bay restoration commission

STEWARDS OF SANTA MONICA BAY

santa monica bay restoration commission ✐ 320 west 4th street, ste 200; los angeles, california 90013
213/576-6615 phone ✐ 213/576-6646 fax ✐ santamonicabay.org

MEETING OF
THE SANTA MONICA BAY RESTORATION COMMISSION
TECHNICAL ADVISORY COMMITTEE
Contact: Lia Protopapadakis (310-216-9826)

APPENDIX – INDEX DEVELOPMENT PRESENTATIONS

Joe Gully for Don Cadien (LACSD), Benthic Response Index (BRI): The three keys to developing an index are sensitivity, repeatability and accuracy. Univariate and multivariate analysis does not show enough resolution in all cases. The important question to resolve at the outset is how to define good conditions and bad conditions (reference conditions) as they relate to human impact or habitat quality. Indexes, such as the BRI, are data intensive. Others, like RIVPACs or CRAM, are knowledge intensive.

RIVPAC - River Invertebrate Prediction and Classification System

CRAM – California Rapid Assessment Method (wetlands)

The BRI took twenty years to collect data, five years to build, and three years to refine. After defining the pollution gradient index developers selected ~230 species that responded to that gradient and assigned each species a pollution tolerance score. Based on these scores, they could classify a site based on the species assemblages found. The BRI is limited in that that the species list only included the species present in the 20 years of data collected before treatment began. New species that have now moved in cannot be added to the index. Also, the BRI cannot be transferred to other areas without time consuming and intensive data collection. To apply the BRI to bays and harbors four different indexes were combined and modified.

AMBI – AZTI's Marine Biotic Index

AZTI – A technology center specializing in marine and food research

AMBI, another index for soft bottom habitats developed in Europe, compares observed vs expected conditions. Local animals are categorized based on knowledge of their pollution tolerance. This index is transferable, has been studied for its interchangeability, and its species list is not limited.

Ken Schiff (SCCWRP), Freshwater Indices: The State is currently working on developing bioassessments or biocriteria for streams. They have already developed standardized methods, taxonomic identification, and data management (CEDEN). SWRCB is creating biocriteria using invertebrates in streams because this is what they have ready to go. They will use this to regulate water quality using tiered objectives based on a stream's physical characteristics (steep terrain, perennial, unarmored). A water body would have to meet the biocriteria range within their tier. It will discourage municipalities from allowing high quality natural streams from deteriorating in a way that doesn't exist now, but may discourage municipalities from removing armoring streams. They are holding training sessions and would like to expand this to many waterbodies and different species. Now is the time for partnering to develop new tools like algae-based biocriteria which may respond better to nutrients.

CEDEN – California Environmental Data Exchange Network

IBI – Index of Biological Integrity

The IBI is a multimetric index. It starts with a biological species list, these are grouped into metrics, watching for circular or overlapping metrics, and compared to a pollution gradient (ie nutrients). The metrics that show responses are used. These are scaled or weighted for separation. Then thresholds are drawn. This method is statistically based on reference data. As of today, this index developed for algae and nutrients does not appear to be transferable to creeks in flat terrain and non perennial streams. It will likely not transfer to armored streams.

RIVPAC has an 800-900 site data set. It works well in every region, but the local IBI is more sensitive than RIVPAC. IBI was used in the state 305(b) report published recently. There is opportunity to refine RIVPAC. Rich noted that freshwater fish may not be the most useful of indicators to go into an index. *Ken noted that as part of this effort the Storm Water Monitoring Coalition is about to start their second summer and the Santa Monica Bay is treated as one unit, which will be helpful for analysis. This coalition is collecting data on invertebrates, algae, water chemistry and toxicity and could answer questions such as how many stream miles are impaired? Which stressors are riskier for the area? How is the area changing overtime? How does it compare to other watersheds? For the SMBay the SMBRC could try applying IBI and RIVPAC, comparing them and possibly developing and refining them further.*

Betty Fetscher (SCCWRP), CRAM: CRAM is a rapid assessment model, with the emphasis on the rapid. It should take a 2-3 person team less than 4 hours of field time. It is a structured "Best Professional Judgment" (BPJ) grading system. Because of this it requires a high level of expertise (ie equivalent to the training required to delineate an Army Corps of Engineers wetland boundary jurisdiction). The method requires the team to rate specified habitat indicators based on observational data. The ratings for all indicators at a site are combined to obtain the site score, analogous to a Grade Point Average. The method is transferable because relying on BPJ allows the scoring to be tuned to each habitat type. However scaling the method to larger areas can be problematic. The method was validated by comparing CRAM scores to data-based assessments at well studied sites. Its drawbacks are that it relies on highly trained assessors. There is some variability between assessors too (~9% when measured). CRAM is currently used as one parameter by the Southern California Storm Water Monitoring Coalition (mywaterquality.waterboards.gov). There is also a CRAM website (www.cramwetlands.org) where "ambient data" is available. Reference sites are being scored statewide. Right now they are working on validating the method for depressional wetlands. In the future they intend to work on resolving the expected improvement trajectory for wetlands in urban areas. They are attempting to develop bins for the CRAM scores, because % is not useful when determining if a mitigation project was successful or not. A reference condition is already built into each attribute. However, to bin the CRAM scores they will need to use an overall reference condition to establish the bins. Chris Solek is the guy to go to for data from ambient surveys (he doesn't do the project surveys). CRAM wouldn't necessarily correlate with water quality or habitat measures. An example of how it can be used in coordination with IBI (in-stream indicator) is if a site has a good IBI and a bad CRAM score, water quality is probably not the problem; the issue is the habitat availability. To compare areas with different sizes (ie the Malibu vs Ballona wetlands) need to do several CRAM surveys on the larger site. All this is given in user manual.

