OTAY RIVER WATERSHED
SPECIAL AREA MANAGEMENT PLAN

SUMMARY REPORT AND
USER MANUAL FOR GIS DATABASE

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1.0 INTRODUCTION

1.1 BACKGROUND ON SPECIAL AREA MANAGEMENT PLANS

The 1980 Amendments to the Coastal Zone Management Act define the Special Area Management Plan (SAMP) process as "a comprehensive plan providing for natural resource protection and reasonable coastal-dependent economic growth containing a detailed and comprehensive statement of policies, standards and criteria to guide public and private uses of lands and waters; and mechanisms for timely implementation in specific geographic areas within the coastal zone."

The United States Army Corps of Engineers (USACE) indicated this process of collaborative interagency planning within a geographic area of special sensitivity is applicable in non-coastal areas and can be useful to reduce challenges associated with the traditional case-by-case review of projects. The objectives are that developmental interests can plan with predictability and environmental interests are assured that individual and cumulative impacts are analyzed in the context of broad ecosystem needs.

1.2 DEVELOPMENT OF THE OTAY RIVER WATERSHED SAMP

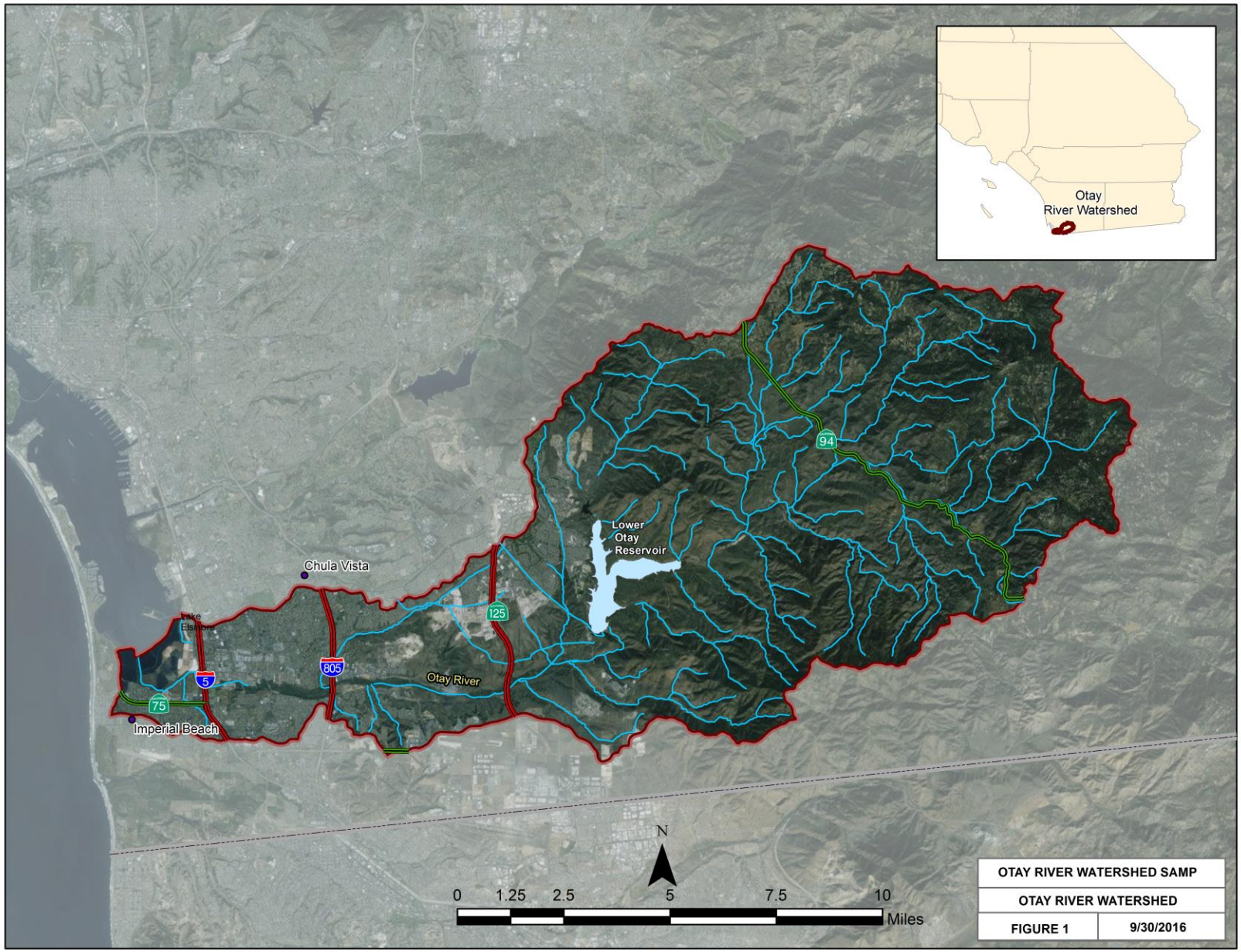
The USACE's Los Angeles District Regulatory Division initiated the Otay River Watershed SAMP in 2003 as a comprehensive plan for protecting and enhancing aquatic resources in the watershed while providing for the permitting of reasonable economic development and public infrastructure/maintenance activities in consideration of local land use plans and the regional Multiple Species Conservation Plan (MSCP) for San Diego County. Conceptual elements of the SAMP included:

- An abbreviated permitting process for projects in the watershed subject to the USACE permit authority under Section 404 of the Clean Water Act (CWA).
- A comprehensive aquatic resource conservation program and restoration plan for the protection, restoration/enhancement, and management of aquatic resources within the watershed**.**

The Otay River Watershed encompasses approximately 145 square miles (92,920 acres) bounded by the crest of the San Ysidro Mountains on the south, Skyline Drive on the north and the Pacific Ocean to the west. Figure 1 shows the boundaries of the watershed.

1.2.1 Goal and Objectives

The SAMP was originally intended to provide aquatic resource assessment tools and a watershed-specific regulatory framework to preserve, enhance, and restore aquatic resources, while allowing reasonable and responsible economic development within the watershed.


Otay
River Watershed
Lower
Otay
Reservoir
Chula Vista
Lake
Otay River
Imperial Beach
94
125
805
5
75
N
0 1.25 2.5 5 7.5 10
Miles
OTAY RIVER WATERSHED SAMP
OTAY RIVER WATERSHED
FIGURE 1
9/30/2016

The goals of the SAMP process included: 1) establishing a watershed-wide aquatic resource reserve program; and 2) minimizing individual and cumulative impacts of future projects in the watershed. At the end of the SAMP process, it was intended that there would be areas to be protected and preserved, as well as areas where future regulated activities would be allowed to occur, provided they meet specific SAMP permit criteria developed for the protection of aquatic resources within the watershed. These regulated activities would include residential, commercial, industrial, recreational development; public infrastructure such as roads and utilities; and maintenance of public facilities.

The objectives of the Otay River Watershed SAMP included: (1) evaluate the extent and condition of existing aquatic resources in the watershed; (2) develop a comprehensive management plan and reserve program to preserve and enhance existing aquatic resources; and (3) identify alternative land development scenarios in the context of the aquatic resource management actions and reserve designs.

1.2.2 Coordination with County Planning Process and Stakeholders

The SAMP was originally initiated in coordination with the County of San Diego's Multiple Species Conservation Plan (MSCP). The SAMP was intended as a separate, stand-alone process to address aquatic resources but considered the conservation strategy and reserve program that was developed for threatened and endangered species as part of the MSCP.

In development of the SAMP, the USACE committed to working cooperatively with local, state and federal stakeholder agencies including:

- San Diego County Department of Planning and Land Use (County);
- California Department of Fish and Wildlife (CDFW) (formerly California Department of Fish and Game), South Coast Region;
- U.S. Fish and Wildlife Service (USFWS) Region I;
- U.S. Environmental Protection Agency (USEPA) Region IX; and
- California Regional Water Quality Control Board (RWQCB) (Region 9 – San Diego).

1.2.3 USACE Assessment and Restoration of Aquatic Resources

The SAMP began with two key USACE studies that defined and characterized aquatic resources within the watershed:

- Planning Level Delineation and Geospatial Characterization of Aquatic Resources for Otay Watershed, San Diego County (PLD) prepared by Robert Lichvar (2003) of the USACE's Engineering Research Development Center (ERDC) Cold Regions Research and Engineering Laboratory (CRREL); and

- Assessment of Riparian Ecosystem Integrity: Otay River Watershed (also referred to the Landscape Level Functional Assessment (LLFA) prepared by R. Daniel Smith (2004) of the USACE's ERDC Waterways Experiment Station (WES).

A third study was prepared that identified a series of restoration templates that could be applied to various reaches of the riparian ecosystems to help improve ecosystem functional integrity:

- Riparian Ecosystem Restoration Plan for the Otay River Watershed: General Design Criteria and Site Selection (Restoration Plan) by R. Daniel Smith (2006) of the USACE's ERDC WES.

