Applied Aquatic Science

09.14.2016

Prepared for the California Wetland Monitoring Workgroup

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Overview

This document provides a full suite of background information on EcoAtlas, reporting on its origins, purposes, scientific background, features, functionality, history, target audiences, and specifications. EcoAtlas is a set of tools for generating, assembling, storing, visualizing, sharing, and reporting environmental data and information. The tools can be used individually or together, and they can be adjusted or tuned to meet the specific needs of environmental planners, regulators, managers, scientists, and educators.

This document is meant to be complementary to a business case report.

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Introduction

Origins

The term “EcoAtlas” has been in use for over 20 years in association with the study, assessment, and reporting of aquatic resources in California. What began as “Wetland Tracker” in 2000, with its goal of recording essential information about wetland restoration projects in the greater Bay Area, later blossomed into a broad technological ecosystem of interrelated tools, each focused on delivering specialized, program-focused features, as defined by key stakeholder groups. Having evolved over time, EcoAtlas comprises a diverse toolset, but the collection shares common libraries, common approaches, and common development methodologies. Though each emerged from different funding opportunities and requirement drivers, the toolset collectively addresses a synthesized “whole watershed approach.” Whether estimating the ideal riparian buffer width for a given stream or assessing the health of a wetland at the edge of the estuary, the EcoAtlas tools allow practitioners to deploy the *right tool for the job* across the entire watershed, thereby producing a complete picture through composite outputs.

Scientific Background and Purpose

EcoAtlas is synonymous with the framework and toolset of the Wetland and Riparian Area Monitoring Plan (WRAMP) of the California Wetland Monitoring Workgroup (CWMW). EcoAtlas operationalizes WRAMP by enabling users to assess the abundance, distribution, diversity, and condition of surface waters in the landscape or watershed context. EcoAtlas has been used to apply the WRAMP framework for wetland and stream protection in a variety of California watersheds, and it can be adjusted to more generally support natural resource planning, assessment, monitoring, and reporting (http://sfei.li/cwmw1). EcoAtlas, in essence, represents a distillation of the best

science-based, rigorous thinking and planning conducted by the CWMW over the course of many years. The WRAMP Framework page, cited above, contains a trove of studies, reports, and presentations that demonstrate the support the WRAMP framework and EcoAtlas.

A central aspect of the WRAMP framework is a classification of environmental data, their methods of collection, and their stated purposes into three levels.

- **Level 1 data: Maps and spatial information.** These data consist of map-based inventories of aquatic areas and related resources, including rivers, streams, lakes, bays, wetlands, and their riparian areas, plus events and activities that have a direct effect on the distribution, abundance, diversity, or condition of aquatic resources. Level 1 maps may serve to plan and conduct landscape and watershed profiles of aquatic resource condition.
- **Level 2 data: General wetland condition information.** This extensive dataset comprises rapid, field-based semi-quantitative measures of the overall condition of aquatic resources. In California, the California Rapid Assessment Method (CRAM) is the most widely used Level 2 method for assessing the conditions of wetlands and streams. Other Level 2 assessments exist and may also be used when needed.
- **Level 3 data: Specific condition information.** These datasets are quantitative, field measurements of specific aspects of condition. Plant species composition, nesting bird surveys, spawning success, and groundwater recharge rates are examples of Level 3 data types. Level 3 methods can vary from site to site for the same kinds of Level 3 data (http://www.mywaterquality.ca.gov/monitoring_council/wetland_workgroup/index.html)

For this document, we will not feature in-depth descriptions of the WRAMP framework (which may be found on the WRAMP details page: http://www.mywaterquality.ca.gov/monitoring_council/wetland_workgroup/wramp/index.html), but rather we will describe the nature of the individual EcoAtlas tools, their purposes, the detailed history of their enhancements, their target audiences, and their underlying infrastructure.

