SECTION 3.2

Biological Resources

3.2 Biological Resources

3.2.1 Introduction and Summary

This section presents the environmental setting and potential impacts to biological resources associated with the Proposed Project and Alternatives. It also presents mitigation measures for potential impacts to biological resources. Each discussion is arranged, according to four geographic subregions, and addresses biological resources associated with habitat types in each geographic subregion: LCR, IID water service area and AAC, Salton Sea, and SDCWA service area. Table 3.2-1 summarizes the impacts to biological resources that could result from implementation of the Proposed Project or Alternatives.

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
Lower Colorado River				
BR–1: Reduced flow levels in the LCR could reduce the acreage of cottonwood-willow communities: Less than significant impact with implementation of biological conservation measures.	Continuation of Baseline conditions.	**A2-BR–1: Reduced flow levels in the LCR could reduce the acreage of cottonwood-willow communities:** Less than significant impact with implementation of biological conservation measures.	**A3-BR–1: Reduced flow levels in the LCR could reduce the acreage of cottonwood-willow communities:** Less than significant impact.	Same as BR-1.
BR–2: Reduced flow levels in the LCR could reduce the acreage of honey mesquite bosque communities: Less than significant impact.	Continuation of Baseline conditions.	**A2-BR–2: Reduced flow levels in the LCR could reduce the acreage of honey mesquite bosque communities:** Less than significant impact.	**A3-BR–2: Reduced flow levels in the LCR could reduce the acreage of honey mesquite bosque communities:** Less than significant impact.	Same as BR-2.
BR–3: Reduced flow levels in the LCR could reduce the acreage of screwbean mesquite bosque communities: Less than significant impact.	Continuation of Baseline conditions.	**A2-BR–3: Reduced flow levels in the LCR could reduce the acreage of screwbean mesquite bosque communities:** Less than significant impact.	**A3-BR–3: Reduced flow levels in the LCR could reduce the acreage of screwbean mesquite bosque communities:** Less than significant impact.	Same as BR-3.

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
BR–4: Reduced flow levels in the LCR could reduce the acreage of backwater habitat: Less than significant with implementation of biological conservation measures.	Continuation of Baseline conditions.	**A2-BR–4: Reduced flow levels in the LCR could reduce the acreage of backwater habitat:** Less than significant with implementation of biological conservation measures.	**A3-BR–4: Reduced flow levels in the LCR could reduce the acreage of backwater habitat:** Less than significant with implementation of biological conservation measures.	Same as BR-4.
BR–5: Reduced acreage of cottonwood-willow vegetation could affect special-status species: Less than significant with implementation of biological conservation measures.	Continuation of Baseline conditions.	**A2-BR–5: Reduced acreage of cottonwood-willow vegetation could affect special-status species:** Less than significant with implementation of biological conservation measures.	**A3-BR–5: Reduced acreage of cottonwood-willow vegetation could affect special-status species:** Less than significant with implementation of biological conservation measures.	Same as BR-5.
BR–6: Reduced acreage of open water in backwaters could affect special-status wildlife species: Less than significant with implementation of biological conservation measures.	Continuation of Baseline conditions.	**A2-BR–6: Reduced acreage of open water in backwaters could affect special-status wildlife species:** Less than significant with implementation of biological conservation measures.	**A3-BR–6: Reduced acreage of open water in backwaters could affect special-status wildlife species:** Less than significant with implementation of biological conservation measures.	Same as BR-6.
BR–7: Reduced acreage of emergent vegetation in backwaters could affect special-status species: Less than significant with implementation of biological conservation measures.	Continuation of Baseline conditions.	**A2-BR–7: Reduced Acreage of Emergent Vegetation in Backwaters Could Affect Special-Status Species:** Less than significant with implementation of biological conservation measures.	**A3-BR–7: Reduced Acreage of Emergent Vegetation in Backwaters Could Affect Special-Status Species:** Less than significant with implementation of biological conservation measures.	Same as BR-7

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
BR – 8: Reduced Acreage of Aquatic Habitat Could Affect Special-Status Fish Species: Less than significant with implementation of biological conservation measures.	Continuation of Baseline conditions.	**A2-BR – 8: Reduced Acreage of Aquatic Habitat Could Affect Special-Status Fish Species:** Less than significant with implementation of biological conservation measures.	**A3-BR – 8: Reduced Acreage of Aquatic Habitat Could Affect Special-Status Fish Species:** Less than significant with implementation of biological conservation measures.	Same as BR-8
Impact BR – 9: Reduced Diversions from the LCR Could Affect Special-Status Fish Species. Beneficial impact.	Continuation of Baseline conditions.	**Impact A2-BR – 9: Reduced Diversions from the LCR Could Affect Special-Status Fish Species.** Less than significant.	**Impact A3-BR – 9: Reduced Diversions from the LCR Could Affect Special-Status Fish Species.** Less than significant.	Same as BR-9
IID Water Service Area and AAC				
BR – 10: Reduced Flows in the Drains Could Alter Drain Vegetation and Affect Wildlife: Less than significant.	Continuation of Baseline conditions.	**A2-BR – 10: Reduced Flows in the Drains Could Alter Drain Vegetation and Affect Wildlife:** Less than significant.	**A3-BR – 10: Reduced Flows in the Drains Could Alter Drain Vegetation and Affect Wildlife:** Less than significant.	**A4-BR – 1: Reduced Flows in the Drains Could Alter Drain Vegetation and Affect Wildlife:** Less than significant.
BR – 11: Increased Salinity in the Drains Could Alter Drain Vegetation and Affect Wildlife: Less than significant with implementation of the HCP-IID component.	Continuation of Baseline conditions.	**A2-BR – 11: Increased Salinity in the Drains Could Alter Drain Vegetation and Affect Wildlife:** Less than significant with implementation of the HCP-IID component.	**A3-BR – 11: Increased Salinity in the Drains Could Alter Drain Vegetation and Affect Wildlife:** Less than significant with implementation of the HCP-IID component.	**A4-BR – 2: No Change in Salinity in the Drains Would Occur:** No impact.
BR – 12: Changes in Water Quality in Drains Could Affect Wildlife: Less than significant with implementation of the HCP-IID component.	Continuation of Baseline conditions.	**A2-BR – 12: Changes in Water Quality in Drains Could Affect Wildlife:** Less than significant with implementation of the HCP-IID component.	**A3-BR – 12: Changes in Water Quality in Drains Could Affect Wildlife:** Less than significant with implementation of the HCP-IID component.	**A4-BR – 3: No Adverse Effects to Fish or Wildlife in the Drains and Rivers Would Occur from Water Quality Changes:** No impact.

Table of Contents Continue

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
BR – 13: Reduced Flows in the Rivers Could Alter Vegetation and Affect Wildlife: Less than significant.	Continuation of Baseline conditions.	**A2-BR – 13: Reduced Flows in the Rivers Could Alter Vegetation and Affect Wildlife:** Less than significant.	**A3-BR – 13: Reduced Flows in the Rivers Could Alter Vegetation and Affect Wildlife:** Less than significant.	**A4-BR – 4: Reduced Flows in the Rivers Could Alter Vegetation and Affect Wildlife:** Less than significant.
BR – 14: Installation of Seepage Recovery Systems Could Remove Tamarisk Scrub and Affect Associated Wildlife: Less than significant. No impact if only on-farm or fallowing methods are used.	Continuation of Baseline conditions.	Not applicable.	**A3-BR – 14: Installation of Seepage Recovery Systems Could Remove Tamarisk Scrub and Affect Associated Wildlife:** Less than significant. No impact if only on-farm or fallowing methods are used.	Not applicable.
BR – 15: Reservoir Construction Could Remove Tamarisk Scrub and Affect Associated Wildlife: Less than significant.	Continuation of Baseline conditions.	Not applicable.	**A3-BR – 15: Reservoir Construction Could Remove Tamarisk Scrub and Affect Associated Wildlife:** Less than significant.	Not applicable.
BR – 16: Installation of On-farm Irrigation System Measures Could Affect Wildlife Using Agricultural Fields: Less than significant.	Continuation of Baseline conditions.	**A2-BR – 14: Installation of On-farm Irrigation System Measures Could Affect Wildlife Using Agricultural Fields:** Less than significant.	**A3-BR – 16: Installation of On-farm Irrigation System Measures Could Affect Wildlife Using Agricultural Fields:** Less than significant.	Not applicable.
BR – 17: Operation of On-Farm Water Conservation Measures Could Affect Wildlife Using Agricultural Fields: No impact.	Continuation of Baseline conditions.	**A2-BR – 15: Operation of On-Farm Water Conservation Measures Could Affect Wildlife Using Agricultural Fields:** No impact.	**A3-BR – 17: Operation of On-Farm Water Conservation Measures Could Affect Wildlife Using Agricultural Fields:** No impact.	Not applicable.

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
BR – 18: Installation of System-Based Water Conservation Could Reduce the Acreage of Agricultural Fields and Affect Associated Wildlife: Less than significant.	Continuation of Baseline conditions.	Not applicable.	**A3-BR – 18: Installation of System-Based Water Conservation Could Reduce the Acreage of Agricultural Fields and Affect Associated Wildlife:** Less than significant.	Not applicable.
BR – 19: Fallowing Could Reduce the Acreage of Agricultural Fields and Affect Associated Wildlife: Less than significant. No impact if only on-farm or system-based methods are used.	Continuation of Baseline conditions.	Not applicable.	**A3-BR – 19: Fallowing Could Reduce the Acreage of Agricultural Fields and Affect Associated Wildlife:** Less than significant. No impact if only on-farm or system-based methods are used.	**A4-BR – 5: Fallowing Could Reduce the Acreage of Agricultural Fields and Affect Associated Wildlife:** Less than significant.
BR – 20: Fallowing Would Not Change the Amount of Desert Habitat: No impact.	Continuation of Baseline conditions.	Not applicable.	**A3-BR – 20: Fallowing Would Not Change the Amount of Desert Habitat:** No impact.	**A4-BR – 6: Fallowing Would Not Change the Amount of Desert Habitat:** No impact.
BR – 21: Reduced Flows in the Drain Could Affect Fish and Aquatic Habitat: Less than significant.	Continuation of Baseline conditions.	**A2-BR – 16: Reduced Flows in the Drain Could Affect Fish and Aquatic Habitat:** Less than significant.	**A3-BR – 21: Reduced Flows in the Drain Could Affect Fish and Aquatic Habitat:** Less than significant.	**A4-BR – 7: Reduced Flows in the Drain Could Affect Fish and Aquatic Habitat:** Less than significant.
BR – 22: Water Quality Changes in the Drains and Rivers Could Affect Fish and Aquatic Habitat: Less than significant.	Continuation of Baseline conditions.	**A2-BR – 17: Water Quality Changes in the Drains and Rivers Could Affect Fish and Aquatic Habitat:** Less than significant.	**A3-BR – 22: Water Quality Changes in the Drains and Rivers Could Affect Fish and Aquatic Habitat:** Less than significant.	No impact.