The GIS mapping data produced from these three studies are key GIS layers in Otay River Watershed SAMP GIS database and are briefly described in the following three subsections.

1.2.3.1 PLD

The PLD was performed to describe the baseline occurrence of aquatic resources observed in the watershed, and is defined as the identification of areas that meet both the jurisdictional requirements under Section 404 of the CWA and the California Fish and Game (CFG) Code Section 1600 at a watershed scale. For the PLD, sampling protocols outlined in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) and 33 CFR 328 were modified for use at the watershed scale. The PLD was accomplished by combining onsite mapping efforts for vegetation and hydrogeomorphic surfaces with detailed field sampling to provide locations of aquatic resources and their regulatory status under Section 404. The work required interpretation of orthophoto quadrangles and stereoscopic aerial photography, and verifying the jurisdictional status and location of identified aquatic resources using sampling and global positioning system (GPS) techniques at representative numbers of field locations. A planning level map of aquatic resources including jurisdictional waters of the U.S. was created which provided a tool for the visualization of these resources within an ARC INFO or ArcView based GIS. With this data, a GIS database of riparian ecosystems and watershed characteristics was developed, which was subsequently used in the LLFA process (as described below). Although the PLD is considered highly accurate at the planning level, it does not replace the need for project-specific delineations for permitting purposes.

1.2.3.2 LLFA

The LLFA was conducted to characterize and rank the functional "integrity" of the watershed's riparian ecosystems for the purpose of evaluating SAMP alternatives. Integrity refers to the quality, or state of being complete, and implies correspondence with a natural or original condition of the resource. Riparian ecosystems with high ecosystem "integrity" were considered to: (1) exhibit the full range of physical, chemical, and biological attributes and processes that characterized riparian ecosystems in the southern California region over short and long term cycles prior to cultural alteration; and (2) support a balanced, integrated, and adaptive biological community resulting from natural evolutionary and biogeographic processes.

A first step in the LLFA was to divide the riparian ecosystem along the project site drainages into assessment units or "riparian reaches", taking into account the influence of the adjacent upland areas and drainage basin on the aquatic resources. Riparian reaches were defined as the segment of the main stem bankfull stream channel and adjacent riparian ecosystem that was relatively homogenous in term of geologic, geomorphic, biological, hydrologic and cultural alteration characteristics.

Next, characterization of each riparian reach was accomplished during a site visit to each reach that included observations of species and locations of dominant vegetation based on geomorphic features (i.e., bankfull channel, floodplain, terrace), measurement of channel. A characterization of the riparian reaches based on the endpoint indicators (hydrology, water quality and habitat) was accomplished using data from field visits and use of aerial photographs and topographic maps, and assigning values representing a percentage deviation from the culturally-unaltered (reference) condition for each of the three endpoint indicators. The indicator values were then converted to numerical scores with the highest values representing a riparian reach in close concurrence with the reference condition (high integrity), and the lowest scores having deviation of 50% or more from the reference condition (low integrity). Maps showing functional integrity rankings for hydrology, water quality and habitat indices were then developed for the riparian reaches of the watershed.

1.2.3.3 Restoration Plan

The Restoration Plan developed a classification of potential Restoration Templates for riparian ecosystems in various states of cultural alteration, applicable across all geomorphic zones. The study examined each riparian reach to establish specific restoration criteria in terms of channel cross section and form, the scale of terraces present, and dominant vegetation types appropriate to each of the Restoration Templates. Using aerial photography and field assessment data, restoration templates were assigned to each riparian reach based on the condition of the channel, riparian vegetation, and surrounding land uses. The assigned restoration template was intended to represent the best possible restoration target, given the potential natural patterns expected for the riparian reach's geomorphic conditions. The objective of each template was to re-establish, to the extent possible, all of the vegetation zones present under relatively natural conditions, and in relative proportions approximately corresponding to the extent of the geomorphic surfaces found in relatively intact reference reaches.

It was recognized that the restoration templates were intended to be general templates structured specifically to determine the feasibility of restoring individual reaches, and to prioritize restoration actions based on the functional benefits likely to be realized. While final restoration designs could resemble these templates and associated relative dimensions, site-specific restoration designs would have to be developed and include grading plans and specifications for planting stock, planting densities, irrigation practices, and similar requirements.

