Chapter 12
Botanical Resources and Wetlands

12.1 Affected Environment

This section describes the affected environment related to botanical resources and wetlands for the dam and reservoir modifications that are proposed under SLWRI action alternatives. For a more in-depth description, see the *Botanical Resources and Wetlands Technical Report.*

The botanical resources and wetlands setting for the Shasta Lake and vicinity portion of the primary study area consists of the impoundment area (five arms and the Main Body of Shasta Lake, as described below) and the relocation areas (Figure 12-1).

Reclamation established project boundaries for focused surveys in the areas that would be subject to inundation under the various enlargement scenarios. The lower boundary corresponds to the current full pool elevation defined by Reclamation (1,070-foot mean sea level contour line). The upper boundary was established using the 1,090-foot mean sea level contour line around the entire lake. This area is referred to as the "impoundment area" (Figure 12-1).

Areas subject to physical disturbance as an indirect result of the proposed project (i.e., areas proposed as relocation sites for roadways, bridges, utilities, and campgrounds that would be inundated after the enlargement of Shasta Dam as well as proposed dike locations) were incorporated into the Shasta Lake and vicinity portion of the primary study area. These locations are hereafter referred to as "relocation areas" (Figure 12-1).

To examine the biological resources along riverine reaches that would be subject to inundation if Shasta Dam were enlarged, reaches of 11 streams and rivers that are tributary to Shasta Lake were also incorporated into the Shasta Lake and vicinity portion of the primary study area. These streams were selected by Reclamation in conjunction with the USFS as an initial sampling of streams representative of riverine and riparian habitats. Subsequently, botany studies have been expanded into select areas of the impoundment area and within all of the relocation areas.

As a component of the SLWRI, Reclamation proposes to restore and/or enhance riparian and riverine habitats at six locations along the lower Sacramento River below Shasta Dam. These six locations occur generally between the city of Redding and Reading Island, Shasta County, California. The purpose of the

restoration effort is to improve spawning and rearing habitat for anadromous fish occurring in the Sacramento River. These six locations are referred to as the potential Sacramento River downstream habitat restoration areas (Figure 12-2).

For the purposes of this investigation, approximate acreages for vegetation types and waters of the United States are reported by arm of the lake. For a relocation area that falls between two arms, the area is included with the arm that has the most acreage of the vegetation type or water of the United States. Habitats and waters of the United States are also reported for the potential Sacramento River downstream habitat restoration areas.

Vegetation communities and special-status plant species in the extended study area are discussed in less detail. The extended study area includes the Sacramento River basin from Red Bluff Pumping Plant (RBPP) south to the Delta. It also includes the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) area and portions of the American River basin, San Joaquin River basin, and the water service areas of the CVP and the SWP.

Descriptions of biological resources were derived primarily from the following sources:

- SLWRI Mission Statement Milestone Report (Reclamation 2003)
- SLWRI Initial Alternatives Information Report (Reclamation 2004)
- Chapter 3, “Biological Environment,” in the Draft SLWRI Plan Formulation Report (Reclamation 2007)
- USFWS Endangered Species Lists
- The California Natural Diversity Database (CNDDB)
- The California Native Plant Society (CNPS) online inventory
- Numerous technical studies of botanical and wetland resources conducted by Reclamation in the Shasta Lake and vicinity portion of the primary study area since 2002.