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
BR – 23: Reduced Flows in the Rivers Could Affect Fish and Aquatic Habitat: Less than significant.	Continuation of Baseline conditions.	**A2-BR – 18: Reduced Flows in the Rivers Could Affect Fish and Aquatic Habitat:** Less than significant.	**A3-BR – 23: Reduced Flows in the Rivers Could Affect Fish and Aquatic Habitat:** Less than significant.	**A4-BR – 8: Reduced Flows in the Rivers Could Affect Fish and Aquatic Habitat:** Less than significant.
BR – 24: Reduced Flows in the Drains Could Affect Desert Pupfish: Less than significant with implementation of the HCP-IID component.	Continuation of Baseline conditions.	**A2-BR – 19: Reduced Flows in the Drains Could Affect Desert Pupfish:** Less than significant with implementation of the HCP-IID component.	**A3-BR – 24: Reduced Flows in the Drains Could Affect Desert Pupfish:** Less than significant with implementation of the HCP-IID component.	**A4-BR – 9: Reduced Flows in the Drains Could Affect Desert Pupfish:** Less than significant with implementation of the HCP-IID component.
BR – 25: Construction of System-Based Measures Could Affect Razorback Suckers: Less than significant with implementation of the HCP-IID component.	Continuation of Baseline conditions.	Not applicable.	**A3-BR – 25: Construction of System-Based Measures Could Affect Razorback Suckers:** Less than significant with implementation of the HCP-IID component.	Not applicable.
BR – 26: Water Quality Changes in the Drains Could Affect Special-Status Species: Less than significant with implementation of the HCP-IID component.	Continuation of Baseline conditions.	**A2-BR – 20: Water Quality Changes in the Drains Could Affect Special-Status Species:** Less than significant with implementation of the HCP-IID component.	**A3-BR – 26: Water Quality Changes in the Drains Could Affect Special-Status Species:** Less than significant with implementation of the HCP-IID component.	No impact.
BR – 27: Changes in Drain Habitat Could Affect Special-Status Species: Less than significant with implementation of the HCP-IID component.	Continuation of Baseline conditions.	**A2-BR – 21: Changes in Drain Habitat Could Affect Special-Status Species:** Less than significant with implementation of the HCP-IID component.	**A3-BR – 27: Changes in Drain Habitat Could Affect Special-Status Species:** Less than significant with implementation of the HCP-IID component.	**A4-BR – 10: Changes in Drain Habitat Could Affect Special-Status Species:** Less than significant.

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
BR – 28: Changes in the Tamarisk Scrub Habitat Could Affect Special-Status Species: Less than significant.	Continuation of Baseline conditions.	**A2-BR – 22: Changes in the Tamarisk Scrub Habitat Could Affect Special-Status Species:** No impact.	**A3-BR – 28: Changes in the Tamarisk Scrub Habitat Could Affect Special-Status Species:** Less than significant.	**A4-BR – 11: Changes in the Tamarisk Scrub Habitat Could Affect Special-Status Species:** No impact.
BR – 29: Water Conservation Practices Could Affect Special-Status Species Associated with Agricultural Fields: Less than significant.	Continuation of Baseline conditions.	**A2-BR – 23: Water Conservation Practices Could Affect Special-Status Species Associated with Agricultural Fields:** Less than significant.	**A3-BR – 29: Water Conservation Practices Could Affect Special-Status Species Associated with Agricultural Fields:** Less than significant.	**A4-BR – 12: Water Conservation Practices Could Affect Special-Status Species Associated with Agricultural Fields:** Less than significant.
BR – 30: Water Conservation Practices Could Affect Special-Status Species Associated with Desert Habitat: Less than significant.	Continuation of Baseline conditions.	Not applicable.	**A3-BR – 30: Water Conservation Practices Could Affect Special-Status Species Associated with Desert Habitat:** Less than significant.	Not applicable.
BR – 31: Water Conservation Practices Could Affect Burrowing Owls: Less than significant.	Continuation of Baseline conditions.	**A2-BR – 24: Water Conservation Practices Could Affect Burrowing Owls:** Less than significant.	**A3-BR – 31: Water Conservation Practices Could Affect Burrowing Owls:** Less than significant.	**A4-BR – 13: Water Conservation Practices Could Affect Burrowing Owls:** Less than significant.
HCP-IID-BR – 32: Creation of Managed Marsh Habitat Would Benefit Wildlife Associated with Drain Habitat: Beneficial impact.	Continuation of Baseline conditions.	**Same as HCP-IID-BR-32.**	**Same as HCP-IID-BR-32.**	**Same as HCP-IID-BR-32.**
HCP-IID-BR – 33: Creation of Managed Marsh Could Decrease Agricultural Field Habitat: No impact.	Continuation of Baseline conditions.	**Same as HCP-IID-BR-33.**	**Same as HCP-IID-BR-33.**	**Same as HCP-IID-BR-33.**

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
HCP-IID-BR – 34: Creation of Native Tree Habitat Could Benefit Wildlife Associated with Tamarisk Scrub: Beneficial impact.	Continuation of Baseline conditions.	**Same as HCP-IID-BR-34.**	**Same as HCP-IID-BR-34.**	**Same as HCP-IID-BR-34.**
HCP-IID-BR- 35: The Desert Habitat Conservation Strategy Would Avoid Impacts to Wildlife Associated with Desert Habitat: No impact.	Continuation of Baseline conditions.	**Same as HCP-IID-BR-35.**	**Same as HCP-IID-BR-35.**	**Same as HCP-IID-BR-35.**
HCP-IID-BR–36: Avoidance Measures Would Benefit Burrowing Owls: Beneficial impact.	Continuation of Baseline conditions.	**Same as HCP-IID-BR-36.**	**Same as HCP-IID-BR-36.**	**Same as HCP-IID-BR-36.**
HCP-IID-BR–37: Avoidance Measures of Burrowing Owl Conservation Strategy Would Benefit Other Special-Status Species: Beneficial impact.	Continuation of Baseline conditions.	**Same as HCP-IID-BR-37.**	**Same as HCP-IID-BR-37.**	**Same as HCP-IID-BR-37.**
HCP-IID-BR–38: Desert Pupfish Conservation Strategy Would Increase Habitat for Pupfish: Beneficial impact.	Continuation of Baseline conditions.	**Same as HCP-IID-BR-38.**	**Same as HCP-IID-BR-38.**	**Same as HCP-IID-BR-38.**

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
HCP-IID-BR–39: Increased Habitat from the Desert Pupfish Conservation Strategy Would Benefit Other Special-Status Species: Beneficial impact.	Continuation of Baseline conditions.	**Same as HCP-IID-BR-39.**	**Same as HCP-IID-BR-39.**	**Same as HCP-IID-BR-39.**
HCP-IID-BR– 40: HCP Measures Would Avoid Impacts to Razorback Suckers: No impact.	Continuation of Baseline conditions.	**Same as HCP-IID-BR-40.**	**Same as HCP-IID-BR-40.**	**Same as HCP-IID-BR-40.**
Salton Sea				
BR – 41: Reduced Drain Flows Could Affect Adjacent Wetlands Dominated by Cattail/Bulrush Vegetation: No impact.	Continuation of Baseline conditions.	**Same as BR-41.**	**Same as BR-41.**	**Same as BR-41.**
BR – 42: Reduced Sea Elevation Could Affect the Acreage of Adjacent Wetlands Dominated by Tamarisk and Shoreline Strand: Less than significant.	Reduced Sea elevation could decrease acreage of tamarisk-dominated areas and shoreline strand.	**A2-BR – 25: Reduced Sea Elevation Could Affect the Acreage of Adjacent Wetlands Dominated by Tamarisk and Shoreline Strand:** Less than significant.	**A3-BR – 32: Reduced Sea Elevation Could Affect the Acreage of Adjacent Wetlands Dominated by Tamarisk and Shoreline Strand:** Less than significant.	**A4-BR – 14: Reduced Sea Elevation Could Affect the Acreage of Adjacent Wetlands Dominated by Tamarisk and Shoreline Strand:** Less than significant.
BR – 43: Increased Salinity Would Change Invertebrate Resources in the Salton Sea: Less than significant.	Continuation of existing trend toward dominance by halotolerant organisms.	**A2-BR – 26: Increased Salinity Would Change Invertebrate Resources in the Salton Sea:** Less than significant.	**A3-BR – 33: Increased Salinity Would Change Invertebrate Resources in the Salton Sea:** Less than significant.	**A4-BR – 15: Increased Salinity Would Change Invertebrate Resources in the Salton Sea:** Less than significant.

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
BR – 44: Changes in the Invertebrate Community Could Affect Shorebirds and Other Waterbirds: Less than significant.	Continued use by shorebirds that feed on invertebrates in the Sea.	**A2-BR – 27: Changes in the Invertebrate Community Could Affect Shorebirds and Other Waterbirds:** Less than significant.	**A3-BR – 34: Changes in the Invertebrate Community Could Affect Shorebirds and Other Waterbirds:** Less than significant.	**A4-BR – 16: Changes in the Invertebrate Community Could Affect Shorebirds and Other Waterbirds:** Less than significant.
BR – 45: Increased Salinity Would Reduce Fish Resources in the Salton Sea: Less than significant.	Continuation of existing trend toward reduction and loss of fish species.	**A2-BR – 28: Increased Salinity Would Reduce Fish Resources in the Salton Sea:** Less than significant.	**A3-BR – 35: Increased Salinity Would Reduce Fish Resources in the Salton Sea:** Less than significant.	**A4-BR – 17: Increased Salinity Would Reduce Fish Resources in the Salton Sea:** Less than significant.
BR – 46: Reduced Fish Abundance Would Affect Piscivorous Birds: Less than significant with implementation of the HCP-SS component.	Continuation of existing trend toward reduction in use by piscivorous birds.	**A2-BR – 29: Reduced Fish Abundance Would Affect Piscivorous Birds:** Less than significant with implementation of the HCP-SS component.	**A3-BR – 36: Reduced Fish Abundance Would Affect Piscivorous Birds:** Less than significant with implementation of the HCP-SS component.	**A4-BR – 18: Reduced Fish Abundance Would Affect Piscivorous Birds:** Less than significant with implementation of the HCP-SS component.
BR – 47: Changes in Selenium in the Salton Sea Would Not Affect Fish and Birds: No impact.	Continuation of Baseline conditions.	**A2-BR – 30: Changes in Selenium in the Salton Sea Would Not Affect Fish and Birds:** No impact.	**A3-BR – 37: Changes in Selenium in the Salton Sea Would Not Affect Fish and Birds:** No impact.	**A4-BR – 19: Changes in Selenium in the Salton Sea Would Not Affect Fish and Birds:** No impact.
BR – 48: Reduced Sea Elevation Could Affect Colonial Nest/Roost Sites: Less than significant.	Reduced Sea elevation would result in loss of water surrounding nesting areas.	**A2-BR – 31: Reduced Sea Elevation Could Affect Colonial Nest/Roost Sites:** Less than significant.	**A3-BR – 38: Reduced Sea Elevation Could Affect Colonial Nest/Roost Sites:** Less than significant.	**A4-BR – 20: Reduced Sea Elevation Could Affect Colonial Nest/Roost Sites:** Less than significant.
BR – 49: Reduced Sea Elevation Could Affect the Availability of Mudflat and Shallow Water Habitat: Less than significant.	Reduced Sea elevation would result in changes in the amount of mudflat and shallow water habitat.	**A2-BR – 32: Reduced Sea Elevation Could Affect the Availability of Mudflat and Shallow Water Habitat:** Less than significant.	**A3-BR – 39: Reduced Sea Elevation Could Affect the Availability of Mudflat and Shallow Water Habitat:** Less than significant.	**A4-BR – 21: Reduced Sea Elevation Could Affect the Availability of Mudflat and Shallow Water Habitat:** Less than significant.

