EXHIBIT D

Compensation Planning Framework

Sacramento District
California In-Lieu Fee Program

Compensation Planning Framework

Contents

The Compensation Planning Framework (Framework) addresses the specific requirements of the 2008 Rule. To this end, the Framework is divided into two parts. Part I sets forth an overview of the elements of the Framework that apply to the ILF Program across all Service Areas, including general project prioritization. Part II sets forth detailed descriptions of each Service Area, including historic and current impacts to regional wetlands and a prioritization of how these Service Area-specific impacts may be addressed through implementation of future ILF Projects. Numerous regional- and watershed-specific sources were analyzed and incorporated into the preparation of this document; however, three key planning documents have shaped the general approach to the compensation needs and restoration planning within the ILF Program area. These documents are: USFWS Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005), Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead (NMFS 2009), and The Sacramento River Basin - A Roadmap to Watershed Management (Sacramento River Watershed Program 2010).

Part I. Elements of the Compensation Planning Framework

A. Geographic Service Areas

The ILF Program Area is the jurisdiction of the Sacramento District within California. The ILF Program Area is divided into Vernal Pool Service Areas and Aquatic Resource Service Areas. Vernal Pool Service Areas have been adapted from the USFWS Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS Recovery Plan) (USFWS, 2005); Aquatic Resource Service Areas have been developed by incorporating aspects of habitat functions, species utilization, water quantity and quality, and hydrologic connectivity within a contiguous integrated unit. As such, a key element of the ILF Program is that it is “ecological performance-based” rather than strictly geography-based, resulting in Aquatic Resource Service Areas that consist of several 8-digit Hydrologic Unit Code (“HUC”) watersheds. While major river systems and watersheds serve as the basic units for the ILF Program’s Aquatic Resource Service Areas, siting of restoration projects will be based on resource-specific factors such as watershed proximity, landscape position, and wetland functions. Similarly, vernal pool regions, as defined in the USFWS Recovery Plan, are the basic units for the ILF Program’s Vernal Pool Service Areas, and additional ecological factors such as “Core Areas” within the vernal pool regions will factor greatly into the process for siting compensatory mitigation ILF Projects to be implemented with funds from the Transfer of Advance Credits. Additional information regarding each Service Area classification is included below, with information on individual Service Areas included in Part I.A and B of the Compensation Planning Framework.

1. Vernal Pool Service Areas

The SPK CA ILF Program establishes 12 Vernal Pool Service Areas based on the Vernal Pool Regions identified in the USFWS Recovery Plan that occur within the Sacramento District. Because of the boundary of the ILF Program, portions of certain vernal pool regions have been excluded from the individual Service Areas, as noted below. Every vernal pool region that exists partially or in its entirety within ILF Program Area is listed below and depicted in **Figure 1**.

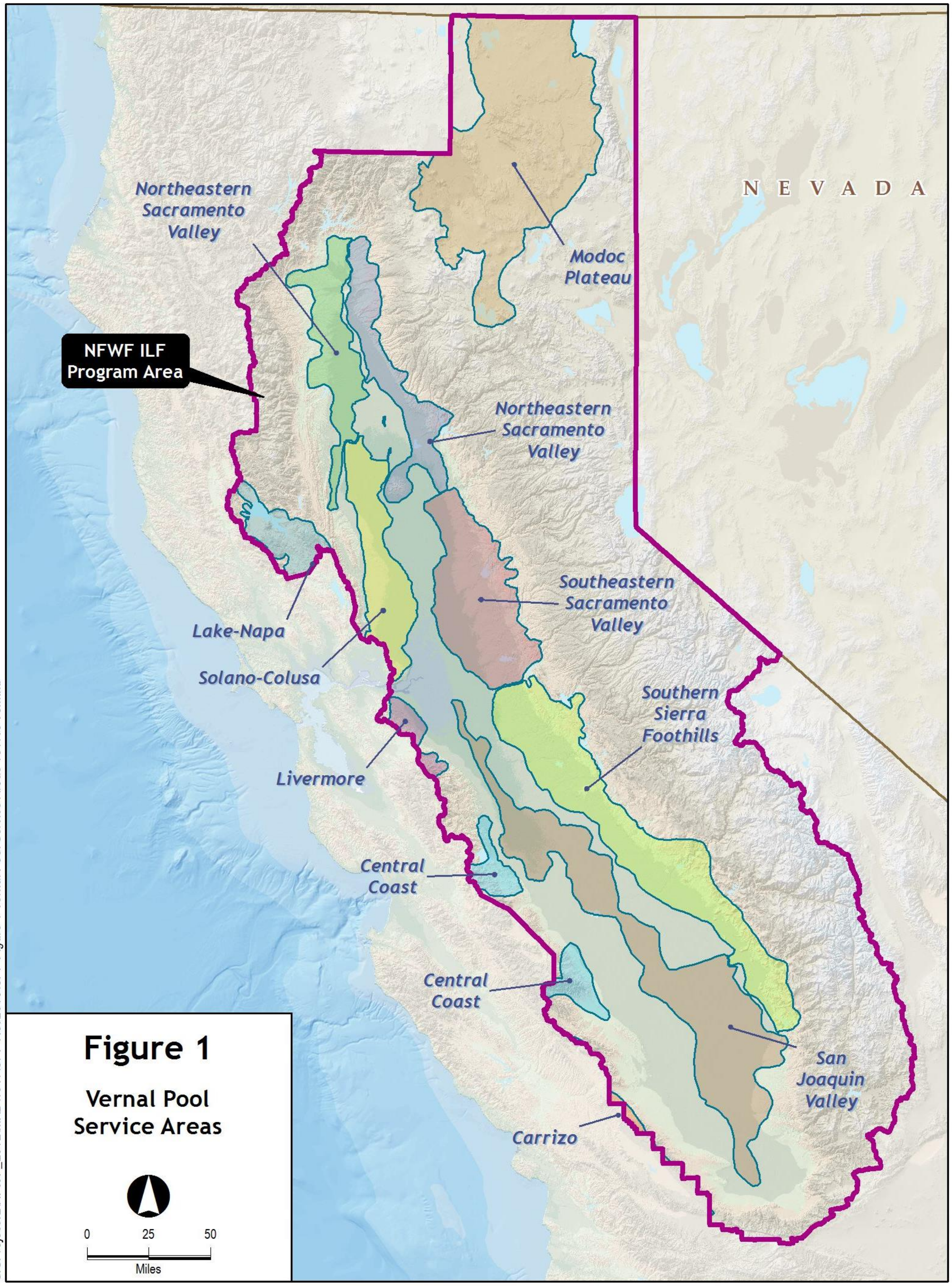


Figure 1

Vernal Pool Service Areas

GIS\Project12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 1 Vernal Pool Service Areas 131118 v3.mxd

a. Carrizo (partially within the ILF Program Area)
b. Central Coast (partially within the ILF Program Area)
c. Lake-Napa (partially within the ILF Program Area)
d. Livermore (partially within the ILF Program Area)
e. Modoc (partially within the ILF Program Area)
f. Northeastern Sacramento Valley
g. Northwestern Sacramento Valley
h. San Joaquin Valley
i. Solano-Colusa (partially within the ILF Program Area)
j. Southeastern Sacramento Valley
k. Southern Sierra Foothills
l. All Other Vernal Pool Areas (Vernal Pool landscapes not within a vernal pool region)

Additional information regarding the Vernal Pool Service Areas is described in Part II.A of the Framework. Much of the information included in the Framework has been adopted from the USFWS Recovery Plan and/or the *California Vernal Pool Assessment Preliminary Report* (Keeler-Wolf et al., 1998). Additional information regarding Service Areas and funding can be found in **Section D**.

2. Aquatic Resource Service Areas

The ILF Program establishes 17 Aquatic Resource Service Areas (**Figure 2**) based on river systems and watersheds identified within this ILF Program in Part II.B of the Framework.

A typical planning-level watershed in the Sacramento District is defined by the 8-digit hydrologic unit codes (HUCs), which provide a valuable planning tool for assessing impacts within an immediate region. However, because of the preferences expressed in the 2008 Rule and new State Water Board guidance for a comprehensive watershed approach, a larger assessment area has been developed for each Aquatic Resource Service Area to accurately evaluate wetland losses, pressures, and restoration objectives. In particular, Aquatic Resource Service Areas have been expanded to incorporate portions of several 8-digit HUCs in order to allow for a more comprehensive examination of the habitat functions, salmonid species utilization, water quantity and quality, and connectivity within the headwater, tributary, and floodplain elevations of an entire watershed. This allows for a more complete understanding of historic and current conditions and the most appropriate ways to offset these impacts. Further, evaluating watersheds and river systems from headwater to floodplain elevations allows for the integration of previously established conservation plans and goals, such as those related to regional water quality improvements and anadromous fish recovery.

As sufficient funding is vital to ensure successful implementation and sustainability of ILF Projects, the size of each of the Aquatic Resource Service Areas has also been examined with respect to its ability to generate funds from Transfers of Advance Credits to develop and implement ILF Projects. Given that the ILF Program will provide compensatory mitigation in locations underserved by mitigation banks, often due to lower levels of permit activity, it is important that Aquatic Resource Service Areas are of an appropriate size to facilitate the accumulation of funds

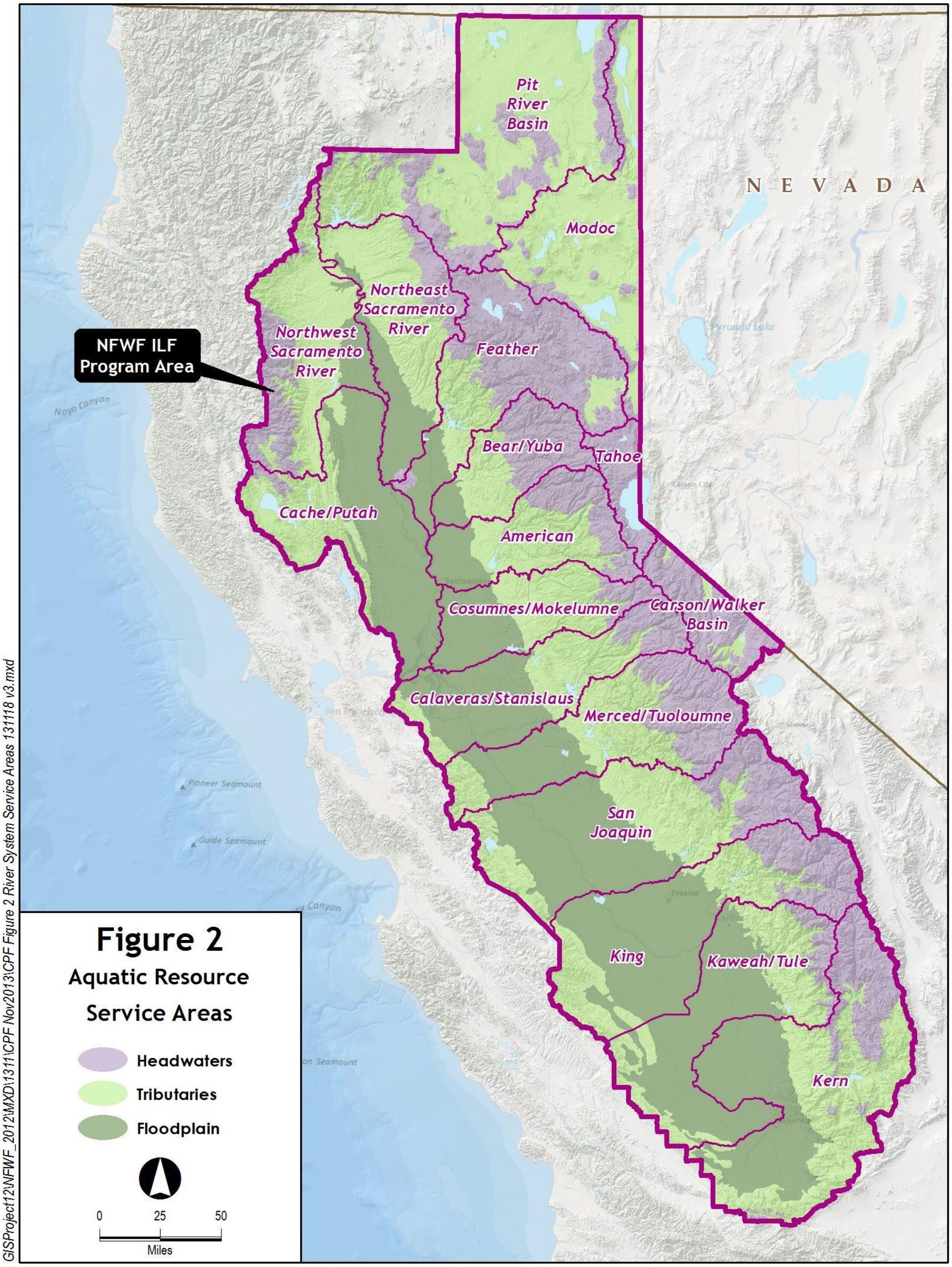


Figure 2
Aquatic Resource
Service Areas
Headwaters
Tributaries
Floodplain
0
25
50
Miles
NFWF ILF
Program Area
N E V A D A
Pit
River
Basin
Modoc
Northeast
Sacramento
River
Northwest
Sacramento
River
Feather
Bear/Yuba
Tahoe
Cache/Putah
American
Cosumnes/Mokelumne
Carson/Walker
Basin
Calaveras/Stanislaus
Merced/Tuoloumne
San
Joaquin
King
Kaweah/Tule
Kern
Pioneer Seamount
Guide Seamount
Noyo Canyon
GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 2 River System Service Areas 131118 v3.mxd

across a broad region to implement high quality projects. However, since it is also important that areas with dramatically different ecosystems and impacts remain unique, ecological similarities of each Service Area were further examined in determining the Service Areas depicted in **Figure 2**. Thus, the boundary of each Aquatic Resource Service Area has been refined from 8-digit HUCs to incorporate larger riverine- based boundaries through examinations of both the ecology and economic viability of each area to support ILF Program goals. The Aquatic Resource Service Areas are listed in Table 1, along with the 8-digit HUCs they encompass. Additional information regarding Service Areas and funding is set forth in **Section D**.

Table 1: Aquatic Resource Service Areas

"Watershed" Service Area	HUC 8
Pit River	18010204, 18020001, 18020002, 18020003, 18020004, 18020005
Modoc	18080001, 18080002, 18080003, 17120007, 16040203, 16040204
Northeast Sacramento River	18020151, 18020152, 18020154, 18020155, 18020156, 18020157, 18020158
Northwest Sacramento River	18010103, 18010104, 18020115, 18020151, 18020153, 18020155, 18020156, 18020157
Cache/Putah Rivers	18010110*, 18020104, 18020162, 18020116, 18020163
Feather River	18020121, 18020122, 18020123, 18020159
Bear/Yuba Rivers	18020125, 18020126, 18020159
American River	18020111, 18020129, 18020128, 18020161
Cosumnes/Mokelumne Rivers	18020163, 18040013, 18040012
Tahoe	16050101, 16050102
Carson/Walker Rivers	16050201, 16050301, 16050302
Calaveras/Stanislaus Rivers	18040003, 18040011, 18040010, 18040051
Merced/Tuolumne Rivers	18040002, 18040008, 18040009
San Joaquin River	18040001, 18040006, 18040007, 18040014
King River	18030009, 18030010, 18030012
Kaweah/Tule Rivers	18030006, 18030007, 18030012, 18060003, 18060004*
Kern River	18030001, 18030002, 18030003, 18030004, 18030005, 18060003, 18060007, 18070102

B. Analysis of Historic Aquatic Resource Loss

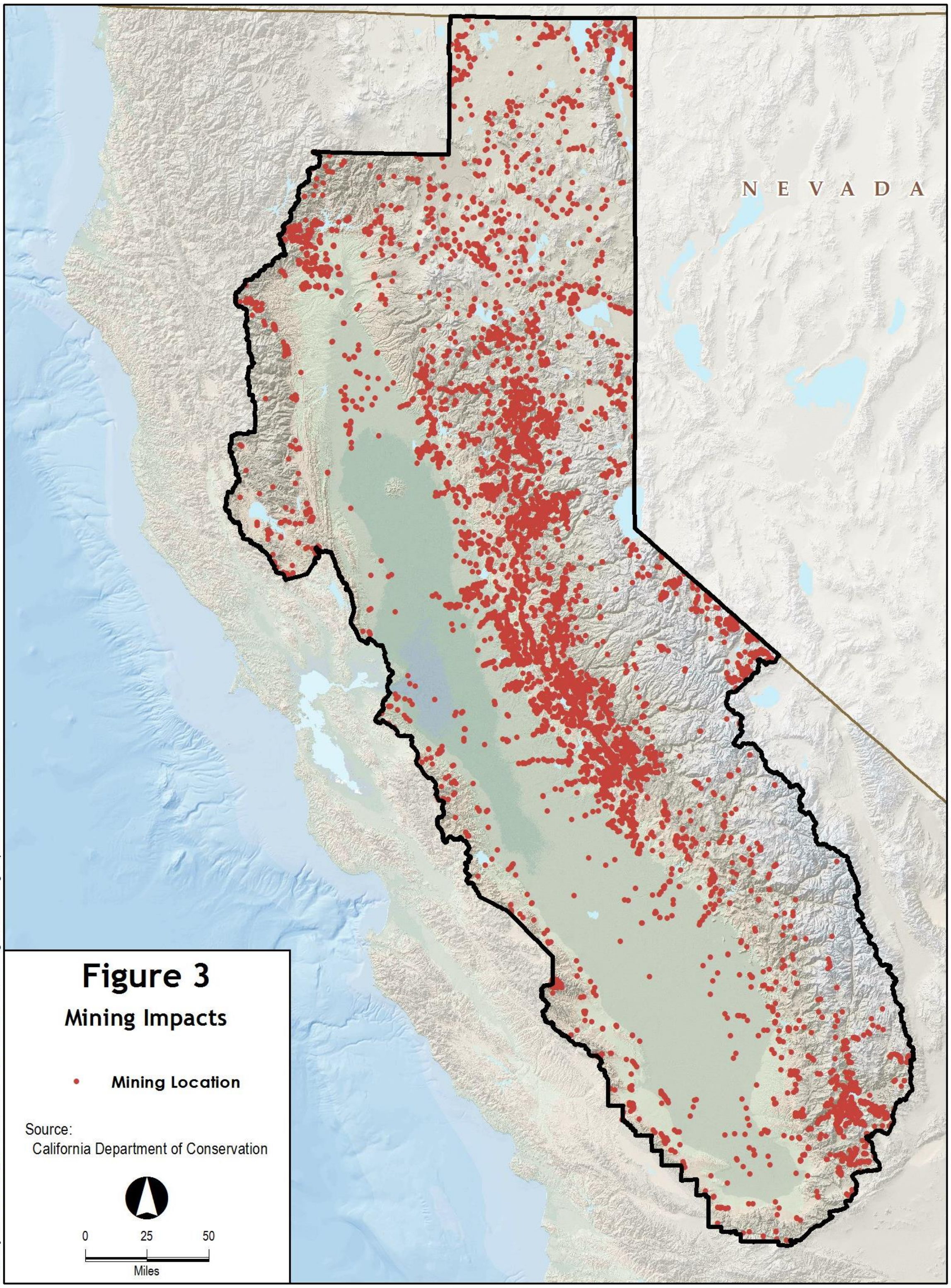
The majority of historic aquatic resource loss across the ILF Program Area can be attributed to seven primary activities: mining, timber/forest management, water resource development/hydropower, agricultural conversion/irrigation, urban/community development, flood protection/levee construction, and road development.

1. Mining

Mining activities have been a formative force throughout California both economically and environmentally, changing the hydrology and landforms of the State beginning with the start of the Gold Rush in the 1840s and continuing through the present day. Prior to mining, few to no impacts to wetlands had occurred, as there was limited population and industry the State. The start of these activities resulted in significant and direct changes to aquatic resources throughout many of the State's watersheds. These impacts were especially poignant in the mid- and lower elevations of the Sierra Nevada adjoining the Sacramento Valley (**Figure 3**). In the tributary reaches of these watersheds, entire landscapes were altered through hydraulic mining operations of placer deposits, changing the physical pathways of overland flows and water quality characteristics throughout the hydrologic system. Chemicals, such as mercury and arsenic, were flushed into the waterways, and hundreds of thousands of tons of sediment were discharged when entire hillsides were washed away to expose gold seams. These impacts were exacerbated by other activities associated with mining in this region, such as clear-cutting forests for materials to support mining operations, water infrastructure development to aid in transport of minerals and other resources, grazing and agriculture conversion to feed the miner population, construction of new communities to support this population, and road development to access new mine sites. Even in the southern Sierra Nevada, along the Kern and San Joaquin rivers, where large gold deposits were not successfully exploited, impacts from these affiliated activities occurred as the State's gold-hungry population expanded.

Concurrently, within the lower reaches of these same watersheds, dredge mine operations became established in the historic high floodplains adjoining major river systems throughout the Central Valley. This resulted in the accumulation of fine particulate matter in waterways already choked with mining-related sediments washed downstream from higher-elevation mines, further degrading higher-order stream channels and lower river terraces. These enormous sediment loads soon made vital riverboat commerce nearly impossible throughout the region, leading to the implementation of large-scale dredging projects and levee construction to increase river velocity, promoting further sediment transport in many major Central Valley waterways. While these activities were successful in restoring boat passage, they also further modified lower river systems as dredged materials were indiscriminately piled along riparian corridors, burying adjacent wetlands and marshes and effectively channelizing major waterways. Diversions of water from main stem rivers to facilitate both hydraulic and dredger mining also resulted in significant aquatic resource degradation, as water was removed from the system faster than it could be replenished, leading to the deterioration of wetlands that historically formed as a result of large flood events.

In later years, as hydraulic mining was outlawed and unexplored gold areas dwindled, excavation for aggregate to facilitate extensive public and private construction projects continued to



GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 3 Mining Impacts 131121 v3.mxd contribute sediment into area aquatic resources. These activities also resulted in dramatic impacts to vernal pool complexes, drainages, and swales in floodplain elevations, which were mined for the gravel and clay substrate that comprise many of these systems.

2. Timber and Forest Management

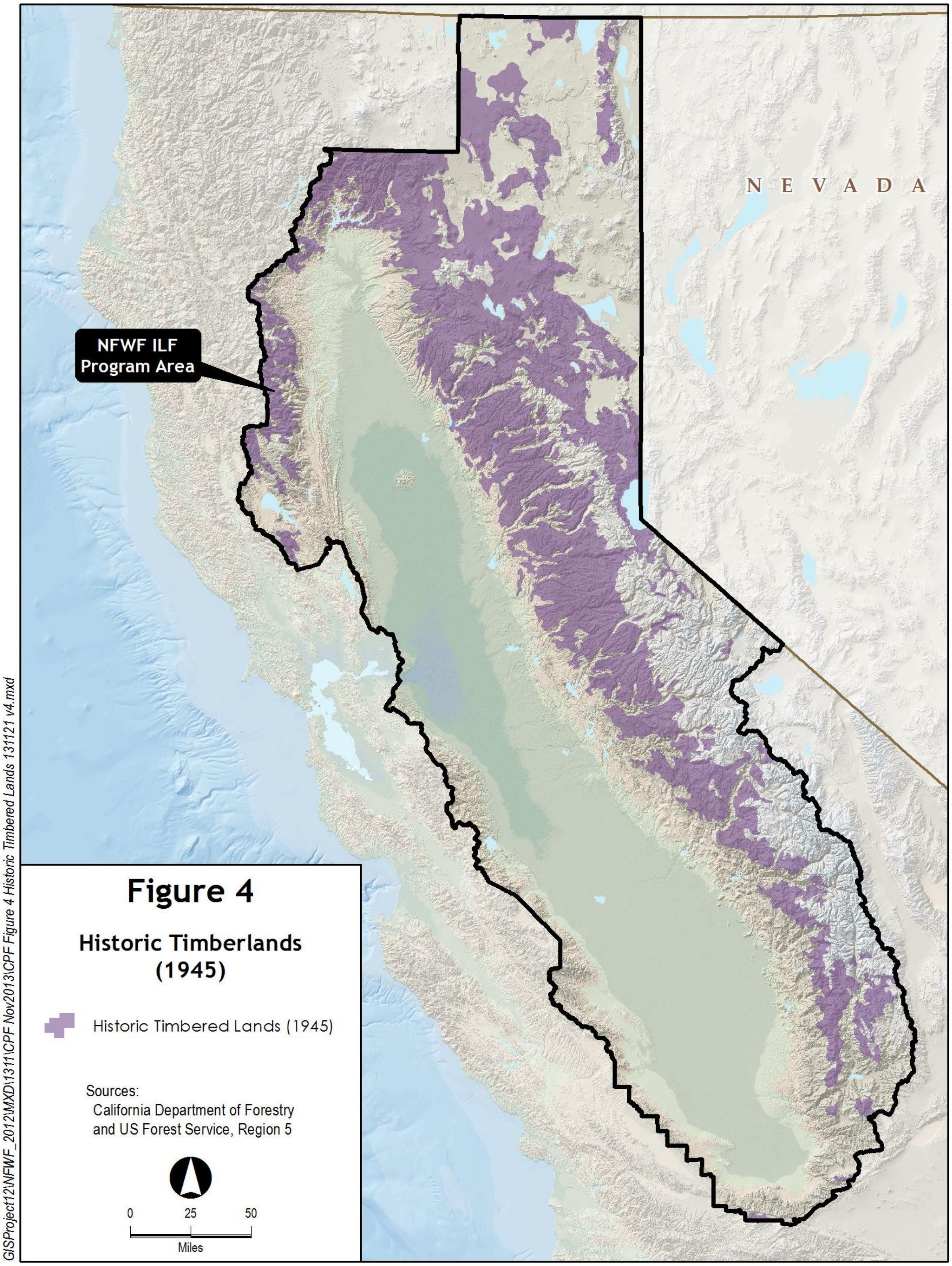
Limited timber harvest and extraction occurred in northern California before the start of the Gold Rush, with forest resource utilization generally confined to felling trees for construction of modest homesteads and limited grazing activities in open forests and riparian areas. This changed dramatically with the discovery of gold, spurring demand for building materials to develop mining infrastructure, establish railroads, and construct communities to house and support the mining work force. This demand for lumber led to widespread deforestation, especially in watersheds adjoining the Sacramento Valley and Redding area, with concomitant erosion throughout mid-elevation forests (**Figure 4**). This resulted in the sedimentation of headwaters and tributary streams and adding to the cumulative effects of direct mining activities over the next several decades. Reductions in overall forested acreage also impacted groundwater recharge in this region due to the loss of precipitation interception, which allows for the slow percolation of water into deeper soils.

As mining operations began to dwindle at the end of the 19th century, logging continued to grow, with the commercial timber industry becoming a powerful economic force in parts of northern California for the next 100 years. The result of these sustained forestry practices was the development of access roads along numerous stream corridors, as well as frequent alterations of natural drainage patterns in logged watersheds. This led to impaired riparian and wetland functions in these areas. These historic practices, and the roads left behind, continue to contribute to chronic sedimentation and disjunct watercourses throughout regional watersheds.

In locations where commercial logging ceased, natural reforestation began to occur as mining operations disappeared, allowing for the restablization of soils in these regions. However, even as these forests began to recover and became densely colonized by saplings, a new paradigm of fire suppression came to dominate public and private forest management. As a result, beginning in the 1940s, forests became, and remain, heavily overgrown with timber, brush, and other vegetation. This has created significant ladder fuel concentrations, promoting catastrophic wildfires and ultimately resulting in new sources of sediment that enter aquatic resources, as burned hillsides provide limited soil stabilization. Further, high-intensity fires can decimate vegetation along riparian corridors and other wetlands, reducing the values and functions of these features.

3. Water Resource Development

Water resource development and operations also dramatically increased with the start of the Gold Rush. Prior to this period, water resource use within the ILF Program area focused primarily on supporting small-scale livestock operations and homestead communities. With the start of large-scale mining operations, however, demand for water infrastructure for both water delivery and the transport of goods spiked in the middle and lower elevations of the Sierra Nevada. This required the development of an intricate system of flumes, small dams, and canals in these regions as well as in the Siskiyou Mountains and Coast Range Mountains, though to a


NEVADA
NFWF ILF
Program Area
Figure 4
Historic Timberlands
(1945)
Historic Timbered Lands (1945)
Sources:
California Department of Forestry
and US Forest Service, Region 5
0
25
50
Miles
GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 4 Historic Timbered Lands 131121 v4.mxd

lesser degree in these western locations. As with logging, development of water resources surged even as mining activities began to wane, due to the evolution in use of these facilities from meeting mining interests to satisfying new industry needs. Specifically, these new needs focused on water development for agriculture/municipal, flood control, and electricity uses (**Figure 5**).

- *Agriculture/Municipal*

  Prior to the start of mining, the San Joaquin and Sacramento valleys had been viewed as an uninhabitable wilderness by European settlers, alternately comprised of extensive marshlands and dry, near-desert grasslands. However, beginning in the 1860s, it became apparent that these areas could support a cornucopia of crops, so long as adequate water could be delivered to these locations. As a result, the Bureau of Reclamation (BOR) began to construct numerous dams and other water infrastructure in tributary and floodplain stretches of the river systems throughout the ILF Program Area, especially in the 1930s. As urban areas developed, some of these dams were also used to supply municipal drinking water.

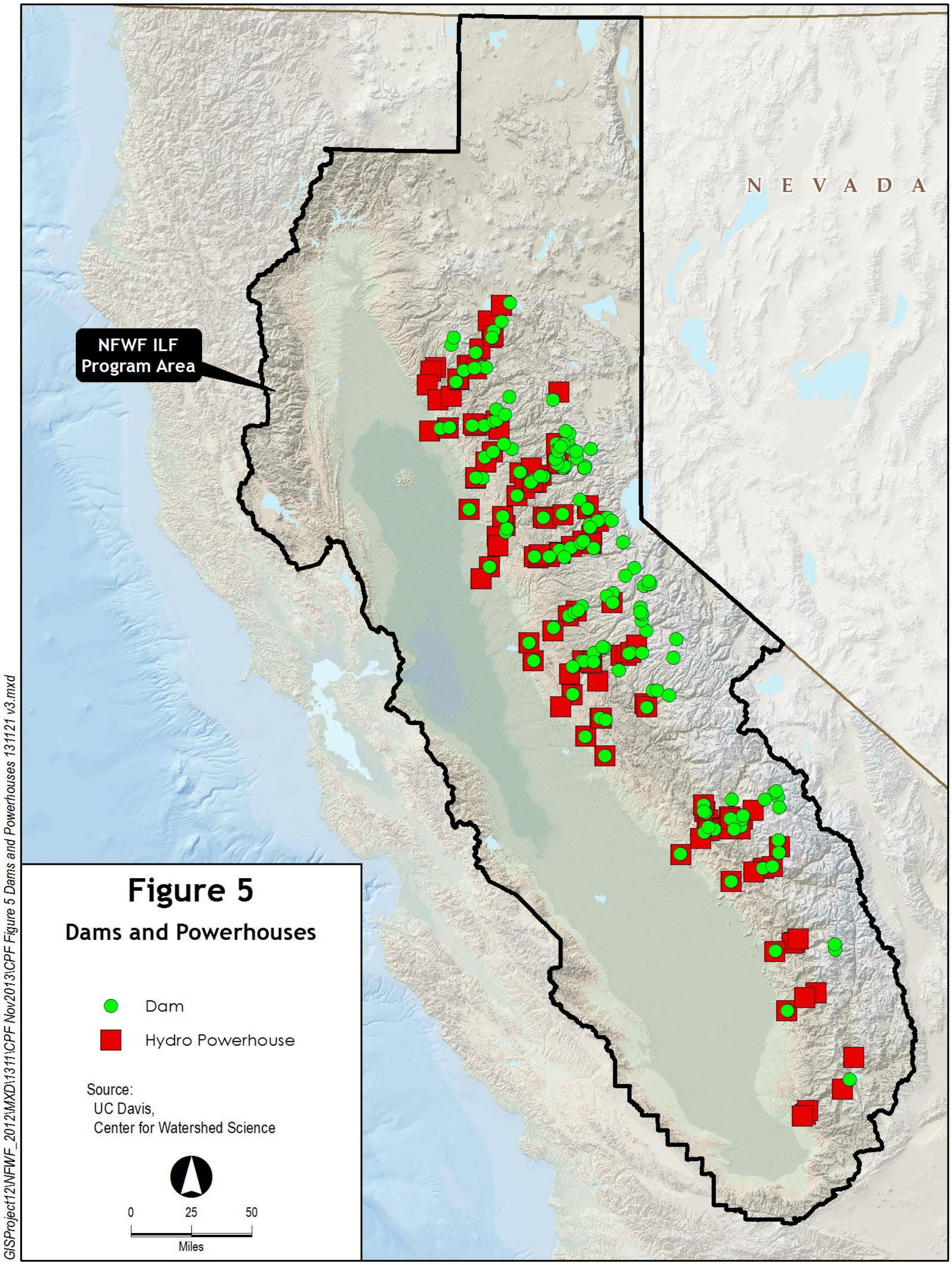
- *Flood Control*

  As agricultural and urban centers began to expand, the need increased for additional developable land. As much of the Central and San Joaquin valleys had once been covered by thousands of square miles of seasonal wetlands, this process required both the draining of these features and the prevention of their natural reestablishment resulting from the substantial annual snowmelt from the Sierra Nevada. Thus, beginning in the early 1920s, numerous dams were also established by the Corps to reduce flooding of crop and urban areas.

- *Electricity*

  As the BOR and Corps competed for dam locations, each attempting to fulfill their agency's particular mission, it soon became clear that these large-scale projects required additional financing beyond federal funds. Further, with the expansion of large urban centers such as Los Angeles and Sacramento, new power sources were in high demand throughout the first decade of the 20th century. Thus, a series of hydroelectric projects were developed as part of many of the agricultural or flood control dams.

  The end result of this additional water utilization across the ILF Program Area was a significant and direct reduction in aquatic resources, including the loss of riparian and fisheries habitats, which became either inundated by reservoirs or dewatered by the construction of engineered waterways. This development of new dams and waterways also prohibited fish passage in certain regions, extirpating salmonids from many historic spawning areas and migratory corridors. Additionally, implementation of these projects resulted in the substantial alteration of natural hydrologic patterns, leading indirectly to the loss of natural flood regimes necessary to sustain riparian habitats and other floodplain wetlands in lower reaches of the watersheds. The loss of these wetlands, in turn, further facilitated the conversion of natural landscapes into intensive agricultural operations.


NEVADA
NFWF ILF Program Area
Figure 5
Dams and Powerhouses
Dam
Hydro Powerhouse
Source:
UC Davis,
Center for Watershed Science
0
25
50
Miles
GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 5 Dams and Powerhouses 131121 v3.mxd

4. Agricultural Conversion and Irrigation

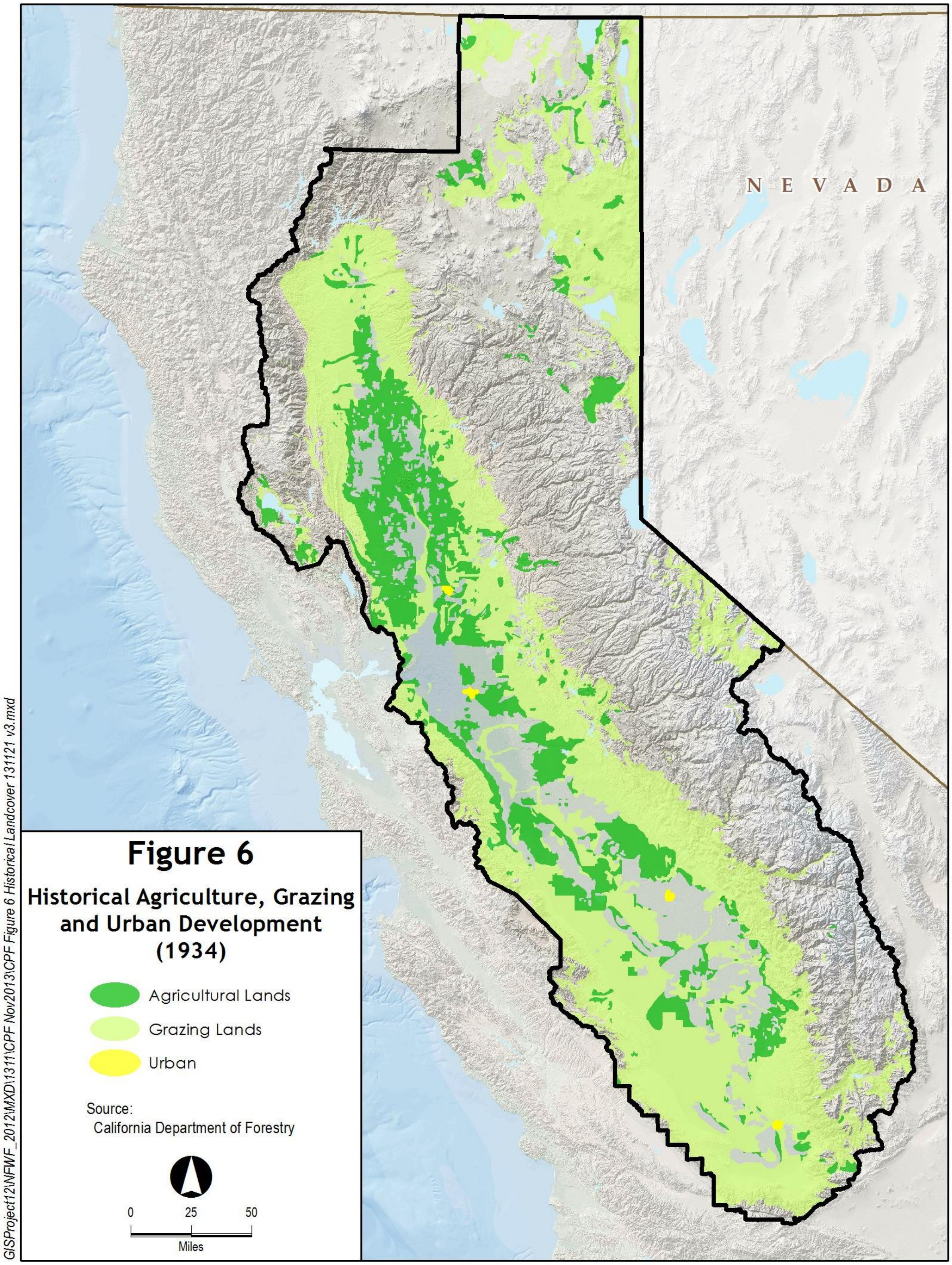
With the start of mining activities, agriculture rapidly developed and dramatically transformed ecoregions throughout the California landscape (**Figure 6**). To meet the demands of a burgeoning mining population, extensive and largely uncontrolled grazing operations were rapidly established throughout the Sierra Nevada. The result of these practices was the ongoing removal of streamside vegetation, down cutting of river channels, soil compaction, and the addition of significant nitrogen and sediment loads in headwaters, which were then carried to downstream receiving regions. These impacts were especially apparent in mountain meadow ecosystems in the southern Sierra Nevada where heavy sheep and cattle utilization occurred. In certain locations, these activities resulted in the complete dewatering of river systems, due to reduced water percolation and the subsequent loss of groundwater recharge. Additionally, increases in livestock operations resulted in the creation of stock ponds and private reservoir systems, often constructed in creek channels, further altering natural aquatic resources.

In lower elevations, the cumulative effects of sedimentation due to grazing, logging, and mining activities in the upper watersheds, in concert with water resource development and flood control projects at mid-elevation, facilitated the desiccation of many historic off-channel seasonal and marsh wetlands. Starting in the 1860s, waterways were also straightened, and occasionally paved, to increase water delivery for agricultural and municipal use. This resulted in the rapid reclamation of many former marshlands for agricultural use. In wetland basins such as the Natomas or Tulare basins, which remained prone to seasonal wetland inundation even with the construction of dams and loss of systemic hydrologic connectivity, large pumping facilities were established to remove water and further aid in this reclamation process. These activities effectively allowed for the near-complete loss of historic riparian and off-channel aquatic resources for agricultural land use.

Additionally, water diversions from main stem rivers for irrigated agriculture began to alter low-flow conditions of river and floodplain systems in the region. Groundwater overdraft for agricultural use, which began in earnest around the second half of the 20th century, also contributed to the dewatering of some smaller Central Valley stream systems such as the Cosumnes River and drainages on the western side of the San Joaquin Valley. Further, many low-gradient and ponded wetlands, such as vernal pools, were deep ripped to make room for new crops and/or irrigated pasturelands. The arability of these near-level and easily accessible landscapes resulted in the loss today of more than 90% of vernal pools in California. The loss of wetlands as a result of each of these factors was further exacerbated by rapid urban and community development, which the new, extensive agricultural sector could now feed and support.

5. Urban and Community Development

Community and urban development was historically very limited in the upper reaches of California's watersheds, primarily restricted to single homesteads associated with small ranching operations. However, development activities increased with the onslaught of mining, resulting in


NEVADA
Figure 6
Historical Agriculture, Grazing and Urban Development (1934)
Agricultural Lands
Grazing Lands
Urban
Source:
California Department of Forestry
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50
Miles
GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 6 Historical Landcover 131121 v3.mxd

the construction of numerous townships, especially near active mine sites (**Figure 7**). As with logging and agriculture, the independent commercial success of these communities allowed some communities to persist past the primary mining era, though populations shrank as mining and logging activities subsided. However, remaining townships continued to construct new buildings along or nearby tributary creek channels and in associated floodplains, contributing to the direct loss of wetlands and riparian areas. While confined to relatively small areas in the overall watershed, these urban impacts were augmented by the growth in mountain rural home developments, especially since the 1990s, resulting in numerous one- to five-acre residential plots, often situated adjacent to rivers or lakes. Further, with the construction of reservoirs, urban development in support of recreational activities quickly followed, impacting new marsh and wetland habitats that became established as a result of these new impoundments. Each of these developments added to the cumulative impacts to aquatic resources throughout the ILF Program Area's tributary and headwater reaches.

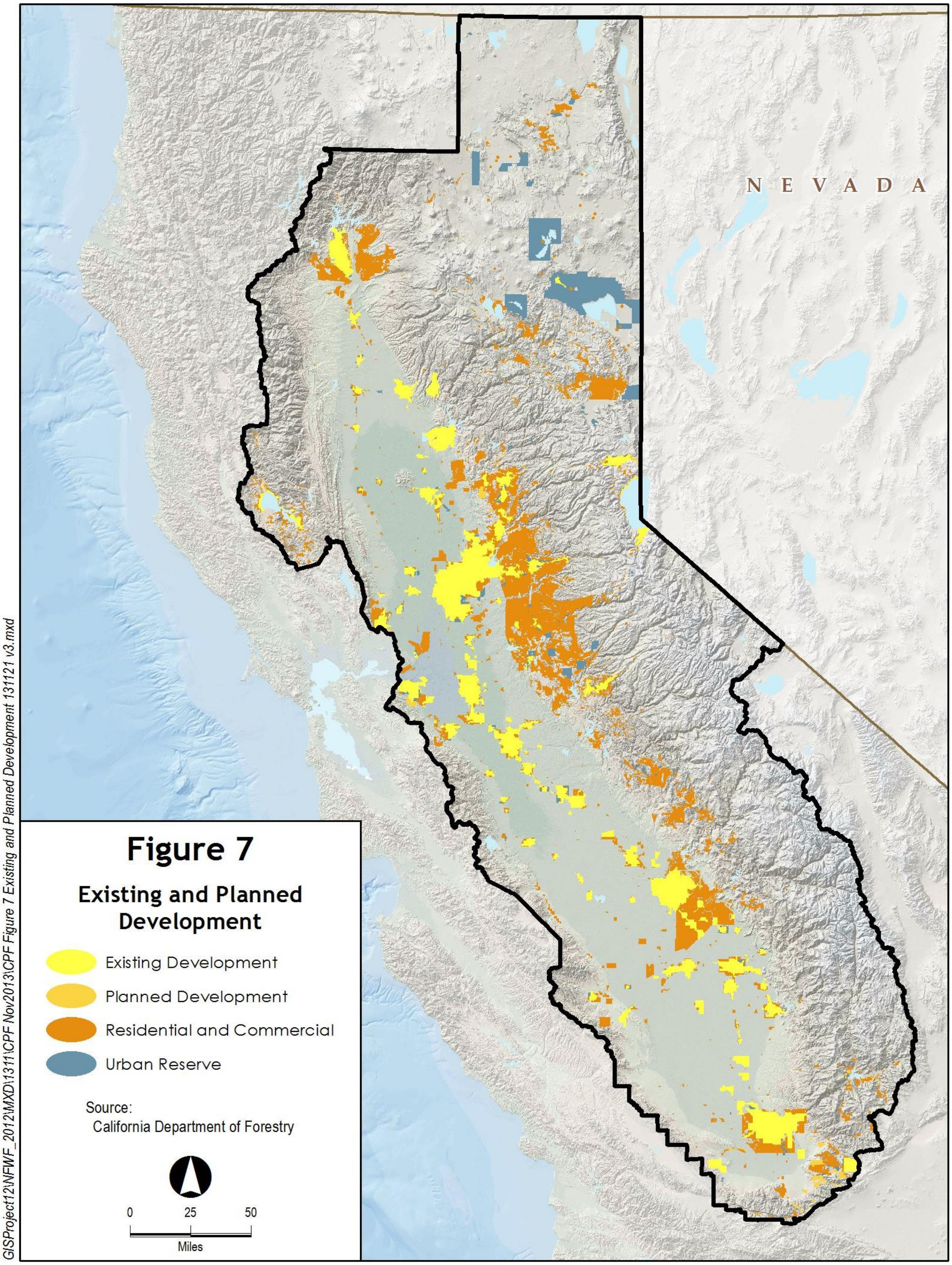
In lower reaches of the river systems, urban and community development also increased rapidly as mining, timber, and agricultural production grew and the population necessary to support these and other new industries expanded. As with smaller mountain communities, many of these high-growth areas were situated in the vicinity of main stem rivers to allow for the easy transport of goods and people. This resulted in similar impacts to river systems as those noted farther upstream, including construction in wetland and riparian areas, though at a significantly larger scale. Additionally, chemical, sediment, and hydrologic runoff from hard surfaces in urban areas increased to such a level that natural flow patterns were severely and permanently altered. This, in addition to the straightening of waterways as they passed through urban centers, further contributed to changes in main stem hydrology already initiated by water infrastructure development.

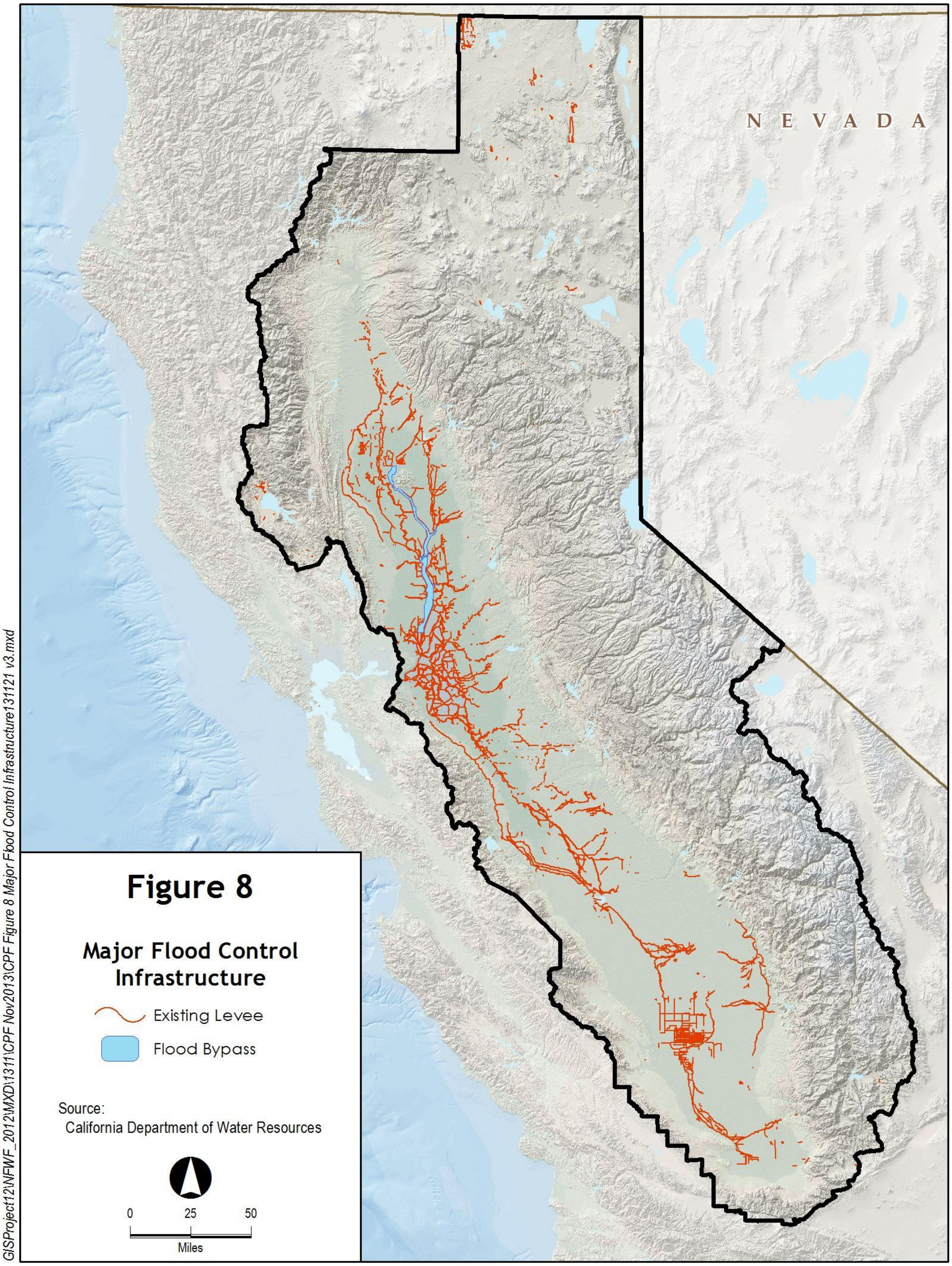
In more rural areas, both in the Central Valley and Sierra Nevada, numerous domestic wells were drilled to support development of mining and agricultural-based communities, contributing to the overdraft of groundwater that was already strained by agricultural use. These residential activities may have contributed to the dewatering of some smaller perennial or intermittent drainages. Many small contributing Central Valley streams were also channelized to facilitate both urban and rural development and reduce flooding, further contributing to agriculture reclamation and urban expansion.

Urbanization also had dramatic impacts on vernal pool complexes, due to the relatively level and easily accessible forms of these areas. As development radiated out to surrounding areas, large residential, commercial, and military areas replaced many of the historic vernal pool ecosystems.

6. Flood Protection/Levee Construction

Locations in the upper reaches of the Sierra Nevada watersheds have historically experienced limited population growth, and thus limited flood protection has been warranted in these areas (**Figure 8**). This has also been true for many mid-elevation river tributary systems, though some flood protection projects were implemented in this region with the start of mining activities in an attempt to protect hydraulic mines and surrounding communities. Primarily, this protection came in the form of diversions and/or the channelization of tributary creek channels, which, in conjunction with building development, contributed to the loss of riparian habitats in specific areas.


NEVADA
Figure 7
Existing and Planned Development
Existing Development
Planned Development
Residential and Commercial
Urban Reserve
Source:
California Department of Forestry
0
25
50
Miles
GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 7 Existing and Planned Development 131121 v3.mxd


NEVADA
Figure 8
Major Flood Control Infrastructure
Existing Levee
Flood Bypass
Source:
California Department of Water Resources
0
25
50
Miles
GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 8 Major Flood Control Infrastructure131121 v3.mxd

6. Flood Protection/Levee Construction

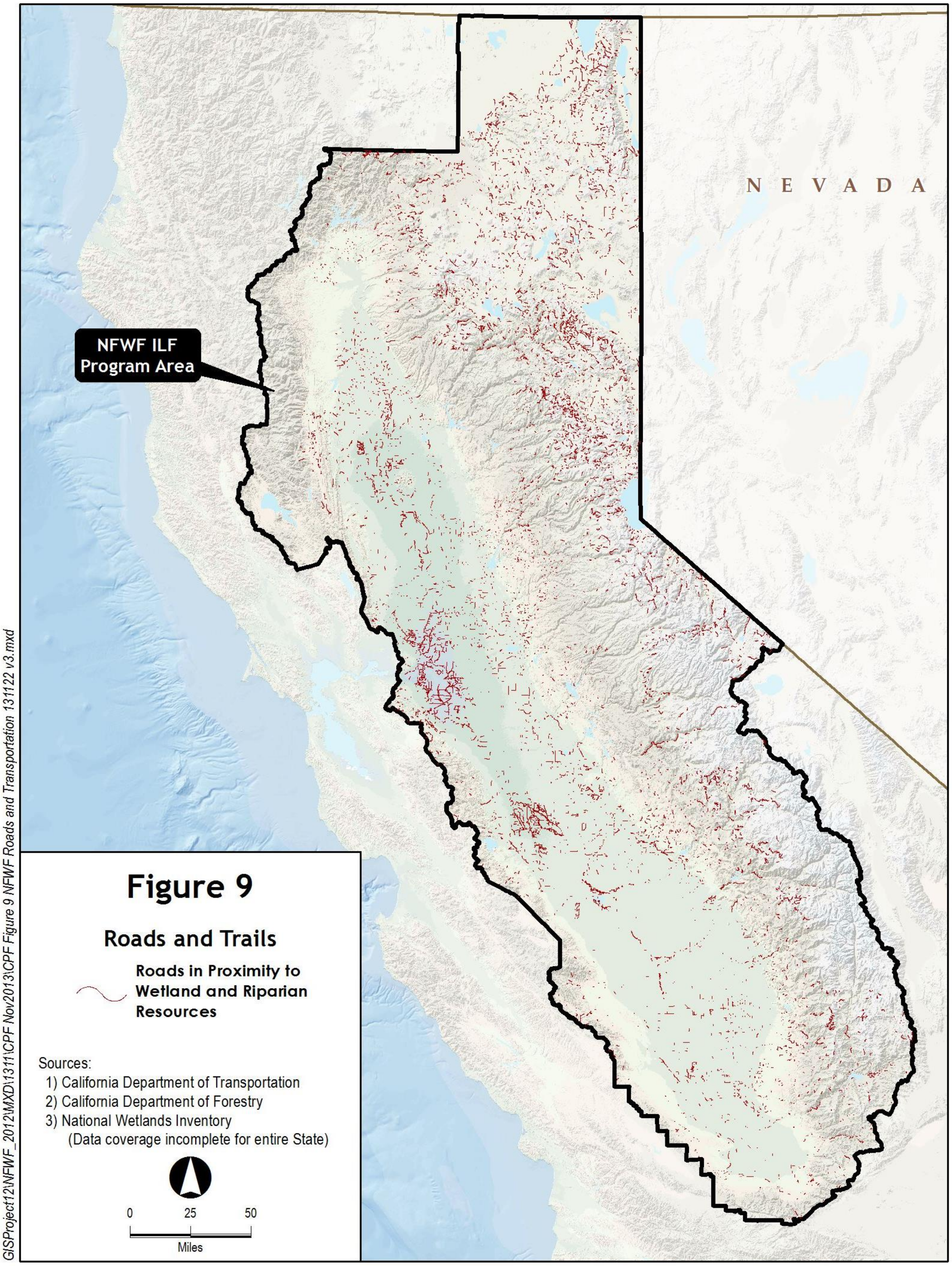
Locations in the upper reaches of the Sierra Nevada watersheds have historically experienced limited population growth, and thus limited flood protection has been warranted in these areas (**Figure 8**). This has also been true for many mid-elevation river tributary systems, though some flood protection projects were implemented in this region with the start of mining activities in an attempt to protect hydraulic mines and surrounding communities. Primarily, this protection came in the form of diversions and/or the channelization of tributary creek channels, which, in conjunction with building development, contributed to the loss of riparian habitats in specific areas.

In contrast, main stream channels at lower elevations experienced extensive historic impacts to river resources resulting from flood protection projects. These projects, focused on protecting both urban development areas and agricultural lands, have resulted in the construction of massive levee and bypass systems as well as the establishment of complex overflow pumping operations, significantly altering the functionality of floodplains. Clear examples of this can be seen along the primary stems of the Sacramento, American, and San Joaquin rivers. Lower river systems have also been impacted by large dam projects, as discussed above, including Friant Dam, Isabella Dam, and Folsom Dam, which, in addition to providing flood control mechanisms, have served to support water distribution for urban populations and agricultural landscapes.

7. Roads and Trails

Significant historic trail, road, and railway development occurred throughout the ILF Program Area (**Figure 9**). In upper and mid-elevations of the Sierra Nevada, these activities started primarily after the beginning of the mining boom. Initially, these road and trail systems facilitated supply and worker access to remote mining sites or travel across the Sierra Nevada, but this system rapidly grew to allow the transport of goods and livestock to support logging, grazing, and community development. Many roads through these areas closely followed streams, due to the relatively level terrain of these corridors, with some evolving to railroad beds or highways over time. The continued use and development of these road systems required the cutting and leveling of creek embankments and the addition of riprap or other engineered materials, resulting in losses of riparian areas and riverine habitat degradation. Manipulation of the topography to accommodate these projects also altered overland flow patterns and increased erosion, as well as runoff, into creek channels, further affecting water quantity and quality.

In lower elevations, most road construction occurred outside of the floodplains prior to the development of flood control infrastructure. Due to this, losses of riverine aquatic resources were historically limited to bridge crossings. However, once flooding threats were reduced due to the development of water infrastructure systems, highways (as well as smaller access roads associated with agricultural and new petroleum and natural gas operations), became more abundant, increasing road impacts as they encroached on upper floodplain terraces. Similar to effects at higher elevations, road bed development in these areas resulted in the alteration of overland flows as well as the creation of artificial wetlands in roadside ditches. Increased vehicle use also reduced water quality.


GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 9 NFWF Roads and Transportation 131122 v3.mxd
NEVADA
NFWF ILF Program Area
Figure 9
Roads and Trails
Roads in Proximity to Wetland and Riparian Resources
Sources:
1) California Department of Transportation
2) California Department of Forestry
3) National Wetlands Inventory (Data coverage incomplete for entire State)
0 25 50
Miles

C. Aquatic Resource Threats, Current Conditions, and Goals & Objectives

Current threats to aquatic resources are highly correlated with historic wetland losses in northern California. Thus, impacts to regional wetlands exist in the form of both new actions related to the activities above as well as continued functional degradation resulting from these historic practices. A deviation from this pattern can be seen, however, in the federal protection and management of many tributary and headwater landscapes in California through the establishment of national parks, national forests, and wilderness areas, which began in earnest in the early 1900s. In total, these areas now comprise approximately 30% of the overall ILF Program Area. While initially many of the national forest lands were utilized as areas from which natural resources could be extracted, in recent decades the land management paradigm in these forests has shifted to natural resource preservation. Thus, while activities such as logging, grazing, and road/trail development still occur within these federal landscapes, these activities are implemented as part of existing regional conservation planning efforts. Therefore, impact and conservation activities within these areas have primarily been excluded from discussion in this section and from Part II.A and B.

For the remaining lands within the ILF Program Area, this section provides an overview of ongoing threats and a summary of baseline wetland conditions within the ILF region. It also includes general resource goals and objectives related to mitigating each of these threats. These goals and objectives may shift over time as new data becomes available and/or threats evolve. Therefore, goals should be viewed from an adaptive perspective, with both general and specific Service Area objectives allowed to shift over time as resource functional values adjust. Additional Service Area-specific information on threats and resource goals is included in Part II.A and B.

1. Mining

- *Current Conditions*

  Since the end of the 19th century, mining activities throughout the tributary elevations of the ILF Program Area have dramatically decreased. While several large-scale modern pit mines exist in more arid regions, most mining is currently limited to small-scale hobby mines scattered throughout public and private lands. However, with gold prices rising and recent advances in technology that reduce the costs of mineral extraction, historic mines are re-opening in some areas and hobby mining appears to be experiencing resurgence. Therefore, gold mining may re-emerge as a significant threat to mid-elevation aquatic resources. This will result in additional sedimentation and increased overland flows in these areas as well as reduced vegetative cover, negatively affecting aquatic resources in these regions.

  In lower elevations, historic placer gold mining operations have ceased. However, mining for aggregate materials, primarily to support ongoing infrastructure and residential/commercial development, continues throughout the Central Valley. While most of this activity occurs along ancient, now primarily dry, riverbeds, limited aggregate mining continues in some active riverine channels – Stony Creek and the San Joaquin River are two examples. These activities can contribute to the chronic sedimentation of local river systems and lead to a loss of riparian habitat. Further, earth-moving activities in uplands adjacent to aquatic resources may affect overland flow and drainage patterns, impacting regional hydrology.

These present-day mining threats are exacerbated by the effects of historic mining operations, including the continued presence of remnant dredge material along many main stem channels, which hinders the natural recruitment of riparian vegetation. Further, legacy chemical contaminants from early mining operations, such as mercury and arsenic, continue to adversely affect water quality conditions of receiving waters and the wildlife that inhabit them. Wetland restoration projects in floodplain reaches are believed to contribute to the re-release of many of these contaminants into ecosystems via the use of earth-moving vehicles, which free mercury from accumulated sediment into low elevation waterways.

In addition to affecting riverine areas, mining continues to impact vernal pools and degrade surrounding vernal pool complexes in some areas, especially in the Sacramento region. Primarily, this is related to gravel and clay extraction in support of roads and other urban infrastructure development.

- *Aquatic Resource Goals and Objectives*

Because of the extent of disturbance to river systems resulting from historic mining within tributary reaches of the Service Areas, ILF Program goals in impacted areas will favor projects that meet no-net-loss objectives, yet minimize further contamination of receiving waters by legacy contaminants. In floodplain elevations, ILF Program Aquatic Resource Service Area objectives will be concentrated on restoring channel planforms, re-creating natural drainage patters, and enhancing riparian habitat features in former mining areas. In situ restoration of vernal pool complexes impacted by mining is challenging and can result in greater impacts to these aquatic resources than the initial disturbance alone. Therefore, goals and objectives for these areas will focus on the restoration or reestablishment of other vernal pool landscapes within Core Areas as defined by the USFWS Recovery Plan.

2. Timber and Forest Management

- *Current Condition*

While timber harvest has had substantial impacts in northern California for over 150 years, these activities have dramatically declined in the 21st century due to increased regulation on public lands and the exportation of much of this industry abroad (**Figure 4**). In those mid-elevation regions where logging and associated access road construction still occurs, Best Management Practices (BMPs) have been developed to minimize effects to aquatic resources. However, complete implementation of these BMPs, especially related to stream crossings and creek channel buffers, remains elusive. This results in continuing threats to riparian habitats and the species that inhabit them through direct loss of habitat and ongoing sedimentation and erosion.

Forested areas that have remained unthinned also pose threats to aquatic resources, due to a regime of extreme wildfires borne from the fire suppression paradigm adopted by public and private land managers beginning in the 1940s. While prescribed burn practices to reduce understory vegetation and duff accumulation have become more common in certain areas, continued exurban development and air quality concerns limit implementation of these efforts on a broad scale. Because of this, annual catastrophic fire events in in the Sierra Nevada foothills persist, resulting in increased sheet erosion and sediment buildup in river systems.

- *Aquatic Resource Goals and Objectives*

As the threat of continued timber harvest is limited and many of the areas historically denuded by mining activities have recovered via natural recruitment, ILF Program objectives in harvested areas will focus on restoring decommissioned logging roads within and adjacent to stream and wetland areas. These activities will discourage the continued use of these abandoned access roads, reducing erosion and aiding the return of natural drainage patterns throughout impacted watersheds. In overgrown areas, ILF Program objectives will favor projects that promote fuel management treatments to minimize erosion and limit sedimentation in regional riverine systems.

3. Water Resource Development

- *Current Condition*

Water resource development and operation of this infrastructure continues to be a major threat to California's wetlands. While new large-scale dam and reservoir construction is rare, the relicensing and expansion of reservoirs to accommodate growing populations and a changing global climate has resulted in the continued inundation of aquatic resources and riparian habitats, many of which have formed along the previous waterlines of existing canals and water storage facilities. Similarly, while new large-scale impacts from operations of water resource and hydropower projects have improved over historic practices, natural hydrologic flows are still significantly altered from traditional patterns. Thus, while operational alterations have resulted in modest improvements to downstream resources, including fisheries in particular, many lower-elevation riparian and floodplain habitats continue to experience limited natural recruitment. The development of these biotic and physical ecosystem attributes have been further hindered due to ongoing operation and maintenance activities by flood control and water districts that implement vegetation control measures to retain levee stability and facilitate water transport.

Upstream of major dams, fish utilization has somewhat improved through the installation of fish ladders and/or fish trucking programs. However, many areas continue to have limited connectivity with spawning and migratory habitats, hindering recovery efforts for native fisheries. In addition, juvenile salmonid numbers continue to be impacted through entrainment and entrapment due to tributary water diversions, as well as invasive predatory species.

- *Aquatic Resource Goals and Objectives*

To augment current operational adjustments, ILF Program goals and objectives in areas impacted by water resource development will show preference for the active restoration of degraded riparian and riverine locations. This may include activities such as the implementation of floodplain restoration projects to expand riparian corridors, the development of vegetated buffers along river systems through either active planting or revised operation and management practices, or increasing sinuosity in straightened channels. Additionally, opportunities to restore natural hydrology where possible, create, restore, and/or protect in-stream aquatic habitats, improve water quality, and increase and/or improve upon existing self-sustaining wetland acreage will be assessed. These activities will aid in improving the biotic, physical, and buffer and landscape attributes of regional wetlands in conjunction with local and regional planning documents, projects, and objectives.

4. Agricultural Conversion and Irrigation

- *Current Condition*

Agricultural conversion impacts to aquatic resources in tributary and headwater reaches in the ILF Program Area have greatly diminished since the end of the Second World War, due to the general urbanization of American society. Today, only moderate grazing still occurs in these areas, much of which is tightly managed through public land leases with federal entities such as the U.S. Forest Service (USFS) and Bureau of Land Management (BLM). However, legacy grazing degradation in these regions persists in the form of incised riverine channels, historic sediment deposits, and altered mountain meadow hydrology. Additionally, some ongoing use by livestock in mountain meadow riverine channels continues, which results in soil compaction, overgrazing of riparian vegetation, alteration of hydrology, and sediment and nitrogen deposition into tributary stream systems.

In floodplain landscapes the conversion of riparian habitats for agriculture is currently minimal, due to both increased regulation of these activities as well as previous conversion activities, which have left few native riparian and off-channel wetland areas intact. Conversely, water diversions and groundwater pumping for irrigation continue to threaten water resources and aquatic habitat functions throughout the Central Valley. Indeed, areas such as the Tulare Basin that historically supported many square miles of marshlands are now implementing experimental methods to offset irrigation water shortages resulting from years of groundwater overdraft.

Vernal pool complexes also continue to be degraded as a result of agricultural activities, especially as vineyard and orchard conversions gain popularity throughout the Central Valley. Deep ripping, irrigation, and laser leveling all contribute to the continued degradation of these rare ecosystems. The effects of these activities are augmented by the introduction of invasive species into these converted landscapes, via livestock or farm equipment, that rapidly become established in the surrounding area, displacing native vernal pool species on adjoining properties.

- *Aquatic Resource Goals and Objectives*

ILF Program objectives for funds collected from upper watershed areas affected by agricultural conversion will focus on the restoration of historically impacted mountain meadow hydrology through the aggradation of downcut stream corridors and restoration of natural hydrologic functions. Additionally, ILF Program goals in impacted headwater and tributary channels will focus on restoring vegetation to degraded stream channels and implementing grazing management practices focused on reducing livestock use of riverine habitats. This may include the establishment of fencing along creek corridors or providing an alternative water supply. In lower elevations, ILF funds will be directed toward retiring less productive farmland within historic floodplains through the acquisition of fee title or easements from willing sellers, and implementing active river restoration projects, particularly in areas where farm berm setbacks can be incorporated into overall project design.

In vernal pool regions impacted by agriculture, goals and objectives will focus on enhancement, rehabilitation, or reestablishment of vernal pool complexes within Core Areas as defined by the USFWS Recovery Plan. Reestablishment may also be pursued in areas outside of Core Areas, adjacent to existing preserves, as appropriate.

