3.0 DESCRIPTION OF GROUNDWATER MODELING SCENARIOS

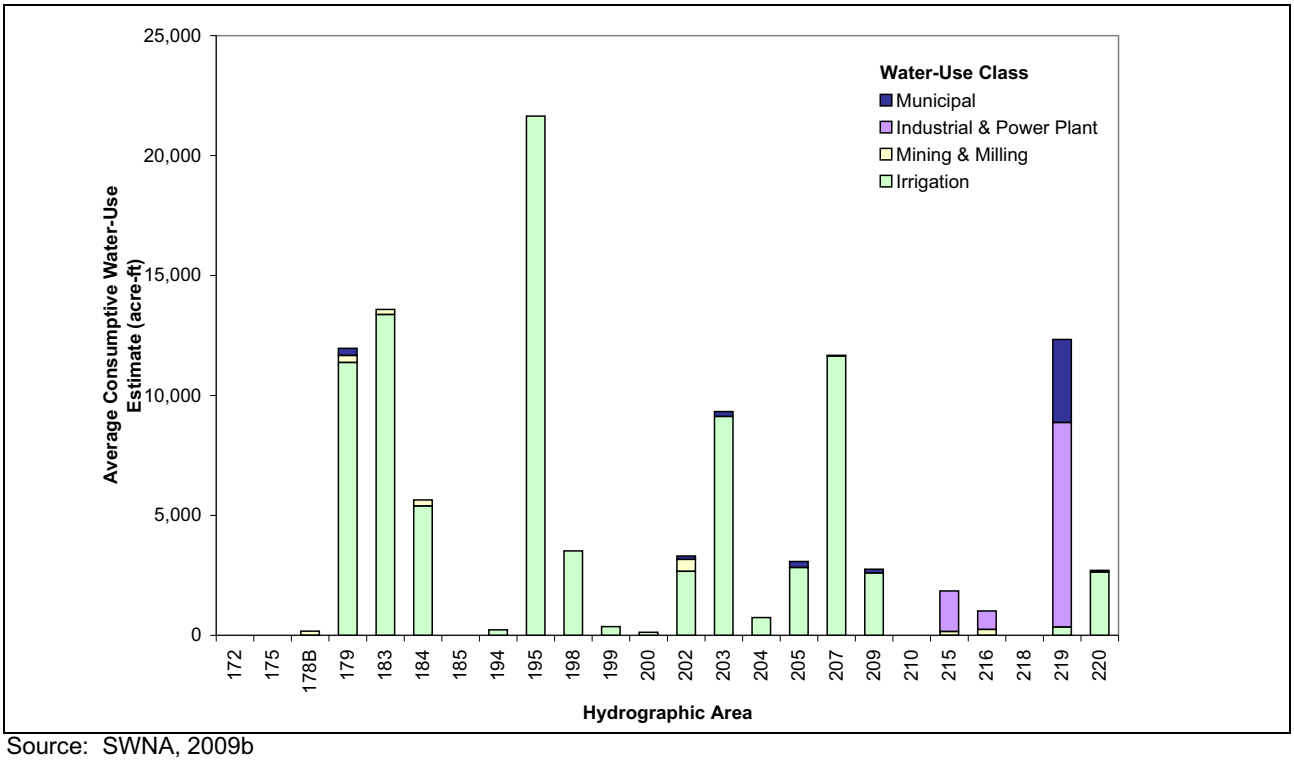
Groundwater modeling scenarios representing anticipated pumping conditions prior to the development of the Project and various Project alternatives were derived in support of the BLM EIS analysis of the Project. Schedules of groundwater consumptive uses defined by these scenarios were developed and then simulated using the transient numerical model to describe the potential, indirect groundwater-related effects of each scenario. Descriptions of the groundwater development scenarios are presented for each alternative in the following order: (1) No-Action scenario, (2) Proposed Action and project alternative scenarios, (3) NEPA cumulative scenarios, and (4) Cessation of pumping scenario. The scenarios are described in detail in the following section. The simulation of these scenarios and associated results are described in Section 4.0.

3.1 No Action

The No Action groundwater development scenario represents the continuation of current groundwater use into the future without pumping from either the proposed wells or additional pumping wells. The simulation results represented by this scenario provide estimates of the pre-Project hydrologic conditions from which the potential, indirect groundwater-related effects of the alternative groundwater development scenarios can be derived.

The water-use schedule for the No Action scenario is based on the estimates of historical consumptive groundwater uses that are documented in the CCRP numerical model report (SNWA, 2009b) for the period 1945 to 2004. More specifically, the consumptive-use rates estimated for the last few years of the historical period (2001 to 2004) (Figure 3-1) were used for the scenario simulation period from 2005 to 2249. The consumptive-use estimates are inclusive of the 11,300 afy of existing Coyote Spring Investment (CSI) groundwater rights in Lake Valley that are expected to be transferred to Coyote Spring Valley using Project facilities and the 8,000 afy of existing SNWA groundwater rights associated with SNWA-owned ranch properties in Spring Valley that will be transferred to southern Nevada. The 11,300 afy of CSI groundwater rights are already in use and are therefore represented in the pre-2005 water-use schedule. All of the SNWA-owned ranch rights have been or will be placed to beneficial uses to support agriculture in the respective basins before Project-related pumping begins. These rights are represented in the water-use schedules as 4,345 afy of current use with the remaining rights, 3,655 afy, being put into production by 2012.