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
BR – 50: Water Quality Changes Could Increase the Incidence of Avian Disease Outbreaks: No impact.	Continuation of Baseline conditions.	**Same as BR-50.**	**Same as BR-50.**	**Same as BR-50.**
BR – 51: Increased Salinity Could Isolate Drains Supporting Desert Pupfish: Less than significant with implementation of the HCP-SS component.	Continuation of existing trend toward increased salinity, but salinity increases would not prevent movement of pupfish among drains.	**A2-BR – 33: Increased Salinity Could Isolate Drains Supporting Desert Pupfish:** Less than significant with implementation of the HCP-SS component.	**A3-BR – 40: Increased Salinity Could Isolate Drains Supporting Desert Pupfish:** Less than significant with implementation of the HCP-SS component.	**A4-BR – 22: Increased Salinity Could Isolate Drains Supporting Desert Pupfish:** Less than significant.
HCP-SS-BR – 52: Implementation of the HCP Would Avoid Conservation-induced Changes in Fish Resources and Impacts to Piscivorous Birds: Less than significant.	Continuation of existing trend toward reduction in use by piscivorous birds .	**Same as HCP-SS-BR-52.**	**Same as HCP-SS-BR-52.**	**Same as HCP-SS-BR-52.**
HCP1-BR – 53: Implementation of the HCP Would Benefit Colonial Nesting and Roosting Birds: Beneficial impact.	Reduced Sea elevation would result in loss of water surrounding nesting areas.	**Same as HCP-SS-BR–53.**	**Same as HCP-SS-BR–53.**	**Same as HCP-SS-BR–53.**
HCP-SS-BR–54: Creation of Native Tree Habitat Could Benefit Wildlife Associated with Tamarisk Scrub: Beneficial impact.	Continuation of Baseline conditions.	**Same as HCP-SS-BR–54.**	**Same as HCP-SS-BR–54.**	**Same as HCP-SS-BR–54.**

TABLE 3.2-1
Summary of Impacts to Biological Resources

Proposed Project: 300 KAFY All Conservation Measures	Alternative 1: No Project	Alternative 2: 130 KAFY On-farm Irrigation System Improvements Only	Alternative 3: 230 KAFY All Conservation Measures	Alternative 4: 300 KAFY Fallowing Only
HCP-SS-BR-55: Maintenance of Population Connectivity Would Benefit Desert Pupfish: Beneficial impact.	Continuation of existing trend toward increased salinity with no increase in the isolation of pupfish populations.	**Same as HCP-SS-BR-55.**	**Same as HCP-SS-BR-55.**	**Same as HCP-SS-BR-55.**
HCP-SS-BR-56: Implementation of the HCP Would Delay Changes in the Invertebrate Community of the Salton Sea and Responses of the Shorebird and Other Waterbird Community from Water Conservation and Transfer: Less than significant	Continuation of existing trend toward increased salinity with resulting changes in invertebrate and avian community piscivorous birds	**Same as HCP-SS-BR-56.**	**Same as HCP-SS-BR-56.**	**Same as HCP-SS-BR-56.**
HCP-SS-BR-57: The Acreage of Mudflat and Shallow Water Habitat Could Change with Implementation of the HCP: Less than significant	Reduced Sea elevation could change the amount of mudflat and shallow water habitat.	**Same as HCP-SS-BR-57.**	**Same as HCP-SS-BR-57.**	**Same as HCP-SS-BR-57.**
SDCWA Service Area				
No Impacts.	Continuation of Baseline conditions.	No impacts.	No impacts.	No impacts.

3.2.2 Regulatory Framework

3.2.2.1 Federal Regulations and Standards

The Proposed Project and Alternatives would be subject to the following federal regulations with respect to biological resources:

- NEPA, as amended (42 USC §§ 4321 *et seq*). This act declares a national policy to promote efforts that prevent damage to the environment and benefit human health and

welfare, increase understanding of natural resources, and establish a National Council on Environmental Quality.

- ESA, including coordination requirements of Sections 7 and 10 and HCP requirements of Section 9 (16 USC §§1531 *et seq.*; 50 Code of Federal Regulations [CFR] Part 402). Section 9 of ESA prohibits the "take" of species federally listed as threatened or endangered. Take is defined to include harm or harassment, including significant habitat modification or degradation that could potentially kill or injure wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Take incidental to otherwise lawful activities can be authorized under Section 7 of ESA, where a federal nexus or agency is involved. Section 10 of ESA provides for project proponents of non-federal activities to apply for an Incidental Take Permit. An HCP must be prepared that specifies impacts to federally listed species and measures to minimize and mitigate such impacts. If approved by the USFWS, an Incidental Take Permit for the action will be issued.

- Migratory Bird Treaty Act (16 USC 703-712; 50 CFR 10). The federal Migratory Bird Treaty Act prohibits the take of migratory birds, unless permitted.

- Fish and Wildlife Coordination Act of 1958 (16 USC 661-667[e]). This act authorizes the Secretaries of Agriculture and Commerce to cooperate with federal and state agencies to protect and increase the supply of game and mammals. Under an amendment to the act, consultation with the USFWS and state fish and wildlife agencies are required when the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted…or otherwise controlled or modified" by an agency under a federal permit or license. The purpose of the consultation is to prevent the loss of, or damage to, wildlife resources.

- Executive Order 11990 Protection of Wetlands. The purpose of the Protection of Wetlands Executive Order is to minimize the destruction or degradation of wetlands and avoid new construction in wetlands wherever a reasonable alternative exists.

- Sections 401 and 404 of the CWA (33 USC §§1344). Activities with the potential to discharge fill materials into "waters of the U.S." are regulated under Section 404 of the CWA, as administered by the Corps. Wetlands are considered "waters of the U.S." with respect to discharge of fill materials.

3.2.2.2 State Regulations and Standards

The Proposed Project and Alternatives would be subject to the following state regulations and policies regarding biological resources:

- CEQA as amended (Public Resources Code [PRC] §§21000 et seq.). CEQA goals assist California public agencies in identifying potential significant environmental effects of their actions and either avoiding or mitigating those effects, when feasible.

- CESA (California Fish and Game Code §§2050 et seq.). Section 2050 of the California Fish and Game Code prohibits activities that jeopardize or take a species listed as threatened or endangered in the state. Projects that could affect species listed as threatened or endangered by the state might require an Incidental Take Permit from the California

Department of Fish and Game (CDFG) under Section 2081 of the Fish and Game Code. The application for this permit requires an analysis of impacts to the species from the Proposed Project and measures to mitigate the impacts.

- California Fully Protected Wildlife Species Provisions (California Fish and Game Code §§3511, 4700, 5050, and 5515). These provisions prohibit the taking of fully protected birds, mammals, amphibians, and fish.
- Fish and Wildlife Protection and Conservation: Streambed Alteration Agreements (California Fish and Game Code §1600). Section 1600 of the Fish and Game Code regulates the alteration of the bed, bank, or channel of a stream, river, or lake, including dry washes. Alterations include diversion, obstruction, or change in the natural flow or bed, channel, or bank of any river, stream, or lake designated by CDFG in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit. Activities that could affect jurisdictional areas can be authorized through issuance of a Streambed Alteration Agreement (SAA).

3.2.3 Environmental Setting

3.2.3.1 Lower Colorado River

The LCR geographic subregion is defined as the mainstem and the 100-year floodplain of the Colorado River from Parker Dam downstream to Imperial Dam. This subregion includes approximately 140 river miles.

HISTORIC AND CURRENT RIVER CONDITIONS

Historically, the Colorado River mainstem contained fast-moving water that carried high volumes of sediment that originated from tributaries and eroded from terraces and banklines. Consequently, little rooted vegetation was in the main channel. Riparian vegetation along the banklines contributed the majority of organic matter to the River, and the tributaries contributed the rest. River levels fluctuated seasonally with high flows in the spring that coincided with spring runoff from the upper reaches of the River (USFWS 1997a). Flows generally decreased during the summer, but could increase locally and daily with local rainfall (Turner and Karpiscak 1980). Lowest flows generally occurred between October and March, but flows could also be affected by rainfall that raised local water levels temporarily.

The dynamics of the River continually changed the adjacent environment by destroying and re-creating riparian and nearby upland habitats. The meanders of the Colorado River created oxbows, which were occasionally cut off from the mainstem and formed backwaters. Depending on local conditions, these backwaters could become unsuitable for wildlife as summer temperatures rose and high evaporation rates increased the salinity and TDS in the water. Other River features included eddies, channel pools, and runs. During the large spring floods, eroded terraces dumped into the River, transporting enough sediment to fill in marshes or backwaters.

River management has changed the River's morphology and processes from natural river conditions. In its current condition, the River has the following characteristics:

- An incised channel
- Decreased river level

- Stabilized banklines
- Clear water in the mainstem
- Little overbank flooding
- Fewer meanders
- Lowered groundwater
- Large bodies of calm water (i.e., reservoirs)

These characteristics have negatively affected historically occurring native species in the Colorado River ecosystem.

WILDLIFE AND WILDLIFE HABITAT

Riparian-Communities

The regional hydrology and geology of the LCR subregion historically interacted with site specific conditions (i.e., moisture, soil texture and salinity, and depth to groundwater) to create a regional mosaic of plant communities (Johnson et al. 1988). The distribution of communities varied over time, in response to the fluctuating River level and meandering channel. Spring floods could destroy a patch of riparian forest, but they also deposited sediment downstream onto which a similar plant community could become re-established. Riparian vegetation was established on the terraces, beaches, and sandbars created each year. The location of a specific plant community depended on the relationship between the flood and the elevation of the terrace or beach (Rosenberg et al. 1991).

Periodic flooding was instrumental in the establishment of plant communities because it dispersed and scoured seeds, buried competitive woody and herbaceous cover, moistened the soil, recharged the groundwater, flushed salts, and contributed to nutrient cycling and overall system productivity (Stromberg et al. 1991 and 1993). Riparian areas along the River provided organic material to support aquatic resources. The structure of the vegetation and distribution of plant communities provided habitat for riparian wildlife species locally and regionally.

Based on 1997 aerial photographs, vegetation communities along the LCR between Parker and Imperial Dams were characterized following the classification developed by Anderson and Ohmart (1976, 1984a) and mapped (Younker and Andersen 1986; CH2M HILL 1999; Figure 3.2-1). The acreage of each plant community is presented in Table 3.2-2.

Although species composition along the River always varied locally, modifications to the river and its floodplain since the mid-1900s have altered plant species composition and structural characteristics of riparian habitats. As shown in Table 3.2-2, the 1,502 acres of native cottonwood-willow (*Populus* spp.–*Salix* spp.) in the Project area account for only 3 percent of the vegetation. The introduced suite of tree species of the genus *Tamarix*, collectively known as salt cedar (*Tamarix chinensis*), now accounts for 85 percent of the acreage of riparian vegetation between Parker and Imperial Dams. Of the 58,296 mapped acres of vegetation (excluding agriculture), 30,840 acres are stands of nearly pure salt cedar and 19,225 acres are a mix of salt cedar and a native mesquite (*Prosopis* spp.). Further, most of the native vegetation does not exhibit the characteristics of a mature stand. The ecology, habitat characteristics, flooding, and groundwater requirements of the plant communities in the LCR subregion are described in more detail in the Target Restoration Parameters for the LCR Multi-Species Conservation Program (MSCP) (Ogden Environmental and Energy Services 1998).

TABLE 3.2-2
Plant Communities within the LCR 100-Year Floodplain

Structure Type	Acres	Percent of Total Vegetation[a]
Cottonwood-willow	1,502	3
Salt cedar-honey mesquite	14,200	24
Salt cedar-screwbean mesquite	5,025	9
Salt cedar	30,840	53
Honey mesquite	3,128	5
Arrowweed	2,773	5
Atriplex	511	<1
Creosote	317	<1
TOTAL	**58,296**	

[a] Excluding 1,723 acres of agriculture.
Source: CH2M HILL, 1999.

Wildlife Associated with Riparian Communities. Riparian habitats, especially in arid regions, provide important habitat for wildlife. They provide a cooler microclimate and protection during hot temperatures and a source of water and food. Bird species occupying riparian habitat include riparian specialists, such as yellow warbler (*Dendroica petechia*), southwestern willow flycatcher (*Empidonax traillliextimus*), yellow-breasted chat, and belted kingfishers, as well as more generalist species, such as mourning doves (*Zenaida macroura*). Historically, the Colorado River was a conduit for dispersing and migrating birds. Some of that movement is still seen today. Habitat conversion in the subregion has increased the richness of bird species through the addition of species with broad, general habitat requirements. Other species, particularly those dependent on riparian habitats, have declined as the plant communities changed in composition and structure.