5. Urban and Community Development

- *Current Condition*

  California's population has continued to steadily increase since the 1950s. Current population is estimated to be over 38 million, with projections indicating this number will increase to 51 million by 2050. Much of this growth will be within the floodplain areas of relatively rural but rapidly urbanizing counties in the Central Valley such as Fresno, San Joaquin, and Kern Counties.[1] These result in losses of riparian habitats and vernal pool complexes due to direct urban development, as well as indirect infrastructure and public utilities improvements needed to maintain these population centers. Further, development threats will continue to persist in headwater and tributary areas due to recreation or resort site construction and continued growth of one- to five-acre exurban residential plots. These activities are currently resulting in losses of mountain meadow wetlands, as well as riparian and riverine habitats. Debris, sediment, and chemical runoff resulting from these activities continue to impact the current conditions of these aquatic systems. Further, well establishment strains groundwater resources, impacting natural springs and small perennial creek channels in certain locations.

- *Aquatic Resource Goals and Objectives*

  To offset development impacts to aquatic resources, ILF Program objectives in Aquatic Resource Service Areas will focus on opportunities to restore currently degraded reaches of headwater streams by improving riverine buffers along creeks in proximity to developed areas and improving stream channel sinuosity in areas affected by urban development. ILF Projects will also work to repair past damage from pollution sources from existing development sites and creating conservation buffers to eliminate deleterious effects of future construction and growth when possible.

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[1] *California Department of Finance. 2012. Interim Population Projections for California and Its Counties 2010-2050.*

In Vernal Pool Service Areas impacted by urban growth, goals and objectives will focus on restoration or reestablishment of vernal pool complexes within Core Areas as defined by the USFWS Recovery Plan, and/or preservation via conservation easement and acquisition by conservation parties in fee-title and long-term management of these features.

6. Flood Protection/Levee Construction

- *Current Condition*

  Headwater wetlands in ILF Program watersheds have continued to remain largely free of threats from flood protection activities, due to both limited populations and an absence of concentrated hydrologic flows in these regions. Aquatic resources in tributary and main stem elevations, however, continue to be threatened by a number of flood protection projects, especially in and around riparian areas and historic floodplains. These include the ongoing operation of flood control dams and canal and levee maintenance. Current proposed regulatory changes, such as the U.S. Army Corps of Engineers' policy regarding the removal of levee vegetation and the USFWS's pending delisting of the Valley elderberry longhorn beetle, may further augment these threats to remnant riparian habitats. Implementation of either of these revised policies may result in further loss of riparian habitat via vegetation clearing and/or installation of riprap or other hardscape to existing river corridors.

- *Aquatic Resource Goals and Objectives*

  To counterbalance flood protection threats, ILF Program goals and objectives will focus on the implementation or augmentation of farm berm setback projects, where possible, that will allow for the restoration of floodplain habitats adjacent to main stem river channels. Additional projects may also include the purchase and retirement of historic flood easements or agricultural lands within leveed areas through purchase of fee title or conservation easements from willing sellers, and the reestablishment of riparian habitats within these former crop fields.

7. Climate Change

- *Current Condition*

  Aquatic resources in headwaters, tributaries, and floodplains will all be impacted by global climate change in future years. While it is still uncertain what the precise effects of these man-made activities will be for Northern California habitats, temperatures are anticipated to increase by approximately 5 to 6 degrees Fahrenheit in the 21st century. Further, precipitation levels are anticipated to change throughout the ILF Program Area, with an overall effect of increased rain events but decreased snow storms, resulting in increased water availability in the winter and reduced water resources in the summer. This will simultaneously result in the need for increased flood protection and significant groundwater demands. Warmer conditions may also result in less water availability for wetlands and the species that depend on them. Salmonids are particularly sensitive to changes in climate, especially in their marine life stages, due to changes in upwelling cycles and ocean acidification levels. These conditions are all predicted to change, although it is uncertain precisely how much. A variable ocean condition such as sea level rise, which in some models is predicted to occur by a meter, is a concern for juvenile salmonids that utilize the Delta estuaries and lagoons that would become inundated.

- *Aquatic Resource Goals and Objectives*

To counterbalance climate change threats, ILF Program goals and objectives will focus on aiding in the implementation of ILF Projects that will minimize the impacts to aquatic resources from climate change to the maximum extent practicable. These may include developing projects that address goals defined in the Interior Department's High Priority Goals for Climate and the National Marine Fisheries Central Valley Salmonid Recovery Plan or other similar documents.[2]

8. Roads and Trails

- *Current Condition*

Continued expansion of foothill communities and populations, plus an overall increased societal desire to access foothill and mountain areas, has led to ongoing road realignments and improvements to increase vehicle capacity and safety throughout the Sierra Nevada. This threatens aquatic resources through the incremental loss and degradation of the riverine resources that has persisted since the Gold Rush era. Specifically, road impacts continue to create greater hydrologic runoff, alter overland flow patterns, and increase erosive conditions for the region. Off-highway vehicle (OHV) use of National Forest Service roads in particular is known to increase erosion in a watershed, leading to further sedimentation throughout a river system. Further, attempts to prevent catastrophic wildfire or automobile accidents along many highways and county roads often include vegetation removal, reducing riparian habitats in areas where vehicle travel abuts river channels. These practices also frequently include the application of herbicides, which can reduce water quality in a region. Lower-elevation waterways continue to experience similar threats, resulting from ongoing road realignment, highway widening, and bridge retrofit projects.

- *Aquatic Resource Goals and Objectives*

To address road development impacts, ILF Program objectives throughout the region will focus on riverine habitat restoration projects that have sustained impacts from road construction. Opportunities for rehabilitation of these areas will be assessed. Rehabilitation and restoration may include relocating roads farther from historic stream corridors where possible. Additional Projects may focus on establishing streamside buffers to discourage further development and degradation of riparian areas. The ILF Program will also have the goal of encouraging the installation of bioengineered solutions to remediate runoff pollution and halting erosion to promote higher water quality within riverine habitats at all elevations. Finally, ILF Program goals and objectives will focus on improving in-stream habitat and migratory pathways for aquatic organisms.

[2] U.S. Bureau of Reclamation. 2011. *SECURE Water Act Section 9503(c) - Reclamation Climate Change and Water*.

D. Additional Current Condition Information for Aquatic Resource Service Areas

In addition to the analysis of the current conditions described in Part I.C, current condition information included in Part II.A incorporates data utilized by the State Water Board in Ecoatlas. This information includes: 1) land cover type; 2) wetland type and extent; and 3) identification and classification of impaired waterways. Each of these current condition categories is included in the appendix of the associated individual Aquatic Resource Service Areas. In addition, riparian quality data has also been incorporated as a figure into the current conditions information for each Aquatic Resource Service Area.

1. Land Cover Type

Land cover information incorporated into the current conditions for individual Service Areas is directly adopted from the 2006 National Land Cover Database. The coarse information used in this data set has been standardized and compiled by the US Geological Survey for the entire United States; however, refinement of these data may be required in future Framework updates. Land cover types within the Program Area include:

- Open Water
- Perennial Ice/Snow
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous
- Wetlands

2. Impaired Waterways

Current condition information for impaired waterways within the individual Service Areas includes the name of the impaired water body, the pollutant category, the type of pollutants, and the total daily maximum limit (TMDL) requirements for these pollutants, where these limits have been developed.

The following water pollutant categories have been identified within the Program Area:

- Hydromodification

- Metals/Metalloids
- Miscellaneous
- Nuisance
- Nutrients
- Other Inorganics
- Other Organics
- Pathogens
- Pesticides
- Salinity
- Sediment
- Toxicity
- Trash

TMDLs have not been completed for every impaired feature within the ILF Program Area. Therefore, additional information regarding TMDLs for specific impaired waterways will be added with each Framework update. The most current information regarding TMDLs and how these can be addressed within each Service Area can be accessed via the State Water Board website.[3]

DISCLAIMER: GIS mapping of the extent of each impaired waterway has been initiated by the Water Boards. However, this information currently contains a number of redundancies that disallows the incorporation of this data into the current Framework. As such, this information will be added to the current conditions of individual Service Areas as it becomes available during each Framework update.

3. Wetland Type and Extent

Wetland type and extent information incorporates data from the 2013 National Wetland Inventory (NWI) and the most recent National Hydrography Dataset (NHD) as well as other sources included in the California Aquatic Resource Inventory (CARI). However, as NWI, NHD and other CARI data sets are currently incomplete and/or inconstant in their identification of wetland extent and type across the ILF Program Area, refinement of this current condition information for each Service Area will be a vital component of the Framework reviews of this data will occur no less frequently than every five years to determine if an update in needed.

The following wetland types have been identified using NHD, NWI, and CARI data sources within the ILF Program Area:

- Estuary
- Ice Mass
- Lake/Pond
- Playa
- Reservoir
- Swamp/Marsh

- Estuarine and Marine Deepwater

[3] http://www.swrcb.ca.gov/water_issues/programs/tmdl/

- Freshwater Emergent
- Freshwater Forested/Shrub
- Freshwater Pond
- Lake
- Riverine
- Other

DISCLAIMER: Because of the incompleteness and non-conformity of the information currently included in NWI, NHD and CARI data, these data sets are under continuous revision. Therefore, past and future information provided on the current conditions of individual Service Areas cannot be used to track the ILF Program as a variety of factors, including changes in data, may have contributed to an apparent increase or decrease in aquatic resources. Rather, projects implemented under the ILF Program will be described within the individual Service Area and on the ILF Program GIS database which will classify each project by name, location, and restoration type to allow for accurate ILF Program tracking. Similarly, due to the ongoing refinement of NWI/NHD/CARI data sets, changes in wetland type and extent within a given Service Area cannot be exclusively relied upon to identify project priorities. Rather, these priorities are informed by multiple sources, as described in Part I.D, Part II.A and Part II.B of this document.

4. Riparian Quality

Riparian quality maps have been developed for individual Service Areas using data sets provided by the California Department of Forestry and Fire Protection (Cal Fire), Fire and Resource Assessment Program (FRAP). This data set intersects NHD and NLCD data to identify riparian features and the associated vegetation types within 50 feet of these aquatic resources. FRAP extrapolated the condition of each riparian area based on the type of land cover identified, and classified each waterway as being of high, medium and lowest quality.

DISCLAIMER: As stated above, NHD data continues to be revised as more information becomes available. Similarly, the NLCD information is coarse and may be further refined over time. To account for these changing data sets, FRAP regularly updates these available GIS data sets. The next update is anticipated in 2015. Because of this, riparian quality maps cannot provide a measurement of ILF Program success. Instead they serve solely to give an overview of current conditions. Riparian quality maps will be revised as needed to incorporate new data sets with each Framework update.

Similar information such as the data sets described above may be incorporated as needed into the individual Service Areas for vernal pools. Due to the ongoing refinement of the Ecoatlas data, this information is not included within Part II.B. However, as relevant current condition information is developed, it may be incorporated into the vernal pool Service Areas with each Framework update.

E. Prioritization Strategy and Criteria

The purpose of this section is to guide the selection of ILF Projects. The overall prioritization strategy consists of five best practices for compensation, such as proper landscape setting,

improvement of ecosystem attributes, compensation for impacts to Federally protected species habitat including salmon and steelhead, etc. For specific Aquatic Resource Service Areas and

Vernal Pool Service Areas, ecosystem functions that have been most severely impacted by current and historic activities have been identified in Part II.A and B. Objectives and actions to address impaired ecosystem functions have been drawn from local Integrated Regional Water Management Planning Program ("IRWMP") goals, TMDL and other Water Quality goals, regional watershed and fisheries recovery goals, and other local or regional planning documents. These objectives and actions have been incorporated into this ILF program as project selection criteria, and ILF Projects will be prioritized when they can address one or more of these criteria (see Project Evaluation Criteria, Exhibit E). Additional prioritization criteria for applicable ecological and geographical objectives and actions within individual Service Areas will be considered during the ILF proposal stage as information becomes available.

As ILF funds become available, prioritization of individual projects within both Vernal Pool and Aquatic Resource Service Areas will be assessed based on:

1. Landscape Setting

The ability of a project to remain physically viable and ecologically sustainable will be evaluated by examining:

a. Ecoregional Relevance. The extent to which the site is ecologically relevant, in a vernal pool region, as defined by the USFWS Recovery Plan, or "ecoregion basis," to past and projected aquatic resource impacts within, and related to, the applicable Service Area. Ecoregions have been adapted from EPA ecoregions (levels 3 and 4) and are identified in each Aquatic Resource Service Area as "headwaters," "tributaries," and "floodplains" (Part III.B). Projects that address salmonid recovery goals, as defined by the National Marine Fisheries Service (NMFS) for relevant watershed, will be prioritized.
b. Landscape Position. The extent to which the site has a landscape position that is physically suitable for the type of project proposed (e.g., first-order stream restoration in a headwaters setting).
c. Geographic Proximity. The ability of the site to maximize, to the extent feasible, the proximity and watershed nexus to the past and projected aquatic resource impacts and/or the proximity of the site to previously protected landscapes (e.g. existing mitigation banks, private conservation easements, wildlife refuges, etc.).

2. Improvement of Impacted Ecosystem Attributes

The ability of a project to improve impacted attributes as described above and identified for each Service Area in Part II.A and II.B.[4] Project proponents will be encouraged to utilize CRAM, or a hydrogeomorphic (HGM) approach that focuses on the improvement and/or restoration of ecosystem functions as they pertain to the Landscape Setting, as listed above, or similar analysis to identify the level of lift anticipated for each impacted attribute and function as a result of the proposed project compared with ambient conditions and/or reference sites.

[4] Quantitative data on each attribute may not exist or may exist at a scale that cannot be utilized for overall Service Area evaluations. In these instances information based on literature review, interviews with local experts, and best professional judgment has been used to make informed qualitative assessments of each attribute within the Service Area. As more information becomes available, impaired attributes and project preferences identified in the CPF may shift, resulting in a change of priorities for individual watershed over time. However, the most current priorities for each Service Area will be included in individual requests for proposals (RFP) issued upon accumulation of sufficient ILF funds.

Projects may be identified by assessing impacts to the following CRAM attributes:

- Buffer and Landscape Condition and Context: Activities occurring in adjoining upland buffer throughout the Service Area that can reduce the effects of stressors on the wetland's condition. The landscape context of a wetland consists of the lands, waters, and associated natural processes and human uses that directly affect the condition of regional wetlands or their buffers. This includes the status of riparian and vernal pool vegetation.
- Hydrology: The sources, quantities, and movements of water, plus the quantities, transport, and fates of water-borne materials, particularly sediment as bed load and suspended load.
- Physical Structure: The spatial organization of living and non-living surfaces that provide habitat structure for biota. This may include the capacity of wetlands to support characteristic flora and fauna. Physical attributes such as stream sinuosity, riparian habitat structure, and micro-habitat availability within vernal pools as part of appropriate grassland management are examples.
- Biotic: The presence of living or dead organic matter that contributes to material structure, architecture, and biogeochemical processes of regional wetlands.

3. Conformity with Existing Resource Plans

ILF Projects will be prioritized based on their ability to aid in the achievement of existing regional biotic and aquatic resource goals. The ILF Program will promote projects that can integrate additional funding sources for wetland, fish, and/or wildlife restoration, thereby increasing resource benefits and compensation efficiencies. This includes addressing objectives described in the Interior Department's High Priority Goals for Climate, local IRWMPs, the most recent version of the State Water Resources Control Board's Compilation of Water Quality Goals, and/or recovery goals as outlined in the Sacramento River Watershed Program ("SRWP")-, NOAA-, or USFWS-issued recovery plans, and other large-scale resource protection planning efforts, as appropriate for individual Service Areas. With respect to Service Areas that contain part of or an entire planning area for a Habitat Conservation Plan (HCP) or Natural Community Conservation Plan (NCCP), ILF Projects may provide compensatory mitigation for activities that are not covered under the HCP or NCCP, or for activities of persons or entities that are not participants in the HCP or NCCP, in which case ILF Projects will be prioritized based at a minimum on their consistency with HCP or NCCP goals. If participants in an HCP or NCCP wish to utilize the ILF Program for any of their covered activities, the Project Sponsor will work with the participants to accommodate this, including, if necessary, establishing a special-purpose Service Area.

4. Compliance with the 2008 Rule

Each ILF Project will include the following elements in accordance with the 2008 Rule.

a. Objectives
b. Site Selection
c. Site protection instrument

d. Baseline information
e. Determination of credits

f. Mitigation work plan
g. Maintenance plan
h. Performance standards
i. Monitoring requirements
j. Long-term management plan
k. Adaptive management plan
l. Financial assurances

5. Additional Prioritization for Vernal Pool Service Areas

For Vernal Pool Service Areas, (Part II.A), prioritization will also focus on the persistence and expansion of federally listed vernal pool species through the rehabilitation and/or reestablishment of vernal pool features. Specifically, projects will be evaluated on:

a. Location of Proposed Project: Significant consideration will be given to projects located within or immediately adjacent to vernal pool Core Areas within each impacted Vernal Pool Service Area, as defined by the USFWS Recovery Plan.
b. Local Population Densities: Significant consideration will be given for projects that will enhance, rehabilitate, or reestablish features in complexes that currently have a low occurrence of federally listed vernal pool species but which are located in areas known to contain a high density of these species. Projects will be prioritized based on high-density locations identified in five-year reviews for vernal pool species, as issued by USFWS, or other similar documents.

A decision matrix detailing the steps leading up to project prioritization and implementation of selected projects can be found in **Exhibit E**.

F. Satisfying Criteria for Use of Preservation

Preservation is permissible under certain circumstances set forth in the 2008 Rule. Preservation may often be credited if it is part of a broader complex of restoration and/or rehabilitation activities, such as improving land management to encourage the persistence of habitat for listed species or implementing activities to encourage hydrologic connectivity and native species dispersal. Additionally, resource specialists have posited that locations with sensitive ecological features and intact natural processes should be protected; one example of a particular geography in which preservation may be appropriate is mountain environments such as the Sierra Nevada range (Moyle, et al, 1996). Finally, wetland preservation projects will be prioritized based on an ILF Project's ability to help achieve goals outlined in approved IRWMPs and/or aid in the protection of areas that contain Primary Constituent Elements (PCUs) for wetland-dependent species as identified by NOAA and/or the USFWS within a particular Service Area.

G. Partner Engagement

The ILF Program is designed to encourage collaboration, cooperation, and coordination, as appropriate, with private entities, government agencies, and non-profit conservation organizations to share data and other information about resource conditions and mitigation opportunities within Service Areas. This information will inform specific conservation project selection as well as aid in the adaptation of Service Area priorities as new threats evolve and restoration data becomes available. Thus, the Program Sponsor will consider input from private and public partners and continue outreach to these entities as it refines the ILF Program goals, objectives, and implementation strategies throughout the life of the ILF Program.

Further, the Program Sponsor intends to engage partners – such as non-profit conservation organizations, local land trusts, federal, state, tribal, and local aquatic resource management and regulatory authorities, private entities, and others – to develop and implement high-quality mitigation projects to be funded through the ILF Program. Some of these entities will also be engaged for site protection (e.g., acceptance of conservation easements) and long-term land stewardship. The Project Sponsor will use various means of engaging partners, such as directed contracts or requests for proposals.

1. Long-Term Protection and Management Strategies

As provided in Section VI.B.4. of the Instrument, the Program Sponsor shall be responsible for ensuring long-term protection of each ILF Project site through the use of a Conservation Easement or other protection mechanism acceptable to the applicable IRT Members. Long-term protection and management will be specifically addressed in management plans that will be developed for each ILF Project site and approved by the applicable IRT Members. The Program Sponsor does not contemplate holding easements or implementing land management on ILF Project sites. Instead, the Program Sponsor intends to partner with non-profits, land trusts, and others to provide for long-term protection and stewardship of ILF Project sites. Long-term management of ILF Project sites will be funded through long-term management and maintenance funds (a.k.a., long-term stewardship funds or "mitigation endowments").

H. Periodic Evaluation and Reporting

The Program Sponsor will meet with the IRT bi-annually to report on progress toward achieving the ILF Program's goals and objectives, and will submit to each IRT Member an Annual Report in accordance with Section IV.E. of the Instrument. In addition, since the Framework will be a living document that is evaluated periodically, and updated and refined as necessary to incorporate new information, updates to the Framework will be presented to the IRT at a bi-annual meeting no less frequently than every five years.

Further, the Project Sponsor will maintain an ILF Program website where the Program Sponsor will post information from time to time about the ILF Program, such as the most recent ILF Program Instrument and associated technical documents, annual reports, and approved Project Development Plans. This will provide transparency, facilitate partnerships, and aid in the refinement over time of the ILF Program, including the Framework.

I. GIS Database

The Program Sponsor will develop and maintain a GIS database for the Program Area and each Service Area within it. This database will contain information such as impact level, type, and location; required compensatory mitigation credits; ILF Projects implemented; and total acreages realized.

Part II. Description of Individual Aquatic Resource Service Areas

Please see **Appendices A-Q** for individual Aquatic Resource Service Areas descriptions.

Appendix A-I

Pit River System

A. Pit River Watershed

The Pit River Watershed Service Area is 7.004 square miles and includes the Pit River, Lake Shasta, parts of the McCloud River, and Goose Lake (**Figure A-1**). Goose Lake occupies the border of northeastern California and southern Oregon, down to Lake Shasta in the southwest corner of the Service Area. The North and South forks of the Pit River originate in the eastern side of the Warner Mountains and northern part of the Sierra Nevada Range and later join, flowing southwest into Lake Shasta. The Pit River features 21 principal tributary streams and 63 jurisdictional dams and reservoirs (SRWP Pit, 2013). The lower portion of the Pit River is blocked by a series of PG&E hydroelectric dams and reservoirs that provide power. Lake Shasta is formed by Shasta Dam and is one of the largest reservoirs in the state of California. This dam is the most prominent in the region and provides hydroelectric power, water for agriculture and human consumption, and flood protection. The McCloud River and portions of the Sacramento River are also included in the Pit River Watershed Service Area and flow through mountainous headwater regions before emptying into Lake Shasta. This region is not densely populated, and communities such as Alturas, Burney, and Mount Shasta are the largest towns in the system. Vegetation in the upper elevations in this region consists of mixed conifer forest, juniper, aspen stands, and sagebrush, while the lower elevations feature valleys with wetlands, riparian areas, irrigated farmland, and pasture (SRWP Pit, 2013). Land cover composition for this watershed is illustrated in **Appendix II.A.1.**

1. Historic Impacts

Agriculture and livestock grazing have been the primary factors in the elimination of aquatic habitat, primarily for the production of livestock forage crops and wild rice in the Pit River area. Historic mining activity near the headwaters and tributaries of the Pit River watershed led to the establishment of a prominent timber harvesting industry, especially along the McCloud River, that has continued to grow to this day. Although this Service Area is not densely populated, historic road use to access mining and timber harvesting sites have impacted the region. The combination of timber harvest, road use, and a past history of wildfires have caused major influxes of sedimentation in the waterways that may be problematic for many years (CalEPA, 2003). Since its creation in 1945, Lake Shasta has suffered from impacts of historic acid mine drainage and gravel mining polluting its waters, as well as those of creeks and streams in the Pit River Watershed Service Area (CalEPA, 2003). These water quality issues continue to this day. The many dams and diversions within the Pit River Watershed Service Area and the Shasta Dam have inhibited Chinook salmon and steelhead migration to historic spawning habitat on the upper reaches of the Sacramento and McCloud Rivers (NCWA, 2006).

Table A-1. Historical Impacts to Pit River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Pit	Headwaters	M	M	L	L	L	L	L
	Tributaries	M	M	M	M	L	L	L
	Main Stem/Floodplain	L	L	M	M	L	L	L

H= High, M= Medium, L=Low

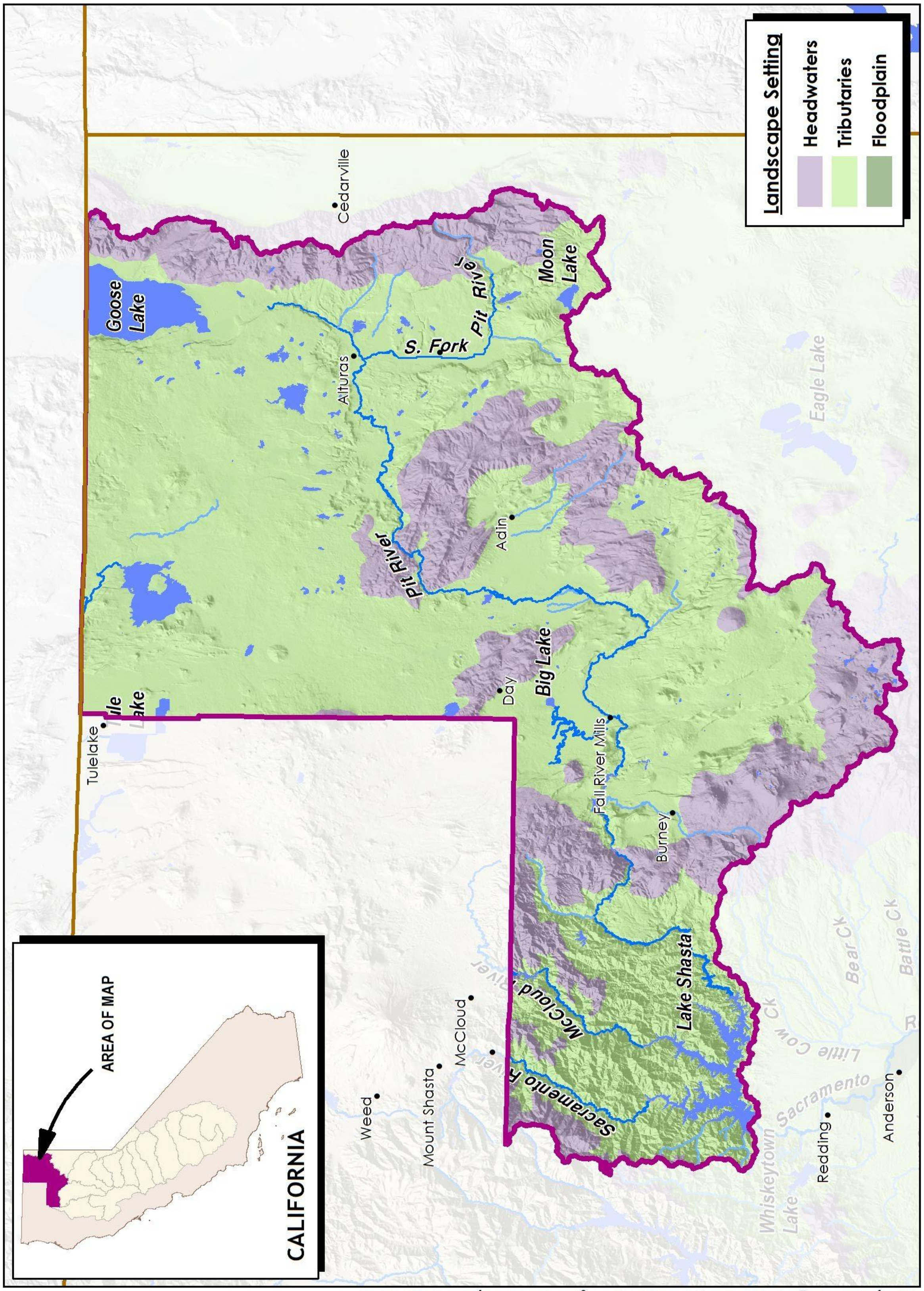
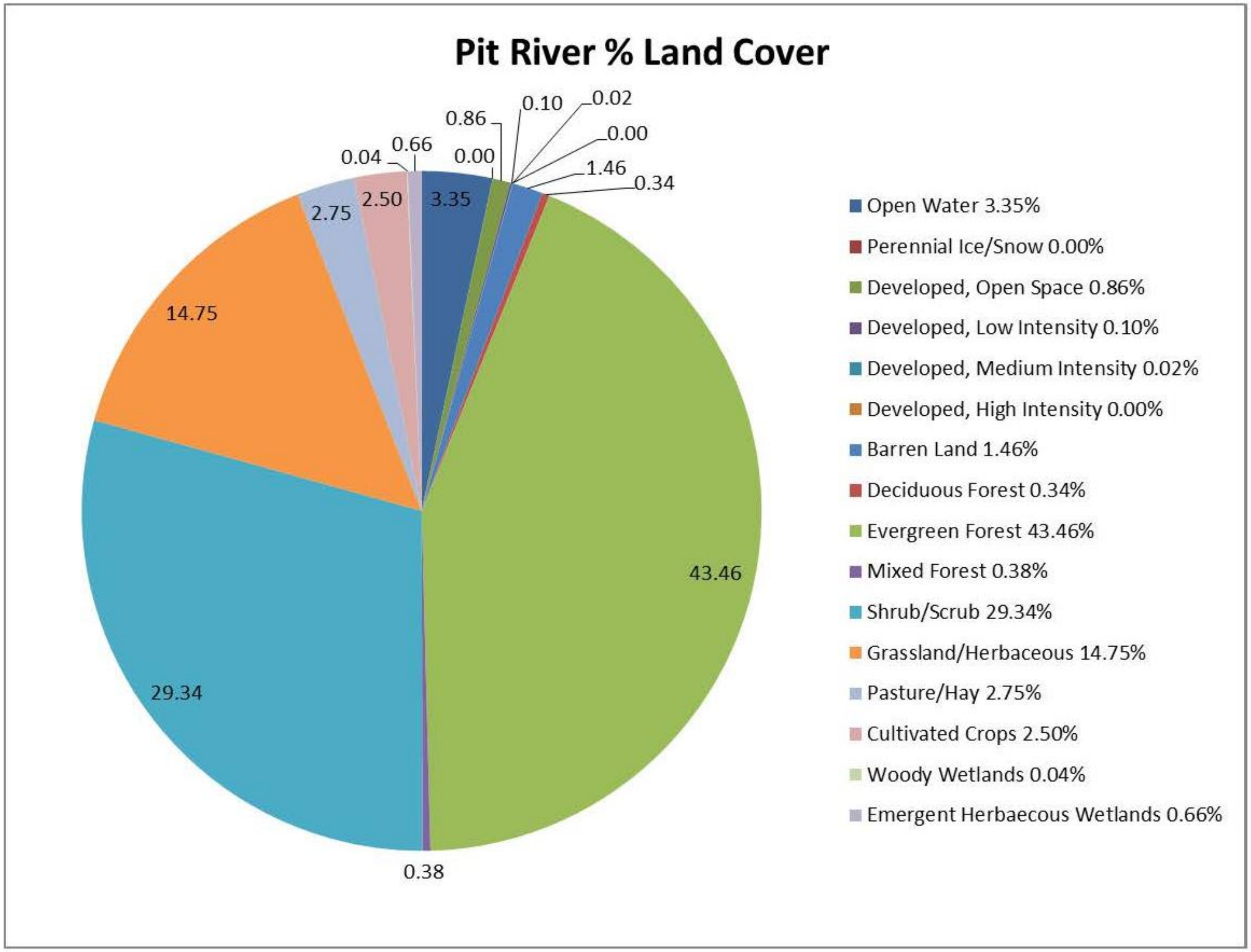


Figure A-1
Pit River Watershed

Appendix II.A.1



2. Current Impacts and Attribute Status

Agriculture and commercial timber harvest practices continue to utilize riparian habitat land as the main industries in the Pit River Watershed Service Area. Land management activities like livestock grazing, road construction, timber harvesting, and channel modifications cause an increase in sedimentation loading and increased water temperatures, which inhibit productive fish habitat (CalEPA, 2003). Projects in the Upper Pit River Watershed to improve water quality and degraded channels through habitat restoration and stream bank modification have been proposed (SRWP, 2013). The Pit River Watershed is an important fishery in California due in large part to its mostly uninhabited landscape. The upper Pit River waterways, unlike the eastern systems, including the Fall River and Hat Creek, are spring fed and support a large water supply and extensive wetlands (Cannon, pers. comm.). Additionally, they provide "blue ribbon" native trout fisheries, and the lower portions of the river support warm-water species like bass and brown bullhead (CalEPA, 2003). Federally listed aquatic species – including Modoc sucker, rough sculpin, Pit roach, western pond turtle, and Shasta crayfish – are also found in this region (SRWP Pit, 2013). Ecosystem and fisheries restoration plans for the Pit River Watershed Service Area include improving aquatic ecosystem health, maintaining suitable conditions for salmonids, and facilitating fish movement with fish screens and ladders, increasing spawning gravel, and improving access to fish spawning habitat (NCWA, 2006). California Trout implemented a restoration project on Hat Creek in the early 1970s, an effort that improved fish habitat and led to the establishment of the creek as California's first official Wild Trout Area. Montane meadow habitats are prevalent within the lower portion of the Pit River Watershed Service Area boundary and require protection and enhancement projects (Montane Meadows Map NFWF folder). Wetlands and irrigated farmland in the watershed also provide habitat for numerous migratory and resident waterfowl species, and organizations such as Ducks Unlimited and the California Waterfowl Association are working on projects to improve the physical structure, biotic structure, and buffer zones of these aquatic habitats.

Table A-2. Current Impacts to Pit River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Pit	Headwaters	L	M		M		L	
	Tributaries	M	H	M	M		L	L
	Main Stem/Floodplain			M	H		L	L

H= High, M= Medium, L=Low

Due to extensive agricultural, mining and timber harvesting activity, the hydrology, physical structure, wetland acreage, and diversity attributes have been highly impacted throughout the headwater and tributary regions of the Pit River Watershed (**Figure A-2**). The loss of these attributes has had a profound impact on buffer and landscape context and has slightly impacted biotic structure, especially in regard to fisheries, in the Service Area.

Because of the current absence of pre-settlement data, the precise acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the Pit River Watershed Service Area. However, Native American territories within the region were said to include hundreds of acres of rich riparian environments, swampland, wetlands, meadows, and heavily forested upland areas (Vestra, 2004). Current wetland types and extents for this Service Area are listed in **Appendix II.A.2**.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM type approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.A.3.**

Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Plant and/or manage adjacent upland buffers to protect riparian corridors against catastrophic fire.
- Prioritization for applicable ecological objectives will be considered during the ILF proposal stage.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality at Burney Creek and within possible restoration sites.
- Work to improve water quality and meet TMDLs in the following categories; Pathogens, Metal/Metalloids and Miscellaneous (**Appendix II.A.3.)**.
- Work to improve natural channel morphology and reduce erosion in the Upper Pit River watershed. Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure A-1** or other reliable sources of information on riparian restoration needs.

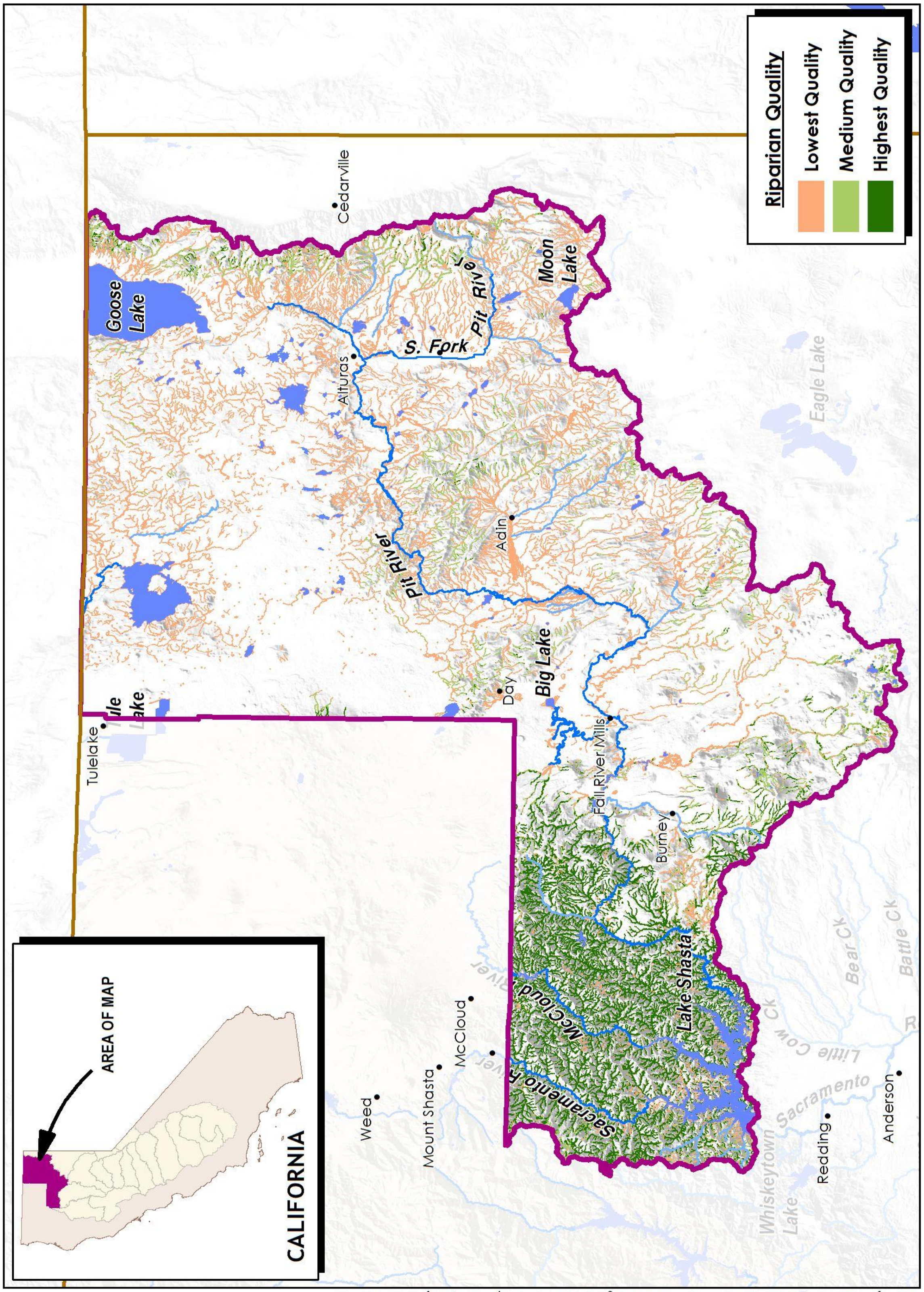


Figure A-2
Pit River Watershed Riparian Quality Map

GISProject12\NFWF_2012\MXD\1408\CPF Rev\CPF Figure A-2 Pit River Riparian Quality 140808 v5.mxd

Appendix II.A.2

Pit River Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	13455.96
Estuary	0.01
Ice Mass	18.19
LakePond	6035.49
Playa	142.26
Reservoir	351.14
SwampMarsh	930.63
Freshwater Emergent Wetland	166001.23
Freshwater Forested/Shrub Wetland	10848.58
Freshwater Pond	2686.35
Lake	137793.46
Other	490
Riverine	4534.85

Appendix II.A.3 Pit

Pit River Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Ash Creek, Upper	pH	Miscellaneous	5A	1224575.92
Beaver Creek	Specific Conductivity	Salinity		1440637.50
Burney Creek	Specific Conductivity	Salinity		2555036.01
Canyon Creek (Modoc County)	Escherichia coli (E. coli)	Pathogens	5A	1181697.09
East Creek, Upper (Modoc and Lassen Counties)	pH	Miscellaneous		425995.26
Fall River (Pit)	Escherichia coli (E. coli)	Pathogens		750549.61
Fitzhugh Creek, Lower (Modoc County)	Chloride	Salinity		697718.32
Hat Creek	pH	Miscellaneous		3404323.85
Horse Creek (Rising Star Mine to Shasta Lake)	Specific Conductivity	Salinity		32922.53
Hulbert Creek (Modoc County)	pH	Miscellaneous		271215.50
Klamath River HU, Lost River HA, Clear Lake, Boles HSAs	Nutrients	Nutrients		42955436.14
Klamath River HU, Lost River HA, Tule Lake and Mt Dome HSAs	Temperature, water	Miscellaneous		14044061.51
Little Backbone Creek, Lower	Acid Mine Drainage	Metals/Metalloids	5A	60787.57
Pit River (from confluence of N and S forks to Shasta Lake)	Escherichia coli (E. coli)	Pathogens		18942735.58
Pit River, North Fork	Specific Conductivity	Salinity		1444865.39
Pit River, South Fork	pH	Miscellaneous	5A	2402205.96
Rush Creek (Modoc County)	pH	Miscellaneous	5A	605411.45
Thoms Creek (Modoc County)	pH	Miscellaneous		745998.24
Town Creek	Cadmium	Metals/Metalloids	5A	62396.94
Washington Creek (Modoc County)	pH	Miscellaneous		372329.31
West Squaw Creek (below Balaklala Mine)	Zinc	Metals/Metalloids	5A	127964.80
Willow Creek (Lassen County, Central Valley)	Total Dissolved Solids	Salinity		1452563.94
Britton Lake	Mercury	Metals/Metalloids	5A	1099.77
Eastman Lake (Shasta County)	pH	Miscellaneous	5A	18.96
Klamath River HU, Tule Lake and Lower Klamath Lake National Wildlife Refuge	pH (high)	Miscellaneous	5B	2059.76
Shasta Lake	Mercury	Metals/Metalloids	5A	27334.39
Shasta Lake (area where West Squaw Creek enters)	Zinc	Metals/Metalloids	5A	19.90

- Prioritization for applicable geographic actions will be considered during the ILF proposal stage.

All projects will also be evaluated on their ability to align with local IRWMP goals, Regional Water Board goals for restoration of impaired waterways in accordance with the Clean Water Act section 303(d) and Central Valley Salmon/Steelhead Recovery Plans within the Service Area.

6. References

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Appendix B-I

Modoc River System

B. Modoc Watershed

The Modoc Service Area is approximately 3,950 square miles and includes land within both Modoc and Lassen Counties on the eastern side of the Sierra Nevada (**Figure B-1**). Large water bodies within this Service Area include Honey Lake, Eagle Lake, and Lower Lake. There are 61 dams in the County of Modoc and 50 dams in Lassen County (CA Hometown Locator, 2013). The largest river in this watershed is the Susan River. The Headwaters of the Susan River begin at Caribou Lake and flow east to the Caribou Lake 234 Dam. About 11 miles northwest of the city of Susanville, the Susan River enters the Great Basin and meets another dam to form the McCoy Flat Reservoir. A number of creeks, gulches, and sloughs run into the Susan River both before and after the City of Susanville, the main urban center of this Service Area (population 17,685). Many of these creeks have been extensively modified by a series of canals and levee systems for use in ranch irrigation. The Susan River reaches its terminus at Honey Lake. Honey Lake is an endorheic sink that evaporates to become an alkali flat in summer months. Eagle Lake is situated 16 miles to the northeast of Susanville. This lake has no natural outlet and is the second-largest freshwater lake in California (BLM, 2012). Sections of the Modoc and Lassen National Forests are located within the boundaries of this Service Area. These national forests are managed by the U.S. Forest Service and the Bureau of Land Management BLM (USDA, 2013), and therefore forestry and fire management are common projects within these areas. Land cover composition for this watershed is illustrated in **Appendix II.B.1.**

1. Historic Impacts

The Gold Rush in the 1840s brought many settlers to the Modoc region. Industries such as timber mills and railroad were developed to exploit the region's vast forested areas. In the early 1900s, some of the largest timber mills in Lassen County were built near Susanville (Lassen County History, 2012). These in turn supplied California with a large amount of its lumber, with the peak output being reached in 1948, when the area supplied approximately a tenth of the State's demand. This dropped considerably, however, by the 1960s. While Lassen County's 1968 General Plan continued to cater to both the timber and livestock industries, it also gave rise to several resource conservation policies to protect resources, reforest land, and protect the physical environment (Lassencounty.org, 2013). Beginning in 2007, due to increased restrictions on lumber extraction, many of the once-numerous large mills had gone out of business (Anderson Valley Post, 2009). However, this was not before the extraction of timber resources had led to high levels of sedimentation and water quality issues in the Susan River and many of its connected waterways (BLM, 2012). Water diversions for agriculture have also affected many of the lakes and creeks in this Service Area. For example, Eagle Lake has a history of attempted water diversion projects, such as the Merrill Project and the Bly Irrigation Tunnel Project, but due to the high alkalinity of the water preventing its use for crop irrigation, financial failures and political battles over downstream water rights and potential extinction of the Eagle Lake trout (*Oncorhynchus mykiss aquilarum*), all of the water diversion projects for irrigation on this body of water have been unsuccessful (DOI BLM, 2012).

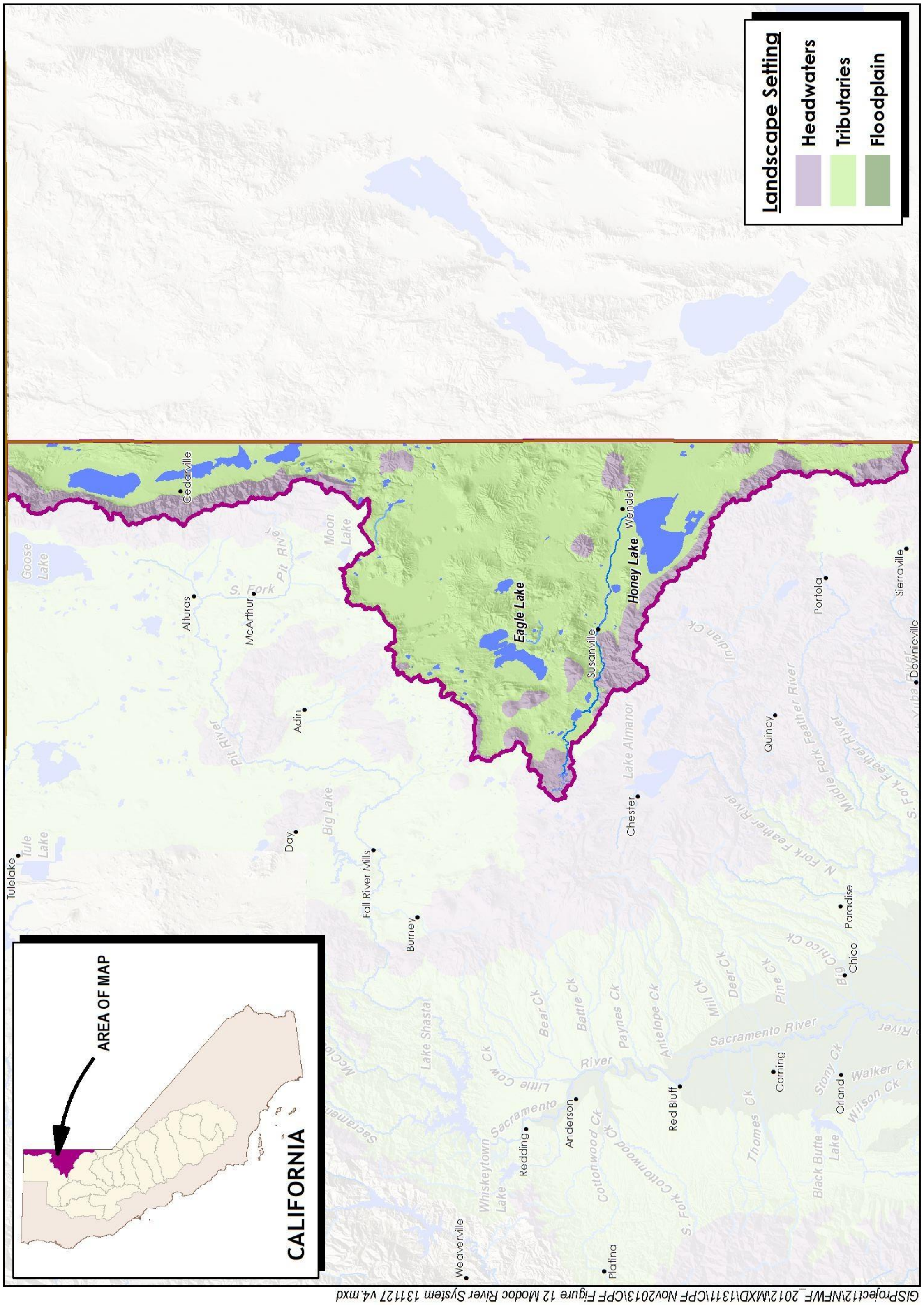

Figure B-1
Modoc Watershed

Appendix II.B.1

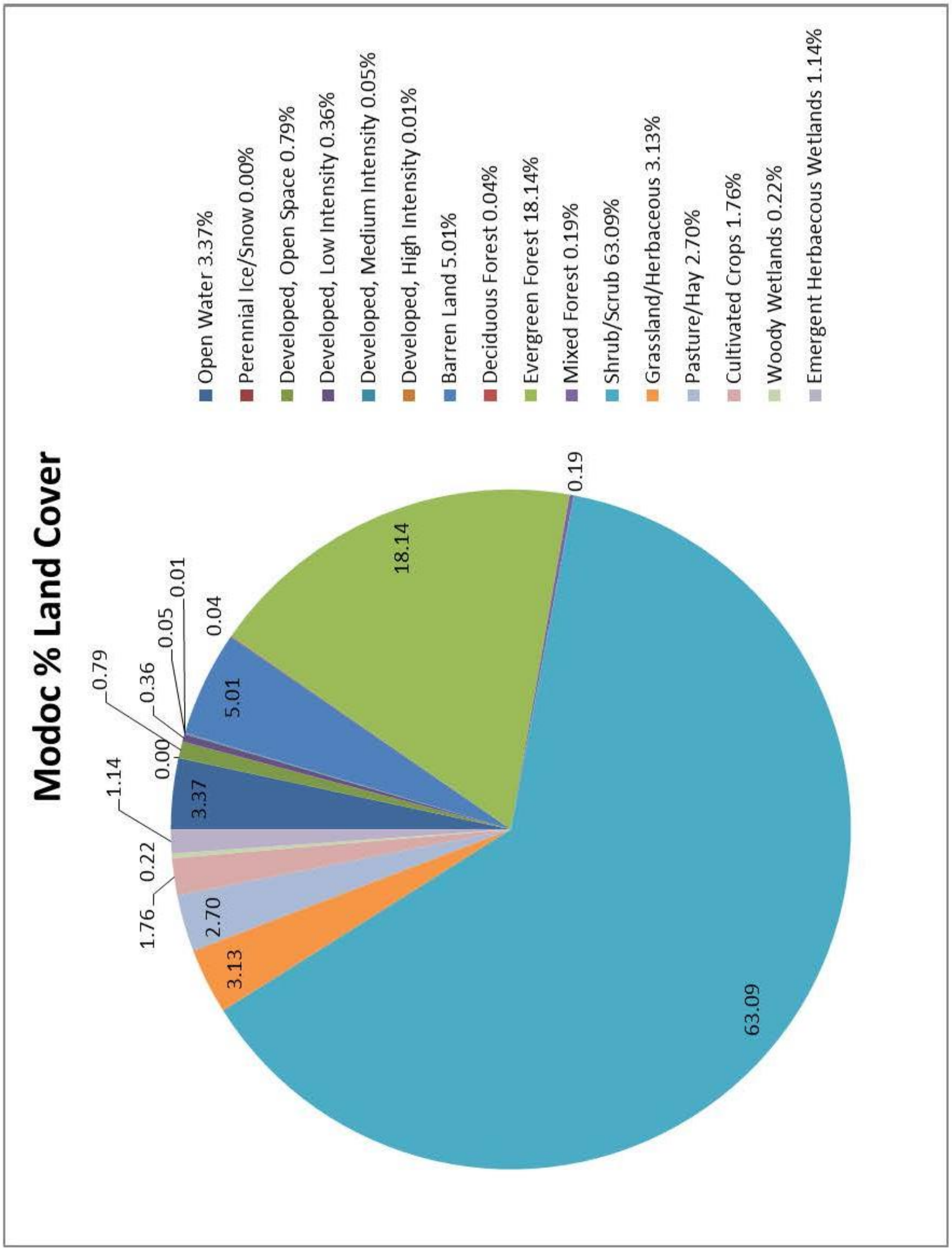

Table B-1. Historical Impacts to Modoc Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Modoc	Headwaters	L	L	L	L	L	L	L
	Tributaries	L	H	L	L	L	L	L
	Main Stem/Floodplain	L	L	L	L	L	L	L

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

Today, timber, row crops, grazing, and a variety of other industries are still vitally important economically to this area (RDC, 2012). This is especially true for the areas surrounding the Susan River. Impacts from these practices are still of concern and continue to affect the waterways within this Service Area, despite the timber industry being highly regulated by the U.S. Forest Service (USDA, 2013). Water diversions for agriculture and livestock management are one of the region's primary threats; as reduced flows affect wildlife and water quality, and livestock grazing practices contribute to bank erosion (RCD, 2012). To minimize these impacts, the Honey Lake Resource Conservation District (RCD) has been working with local agencies and private landowners to implement the Susan River Watershed Management Strategy. This strategy considers these threats and those posed by future climate change (RDC, 2012). However, the RCD is also implementing a plan for flood management and control in this area to alleviate biannual flood events (IICIP, 2012). This will result in additional impacts to area wetlands.

The many dams and diversions in support of irrigation within the downstream sections of this Service Area act as barriers and prevent native trout from accessing spawning grounds upstream. The Bly Irrigation Tunnel, in combination with natural drought conditions in the 1930s, nearly brought the native Eagle Lake trout to the point of extinction when water levels became too low. This resulted in California Department of Fish and Wildlife's involvement in the 1950s, which provided an artificial propagation program for Eagle Lake trout within the system. The program continues to be a great success that, in conjunction with higher lake levels and improved water quality, has contributed to the rehabilitation of the species, although through artificial means (DOI BLM, 2012). Ecosystem and fisheries restoration plans for the Modoc Watershed Service Area include proposals to delist the Modoc sucker (*Catostomus microps*) (Jarrell, 2014), improving aquatic ecosystem health, maintaining suitable conditions for native trout, facilitating fish movement with fish screens and ladders, and improving access to fish spawning habitat.

Cascade montane meadows are widespread in the western portion of this Service Area and require preservation (USDA Forest Service Montane Meadows map). Although overall future projections show a minimal amount of urbanization in this Service Area, land surrounding Honey Lake and Eagle Lakes has been designated as urban reserves (CA Dept. of Forestry Map).

Table B-2. Current Impacts to Modoc Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Modoc	Headwaters	L	L	M	M	L	L	L
	Tributaries	L	M	M	M	L	L	L
	Main Stem/Floodplain	L	L	L	L	L	L	L

H= High, M= Medium, L=Low

Due to extensive agricultural and water resource development, the hydrology, physical structure, wetland acreage, and diversity attributes have been highly impacted throughout the headwater and tributary regions of the Modoc Watershed Service Area (**Figure B-2**). The loss of these attributes has had a profound impact on buffer and landscape context and has slightly impacted biotic structure, especially in regard to fisheries, in the tributary regions.

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the Modoc Watershed Service Area. Current wetland types and extents for this Service Area are listed in **Appendix II.B.2.**

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.B.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Prioritization for applicable ecological actions will be considered during the ILF proposal stage.

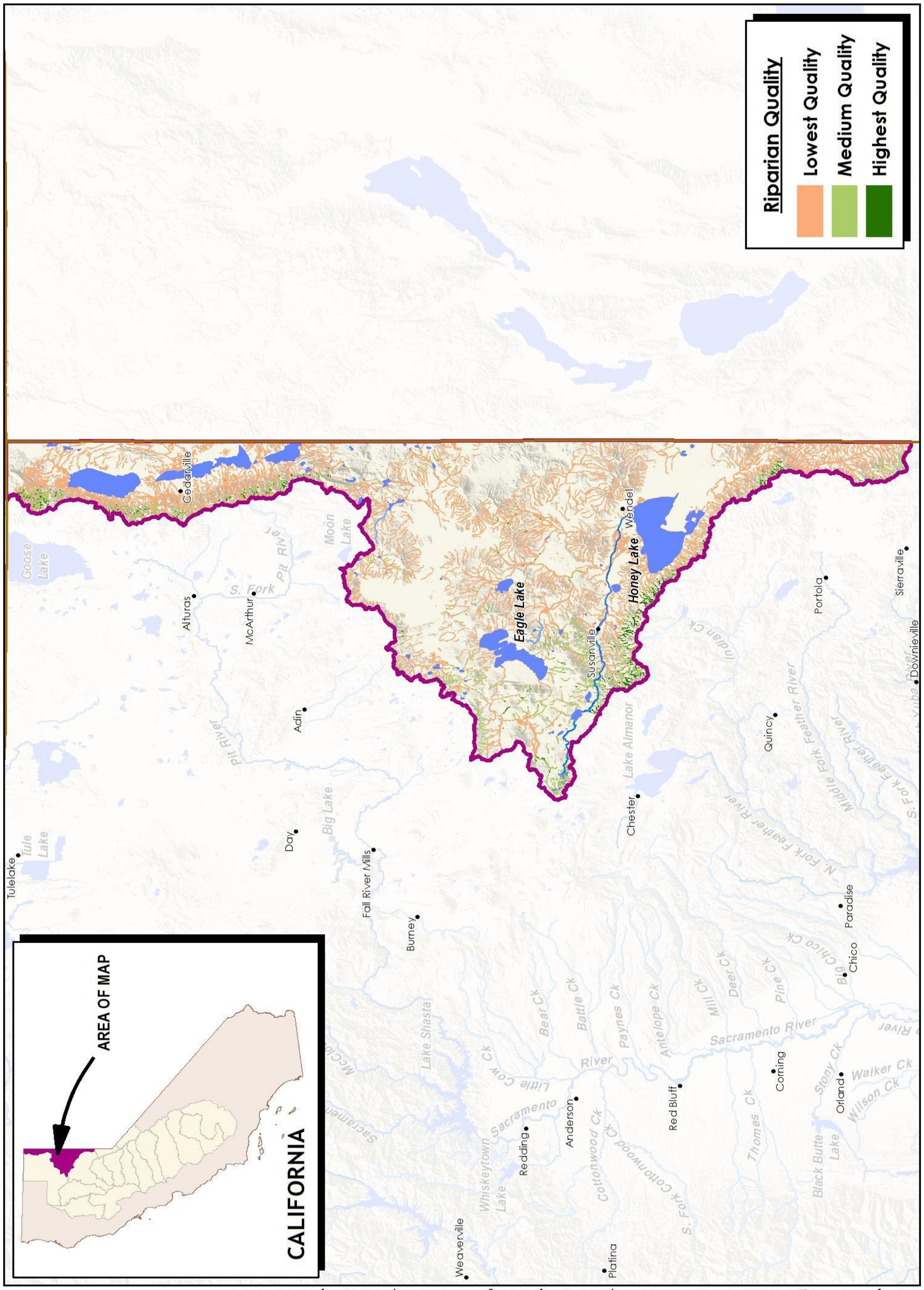

Figure B-2
Modoc Watershed Riparian Quality Map

Appendix II.B.2

Modoc Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	5975.92
LakePond	10694.86
Playa	210.86
Reservoir	12.63
SwampMarsh	393.2
Freshwater Emergent Wetland	108149.05
Freshwater Forested/Shrub Wetland	67895.21
Freshwater Pond	1010.58
Lake	164699.54
Other	7947.25
Riverine	665.16

Appendix II.B.3

Modoc Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Alaska Canyon Creek	Sediment	Sediment		357942.56
Barber Creek, North	Temperature, water	Miscellaneous		264075.77
Bare Creek	Sediment	Sediment		896516.47
Bidwell Creek	Turbidity	Sediment		777255.97
Cedar Creek	Total Kjeldahl Nitrogen (TKN)	Nutrients		559958.14
Cheney Creek	Phosphorus	Nutrients		420134.02
Cole Creek (Modoc County)	pH	Miscellaneous		148698.95
Cottonwood Canyon (Lassen County)	Total Coliform	Pathogens		162119.87
Cow Head Slough	Sediment	Sediment		375390.78
Dry Creek (Lassen County)	Dissolved oxygen saturation	Nutrients		439776.14
Eagle Creek (Modoc County)	pH	Miscellaneous		707959.47
Emerson Creek	Total Nitrogen as N	Nutrients		511145.98
Granger Creek	Turbidity	Sediment		368849.04
Horse Camp Spring Creek	Turbidity	Sediment		54066.82
Lassen Creek	Flow alterations	Hydromodification		508334.33
Milk Creek	Phosphate	Nutrients		370643.01
Mill Creek (Modoc County)	Specific Conductance	Salinity		267338.47
North Creek	Specific Conductance	Salinity		204505.74
Pine Creek (Lassen County)	Sedimentation/Siltation	Sediment		3557697.84
Red Rock Creek	Phosphate	Nutrients		997502.22
Sand Creek (Modoc County)	Phosphate	Nutrients		969925.80
Secret Creek	Phosphate	Nutrients		1112511.78
Shinn Canyon	Specific Conductance	Salinity		437227.54
Silver Creek (Lassen County)	Sediment	Sediment		413487.28
Skedaddle Creek	Sediment	Sediment		1117249.91
Slate Creek	Nitrate	Nutrients		220490.51
Smoke Creek	Nitrate	Nutrients		950603.12
Smoke Creek tributary, unamed (Lassen County)	Nitrate	Nutrients		546853.05
Stony Creek (Lasssen County)	Phosphate	Nutrients		507853.25
Susan River (Headwaters to Susanville)	Total Nitrogen as N	Nutrients	5A	2366262.24
Susan River (Litchfield to Honey Lake)	Unknown Toxicity	Toxicity	5A	541478.31
Susan River (Susanville to Litchfield)	pH	Miscellaneous		1044833.55
Willow Creek (Lassen County)	Fecal Coliform	Pathogens		1935777.00
Willow Ranch Creek	Temperature, water	Miscellaneous		345080.71
Buckhorn Reservoir	Dissolved oxygen saturation	Nutrients		102.43
Eagle Lake (Lassen County)	Phosphorus	Nutrients	5A	20704.41
Honey Lake	Arsenic	Metals/Metalloids	5A	57757.16
Honey Lake Area Wetlands	Metals	Metals/Metalloids	5A	62592.11
Honey Lake Wildfowl Management Ponds	Trace Elements	Metals/Metalloids	5A	665.09
Morgan Spring (Lassen County)	Specific Conductance	Salinity		0.23
Newland Reservoir	Specific Conductance	Salinity		60.66
Pryor Spring (Lassen County)	Turbidity	Sediment		3.89

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Nutrients and Toxicity (**Appendix II.B.3.)**.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure B-2**.
- Prioritization for applicable geographic actions will be considered during the ILF proposal stage.

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Appendix C-I

Northwest Sacramento River System

C. Northwest Sacramento Watershed

The Northwest Sacramento Watershed Service Area contains a portion of the Sacramento River with numerous creeks that drain into the Sacramento Valley **(Figure C-1)**. One of these creeks is Stony Creek, which is 65 miles in length and flows northeast until it enters Black Butte Lake, formed by the Black Butte Dam. The Black Butte System provides flood protection and water for irrigation and municipal use for nearby towns and agricultural lands. Similarly, the majority of the creeks in this Service Area provide water for irrigation purposes. The cities of Chico and Red Bluff are located within the Service Area's boundaries and are considered the main urban centers of this watershed. The city of Red Bluff is located adjacent to the Sacramento River. The Northwest Sacramento Watershed Service Area is 3,445 square miles. Vegetation in this region is comprised of conifer forests within the higher elevations, chaparral and oak woodlands as elevation decreases, and grassland, ephemeral wetland, and agricultural designated land in the lower-elevation floodplains (SRWP East, 2013). Land cover composition for this watershed is illustrated in Appendix II.C.1.

1. Historic Impacts

The Sacramento River once was bordered by thousands of acres of riparian forest and valley oak woodlands along higher river terraces and seasonal marshlands in the lower lying areas (SRWP Valley, 2013). The riparian zones surrounding the Sacramento River were also buffered by wetlands, valley/foothill hardwoods, and extensive grasslands in the floodplain portion of the Service Area (Pre-1900 Historical Habitat Map). In 1849, the city of Red Bluff became a commercial hub and the navigation center on the Sacramento River for shipping goods with steamers making their way from San Francisco (RBCC, 2013). This new industry, along with the Gold Rush, brought settlers to the region who settled the land and created farms. Since then, the primary use of the land within the Northwest Sacramento Watershed has been agriculture, horticulture, and livestock grazing. The timber industry has also had a strong historical presence in the headwaters and upper tributary regions of the Northwest Sacramento Watershed Service Area, and has threatened numerous creeks in the region with an increase in sedimentation due to erosion from deforestation in the higher elevations (Tehama Co., 2012). The Lower Stony Creek, which connects to the Sacramento River, also has a history of intensive in-channel gravel mining, which contributed to a loss of sediment from the creek bed and to changes in stream morphology. This drastic decrease in sediment resulted in the high-velocity churning of different sediments, causing scouring and incision of the stream bank channels (SRWP Stony, 2012). The high occurrence of past and present livestock grazing within the floodplain and tributary portions of the Service Area has also degraded stream banks and caused an increase in sedimentation within the creeks. While many of these issues still exist today, land management and mining operations have altered some practices to comply with regulatory standards for mitigation purposes, reducing their overall impact within the watershed (SRWP Stony, 2012). Whiskeytown Lake, one of the primary water developments in this Service Area, is also a popular recreation area fed by Clear Creek, located 15 miles west of Redding. Water quality sampling taken in the 1980s found high levels of fecal coliform contamination in the Lake resulting from recreational and agricultural activities in the area. These findings demonstrated that water quality had been dramatically impacted by human activity, resulting in an extensive cleanup and management effort that has since improved conditions in recent years (SRWP Stony, 2012).