The No Action simulation period starts at the beginning of year 2005 and ends the same year as all other groundwater development scenarios simulated as part of the EIS analysis. The beginning year of 2005 represents the initial hydraulic conditions of the flow system incorporated in the model by using the hydraulic heads simulated by the transient numerical model for the end of 2004 (SNWA, 2009b). This initial hydraulic-head distribution implicitly includes the effects of the historical



Source: SWNA, 2009b

Figure 3-1
Average Consumptive Water Use by Hydrographic Area for Time Period 2001-2004

pumping for the 1945 to 2004 period (SNWA, 2009b). The simulated well distribution and water-use schedule for this scenario is presented in Figure 3-2.

3.2 Project Alternatives

Groundwater development scenarios for project alternatives were derived, constructed and are described in this section. The water-use schedules for each of the scenarios include the consumptive-use estimates simulated as the No Action scenario. Any reasonably foreseeable, future nonproject groundwater uses are included and are simulated in the Cumulative Pumping scenarios described in Section 3.3.

3.2.1 Proposed Action

In the Proposed Action scenario, the full application volume of SNWA's pending applications are simulated. The application volumes per basin are:

- Delamar Valley - 11,584 afy
- Dry Lake Valley - 11,584 afy
- Cave Valley - 11,584 afy
- Spring Valley - 91,224 afy
- Snake Valley - 50,679 afy

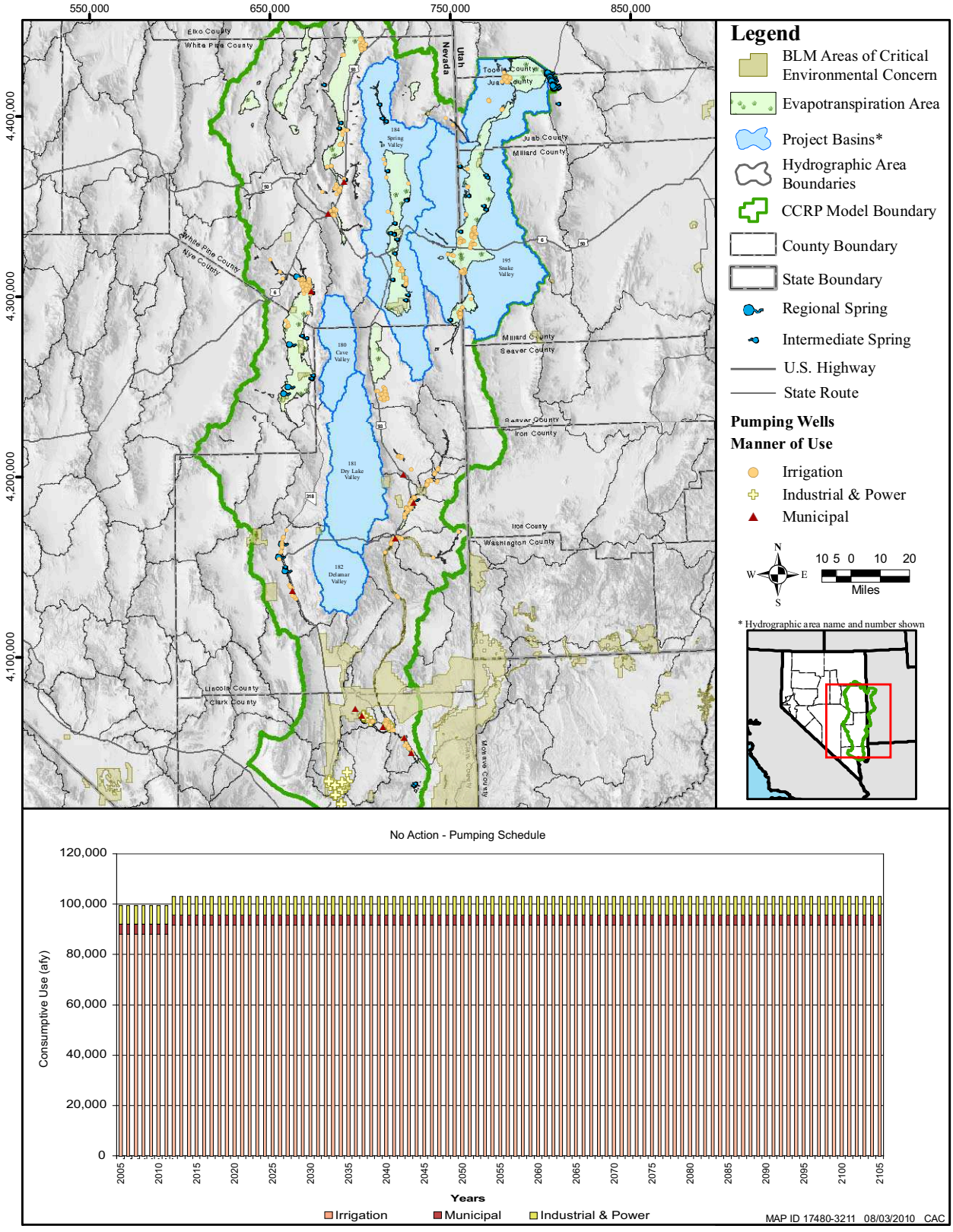


Figure 3-2
No Action - Pumping Distribution

The pumping is distributed spatially within the project basins with the objective of minimizing the pumping effects at (1) PODs associated with senior water rights and (2) areas containing sensitive or listed species and/or their groundwater-related habitat. This distribution reflects the adaptive management strategies that SNWA plans to utilize in managing the resource by redistributing pumping to minimize effects. The total number of wells that are scheduled to pump during a given year is based on the volume required to meet demands for that year (Figure 3-3).

