

### 3.4 VEGETATION

#### 3.4.1 Affected Environment

The assessment area supports vegetation typical of the Great Basin region. The extremes of climate, elevation, exposure and soil type all combine to produce a diverse growth environment for a wide variety of plants. The main zonal plant communities in northern Nevada are playa lakebed (unvegetated), desert sink scrub, saltbush scrub, sagebrush scrub, pinyon-juniper woodland, subalpine woodland, and montane coniferous forest. Azonal communities include broadleaf riparian scrub, woodland and forest, dune, and meadow. Plant communities have been subdivided into associations or alliances. A system is being developed at this level throughout the United States. Eventually the extent of each association can be analyzed for rarity. The Nevada Natural Heritage Program maintains a complete list of alliances and associations for the State of Nevada. Also, the willow riparian woodland has been lumped. The following communities and associations have been mapped within the assessment area.

**TABLE 3.4-1  
PLANT COMMUNITY ACREAGE FOUND WITHIN THE ASSESSMENT AREA**

Plant Community/ Association		Acreage	% of Total Vegetation	Acreage for the Resource District*
<b>A</b>	<b>Desert sink scrub</b>	<b>278,438</b>	<b>8.27</b>	
1	Iodine bush	6,768	0.02	16,242
2	Alkali sacaton	1,157	0.03	11,033
3	Black greasewood	225,701	6.86	512,317
4	Greasewood-sagebrush	44,812	1.36	66,345
A/B	Desert sink-saltbush transition			
1	Shadscale-black greasewood	153,076	4.65	687,424
<b>B</b>	<b>Saltbush scrub</b>	<b>1,473,159</b>	<b>44.79</b>	
1	Shadscale	378	0.01	12,363
2	Shadscale-Bailey greasewood	353,132	10.76	671,735
3	Shadscale-Cooper wolfberry	3,549	0.1	4,746
	Shadscale-black greasewood	153,076	10.7	687,424
4	Shadscale-budscale	957,063	29.1	2,120,558
5	Sickle saltbush	653	0.01	3,734
6	Four-wing saltbush	100,030	3.04	165,159
7	Horsebrush-4-wing saltbush	5,944	0.18	5,944
8	Torrey's quailbush	32,651	0.99	60,167

Plant Community/ Association		Acreage	% of Total Vegetation	Acreage for the Resource District*
9	Spiny hop sage	5,787	0.17	7,598
10	Winterfat	13,972	0.42	39,304
<b>C</b>	<b>Sagebrush scrub</b>	<b>966,051</b>	<b>29.35</b>	
1	Threetip sagebrush	387	0.01	2,622
2	Black sagebrush	41,102	1.25	158,222
3	Wyoming sagebrush	583,814	17.75	2,652,693
4	Mountain sagebrush	51,692	1.57	789,498
5	Big sagebrush	86,424	2.62	285,483
	Basin sagebrush	79,054	2.4	143,107
6	Lahontan sagebrush	181,299	5.51	844,942
7	Low gray sagebrush	21,333	0.64	587,223
<b>D</b>	<b>Freshwater marsh</b>			
1	Emergent aquatic-cattails	766	0.02	498
<b>E</b>	<b>Riparian scrub-forest</b>	<b>53,572</b>	<b>1.62</b>	
1	Willow	50,379	1.53	88,882
2	Silver buffaloberry	3,193	0.09	4,038
<b>F</b>	<b>Meadow bottomland</b>			
1	Tufted hairgrass	50	Trace	1,074
<b>G</b>	<b>Alkali meadow</b>			
1	Inland saltgrass	8,206	0.25	8,206
<b>H</b>	<b>Pinyon-juniper woodland</b>	<b>76,358</b>	<b>0.69</b>	
1	Pinyon-Utah juniper	11,874	0.36	43,062
2	Utah juniper	10,912	0.33	117,400

\*Total vegetation cover for the Winnemucca resource district.

**TABLE 3.4-2  
OTHER LAND FORMS**

Other Land Forms	Acreage	Percent	Acreage for the Resource District*
Playa lakebed	148,888	4.52%	659,437
Open water	13,346	0.4%	22,673

\*Total vegetation cover for the Winnemucca resource district.

