



Council for
Watershed Health



Urban Waters Federal Partnership

INDICATORS OF WATERSHED HEALTH FOR THE LOS ANGELES RIVER WATERSHED

An Integrated Assessment Framework of Watershed Health

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INTRODUCTION

A watershed is a boundary on a map representing a physical space in the world, where water moves over and shapes the land, draining to a common waterway such as a river or ocean. The processes within a watershed are categorized as physical, such as water moving sediments to carve a streambed, chemical, such as the cycling of nutrients through a wetland ecosystem, and biological, such as interactions between predators and prey species. When you consider people living in a watershed, you must also account for economic processes, such as the cost of water that is used to irrigate agricultural products, and social conditions, such as spaces for community gatherings and access to nature. Ecosystem, economic, and civic processes together contextualize the world we live in. And, when properly functioning and balanced, healthy watersheds are the basis for human health and well-being.¹

In California, water and land are the basis for our society. We've altered the natural processes of both, considerably. Most of those alterations have brought great prosperity to the people of California. Some of the changes we've wrought have unintended outcomes that harm us – ozone pollution is one clear example; the loss of streams and wetlands is another.

As Council for Watershed Health, we believe that effective collaborative management of water and land can redress the imbalances in between the natural and built environments, resulting in improved health and wellbeing. Applying a triple bottom line philosophy to our work, we seek to (1) restore ecosystem processes we rely on for our biological systems, and mental and spiritual health (2) produce economic vitality with rewarding work and opportunity for all people, and (3) bring more equity and fulfillment to our communities. We have been working to achieve these goals since 1996.

Understanding and communicating about environmental and community conditions over the long-term is a critical aspect of sustainable environmental management and policy formulation. The Watershed Health Assessment Framework for the Los Angeles River tracks, informs, and inspires change in our community. The framework is a clear and easily understood way to regularly educate the public and policy-makers about the health of our communities by uncovering and linking together the knowledge earned by all those working on different aspects of human health and wellbeing. By using water and watersheds as the organizing principle, we can promote the three key elements of watershed health - healthy people, healthy ecosystems, and a healthy economy. In order to define a "healthy watershed," we turned to the organizational vision of Council for Watershed Health (Council) for the future: Vision 2025.

¹ U.S. EPA (2012, February). Healthy Watersheds. Retrieved May 19, 2014, from <http://water.epa.gov/healthywatersheds>.

BACKGROUND

Indicators of Watershed Health for the Los Angeles River Watershed is listed as a project on the work plan of the Urban Waters Federal Partnership for the Los Angeles River Watershed.² Designed as an education, outreach, and research project, the Council was awarded a US EPA Urban Waters Small Grant in 2012 to identify the commonly-held goals for the Los Angeles River Watershed and develop a framework of indicators to help us communicate progress in achieving those goals.

The framework builds upon the Council's previous work, Southern California Watershed Assessment Framework,³ a California Department

of Water Resources funded project (Agreement No. 4600007907), which laid the groundwork for measuring the condition of an urban watershed. That study produced an assessment of the Arroyo Seco watershed, which is a tributary of the Los Angeles River. In addition, the Council has worked with partners to create an assessment tool for the Santa Ana Watershed Project Authority One Water One Watershed Plan 2.0 (OWOW 2.0),⁴ and worked with University of California, Davis, the Department of Water Resources and the US EPA to develop performance metrics for water sustainability throughout California. This latter project is incorporated in the California Water Plan Update 2013.

VISION 2025

The Council for Watershed Health envisions that by 2025 the cities of southern California are models of sustainable urban watershed management. The region's watersheds are managed for environmental health, social equity, and economic vitality with:

- Clean water
- Reliable local water supply
- Restored native habitats
- Ample parks and open spaces
- Integrated flood management
- Revitalized rivers, and
- Vibrant communities

² Urban Waters Federal Partnership. (2014, February). Work Plan Update. Retrieved May 19, 2014 from <http://goo.gl/uxT9IS>.

³ Council for Watershed Health. (2011). Southern California Watershed Assessment Framework. Retrieved May 19, 2014 from <http://goo.gl/XwQCvD>.

⁴ Santa Ana Watershed Project Authority (2014). OWOW 2.0 Plan. Retrieved May 19, 2014 from <http://goo.gl/G69bCw>.

METHOD

Developing a suite of indicators of watershed health that incorporates sound science and is supported by regional stakeholders requires a collaborative approach. The first step brought the Urban Waters Partnership participants into a technical advisory group. With input from the advisory group, Council researchers produced a draft collective vision for the watershed. Using that vision, goals and a set of indices were developed that would be the basis for an assessment. Out of this initial process, we developed a case statement,⁵ which was used as the basis for the second step.

