Ecosystem Portal Options

The California Water Quality Monitoring Council's draft Comprehensive Strategy document lists 11 separate themes in Table 3 (e.g., estuaries, lakes, rocky intertidal, subtidal benthos) that fall under the broad heading: Are our aquatic ecosystems healthy? These themes reflect separate habitat types or categories of species that are ecologically distinct focal points of public concern and management attention. Many of these are subject to their own management regimes, with their status addressed by separate monitoring programs. On the other hand, answering the overall question about ecosystem health requires integrating data and information from multiple themes.

Discussion at previous Council meetings has highlighted the need to streamline the presentation of information about the 11 separate themes because showing all themes as separate portals on the Council's main page would be confusing. Consideration of how to organize the themes on the Council's website also provides an opportunity to think about the underlying workgroup structure, how assessment results should be presented, and the overall data management philosophy for the ecosystem themes.

Portal and workgroup structure

Figure 1 illustrates the current portal structure on the Council's My Water Quality Website. In this structure, wetlands, streams and rivers, estuaries, lakes, and anadramous fish have separate portals at the first level below the Aquatic Ecosystems portal, with a number of ocean-related themes combined into a single portal at this second level. Figure 1 also illustrates a workgroup structure in which the Monitoring Council provides oversight directly to the five freshwater portals, while the Ocean Protection Council (OPC) provides similar oversight, under the Council's overall direction, for the set of ocean portals.

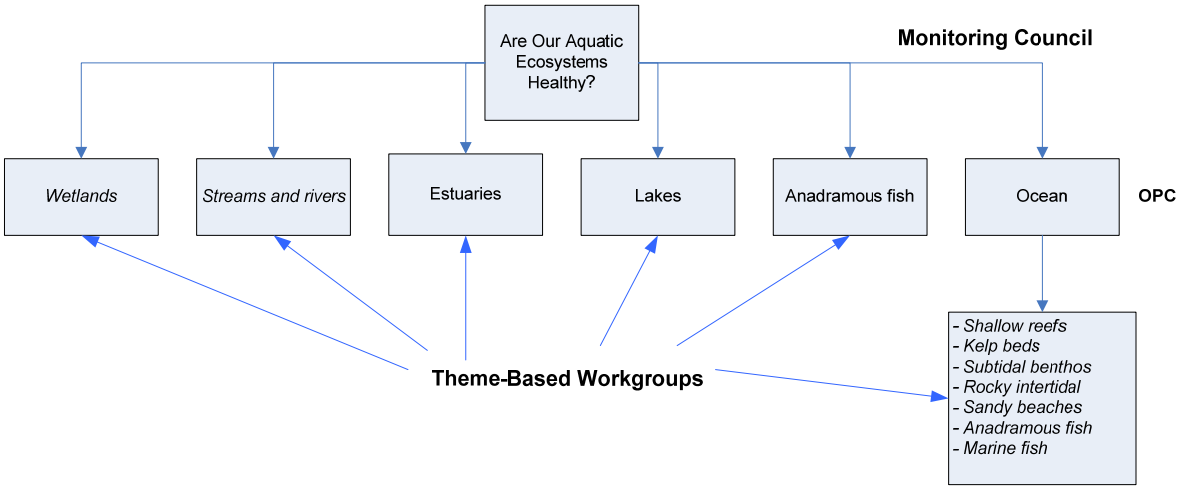

Figure 1. Current structure of ecosystem portals on the Council's My Water Quality website. Wetlands and Streams and rivers are shown in italics to indicate that workgroups already exist for these themes.

Figures 2 and 3 illustrate two alternatives for organizing portals on the Council's website. In Figure 2, there are four levels of portals, beginning with the overarching Aquatic Ecosystems portal at the top and ending with separate portals for each habitat / species type (i.e., theme). Freshwater and marine ecosystems would be accessed through separate portals under an overall aquatic ecosystems main portal. Separate freshwater and marine workgroups would provide oversight to each group of themes related to

freshwater and ocean systems, respectively. Each theme (e.g., rivers and streams, shallow reefs) portal at the lowest level would be managed by a theme-based workgroup and be structured around the typical set of standard assessment questions such as:

- Where are California's wetlands / subtidal reefs / kelpbeds / estuaries?
- How much wetland / subtidal reefs / kelpbed / estuarine habitat does California have?
- How healthy are California's wetlands / subtidal reefs / kelpbeds / estuaries?
- What is being done to improve California's wetlands / subtidal reefs / kelpbeds / estuaries?