The assessment area has been divided into numbered hydrographic regions. Hydrographic Region 1 is located in the northwestern portion of the resource area. It contains one PVA, and 15 sections of pending leases. The PVA is adjacent to the Sheldon National Wildlife Area. The main drainage is the Craine Creek drainage. The dominant vegetation is sagebrush and shadscale-budsage.

Hydrographic Region 2 is a large region making up the western boundary of the WFO. The region is made up of low valleys and the Granite Range (9,056 feet elevation). The main lease applications are north of Gerlach and in the San Emido Desert. This hydrographic region contains two KGRAs, five PVAs, and three pending lease areas. The dominant vegetation is Wyoming sagebrush, shadscale-budsage, black greasewood, and shadscale with greasewood.

Hydrographic Region 3 is a small region in the northeastern corner of the resource area. It is east of the Humboldt Toiyabe National Forest and drains the eastern slopes of the Santa Rosa Range. This drainage system is dominated by Wyoming sagebrush and low gray sagebrush. This region does not contain leases.

Hydrographic Region 4 is a large drainage making up the east-central portion of the resource area. It contains three PVAs and scattered lease sections near Edna Mountain, the California Emigrant Trail, and near Little Poverty Mountain. The region is drained by the Humboldt River. The dominant vegetation is Wyoming sagebrush, mountain sagebrush, low gray sagebrush, willow riparian forest, and greasewood scrub. Geothermal exploration would take place in saltbush and sagebrush scrub.

Hydrographic Region 5 is a moderate sized drainage in the southwestern portion of the resource area surrounded by mountains. The southern portion contains pending leases within a KRVA and lease applications near Cinnabar Peak. The dominant vegetation is shadscale-greasewood, shadscale-budsage, Wyoming sagebrush, and low gray sagebrush. The KRGA is located within saltbush scrub.

Hydrographic Region 6 is dominated by Pyramid Lake and land ownership is primarily Native American. The eastern portion is in the southwestern corner of the assessment area. Several lease sites are located east of Russell Peak. Much of Hydrographic Regions 5 and 6 are in a large PVA. The dominant vegetation is shadscale-budsage, and Lahontan sagebrush. The pending leases are located within saltbush scrub.

Hydrographic Region 10 is a large basin containing the Dixie Valley Drainage. It contains three PVAs, two KRVA's, and several scattered pending lease sites. The dominant vegetation is shadscale-greasewood association. The geothermal exploration would take place in saltbush scrub.

**TABLE 3.4-3  
PLANT ASSOCIATION ACREAGE BY HYDROGRAPHIC REGION**

<b>Plant Community/ Association</b>	<b>HR-1</b>	<b>HR-2</b>	<b>HR-3</b>	<b>HR-4</b>	<b>HR-5</b>	<b>HR-6</b>	<b>HR-10</b>
<b>Desert sink scrub</b>							
Iodine bush	29	1,832		7,091	1,736		
Alkali sacaton	204			10,828			
Black greasewood	10,434	290,142		167,753	4,310	11,193	10,998
Greasewood-sagebrush	7,111	33,822		24,539			
Desert sink-saltbush transition							
Shadscale-black greasewood	2,612	210,579		115,476	4,008		
<b>Saltbush scrub</b>							
Shadscale		12,127		235			
Shadscale-Bailey greasewood	155			108,867	250,470	32,516	
Shadscale-boxthorn				3,737			
Shadscale-black greasewood	7,804	478,565				3,001	
Shadscale-budscale	52,890	554,796		707,891	230,102	61,373	
Sickle saltbush		1,522	197	797	1,217		
Four-wing saltbush		67,983		25,507	44,769	15,454	
Horsebrush-4-wing saltbush						5,945	
New Mexico (Torrey) saltbush	3,382	15,397		4,035			
Spiny hop sage		6,827		770			
Winterfat		15,385	90	19,186	4,643		
<b>Sagebrush scrub</b>							
Threetip sagebrush	2,531						
Black sagebrush	2,320			86,546			

