Appendix 3: Theme-by-Theme Evaluations

Though effective portals have been developed for some of the themes and sub-themes listed in Appendix 1, there are many others for which standardized monitoring and assessment programs, accessible through web-based portals, have not yet been developed. The evaluation presented here (with supporting detail in the fact sheets below) assesses the current status, for each theme and sub-theme, of the extent to which they meet the criteria for effective portals described above. By identifying specific shortcomings for each theme and sub-theme, this assessment provides a basis for establishing the detailed implementation priorities and plans outlined in Appendix 7.

The evaluation framework described in Table A3.1 establishes benchmarks, or performance measures, for the six attributes described in the body of the report.

Table A3.1. Criteria and rating benchmarks for the evaluation of current theme-based portals.

Evaluation criteria	Rating benchmarks / performance measures
Strategy, objectives, design	**Low**: No core questions; no, or many undifferentiated, target audiences; poorly articulated or conflicting objectives; uncoordinated monitoring efforts not focused on questions or objectives **Medium**: Core questions and target audiences implicit in program design; objectives implicit but only partly standardized and not directly used to structure design effort **High**: Core questions standardized, clearly stated, and focused on specific audience(s); clearly stated and common objectives address standardized core questions and inform all aspects of design
Indicators and methods	**Low**: Indicators and methods uncoordinated, not validated; no QA procedures or plan **Medium**: Indicators and methods validated but not standardized statewide; QA procedures exist but are poorly matched to objectives and not standardized statewide **High**: Standardized, scientifically validated, and clearly documented indicators, methods, and QA procedures that match monitoring objectives
Data management	**Low**: No data management procedures or documentation **Medium**: Data management procedures exist but are not standardized statewide and only poorly support access to data **High**: Standardized and clearly documented data management procedures are standardized statewide and fully support access to data at multiple levels

Evaluation criteria	Rating benchmarks / performance measures
Consistency of assessment endpoints	**Low**: No data analysis or assessment procedures used or documented **Medium**: Data analyzed but methods not standardized; assessment tools exist but not fully validated or standardized **High**: Data analysis methods and assessment tools fully validated, clearly documented, and standardized statewide
Reporting	**Low**: No reporting process or products **Medium**: Intermittent reports, available with some effort **High**: Readily available regular reports focused on core questions and objectives; ability to create user reports from multiple perspectives
Program sustainability	**Low**: No systematic program evaluation, planning, or long-term funding devoted to infrastructure needs related to standardization and data integration **Medium**: Intermittent internal program review and planning that may or may not include infrastructure needs; limited funding for infrastructure **High**: Regular external program evaluations and planning for all program needs

Table A3.2 presents an overall summary of how each theme and sub-theme rates on the six evaluation criteria in Table A3.1, focusing primarily on the major statewide and/or regional programs that provide a basis for overall statewide assessments of condition. This systematic and global evaluation enables the status of all themes to be compared in relation to a consistent standard. This will help identify major redundancies and gaps in the current system of monitoring programs and portals, as well as help determine how close to or far from ideal the major themes and sub-themes are. These ratings also provide a structure for developing the implementation plan in Chapter 3, i.e., defining what must be done to bring all ratings up to "high".

There are several important insights to be gained from Table A3.2. First, there is a tremendous diversity of issues and related data types across the themes and sub-themes, which serves to highlight the challenges involved in developing a comprehensive strategy that adequately addresses all data types. Second, there is an equivalent diversity in the ratings for themes and sub-themes. While only one theme (the surface water sub-theme in the Is our water safe to drink? theme) rated High on all six criteria, there are a number of sub-themes that rated at least Medium on all criteria. This provides support for the Council's optimism that there is a productive starting point for undertaking the efforts needed to achieve the Statute's goals. Third, some themes rated Low on most or all criteria. This, combined with the sheer volume of programs, monitoring designs, and data, emphasizes the amount of sustained and coordinated effort needed to improve access to useful data and information products across all themes and sub-themes.

Table A3.2. Summary ratings for each theme-based portal on each of the evaluation criteria. Evaluations apply to the entire theme / sub-theme, not to individual programs or current websites. Supporting information is available in the individual fact sheets below. Note that the evaluation of each theme and sub-theme is matched with a set of specific implementation actions that are detailed in Appendix 7.

Theme-based portals	Strategy, objectives, design	Indicators and methods	Data management	Assessment endpoints	Reporting	Sustainability
Are our aquatic ecosystems healthy?						
Wadeable streams	High	High	Medium	High	Medium	Medium
Rivers	Low	Low	Medium	Low	Low	Low
Lakes	Low	Low	Low	Low	Low	Low
Coastal waters						
Shallow marine reefs	High	Medium	Medium	Medium	Medium	Low
Intertidal	High	Medium	Medium	Medium	High	Low
Subtidal benthos	High	High	Medium	Medium	Medium	High
Enclosed bays and estuaries	Medium	Medium	Medium	Medium	Medium	Medium
Wetlands	Medium	Medium	Medium	High	Medium	Medium
Fisheries						
Anadromous fish	Medium	Medium	Medium	Medium	High	Low
Freshwater fish	Low	Low	Low	Low	Low	Low
Marine fish	Medium	Medium	Medium	Medium	Medium	Medium
Invasive species	High	Medium	Medium	Medium	Medium	Low
Harmful algal blooms	High	High	Medium	High	High	Low