In addition to being a set of tools, EcoAtlas can aggregate data from its toolset and from other sources to increase their usefulness. The California Aquatic Resource Inventory or **CARI** (http://sfei.org/cari) forms the base map that identifies and classifies all surface waters of the state. Data and groundwater resources can be added in the future through appropriate sources. **Project Tracker** (http://ecoatlas.org/about/#project-info) represents the latest generation of the Wetland Tracker functionality and tracks planned activities that modify habitat, such as wetland restoration, mitigation, or habitat

conservation. This tool benefits from a broad-based collaboration and now offers a diverse collection of habitat project data throughout California. By assembling and tracking information about landscape change, Project Tracker can help to inform future versions of habitat classification through CARI. CARI and Project Tracker facilitate “Level 1” inventories of aquatic resources and habitat projects according to the WRAMP framework. The California Rapid Assessment Method or **CRAM** (http://sfei.org/data/cram) is the most widley used “Level 2” means for assessing the overall condition or health of wetlands and streambeams. Different types of wetlands, as defined by CARI, are assessed using different CRAM modules. Modules can be revised or added as needed to reflect changes in the CARI classification system. CRAM assesments comprise one of the statewide datasets summarized within the **Landscape Profile Tool** (http://ecoatlas.org/about/#landscape-profile), an innovative geospatial selection and reporting interface that permits users to identify and map an area of interest on their computer screens, automatically assemble a variety of information associated with the area, and generate summary reports tailored to programmatic needs. Although currently not displayed in EcoAtlas, the Riparian Zone Estimator Tool or **RipZET** (http://sfei.org/projects/ripzet) is a “Level 1” method for determining the likely existing or planned extent of riparian areas based on the concept of “functional riparian width.” According to this concept, different riparian functions can extend different distances from their adjacent surface waters depending on topographic slope, vegetation, land use, and position along a drainage network. RipZET translates this concept into estimates of riparian width for selected riparian functions, and the tool is modular so that new functions can be added as needed.