Mammals associated with this riparian habitat include deer mouse (*Peromyscus maniculatus*), cotton rat (*Sigmodon hispisus*), muskrat, raccoon, common gray fox (*Urocyon cinereoargenteus*), ringtail cat (*Bassariscus astutus*), and coyote (*Canis latrans*). Beaver (*Castor canadensis*) was historically abundant in this Southwestern habitat but is associated primarily with willow and cottonwood trees and permanent water sources. These tree species have declined with disturbance and channelization of water resources, and the beaver is now generally absent or scarce along the river drainages.

Reptile and amphibian species that use this community type include the spiny softshell turtle, bullfrog, leopard frog, and Woodhouse's toad (*Bufo woodhousei).*

Backwaters and Marshes. Under historical conditions, backwaters were formed when the meandering Colorado River created oxbows that were occasionally cut off from the mainstem. Backwaters created by beaver dams were common in some areas (Hoffmeister 1986), but were not permanent. In addition to persistent natural backwaters, many have been constructed since the 1960s by Reclamation between Parker and Imperial Dams to

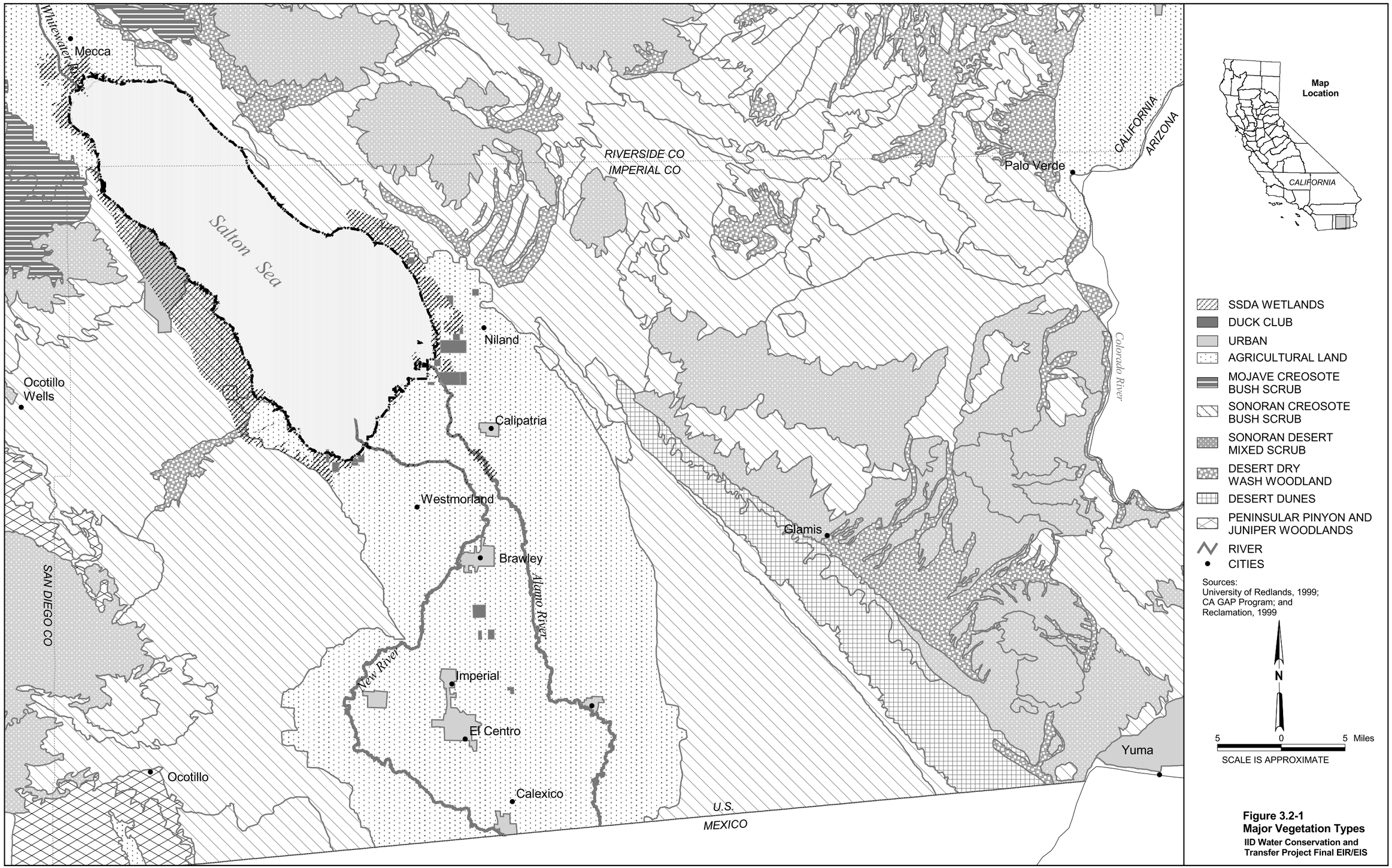


Figure 3.2-1
Major Vegetation Types
IID Water Conservation and Transfer Project Final EIR/EIS

improve recreational opportunities, river navigation, river hydraulics, and fish and wildlife (Reclamation 1987).

Backwaters provide important fish and wildlife habitat. Historically, native fish used backwaters throughout their life histories as locations for spawning, foraging, and protection from predation (Minckley 1979). Although the physical and chemical environment of backwaters has changed significantly since management of the River began, backwater environments still fall within the physiological tolerances of the native fish (Marsh and Langhorst 1988; Robinson et al. 1996). Backwater areas also support riparian vegetation that provides habitat for riparian bird species. However, the edges of some backwaters have been stabilized with riprap or other structures, which reduces their value to wildlife.

Within the reach from Parker Dam to Imperial Dam, 198 backwaters represent 3,955 acres with 6,170 acres of emergent vegetation (Table 3.2-3). Most of the acreage in backwater habitat is concentrated in the southern portion of the reach. Between Parker Dam at River Mile 189.5 and River Mile 160, there are approximately 792 acres of backwaters and emergent vegetation. There are approximately 1,274 acres between Parker Dam and River Mile 95 at Cibola National Wildlife Refuge (NWR) and 7,000 acres between Cibola NWR and Imperial Dam (River Mile 49.2).

TABLE 3.2-3
Acreage of Backwaters Along the LCR Between Parker and Imperial Dams

State	Number of Backwaters	Acres of Open Water	Acres of Emergent Vegetation
Arizona	95	2,256	3,307
California	103	1,699	2,863
Total	**198**	**3,955**	**6,170**

Source: Ogden Environmental and Energy Services Geographic Information System.

Marshes develop at the lowest terraces of the floodplain where water persists or the water table is at the surface (USFWS 1997a). Like backwaters, marshes are ephemeral features whose persistence depends on their size and the severity of natural disturbances. Marshes combine terrestrial and aquatic environments that provide habitat for some species. Currently, approximately 5,798 acres of marshes are in the LCR subregion (Table 3.2-4).

Wildlife Associated with Backwater/Marsh Communities. Backwater and marsh habitats provide habitat for a diversity of wildlife species. The shallow water of these backwater areas supports emergent vegetation. Aquatic areas interspersed with emergent vegetation create a structurally diverse and complex habitat that attracts wildlife.

Backwater and marsh habitats provide stopover habitat for migrating birds. In addition to neotropical migrants, white pelicans (*Pelecanus erythrorhynchos*) that migrate through the LCR corridor in the fall probably forage in backwaters. Bald eagles forage in backwaters throughout the year. Many birds and amphibians also use these habitats for breeding. Backwaters support development of willows that provide nesting habitat for the southwestern willow flycatcher (*Empidonax traillii extimus*) and other songbirds. Clark's grebe (*Aechmophorus clarkii*) typically builds a floating nest platform in large stands of tules

or cattails. Backwaters support the persistently submerged vegetation onto which adult frogs attach eggs, and the shallow pools are used by tadpoles (Zeiner et al. 1988).

TABLE 3.2-4
Structural Characteristics and Acreage of Marsh Habitat

Acres	Characteristics
1,554.0	Nearly 100 percent cattail/bulrush, small amounts of *Phragmites*, open water
405.4	Nearly 75 percent cattail/bulrush, many trees and grasses interspersed
2,129.7	About 20-25 percent cattail/bulrush, small amounts of *Phragmites*, open water, some trees and grasses
955.0	About 30-35 percent cattail/bulrush, many trees and grasses interspersed
280.7	About 50-75 percent cattail/bulrush, few trees and grasses interspersed
344.8	Nearly 100 percent *Phragmites*, little open water
128.1	Open marsh (75 percent water) adjacent to sparse marsh vegetation, sandbars, and mudflats when the river is low

Source: Anderson and Ohmart 1984a.

Like riparian habitats, marshes provide a unique combination of terrestrial and aquatic habitats used by species in the LCR subregion. Most notable are amphibians, which use these two habitat types for different stages of their life histories. The California black rail (*Laterallus jamaicensis coturniculus*) is found in shallow marshes where it probes the substrate or picks food from the surface (Ehlrich et al. 1992). The white-faced ibis (*Plegadis chihi*) nests in colonies near the ground or over water in extensive, undisturbed marshes with large stands of tall bulrushes (Palmer 1962; Burger and Miller 1977; Terres 1980). In the U.S., the Yuma clapper rail (*Rallus longirostris yamanensis*) is found at the highest densities in mature stands of dense to moderately dense cattails and bulrushes of freshwater marshes.

Special-Status Species. The LCR provides habitat for many species with special state or federal status. Special-status species potentially along the LCR, their status, and general habitat associations are summarized in Table 3.2-5.

TABLE 3.2-5
Special-Status Species Potentially Along the LCR

Common name	Scientific Name	Federal Status[a]	State Status[a]	Habitat[b]
Amphibians And Reptiles				
Colorado river toad	*Bufo alvarius*	-	CSC	D, A
Desert tortoise	*Gopherus agassizii*	FT	ST	D
Lowland leopard frog	*Rana yavapaiensis*	SC	AWC	W, A
Northern leopard frog	*Rana pipiens*	-	CSC AWC	W, A
Relict leopard frog	*Rana onca*	-	AWC	W, A
Sonoran mud turtle	*Kinosternon sonoriense*		CSC	A
Birds				
American peregrine falcon	*Falco peregrinus anatum*	DM	CE/FP AWC	G

TABLE 3.2-5
Special-Status Species Potentially Along the LCR

Common name	Scientific Name	Federal Status[a]	State Status[a]	Habitat[b]
Arizona Bell's vireo	*Vireo bellii arizonae*		CE	R
Bald eagle	*Haliaeetus leucocephalus*	FT	CE/FP AWC	A, W
Burrowing owl	*Athene cunicularia*	SC	CSC	Ag
California black rail	*Laterallus jamaicensis coturniculus*		CT/FP AWC	W
California brown pelican	*Pelecanus occidentalis californicus*	FE	CE/FP	A, W
Clark's grebe	*Aechmophorus clarkii*		AWC	A
Crissal thrasher	*Toxostoma crissale*	-	CSC	D
Elf owl	*Micrathene whitneyi*		CE	D
Fulvous whistling-duck	*Dendrocygna bicolor*	SC	CSC	W
Gila woodpecker	*Melanerpes uropygialis*		CE	R
Gilded northern flicker	*Colaptes auratus chrysoides*		CE	R
Golden eagle	*Aquila chrysaetos*		CSC/FP	G
Greater sandhill crane	*Grus canadensis tadiba*	-	T/FP	Ag, W
Harris hawk	*Parabuteo unicinctus*		CSC	R
Large-billed savannah sparrow	*Passerculus sandwichensis rostratus*	S	-	R
Least bittern	*Ixobrychus exilis*	SC	CSC AWC	W
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE / CH	CE/AWC	R
Summer tanager	*Piranga rubra*	-	CSC	R
Swainson's hawk	*Buteo swainsoni*		CT AWC	R, Ag
Vermilion flycatcher	*Pyrocephalus rubinus*	-	SCS	R
Western yellow-billed cuckoo	*Coccyzus americanus*		CE AWC	R
Willow flycatcher	*Empidonax traillii*		CE	R
Yellow warbler	*Dendroica ptechia*	-	CSC	R
Yuma clapper rail	*Rallus longirostris yumanensis*	FE	CT/FP AWC	W
Mammals				
Allen's big-eared bat	*Idionycteris (=Plecotus) phyllotis*	SC	CSC AWC	G
Big free-tailed bat	*Nyctinomops macrotis*	-	CSC	G
Cave myotis	*Myotis velifer brevis*	SC	CSC	G
California leaf-nosed bat	*Macrotus californicus*	SC	AWC CSC	G
Greater western mastiff	*Eumops perotis californicus*	SC	AWC CSC	G
Mexican long-tongued bat	*Choeronycteris mexicana*	SC	CSC	G