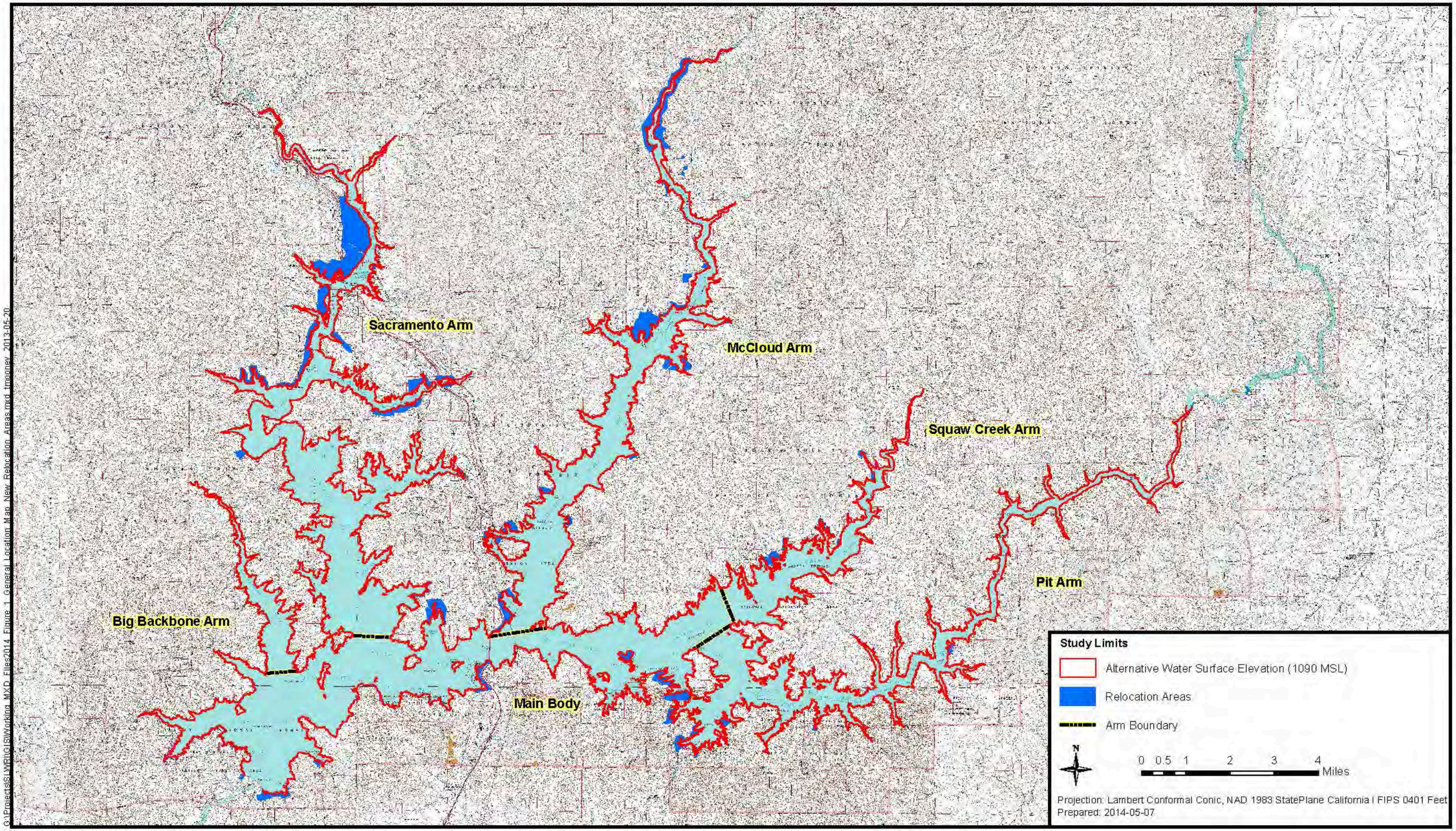

Figure 12-1. Study Limits

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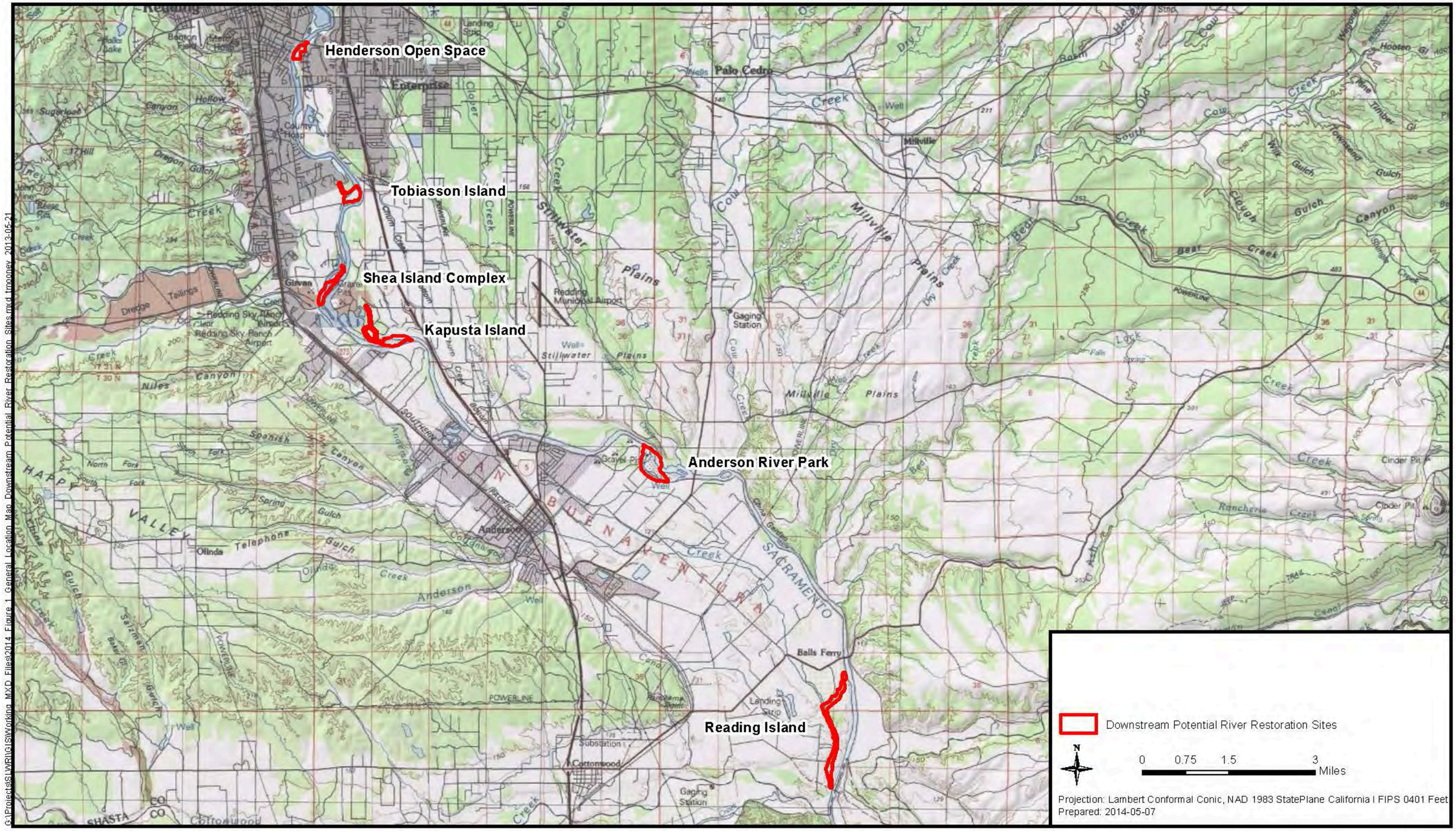

Figure 12-2. General Location Map Downstream Potential River Restoration Areas

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Several attachments to the *Botanical Resources and Wetlands Technical Report* provide detailed lists and descriptions of special-status species present in the primary and extended study areas:

- Attachment 1, "Lists of All Special-Status Plant Species Known from or Potentially Present in the Primary and Extended Study Areas"
- Attachment 2, "List of Plant Species Observed in the Shasta Lake and Vicinity Portion of the Primary Study Area"
- Attachment 3, "Special-Status Plant Species Known to Occur in the Shasta Lake and Vicinity Portion of the Primary Study Area"
- Attachment 4, "List of All Sensitive Plant Species in the Extended Study Area Reported to the CNDDB"
- Attachment 5, "Known Weed Source Locations, Potential Mode of Spread, and Risk of Spread"
- Attachment 6, "Botanical Survey Report 2002-2014"

12.1.1 Vegetation Communities

Shasta Lake and Vicinity

Reclamation conducted extensive mapping to characterize the plant communities in the Shasta Lake and vicinity portion of the primary study area. The study area for botanical resources and wetlands in the Shasta Lake and vicinity portion of the primary study area corresponds to the area that would be subject to inundation under all action alternatives and areas where infrastructure would be removed, modified, or relocated (Figure 12-1). The vegetation mapping followed the technical approach described in *A Manual of California Vegetation* (MCV) (Sawyer and Keeler-Wolf 1995), using the vegetation alliance classification system described in *A Manual of California Vegetation, Second Edition* (Sawyer et al, 2009).

The MCV represents the most recent effort to provide a common and accepted vegetation classification system for use throughout California. It classifies vegetation into a set of plant alliances, provisional alliances, special stands, or semi-natural stands. In this system, the plant species dominance or importance in the layer (i.e., tree, shrub, and ground) with the greatest amount of cover determines the vegetation alliance classification. The same approach used to describe and classify MCV types was applied when other vegetation types not described in the current MCV were encountered and determined to be significant vegetative components.

Vegetation mapping was conducted using recent 1:2,400-scale rectified color aerial photography. All vegetation mapping was performed in the field by

ground truthing the primary study area from boat, vehicle, and/or on foot. MCV plant alliances were identified and delineated onto the aerial photographs. The delineated boundaries were digitized and generated in ArcGIS/ArcInfo software for display and data query purposes.

The Shasta Lake and vicinity area is characterized by a variety of vegetation types typical of transitional mixed woodland and low-elevation forest habitats. MCV plant series types in this portion of the primary study area are birch-leaf mountain mahogany chaparral, black willow thicket, blue oak woodland, Brewer's oak scrub, buck brush chaparral, California annual grassland, California black oak forest, California ash chaparral, California buckeye groves, California yerba santa scrub, canyon live oak forest, deer brush chaparral, Fremont cottonwood forest, ghost pine woodland, Himalayan blackberry brambles, interior live oak chaparral, interior live oak woodland, knobcone pine forest, mixed willow, Oregon ash groves, Oregon white oak woodland, pale spike rush marshes, ponderosa pine–Douglas fir forest, ponderosa pine forest, red osier thickets, sandbar willow thickets, spicebush thickets, valley oak woodland, white alder groves, and white leaf manzanita chaparral. Vegetation in each of these series varies, with dramatic changes often occurring in relation to aspect, slope, geologic substrate, or juxtaposition with other habitats.

Summaries of MCV types found in the impoundment area along the Main Body and the five arms of Shasta Lake are shown in Table 12-1, and the acreage of MCV types found in the relocation areas along the Main Body and the five arms of Shasta Lake is shown in Table 12-2. The locations of each type are depicted on Figures 12-3a through 12-3f. General descriptions of each type are provided below. Plant taxonomy follows Baldwin et al. (2012).

Table 12-1. Summary of Plant Communities in the Impoundment Area

Plant Series	Area (Acres)						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Arroyo willow thickets	0.15	0.00	0.00	0.00	0.00	0.00	0.15
Barren[1]	2.30	0.00	13.16	11.18	0.00	2.84	29.48
Birch-leaf mountain-mahogany chaparral	0.00	0.00	0.00	2.23	0.00	0.00	2.23
Black willow thicket	0.00	0.00	0.02	0.00	0.00	0.02	0.04
Blue oak woodland	1.27	0.00	0.00	0.70	0.00	4.08	6.05
Brewer oak scrub	9.78	0.17	51.62	4.99	4.51	7.78	78.85
Buck brush chaparral	0.90	2.42	2.11	1.59	0.67	0.19	7.88
California annual grassland	0.58	0.34	4.17	0.94	0.00	0.33	6.36
California black oak forest	71.45	14.14	160.32	47.44	1.72	5.06	300.13
California buckeye groves	0.00	0.00	0.20	0.001	0.00	0.00	0.20
California yerba santa scrub	0.75	0.00	0.00	0.00	0.00	11.58	12.33
Canyon live oak forest	9.80	18.41	53.80	48.31	26.78	110.51	267.61
Deer brush chaparral	0.18	0.00	0.00	0.08	0.00	2.34	2.60
Fremont cottonwood forest	0.00	0.00	0.07	0.00	0.00	0.05	0.12
Ghost pine woodland	54.05	0.00	51.29	13.50	22.03	30.54	171.41
Himalayan blackberry brambles	0.00	0.00	0.00	0.00	0.00	0.44	0.44
Interior live oak chaparral	1.24	0.00	10.05	0.01	0.00	24.22	35.52
Interior live oak woodland	2.00	0.00	0.14	0.09	0.00	2.28	4.51
Knobcone pine forest	32.96	0.40	16.38	20.72	47.87	79.83	198.16
Mixed willow	1.39	1.46	14.56	0.16	0.19	0.83	18.59
Oregon ash groves	0.00	0.00	0.00	0.17	0.00	0.00	0.17
Oregon white oak woodland	0.00	0.00	0.00	1.09	0.00	0.66	1.75
Ponderosa pine–Douglas fir forest	5.02	0.00	28.37	50.04	69.02	127.51	279.96
Ponderosa pine forest	225.95	36.67	212.79	208.77	59.33	101.17	808.01

Table 12-1. Summary of Plant Communities in the Impoundment Area (contd.)