<b>Plant Community/ Association</b>	<b>HR-1</b>	<b>HR-2</b>	<b>HR-3</b>	<b>HR-4</b>	<b>HR-5</b>	<b>HR-6</b>	<b>HR-10</b>
Wyoming sagebrush	11,281	939,441	152,929	1,010,246	223,269	25,971	
Mountain sagebrush	82,889	397,544	1,340	199,964	25,912	5,430	
Big sagebrush	24,656	194,318	490	82,868		11,938	743
Basin sagebrush	7,408	478,117	327	84,827			
Lahontan sagebrush	38,379	550,731		71,962	147,127	36,643	
Low gray sagebrush	21,308	320,437	55,717	176,710	1,381		
<b>Fresh water marsh</b>							
Emergent aquatic-cattails					498		
<b>Riparian scrub-forest</b>							
Willow		20,995	143	66,724			
Silver buffaloberry		3,950					
<b>Meadow bottomland</b>							
Tufted hairgrass	222	852					
<b>Alkali meadow</b>							
Inland saltgrass		8206					
<b>Pinyon-juniper woodland</b>							
Pinyon-Utah juniper							
Utah juniper		109,119		8,286			

See Figure 2-1 for hydrographic unit number location

### **3.4.1.1 Zonal Plant Communities**

**Barren Playas.** Only 4.5 percent of the PVAs are composed of lakebeds. Playas are generally devoid of vegetation due to high concentrations of salts associated with standing water that slowly evaporates after rains. Sandy islands with vegetation occasionally form on the lakebeds.

**Desert Sink Scrub.** Approximately 8 percent of the PVAs are composed of desert sink scrub plant community. It occurs in valley bottoms throughout the assessment area. Black greasewood is an indicator of a high water table and is closely associated with alkali meadows and dry bottomland. This vegetation type mainly produces less palatable shrubs and few grasses. Annual precipitation is 3-8 inches. Plants growing here are: big sagebrush, shadscale (*Atriplex confertiflora*), gray molly kochia, alkali rabbitbrush (*Chrysothamnus parryi*), seepweed, alkali sacaton (*Sporobolus airoides*), inland saltgrass (*Distichlis spicata*), Indian ricegrass (*Oryzopsis hymenoides*), bottlebrush squirreltail (*Elymus elymoides*), and bluegrass. This plant community has been mapped with three associations:

*Allertolfea occidentalis* (iodine bush) association

*Sarcobatus vermiculatus* (black greasewood) association

*Sarcobatus vermiculatus* -*Artemisia tridentata* (greasewood-sagebrush) association

**Saltbush Scrub.** This is the most dominant vegetation type in the assessment area. It covers approximately 44 percent of the PVAs. The ecological sites associated with this type occur mainly in the valleys on alluvial fans and up into the hills in the southern portion of the assessment area. Precipitation ranges from 3-8 inches. In these areas, the vegetation is dominated by shadscale and bud sagebrush (*Artemisia spinescens*), Bailey greasewood (*Sarcobatus baileyi*), Douglas rabbitbrush (*Chrysothamnus douglasii*), four-wing saltbush (*Atriplex canescens*), or winterfat (*Krashenninikovia lanata*). Perennial grasses include Indian ricegrass, bottlebrush squirreltail, needle and thread (*Stipa* sp.), sand dropseed (*Sporobolus cryptandrus*), and desert needlegrass (*Stipa speciosa*). The saltbush community has been divided into ten associations, they are:

*Atriplex gardneri* var. *falcata* (sickle saltbush) association

*Atriplex canescens* (four-wing saltbush) association

*Tetradymia* sp.-*Atriplex canescens* (Horsebrush-4-wing saltbush) association

*Atriplex confertifolia*-*Artemisia spinosa* (shadscale-budsage) association

*Atriplex confertifolia*-*Sarcobatus vermiculatus* (shadscale-greasewood) association

*Atriplex confertifolia*-*Lycium cooperi* (shadscale-wolfberry) association

*Atriplex confertifolia*-association

*Atriplex torreyi* (Torrey's quailbush) association

*Grayia spinescens* (spiny hopsage) association

*Krashenninikovia lanata* (winterfat) association

**Sagebrush Scrub Plant Community.** The sagebrush community makes up 29 percent of the vegetation within the PVAs. Sagebrush scrub is the second most common vegetation type in the PVAs. Sagebrush is not as tolerant of saline soils as saltbush. Big sagebrush occurs mainly in the mountains and hills and is less common in the southern half of the planning area, which is

dryer and warmer. This community is dominated by four subspecies of Great Basin sagebrush (*Artemisia tridentata* ssp. *tridentata*, ssp. *Wyomingensis*, ssp. *vaseyana* and ssp. *lahontensis*). The height of this scrub is between 1 and 6.5 feet tall and total cover can range from 10 percent on degraded sites to nearly 60 percent. More commonly, shrub cover is about 25 percent of the ground while forbs and grasses cover another 25 percent. Another common sagebrush in the assessment area is the much lower black sagebrush (*Artemisia nova*), which is normally common on, carbonate hillsides.