Table of Contents


Continue

TABLE 3.2-5
Special-Status Species Potentially Along the LCR

Common name	Scientific Name	Federal Status[a]	State Status[a]	Habitat[b]
Occult little brown bat	*Myotis lucifugus occultus*	S	CSC	G
Pale Townsend's big-eared bat	*Corynorhynus townsendii pallescens*	SC	CSC	G
Pallid bat	*Antrozous pallidus*	SC		G
Red bat	*Lasiurus blossevilli*		AWC	G
Spotted bat	*Euderma maculatum*		AWC	G
Colorado River hispid cotton rat	*Sigmodon arizonae plenus*	-	CSC	Ag, R
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLMSS		D
Ringtail	*Bassariscus astutus*		FP	R
Yuma hispid cotton rat	*Sigmodon hispidus eremicus*	SC	CSC	Ag, R

[a] Status Codes:
SC: Species of Concern
CSC: California Species of Special Concern
AWC: Arizona Wildlife of Concern
CE: California endangered
CH: Critical habitat
CT: California threatened
FE: Federally endangered
FT: Federally threatened
FP: California Fully Protected
DM: Delisted – monitored
BLMSS: Bureau of Land Management Sensitive Species

[b] Habitat Codes
A: Aquatic
Ag: Agricultural fields
D: Desert
G: Generalist at this level and/or requires specific microhabitat to persist in area
R: Riparian
W: Wetland

FISH AND AQUATIC RESOURCES

Several species of fish endemic to the Colorado River are in the LCR subregion. The natural history of these fish was tied to the changing physical environment of the Colorado River. When seasonal floods inundated the floodplains, pools were created behind sandbars and formed backwaters (Mickley 1979). The native fish did not spend time in the fast-flowing mainstem, but navigated to refuge areas along the main channel and off-channel areas (i.e., backwaters). Periodic droughts made these habitats unsuitable, and the fish entered the mainstem and traveled to other refuge areas. All age classes used these refuge habitats (Minckley 1979).

At least 24 non-native species of fish have been introduced into the LCR (Minckley 1979; Marsh and Langhorst 1988). They are a combination of sport fish (such as channel catfish [*Ictalurus punctatus*], largemouth bass [*Micropterus salmonides*]), discarded bait fish (such as golden shiner [*Notemigonus crysoleucus*]), and biological control introduced species (such as mosquitofish [*Gambusia affinis*]). Predation of native fish or their eggs by these non-native species has largely eliminated the native species from the mainstem and backwaters of the LCR (Minckley 1979). Currently, native fish persist in reservoirs created by dams on the LCR's mainstem, although these populations show no evidence of successful recruitment.

Special-Status Species. Four native fish species are listed by the federal government as endangered within the LCR subregion (Table 3.2-6). The life history, habitat requirements,

status, and distribution of these four fish species are available in other sources, including the Federal Register listings (razorback suckers [56 FR 54957], bonytail chub [45 FR 27713], Colorado pikeminnow [32 FR 4001]), Desert pupfish [51 FR 10842], recovery plans (razorback suckers [USFWS 1998A], bonytail chub [USFWS 1991]) and Biological Opinions on the operation of the LCR facilities (USFWS 1997, 2001). The desert pupfish is a federally listed endangered fish species that once occurred along the Colorado River, but no longer occurs between Parker and Imperial Dams.

TABLE 3.2-6
Special-Status Fish Species in the LCR

Common Name Scientific Name	Status	Occurrence In LCR
Razorback sucker *Xyrauchen texanus*	FE/CH designated CE, CFP	Mainstem LCR below Parker Dam, Lake Mohave, Lake Mead, and Lake Havasu
Bonytail chub *Gila elegans*	FE/CH designated CE	Lake Mohave and Lake Havasu
Colorado pikeminnow *Ptychochelus lucius*	FE/CH designated CE, CFP	None; extirpated
Desert pupfish *Cyprinodon macularius*	CE, FE	None; extirpated

Notes: CE: California endangered
CFP: California fully protected
CH: Critical habitat
CT: California threatened
FE: Federally endangered
FT: Federally threatened

3.2.3.2 IID Water Service Area, AAC, and Salton Sea

To describe the existing environment for biological resources, the IID water service area and AAC discussion is combined with the Salton Sea discussion.

BACKGROUND

The Imperial Valley lies within the Salton Trough (Cahuilla Basin), which is flat terrain. The Salton Trough encompasses a large portion of the Colorado Desert (a subdivision of the Sonoran Desert, extending through portions of Mexico and southern Arizona), with much of the area below sea level. Prior to European settlement, the area consisted of native desert vegetation and wildlife. As a result of the formation of the Salton Sea and the intensification of agricultural activities in the Imperial and Coachella Valleys, Salton Trough ecology has changed radically. Water in the drains and canals created for agricultural activity supports the development of mesic (marsh-associated) vegetation and, in some locations, patches of marsh-like habitats. These mesic habitats, in addition to the productive agricultural fields, attract and support wildlife that historically would have been absent or present in low numbers in the native desert habitat. Today, small areas of native desert habitat persist in the area, but the area mainly supports habitats created and maintained by water imported to Imperial Valley for agricultural production.

WILDLIFE AND WILDLIFE HABITAT

Four general terrestrial wildlife habitats occur in the Salton Sea and Imperial Valley areas and along the AAC:

- Drain habitat

- Tamarisk scrub habitat
- Desert habitat
- Agricultural field habitat

These habitats and the associated wildlife are described subsequently.

Drain Habitat. Wet area habitats in the Project area are collectively referred to as drain habitat. Drain habitat in the Project area occurs in association with the drainage and conveyance systems, in managed marshes on state and federal refuges and private duck clubs, and as unmanaged vegetation adjacent to the Salton Sea.

Drainage System. Currently, IID operates and maintains 1,456 miles (cited from IID Memorandum, dated October 4, 2000) of agricultural drains (Figure 3.2-2). These drains typically are unlined, dirt channels with 65 miles of the drainage network in buried pipes. Main drain channels have an average depth of 8 to 11 feet, with a typical side-slope embankment ratio of 1:1. Lateral ditches have an average depth of 7 feet, with a typical side-slope embankment ratio of 1:1. Some drainage channels are steep-sided with sloughing embankments from years of erosion prior to stabilization; others are sloped more gradually. Water flow in drains is determined by the irrigation practices on fields adjacent to the drains. Drains contain flows during irrigation, and storms may add to flows in the drains. Peak flows occur during storms and during April and May.

Vegetation in the drains is limited to the embankment slope or sediments directly in the drain channel and typically consists of invasive species, such as saltgrass, salt bush, bermuda grass, common reed, and salt cedar. Emergent vegetation is restricted to a narrow strip at the drain bottom from 3 to 15 feet wide, with more drought-tolerant vegetation on drain embankments. Some drain banks are devoid of vegetation, with only a narrow band of saltgrass or bermuda grass adjacent to the edge of the water. Cattail, bulrushes, rushes, and sedges occur in drain channels, typically in sparse, isolated patches. More extensive stands of cattail/bulrush vegetation may persist where maintenance activities are infrequent. In addition, stands of common reed and cattails occur at the mouths of drains where they empty into rivers or the Salton Sea. Table 3.2-7 lists plant species in irrigation drains in the Imperial Valley.

Maintenance activities associated with the drains include maintaining the gravity flow of tilewater into the drains, conveyance capacity and efficiency, and structural integrity of the drains. Vegetation is cleared from drains primarily via mechanical means; occasionally, vegetation is controlled by prescribed burns or chemical control methods. Drains are cleaned as needed, depending on the extent of sediment and vegetation accumulation. Drains with the lowest gradient accumulate sediment more rapidly and may require cleaning annually. Other drain segments may not require cleaning for 10 years or more. Maintenance activities limit the extent of vegetation in the drains.

During the development of an EIR for IID's Modified East Lowline and Trifolium Interceptors and Completion Projects (IID 1994), drains were surveyed in areas potentially affected by the projects (Figure 3.2-3). In all, about 506 miles of drain were surveyed. For each drain, the general vegetation characteristics were described, with particular emphasis given to patches of cattail or bulrush vegetation. The qualitative assessment showed that

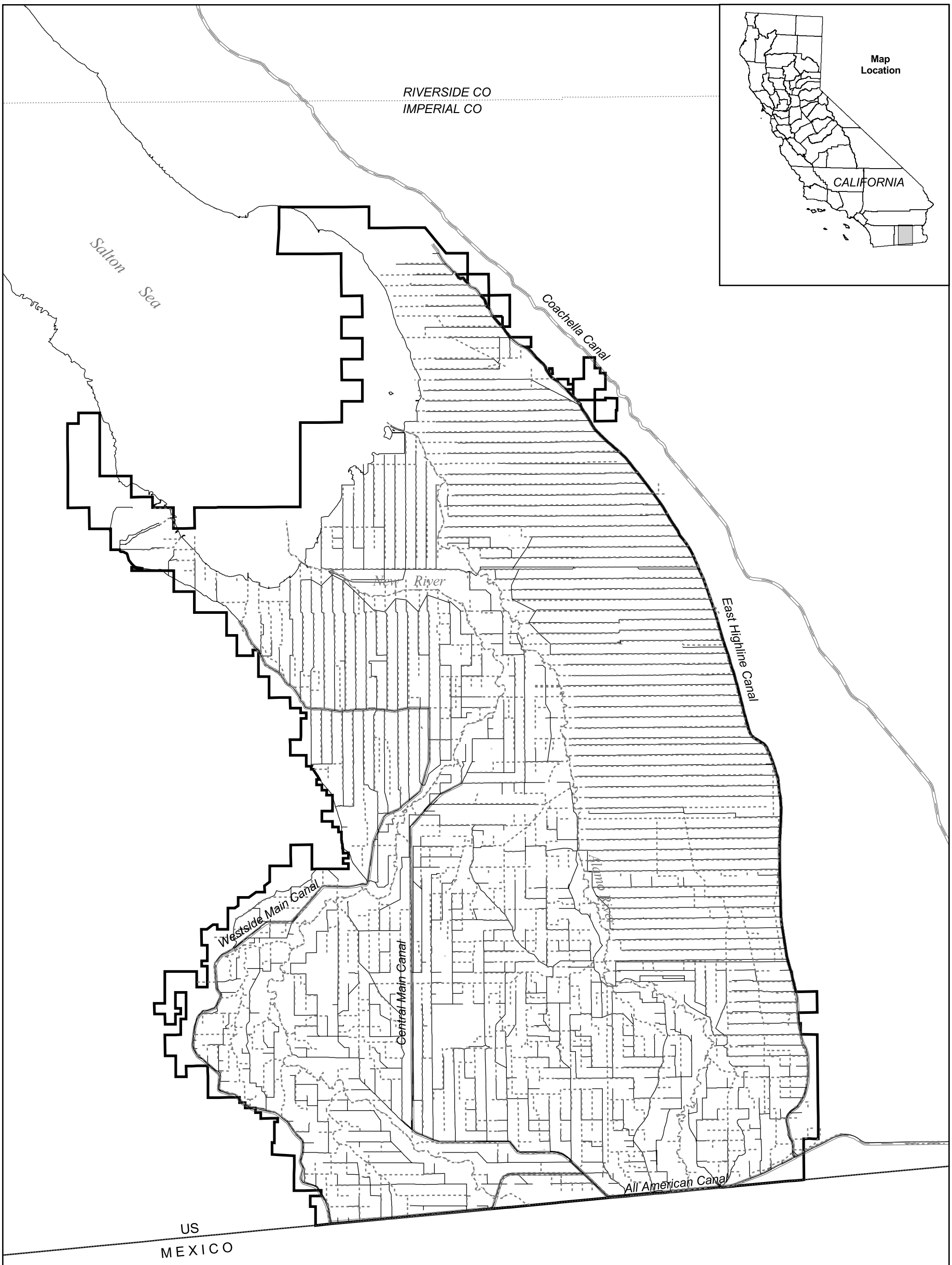


Figure 3.2-2
Canals and Drains in the IID Water Service Area
IID Water Conservation and Transfer Project Final EIR/EIS

