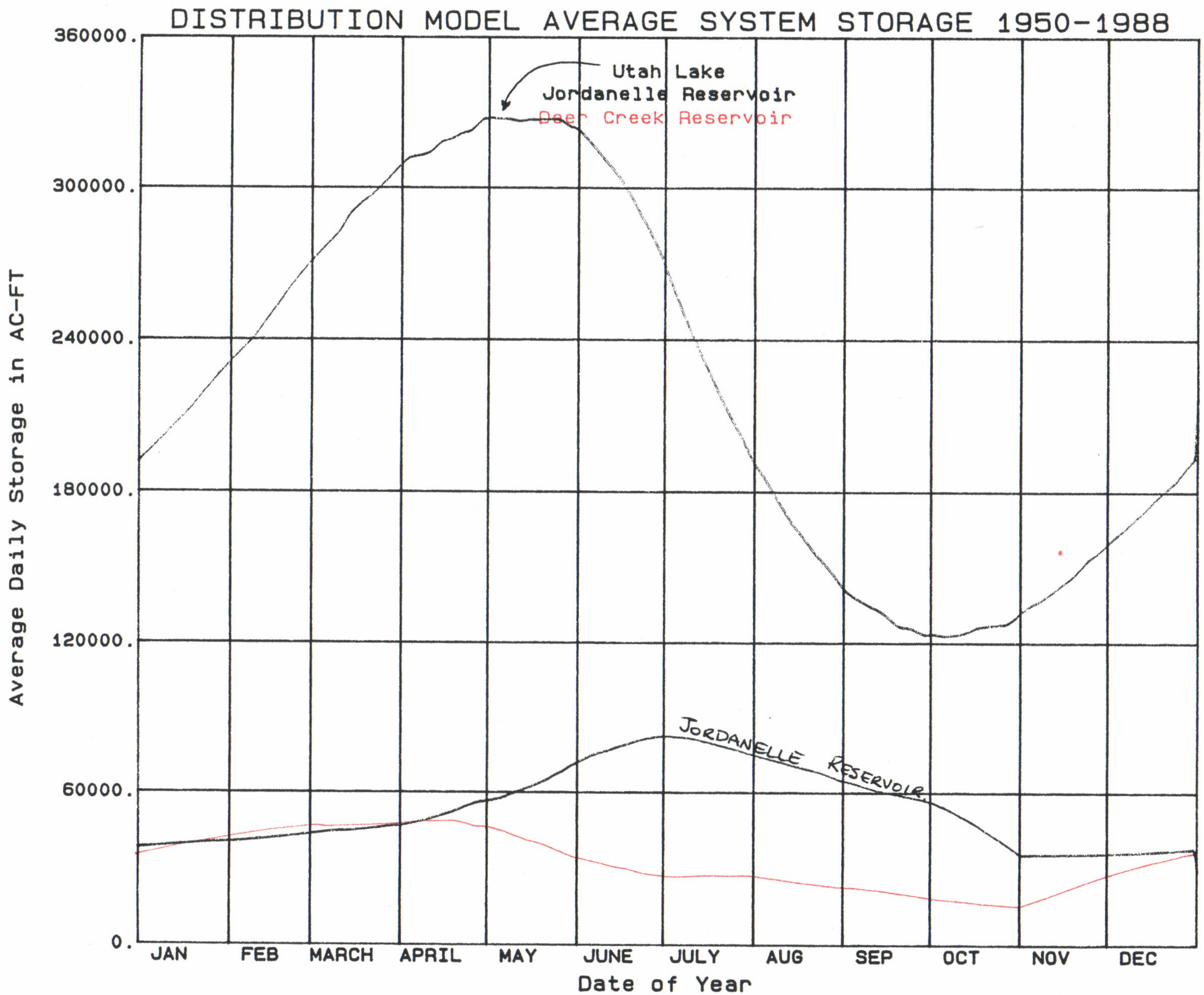

DISTRIBUTION MODEL AVERAGE SYSTEM STORAGE 1950-1988
Utah Lake
Jordanelle Reservoir
Deer Creek Reservoir
JORDANELLE RESERVOIR
360000.
300000.
240000.
180000.
120000.
60000.
0.
Average Daily Storage in AC-FT
JAN
FEB
MARCH
APRIL
MAY
JUNE
JULY
AUG
SEP
OCT
NOV
DEC
Date of Year