Plant Series	Area (Acres)						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Red osier thickets	0.00	0.00	0.00	0.12	0.00	0.00	0.12
Riverine[1]	0.00	0.88	5.24	15.43	1.41	0.00	22.96
Sandbar willow thickets	0.00	0.00	0.00	0.28	0.07	0.00	0.35
Spicebush thickets	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Urban[1]	22.04	0.00	0.00	0.00	0.00	1.92	23.96
White alder groves	1.34	4.47	9.70	12.40	1.18	2.85	31.94
White leaf manzanita chaparral	16.60	12.30	98.22	6.21	7.49	2.86	143.68
Total	459.76	91.67	732.20	446.49	242.28	519.90	2492.29

Notes
[1] CWHR Wildlife Habitat Type; no corresponding plant series type included in *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995).

Table 12-2. Summary of Plant Communities in the Relocation Areas

Plant Series	Area (Acres)						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Barren[1]	22.32	0.00	74.17	29.66	11.53	12.77	150.46
Birch-leaf mountain-mahogany chaparral	0.00	0.00	0.00	0.41	0.00	0.00	0.41
Black willow thicket	0.00	0.00	0.03	0.00	0.00	0.00	0.03
Blue oak woodland	0.00	0.00	0.00	3.68	0.00	0.93	4.61
Brewer oak scrub	5.46	0.00	13.22	8.40	0.00	0.12	27.20
Buck brush chaparral	0.00	0.00	0.77	1.45	0.00	0.04	2.26
California annual grassland	4.76	0.00	20.31	9.75	0.84	0.23	35.89
California ash chaparral	0.00	0.00	0.00	0.68	0.00	0.00	0.68
California black oak forest	35.03	0.00	131.78	77.04	1.29	0.04	245.17
California buckeye groves	0.00	0.00	0.00	1.58	0.00	0.00	1.58
California yerba santa scrub	0.09	0.00	0.00	0.00	0.00	2.75	2.83
Canyon live oak forest	1.06	0.00	8.10	77.26	4.98	5.60	96.99

Table 12-2. Summary of Plant Communities in the Relocation Areas (contd.)

Plant Series	Area (Acres*)						
	Main Body	Big Backbone Arm	Sacramento Arm	McCloud Arm	Squaw Creek Arm	Pit Arm	Total
Deer brush chaparral	0.18	0.00	0.00	0.57	0.00	0.40	1.15
Ghost pine woodland	105.48	0.00	41.27	29.95	13.48	11.94	202.11
Himalayan blackberry brambles	0.15	0.00	0.00	0.06	0.00	0.00	0.21
Interior live oak chaparral	0.00	0.00	0.60	0.00	0.00	22.70	23.29
Interior live oak woodland	0.00	0.00	0.00	0.00	0.00	0.05	0.05
Knobcone pine forest	0.11	0.00	40.64	9.65	1.94	13.96	66.30
Lacustrine[1]	0.00	0.00	0.00	0.001	0.00	0.00	0.001
Mixed willow	0.08	0.00	0.73	0.00	0.06	0.01	0.87
Oregon ash groves	0.00	0.00	0.00	0.33	0.00	0.00	0.33
Oregon white oak woodland	0.00	0.00	0.00	5.72	0.07	0.00	5.72
Pale spike rush marshes	0.00	0.00	6.51	0.00	0.00	0.00	6.51
Ponderosa pine–Douglas fir forest	0.00	0.00	13.06	106.07	15.62	11.80	146.55
Ponderosa pine forest	156.56	0.00	458.50	347.64	43.08	35.97	1041.75
Riverine[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sandbar willow thickets	0.00	0.00	0.00	0.09	0.00	0.00	0.09
Spicebush thickets	0.00	0.00	0.00	0.64	0.00	0.00	0.64
Urban[1]	20.65	0.00	227.46	0.48	0.00	0.57	249.16
Valley oak woodland	0.00	0.00	1.06	0.00	0.00	0.00	1.06
White alder groves	0.00	0.00	0.23	1.90	0.17	0.00	2.31
White leaf manzanita chaparral	7.28	0.00	41.41	14.88	4.38	0.00	67.94
Total	359.20	0.00	1,079.84	727.92	97.44	119.83	2,387.23

Note:
[1] CWHR Wildlife Habitat Type; no corresponding plant series type included in *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995).