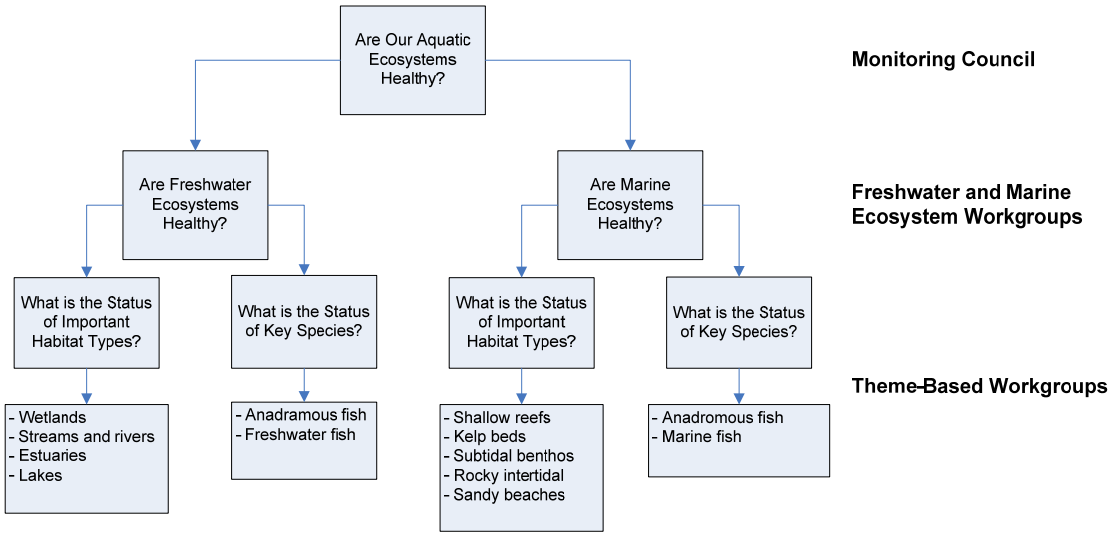

Figure 2. One approach to organizing portals and workgroups for the set of ecosystem themes identified by the Monitoring Council.

The workgroup structure in Figure 2 differs from that in Figure 1 in the addition of a freshwater workgroup to provide overall direction to the set of freshwater themes. Two higher level workgroups would provide direction for the freshwater and marine portals. For example, the Ocean Protection Council has been suggested as an entity that could provide similar direction for the marine portals. Separate theme-based workgroups would then focus on individual habitats / species such as wadeable streams or kelpbeds. In many cases (e.g., rocky intertidal, wetlands), a community of scientists and managers have already organized themselves into the equivalent of a workgroup, while other themes (e.g., rivers) would require additional organization. Separate workgroups at this lowest level will be needed because the data, scientific issues, and assessment analyses for each will differ. However, each lower-level workgroup should include one or more members from the freshwater or marine ecosystem workgroups to ensure consistency of approach across themes and to identify opportunities for broader integration across themes.

Figure 3 illustrates another possible portal structure. It differs from that in Figure 2 by not splitting out habitats and species into separate portals for freshwater and marine ecosystems, and therefore has only three instead of four layers. However, the workgroup and management structure is identical to that in Figure 1.