TABLE 3.2-7
Typical Plant Species in Drains in Imperial Valley

Species Name	
Adenophyllum porophylloides (false odora)	*Leptochloa uninerva* (mexican sprangletop)
Aristida oligantha (prairie three awn)	*Malvella leprosa* (alkali mallow)
Atriplex sp. (saltbrush)	*Paspalum dilatatum* (dallisgrass)
Baccharis emoryi (Emory's baccharis)	*Phragmites communis* (common reed)
Bassia hyssopifolia (five-hook bassia)	*Polygonum aviculare* (prostrate knotweed)
Carex sp. (sedge)	*Polygonum* sp. (knotweed)
Chamaesyce melanadenia (prostrate spurge)	*Polygonum* sp. (beard grass)
Croton californicus (croton)	*Prosopis* sp. (mesquite)
Cryptantha sp. (popcorn flower)	*Psilostrophe cooperi* (paper-daisy)
Cynodon dactylon (desert tea)	*Rumex crispus* (curly dock)
Eriogonum sp. (buckwheat)	*Salsola tragus* (Russian thistle)
Heliotropium curassavicum (alkali heliotrope)	*Scirpus* sp. (bulrush)
Juncus sp. (rush)	*Sesbania exaltata* (Colorado river hemp)
Lactuca serriola (prickly lettuce)	*Suaeda torreyana ramosissima* (iodine bush)
Larrea tridentata (creosote bush)	*Tamarix* sp. (salt cedar)
Leptochloa fascicularis (bearded sprangletop)	*Typha* sp. (cattail)

Sources: IID 1994; Reclamation and SSA 2000.

vegetation in the drains is dominated by such species as common reed, saltgrass, bermuda grass, salt bush, and mallow, with only limited areas of cattails. Habitat conditions of the drains surveyed for the Lowline and Trifolium Interceptors and Completion Projects are described in Table 2.3-2 of the HCP.

Hurlbert (1997) also surveyed drains in the Project area. In this study, the percent cover for each major vegetation species (*Phragmites*, *Tamarix*, *Pluchea*, *Typha*, and *Atriplex*) and habitat type (herbaceous, bare ground, and other) was estimated in 10 drains. Each drain was surveyed by driving its length and stopping every 0.1 mile. At each stop, percent coverage for each major vegetation species or habitat type was determined in the area extending 100 feet on either side of the point. The survey was conducted in the winter (late 1994/early 1995) and spring (late May 1995). Based on these data, Hurlbert (1997) calculated the average percentage cover of each major vegetation species in each drain separately for the winter and spring surveys. The 10 drains surveyed were distributed throughout Imperial Valley and covered about 78 miles (Figure 3.2-4)[1].

Hurlbert (1997) summarized the data in two ways. First, the percentage of the total drain covered by the major vegetation species and cover categories was calculated (Table 3.2-8). This method provides the most accurate characterization of the plant species composition and percentage of the drain supporting vegetation. The second method of summarizing the data focused on habitat characteristics rather than plant species composition. In this method, survey locations with less than a median of 15 percent vegetation cover were classified as

[1] Data for P Drain are believed to be reported incorrectly in Hurlbert (1997), and data from this drain were not used in this analysis. Without inclusion of P Drain, about 70 miles of drains were surveyed.

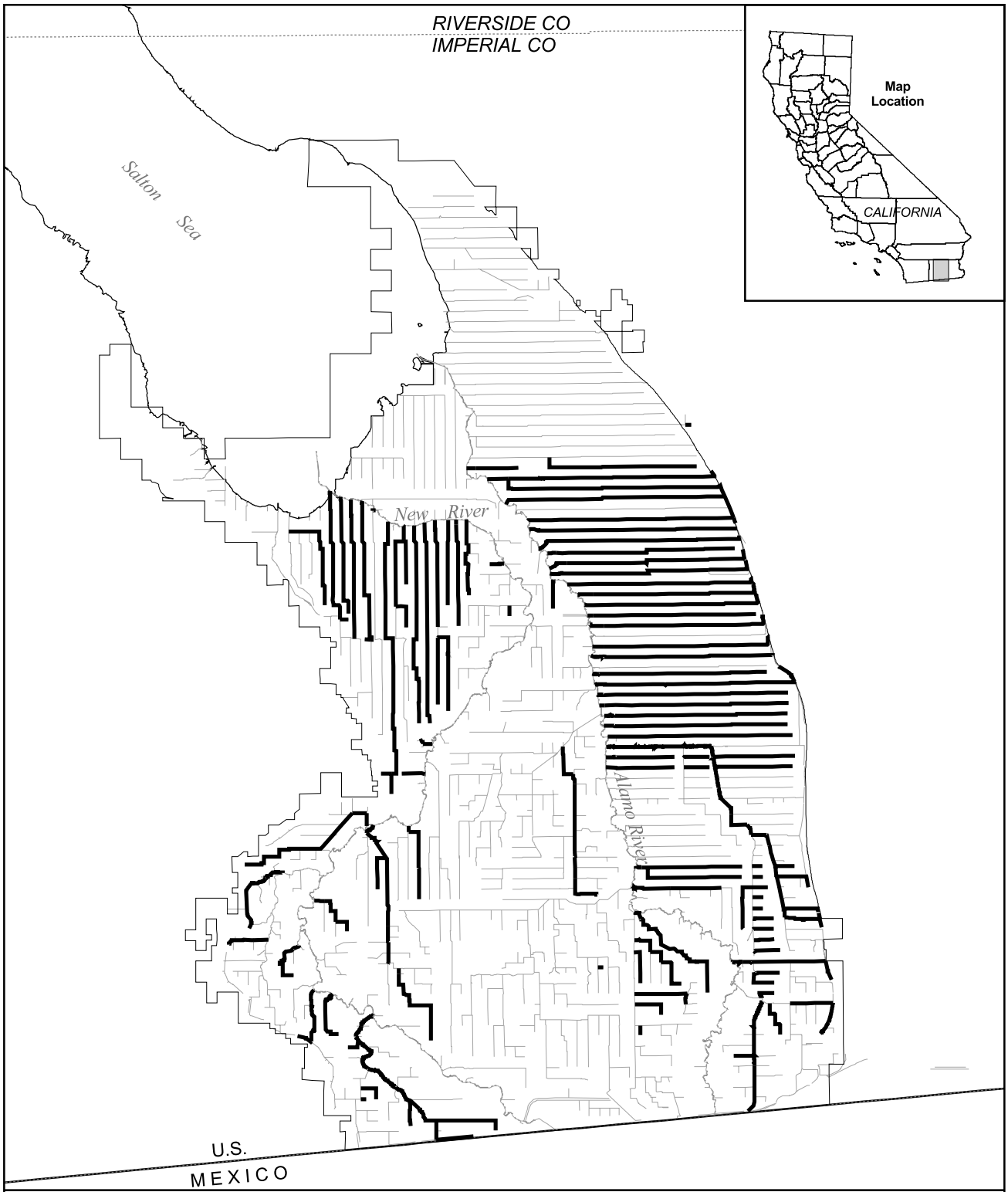


Figure 3.2-3
Drains Surveyed for the Modified Trifolium Interceptor, East Lowline, and Completion Projects
IID Water Conservation and Transfer Project Final EIR/EIS

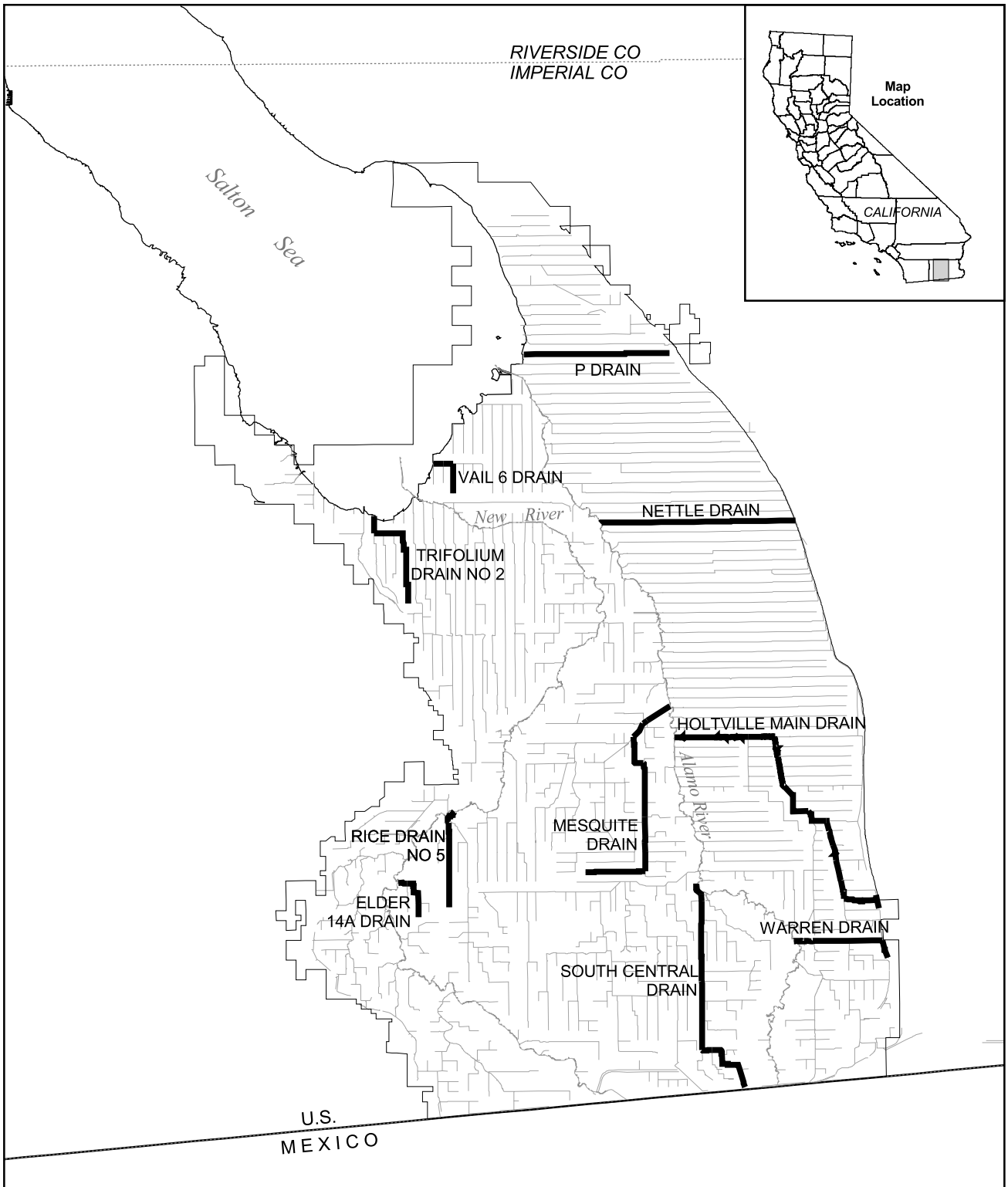


Figure 3.2-4
Drains Surveyed in HCP Area by Hurlbert, et al (1997)
IID Water Conservation and Transfer Project Final EIR/EIS