As a second step, these draft ideas were the centerpiece of three focused stakeholder workshops,⁶ to which we invited resource managers, researchers, and watershed monitors.⁷ At the workshops, participants were asked to participate in three facilitated discussions:

1. Developing a Shared Vision for the Future, related to the LAR Watershed;
2. Identifying indicators for the LAR; and
3. Establishing a partnership

In addition, we engaged businesses with a footprint in the region and an interest in watershed health. This engagement was less successful than our work with the watershed stakeholders who are with government, academia, or nonprofit sectors and is an ongoing focus. In the absence of a regulatory mandate, we believe business partners are essential for an ongoing report card process.

Following these stakeholder engagements, Council researchers refined the goals and indices, developed a draft final suite of indicators,⁸ and submitted this back to our stakeholders for review. This suite of indicators is described below, and will provide input into the next phase of this work where existing and new knowledge are used to produce a report card as a communication tool for the status and trends of the health of the watershed.

⁵ Appendix A

⁶ Appendix B

⁷ Appendix C

⁸ Appendix D

FRAMEWORK

The health of a watershed depends on the health of its fundamental elements: people, economy and ecosystems. These elements have complex, multi-faceted relationships with one another. For example, business practices impact our environment while also providing secure employment for people, who in turn rely on services and resources from the environment.⁹

To unpack these relationships, the Watershed Health Assessment Framework for the Los Angeles River includes three indices: Healthy People, Healthy Economy, and Healthy Ecosystems. Creating an index for each element allows us to individually track the progress of these critical components

of the watershed. Later, the analysis of conditions and trends within the three indices will include a synthesis of linkages between the indices, so that our understanding of the conditions of one informs our understanding of the others.

In order to track progress, each index is populated with measurable indicators. For example, the quality of water delivered to consumers directly impacts their health. The Quality of Water Supplies indicator is combined with other indicators to determine how well the watershed is supporting human health. Each index contains indicators that are keystone pieces of their overarching index. In other words, the assessment framework identifies the vital signs of a healthy watershed.

Index	Indicator
Healthy People	Quality of water supplies
	Availability of developed outdoor recreational space
	Strength of social networks
	Extent of urban heat island impacts
	Support for water & land initiatives
Healthy Economy	Cost & reliability of water & power
	Water-energy nexus (embedded water in power, power used to manage water)
	Adaptation planning in the watershed
	Per capita water use
Healthy Ecosystems	Freshwater aquatic & riparian habitat health
	Coastal & estuarial aquatic habitat health
	Extent of protected native landscapes
	Flexibility of management network

⁹ Bunch, M. J., Morrison, K. E., Parkes, M. W., & Venema, H. D. (2011). Promoting health and well-being by managing for social-ecological resilience: the potential of integrating ecohealth and water resources management approaches. *Ecology and Society* 16 (1): 6. Retrieved from <http://www.ecologyandsociety.org/vol16/iss1/art6>.



Healthy People Index

Quality of life is an important component of our health and wellbeing. Examining the built and natural environments for their positive and negative impacts on people is one purpose of this index. Our social institutions can mobilize and improve lives. Certain indicators of watershed conditions and networks also reveal human conditions. The Healthy People Index includes the following indicators:

- **Quality of Water Supplies** - The safety of tap water is critical to disease prevention and human health. Public and private water companies monitor delivered water for contaminants to ensure it complies with regulations set by Environmental Protection Agency (EPA) and the California Department of Public Health (CDPH).
- **Availability of Developed Outdoor Recreational Space** - Access to open space encourages community, recreation and exercise. Trust for Public Land and Council for Watershed Health are tracking the availability of developed outdoor recreational space.
- **Strength of Social Networks** - We have learned from past disasters that resilience comes from community connectivity.^{10, 11} Though this is a clearly understood component of civic health,¹² we were unable to identify a measurement methodology. In future work, we hope to find partners or additional research that will allow this indicator to be measured and tracked over time. Drawing attention, and activity, that increases the social connectedness of the region's communities will improve our health and well-being.
- **Extent of Urban Heat Island** – The urban heat island effect is caused by the extensive use of concrete, asphalt and other pavements that absorb the sun's rays. Cities can be degrees hotter than nearby suburban or rural areas. This is a problem for vulnerable populations like elderly and children. The California Air and Resources Board and the Lawrence Berkeley National Laboratory are developing a technique to help us understand the albedo of our built and natural environments.¹³
- **Support for Water & Land Initiatives** – As the environment impacts people, people impact the environment. This Indicator analyzes the agendas of governing bodies within the watershed, to determine if the issues relevant to watershed health are being considered. Analyses of agenda is a tool that has long been used in political science to evaluate how important an issue (in this case water and land) is in a civic setting.¹⁴ This technique was used in our assessment of the Arroyo Seco watershed, and can be implemented by any organization with the assistance of groups of students, either as interns or as a class project.