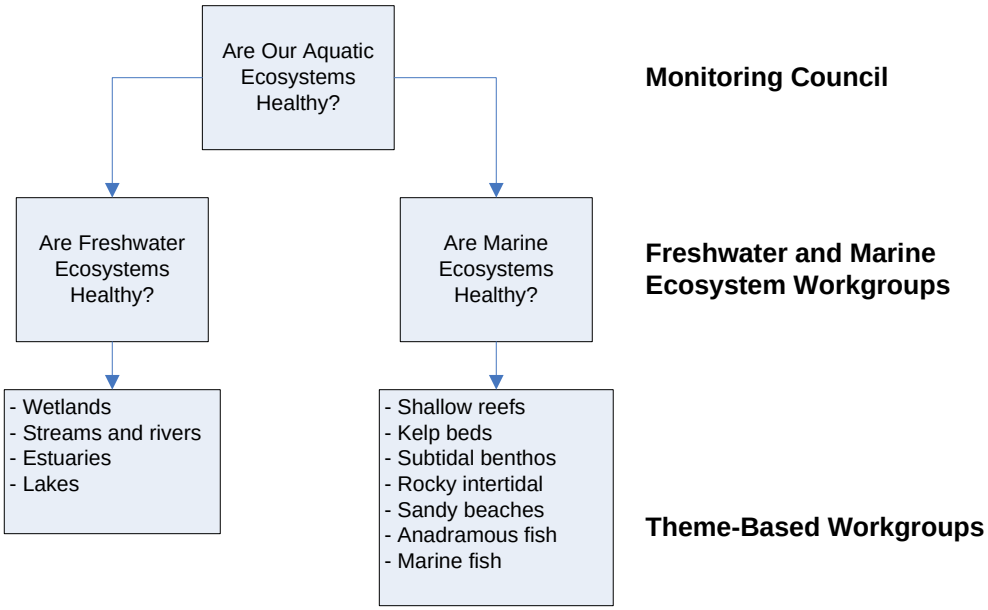

Figure 3. An alternative structure for organizing ecosystem portals that combines habitats and species into single portals for freshwater and marine system.

This brief discussion highlights the need to establish a naming convention for the different layers of the portal structure, all of which are currently referred to as “portals.” This has begun to create some confusion.

Assessment approaches

Presenting summary, map-based assessment results is a challenge for many of the ecological themes because of their inherent complexity. Representing the status of a habitat like estuaries or wetlands is quite different than simply indicating whether a bacterial indicator is above or below a regulatory standard. Derived indices like CRAM (for wetlands and riparian habitats) can solve this problem to some extent, but they still capture only a portion of the factors involved in assessing ecosystem function.

In general, there are two approaches used to simplify the assessment process and the presentation of assessment results. The first, as just mentioned, is to created derived indices, such as CRAM, the IBI, or the multiple lines of evidence approach for sediment quality in California’s bays and estuaries. This approach integrates multiple data types to produce a single number or a judgment associated with a location. This makes interpretation relatively easy but hides underlying complexity.

A second approach retains the detail related to multiple parameters while attempting to simplify its presentation through the use of tabular and graphical methods. However, the ultimate integration and assessment is typically left to the user (see Figures 4 - 7). Figure 4 and 7 provide examples of how derived indices, such as the IBI, can be included as one element in a multiple parameter approach.

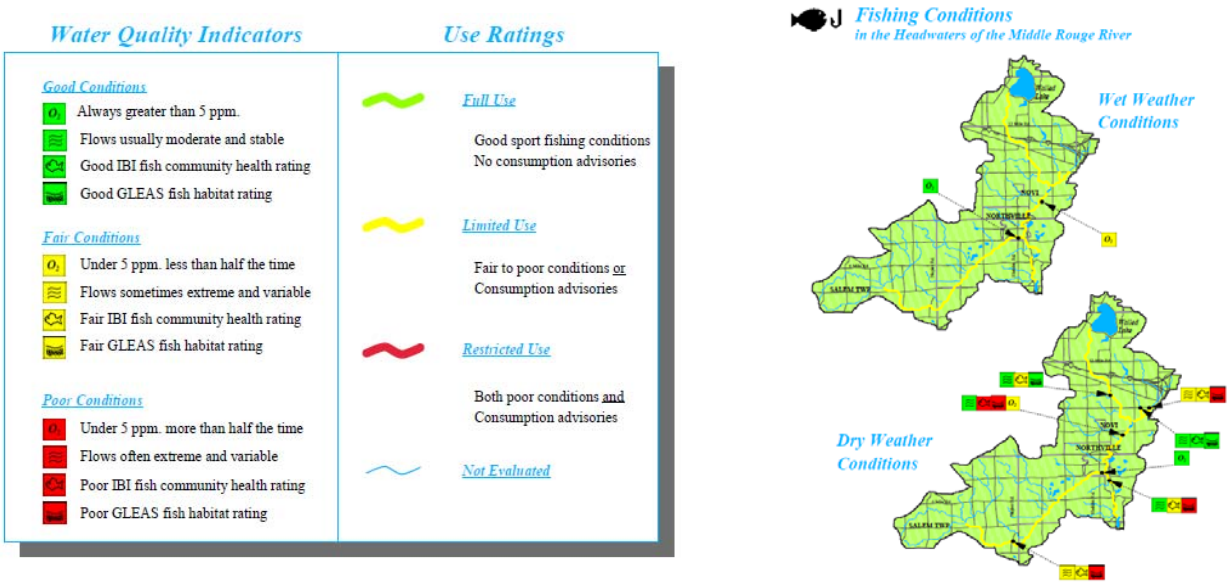

Figure 4. Sample assessment information from the Rouge River Wet Weather Demonstration Project.

