2.0 WATER NEEDS

Water resource planning requires reliable forecasts of population and water demand. Increasing populations translate into increased water demand for municipal, residential and commercial uses. Community growth, the growth of local commerce and industry and the development of new industries all increase demand for water. Projections of the Sabine Basin's population growth and increased water demands for the planning period, 2000 through 2050, are needed to determine the extent of future water supply requirements within the Basin.

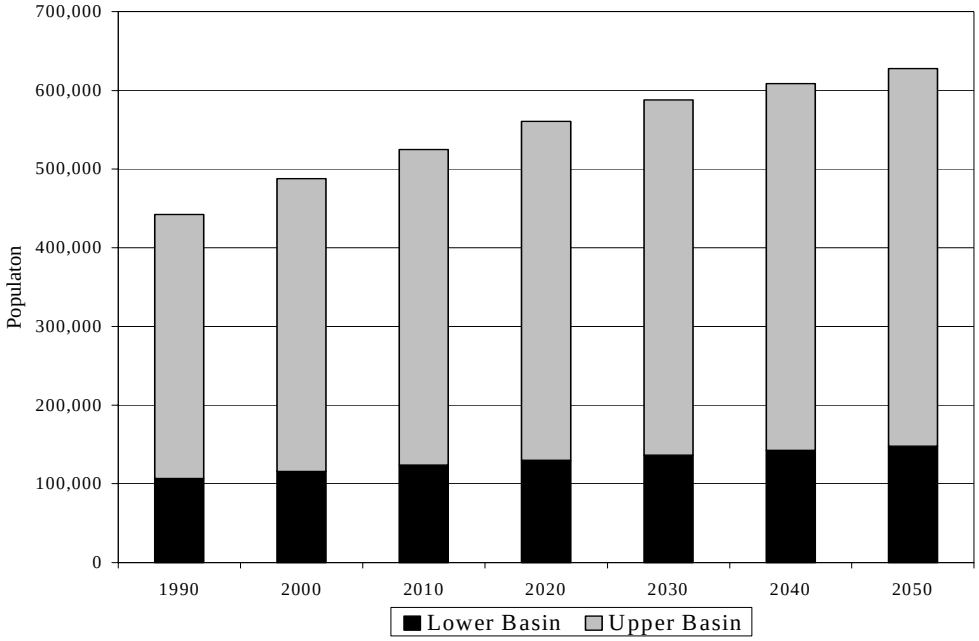
The Texas Water Development Board (TWDB), Texas Natural Resource Conservation Commission (TNRCC) and the Texas Parks and Wildlife Department (TPWD) have jointly developed a consensus-based planning approach for state-wide projections of population and water demands. These projections, termed the Consensus Planning Projections, forecast different water use scenarios by decade, and, as required by the TWDB, were used as the basis for water supply planning in this Management Plan.

2.1 Population Projections

Population projections developed through the Consensus Planning process are based on 1990 U.S. Census data. The 1990 population of the Sabine Basin was 442,358, with the Upper Basin accounting for 76 percent of the total population. Longview is the largest city in the Basin with a 1990 population over 70,000. Orange, Texas, is the only city located totally within the Lower Basin with a 1990 population greater than 5,000.

Future growth within the Sabine Basin is forecast at the county level using a standard demographic model. Population within the counties is allocated by cities (for cities over 1,000 in population). The remaining population is grouped in the "County Other" category. The demographic model generates four scenarios based on varying rates of migration: 0.0 Migration, 0.5 Migration, 1.0 Migration, and the "Most Likely" Scenario. For the Sabine Basin, the highest population growth occurs under the "most likely" scenario. This represents the most conservative conditions and therefore was used for planning purposes. Figure 2.1 illustrates the "most likely" population projections and indicates the Upper and Lower Basin share.

Figure 2.1: Projected "Most Likely" Population in the Sabine Basin



The "most likely" scenario predicts:

- The Sabine River Basin population will increase 42 percent from 1990 to a total projected population of 627,800 in 2050.
- The distributions of population between the upper and lower portions of the Basin will remain relatively stable.
- The counties near the Dallas-Fort Worth Metroplex will experience rapid rates of growth consistent with Metroplex development rates.
- Leading population growth in the Lower Basin is Orange County with a projected increase of 51 percent over the 60-year period.

