

Tracking Monitoring and Performance Measures at the Watershed Scale

Suivi de la surveillance et des mesures du rendement à l'échelle du bassin versant

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RÉSUMÉ

Avec de nombreux programmes fédéraux, provinciaux, et municipaux finançant des projets de restauration, comment pouvons-nous suivre les avantages et les impacts cumulatifs de ces projets sur un bassin versant? L'ensemble d'outils EcoAtlas (ecoatlas.org) a évolué sur vingt ans pour répondre à cette question en Californie. EcoAtlas intègre une cartographie standardisée des ressources aquatiques, des informations de suivi sur les projets de restauration et les impacts sur ces ressources, des méthodes d'évaluation de l'état des zones humides et des outils de visualisation pour générer des profils de bassin versant, la connectivité des habitats et le changement net du paysage au fil du temps.

Les outils peuvent également être personnalisés pour répondre à des besoins régionaux spécifiques, tels que la coordination de la planification de l'adaptation des rives, la communication des zones d'opportunité pour l'amélioration des rives et la surveillance post-incendie dans un bassin versant. EcoAtlas répond à un besoin critique de suivre et d'agrèger les données environnementales à travers les agences et le temps pour mieux informer la planification et la prise de décision qui soutiennent la protection et la restauration de l'habitat.

ABSTRACT

With numerous federal, provincial, and municipal programs funding restoration projects, how can we track the cumulative benefits and impacts of these projects on a watershed? The EcoAtlas toolset (ecoatlas.org) has evolved over twenty years to answer this question in California. EcoAtlas integrates standardized mapping of aquatic resources, tracking information on restoration projects and impacts to these resources, methods for assessing wetland condition, and visualization tools for generating watershed profiles, habitat connectivity, and net change to the landscape over time.

The tools can also be customized to meet specific regional needs, such as coordinating shoreline adaptation planning, communicating opportunity areas for riparian enhancement, and post-wildfire monitoring in a watershed. EcoAtlas fills a critical need to track and aggregate environmental data across agencies and time to better inform planning and decision-making that support habitat protection and restoration.

KEYWORDS

data visualization, ecological restoration, watershed management

EcoAtlas (ecoatlas.org) 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. It has been developed over the course of decades to meet the needs of California's landscape restoration community.

Its functions, data, and resulting outputs -- maps, charts, and analyses -- reflect the methods and peer-reviewed studies that emerge from the Wetland and Riparian Area Monitoring Plan (WRAMP) developed by the California Wetland Monitoring Workgroup (CWMW). The WRAMP Framework [web page](#) contains a trove of studies, reports, and presentations that demonstrate the support for 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 the following three levels:

- **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. Maps may serve to plan and conduct landscape and watershed profiles of aquatic resource condition.
- **General wetland condition information.** This extensive dataset comprises rapid, field-based semi-quantitative measures of the overall condition or health of aquatic resources. In California, the California Rapid Assessment Method (CRAM) is the most widely used method for assessing the overall health of wetlands and streams. Other assessment tools exist and may also be used when needed.
- **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 these data types.

EcoAtlas can be used to prioritize, plan, and track aquatic habitat projects in the watershed context. The California Aquatic Resource Inventory (CARI) provides information on the abundance, diversity, and distribution of wetlands and related habitats throughout California. 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 basemap in EcoAtlas to coordinate monitoring and assessment at the landscape scale across federal, state, and municipal agencies, while providing enough detail to inform municipal land-use planning.

Accompanying CARI is the CARI Editor, an interactive, online map editor tool 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 updates for review and integration into the authoritative CARI dataset, thereby maintaining CARI's currency and applicability to decision making. Establishing baselines of existing aquatic resources will increase the capacity to assess regional and statewide net change in the abundance, diversity and distribution of wetlands and support coordinated climate adaptation.

Success in habitat restoration is measured over long time spans, but this does not preclude forecasting project performance. Habitat Development Curves (HDCs) are used to evaluate the rate of habitat development for projects, relative to each other and to project-specific timelines. Wetland and stream condition based on the California Rapid Assessment Method scores have been used to develop regional HDCs for some CARI habitat types. Each HDC represents the average rate of development bounded by its 95% confidence interval. CRAM scores for projects that are well-designed and managed for their location and setting tend to plot on or above their appropriate HDCs. In general, as a project matures ecologically, its scores are expected to increase. However, if the rate of improvement or its forecasted end-point are not acceptable, CRAM includes information that can be used to guide corrective measures. Project managers can use the HDCs to guide modifications in project design or management, as necessary to improve project performance.

A Cumulative Distribution Function (CDF) of CRAM scores represents the range and distribution of scores based on a probabilistic survey within a region or evaluation area. Scores for any particular project can be plotted on the associated CDF to compare the project to ambient or background conditions. CDFs can also be used to set regional project performance criteria. For example, for a project to improve ambient conditions for habitat types within its boundary, it should score above the 50th percentile of the associated CDF. Plotting the same project score on its associated HDC will help

determine if and when the project is likely to achieve an acceptable score in the future.

EcoAtlas fills a critical need to track and aggregate environmental data across agencies and time to better inform planning and decision-making that support habitat protection and restoration. In addition, these tools help planners include habitat protection and restoration in their climate change adaptation plans and projects. Ways for the public to track and visualize progress will continue to be improved.

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