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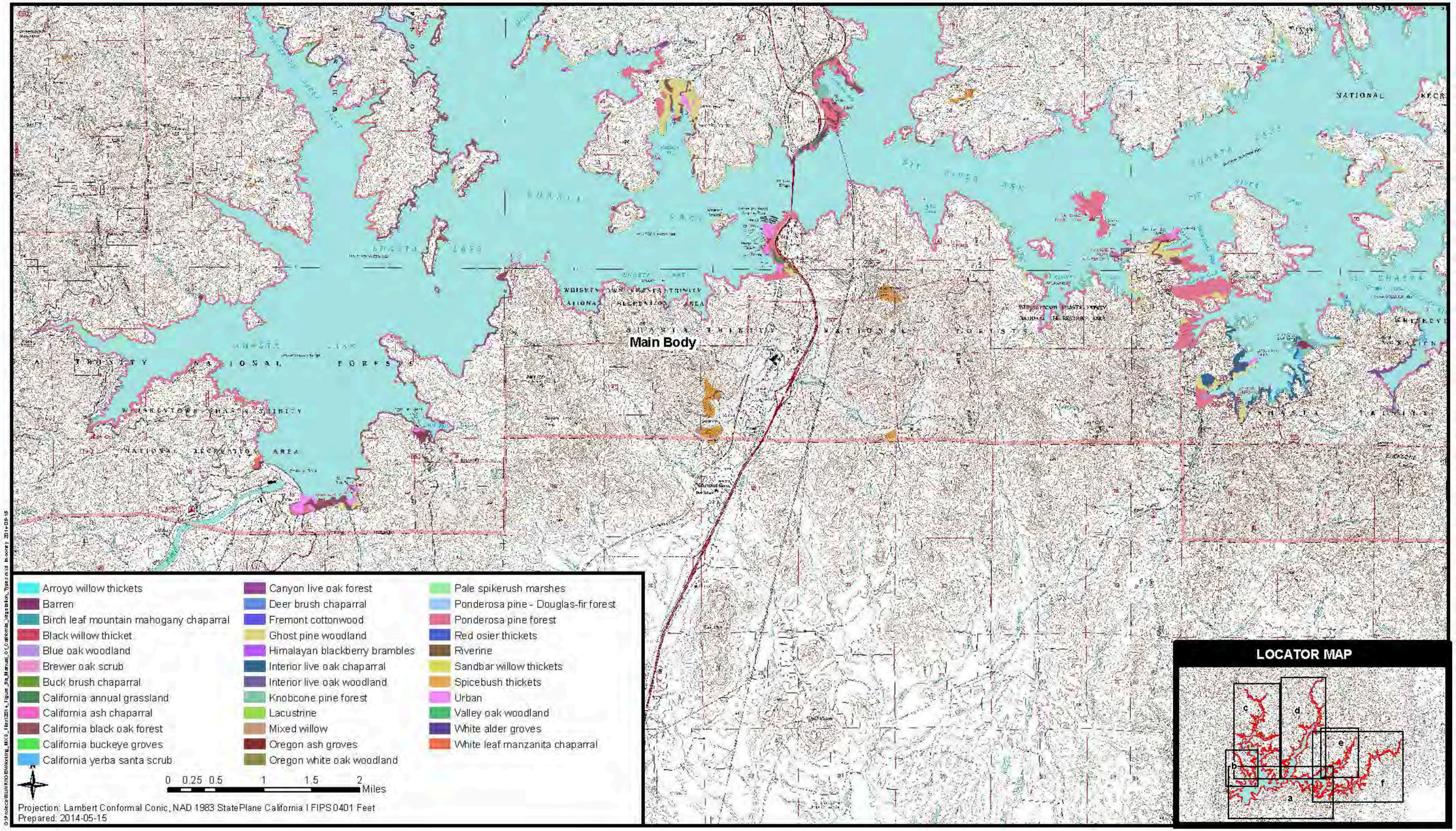

Figure 12-3a. Manual of California Vegetation Types

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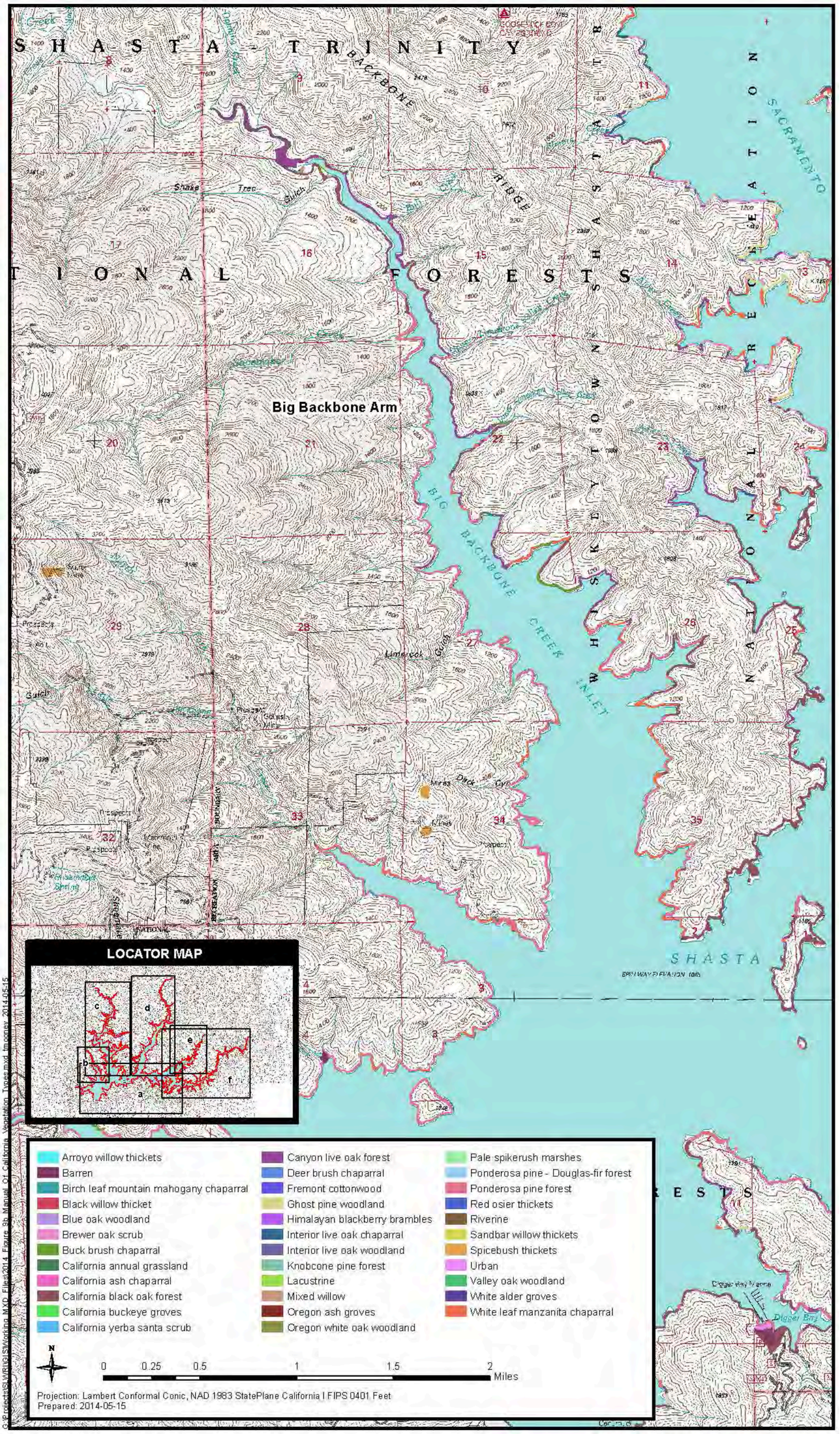