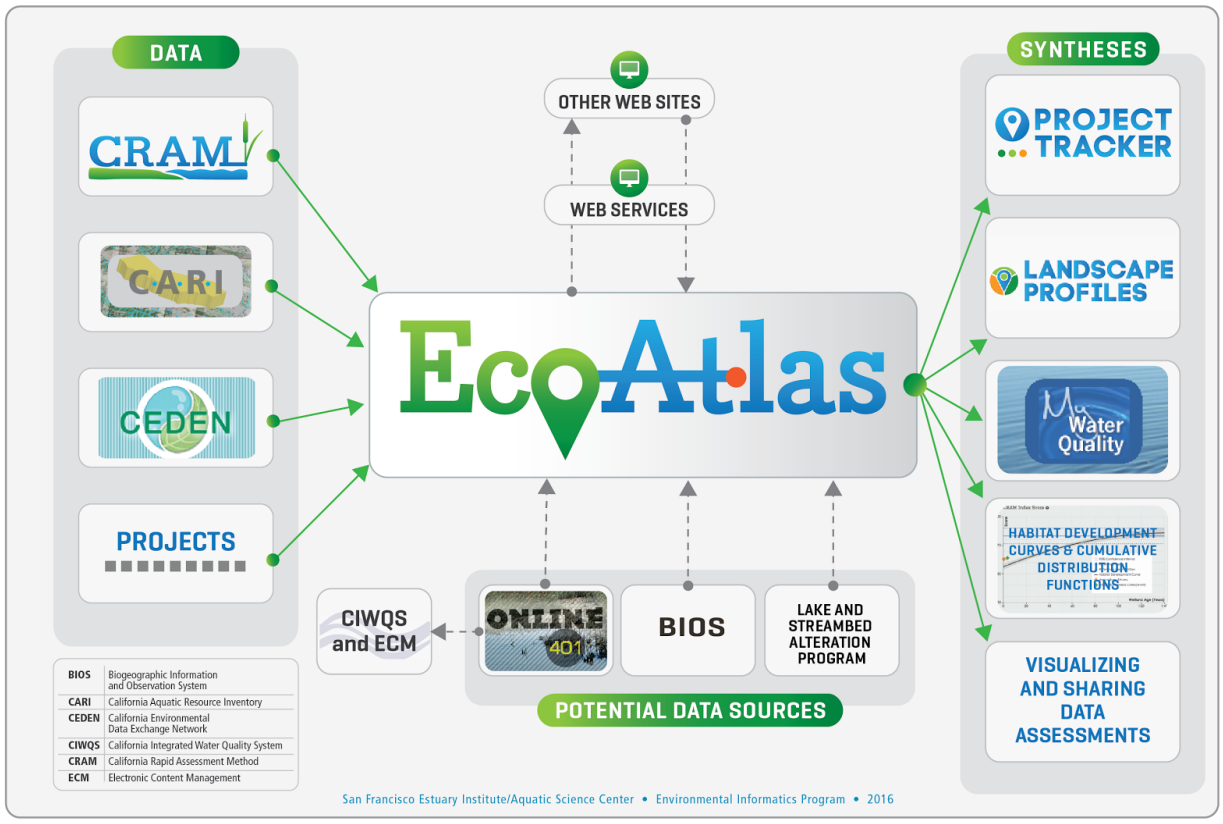

Figure 1: The EcoAtlas Technology Ecosystem

Although part of an integrated approach to managing landscapes and watersheds, each EcoAtlas tool can function more or less independently, yielding desired information for a particular purpose and user community.

The detailed descriptions for each tool follow below.

Detailed Tool Descriptions

- ### California Aquatic Resource Inventory (CARI) (http://sfei.org/cari)

  CARI is a Geographic Information System (GIS) dataset of surface waters and their riparian areas consisting of polygon and line features with data-rich attributes that can be used for developing broad- or fine-scale landscape summaries of aquatic features. CARI is a seamless statewide map compiled from multiple data sources and standardized to a common classification system. This statewide dataset provides the best available map of state surface waters and serves as the base

map in EcoAtlas to coordinate monitoring and assessment at the landscape scale across federal, state, and local agencies, while providing enough detail to inform local land use planning. Accompanying CARI is the CARI Editor, an interactive, online GIS mapping interface that facilitates user-generated updates to information associated with the CARI dataset. When users encounter any discrepancy between CARI details and actual landscape conditions, they can suggest changes that can be reviewed and incorporated into the authoritative CARI data, thereby maintaining CARI's currency and ready applicability to decision making.

- ## Project Tracker (http://ecoatlas.org/about/#project-info)

  EcoAtlas tracks planned activities that modify habitat, such as wetland or stream restoration, mitigation, or habitat conservation. Projects are viewable on the interactive map and summarized in individual project pages. Project information is available for the San Francisco Bay Area, Sacramento-San Joaquin Delta, North Coast, Central Coast, South Coast, and Lake Tahoe area. New projects can be uploaded using the Project Tracker data entry forms. Project details can be entered online and accessed by environmental managers, planners, and stakeholders to inform wetland management and planning decisions. An easy-to-use mapping tool enables project managers to draw project sites using aerial imagery or upload an existing map file of the project site.

  Public information is available on EcoAtlas where projects can be viewed on a common base map to help inform wetland management and planning decisions.

In the San Francisco Bay Area, project information is collected for all new 401 certified projects through the Wetland and Riparian Project Form. Submission of this form is a 401 permit condition of the San Francisco Bay Regional Water Quality Control Board. In 2016, the Lahontan Water Board (Regional Water Board 6) formally adopted the use of Project Tracker and requires applicants for 401 Certifications and Waste Discharge permits to upload project information into Project Tracker.

Project Information Page (PIP)

Each PIP includes information on the project's location, type (mitigation or non-mitigation), identification numbers, habitat plan, site status, restoration events, contacts, funding sources, and performance criteria. If available, related

habitat impacts and CRAM assessments are also summarized.

Files & Links

Project Tracker serves as a repository for files and web links. A project's file library provides access to reports, data, photos, videos, and other files related to a project. Project managers and members of the public can submit reports and project-related files to share with others.

Project Maps

When available, project maps and site boundaries are displayed on EcoAtlas. In a few cases, information on a project's size and general location is known, but a detailed boundary has not been provided. In such cases, the project is mapped as a dashed circle, centered on the project's location, and with a size equal to the known project area. These dashed circle approximations provide EcoAtlas users a visual representation of a project's size and location, and are replaced with an actual boundary when this information becomes available.