Figure M-5

```
c                  Utah Division of Water Rights
c                  Utah Lake Distribution Model
c                            10/4/91




c     This is the source listing for the model to evaluate the possble effects
c of the proposed distribution plan on Utah Lake and tributaries.  It consists
c of a series of modules written in WATMODEL language.  The modules are:

c              1)   Utah Lake Average Daily Temperature
c              2)   Utah Lake Inflow Computation
c              3)   Utah Lake Inflow Smoothing
c              4)   Provo River Reach Gain and Diversion estimations
c              5)   Reservoir operation model for Utah Lake,Deer Creek
c                   and Jordanelle.


c     The model and data are intended to span a daily period from
c 1/1/1950 to 12/31/1988.  Some flow records must be correlated and
c combined to get period data.  The Provo River Commissioner has
c not published data for 1985, 1986 and 1988.  Data for the missing years
c has been obtained from records of the Deputy Commissioner for the
c Upper Provo River.  Records for the Lower Provo were estimated.

c     The purpose of this model is to investigate options which allow
c storage in upstream reservoirs but still protect the rights served
c from Utah Lake and other direct flow users.  The model was not
c designed for water supply analysis.  Rather it is designed for
c distribution analysis.
c




                           MODULE 1
                 Temperature Computation Module

C Computes mean daily temperature for Utah Lake using an average of minimum and
C maximum temperatures from a number of stations surrounding the Lake.  This
C approach was undertaken to fill gaps which would occur if any single
C station in the study area were used as a base and to account for the
C various temperature differentials which may occur around Utah Lake.  The
C records were taken from CDROM disc of weather data for Utah.
C
echo on
c
c                                                  Watmodel source code consists
c                                                  of a group of logical statements
c                                                  or expressions which are called
c                                                  rules.  A module of rules begins
c                                                  with the command DEF_RULES and
c                                                  ends with the command END_RULES.
c                                                  The rules are actually executed
c                                                  when the command MODEL is given.
c                                                  When executed the rules are
c                                                  performed once for each day in
c                                                  the modeling period.
c
c                                                  NOTE: watmodel code is not
c                                                  character case sensitive.  Case
c                                                  is used here for emphasis, it
c                                                  has no effect on watmodel itself.
Def_Rules

c                                                  The FILE command connects a
c                                                  variable (in this case MINTL)
c                                                  to a watmodel formatted file,
c                                                  which in this case is
c                                                  U8973005.NWS.MODELS.  Watmodel
c                                                  files contain daily data in an
c                                                  organized fashion so any value
```

```
      c                                                    can be quickly retreived or
      c                                                    saved to them.  The FILE
      c                                                    command is actually declaring
      c                                                    MINTL is a single dimension
      c                                                    array, the values of which are
      c                                                    contained in a file.  Any
      c                                                    reference to the variable in
      c                                                    the equations below is an
      c                                                    automatic reference to the
      c                                                    file.  If no subscript is used
      c                                                    with the variable in the code a
      c                                                    default subscript of the current
      c                                                    day of the modelling period is
      c                                                    assumed by the model.

      c                                            ******* Lehi station
      File Mintl u8973005.nws.models
      File Maxtl u8973004.nws.models
      c                                            ******* Springville station
      file Mintsp N0811905.nws.models
      file Maxtsp N0811904.nws.models
      c                                            ******* American Fork station
      File MintAm N0521905.nws.models
      File MaxtAm N0521904.nws.models
      c                                            ******* BYU station
      File Mintbyu N0706405.nws.models
      file Maxtbyu N0706404.nws.models
      c                                            ******* Geneva 1 station
      File Mintgn1 N0318205.nws.models
      file Maxtgn1 N0318204.nws.models
      c                                            ******* Provo station
      File Mintprov N0706805.nws.models
      File Maxtprov N0706804.nws.models
      c                                            ******* Geneva 2 station
      File Mintgn2 N0318305.nws.models
      File Maxtgn2 N0318304.nws.models

      Real TOTMIN
      Real TOTMAX

      Integer MINPNT
      Integer MAXPNT

      c                                            ******* Output file.  The "W" means
      c                                                    data can be both read and
      c                                                    written back to the file (the
      c                                                    variable AVRGTEMP can be assigned
      c                                                    values as well as yield values
      c                                                    when referenced in the rules).
      c                                                    WATMODEL files are read only
      c                                                    by default to avoid accidental
      c                                                    damage to data contained in them.
      FILE  AVRGTEMP AVRGTEMP        W
      C
      TOTMIN=0.
      TOTMAX=0.
      MINPNT=0
      MAXPNT=0

      c                                                    the variable NO_DATA is a system
      c                                                    variable which contains the value
      c                                                    1.0 E-20.  This is the value
      c                                                    assigned to watmodel file variables
      c                                                    and elsewhere if a record is missing
      c                                                    or the read request is outside
      c                                                    the range of data in the file.
      if MINTL <> NO_DATA then
         TOTMIN=TOTMIN+MINTL
         MINPNT=MINPNT+1
      endif
      If MAXTL <> NO_DATA then
         TOTMAX=TOTMAX+MAXTL
         MAXPNT=MAXPNT+1
```

```
endif

if MINTSP <> NO_DATA then
   TOTMIN=TOTMIN+MINTSP
   MINPNT=MINPNT+1
endif
If MAXTSP <> NO_DATA then
   TOTMAX=TOTMAX+MAXTSP
   MAXPNT=MAXPNT+1
endif

if MINTAM <> NO_DATA then
   TOTMIN=TOTMIN+MINTAM
   MINPNT=MINPNT+1
endif
If MAXTAM <> NO_DATA then
   TOTMAX=TOTMAX+MAXTAM
   MAXPNT=MAXPNT+1
endif

if MINTBYU <> NO_DATA then
   TOTMIN=TOTMIN+MINTBYU
   MINPNT=MINPNT+1
endif
If MAXTBYU <> NO_DATA then
   TOTMAX=TOTMAX+MAXTBYU
   MAXPNT=MAXPNT+1
endif

if MINTGN1 <> NO_DATA then
   TOTMIN=TOTMIN+MINTGN1
   MINPNT=MINPNT+1
endif
If MAXTGN1 <> NO_DATA then
   TOTMAX=TOTMAX+MAXTGN1
   MAXPNT=MAXPNT+1
endif

if MINTPROV <> NO_DATA then
   TOTMIN=TOTMIN+MINTPROV
   MINPNT=MINPNT+1
endif
If MAXTPROV <> NO_DATA then
   TOTMAX=TOTMAX+MAXTPROV
   MAXPNT=MAXPNT+1
endif

if MINTGN2 <> NO_DATA then
   TOTMIN=TOTMIN+MINTGN2
   MINPNT=MINPNT+1
endif
If MAXTGN2 <> NO_DATA then
   TOTMAX=TOTMAX+MAXTGN2
   MAXPNT=MAXPNT+1
endif

c                                                ******* Compute average or
c                                                        use previous day's
c                                                        temperature.
if MINPNT > 0 and MAXPNT > 0 then
   AVRGTEMP=(TOTMIN/MINPNT+TOTMAX/MAXPNT)/2.
else
   AVRGTEMP=AVRGTEMP(TIME-1)
endif
c                                                        The STOP command in the rules
c                                                        indicates the stopping point
c                                                        for rules execution during a
c                                                        model.  When the statement is
c                                                        encountered the model goes on
c                                                        to the next day in the modelling
c                                                        period.
Stop
End_Rules
```

```
c                                                   The MODEL causes actual execution