3.2.2 Alternative A - Distributed Pumping - Reduced Quantities

In the Alternative A scenario, the volumes of SNWA's pending applications have been reduced. The volumes per basin have been reduced to:

- Delamar Valley - 2,493 afy
- Dry Lake Valley - 11,584 afy
- Cave Valley - 4,678 afy
- Spring Valley - 60,000 afy
- Snake Valley - 36,000 afy

The pumping is distributed spatially within the project basins with the same purpose as described for the Proposed Action. The total number of wells that are scheduled to pump during a given year is based on the volume required to meet demands for that year (Figure 3-4).

3.2.3 Alternative B - Current Points of Diversion

In the Alternative B - Current PODs scenario, the full application volume of SNWA's pending applications are simulated. The application volumes per basin are:

- Delamar Valley - 11,584 afy
- Dry Lake Valley - 11,584 afy
- Cave Valley - 11,584 afy
- Spring Valley - 91,224 afy
- Snake Valley - 50,679 afy

The pumping in each valley was distributed equally among all the PODs in the valley based on the demand schedule, up to maximum rates equivalent to the diversion rates associated with the individual applications. The total number of wells that are scheduled to pump during a given year is based on the volume required to meet demands for that year (Figure 3-5).

3.2.4 Alternative C - Intermittent Pumping

The Alternative C - Intermittent Pumping scenario reflects a strategy that SNWA would employ based on water availability from the Colorado River. SNWA may be able to reduce deliveries from the Project during times of available surplus Colorado River water but would require full delivery of Project water during times of normal and drought conditions. Because projecting occurrences of drought and surplus on the Colorado River is inherently uncertain due to the variability in climatic