Habitat Development Curves

Wetland Habitat Development Curves (HDCs) are used to evaluate the rate of habitat development for restoration and mitigation projects, and how they compare to other projects of the same age and habitat type, based on CRAM. HDCs have recently been developed for three CARI wetland types (riverine, estuarine, and depressional) using existing CRAM assessments from wetlands across California. Each curve represents the average rate of development bounded by its 95% Confidence Interval (CI), plus the average condition and 95% CI for the reference sites. Projects that are well-designed for their location and setting, and well-managed tend to be on or above the curve. In general, as projects age, their habitats should mature, gaining similarity to the reference sites, such that the project's CRAM scores increase. HDCs for the CRAM Attributes and Metrics can be used to understand and correct habitat developmental problems.

The HDC is available as a separate tab in the Project Information Page and is only visible when a project has a recorded construction end date (groundwork end date), and there are existing CRAM assessments for the project boundaries in the statewide CRAM database.

- ## California Rapid Assessment Method (CRAM) (http://sfei.org/data/cram)

  CRAM is a cost-effective and scientifically sound rapid assessment method for monitoring and assessing the ecological conditions of wetlands and streams throughout California. It takes less than half a day to assess a site, based on its landscape setting, hydrology, physical structure and biological structure. A single, standardized CRAM module exists for each of the eight major types (and some sub-types) of wetlands and streams identified by CARI. Standardization facilitates comparing individual wetland areas of the same and different types. It also enables statistical comparisons between groups of the same or different types at any spatial scale for which the necessary data are available, including local, regional and statewide scales. CRAM can also be used to assess the performance of compensatory mitigation projects and restoration projects, relative to impact sites, reference sites, or average conditions (see HDC above). The easy-to-use, online data entry forms ensure that all of the appropriate site information and field data associated with CRAM assessments are entered. Practitioners can draw CRAM assessment sites online using aerial imagery of the site and make public information available on EcoAtlas to help inform wetland management and planning decisions.

- ## Landscape Profile Tool (http://ecoatlas.org/about/#landscape-profile)

  The Landscape Profile Tool summarizes ecological information at various spatial scales for planning, assessment, and reporting. Based on the user-specified area of interest, the tool generates graphical summaries of the following data sources:

  - abundance and diversity of existing aquatic resources based on California Aquatic Resource Inventory (CARI);
  - abundance and diversity of historical aquatic resources and terrestrial plant communities;
  - survey and project summary statistics for eelgrass aquatic resources;
  - ecological restoration based on Habitat Projects;
  - aquatic resource condition based on California Rapid Assessment Method (CRAM);
  - human population based on 2010 Census and language spoken at home based on the 2008-2012 American Community Survey;
  - species of special status (both federally and California listed species) based on California Natural Diversity Database (CNDDB) (currently an unavailable service); and
  - developed land cover by the 2011 National Land Cover Database (NLCD).

Users have several options for determining their area of interest. These include using USGS StreamStats to delineate an upstream catchment from a pour point; drawing and editing a polygon through a series of map clicks; selecting a pre-defined area for a congressional district, county, or hydrologic region (HUC8, HUC10, HUC12); or uploading an existing KML or Esri shapefile.

Users may view a Landscape Profile in a pop-up box or print a detailed PDF report that also includes background information on each of the data sources. The Print Map feature allows users to download a PDF and share a map view with accompanying notes.

- ### Riparian Zone Estimator Tool (RipZET) (http://sfei.org/projects/ripzet)

  RipZET is a decision support tool developed by the San Francisco Estuary Institute and Aquatic Science Center for the California Riparian Habitat Joint Venture and the California Water Resources Control Board to assist in the visualization and characterization of riparian areas in the watershed context.

  RipZET works within a Geographic Information System (GIS) to estimate the likely extent of riparian areas based on the concept of "functional riparian width." According to this concept, different riparian functions can extend different distances from their adjacent surface waters, depending on topographic slope, vegetation, land use, and position along a drainage network. RipZET translates this concept into estimates of riparian width for selected riparian functions, and the tool is modular so that new functions can be added as needed. RipZET provides reach-scale estimates of the riparian width associated with the relevant riparian functions (e.g., large woody debris supply in wetlands and in headwater channels or floodwater storage in low-gradient alluvial channels). RipZET's ability to visualize and quantify riparian widths and lengths for selected riparian functions makes it a powerful tool for assisting in the development of effective riparian management and restoration approaches throughout the state.