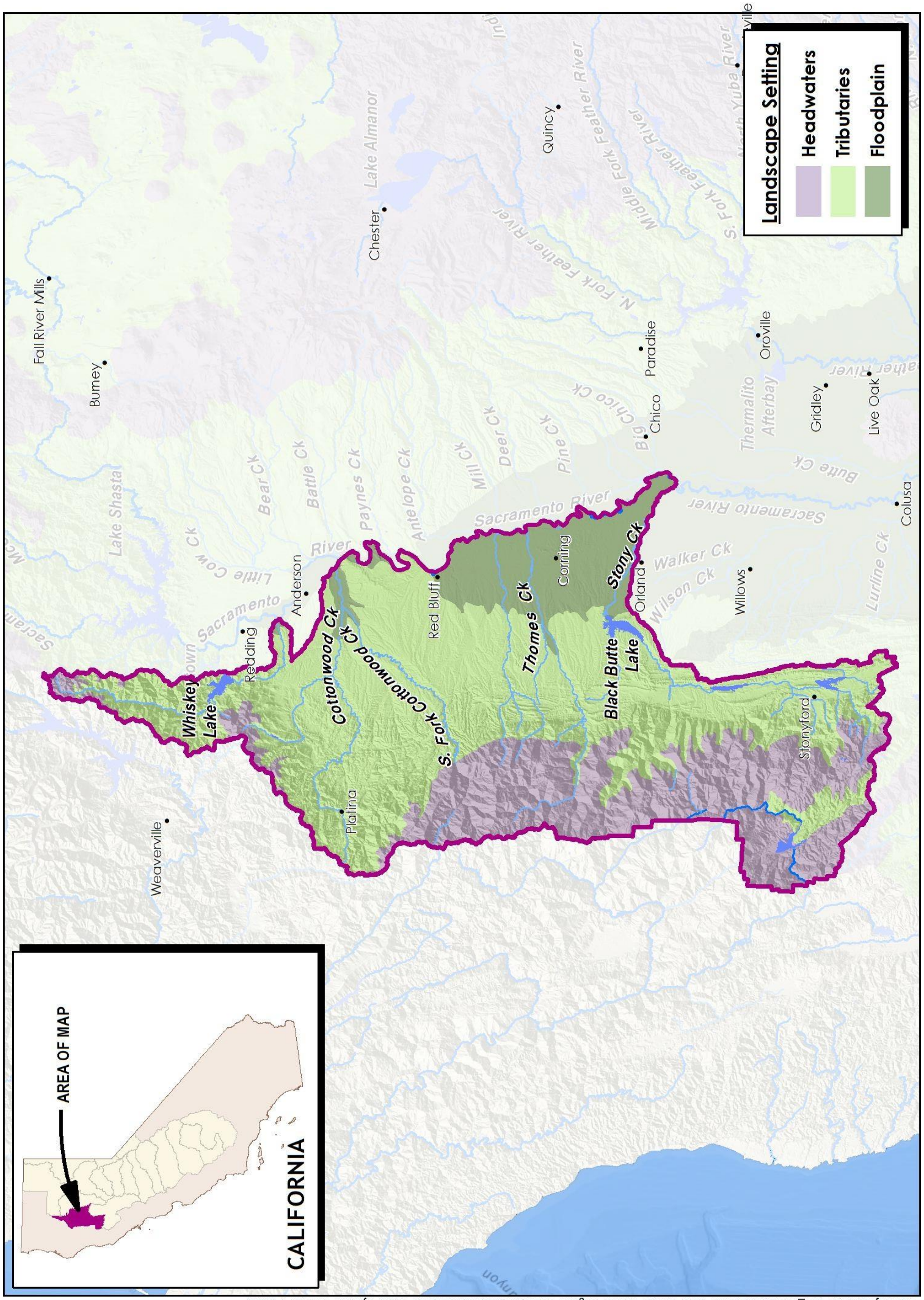

Figure C-1
Northwest Sacramento River Watershed

GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 14 Northwest Sacramento River System 131127 v4.mxd

Appendix II.C.1

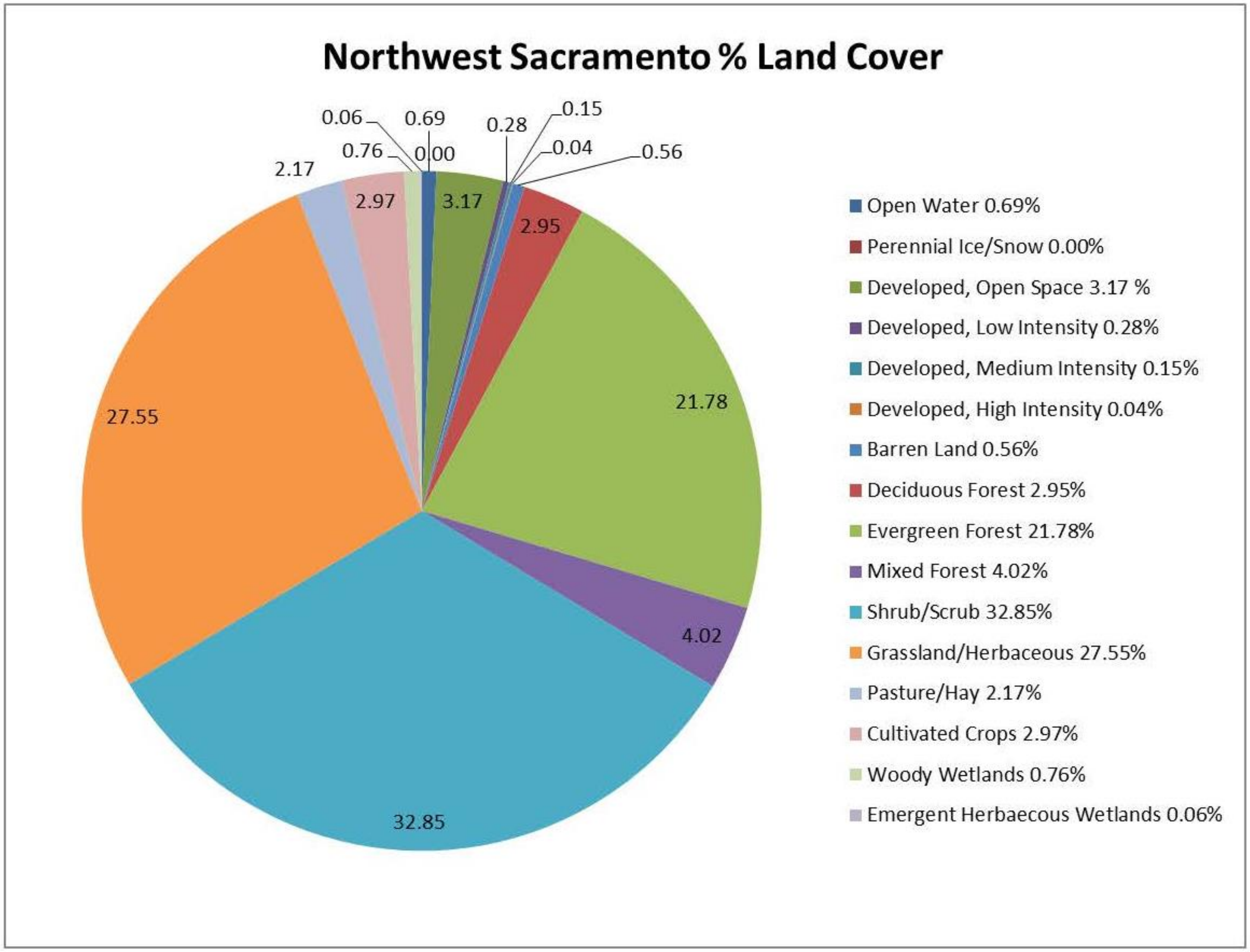

Table C-1. Historical Impacts to Northwest Sacramento Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Red Bluff	Headwaters	L	M		M		L	
	Tributaries		M	M	H	L	M	
	Main Stem/Floodplain			M	H	M	L	M

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

The Service Area is within the boundary of a large natural gas production area that generates both natural gas and electricity for much of California. These activities endanger the system's waterways with the risk of pollution from the extraction process, as this can lead to land subsidence affecting the waterways. Further, the process of hydraulic fracturing (or "hydrofracking") uses millions of gallons of water, reducing water availability for local aquatic resources (Tehama Co., 2012).

While much of the water in the Northwest Sacramento Watershed Service Area is used for irrigation purposes, several creeks still provide quality habitat for native fish species. Upper Stony Creek and Black Butte Reservoir provide a popular sport fishery for bass, rainbow trout, hardhead, catfish, and carp, but Black Butte Dam blocks any upstream anadromous fish migration (SRWP Stony, 2012). However, the USFWS Anadromous Fish Restoration Program still lists Stony Creek as high priority for increasing migratory salmonid populations that are adversely affected by temperature, hydrology, and channel habitat conditions (SRWP Stony, 2012). Ecosystem and fisheries restoration plans for the Northwest Sacramento Service Area include improving aquatic ecosystem health, revitalizing salmonid populations in creeks, maintaining suitable conditions for salmonids, facilitating fish movement with fish screens and ladders, increasing spawning gravel, and improving access to fish spawning habitat (NCWA, 2006).

Table C-2. Current Impacts to Northwest Sacramento Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Red Bluff	Headwaters	L	M		M		L	
	Tributaries	L		M	H	M	M	
	Main Stem/Floodplain			M	H	M	L	M

H= High, M= Medium, L=Low

Timber harvesting still takes place in the headwater elevations of the Service Area (US Forest Service Map). The lower elevations of this Service Area primarily feature irrigated agriculture, but also contain valuable wildlife habitat like vernal pools, riparian buffer zones, and wetlands (SRWP Eastside, 2013). This habitat is important for native vegetation and for migrating waterfowl along the Pacific Flyway. The Sacramento Valley IRWMP, which corresponds to the Northwest Sacramento Watershed Service Area, aims to protect these and other existing wetlands and to create more wetland and buffer habitat (NCWA, 2006). These projects are important for protection of species and wetland resources, as future projections show continued agricultural development and urbanization will further endanger the riparian and wetland ecosystems within this Service Area, especially near the city of Chico (CA Dept. of Forestry Development Map). Due to extensive agricultural and water resource development in the form of agricultural dams and diversions, the hydrology, physical structure, wetland acreage, and diversity functions have been highly impacted throughout the lower elevations of the Northwest Sacramento Watershed Service Area (**Figure C-2**). The loss of these functions has had an impact on buffer and biotic structure, especially in regard to fisheries, at the lower elevations.

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource functions that have been impacted over the past 250 years cannot be precisely determined within the Northwest Sacramento System Service Area. However, the Sacramento River throughout the Central Valley was historically bordered by over 500,000 acres of riparian and wetland habitat, but today only 5% of the original wetland buffer habitat along the Sacramento River corridors remains (SRWP Valley, 2013). Current wetland types and extents for this Service Area are listed in **Appendix II.C.2.**

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.

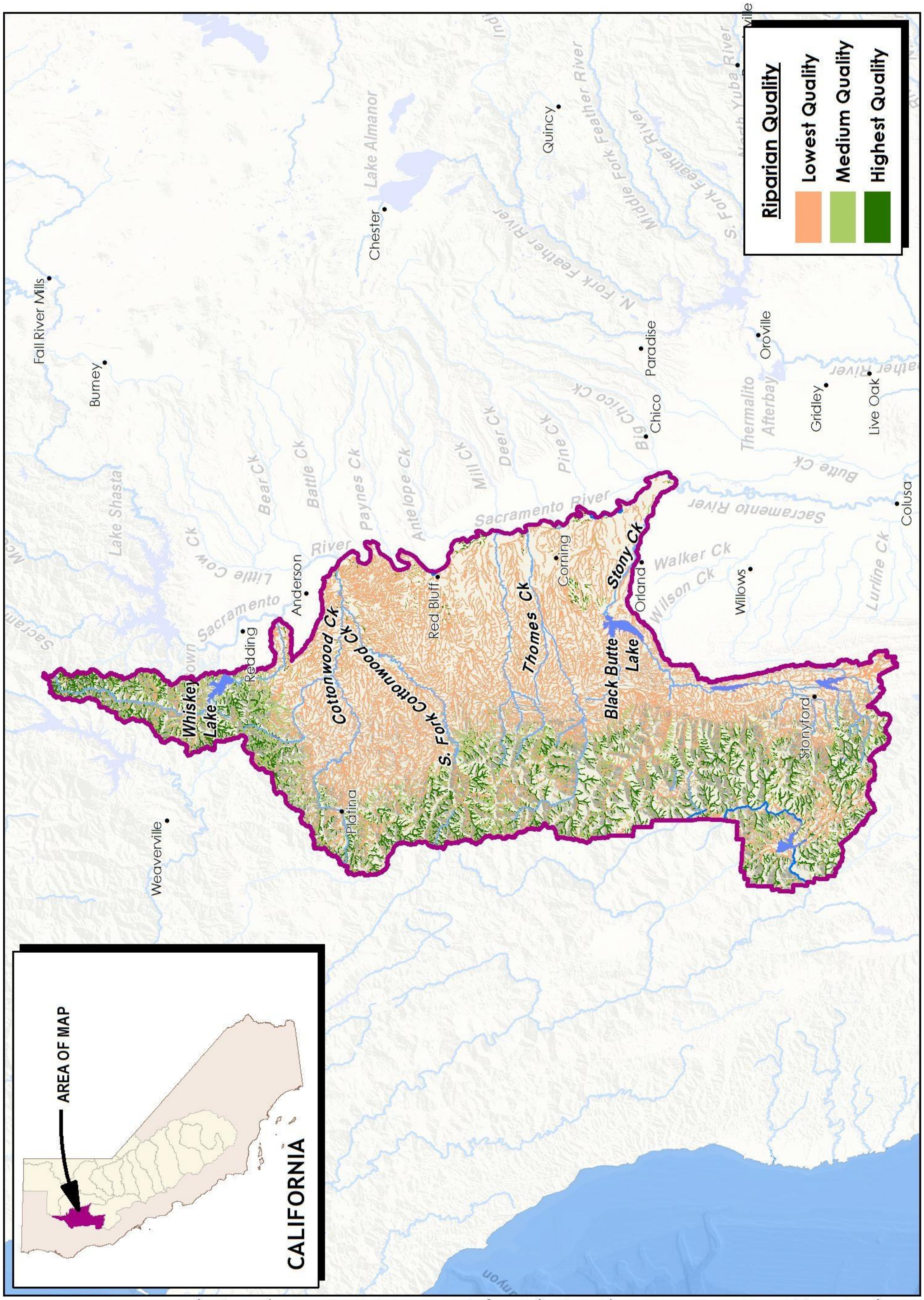

Figure C-2
Northwest Sacramento River Watershed Riparan Quality Map

GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\Riparian Quality\CPF Figure 15 Northwest Sacramento River Riparian Quality 131122 v4.mxd

Appendix II.C.2

Northwest Sacramento Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	13576.1
LakePond	1387.12
Reservoir	81.56
SwampMarsh	91.58
Freshwater Emergent Wetland	13835.17
Freshwater Forested/Shrub Wetland	8059.77
Freshwater Pond	2427.26
Lake	12352.63
Other	249.82
Riverine	14408.64

- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.C.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Improve and/or expand riparian buffers and salmonid habitats through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Additional prioritization for applicable ecological objectives will be considered during the ILF proposal stage.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Other Organics, Metal/Metalloids and Miscellaneous (**Appendix II.C.3.)**.
- Plant and/or manage adjacent upland buffers to protect riparian corridors against catastrophic fire within Thomas Creek.
- Restore wetland meadows within the Thomas Creek watershed.
- Work to improve natural channel morphology in Thomas Creek.
- Improve in-stream habitat diversity and function, including wetlands/riparian restoration and gravel augmentation within Thomas, Clear, Cottonwood, and Beegum creeks.
- Work to improve natural channel morphology in Cottonwood and Beegum creeks.
- Reduce sedimentation within the Clear Creek watershed.

Prioritization of applicable opportunities for riparian restoration will be assessed based areas of medium and lowest quality as shown in **Figure C-2**.

Appendix II.C.3

Northwest Sacramento Watershed				
Water Body Name	Pollutant Category	Pollutant Type	TMDL Status	Linear Feet Impacted
Burch Creek (Tehama County)	Diazinon	Pesticides		1541194.80
Clear Creek (below Whiskeytown Lake, Shasta County)	Mercury	Metals/Metalloids	5A	1123518.61
Eel River HU, Middle Fork HA, Eden Valley and Round Valley HSAs	Specific Conductivity	Salinity		11833.44
Eel River HU, Middle Fork HA, Wilderness and Black Butte HSAs	Temperature, water	Miscellaneous	5B	5636656.22
Eel River HU, Upper Main HA (Includes Tomki Creek)	Aldrin | Atrazine | Azinphos, Ethyl (Ethyl Guthion) | Bolstar | Carbofuran | Chlordane | Chlorothalonil | Chlorpyrifos | Chlorpyrifos, methyl | Ciodrin | Dacthal | Demeton s | Dichlofenthion | Dichlorvos | Dieldrin | Dimethoate | Dioxathion | Dyfonate (F	Other Organics		37473667.80
Sacramento River (Keswick Dam to Cottonwood Creek)	Zinc	Metals/Metalloids		1843.05
Sacramento River (Cottonwood Creek to Red Bluff)	Mercury	Metals/Metalloids	5A	1958866.09
Sacramento River (Red Bluff to Knights Landing)	PCBs (Polychlorinated biphenyls)	Other Organics	5A	34900.29
Stony Creek	Escherichia coli (E. coli)	Pathogens		3441193.88
Willow Creek (Shasta County, below Greenhorn Mine to Clear Creek)	Zinc	Metals/Metalloids	5A	255133.08
Black Butte Reservoir	Mercury	Metals/Metalloids	5A	4506.82
East Park Reservoir	Mercury	Metals/Metalloids	5A	1698.01
Eel River HU, Upper Main HA, Lake Pillsbury HSA, Lake Pillsbury	Mercury	Metals/Metalloids	5A	1973.45
Stony Gorge Reservoir	Mercury	Metals/Metalloids	5A	1410.64
Whiskeytown Lake (areas near Oak Bottom, Brandy Creek Campgrounds and Whiskeytown)	Mercury	Metals/Metalloids	5A	97.55

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Appendix D-I

Cache/Putah River System

D. Cache/Putah Rivers Watershed

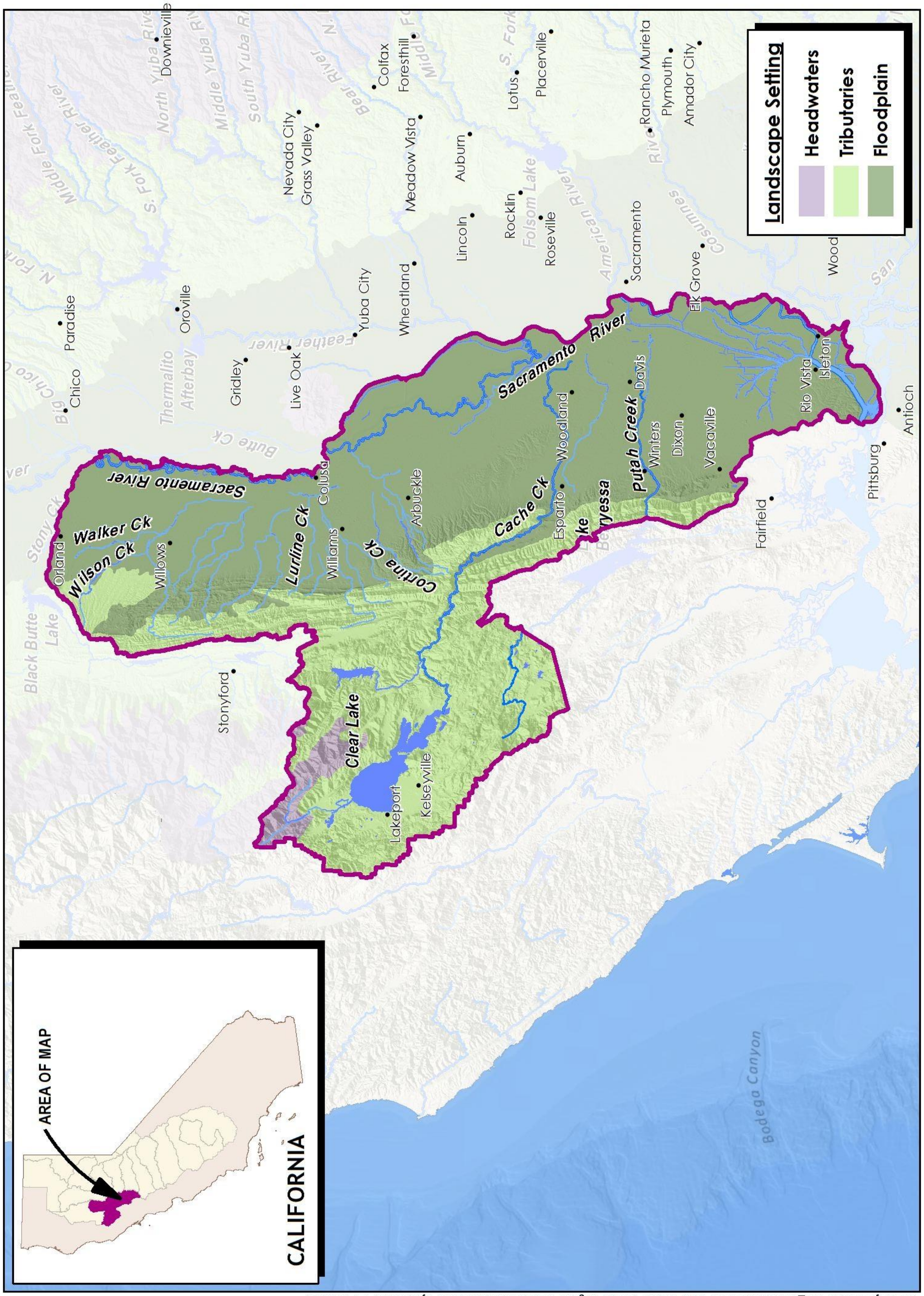
The Cache/Putah Rivers Watershed Service Area, containing a variety of unique watershed features within its boundaries, is 4,380 square miles in size (**Figure D-1**). The Sacramento River runs along the eastern portion of the system's boundary and connects with numerous creeks before reaching the very beginning of the Sacramento-San Joaquin River Delta system at the southern- most point of the Watershed Service Area boundary. Clear Lake and Lake Berryessa are major creek outlets in Cache Creek and Putah Creek, respectively. Cache Creek originates at Clear Lake, which is one of the largest natural freshwater lakes in California and features 1,400 acres of surrounding restored wetlands that were converted from agricultural properties (MCFDR, 2012). Putah Creek begins in the Mayacamas Mountains within the Coast Range and flows southeast, connecting with numerous creeks and tributaries before it merges with Butte Creek in Napa County and before emptying into Lake Berryessa. After leaving Lake Berryessa, Putah Creek continues to flow east and passes through the towns of Winters and Davis until it enters the Yolo Bypass near the Sacramento Deep Water Channel (SRWP Putah, 2013). The major cities in this watershed include Davis, Dixon, Vacaville, and Woodland. Land cover composition for this watershed is illustrated in **Appendix II.D.1.**

Land use and vegetation within the Cache Creek watershed include mixed chaparral habitat such as cottonwoods, willows, oaks, and alders within the upper stretches, and oak woodlands within the middle portion of the creek, before transitioning into agricultural lands (SRWP Cache, 2013). Vegetation within the Putah Creek watershed includes Central Valley mixed riparian woodland habitat that includes an understory of box elder, Oregon ash, and willow, as well as canopy species that include Fremont cottonwood, Valley oak, and California sycamore (SRWP Putah, 2013). Historic habitat and land use in this Service Area pre-1900s was primarily wetlands and riparian habitat surrounding the Sacramento River in the east. A buffer of grassland and some valley/foothill hardwoods were also present (Central Valley Historical Habitat Map).

1. Historic Impacts

Historic gold mining was common in this Service Area, and it is estimated that there are over 40 abandoned mines in this region (SRWP Cache, 2013). About one half of all mercury that enters the Sacramento River system originates from Cache Creek due to run off from surrounding abandoned mercury mines. Cache Creek is also a primary source of mercury used for gold mining in the Sierra (SRWP Cache, 2013). Gravel mining continued to be a focal industry within the Cache Creek watershed. Sedimentation and mining waste from these past and present mining activities create buildup within the Cache Creek system and disturb habitat and fish and wildlife species. The Cache Creek Settling Basin was developed to restrict some of this sediment from flowing through the entire system, capturing sediment and revitalizing groundwater recharge as Cache Creek runs into the Yolo Bypass and, eventually, the Sacramento River.

Putah Creek has also had to battle with the repercussions of historic mining waste and sediment buildup. With the influx of settlers to the region from the Gold Rush, timber harvesting within the forested headwaters of the Service Area became a common trade and brought on the creation of roads to access the mines and logging regions. Agriculture, which brought the construction of dams and diversions for irrigation water, flood control, and water for an increasing population, also became widespread throughout the floodplains of the Cache/Putah Rivers Watershed



GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 16 CachePutah River System131127 v4.mxd

Figure D-1
Cache/Putah Rivers Watershed

Appendix II.D.1

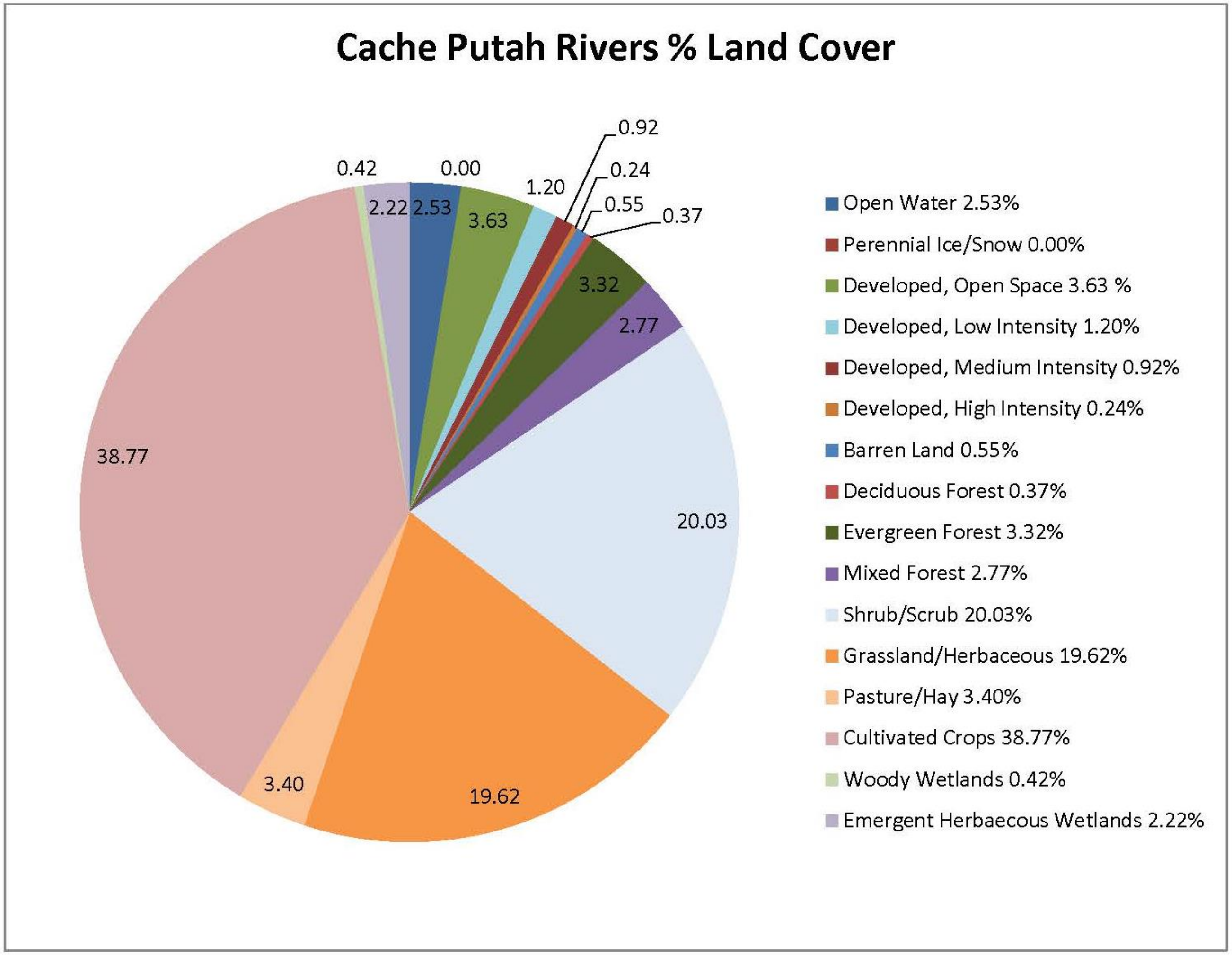


Table D-1. Historical Impacts to Cache/Putah Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Cache/Putah	Headwaters	L	L	L	L	L	L	L
	Tributaries	L	L	L	L	L	L	L
	Main Stem/Floodplain	L	L	L	H	L	L	L

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

Cache Creek and Putah Creek contain numerous water development structures that allow for water storage, flood control, hydroelectric power, and agricultural and urban water use (SRWP Cache/Putah, 2013). The major structures include the Cache Creek Dam of Clear Lake, Indian Valley Reservoir, and the Capay Diversion Dam, located along Cache Creek. The Monticello Dam of Lake Berryessa and the Putah Diversion Dam are located along Putah Creek.

There are two dams along Cache and Putah creeks. The settling basin below Cache Creek prevents salmon from entering the creek (Cannon, pers. comm.). The dam prevents Chinook salmon, Pacific lamprey, and steelhead from accessing historic spawning habitat in Putah Creek. The Putah Creek watershed is rich in wildlife, and its fishery is a major recreational attraction for the area. Although the majority of fish are introduced game species, native fish such as hitch, squawfish, rainbow trout, and Sacramento sucker are present. Ecosystem and fisheries restoration plans for the Cache/Putah Rivers WatershedService Area include projects to restore Chinook salmon and steelhead migration to the upper regions of these waterways through fish ladders and screens and to improve aquatic ecosystem health. Other projects include protecting existing natural wetlands and creating more wetland and buffer habitat in order to protect native fish and wildlife species associated with wetland and/or riverine habitat (Kennedy/Jenks, 2012). These projects are especially pertinent, as future projections show continued agricultural development and urbanization, and fire and flood will further endanger the riparian, forest, and wetland ecosystems within this Service Area (CA Dept. of Forestry Development map).

Table D-2. Current Impacts to Cache/Putah Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Cache/Putah	Headwaters	L	L	L	L	L	L	L
	Tributaries	L	L	L	L	L	M	L
	Main Stem/Floodplain	L	L	L	H	L	H	M

H= High, M= Medium, L=Low

The cumulative impact of these activities has been the dramatic degradation of the biotic attributes of the watershed due to both the direct loss of organic matter and fisheries habitats as well as the synergistic results of reduced buffer and landscape, physical structure and hydrologic attributes (**Figure D-2**). Combined, this has impacted biotic functions at the tributaries and floodplains of the Service Area.

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the Cache/Putah Rivers Watershed Service Area. However, Native American territories within the region were said to include hundreds of acres of rich riparian forested environments, grasslands, wetlands, chaparral, and oak woodland (Barbour & Whitworth 2001). Current wetland types and extents for this Service Area are listed in **Appendix II.D.2**.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.D.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

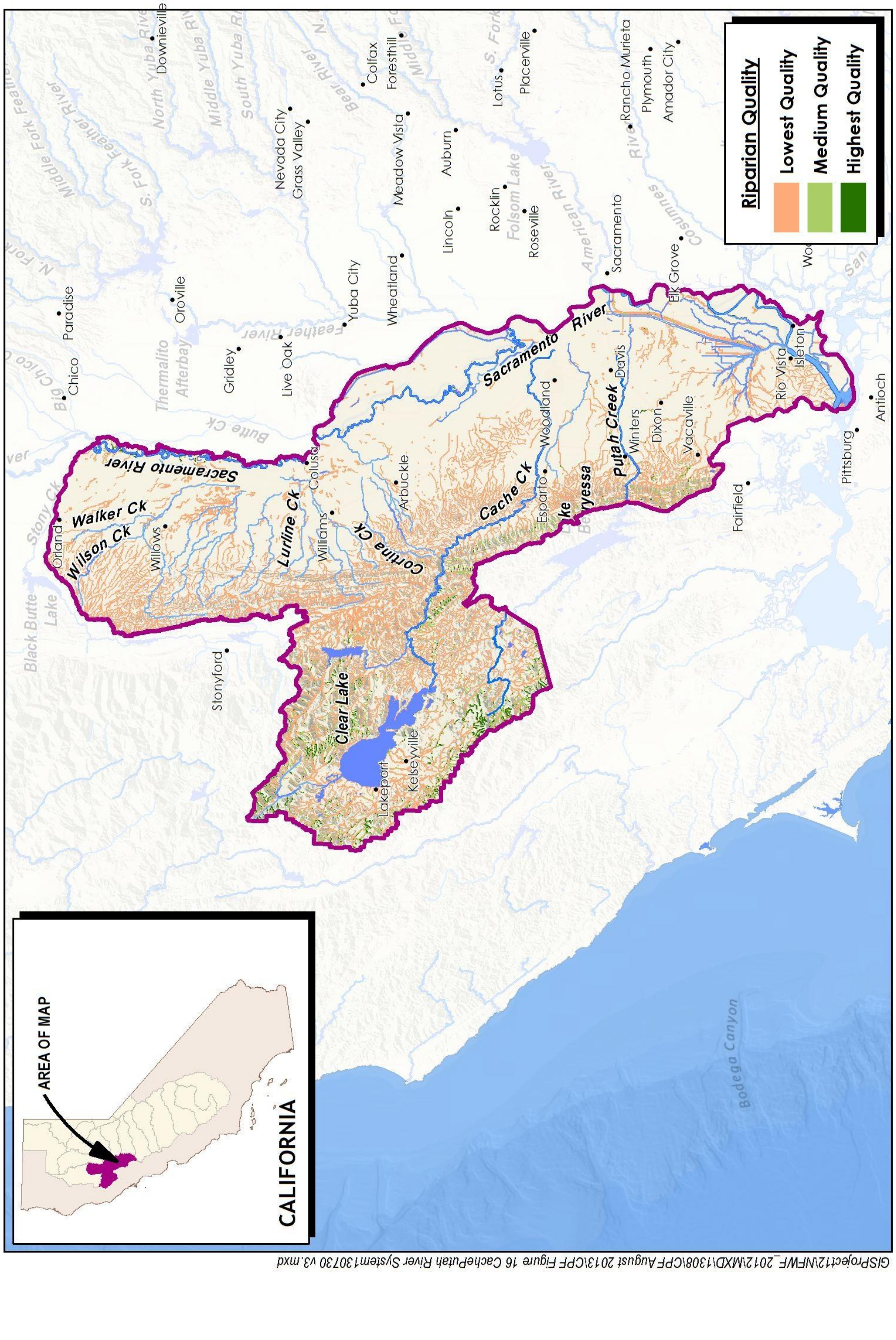


Figure D-2
Cache/Putah Rivers Watershed Riparian Quality Map

GISProject12\NFWF_2012\MXD\1308\CPF August 2013\CPF Figure 16 CachePutah River System130730 v3.mxd

Appendix II.D.2

Cache/Putah Rivers Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	11265.96
LakePond	5646.69
Playa	58.23
Reservoir	359.18
SwampMarsh	1602.51
Estuarine and Marine Deepwater	3482.58
Estuarine and Marine Wetland	2451.5
Freshwater Emergent Wetland	57513.78
Freshwater Forested/Shrub Wetland	12042.27
Freshwater Pond	4074.78
Lake	43286.61
Other	112454.82
Riverine	30929.13

Appendix II.D.3

Cache/Putah Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Bear Creek (Colusa County)	Mercury	Metals/Metalloids	5B	957303.81
Butte Slough	Low Dissolved Oxygen	Nutrients	5A	644.35
Cache Creek, Lower (Clear Lake Dam to Cache Creek Settling Basin near Yolo Bypass)	Fecal Coliform	Pathogens		6848682.17
Cache Creek, North Fork (below Indian Valley Reservoir, Lake County)	Mercury	Metals/Metalloids	5B	903314.48
Colusa Basin Drain	pH (low)	Miscellaneous		4839375.66
Davis Creek (downstream from Davis Creek Reservoir, Yolo County)	Mercury	Metals/Metalloids	5A	398231.26
Davis Creek (upstream from Davis Creek Reservoir, Yolo County)	Mercury	Metals/Metalloids	5A	306267.37
Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	Unknown Toxicity	Toxicity	5A	150.05
Freshwater Creek (Little Valley to Salt Creek, Colusa County)	Propanil (DCPA mono- and di-acid degrad)	Pesticides		1963737.06
Gordon Slough (from headwaters and Goodnow Slough to Adams Canal, Yolo County)	Oxygen, Dissolved	Nutrients	5A	483853.85
Harley Gulch	Mercury	Metals/Metalloids	5B	379795.70
Knights Landing Ridge Cut (Yolo County)	Boron	Metals/Metalloids	5A	891242.06
McGaugh Slough (Lake County)	Escherichia coli (E. coli)	Pathogens		374110.36
Putah Creek (Solano Lake to Putah Creek Sinks; partly in Delta Waterways, northwestern portion)	Chlorpyrifos	Pesticides		1705455.48
Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	Arsenic | Cadmium | Chromium (total) | Copper | Lead | Mercury | Nickel | Selenium | Silver | Zinc	Metals/Metalloids		21533.17
Russian River HU, Upper Russian River HA, Coyote Valley HSA	Pesticides	Pesticides		74391.98
Russian River HU, Upper Russian River HA, Ukiah HSA	pH	Miscellaneous		111202.01
Sacramento River (Red Bluff to Knights Landing)	PCBs (Polychlorinated biphenyls)	Other Organics	5A	6353997.53
Sacramento River (Knights Landing to the Delta)	Chlordane	Pesticides	5A	680296.84

Cache/Putah Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Sacramento Slough	Diazinon	Pesticides		105446.94
Sand Creek (Colusa County)	pH (low)	Miscellaneous		1260029.77
Spring Creek (Colusa County)	Sediment Toxicity	Toxicity	5A	842328.27
Stone Corral Creek	Chlorpyrifos	Pesticides		1418319.47
Sulphur Creek (Colusa County)	Mercury	Metals/Metalloids	5A	875809.51
Sutter Bypass	Mercury	Metals/Metalloids	5A	12918.21
Sycamore Slough (Yolo County)	pH (high)	Miscellaneous		1059310.72
Toe Drain (in Delta Waterways, northwestern portion)	Unknown Toxicity	Toxicity		18845.49
Tule Canal (Yolo County)	Dichlorvos	Pesticides		624272.89
Ulatis Creek (Solano County)	Sediment Toxicity	Toxicity		1069993.59
Willow Slough (Yolo County)	Unknown Toxicity	Toxicity		650208.11
Willow Slough Bypass (Yolo County)	Fecal Coliform	Pathogens	5A	465906.43
Winters Canal (Yolo County)	Diazinon	Pesticides	5A	923548.60
Clear Lake	Nutrients	Nutrients	5B	40070.34
Davis Creek Reservoir	Mercury	Metals/Metalloids	5A	163.30
Delta Waterways (central portion)	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	5A	127.22
Delta Waterways (northern portion)	Chlordane	Pesticides	5A	6506.53
Delta Waterways (northwestern portion)	Group A Pesticides	Pesticides	5A	2587.40
Delta Waterways (western portion)	Diazinon	Pesticides	5B	6696.92
Indian Valley Reservoir (Lake County)	Mercury	Metals/Metalloids	5A	3469.41
Sacramento San Joaquin Delta	Selenium	Metals/Metalloids	5A	157.46
Solano, Lake	Mercury	Metals/Metalloids	5A	15.49

4. Ecological Objectives Identified within Watershed Plans

- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Improve and/or expand riparian buffers and salmonid habitats through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains.
- Work to improve natural channel morphology.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Improve in-stream habitat diversity and function, including wetlands/riparian restoration and gravel augmentation.
- Improving fish passage systems throughout the Service Area.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pathogens, Metal/Metalloids, Nutrients, Other Organics, Toxicity and Pesticides (**Appendix II.D.3.)**.
- Work to improve watershed functions within the coastal range and interior valleys, including Capay Valley.
- Work to improve water quality within the Putah and Cache Creek Watersheds.
- Plant and/or manage adjacent upland buffers to protect riparian corridors against catastrophic fire in the upper coastal range watersheds above Clear Lake, and Indian Valley.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure D-2**.

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Appendix E-I

Northeast Sacramento River System

E. Northeast Sacramento Watershed

The Northeast Sacramento Watershed Service Area contains a major section of the Sacramento River that features numerous creeks and several reservoirs within its borders (**Figure E-1**). Keswick Dam and Reservoir and Spring Creek Dam and Reservoir are the primary water developments in the northern portions of the Service Area. The Keswick Dam is a major feature in the Northeast Sacramento Watershed that provides water for irrigation and power generation for municipal and industrial needs. The cities of Redding and Red Bluff are located along the headwaters of the Sacramento River within the Service Areas' boundaries and are considered the main urban centers of this watershed. The Northeast Sacramento Watershed Service Area is 3,343 square miles. Vegetation in this region is comprised of white fir and mixed conifer forest in the upper portion of the Service Area, with Valley oak forest, willow shrub forest, perennial grassland, and ephemeral wetland, as well as urban/agriculture areas, comprising the main land cover in the tributary and floodplain regions. The Northeast Sacramento Watershed is an important component of the native salmonid life cycle, as many of its tributaries were historically used as migration paths and spawning grounds for the spring and falls runs of Chinook salmon and the Central Valley Steelhead. Restoration projects in the Battle Creek, Cow Creek, and the Upper Sacramento River watersheds are important to the recovery efforts of native salmon populations (NOAA, 2009). Land cover composition for this watershed is illustrated in **Appendix II.E.1.**

1. Historic Impacts

The Sacramento River once was bordered by thousands of acres of riparian forest and Valley oak woodlands along higher river terraces and seasonal marshlands in the lower-lying areas (SRWP Valley, 2013). Additionally the Sacramento River bolstered abundant populations of native salmonids (NOAA, 2009). However, in the floodplain region, the landscape changed drastically when agricultural conversion and urbanization in the form of dams, levees, and channelization became widespread in the mid-1800s. These water development systems continue to be used to this day. Past and current land use activities that surrounded the many waterways in the Northeast Sacramento Watershed Service Area included timber harvest, road use, agriculture, and livestock grazing (NOAA, 2009). Grazing occurred in the upper reaches of the region, and roads that were constructed to access historic mining, agriculture, and timber harvesting sites are often still used.

Additional historic impacts to the Service Area include the Iron Mountain Mine, which operated from the 1860s until 1963. Due to discharges into Spring Creek, Boulder Creek, and Slickrock Creek and their tributaries, the mine was named a Superfund Site in 1983 in light of its water quality contamination (EPA, 2006). These discharges augmented other historic mining and timber harvesting impacts, which were prominent within the mountainous headwaters and surrounding tributary lands in the Northeast Sacramento Watershed Service Area in the mid-1900s (US Forest Service Timber Map; Mining Activity Map).

Historically, native populations of spring and falls runs of Chinook salmon, as well as the Central Valley Steelhead, were abundant in many of the tributaries in this Service Area. Dams and other water diversions, channelization, agricultural and grazing runoff, predation, hatchery competition, and entrainment are just a few of the issues that have contributed to the declining

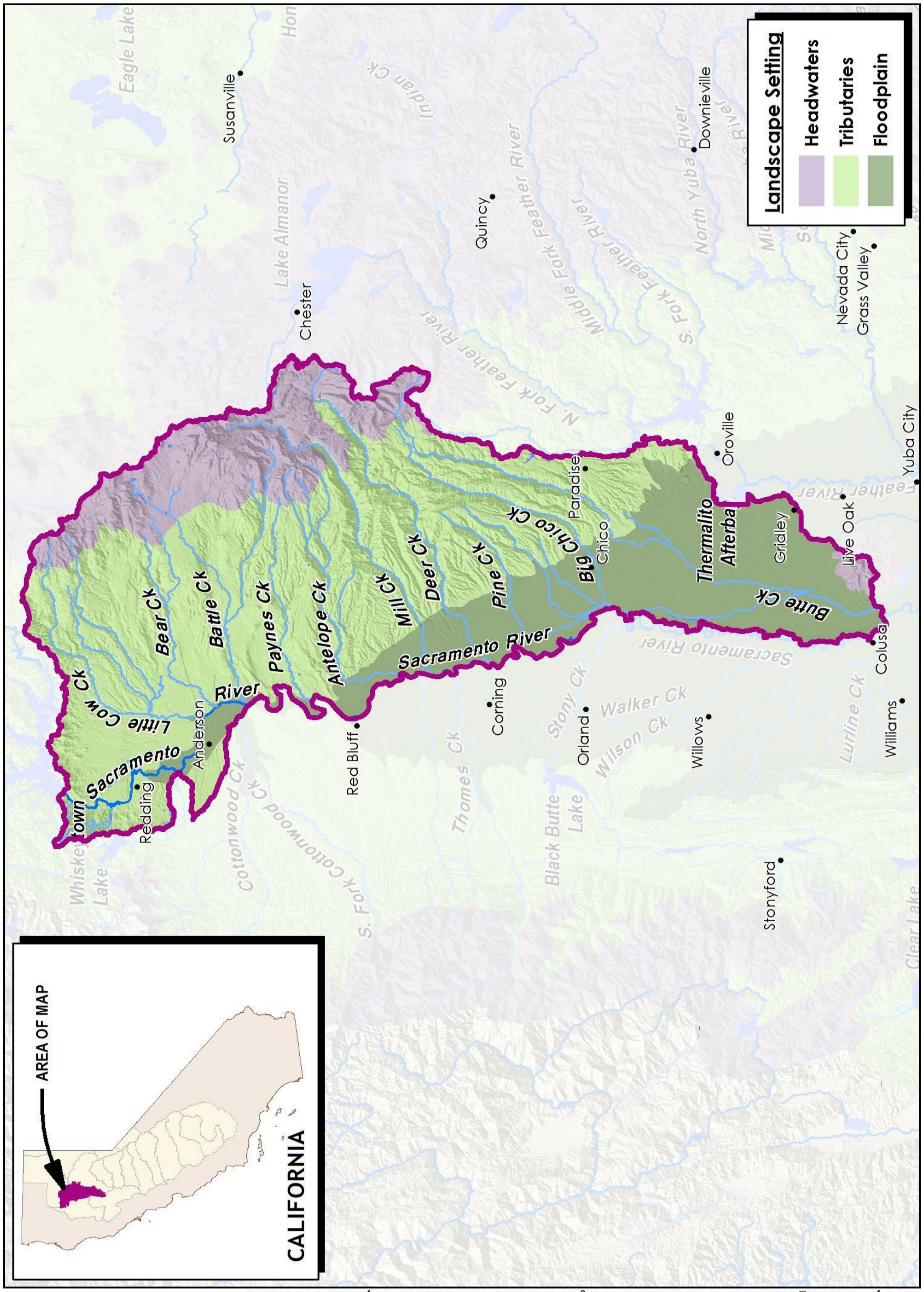

Figure E-1
Northeast Sacramento River Watershed

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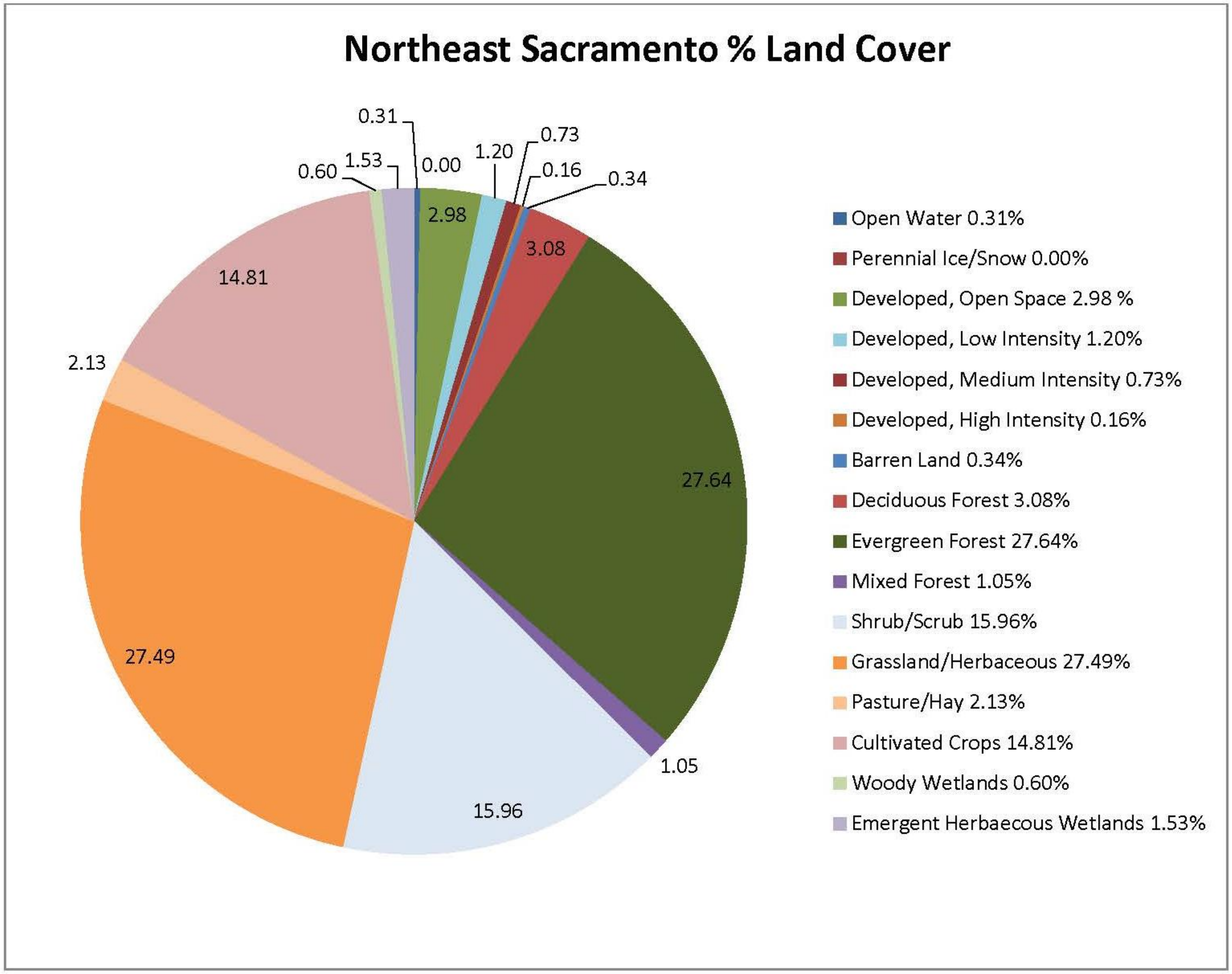
Appendix II.E.1



Creek, which, prior to the 1850s, may have been the most important tributary along the Sacramento River for salmon production (NOAA, 2009). Cow Creek is also an important salmonid tributary, and historically was settled because of its agriculture potential. This area also experienced gold and copper mining activity in its northern reaches, which helped further fuel the spread of rangeland, agriculture, and hydropower development (NOAA, 2009).

Table E-1. Historical Impacts to Northeast Sacramento Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Redding	Headwaters	L	H	L	L	L	L	L
	Tributaries	M	L	M	L	L	M	L
	Main Stem/Floodplain	L	L	L	M	M	M	M

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

Federal agencies play a prominent role in resource management in the Service Area. The Federal Bureau of Reclamation manages the mining drainage runoff from the Iron Mountain Mine through controlled dilution procedures. Proper treatment of the runoff is necessary so that this stretch of the Sacramento River can provide prime habitat for salmonid spawning grounds. The upper reaches of the Sacramento River once provided ideal spawning habitat for Chinook salmon and steelhead trout before dams and diversions for agriculture were constructed (USFWS, 2011). The upper Sacramento River is currently the only existing habitat for winter-run Chinook salmon in the Sacramento River watershed (NOAA, 2009). Currently, Coleman National Fish Hatchery on Battle Creek provides artificial spawning grounds for hundreds of thousands of salmonids that are released annually into local watersheds (USFWS, 2011). However, the high production of hatchery fish has led to concerns of hybridization of hatchery and natural-run salmon (NOAA, 2009). The Central Valley Steelhead has also been impacted by the water diversions in this watershed, and their decline is thought to be consistent with both runs of Chinook salmon (NOAA, 2009). While much of the water in the Northeast Sacramento Watershed Service Area is used for irrigation purposes, several creeks still provide quality habitat for native fish species, including salmonids, Pacific lamprey, and Sacramento pikeminnow. However, these areas continue to be threatened by agriculture and extensive recreation, resulting in dramatic fluctuations in native species populations, jeopardizing these resources' continued use as native fisheries (SRWP Big Chico, 2012). Urban development in Chico also causes debris, sediment, and chemical pollution to enter the creek due to the close proximity of these activities to the river channel. Ecosystem and fisheries restoration plans for the Northeast Sacramento Watershed and its tributaries include improving aquatic ecosystem health, maintaining suitable conditions for salmonids, facilitating fish movement with fish screens and ladders, increasing spawning gravel, and improving access to fish spawning habitat (NCWA, 2006). In addition, restoration projects such as the Battle Creek Salmon and Steelhead Restoration Project headed up by the National

Marine Fisheries Service intends to address further improvements to increase stream flows and develop agreements to control flows and hatchery releases (NOAA, 2009).

The Bureau of Land Management, meanwhile, manages sections of land between the Battle Creek and Paynes Creek tributaries, which feature recreational trails as well as wetland habitat (BLM, 2013). These wetlands serve as habitat for migrating birds along the Pacific Flyway and provide a buffer for riparian zones. The Sacramento Valley IRWMP, which corresponds to the Northeast Sacramento Watershed Service Area, aims to protect these and other existing wetlands, create more wetland and buffer habitat, and protect agricultural ricelands, which have become a surrogate for natural wetland habitats for giant garter snake and migrating waterfowl (NCWA, 2006). Projects that focus on non-agricultural and/or self-sustaining wetlands are important for the protection of species and wetland resources, as future projections show continued agricultural development and urbanization will further endanger the riparian and wetland ecosystems within this Service Area (CA Dept. of Forestry Map).

Table E-2. Current Impacts to Northeast Sacramento Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Redding	Headwaters	L	H	L	L	L	L	L
	Tributaries	L	M	M	M	M	M	L
	Main Stem/Floodplain	L	L	M	M	H	M	M

H= High, M= Medium, L=Low

The cumulative impact of these activities has been the dramatic degradation of the ecological functions of the watersheds contained in this Service Area, due to both the direct loss of organic matter and fisheries habitats as well as the synergistic results of reduced buffer and landscape, physical structure, and hydrologic functions. Combined, this has impacted the ecological functions at all levels of the Service Area (**Figure E-2**).

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource functions that have been impacted over the past 250 years cannot be precisely determined within the Northeast Sacramento Watershed Service Area. However, the Sacramento River throughout the Central Valley was historically bordered by over 500,000 acres of riparian and wetland habitat. Today only 5% of the original wetland buffer habitat along the Sacramento River corridors remains (SRWP Valley, 2013). Current wetland types and extents for this
Service Area are listed in **Appendix II.E.2.**

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

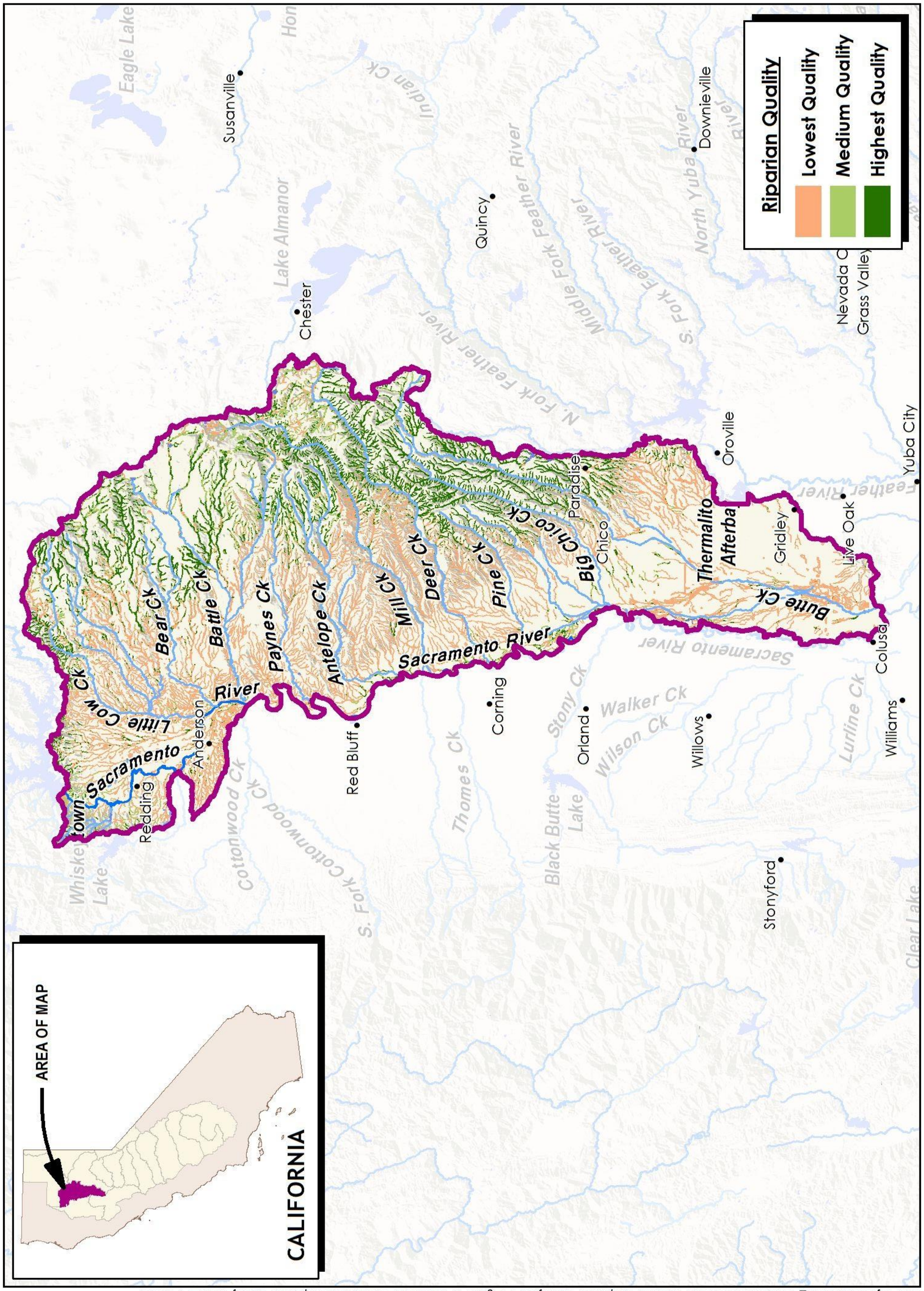


Figure E-2
Northeast Sacramento River Watershed Riparian Quality Map

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Appendix II.E.2

Northeast Sacramento Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	7178.15
Ice Mass	26.86
LakePond	865.6
Playa	5.12
Reservoir	48.34
SwampMarsh	848.82
Freshwater Emergent Wetland	102830.91
Freshwater Forested/Shrub Wetland	19530.9
Freshwater Pond	2543.19
Lake	1969.63
Other	74.44
Riverine	11132.63

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.E.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

*4. **Ecological Objectives Identified within Watershed Plans***

- Work to improve water quality within possible restoration sites.
- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Plant and/or manage adjacent upland buffers to protect riparian corridors against catastrophic fire.

Improve and or expand riparian buffers and salmonid habitats through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pathogens, Metal/Metalloids, Nutrients and Other Organics (**Appendix II.E.3.)**.
- Restore wetland meadows within the Mill Creek Watershed.
- Restore riparian areas along the lower Antelope watershed and Big Chico Creek.
- Plant and/or manage adjacent upland buffers to protect riparian corridors against catastrophic fire within Deer, Mill, and Butte creeks.
- Reduce road and stream development sediment load within headwaters of Mill Creek, Deer Creek Meadows, and Gurnsey Creek.
- Improve fish passage systems within the North and South forks of Battle Creek and Mill Creek and throughout the Service Area.
- Improve in-stream habitat diversity and function, including wetlands/riparian restoration and gravel augmentation within Battle Creek and Cow Creek, as well as in the Upper Sacramento River.

Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure E-2.**

Appendix II.E.3

Northeast Sacramento Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Anderson Creek (Shasta County)	Sediment Toxicity	Toxicity		1039349.44
Antelope Creek (Tehama County)	Oxygen, Dissolved	Nutrients		1793060.52
Big Chico Creek (Butte and Tehama Counties)	Diazinon	Pesticides		2867067.92
Butte Creek (Butte County)	Lead	Metals/Metalloids		6149686.43
Butte Slough	Low Dissolved Oxygen	Nutrients	5A	1258.16
Cherokee Canal	Diazinon	Pesticides		1211769.19
China Slough (from Leininger Road to Sacramento River, Tehama County)	Sediment Toxicity	Toxicity		343049.75
Clear Creek (below Whiskeytown Lake, Shasta County)	Mercury	Metals/Metalloids	5A	47.29
Clover Creek	Fecal Coliform	Pathogens	5A	706846.97
Comanche Creek (from Little Chico Creek to Angel Slough, Butte and Glenn Counties)	Propanil (DCPA mono- and di-acid degrad)	Pesticides		940829.42
Dry Creek (tributary to Clear Creek, Butte County)	Mercury	Metals/Metalloids		1149786.72
Hamilton Slough (from south of Thermalito Afterbay to south of Biggs, Butte County)	Sediment Toxicity	Toxicity		253888.03

Appendix II.E.3

Northeast Sacramento Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Anderson Creek (Shasta County)	Sediment Toxicity	Toxicity		1039349.44
Antelope Creek (Tehama County)	Oxygen, Dissolved	Nutrients		1793060.52
Big Chico Creek (Butte and Tehama Counties)	Diazinon	Pesticides		2867067.92
Butte Creek (Butte County)	Lead	Metals/Metalloids		6149686.43
Butte Slough	Low Dissolved Oxygen	Nutrients	5A	1258.16
Cherokee Canal	Diazinon	Pesticides		1211769.19
China Slough (from Leininger Road to Sacramento River, Tehama County)	Sediment Toxicity	Toxicity		343049.75
Clear Creek (below Whiskeytown Lake, Shasta County)	Mercury	Metals/Metalloids	5A	47.29
Clover Creek	Fecal Coliform	Pathogens	5A	706846.97
Comanche Creek (from Little Chico Creek to Angel Slough, Butte and Glenn Counties)	Propanil (DCPA mono- and di-acid degrad)	Pesticides		940829.42
Dry Creek (tributary to Clear Creek, Butte County)	Mercury	Metals/Metalloids		1149786.72
Hamilton Slough (from south of Thermalito Afterbay to south of Biggs, Butte County)	Sediment Toxicity	Toxicity		253888.03

Northeast Sacramento Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Lindo Channel	Diazinon	Pesticides		365962.54
Little Chico Creek (Butte County)	Mercury	Metals/Metalloids		1748499.11
Little Cow Creek (downstream from Afterthought Mine)	Cadmium	Metals/Metalloids	5A	70727.51
Main Drainage Canal	pH	Miscellaneous		583120.08
Mill Creek (Tehama County)	Total Dissolved Solids	Salinity		3489942.43
Mud Creek (Butte County)	Unknown Toxicity	Toxicity	5A	928418.15
Oak Run Creek	Fecal Coliform	Pathogens	5A	357837.23
Pine Creek (Butte County)	Escherichia coli (E. coli)	Pathogens		725210.66
Sacramento River (Keswick Dam to Cottonwood Creek)	Zinc	Metals/Metalloids		1866680.02
Sacramento River (Cottonwood Creek to Red Bluff)	Mercury	Metals/Metalloids	5A	30433.12
Sacramento River (Red Bluff to Knights Landing)	PCBs (Polychlorinated biphenyls)	Other Organics	5A	3503218.11
South Cow Creek	Fecal Coliform	Pathogens	5A	498407.63
Spring Creek, Lower (Iron Mountain Mine to Keswick Reservoir)	Escherichia coli (E. coli)	Pathogens		165516.46
Keswick Reservoir (portion downstream from Spring Creek)	Copper	Metals/Metalloids	5A	134.95
Shasta Lake	Mercury	Metals/Metalloids	5A	1.82

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Appendix F-I

Feather River System

F. Feather River Watershed

The Feather River Service Area is approximately 4,257 square miles and contains several small urban communities, including Quincy to the north and Yuba City in the south (**Figure F-1**). The watershed is unique in that it surpasses the crest of the Sierra Nevada. While the eastern portion of the watershed is defined by an alluvial meadow system forming the headwaters of the Feather River, western slope tributaries consist of steep V-shaped canyons. Governmental agencies play a significant role in the function and management of the watershed, as nearly 80% of headwater lands are under U.S. Forest Service ownership and the State Water Project (SWP) controls, including Lake Oroville, which is the second-largest man-made lake in the State. Utility companies are also prominent landowners, with Pacific Gas and Electric (PG&E) owning and operating Lake Almanor, another major reservoir within the Service Area, and several extensive hydroelectric facilities along Rock Creek and in the upper Feather River.

The Feather River itself is a highly important waterway in northern California, as it forms the main tributary for the Sacramento River and is intricately connected to other major rivers within the Central Valley. The river is comprised of four major tributaries: the South Fork, Middle Fork, North Fork, and East Branch of the Feather River, which come to a confluence with the Yuba and Bear Rivers in the lower river and terminates in Lake Oroville. Land cover composition for this watershed is illustrated in **Appendix II.F.1.**

1. Historic Impacts

For the last 140 years, the Feather River watershed has been impacted by industry and the associated human populations that have developed in the area. Historic mining, grazing, timber harvest, wildfires, floods, and railroad/road construction have all had an impact on this riverine system (FRCRM, 2012). Indeed, over 60% of the watershed has been degraded due to these past activities, leading to an increase in erosion, reduced water quality, diminished vegetation and soil productivity, and degraded terrestrial and aquatic habitats. These activities contributed to the EPA listing the Feather River below Oroville Dam as an impaired waterway in 2002 due to pollution from copper, mercury, and pesticides (EPA, 2012). The Feather River was subsequently taken off the impaired waterway list in 2010 due to improvements in water quality management.

Table F-1. Historical Impacts to Feather River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Feather	Headwaters	H	H	M	L	L	L	L
	Tributaries	L	H	H	L	M	M	M
	Main Stem/Floodplain	L	L	L	H	L	M	M

H= High, M= Medium, L=Low

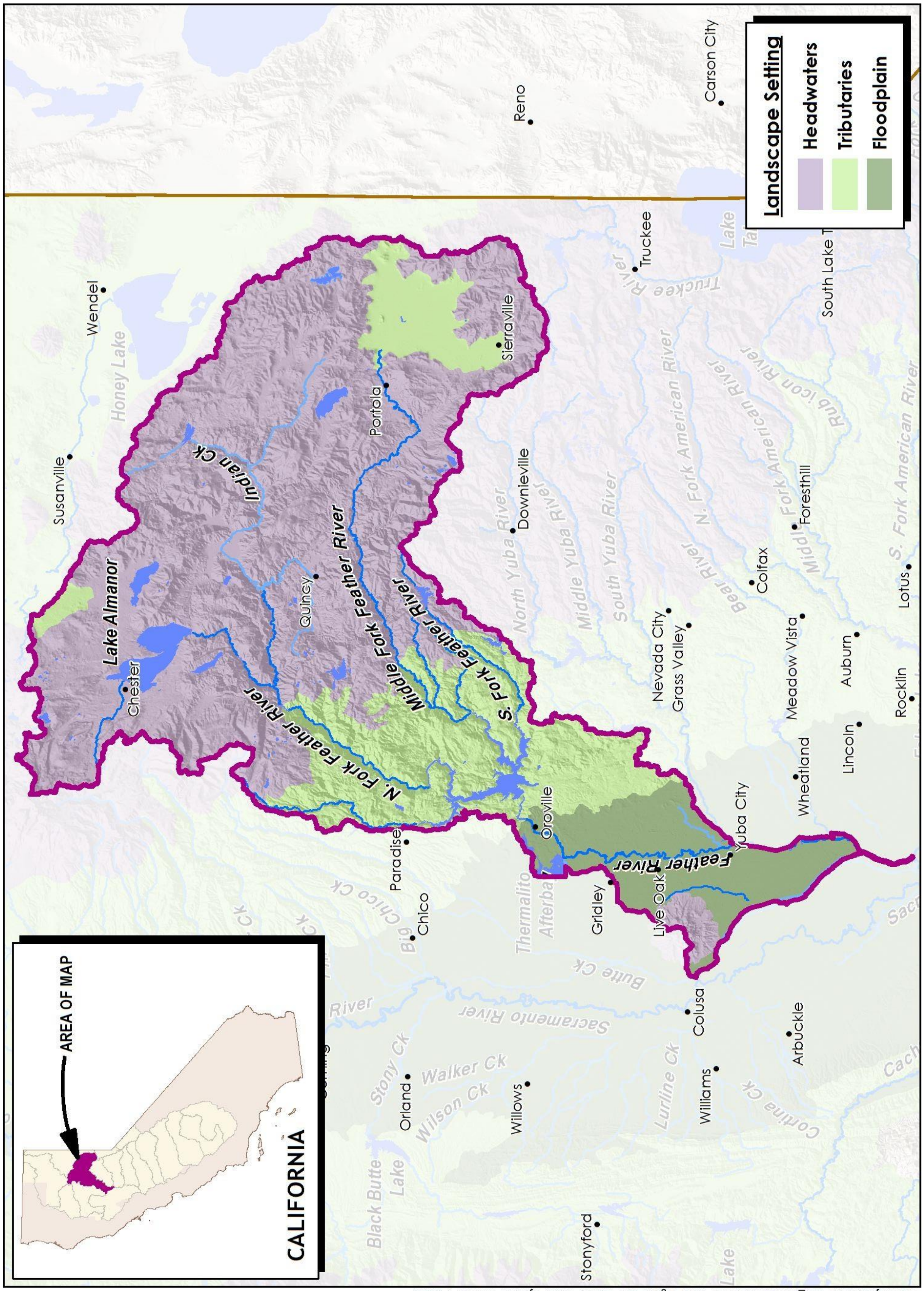
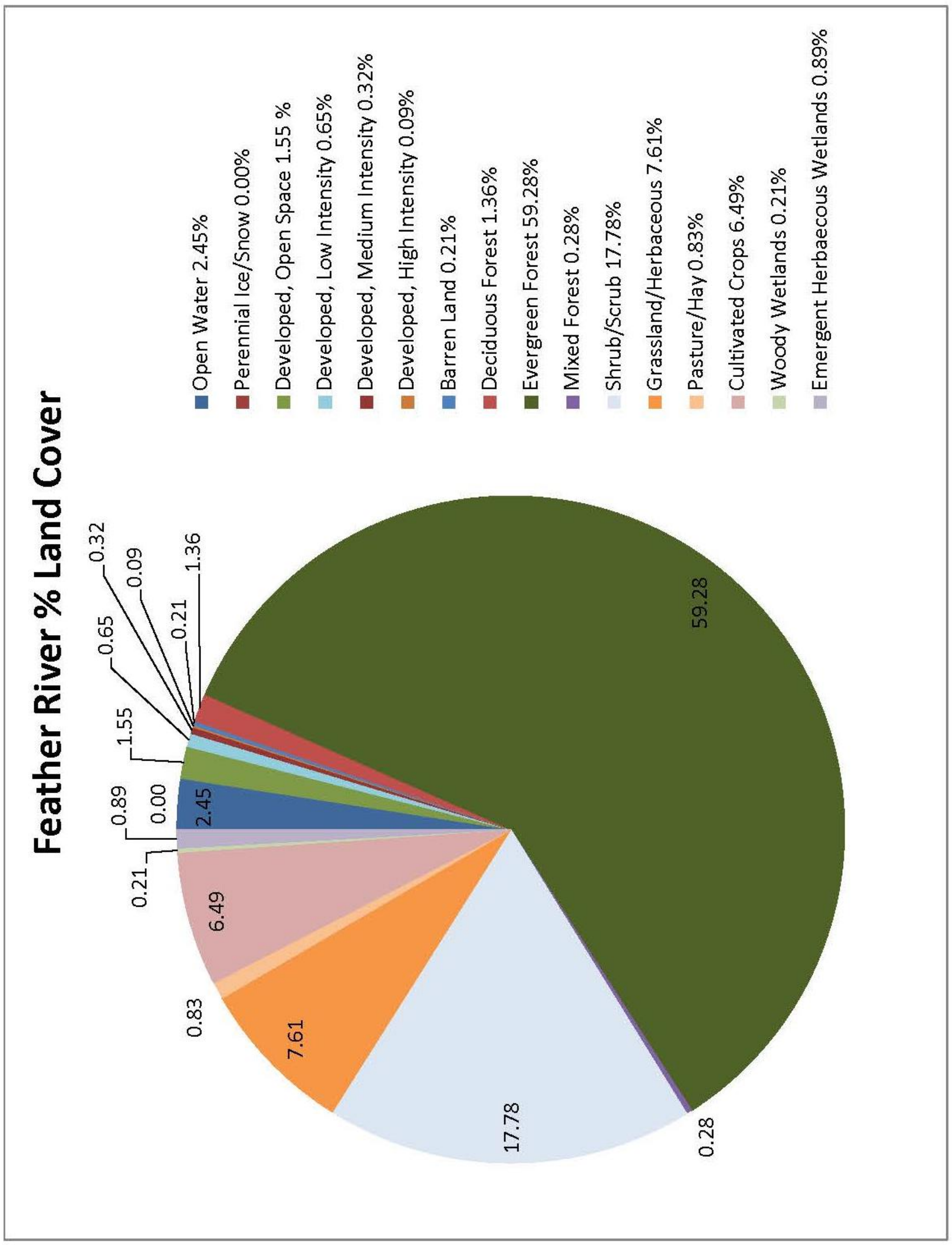


Figure F-1
Feather River Watershed

Appendix II.F.1



2. Current Impacts and Attribute Status

The Feather River Watershed is highly impacted by water development, as it is the major source of water for the SWP, providing water for agriculture and power throughout the State (FRCRM, 2012). Oroville Dam, and its associated infrastructure, also serves as flood control for nearby farms and urban areas alike through a system of canals and levees. This system of dams, forebays, and afterbays make up 13 major impoundments within the tributary and floodplain portions of the watershed, and have greatly impacted native fisheries throughout the Service Area, eliminating spawning habitats and impairing fish movement. While there are proposals to reintroduce salmonids to the Upper Feather River, no actions have yet been taken (IRWMP, 2005). The North Fork of the Feather River is in relatively good condition; however, restoration is needed for the valley floodplains and riparian woodland areas (Cannon, pers. comm.).