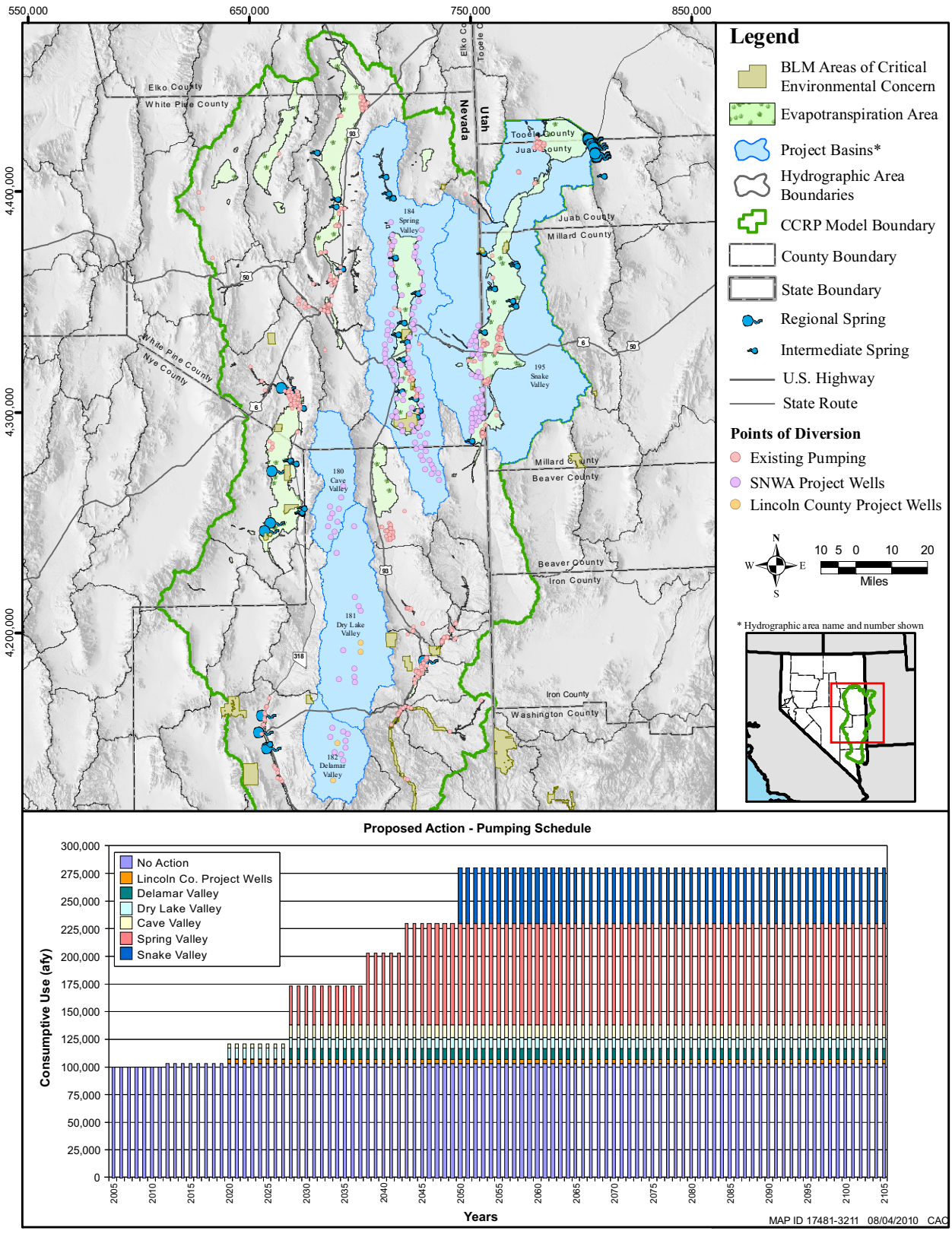


Figure 3-3
Proposed Action - Pumping Distribution

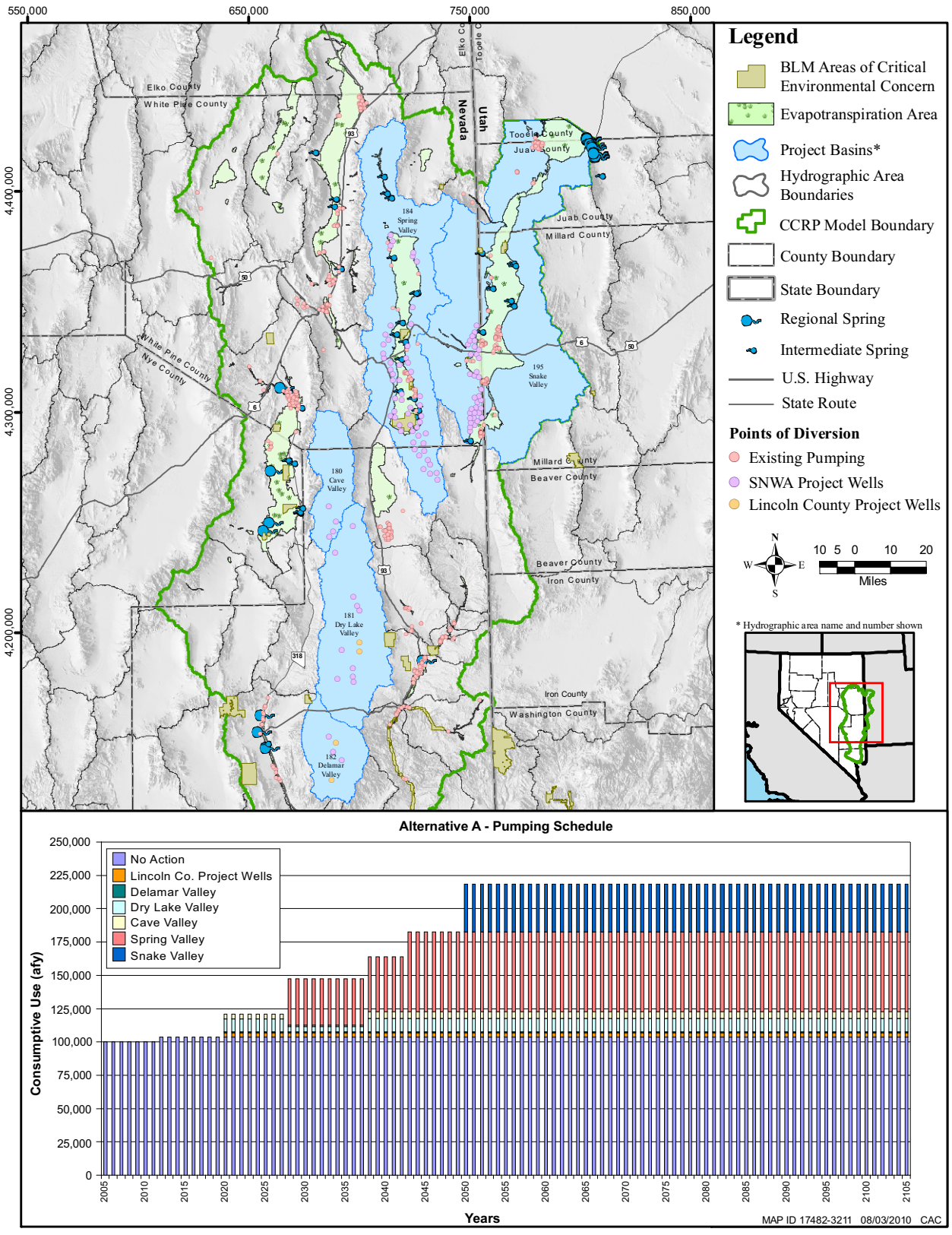


Figure 3-4
Pumping Distribution for Alternative A- Distributed Pumping Reduced Quantities