1.3 OUTCOME OF THE OTAY RIVER WATERSHED SAMP

Between 2005 and 2010, the USACE Los Angeles District conducted outreach and held coordination meetings with the various stakeholder agencies including the County, CDFW, RWQCB, USEPA, and USFWS to establish SAMP program elements consisting of an aquatic resource conservation area and a watershed-wide SAMP permitting framework. The intent of the SAMP program elements was to conserve existing high integrity aquatic resources; streamline Section 404 permitting in areas with lower integrity aquatic resources; prioritize and restore riparian reaches of the watershed to achieve an overall increase the watershed's ecosystem integrity; and minimize overall cumulative impacts of new development and infrastructure maintenance activities in the watershed.

Establishment of SAMP program elements was not ultimately achieved. The USACE redirected resources into establishing a SAMP GIS database that incorporates ERDC's PLD, LLFA and Restoration Plan elements. The resulting SAMP GIS database is intended to be a practical tool for use by USACE staff in making well-informed decisions on CWA Section 404 permits with regard to the character and functions of existing jurisdictional aquatic resources and prioritization of mitigation/restoration in targeted areas of the watershed. The GIS database will also be a useful tool for local stakeholders to use in watershed management and land use planning evaluations. Section 4.0 addresses intended uses of the SAMP GIS database in further detail.

2.0 OTAY RIVER WATERSHED SAMP GIS DATABASE

The USACE Los Angeles District contracted with AECOM (formerly URS Corporation) to compile and create a SAMP GIS database to help assess the past, existing and future aquatic resource conditions of the watershed. The work was conducted under Contract No. W91238-11-D-0016 Task Order CQ01.

The data compiled includes existing USACE SAMP data for the watershed (PLD, LLFA and Restoration Plan as described previously in Section 1.2.3) as well as data on geology, geomorphology, hydrology, surface and groundwater quality, flood control facilities, land use, resource conservation, and wetland and biological information for the watershed. The data was compiled in GIS format including tables for all available attributes of GIS layers.

2.1 PURPOSE OF THE SAMP GIS DATABASE

The purpose of the project is to create a comprehensive and well-documented GIS database of the riparian ecosystem and related data, made available to USACE staff and other watershed stakeholders, to help assess past, present and future aquatic resource conditions of the watershed in light of land use changes.

The GIS database was formatted and transmitted to the USACE for use as an on-line mapping tool for desktop users of Corps Map, ArcGIS, or equivalent. This user manual was prepared at the conclusion of the GIS work to serve as a guide to the GIS database layers by providing a summary and description of each data layer, source data for each layer, and use limitations of the data if any.

2.2 GIS LAYERS COMPRISING THE DATABASE

The GIS layers for the watershed are derived from a variety of sources, primarily the USACE's SAMP PLD, LLFA and Restoration Plan. Other data sources include but are not limited to County of San Diego, State Water Resources Control Board (SWRCB), United States Geologic Survey (USGS), USFWS, and Southern California Association of Governments (SCAG). A listing of each layer is provided below along with the data source. Appendix A contains a discussion of each layer, its source, and limitations of use.

GIS Layer	Source
Otay River Watershed Boundary	USACE ERDC – WES
SAMP Data and Analysis	
PLD • Mainstem Waterways • Mainstem Tributaries • Washes • Springs • Hydrogeomorphic Floodplain Units • Regulatory Probability Rating Units • Vegetation Species Association Units	USACE ERDC-CRREL
LLFA • Hydrologic Integrity (Normalized Index Scores) • Water Quality Integrity (Normalized Index Scores) • Habitat Integrity (Normalized Index Scores)	USACE ERDC - WES
Restoration Planning for Riparian Ecosystems • Possible Opportunities (Priorities by Restoration Goal) • Geomorphic Zones of the Watershed • Restoration Templates • Baseline Hydrologic Integrity (Normalized Index Scores) • Baseline Water Quality Integrity (Normalized Index Scores) • Baseline Habitat Integrity (Normalized Index Scores) • Level of Restoration Effort • Potential for Functional Gains • Restoration Scenarios to Increase Hydrologic Integrity • Restoration Scenarios to Increase Water Quality Integrity • Restoration Scenarios to Increase Habitat Integrity	USACE ERDC - WES