c                                                   of the rules module above.  It
c                                                   watmodel to execute the rules
c                                                   once for each day between Oct 1 1949
c                                                   and Dec. 31, 1989.
Model 10/1/1949 to 12/31/1989

C                                 MODULE 2

C                   Computing Inflow to Utah Lake
C
C                               May 1, 1991

c         The method used to compute the inflow to Utah Lake is to solve
c     a mass balance equation for the Lake (inflow=change in storage + outflow).
c     The components of outflow include releases measured at Jordan Narrows,
c     diversion by the Utah Lake Distributing Company and evaporation as
c     estimated using the Blaney Criddle method with acreage areas derived from the
c     daily storage contents of the Lake.  The Jordan Narrows gage used to
c     estimate releases from the Lake also includes some flow which originates
c     in the Alpine area.  No effort has been made to remove this component
c     from the record.  Computed evaporation may also deviate from
c     actual evaporation to some extent, but since the operation simulation in
c     module 5 computes evaporation in the same manner it is assumed the
c     error introduced will be slight.
c
c
C
  run  file utahlake.damcap.models;shr
  run  file utahlake.damarea.models;shr

  echo on
  def_rules

c                                                   ******* The statements below
c                                                           declare TABLE variables.
c                                                           A TABLE variable is
c                                                           a sort of function, references
c                                                           to which must include one
c                                                           parameter which is the lookup value
c                                                           value.  The variable contains a
c                                                           value either direcly or by linear
c                                                           intepolation from values in the table
c                                                           which relate to the lookup value.
c
c                                                           Values for the table can be
c                                                           assigned from external sources
c                                                           by naming a valid file name
c                                                           as the second parameter to the
c                                                           of the command as is illustrated
c                                                           below or can be assigned
c                                                           internally using the VALUE command.

c                                                   ******* These two tables
c                                                           contain relationships
c                                                           between elevation
c                                                           and Utah Lake contents
c                                                           and area.  The reverse
c                                                           subcommand reverses
c                                                           the lookup and object
c                                                           values in the table
c                                                           so you look up an
c                                                           elevation in the
c                                                           LAKECAP table based
c                                                           upon lake contents.
c
```

```
        table   LAKECAP   utahlake.damcap.models              reverse
        table   LAKEAREA  utahlake.damarea.models

  c                                                   ******* Temperature data
  c                                                           created by module 1.
        file    MTEMP      avrgtemp

  c                                                   ******* This is the USGS
  c                                                           stream gage at Jordan
  c                                                           Narrows.  It can be
  c                                                           accessed directly
  c                                                           since it has no data
  c                                                           holes during the
  c                                                           modeling period.
  c
  c                                                           The DIVERT command
  c                                                           declares the variable
  c                                                           name following it is
  c                                                           to be connected to a
  c                                                           database record, in this
  c                                                           case the USGS database
  c                                                           station 10167000.
  c
        divert  JORDAN_OUT      usgs 10167000
  c                                                   ******* These records are
  c                                                           reported by the ULJR
  c                                                           commissioner.
  c
        divert  UL_DISTRIBUTING utah lake/jordan river=utah lake distributing canal
        divert  UL_CONTENTS     utah lake/jordan river=utah lake storage content

  C                                               ******* Output file, units are CFS

        file UL_INFLOW  ulinflow                  W

  c                                               ******* Later outflow from the
  c                                                       proposed plan is to be
  c                                                       compared with historic
  c                                                       ouflow so this variable is
  c                                                       used to hold the historic
  c                                                       values for later analysis.

        file OUTFLOW    uloutflw                  W

  c                                               ******* Take difference in daily
  c                                                       lake contents.  NOTE: Storage
  c                                                       records in the database are
  c                                                       in AC-FT while flow records
  c                                                       are in CFS.  The AF_TO_CFS
  c                                                       function converts to CFS.

        UL_INFLOW=af_to_cfs(UL_CONTENTS-UL_CONTENTS(time-1))

  c                                               ******* Add in measured outflow

        UL_INFLOW=UL_INFLOW+JORDAN_OUT+UL_DISTRIBUTING

  c                                               ******* and evaporation.
  c                                                       Function EV_TRAN computes
  c                                                       evapotranspiration using
  c                                                       the Blaney-Criddle method.
  c                                                       It requires three parameters
  c                                                       kc, temperature, and latitude.


  UL_INFLOW=UL_INFLOW+af_to_cfs((LAKEAREA(LAKECAP(UL_CONTENTS))+LAKEAREA(LAKECAP(UL_CONTENTS(TIME-1))))/2.*ev_tran(1.35,MT
  EMP,40.2)/12.)

  c                                          ******* Outflow

        OUTFLOW=JORDAN_OUT+UL_DISTRIBUTING
        stop
    end_rules
```

```
   model 1/1/1950 to 12/31/1988
c




c                                   MODULE 3
c                     Smoothing Routine for Utah Lake Inflow
c
c          This module was added to smooth out some of the data anomalies
c       introduced by the mass balance inflow computation.  Because measurement
c       precision of contents in Utah Lake is poor relative to in and out
c       flow being measured it was felt smoothing the data out would provide a
c       a better estimation of daily inflows.  The smoothing is not so critical
c       for the data up to 1978 since it was digitized from elevation graphs for
c       Utah Lake which already incorporate some smoothing.  The data after 1978
c       is the reported daily data for Utah Lake and includes the effects of
c       wind which can make a considerable difference.

c          The smoothing method employeed is just the averaging of several days
c       flows in vicinity of the day in question.  The resulting output should
c       have a total flow equivalent to the the input flows but should average out
c       local extremes.
c
echo on

      def_rules

          file    inflow    ulinflow
          file    outflow   ulsmooth          w


c                                                   ******* The mean function finds
c                                                           the mean value for a
c                                                           variable over the time
c                                                           time range specified.  The
c                                                           system variable TIME
c                                                           contains the time (an
c                                                           integer value) of the
c                                                           current day of the