MIRI – Megabenthic Invertebrate Response Index

TRI – Trawl Response Index

Jim Allen (ECOrp), Fish Response Index (FRI): The FRI (and its related indexes for different capture methods (MIRI and TRI) was modeled after the BRI. The model uses identified fish guilds, stratified by depth for demersal flatfish. It has been used to detect pattern changes with ENSO and other climactic shifts. It corresponds with BRI, when the BRI scores are low, but is more sensitive than BRI at higher BRI scores. The reference sites were based on best and worse sites in the Bay.

MARINe – Multi-Agency Rocky Intertidal Network

Rich Ambrose, rocky intertidal indicators: The MARINe group has been working on developing an index for rocky intertidal species for 5 years. They first tried to model an index off of CRAM. Most recently, they tried a BPJ exercise with the help of SCCWRP and USC SeaGrant. ~20 experts in CA were given typical data collected in the rocky intertidal and limited metadata to go with it. The experts were asked to rank the sites by the level of disturbance and explain how they did it. Then they met to compare results. There was some agreement at the extreme ends of the spectrum. However there was a lot of mismatching at sites in the middle. The methods varied, but could be grouped into three categories: 1) community statistics, 2) weighted indicator groups, and 3) Natural history characteristics. Almost everyone ignored a substantial subset of the data. There was also a substantial difference in how "disturbance" was interpreted by the experts (ie. physical disturbance or human disturbance). In the rocky intertidal, it is very difficult to distinguish between anthropogenic and natural disturbance, especially in places with relatively very little disturbance. Also, commonly sampled taxa are not best indicators of human disturbance. They decided to repeat the exercise with a few improvements: 1) the data set will include a wider range of anthropogenic disturbance (potentially causing a new artifact of two biogeographic regions), 2) disturbance has been defined as deviation from expected, which will likely drive most experts to conduct multi-dimensional scaling (MDS) analyses. There are existing indexes for rocky intertidal habitat in British Columbia. This index is not very transferable to California because the driver of disturbance is pulp mill discharges, which can be relatively easily identified. In southern California human-caused disturbance includes poor water quality, collection, and trampling. Each of these activities affects different species in different ways. *Joe Gully suggested running basic stats on the data against different types of disturbance to see what comes out.* The challenge still remains that the disturbance gradient is not easily defined for any type of disturbance.

CRANE – Cooperative Research and Assessment of Nearshore Ecosystems

Dan Pondella, rocky reef indicators: The last State of the Bay Report used Jim Allen's fish guild analysis (MJ Allen 1982, Bond el al 1999) to rank the "value" or health of rocky reefs in the Santa Monica Bay. This can be seen as analogous to the Army Corps of Engineers "restoration value" (ie. value of restoring Portuguese Bend vs Rocky Reef). The model is based on fish density, fidelity, and average size. It is scaled to area. It is good at assessing restored habitat. Currently, the output is scaled in GIS, where the "reference" is the best reef in the bight, but the bins are statistically defined. The metric can be transferred to different habitats, because fish guilds have been defined for all California habitats and contain less variance. It also works for any sampling methods that include a way of estimating density. It is empirically driven. However no thresholds have been developed yet. Between the Bight '08 effort and CRANE surveys, 72 reefs have been surveyed. It would be possible to look at the trophic guilds and see how they react to different stressors. Another challenge would be to normalize this metric across regions. It was developed in southern California, so it should be tested as to whether it is universal or not. Then

categories and thresholds can be used to normalize the metric across regions either statistically or using BPJ. What factors are driving changes? Right now, they are all treated equally. Some questions have not yet been tested; such as if entire guilds fell out, how would that affect the model? Or how would the model rate a predator dominated system?

Karen Martin, Sandy Beaches: It was encouraging to hear the different approaches taken to develop an index for different habitats, because doing this for beaches now seems more possible. Beaches are heavily impacted but not well studied. Many animals ephemerally use the beach (nesting, foraging, etc). They may be the most similar to low salinity, tidal freshwater habitats where the relationships seem to disappear. Another issue is that there are no acceptable reference sites now, but perhaps a historical reference could be used. The CRAM uses structure and expectations of a group to identify what's expected in the habitat. SCCWRP could partner via CRAM.