GIS Layer	Source
Riparian Ecosystems within Public/Conserved Lands • Bureau of Land Management (BLM) • State of California • County of San Diego • Public-Quasi-Public Conserved Lands, San Diego County	San Diego County and other public agencies and conservation groups. California Protected Areas Database
Analysis of Future Land Use • Vacant Land Planned for Development (2015)	Aerial Map 2015 General Plans for San Diego County and local cities
Geology & Soils Data • Faults • Liquefaction Zones • Rock Type • Soils (SSURGO) Soil Survey	California Geologic Survey, USGS California Division of Mines and Geology United States Department of Agriculture - National Resource Conservation Service

Hydrography and Hydrologic Data
• National Wetland Inventory (NWI)
• National Hydrography Dataset (NHD) Flowline
• FEMA Flood Zones (100-year floodplain)
• Flood Infrastructure
  ○ Road Culverts
  ○ Drain Conveyances
  ○ Levees
  ○ Detention/Retention Basins
	USFWS
	USGS
	Federal Emergency Management Agency (FEMA)
	San Diego County

Water Quality Impaired Waterbodies (303(b) and 303(d)-Listed Waters) • Streams • Lakes	SWRCB
Habitat & Wildlife Linkages for Riparian Species Federally Designated Critical Habitats • Least bell's vireo • Mexican Flannelbush • Otay tarplant • Quino Checkerspot Butterfly • Riverside Fairy Shrimp • San Diego Fairy Shrimp • San Diego thommint • Spreading Naverretia • Western Snowy Plover Wildlife Linkages and Corridors	USFWS San Diego County
Land Use & Land Cover Land Use Land Cover	San Diego County

GIS Layer	Source
Aerial Photos as Background Layer 1971 Digital Historical Aerial Photo 1994 Digital Historical Aerial Photo 2014- 2016 Digital Aerial Photos	 NETR (see Section 2.3) NETR (see Section 2.3) ESRI

2.3 AERIAL AND STREET IMAGERY

In addition to the GIS layers developed for use in the Otay River Watershed SAMP GIS database, several different background layers are available for analysis. The ESRI platform that supports the system includes numerous background layers including current aerial photography covering the entire project area, USGS topographic maps, various street layer depictions, and special user layers.

The project also includes two additional layers of historic aerial photographs. Two black and white, ortho-rectified MrSid format files of compiled aerial photography were procured from National Environmental Title Research (NETR) for the entire Otay River Watershed for two historical periods 1971 and 1994 to visually capture the change in landscape over time. Both of the two seamless photographs generally have a resolution of 1 meter per pixel and are almost completely continuous.

3.0 ANALYSIS USING THE SAMP GIS DATABASE

The Otay River Watershed SAMP GIS database can be used to provide watershed information based on a single purpose GIS layer or combined to provide an overlay analysis using two or more GIS layers.

Example data from a single GIS layer:

- Identification of aquatic resources with degraded habitat integrity
- Identification of vacant land that is planned for development
- Analysis of historical land use using historical aerial photography
- Identification of lands designated in the MSCP
- Identification of flood control infrastructure facilities of San Diego County
- Analysis of the extent of stream channelization
- Increase in water quality integrity for restoration of riparian ecosystem immediately adjacent to waters of the U.S. (Restoration Scenario 1 – see discussion below)*
- Increase in habitat integrity for local drainage basins, based on restoration of rangeland in upland areas to native vegetation (Restoration Scenario 2 – see discussion below)*

- Increase in hydrologic integrity for local drainage basins based on restoration of agricultural land in upland areas to native vegetation (Restoration Scenario 3 – see discussion below)*

Example data from overlay analysis of combined GIS layers:

- Identification of areas of potential land development that may be intruding into high integrity riparian habitat
- Identification of areas of potential land development that may encroach into critical habitats or wildlife migration corridors
- Analysis of acreage of impacts to a riparian resource from a potential land development
- Analysis of high integrity riparian areas subject to erosion/sedimentation
- Analysis of historical change to aquatic resources from land development and flood control
- Analysis of the integrity of aquatic resources in areas designated Public-Quasi-Public Conserved lands
- Identification of soil type in riparian areas with low habitat integrity

*Restoration Scenario Layers:

The SAMP GIS database contains a series of individual restoration planning layers that show the increases in habitat, hydrologic and water quality integrity for three different restoration scenarios. These scenarios are:

- Scenario 1: Restoration within the riparian ecosystem immediately adjacent to waters of the U.S. (e.g., stream channel geomorphic features, riparian vegetation, etc). The increase in integrity under Scenario 1 was determined by subtracting the baseline integrity from the integrity calculated under Scenario 1 for each local drainage area. This was done for all three indices of integrity: habitat, hydrologic and water quality.