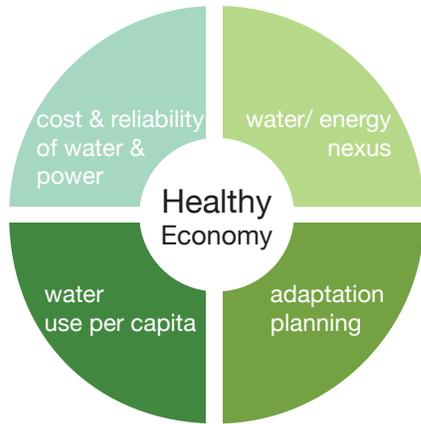
¹⁰ Cutter, S.L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., Webb, J. (2008). A place-based model for understanding community resilience to natural disasters. Elsevier 18: 598-606. Retrieved from <http://www.elsevier.com/locate/gloenvcha>.

¹¹ Tompson, T., Benz, J., Agiesta, J., Cagney, K., Meit, M. (2013). Resilience in the Wake of Super Storm Sandy, The Associated Press-NORC Center for Public Affairs Research. Retrieved from <http://www.apnorc.org/projects/Pages/resilience-in-the-wake-of-superstorm-sandy.aspx>.

¹² A. Bellomo, Los Angeles County Department of Public Health, Director of Environmental Health, personal communication, May 19, 2014.

¹³ Lawrence Berkeley National Laboratory (2014). Projects: California Roof Albedo. Retrieved from <http://heatisland.lbl.gov/projects/projects-california-roof-albedo>. The California Roof Albedo Project aims to improve measurements of solar reflectance throughout California, using high-resolution aerial imagery to measure reflectance of visible and near-IR radiation.

¹⁴ Cobb, R. W., & Elder, C. D. (1972). Participation in American politics: The dynamics of agenda-building. Boston: Allyn and Bacon.



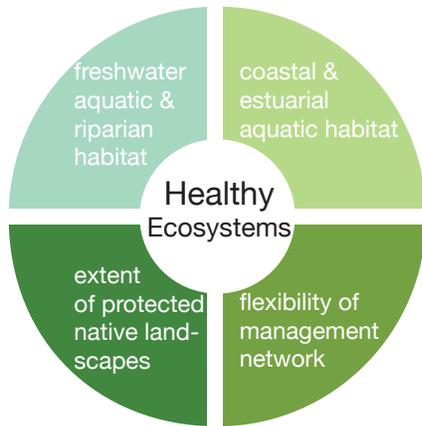
Healthy Economy Index

The Healthy Economy Index considers how we consume our environmental services and resources, how we distribute them equitably, and how we prepare for future conditions such as climate change and population growth. This index highlights the important nexus between water security, energy reliability and the strength of our industries. The Healthy Economy Index includes the following indicators:

- **Cost and Reliability of water and power** – Climate change and population growth create challenges at the water-energy nexus. This indicator will include measures of water and power reliability and water and power cost. Balancing these four metrics will be a challenging and core function of public and private utilities moving forward.
- **Water-Energy Nexus** - Generating power requires water. Likewise, treating, heating and delivering water requires energy. In both cases, water is consumed and carbon is emitted. A healthier watershed is one where both water in embedded in power and power used to manage water are being reduced at a sustainable rate.¹⁵

- **Adaptation Planning in the Watershed** - Unpredictable disturbances, like droughts, floods, and earthquakes, demand watershed management that is integrated and flexible. This indicator evaluates the governance and management within the watershed, and specifically, its efforts to produce an ability to adapt to unpredictable events.
- **Water Use per Capita** - Overconsumption paired with drought threatens our water security. The Per Capita Water Use Indicator tracks how much water our region consumes per person to help encourage and celebrate conservation.

¹⁵ E. Birenbaum, Program Manager, Southern California Edison, personal communication, May 15, 2014. Southern California Edison is currently developing a metric to track the water footprint in each kWh of energy used.