The following fact sheets for each theme and sub-theme are intended to furnish background information that supports the summary ratings in Table A3.2 and also provide a starting point for the implementation plan presented in Appendix 7. Fact sheets are organized according to the following template:
- Title
- Website(s) (if applicable)
- Sponsor(s)
- Brief description, including purpose
- Agencies contributing data
- Evaluation in terms of the six criteria
- Additional monitoring programs that could be relevant

The evaluations focus primarily on the major statewide and/or regional programs that provide a basis for overall statewide assessments of condition. Additional programs that are more restricted in scope are simply listed, as secondary targets for subsequent phases of evaluation, standardization, and integration efforts in the implementation plan. Finally, any monitoring program that measures a constituent related to a theme or sub-theme produces data that are potentially useful in assessment. However, these programs are so numerous, diverse, and, for the most part, restricted in spatial scope, that we have not included this larger set of monitoring programs in the following evaluation.

Status of aquatic life

The protection of aquatic life is a central part of the management and regulatory programs maintained by Cal/EPA and The Resources Agency. For example, the protection of aquatic life beneficial uses is mandated in NPDES discharge permits and the Department of Fish and Game monitors the status of many marine and freshwater fisheries stocks. Aquatic life is managed from both species-specific (e.g., Coho salmon) and a habitat (e.g., rocky reefs) perspectives.

Wadeable streams

Website: SWAMP Wadeable Streams Assessment –
http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/assess_socal2004.pdf;
http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/factsheets/305breport2006.pdf
Sponsor: State Water Board
Description: This program, conducted by the Surface Water Ambient Monitoring Program (SWAMP), is intended to answer key questions about water quality and biological condition in wadeable streams statewide. A randomized design with standardized indicators provides the ability to assess overall water quality and ecological condition, estimate the proportion of wadeable streams falling into different categories of condition, and track changes in these measures over time. Monitoring results also help in prioritizing problem areas for further investigation. The program is implemented as a cooperative effort between the State Water Board and the Regional Water Boards.
Evaluation:
1. Strategy, objectives, design: The program asks and answers clear questions, with specific audiences in mind. The monitoring objective is to assess the percentage of stream miles falling into different condition categories and to track how those percentages change over time. The monitoring design is specifically tailored to match the strategy and objective. It is well-described, standardized, and implemented consistently statewide
   Score: High
2. Indicators and methods: Indicators are centrally developed and standardized, with training available in field procedures. There is ongoing methods research to develop indicators applicable to a wider range of stream types, as well as to determine if CRAM (California Rapid Assessment Protocol) can provide equivalent results for less cost. Procedure manuals and indicator descriptions are available on the SWAMP website. Quality assurance is a central part of the program, with standardized methods and data required to meet SWAMP standards before entry into the SWAMP database
   Score: High
3. Data management: Basic data management procedures are well established; however, SWAMP formats for bioassessment data have not been finalized. Nor have tiered quality assurance requirements been developed for the inclusion of monitoring data from other sources (e.g., regional monitoring and NPDES permit monitoring programs). Data from the SWAMP are stored in the BDAT / CEDEN database in a standardized format and are available for search and download to any interested user
   Score: Medium
4. Consistency of assessment methods: Analysis and assessment follows detailed and standardized protocols described in the assessment report and in greater detail in a series of technical reports available on the SWAMP website. The assessment approach

allows for examination of status and trends at the statewide, regional, watershed, and site-specific level
Score: High

5. Reporting: A statewide assessment report is available on the SWAMP website. However, there are no interactive features to enable users to focus on a specific area or directly obtain the underlying data through a link to the database. In addition, the SWAMP website is not structured for ease of access to themes or program areas. The website is currently being redesigned to address these problems
Score: Medium

6. Program sustainability: There is no readily available description of a periodic program planning or evaluation process, although the SWAMP as a whole recently underwent a thorough external evaluation and the program is developing a formal business plan
Score: Medium

Rivers

Website: NAWQA – http://ca.water.usgs.gov/nawqa.html; State 303(d) List – http://www.swrcb.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml; Impaired Water Bodies – http://www.cacoastkeeper.org/impaired_waterbodies/
Sponsor: NAWQA – US Geological Survey; State 303(d) List – State Water Board; Impaired Water Bodies – California Coastkeeper
Description: See the description of NAWQA above (p. 12) in the Drinking Water – Surface Water sub-theme. The periodic 303(d) listing process identifies water bodies and water body segments that do not meet designated beneficial uses pertaining to aquatic life (and other uses). While there is a statewide listing policy, it is applied somewhat differently within each regional board region. There is no coordinated statewide monitoring program for all beneficial uses, and listing decisions are made using all available data. California Coastkeeper provides these listings in a map-based interface that enables users to visualize listings by region and category of pollutant.
Evaluation:

1. Strategy, objectives, design: The State's 303(d) listing program asks and answers clear questions, with specific audiences in mind, and listings are used as the basis for management decisions about implementing specific responses, such as Total Maximum Daily Loads (TMDL) programs, to water quality problems. However, with the exception of NAWQA, there are no coordinated statewide monitoring programs for assessing rivers, with the result that data used in the 303(d) listing process for rivers is gathered for a variety of objectives, using a variety of monitoring designs. This requires regional board staff to conduct site-specific and ad hoc efforts to determine which data meet the objectives of the assessment and listing process
Score: Low

2. Indicators and methods: Other than for NAWQA, there are no indicators, sampling, or quality assurance methods that are standardized statewide
Score: Low

3. Data management: See the description of NAWQA and CIWQS data management protocols and tools above (p. 12) in the Drinking Water – Surface Water sub-theme. However, there are a number of other data sources used in the periodic 303(d) assessment process. Each regional water board gathers and assesses all available data at the regional level and prepares a fact sheet explaining each listing that is then compiled with other fact sheets at the statewide level. However, there are no standardized data management procedures regional water boards must follow, local and

regional data are not necessarily input into a database in each region, and there is no mechanism for coordinating the underlying assessment data into a statewide database
Score: Medium

4. Consistency of assessment methods: NAWQA produces assessments using consistent methods statewide. While there are standardized water quality criteria for many parameters, regulatory targets may also differ widely across the state depending on each region's Basin Plan and the requirements of individual TMDLs. In addition, each regional water board may interpret the state's 303(d) listing criteria somewhat differently, with the result that assessments of impairment in rivers statewide do not reflect a consistent and standardized assessment approach
Score: Low

5. Reporting: NAWQA and CIWQS provide query and reporting products and tools that focus on water quality and not directly on measures of aquatic life. The State Board's 303(d) listing website provides tabular summaries and explanations of listings in each region, but does not provide access to the underlying monitoring data
Score: Low

6. Program sustainability: There is no readily available description of a periodic program planning or evaluation process
Score: Low

Additional monitoring programs: Other monitoring programs that collect data potentially relevant to the assessment of aquatic life in rivers include regional watershed monitoring programs such as those for the Sacramento, San Gabriel, and Los Angeles Rivers.

Lakes

Website: NA
Sponsor: NA
Description: There are no regional or statewide monitoring programs targeted at water quality or the ecological status of aquatic resources in lakes.
Evaluation:

1. Strategy, objectives, design: There is no statewide strategy for monitoring water quality or the ecological status of aquatic resources in lakes. However, each Regional Water Board's Basin Plan specifies water quality objectives that apply to surface waters in each region, including lakes
Score: Low

2. Indicators and methods: There are no statewide indicators or monitoring methods targeted specifically at lakes
Score: Low

3. Data management: There are no regional or statewide data management protocols specific to monitoring and assessment data from lakes
Score: Low

4. Consistency of assessment methods: There are no assessment methods targeted specifically at lakes
Score: Low

5. Reporting: There are no reports targeted specifically at lake water quality or the status of aquatic resources in lakes
Score: Low

6. Program sustainability: There is no readily available description of a periodic program evaluation or planning process
Score: Low

Coastal waters: Shallow marine reefs

Website: CDFG CRANE – http://www.dfg.ca.gov/marine/fir/sss.asp#crane;
Reef Check – http://www.reefcheck.org/rcca/rcca_home.php
Sponsor: Department of Fish and Game; Reef Check
Description: CDFG's Cooperative Research and Assessment of Nearshore Ecosystems (CRANE) is a collaborative effort between the California Department of Fish and Game (CDFG), various universities, private organizations, and government programs to gather and report data for fishery management and performance of marine protected areas. In 2004, funding was available for a wide-scale survey and report of fish and invertebrate populations in shallow, rocky habitats accessible to divers (Monterey to San Diego, including the Channel Islands). Reef Check California aims to support the CRANE program by establishing a network of volunteers trained to carry out surveys of nearshore reefs providing data on the status of key indicator species.
Evaluation:

1. Strategy, objectives, design: The programs ask and answer clear questions, with specific audiences in mind. However, there is no direct link to management actions. Specific monitoring objectives are stated on the Reef Check website (but not the CRANE website) and are to assess the relative abundance and size distribution of target species and how these parameters are changing over time. This will permit the evaluation of population and community attributes at sites inside and outside of existing and proposed Marine Protected Areas and will provide insight into how different sites respond to newly imposed management measures. The monitoring design is standardized statewide and is described in CRANE's 2006 summary report and in detail on the Reef Check website. Both programs have scientific advisory teams who provide input and feedback to ensure the scientific quality of the programs' data
   Score: High
2. Indicators and methods: Indicators are standardized statewide and are described in CRANE's 2006 summary report and on the Reef Check website. Basic quality assurance procedures are described very briefly in CRANE's 2006 report. A quality assurance plan, with detailed procedures, is posted on Reef Check's website. These procedures are included in Reef Check's 4 – 5 day volunteer training program, which includes both classroom and field training in the sampling and data management protocols
   Score: Medium
3. Data management: The basic data flow is described in CRANE's 2006 report. Reef Check's data management procedures are well established and clearly defined, and include standardized data entry forms. The program has a designated full-time database manager. Summarized data (e.g., mean, standard error) are available as tables in a PDF document. However, there are no tools for searching or downloading raw data from either website or exporting them to other formats. Nor are the databases from the two programs integrated
   Score: Medium
4. Consistency of assessment methods: Data analysis methods are described in CRANE's 2006 summary report and Reef Check's 2006 – 97 report, and consist of the preparation of summary descriptive statistics, correlation analyses, and multivariate pattern analysis. There are no assessment frameworks or thresholds for evaluating and comparing condition
   Score: Medium
5. Reporting: Data summary reports and the 2006 analysis and assessment report are available on the CRANE website. Reef Check also produced a two-year report assessing data collected in 2006 and 2007. Analyses included basic descriptions of