Table F-2. Current Impacts to Feather River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Feather	Headwaters	H	M	M	L	L	L	L
	Tributaries	L	L	H	L	M-L	M	M
	Main Stem/Floodplain	L	L	M	H	M-L	M	M

H= High, M= Medium, L=Low

Agricultural activities also continue to impact the Central valley, foothills, and mountain watershed, including wetlands and adjoining uplands in floodplain and headwater regions. In lower elevations, irrigation canals and high-intensity crops have resulted in a loss of riparian habitats, while heavy grazing in headwater areas has contributed to the loss of riparian habitats and large mountain meadow systems on the upper, middle, and north forks of the river (**Figure F-2**). This has resulted in large amounts of sediment entering regional waterways. This is especially true on the East Branch of the North Fork Feather River (EBNFFR), where 1.1 million tons of sediment is deposited at Rock Creek Dam annually, primarily due to extensive riverine head cuts (IRWMP, 2005). Thus, agricultural activities at various levels of the Service Area have significantly impacted the buffer and landscape as well as hydrologic attributes of the watershed.

The amount of water-borne materials, particularly sediments as bed and suspended loads within regional waterways, is further augmented by the erosion of road and historic railroad beds (Ecosystem Sciences, 2004). Many of these roads and associated stream crossings are the result of historic and current logging activities (State Forestry THP map). Water is the key limiting factor for many of the streams above Oroville Dam. The development of these access routes has disrupted the hydrologic regimes for these streams at the headwater and tributary elevations. Hydrologic attributes at these same elevations have also been affected by reduced water movement due to the management of the watershed’s extensive water development system.

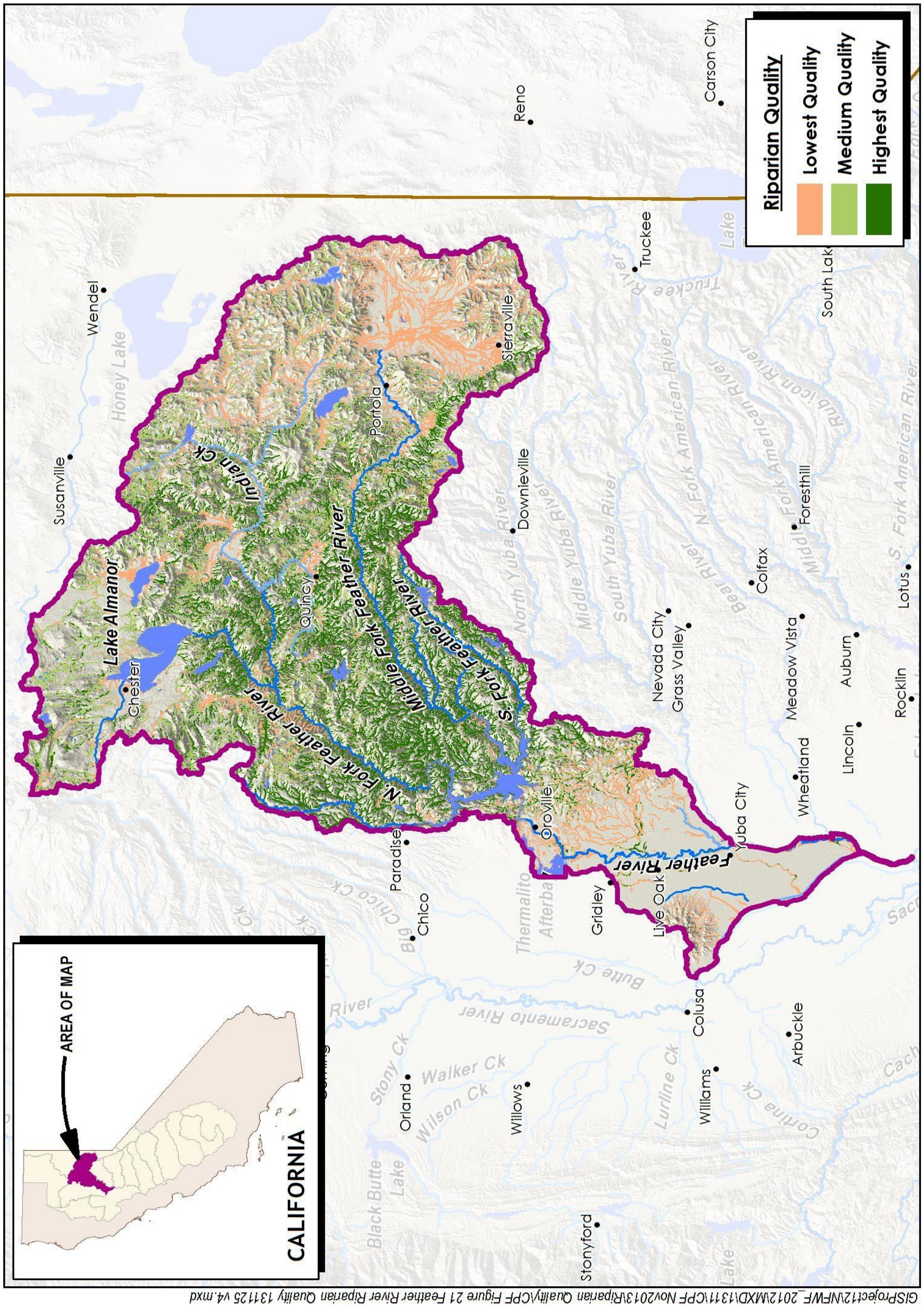


Figure F-2
Feather River Watershed Riparian Quality Map

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Urban development is also anticipated to increase in the region, especially at floodplain and tributary elevations (CA Dept. of Forestry map). This growth will likely further reduce floodplain and riparian habitats in the Lake Oroville/Yuba City region, as well as in the mountain meadows surrounding Lake Almanor (Sierra Nevada Forest Plan Amended EIS map). This will likely reduce physical attributes within the watershed through the further channelization and landscaping of waterways to protect against flooding, especially as levee construction and maintenance regulations are strengthened at the State and Federal levels.

The cumulative impact of the above activities has been the dramatic degradation of the biotic attributes of the watershed, due to both to the direct loss of organic matter and fisheries habitats, as well as the synergistic results of reduced buffer and landscape, physical structure, and hydrologic attributes. Furthermore a history of mining, logging, road building, flooding, hydroelectric and water storage development, erosion, and fire have impacted biotic functions at all levels of the Service Area (Cannon, pers. comm.).

Because of the current absence of pre-settlement data, the precise acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be determined. However, it is assumed to be at a high level, especially in the floodplain and tributary portions of the watershed, due to the large amount of water and agriculture development in these areas. Current wetland types and extents for this Service Area are listed in Appendix II.F.2.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.F.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Work to improve water quality and sedimentation within possible restoration sites.
- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Work to improve riverine and floodplain geomorphology.

- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Plant and/or manage adjacent upland buffers to protect riparian corridors against catastrophic fire.
- Improve in-stream habitat diversity and function, including wetlands/riparian restoration and gravel augmentation.

Assess fish habitat restoration above fish barriers though restoration of riparian areas and physical structure.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pesticides, Metal/Metalloids, Toxicity and Nutrients (**Appendix II.F.3.)**.
- Work to improve natural channel morphology in the lower Feather River floodplain, including Sutter Bypass.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure F-2**, Riparian Quality Map (FRAP, 2008).

Additional prioritization for applicable geographic actions will be considered during the ILF proposal stage.

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Appendix II.F.2

Feather River Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	18370.19
LakePond	2530.96
Playa	2
Reservoir	44.94
SwampMarsh	850.16
Freshwater Emergent Wetland	71434.44
Freshwater Forested/Shrub Wetland	18523.56
Freshwater Pond	2217.98
Lake	61840.05
Other	38.09
Riverine	7701.9

Appendix II.F.3

Feather River Watershed				
Water Body Name	Pollutant Category	Pollutant Type	TMDL Status	Linear Feet Impacted
Butt Creek (below Keefer Ranch to Lake Almanor)	Boron	Metals/Metalloids		279245.81
Butte Slough	Low Dissolved Oxygen	Nutrients	5A	656076.61
Concow Creek (tributary to West Branch Feather River, Butte County)	Unknown Toxicity	Toxicity	5A	611538.39
Dolly Creek	Zinc	Metals/Metalloids	5A	93117.82
Fall River, tributary to Feather River, Middle Fork (Butte and Plumas Counties)	Fecal Coliform	Pathogens		1410374.50
Feather River, East Branch North Fork (Plumas County)	Selenium	Metals/Metalloids		1155802.16
Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	Unknown Toxicity	Toxicity	5A	4313197.75
Feather River, Middle Fork (Sierra Valley to Lake Oroville, Butte and Plumas Counties)	Unknown Toxicity	Toxicity	5A	5008918.09
Feather River, North Fork (below Lake Almanor)	Unknown Toxicity	Toxicity	5A	3431253.12
Feather River, South Fork (from Little Grass Valley Reservoir to Lake Oroville, Butte and Plumas Counties)	Unknown Toxicity	Toxicity	5A	2212717.23
Feather River, West Branch (from Griffin Gulch to Lake Oroville)	Unknown Toxicity	Toxicity	5A	2412143.15
Flea Valley Creek	Temperature, water	Miscellaneous		179217.19
Gilsizer Slough (from Yuba City to downstream of Township Road, Sutter County)	Oxyfluorfen	Pesticides	5A	719710.49
Glen Creek (from Kelly Ridge to Glen Pond, Butte County)	Fecal Coliform	Pathogens		308882.09
Goodrich Creek (Lassen County)	Boron	Metals/Metalloids		969864.07
Hamilton Slough (from south of Thermalito Afterbay to south of Biggs, Butte County)	Sediment Toxicity	Toxicity		244678.56
Honcut Creek (Butte and Yuba Counties)	Copper	Metals/Metalloids		631596.76
Indian Creek (from Antelope Lake to East Branch of North Fork Feather River, Plumas County)	Unknown Toxicity	Toxicity		2375297.09
Indian Creek (headwaters to Antelope Lake, Plumas County)	Chloride	Salinity		626597.86
Jack Slough	Diuron	Pesticides		938651.03
Jamison Creek (Plumas County)	Boron	Metals/Metalloids		688764.56
Last Chance Creek (Plumas County)	Chloride	Salinity		888925.96
Lights Creek (Plumas County)	Chromium (total)	Metals/Metalloids		334037.94
Little Grizzly Creek	Copper	Metals/Metalloids	5A	593153.39

Feather River Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Live Oak Slough	Oxyfluorfen	Pesticides	5A	523331.20
Mill Creek (Butte County)	Temperature, water	Miscellaneous		322060.22
Morris Ravine (tributary to Thermalito Diversion Pool, Butte County)	Fecal Coliform	Pathogens		131154.66
Morrison Slough	Diazinon	Pesticides	5A	840893.79
North Forebay Creek (tributary to Thermalito Forebay, Butte County)	Fecal Coliform	Pathogens		158854.08
Red Clover Creek (Plumas County)	Selenium	Metals/Metalloids		1826988.24
Rock Creek (Plumas County)	Selenium	Metals/Metalloids		1294946.89
Simmerly Slough (Yuba County)	Oxygen, Dissolved	Nutrients		346881.07
Spanish Creek (Plumas County)	Unknown Toxicity	Toxicity		1810217.44
Sucker Run (Butte County)	Lead	Metals/Metalloids		672113.95
Sulphur Creek (Plumas and Sierra Counties)	Chromium (total)	Metals/Metalloids		545030.95
Sutter Bypass	Mercury	Metals/Metalloids	5A	1428627.78
Wadsworth Canal	Unknown Toxicity	Toxicity		1011502.96
Wolf Creek (Plumas County)	Arsenic	Metals/Metalloids		933324.75
Almanor Lake	Mercury	Metals/Metalloids	5A	25314.61
Butt Valley Reservoir (Plumas County)	Temperature, water	Miscellaneous		1515.36
Frenchman Lake	Mercury	Metals/Metalloids		1528.45
Glen Pond	Fecal Coliform	Pathogens		2.83
Mile Long Pond (Butte County)	Mercury	Metals/Metalloids	5A	83.53
Oroville Wildlife Area Fishing Pond (Butte County)	Unknown Toxicity	Toxicity	5A	2.31
Oroville, Lake	Copper	Metals/Metalloids		15400.21
Pacific Heights Pond, Lower (Butte County)	Unknown Toxicity	Toxicity	5A	10.18
Pacific Heights Pond, Upper (Butte County)	Fecal Coliform	Pathogens		2.40
Robinsons Riffle Pond (Butte County)	PCBs (Polychlorinated biphenyls)	Other Organics	5A	7.90
Thermalito Afterbay	Mercury	Metals/Metalloids	5A	3863.43
Thermalito Diversion Pool	PCBs (Polychlorinated biphenyls)	Other Organics		269.25
Thermalito Forebay	Copper	Metals/Metalloids		538.25

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Appendix G-I

Bear/Yuba River System

G. Bear/Yuba Rivers Watershed

The Bear/Yuba Rivers Watershed Service Area contains the Yuba and Bear Rivers in their entirety and incorporates numerous creeks and drainages (**Figure G-1**). These rivers include categories that can be divided into upper, middle, and lower reaches. Sierra streams make up the upper streams, while mountain-foothill streams that are highly developed make up the middle and valley stream in the lower reaches. These lower streams, although highly altered by dams, provide important tail-water habitat for salmon and steelhead (Cannon, pers. comm.). Both the Bear and Yuba rivers travel through several reservoirs before ultimately emptying into the Feather River, with the Yuba entering this main stem river at Marysville and the Bear joining this system several miles downstream. Both rivers originate on the west slope of the Sierra Nevada Mountains within Tahoe National Forest and flow southwest through the foothills and into the Sacramento Valley. The Yuba River consists of the North, Middle, and South forks which eventually combine to create the mainstem of the Yuba River just above Englebright Lake. The major reservoirs on the Yuba River are Englebright Lake and New Bullard's Bar Reservoir. There are over 100 jurisdictional dams and diversions located on the Yuba River. The South Fork of the Yuba River contains 20 of those development structures (SRWP Yuba, 2013). The Bear River consists of the Upper Bear and the Middle Bear. Near the river's origins, Spaulding Lake and the Drum Canal feed the Upper Bear River at the Drum Afterbay (SRWP Bear, 2013). The major reservoirs located on the Bear River are Spaulding Lake, Dutch Flat Reservoir, Rollins Reservoir, Lake Combie, and Camp Far West Reservoir. The numerous diversions and dams on the Bear River watershed almost entirely regulate the flow of the river (SRWP Bear, 2013). All of these water resource development structures and reservoirs provide hydroelectric power production, capture mining debris, and control flooding, as well as provide water for storage, irrigation, and municipal use. The cities of Grass Valley, Marysville, Nevada City, and Colfax are the main urban centers of this Service Area. The Bear/Yuba Rivers Watershed Service Area is 1,940 square miles. Vegetation in this region is comprised of mixed conifer in the upper portion of the Service Area and oak woodlands, chaparral communities, perennial grassland, wet meadows, and ephemeral wetlands, as well as urban/agriculture in the tributary/floodplain regions of the Service Area (SRWP Yuba, 2013). Land cover composition for this watershed is illustrated in **Appendix II.G.1.**

1. Historic Impacts

Historic hydraulic mining and mercury contamination have impaired and continue to impact the Bear River. The Lower Bear River has been especially affected by a combination of high amounts of mining sediment and flood control levees that have caused the river to become deeply incised (BRA, 2013). Historic mining was more prevalent on the Bear River than on the Yuba River. However, hydraulic mining did occur on the Yuba River in the mid- to late-1800s and resulted in a significant amount of sediment and mercury runoff (SRWP Yuba, 2013). With the decline of mining activities after the Gold Rush, timber harvesting practices became prevalent within the headwater and tributary regions of both the Yuba River and Bear River, and those practices still continue today. With an increase in settlers to the region, land use in the floodplain and lower tributary regions of the Service Area also was converted to agricultural and grazing land, and farming settlements were created.

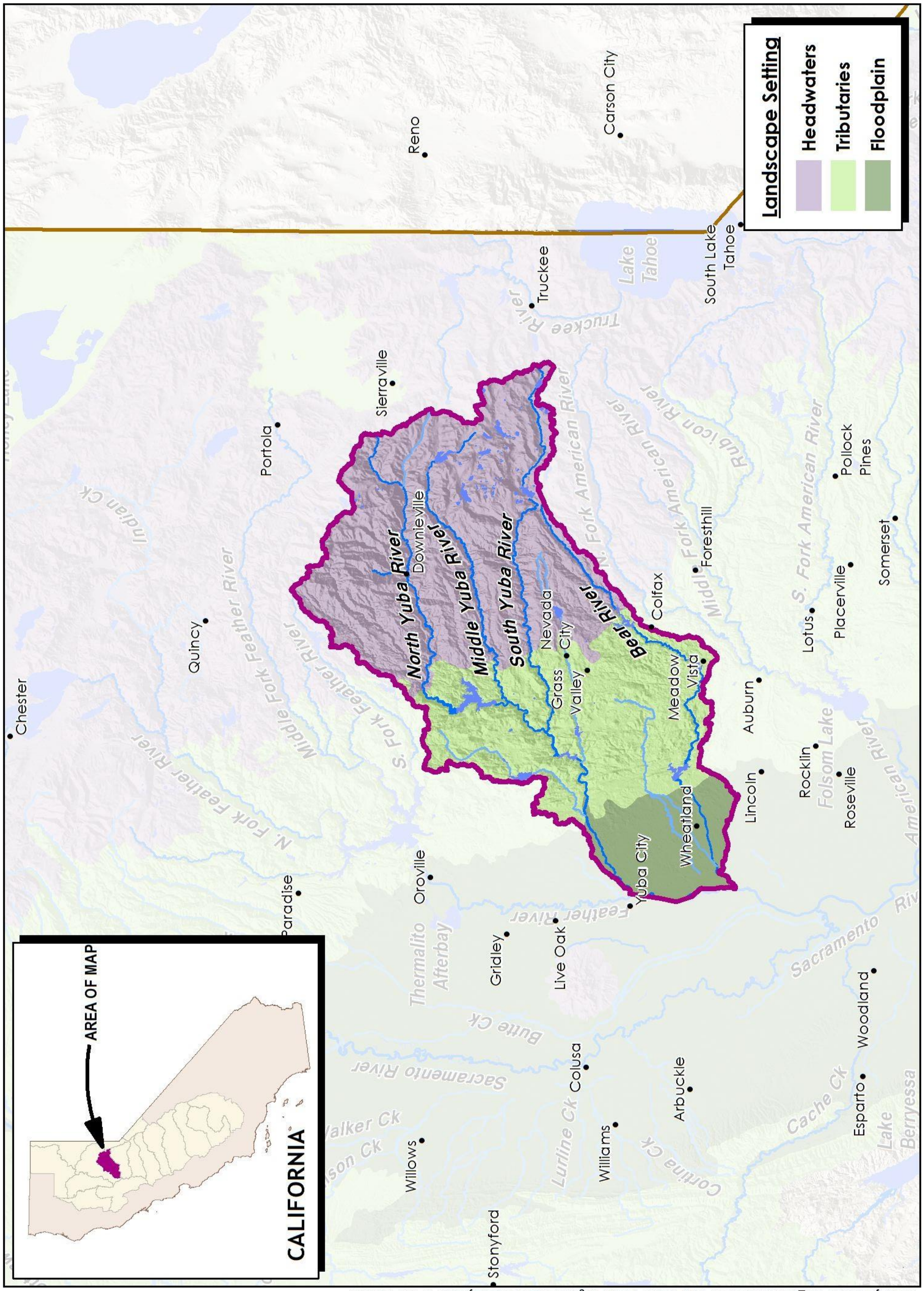

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Figure G-1
Bear/Yuba Rivers Watershed

Appendix II.G.1

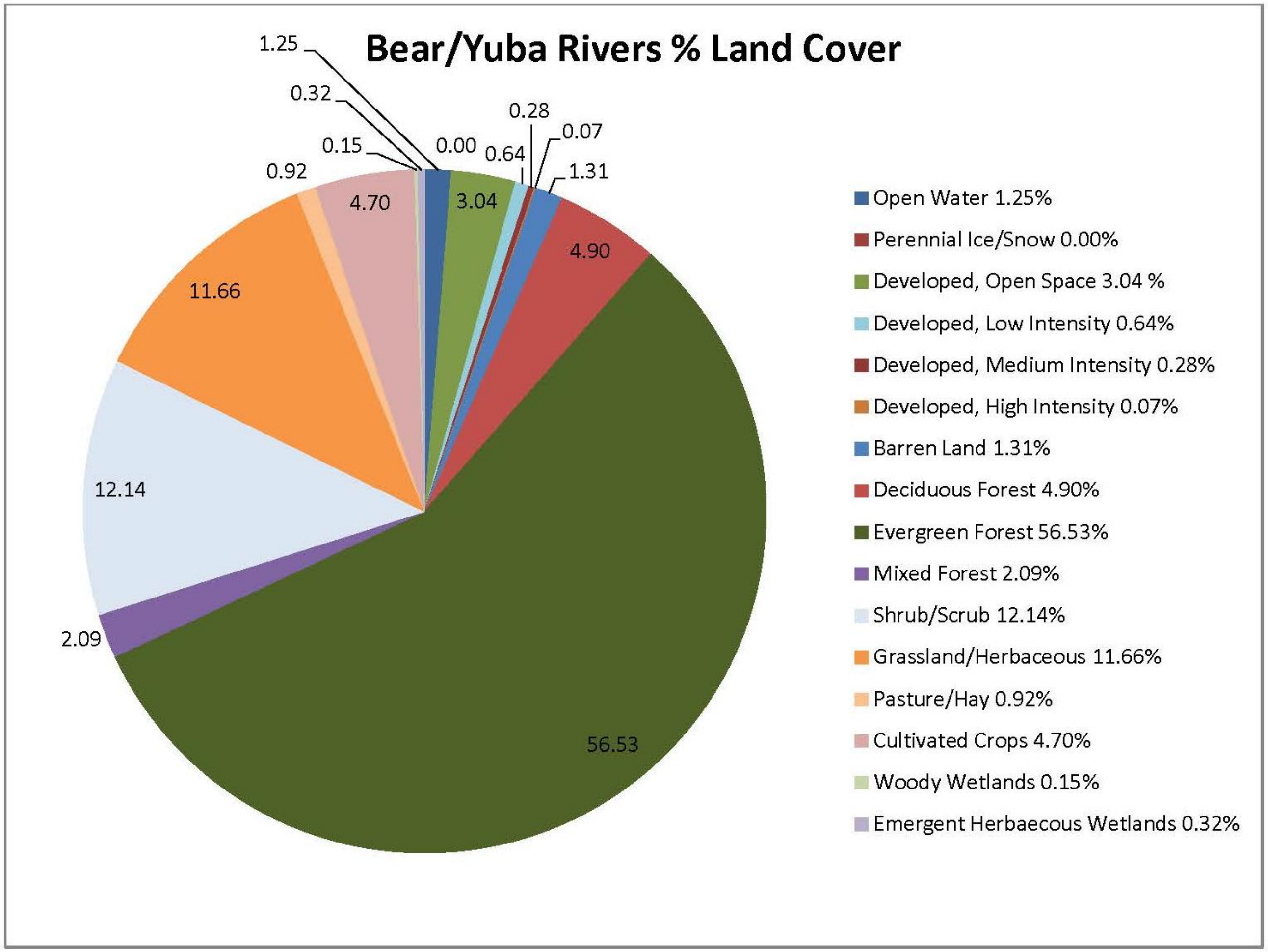

Table G-1. Historical Impacts to Bear/Yuba Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Bear/Yuba	Headwaters	H	M	L	L	L	L	L
	Tributaries	H	H	H	L		M	H
	Main Stem/Floodplain	L	L	M	H	M	M	H

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

The Yuba and Bear rivers are highly developed with water diversion structures and reservoirs, and while construction has slowed in recent years, proposals for these projects have threatened the Bear/Yuba Rivers Watershed Service Area as recently as 2011 (BYLT, 2012). Water quality issues for the Yuba and Bear rivers include trends in warming water temperatures that upset fish and wildlife populations, primarily as a result of dams and diversions. Sediment loading is also a continuing problem for the Bear and Yuba rivers due to historic mining runoff, as well as recent road construction, housing developments, logging, and recreational activities. The Bear River portion of the Service Area has one of the highest road densities of the watersheds within the Sierra Nevada, with over 2,000 miles of roads as compared to about 990 miles of waterways (SRWP Bear, 2013). This results in about 45% of the streams within the Bear River Watershed being located within 100 meters of a public road, increasing the risk of sedimentation and erosion. The lower reaches of the Yuba and Bear rivers within the Sacramento Valley are surrounded by agricultural lands that require water for irrigation and livestock and are subject to erosion and chemical pollution in the waterways. Beale Air Force Base includes a portion of the Bear River within its property, located within the Service Area. Environmental mitigation and preservation efforts at Beale Air Force Base have become increasingly successful over the years in protecting and enhancing riparian forest habitat that provides refuge for plant and wildlife species (DOD, 2008). Preservation of wetlands and mountain meadows by other groups also occurs in the higher elevations of the Service Area in an attempt to protect species and wetland resources at these locations as agricultural development and urbanization are anticipated to increase (CA Dept. of Forestry Development Map).

The numerous diversions and dams on the Bear River have caused considerable impacts to historic fish numbers, as the Bear River once supported substantial salmon and steelhead runs. The river now provides only limited habitat for salmon 16 miles below Camp Far West Dam (SRWP Bear, 2013), and steelhead are only found above the dam (Cannon, pers. comm.). However, the Bear River does support populations of rainbow and brown trout that attract anglers to the region, and waterfowl are prevalent throughout the watershed (SRWP Bear, 2013). The Yuba River once supported as much as 15% of the annual fall-run Chinook salmon run within the Sacramento River Basin (SRWP Yuba, 2013). These numbers have decreased over the years, though the Yuba River still remains a valuable system for steelhead trout, rainbow trout and fall-run Chinook salmon (SRWP Yuba, 2013). In 2008, the State Water Resources Control Board (SWRCB) approved the Lower Yuba River Accord Agreement, which calls for increased in-stream fisheries flows for wild, native salmon and steelhead, as well as increased water supplies for irrigation and urban use (SRWP Yuba, 2013). Ecosystem and fisheries restoration plans for the Bear River include identifying anadromous fishery limiting factors by conducting a baseline study and quantifying the amount of non-natal rearing habitat that exists only in the lower few miles of the watershed (CABY, 2013). Ecosystem and fisheries restoration plans for the Yuba River include improving aquatic ecosystem health to maximize in-stream production of anadromous fish, continuing juvenile salmon and steelhead life history evaluations, improving fish passage at numerous dams by installing fish screens and ladders, and improving access to fish spawning habitat (CABY, 2013).

Table G-2. Current Impacts to Bear/Yuba Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Bear/Yuba	Headwaters	L	H	H	L	L	H	L
	Tributaries	L	H	H	L	M	H	H
	Main Stem/Floodplain	L	L	L	M	L	M	H

H= High, M= Medium, L=Low

Due to extensive agricultural and water resource development, the hydrology, physical structure, wetland acreage, and diversity attributes have been highly impacted throughout all regions of the Bear/Yuba Rivers Watershed Service Area (**Figure G-2**). The loss of these attributes has had a profound impact on buffer and landscape context and has impacted biotic structure, especially in regard to fisheries, in the all regions of the Service Area.

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the Bear/Yuba Rivers Watershed Service Area. However, Native American territories within the region were said to include hundreds of acres of dense pine fir forests, grassland plains, and oak savannah, as well as numerous creeks where the Nisenan, Miwok, and Maidu tribes hunted wild game and gathered acorns, roots, and berries (Anderson & Moratto, 1996). Current wetland types and extents for this Service Area are listed in **Appendix II.G.2**.

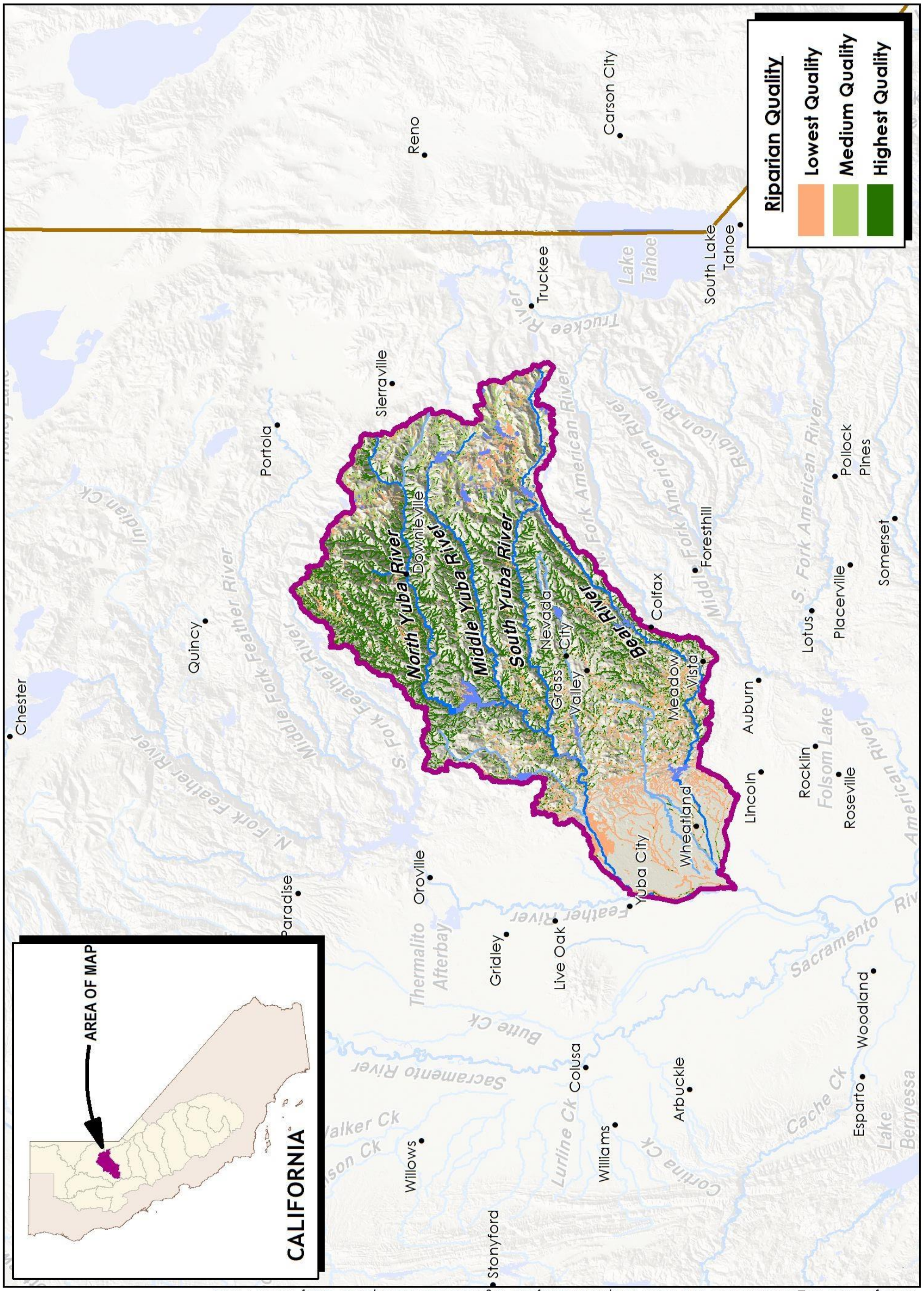

Figure G-2
Bear/Yuba Rivers Watershed Riparan Quality Map

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Appendix II.G.2

Bear/Yuba Rivers Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	8615.45
LakePond	2028.6
Reservoir	12.05
SwampMarsh	205.6
Freshwater Emergent Wetland	3431.03
Freshwater Forested/Shrub Wetland	5880.78
Freshwater Pond	2558.99
Lake	15330.22
Other	47.89
Riverine	2368.1

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.G.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Work to improve water quality and reduce mercury contamination within possible restoration sites.
- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Improve and/or expand riparian buffers and salmonid habitat through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Plant and/or manage adjacent upland buffers to protect riparian corridors against catastrophic fire.
- Work to improve natural channel morphology and side/off channel spawning and rearing habitat for salmonids.
- Improving fish passage systems throughout the Service Areas.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pathogens, Metal/Metalloids, Toxicity and Miscellaneous (**Appendix II.G.3.)**.
- Improve floodplain habitats in the lower river and watershed functions in the upper watershed.
- Improve in-stream habitat diversity and function, including wetlands/riparian restoration and gravel augmentation in the lower Yuba River below Englebright Dam and in the Bear River.
- Prioritization of applicable opportunities for riparian restoration will be assessed based areas of medium and lowest quality as shown in **Figure G-2**, Riparian Quality Map (FRAP, 2008).

Appendix II.G.3

Bear/Yuba Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Bear River, Lower (below Camp Far West Reservoir)	Cadmium	Metals/Metalloids		1366748.19
Bear River, Upper (from Combie Lake to Camp Far West Reservoir, Nevada and Placer Counties)	Mercury	Metals/Metalloids	5A	1560664.48
Deer Creek (from Deer Creek Reservoir to Lake Wildwood, Nevada County)	Mercury	Metals/Metalloids	5A	1019015.65
Deer Creek (Yuba County)	pH	Miscellaneous	5A	269412.52
Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	Unknown Toxicity	Toxicity	5A	430063.10
French Ravine	Bacteria	Pathogens	5A	105599.84
Gold Run (Nevada County)	Mercury	Metals/Metalloids	5A	117724.75
Greenhorn Creek (Nevada Co)	Arsenic	Metals/Metalloids		828403.03
Humbug Creek	Zinc	Metals/Metalloids	5A	139566.71

Bear/Yuba Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Kanaka Creek	Arsenic	Metals/Metalloids	5A	615614.78
Little Deer Creek	Mercury	Metals/Metalloids	5A	257502.78
Squirrel Creek (Nevada County)	Mercury	Metals/Metalloids		744022.39
Wolf Creek (Nevada County)	Fecal Coliform	Pathogens	5A	1442597.93
Yankee Slough (Placer and Sutter Counties)	Oxygen, Dissolved	Nutrients		838688.13
Yuba River, Lower	Fecal Coliform	Pathogens		1096262.26
Yuba River, Middle Fork	Mercury	Metals/Metalloids	5A	2861742.50
Yuba River, North Fork	Mercury	Metals/Metalloids	5A	2420198.72
Yuba River, South Fork (Spaulding Reservoir to Englebright Reservoir)	Temperature, water	Miscellaneous	5A	3063354.57
Camp Far West Reservoir	Mercury	Metals/Metalloids	5A	1945.33
Combie, Lake	Mercury	Metals/Metalloids	5A	362.05
Englebright Lake	Mercury	Metals/Metalloids	5A	754.41
New Bullards Bar Reservoir	Mercury	Metals/Metalloids	5A	3864.32
Rollins Reservoir	Mercury	Metals/Metalloids	5A	773.75
Scotts Flat Reservoir	Mercury	Metals/Metalloids	5A	659.98
Wildwood, Lake (Nevada County)	Mercury	Metals/Metalloids	5A	289.24

Additional prioritization for applicable geographic actions will be considered during the ILF proposal stage.

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Appendix H-I

American River System

H. American River Watershed

The American River Service Area is approximately 2,589 square miles and contains many small and medium urban communities in its tributary elevations, including Colfax, Auburn, and Placerville (**Figure H-1**). The lower portion of the river watershed features larger cities such as Roseville, Rocklin, Lincoln, Folsom, El Dorado Hills, and Sacramento. The American River Service Area begins within the Tahoe and El Dorado National Forests at the crest of the Sierra Nevada Mountains west of Lake Tahoe (SRWP American, 2013). This portion of the upper watershed consists of fertile canyons, forested ridges, and massive rock formations with mixed conifers and montane hardwoods (SRWP American, 2013). The Service Area incorporates the Rubicon River, which originates near Clyde Lake in El Dorado County and flows north-northwest feeding numerous smaller reservoirs until it meets the Middle Fork of the American River. The Middle Fork of the American River meets the North Fork within the Auburn State Recreation Area before these conjoined waterways combine with the South Fork of the American River at Folsom Lake, formed by Folsom Dam. Water is released from Folsom Dam to feed the lower portion of the American River, which is then contained by the Nimbus Dam to form Lake Natoma. As water is released from this feature, the main stem of the American River continues to flow southwest to join the Sacramento River through a channel that has been extensively leveed within the Sacramento city limits. While this portion of the watershed is highly urbanized, it does include the American River Parkway, which provides a 30-mile long buffer of primarily riparian habitat with scrub, forest, and understory species, as well as oak woodlands (ARP, 2013). Historic land use in the lower American River watershed included agricultural, and grazing lands, with upper-elevation vegetation consisting of pine fir forests, true fir forests, and rocky forested lands (CA Dept. of Forestry Map). Land cover composition for this watershed is illustrated in **Appendix II.H.1.**

1. Historic Impacts

The discovery of gold in 1848 on the South Fork of the American River sparked the historic California Gold Rush and brought many changes to the Sacramento region, especially at tributary elevations. As the Gold Rush attracted more mining operations over time, gold became increasingly difficult to access and new technologies to access this gold became more destructive to the land. Miners began using high-pressured hydraulic techniques that could and did wash away entire hillsides. In turn, this caused towns downstream to be flooded with sediment. In addition to sediment loading, water quality was also impacted by the use of mercury, arsenic, cyanide, and other toxins for mining purposes. The many forests in the upper portions of the watershed surrounding the North, Middle, and South forks of the American River were cut down for mining timbers, which also caused additional sedimentation (CLCC, 2013).

The lower portion of the American River Watershed was originally developed for agriculture to support this mining community, but has since become primarily urbanized. From 1988-1998, Sacramento, Placer, Yolo, El Dorado, Sutter, and Yuba counties experienced extensive population growth that has resulted in approximately 41,000 acres being converted to urban use from agricultural lands, wetlands, and timberlands (RWA, 2006). However, agriculture continues to exist in many areas within this Service Area. Because of the historic agriculture, urban development, mining, and timber activities, protecting surface water quality within the American River Service Area from non-point source pollution has been considered to be a high priority (RWA, 2006).

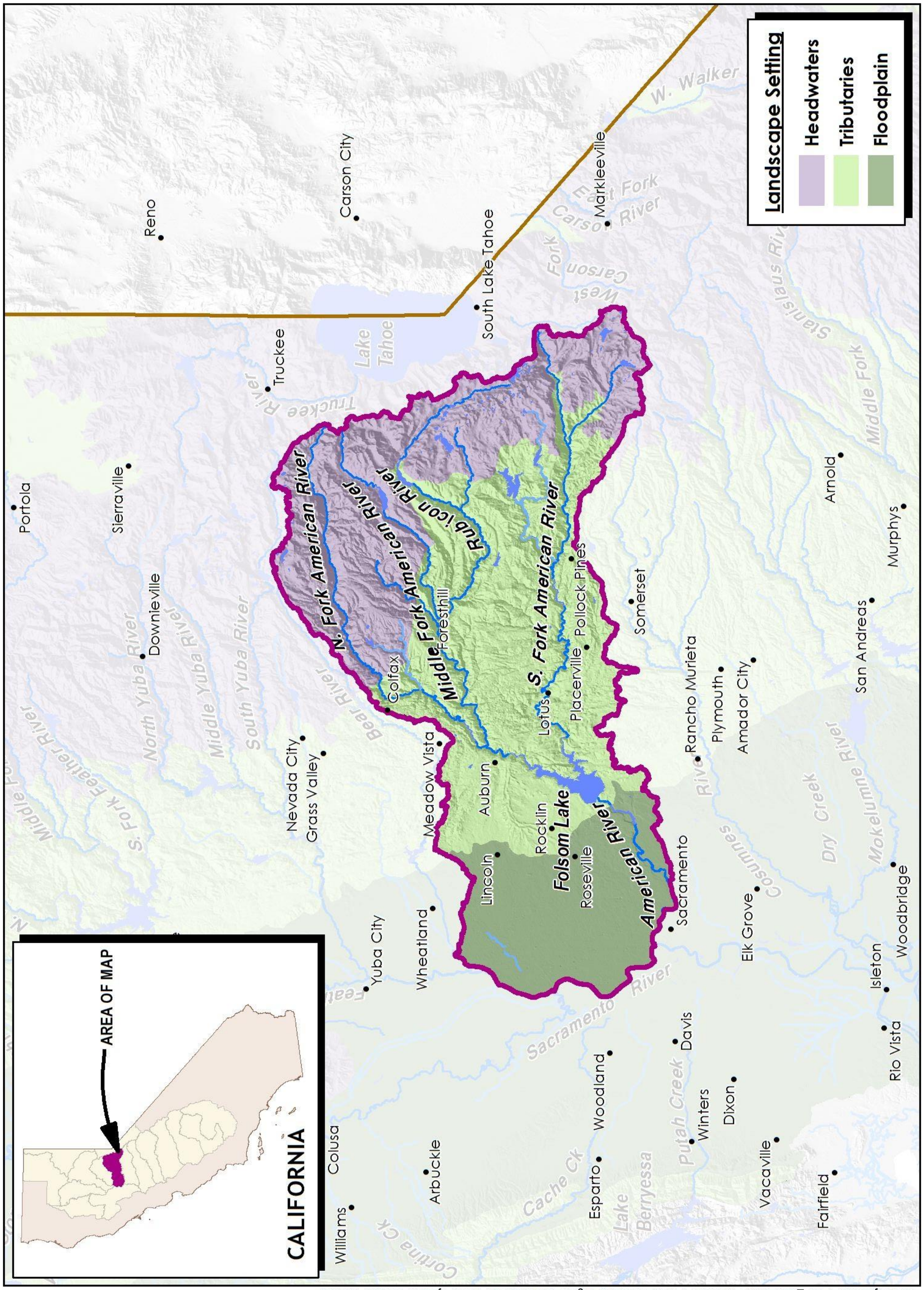

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Figure H-1
American River Watershed

Appendix II.H.1

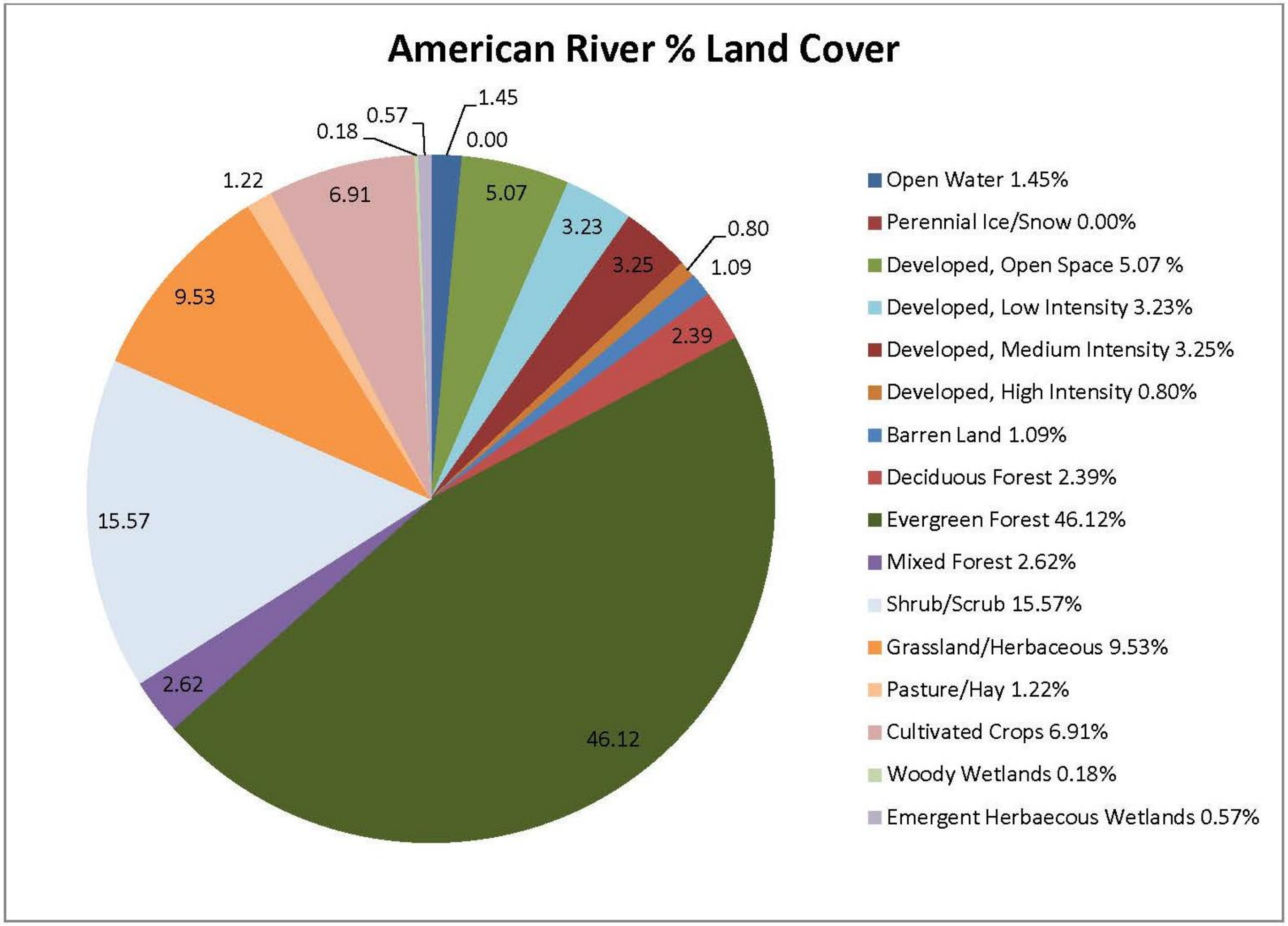

Table H-1. Historical Impacts to American River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
American	Headwaters	L	M	L	L	L	L	L
	Tributaries	H	M	M	L	M	M	H
	Main Stem/Floodplain	L	L	H	H	H	M	H

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

Dams and reservoirs are common on all three forks of the American River and throughout the Service Area, allowing for production of hydroelectric power, accumulation for water storage and agriculture and urban uses, recreational purposes, and the blockage of historic hydraulic mining debris (SRWP American, 2013). However, these dams also prevent steelhead trout and Chinook salmon from returning to historic spawning grounds upstream. On the lower portion of the American River, Nimbus Dam, a hydro-regulation dam, acts as the primary barrier for anadromous fish and directs water into Folsom South Canal. Nimbus Dam contains the Nimbus Salmon, Steelhead, and Trout Hatchery, which acts as mitigation for salmonid populations due to the construction of Folsom and Nimbus Dams along the river's floodplain. The California Department of Fish and Wildlife (CDFW) manage the Nimbus Fish Hatchery. They currently report production numbers of around 4,000,000 Chinook salmon and 430,000 steelhead trout a year (CDFW, 2013). Chinook salmon and steelhead are just two of 40 species of native and nonnative fish that have been documented in the lower portions of the American River (RWA, 2006). The Upper American River is a prime fishery for rainbow and brown trout, and there have also been sightings of hitch, Sacramento sucker, pikeminnow, and riffle sculpin (RWA, 2006).

The lower American River currently supports salmon and steelhead populations that were once sustained above the dams and reservoirs. This important habitat is subject to unnatural flows and sediment regimes. Much of the riparian floodplain areas remain unchanged and are bordered by levees in the lower end. It is in these floodplain wetland complexes that significant restoration is needed (Cannon, pers. comm.). Water quality issues, such as sedimentation from historic and current timber harvesting and mining activity, still occur within the headwater and tributary regions of the Service Area. The IRWMP for the American River Basin includes objectives for habitat restoration, such as actions to preserve fisheries and in-stream habitat and maintain in-stream flows and suitable year-round stream temperatures (RWA, 2006). It also focuses on enhancing riparian, oak woodland, grassland, and agricultural habitats within the Service Area. The River Corridor Management Plan prepared by the Lower American River Task Force proposes to increase and achieve and/or maintain viable populations of naturally spawning native fish species such as fall-run Chinook salmon, steelhead, delta smelt, and split-tail smelt, in addition to the maintenance of popular non-native sport fish such as American shad and striped bass populations in the river (RWA, 2006). In tributary and headwater stretches, proposals for the protection of numerous mountain meadows are also being put forth. These proposals are important for the protection of species and wetland resources, as future projections show continued urbanization, timber, and agricultural development will further endanger the riparian and wetland ecosystems throughout this Service Area (CA Dept. of Forestry map).

Table 17. Current Impacts to American River Watershed

Location		Minin g	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
America n	Headwaters	L	L	L	L	L	L	L
	Tributaries	L	M	H	L	H	M	H
	Main Stem/Floodplain	L	L	H	L	H	M	H

H= High, M= Medium, L=Low

The cumulative impact of the activities described above has been the dramatic degradation of the biotic attributes of the watershed due to the prevalence of urban and agricultural development and the direct loss of organic matter and fisheries habitats. The synergistic results of reduced buffer and landscape, physical structure, and hydrologic attributes have been problematic as well. Combined, this has impacted biotic functions and resulted in degradation of aquatic, riparian, upland, forest, and floodplain wetland habitats at all levels of the Service Area (**Figure H-2**).

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the American River Watershed Service Area. However, Native American territories within the region were said to include hundreds of acres of grassland plains, oak savannah, and seasonal streams where the Nisenan tribe hunted wild game and gathered acorns, roots, and berries (ARC, 2009). Additionally, because of extensive water development in the upper and middle watersheds over the past century, insufficient hydrology during drier summers remains a concern in protecting stream habitats and beneficial uses (Cannon, pers. comm.). Current wetland types and extents for this Service Area are listed in **Appendix II.H.2**.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.

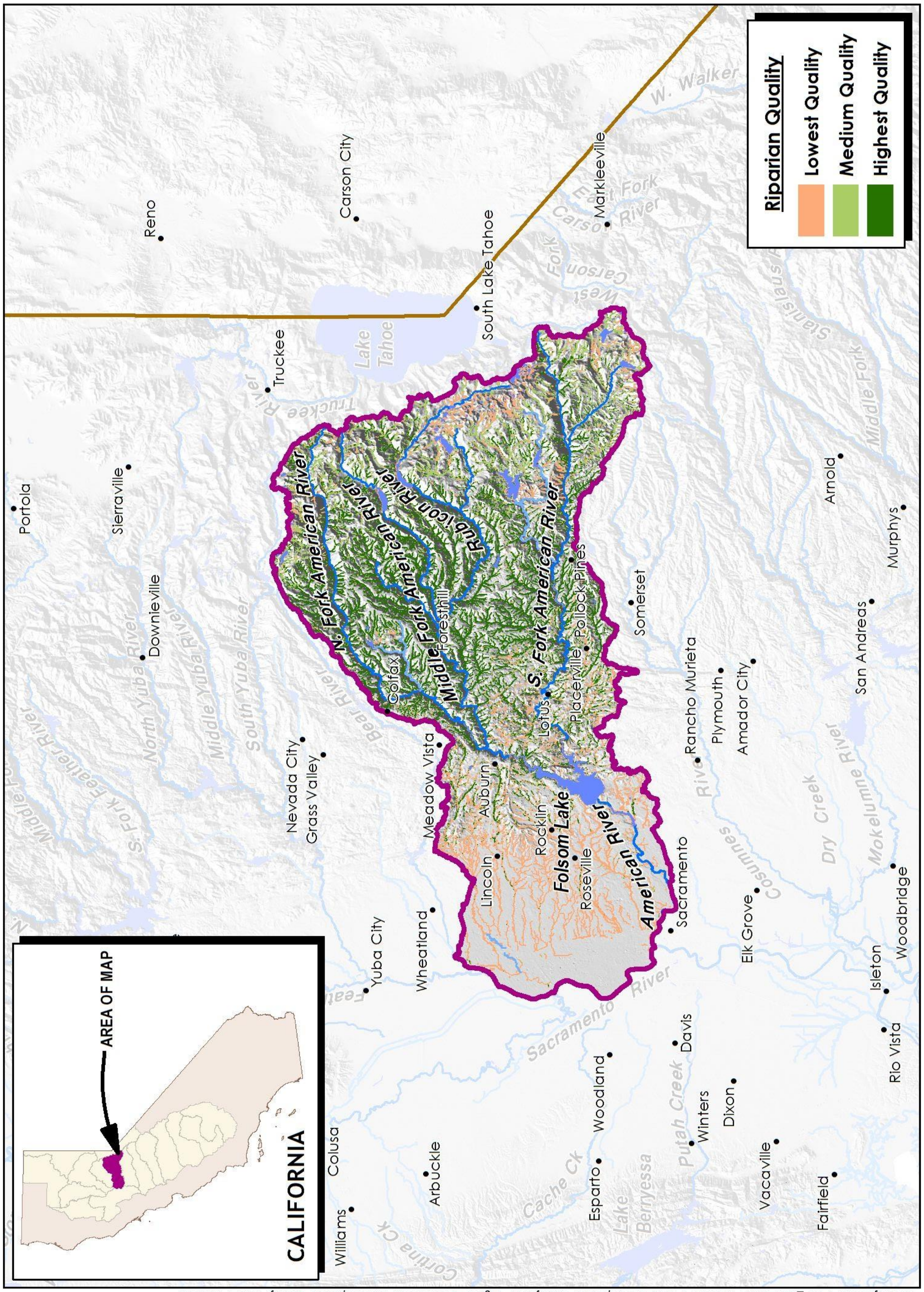

Figure H-2
American River Watershed Riparian Quality Map

GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\Riparian Quality\CPF Figure 25 American River Riparian Quality 131127 v4.mxd

Appendix II.H.2

American River Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	10662.34
LakePond	1682.26
Reservoir	100.1
SwampMarsh	31.97
Freshwater Emergent Wetland	4695.13
Freshwater Forested/Shrub Wetland	7013.32
Freshwater Pond	3523.98
Lake	23491.4
Other	209.51
Riverine	4400.82

- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.H.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Work to improve water quality and reduce mercury contamination within possible restoration sites.
- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Improve and/or expand riparian buffers and salmonid habitats through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Plant and or manage adjacent upland buffers to protect riparian corridors against catastrophic fire.
- Work to improve fish passage systems throughout the Service Area.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pesticides, Metal/Metalloids, Toxicity and Other Organics (**Appendix II.H.3.)**.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure H-2**, Riparian Quality Map (FRAP, 2008).

Prioritization for applicable geographic actions will be considered during the ILF proposal stage.

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Appendix II.H.3

American River Watershed				
Water Body Name	Pollutant Category	Pollutant Type	TMDL Status	Linear Feet Impacted
Natomas East Main Drainage Canal (aka Steelhead Creek, upstream of confluence with Arcade Creek)	PCBs (Polychlorinated biphenyls)	Other Organics	5A	811101.22
North Canyon Creek (El Dorado County)	pH (high)	Miscellaneous		211752.20
Pleasant Grove Creek	pH	Miscellaneous		1245299.80
Pleasant Grove Creek, South Branch	pH	Miscellaneous		464487.34
Sacramento River (Knights Landing to the Delta)	Chlordane	Pesticides	5A	1256793.91
Secret Ravine (Placer County)	Ammonia	Nutrients		564368.01
Strong Ranch Slough	Chlorpyrifos	Pesticides	5B	407096.55
Weber Creek (El Dorado County)	pH	Miscellaneous		1457571.04
White Rock Creek (El Dorado County)	Specific Conductivity	Salinity		198816.53
Willow Creek (Sacramento County)	Specific Conductivity	Salinity		567587.97
Folsom Lake	Mercury	Metals/Metalloids	5A	11063.88
French Meadows Reservoir	Mercury	Metals/Metalloids		1420.41
Hell Hole Reservoir	Mercury	Metals/Metalloids	5A	1370.35
Natoma, Lake	Mercury	Metals/Metalloids	5A	484.99
Oxbow Reservoir (Ralston Afterbay, El Dorado and Placer Counties)	Mercury	Metals/Metalloids	5A	65.05
Slab Creek Reservoir (El Dorado County)	Mercury	Metals/Metalloids	5A	242.07

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Appendix I-I

Cosumnes/Mokelumne River System

I. Cosumnes/Mokelumne Rivers Watershed

The Cosumnes/Mokelumne Service Area is comprised of approximately 2,399 square miles (**Figure I-1**). The Cosumnes River originates on the eastern slopes of the Sierra Nevada Mountains and flows through the El Dorado National Forest (NOAA, 2009). The river moves southwest before meeting the Mokelumne and terminating in the Sacramento and San Joaquin Delta confluence (CABY, 2012). The Mokelumne River originates in the Sierra Nevada and drains 661 square miles, with 570 square miles comprising the upper watershed (NOAA, 2009). The lower reaches of the river flow through the Central Valley and into the confluence of the San Joaquin/Sacramento Delta (FishBio Mokelumne, 2007) just north of Stockton (NOAA, 2009). This river is blocked by two large reservoirs owned and operated by East Bay MUD (Cannon, pers. comm.), the Camanche Dam and Reservoir and the Pardee Dam and Reservoir farther upstream. This water development infrastructure provides hydroelectric power and flood control on the Mokelumne River, and supplies water to the East Bay, which is its main function (Cannon, pers. comm.). Additionally, these dams assist in the blockage of acid mine drainage, reducing pollution of the lower reaches of the river. The vegetation within this Service Area consists largely of grassland and oak woodlands, with many montane meadows in headwater regions (NOAA, 2009). Land cover composition for this watershed is illustrated in **Appendix II.I.1.**

1. Historic Impacts

Historic mining in and around the Mokelumne River greatly reduced and, in some years, extirpated the local salmonid population, due to water pollution and increased sedimentation. The upper floodplain and lower tributary regions of the Cosumnes River were also impacted by historic mining activity. With the increase in settlers to the region during the Gold Rush, timber harvesting became a prominent industry in the headwater and tributary regions of both rivers and impacted water quality through increased sedimentation as well. During this time, land use in the floodplain region of the Service Area shifted from an extensive system of riparian and wetland buffers to one defined by a variety of agricultural lands, including grazing, irrigation, and dry land agriculture (Historical Land Cover Map). Like all Sierra rivers, the Mokelumne and Cosumnes have been impacted by historic mining that has altered the natural hydrology and ecosystems in the upper watersheds (Cannon, pers. comm.). All of these industries required road construction for easier access, allowing for cities to be built primarily within the floodplain region. This in turn required flood control in the form of dam construction. The result of these activities was the creation of fish passage barriers such as the Camanche and Pardee dams, which, in conjunction with the Woodbridge ladder, have resulted in an 85% loss of original fish spawning habitat on the Mokelumne River (NOAA, 2009). The Cosumnes River also historically supported thousands of Chinook salmon, but fish passage problems – including barriers to migration, fish ladders, and screens, intense habitat degradation, and loss of fall attraction flows on the river – have caused the numbers of Chinook salmon to drop to a few hundred over the years (CABY, 2012). River flows in the upper watershed have been virtually eliminated due to water diversions and depletion of groundwater resources impacting the lower watershed (Cannon, pers. comm.). Additionally, the middle and lower watershed has experienced the elimination of much of its riparian floodplain forests (Cannon, pers. comm.).

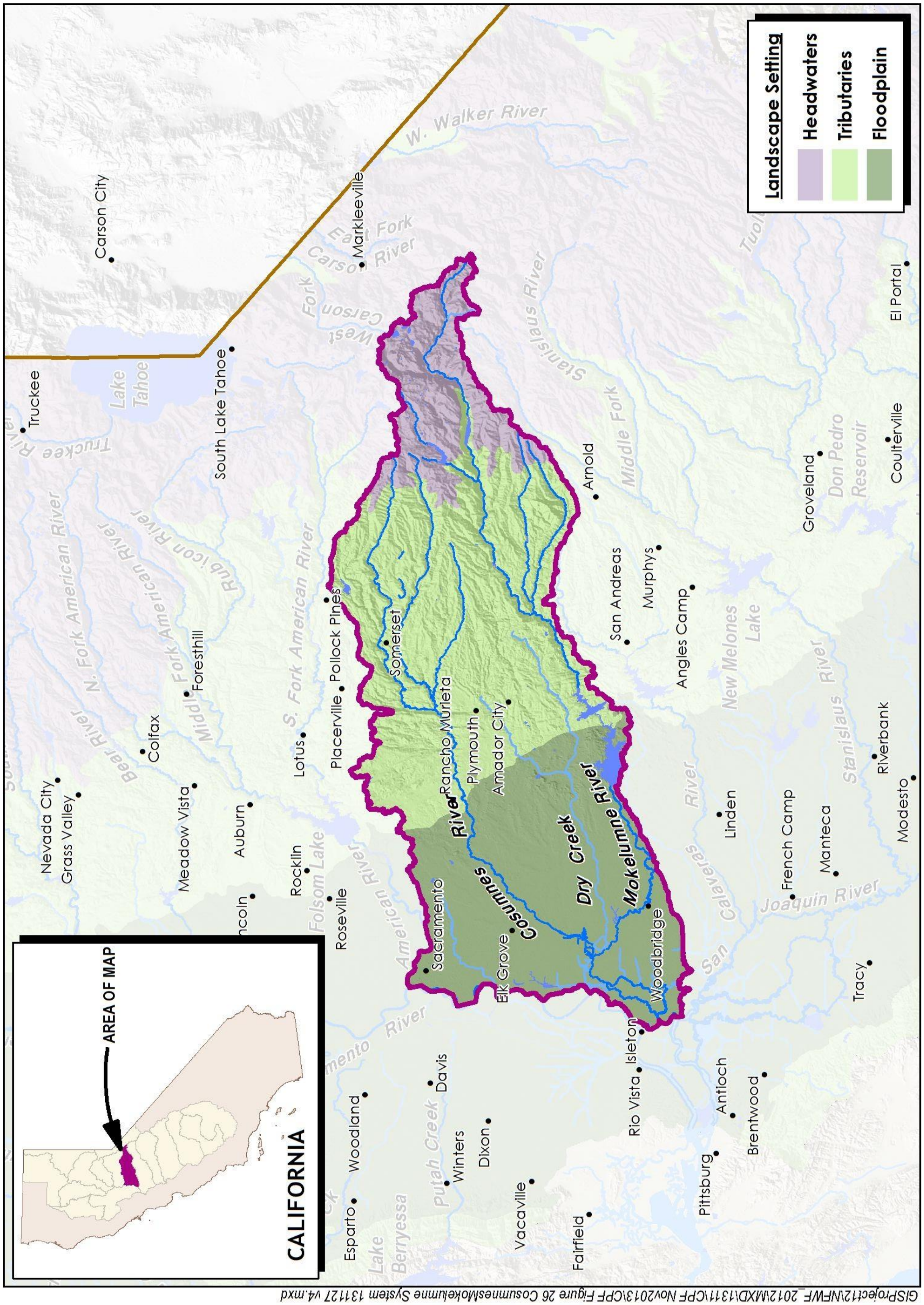

Figure I-1
Cosumnes/Mokelumne Rivers Watershed

Appendix II.I.1

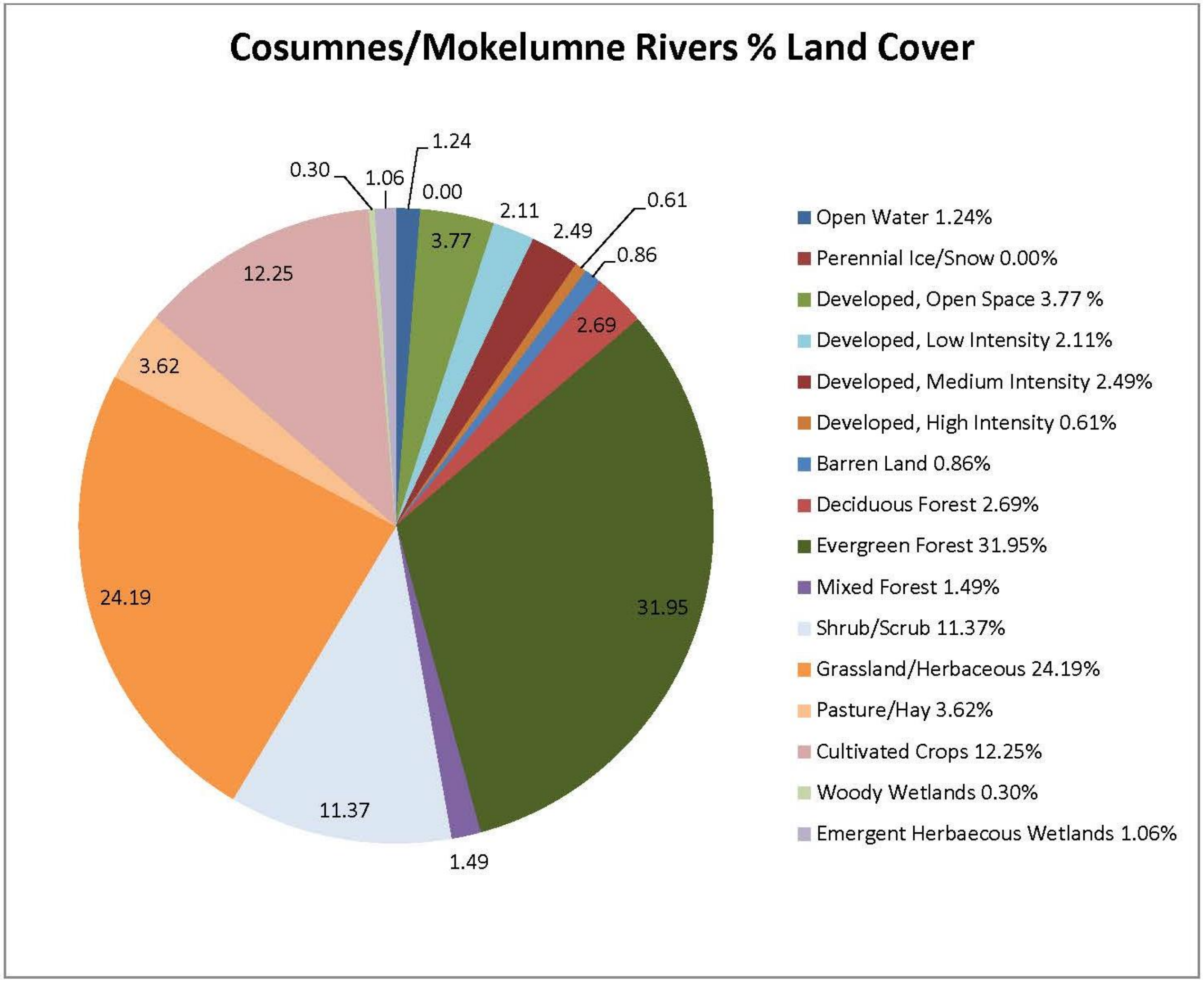

Table I-1. Historical Impacts to Cosumnes/Mokelumne Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Cosumnes/ Mokelumne	Headwaters	L	L	M	L	L	L	L
	Tributaries	H	H	M	L	L	M	L
	Main Stem/Floodplain	L	L	M	H	M	H	M

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

According to a 2009 report issued by NOAA and cited in the National Marine Fisheries document, the viability for potential or existing populations of steelhead and salmonids to survive long-term in the Mokelumne River as it stands today are low to moderate. It also states that there are currently no spring-run Chinook populations existing in the lower reaches (NOAA, 2009). The Camanche Dam has confined salmon to the lower reaches of the river in the valley (Cannon, pers. comm.). Impacts from historic mining and timber harvest activities still exist in the Mokelumne River. Current stressors in the lower river reach also include competition and/or lack of salmon spawning habitat, inconsistent water temperatures, reductions in flow regimes, habitat alteration and degradation, and passage barriers. Major land use within the Mokelumne River continues to include timber and grazing practices in the upper watershed, impacting natural watershed functions and ecosystems (Cannon, pers. comm.). Projects to improve upper and lower watershed ecosystem health by improving watershed functions through riparian and floodplain restoration on the Mokelumne River are needed (Cannon, pers. comm.).