2.2 Water Use

The TWDB defines six water use classifications for statewide water planning purposes: municipal, manufacturing, irrigation, livestock, steam power generation, and mining. Population, weather conditions and water conservation measures in force in a community largely determine municipal water use. Manufacturing, irrigation, livestock, steam power generation, and mining water uses are determined by broader economic and technological factors.

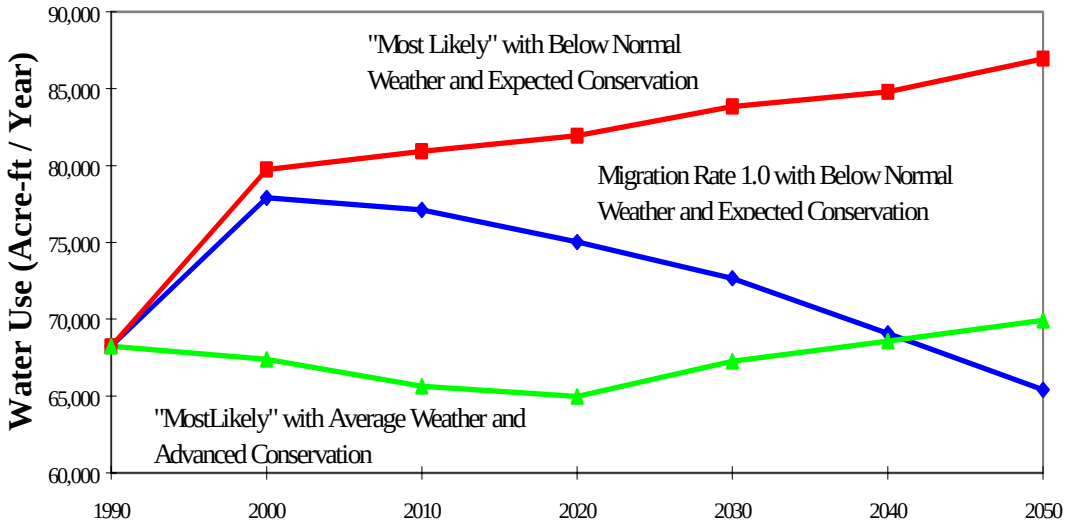
The TWDB prepared projected water requirements, by use type, for each decade from 2000 through 2050 as part of the *1996 Consensus-Based Update to the Texas Water Plan.* TWDB developed several scenarios for most water use types based upon specific population projections and water use assumptions. The "Most Likely" scenario projections were used for municipal, irrigation, livestock, power and mining water use categories. The projections selected for manufacturing water use represent the higher demand series, "Low Oil Price without Conservation".

Municipal Water Demands

City-specific municipal water use projections are based on a historical per capita water use rate multiplied by projected future population estimates. These estimates are adjusted to reflect the impact of climate and conservation activities on water demands in each community through different water use scenarios. To assess the effects of climatic conditions, two weather-related scenarios are developed: average rainfall patterns and below normal rainfall patterns. Adjustments to water use projections for conservation efforts are identified by three levels of conservation savings: plumbing code only, expected, and advanced. In addition, the different population projections are included in generating the range of municipal water use scenarios.

The TWDB's "most likely" municipal water use projections assume a per capita water use rate adjusted for below normal rainfall conditions and expected conservation savings. The municipal water use estimates are calculated by applying this rate to the "most likely" population scenario for each city with a population of 1,000 or more and for the "county other" category. This scenario generally represents the highest demand condition among the projections. To confirm this assumption for the Sabine Basin, the differences in municipal water required for three scenarios were evaluated. As shown on Figure 2.2, the "most likely" scenario with below normal weather and expected conservation, yields the highest water demand each decade over the next 50 years. Since this scenario represents the most conservative conditions and plans for providing water supply during drought conditions (below normal weather), it was used to predict municipal water use requirements for the Basin.