abundance and distribution, as well as spatial pattern analyses. Users do not have the ability to define and run reports using their own criteria, nor are reports of the two programs coordinated or integrated
Score: Medium

6. Program sustainability: There is no readily available description of a periodic program planning or evaluation process
Score: Low

Coastal waters: Intertidal

Website: http://www.marine.gov/
Sponsor: Cooperative interagency group
Description: The MARINe partnership of local, State, and Federal agencies, universities and private organizations monitors rocky intertidal sites along the coast of California, including the islands, on a long-term basis. It represents the largest program of its kind on the west coast. Many of the sites have been monitored consistently for 15-20 years. A standardized set of Core Protocols are used to monitor rocky intertidal habitat each fall and spring at 89 MARINe sites. These data are funded by multiple partners and are entered into a common database for analysis. Sites are spaced every 10 to 15 miles along the coast on the mainland and offshore islands. Continuous monitoring provides resource managers with early warnings of abnormal conditions, such as the discovery of the withering foot syndrome which has affected black abalone across the coast.

Evaluation:
1. Strategy, objectives, design: MARINe asks and answers clearly defined set of questions about status and long-term trends, as defined by an interagency Steering Committee. Specific monitoring objectives are not defined on the program's website, but can be inferred from the program's overall goals and the analysis approaches. The monitoring and sampling protocols are established by an interagency Science Panel. These are standardized statewide and described in detail on the program's website and in publications and reports accessible from the website. The monitoring design and sampling protocols are targeted directly at the program's goals to describe status and long-term trends
Score: High

2. Indicators and methods: Indicators and methods are standardized statewide, with allowances for regional differences in species distributions, and are described on the program's website and in reports and publications available from the website. Quality assurance is conducted by each program partner; however, quality assurance methods are not described on the program's website
Score: Medium

3. Data management: Data management protocols are established by a Database Panel, but are not described on the program's website or in any reports listed on the website. Data are transferred to a central database, which is currently being organized with standardized formats. Data are not available remotely but must be requested from the MARINe program
Score: Medium

4. Consistency of assessment methods: The program is working with state agencies in their evaluation of discharges into Areas of Special Biological Significance, and with monitoring of marine protected areas. Indices of intertidal community health being generated by MARINe will allow condition to be categorized and federal and state agencies to assess measures to reduce impacts to this critical shoreline habitat. The

website enables users to generate simple time plots of the abundance of individual species at specific sites
Score: Medium

5. Reporting: MARINe partners have produced a large number of reports and publication based on the program's monitoring data, and these are listed on the program's website
Score: High

6. Program sustainability: There is no readily available description of a periodic program planning or evaluation process
Score: Low

Coastal waters: Subtidal benthos

Website: Bight Program – http://www.sccwrp.org/sitemap.html#Regional;
CCLEAN – http://www.cclean.org
Sponsor: Bight Program – Southern California Coastal Water Research Project (SCCWRP); CCLEAN – several dischargers and the Central Coast Regional Water Board
Description: Both the Bight Program in southern California and the Central Coast Long-term Environmental Assessment Network (CCLEAN) are comprehensive regional monitoring programs that focus on the condition of key indicators of ecosystem health, including subtidal benthos, along the nearshore shelf. Both programs also include elements designed to identify and quantify linkages between terrestrial sources of pollutants and effects in the marine environment. The Bight Program conducts a synoptic survey of the Southern California Bight once every four to five years, while CCLEAN conducts monitoring year-round on an ongoing basis.
Evaluation:

1. Strategy, objectives, design: Both programs ask and answer clearly stated questions, with specific audiences in mind. Both programs define specific objectives and link these to explicit monitoring and data analysis designs. Both programs provide detailed descriptions and documentation on their respective websites. However, the two programs operate in distinct parts of the state and are not coordinated in any way
Score: High

2. Indicators and methods: Both programs use indicators and monitoring methods that are standardized across their respective program activities within reach region, but are not standardized statewide. All sampling and analysis methods, as well as quality assurance procedures, are available on each program's website
Score: High

3. Data management: Data management procedures for both programs are well established, though they are not described on the programs' respective websites. CCLEAN does not provide data download capabilities. The Bight Program website allows users to map stations according to measurement type or broader survey type, and to download entire surveys (e.g., infaunal abundance) of particular data types. However, the mapping function is limited and not linked to the data download function. There are no readily available options to query the database and select subsets of data for specific locations or times
Score: Medium