c                                                           modeling period.
c

          outflow=mean(inflow,time-3,time+3)
          stop
      end_rules

      model 1/1/1950 to 12/31/1988





C                              MODULE 4
C                             Provo River
C                     Diversions and flow Analysis
C
c          This module has the task of determining the flows available from the
c       upper Provo to fill Deer Creek and Jordanalle.  The basic assumption is
c       direct flow diversions (rights prior to the storage rights) must continue
c       as reported historically.  When finished this module will identify the
c       diversions which must be made to Heber Valley and Utah County, the
c       gain in the Provo River from Heber Valley, and the gain-loss to the
c       river from Deer Creek to Utah Lake.
c
def_rules
C




                                                   ******* Diversions
C
 divert fort_field    provo river=fort field canal
 divert geneva        provo river=geneva steel
```

```
  divert lake_bottom   provo river=lake bottom canal
  divert little_dry    provo river=little dry creek
  divert murdock_total provo river=murdock canal (total flow)
  divert orem_golf     provo river=orem golf course
  divert park_nuttal   provo river=park-nuttal and barton-young ditches
  divert phillips      provo river=phillips ditch
  divert provo_bench   provo river=provo bench canal
  divert north_bench   provo river=provo bench canal (north opening)
  divert city_race     provo river=provo city canal (city race)
  divert factory_race  provo river=provo city canal (factory race)
  divert l_east_union  provo river=provo city canal (lower east union)
  divert tanner_race   provo river=provo city canal (tanner race)
  divert timpanogas    provo river=timpanogas canal (utah county)
  divert u_east_union  provo river=upper east union
  divert west_union    provo river=west union canal

c                                                   ******* Deer Creek
  divert deer_crk provo river=deer creek reservoir (daily contents)
  divert tunnel   provo river=duchesne tunnel
  divert weber    provo river=weber-provo canal
  divert sl_duct  provo river=salt lake aqueduct diversion

c                                                   ******* Heber Valley
  divert midway   provo river=midway irrigation canal (river ditch)
  divert wasatch  provo river=wasatch and extension irrigation canal
  divert timp     provo river=timpanogas irrigation canal (wasatch)
  divert north_f  provo river=north field irrigation canal
  divert island   provo river=island ditch
  divert ontario  provo river=ontario tunnel summary

c                                                   ******* Streamflow gages
  file  provo_provo    C0163000
  file  provo_deer     C0159500
  file  hailstone      C0155000

c                                                   ******* Output file
  file  provo_gain  provgain              W
  file  provo_div   provodem              W
  file  heber_gain  hebrgain              W
  file  heber_dem   hebrdem               W




c                                                   ******* Add Heber Valley Diversions

      heber_dem=midway+wasatch+timp+north_f+island
      if heber_dem < 1.0 then heber_dem=0.

c                                                   ******* Compute Heber return flow
c                                                           by doing a mass balance on
c                                                           Deer Creek Reservoir.
c                                                           Neglect evaporation for
c                                                           now.

     heber_gain  =af_to_cfs(deer_crk-deer_crk(time-1))

c                                                  ******** Add in releases from Deer
c                                                           Creek, and diversions
c                                                           above the dam.  Take out
c                                                           the gaged flow above the
c                                                           diversions.

     heber_gain  =heber_gain+provo_deer+sl_duct-hailstone-ontario+heber_dem

c                                                   ******* Now do the same thing for
c                                                           the reach between Deer
c                                                           Creek and Utah Lake.

  provo_gain=provo_provo-provo_deer
  provo_gain=provo_gain+fort_field+geneva+lake_bottom+little_dry
  provo_gain=provo_gain+murdock_total+orem_golf+park_nuttal+phillips+provo_bench
  provo_gain=provo_gain north_bench+city_race+factory_race+l_east_union
```

```
 provo_gain=provo_gain+tanner_race+timpanogas+u_east_union+west_union

c                                                     ******* Create a combined record
c                                                             of historical direct flow
c                                                             diversions which can
c                                                             be used as a demand on the
c                                                             system.  These diversions
c                                                             should not include
c                                                             Deer Creek water.

 provo_div =fort_field+geneva+lake_bottom+little_dry+
 provo_div =provo_div+orem_golf+park_nuttal+phillips+provo_bench
 provo_div =provo_div+north_bench+city_race+factory_race+l_east_union
 provo_div =provo_div+tanner_race+timpanogas+u_east_union+west_union

c                                                     ******* The commissioner data is
c                                                             missing for 1985, 1986 and
c                                                             1988 so fill in the record
c                                                             with the previous year
c                                                             values.

 if year = 1985 or year = 1986 or year = 1988 then
      provo_gain=provo_gain-provo_div
      provo_div =provo_div(time-365)
      provo_gain=provo_gain+provo_div
 endif

 stop

 end_rules
 model  1/1/1950 to 12/31/1988

c
c



c
c                            MODULE 5
c                 Daily Utah Lake Operation Model



c                                                         ******* This makes these
c                                                                 public tables readable

      run FILE UTAHLAKE.DAMCAP.MODELS;SHR
      run FILE UTAHLAKE.DAMAREA.MODELS;SHR

      def_rules

c                                                         ******* Utah Lake capacity
c                                                                 and elevation tables

          table   UL_STOR         UTAHLAKE.DAMCAP.MODELS      reverse
          table   UL_AREA         UTAHLAKE.DAMAREA.MODELS

c                                                         ******* Utah Lake primary
c                                                                 storage right delivery
c                                                                 values in ac-ft / day
          table   UL_PRI_TBL
                  value   1.0        37.
                  value   2.0        40.9
                  value   3.0        37.
                  value   4.0       170.6
                  value   5.0       677.4
                  value   6.0      1083.0
                  value   7.0      1618.7
                  value   8.0      1315.9
                  value   9.0       808.3
                  value  10.0       314.5
                  value  11.0        38.2
                  value  12.0        37.0
```

```
                                                     ******* Utah Lake secondary
c                                                            storage delivery
c                                                            table in AC-FT/DAY
c
         table    UL_SEC_TBL
                  value   1.0        153.4
                  value   2.0        153.4
                  value   3.0        200.5
                  value   4.0        368.4
                  value   5.0        474.0
                  value   6.0        676.8
                  value   7.0        558.9
                  value   8.0        389.7
                  value   9.0        249.5
                  value  10.0        153.4
                  value  11.0        153.4
                  value  12.0        153.4

                                                     ******* This is the Deer Creek
c                                                            irrigation delivery
c                                                            table taken from
c                                                            historic flows to
c                                                            Murdock Canal. Units
c                                                            are AC-FT/DAY.
c
         table    DEER_IR_TBL
                  value   1.0          0.
                  value   2.0          0.
                  value   3.0          0.
                  value   4.0         70.8
                  value   5.0        458.48
                  value   6.0        590.4
                  value   7.0        592.6
                  value   8.0        498.4
                  value   9.0        391.2
                  value  10.0         87.7
                  value  11.0          0.4
                  value  12.0          0.

                                                     ******* This is an annual
c                                                            unit demand table for
c                                                            M&I water.  It was