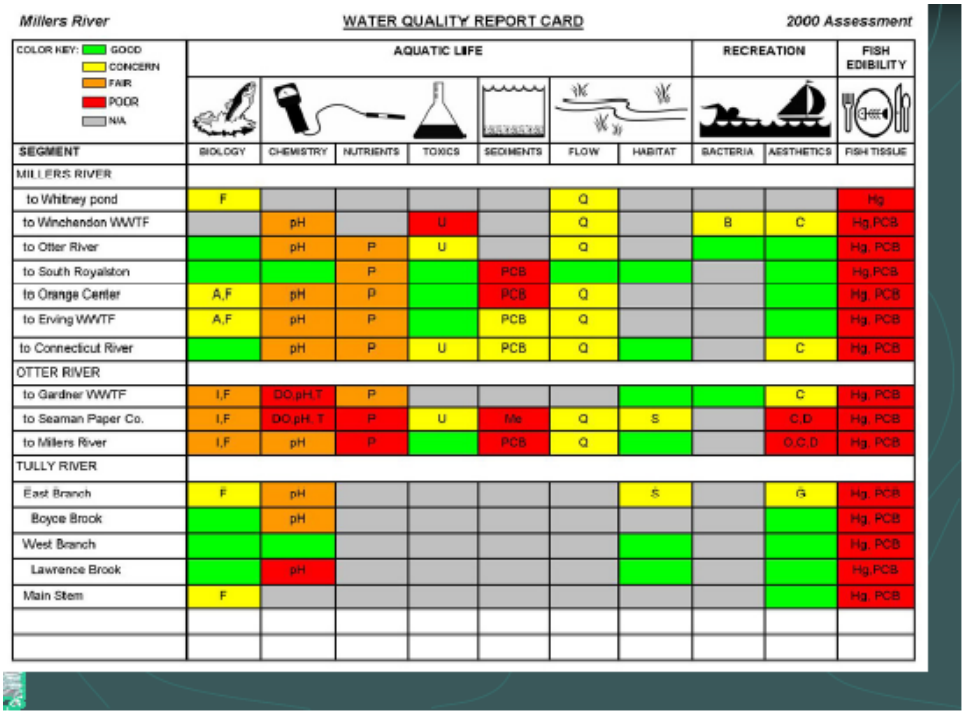

Figure 5. One portion of a watershed water quality report card developed by the Massachusetts Department of Environmental Protection. This excerpt focuses on aquatic life.

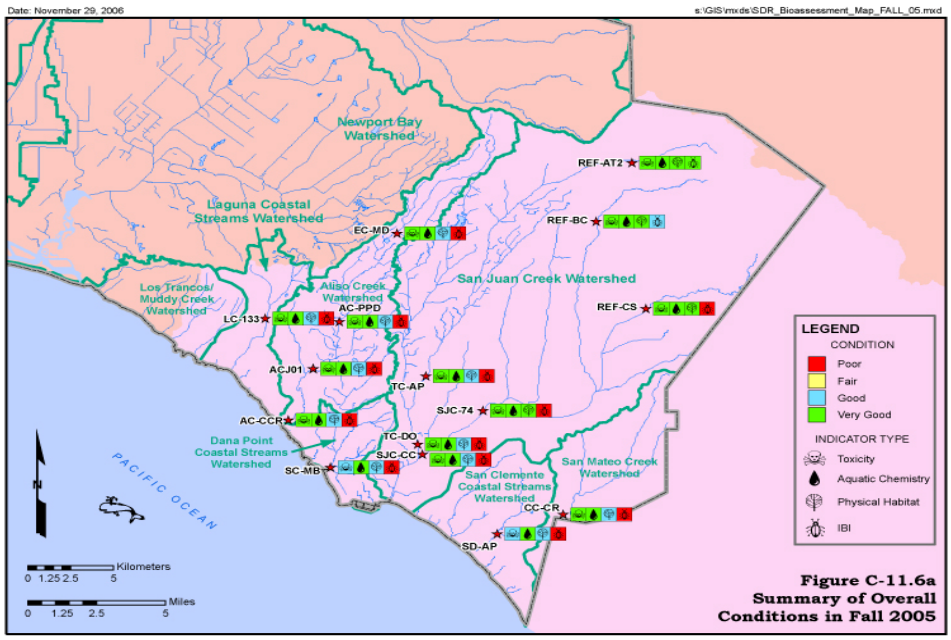

Figure 6. Summary of stream conditions as reflected in bioassessment monitoring data. From the Orange County Stormwater Program's 2006 annual report to the San Diego Regional Water Quality Control Board.