While sagebrush often form pure stands, more commonly it is associated with many other shrub species primarily desert peach (*Prunus andersoni*), and green Ephedra (*Ephedra viridis*). Rubber and sticky leaf rabbitbrush (*Chrysothamnus nauseosus* and *C. viscidiflorus*) are common early successional species following fires. Spiny hopsage (*Grayia spinosa*) frequently occurs at the lower elevations and is part of the transition at lower elevations with the saltbush scrub community. Common grasses in the sagebrush scrub include squirreltail grass (*Elymus elymoides*), great basin wildrye (*Elymus cinereus*), Sandburg bluegrass (*Poa secunda*), muttongrass and beardless wheatgrass, bluebunch wheatgrass (*Pseudoroegneria spicata*), Thurber needlegrass (*Achnatherum thurberianum*), and needle and thread grass (*Stipa comata*). Cheat grass (*Bromus tectorum*) is a major problem in this community after fires. Eight associations of sagebrush scrub have been mapped, they are:

*Artemisia arbuscula* (low gray sagebrush) association  
*Artemisia tridentata* ssp. *tridentata* (Big sagebrush)  
*Artemisia tridentata* ssp. *vaseyana* (Basin big sagebrush)  
*Artemisia tridentata* ssp. *wyomingensis* (Wyoming sagebrush) association  
*Artemisia tridentata* ssp. *vaseyana* (Mountain sagebrush) association  
*Artemisia tridentata* ssp. *lahontensis* (Lahontan sagebrush) association  
*Artemisia tripartita* (threetip sagebrush) association  
*Artemisia nova* (black sagebrush) association

**Pinyon-Juniper Woodland.** Single-leaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) woodlands visually dominate less than one percent of the PVAs. These woodlands grow in the mountains and are more common at higher elevations. Understory vegetation is sparse and usually includes black sagebrush or big sagebrush. Understory plants also include bitterbrush (*Purshia glandulosa*), green Ephedra (*Ephedra viridis*), desert snowberry (*Symphoricarpos* sp.), Utah serviceberry *Amelanchier utahensis*), mountain mahogany (*Cercocarpus ledifolius*), rabbitbrush (*Chrysothamnus nauseosus*), rubberweed (*Haplopappus nanus*), Indian ricegrass (*Oryzopsis hymenoides*), needlegrasses (*Stipa*), bottlebrush squirreltail (*Elymus elymoides*), Sandburg bluegrass (*Poa secunda*), and Canby bluegrass (*Poa canbyi*),. Average annual precipitation is above 12 inches.

Pinyon Pine and junipers are most common on hillsides and well-drained soils at moderate elevations. Junipers occur at lower elevations in pure stands, and pinyons can occur in pure stands at the higher elevation limits of this community. Two associations of this community have been mapped, they are:

*Pinus monophylla*-*Juniperus osteosperma* (pinyon pine-Utah juniper) association

*Juniperus osteosperma* (Utah Juniper) association

### 3.4.1.2 Azonal Communities

**Alkali Meadows and Bottomlands.** Less than 1 percent of the PVAs are composed of alkaline meadow. These meadows occur on valley bottoms with high water tables throughout the assessment area. Small meadows are rare in the sagebrush community. Existing meadows have experienced heavy livestock grazing and are now dominated by low palatable plants such as western blue-flag (*Iris missouriensis*) and thistle (*Cirsium* sp.). Meadows have up to 85 percent grass. Annual precipitation is between 3-8 inches. Plants growing here include: inland saltgrass, alkali sacaton, Baltic rush (*Juncus balticus*), basin wildrye (*Elymus cinereus*), black greasewood, rubber rabbitbrush (*Chrysothamnus nauseosus*), and alkali rabbitbrush. Forbs are generally more common than annuals with the most common genera including; locoweed (*Astragalus* sp.), Indian paint brush (*Castilleja*), buckwheat (*Eriogonum*), lupine (*Lupinus*), and beardtongue (*Penstemon*). Alkaline seeps and springs and playa edges are other habitats dominated by saltgrass. The only association is:

Inland saltgrass (*Distichlis spicata*) alkaline meadow

**Riparian Scrub/ Forest.** Willows dominate less than 1 percent of the PVAs. Willows occur as scrub, woodland, or thick forests along streams, springs, and at seeps. Typical riparian vegetation species include: aspen, willow species, wild rose, sedge species, rush species, and Kentucky bluegrass.