Healthy Ecosystems Index

The Healthy Ecosystems Index considers the condition of specific habitats, the extent to which native lands are protected, and how is habitat management structured. The Ecosystem Index is developed to evaluate not only current conditions, but also the potential to impact future conditions through governance. The Healthy Ecosystem Index includes the following indicators:

- **Freshwater Aquatic & Riparian Habitat Health** - The water and habitat in our rivers, streams and riparian zones are directly impacted by the runoff from our urban environment. The Freshwater Aquatic & Riparian Habitat Health Indicator follows the quality of water and condition of habitat in this urban ecosystem. Existing monitoring programs supported by wastewater dischargers through NPDES permits and housed at the Council for Watershed Health provide data for this indicator.
- **Coastal & Estuarial Aquatic Habitat Health** - As all of the water drains to the coast, coastal and estuarial health can indicate the overall health of the watershed. This indicator monitors beach water quality and health of near shore species. The Santa Monica Bay Restoration Commission provides periodic assessments

of the health of the Santa Monica Bay, and a partnership between Los Angeles County Department of Public Health and environmental NGO Heal the Bay provides routine assessments of beach water quality. San Pedro Bay, the marine water body to which the Los Angeles River drains does not have routine assessments of its ecosystem condition. An April 2010 reconnaissance study¹⁶ from the US Army Corps of Engineers has a snapshot of current conditions, which may become baseline for future consideration.

- **Extent of Protected Native Landscapes** - This indicator considers two aspects of “protection” for native landscapes. First, an analysis will consider how much of the undeveloped open space of the watershed is protected from development. Three datasets, including one maintained by Southern California Association of Governments and two produced and maintained by GreenInfo Network will be used to measure this indicator. Second, the indicator will consider the protection of these spaces from invasive plant species. The Council for Watershed Health has mapped the extent of four of the most significant invasive plant species. The California Invasive Plant Council and the Los Angeles Weed Management Area maintain records of invasive plant removal projects.
- **Flexibility of Management Network** - Fragile and changing conditions of our natural habitats requires a management structure capable of adapting. This indicator evaluates the flexibility of ecosystem management. Many participants in stakeholder engagement raised the need for this indicator, however it is without a strong method for measurement. Because of its significance, we have included it knowing that more research is needed to uncover an appropriate method of assessment.

¹⁶ Breakwater Reconnaissance Study. (2010). Retrieved from <http://www.longbeach.gov/citymanager/ga/breakwater>.

Establishing Thresholds

In future work, thresholds will be produced for each indicator, providing a worst and best condition for the system it represents. With thresholds, each indicator can be judged in the space between “worst” and “best.” This normalizes each indicator for its “distance to target.” This allows the indicators to be comparable to each other and combined to evaluate progress toward overall goals.¹⁷

Reporting indicator scores can be in the form of a number (e.g., on a score of 0 to 100), conversion from the number to a grade, or conversion from the number to a color on a common scale (e.g., red to green). The intent of each of these approaches is to convey to report card users the condition of components of the watershed, represented by indicators, relative to goals for the watershed. Over time the report card maintains consistency in the measured indicators, the targets for each indicator, and goals for the system. When these report card attributes are changed, the changes should be transparent so that report card values can be compared over time.

CONCLUSIONS AND NEXT STEPS

Over the past twenty years, Los Angeles’ river has re-entered the consciousness of the region, changing from its image as nothing more than an open storm sewer, into an image that opens up prior impossibilities that include a river.¹⁸ With the help of activists, engineers, scientists, planners, and policy-makers, the Los Angeles River is in the process of being transformed from an intentionally hidden and mostly ignored feature of Los Angeles into a celebrated icon.¹⁹

The transformation is emblematic of how Los Angeles is continually reinventing itself.²⁰ With the growing awareness of the economic and social benefits of a river, this change can be thought of as a disruptive innovation for Los Angeles that will create new markets and value in neighborhoods both near the river and throughout its watershed. The Council for Watershed Health has partnered, for example, with the Federal Reserve Bank of San Francisco to facilitate conversations on the nexus and mutual benefits between river revitalization and economic development.

The tools that are required to weave the threads of change include organizations, investments, policies, and report cards to track and report on status and trends. As work in other places has suggested, it is necessary to develop a framework that uncovers and links together the disparate knowledge held by many in order to assess, inform, and inspire lasting, positive changes in the state of the river basin.^{21, 22}

The framework we are developing with our partners promotes the three key elements of sustainability: a healthy economy supporting healthy people within a healthy environment in Los Angeles. Developing a suite of indicators that reflects this vision requires a collaborative approach and a sophisticated plan to assess and report on the new, possible Los Angeles River. Using water and watersheds as the organizing principle, we are building a shared understanding of what we mean by a healthy watershed in the context of urban Los Angeles.