The Cosumnes River has high to moderate restoration potential according to the 2009 Recovery Plan issued by NOAA (NOAA, 2009). The most pristine section of this river lies within the Cosumnes River Preserve (CRP). The Preserve is a partnership with local, private, State, and Federal organizations to preserve over 46,000 acres of land along the Cosumnes River (CRP, 2012). Most of these acres of land consist of wetlands, which provide a diverse habitat that is critical to an abundance of plant and animal life, including migratory birds (CRP, 2012). Additional public and private sector preserves adjacent to the Cosumnes River Preserve have also since been established, adding to the overall ecological stability of this area. Projects and preserves like these are important for the protection of species and wetland resources, as future projections show continued agricultural development and urbanization will further endanger the riparian and wetland ecosystems and fisheries within this Service Area (CA Dept. of Forestry Development Map).

Table I-2. Current Impacts to Cosumnes/Mokelumne Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Cosumnes/ Mokelumne	Headwaters	L	L	M	L	L	L	L
	Tributaries	H	H	M	L	H-M	M	M
	Main Stem/Floodplain	L	L	M	H	L	H	M

H= High, M= Medium, L=Low

The cumulative impact of development activities has been the dramatic degradation of the biotic attributes of the tributaries and floodplains, due to both the direct loss of organic matter and fisheries habitats as well as the synergistic results of reduced buffer and landscape, physical structure, and hydrologic attributes (**Figure I-2**). Combined, these activities have impacted biotic functions at the floodplain and tributary levels of the Service Area.

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the Cosumnes/Mokelumne Rivers Watershed Service Area. However, there are accounts of the Plains Miwok and Northern Sierra Miwok, who historically inhabited the land surrounding the Cosumnes and Mokelumne Rivers, using the hundreds of acres of rich riparian forested zones, extensive grasslands, wetlands, and oak woodlands for hunting and gathering (Milliken, 2008). Current wetland types and extents for this Service Area are listed in Appendix II.I.2.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.I.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

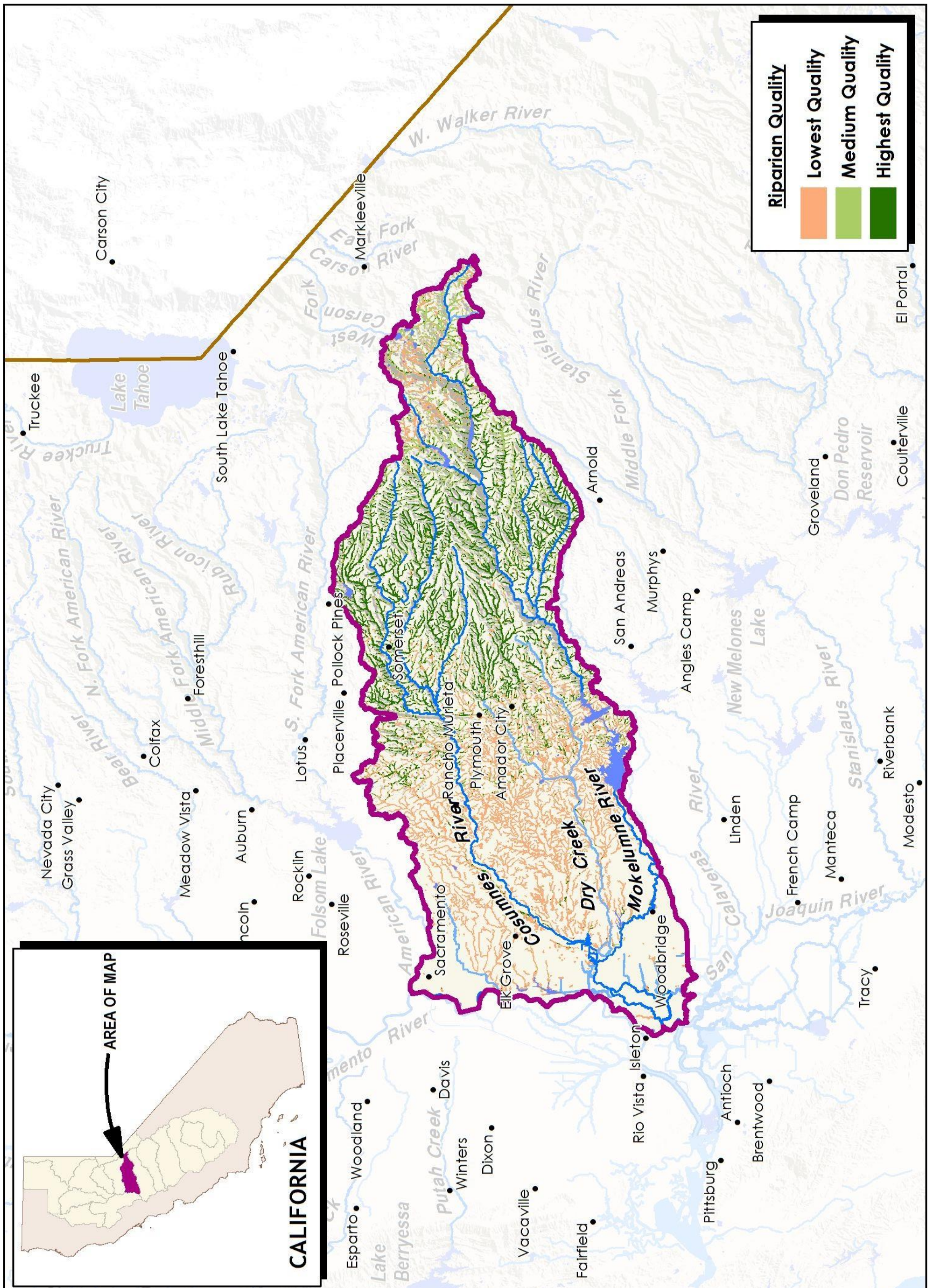

Figure H-2
Cosumnes/Mokelumne Rivers Watershed Riparian Quality Map

Appendix II.I.2

Cosumnes/Mokelumne Rivers Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	8132.69
LakePond	1855.64
Reservoir	487.73
SwampMarsh	214.85
Freshwater Emergent Wetland	12418.79
Freshwater Forested/Shrub Wetland	4614.35
Freshwater Pond	4493.36
Lake	14887.98
Other	65926.43
Riverine	6270.29

Appendix II.I.3

Cosumnes/Molelumne Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Bear River (from Allen to Upper Bear River Reservoir, Amador County)	pH (low)	Miscellaneous	5A	530485.11
Bear River (Lower Bear River Reservoir to Mokelumne River, N Fork, Amador County)	pH	Miscellaneous		341371.53
Big Indian Creek (Amador County)	Escherichia coli (E. coli)	Pathogens		1060202.94
Carson Creek (from WWTP to Deer Creek)	Aluminum	Metals/Metalloids	5A	734255.25
Cosumnes River, Lower (below Michigan Bar; partly in Delta Waterways, eastern portion)	Oxygen, Dissolved	Nutrients		2215401.35
Cosumnes River, Upper (above Michigan Bar)	Specific Conductivity	Salinity		1075907.46
Deer Creek (Sacramento County)	pH (high)	Miscellaneous		746157.89
Dry Creek (Sacramento and San Joaquin Counties; partly in Delta Waterways, eastern portion)	Unknown Toxicity	Toxicity		1489128.83
Elder Creek	Chlorpyrifos	Pesticides	5B	701465.62
Elk Grove Creek	Diazinon	Pesticides	5B	434302.01
Meadow Creek (below Meadow Lake Dam to Mokelumne River, N Fork)	Oxygen, Dissolved	Nutrients		146516.18
Mokelumne River, Lower (in Delta Waterways, eastern portion)	pH	Miscellaneous		1916001.62
Mokelumne River, Middle Fork	Escherichia coli (E. coli)	Pathogens		1763570.39
Mokelumne River, North Fork	Specific Conductivity	Salinity		2749364.71
Mokelumne River, Upper	Fecal Coliform	Pathogens		685205.51

Cosumnes/Molelumne Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Morrison Creek	Pentachlorophenol (PCP)	Other Organics	5A	1659315.75
Rattlesnake Creek (at confluence w Mokelumne River, N Fork)	Chloride	Salinity		57216.69
Sacramento River (Knights Landing to the Delta)	Chlordane	Pesticides	5A	54083.97
Sugar Pine Creek (tributary to Lower Bear River Reservoir)	Oxygen, Dissolved	Nutrients		124319.06
Sutter Creek (tributary to Dry Creek, Amador County)	Sediment Toxicity	Toxicity		2027363.28
Amador Lake	Nitrate as Nitrate (NO3)	Nutrients		298.51
Beach Lake	Mercury	Metals/Metalloids	5A	95.71
Blue Lake, Lower (Alpine County)	Oxygen, Dissolved	Nutrients		160.81
Camanche Reservoir	Mercury	Metals/Metalloids	5A	7389.15
Delta Waterways (central portion)	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	5A	2185.39
Delta Waterways (eastern portion)	DDT (Dichlorodiphenyltrichloroethane)	Pesticides	5A	1283.72
Delta Waterways (northern portion)	Chlordane	Pesticides	5A	288.55
Jenkinson Lake (El Dorado County)	Nitrate as Nitrate (NO3)	Nutrients		479.94
Lower Bear River Reservoir	pH	Miscellaneous		725.31
Pardee Reservoir	Mercury	Metals/Metalloids	5A	2185.15

4. Ecological Objectives Identified within Watershed Plans

- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage in Service Area.
- Improve and/or expand riparian buffers and salmonid habitats through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Work to improve natural channel morphology.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pesticides, Metal/Metalloids and Other Organics (**Appendix II.I.3.)**.
- Restoration of riparian floodplain forests and tidal wetland areas below Camanche Dam.
- Improve in-stream habitat diversity and function, including wetlands/riparian restoration and gravel augmentation within the Mokelumne River.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure I-2**, Riparian Quality Map (FRAP, 2008).

Additional prioritization for applicable geographic actions will be considered during the ILF proposal stage.

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Appendix J-I

Tahoe River System

J. Tahoe Watershed

The Tahoe Watershed Service Area is 803 square miles and features Lake Tahoe, the Truckee River, and numerous streams and creeks within its boundaries (**Figure J-1**). Lake Tahoe itself is fed by a series of 63 streams and creeks, though its sole outlet is the Truckee River (Murphy & Knopp, 2000). The Truckee River travels from Tahoe City, California, northeast through the cities of Truckee and Reno before flowing east and emptying into Pyramid Lake in Nevada (UCDTERC, 2012). The river features numerous diversion dams and canals that provide water for irrigation use in western Nevada and municipal purposes for communities in both California and Nevada. Lake Tahoe is the largest alpine freshwater lake in North America and contains around 122,160,280 acre-feet of water. About two-thirds of Lake Tahoe's shoreline lies within California borders, the rest residing over the Nevada State line. South Lake Tahoe, Tahoe City, and Kings Beach are the major communities surrounding Lake Tahoe in California. Riparian floodplain forests and lentic wetland ecosystems are important in this Service Area, and Lakeside development has taken a toll on these systems (Cannon, pers. comm.). Vegetation types in the Tahoe Basin include subalpine forest, red fir forest, yellow pine forest, sagebrush scrub, shrub association, deciduous riparian, wetland associations, and meadow association (TRPA, 2011). Because of its location high in the Sierra Nevada, this Service Area only includes headwater and tributary regions. Land cover composition for this watershed is illustrated in **Appendix II.J.1.**

1. Historic Impacts

Timber harvests in the Tahoe Watershed Service Area began with the discovery of silver at the Comstock Lode in Nevada in the mid-1800s that were implemented to support the mining industry (Tahoe Regional Planning Agency, 2013). Once the mining boom slowed, logging in this region continued to grow as its own industry over the years. The Tahoe Watershed Service Area still contained a large amount of timber land within its borders even as late as 1945 (Timbered Lands of 1945 and Current Timberland Harvest Plans Map). With the prevalence of timber and mining activity in the region, roads were constructed to accommodate those industries and made the Lake Tahoe area easier to access. This likely was a factor that allowed Tahoe City and other resort communities surrounding Lake Tahoe to get their start. The increase in urban development in this region led to a decrease in natural seasonal wetlands and montane meadow habitats that supported wildlife. Allocation of water resources was also a major factor that allowed development to commence in the Tahoe Watershed Service Area. The Lake Tahoe Dam, Derby Dam, and Truckee Canal are all pieces of water resource infrastructure located within California that provide irrigation and municipal water for western Nevada and eastern California. Currently, the Lahontan Valley in Nevada claims one-third of the water for irrigation of crops and pastures. Another important use of the Truckee River is for drought relief, as well as for spawning of the endangered cui-ui fish that can only be found in this Truckee River/Pyramid Lake watershed. Lake Tahoe also once supported an extensive population of Lahontan cutthroat trout, which would migrate from Pyramid Lake in Nevada to Lake Tahoe via the Truckee River in immense numbers up through the mid-1800s (University of California, 2007). However, due to overharvesting implemented to feed the region's considerable mining population, the population of this species began to dwindle, and was finally extirpated from the Tahoe region by 1940 because of dam construction (USFWS, 2008). Today, water quality and clarity issues, like cultural eutrophication, have major impacts on Lake Tahoe's ecology.

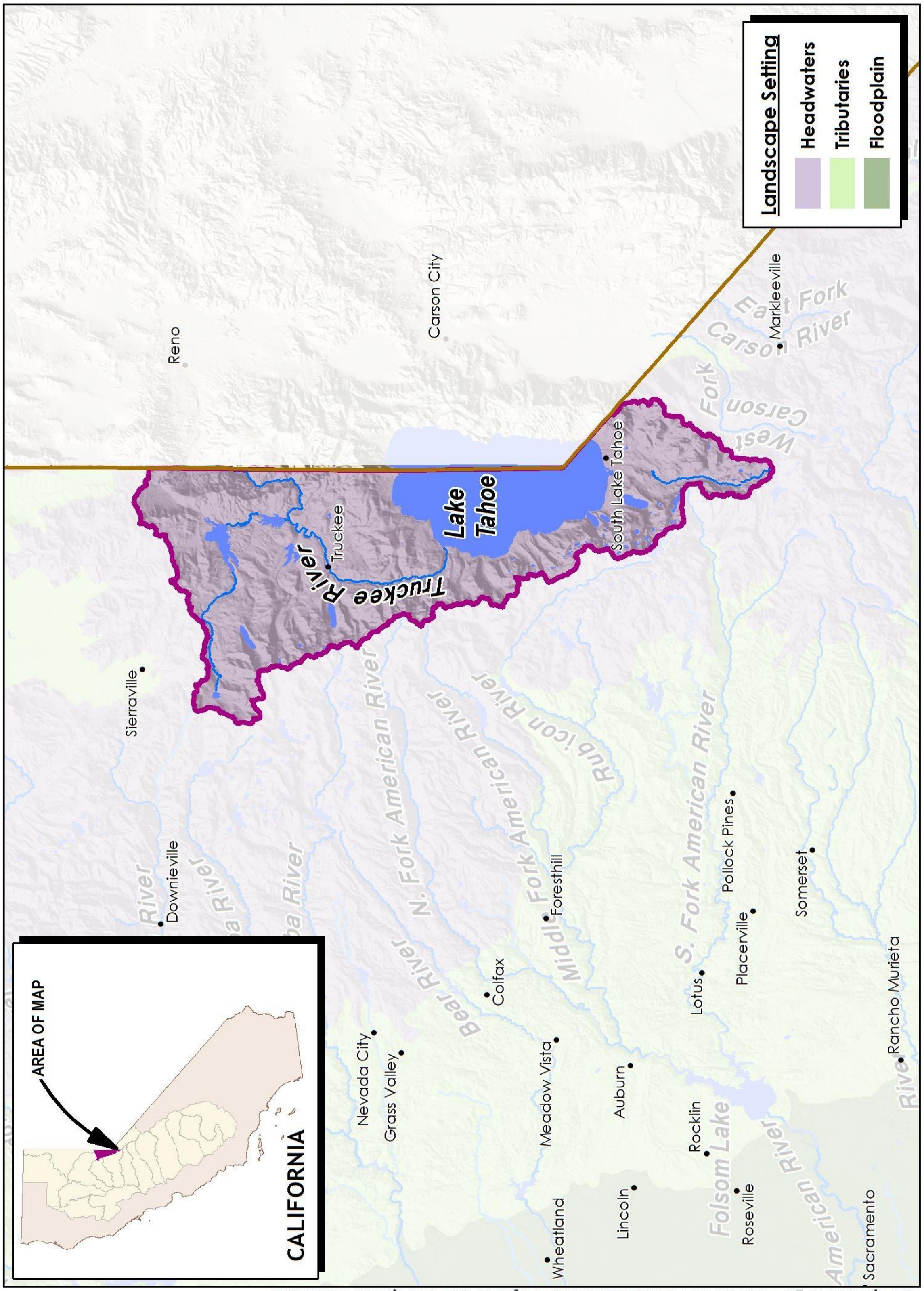

Figure J-1
Tahoe Watershed

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Appendix II.J.1

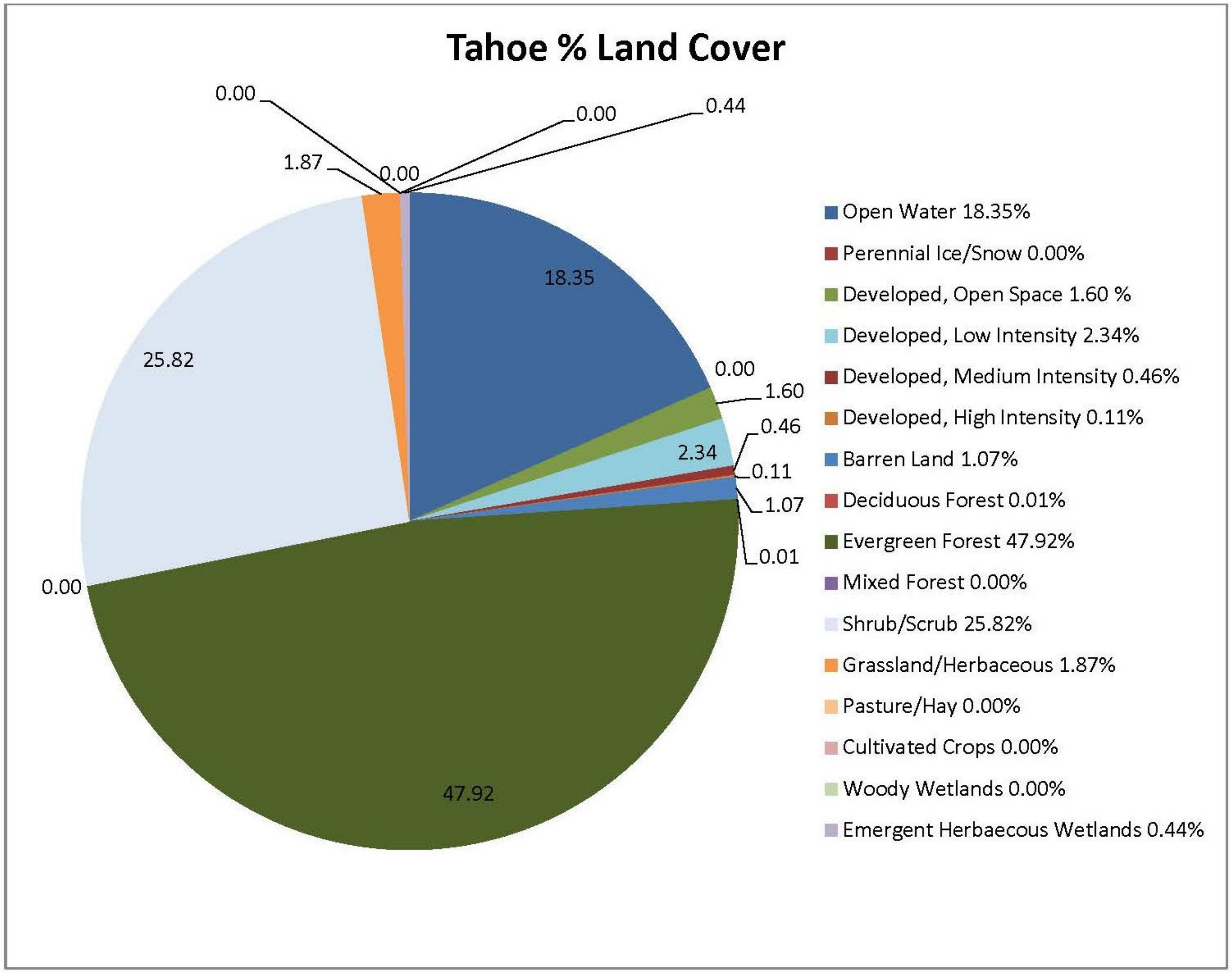

Table J-1. Historical Impacts to Tahoe Watershed

Locatio n		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Tahoe	Headwaters	L	H	L	L	M	M	L
	Tributaries	L	H	L	L	M	M	L
	Main Stem/Floodplain	L	L	L	L	M	H	L

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

Wildfires, which cause massive amounts of erosion and sedimentation to occur in the many creeks and streams that feed into Lake Tahoe, have become more prevalent and hotter in recent years due to a number of factors, including: fire suppression, reductions in old growth forests, increased prominence of younger trees susceptible to drought, and an increased risk of disease/parasites that plague the forests (UCD, 2001). Angora Creek is an Upper Truckee River drainage that is still battling high concentrations of sediment, nitrate, and phosphorus levels due to the erosion and loss of vegetation caused by the Angora Fire of 2007. Elements such as these, as well as pollution runoff from urbanized areas and atmospheric deposition of nitrogen, promote algal growth and are currently thought to be primary factors contributing to the loss of clarity in Lake Tahoe (UCDTERC, 2012). Stream channel and shoreline erosion also play key roles in the loss of water clarity and increase in nutrient and sediment input. The Lake Tahoe Interagency Monitoring Program (LTIMP) noted that over 75% of the excess nutrients entering Lake Tahoe came from the Upper Truckee River, Trout Creek, and Blackwood Creek and that 2011 loads of sediment and nutrients were 2-3 times greater than they were in 2010 (UCDTERC, 2012).

The Truckee River supports a large sport fish population. A self-sustaining population of brown trout is also prevalent in this Service Area. Protecting and enhancing the riparian habitat of the Truckee River and the many streams and creeks of Lake Tahoe are crucial to maintaining this valuable fishery. Mountain meadows are widespread and a key wetland habitat in this region that need protection and enhancement, as many of them have been destroyed, damaged, or altered by development or fire (Cannon, pers. comm.).

Over the years, an increase in roads, as well as construction of tourist facilities such as hiking trails, has caused an increase in erosion and sedimentation in the watershed and negatively impacted water quality. Other tourist attractions – such as the many operating ski resorts in the winter and an abundance of water sports, beach, and camping activities in the summer – influence the area during these peak seasons and present a risk to water quality and the surrounding riparian and wetland habitat. Lake Tahoe's ever-growing popularity has created a conflict between developers (who wish to continue building homes, communities, and attractions in close proximity to the shoreline) and ecologists who are concerned about Lake Tahoe's water quality and clarity, amongst other issues.

Table J-2. Current Impacts to Tahoe Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Tahoe	Headwaters	L	L	L	L	M	H	L
	Tributaries	L	L	L	L	M	H	L
	Main Stem/Floodplain	n/a	n/a	n/a	n/a	n/a	n/a	n/a

H= High, M= Medium, L=Low

Due to extensive urban and water resource development, the hydrology, wetland acreage, and diversity attributes have been highly impacted throughout the headwater and tributary regions of the Tahoe Watershed Service Area (**Figure J-2**). The loss of these attributes has had a profound impact on buffer and landscape context and has slightly impacted biotic structure, especially in regard to fisheries, in the Service Area.

Because of the current absence of pre-settlement data, the precise acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the Tahoe Watershed Service Area. However, Native American territories within the region were said to include hundreds of acres of dense forests, rich riparian habitat, wetlands, and montane meadows in which the Washoe people hunted, fished, and gathered (Forney, et al., 2001). Current wetland types and extents for this Service Area are listed in **Appendix II.J.2.**

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.J.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

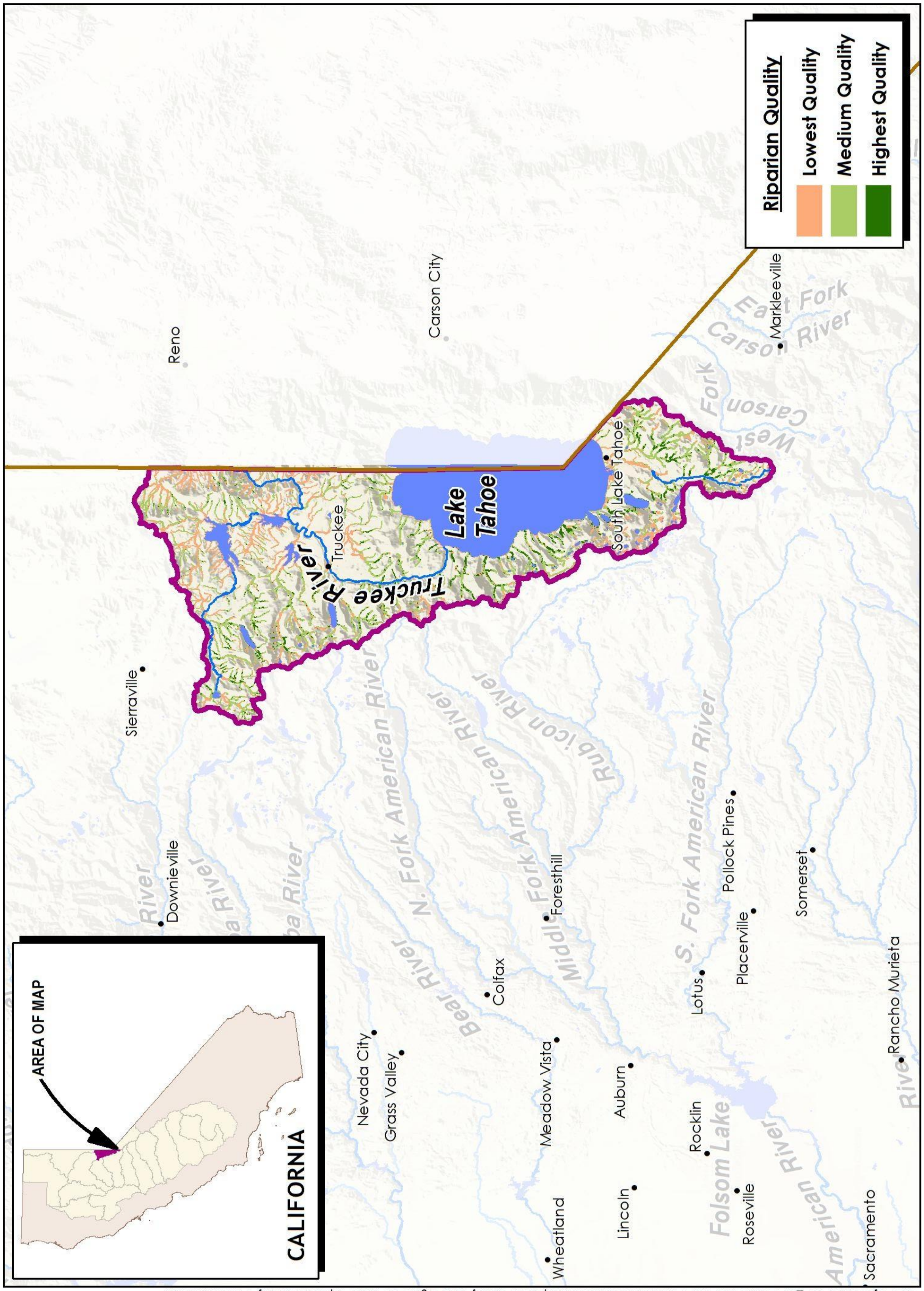

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Figure J-2
Tahoe Watershed Riparian Quality Map

Appendix II.J.2

Tahoe Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	3036.14
LakePond	351.95
Reservoir	17.94
SwampMarsh	155.63
Freshwater Emergent Wetland	7468.81
Freshwater Forested/Shrub Wetland	6739.46
Freshwater Pond	689.55
Lake	95482.67
Other	37.15
Riverine	695.17

Appendix II.J.3

Tahoe Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Bear Creek (Placer County)	Sedimentation/Siltation	Sediment		188929.63
Big Meadow Creek	Pathogens	Pathogens		86252.84
Blackwood Creek	Sedimentation/Siltation	Sediment	5B	371928.90
Bronco Creek	Sedimentation/Siltation	Sediment	5B	73267.17
Cold Creek	Sediment	Sediment		448585.02
General Creek	Phosphorus	Nutrients	5A	574726.62
Gray Creek (Nevada County)	Sedimentation/Siltation	Sediment	5B	163037.53
Heavenly Valley Creek (source to USFS boundary)	Phosphorus	Nutrients	5A	127719.46
Heavenly Valley Creek (USFS boundary to Trout Creek)	Sedimentation/Siltation	Sediment	5A	91703.31
Squaw Creek	Sedimentation/Siltation	Sediment	5B	501266.44
Tallac Creek (below Hwy 89)	Pathogens	Pathogens	5A	123387.83
Trout Creek (above Hwy 50)	Phosphorus	Nutrients	5A	643269.27

Tahoe Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Trout Creek (below Hwy 50)	Nitrogen	Nutrients	5A	51664.81
Truckee River	Sedimentation/Siltation	Sediment	5B	2452945.18
Truckee River, Upper (above Christmas Valley)	Iron	Metals/Metalloids	5A	283308.33
Truckee River, Upper (below Christmas Valley)	2, 6- diethylaniline | 2-chloro-4-isopropylamino-6-amino-s-triazine | Alachlor | Atrazine | Azinphos-methyl (Guthion) | Benefin | Butylate | Carbaryl | Carbofuran | Chlorpyrifos | Cyanazine | DDE (Dichlorodiphenyldichloroethylene) | Dacthal | Diazinon |	Pesticides		727667.58
Ward Creek	Phosphorus	Nutrients	5A	359571.89
Cinder Cone Springs	Nitrate as Nitrate (NO3)	Nutrients		1.04
Donner Lake	Priority Organics	Other Organics	5A	819.30
Tahoe, Lake	Sedimentation/Siltation	Sediment	5A	85318.67

4. Ecological Objectives Identified within Watershed Plans

- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Improve and/or expand riparian buffers and salmonid habitats through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Plant and/or manage adjacent upland buffers to protect riparian corridors against catastrophic fire.
- Prioritization for applicable ecological objectives will be considered during the ILF proposal stage.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pathogens, Metal/Metalloids, Sediment and Nutrients (**Appendix II.J.3.)**.
- Restore riparian areas along the Upper Truckee River watershed.
- Work to improve natural channel morphology in the Upper Truckee River watershed.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure J-2**, Riparian Quality Map (FRAP, 2008).

Prioritization for applicable geographic actions will be considered during the ILF proposal stage.

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Appendix K-I

Carson/Walker River System

K. Carson/Walker Rivers Watershed

The Carson/Walker Rivers Watershed contains two major rivers that originate in the Sierra Nevada Mountains in California and flow north and northeast to empty into reservoirs in the Great Basin of Nevada (**Figure K-1**). The Carson/Walker Rivers Watershed Service Area is 1,361 square miles. Historic land use within this Service Area primarily consisted of grazing in grassy uplands. Some wetlands were present in floodplain regions, and forested lands dominated ecotones at higher elevations (CA Dept. of Forestry Map). The California portion of this watershed receives the majority of the precipitation that accounts for much of the surface water flows, but the Nevada portion utilizes the majority of the water for irrigation and ranching (NDWR Walker/Carson, 2011). Land cover composition for this watershed is illustrated in **Appendix II.K.1.**

The Carson River consists of a western and eastern fork within the upper watershed, which flow along 40 miles in the west and 74 miles in the eastern fork, respectively. The forks merge directly southeast of Genoa in Nevada. The river then flows north past Carson City to Mexican Dam before entering Lahontan Reservoir, finally emptying into the lowest part of the watershed within Carson Sink in Central Nevada. Within the California portion of the Service Area, Markleeville is the main urban center. Vegetation within the upper mountainous reaches of the Carson River consists of forest habitats that support pine, cedar, and fir trees. Riparian areas include black cottonwood, aspen, alder, willows, and grasslands that support mountain meadows (CRC, 2003).

The East and West forks of the Walker River originate south of the Carson River within California. The East Fork of the Walker River flows north through California to form Bridgeport Reservoir before crossing the Nevada State line and merging with the West Fork about 7 miles south of the town of Yerington. The West Fork of the Walker River flows north through California until it collects at Topaz Reservoir on the border of California and Nevada. The West Fork then continues into Nevada until it meets the East Fork to form the main stem of the Walker River. From here, the river flows north before making a sharp turn southeast and emptying into Walker Lake. Vegetation within the California portion of the Walker River Watershed is very similar to that of the Carson River Watershed. There are no major townships in the California portion of the Walker River Service Area. The entire Service Area within California incorporates only headwater and tributary regions of these river systems.

1. Historic Impacts

Mercury contamination is a predominant water quality issue in both the Carson and Walker rivers due to mining activities in the 19th century. The Comstock Mining region near Virginia City, Nevada, caused a prodigious amount of mercury pollution during this time that is still present today. There are approximately 40 inactive mines located throughout the Carson River watershed that also put the river at further risk for contamination from acid mine drainage (WRCB, 2002). The Carson and Walker River Service Area's land and water quality were also impacted by historic mining through deforested slopes, abandoned mine tailings, and steep cuts in channels, resulting in erosion throughout the watershed (CRC, 2003). Mercury-contaminated sediment from historic mining activity likely washed downstream, leading to its discovery within the Walker River Basin in the 1990s. Due to the extent of mining activities in the region, land

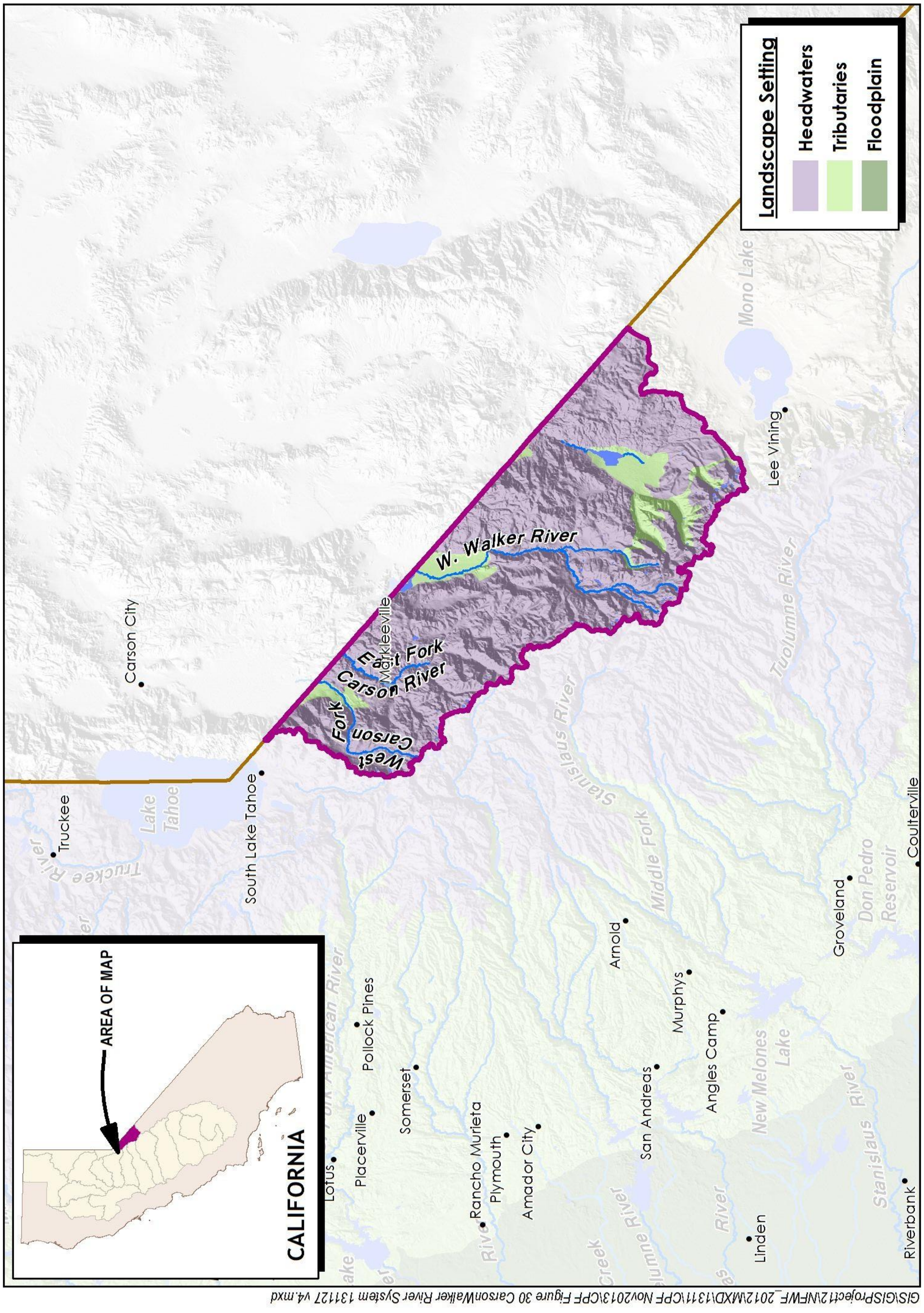
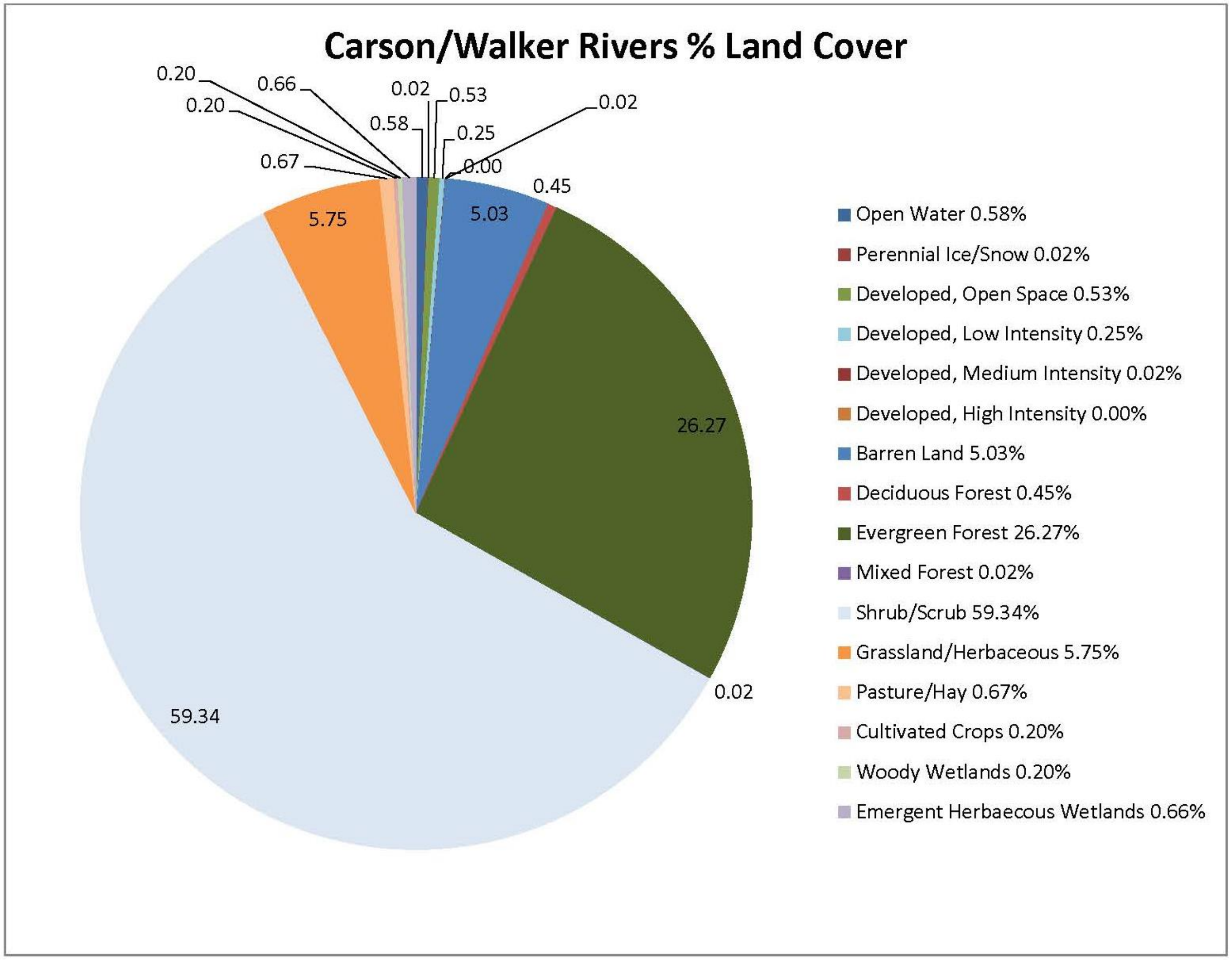


Figure K-1
Carson/Walker Rivers Watershed

Appendix II.K.1



uses consisting of timber harvesting in the mountainous regions of the watershed and agriculture and ranching in the valleys prospered. Agriculture, especially in Nevada, remains a vital industry that relies on the water from these river systems today.

Table K-1. Historical Impacts to Carson/Walker Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Carson/Walker	Headwaters	M	L	L	L	L	L	L
	Tributaries	M	L	L	L	L	L	L
	Main Stem/Floodplain	n/a	n/a	L	n/a	n/a	n/a	n/a

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

The Leviathan Mine is an abandoned open-pit sulfur mine within the Carson River Service Area. Due to chemical and sediment contamination into Leviathan Creek, Aspen Creek, and the East Fork of the Carson River, the mine was listed as a Superfund site in 2000. Historic mining drainage infiltrates the waterways and damages all tiers of the ecosystem, including algae, insects, and fish (EPA Region 9, 2012). Cleanup and water treatment processes continue at this site today.

The agriculture and cattle-grazing industries still dominate the land use within the Carson and Walker River Service Area and are the main employers within this region. This presents a challenge to water quality within the Service Area, due to the high risk of water pollution and sedimentation that these activities can cause. Despite this, the Carson and Walker rivers are known for their fisheries. The West and East forks of the Carson River within California are considered to be “trophy trout” streams and feature golden, rainbow, brown, brook, and Lahontan cutthroat trout (CRC, 2003).

Restoration projects for the Carson and Walker Rivers Watershed Service Area aim to reestablish channel shape, encourage floodplain accessibility, reestablish native riparian vegetation, reduce sedimentation, protect and enhance wetlands, eliminate invasive plant species, reduce non-point source pollution, and to improve natural fisheries in the California and Nevada portions of this Service Area (CRC, 2003).

Table K-2. Current Impacts to Carson/Walker Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Carson/Walker	Headwaters	L	L	L	L	L	L	L
	Tributaries	M	L	L	M	L	L	L
	Main Stem/Floodplain	n/a	n/a	n/a	n/a	n/a	n/a	n/a

H= High, M= Medium, L=Low

Due to past mining and current agricultural development, the hydrology, physical structure, wetland acreage, and diversity attributes have been highly impacted throughout the headwater and tributary regions of the Carson/Walker Service Area (**Figure K-2**). The loss of these attributes has had a profound impact on buffer and landscape context and has impacted biotic structure, especially in regard to fisheries. These trout fisheries rely on the availability and quality of cold water, which are determined by the watershed functions. These watersheds are impacted by anthropogenic stressors such as logging, agriculture, mining, and urban growth. Restoration of floodplain riparian forests and upper watershed functions are necessary in this Service Area (Cannon, pers. comm.).

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the Carson/Walker Rivers Watershed Service Area. However, Native American territories within the California portion of the Service Area were said to include hundreds of acres of rich riparian habitat, widespread grasslands, montane meadows, and forested mountains in which the Washoe people hunted, fished, and gathered (Forney et al., 2001). Current wetland types and extents for this Service Area are listed in **Appendix II.K.2**.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.K.3**. Utilizing the tools

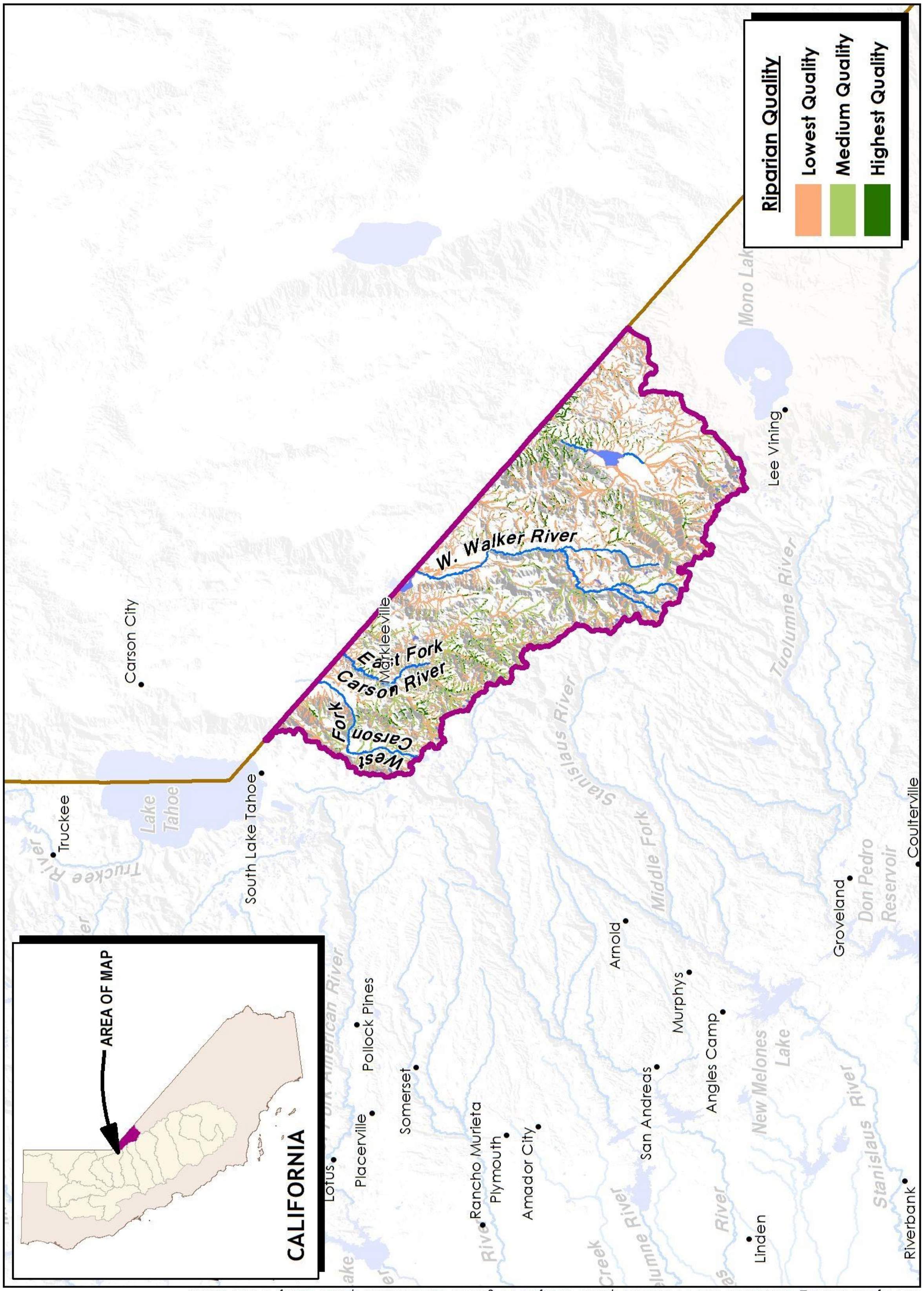


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Figure K-2
Carson/Walker Rivers Watershed Riparian Quality Map

Appendix II.K.2

Carson/Walker Rivers Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	1942.99
Ice Mass	877.29
LakePond	304.81
Playa	35.62
Reservoir	6.02
SwampMarsh	71.35
Freshwater Emergent Wetland	38247.35
Freshwater Forested/Shrub Wetland	7263.78
Freshwater Pond	699.95
Lake	6073.18
Other	18.34
Riverine	880.38

Appendix II.K.3

Carson/Walker Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Aspen Creek	Metals	Metals/Metalloids	5C	58949.99
Aurora Canyon Creek	Habitat alterations	Miscellaneous		511041.81
Bodie Creek	Mercury	Metals/Metalloids	5A	612971.24
Bryant Creek	Metals	Metals/Metalloids	5C	202274.19
Buckeye Creek	pH	Miscellaneous		1087551.95
Carson River, East Fork	Fecal Coliform	Pathogens		2939302.45
Carson River, West Fork (Headwaters to Woodfords)	Pebulate	Pesticides		1140176.08
Carson River, West Fork (Paynesville to State Line)	Pathogens	Pathogens	5A	208195.26
Carson River, West Fork (Woodfords to Paynesville)	Nitrogen	Nutrients	5A	227693.10
Clark Canyon Creek	Habitat alterations	Miscellaneous		313914.78
Clearwater Creek	Sedimentation/Siltation	Sediment	5A	801155.47

Carson/Walker Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
East Walker River, above Bridgeport Reservoir	Pathogens	Pathogens	5C	471254.12
East Walker River, below Bridgeport Reservoir	Copper	Metals/Metalloids		507503.69
Green Creek	Total Kjeldahl Nitrogen (TKN)	Nutrients		1053564.30
Hot Springs Canyon Creek	Sedimentation/Siltation	Sediment		181290.22
Indian Creek (Alpine County)	Pathogens	Pathogens	5A	739802.82
Leviathan Creek	Metals	Metals/Metalloids	5C	204745.57
Monitor Creek	Sulfates	Other Inorganics	5A	252800.10
Robinson Creek (Barney Lake to Twin Lakes)	Dissolved Kjeldahl Nitrogen	Nutrients		252519.06
Robinson Creek (Hwy 395 to Bridgeport Res)	Pathogens	Pathogens	5C	111847.67
Robinson Creek (Twin Lakes to Hwy 395)	Pathogens	Pathogens	5C	576756.22
Rough Creek	Habitat alterations	Miscellaneous		500067.41
Swauger Creek	Pathogens	Pathogens	5C	860953.92
Virginia Creek	Nitrate/Nitrite (Nitrite + Nitrate as N)	Nutrients		1080472.08
West Walker River	Total Kjeldahl Nitrogen (TKN)	Nutrients		3084686.64
Wolf Creek (Alpine County)	Sedimentation/Siltation	Sediment	5A	748965.60
Bridgeport Reservoir	Sedimentation/Siltation	Sediment	5A	2614.44
Indian Creek Reservoir	Phosphorus	Nutrients	5B	164.31
Topaz Lake	Sedimentation/Siltation	Sediment		928.42

above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Prioritization for applicable ecological actions will be considered during the ILF proposal stage.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pathogens, Metal/Metalloids, Nutrients, Sediment and Other Inorganics (**Appendix II.K.3.)**.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure K-2**, Riparian Quality Map (FRAP, 2008).

Prioritization for applicable geographic actions will be considered during the ILF proposal stage.

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Appendix L-I

Calaveras/Stanislaus River System

L. Calaveras/Stanislaus Rivers Watershed

The Calaveras/Stanislaus Rivers Watershed Service Area is 3,421 square miles and contains the main connection of the Sacramento-San Joaquin River Delta in the northwestern portion of its borders (**Figure L-1**). This link between the Sacramento and San Joaquin rivers provides very important habitat for anadromous salmonid and steelhead as they migrate upriver to spawn, as well as for migrating waterfowl. The Calaveras River and the Stanislaus River to the south flow east to southwest before connecting with the San Joaquin River within the Service Area. The Calaveras River features New Hogan Reservoir, formed by the New Hogan Dam, which provides flood control, hydroelectric power, and water for irrigation, recreation, and urban use. The Stanislaus River features a north, middle and south fork that all converge a few miles upstream of New Melones Lake. The upper watershed of the Stanislaus River is heavily dammed and diverted for irrigation and municipal water use along all three forks as well as along the mainstem. The Calaveras/Stanislaus Rivers Watershed Service Area features numerous urban centers, primarily located within the floodplains, such as Stockton, Tracy and Modesto. Vegetation in this region is comprised of delta marshland and riparian habitat in the lower elevations, chaparral, grasslands, and valley oak woodlands in the foothill and mid-elevations, and timber lands consisting of fir trees in the higher elevations (San Joaquin County, 1992). Land cover composition for this watershed is illustrated in **Appendix II.L.1.**

1. Historic Impacts

Prior to 1900, the floodplain regions of this Service Area featured widespread grasslands, riparian habitat buffers surrounding the Calaveras and Stanislaus Rivers, and natural wetlands that could be found throughout the area, and that provided a buffer around the San Joaquin River and Delta system (CA pre-1900 habitat map). Historic mining activity and timber harvesting took place in the upper elevations and in the tributary portions of this Service Area, and led to an increase in road construction, as well as the development of agriculture and livestock grazing as prominent industries in the fertile floodplains. The community of Angels Camp was one of the major gold and placer mining settlements that existed in this Service Area in the late 1840s. Agriculture that supported these settlements also brought an influx of people to lower elevations, and farming communities were formed that later became cities like Stockton and Modesto. The many dams, levees, and diversions that were constructed throughout this Service Area for flood control and agricultural and municipal purposes resulted in blocking salmon and steelhead from accessing historic spawning habitat farther upstream in the delta system and the Calaveras and Stanislaus rivers.

2. Current Impacts and Attribute Status

Historic and current mining waste drainage runoff can cause stream degradation and blockage in the Calaveras, Stanislaus, and San Joaquin rivers due to the prevalence of mines in the foothills and higher elevations of the Service Area. Water pollution from the use of chemicals for agricultural production is also a major risk to the San Joaquin River, delta system, and the lower reaches of the Calaveras River and Stanislaus River. Timber harvesting still takes place in the higher elevations of the Service Area in regions that have been logged since 1945 and presents the possibility of erosion and sedimentation occurring within the Calaveras and Stanislaus rivers (US Forest Service Map, past and present timberlands).

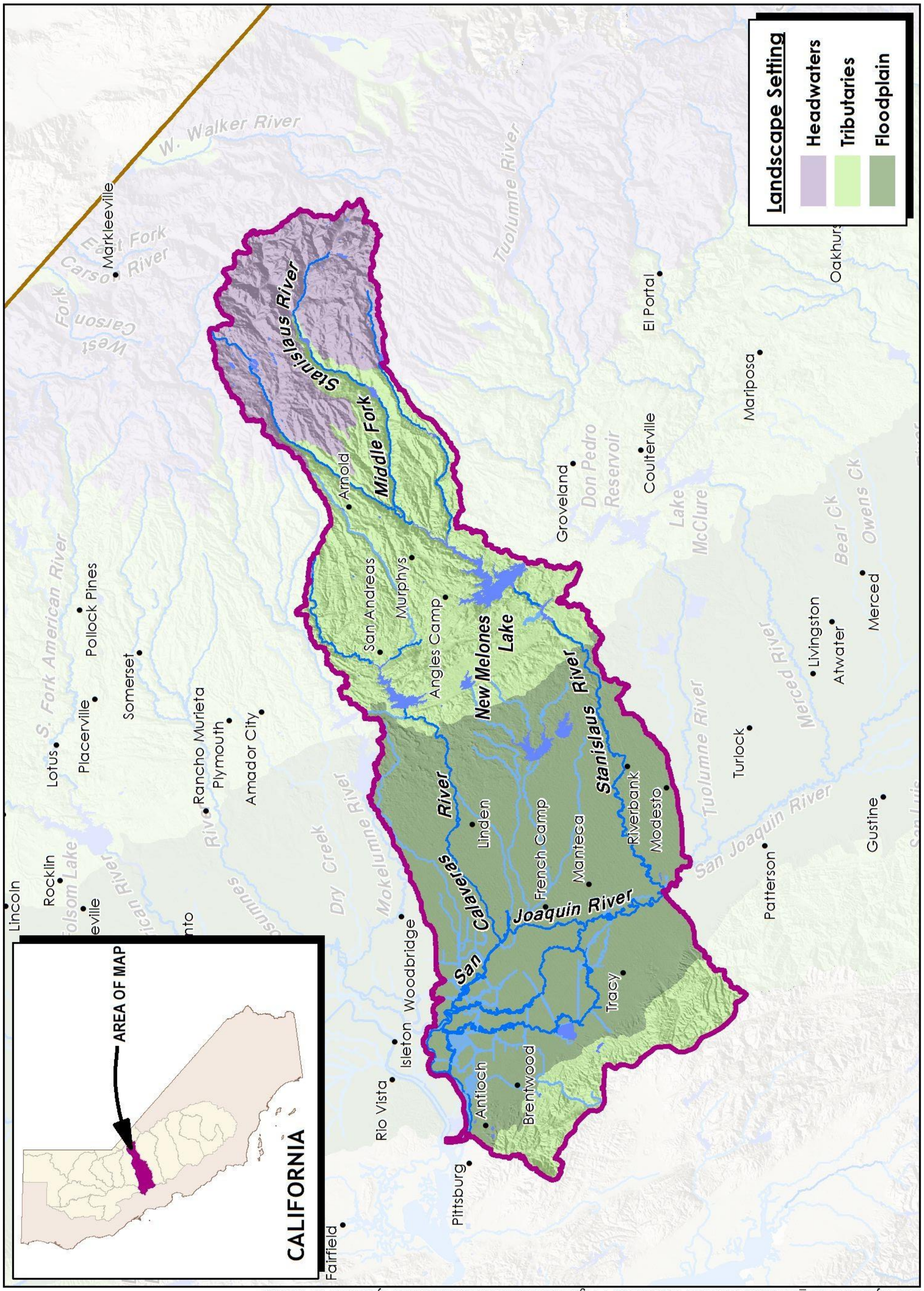

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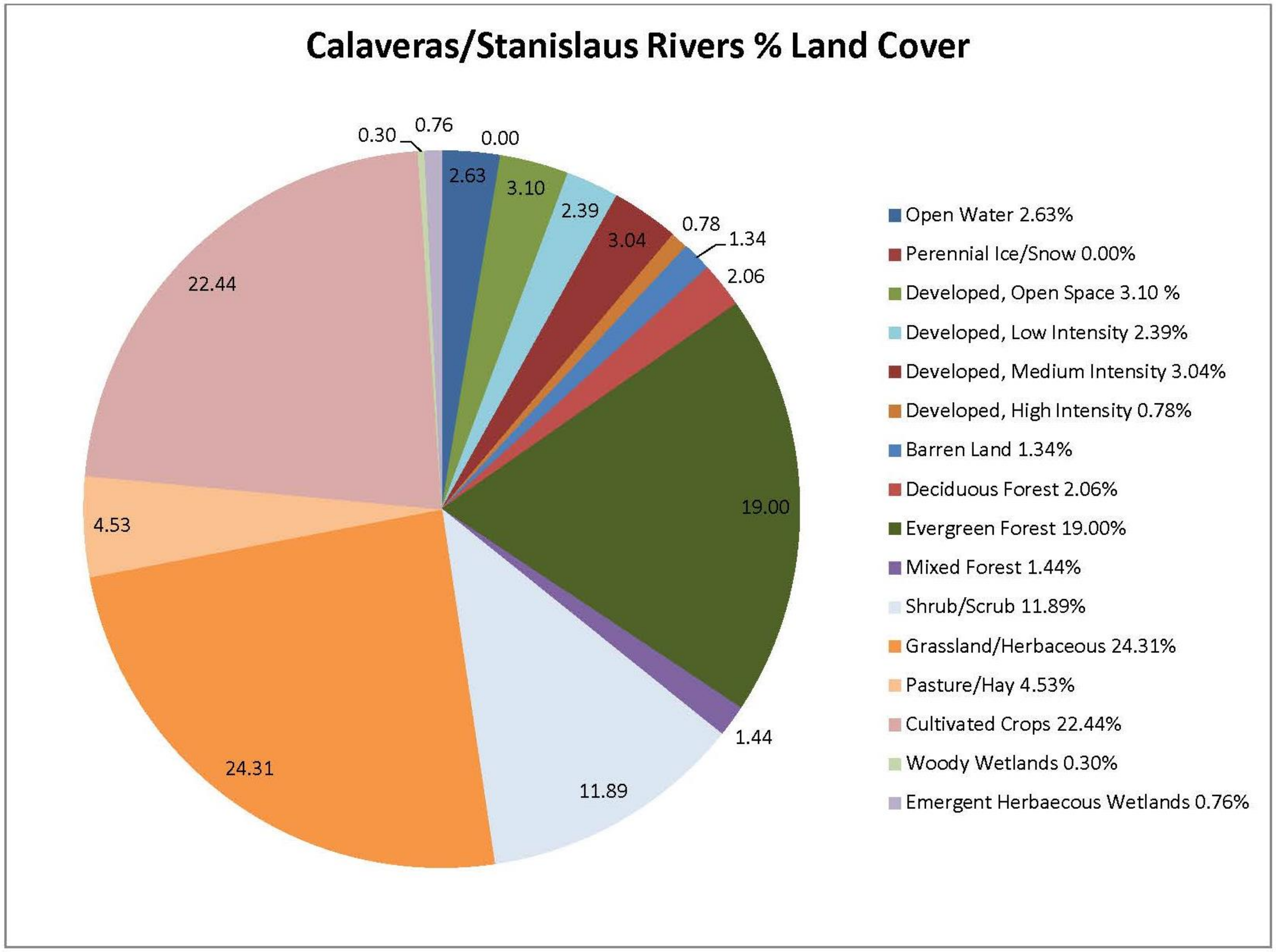
Figure L-1
Calaveras/Stanislaus Rivers Watershed

Appendix II.L.1



The upper reaches of the Calaveras River and the Stanislaus River once provided prime spawning habitat for steelhead and Chinook salmon before being heavily dammed and diverted for agricultural purposes. The San Joaquin River also once supported the southern-most Chinook salmon run in North America (FishBio San Joaquin, 2007). Proposals to restore the continuous flows of the entire San Joaquin River in order to reestablish naturally reproducing Chinook salmon, as well as a water management program that minimizes water supply impacts to agricultural entities and residents within the San Joaquin River Basin, have been suggested (FishBio San Joaquin, 2007). Ecosystem and fisheries restoration plans for the Calaveras and Stanislaus rivers include improving aquatic ecosystem health, monitoring migration of fish to assist water management decisions, maintaining suitable conditions for salmonids, facilitating fish movement with fish screens and ladders, and improving access to fish spawning habitat (FishBio Calaveras/Stanislaus, 2007).

The remaining natural wetlands and riparian zones within the tributary and floodplain regions of this Service Area have received some protection and attention from non-profit groups, as well as from governmental agencies. The River Partners organization conducted the Buffington Project in 1999, which restored and enhanced about 53 acres of riparian habitat along the Stanislaus River (River Partners, 2010). Projects like these have been proposed to protect existing wetlands, create more wetland and buffer habitat, and protect montane meadows, which are prevalent in the higher elevations of the Service Area. These projects are an important start for the protection and recovery of species and wetland resources and habitats, as future projections show continued agricultural development and urbanization will further endanger the riparian, woodland, floodplain, and wetland ecosystems within this Service Area (CA Dept. of Forestry Development Map).

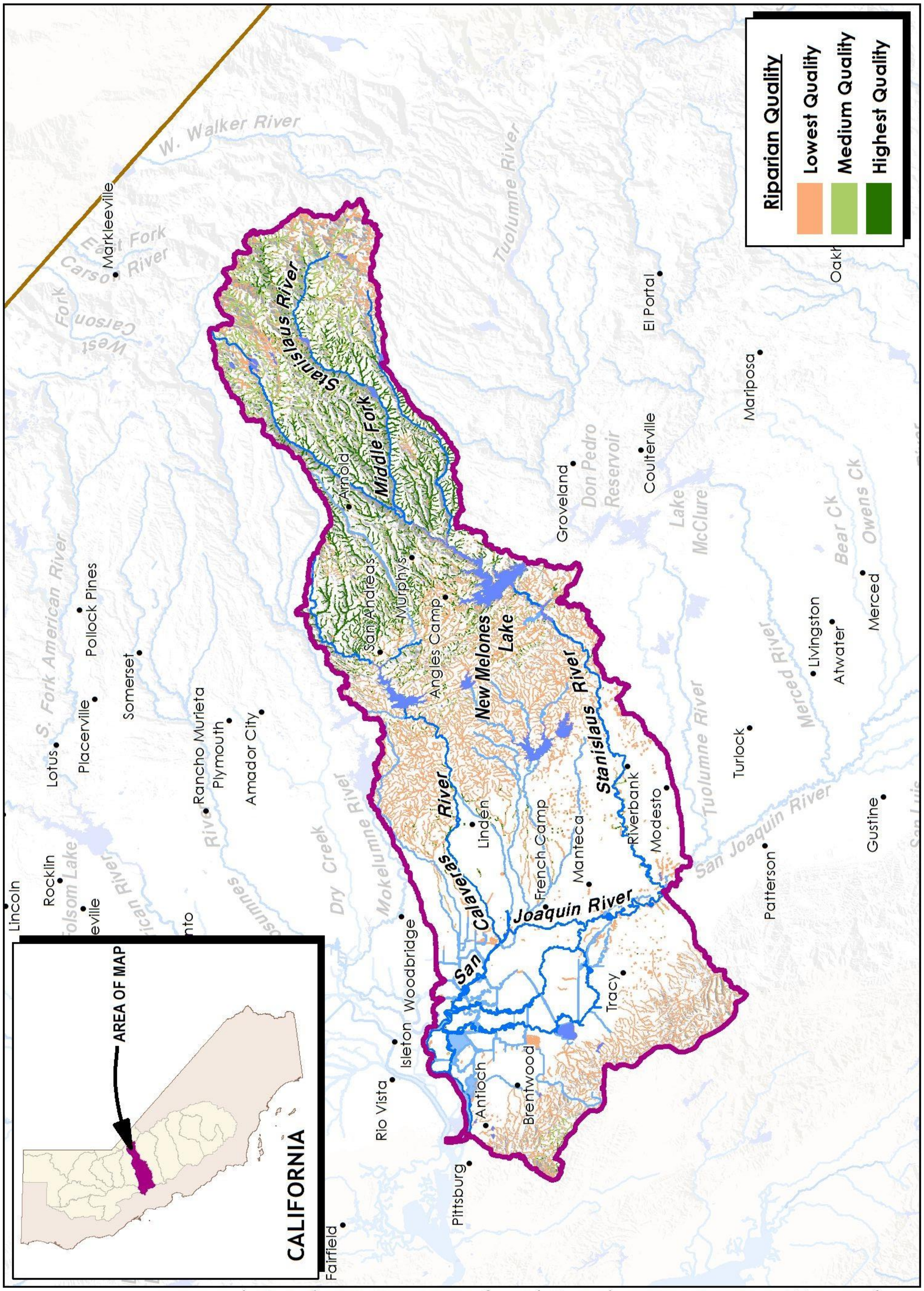
Table L-1. Current Impacts to Calaveras/Stanislaus Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Calaveras/Stanislaus	Headwaters	L	L	M	L	L	L	
	Tributaries	H	M	H	M	M-L	H	L
	Main Stem/Floodplain	L	L	M	H	L	H	H

H= High, M= Medium, L=Low

The cumulative impact of these activities has been the dramatic degradation of the biotic attributes of the watershed, due to both the direct loss of organic matter and fisheries habitats as well as the synergistic results of reduced buffer and landscape, physical structure, and hydrologic attributes (**Figure L-2**). Combined, this has impacted biotic functions at all levels of the Service Area.