Riparian areas within the sagebrush scrub are usually dominated by species of willow (*Salix*). In well-developed riparian areas, gallery forests of Fremont cottonwood (*Populus fremontii*) occur with small thickets of western chokecherry (*Prunus virginiana*) blue elderberry (*Sambucus cerulea*), and buffalo-berry (*Shepardia argentea*). Only two associations of this community have been mapped, they are:

*Salix* (Willow riparian scrub/forest) association

*Shepardia argentea* (silver buffaloberry) association

The lower elevation limits of this community in northern and central Nevada are determined by the presence of saline soils in the valley bottoms. Sagebrush seedlings are not tolerant of saline conditions but sagebrush sometimes descends into the blackbrush scrub along large washes with deep sandy soils.

**Grassland.** Occasionally grassy bottomlands occur in river bottoms. Tufted hairgrass is fairly common in mountain meadows and springs throughout the western United States. It forms grasslands with some sagebrush, and other grasses such as Nevada bluegrass within the resource area. The only non-alkaline meadow or grassland mapped is:

*Deschampsia cespitosa* (tufted hairgrass) association

**Freshwater Marsh.** Emergent water plants dominate along the edges of manmade ponds and drainage ditches. Such areas are usually dominated by cattails (*Typha* sp.). Cattails can also occur in natural environments along slow moving streams. Cattle often heavily disturb Marshes because cattle spend a large portion of their time near water. The only mapped marsh association is:

Cattail Freshwater marsh

According to Table 3.4.1, the most common plant communities within the resource area are Wyoming sagebrush (24 percent), Shadscale-budsage (19 percent), mountain sagebrush (7 percent), shadscale-bailey greasewood (6 percent), and black greasewood (4.6 percent). The least common are alkali sacaton (0.1 percent), cattail trace, tufted hairgrass trace, shadscale (0.1 percent), horsebrush-four-wing saltbush (0.05 percent), shadscale-boxthorn (0.04 percent), sickle saltbush (0.03 percent) silver buffaloberry (0.03 percent), and willow (0.8 percent). Impacts to these uncommon plant communities may be significant and should be minimized.