c                                                            derived from the
c                                                            historic flows of the
c                                                            Salt Lake Aqueduct.
c
         table    MI_TBL
                  value   1.0          0.001364
                  value   2.0          0.001329
                  value   3.0          0.001174
                  value   4.0          0.001450
                  value   5.0          0.002335
                  value   6.0          0.003430
                  value   7.0          0.005574
                  value   8.0          0.006345
                  value   9.0          0.004647
                  value  10.0          0.002374
                  value  11.0          0.001340
                  value  12.0          0.001367



                                                     ******* System (SS) to Priority
c                                                            conversion table.
c                                                            Units are storage in
c                                                            AC-FT.  Note the
c                                                            table lookup value
c                                                            is day of the year
c                                                            rather than month.
c
         table    SS_TBL
                  value   0.       616700.
                  value   15.      616700.
                  value   46.      616700.
                  value   75.      615000.
                  value   106.     575000.
```

```
                    value   136.    475000.
                    value   167.    400000.
                    value   197.    350000.
                    value   228.    250000.
                    value   259.    200000.
                    value   305.    125000.
                    value   306.    616700.
                    value   350.    616700.
                    value   366.    616700.

c                                                   ******* This is the Utah Lake
c                                                           spill table.  It
c                                                           defines the maximum
c                                                           release rate from
c                                                           Utah Lake without
c                                                           pumping.  The table is
c                                                           organized consists of
c                                                           elevation and CFS flows.
        table   UL_SPL_TBL
                    value  4489.29    901.
                    value  4490.0    1291.
                    value  4491.0    1800.
                    value  4491.5    2045.
                    value  4492.0    2306.
                    value  4492.3    2721.
                    value  4493.85   4038.
                    value  4495.0    5200.
c
c                                                   ******* Basic data required as
c                                                           input to the model.
c                                                           These values were
c                                                           derived from USGS,
c                                                           NWS, or commissioner
c                                                           records.

            divert  WEBER_CANAL     provo river weber-provo canal
            divert  DUSCH_TUNNEL    provo river duchesne tunnel
            divert  ONTARIO         provo river ontario tunnel summary

c                                                   ******* Correlated Hailstone
c                                                           and Provo@Provo
c                                                           records
            file    PROVO_HAIL      C0155000
            file    PROVO_PROVO     C0163000
c                                                   ******* Utah Lake inflow and
c                                                           temperature derived
c                                                           in previous modules.
            file    UL_INFLOW       ULSMOOTH
            file    UL_MEANT        AVRGTEMP
c                                                   ******* Provo river demands
c                                                           and reach gain/loss
c                                                           determined in previous
c                                                           module.
            file    HEBER_GAIN      HEBRGAIN
            file    PROVO_GAIN      PROVGAIN
            file    HEBER_DMD       HEBRDEM
            file    PROVO_DMD       PROVODEM


c                                                   ******* Set reservoir content
c                                                           control variables to
c                                                           their various values
c                                                           in AC-FT.
            real    UL_CAP           870000.
            real    UL_PRI_CAP       125000.
            real    UL_DEAD          128300.
c
            real    DEER_CAP         152500.
            real    JORD_CAP         335000.

c                                                   ******* Working variables
c                                                           may also be initialized
c                                                           to AC-FT values.
```

```
        real    UL_PRI          125000.
        real    DEER_SS              0.
        real    DEER_PRI             0.
        real    JORD_SS              0.
        real    JORD_PRI             0.
c                                            ******* Output data
c                                                    All output is in CFS
c                                                    except for reservoir
c                                                    contents values which
c                                                    are in AC-FT.
        file    UL_EVAP         ulday001      W
        file    UL_PRI_DEL      ulday002      W
        file    UL_SEC_DEL      ulday003      W
        file    UL_TOT_DEL      ulday103      W
        file    DEER_DEL        ulday004      W
        file    JORD_DEL        ulday005      W
        file    UL_SSS          ulday006      W
        file    UL_SPRI         ulday007      W
        file    UL_TOT          ulday008      W
        file    DEER_SSS        ulday009      W
        file    DEER_SPRI       ulday010      W
        file    DEER_TOT        ulday011      W
        file    JORD_SSS        ulday012      W
        file    JORD_SPRI       ulday013      W
        file    JORD_TOT        ulday014      W
        file    HEBER_DEL       ulday015      W
        file    PROVO_DEL       ulday016      W
        file    UL_SPILL        ulday017      W

c                                            ******* Branch variables
c                                                    are used to auto-
c                                                    connect flows from
c                                                    different reaches.
c                                                    The second parameter
c                                                    in the declaration
c                                                    is the lag time for
c                                                    flows to move through
c                                                    the reach.

c                                            ******* R1 is the reach above
c                                                    Jordanelle where flows
c                                                    going past Jordanelle
c                                                    are introduced.
        branch  R1      0.
c                                            ******* R2 is the reach in
c                                                    which flows are to
c                                                    Heber Valley and
c                                                    from/to Jordanelle.
        branch  R2      0.
c                                            ******* R3 is the reach below
c                                                    below Jordanelle where
c                                                    Heber Valley flows
c                                                    join the Provo and
c                                                    flows are taken
c                                                    from/to Deer Creek.
        branch  R3      0.
c                                            ******* R4 is the reach from
c                                                    Deer Creek to Utah
c                                                    Lake where Utah Valley
c                                                    diversions must be
c                                                    delivered and river
c                                                    gain/losses must be
c                                                    accounted for.
        branch  R4      0.
c                                            ******* UL_SS is the Utah Lake
c                                                    segment of the model.
c                                                    This branch contains
c                                                    flows contributed to
c                                                    Utah Lake as well as
c                                                    the previous day's
c                                                    system storage.
        branch  UL_SS  0.