¹⁷ Pantus, F. J., & Dennison, W. C. (2005). Quantifying and Evaluating Ecosystem Health: A Case Study from Moreton Bay, Australia. *Environmental Management*. doi:10.1007/s00267-003-0110-6.

¹⁸ Steele, N.L.C., et al. (2013). Revitalized rivers and vibrant communities: the promise in Los Angeles. *Urban Coast* 4(1): 20-31.

¹⁹ Morrison, P., & Lamonica, M. (2001). *Río L.A.: Tales from the Los Angeles River*. Santa Monica, Calif: Angel City Press.

²⁰ Gottlieb, R. (2007). *Reinventing Los Angeles: Nature and community in the global city*. Cambridge, Mass: MIT Press.

²¹ Healthy-e-Waterways. (2012). South East Queensland Health-e-Waterways. Retrieved May 19, 2014 from <http://www.health-e-waterways.org/reportcard/2012/subregion/Moreton%20Bay>.

²² Integrated and Applied Network. (2014). Projects. Retrieved May 19, 2014 from http://ian.umces.edu/projects/#_Current_Projects.

APPENDIX A: ASSESSING THE WATERSHEDS: A VISION FOR SOUTHERN CALIFORNIA

Water is the primary medium through which climate change influences the Earth's ecosystems and therefore people's livelihoods and well-being.¹

Today, we know that many people have only a weak connection to the natural systems they rely upon and a vague idea of the impacts of climate change on their lives. And yet human well-being is inextricably tied to the services provided by healthy ecosystems, for example clean water and air, healthful food, and inspirational landscapes. It is vital that we value and communicate the connections between natural systems and humans, especially in our cities, where people perceive they are most disconnected from the natural world and least understand how they are dependent on its resources.

To catalyze the necessary changes in practices and policies, the Council for Watershed Health relies on its organizational "Vision 2025."

We envision that by 2025 the Los Angeles region is a model of sustainable, urban watershed management. The region's watersheds are managed for environmental health, social equity, and economic vitality with:

- Clean Waters
- Reliable Local Water Supplies
- Restored Native Habitats
- Ample Parks and Open Spaces
- Integrated Flood Management
- Revitalized Rivers and Urban Centers

Looking at our own experiences, and examples throughout the world, we believe the creation of an integrated assessment for reporting on the state of our environment is the most effective way to describe and encourage the progress towards this vision.

Scientific, data-driven assessments provide people with confidence in decision-making and provide managers with the information they need to implement changes. It is also important to inspire the public through regular reports on how things are changing. We know that what we measure affects what we do in powerful ways.

What is the solution?

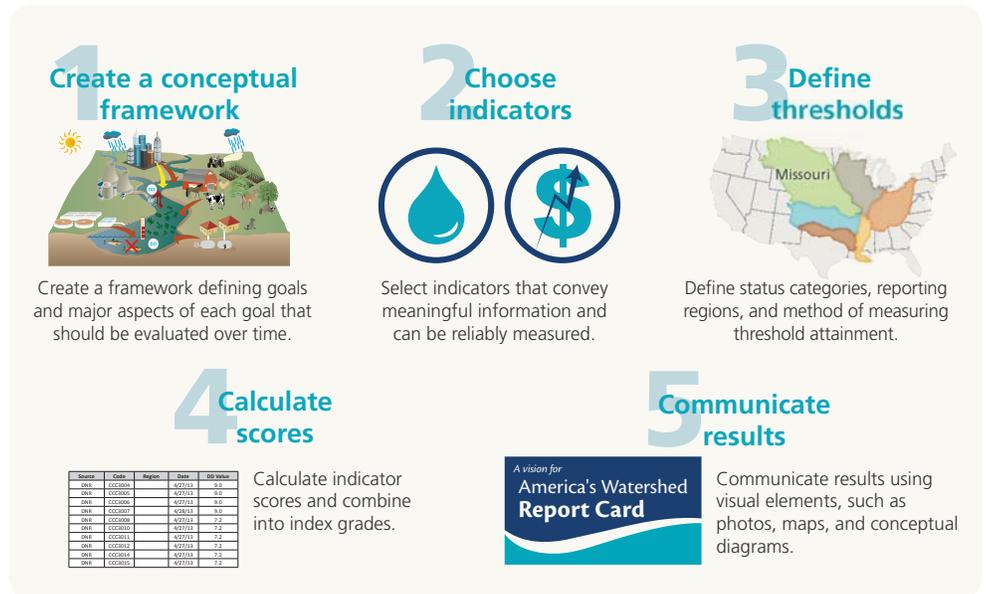
Through building a dynamic, publicly accessible and scientifically valid web-based report card we can show how the efforts of our cities, organizations, agencies, businesses and academia are working together to catalyze improvements in the environment. This report card will be based on the collaborative efforts of the many agencies and organizations that are tracking specific measures and will be responsive to the needs to decision-makers and resource managers.