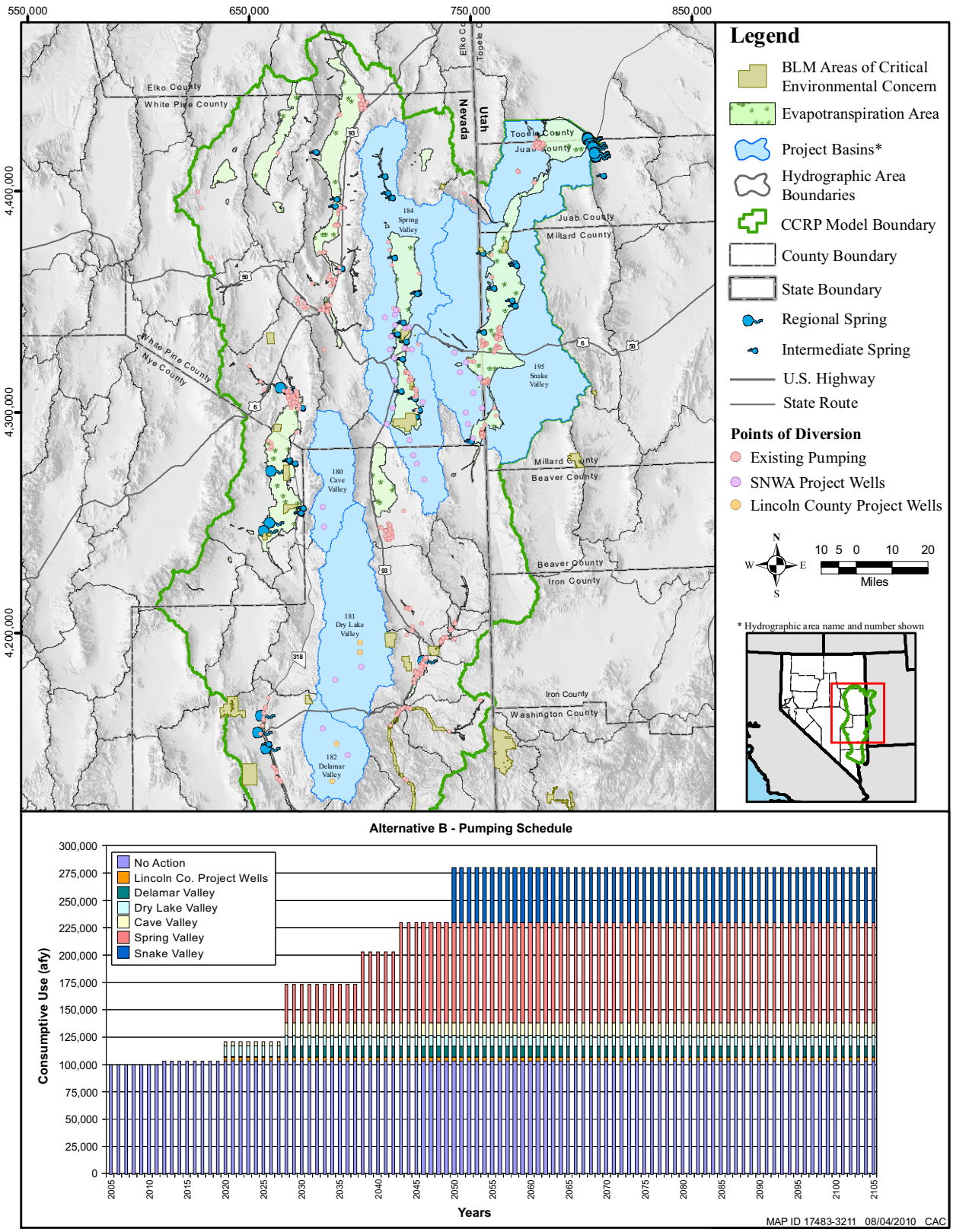


Figure 3-5
Pumping Distribution for Alternative B - Current Points of Diversion

conditions affecting surface-water runoff to the Colorado River, 5-year intermittent periods reflecting occurrences of normal/drought or surplus conditions were assumed in the water-use schedule after the Project reaches full development in 2050. During these periods, the Project water-use schedule is either maintained at the levels described for the Distributed Pumping - Reduced Quantities scenario (Alternative A) or is reduced to a minimum pumping volume of 9,000 afy. The minimum pumping volume in each project basin is projected to be as follows:

- Spring Valley - 3,000 afy
- Snake Valley - 2,000 afy
- Cave Valley - 1,000 afy
- Dry Lake Valley - 2,000 afy
- Delamar Valley - 1,000 afy

The minimum annual volume represents the quantity needed to maintain functionality of pumps, pipelines, and other facilities without major shutdown and startup issues. It is also assumed that pumping the following rights would continue and be conveyed through Project facilities during the intermittent periods of reduced SNWA pumping: (1) 3,000 afy of Lincoln County rights in Dry Lake and Delamar valleys and (2) 11,300 afy of interbasin transfer of groundwater from Lake Valley to Coyote Spring Valley by CSI. Thus, the total volume of groundwater conveyed through the Project facilities during the intermittent periods of reduced SNWA pumping would be approximately 23,000 afy. The simulated well distribution and water-use schedule for this scenario is presented in Figure 3-6.

3.2.5 Alternative D - LCCRDA Corridor

The Alternative D - LCCRDA Corridor scenario assumes that groundwater pumping would only occur in the basins, or portions thereof, located within Lincoln and Clark counties based on the issuance of rights-of-way mandated under LCCRDA. The pumping distribution described here does not include Snake Valley because there is only a very small portion of Snake Valley located within Lincoln County (approximately 1 km^2). The water-use schedules for the other project basins reflect those defined for the Distributed Pumping - Reduced Quantities scenario (Alternative A) and include:

- Delamar Valley - 2,493 afy
- Dry Lake Valley - 11,584 afy
- Cave Valley - 4,678 afy
- Spring Valley - 60,000 afy
- Snake Valley - 0 afy

Under this scenario, the distribution of pumping in Spring Valley is confined to the southern portion of the valley within Lincoln County. The simulated well distribution and water-use schedule for this scenario is presented in Figure 3-7.