Figure 2.2: Sabine Basin Municipal Water Requirements by Scenario



Manufacturing Water Demands

Manufacturing water use forecasts are developed through national and statewide growth outlooks for various industry categories, regional and county shares of manufacturing output, historical water use records, and industry-specific water use efficiencies. Projections are based on two assumptions regarding industry growth; the expansion of existing capacity and new manufacturing locations, and the historical relationship between the price of oil and industrial activity continuing over the next 50 years. The TWDB prepared seven scenarios reflecting these assumptions: Baseline Oil Prices, with and without conservation, Low Oil Prices, with and without conservation, High Oil Prices, with and without conservation, and No Growth. The "Low Oil Prices without conservation" scenario projects the highest manufacturing demands for the Basin and was used to identify future water requirements in the Sabine Basin. For planning purposes, this is consistent with other demand scenarios chosen for the Management Plan and it recognizes the relative size and importance of manufacturing water use in the Basin.

Irrigation Water Demand

The TWDB irrigation water demand projections are based on crop-specific prices, yields, production costs, water costs, acres under production, irrigation systems and improvements in water use efficiency and Federal farm policy. TWDB's "most likely" scenario, which was used

in this Plan, assumes changes in crop yields with prices, production costs and Federal farm payments remaining at current levels. It also assumes the adoption of advanced irrigation technology that will achieve very efficient water use. For the East Texas Region, this is generally not a good assumption. Much of the irrigation water use in southeast Texas is for rice farming. New technology and advances in agriculture are now allowing rice farmers to produce two crops per year on their land, which actually *increases* the water use. However, because TWDB required that Consensus Planning data be used in this study, the "most likely" scenario was used.

Steam Power Water Demand

Steam power electric generation water use projections were based on power generation demands and estimates of the water needed to produce the required power use capacity. Future demand is estimated using information on historical water use patterns by power generating plants, planned plant expansions, ownership of fuel sources used for generation, plant operating characteristics, and the impacts of energy conservation on demand. TWDB developed two projection series reflecting "high" and "low" water use scenarios.

In this study, the “high” use series was used for steam electric water use projections. This series assumes 1) the use of existing plant technology with no change in electric power generation capacity and 2) a water use rate equal to the average water use between 1988 and 1991.

Livestock Water Demand

Livestock water use is calculated by multiplying the projected number of livestock by the water consumption per unit of livestock. Water use for livestock is assumed to remain constant after the year 2000.

Mining Water Demand

The mining industry uses water for processing, leaching to extract ores, dust control and reclamation. Water use for mining makes up only about one percent of the overall usage of water in Texas. Therefore, a single series of projections was produced by TWDB. However, in the Sabine Basin mining represents a larger percentage of the total water demand.

2.3 Projected Water Demands

The water demands for the Sabine Basin are projected to increase approximately 124 percent from 1990 to 2050. The largest increases in water demands are attributed to growth in manufacturing, mining and power generation. The distribution between Upper and Lower Basin total demands varies only slightly over the 50-year planning period, with the Upper Basin demands representing 71 to 76 percent of the total. The increases in the Upper Basin are driven by water supply for manufacturing demands in Harrison County, increased mining demands in Wood and Panola counties, and power production in Gregg and Harrison counties. Through the public participation process for this study, there were some concerns raised over the high demand projections for manufacturing in Harrison County. For this reason, this plan recommends a staged water development program that has the flexibility to provide water supply as the demand occurs, without investing large amounts of capital for demand that may not ever materialize. The Lower Basin demands increase at a consistent rate over the planning period, with the largest increases occurring in Orange County. The distribution of water demands by use type for the entire Basin in 2050 is shown on Figure 2.3. The water use requirements by decade are shown on Figure 2.4.