		SEVERITY OF EFFECT			
		UNAFFECTED	LOW EFFECT	MODERATE EFFECT	HIGH EFFECT
POTENTIAL FOR CHEMICALLY-MEDIATED EFFECTS	Minimal Potential	Unimpacted	Likely Unimpacted	Likely Unimpacted	Inconclusive
	Low Potential	Unimpacted	Likely Unimpacted	Possibly Impacted	Possibly Impacted
	Moderate Potential	Likely Unimpacted	Possibly Impacted or Inconclusive[1]	Likely Impacted	Likely Impacted
	High Potential	Inconclusive	Likely Impacted	Clearly Impacted	Clearly Impacted

[1] Inconclusive category when chemistry is classified as minimal exposure, benthic response is classified as reference, and toxicity response is classified as high.

Figure 7. Final step in the assessment process for evaluating sediment quality objectives (SQO) based on multiple lines of evidence (sediment chemistry, sediment toxicity, benthic infaunal community indices).

The challenge in developing ecosystem assessments of either type lies in identifying the key lines of evidence and then deciding how to derive indices and/or combine multiple lines of evidence in an overall assessment. However, the State of California has embarked on a number of efforts to develop more sophisticated assessment approaches that depend heavily on ecological information about the status of aquatic environments. As a result, there is likely to be an increasing number of ecologically based assessment tools for use in answering questions about aquatic ecosystems.

Data management

Whatever portal structure and assessment approaches are ultimately implemented will depend on a data management system that has, at a minimum, the following features:

- The intention and ability to encompass all aquatic ambient monitoring data, including that from major permittees (e.g., POTWs, stormwater programs, ports and harbors), resource assessment programs (e.g., habitat and stock assessments), and targeted projects (e.g., grant projects, wetland projects)
- Streamlined reporting and data submission tools that enable users to input data to a single intake point, even if it is later split and distributed to multiple databases
- Clear criteria for formats, documentation, and QAQC standards that apply to all data types and sources
- The ability to search, access, and retrieve data from multiple themes, programs, and/or locations to support more complex analyses and assessments
- All data referenced to a common basemap to support query and data integration functions

At present, none of these criteria are being met. There are conflicting definitions of “ambient” which hamper the identification of the universe of target data. Data from various sources go to an equally wide variety of data systems (Figure 8), using data submission tools that are often ad hoc or customized to single users. Figure 8 is neither comprehensive nor complete about specific details. For example, only some stormwater ambient data is being input to CEDEN and this only as a pilot for aquatic chemistry data. Loadings data will be much more complex. As another example, while some POTW ambient monitoring data are being reported to CIWQS, this is mostly in formats (e.g., PDF) that are not usable in a true database, because CIWQS is not designed to adequately deal with ambient monitoring data.

The roles and relationships of the various data systems have not been comprehensively defined. For example, POTW ambient monitoring data go to CIWQS, while stormwater ambient monitoring data go to CEDEN, although both collect exactly the same types of data with stations that are often in close proximity. There are no links between these systems that would enable users to search for and combine data from more than a single system.