```

```
c                                        ******* The connect command
c                                                connects the branches
c                                                above together to
c                                                form a network of
c                                                upstream branch to
c                                                downstream.
        connect R1      R2
        connect R2      R3
        connect R3      R4
        connect R4      UL_SS

c                                        ******* On the first day of
c                                                the modelling period
c                                                convert reservoir
c                                                parameters to CFS-DAYS
c                                                for easier internal
c                                                integrity checking.
c
        if time = begtime then
           UL_PRI     =af_to_cfs(UL_PRI)
           DEER_SS    =af_to_cfs(DEER_SS)
           DEER_PRI   =af_to_cfs(DEER_PRI)
           JORD_SS    =af_to_cfs(JORD_SS)
           JORD_PRI   =af_to_cfs(JORD_PRI)
        endif







c                                        ******* Start by putting flows
c                                                in the branch network.
c                                                Note: They automatically
c                                                flow between reaches.
        R1    =PROVO_HAIL+ONTARIO
        R3    =R3+HEBER_GAIN
        R4    =R4+PROVO_GAIN
c                                        ******* UL_SS is to contain
c                                                the daily amount of
c                                                system storage in Utah
c                                                Lake so the previous
c                                                day's storage must be
c                                                added to inflows.
c                                                Subract inflows from
c                                                the Provo from
c                                                UL_INFLOW since they
c                                                will be supplied
c                                                through the branch
c                                                network.

        UL_SS=UL_SS+af_to_cfs(UL_SSS(TIME-1))+UL_INFLOW-PROVO_PROVO

c                                        ******* Deduct evaporation
c                                                losses from reservoirs
c                                                using the previous day
c                                                contents.  Currently
c                                                only Utah Lake is
c                                                considered.

c              NOTE:  The DISTRIBUTE command is a multifunction command
c                     requiring 5 parameters which are:
c                               SOURCE
c                               DESTINATION
c                               BEGINNING DATE
c                               ENDING DATE
c                               QUANTITY
c                     The command performs a delivery from the SOURCE
c                     to the DESTINATION of QUANTITY during the period
c                     between BEGINNING DATE and ENDING DATE.  As part
c                     of the delivery the command checks the value of
c                     SOURCE and QUANTITY and delivers only positive
```

```
c                       values of QUANTITY or a part of it available in
c                       the SOURCE.  If the SOURCE is a branch variable
c                       only the amount available from the SOURCE down
c                       in the connected flow network is delivered.
c
        UL_EVAP=0.
        DISTRIBUTE UL_SS UL_EVAP 1/1 12/31 af_to_cfs(UL_AREA(UL_STOR(UL_TOT(TIME-1)))*EV_TRAN(1.35,UL_MEANT,40.2)/12.)

c                                                   ******* put transbasin
c                                                           diversion water less
c                                                           transmission loss in
c                                                           Deer Creek.

        DISTRIBUTE R3 DEER_PRI 1/1 12/31 0.96*(WEBER_CANAL+DUSCH_TUNNEL)

c                                                   ******* Move any system storage
c                                                           needed downstream.

        DISTRIBUTE JORD_SS R2 1/1 12/31 af_to_cfs(UL_PRI_TBL(MONTH)+UL_SEC_TBL(MONTH))-UL_SS
        DISTRIBUTE DEER_SS R3 1/1 12/31 af_to_cfs(UL_PRI_TBL(MONTH)+UL_SEC_TBL(MONTH))-UL_SS

c                                                   ******* Make deliveries by
c                                                           priority order.
        HEBER_DEL  =0.
        PROVO_DEL  =0.
        UL_PRI_DEL =0.
        UL_SEC_DEL =0.
        DEER_DEL   =0.
        JORD_DEL   =0.
c
        DISTRIBUTE UL_SS    UL_PRI_DEL  1/1 12/31 af_to_cfs(UL_PRI_TBL(MONTH))
        DISTRIBUTE UL_PRI   UL_PRI_DEL  1/1 12/31 UL_PRI_DEL-af_to_cfs(UL_PRI_TBL(MONTH))
        DISTRIBUTE R4       PROVO_DEL   1/1 12/31 PROVO_DMD
        DISTRIBUTE R2       HEBER_DEL   1/1 12/31 HEBER_DMD
        DISTRIBUTE UL_SS    UL_SEC_DEL  1/1 12/31 af_to_cfs(UL_SEC_TBL(MONTH))
        DISTRIBUTE DEER_PRI DEER_DEL    1/1 12/31 af_to_cfs(24000.*MI_TBL(MONTH))
        DISTRIBUTE DEER_PRI DEER_DEL    1/1 12/31 af_to_cfs(DEER_IR_TBL(MONTH))
        DISTRIBUTE JORD_PRI JORD_DEL    1/1 12/31 af_to_cfs(100000.*MI_TBL(MONTH))

c                                                   ******* Make up any shortage
c                                                           in the Utah Lake
c                                                           Primary Pool from
c                                                           remaining system
c                                                           storage.

        DISTRIBUTE UL_SS    UL_PRI      1/1 12/31 af_to_cfs(UL_PRI_CAP)-UL_PRI

c                                                   ******* Distribute any excess
c                                                           as system storage in
c                                                           the upstream reservoirs.
c                                                           Also remove water from
c                                                           Deer Creek if it over
c                                                           capacity from transbasin
c                                                           Diversions.

        DISTRIBUTE R3       DEER_SS     1/1 12/31 af_to_cfs(DEER_CAP)-DEER_PRI-DEER_SS
        DISTRIBUTE DEER_SS  R3          1/1 12/31 DEER_SS+DEER_PRI-af_to_cfs(DEER_CAP)
        DISTRIBUTE DEER_PRI R3          1/1 12/31 DEER_SS+DEER_PRI-af_to_cfs(DEER_CAP)
        DISTRIBUTE R2       JORD_SS     1/1 12/31 af_to_cfs(JORD_CAP)-JORD_PRI-JORD_SS

c                                                   ******* Convert any excess
c                                                           system storage to
c                                                           priority storage.

        DISTRIBUTE DEER_SS  DEER_PRI    1/1 12/31 UL_SS+DEER_SS+JORD_SS-af_to_cfs(SS_TBL(anntime))
        DISTRIBUTE JORD_SS  JORD_PRI    1/1 12/31 UL_SS+DEER_SS+JORD_SS-af_to_cfs(SS_TBL(anntime))


c                                                   ******* Spill from Utah Lake
c                                                           if it is over capacity.
        UL_SPILL=0.
                   D I S T R I B U T E   U L _ S S          U L _ S P I L L           1 / 1   1 2 / 3 1
   min(af_to_cfs(UL_DEAD-UL_CAP)+UL_PRI+UL_SS,UL_SPL_TBL(UL_STOR(UL_DEAD+cfs_to_af(UL_PRI+UL_SS)))-UL_PRI_DEL-UL_SEC_DEL)
```

```
c                                                  ******* Save various values in
c                                                          proper units.
         UL_TOT_DEL=UL_PRI_DEL+UL_SEC_DEL
         UL_SSS    =cfs_to_af(UL_SS)
         UL_SPRI   =cfs_to_af(UL_PRI)
         UL_TOT    =UL_SSS+UL_SPRI+UL_DEAD
         DEER_SSS  =cfs_to_af(DEER_SS)
         DEER_SPRI =cfs_to_af(DEER_PRI)
         DEER_TOT  =DEER_SSS+DEER_SPRI
         JORD_SSS  =cfs_to_af(JORD_SS)
         JORD_SPRI =cfs_to_af(JORD_PRI)
         JORD_TOT  =JORD_SSS+JORD_SPRI

         stop
      end_rules

      model 1/1/1950 to 12/31/1988
      end
```