4. Consistency of assessment methods: Assessment methods are consistent within each program. The Bight Program has developed standardized assessment thresholds for infaunal communities that allow them to be subset into different categories of impact. The CCLEAN program has not developed or applied similar assessment tools
Score: Medium

5. Reporting: Both programs regularly produce detailed assessment reports and make them available on their respective websites. However, neither program provides ad hoc query tools that would enable users to produce customized reports
Score: Medium

6. Program sustainability: Both programs have a medium- to long-term funding base that reflects the results of internal planning processes. However, this information is not provided on the programs' websites
Score: High

Coastal waters: Enclosed bays and estuaries

Website: Sediment Quality Objectives (SQO) –
http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/sedimentqual_bays estuaries.pdf; http://www.swrcb.ca.gov/water_issues/programs/bptcp/sediment.shtml;
RMP – http://www.sfei.org/rmp; IEP – http://www.iep.water.ca.gov/;
Bight Program – http://www.sccwrp.org/sitemap.html#Regional

Sponsor: SQO – State Water Board, RMP – San Francisco Estuary Institute (SFEI); IEP – multiple state and federal agencies; Bight Program – SCCWRP

Description: There are four major programs that focus, with some degree of overlap, on bays and estuaries. The only one that is statewide is the State Water Board's sediment quality objectives program. This is a multiyear effort to develop and implement objectives for enclosed bays and estuaries that protect aquatic ecosystems and human health from the direct (e.g., toxicity) and indirect (e.g., health impacts from eating contaminated seafood) effects of sediment contamination. The program has focused primarily on the development of an impact assessment framework and associated thresholds, monitoring methods, and standardized assessment tools. The program conducted a statewide assessment of sediment quality, using available data, to demonstrate the applicability of the approach and obtain an initial estimate of the percentage of the area of bays and estuaries falling into different categories of impact. The new objectives will be included in permits and will form the basis of expanded monitoring requirements. Two of the remaining programs focus on the San Francisco Bay and Delta, the San Francisco Estuary Institute's Regional Monitoring Program (RMP) for San Francisco Bay and the Interagency Ecological Program (IEP). The RMP is funded by a consortium of dischargers in the region and managed by a Steering Committee including consortium members and the Regional Water Board. The program focuses on a set of questions related to the management of contaminant impacts and aquatic resources. The IEP is funded and managed by a consortium of several state and federal agencies (US EPA, US Army Corps of Engineers, US Bureau of Reclamation, National Marine Fisheries Service, US Geological Survey, US Fish and Wildlife Service, Department of Water Resources, Department of Fish and Game, State Water Board). The IEP focuses primarily on the impacts to the Delta of water withdrawals and has developed several long-term datasets tracking the status of key ecological resources. These programs are not yet well integrated.

Evaluation:

1. Strategy, objectives, design: All programs ask and answer clear questions, with specific audiences in mind. All programs state clear objectives, with some defined in greater detail, and there are substantial differences in objectives across all four programs. Monitoring designs also differ substantially, largely due to differences in program objectives and in the structure and dynamics of large vs. small bays and estuaries. For example, the SQO only loosely defines monitoring requirements, while the other three programs have well-established monitoring designs. Monitoring objectives and designs are well described on the programs websites and their respective designs have not been integrated

Score: Medium

2. Indicators and methods: Indicators for the sediment quality objectives program are standardized statewide and well developed and described in summary form in the statewide assessment report and in greater technical detail in a series of reports available on the State Water Board's sediment quality objectives website. Indicators and methods for the other three programs are standardized within each program, and described on their respective websites, but are not well coordinated or standardized across programs
   Score: Medium

3. Data management: Data management procedures are well developed for the IEP, RMP, and Bight Program and all data are available on the programs' respective websites. Data from the statewide SQO assessment are currently housed at SCCWRP and procedures have not been established for ongoing capture of new sediment quality data, maintenance of the database, or inclusion of the database in the BDAT/CEDEN system. Data from the RMP and IEP are readily accessible through a variety of map-based and menu-driven query and download tools that enable users to define subsets of data. The IEP data are housed in and directly accessible from larger data repositories such as CEDEN and BDAT. The Bight Program website allows users to map stations according to measurement type or broader survey type, and to download entire surveys (e.g., infaunal abundance) of particular data types. However, the mapping function is limited and not linked to the data download function. There are no readily available options to query the database and select subsets of data for specific locations or times
   Score: Medium

4. Consistency of assessment methods: Analysis and assessment methods for the sediment quality objectives program follow detailed and standardized protocols described in summary in the statewide assessment report and in greater technical detail in a series of technical reports available on the State Water Board's website. The other three programs also describe their assessment methods, but use program-specific approaches that are consistent within each program but not coordinated or standardized across programs. The sediment quality objectives program is the only program that has defined formal, regional and statewide assessment thresholds for categorizing condition. All programs have formal mechanisms in place to manage the development, review, validation, and updating of their assessment approaches
   Score: Medium

5. Reporting: A statewide sediment quality objectives assessment report is available on the State Water Board's sediment quality objectives and SWAMP websites. However, there are no interactive features to enable users to focus on a specific area or directly obtain the underlying data through a link to the database. Plans for future reporting have not been developed. The other three programs provide a large number of reports on their respective websites that address a range of issues related to contamination, anthropogenic sources, and ecological status. None of the programs have the capability to interactively produce user-defined reports
   Score: Medium