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the Calaveras/Stanislaus Rivers Watershed Service Area. However, Native



GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\Riparian Quality\CPF Figure 33 CalaverasStanislaus Riparian Quality 131118 v4.mxd

Figure L-2
Calaveras/Stanislaus Rivers Watershed Riparian Quality Map

American territories within the region were said to include hundreds of acres of rich riparian forested zones, extensive grasslands and wetlands, and oak woodlands (San Joaquin County, 1992). Current wetland types and extents for this Service Area are listed in **Appendix II.L.2.**

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.L.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Work to improve fish passage systems throughout the Service Area.
- Additional prioritization for applicable ecological actions will be considered during the ILF proposal stage.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality of possible restoration sites within the Calaveras River.
- Work to improve water quality and meet TMDLs in the following categories; Pathogens, Metal/Metalloids, Pesticides and Nutrients (**Appendix II.L.3.)**.
- Improve and/or expand riparian buffers and salmonid habitats through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains along the Stanislaus River and its tributaries.
- Improve in stream habitat diversity and function, including wetlands/riparian restoration and gravel augmentation within the Calaveras River and upstream of Oakdale along the Stanislaus River.
- Work to improve natural channel morphology in the Stanislaus River.

Appendix II.L.2

Calaveras/Stanislaus Rivers Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	12427.46
Ice Mass	176.2
LakePond	4898.92
Reservoir	518.41
SwampMarsh	217.31
Estuarine and Marine Deepwater	2407.36
Estuarine and Marine Wetland	504.42
Freshwater Emergent Wetland	11437.44
Freshwater Forested/Shrub Wetland	7592.2
Freshwater Pond	4553.26
Lake	30912.8
Other	174220.47
Riverine	24257.84

Appendix II.L.3

Calaveras/Stanislaus Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Avena Drain	Ammonia	Nutrients	5A	403804.59
Bear Creek (San Joaquin and Calaveras Counties; partly in Delta Waterways, eastern portion)	Low Dissolved Oxygen	Nutrients	5A	2636080.32
Calaveras River, Lower (from Bellota Weir to Stockton Diverting Canal)	Chromium (total)	Metals/Metalloids		1344250.62
Calaveras River, Lower (from New Hogan Reservoir to Bellota Weir)	Cadmium	Metals/Metalloids		1181248.74
Calaveras River, Lower (from Stockton Diverting Canal to the San Joaquin River; partly in Delta Waterways, eastern portion)	Diazinon	Pesticides	5B	478189.37
Calaveras River, North Fork (Calaveras County)	Chromium (total)	Metals/Metalloids		1713032.55
Calaveritas Creek (Calaveras County)	Nitrate as Nitrate (NO3)	Nutrients		665706.11
Duck Creek (San Joaquin County)	Mercury	Metals/Metalloids	5A	2115123.53
Dunn Creek (Mt Diablo Mine to Marsh Creek)	Metals	Metals/Metalloids	5A	44143.61
Five Mile Slough (Alexandria Place to Fourteen Mile Slough; in Delta Waterways, eastern portion)	Methidathion	Pesticides		53412.39
French Camp Slough (confluence of Littlejohns and Lone Tree Creeks to San Joaquin River, San Joaquin Co; partly in Delta Waterways, eastern portion)	Methidathion	Pesticides		286343.02
Kellogg Creek (Los Vaqueros Reservoir to Discovery Bay; partly in Delta Waterways, western portion)	pH	Miscellaneous		856587.42
Littlejohns Creek	Diuron	Pesticides		4388526.59
Lone Tree Creek	pH (low)	Miscellaneous		940251.55
Marsh Creek (Dunn Creek to Marsh Creek Reservoir)	Mercury	Metals/Metalloids	5A	719665.47

Calaveras/Stanislaus Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Marsh Creek (Marsh Creek Reservoir to San Joaquin River; partly in Delta Waterways, western portion)	pH	Miscellaneous		612400.48
Middle River (in Delta Waterways, southern portion)	Low Dissolved Oxygen	Nutrients	5A	7426.27
Mormon Slough (Commerce Street to Stockton Deep Water Channel; partly in Delta Waterways, eastern portion)	Propanil (DCPA mono- and di-acid degrad)	Pesticides		17876.69
Mormon Slough (from Stockton Diverting Canal to Bellota Weir--Calaveras River)	Methyl Tertiary-Butyl Ether (MTBE)	Other Organics		850515.94
Mormon Slough (Stockton Diverting Canal to Commerce Street)	Pathogens	Pathogens	5A	328312.09
Mosher Slough (upstream of I-5; partly in Delta Waterways, eastern portion)	Pathogens	Pathogens	5A	216162.37
Mountain House Creek (from Altamont Pass to Old River, Alameda and San Joaquin Counties; partly in Delta Waterways, southern portion)	Boron	Metals/Metalloids		680702.23
Paddy Creek (San Joaquin County)	Oxygen, Dissolved	Nutrients		839563.85
Paradise Cut (in Delta Waterways, southern portion)	Chlorpyrifos	Pesticides		110188.92
Pixley Slough (San Joaquin County; partly in Delta Waterways, eastern portion)	Malathion	Pesticides		725839.27
San Antonio Creek (Calaveras County)	Nickel	Metals/Metalloids		2051014.78
San Joaquin River (Tuolumne River to Stanislaus River)	Lindane/gamma Hexachlorocyclohexane (gamma-HCH)	Pesticides		1239.49
San Joaquin River (Stanislaus River to Delta Boundary)	DDE (Dichlorodiphenyldichloro ethylene)	Pesticides	5A	198816.28
Sand Creek (tributary to Marsh Creek, Contra Costa County; partly in Delta Waterways, western portion)	Dieldrin	Pesticides	5A	659766.87

Calaveras/Stanislaus Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Smith Canal (in Delta Waterways, eastern portion)	Pathogens	Pathogens	5A	155078.45
Stanislaus River, Lower	Nickel	Metals/Metalloids		4349899.62
Stanislaus River, Upper (New Melones Res to Tulloch Res)	Escherichia coli (E. coli)	Pathogens		336414.12
Temple Creek	Ammonia	Nutrients	5A	634441.71
Tom Paine Slough (in Delta Waterways, southern portion)	Lead	Metals/Metalloids		337837.22
Walker Slough (partly in Delta Waterways, eastern portion)	Pathogens	Pathogens	5B	113755.12
Walthall Slough (in Delta Waterways, eastern portion)	Oxygen, Dissolved	Nutrients		280015.81
Delta Waterways (central portion)	DDT (Dichlorodiphenyltrichloro ethane)	Pesticides	5A	9112.23
Delta Waterways (eastern portion)	DDT (Dichlorodiphenyltrichloro ethane)	Pesticides	5A	1687.81
Delta Waterways (export area)	Unknown Toxicity	Toxicity	5A	583.43
Delta Waterways (southern portion)	DDT (Dichlorodiphenyltrichloro ethane)	Pesticides	5A	3125.40
Delta Waterways (Stockton Ship Channel)	Unknown Toxicity	Toxicity	5A	1603.40
Delta Waterways (western portion)	Diazinon	Pesticides	5B	7579.49
Marsh Creek Reservoir	Mercury	Metals/Metalloids	5A	278.33
New Hogan Lake (Calaveras County)	Zinc	Metals/Metalloids		3179.73
New Melones Reservoir	Mercury	Metals/Metalloids	5A	1654.14
Sacramento San Joaquin Delta	Selenium	Metals/Metalloids	5A	721.40
Tulloch Reservoir	Mercury	Metals/Metalloids	5A	992.09
Woodward Reservoir	Mercury	Metals/Metalloids	5A	1774.61

Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure L-2**, Riparian Quality Map (FRAP, 2008).

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Appendix M-I

Merced/Tuolumne River System

M. Merced/Tuolumne Rivers Watershed

The Merced/Tuolumne Rivers Watershed Service Area is 4,057 square miles in size and contains a segment of the San Joaquin River as well as numerous creeks and several reservoirs (**Figure M-1**). The Tuolumne River and the Merced River south of it originate in the Sierra Nevada Mountains and flow east to southwest before connecting with the San Joaquin River within the Service Area. The Tuolumne River features a north, middle, and south fork, and the Merced River features a north and a south fork. New Exchequer Dam and Lake McClure on the Merced River and Don Pedro Dam and Reservoir on the Tuolumne River are two major features of water resource development infrastructure present in the Service Area. These dams and reservoirs, along with other smaller diversion dams and canals, provide water for irrigation, municipal use, power generation, flood control, and water storage. The Tuolumne and Merced Rivers both originate within Yosemite National Park, and contribute to the geological landscape of the Park. The Merced River runs through the Yosemite Valley while the Tuolumne River is blocked off by the dam at the terminus of the Hetch Hetchy Reservoir. This reservoir provides drinking water for the city of San Francisco. The cities of Turlock, Patterson and Modesto are located throughout the floodplain region of the Service Area and are considered to be the main urban centers of these watersheds. There are three main ecosystems within this Service Area, Sierra (containing some reservoirs), Foothills (containing the remainder of the reservoirs), and the Central Valley. Vegetation in these regions is comprised of wetland marsh, riparian forested zones, and herbaceous species in the lower elevations, chaparral, grasslands, and valley oak woodlands in the foothill and mid-elevations, and timber lands consisting of fir trees in the higher elevations (DWRSJ, 2002). Land cover composition for this watershed is illustrated in **Appendix II.M.1.**

1. Historic Impacts

Prior to 1900, the floodplain regions of this Service Area featured widespread grasslands, riparian habitat buffers surrounding the Merced and Tuolumne Rivers, and natural wetlands that could be found throughout the area. These provided a buffer around the San Joaquin River (CA pre-1900 habitat map). Historic mining activity and timber harvesting took place in the upper elevations and in the tributary elevations along the Tuolumne and Merced rivers in this Service Area. The influx of settlers to the region led to an increase in road construction, as well as the development of agriculture and livestock grazing as a prominent industry in the fertile floodplains. The many dams, levees, and diversions that were constructed throughout this Service Area for flood control, agricultural, and municipal purposes resulted in blocking salmon and steelhead from accessing historic spawning habitat farther upstream in the San Joaquin, Merced, and Tuolumne rivers.

The creation of Yosemite National Park by Congress in 1890 allowed for the protection of the land within this Service Area in a time when mining for gold and logging timber were rampant. The first tourists to the area arrived in 1855 and stimulated the construction of roads, homes and lodging for human development in this remote location (FishBio Merced, 2007). Millions of tourists continue to frequent Yosemite National Park each year and increase human impact on the wetlands and riparian habitats along the Merced and Tuolumne rivers that run through the Park.

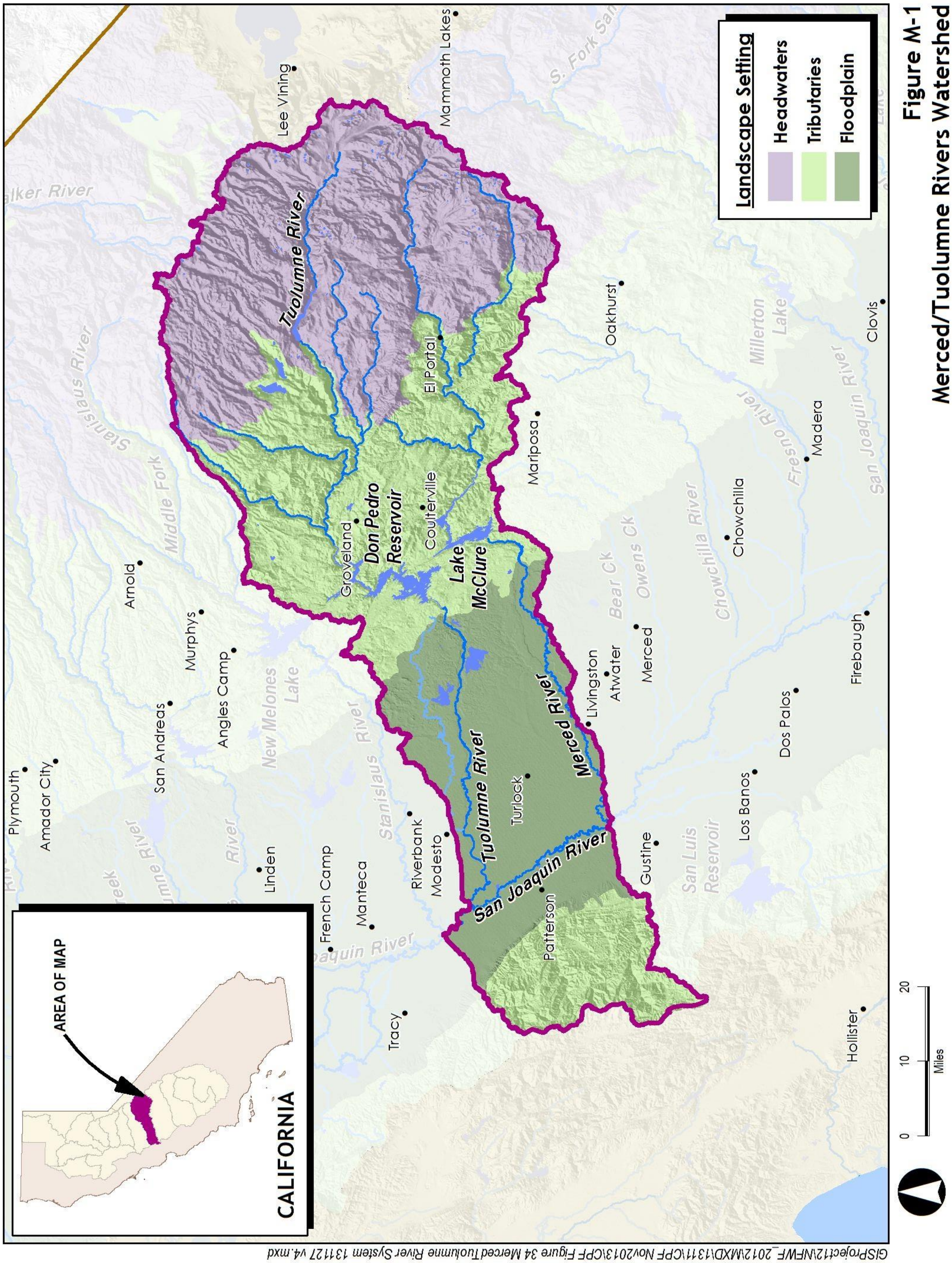
Figure M-1
Merced/Tuolumne Rivers Watershed
Landscape Setting
Headwaters
Tributaries
Floodplain
CALIFORNIA
AREA OF MAP
0
10
20
Miles
Tuolumne River
Merced River
San Joaquin River
Don Pedro Reservoir
Lake McClure
Lee Vining
Mammoth Lakes
El Portal
Oakhurst
Mariposa
Coulterville
Groveland
Arnold
Murphys
Angles Camp
San Andreas
Plymouth
Amador City
Linden
French Camp
Manteca
Riverbank
Modesto
Tracy
Turlock
Patterson
Gustine
Livingston
Atwater
Merced
Los Banos
Dos Palos
Chowchilla
Madera
Firebaugh
Clovis
Hollister
Walker River
Stanislaus River
Middle Fork
New Melones Lake
Bear Ck
Owens Ck
Chowchilla River
Fresno River
Millerton Lake
San Joaquin River
San Luis Reservoir
S. Fork San
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Appendix II.M.1

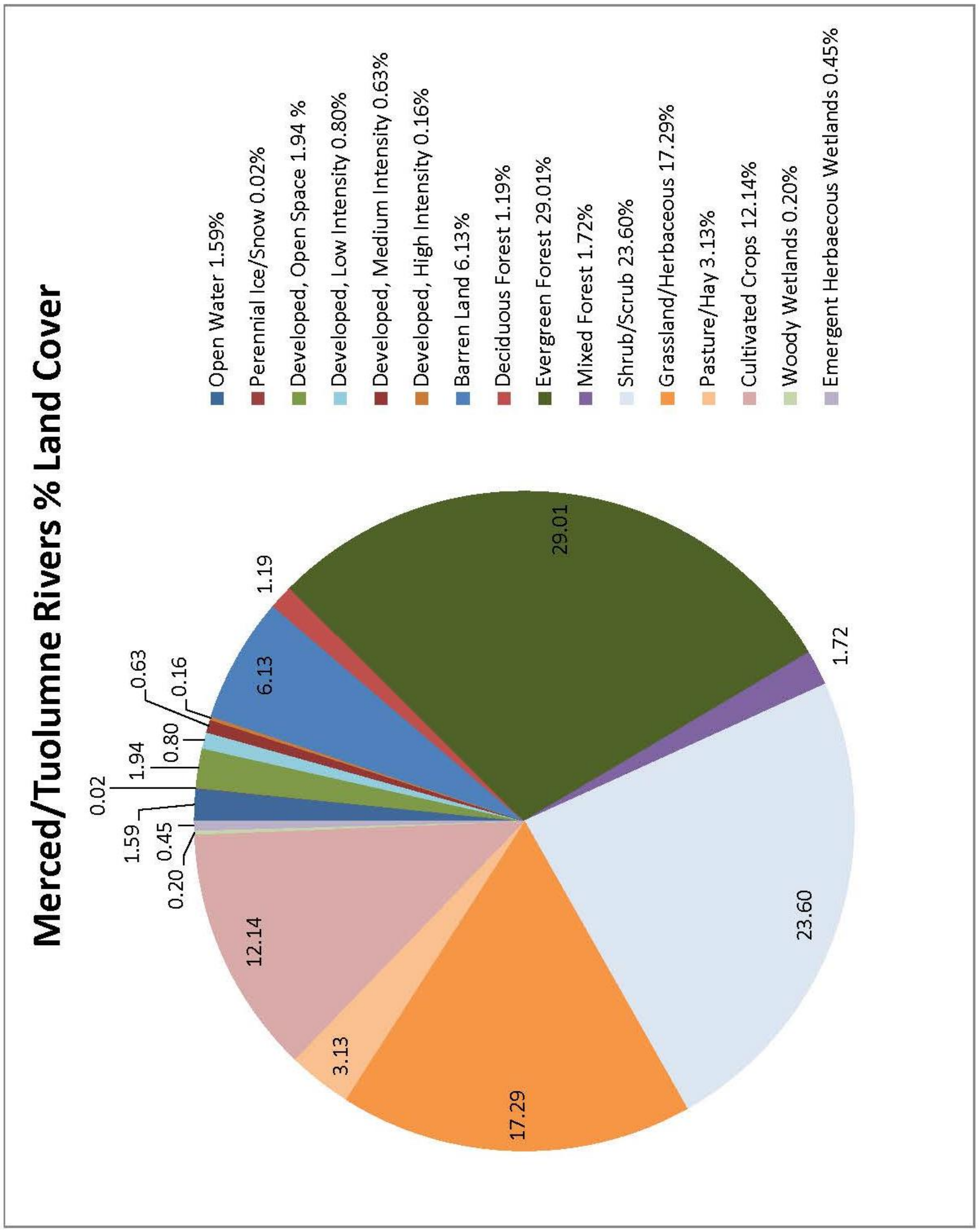

Table M-1. Historical Impacts to Merced/Tuolumne Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Merced/ Tuolumne	Headwaters	M	M	M	L	L	L	L
	Tributaries	H	M	M	M	M	L	L
	Main Stem/Floodplain	M	L	M	H	M	L	L

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

Historic and current mining waste drainage runoff can cause stream degradation and blockage in the Merced, Tuolumne, and San Joaquin rivers due to the prevalence of mines in the foothills and higher elevations of the Service Area. Water pollution from the use of chemicals for agricultural production is also a major risk to the San Joaquin River and the lower reaches of the Merced River and Tuolumne River. In addition, gravel and dredger gold mining has left extensive damage in the valleys (Cannon, pers. comm.). Timber harvesting still takes place in the higher elevations of the Service Area in regions that have been logged since 1945 and contribute to the possibility of erosion and sedimentation occurring within the Merced and Tuolumne Rivers (US Forest Service Map, past and present timberlands).

The upper reaches of the Merced River and the Tuolumne River once provided prime spawning habitat for steelhead and Chinook salmon before being heavily dammed and diverted for agricultural purposes. The San Joaquin River also once supported the southernmost Chinook salmon run in North America (FishBio San Joaquin, 2007). Ecosystem and fisheries restoration plans for the Merced and Tuolumne rivers include improving aquatic ecosystem health, monitoring migration of fish to assist water management decisions, maintaining suitable conditions for salmonids, facilitating fish movement with fish screens and ladders, and improving access to fish spawning habitat (FishBio Tuolumne, 2007).

The remaining natural wetlands and the riparian zones within the tributary and floodplain regions of this Service Area receive less attention than the portions of the Merced and Tuolumne Rivers that run through Yosemite National Park, but are also in need of protection and enhancement. However, it is important to recognize that lower anadromous zones and their values are different from park zones and therefore vary in their need for protection (Cannon, pers. comm.). Projects to protect existing wetlands, create more wetland and buffer habitat, and protect montane meadows, which are prevalent in the higher elevations of the Service Area have been proposed for these areas. These projects are important for the protection of species and wetland resources, as future projections show continued agricultural development and urbanization will further endanger the riparian and wetland ecosystems within this Service Area (CA Dept. of Forestry Development Map).

Table M-2. Current Impacts to Merced/Tuolumne Rivers Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Merced/ Tuolumne	Headwaters	L	L	M	L	L	L	L
	Tributaries	L	L	M	H	M	L	L
	Main Stem/Floodplain	L	L	M	H	M	L	L

H= High, M= Medium, L=Low

Due to extensive agricultural and water resource development, the hydrology, physical structure, wetland acreage, and diversity attributes have been highly impacted throughout the lower elevations of the Merced/Tuolumne River Service Area (**Figure M-2**). The loss of these attributes has had a profound impact on buffer and biotic structure, especially in regard to fisheries, at the lower elevations.

Because of the current absence of pre-settlement data, the acreage and/or diversity of aquatic resource attributes that have been impacted over the past 250 years cannot be precisely determined within the Merced/Tuolumne Rivers Watershed Service Area. However, Native American territories within the region were said to include hundreds of acres of rich riparian forested zones, extensive grasslands and wetlands, and oak woodlands (Friends of the River, 2006-13). Current wetland types and extents for this Service Area are listed in **Appendix II.M.2**.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.M.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

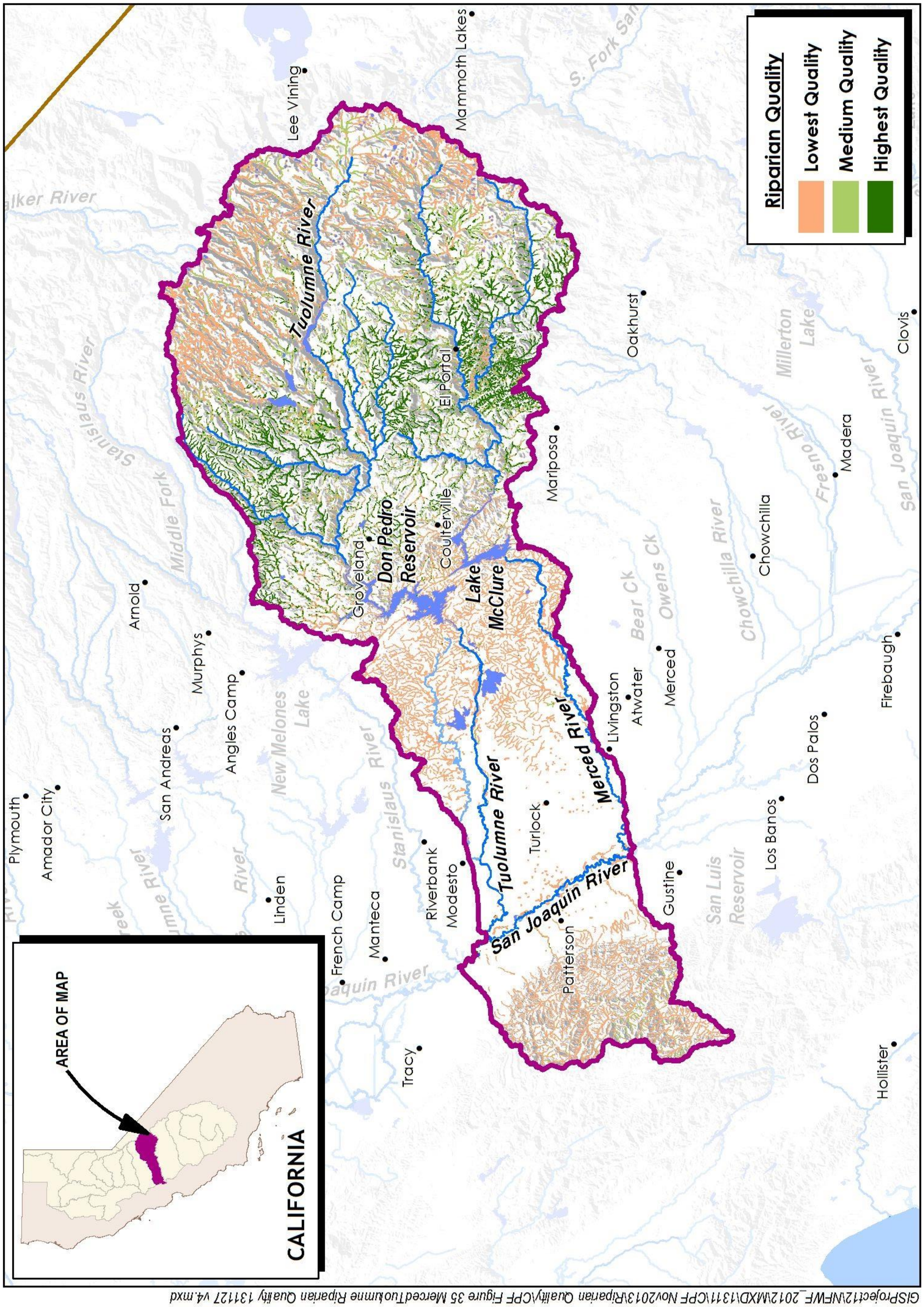

Figure M-2
Merced/Tuolumne Rivers Watershed Riparian Quality Map

Appendix II.M.2

Merced/Tuolumne Rivers Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	13012.66
Ice Mass	1204.42
LakePond	2382.72
Playa	14.7
Reservoir	559.3
SwampMarsh	382.15
Freshwater Emergent Wetland	19933.72
Freshwater Forested/Shrub Wetland	13344.31
Freshwater Pond	4861.41
Lake	37115.4
Other	647.01
Riverine	6533.75

Appendix II.M.3

Merced/Tuolumne Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Curtis Creek (Tuolumne County)	Oxygen, Dissolved	Nutrients		734547.22
Del Puerto Creek	Simazine	Pesticides		409946.78
Dry Creek (tributary to Tuolumne River at Modesto, E Stanislaus County)	Simazine	Pesticides		2125824.28
Grayson Drain (at outfall)	Oxygen, Dissolved	Nutrients		1878.16
Harding Drain	Sediment Toxicity	Toxicity		527825.94
Highline Canal (from Mustang Creek to Lateral No 8, Merced and Stanislaus Counties)	Diazinon	Pesticides		917125.65
Hospital Creek (San Joaquin and Stanislaus Counties)	Methyl Parathion	Pesticides		1303283.93
Ingalsbe Slough (tributary to Merced River, Merced County)	Unknown Toxicity	Toxicity	5A	610599.05
Ingram Creek (from confluence with Hospital Creek to Hwy 33 crossing)	Nitrate as Nitrate (NO3)	Nutrients		177017.48
Ingram Creek (from confluence with San Joaquin River to confluence with Hospital Creek)	Salinity	Salinity	5A	133429.13
Lewis Fork (Madera County)	pH	Miscellaneous		26194.24
Merced River, Lower (McSwain Reservoir to	Unknown Toxicity	Toxicity	5A	3146777.98
Merced River, Upper	pH	Miscellaneous		1792920.24
Mustang Creek (Merced County)	Unknown Toxicity	Toxicity		268817.55

Merced/Tuolumne Rivers Watershed				
Water Body Name	Pollutant Category	Pollutant Type	TMDL Status	Linear Feet Impacted
Orestimba Creek (above Kilburn Road)	Propargite	Pesticides		578611.16
Orestimba Creek (below Kilburn Road)	Trebufos	Pesticides		169968.69
Salado Creek (Stanislaus County)	Zinc	Metals/Metalloids		600119.15
San Joaquin River (Merced River to Tuolumne River)	Malathion	Pesticides		2159540.38
San Joaquin River (Tuolumne River to Stanislaus River)	Lindane/gamma Hexachlorocyclohexane (gamma-HCH)	Pesticides		567898.19
Sullivan Creek (from Phoenix Reservoir to Don Pedro Lake, Tuolumne County)	Escherichia coli (E. coli)	Pathogens	5A	685470.81
Tuolumne River, Lower (Don Pedro Reservoir to San Joaquin River)	Specific Conductivity	Salinity		5102800.07
Tuolumne River, Upper (Don Pedro Res to Hetch Hetchy Reservoir)	Invasive Species	Miscellaneous		2590717.36
Westley Wasteway (Stanislaus County)	Oxygen, Dissolved	Nutrients		253518.77
Woods Creek (Tuolumne County)	pH	Miscellaneous		961758.86
Don Pedro Lake	Mercury	Metals/Metalloids	5A	11055.60
Hetch Hetchy Reservoir	Mercury	Metals/Metalloids	5A	1839.80
McClure Reservoir (Mariposa County)	Mercury	Metals/Metalloids	5A	5604.98
Modesto Reservoir	Mercury	Metals/Metalloids	5A	1964.13
Turlock Lake	Mercury	Metals/Metalloids	5A	3179.54

4. Ecological Objectives Identified within Watershed Plans

- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Improve in-stream habitat diversity and function, including wetlands/riparian restoration and gravel augmentation.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Work to improve fish passage systems throughout the Service Area.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pathogens, Toxicity and Salinity (**Appendix II.M.3.)**.
- Improve and/or expand riparian buffers and salmonid habitats through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains along the Merced River.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure M-2**, Riparian Quality Map (FRAP, 2008).

Additional prioritization for applicable geographic actions will be considered during the ILF proposal stage.

6. References

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Appendix N-I

San Joaquin River System

N. San Joaquin Watershed

The San Joaquin Watershed Service Area is approximately 5,811 square miles and contains several smaller urban areas (100,000 people) including Merced, Madera, and Los Banos (**Figure N-1**). The San Joaquin headwaters, comprised of the South and Middle forks, are approximately 10,000 feet above sea level in the Sierra Nevada. Flows enter this river system from the southern portion of Yosemite National Park and several surrounding wilderness areas in the highest portions of the Service Area, while major tributaries such as the Merced, Tuolumne, and Stanislaus contribute to the main channel at floodplain elevations. This makes the San Joaquin watershed one of the largest in California.

Even prior to construction of the extensive dam and canal system in this Service Area, extreme fluctuations in water availability and temperature were typical because of the watershed's size and the differing ecotones it encompasses. Because of this, the main stem could have been categorized as both a cold and warm water system at different times and locations. This allowed the system to support a plethora of fish, including at least 23 native species, with 12 of these being endemic (Sierrafoothill.org, 2006). Further, due to subsurface seepage from Tulare Lake, which may have doubled the river's volume, permanent and seasonal freshwater marshes that lined the lower San Joaquin River channel were able to persist and support these abundant fisheries even through hot, dry summers (Sierrafoothill.org, 2006). Upland vegetation throughout the watershed varies from alpine dwarf shrub, red fir forest, yellow pine forests, pinyon-juniper woodland, and valley grasslands. Land cover composition for this watershed is illustrated in **Appendix II.N.1.**

1. Historic Impacts

Like much of northern California, gold mining played a formative role in the development of this Service Area. However, unlike in the Sacramento Valley, mining did not directly impact the region's natural resources, as most of these activities consisted of placer, versus hydraulic, mining since gold in this area was of a fine texture mixed with sand and gravel (Sierrafoothill.org, 2006). While some timber harvest did occur, this too played a relatively minor role in the watershed. Rather, the primary alteration of the landscape occurred due to the intermarriage of agriculture and water development, which supported large mines elsewhere in the State.

In 1880, the Upper San Joaquin Irrigation Company attempted the first large-scale water storage facility in the Service Area, designed to irrigate 250,000 acres with water diverted from the San Joaquin River. While this dam was destroyed by floods in 1882, it began a trend of extensive water infrastructure development that would result in over 350,000 acres of irrigated land in the San Joaquin Basin by 1900 (Sierrafoothill.org, 2006). The demand for irrigation water continued to grow as various interests utilized drainage basins such as Kesterson Reservoir (Cannon, pers. comm.) to drain the lower river, which historically supported extensive wetlands of the San Joaquin Valley. The water from these basins was used to facilitate agricultural conversion to farms. Thus, in 1937 construction of the Friant Dam began, which served to provide flood control and irrigation to almost 1,000,000 acres of farmland in Fresno, Kern, Madera, and Tulare counties. Unfortunately, this resulted in several reaches of the river being dewatered under dry to normal conditions, with the exception of return flows from agricultural operations and flooding

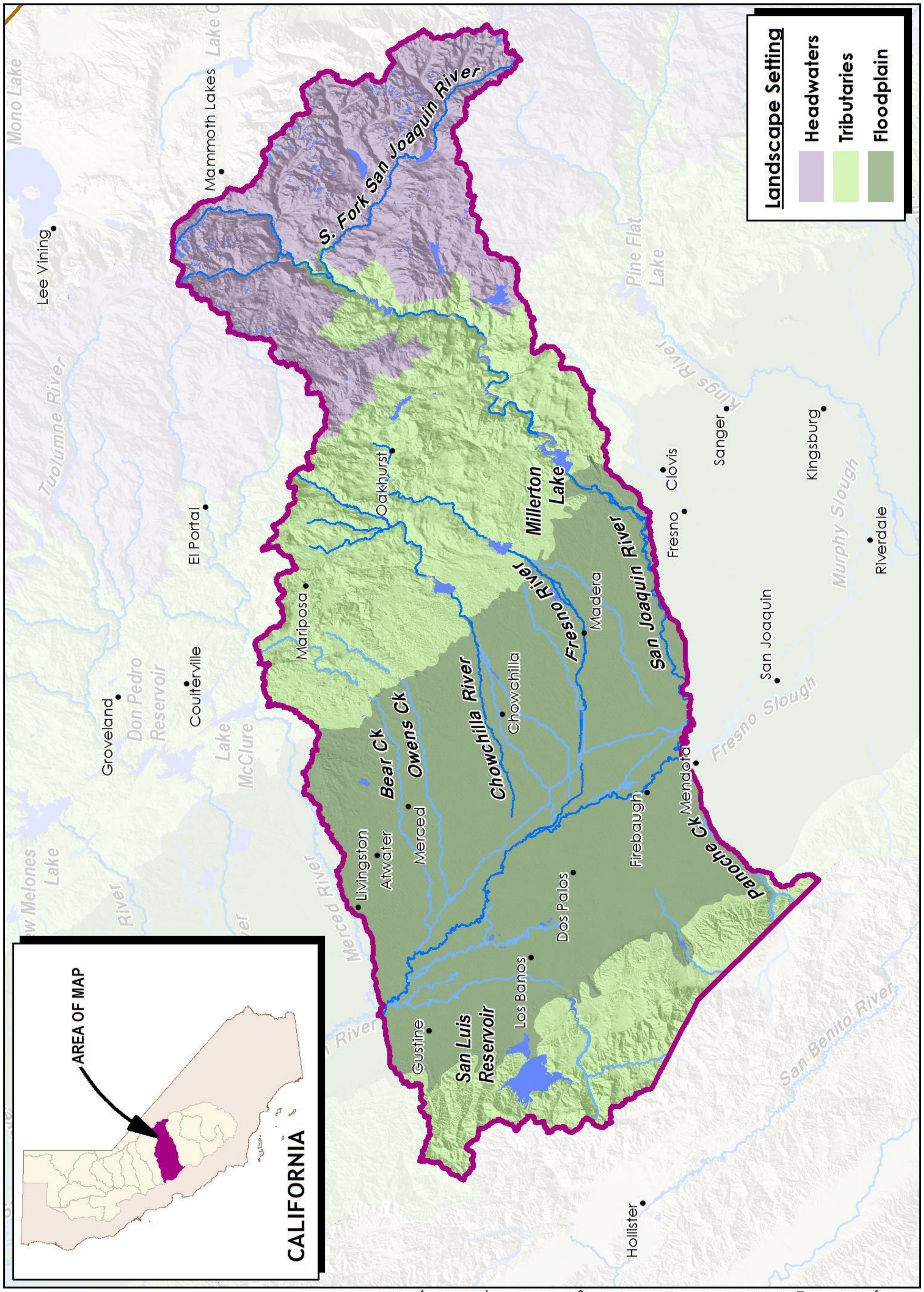
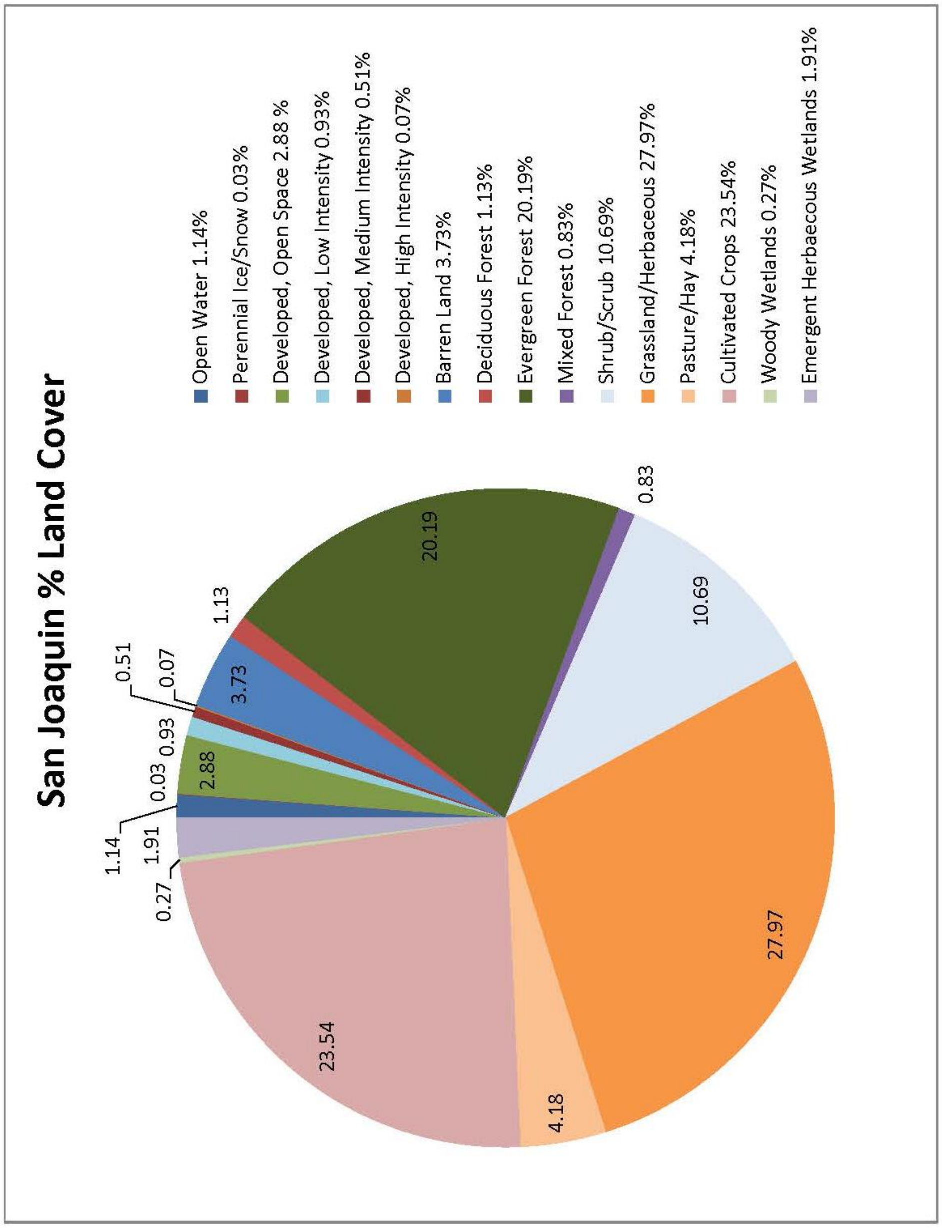


Figure N-1
San Joaquin River Watershed

Appendix II.N.1



in wet years (A. Raabe, pers. comm.). The limited flows from Friant Dam are unable to provide enough water to support habitat for year-round salmonid fisheries and, as a result, have low potential to support a viable, healthy population of Steelhead and only supports one resident population of Chinook salmon (NOAA, 2009). Much of the water that does remain in the system is diverted to a variety of canals, including the East Side Bypass, which further distributes water for both agricultural and municipal uses while regulating floods in the lowest elevations. Despite these massive diversions, however, the watershed continues to experience an overdraft of ground water due to extensive groundwater pumping in support of irrigation.

Hydroelectric dam development has also had a major impact on the Service Area. The Big Creek Hydroelectric Project, located in the foothills above Friant Dam, is one of the most extensive hydroelectric projects in the world. It was constructed by Southern California Edison in 1911. It is comprised of six major reservoirs, 27 dams, nine powerhouses, and miles of interconnecting infrastructure (Southern California Edison, 2013). The cumulative impact of these dams, in conjunction with irrigation and diversion infrastructure, has been the loss of migration pathways and spawning habitat for anadromous and other native fish since the 1940s (A. Raabe, pers. comm.). Furthermore, the introduction and success of non-native fish in the Service Area, starting in the 1870s by the Commission of Fisheries, increased competition with native species for dwindling resources in floodplain and tributary reaches. All these factors contributed to the extirpation of spring-run Chinook by 1949 and the end of commercial fishing in the watershed for all salmonids by 1957 (Sierrafoothill.org, 2006). No plans to reintroduce salmon above Friant Dam are proposed (Cannon, pers. comm.).

Table N-1. Historical Impacts to San Joaquin River

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
San Joaquin	Headwaters	L	L	L	L	L	L	L
	Tributaries	L	M	H	L	M	M	H
	Main Stem/Floodplain	M	L	H	H	M	H	H

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

Water diversions for irrigation and the extensive hydroelectric-associated infrastructure continue to threaten wetland and riparian areas throughout the Service Area. As a result of these threats, a coalition of environmental groups, led by the Natural Resources Defense Council (NRDC), filed a lawsuit challenging the renewal of water service contracts between the United States and the Central Valley Project Friant Division contractors in 1988 (A. Raabe, pers. comm.). A settlement agreement (Settlement) was reached in 2006 requiring State and Federal agencies to implement certain ecological objectives. These include several restoration goals that will "restore and maintain fish populations in 'good condition' in the main stem of the San Joaquin River, including naturally reproducing and self-sustaining populations of salmon [and the reintroduction of spring- and fall-run Chinook] and other fish" below Friant Dam. Water management goals are intended to “reduce or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from [activities implemented under the restoration goals]” (Settlement Agreement, 2006). While progress is being made to meet the terms of the Settlement, timelines are approximately two years behind with pilot salmonid re-introduction estimated for 2014. The 2006 Settlement Agreement however, did not specifically identify steelhead in the recovery plan (NOAA, 2009).

Additional dam development has been proposed upstream of Friant Dam by the Bureau of Reclamation and the California Department of Water Resources. Temperance Flat Dam would serve to increase water storage, facilitating additional water usage, while reducing flooding and increasing hydroelectric output. This will further impact all types of wetland and riverine habitat, as well as native fish habitat, including creating additional impacts to the recovery and reintroduction plans for native salmonids (NOAA, 2009). However, these impacts may also aid in the creation of shallow water habitat that would be beneficial to many species (BOR, 2003).

Table N-2. Current Impacts to San Joaquin River

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
San Joaquin	Headwaters	L	L	L	L	L	L	L
	Tributaries	L	L	H	L	M	L	H
	Main Stem/Floodplain	L	L	H	H	M	M	H

H= High, M= Medium, L=Low

The cumulative impact of the above activities has been the dramatic degradation of hydrology and physical attributes in the tributary and floodplain reaches of the watershed (**Figure N-2**). Further, intensive farming in lower elevations has resulted in extensive declines in the buffer and landscape attributes in these reaches. Impacts to these attributes have, in turn, resulted in the degradation of biotic, acreage, and diversity attributes in much of the watershed, contributing to the loss of approximately 95% of all wetlands in the San Joaquin Valley. Headwater areas, in contrast, remain relatively intact due to their protection within National Park and Wilderness boundaries. Current wetland types and extents for this Service Area are listed in Appendix II.N.2.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.

Appendix II.N.2

San Joaquin Watershed	
Wetland Type	Extent (Acreage or Miles)
Streams	23162.63
Ice Mass	1669.75
LakePond	4336.79
Reservoir	276.55
SwampMarsh	2283.88
Freshwater Emergent Wetland	97054.36
Freshwater Forested/Shrub Wetland	18322.59
Freshwater Pond	7728.98
Lake	44350.1
Other	1476.06
Riverine	8001.99

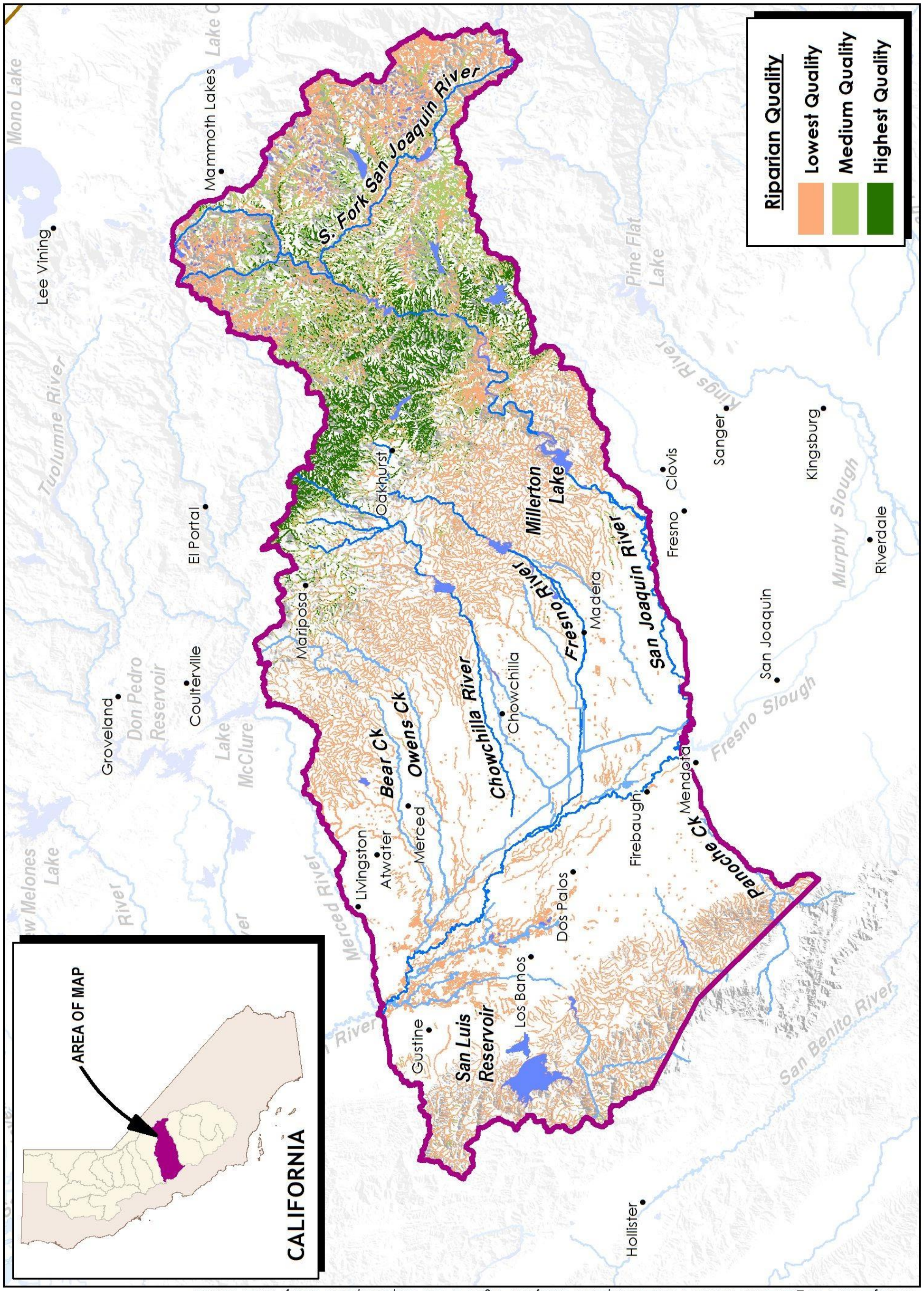


Figure N-2
San Joaquin River Watershed Riparian Quality Map

GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\Riparian Quality\CPF Figure 37 San Joaquin Riparian Quality 131127 v4.mxd

- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.N.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Work to improve natural hydrology for restoration of riparian and in-stream aquatic habitats for salmonids and to increase wetland acreage.
- Improve and/or expand riparian buffers and salmonid habitats through stream bank restoration, including restoration of riparian vegetation in tributaries and floodplains.
- Work to improve riverine and floodplain geomorphology.
- Enhance and/or create secondary off-channel salmonid rearing habitats.
- Prioritization for applicable ecological objectives will be considered during the ILF proposal stage.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pathogens, Metal/Metalloids, Toxicity, Pesticides and Miscellaneous (**Appendix II.N.3.)**.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure N-2**, Riparian Quality Map (FRAP, 2008).

Prioritization for applicable geographic actions will be considered during the ILF proposal stage.

6. References

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Appendix II.N.3

San Joaquin Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Agatha Canal (Merced County)	pH	Miscellaneous	5A	157231.43
Ash Slough (Madera County)	Sediment Toxicity	Toxicity		1716119.88
Bear Creek (from Bear Valley to San Joaquin River, Mariposa and Merced Counties)	Chlorpyrifos	Pesticides		5033994.98
Berenda Creek (Madera County)	Sediment Toxicity	Toxicity		1343745.72
Berenda Slough (Madera County)	Oxygen, Dissolved	Nutrients		1864895.99
Black Rascal Creek (Merced County)	Sediment Toxicity	Toxicity		607506.93
Chowchilla River (Above Eastman Lake to confl w Chowchilla East and West Forks)	Invasive Species	Miscellaneous		804489.28
Chowchilla River (below Eastman Lake)	Invasive Species	Miscellaneous		2175761.83
Chowchilla River, East Fork (Confl w Chowchilla River to Headwaters)	Invasive Species	Miscellaneous		1069808.80
Chowchilla River, Middle Fork (Confl with Chowchilla River West Fork to Headwaters)	Invasive Species	Miscellaneous		739789.33
Chowchilla River, West Fork (Confl w Chowchilla River to Headwaters)	Invasive Species	Miscellaneous		1282795.25
Coarse Gold Creek	Oxygen, Dissolved	Nutrients		1600451.92
Cottonwood Creek (S Madera County)	Oxygen, Dissolved	Nutrients		1853379.60
Crooks Creek	pH	Miscellaneous		310402.54
Deadman Creek (Merced County)	Oxygen, Dissolved	Nutrients		696501.13
Deep Slough (Merced County)	Nitrate as Nitrate (NO3)	Nutrients		290060.12
Dry Creek (Madera County)	Chlorpyrifos	Pesticides		1546485.53
Duck Slough (Merced County)	Escherichia coli (E. coli)	Pathogens	5A	1692039.97
Fresno River (Above Hensley Reservoir to confl w Nelder Creek and Lewis Fork)	pH	Miscellaneous		1894366.56

San Joaquin Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Fresno River (below Hensley Reservoir)	Invasive Species	Miscellaneous		3791869.58
Lewis Fork (Madera County)	pH	Miscellaneous		566828.91
Little Panoche Creek	Unknown Toxicity	Toxicity		1045634.44
Lone Willow Slough (Madera County)	Permethrin, total	Pesticides		1201194.56
Los Banos Creek (below Los Banos Reservoir, Merced County)	Unknown Toxicity	Toxicity		2036157.15
Merced River, Lower (McSwain Reservoir to San Joaquin River)	Unknown Toxicity	Toxicity	5A	3351.92
Miami Creek (Madera and Mariposa Counties)	Specific Conductivity	Salinity		833589.92
Miles Creek (Merced County)	Diuron	Pesticides	5A	819790.34
Mud Slough, North (downstream of San Luis Drain)	Unknown Toxicity	Toxicity	5A	873123.72
Mud Slough, North (upstream of San Luis Drain)	Pesticides	Pesticides	5A	1545837.88
Nelder Creek (Madera County)	pH	Miscellaneous		466073.49
Newman Wasteway	Boron	Metals/Metalloids	5A	525773.47
Owens Creek (Merced County)	Unknown Toxicity	Toxicity		1251575.32
Panoche Creek (Silver Creek to Belmont Avenue)	Selenium	Metals/Metalloids	5A	1117412.77
Peterson Creek (Madera and Mariposa Counties)	Oxygen, Dissolved	Nutrients		294277.25
Poso Slough	Salinity	Salinity		901205.24
Salt Slough (upstream from confluence with San Joaquin River)	Dacthal	Pesticides		625997.71
San Joaquin River (Mendota Pool to Bear Creek)	Selenium	Metals/Metalloids		4260523.05

San Joaquin Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
San Joaquin River (Bear Creek to Mud Slough)	Nitrate as Nitrate (NO3)	Nutrients		910812.15
San Joaquin River (Mud Slough to Merced River)	Group A Pesticides	Pesticides	5A	187818.03
San Joaquin River (Merced River to Tuolumne River)	Malathion	Pesticides		1453.61
San Joaquin River (below Mammoth Pool Reservoir to Millerton Lake)	Invasive Species	Miscellaneous		2429763.63
San Joaquin River (Friant Dam to Mendota Pool)	Invasive Species	Miscellaneous	5A	7067275.82
Sand Slough (Merced County)	Sediment Toxicity	Toxicity		592458.40
Santa Rita Slough (from San Joaquin River to Wood Slough, Fresno and Merced Counties)	pH	Miscellaneous		553425.45
South Slough (Merced County)	Sediment Toxicity	Toxicity		887050.11
Turner Slough (Merced County)	Nickel	Metals/Metalloids		198548.91
Willow Creek (Madera County)	Temperature, water	Miscellaneous	5A	395577.70
Grasslands Marshes	Electrical Conductivity	Salinity	5A	7962.02
Hensley Lake	Oxygen, Dissolved	Nutrients	5A	1669.01
Mendota Pool	Mercury	Metals/Metalloids	5A	271.58
Millerton Lake	Mercury	Metals/Metalloids	5A	4366.05
ONeill Forebay	Mercury	Metals/Metalloids	5A	2254.19
Ramona Lake (Fresno County)	Chlorpyrifos	Pesticides		27.99
San Luis Reservoir	Mercury	Metals/Metalloids	5A	13007.49

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Appendix O-I

Kings River System

O. Kings River Watershed

The Kings River Service Area is approximately 5,295 square miles and encompasses several sizeable cities including Fresno and Clovis (**Figure O-1**). The river itself is comprised of three primary forks. The Middle and South forks headwaters originate in Kings Canyon National Park, while the North Fork begins in the John Muir Wilderness. The South Fork flows through Kings Canyon and is one of most spectacular formations in the Park. All forks begin at over 10,000 feet above sea level and join to form the main channel in the foothills of the Sierra Nevada, southeast of Fresno. Shortly after the forks conjoin, water is captured at Pine Flat Dam, creating one of the largest reservoirs in California. Below the dam, the Kings River divides into several distributaries, with the southern distributary contributing water to the Tulare basin while the northern distributaries join the San Joaquin River. At one time, water from the Kings River contributed directly to the Tulare Lake and surrounding extensive wetlands. However, much of this water has since been diverted for agriculture and/or is stored behind Pine Flat Dam. Flows from the Kings River also at one time emptied into Fresno Slough, helping to connect Tulare Lake to the San Joaquin River during especially high flows. Today these flows are confined to Sierra trout streams and agricultural grazing lands, and supply water to the lower watershed (Cannon, pers. comm.).

Vegetation within this watershed consists of conifer forests in the upper elevations, with grasslands and limited softwoods predominant in the floodplain regions. Additionally, a number of endemic species occur within Kings Canyon as it flows through Kings Canyon National Park, including Fresno County bird's-beak, Kings River buckwheat, and Tehipite Valley jewelflower (Vorobik & Hass, 2001). Land cover composition for this watershed is illustrated in **Appendix II.O.1.**

1. Historic Impacts

Like many areas in the southern Sierra Nevada, the industry that developed in anticipation of mining activities had a greater impact on the landscape than any mineral extraction. Thus, while numerous mining claims were made in the tributary and headwater regions of the Service Area, most of these landscapes were utilized for cattle and sheep grazing. This was especially true after a severe drought and flood cycle along the floodplain reaches of the river system in the early 1860s forced livestock operators to find pastures at higher elevations during the summer months (Dilsaver & Tweed, 2004). These activities, along with attempts to exploit the significant timber resources of the Service Area in what would eventually become Kings Canyon National Park, resulted in the development of an extensive road and trail system in the tributary portions of the watershed. While high profits were never realized by silviculture activities due to high transportation costs, many of the roads remained (Dilsaver & Tweed, 2004). All attempts at commercial extraction of natural resources in the headwaters and upper tributaries ceased in 1940 with the establishment of Kings Canyon National Park (ERRCT, 2001).

Settlement activities at floodplain elevations started in the 1850s with the development of agriculture, as well as a number of water diversions to support it (ERRCT, 2001). In 1867, the Fresno Irrigation District Company started construction on the Centerville Ditch, the first large-scale water development project used solely for irrigation, pulling water from the Kings River.

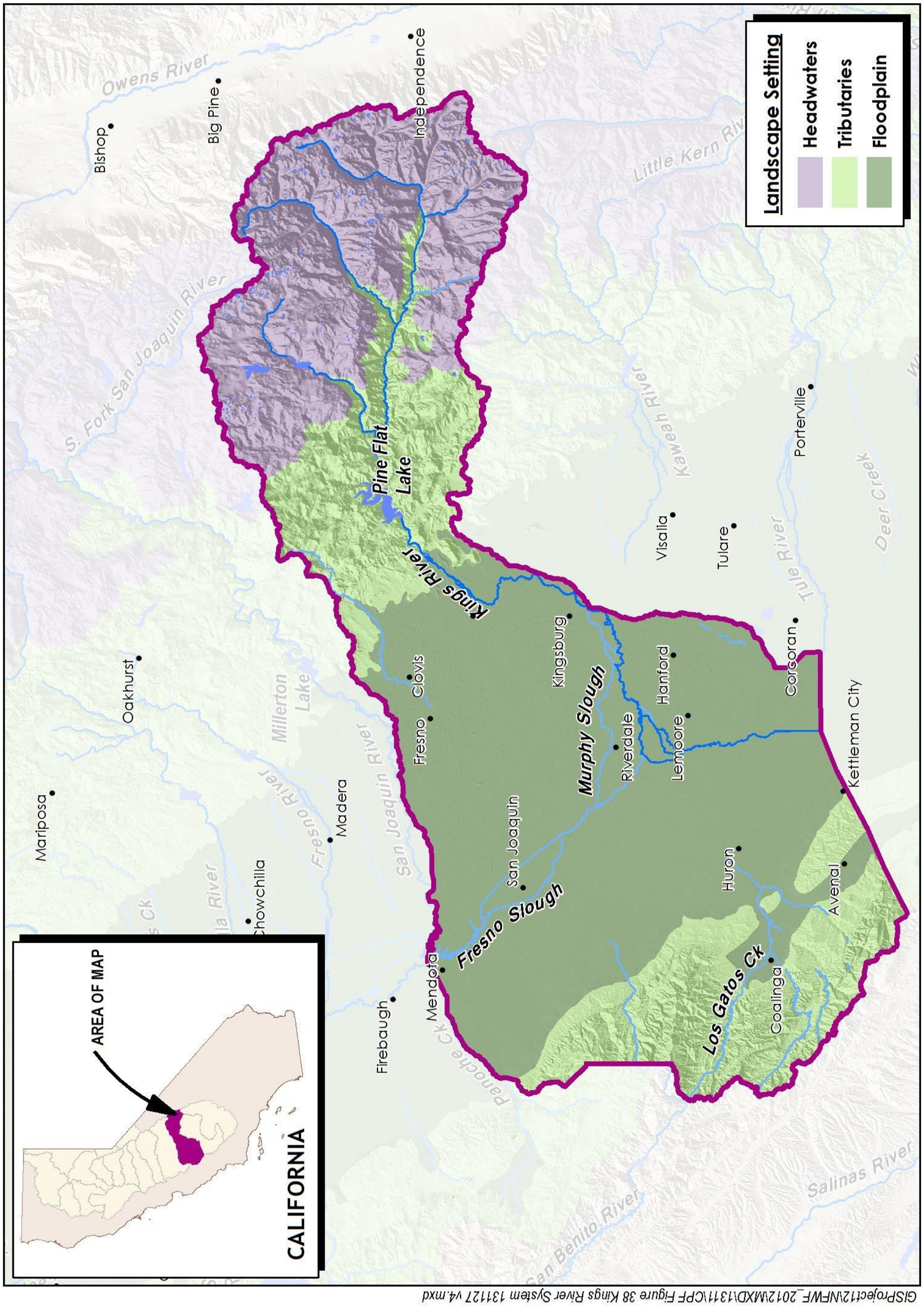
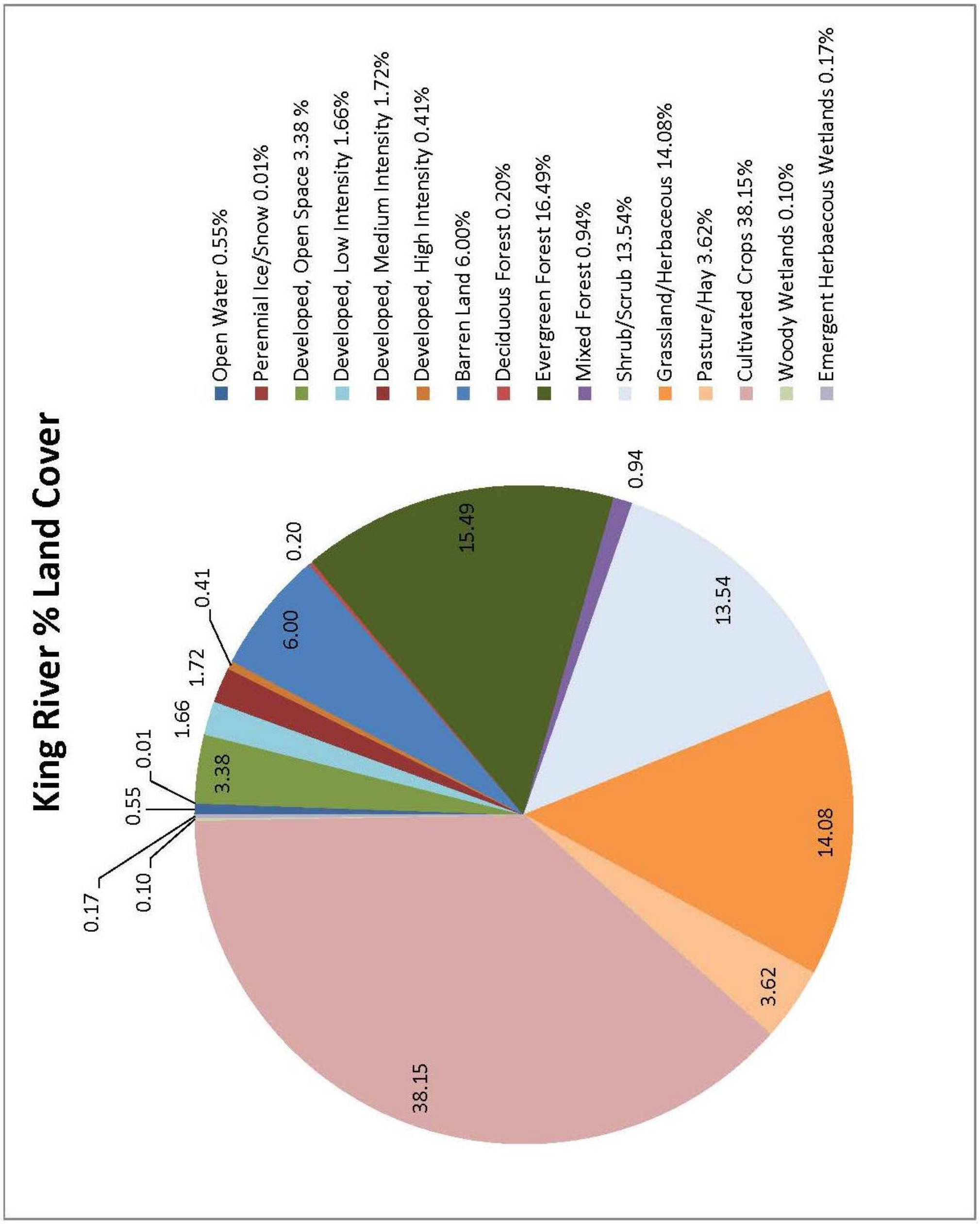


Figure O-1
Kings River Watershed

Appendix II.O.1



This project, in conjunction with similar projects implemented at this time, resulted in the irrigation of over 188,000 flood acres on the San Joaquin Valley floor by 1880 (Sierra Foothill.org, 2006). Upon the establishment of this new irrigation system, however, a rush to develop previously unproductive ground resulted in innumerable lawsuits over water rights (ERRCT, 2001). This led to the eventual development of the Pine Flat Dam. Discussions about the dam had been ongoing since the early 1900s leading to a bitter disagreement regarding who would manage the reservoir and resulted in postponed construction for decades. Eventually, it was decided that the dam would be split between use for flood control, as managed by the U.S. Army Corps of Engineers, and irrigation use, as overseen by the Bureau of Reclamation (ERRCT, 2001). Pine Flat Dam – as well as several other dams within the watershed, including the Wishon and Courtright Dams – was also eventually developed to produce hydroelectric power.