Figure 12-3b. Manual of California Vegetation Types

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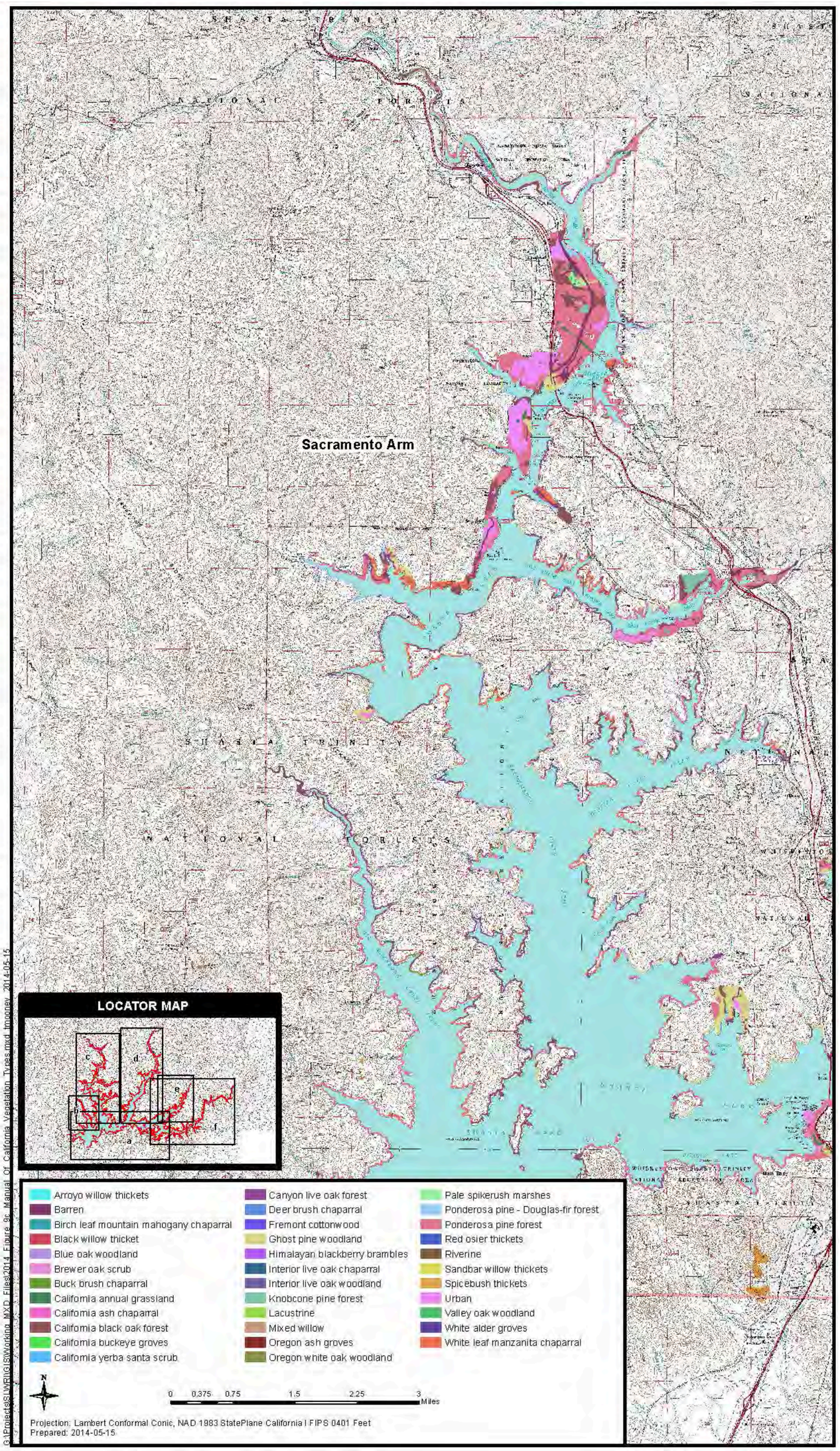