6. Program sustainability: There is no readily available description of a periodic program planning or evaluation process for the sediment quality objectives program. The other three programs have formal planning and evaluation processes overseen by management committees. However, these planning processes are independent of each other
   Score: Medium

Wetlands

Website: CRAM – http://www.cramwetlands.org/;
Wetland Tracker - http://www.wetlandtracker.org/;
California Wetlands Information System – http://ceres.ca.gov/wetlands/
Sponsor: CRAM and Wetland Tracker – State Water Board; Wetlands Information System – Resources Agency
Description: The California Rapid Assessment Method (CRAM) is a standardized, cost-effective tool for assessing the health of wetlands and riparian habitats. CRAM software guides users through assessment procedures that are applicable to all wetland types. It is designed for assessing ambient conditions within watersheds, regions, and throughout the State. It can also be used to assess the performance of compensatory mitigation projects and restoration projects. The CRAM portal provides a mechanism for independent monitoring programs to apply the method and enter their data into a centralized system. CRAM data and results are also accessible through the State Water Board's Wetland Tracker, which is intended to eventually become the portal for entry into all wetlands monitoring and assessment data for the state. A proposal is currently pending before Cal/EPA to fund further development of Wetland Tracker, intended to make it the central web portal for wetland mapping, monitoring, and assessment information. The Wetlands Information System is a directory that links to other programs and data sources related to wetlands. It does not contain any tools that would enable users to directly access, integrate, or work with data from these other sources.
Evaluation:
1. Strategy, objectives, design: The program asks and answers a clear question, with specific audiences in mind. The monitoring objective is to provide rapid, scientifically defensible, standardized, cost-effective assessments of the status and trends in the condition of wetlands and related policies, programs and projects throughout California. There is a three-level monitoring design, recommend by the Wetlands Recovery Project. However, this is not universally applied and individual monitoring programs with somewhat different designs can all enter their data into the CRAM database.
   Score: Medium
2. Indicators and methods: Indicators and monitoring methods are well developed and standardized, though they are in the last phase of field testing and final revision. The schedule for training sessions is posted on the CRAM website, as are detailed methods manuals and user guides. There is no systematic quality assurance applied to data submitted to the site. Funds exist (104b3 and CIAP) to develop regional "audit teams" of trained CRAM experts for coastal regions that will provide third-party review of selected CRAM results by re-CRAMming the sites.
   Score: Medium
3. Data management: Data management procedures are well established and data are housed in a database maintained by SFEI. The CRAM methodology is being field tested and finalized and the CRAM database is being updated regularly to reflect these adjustments and will not be integrated with BDAT / CEDEN until it has stabilized. The database has preprogrammed routines for remote data entry by participants. At this time, there are no tools for search, selecting, and downloading data, although this functionality is included in the CIAP project that begins this fall. The funded task includes downloading by site, combination of sites, wetland type, watershed (Cal Water 2), congressional district, Water Board, and statewide.
   Score: Medium
4. Consistency of assessment methods: CRAM is level 2 of a three-level assessment strategy for wetlands that begins at the landscape level and ends at the detailed site level. Assessment thresholds are well developed and standardized statewide. Software

to apply the CRAM metrics and user manuals are available for download from the program's website. The CRAM database will eventually be merged with the Wetland Tracker database to allow users to visualize extent and condition assessments simultaneously. For each wetland type, at each of several scales, Wetland Tracker will generate a "report" of the size-frequency of all wetland polygons, the size-frequency of the wetland polygons for projects, the CRAM condition frequency (by attribute and site score) for all sites, and for project sites.
   Score: High
5. Reporting: The website has a Google Maps interface that displays all wetlands in the system. Clicking on specific sites brings up summary information for that wetland and a chart of CRAM scores. Wetlands can also be selected from a drop-down list of available sites and viewed regionally via the interactive mapping function of Wetland Tracker (www.wetlandtracker.org), although not all wetland scores are visible at every scale. However, no reports summarizing and synthesizing results have been prepared. Access to these and other information about wetlands will be centralized through a main wetlands portal, perhaps CERES, that has not yet been decided
   Score: Medium
6. Program sustainability: There is no readily available description of a periodic program planning or evaluation process, although program planning is managed by the Wetlands Monitoring Council.
   Score: Medium

