Working list of Institute ideas

The Watershed Science Institute is collecting ideas for potential projects to be discussed at an upcoming workshop (to be scheduled) with members of the San Diego River watershed monitoring workgroup and other interested parties. The projects are organized into the four categories used by the Southern California Stormwater Monitoring Coalition (SMC), as these provide a useful initial organizing structure. The four categories are:

- Ecosystem characterization and assessment
- Method development and tool evaluation
- Optimizing management effectiveness
- Foundational scientific understanding

**Ecosystem characterization and assessment**

**Fire effects on water quality**
Jeff Pasek 03/02/15
Large wildland fires increase risks to water quality from both the burned natural landscape and the burned human materials (e.g., houses, cars, junk piles). Matt Rahn is conducting research on aerial deposition of contaminants from burned human materials but there is little if any research on contaminants on and in soils that are mobilized by later rainfall.

**Post-fire disturbance**
Jeff Pasek 03/11/15
One of the largest sources of post-fire disturbance is utility trucks traveling throughout the burned area to restore utilities (power lines, transformers, pumping stations, etc.). While the firefighters themselves do a good job of remediating the disturbance they cause with their firelines and roads, the utilities have no requirement to do so and generally do not restore areas they disturb after a large fire. There are very accurate aerial photographs taken during and after fires that could be combined with the maps of the fire lines to determine where the utilities have caused disturbance. Simply quantifying this disturbance as a first step would be a large step forward and the photos, maps, and other information from the recent large fires in the San Diego provide a large amount of raw material to work with.

**Urbanization effects on riparian vegetation**
Trent Biggs 02/20/15
One of Trent’s MS students (Tom Strand) is planning to do a channel condition assessment (channelized or not, plus vegetation status using remote sensing) for urban areas of different ages in San Diego. The study’s focus is on how riparian vegetation (measured by satellite and perhaps LiDAR) changes during urbanization. This work could contribute to a better working definition of modified streams for the purpose of categorizing streams for the assessment of biological condition. This would be relevant to the San Diego Regional Water Board’s interest in developing numeric biological objectives. A better understanding of the relationship between instream condition (as measured at the moment by benthic macroinvertebrates and algae) and channel and/or landscape condition would be very useful.

The Regional Board is also interested in prospective tools that would help them better protect areas that are in good condition now but would be at risk from future development. Having a documented link
between urbanization and changes in riparian vegetation would be useful, because that could then link to other assessment tools, such as CRAM, which is being used widely for wetlands and riparian assessment.

**Method development and tool evaluation**

**Extract local/regional scale map products from statewide assessment**

Brock Bernstein 02/28/15

Extract local/regional scale map products from the Healthy Streams (now Watershed) Partnership statewide assessment (California Integrated Assessment of Watershed Health). This used remote sensing data, along with site data, to derive predictive relationships that were the basis of assessments of condition, vulnerability, etc. If these products, along with the modeling algorithms, were available at local/regional scales, they would be useful as:

1. Guidance on what indicators to include in local/regional monitoring programs
2. Background and context to help focus monitoring efforts and interpret their results (but only if local and regional results are readily available)
3. Opportunities to compare modeled results with actual local/regional monitoring data (but only if local and regional results are readily available)
4. Accelerate the application and acceptance of more integrative monitoring/modeling approaches to regional assessment

Local and regional programs would benefit from access to higher resolution maps of these statewide products at the watershed scale. The figures in the integrative report are a useful overview of the entire state but don’t provide the resolution needed to see patterns at local and regional scales. As a result, the study’s results at present are useful only in a theoretical sense, but have no practical application for local and regional practitioners.

While the raw data are available from the project’s ftp site, using them in their present form would require additional effort and specialized expertise. Data products at the watershed and subwatershed scale may be extractable from the report’s raw figures because these were built up from results from all the individual drainage areas (> 130,000 throughout the state). It should therefore be possible to cut out pieces of the statewide map and blow them up for their own use. Failing that, local/regional scale maps could be produced from the project’s data files.