We recognize that human well-being is intrinsically tied to clean air, access to clean water, parks, and natural open spaces, and healthful food. The services provided by healthy ecosystems are essential to healthy communities and healthy people. In developing a tool that measures, values, and tracks progress towards urban water resources sustainability for the region we will catalyze the changes that lead to a healthy environment and strong economy.

¹ UN-Water fact sheet, http://www.unwater.org/downloads/UNWclimatechange_EN.pdf

A clear and easily understood way to regularly inform people about the health of our environment will uncover the knowledge needed to promote ecological health, social equity, and economic vitality. By using water and watersheds as the organizing principle, the report card will reconnect people to their landscape and water. It will become one of the critical tools for changing how people imagine the city, pointing the way towards so many of the changes we know are dearly needed.

The project will measure environmental indicators within a geographic context over time and compare where we are to where we need to go. A web portal and mobile app will use maps to display the status and trends of environmental health, social equity, and economic sustainability in the region, based on existing and newly-developed measures. By understanding how the region is performing and how efforts spread among institutional and civil society are interrelated, the paths forward will reveal themselves.



Taken from America's Watershed Initiative. <http://www.greatriverspartnership.org/en-us/NorthAmerica/Mississippi/Pages/Advancing-a-Vision-for-the-Mississippi.aspx>

What is the framework?

We have developed a proposed framework for a watershed health integrated assessment. Each of eight indices is underpinned by an aspirational goal. A limited set of indicators and metrics will be selected that track progress towards the goals, can be measured with available data, and will persist over time. Indicators will be scored based on distance to target. For a detailed description of methodology, see "Assessing Ecosystem Values of Watersheds in Southern California".²

Watershed Health Integrated Assessment Framework

- Water Quality Index
- Goal: Clean Water
- Water Supply Index
- Goal: Reliable Sufficient Local Water Supplies
- Ecosystem Index
- Sub-indices – Coastal, Riverine/Wetland, Upland
- Goal: Healthy Ecosystems
- Outdoor Recreation Index
- Goal: Ample Parks and Open Spaces for People
- Watershed Management Index
- Goal: Integrated Watershed Planning and Management
- Human Health and Prosperity Index
- Goal: Healthy People and a Strong Economy

² UN-Water fact sheet, http://www.unwater.org/downloads/UNWclimatechange_EN.pdf

What are the key objectives?

Creating a public-private partnership with a network of organizations and agencies that measure and monitor the environment will create a holistic and meaningful reporting structure. Not only will we engage research and monitoring groups, we will create stronger ties to resource managers who are in charge of compliance with regulations and meeting community needs. The latter groups need the information generated by the former groups but often do not have access, may not sufficiently understand how monitoring applies to their management, or do not have assurance as to the quality of the data. The project will serve to upgrade the quality of data collection, whether from professional or citizen groups, and present it in a meaningful and trusted way to the resource managers. In this way we will accomplish the following key objectives.