TABLE 3.2-8
Percentage of Drain Area Composed of Each Major Plant Species or Other Habitat Type for the 10 Drains Surveyed by Hurlbert (1997)

	Drains									
Vegetation Cover	**Vail Cut-off**	**Trifolium No. 2**	**Elder Nos. 14/14A**	**Rice No. 5**	**Nettle**	**Holtville Main**	**Warren**	**South Central**	**Mesquite**	**P[a]**
Herbaceous	70.7	44.9	32.2	29.2	55.5	22.9	46.3	40.7	34.9	*34.9*
Bare ground	18.9	31.7	58.9	64.8	31.3	20.7	33.0	41.9	45.8	*45.8*
Atriplex		0.6				2		1.1	3.2	*3.2*
Phragmites	7.5	3.5	2.1	3.3	10.6	7.7	12.9	3.5	0.9	*0.9*
Pluchea		8.7		0.9	0.7	6.8		4.6	5.2	*5.2*
Tamarix		7.6	0.5			29.6	1.0	0.5	3.0	*3.0*
Typha						6.3	1.5	3.8	1.1	*1.1*
Other	2.7	2.9	6.3	1.7	1.7	3.8	5.1	3.7	6.1	*6.1*

[a] Numeric values reported of percent vegetation for P Drain are identical to those for Mesquite Drain and are inconsistent with other information presented for P Drain. Thus, these values are believed to be incorrect.
Source: Hurlbert 1997.

bare ground / herbaceous. Survey locations with between 15 and 37.5 percent vegetation cover were classified as sparse cover.

Survey locations with 37.5 percent vegetation cover or greater were classified according to the dominant vegetation species (Table 3.2-9). Values reported in Tables 3.2-8 and 3.2-9 are the average of winter and spring surveys.

Hurlbert's (1997) quantitative data are consistent with the qualitative descriptions of the drains reported in the 1994 EIR (IID 1994). The first method used to characterize vegetation showed that herbaceous cover and bare ground composed the majority of the drains (median equals 82.7 percent, range 43.6 to 94 percent). Except for Holtville Main Drain, herbaceous cover and bare ground composed about 75 to 95 percent of the drains. The second method used to characterize drain habitat showed a similar pattern. Bare ground / herbaceous cover and sparse cover composed 72 to 96 percent of the drains, except for the Holtville Main Drain where these habitats covered only 35 percent of the drain. The qualitative descriptions from the 1994 EIR and Hurlbert (1997) data show that vegetation typically is limited along the drains.

Both studies indicate that common reed (*Phragmites* sp.) is the most prevalent plant species. Cattails are uncommon and occur in small, localized areas. Except for small, localized areas of cattails and occasionally bulrushes, the drains do not support emergent vegetation. As such, habitat availability and quality for marsh-associated species are poor.

Data reported by Hurlbert (1997) were used to estimate the acreage of vegetation supported by IID's drainage network. Hurlbert (1997) only characterized vegetation between the drain banks. A standard lateral drain (excluding the water surface) is about 14 feet wide at the top of the drain embankment (Figure 3.2-5). Assuming all drains are 14 feet wide, the 1,456 miles (cited from IID Memorandum, dated October 4, 2000) of drains in the Imperial Valley cover 2,471 acres. However, as described, potential habitat includes only a small proportion of the drains. The average percent cover of bare ground and herbaceous cover[2] was calculated for each of nine drains from data in Hurlbert (1997).[3] The remaining portion of the drain was assumed to be vegetated. It was then assumed that the drains surveyed represented all drains in the Imperial Valley. Acres of vegetation supported by the entire drainage system were calculated based on the percentage vegetation supported by the drains surveyed weighted by the drain's length. With this method, an estimated 652 acres of vegetation are supported in the drains.

As noted, the nine drains surveyed were assumed to represent the entire drainage system. This assumption may not be accurate, but is necessary without more complete information. In particular, Holtville Main Drain is unusual. Good water quality, combined with the drain's large size, allows Holtville Main Drain to support substantially more vegetation than is typical. As shown by Hurlbert's data, Holtville Main Drain is 56 percent vegetated, while the next most vegetated drain (Trifolium 2) is only 23 percent vegetated. The remaining drains surveyed have less vegetation. Holtville Main Drain was also the longest drain surveyed at 17.8 miles, followed by South Central Drain at 12.2 miles. Because the estimate of the amount of vegetation in the drainage system was derived from the percentage of

[2] Herbaceous cover consists of annual weedy vegetation that provides little or no habitat value to wildlife.

[3] As noted in Table 2.3-4, data presented for P Drain in Hurlbert (1997) are believed to be incorrectly reported. As such, data from P Drain were not used in this analysis.


Table of Contents Continue

TABLE 3.2-9
Percent of Habitat Types at Survey Points Along Drains Surveyed by Hurlbert (1997)

	Drains									
Habitat	**Vail Cut-off**	**Trifolium No. 2**	**Elder Nos. 14/14A**	**Rice No. 5**	**Nettle**	**Holtville Main**	**Warren**	**South Central**	**Mesquite**	**P**
Bare Ground/ Herbaceous	79.2	41.0	88.0	89.2	58.2	13.5	59.1	61.9	48.8	64.3
Sparse cover	6.3	31.4	8.0	4.9	19.8	22.2	17.2	20.0	36.0	17.1
Phragmites	14.6	2.9	4.0	3.6	19.6	9.4	19.8	3.5	1.2	7.1
Pluchea	0	13.3	0	0	1.5	6.4	0	6.2	6.0	5.5
Tamarix	0	10.5	0	0	0	35.1	0	0.5	0	0
Phragmites/Pluchea	0	0	0	2.5	0.5	0	0	0.5	0	5.5
Atriplex	0	0	0	0	0.5	0	0	0.5	0.4	0
Typha	0	0	0	0	0	7.6	0	0	0.8	0
Tamarix, Pluchea	0	0	0	0	0	3.2	0	6.7	0	0
Phragmites, Tamarix	0	1.0	0	0	0	0	3.9	0	0	0
Tamarix, Typha	0	0	0	0	0	1.8	0	0	0	0
Tamarix, Other	0	0	0	0	0	0.8	0	0	0	0
Pluchea, Atriplex	0	0	0	0	0	0	0	0	0	0.7
Other	0	0	0	0	0	0.4	0	0.5	6.8	0

Source: Hurlbert 1997.

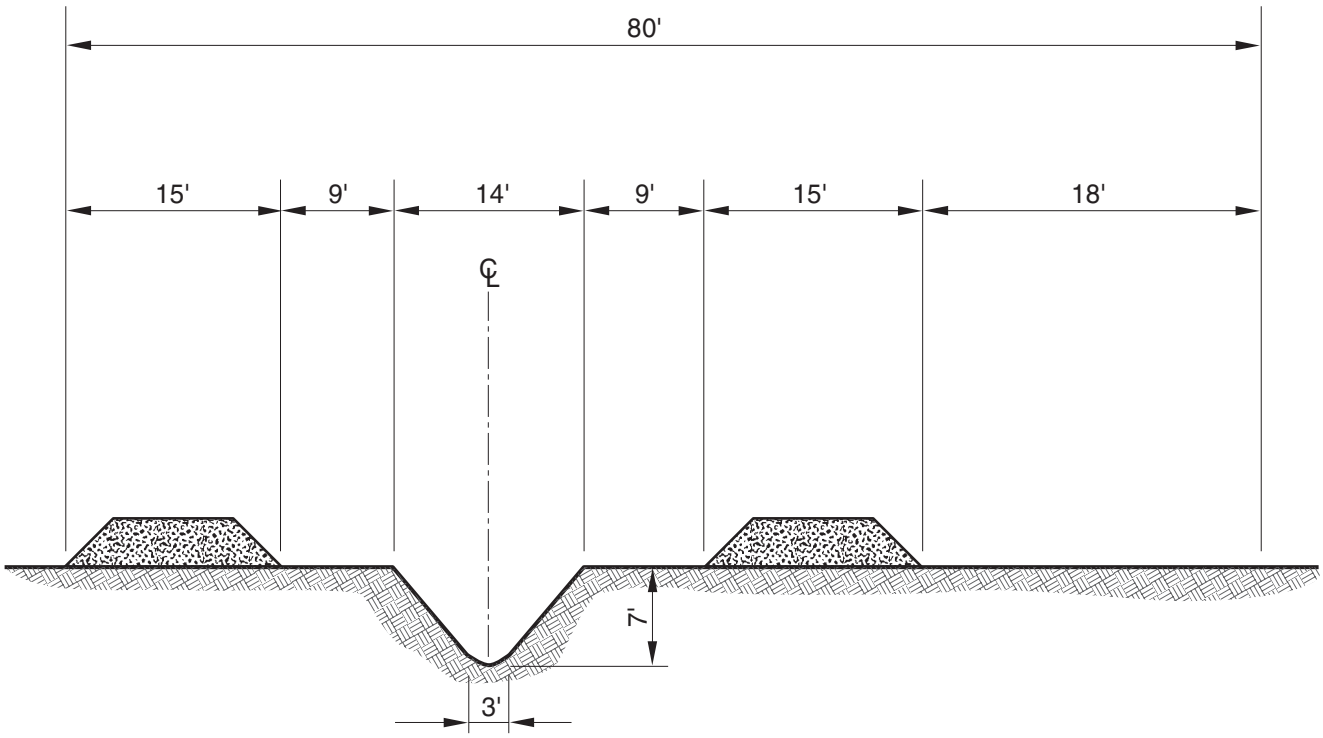


Figure 3.2-5
Typical Lateral Drain Profile

vegetation in each of the drains surveyed weighted by their lengths, inclusion of Holtville Main Drain (the longest drain with an atypical amount of vegetation) may have overestimated the amount of vegetation in the entire drainage system.