Table O-1. Historical Impacts to Kings River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Kings	Headwaters	L	L	L	H	L	M	L
	Tributaries	L	M	M	M	L	H	H
	Main Stem/Floodplain	L	L	M	H*	H	H	M

H= High, M= Medium, L=Low

The development of Pine Flat Dam had dramatic impacts to fish and wildlife resources within the Service Area. Thus, the California Department of Fish and Game entered into an agreement with the Kings River Water Association (KRWA) in 1964 to provide for the preservation, protection, maintenance, and enhancement of then-existing fish and wildlife resources in and adjacent to the Kings River through the maintenance of minimum flows. However, these efforts proved insufficient to retain sustainable fisheries within the watershed, resulting in the issuance of a Public Trust Complaint by regional anglers. The outcome of this conflict was the voluntary implementation of the Fisheries Management Program (FMP) in 1999 by the KRWA (ERRCT, 2001). The anglers have since worked with the KRWA to maintain 12% of their storage rights to improve fisheries habitats within the watershed and contribute funding for additional habitat restoration work per agreements in the FMP. The FMP has also improved conditions for fisheries by modifying stream flow velocity, creating calm areas and increasing spawning habitat available for trout in the river (KRF, 1999).

2. Current Impacts and Attribute Status

Aquatic resources in headwaters within the Service Area face minimal current and future threats due to their protection within National Park and Wilderness Area boundaries. However, lower tributary and floodplain wetlands remain threatened by agricultural and water development. In addition to Pine Flat Reservoir, a second large dam on the Kings River, the Rogers Crossing

Dam, was proposed in the late 1980s. Thus far, environmental and recreational concerns have halted this project, but plans to raise Pine Flat Dam have been presented to increase flood control and water supplies, which are currently insufficient to irrigate the 1.1 million acres of farmland watered from the Kings (ERRCT, 2001). This may also reduce groundwater pumping, which has resulted in ground water overdraft in the Service Area (KRCD, 2006).

Additionally, emerging threats to aquatic resources from urban and mining expansions are impacting the region. It is anticipated that by 2020, 38,000 acres of new urban land is expected in the Upper Kings Basin, 31,000 of which will be converted agricultural lands (KRCD, 2006). Meanwhile, aggregate mining in the lower Kings floodplain is being implemented on former agricultural lands adjacent to the Kings River and related tributaries to provide material for the increased urban growth (NAWIC, 2008). These activities will likely augment demand for flood control and water supply, resulting in additional impacts to aquatic resources throughout the tributary and floodplain regions of the watershed.

Table O-2. Current Impacts to Kings River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Kings	Headwaters	L	L		L		L	
	Tributaries	L	L	L	M*	M	H	L
	Main Stem/Floodplain	M		M*	H*	M	M	L

H= High, M= Medium, L=Low

The cumulative impact of the activities has been the dramatic degradation of hydrology and physical attributes in the tributary and floodplain reaches of the watershed (**Figure O-2**). Further, intensive farming in lower elevations has resulted in dramatic declines in the buffer and landscape attributes in these reaches. Impacts to these attributes have, in turn, resulted in the degradation of biotic, acreage, and diversity attributes in much of the watershed, contributing to the loss of approximately 95% of all wetlands in the region. Current wetland types and extents for this Service Area are listed in **Appendix II.O.2.**

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.

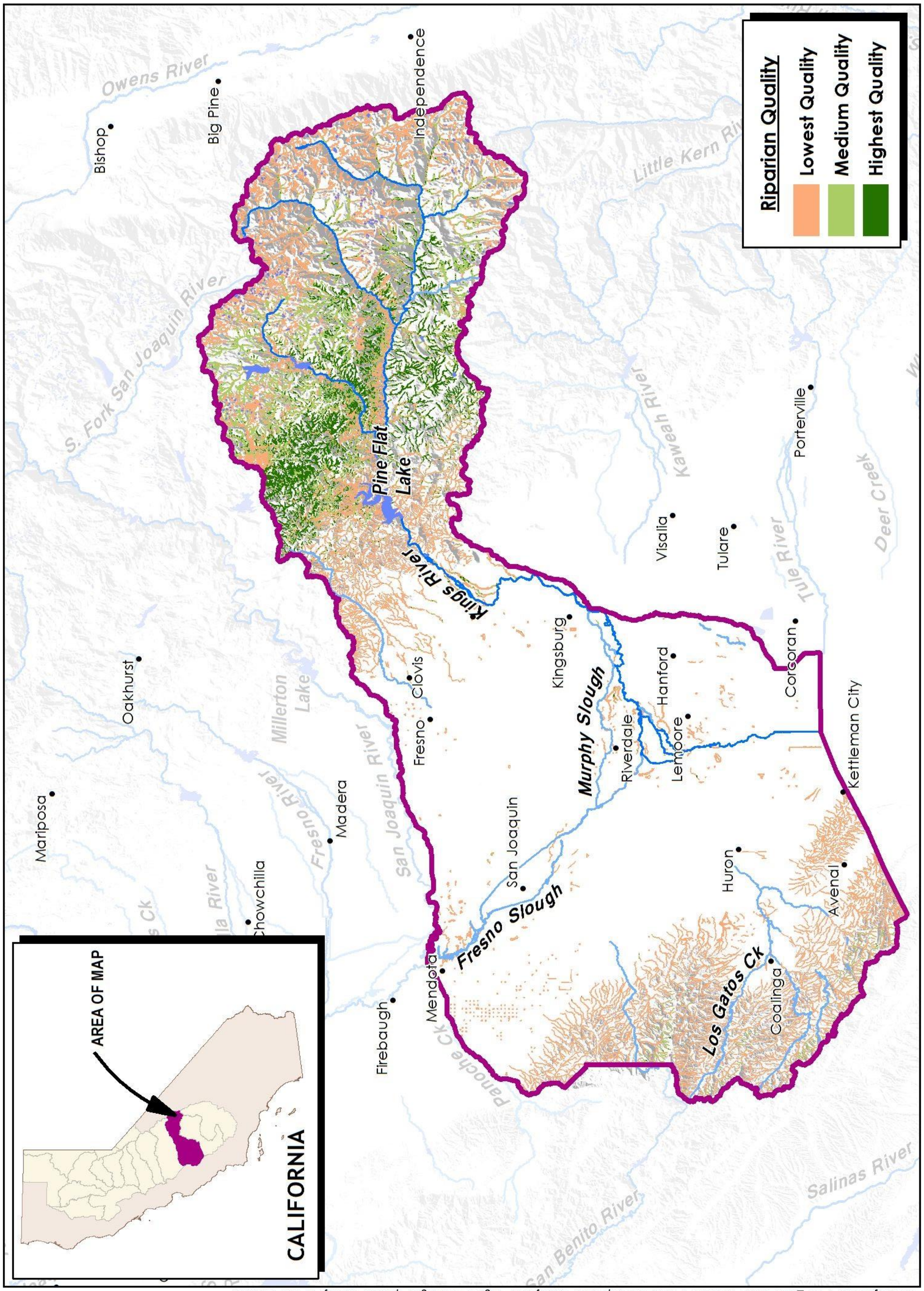


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Figure O-2
Kings River Watershed Riparian Quality Map

Appendix II.O.2

Kings River Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	13346.05
Ice Mass	1352.32
LakePond	2866.71
Playa	0.1
Reservoir	190.32
SwampMarsh	464.89
Freshwater Emergent Wetland	20836.74
Freshwater Forested/Shrub Wetland	11867.14
Freshwater Pond	3580.05
Lake	55705.72
Other	1267.25
Riverine	6898.62

- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.O.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Prioritization for applicable ecological actions will be considered during the ILF proposal stage.

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pesticides (**Appendix II.O.3.)**.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure O-2**, Riparian Quality Map (FRAP, 2008).

Prioritization for applicable geographic actions will be considered during the ILF proposal stage.

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Appendix II.O.3

King River Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Cross Creek (Kings and Tulare Counties)	Sediment Toxicity	Toxicity		14460.01
Fresno Slough (from Graham Road to James Bypass, Fresno County)	Oxygen, Dissolved	Nutrients		958669.22
Kings River, Lower (Island Weir to Stinson and Empire Weirs)	Ammonia	Nutrients		2276053.18
Kings River, Lower (Pine Flat Reservoir to Island Weir)	Chlorpyrifos	Pesticides	5A	6904359.81
Kings River, Middle Fork (Confl w Main Fork to confl w Silver Creek)	Invasive Species	Miscellaneous		394404.33
Kings River, South Fork (Confl w Main Fork to confl w Grizzly Creek)	Invasive Species	Miscellaneous		606345.78
Kings River, Upper North Fork	Escherichia coli (E. coli)	Pathogens		2113042.73
Lewis Creek (Fresno County)	Escherichia coli (E. coli)	Pathogens		428259.79
Los Gatos Creek (Fresno County)	Unknown Toxicity	Toxicity		3121742.84
Murphy Slough (from Kings River to Fresno Slough, Fresno County)	Sediment Toxicity	Toxicity		1624127.80
Ten Mile Creek (Kings River, South Fork)	Escherichia coli (E. coli)	Pathogens		591811.96
Tule River, Lower	Invasive Species	Miscellaneous		3406.56
Hume Lake	Specific Conductivity	Salinity		87.29
Mendota Pool	Mercury	Metals/Metalloids	5A	2773.89
Pine Flat Reservoir	Mercury	Metals/Metalloids	5A	5770.67

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Appendix P-I

Kaweah/Tule River System

P. Kaweah/Tule Rivers Watershed

The Tule/Kaweah River Service Area is approximately 4,568 square miles and is comprised of several forks that once emptied into the terminal sink of Tulare Lake (**Figure P-1**). The watershed is bound by Mt. Whitney to the east, the Tehachapis to the south and the coast range to the west. The watershed consists of several small urban areas (150,000), including Visalia and Porterville. The watershed contains several large dams, including Terminus Dam, which separates the upper and lower watersheds of the Kaweah River and the Success Dam, which is the main regulating facility on the Tule River (BOR, 2009).

Tulare Lake was once the largest freshwater lake west of the Mississippi, with the second-largest surface area in U.S. (790 square miles at its recorded peak in 1868) (ECORP, 2007). This immense shallow lake was fed by snowmelt from the Sierra Nevada, which caused other lakes and rivers in the region to overflow their channels, combining to create a wetland/riparian forest complex that covered between 50,000 and 515,000 ac., depending on annual precipitation. However, today this habitat exists only in fragmented remnants east of Arvin and southeast of Lost Hills (Garcia and Associates, 2006). Land cover composition for this watershed is illustrated in **Appendix II.P.1.**

1. Historic Impacts

Historic effects to the Tule/Kaweah watershed resulted from silver mining, water development, and agricultural activities. While most headwater areas have been protected for over a century as part of Sequoia/Kings Canyon National Park, massive water development has occurred in the floodplain and tributary elevations. Water diversions from Tulare Lake and regional floodplain waterways were developed to support irrigation beginning in the 1860s, followed closely by the establishment of dams in the tributary portions of the watershed. This led to the near-complete draining of the lake by 1899 and the subsequent reclamation of the lakebed for high intensity agriculture (ECORP, 2007). During the 1930s much of the once-extensive riparian and marsh habitats in floodplain elevations surrounding Tulare Basin disappeared due to lowered water tables from groundwater pumping used to supplement regional irrigation (Garcia and Associates, 2006). While these activities slowed in the 1960s due to environmental regulations, substantial overdraft of groundwater resources had already occurred, leading to land subsidence within these areas (BOR, 2009). To address both water shortages and increasing agricultural water demands, large reservoirs were established on the four major rivers feeding Tulare Basin, as well as massive State and federal water infrastructure projects used to import water from other regions (ECORP, 2007). This extensive water development also reduced regional flooding of agricultural and urban areas. These cumulative activities resulted in the disappearance of the lower reaches of the Kaweah and Tule rivers except during high flow events.

This highly managed aquatic system eventually extirpated native fish while facilitating invasive species establishment. While the last Chinook salmon in the watershed was seen in the mid-1970s, invasive white bass were identified in the floodplain reaches of the Kaweah. Though CDFW has kept this species from reaching the Sacramento/San Joaquin Delta, it is uncertain whether white bass have been fully eradicated from the system (BLM, 1997).

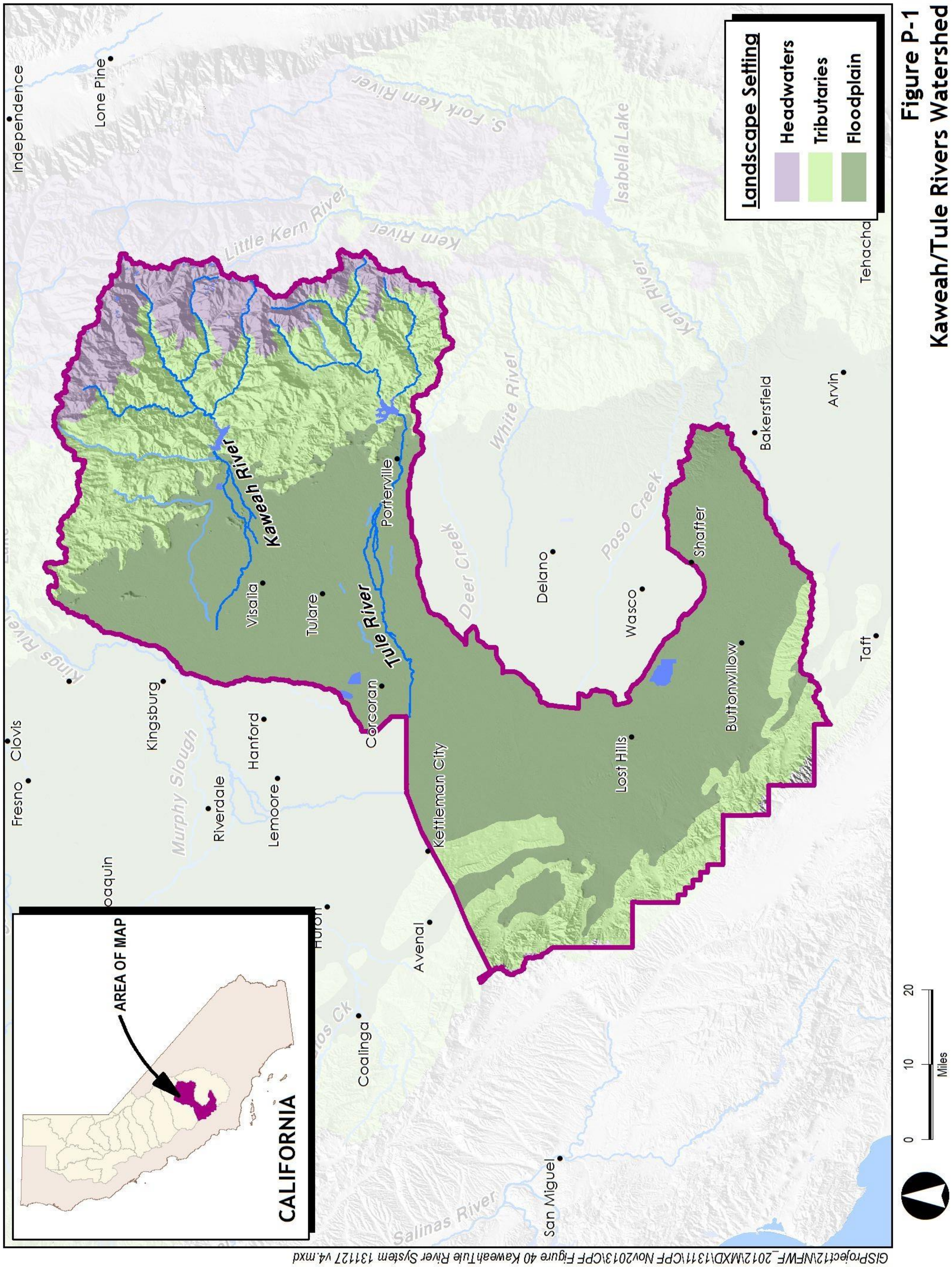

Figure P-1
Kaweah/Tule Rivers Watershed
Landscape Setting
Headwaters
Tributaries
Floodplain
CALIFORNIA
AREA OF MAP
0
10
20
Miles
Kaweah River
Tule River
Kern River
Little Kern River
S. Fork Kern River
Isabella Lake
White River
Deer Creek
Poso Creek
Kings River
Murphy Slough
Salinas River
Independence
Lone Pine
Fresno
Clovis
Kingsburg
Riverdale
Hanford
Lemoore
Visalia
Tulare
Porterville
Corcoran
Kettleman City
Huron
Avenal
Coalinga
San Miguel
Delano
Wasco
Shafter
Lost Hills
Buttonwillow
Bakersfield
Arvin
Taft
Tehacha
GISProject12\NFWF_2012\MXD\1311\CPF Nov2013\CPF Figure 40 KaweahTule River System 131127 v4.mxd

Appendix II.P.1

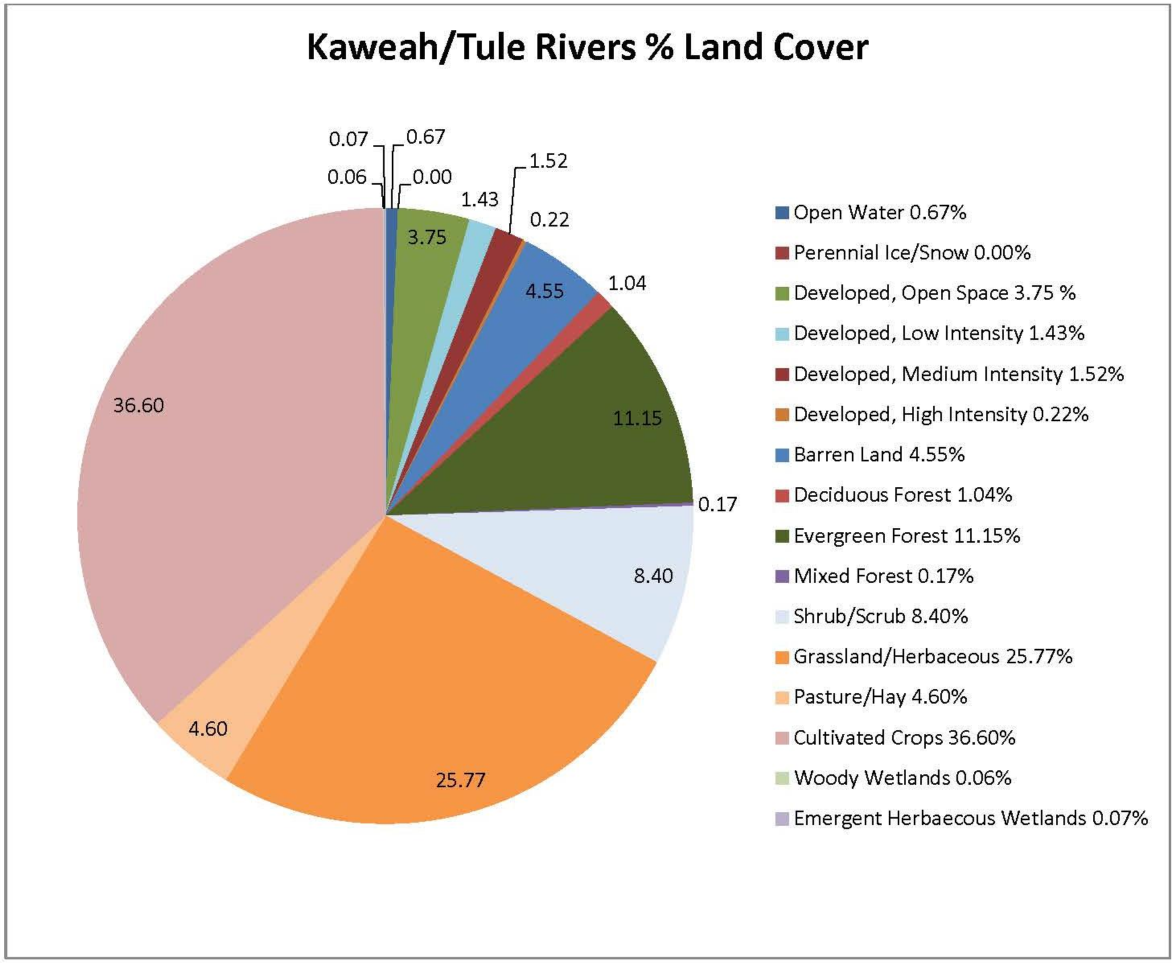

Table P-1. Historical Impacts to Kaweah/Tule River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Kaweah/Tule	Headwaters	L	L	L	L	L	L	L
	Tributaries	L	L	L	M	L	H	L
	Main Stem/Floodplain	L	L	M	H	L	H	L

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

Today the Kaweah/Tule Service Area is impacted by recreation, flood control, and agriculture. While recreation is primarily associated with activities in headwaters at Sequoia National Park, continued impacts from flood control and agriculture are pervasive throughout tributary and floodplain regions. Additionally, though efforts have been made to replenish groundwater used for irrigation, this water source continues to diminish due to a series of drought years and curtailments of water deliveries resulting from the implementation of environmental protection measures (BOR, 2009). To address this challenge, local water districts have created percolation ponds along the lower stretches of the Tule for groundwater recharge. However, these activities further modify the basin's hydrography, resulting in additional impacts to the region's water resources (ECORP, 2007). The effects of continued loss and manipulation of aquatic areas in the region has reduced native fish populations throughout the lower watershed. While rainbow trout are stocked in certain areas, very few fish survive the summer months due to the dewatering of much of the system during this time, resulting in fisheries within the Service Area being limited to sport fish within the managed reservoir system (ECORP, 2007).

Table P-2. Current Impacts to Kaweah/Tule River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Kaweah/Tule	Headwaters	L	L	L	L	L	L	>
	Tributaries	L	L	L	M	L	H	L
	Main Stem/Floodplain	L	L	M*	H	L	H	L

H= High, M= Medium, L=Low

Additional recent threats to wetlands in the Service Area include oil exploration and urban development. The oil-productive area in the southwestern portions of the watershed total nearly 250,000 ac. with step out areas estimated to be over 340,000 ac. (Garcia and Associates, 2006). With the expansion of the oil and natural gas industry in the region, additional roads will be developed, further impacting regional wetlands through erosion and petrochemical runoff. An increase in energy exploration will also increase urban growth in the region, with populations expected to grow in the watershed by 1.3 million people from 2000-2030 (Provost & Pritchard Consulting Group, 2011). These numbers may be further augmented by the development of high-speed rail and associated industries in the region.

Wetland functions within this Service Area provide localized stream habitat, regional waterfowl habitat, and water supplies for agricultural purposes, while helping to maintain overall water quality within the watersheds (Cannon, pers. comm.). Due to extensive agricultural and water resource development, the hydrology, physical structure, wetland acreage and diversity attributes have been highly impacted throughout the lower elevations of the Service Area (**Figure P-2**). The loss of these attributes has had a profound impact on buffer and biotic structure, especially in regard to fisheries, at the lower elevations. Thus, while the precise quantity of native habitats lost is uncertain, it is estimated that 90-95% of these areas have disappeared (Provost & Pritchard Consulting Group, 2011). Current wetland types and extents for this Service Area are listed in Appendix II.P.2.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.P.3**. Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Prioritization for applicable ecological objectives will be considered during the ILF proposal stage.

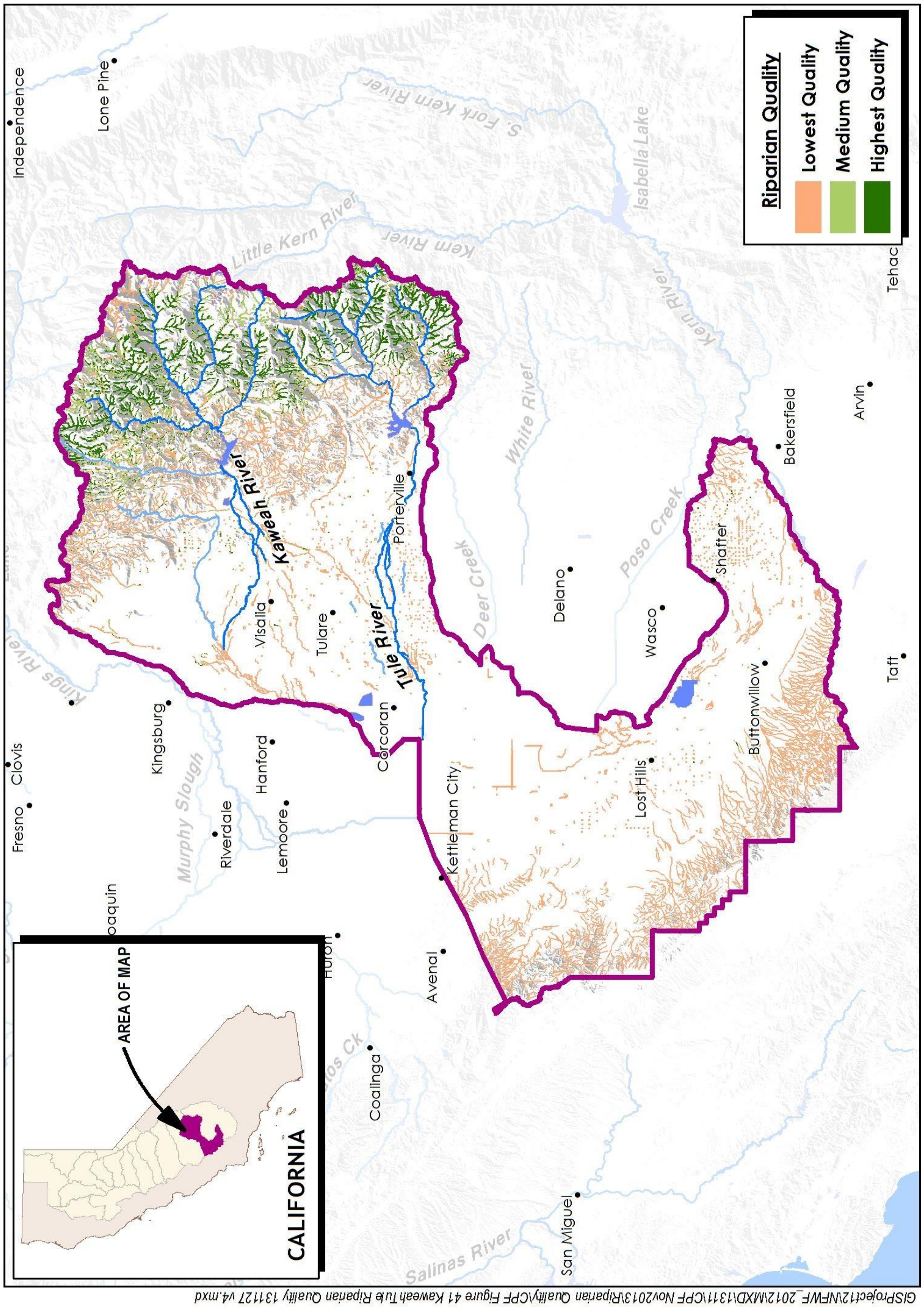

Figure P-2
Kaweah/Tule Rivers Watershed Riparian Quality Map

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Appendix II.P.2

Kaweah/Tule Rivers Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	7259.24
Ice Mass	118.18
LakePond	1905.37
Reservoir	717.33
SwampMarsh	314.96
Freshwater Emergent Wetland	20567.71
Freshwater Forested/Shrub Wetland	3371.64
Freshwater Pond	3881.95
Lake	58234.41
Other	1822.1
Riverine	4345.16

Appendix II.P.3

Kaweah/Tule Rivers Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Bates Slough (from Avenue 200 to Deep Creek, Tulare County)	pH (high)	Miscellaneous		476585.21
Cross Creek (Kings and Tulare Counties)	Sediment Toxicity	Toxicity		2035716.11
Elbow Creek (from Mathews Ditch to Cottonwood Creek, Tulare County)	Unknown Toxicity	Toxicity		728063.32
Elk Bayou (Tulare County)	Dimethoate	Pesticides	5A	692672.20
Kaweah River (below Terminus Dam, Tulare County)	pH	Miscellaneous	5A	641309.29
Kaweah River, East Fork (Confl w Kaweah River to Confl w Horse Creek)	Invasive Species	Miscellaneous		992604.95
Kaweah River, Lower (includes St Johns River)	Nitrate as Nitrate (NO3)	Nutrients		1694887.77
Kaweah River, Marble Fork (Confl w Kaweah River Middle Fork to Marble Falls)	Invasive Species	Miscellaneous		259312.60
Kaweah River, Middle Fork (Confl w Kaweah River East Fork to Dome Creek)	Invasive Species	Miscellaneous		866761.82
Kaweah River, South Fork (Confl w Kaweah River to Fork Drive)	Invasive Species	Miscellaneous		103274.54
Kaweah River, Upper (from North Fork to Kaweah Lake)	Specific Conductivity	Salinity		228711.93
Kern River, Lower	Nitrate as Nitrate (NO3)	Nutrients		85.08
Mill Creek (Tulare County)	Sediment Toxicity	Toxicity		1700032.07
Outside Creek (Tulare County)	Nitrate as Nitrate (NO3)	Nutrients		968606.60
Packwood Creek (Tulare County)	Unknown Toxicity	Toxicity	5A	1254742.62
Porter Slough (Tulare County)	Unknown Toxicity	Toxicity		791706.32
San Diego Creek	Toxaphene	Pesticides		69059.03
Tule River, Lower	Invasive Species	Miscellaneous		5091958.19
Tule River, Middle Fork (below confluence of North and South forks of the Middle Fork)	Invasive Species	Miscellaneous		426185.34
Tule River, Upper (below confluence of North and Middle forks to Success Lake)	Invasive Species	Miscellaneous		473374.44
Kaweah Lake	pH	Miscellaneous		1701.798625
Success Lake	Oxygen, Dissolved	Nutrients		2485.672547

5. Geographic Actions Identified within Watershed Plans

- Work to improve water quality and meet TMDLs in the following categories; Pesticides, Toxicity and Miscellaneous (**Appendix II.P.3.)**.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure P-2**, Riparian Quality Map (FRAP, 2008).

Prioritization for applicable geographic actions will be considered during the ILF proposal stage.

6. References

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Appendix Q-I

Kern River System

Q. Kern River Watershed

The Kern River Service Area is approximately 6,460 square miles (**Figure Q-1**). Bakersfield is the primary urban area in the Service Area, with a population of 350,000. The Kern River is the southern-most of the four major rivers that once emptied into the Tulare Basin. The main fork flows from headwaters on Mt. Whitney to the Forks of the Kern, where it joins the Little Kern River. Eventually, these conjoin with the South Fork at Lake Isabella, formed by Isabella Dam. Flows released from the dam enter Kern River Canyon, which developed primarily as a result of tectonic force, before passing through Bakersfield. Historically, the river would eventually empty into Kern Lake, which swelled to cover 8,300 acres in some years. During wet periods, water from Kern Lake would overflow into Buena Vista Lake, which, in turn, would overflow into Tulare Lake. This combined riverine/lake system formed one of the longest river systems in California. However, this system has now dissolved due to the drying up of all lakes in the Tulare Basin as a result of municipal and agricultural demands.

The Kern River is host to a number of important native freshwater fish, including the California golden trout, the Kern River rainbow trout, and the Little Kern golden trout (Kennedy/Jenks, 2012). The upper watershed provides habitat for native salmon and trout species. Riparian and stream wetlands provide critical water supply for essential habitats for these species as well (Cannon, pers. comm.). The lower portions of the watershed may also have once supported a steelhead population; however, there are currently no recovery goals for this species within the watershed, as it has no connection to the San Joaquin River (NOAA, 2009). This may be due to the absence of sufficient habitat for this species in floodplain reaches. By contrast, the upper portions of the Kern River remain in near pristine condition, allowing for designation as a wild and scenic river in 1987. Further, riparian forest along portions of the South Fork are "…one of the highest quality and most extensive stands of that vegetation type in California, hosting the largest populations of Southwestern willow flycatchers and yellow-billed cuckoos in the State" (Kennedy/Jenks, 2012). Vegetation types throughout the watershed include riparian woodland, riparian savannah, quail bush scrub, alluvial scrub, and grassland/scrub. Bakersfield cactus, Hoover's eriastrum, San Joaquin blue curls, and cottony (Kern) buckwheat are some of the sensitive plants found in the River corridor, all of which are dependent on wetland functions within the watershed (Kennedy/Jenks, 2012). Land cover composition for this watershed is illustrated in **Appendix II.Q.1.**

1. Historic Impacts

Gold was discovered along the upper reaches of the Kern River in 1853. However, like many areas in the southern Sierra Nevada, it was the industry that developed in anticipation of extensive mining that had a greater impact on the landscape. Thus, while numerous mining claims were made in the tributary and headwater regions of the Service Area, most of the landscape was heavily utilized for livestock grazing. In fact, by the end of the 1860s, much of the herbaceous vegetation of the region had been either destroyed or replaced with invasive Eurasian grasses. In the northern headwaters, entire basins were so thoroughly denuded that parties traveling on horseback lamented the lack of forage for their caravans. These extensive grazing activities in turn resulted in the development of an intricate trail system in this and neighboring

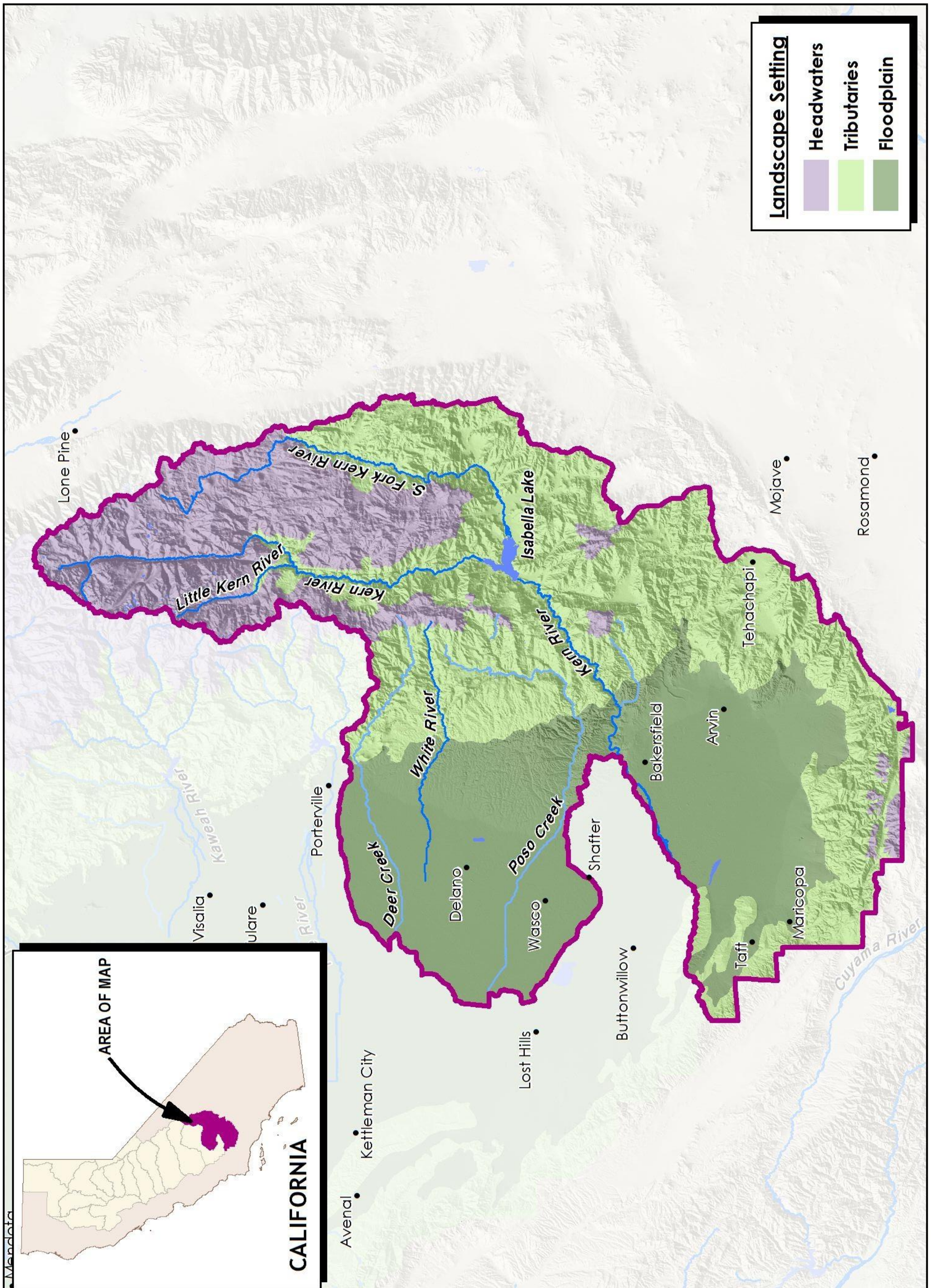

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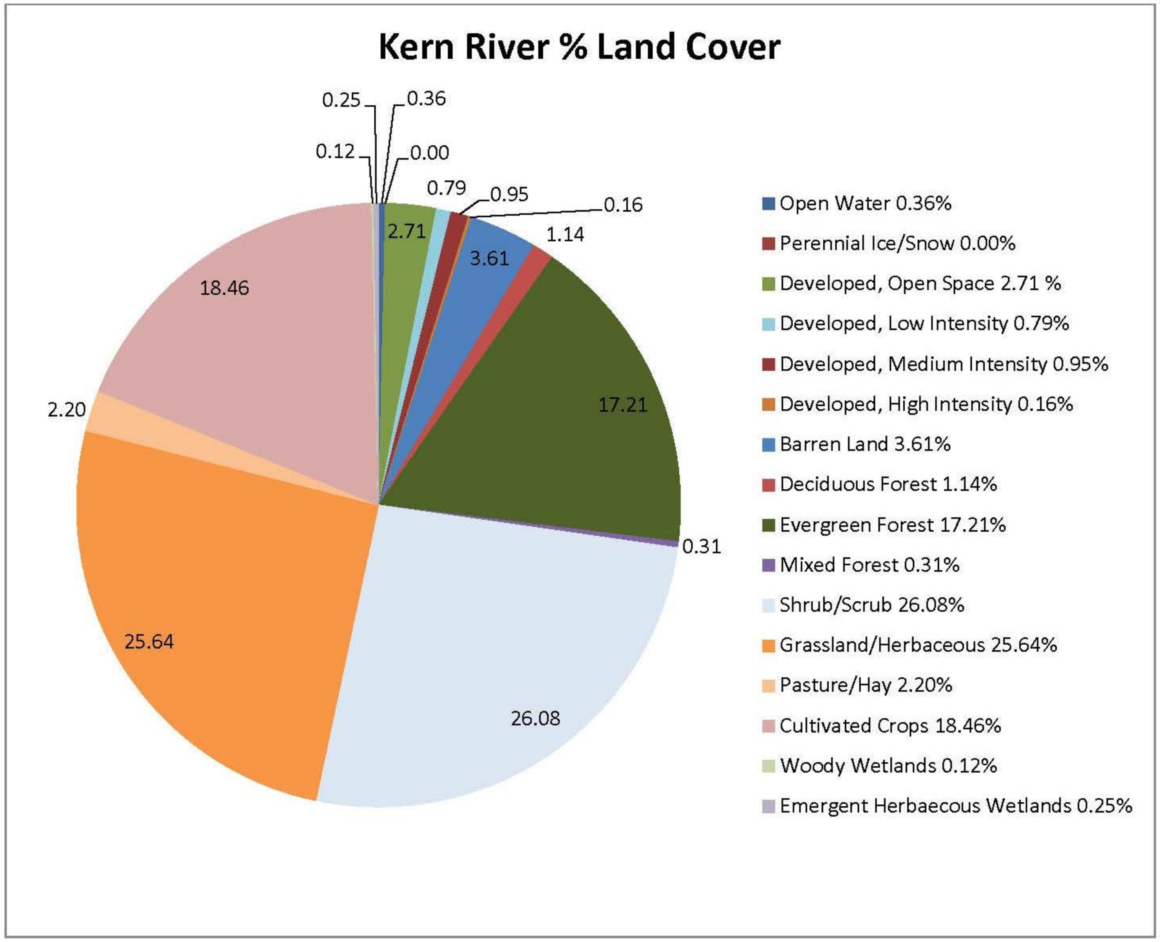
Figure Q-1
Kern River Watershed

Appendix II.Q.1



Service Areas starting in 1861 (Dilsaver & Tweed, 2004). The ecological impacts of these activities can still be seen in mountain meadows throughout what is now Sequoia National Park (Wild Places, 2010), and thus provide a need for restoration of these wetland habitats within the Service Area. Similar to the other major river systems in the San Joaquin Valley, much of the Kern River has been diverted for irrigation since the late 19th century. Flood control measures were also developed through the establishment of Lake Isabella, which was established to protect Bakersfield and other downstream areas (Kennedy/Jenks, 2012). This combination of irrigation and flood control development led to the drawdown of Kern Lake and the complete desiccation of Buena Vista Lake by the mid-20th century. Two small reservoirs have since been developed in the former Buena Vista lake bed to support recreation. The remainder of the former lake bed is now heavily farmed. Diversions through the numerous large canals that exist in floodplain elevations, including the California Aqueduct, Arvin-Edison Canal, and numerous Kern River flood control canals, have also led to the loss of flows in much of the Kern River below Bakersfield, and irrigation has resulted in extensive groundwater overdraft (ECORP, 2007). These river diversions impact wetland services, species, and habitats within their reaches of the Service Area (Cannon, pers. comm.).

In addition, floodplains in the vicinity of Bakersfield contain numerous oil and natural gas resources. Monterey Shale has been extracted since the end of the 19th century, though this has been limited to small quantities, due to the effort and expense historically associated with extraction from these formations (Oilshalegas.com Monterey, 2012). While previous drilling practices allowed for much of the water produced through these activities to drain directly into the river, modern environmental regulations have ended this, and contaminated water is now cleaned at water treatment plants and used to irrigate area farms. Valley wetlands provide important habitat for waterfowl, as well as act as large pollution sinks. These wetlands also provide groundwater recharge services for area farms (Cannon, pers. comm.).

Table Q-1. Historical Impacts to Kern River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Kern	Headwaters	M	M	L	H	L	L	L
	Tributaries	L	M	M	H	L	M	L
	Main Stem/Floodplain	L	L	H	H	M	M	L

H= High, M= Medium, L=Low

2. Current Impacts and Attribute Status

Aquatic resources in headwaters within the Service Area face minimal current and future threats due to their protection within National Parks, Wilderness Areas, Department of Fish and Wildlife lands, and non-profit preserves, as well as Inyo and Sequoia National Forests (Kennedy/Jenks, 2012). However, lower tributary and floodplain wetlands remain threatened by agriculture and water development. In recent years, water for recreational use and recharge areas for municipal supplies has resulted in competition between Bakersfield and established agricultural interests for this finite resource (ECORP, 2007). The river has, however, been allowed to return to areas that had previously run dry due to structural problems with Isabella Dam and the need to reduce stress on this structure.

Aquatic Resources also face a new threat from the ongoing development of the Kern River and Elk Hills oil fields. Due to new extraction techniques, extraction from these fields is no longer cost-prohibitive (Occidental Petroleum Corporation, 2013). This will allow for the potential future extraction of the 3.5 billion barrels of oil that are estimated to exist within the region (Oilshalegas.com Kern, 2012). Additionally, construction of the high speed rail system will result in "development of roads, rail track, and associated infrastructure that may remove or alter jurisdictional waters through filling, hydrological interruption, or other manners that will disturb these resources. In natural areas, these activities may remove or disrupt the hydrology, vegetation, wildlife utilization, water quality conditions, and other biological functions provided by these resources" (URS/HMM/Arup Joint Venture, 2012). These impacts may directly affect the Kern River riparian corridor. However, to minimize impacts, the train will cross riparian areas on elevated structures, and construction may provide future opportunities to restore natural landscapes in the area (URS/HMM/Arup Joint Venture, 2012).

Table Q-2. Current Impacts to Kern River Watershed

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Major Roads	Flood
Kern	Headwaters	L	L	L	L	L	L	L
	Tributaries	L	L	M	M	L	M	L
	Main Stem/Floodplain	L	L	H	H	H	H	L

H= High, M= Medium, L=Low

Currently, 34 groundwater recharge sites exist within the Service Area (ECORP, 2007). Among these is the Kern Water Bank, which consists of 30 square miles southwest of Bakersfield. While the primary purpose of this area is to recharge groundwater and store overland flows at different parts of the year, portions have also been utilized to restore upland and ephemeral wetland habitats as part of a Habitat Conservation Plan/conservation bank hybrid (Kern Water Bank Authority, 1997). This area augments numerous wildlife refuges and non-profit preserves that exist in the floodplain reaches of the watershed (Kennedy/Jenks, 2012).

The cumulative impact of the above activities has been the dramatic degradation of hydrology and physical attributes in the tributary and floodplain reaches of the watershed (**Figure Q-2**). Further, intensive farming and some urban development in lower elevations has resulted in dramatic declines in the buffer and landscape attributes in these reaches. Buffers may also be impacted by future rail development. Adverse effects to each of these attributes, in turn, signify

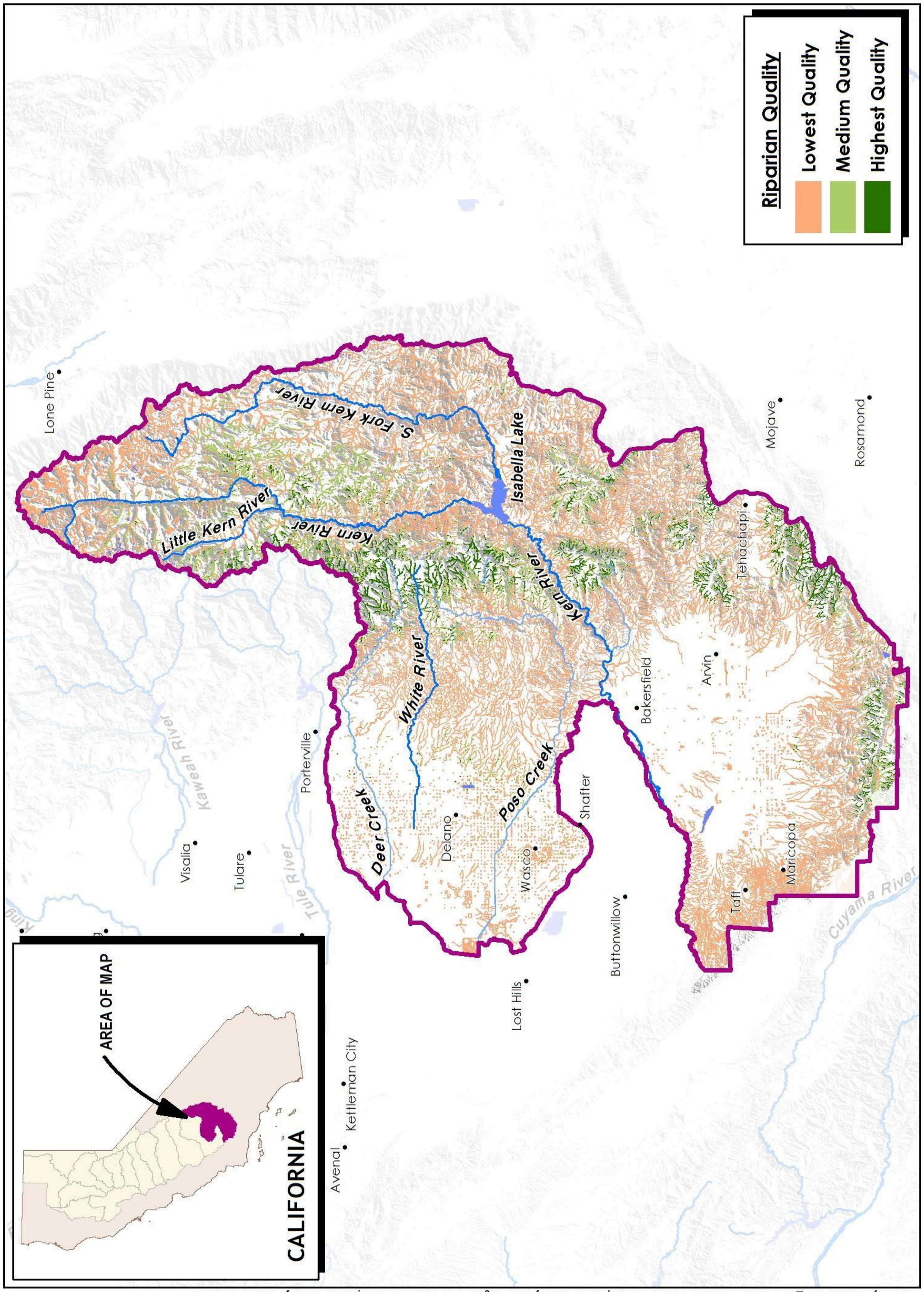


Figure Q-2
Kern River Watershed Riparian Quality Map

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Appendix II.Q.2

Kern River Watershed	
Wetland Type	**Extent (Acreage or Miles)**
Streams	12392.57
Ice Mass	560.64
LakePond	3641.63
Playa	0.06
Reservoir	958.05
SwampMarsh	1459.87
Freshwater Emergent Wetland	25290.17
Freshwater Forested/Shrub Wetland	8081.62
Freshwater Pond	2680.4
Lake	21368.73
Other	2669.64
Riverine	6189.41

the degradation of biotic, acreage, and diversity attributes in much of the watershed. Current wetland types and extents for this Service Area are listed in **Appendix II.Q.2**.

3. Prioritization

Guidelines for addressing ecosystem attributes have been generally outlined for all Aquatic Resource Service Areas in the overall compensation planning framework. Additional general prioritization for project selection should be identified using one or more of the following tools as they apply to project goals and objectives:

- Local IRWMP and/or regional planning documents or conservation goals.
- CRAM and/or an HGM approach.
- The NOAA Draft Recovery Plan for anadromous fish or other regional salmonid recovery plans.
- EcoAtlas
- Clean Water Act section 303(d)(1)(A) for a prioritization of listed impaired waterways.

Project selection for impaired waterways should include objectives to meet all prescribed Total Maximum Daily Limits (TMDL) as listed in **Appendix II.Q.3.** Utilizing the tools above, ILF Project selection will be prioritized when it can address one or more of the following objectives/outcomes:

4. Ecological Objectives Identified within Watershed Plans

- Prioritization for applicable ecological actions will be considered during the ILF proposal stage.

5. Geographic Actions Identified within Watershed Plans

- Prioritization for opportunities to improve water quality will be assessed when TMDLs are designated for areas within this Service Area (**Appendix II.Q.3.)**.
- Prioritization of applicable opportunities for riparian restoration will be assessed based on areas of medium and lowest quality as shown in **Figure Q-2**, Riparian Quality Map (FRAP, 2008).
- Prioritization for applicable geographic actions will be considered during the ILF proposal stage.

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Appendix II.Q.3

Kern River Watershed				
Water Body Name	**Pollutant Category**	**Pollutant Type**	**TMDL Status**	**Linear Feet Impacted**
Deer Creek (Tulare County)	Specific Conductivity	Salinity		3687653.42
Kern River, Lower	Nitrate as Nitrate (NO3)	Nutrients		6633111.51
Kern River, North Fork	pH	Miscellaneous		2409033.81
White River (Tulare County)	pH	Miscellaneous		3183716.96
Isabella Lake	Ammonia	Nutrients		7709.75

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Part III. Description of Individual Vernal Pool Service Areas

Please see **Appendices R-1 through R-12** for individual Vernal Pool Service Areas descriptions.

Appendix R

Individual Vernal Pool Service Areas

Appendix R-1

Modoc Plateau

R-1. Modoc Plateau

The Modoc Plateau Vernal Pool Service Area is approximately 5,263 square miles, located in the northeastern corner of California and is comprised primarily of Modoc, Lassen, and Shasta counties (**Figure R-1**). The Service Area makes up a portion of the Modoc Plateau Vernal Pool

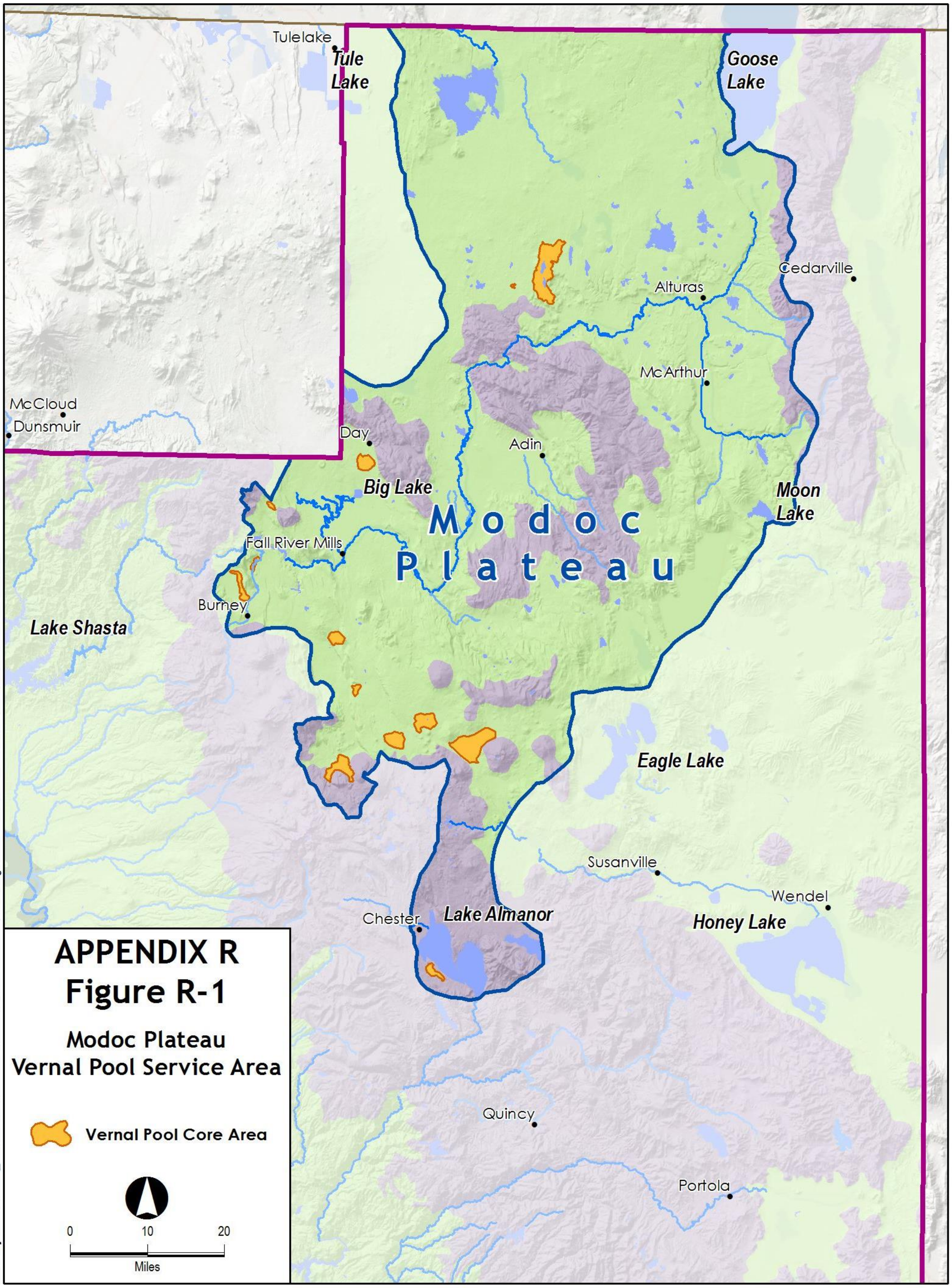
Region as defined in the USFWS Recovery Plan, though it excludes the northerly portion of the Region, which expands into Oregon, and is outside the ILF Program boundary. The Service Area includes portions of all four Core Areas from the USFWS Recovery Plan, including the Northern Modoc Plateau, Western Modoc Plateau, Southwestern Modoc Plateau, and Southern Modoc Plateau (USFWS, 2005). The vernal features that make up the Service Area include the Northern Basalt Flow and Northern Volcanic Mudflow type pools. Some of these features include vernal lakes that may get as large as 100 acres. A key complex for the Modoc Plateau Service Area is the in the area of Devil's Garden, north of Alturas, which has the highest concentration of remaining pools (Keeler-Wolf, et al, 1998).

Biologically, the Modoc Plateau Service Area supports several endemic plant species, including *Pogogyne floribunda*, *Polygonum polygaloides* ssp. *esotericum*, *Eryngium mathiasiae*, and *Mimulus pygmaeus*, as well as several other sensitive plant species; no sensitive vernal pool animals are known from the Service Area. Due to its geographic location, the climate of this Service Area is the coldest of the vernal pool regions of California (Keeler-Wolf, et al, 1998).

A summary of the Modoc Vernal Pool Region, including areas outside of the ILF Program boundary, has been directly adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-1.1. Summary of the Modoc Plateau Vernal Pool Service Area

Modoc Plateau					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Basalt Flow	H	H	M	8	none known
Northern Volcanic Mudflow	H	H	M		



GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-1 Modoc Vernal Pool Service Area 131231 v3.mxd

1. Historic and Current Impacts

Most of the Modoc Plateau Vernal Pool Service Area is not heavily impacted, given its sparse population. There has been conversion of valley-bottom pools to agriculture in the vicinity of Figure R-1: Modoc Plateau Vernal Pool Service Area

Burney, Fall River Mills and Alturas. There have also been instances of impacts due to grazing-related activities, such as conversion of pools to stock ponds.

While much of the land in this Service Area is in public ownership, most is not managed explicitly for vernal pool resources. There are special management areas in the Service Area with vernal pool resources, including the Ash Creek Wildlife Area.

Table R-1.2. Impacts to the Modoc Plateau Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Modoc Plateau	Historic Impacts				X			
	Present Threats				X			

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to well-managed and protected lands. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected lands.
- Hydrology: Restores natural hydrology. Sample projects may include improvement of roadside drainage to avoid diversion of surface flows.
- Biotic: Adjusts grazing and land management practices to account for sensitive biotic resources.
- Acreage: Increases the self-sustaining wetland acreage within the Service Area.

Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

3. References

Keeler-Wolf, et al, 1998. California Vernal Pool Assessment, Preliminary Report. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.

Appendix R-2

Northwestern Sacramento Valley

R-2. Northwestern Sacramento Valley

The Northwestern Sacramento Valley Vernal Pool Service Area is approximately 1,228 square miles (**Figure R-2**). It includes portions of Shasta, Tehama, Glenn, and Colusa counties. This Service Area consists of the entirety of the Northwestern Sacramento Valley Vernal Pool Region of the USFWS Recovery Plan. As such, the Service Area includes all five Core Areas as described within the USFWS Recovery Plan, including Redding, Millville Plains, Red Bluff, Black Butte, and Orland (USFWS, 2005). The vernal pools of this Service Area include primarily Northern Hardpan type pools that occupy old alluvial terraces above the Sacramento Valley floor, generally to west of the Sacramento River. Key complexes occur in the Redding area (i.e. Stillwater Plains) and west of the communities of Red Bluff, Gerber, Corning, and Henleyville. These complexes include the well-known sites of Dales Lake-Manton, Vina Plains, the Llano Seco Rancho unit of the Sacramento River National Wildlife Refuge, Richvale, and Northern Table Mountain (Keeler-Wolf, et al, 1998).

Biologically, the Northwestern Sacramento Valley Service Area supports many of the same vernal plants and animals as the Northeastern Sacramento Valley Vernal Pool Service Area. However, Butte County meadowfoam is not believed to exist in this region (Keeler-Wolf, et al, 1998). A summary of the Northwestern Sacramento Valley Vernal Pool Region, including areas outside of the ILF Program boundary, has been directly adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

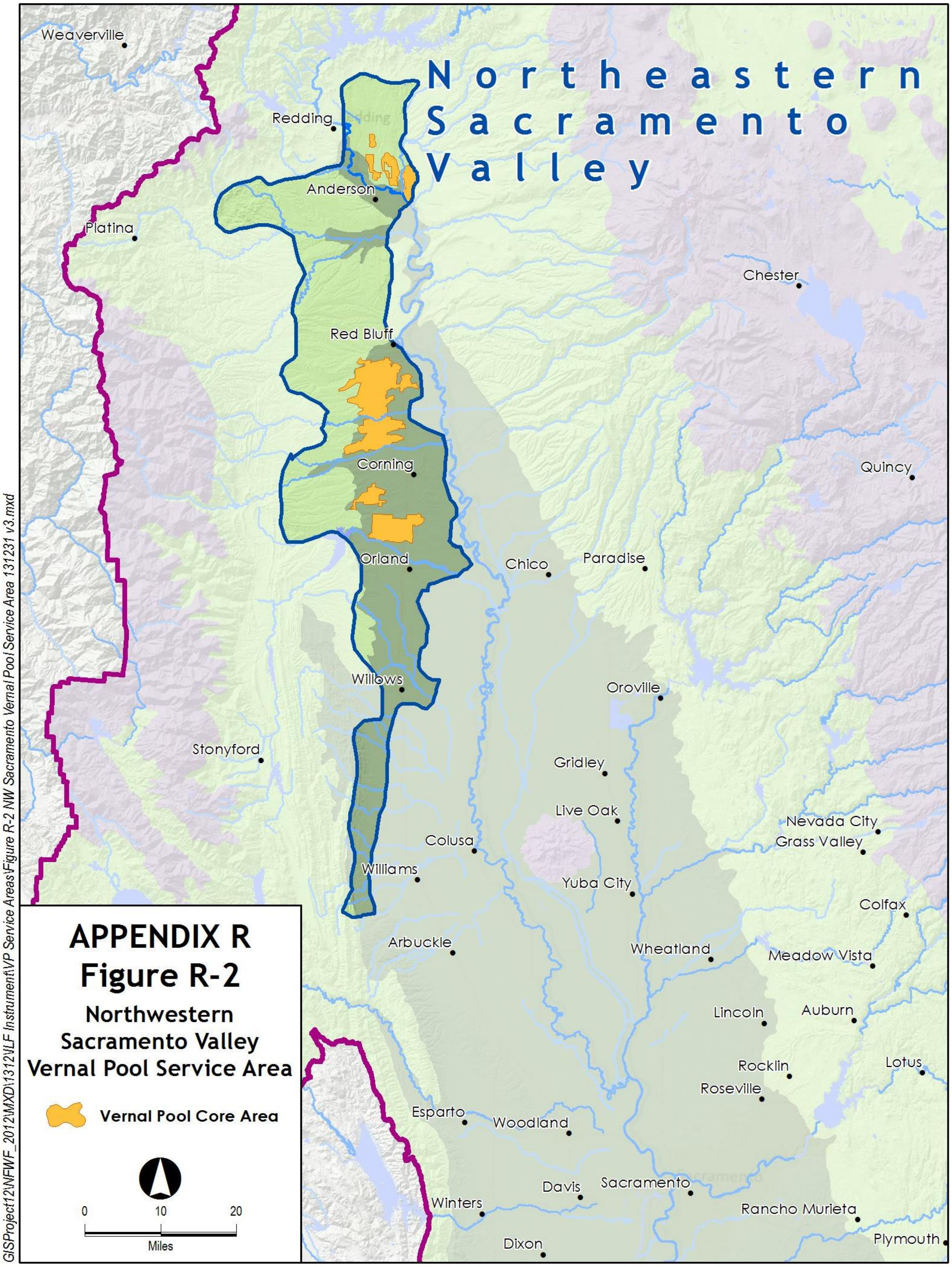
Table R-2.1. Summary of the Northwestern Vernal Pool Service Area

Northwestern Sacramento Valley					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Hardpan	M	M	none known	10	4
Northern Claypan	M	M	L		

1. Historic and Current Impacts

Vernal pools within this Service Area have been impacted by community development around Redding, Red Bluff, Corning, and Orland. Conversion to agriculture has also had an impact; in some areas, thousands of acres have been converted to Eucalyptus *(Eucalyptus cinerea)* plantations. Road construction, off-road vehicle use, and, to a lesser extent, grazing have been identified as further threats.

There are a number of preserves and mitigation areas owned by public and private entities in the Service Area, including the California Department of Fish and Wildlife, the City of Redding, the US Bureau of Reclamation, Pacific Gas and Electric, and the private owner of the Stillwater


Northeastern
Sacramento
Valley
Weaverville
Redding
Anderson
Platina
Chester
Red Bluff
Quincy
Corning
Orland
Chico
Paradise
Willows
Oroville
Stonyford
Gridley
Live Oak
Nevada City
Grass Valley
Colusa
Williams
Yuba City
Colfax
Arbuckle
Wheatland
Meadow Vista
Lincoln
Auburn
Rocklin
Lotus
Roseville
Esparto
Woodland
Davis
Sacramento
Winters
Rancho Murieta
Plymouth
Dixon
APPENDIX R
Figure R-2
Northwestern
Sacramento Valley
Vernal Pool Service Area
Vernal Pool Core Area
0
10
20
Miles
GISProject12\NFWF_2012\MXD\1312\VLF Instrument\VP Service Areas\Figure R-2 NW Sacramento Vernal Pool Service Area 131231 v3.mxd

Plains Mitigation Bank. The USFWS Recovery Plan, however, notes concerns about adequate management and monitoring of some of these preserve sites including one managed and owned by Pacific Gas and Electric (PG&E) and the Stillwater Plains Bank (USFWS, 2005).

Table R-2.2. Impacts to the Northwestern Sacramento Valley Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Northwestern Sac Valley	Historic Impacts				X	X	X	
	Present Threats				X	X	X	

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to well-managed and protected lands. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected lands.
- Hydrology: Restores natural hydrology. Sample projects may include improvement of roadside drainage to avoid diversion of surface flows.
- Biotic: The best potential for restoration occurs in the grazing lands west of Redding to northwest of Orland; these areas could benefit from adjusting the timing and intensity of grazing (Keeler-Wolf, et al, 1998).
- Acreage: Increases the self-sustaining wetland acreage within the Service Area.
- Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

Additionally, restoration, preservation, or reestablishment Project proposals in areas that may support listed species as described in the *Predictive Habitat Analysis and Mapping of Four Rare Vernal Pool Species in Merced, Sacramento, and Placer Counties* report (Predictive Habitat Analysis Report) (Vollmar et al., 2013) are strongly encouraged for the Northwestern Sacramento Valley Vernal Pool Service Area.

6. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Vollmar, John, Schweitzer, Jake, et.al. 2013. *Predictive Habitat Analysis and Mapping of Four Rare Vernal Pool Species in Merced, Sacramento and Placer Counties.*

Appendix R-3

Northeastern Sacramento Valley

R-3. Northeastern Sacramento Valley

The Northeastern Sacramento Valley Vernal Pool Service Area is approximately 1,263 square miles (**Figure R-3**). It includes portions of Shasta, Tehama, Butte, and Yuba counties. This Vernal Pool Service Area consists of the entirety of the Northeastern Sacramento Valley Vernal Pool Region of the USFWS Recovery Plan. As such, the Service Area includes all six Core Areas as described within the USFWS Recovery Plan including Dales, Vina Plains, Chico, Oroville, Palermo, and Honcut (USFWS, 2005). The vernal pools and lakes of the Service Area include the Northern Hardpan, Northern Basalt Flow, and Northern Volcanic Mudflow type features. It also includes well-known key complexes, including Dales Lake-Manton, Vina Plains, the Llano Seco Rancho unit of the Sacramento River National Wildlife Refuge, Richvale, and Northern Table Mountain (Keeler-Wolf, et al, 1998).

Biologically, the Northeastern Sacramento Valley Service Area supports the Butte County meadowfoam (*Limnanthes floccose ssp. californica*), an endemic and federally endangered plant. The Service Area also includes habitat for the federally endangered Conservancy fairy shrimp (*Branchinecta conservation*) and vernal pool tadpole shrimp.