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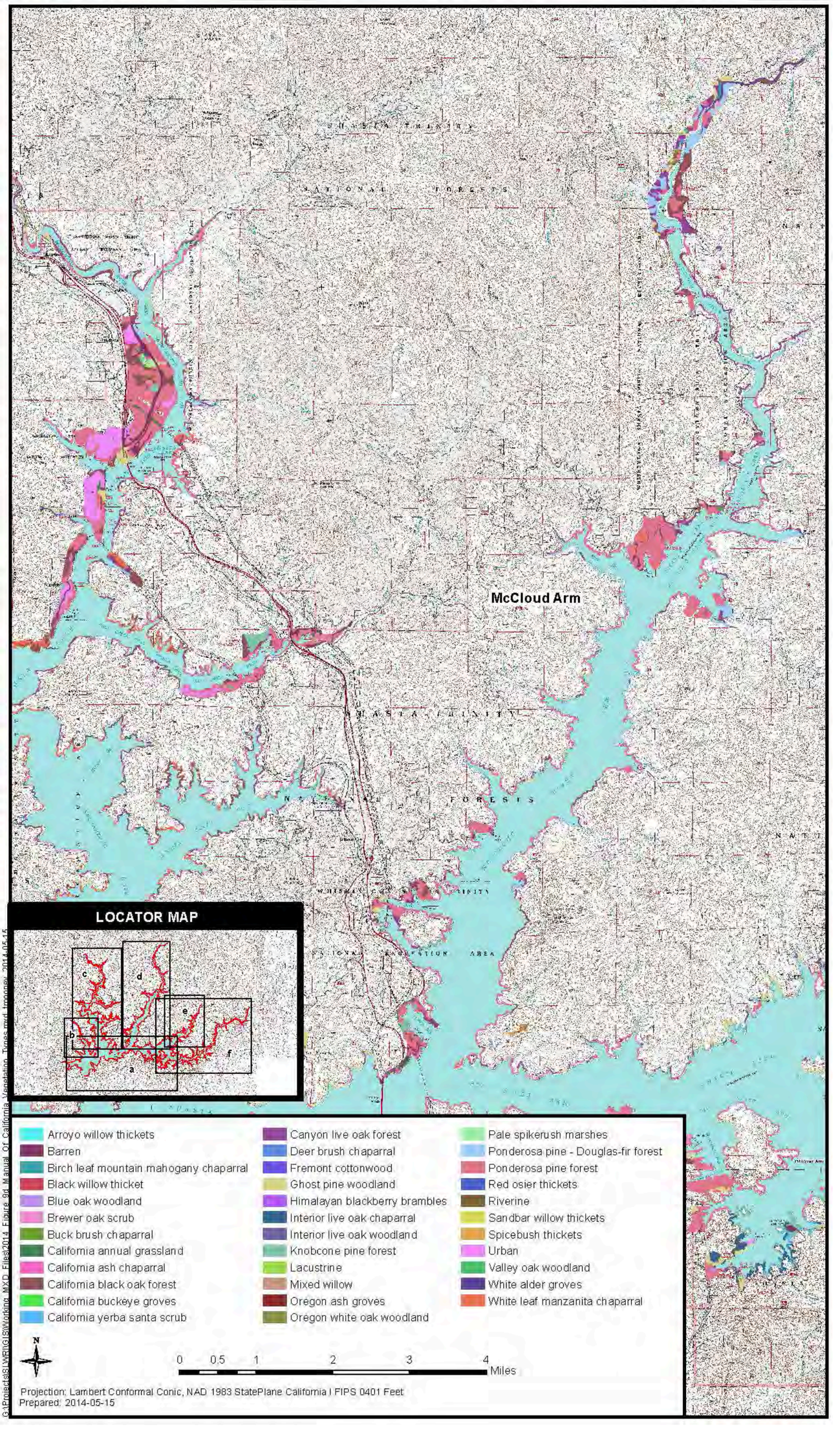

Figure 12-3d. Manual of California Vegetation Types

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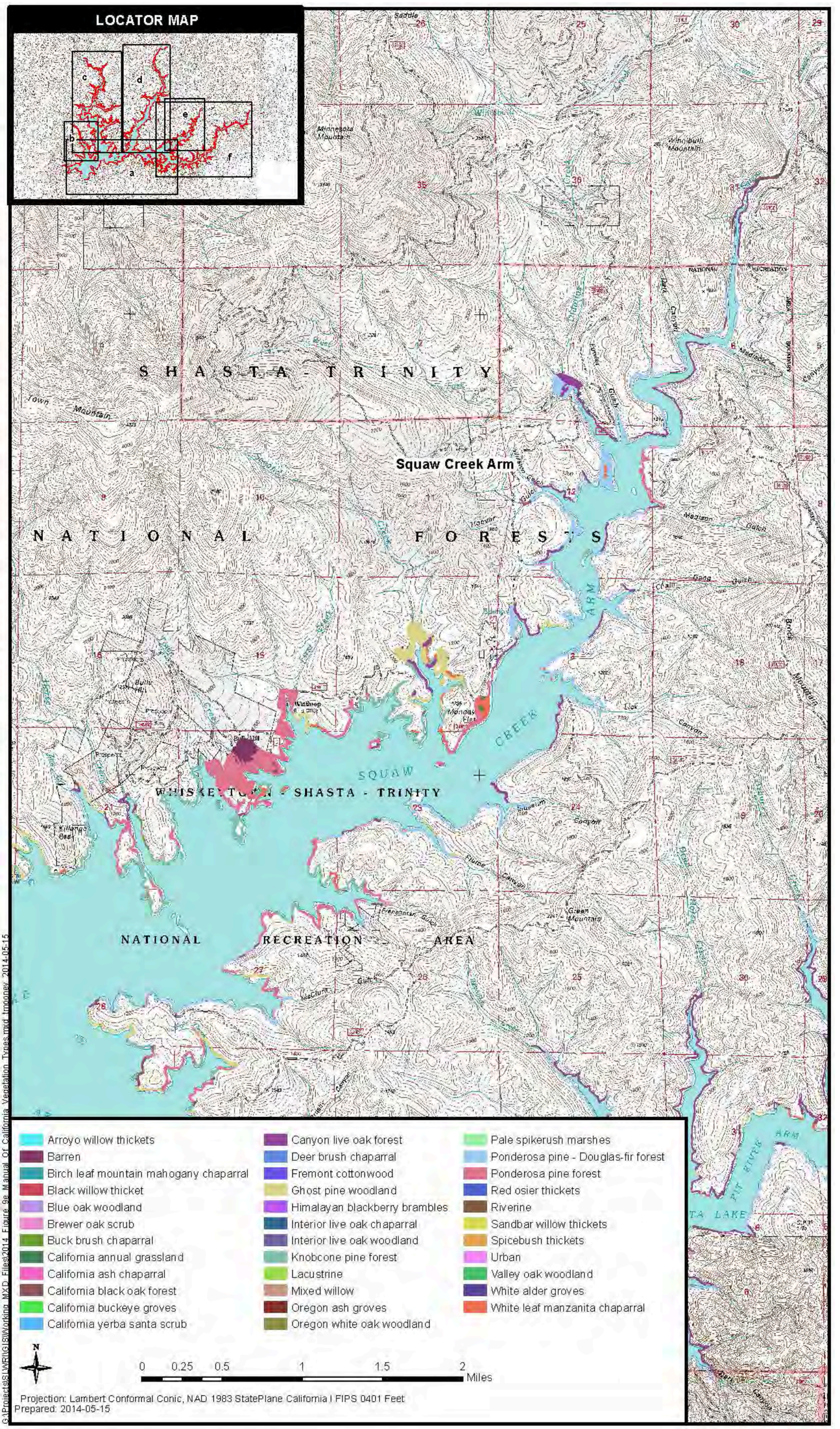