- Scenario 2: Restoration of active or former rangeland within upland areas to native vegetation. The increase in integrity under Scenario 2 was determined by subtracting the baseline integrity from the integrity calculated under Scenario 2 for each local drainage area. This was done for all three indices: habitat, hydrologic and water quality.

- Scenario 3: Restoration of agricultural lands as well as active or former rangeland within upland areas to native vegetation. The increase in integrity under Scenario 3 was determined by subtracting the baseline habitat integrity from the habitat integrity calculated under Scenario 3 for each local drainage area. This was done for all three indices: habitat, hydrologic and water quality.

4.0 INTENDED USES OF THE SAMP WATERSHED DATABASE

The SAMP GIS database is intended for use by staff of the USACE Regulatory Division in making well-informed decisions on CWA Section 404 permits. The database provides staff with a USACE ERDC-prepared planning level delineation and functional integrity characterization of jurisdictional resources that may be impacted by a regulated activity. Staff can rely on this data for an initial desktop assessment of a project's potential impact to the functions and values of the jurisdictional resource (at the reach level) and facilitate decisions on the type and extent of compensatory mitigation that would be needed for no net loss in functions and values. Using the ERDC restoration planning layers, staff can also make decisions on the best locations for compensatory mitigation, as well as the type and level of restoration effort that would be needed to provide an increase in functional integrity of the aquatic resource. From a regulatory management perspective, use of the SAMP database promotes implementation of the Compensatory Mitigation Rule (33 CFR Parts 325 and 332) (40 CFR Part 230) which calls for a watershed approach to mitigation.

Other users of the database could include land use planners within San Diego County and the various cities who will now have access to detailed aquatic resources data that can help inform their decision making when evaluating land development plans or when updating their General Plan including the Open Space/Conservation Element to understand how aquatic resources could be affected by land use change. The data can also be used to help better inform land use planning decisions on new or expanded open space/conservation areas and riparian buffer zones.

Agencies and other stakeholders involved in watershed planning and management can use the SAMP GIS database to identify watershed stressors and impacted resources, restoration potential of various riparian resources, source analysis for assessing total daily maximum loads (TMDLs) and locations for implementing regional best management practices that help address water quality. The data can also be used to help inform decisions on flood plain restoration or riparian habitat restoration. Additionally, stakeholders can use an historical aerial photo layer, combined with overlays of aquatic resources, vacant land planned for development, and public/conserved lands, to analyze the extent of land use change that has occurred in the watershed, as well as changes to aquatic resources, and what areas of remaining resources could best be restored or conserved.

5.0 DATABASE ACCESSIBILITY, MAINTENANCE, AND LIMITATIONS

5.1 ACCESSIBILITY OF SAMP GIS DATABASE

The Otay River Watershed SAMP GIS database is available to all users who access the USACE SAMP webpage, a public site at:

http://www.spl.usace.army.mil/Missions/Regulatory/Projects-Programs/

The GIS maps are provided in ArcGIS server format for non-technical users.

5.2 LONG-TERM MAINTENANCE OF THE DATABASE

GIS layers prepared by public agencies, other than SAMP data layers prepared by the USACE, are expected to be updated from time to time based on changing conditions. Therefore, once per year, GIS staff should review public agency GIS data layers used in the SAMP GIS database and identify if revised/updated postings of the data layers have been made. If revisions/updates have been made, GIS staff should evaluate the significance of the revisions, and consider updating the GIS layer in the SAMP GIS database. In particular, GIS staff should review layers for land use/land cover, property ownership, city boundaries, parcel maps, conserved lands, national wetland inventory, federally-designated critical habitats, impaired waters, and stream hydromodification. Data in these layers may change over time, while data in others layers may not. For example data for soils, rock type, faults and other geologic information is not likely to change on a regular basis, and therefore would not require regular review for map layer updates.

5.3 DATABASE LIMITATIONS

The data in the Otay River Watershed SAMP GIS database is limited to the quality of the data received by public agencies. As discussed in Section 5.2, many data layers require regular review and update to ensure the data layers in the database are the most current.

USACE's SAMP data provided in the PLD, LLFA and Restoration Plan were prepared over the period 2003 to 2006. These SAMP data reflect conditions at the time these studies were conducted. Use of the SAMP data for evaluation of new development, infrastructure or maintenance projects will require review of current aerial maps and/or field verification to confirm present conditions.

APPENDIX

DESCRIPTIONS, SOURCES, AND LIMITATIONS OF OTAY RIVER WATERSHED SAMP GIS DATABASE