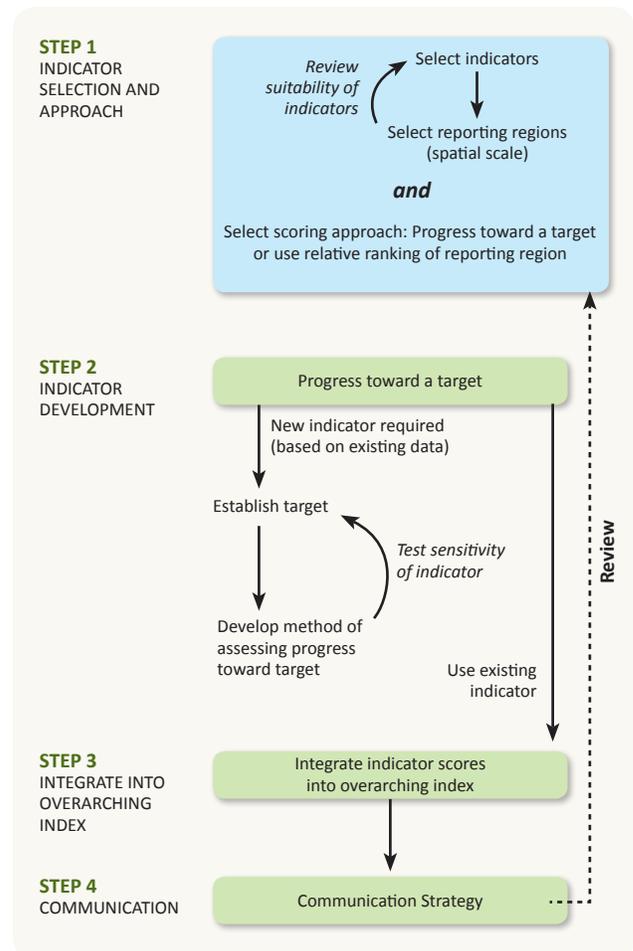
- To build recognition among state and national leaders about the importance of the watersheds of Los Angeles and the value of integrated assessment to support integrated management's goals of improving ecosystem health and human well-being.
- To establish an enduring public-private partnership that connects stakeholders and harnesses the best science to advance a shared vision of the future.
- To develop and communicate regular, trusted assessments (report cards) with measures of status and trends to indicate progress towards system-wide health of the watersheds.
- To elevate projects that are developed and implemented through effective collaboration and integrated resources management.
- To succeed in moving together towards a shared vision of a future with clean water, air, and soils; reliable water supplies; healthy ecosystems; ample parks and open spaces; revitalized rivers; and that supports economic growth and vibrant communities.

How is the project funded?

The primary funding partner is the U.S. Environmental Protection Agency. In-kind funding is being provided in the form of two fellowships.

- Executive Director Nancy Steele is a Durfee Foundation Stanton Fellow (2012-2013). This work is the subject of Dr. Steele's two-year fellowship.
- Julie Castro is an Ann C. Rosenfield Fellow from the UCLA Luskin School of Public Affairs. From summer 2013 and extending through the 2013-2014 school year, Ms. Castro's graduate work will be focused on the project.

The value of this funding and in-kind work is approximately \$100,000. The full two year cost of project development is approximately \$275,000, revealing a funding need of \$175,000. This cost includes bringing together the partnership and includes professional facilitation; identification of indicators that reveal meaningful information for resource managers and the public; collection and analysis of data to allow synthesis producing combined grades for top level measures, such as water supply, water quality, ecosystem health, outdoor recreation, and so on; design and development of a web portal and mobile app; and outreach and publicity for widespread dissemination and education about the new tool.



The four major steps needed to produce a report card. Taken from America's Watershed Initiative. <http://www.greatriverspartnership.org/en-us/NorthAmerica/Mississippi/Pages/Advancing-a-Vision-for-the-Mississippi.aspx>

Who is the Council for Watershed Health?

The Council for Watershed Health, founded in 1996, has collaboration in its DNA. The Los Angeles Basin Water Augmentation Study, begun in 2000, assembled a technical and funding advisory committee of federal, state, and local agencies and nonprofits to investigate the challenges and solutions for capturing stormwater in an urban environment. Early findings showed that it is safe to use polluted water runoff to increase our underground water supplies. Our publication “Stormwater: Asset Not Liability” (2nd ed. 2010) changed the way the region thinks about stormwater as a source of local water supplies.

In 2005 the Council brought together additional partners to design and build the Elmer Avenue Neighborhood Retrofit Project. With phase I completed in 2010, the award-winning project is the most comprehensive “green street” in Los Angeles, converting a disadvantaged street in Sun Valley into a model of urban sustainability. Elmer Avenue captures and cleans more water than is used annually by the 24 houses on the block. The project is a focal point in the community with its meandering sidewalks, solar street lights, and diverse native and drought-tolerant plants. In 2012 the second phase, a mid-block alley-way, Elmer Paseo, was completed. The formerly asphalted alley now is a visually pleasing connector between the block and schools nearby that also captures and infiltrates water.

In 2005, the Council began management of the first watershed monitoring program in the region for the San Gabriel River. In 2007 we began management of a similar research program on the Los Angeles River. In 2011 we produced an authoritative State of the San Gabriel River report and symposium; the State of the Los Angeles River report and symposium will be produced in 2013. Both programs operate with a workgroup of stakeholders that set the annual research and monitoring agenda.

In 2008 the Council began work on a framework of indicators of watershed health in urban regions, the first such project in California to focus on an urban region. Completed in 2010, the project included a report card-style analysis of the state of the Arroyo Seco watershed. Project partners included the California Department of Water Resources, UC Los Angeles, University of Southern California, UC Davis, the US Forest Service, and the California Office of Environmental Health Hazard Assessment, among many others.