At its February 20, 2015 meeting, the Healthy Watershed Partnership group heard that the involvement of local efforts could help groundtruth and validate the statewide approach and products, and help fill data gaps. Such involvement could also help improve the assessment approach.

**Improve watershed report card scoring**

Brock Bernstein

Some of the scoring algorithms in the draft San Diego River watershed report card are unvalidated ad hoc constructions developed by the project team (i.e., fish community, native and invasive amphibians and reptiles). These need further testing and validation, particularly with regard to defining some sort of reference or benchmark for comparison. For the amphibians and reptiles, one approach would be to use the entire southern CA multitaxa database to define the range of distribution and abundance and then score the SD River watershed in comparison to that. However, that would not work for multiple watersheds that cumulatively begin to make up a larger and larger percentage of the entire S CA region.
Another approach would be to select sites that are adjacent or very close to reference sites defined by the State’s biological objectives project. The distribution of amphibians and reptiles at those sites could then form a basis of comparison for other, non-reference, sites.

Any such effort should be done in collaboration with USGS and other scientists knowledgeable about the fauna and their habitat requirements.

**Improve watershed report card structure and visualization**
Brock Bernstein
The watershed report card should be expanded to include Safe to Eat and Safe to Swim attributes and scores. It should also be enhanced to include GIS capability that would display site and watershed subarea scores onto appropriately scaled maps of the watershed. This should be coordinated with the recently approved Stormwater Monitoring Coalition (SMC) project to assess data visualization approaches and make recommendations on one or more preferred approaches.

There are a number of other modifications and enhancements previously identified by the project team needed to improve the reliability, transparency, and usability of the report card tool.

**Build on watershed mapping tool**
The San Diego River watershed mapping tool (http://mappingideas.sdsu.edu/SensorWeb/index.html) could act as an organizing entry point for the watershed report card and for landscape-scale analyses. However, it would need additional development to add features that take it beyond a simple repository of map layers and monitoring data. It would need to be integrated with the watershed report card.

**Host the watershed program database**
Chad Loflen 03/10/15
The San Diego River watershed monitoring and assessment program, and other similar watershed programs in the region in the near future, will need data management support to enable cost-effective production of periodic analyses and reports, including watershed report cards. This would involve some initial design of data management procedures and tools (including, for example, relationships with original sources and ultimate recipients of data), followed by more routine data inspection, reformatting, loading, and maintenance. This support could be structured as a part time job with oversight by a permanent faculty supervisor with expertise in information management.

**Optimizing management effectiveness**

**Watershed management/treatment tradeoff**
Jeff Pasek 03/02/15
The City now has the ability to make drinking water out of almost any sort of water, including sewage. It’s a matter of the money invested in treatment. A key question for a water agency is the value of source water protection (i.e., watershed management) in reducing treatment costs. Does money spent on source water protection produce less, equivalent, more savings in treatment costs? This is an optimization/tradeoff problem.

**Foundational scientific understanding**

**Flow ecology pilot project**
Eric Stein
SCCWRP has a Prop. 84 grant to investigate relationships between flow and biological condition in streams (this is a very simplistic summary of the project). The project has completed work that allows them to predict a variety of flow metrics at ungaged sites based on data from gaged sites. The next step is to investigate relationships between some subset of the large number of flow metrics and measures of biological condition. The project is looking for one or more watersheds where they can apply the Ecological Limits of Hydrologic Alteration (ELOHA) approach and is hoping that the San Diego River watershed could be one of these. Partners in the watershed would contribute readily available data and participate in meetings to interpret study results and develop guidance.

**Channel status and biogeochemical function**

Trent Biggs 02/20/15

Link channel status with biogeochemical functions such as nutrient retention. The issue of biogeochemical function, particularly related to nutrients, will be an important issue for permittees because of the State Board’s Nutrient Numeric Endpoints (NNE) project, which aims to develop numeric objectives for nutrients based on measures of stream condition such as algae, DO, macroinvertebrates, etc. The project’s study plan summarizes the types of analytical and modeling work the NNE project is undertaking and could provide a context for more detailed and site-specific studies of what controls nutrient impacts.