STORAGE RIGHTS GREATER THAN OR EQUAL TO 100 AF, UTAH LAKE DRAINAGE
As of 1991/05/13

PRIORITY DATE / RESERVOIR NAME AND CAPACITY	WRNUM	NAME	CFS	ACRE-FEET

Note: There are several small reservoirs covered by the 1898 Center Creek Decree, the 1902 Peeteetneet Creek Decree, and the 1904 Lake Creek Decree for which no priority dates are given.

PRIORITY DATE / RESERVOIR NAME AND CAPACITY	WRNUM	NAME	CFS	ACRE-FEET
1850/00/00				
Utah Lake 869584.0				
	59-3518	Kennecott Copper Corp.	30.00	21719.3*
1851/00/00				
Silver Lake Reservoir 200.0				
	55-6951	Lehi Irrigation Company	66.60	0.0
	55-6953	Pleasant Grove Irr. Co.	0.00	38.0
	55-7199	American Fork Irr. Co.	0.00	95.2
1853/00/00				
Utah Lake 869584.0				
	59-3496	North Jordan Irr. Co.	27.54	**
	59-3517	Kennecott Copper Corp.	38.40	13750.0
	59-5272	North Jordan Irr. Co. (SLCWCD)	51.49	10000.0
	59-5722	North Jordan Irr. Co. (SLCWCD)	2.57	498.62
1855/00/00				
Tibble Fork Reservoir 259.0				
	55-7376	USA Forest Service	0.00	5.6
	55-7392	USA Forest Service	0.00	6.72
1858/00/00				
Goshen Reservoir 200.0				
	53-988	Goshen Irr. and Canal Co.	19.30	0.0
	53-1094		0.00	0.0
Silver Lake Flat Reservoir 1040.0				
	55-6954	American Fork Irr. Co.	0.00	920.0
	55-7062	Lehi Irr. Co.	0.00	920.0
	35-7198	Pleasant Grove Irr. Co.	441.00	0.0
1859/00/00				
Goshen Reservoir 200.0				
	53-1089	Goshen Irr. and Canal Co.	12.20	0.0
1869/00/00				
Kenneth Anderson Reservoir 132.0				
	55-5621	Kenneth Anderson	4.00	0.0
1870/00/00				
Utah Lake 869584.0				
	53-1031	South Jordan Canal Company	0.00	345.73
	53-1032	South Jordan Canal Company	0.00	145.21
	59-3499	Utah & S. L. Canal Co.	188.36	**
	59-3500	South Jordan Canal Company	116.20	23138.87
	59-5269	Utah & S. L. Canal Co. (SLCWCD)	55.50	10355.04
	59-5270	South Jordan Canal Co. (SLCWCD)	25.80	5384.6

STORAGE RIGHTS GREATER THAN OR EQUAL TO 100 AF, UTAH LAKE DRAINAGE
As of 1991/05/13

PRIORITY DATE / RESERVOIR NAME AND CAPACITY / WRNUM	NAME	CFS	ACRE-FEET
1875/00/00			
Smith Reservoir 106.6			
51- 65	Pace, David Joseph	0.50	0.0
1877/00/00			
Utah Lake 869584.0			
57-7637	East Jordan Irr. Co.	142.13	**
59-5268	East Jordan Irr. Co. (SLCWCD)	27.87	7935.18
1879/00/00			
Utah Lake 869584.0			
57-7624	Salt Lake City	45.83	11000.0
	Central Utah Water Cons. Dist.	104.17	25000.0
1880/00/00***			
Deer Creek Reservoir 152564.0			
55-7060	USA Bureau of Reclamation	7.90	2900.0
55-7061	USA Bureau of Reclamation	1.43	500.0
1887/00/00			
Center Creek Reservoir #5 166.4			
unnamed reservoir 86.2			
Center Creek Reservoir #2 61.2			
Center Creek Reservoir #1 267.4			
55-1440	Center Creek Irr. Co.	0.00	581.2
1890/00/00			
Smith Reservoir 106.6			
51- 67	Park, Boyd L. & Margaret F.	0.40	0.0
	Johnson, Hal C. & Madge L.		
	Jensen, Grant C.		
1891/00/00			
Witt's Lake Reservoir 853.0			
55-1494	Lake Creek Irr. Co.	0.00	853.0
1893/00/00			
Deer Valley Reservoir 172.0			
55-1495	Lake Creek Irr. Co.	0.00	172.0
1895/01/12			
Mona Reservoir 21078.0			
53- 995	Currant Creek Irr. Co.	0.00	21078.0
1898/00/00 ****			
Big East Lake 670.0			
Decree	Payson City	0.00	0.0
1899/00/00			
Tibble Fork Reservoir 259.0			
55-6955	Pleasant Grove Irr. Co.	0.00	0.0
55-7071	Lehi Irrigation Company	0.00	0.0
55-7200	American Fork Irr. Co.	0.00	0.0

STORAGE RIGHTS GREATER THAN OR EQUAL TO 100 AF, UTAH LAKE DRAINAGE
As of 1991/05/13

PRIORITY DATE / RESERVOIR NAME AND CAPACITY / WRNUM	NAME	CFS	ACRE-FEET
1900/00/00			
Center Creek Irrig. Reservoir #4 150.0			
55-1491	Baird, William H.	0.00	26.94
Smith Reservoir 106.6			
51-4356	Park, Boyd L. & Margaret F. Johnson, Hal C. & Madge L. Jensen, Grant	1.50	0.0
1902/00/00			
Mill Hollow Reservoir 316.7			
55-7321	USA Forest Service	0.00	0.0
1902/00/00*****			
Box Lake 300			
Decree	Payson City	0.00	300.0
1904/00/00*****			
Jones Reservoir 176.0			
55-8162	Lake Creek Irr. Co.	0.00	176.0
1905/08/22			
Trial Lake 830.0			
Wall Lake 1015.0			
Washington Lake 1360.0			
55-11108	Timpanogos Irrigation Co. Wasatch Irrigation Company	0.00	3205.0
55-11558	Provo Reservoir Company	0.00	3205.0
1908/09/15			
North Fork Lake #1 (or Weir Lake) 116.0			
North Fork Lake #2 (or Pot Lake) 46.0			
55-11110	Provo Reservoir Water User's Co.	0.00	162.0
North Fork Lake #3 (or Long Lake) 824.1			
55-11111	Provo Reservoir Co.	0.00	824.1
North Fork Lake #4 (or Island Lake) 97.7			
55-11112	Provo Reservoir Water User's Co.	0.00	97.7
North Fork Lake #5 108.0			
55-11113	Provo Reservoir Water User's Co.	0.00	108.0
North Fork Lake #6 420.0			
55-11114	Timpanogos Irr. Co.	0.00	227.0
55-11116	Timpanogos Irr. Co.	0.00	192.5
Lost Lake (or Fire Lake) 1155.0			
55-11115	Provo Reservoir Co.	0.00	368.76
Lost Lake #2 (or Tea Pot Lake) 140.0			
55-11117	Provo Reserovir Co.	0.00	140.0
Star Lake 313.9			
55-11118	Provo Reservoir Co.	0.00	313.9
Marjorie Lake 285.0			
55-11119	Timpanogos Irr. Co.	0.00	175.9
55-11560	Timpanogos Irr. Co.	0.00	84.1
Washington Lake #3 38.0			
55-11120	Provo Reservoir Water User's Co.	0.00	38.0
Lost Lake Reservoir 1155.0			
55-11559	Provo City Corporation	0.00	321.78