Fisheries: Anadromous fish

Website: CalFish – http://www.calfish.org/portals/2/Home/tabid/70/Default.aspx
Sponsor: The Resources Agency, Department of Fish and Game, Department of Water Resources, Coastal Conservancy, Caltrans, Pacific States Marine Fisheries Commission, NOAA Fisheries
Description: This coordinated, state and federal interagency effort is intended to create, maintain, and enhance high quality, consistent data that are directly applicable to policy, planning, management, research, and recovery of anadromous fish and related aquatic resources in California, and to provide data and information services in a timely manner in formats that meet the needs of users. Its primary intent is to centralize access to fisheries and habitat monitoring and assessment data in California. This will make it much easier to develop and maintain statewide data standards and promote further development of related data programs.
Evaluation:
1. Strategy, objectives, design: The portal's overall strategy is broad but clearly stated. Monitoring objectives are defined by each of CalFish's cooperating agencies and vary depending on each agency's mission and the goals of specific programs. Monitoring objectives are available through links to agency programs provided on the website. As for monitoring objectives, monitoring designs are defined by CalFish's cooperating agencies and vary depending on individual program goals. Designs for many programs are available through links provided on the website
   Score: Medium
2. Indicators and methods: Monitoring indicators focus on measures of abundance and distribution and the cooperating agencies work to standardize these across programs. However, there is no information about standardization efforts directly available on the website. Quality assurance procedures are established and implemented by each cooperating agency. There is no information about quality assurance directly available on the website

Score: Medium
3. Data management: Data management procedures are established and implemented by CalFish's cooperating agencies. In addition, there is a broader effort among CalFish's participants to standardize formats to improve access to and integration of data from multiple sources. The website provides links to published data collection and documentation standards and encourages their broader use. Users are able to view data via two basic methods: querying the database tables directly or querying the data geographically. The geographical queries are made possible with an interactive on-line mapping system. This system also provides access to a broad array of framework data (political boundaries, hydrography, quad maps, and many more) that make the spatial data even easier to analyze and understand. Because the tabular and geographical databases are linked, users can move easily between the two systems
Score: Medium
4. Consistency of assessment methods: Given the wide range of issues related to anadromous fisheries, there is no single statewide assessment approach adopted by all agencies. Instead, data analysis and assessment is conducted by CalFish's cooperating agencies to meet their specific needs. However, the website provides descriptions of and links to assessment tools that may be of use to broader audiences, such as a method, developed by the Department of Fish and Game Information Services Branch for deriving salmonid distribution from existing observation data and creating GIS layers identifying this distribution. As another example, the interactive mapping tool enables users to map a wide variety of abundance and distribution data against various habitat, water quality, and management parameters
Score: Medium
5. Reporting: CalFish produces no reports of its own, though a variety of assessment reports are available from each of the cooperating agencies. CalFish does allow users to search the integrated database and create custom reports on population trends and counts, distributions, migration barriers, and fish genetics, as well as view information on individual monitoring programs, hatcheries, and habitat restoration projects
Score: High
6. Program sustainability: There is no readily available description of a periodic program planning or evaluation process
Score: Low

Fisheries: Freshwater fish

Website: Wildlife, Fish, & Plant Information & Programs – http://www.dfg.ca.gov/about/wildlife.html; IEP – http://www.iep.ca.gov/
Sponsor: Wildlife, Fish, & Plant Information & Programs – California Department of Fish and Game; Interagency Ecological Program (IEP) – Department of Water Resources, State Water Resources Control Board, Department of Fish and Game, US Bureau of Reclamation, US Geological Survey, National Marine Fisheries Service, US Army Corps of Engineers, USEPA
Description: The Wildlife, Fish, & Plant website provides information on the range of resource management programs conducted by the Department, with links to biogeographic data, habitat restoration efforts, and grant programs. The IEP conducts extensive monitoring in the Sacramento – San Joaquin Estuary. The IEP's efforts include a combination of long-term trend monitoring and focused shorter-term studies focused on specific problems.
Evaluation:
1. Strategy, objectives, design: There is no overarching monitoring strategy or set of objectives that organizes the information presented by Fish and Game's Information & Programs website. This is rather a catalog that brings a varied collection of disparate

efforts together for ease of reference. The IEP is a coordinated, formally designed, long-term monitoring and assessment program charged at looking at the ecological effects of water withdrawals on the Delta. Goals and objectives are clearly described, and linked to a monitoring design targeted at answering specific questions. Freshwater fish are a central focus of the IEP. However, there is no similar program that focuses on freshwater fish statewide (with the partial exception of anadromous fish, above)
Score: Low

2. Indicators and methods: The IEP uses regionally standardized methods and has an established quality assurance program. However, there is nothing similar for freshwater fish statewide (with the partial exception of anadromous fish, above)
Score: Low

3. Data management: The IEP has well-developed data management procedures that comply with CEDEN standards, and the program's data are housed in the Bay Delta and Tributaries (BDAT) Project site, which is a part of the California Data Exchange Network (CEDEN). BDAT / CEDEN protocols are well described, and the BDAT site contains interactive tools that allow users to search, subset, download, and work with raw monitoring data. BDAT also provides links to specialized web applications outside of the BDAT site. While this may provide a model for a larger, statewide data system that includes data on freshwater fish, the IEP site focuses only on the Delta, and there are no other regional systems of this scope that include freshwater fish elsewhere in the state
Score: Low

4. Consistency of assessment methods: IEP applies consistent analysis and assessment tools to issues related to the Delta. However, there are no similar assessments conducted statewide, and no widely accepted tools to use in such an assessment, were the data available
Score: Low

5. Reporting: The IEP prepares numerous reports, both on its long-term monitoring program and the special studies focused more directly on specific issues. However, while there are ad hoc query tools for selecting subsets of the data, there are no ad hoc reporting tools that enable users to apply different assessment methods to the data. In addition, there are no statewide assessments of the status freshwater fish, nor are there methods that allow users to create their own reports at the statewide scale
Score: Low