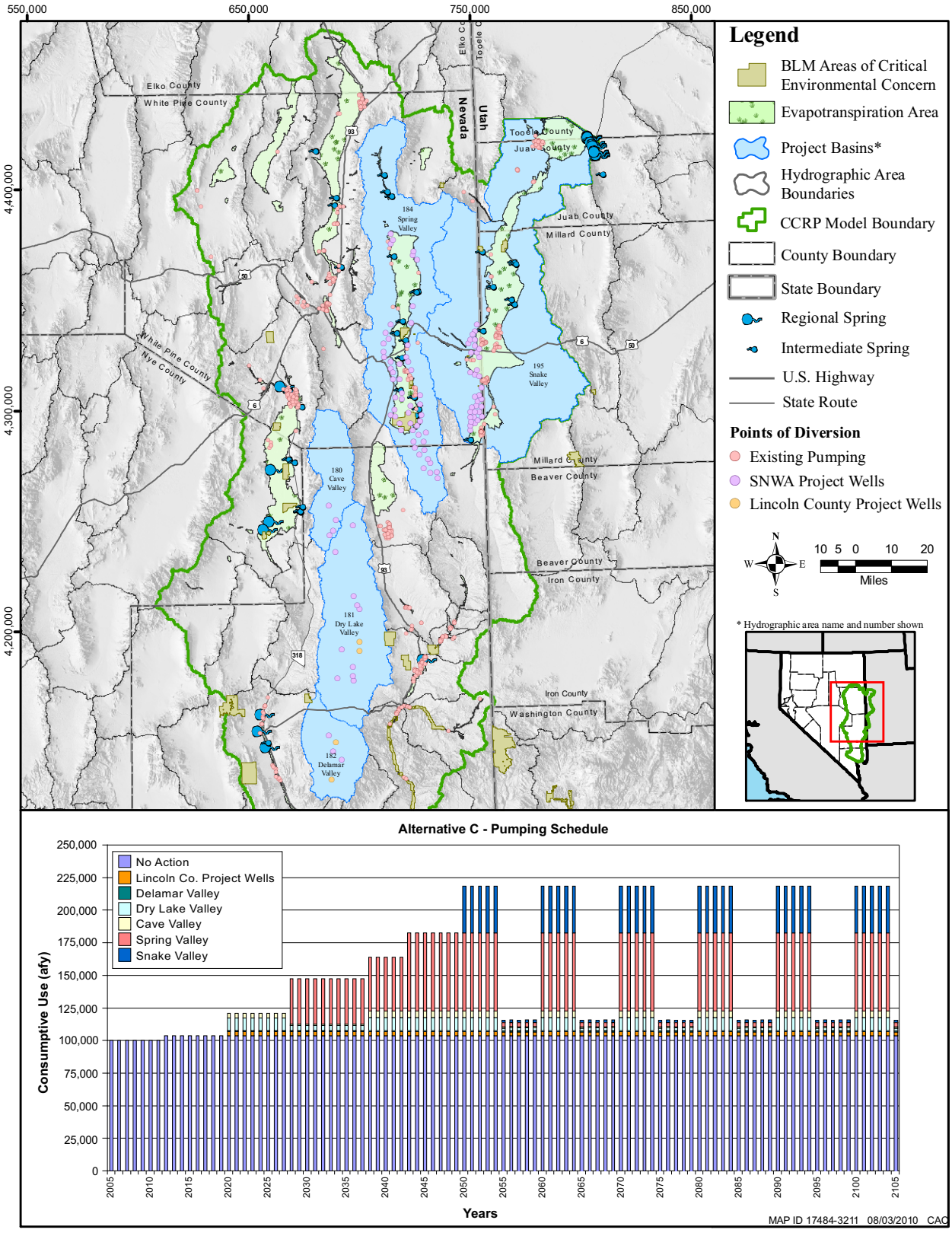


Figure 3-6
Pumping Distribution for Alternative C - Intermittent Pumping

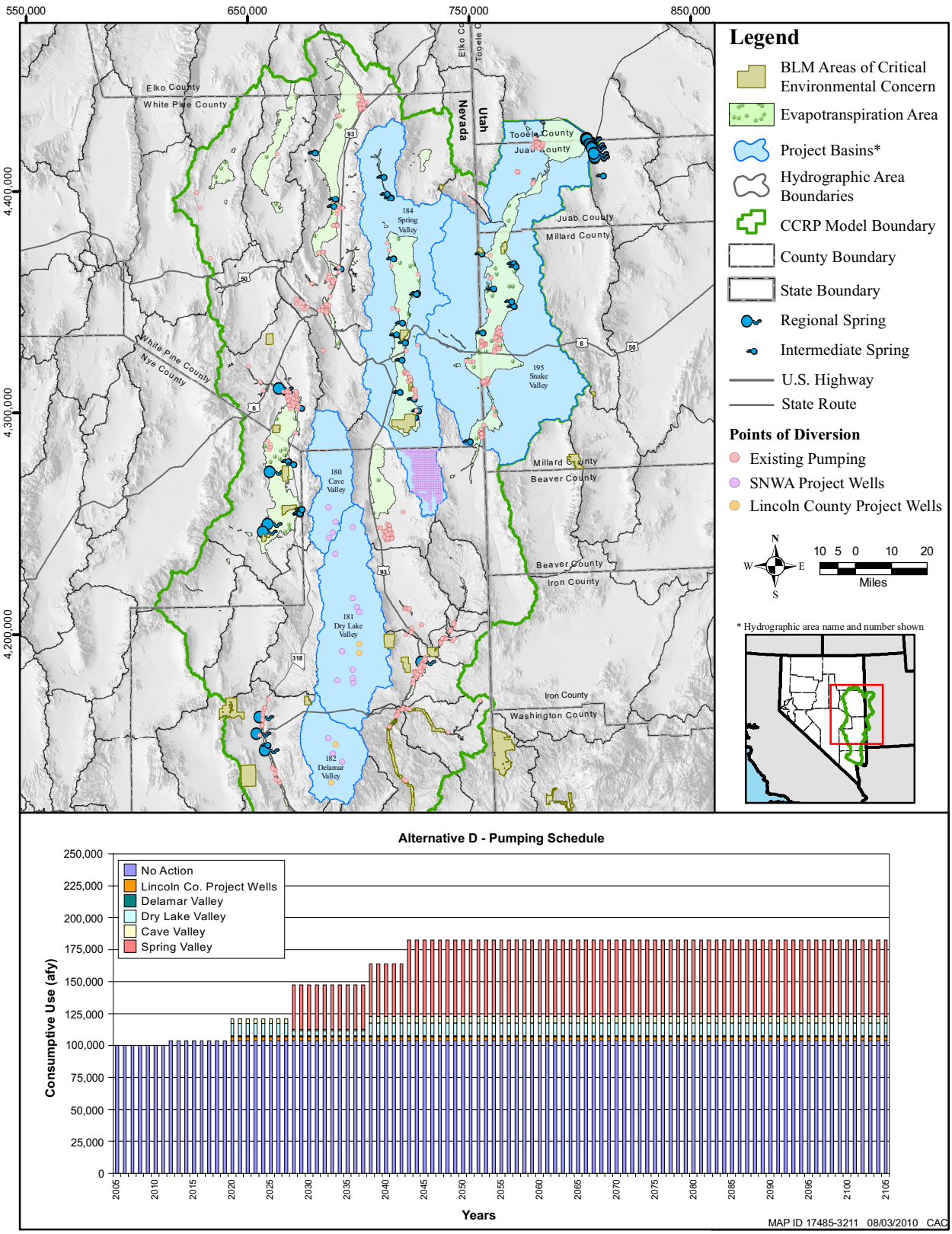


Figure 3-7
Pumping Distribution for Alternative D - LCCRDA Corridor

3.2.6 Alternative E - Delamar, Dry Lake, Cave, and Spring Valleys

Alternative E - Delamar, Dry Lake, Cave, and Spring valleys scenario assumes pumping in Delamar, Dry Lake, Cave, and Spring valleys and not in Snake Valley. This schedule represents a scenario in which a right-of-way is granted in Delamar, Dry Lake, Cave, and Spring valleys, but not in Snake Valley. The volumes and locations of pumping for each valley are the same as those defined for the Distributed Pumping - Reduced Volumes (Alternative A) alternative except for Snake Valley and include:

- Delamar Valley - 2,493 afy
- Dry Lake Valley - 11,584 afy
- Cave Valley - 4,678 afy
- Spring Valley - 60,000 afy
- Snake Valley - 0 afy

The simulated well distribution and water-use schedule for this scenario is presented in (Figure 3-8).

3.3 NEPA Cumulative Pumping Scenarios

The NEPA cumulative pumping scenarios couple a given project alternative (Proposed Action and Alternatives A through E) with future pumping based on NEPA requirements. NEPA cumulative pumping scenario are as follows:

- No Action and NEPA Cumulative
- No Action, Proposed Action and NEPA Cumulative
- No Action, Alternative A and NEPA Cumulative
- No Action, Alternative B and NEPA Cumulative
- No Action, Alternative C and NEPA Cumulative
- No Action, Alternative D and NEPA Cumulative
- No Action, Alternative E and NEPA Cumulative

For this analysis, the groundwater consumptive uses represented in the cumulative pumping scenarios for NEPA analyses include;

- Existing baseline conditions (No Action pumping)
- Proposed Action or Alternative pumping distributions
- Reasonably foreseeable, future uses (non-Federal)
- Reasonably foreseeable, future uses requiring Federal action

Reasonably foreseeable, future uses include existing permitted groundwater rights that are likely to be developed because they are associated with private lands or a previously authorized project (e.g., irrigation and mining water rights), and/or a project proposal has been developed and submitted to a regulatory agency (e.g., industrial water rights for power plants). These uses are listed in Table 3-1, which does not include past and present uses that are already incorporated as part of the No Action scenario. All of the listed rights are existing permitted groundwater rights, unless otherwise