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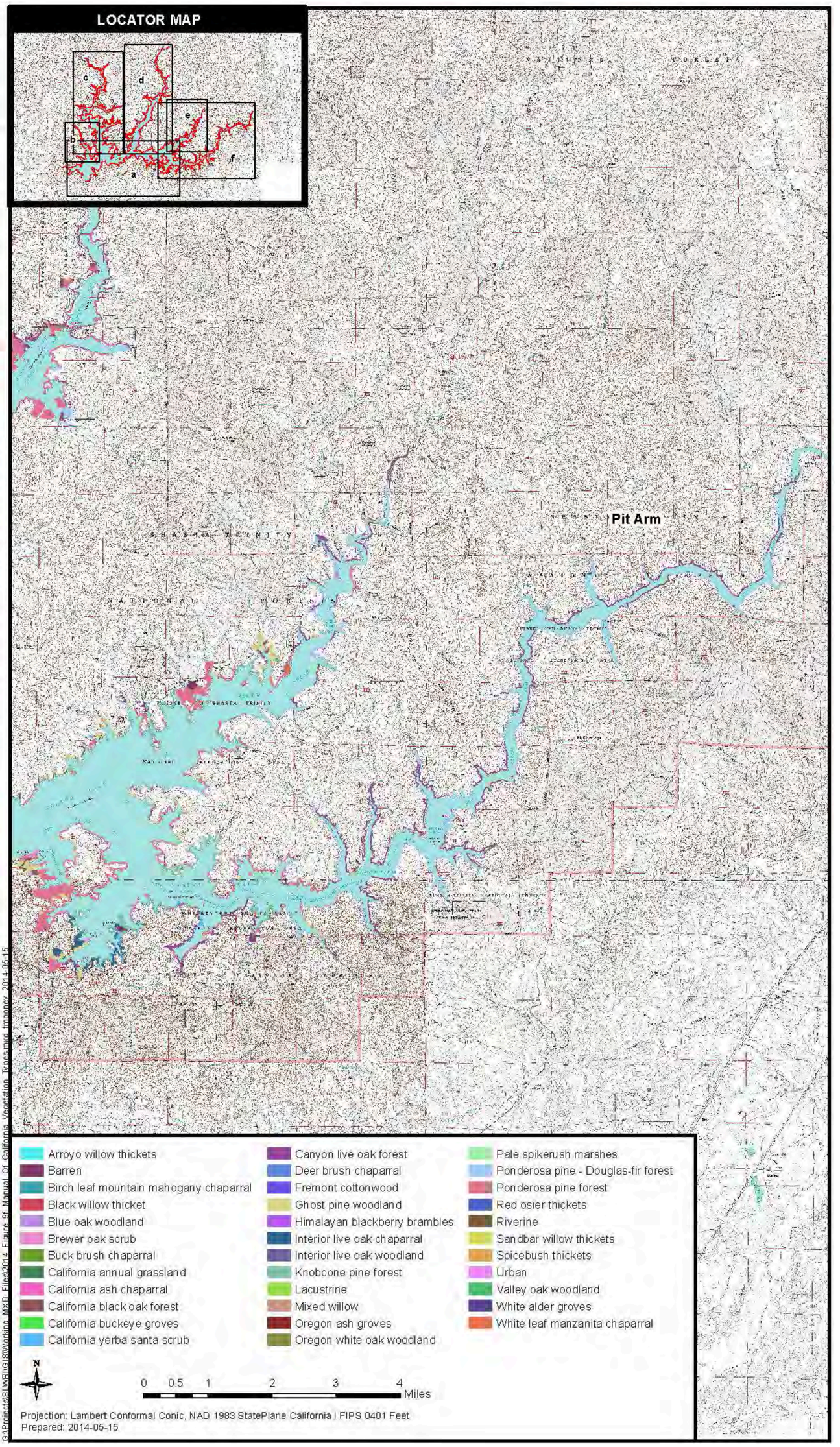

Figure 12-3f. Manual of California Vegetation Types

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