6. Program sustainability: There is no readily available description of a periodic program planning or evaluation process
Score: Low

Fisheries: Marine fish

Website: Department of Fish and Game Marine Region – http://www.dfg.ca.gov/marine/
Sponsor: Department of Fish and Game
Description: The Department of Fish and Game manages a wide range of programs and projects related to marine habitat and sport and commercial fisheries. The primary monitoring activity for marine fisheries is the collection of catch statistics for both sport and commercial fisheries. Commercial catch is more thoroughly monitored, while routine monitoring of sport catch focuses primarily on commercial party boats, leaving an important data gap related to the large numbers of fishermen fishing individually. There is fisheries-independent data for only some commercial species that are the focus of stock assessment efforts.
Evaluation:
1. Strategy, objectives, design: Data collection for sport and commercial fish catch has a clear strategy and well-defined objectives (i.e., track spatial patterns and temporal trends

in catch). Monitoring designs are well established and implemented in a standardized way statewide. There are important data gaps related to fishery-independent survey data for many sport and commercial species, as well as to life history data needed for stock assessments
Score: Medium

2. Indicators and methods: Both indicators and sampling methods for catch statistics have been clearly defined. There are ongoing concerns about data quality due to the well-known problems in acquiring accurate catch and landings data in marine fisheries. Indicators and methods for stock assessments are less well defined and must be adapted to the distribution and life history characteristics of each species. Monitoring protocols for stock assessments have been developed for only some species of concern
Score: Medium

3. Data management: Catch statistics for both sport and commercial fisheries, for current and past years, are readily on the Department's website. However, data are presented as PDF copies of printed tables for individual years, with no tools that enable users to subset or combine data by area or species, or to acquire it in digital format. Data files must be requested directly from the Department
Score: Medium

4. Consistency of assessment methods: Assessment of catch statistics and other related data is performed in the fishery management plans prepared for individual species and updated periodically. These plans have not been completed for all commercially or recreationally important species. Fishery management plans follow a standard format, although there are differences in assessment methods related to species-specific differences in life history characteristics and other key factors
Score: Medium

5. Reporting: Reporting consists primarily of the fishery management plans and periodic updates to these
Score: Medium

6. Program sustainability: The Department has conducted an evaluation of the status of commercial and sport fisheries which resulted in a set of priorities for developing new fishery management plans. However, there is no readily available description of the level of funding needed for this effort and whether such funding is available
Score: Medium

Invasive species

Website: Invasive Species Program – http://www.dfg.ca.gov/invasives/ ; Marine Invasive Species Monitoring Program – http://www.dfg.ca.gov/ospr/about/science/misp.html
Sponsor: Department of Fish and Game
Description: The Invasive Species Program is involved in efforts to prevent the introduction of these species into the state, detect and respond to introductions when they occur, and prevent the spread of non-native invasive species that have become established. The program focuses on addressing the ways by which the species are introduced by human activities and emphasizes prevention of additional introductions, in coordination with other government agencies and non-governmental organizations. The Marine Invasive Species Program is a component of the overall Invasive Species Program, and is a multi-agency effort to control the introduction on Non-Indigenous Species (NIS) from the ballast of ocean-going vessels. The Department conducts monitoring studies to determine the level of invasion in the coastal and estuarine waters of the state, and monitor for new introductions to determine whether the program's ballast control measures are effective. The program also manages a database with the name and location of every known non-native species on the California coast.

Evaluation:

1. Strategy, objectives, design: The program has a clear strategy and objectives that focus on specific mechanisms of species introduction. This has provided the basis for a statewide coastal survey and for building relationships with other state and federal programs. The coastal survey was conducted over a five-year period using a straightforward monitoring design to develop a baseline, with continued monitoring now ongoing
    Score: High
2. Indicators and methods: Reports of invasive species are collected from a wide variety of sources in addition to the survey conducted by the marine component of the program. There are no established data collection or quality assurance standards for data reported to the program from outside sources
    Score: Medium
3. Data management: The program maintains the California Aquatic Non-Native Organism Database (CANOD), which includes information about the pathway of introduction (e.g. ballast water, hull fouling, etc.), date of introduction, locations observed, and native region of each species. CANOD will be refined in the future as more surveys for non-native aquatic species are completed. The entire database can be readily downloaded, but there are no online tools for ad hoc queries, data subsetting, or mapping
    Score: Medium
4. Consistency of assessment methods: The program's monitoring element provides simple summaries of occurrence and abundance that are presented in a consistent format for the entire state. One statewide assessment has been completed, based on data from 2000, but there have been no subsequent statewide assessments
    Score: Medium
5. Reporting: One report based on coastal data from 2000 has been completed and is available online. In addition, the program's website links directly to the websites of other state and federal programs related to invasive species. However, there are no reports from freshwater aquatic habitats, and no online assessment tools that enable users to create their own customized reports or assessments
    Score: Medium
6. Program sustainability: There is no readily available description of a periodic program planning or evaluation process
    Score: Low

Harmful algal blooms

See Shellfish, under Seafood Consumption Safety, above