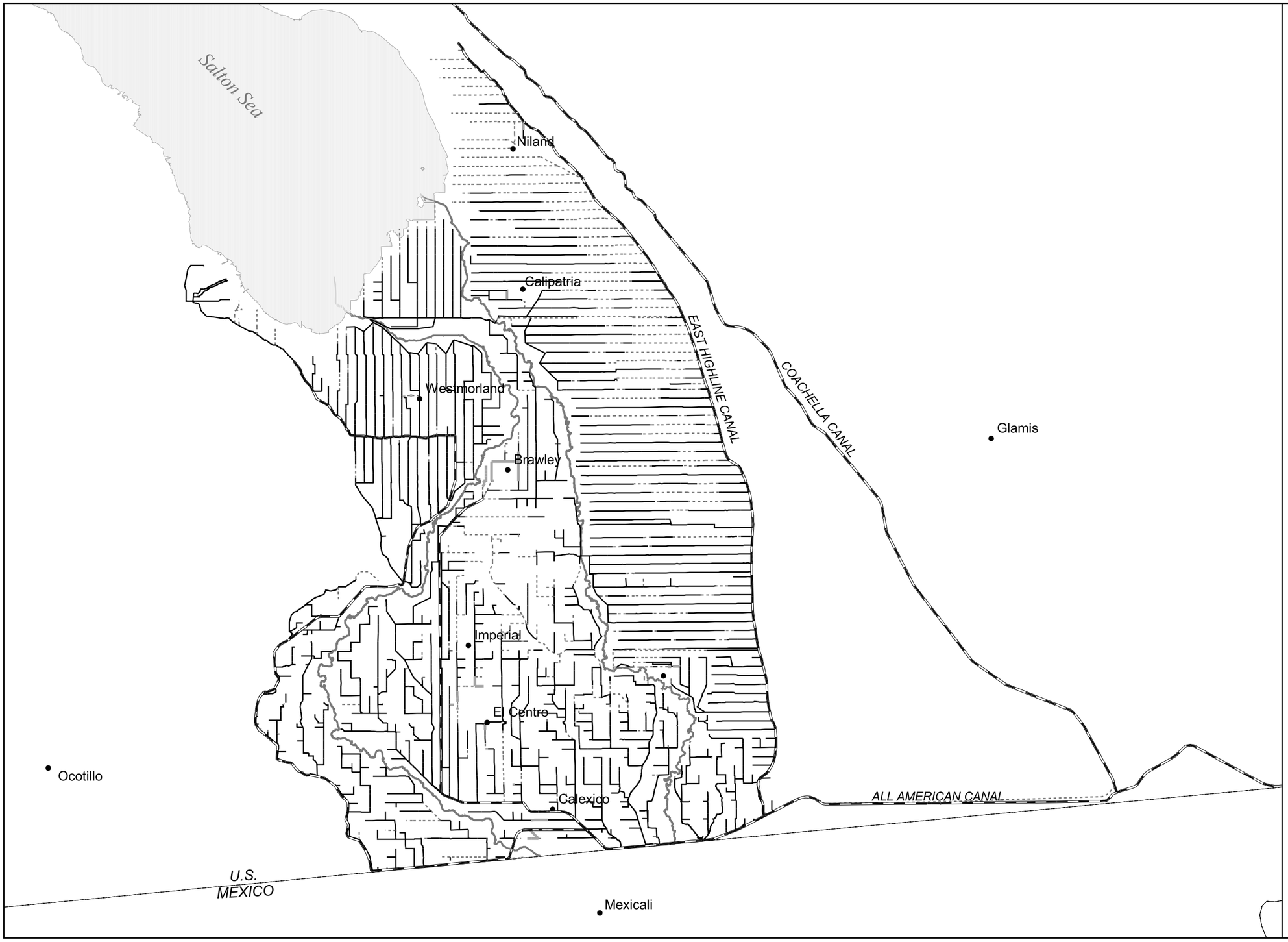
Only a small proportion of the vegetated acreage consists of cattails or bulrushes, which are favored by wildlife species associated with drain habitats. Holtville Main Drain had the greatest percentage of cattails at 6.3 percent, followed by South Central, Warren, and Mesquite Drains at 3.8, 1.5, and 1.1 percent, respectively. The remaining five drains did not support cattails. For the nine drains, the average percent cover of cattails weighted by drain length was 2.5 percent. Based on this average, the entire IID water service area drainage system supports about 63 acres of cattail vegetation.

Conveyance System. Canals that convey water from the LCR to customers in the IID water service area support little vegetation. Approximately 70 percent of the 1,667 miles (cited from IID Memorandum, dated October 4, 2000) of canals in Imperial Valley are concrete-lined or in pipes, and therefore do not support rooted vegetation. Embankment slopes of the lined canals also are maintained free of vegetation. About 537 miles (cited from IID Memorandum, dated October 4, 2000) of the delivery system consist of earthen channels (Figure 3.2-6). The canal slopes support vegetation that typically consists of bands of vegetation at the water surface. The bands of vegetation consist of common reed, saltgrass, Bermuda grass, and salt cedar. Tree and shrub covers are rare or nonexistent on most canals and laterals (IID 1994). Along the AAC, an almost continuous thick stand of common reed (3 to 15 feet wide) grows along both sides of the canal for the majority of its length. The 30-mile-long section of the AAC between Pilot Knob and Drop 4 supports about 30 acres of common reed (Reclamation and IID 1994). Vegetation along the canals is of minimal value to wildlife because it has little emergent vegetation, and water velocity and depth in the canals are too great for most species.

Water seepage has induced phreatophytic vegetation[4] to develop along the AAC in a landscape previously dominated by dry, desert scrub. Between Drops 2 and 3, about 100 acres of scattered phreatophytic vegetation are supported by seepage. Only about 1 acre is emergent wetland vegetation. The remaining vegetation consists of screwbean and honey mesquite (22.6 acres), salt cedar (28.7 acres), and arrowweed (47.2 acres). However, under the AAC lining project, this portion of the AAC will be abandoned and this vegetation will be lost. Effects of loss of this habitat on listed species were evaluated in the EIS/EIR for the AAC Lining Project (Reclamation and IID 1994). A larger (1,422 acres) marsh complex that will not be affected by the AAC lining project is between Drops 3 and 4. Marsh vegetation composes about 111 acres of the complex. Other vegetation within the complex includes salt cedar (755 acres), arrowweed (233 acres), screwbean mesquite (251 acres), and cottonwood and willow (39 acres).

In addition to these areas, phreatophytic vegetation supported by seepage from the AAC exists between Drop 4 and the East Highline Canal. This area is about 100 to 150 acres. Closer to the LCR near Mission Wash, seepage from the AAC supports phreatophytic vegetation totaling about 100 acres. The vegetation composition of these areas has not been

[4] Phreatophytic vegetation is vegetation associated with wet areas. In the HCP area, phreatophytic plant species include tamarisk, common reed, willows, and cattails.



IID DELIVERY CANAL LINING TYPE
- CONCRETE
- EARTH
- PIPED
- MAIN SUPPLY CANALS
- RIVER
- CITIES

Sources:
University of Redlands, 1999; DOI, 1999; and Reclamation, 1999

N

3 0 3 Miles

SCALE IS APPROXIMATE

Figure 3.2-6
Lined and Unlined Canals
Imperial Irrigation District
IID Water Conservation and Transfer Project Final EIR/EIS

determined, but is expected to exhibit a plant species composition similar to that found in other seepage areas along the AAC.

Seepage communities along Imperial Valley canals are rare and mostly limited to areas adjacent to the East Highline Canal. As part of the system-based water conservation activities, IID may install seepage recovery systems along the west side of the East Highline Canal. Seepage communities near proposed seepage recovery systems were digitized from Digital Orthophoto Quarter Quadrangles (DOQQ) and visited during May 2001 to assess vegetation characteristics. Seepage communities on the east side of the East Highline Canal would not be affected by the proposed water conservation measures. The locations of seepage communities near proposed seepage recovery systems are shown in Figure 3.2-7, and the sizes of the seepage areas are listed in Table 3.2-10.

TABLE 3.2-10
Seepage Communities Along the East Highline Canal

Area ID	Acres	Area ID	Acres
1	3.2	17	10.2
2	6.8	18	7.9
3	3.1	19	6.1
4	3.3	20	43.3
5	2.0	21	24.8
6	0.9	22	26.6
7	11.9	23	3.8
8	16.1	24	56.6
9	18.1	25	54.9
10	13.5	26	3.6
11	6.8	27	5.7
12	13.4	28	7.0
13	12.3	29	11.0
14	8.3	30	3.5
15	6.5	31	5.6
16	9.4	32	6.0
		Total (Both Columns):	**412.2 acres**

Note: Area ID refers to Figure 3.2-7.

The plant species composition of the seepage communities is diverse and varies substantially among the seepage areas. Arrowweed, common reed, and tamarisk are the most common species in the seepage communities, with mesquite, cattails, and cottonwoods in some areas. About 412 acres of vegetation supported by seepage from the East Highline Canal occur in areas where seepage recovery systems are under consideration.

Unmanaged Vegetation Adjacent to the Salton Sea. Vegetation has naturally developed along the margins of the Salton Sea. This phreatophytic vegetation occurs above the shoreline and shoreline strand community (see the following discussion of tamarisk scrub habitat).

Unmanaged vegetation includes diked wetlands below the water surface elevation of the Salton Sea. The Salton Sea database (University of Redlands 1999) refers to these unmanaged areas of phreatophytic vegetation as "adjacent wetlands."

The Salton Sea database (University of Redlands 1999) classifies 6,485 acres along the Salton Sea as adjacent wetlands and 64 acres as mudflat. Tamarisk and iodine bush are the most common species of adjacent wetlands (Table 3.2-11; Figure 3.2-8). Cattails and bulrushes are

TABLE 3.2-11
Primary Vegetation of Areas Classified as Adjacent Wetlands in the Salton Sea Database

Primary Vegetation	Total Acres at Salton Sea	Percentage of Adjacent Wetlands	Acres in HCP Area
Iodine bush	1,577	24	1,509
Mixed halophytic shrubs	65	1	-
Arrowweed	597	9	-
Bulrush	17[a]	<1	17
Sea-blite	86	1	86
Tamarisk	2,349	36	437
Cattail	200[a]	3	67
No primary wetland vegetation	1,595	25	1,305
Total	**6,485**	**approx. 100**	**3,421**

[a] See text for further description of these areas.
Source: Salton Sea Database (University of Redlands 1999).

the primary vegetation on 217 acres of adjacent wetlands. In the IID water service area, the Salton Sea database identifies three parcels dominated by cattails: one on the southwestern edge of the Salton Sea (35 acres) and two on the southern edge (32 acres). A fourth parcel on the eastern edge of the Salton Sea is dominated by bulrushes (17 acres). However, three of these areas are misclassified in the Salton Sea database. The first parcel of 35 acres is a managed duck club, and therefore does not meet the definition of an adjacent wetland (i.e., unmanaged areas). Of the two parcels totaling 32 acres, one is an IID drain and the other is a marsh managed by the USFWS. The drain parcel is managed by IID as part of its drainage system. Habitat in this drain was accounted for in the quantification of habitat in the drainage system above. The other parcel managed by USFWS does not meet the definition of an adjacent wetland (i.e., unmanaged areas). The last parcel encompassing 17 acres is sustained by runoff from CDFG's managed marsh area in the Wister Unit. The remaining 133 acres identified as adjacent wetland dominated by cattail or bulrush occur adjacent to the northwestern portion of the Salton Sea and is presumably maintained by drain flows from CVWD.

Managed Marsh. Managed marsh consists of areas actively managed for one or more marsh habitat values and functions. In the Project area, managed marsh occurs primarily on state and federal refuges. Private duck clubs also support managed marsh. These marshes are freshwater marshes maintained with irrigation delivery purchased from IID. They are not supported by the Salton Sea nor are they supported by drainwater. As a result, managed marshes in the Imperial Valley would not be impacted by the Proposed Project or Alternatives. They are described here only to provide improved understanding of the habitats available in the Project area.

STANDARD DRAIN
1
2
3
MALVA 2 DRAIN
4
5
MYRTLE DRAIN
6
East Highline Canal
7
MAPLE DRAIN
8
9
MAGNOLIA DRAIN
10
MOSS DRAIN
ORITA DRAIN
HOLTVILLE MAIN DRAIN NO 6
11
12
HOLTVILLE MAIN DRAIN NO 6
13
14
15
16
TOWNSHIP DRAIN
17
18
19
20
POMELO DRAIN
21
22
HOLTVILLE MAIN DRAIN NO 1
23
24
PAMPAS DRAIN
25
26
EAST HIGHLINE 14 PIPELINE DRAIN
27
28
HOLTVILLE MAIN DRAIN
29
HOLTVILLE MAIN DRAIN NO 2A
WARREN DRAIN
East Highline Canal
30
31
VERDE DRAIN NO 2
32

SEEPAGE AREAS
DRAINS
CANALS
AQUEDUCT/CANAL

N

Source:
University of Redlands, 1999; DOI, 1999

2000 0 2000 Feet
SCALE IS APPROXIMATE

Figure 3.2-7
Seepage Communities Adjacent to the East Highline Canal
IID Water Conservation and Transfer Project Final EIR/EIS

CH2M Hill RDD ArcView Project File \\rddgis\iid\seepage.apr iid_fig3_2-7.pdf 9:35 p.m. 10-7-2002

CH2MHILL

Table of Contents
Continue