### **3.4.2 Environmental Impacts**

#### **3.4.2.1 Proposed Action**

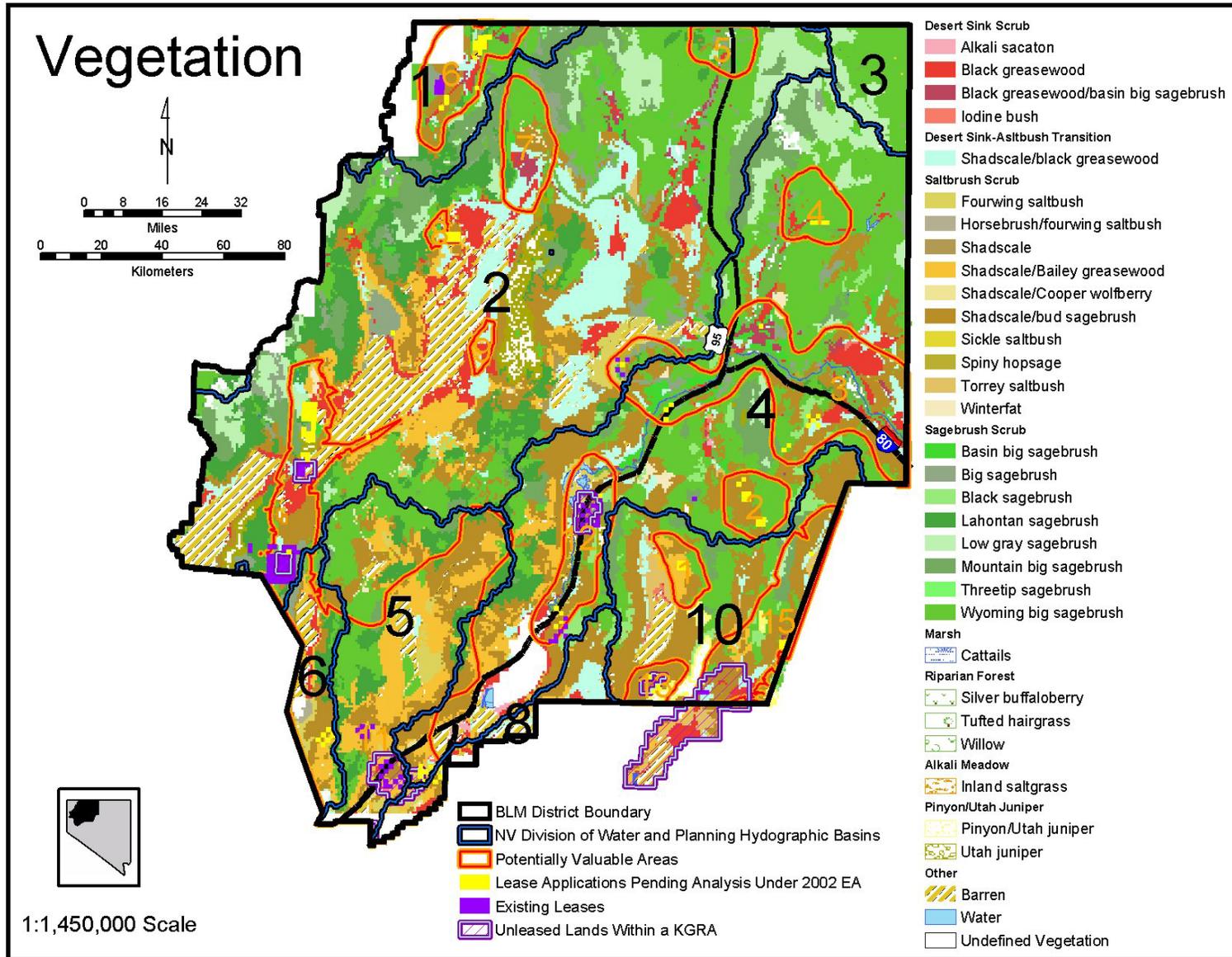
**Direct Impacts** – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

**Indirect Impacts** – When considering the “reasonably foreseeable development scenario,” there could be impacts to vegetation resources in the short term due to operational activity and construction. Long-term impacts to vegetation resources could occur due to upgrading of roads and the change in type of vegetation in areas that are reclaimed. Adverse impacts to vegetation from the various phases of geothermal development include crushing or removal of vegetation and changing vegetation composition. Changes in vegetation due to construction could result in the introduction of weedy annual species and pioneering shrub species that would persist with continued disturbance and lack of maintenance.

The following are the potential environmental impacts on vegetation when analyzing the “reasonably foreseeable development scenario.”

**Exploration.** The majority of the geothermal exploration is likely to occur in vegetation zones containing Saltbush Shrub, Desert Sink Scrub, Sagebrush Scrub, Alkali Meadows and Bottoms, and possibly Playas; it is unlikely that developments would occur in Pinion-Juniper woodlands. Impacts on vegetation during exploration phases are expected to be minor, short term, and localized to a small area based on the “reasonably foreseeable development scenario.”

FIGURE 3.4-1  
 ASSESSMENT AREA VEGETATION



**Development.** The greatest environmental impact on vegetation is expected to occur during the development phase. During this phase development drilling would occur, a mainline road could be constructed, pipelines and access roads would be built, and a power plant and electrical transmission lines constructed. Each of the activities would disturb and remove the vegetation in the affected areas. Damage to vegetation from pipeline corridors is not as severe as from drilling pads. Impacts on vegetation during the development phase would be considered minor and localized to small, however, a somewhat larger area. Seeding disturbed areas would reduce adverse impacts to vegetation.

**Production.** Vegetation disturbance is expected to be minimal during the production phase. Most, if not all vegetation disturbances would have already occurred. During this phase, which could last up to 40 years, some vegetation in previously disturbed areas could be regenerated and allowed to flourish.

**Close-out.** Once production terminates and the decision is made to cease operations, the commercial entity would be required to remove all production and support facilities, pipe lines, electrical transmission lines, and return all disturbed areas to their original conditions (as much as possible). As set out in [Appendix B](#), disturbed areas would be reseeded with approved pure live seed mixes. When properly closed out, the vegetation in the previously disturbed areas should resemble that of the surrounding area.

#### **3.4.2.2 No Action Alternative**

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.