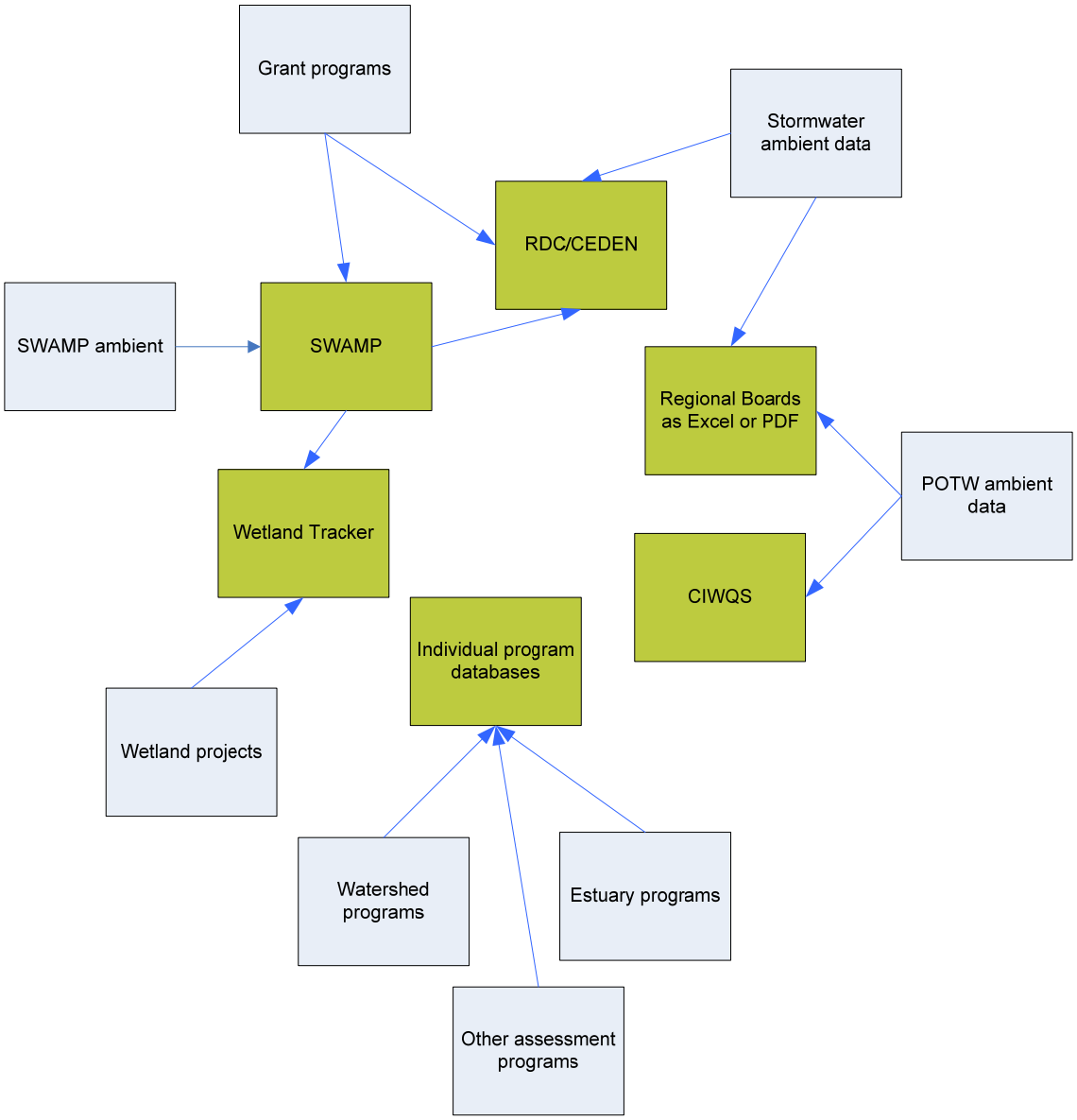

Figure 8. Simplified picture of the current data paths from ambient monitoring programs (blue) to data systems (green).

CEDEN has made some attempts to address these issues but a data system alone will not rationalize the complex and inefficient reporting pathways. For example, creating a crosswalk from CIWQS to CEDEN for ambient POTW monitoring data would allow permittees to avoid multiple data submission steps, but would also involve first loading ambient data into a system not built to receive it. A simpler solution would be to create a data submission tool that would accept all POTW reporting data and then send it to whatever system is most appropriate.

Such solutions, however, would still be hampered by the limited perspective stemming from looking at programs and data systems individually. A more comprehensive potential solution, called the Aquatic Atlas, is being conceptualized by the California Wetlands Monitoring Workgroup. It is being described as a single data management system, organized around the regional data centers, and built on a common base map of aquatic resources for the state. It would accommodate data from all aquatic habitat types and

provide pointers to data sources (e.g., CEDEN, CIWQS, IEP). Individual portal workgroups and other assessment projects could manage their own web pages and analyses independently, and present their derived information in their preferred format, but would all use the Aquatic Atlas as the single access point. This would allow for streamlined access and for more easily combining data from multiple sources and across multiple habitat types.