History

EcoAtlas has evolved over two decades through multiple user communities representing different but integral aspects of the watershed approach to comprehensive aquatic resource protection.

Funding Model to Date

The development of EcoAtlas has been a process of chaining together individual projects, funded by a range of public and philanthropic interests. Each investment forms a new enhancement shared by all of the tools' users. In this way, the application development has advanced the tools as new needs have been expressed, new scientific frameworks have been produced (as was the case with CRAM modules), and new innovations in geospatial technology paved the way for new possibilities. Since its start 1995, the list of Federal and California state sponsors of EcoAtlas development has included the US Environmental Protection Agency, US Army Corps of Engineers, US Fish and Wildlife Service, National Oceanic and Atmospheric Administration–National Marine Fisheries Service, US National Park Service, US Geological Survey, California State Water Resources Control Board, California Department of Transportation, California Department of Water Resources, California Department of Fish and Wildlife, California Department of Conservation, and California Natural Resources Agency. Regional and local sponsors have included public agencies for water quality, agriculture, flood control, public parks, and land use planning. Non-governmental organization (NGO) sponsors have included the San Francisco Bay Joint Venture, Central Valley Joint Venture, Riparian Habitat Joint Venture, Packard Foundation, and Rose Foundation. In addition, abundant in-kind services have greatly benefited EcoAtlas development.

Milestones (http://sfei.org/ecoatlas)

The pathway to the present status of EcoAtlas can be understood via a timeline, recounted below. The many features of the toolset took shape through its multi-year development, which has witnessed the steady accrual of stakeholders and investment as more organizations recognized the essential utility of EcoAtlas and the advantage of enhancing it to meet new demands.

- ### 1993, EcoAtlas Proposed

  EcoAtlas proposed by SFEI as a GIS-based system to track actions to implement the 1993 Comprehensive Conservation and Management Plan (CCMP) of the San Francisco Estuary Project.

- ### 1994, USACE funds EcoAtlas

  The San Francisco District of USACE funds first version of EcoAtlas to support comprehensive planning of the beneficial reuse of sediments dredged from San Francisco Bay and to implement San Francisco Estuary CCMP Wetlands Action 1.1: Establish regional wetland habitat goals of a regional wetlands management plan (Baylands Ecosystem Habitat Goals Project).

- ### 1995, Local, state, federal and NGO support for base maps

Various local, state and federal programs and foundations fund the creation of Bay Area EcoAtlas base maps of historical and present-day aquatic habitats to support the multi-agency Baylands Ecosystem Habitat Goals Project, and watershed-based assessments of sediment sources and aquatic resource abundance, distribution, and diversity.

- 1998, First online version of EcoAtlas

  Various local, state, and federal programs and foundations fund first online version of EcoAtlas coinciding with release of the Baylands Ecosystem Habitat Goals Report by USEPA and the San Francisco Bay Water Board.

- 1998, CCMP signatory agencies develop a plan

  CCMP signatory agencies meet to decide next steps for EcoAtlas, yielding a Beta Test Group and conceptual plan to develop Bay Area EcoAtlas through SFEI as a full service wetland and stream data and information exchange system.

- 2000, Visualizing wetland projects in Wetland Tracker

  Various local, state and federal programs and foundations fund Wetland Tracker functionality for visualizing wetland projects and sharing project information through web-based interactive map.

- 2000, "Wetland Tracker" named as a product of the strategic plan

  SFEI produces strategic plan for EcoAtlas as a set of web-based applications to support environmental planning, regulation, and management in the Bay Area. The first application was called “Wetland Tracker” to support interagency wetland restoration planning and 401/WDR program of the San Francisco Bay Water Board.

- 2005, Functionality and updates to support 401/WDR

  State Board Consolidated Grants Program funds updates of Bay Area EcoAtlas’ base map of existing aquatic resources plus new Wetland Tracker functionality for accessing wetland project information. This results in SOP for aquatic resource mapping and new Wetland Tracker functionality to support 401/WDR at San Francisco Bay Water Board.