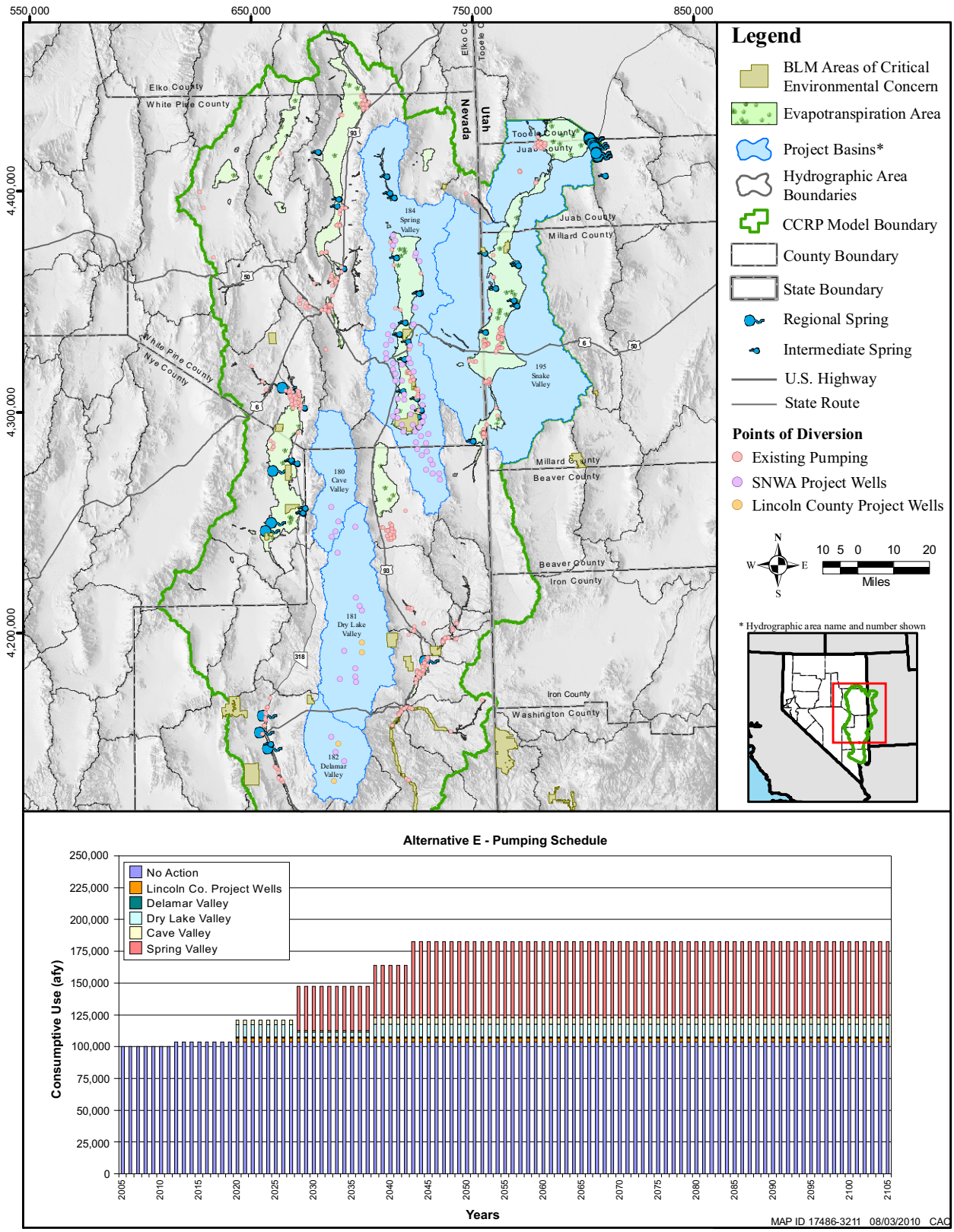


Figure 3-8
Pumping Distribution for Alternative E - Delamar, Dry Lake, Cave, and Spring Valleys

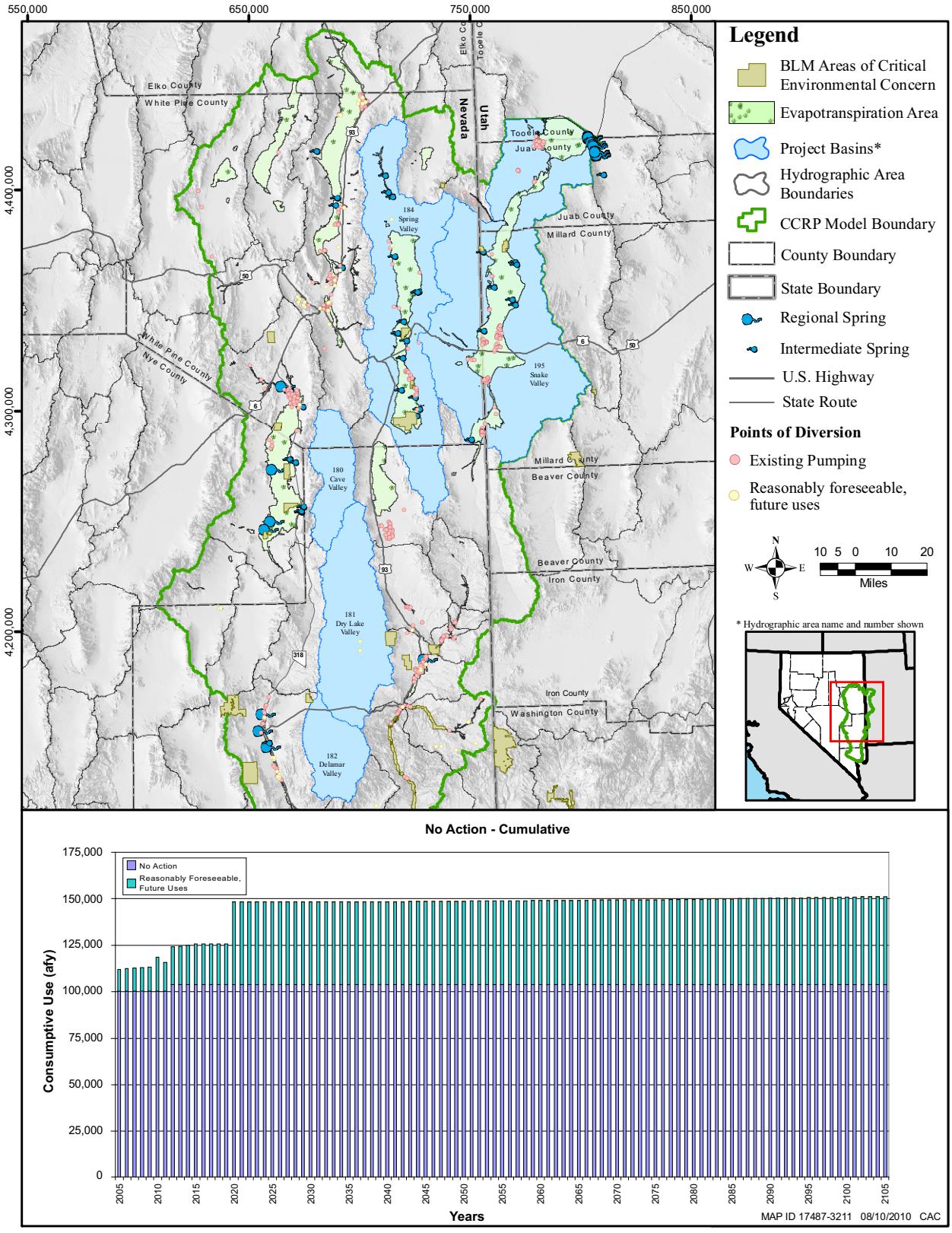


Figure 3-9
No Action - Cumulative Pumping Distribution

noted as pending applications. The simulated well distributions and water-use schedules for these scenarios are presented in Figures 3-9 through 3-15.

3.4 Cessation of Pumping Scenario

The purpose of the cessation of pumping scenario is to estimate how the flow system would respond when and if pumping under the Distributed Pumping - Reduced Quantities scenario (Alternative A) were stopped after 75 years of full production. This scenario is based on the well distribution depicted in Figure 3-3. The water-use schedule shown in Figure 3-3 is applied until the year 2125. All Alternative A pumping is then shut off to allow the flow system to recover until the end of year 2249. In this cessation of pumping scenario, the No Action pumping was continued as scheduled until the end of the simulation period.