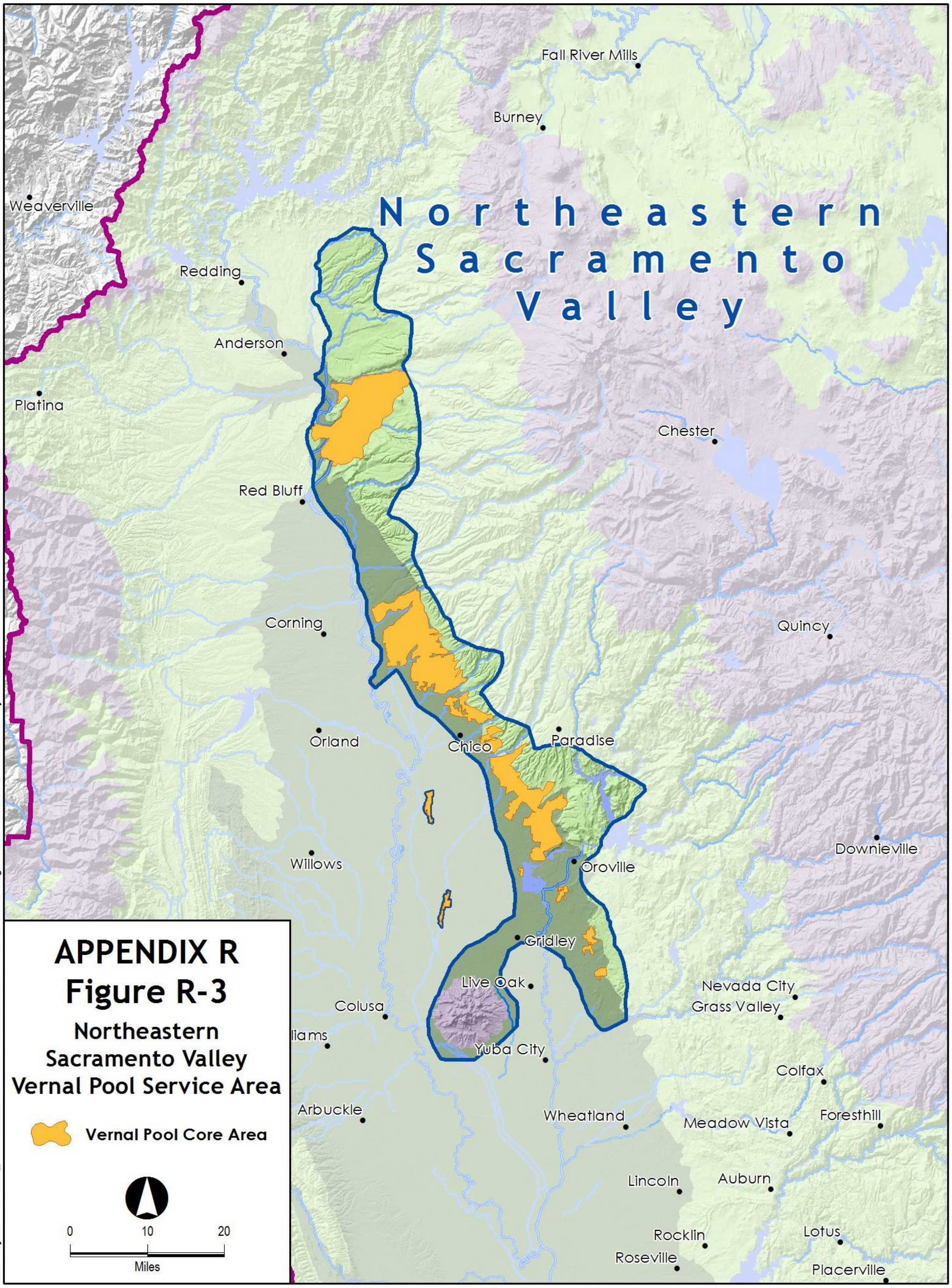
A summary of the Northeastern Sacramento Valley Vernal Pool Region, including areas outside of the ILF Program boundary, has been directly adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-3.1. Summary of the Northeastern Vernal Pool Service Area

Northeastern Sacramento Valley					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Hardpan	M	M	L	15	5
Northern Basalt Flow	M	H	L		
Northern Volcanic Mudflow	M	H	L		

1. Historic and Current Impacts

Pools included in the Northern Basalt Flow and Northern Volcanic Mudflow complexes are not greatly threatened due to their more remote locations outside of urbanizing areas. Northern Hardpan pools, however, have been more heavily impacted from development in and around the communities of Chico, Oroville, and Gridley.



GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-3 NE Sacramento Valley Vernal Pool Service Area 131231 v3.mxd

A number of preserves owned by public and private entities exist in the Service Area, which were created to protect vernal features. These include properties owned and/or managed by the California Department of Fish and Wildlife, the USFWF, the City of Chico, The Nature Conservancy, and private conservation banks.

Table R-3.2. Impacts to the Northeastern Sacramento Valley Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Northeastern Sac Valley	Historic Impacts				X	X	X	
	Present Threats				X	X	X	

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to well-managed and protected lands such as the preserves mentioned above. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected lands.
- Hydrology: Restores natural hydrology. Sample projects may include improvement of roadside drainage to avoid diversion of surface flows.
- Biotic: Northern Hardpan: enhancement and restoration of lands that have been impacted by agriculture and community development. Northern Mudflow and Northern Basalt Flow: adjustment of grazing and land management practices to account for sensitive biotic resources. Sites with Butte County meadowfoam will be strongly considered for preservation.
- Acreage: Increases the self-sustaining wetland acreage within the Service Area.

Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

6. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Appendix R-4

Lake-Napa

R-4. Lake-Napa

The Lake-Napa Vernal Pool Service Area is approximately 621 square miles, located in the interior Coast Range between San Francisco Bay and Clear Lake (**Figure R-4**). This Vernal Pool Service Area encompasses roughly half of the Lake-Napa Vernal Pool Region of the USFWS Recovery Plan;it excludes the portions of the Vernal Pool Region within Napa County, including the Napa Valley and Pope Valley, which lie outside of the ILF boundary (USFWS, 2005). Four vernal pool Core Areas exist within this Service Area: Boggs Lake-Clear Lake, Dry Lake, Jordan Park, and Long Valley. These encompass the two types of vernal pools that exist within this Service Area including the Northern Volcanic Ash Flow type, which are located south of Clear Lake and are thought to be endemic to this region, and the Northern Basalt Flow type, which are located in the vicinity of Stienhart Lake. Key vernal pool complexes include Boggs Lake and Loch Lomond (Keeler-Wolf, et al, 1998).

Biologically, the Lake-Napa Vernal Pool Service Area includes three rare plants that are endemic to this region. These include the Loch Lomond button-celery (*Eryngium constancei*), many-flowered navarretia (*Navarretia leucocephala ssp. plieantha*), and few-flowered navarretia (*Navarretia leucocephala ssp. pauciflora*). The Service Area also contains a number of other State and federally listed plant species, though no currently listed animal species exist within this location (Keeler-Wolf, et al, 1998).

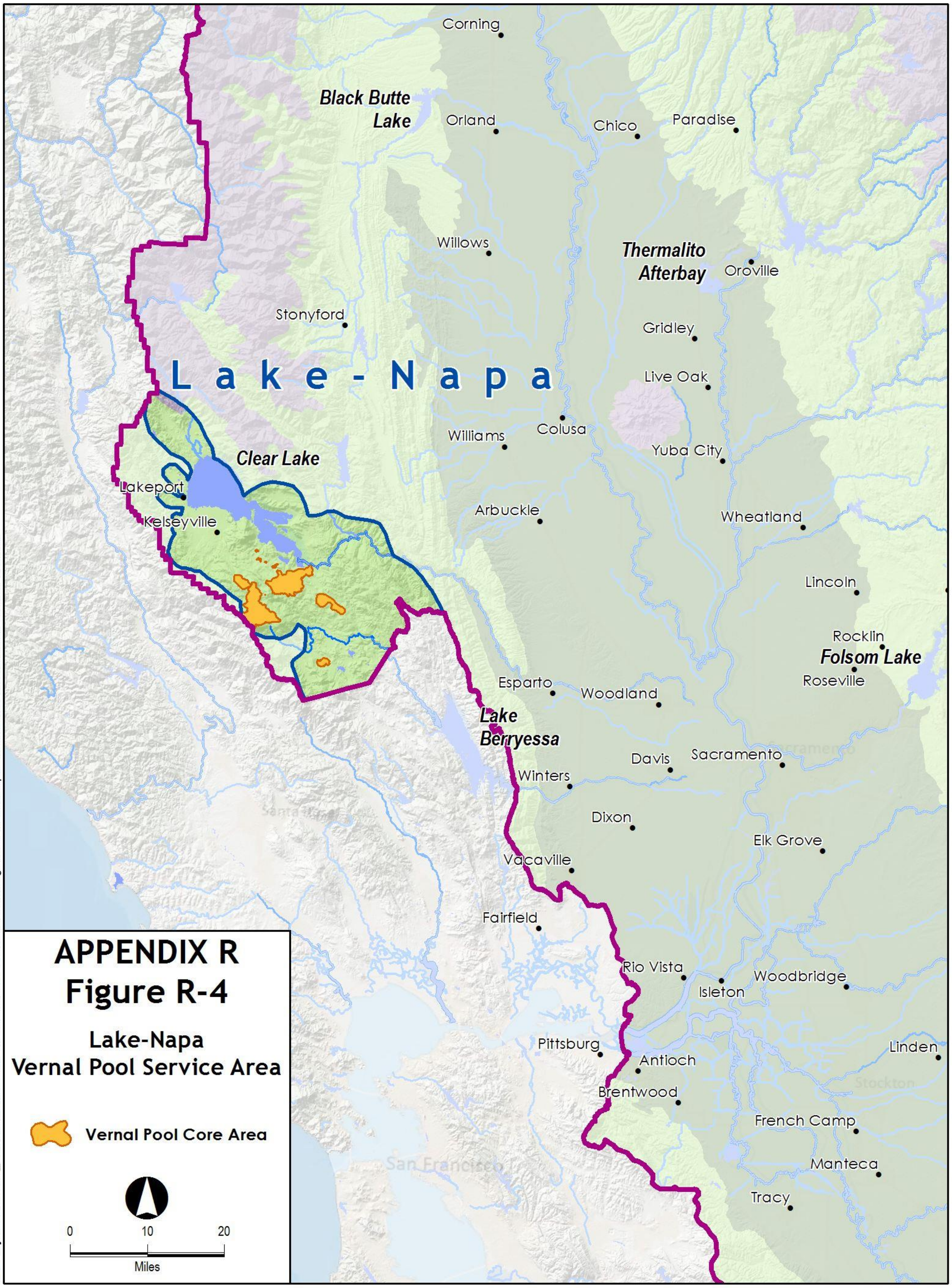
A summary of the Lake-Napa Vernal Pool Region has been directly adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-4.1. Summary the of Lake-Napa Vernal Pool Service Area

Lake-Napa					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Volcanic Ash Flow	M	H	125±		
Northern Basalt Flow	M	H	L	21	1
Northern Vernal Pool	M	M	L		

1. Historic and Current Impacts

Some important complexes in the Service Area are protected by public or non-profit operated preserves such as the Loch Lomond Ecological Reserve and the Boggs Lake Preserve. However, many of the remaining areas continue to be threatened by long-term intensive grazing, draining, deepening, and erosion (Keeler-Wolf, et al, 1998).



GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-4 LakeNapa Vernal Pool Service Area 131231 v3.mxd

Table R-4.2. Impacts to Lake-Napa Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Lake-Napa	Historic Impacts				X	X	X	
	Present Threats				X	X	X	

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Biotic: Adjusts grazing and land management practices to account for sensitive biotic resources. With concurrence with the USFWS and the California Department of Fish and Wildlife, opportunities may exist to enhance or reestablish degraded pools and reintroduce rare species. These may include the enhancement via erosion control at Manning Flat (Keeler-Wolf, et al, 1998).
- Acreage: Increases the self-sustaining wetland acreage within the Service Area.

Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

6. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Appendix R-5

Solano-Colusa

R-5. Solano-Colusa

The Solano-Colusa Vernal Pool Service Area is approximately 1,314 square miles (**Figure R-5**). It occupies the Sacramento Valley floor from southern Glenn County to central Solano County. The majority of the Solano-Colusa Vernal Pool Service Area resides within this Vernal Pool region, as defined by the USFWS Recovery Plan, with only a small portion existing in western Solano County, outside of the ILF boundary (USFWS, 2005). Pools within this Service Area are predominantly of the Northern Claypan type, which are typically found on alkaline soils. However, some Northern Hardpan pools also exist in this Service Area (Keeler-Wolfe, et al, 1998).

Key vernal pool complexes occur in Solano County, between Highway 113 and Travis Air Force Base, and in several of the National Wildlife Refuges in Colusa and Glenn counties. To this effect, four Core Areas have been identified in the USFWS Recovery Plan for prioritized conservation. These include: Sacramento National Wildlife Refuge, Dolan, Woodland, and Jepson Prairie (USFWS, 2005).

Biologically, the Solano-Colusa Vernal Pool Service Area is unique in that it is the only Service Area that contains the federal threatened Delta green ground beetle (*Elaphrus viridis* and federally and State endangered Crampton's tuctoria (*Tuctoria mucronata*). The Service Area also includes the federally endangered Conservancy fairy shrimp (*Branchinecta conservation*) and tadpole shrimp (*Lepidurus packardi)* (Keller-Wolfe, et al, 1998).

A summary of the Solano-Colusa Vernal Pool Region has been adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-5.1. Summary of the Solano Colusa Vernal Pool Service Area

Solano-Colusa					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Claypan	M	M	M	16	7
Northern Hardpan	L	M	none known		

1. Historic and Current Impacts

The vernal pools within this Service Area have been impacted by agricultural practices, urbanization, road construction, and water diversion (Keeler-Wolf, et al, 1998). While there are a number of preserves and mitigation areas owned by public and private entities in the Service Area – including the Jepson Prairie Preserve (Solano Land Trust), the Sacramento National Wildlife Refuge, and several conservation banks, primarily in Solano County – vernal features continue to be impacted by many of these traditional threats.

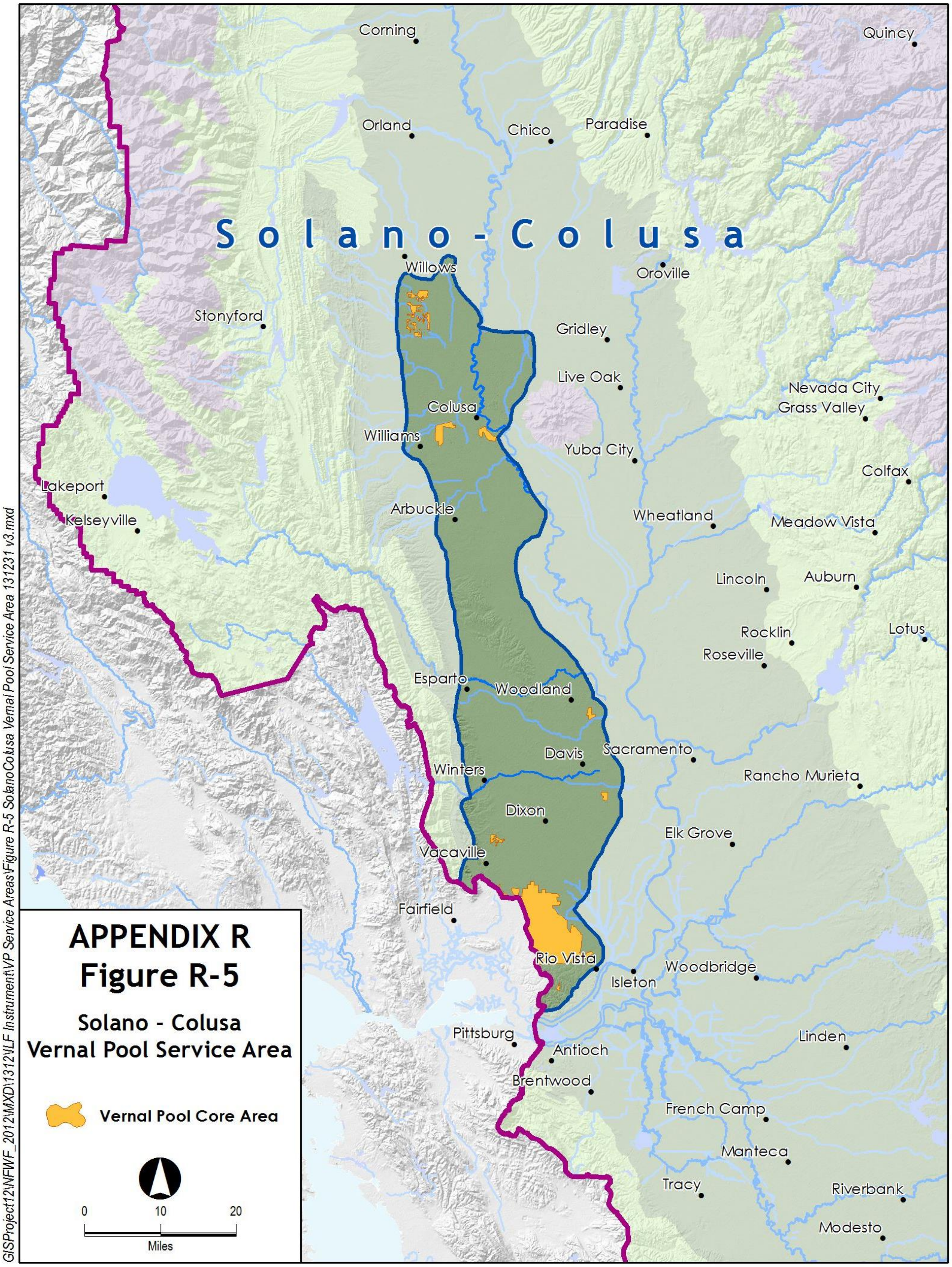

Corning
Quincy
Orland
Chico
Paradise
S o l a n o - C o l u s a
Willows
Oroville
Stonyford
Gridley
Live Oak
Nevada City
Grass Valley
Colusa
Williams
Yuba City
Colfax
Lakeport
Kelseyville
Arbuckle
Wheatland
Meadow Vista
Lincoln
Auburn
Rocklin
Lotus
Roseville
Esparto
Woodland
Davis
Sacramento
Winters
Rancho Murieta
Dixon
Elk Grove
Vacaville
Fairfield
Rio Vista
Isleton
Woodbridge
Pittsburg
Antioch
Linden
Brentwood
French Camp
Manteca
Tracy
Riverbank
Modesto
APPENDIX R
Figure R-5
Solano - Colusa
Vernal Pool Service Area
Vernal Pool Core Area
0
10
20
Miles
GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-5 SolanoColusa Vernal Pool Service Area 131231 v3.mxd

Table R-5.2. Impacts to the Solano-Colusa Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Solano-Colusa	Historic Impacts			X	X	X	X	
	Present Threats				X	X	X	

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to well-managed and protected lands. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected lands.
- Hydrology: Restores natural hydrology across the Service Area. Sample projects may include improvement of roadside drainage to avoid diversion of surface flows.
- Biotic: Enhances habitat through improved land management. Examples may include restoration of rice lands or improved grazing management in existing vernal pool complexes as described by Keeler-Wolfe et al (1998).
- Acreage: Increases the self-sustaining wetland acreage within the Service Area.

Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

6. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Appendix R-6

Southeastern Sacramento Valley

R-6. Southeastern Sacramento Valley

The Southeastern Sacramento Valley Vernal Pool Service Area is approximately 2,106 square miles (**Figure R-6**). It occupies the valley floor and low foothills from southern Yuba County to northeastern San Joaquin County. This Vernal Pool Service Area consists of the entirety of the Southeastern Sacramento Valley Vernal Pool Region within the USFWS Recovery Plan. Four Core Areas have been identified within the Recovery Plan for this Service Area, including Beale, Western Placer County, Mather, Cosumnes/Rancho Seco, and Southeastern Sacramento Valley. Key complexes occur at Beale Air Force Base in Yuba County, throughout Western Placer County, and at, or in the vicinity of, the former Mather Air Force Base in Sacramento County. Features within this Service Area consist of the Northern Hardpan and Northern Volcanic Mudflow types.

Biologically, the Southeastern Sacramento Valley Vernal Pool Service Area contains habitat that supports the endemic and State and federally endangered Sacramento Orcutt grass (*Orcuttia viscida),* as well as the endangered Conservancy fairy shrimp (*Branchinecta conservation*) and the endangered tadpole shrimp (*Lepidurus packardi)*.

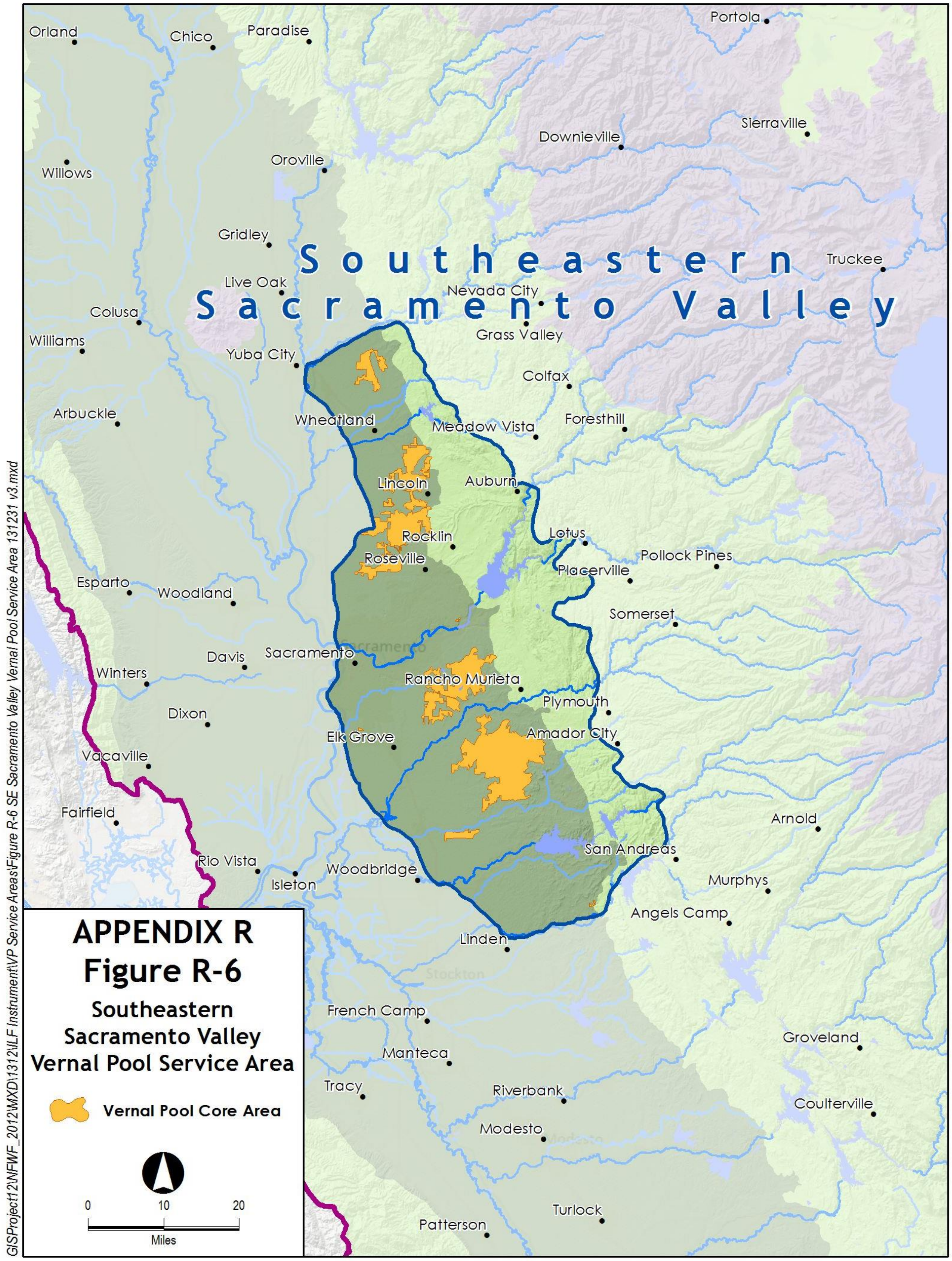
A summary of the Solano-Colusa Vernal Pool Region has been adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-6.1. Summary of the Southeastern Sacramento Valley Vernal Pool Service Area

Southeastern Sacramento Valley					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Hardpan	M	M	L	9	6
Northern Volcanic Mudflow	M	M	L		

1. Historic and Current Impacts

The vernal pools of this Service Area have been impacted primarily by conversion to agriculture; the USFWS Recovery Plan notes that federal records indicate a loss of over 15,000 acres of vernal pool landscape to intensive agricultural uses since 1994 (USFWS, 2005).



Southeastern
Sacramento Valley
Orland
Chico
Paradise
Portola
Sierraville
Downieville
Willows
Oroville
Gridley
Truckee
Live Oak
Nevada City
Colusa
Grass Valley
Williams
Yuba City
Colfax
Arbuckle
Wheatland
Meadow Vista
Foresthill
Lincoln
Auburn
Rocklin
Lotus
Pollock Pines
Roseville
Placerville
Esparto
Woodland
Somerset
Davis
Sacramento
Winters
Rancho Murieta
Plymouth
Dixon
Elk Grove
Amador City
Vacaville
Arnold
Fairfield
San Andreas
Rio Vista
Isleton
Woodbridge
Murphys
Angels Camp
Linden
French Camp
Groveland
Manteca
Tracy
Riverbank
Coulterville
Modesto
Turlock
Patterson
APPENDIX R
Figure R-6
Southeastern
Sacramento Valley
Vernal Pool Service Area
Vernal Pool Core Area
0
10
20
Miles
GIS\Project12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-6 SE Sacramento Valley Vernal Pool Service Area 131231 v3.mxd

While several small preserves exist within this region, many of these areas are “postage stamp” in size and surrounded by highly urbanized development, likely reducing the sustainability of these areas over the long term. Phoenix Park, managed by the local parks and recreation department, is one such example.

Table R-6.2. Impacts to the Southeast Sacramento Valley Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Southeast Sacramento Valley	Historic Impacts			X	X	X	X	
	Present Threats			X	X	X	X	

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to well-managed and protected lands. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected lands.
- Hydrology: Restores natural hydrology. Sample projects may include reestablishment of natural topography in disturbed landscapes.
- Biotic: Enhances habitat through improved land management.
- Acreage: Increases the self-sustaining wetland acreage within the Service Area.
- Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

Additionally, restoration, preservation, or reestablishment project proposals in areas that may support listed species as described in the *Predictive Habitat Analysis and Mapping of Four Rare Vernal Pool Species in Merced, Sacramento, and Placer Counties* report (Predictive Habitat Analysis Report) (Vollmar et al., 2013) are strongly encouraged for the Southeast Sacramento Valley Vernal Pool Service Area.

6. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Vollmar, John, Schweitzer, Jake, et.al. 2013. *Predictive Habitat Analysis and Mapping of Four Rare Vernal Pool Species in Merced, Sacramento and Placer Counties.*

Appendix R-7

Livermore

R-7. Livermore

The Livermore Vernal Pool Service Area is approximately 248 square miles and incorporates portions of eastern Alameda and Contra Costa counties, as well as southwestern San Joaquin County (**Figure R-7**). This Vernal Pool Service Area incorporates parts of the Livermore Vernal Pool Region of the USFWS Recovery Plan, though it excludes the Livermore Valley, is located outside of the ILF Program boundary. Core Areas within the Service Area include portions of the Altamont Hills Core Area (USFWS, 2005). Vernal features within the Service Area are primarily of the Northern Claypan type, though some Northern Hardpan pools may also be present. Key complexes within the Livermore Vernal Pool Service Area include features in the vicinity of Byron Airport. Several complexes also exist at the base of the Coastal Range east of Mt. Diablo, and additional features may occur in the valleys of the Diablo Range, though no mapping efforts have been undertaken at these locations (Keeler-Wolf, et al, 1998).

Biologically, the Livermore Vernal Pool Service Area has no endemic indicator species. However, in its overall biotic relationships, features in this region, especially around Byron and Springtown, mimic the alkaline claypan pools of the San Joaquin Valley region (Keeler-Wolf, et al, 1998). The Service Area may provide habitat for the federally endangered longhorn fairy shrimp as well as several other federally and State listed plant and animal species.

1. Vernal Pool Types

A summary of the Livermore Vernal Pool Region, including areas outside of the ILF Program boundary, has been directly adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-7.1. Summary of the Livermore Vernal Pool Service Area

Livermore					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Claypan	L	L	L	12	3
Northern Vernal Pool	M	M	none known		

2. Historic and Current Impacts

Features within the Livermore Vernal Pool Service Area face several past impacts and current threats, primarily as a result of urban development, agriculture, and overgrazing. The Byron pools are also threatened by invasive non-native plant species and off-road vehicle use. Many of the best remaining pools in the Service Area are located near the Byron Airport and are threatened by the potential expansion of this facility (Keeler-Wolf, et al, 1998).

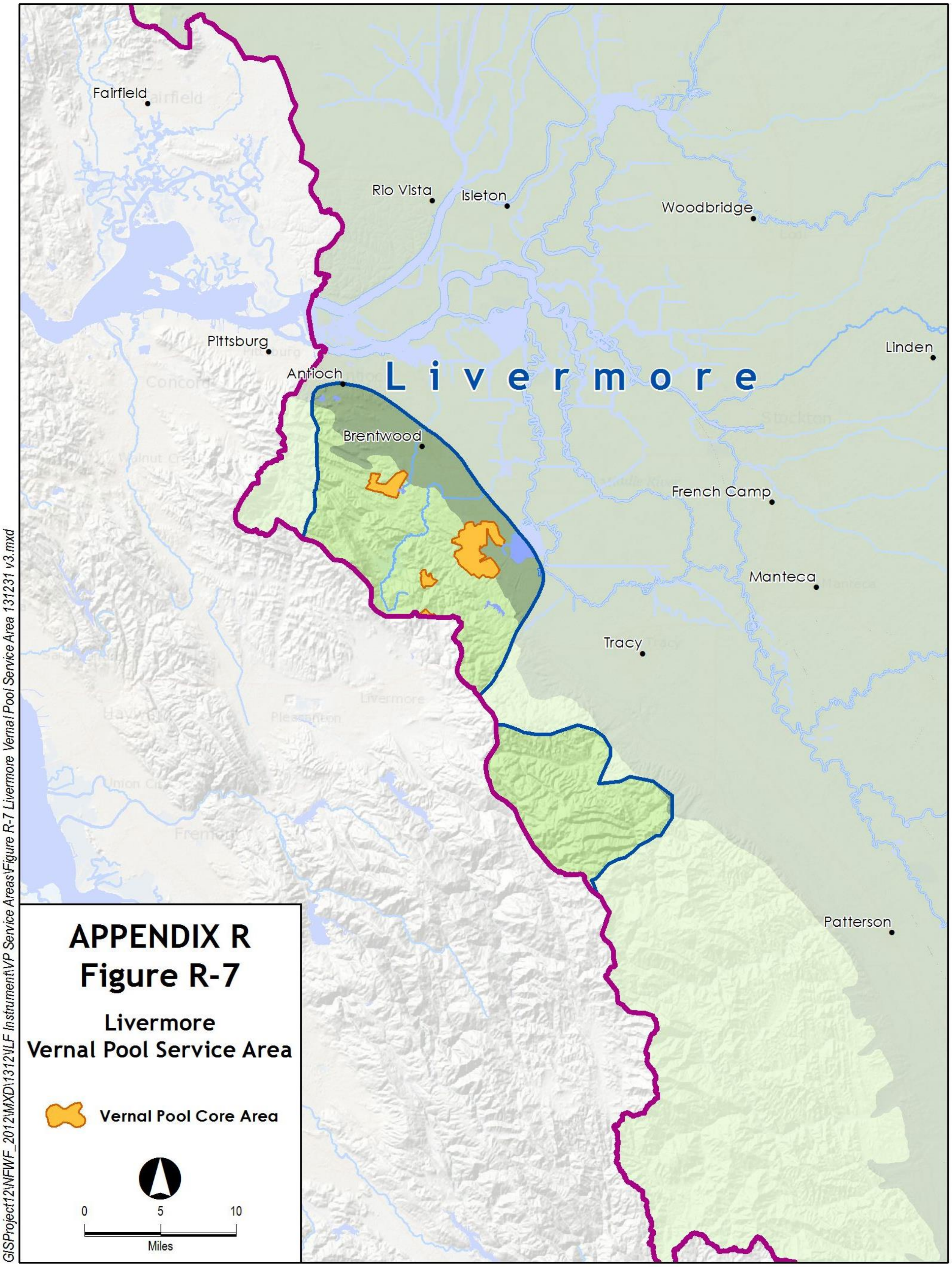

APPENDIX R
Figure R-7
Livermore
Vernal Pool Service Area
Vernal Pool Core Area
0
5
10
Miles
Livermore
Fairfield
Rio Vista
Isleton
Woodbridge
Pittsburg
Antioch
Linden
Brentwood
French Camp
Manteca
Tracy
Patterson
GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-7 Livermore Vernal Pool Service Area 131231 v3.mxd

Table R-7.2. Impacts to the Livermore Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Livermore	Historic Impacts				X	X	X	
	Present Threats				X	X	X	

3. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to well-managed and protected lands. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected lands.
- Hydrology: Restores natural hydrology. Sample projects may include improvement of roadside or airport drainage to avoid diversion of surface flows and/or minimize degradation to vernal pool water quality.
- Biotic: Adjusts grazing and land management practices to account for sensitive biotic resources. Note: the Keeler-Wolf report states that the viability of existing complexes is low and that restoration opportunities are few, due to the scarcity of suitable soils in the area. The Byron area is within the East Contra Cost Habitat Conservation Plan boundary, as well as the related Regional General Permit area, and these plans may provide the best opportunities for compensation.
- Acreage: Increases the self-sustaining wetland acreage within the Service Area.

Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

6. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Appendix R-8

Central Coast

R-8. Central Coast

The Central Coast Service Area is approximately 654 square miles, located in the southern Central Coast Range (**Figure R-8**). As with other areas, the Central Coast Service Area represents only a small subset of the much larger Central Coast Vernal Pool Region as described within the USFWS Recovery Plan, as much of this region is truncated by the ILF program boundary. As such, no Core Areas are present within the Service Area. The Central Coast Service Area consists of two discontinuous polygons that contain vernal features within the interior of the Coast Range (USFWS, 2005). The northernmost of these polygons is in Merced County, southwest of Los Banos, while the southern polygon exists in Fresno County, near Colinga. Typically, the pools within this Service Area occur in geologic basins associated with fault lines and are generically identified as Northern Vernal Pool type (Keeler-Wolf, et al, 1998).

Biologically, the Central Coast Vernal Pool Service Area is unique in that it supports the shining navarretia (*Navarretia nigelliformis* ssp. *radians*), which is endemic to the region. Historically, the Vernal Pool Region also supported Contra Costa goldfields (*Lasthenia conjugens*), though these have not been observed in modern times (Keeler-Wolf, et al, 1998).

A summary of the Central Coast Vernal Pool Region has been directly adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-8.1. Summary of the Central Coast Vernal Pool Service Area

Central Coast					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Vernal Pool	M	M	M	5	3

1. Historic and Current Impacts

The relative isolation of the Central Coast Vernal Pool Service Area has limited the types of impacts. These impacts may have been primarily due to the implementation of grazing practices that were incompatible with local hydrology and biotic functions.

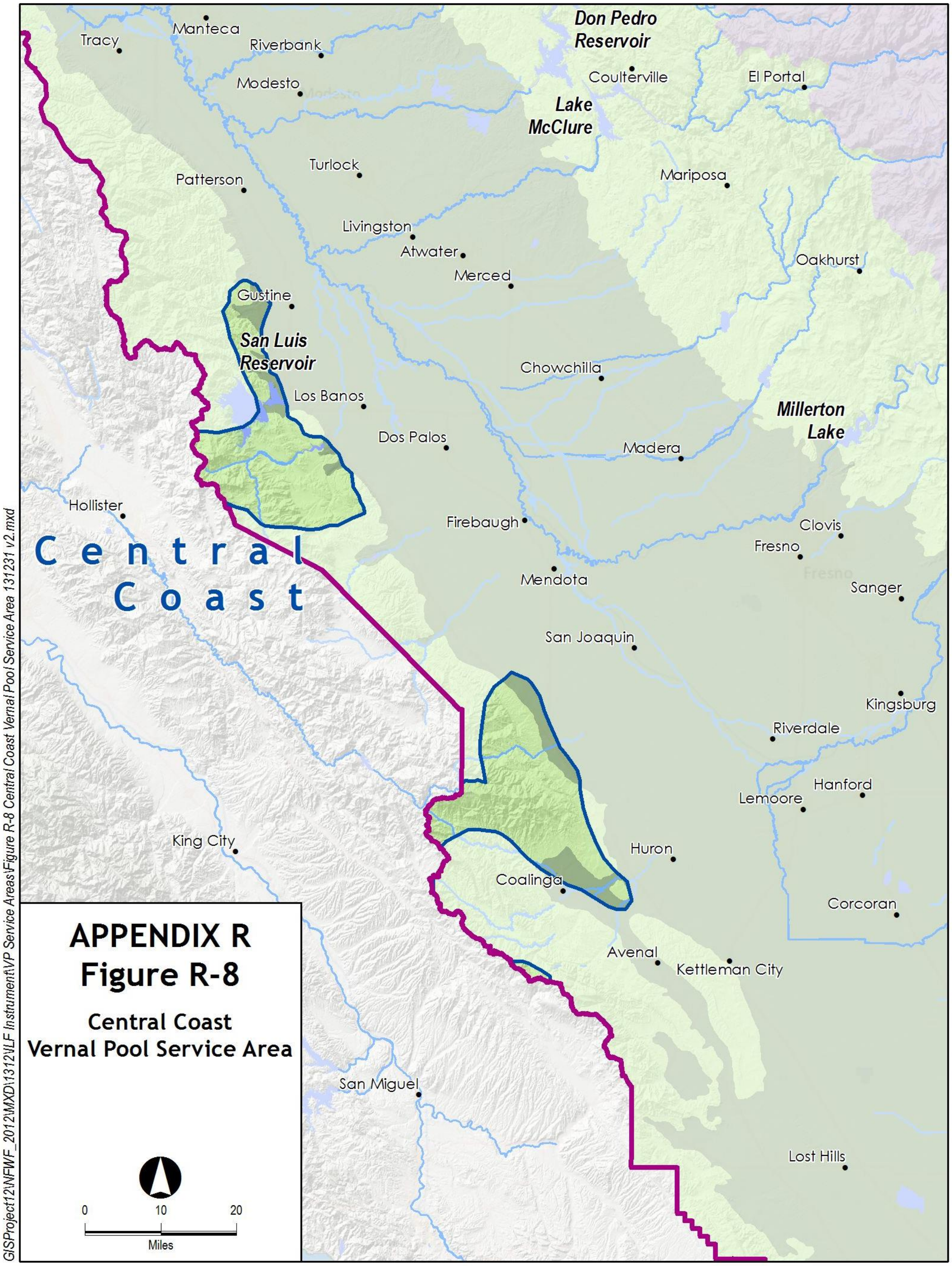

Don Pedro Reservoir
Manteca
Tracy
Riverbank
Coulterville
El Portal
Modesto
Lake McClure
Turlock
Mariposa
Patterson
Livingston
Atwater
Oakhurst
Merced
Gustine
San Luis Reservoir
Chowchilla
Los Banos
Millerton Lake
Dos Palos
Madera
Hollister
Firebaugh
Clovis
Fresno
Central Coast
Mendota
Sanger
San Joaquin
Kingsburg
Riverdale
Hanford
Lemoore
King City
Huron
Coalinga
Corcoran
APPENDIX R
Figure R-8
Central Coast
Vernal Pool Service Area
Avenal
Kettleman City
San Miguel
Lost Hills
0
10
20
Miles
GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-8 Central Coast Vernal Pool Service Area 131231 v2.mxd

Table R-8.2. Impacts to Central Coast Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Central Coast	Historic Impacts				X			
	Present Threats				X			

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to well-managed – and, ideally, protected – lands. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected lands.
- Hydrology: Restores natural hydrology. Sample projects may include improvement of roadside drainage to avoid diversion of surface flows.
- Biotic: Adjusts grazing and land management practices to account for sensitive biotic resources. Sample projects may include conservation easements and linked management plans that optimize grazing regimes that protect the function and values of local habitats.
- Acreage: Increases the self-sustaining wetland acreage within the Service Area.

Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

6. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Appendix R-9

Carrizo

R-9. Carrizo

The Carrizo Service Area is approximately 77 square miles, located in the southern Central Coast Range (**Figure R-9**). The Carrizo Service Area represents only a small subset of the much larger Carrizo Vernal Pool Region as described within the USFWS Recovery Plan, as much of this region is truncated by the ILF program boundary. As such, no Core Areas are present within the Service Area. Similarly, while significant vernal pool complexes exist in the Carrizo Vernal Pool Region, these features are largely associated with Soda Lake, which is located outside of the Carrizo Service Area (USFWS, 2005). Vernal pools that are present within this Service Area are described as isolated features along the San Andreas Fault zone into the Temblor Range and are of the Northern Claypan type (Keeler-Wolfe, et al, 1998).

Biologically, the Service Area is of importance due to its support of the federally endangered Longhorn fairy shrimp (*Branchinecta longiantenna*), as well as a number of federally threatened plant and animal species (Keeler-Wolfe, et al, 1998).

A summary of the Carrizo Vernal Pool Region has been directly adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-9.1. Summary of the Carrizo Vernal Pool Service Area

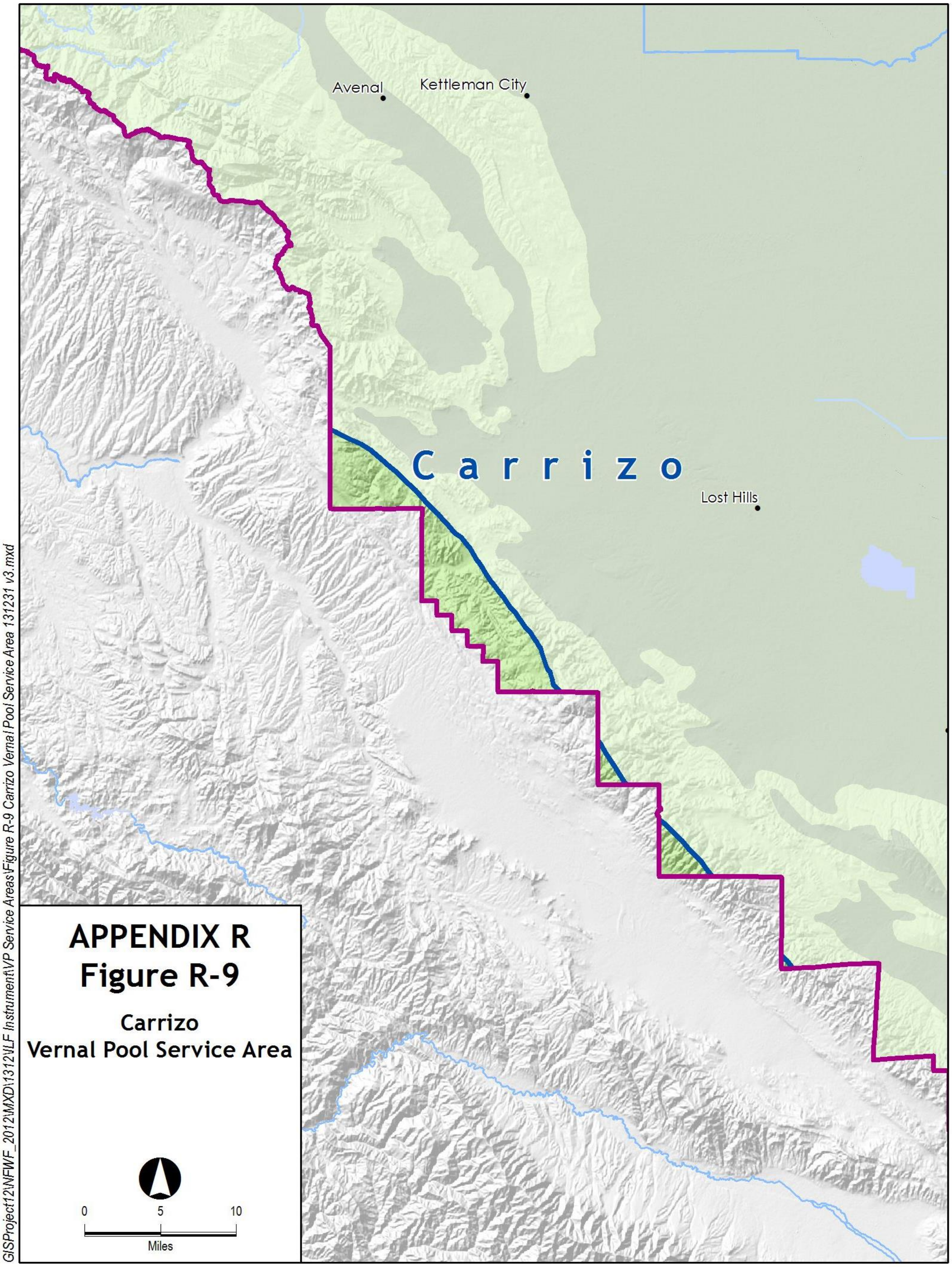
Carrizo					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Vernal Pool	M	M	M	6	4

1. Historic and Current Impacts

Long-term intensive grazing is described as the primary impact to the pools within the Carrizo Service Area. The USFWS Recovery Plan notes that urban and road development also threatens portions of the Carrizo Vernal Pool Region, though this threat has been limited to areas outside of the Carrizo Service Area (USFWS, 2005). Locations within the Service Area, however, are remote and face little probable development.

Table R-9.2. Impacts to Carrizo Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Carrizo	Historic Impacts				X			
	Present Threats				X			


Avenal
Kettleman City
Carrizo
Lost Hills
APPENDIX R
Figure R-9
Carrizo
Vernal Pool Service Area
0
5
10
Miles
GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-9 Carrizo Vernal Pool Service Area 131231 v3.mxd

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to protected lands. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected areas.
- Hydrology: Restores natural hydrology. Sample projects may include improvement of roadside drainage to avoid diversion of surface flows and removing barriers to hydrologic flows.
- Biotic: Adjusts grazing and land management practices to account for sensitive biotic resources. Sample projects may include the establishment of conservation easements and associated management plans that optimize grazing regimes that promote vernal pool functions and values.
- Acreage: Increases the self-sustaining wetland acreage within the Service Area.

Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

3. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Appendix R-10

San Joaquin Valley

R-10. San Joaquin Valley

The San Joaquin Valley Vernal Pool Service Area is approximately 3,821 square miles (**Figure R-10**). It occupies the San Joaquin Valley floor from central San Joaquin County to northern Kern County. This Vernal Pool Service Area consists of the entirety of the San Joaquin Valley Vernal Pool Region of the USFWS Recovery Plan. As such, the Service Area includes all four Core Areas as described within the USFWS Recovery Plan, including Caswell, Grassland Ecological Area, Cross Creek, and Pixley (USFWS, 2005). Vernal pools within this Service Area are predominantly of the Northern Claypan type and generally occur on alkaline soils. Key complexes occur in Madera County, Merced County (including those on the San Luis National Wildlife Refuge and along the Sandy Mush Road area), and Tulare County (including the Cottonwood Creek and Pixley Vernal Pool Preserve) (Keeler-Wolf, et al, 1998).

Biologically, San Joaquin Valley Service Area pools support several rare plants endemic to California, including the lesser saltscale (*Atriplex miniscula*) and the federally threatened and State-endangered San Joaquin Valley Orcutt grass (*Orcuttia inaequalis)*. The Service Area also includes the endangered Conservancy fairy shrimp (*Branchinecta conservation*) and the longhorn fairy shrimp (*Branchinecta longiantenna)* (Keeler-Wolf, et al, 1998).

A summary of the San Joaquin Valley Vernal Pool Region, including areas outside of the ILF Program boundary, has been adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-10.1. Summary of the San Joaquin Valley Vernal Pool Service Area

San Joaquin Valley					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Hardpan	M	M	M	19	9
Northern Claypan	M	M	M		
Northern Basalt Flow	H	H	L		

1. Historic and Current Impacts

The vernal pools of this Service Area have been impacted primarily by conversion to agriculture; the USFWS Recovery Plan notes that federal records indicate a loss of over 15,000 acres of vernal pool landscape to intensive agricultural uses since 1994 (USFWS, 2005).

There are a number of preserves and mitigation areas owned by public and private entities in the Service Area, including the Pixley Vernal Pool Preserve (Center for Natural Land Management)

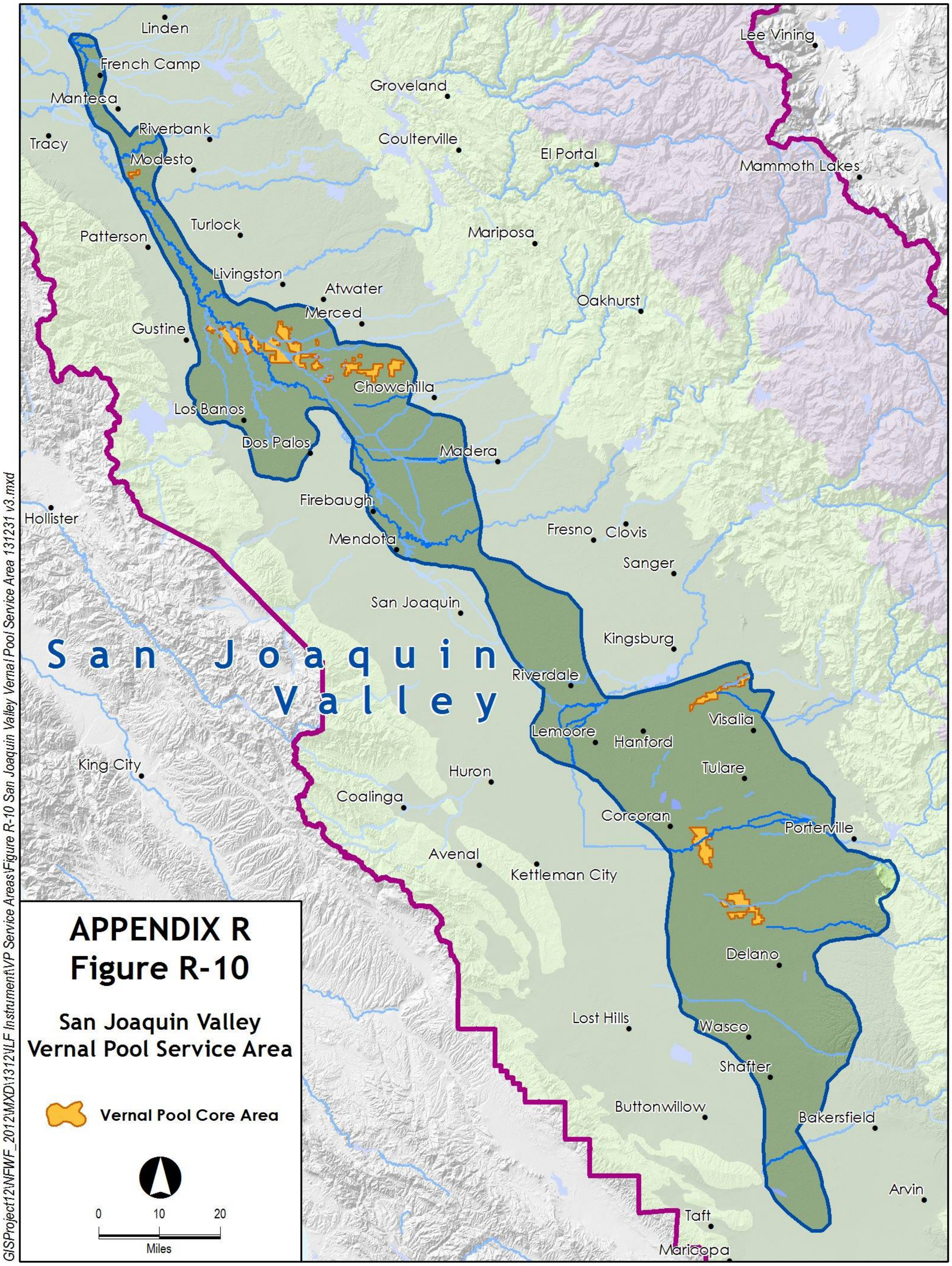

APPENDIX R
Figure R-10
San Joaquin Valley
Vernal Pool Service Area
Vernal Pool Core Area
0
10
20
Miles
San Joaquin
Valley
Linden
French Camp
Manteca
Riverbank
Tracy
Modesto
Turlock
Patterson
Livingston
Atwater
Merced
Gustine
Chowchilla
Los Banos
Dos Palos
Madera
Firebaugh
Mendota
Hollister
Fresno
Clovis
Sanger
San Joaquin
Kingsburg
Riverdale
Lemoore
Hanford
Visalia
Tulare
King City
Huron
Coalinga
Corcoran
Porterville
Avenal
Kettleman City
Delano
Lost Hills
Wasco
Shafter
Buttonwillow
Bakersfield
Arvin
Taft
Maricopa
Groveland
Coulterville
El Portal
Mariposa
Oakhurst
Lee Vining
Mammoth Lakes
GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-10 San Joaquin Valley Vernal Pool Service Area 131231 v3.mxd

Table R-10.2. Impacts to the San Joaquin Valley Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
San Joaquin Valley	Historic Impacts				X	X	X	
	Present Threats				X	X	X	

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to well-managed and protected lands. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected lands.
- Hydrology: Restores natural hydrology. Sample projects may include improvement of roadside drainage to avoid diversion of surface flows.
- Biotic: Enhances habitat through improved land management.
- Acreage: Increases the self-sustaining wetland acreage within the Service Area. Conservation in the northeastern and southern portion of the Service Area is needed (Keeler-Wolf, et al, 1998).
- Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

Additionally, restoration, preservation, or reestablishment project proposals in areas that may support listed species as described in the *Predictive Habitat Analysis and Mapping of Four Rare Vernal Pool Species in Merced, Sacramento, and Placer Counties* report (Predictive Habitat Analysis Report) (Vollmar et al., 2013) are strongly encouraged for the San Joaquin Vernal Pool Service Area.

3. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Vollmar, John, Schweitzer, Jake, et.al. 2013. *Predictive Habitat Analysis and Mapping of Four Rare Vernal Pool Species in Merced, Sacramento and Placer Counties.*

Appendix R-11

Southern Sierra Foothills

R-11. Southern Sierra Foothills

The Southern Sierra Foothills Vernal Pool Service Area is approximately 3,384 square miles (**Figure R-11**). It occupies the low foothills from central Calaveras County to central Kern County. This Vernal Pool Service Area consists of the entirety of the Southern Sierra Foothills Vernal Pool Region of the USFWS Recovery Plan. Within this Service Area, there are 14 Core Areas, including San Joaquin, Shotgun, Farmington, Merced, Turlock, Madera, Table Mountain, Fresno, Kings, Cottonwood Creek, Tulare, Kaweah, Yokohl, and Lake Success (USFWS, 2005). Key complexes occur in Merced County (e.g., Castle Air Force Base and Flying M Ranch) and Madera and Fresno counties (e.g., Table Mountain pools), as well as various other locations. The pools are primarily the Northern Hardpan and Northern Basalt Flow types (Keeler-Wolf, et al, 1998).

Biologically, the vernal pool plants of the Service Area include the spiny-sepaled button-celery (*Eryngium spinosepalum),* an endemic rare species, and succulent owl's clover (*Castilleja campestis ssp. succulenta),* which is federally threatened and State endangered. The Service Area also includes the federally endangered Conservancy fairy shrimp (*Branchinecta conservation*) and endangered tadpole shrimp (*Lepidurus packardi)* (Keeler-Wolf, et al, 1998).

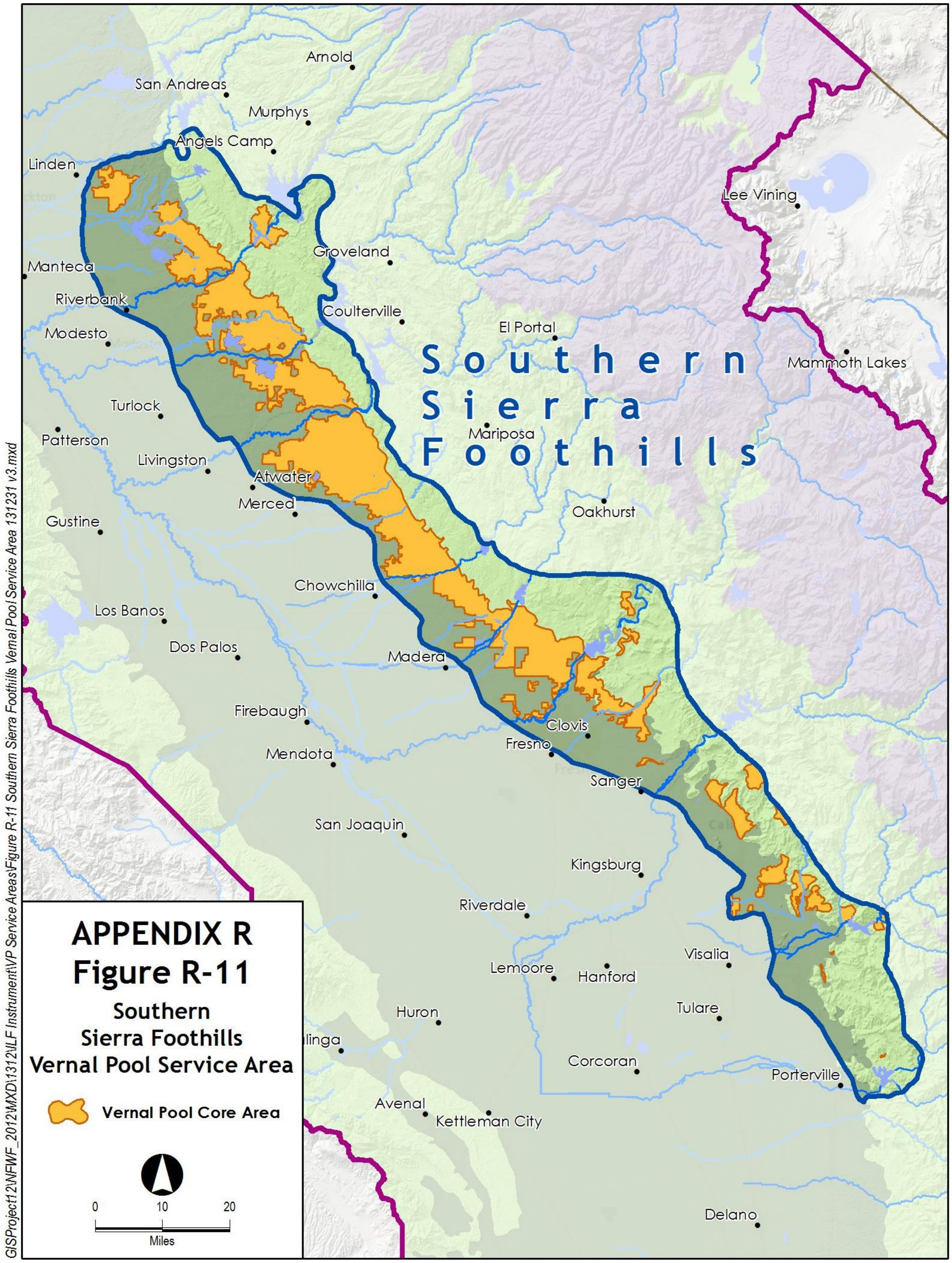
A summary of the Solano-Colusa Vernal Pool Region has been adapted from *California Vernal Pool Assessment* (Keeler-Wolf, et al, 1998).

Table R-11.1. Summary of the Southern Sierra Foothills Vernal Pool Service Area

Southern Sierra Foothills					
Vernal Pool Type	VIABILITY (H, M, L)	RESTORATION OPPORTUNITY (H, M, L)	PROTECTED AREAS (Total Acres) or (H, M, L)	SENSITIVE PLANTS (No. of spp.)	SENSITIVE ANIMALS (No. of spp.)
Northern Hardpan	M	M	M	15	9
Northern Claypan	M	M	M		
Northen Basalt Flow	H	H	L		

1. Historic and Current Impacts

The Northern Basalt Flow vernal pools within this Service Area are of limited extent, but are relatively intact in their historic formations, due to their relative isolation and the intensive effort needed to till these areas for agriculture. The Northern Hardpan pools are extensive through the area and have been significantly impacted by agricultural conversions and urbanization, particularly around urban centers (Keeler-Wolf, et al, 1998).



APPENDIX R
Figure R-11
Southern
Sierra Foothills
Vernal Pool Service Area
Vernal Pool Core Area
0
10
20
Miles
Southern
Sierra
Foothills
Arnold
San Andreas
Murphys
Angels Camp
Linden
Lee Vining
Groveland
Manteca
Riverbank
Coulterville
Modesto
El Portal
Mammoth Lakes
Turlock
Patterson
Mariposa
Livingston
Atwater
Merced
Oakhurst
Gustine
Chowchilla
Los Banos
Dos Palos
Madera
Firebaugh
Clovis
Fresno
Mendota
Sanger
San Joaquin
Kingsburg
Riverdale
Visalia
Lemoore
Hanford
Tulare
Huron
Corcoran
Porterville
Avenal
Kettleman City
Delano
GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-11 Southern Sierra Foothills Vernal Pool Service Area 131231 v3.mxd

However, a number of preserves and mitigation areas owned by public and private entities do exist that help protect the remaining features in the Service Area, including:

- The Nature Conservancy parcels of the Flying M Ranch
- The Stone Corral Ecological Reserve (CA Dept. of Fish and Wildlife)
- The Hogwallow Preserve (Tulare County Historical Society)
- Big Table Mountain/McKenzie Table (multiple entities)
- Castle Air Force Base

Table R-11.2. Impacts to the Southern Sierra Foothills Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Southern Sierra Foothills	Historic Impacts				X	X	X	
	Present Threats				X	X	X	

2. Prioritization

Based on the impacts to Service Area attributes, individual project proposals within the watershed will be evaluated on their ability to meet the following priorities:

- Buffer and Landscape: Is adjacent to well-managed and protected lands. Sample projects may include purchase, enhancement, and protection of private lands that augment existing protected lands.
- Hydrology: Restores natural hydrology. Sample projects may include improvement of roadside drainage to avoid diversion of surface flows.
- Biotic: Enhances habitat through improved land management. The best opportunities for restoration are in basalt flow and hardpan pools that have been impacted by adverse grazing practices (Keeler-Wolf, et al, 1998).
- Acreage: Increases the self-sustaining wetland acreage within the Service Area. Conservation in the northeastern and southern portion of the Service Area is needed.
- Diversity: Provides topographical diversity of design that reflects the range of natural vernal pool resources in the Service Area.

Additionally, restoration, preservation, or reestablishment Project proposals in areas that may support listed species as described in the *Predictive Habitat Analysis and Mapping of Four Rare Vernal Pool Species in Merced, Sacramento, and Placer Counties* report (Predictive Habitat Analysis Report) (Vollmar et al., 2013) are strongly encouraged for the Southern Sierra Foothills Vernal Pool Service Area.

3. References

Keeler-Wolf, et al, 1998. *California Vernal Pool Assessment, Preliminary Report*. California Department of Fish and Game.

US Fish and Wildlife Service, 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon.*

Vollmar, John, Schweitzer, Jake, et.al. 2013. *Predictive Habitat Analysis and Mapping of Four Rare Vernal Pool Species in Merced, Sacramento and Placer Counties.*

Appendix R-12

All Other Vernal Pools

R-12. All Other Vernal Pools Service Area

The All Other Vernal Pools Service Area consists of all vernal pools and complexes outside of the Vernal Pool Regions identified in the USFWS Recovery Plan (**Figure R-12**). This Service Area is approximately 21,135 square miles and includes soil types and geological landscapes throughout the ILF Program Area; thus, pools within this Service Area may consist of any of the four vernal pool types present in the ILF Program Area. Similarly, the biology of this Service Area may contain components found in any of the Vernal Pool Regions. As this Service Area does not include any portion of these recognized Vernal Pool Regions, however, no Core Areas are present within this area.

1. Historic and Current Impacts

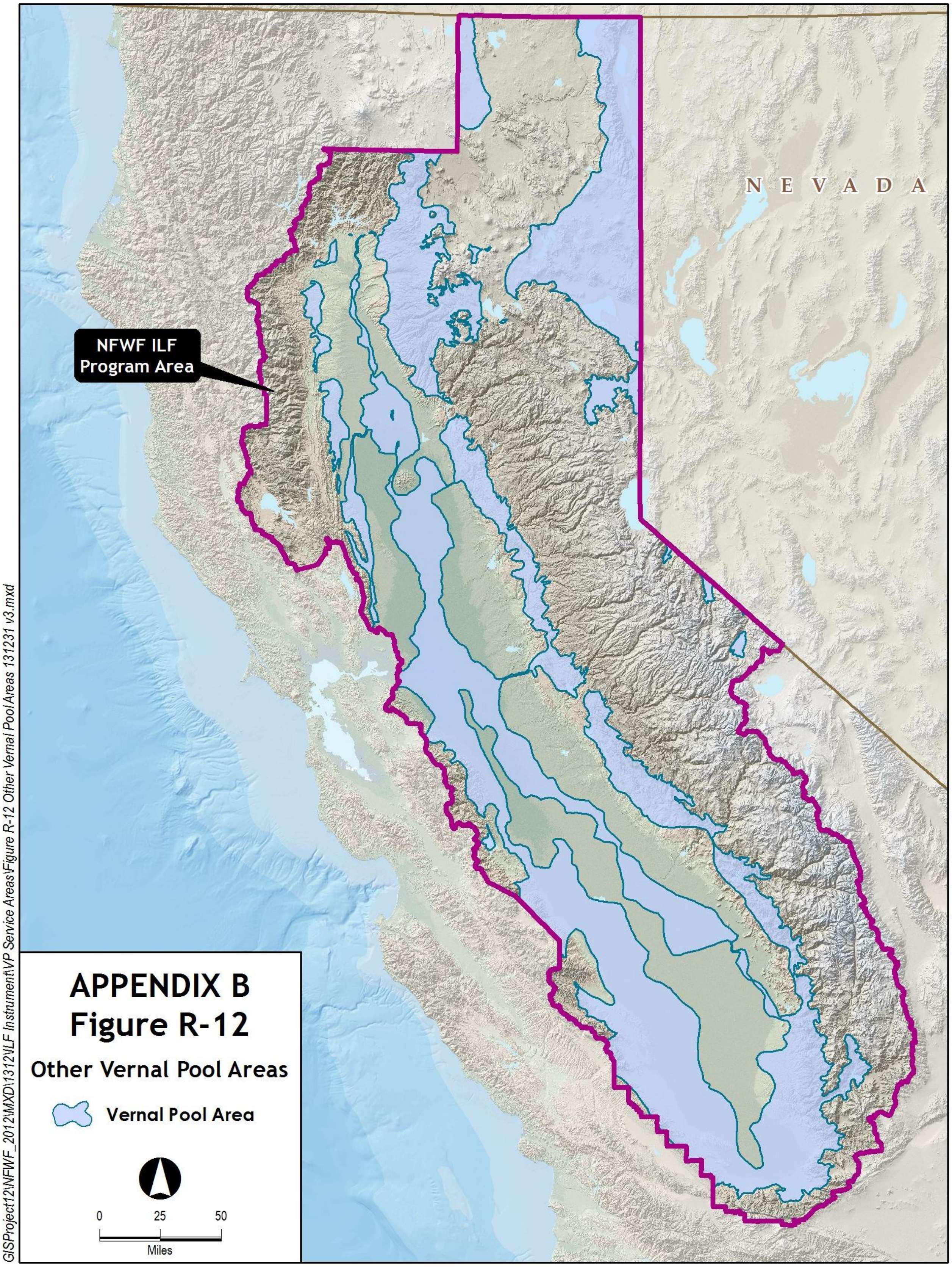
Historic and current threats to vernal pool complexes within this Service Area may include impacts from a variety of activities throughout the ILF Program Area. While the majority of these threats have been the result of agricultural operations, this Service Area also includes locations that have been heavily impacted from urban and related roadway development. These impacts have been especially prevalent in former complexes surrounding the cities of Fresno, Merced, and Red Bluff.

Table R-12.1. Impacts to All Other Vernal Pool Service Area

Location		Mining	Timber	Water Resource Development	Agriculture	Urban	Roads	Flood
Other	Historic Impacts				X	X	X	
	Present Threats				X	X	X	

2. Prioritization

The most suitable locations for restoration and rehabilitation efforts have previously been identified to be within Vernal Pool Regions. Therefore, prioritization of projects for this Service Area will be based upon the priorities of the nearest adjacent Vernal Pool Service Area. Reestablishment activities may occur within the All Other Vernal Pools Service Area, but should be located in close proximity to Vernal Pool Region boundaries to encourage hydrologic and biological connectivity with these locations.


NEVADA
NFWF ILF
Program Area
APPENDIX B
Figure R-12
Other Vernal Pool Areas
Vernal Pool Area
0
25
50
Miles
GISProject12\NFWF_2012\MXD\1312\ILF Instrument\VP Service Areas\Figure R-12 Other Vernal Pool Areas 131231 v3.mxd