- 2006, Project mapping tied to WDRs in SF Bay

  San Francisco Bay Water Board makes project mapping through Wetland Tracker a condition of 401 and WDRs (Waste Discharge Requirements), thus enabling regional wetland change detection through regulatory procedures.

- 2008, Riparian Zone Estimator Tool

  Various local, state and federal programs and foundations fund development of the Riparian Zone Estimator Tool as EcoAtlas application to visualize riparian zones.

- 2008, EcoAtlas made statewide under guidance of California Wetland Monitoring Workgroup

  California Wetland Monitoring Workgroup of the California Water Quality Monitoring Council established with priority to grow Wetland Tracker of EcoAtlas statewide.

- 2008, USEPA funds statewide expansion

  USEPA funds first effort to extend Wetland Tracker as first statewide application of EcoAtlas.

- 2009, Aquatic Resource Mapping SOP

  Aquatic Resource Mapping SOP co-developed with NWI of USFWS and NHD of USGS as California Aquatic Resource Inventory SOP.

- 2010, Landscape Profile Tool funded

  Various federal programs fund Landscape Profile Tool of EcoAtlas to support the watershed approach to 404/401.

- 2010, USEPA funds South and Central Coast expansion

  USEPA funds implementation of Wetland Tracker as EcoAtlas application in the South and Central Coasts.

- 2011, CRAM integrated and statewide base map developed

  State Water Board funds development of statewide EcoAtlas base map for statewide application of Wetland Tracker and for integrating CRAM database into EcoAtlas through CEDEN Regional Data Centers.

- 2011, First National Wetland Condition Assessment

  USEPA funds the first National Wetland Condition Assessment. CRAM data collected as side-by-side comparison with USRAM for sites in California.

- 2011, Riparian Area layer developed for San Francisco Bay

Vegetation and hillslope layers were generated using the Riparian Area Mapping Tool (RAMT), which models the functional area for different ecological and geomorphic processes that contribute to create the riparian zone.

- 2012, Broader pilots by regional water boards

  USEPA funds applications of Wetland Tracker, eCRAM, and Riparian Zone Estimator Tool of EcoAtlas for North Coast, Central Coast, and Lahontan Regional Boards with their partnership.

- 2012, Pilot of "Online 401"

  State Water Board funds statewide pilot of “Online 401” tool as an application of EcoAtlas to enable online application and tracking of 401 Certifications based on San Francisco Bay Water Board experience.

- 2013, Database consolidation into EcoAtlas

  USEPA funds consolidation of the San Francisco Bay Joint Venture, Central Valley Joint Venture, and Delta Conservancy's databases into EcoAtlas.

- 2014, CIAP funding to enhance restoration project database

  Coastal Impact Assistance Program (CIAP) funds the development of restoration project submission forms to provide self-service access to EcoAtlas project database.

- 2014, USEPA funds enhancements to the Landscape Profile Tool

  Landscape Profile Tool v2 includes the ability to upload a KML or Esri shapefile for an area of interest and to download/share maps.

- 2014, EPA funds the creation of a CARI Editor Tool

  The CARI Editor enables individuals to submit suggested updates, deletions or additions of stream and wetland features classified in the California Aquatic Resource Inventory (CARI). CARI serves as the common statewide map in EcoAtlas and was developed using the best available data sources, including several different map intensification efforts that standardized the level of detail for aquatic resources based on similar mapping protocols. It is important to have the mapped aquatic resources as accurate as possible, since amounts are summarized in various reports and the Landscape Profile Tool.

- 2014, MOU signed with SFBJV and CVJV

  SFEI, SFBJV, and CVJV signed an MOU, pledging support for the continued development of and outreach for EcoAtlas.

- 2014, NOAA funds the enhancement of data layers and reporting

  Funding allows the expansion of eelgrass layer, addition of new projects, and incorporation of relevant eelgrass information into Landscape Profile Report.

- 2014, USEPA funds continued application of EcoAtlas to the Lahontan Water Board

  Training efforts will begin soon in the application of EcoAtlas' resources to the needs of the Lahontan Water Board.

- 2014, USEPA funds compilation and visualization of water quality monitoring data in the Delta

  USEPA funds a process for collecting and processing data to facilitate Delta Conservancy's restoration efforts and those of its stakeholders.