Figure 2.3: Sabine Basin Projected 2050 Water Demand

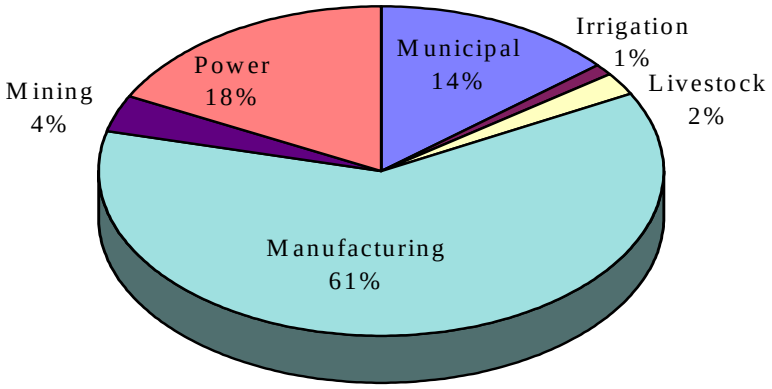
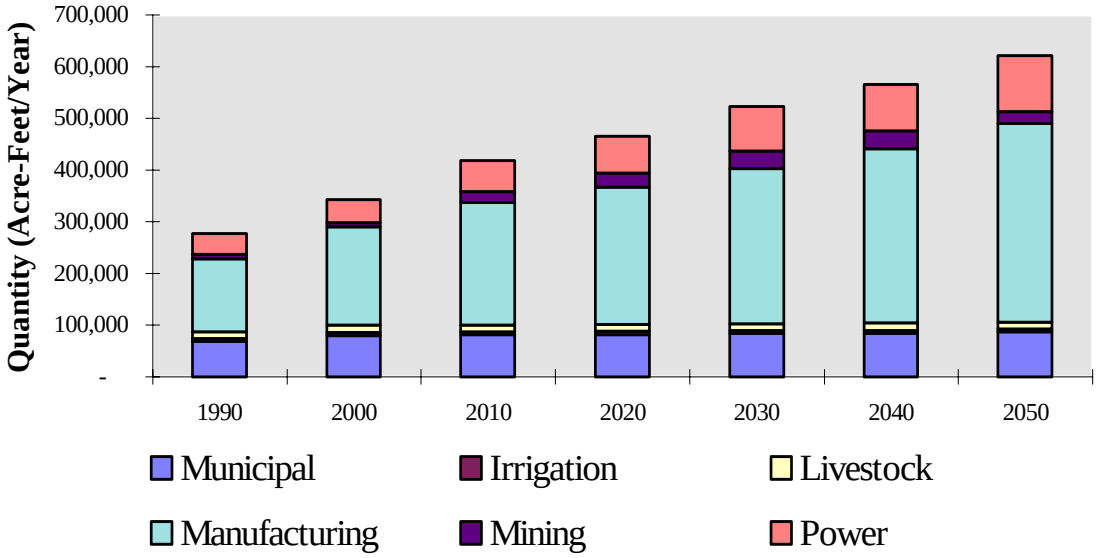


Figure 2.4: Water Use Requirements by Decade



The projected demands identified for the Upper and Lower Basins by water use type are presented in Tables 2.1 and 2.2. County level data for all projection scenarios and use type are included in Appendix C of this report.

Table 2.1: Sabine Upper Basin Water Demand by Use Type (acre-feet)

Decade	*Municipal*	*Irrigation*	*Livestock*	*Manufacturing*	*Mining*	*Power*	*Total*
1990	52,791	715	10,353	90,334	8,736	34,488	197,417
2000	62,533	714	11,327	133,808	7,920	38,300	254,602
2010	63,537	714	11,327	171,121	22,021	50,500	319,220
2020	64,558	714	11,327	192,241	27,431	55,500	351,771
2030	66,045	714	11,327	216,228	35,290	65,500	395,104
2040	66,750	714	11,327	242,239	34,513	65,500	421,043
2050	68,368	714	11,327	275,411	22,743	79,000	457,563

Table 2.2: Sabine Lower Basin Water Demand by Use Type (acre-feet)

Decade	*Municipal*	*Irrigation*	*Livestock*	*Manufacturing*	*Mining*	*Power*	*Total*
1990	15,438	5,568	2,386	50,487	28	5,574	79,481
2000	17,198	5,556	2,311	57,148	33	6,000	88,246
2010	17,390	5,241	2,311	64,826	33	10,000	99,801
2020	17,390	5,241	2,311	73,461	34	15,000	113,437
2030	17,795	5,167	2,311	82,942	35	20,000	128,250
2040	18,043	5,094	2,311	94,787	36	25,000	145,271
2050	18,592	5,024	2,311	107,997	37	30,000	163,961