STORAGE RIGHTS GREATER THAN OR EQUAL TO 100 AF, UTAH LAKE DRAINAGE
As of 1991/05/13

PRIORITY DATE / RESERVOIR NAME AND CAPACITY / WRNUM	NAME	CFS	ACRE-FEET
1908/10/27			
Utah Lake 869584.0			
57-23	Draper Irr. Co./Sandy Canal Co.	50.40	**
59-13	Utah Lake Dist. Co.	124.24	**
59-5271	Utah Lake Dist. Co. (SLCWCD)	10.76	3439.03
59-5273	Draper I.C./Sandy C.C. (SLCWCD)	9.60	2000.0
1909/08/06			
Utah Lake 869584.0			
59-14	Central Utah Water Cons. Dist.	150.00	43739.0
59-15	Central Utah Water Cons. Dist.	150.00	10984.0
1909/11/12			
Big Elk Lake Reservoir 500.0			
55-11550	Washington Irr. Co.	0.00	500.0
1911/02/28			
Utah Lake 869584.0			
59-20	Central Utah Water Cons. Dist.	1.50	2350.0
1917/02/03			
Big Elk Lake Reservoir 500.0			
55-11551	Washington Irr. Co.	0.00	371.1
1924/08/25			
Deer Creek Reservoir 152564.0			
35-8737	USA Bureau of Reclamation	1000.00	136500.0
55- 80			
35-8739	USA Bureau of Reclamation	0.00	74000.0
35-8740	USA Bureau of Reclamation	210.00	0.0
1936/00/00 ****			
Maple Lake 130.0			
Decree	Payson City	0.00	0.0
1936/04/03			
Deer Creek Reservoir 152564.0			
55- 262	USA Bureau of Reclamation	0.00	30000.0
1936/06/25			
Deer Creek Reservoir 152564.0			
43-341	USA Bureau of Reclamation	0.00	50000.0
43-343	USA Bureau of Reclamation	50.00	5000.0
1936/09/12			
Deer Creek Reservoir 152564.0			
35-8756	USA Bureau of Reclamation	1000.00	37200.0
1940/07/02			
Hecla Mining Reservoir 134.0			
55-502	Stichting Mayflower	2.50	0.0

STORAGE RIGHTS GREATER THAN OR EQUAL TO 100 AF, UTAH LAKE DRAINAGE
As of 1991/05/13

PRIORITY DATE / RESERVOIR NAME AND CAPACITY / WRNUM	NAME	CFS	ACRE-FEET
1944/08/31			
Deer Creek Reservoir 152564.0			
43-344	USA Bureau of Reclamation	21.00	4288.0
1945/06/11			
Deer Creek Reservoir 152564.0			
55- 295	USA Bureau of Reclamation	0.00	100000.0
1947/05/01			
Summit Creek Reservoir 841.0			
51-1161	Summit Creek Irr. & Canal Co.	0.00	841.0
1951/05/08			
Deer Creek Reservoir 152564.0			
55- 577	USA Bureau of Reclamation	1.50	0.0
1959/11/30			
Mill Hollow Reservoir 316.7			
55-965	State of Utah Div. of Wild. Res.	1.00	0.0
1964/11/19			
Hayes Reservoir 70000.0			
Mona Reservior Enlargement 70000.0			
Utah Lake 869584.0			
Jordanelle Reservoir 335020.0			
43-3822	USA Bureau of Reclamation	0.00	499937.46
1971/03/18			
Jordanelle Reservoir 335020.0			
55-4494	USA Bureau of Reclamation	0.00	300000.0
1976/08/17			
Lost Lake Reservoir 1155.0			
55-5789	Provo City	0.00	538.0
1976/12/09			
Lindsay Reservoir 175.0			
55-5846	Christensen, Carole Lee	0.00	50.0

* West Jordan Mill water right. Probably non-consumptive.

** Acre-foot value of these water rights is being evaluated by State Engineer.

*** These are 1st and 17th class water rights aquired by Reclamation on lands inundated by Deer Creek Reservoir. Priority date would be about 1880.

**** Date dam was built.

***** Date of Decree.

DIRECT FLOW RIGHTS ON THE JORDAN RIVER

Priority Date	Canal/Ditch	Flow (cfs)	Water Right Numbers
1850	Utah & Salt Lake/North Jordan	30.0	59-3518
1850	Bennion Mill Race	5.0	59-3512, 59-3525 59-3532, 59-3522 59-3530, 59-3503 59-3495, 59-3533 59-3521
1850	Gardner Mill Race	5.3	59-3491, 59-3509 59-3529, 59-3504 59-3535, 59-3510 59-3507, 59-3540
1853	North Jordan Canal	38.4	59-3517
1855	Galena Canal	0.5	59-7644, 57-7657
1855	Galena Canal	1.4	57-7646, 57-7660 57-1802
1855	Galena Canal	2.8	57-7630, 57-7641 57-8925, 57-7645 57-7640, 57-7647 57-7648
1855	Galena Canal	0.6	57-7620, 57-7638
1859	Beckstead Ditch	12.0	59-3924
1864	Mousley Ditch	2.0	57-7636, 57-7658 57-7629
1873	Galena Canal	8.0	57-7625
1873	Galena Canal	9.0	57-7626
1874	Galena Canal	0.7	57-7634, 57-7633 57-7649, 57-7643
1878	Galena Canal	1.2	57-7632
1878	Galena Canal	1.4	57-7642
1912	Utah & Salt Lake/North Jordan	100.0	59-23
1918	Utah & Salt Lake/North Jordan	50.0	59-30