- 2014, USEPA funds visualization and data sharing

  USEPA funds integration of various Delta environmental data into EcoAtlas for visualization and sharing and development of a summary dashboard.

- 2015, Web services added to provide broader access to Project and CRAM data

  To demonstrate principles of transparency and accessibility, web services have been enabled for data about both Project Tracker habitat projects and CRAM assessments (http://sfei.org/content/web-services-sfei). This innovation effectively shares the data with any internet-enabled machine. These project and CRAM data were immediately consumed and displayed by the Central Coast Conservation Action Tracker and Bay Delta Live.

- 2015, USEPA funds business plan

  USEPA funds development of EcoAtlas business plan as prioritized by California Wetland Monitoring Workgroup within the Water Quality Monitoring Council.

- 2015, SWAMP develops SOP for sampling depressional wetlands

  SWAMP developed standard operating procedures (SOP) to sample the biological, chemical, and physical condition of freshwater wetlands within California entitled "Standard Operating Procedures (SOP) for Collection of Macroinvertebrates, Benthic Algae, and Associated Physical Habitat Data in California Depressional Wetlands" [http://www.waterboards.ca.gov/water_issues/programs/swamp/tools.shtml#methods].

- 2015, WRAMP tools included in Prop 1 guidelines

EcoAtlas, CRAM, CARI and Project Tracker are cited as examples of monitoring and assessment tools for tracking progress on wetland and riparian restoration projects.

- 2016, Second National Wetland Condition Assessment

  USEPA conducts the second National Wetland Condition Assessment. There are more sites in California since the West was under-represented in 2011 assessment.

- 2016, Get on the curve: Habitat Development Curves help determine the performance of on-the-ground projects

  How do you know whether your project assessment, conducted by the California Rapid Assessment Method, reflects an improvement that is aligned with ecosystem goals? Habitat Development Curves (HDCs) help to visualize and measure the performance of on-the-ground projects relative to ecosystem goals.

- 2016, Cumulative Distribution Functions released with CalTrans funding

  In recognition of the importance of regional processes and functions, wetland managers must have ready access to information about the extent and condition of wetlands in the context of the surrounding landscape to better evaluate the performance of compensatory mitigation projects within its regional context. To that purpose, regional cumulative distribution function plots (CDFs) have been developed for wetlands using CRAM data. Projects that use CRAM to monitor ecological condition of their wetlands can compare their project scores to the expected HDC and/or the ecoregional CDF using the Landscape Profile tool on EcoAtlas.

  Caltrans provided funding to SFEI to enhance EcoAtlas' analytical tools to allow users to compare project and non-project assessments to the ecoregional Riverine CDF for 6 regions across the state.

- 2016, Uploaded new eelgrass baywide surveys

  Several new eelgrass baywide surveys, provided by NOAA-NMFS, were uploaded to EcoAtlas, including Mendocino Coast (2014-2015), Tomales Bay (2015), Drakes Estero (2005), San Francisco Bay (2014), Santa Monica Bay (2015), and Santa Cruz Island (2015).

- 2016, Presentation at the Southern California Academy of Sciences Annual Meeting

  Adam Obaza, NOAA-NMFS, presented "EcoAtlas: An Online Visualization Tool for Eelgrass Distribution" at the Southern California Academy of Sciences Annual

Meeting. 26 baywide eelgrass surveys from Humboldt Bay to San Diego and 56 eelgrass mitigation projects in Southern California are displayed on EcoAtlas.

- 2016, New search and pagination features

  Now that there are over 2,000 projects in Project Tracker, we've added two new features that will help you quickly find your projects from your Project List. A Search field allows you to search the list of projects by one or more keywords in the project name.

  Pagination allows you to order your projects by name, last updated date or creation date, and scroll through pages of projects. This feature also improves the performance and loads the Project List faster.

- 2016, EcoAtlas used in a high school classroom

  "I used EcoAtlas today in my classroom and the kids LOVED it! We used the polygon drawing tool and studied the landscape profiles that got generated. They found it really accessible and were getting really into it. Thanks so much for creating such a user-friendly and engaging tool!" -- 11th grade Environmental Science class at College Coliseum Prep Academy in Oakland

- 2016, Final Wetland Policy Draft Issued by SWRCB

  Final Wetland Policy draft entitled "Procedures for Discharges of Dredged or Fill Materials to Waters of the State" released by State Water Resources Control Board for public comment.

- 2016, Lahontan Water Board adopts Regional EcoAtlas Tools

  The Lahontan Water Board (Regional Water Board 6) formally adopted EcoAtlas and the California Rapid Assessment Method (CRAM). This will enable the Water Board to visually track and assess the extent of project impacts on a watershed basis throughout the region.

  Beginning August 1 of 2016, 401 Certifications and Waste Discharge Requirements will require applicants to upload project information into EcoAtlas. Applicants will be encouraged to to use CRAM in pre- and post- project assessments.

  CRAM assessments of riverine and slope wetland projects subject to 401 Certification or Waste Discharge Orders are expected to be required in the Truckee River, Lake Tahoe and Carson River watersheds beginning in 2017. This requirement will be expanded to other wetland types and watersheds in the future.

Target Audiences

Each tool of EcoAtlas has its own ordinal sequence of target audiences, meaning that the target audiences may be individually prioritized by tool. Ideally, the tools would be stewarded by a statewide Wetlands Protection Program, with a diverse set of stakeholders, but such a program does not yet exist. Rather the programmatic drivers are emerging regionally. In lieu of a sustainably funded program, the California Wetland Monitoring Workgroup has served as the coordinating body, whose stakeholders express a deep interest in EcoAtlas.

With that caveat, we can broadly classify the audiences for each tool according to general categories. We have made some characterizations that might nevertheless be subject to revision in future versions of each tool. The following matrix shows the primary, secondary, tertiary, and in some cases the quaternary audience tiers for each of the tools.

	Project Proponents, CRAM Practitioners	**Natural Resource Managers**	**Policymakers**	**Municipal Planners**	**Researchers, Scientists**	**General Public, Educators, Advocates**
CARI		Secondary			Primary	Tertiary
Project Tracker	Primary	Secondary				Tertiary
CRAM	Primary	Secondary	Quaternary		Tertiary	
Landscape Profile Tool		Primary	Secondary			Tertiary
RipZET	Secondary	Quaternary		Primary	Tertiary	

Other categories of target audience considered include the following:

- Vector Control
- Agriculture
- Real Estate Development
- Other Business Associations
- Water Districts
- Stormwater Districts

- Water Health
- Groundwater
- Environmental Engineering Firms
- Professional Environmental Organizations

Note that the discarded list is much more specific in nature than those captured in the proposed matrix. While the specific character and category of the audience might vary by regional application of the tool, we believe that a more generalized sense of functional categories can more effectively manage the delivery of product features and overall purpose.

Specifications

Open Source Infrastructure

When work began on Online 401 in 2009, the State Water Resources Control Board advised the California Wetland Monitoring Workgroup to use an open-source software infrastructure to maximize transparency, reduce maintenance and licensing costs, remain vendor-neutral, and optimize versatility. The Workgroup fulfilled this mandate and continued down this path with the open-source redevelopment of the entire software stack, wherever possible.

Underlying EcoAtlas is an open-source framework. The tools employ open-source solutions for the system tier (Linux), the database tier (PostgreSQL with GIS extensions), the mapping functionality (Map Server), the content management (Drupal), and the visual presentation (CakePHP). In turn, this system can still communicate with SQL-compliant databases (such as SQL Server) and offer mapping web services consumable by Esri-based clients.

This open-source infrastructure is entirely consistent with current technology trends, since the most innovative and cost-effective software packages are emerging in the vibrant open-source software sector. EcoAtlas is accordingly poised to take advantage of new requests for enhancement and new innovations as they emerge without entirely refactoring the code base.

Best-of-Breed Visualizations

In the main EcoAtlas map viewer, the data layers are visualized using standards-based protocols via OpenLayers. The layers are OGC-compliant (Open Geospatial Consortium) in their associated web mapping services. This helps to ensure that the project and CRAM data can be shared with other visualization tools. Charts found on the summary pages and elsewhere are visualized using d3.js, a commonly used open-source library.