We are now working with the Santa Ana Watershed Project Authority on indicators development and we have a US EPA grant for the Los Angeles River Watershed. Executive Director Nancy Steele focuses her 2012-2013 Stanton Fellowship on this topic and we will have a UCLA graduate fellow from the Luskin School of Public Policy for 2013-2014.

The Council has long experience with convening workshops, conferences, and symposia. We host a Watershed Symposium series in which we bring divergent viewpoints together around timely topics three to four times a year; a program of as-needed workshops, and occasional multi-day workshops. Examples include “Restoration and Development Challenges of the Los Angeles River” (2013), “On Track? High Speed Rail and the Los Angeles River” (2010), and “Nature Needs Water, Too” (2009). In 2012, the Council convened a multi-day international conference, “The Mediterranean City: A Conference on Climate Change Adaptation” which kicked off the Mediterranean Cities Climate Change Consortium (MC-4.org). Also in 2012, we initiated an Environmental Funders and Media Forum, which we offer twice a year. Another important public education program is our Sustainable Landscape Seminar series which we offer for professionals in the landscaping trade.

APPENDIX B: INDICATOR DEVELOPMENT WORKSHOP: EXECUTIVE SUMMARY

The Project

The Indicators of Health for the Los Angeles River Watershed is a project to develop an assessment framework that measures the economic, social and ecological condition of the region. Funded by the Environmental Protection Agency (EPA) and the Council for Watershed Health (CWH), with in-kind contributions from the Durfee Foundation and the UCLA Luskin School of Public Affairs, the project aims to inspire change by tracking progress. The EPA small grant carries the project through the first phase of researching the feasibility of the assessment framework, identifying other necessary resources, and creating a business and communication plan to advance to the next phase.

The Workshops

The Council for Watershed Health hosted three workshops (April 16 & 17, July 2) with over 30 attendees from businesses, government agencies, nonprofits, etc. During the workshops, the Council shared their vision for the Indicators of Health for the Los Angeles River Watershed, and invited community stakeholders to share their visions for a sustainable Los Angeles as well as the indicators that would show progress towards their vision. There were several outcomes of the workshop:

- Shared visions for a sustainable Los Angeles
- Gained community support for the project
- Discovered other similar efforts, and the methods they use
- Revealed indicators that are already being tracked
- Identified indicators that should be tracked

Common ideas were:

- Watersheds are a means of connecting us, not dividing, the boundaries should expand beyond just the Los Angeles River Watershed.

- Tracking the health of the watershed is important to informing the community and public policy, and should be publically accessible.
- Regulators and businesses often track metrics, but they are either not publically accessible or publically legible. This valuable information should be processed and presentable.

Common questions/concerns were:

- Many important conditions are not quantitative, and might be difficult to measure.
- How can citizen engagement or science, a great resource, be included if it does not meet research standards?
- The public does not understand our urban watershed issues, nor value water enough.
- What will the frequency of the report card be?
- If a grade is based on where we are compared to where we want to be, how is “where we want to be,” determined? Regulatory targets?

The Next Step

After the workshops, the Council compiled a list of goals and indicators based on the attendee comments. The list was internally processed, and using the Vision 2025, the Council has created a preliminary matrix of goals (healthy people, healthy ecosystem, healthy economy, civic engagement and education, and adaptation and resilience), and the indicators that inform our progress reaching those goals. The preliminary matrix has been sent out for review by several workshop attendees. Based on their comments, the Council will create the final goals and indicators matrix.

APPENDIX C: INDICATOR DEVELOPMENT WORKSHOP: ATTENDEES

Workshop 1: April 16, 2013	
Sophie Parker	The Nature Conservancy
Carol Armstrong	LA City
Richard Gomez	LACFCD
Edith de Guzman	Tree People
Jonathan Frame	Arroyo Seco Foundation
Mark Stanley	RMC
Priyanka Wadhawan	USACE
Daniel Lovato	ANF
Marty Dumpis	San Dimas Technology & Development Center
Howard Kahan	EPA Region 9
Pauline Louie	Urban Waters Federal Partnership
Workshop 2: April 17, 2013	
Liz Crosson	LA Waterkeeper
Lara Meeker	LA Waterkeeper
Kirsten James	Heal the Bay
James Alamillo	Heal the Bay
Eric Stein	SCCWRP
Bob Vos	USC
Mark Hanna	Geosyntec
Fraser Shilling	UC Davis
Deb Smith	LA Water Board
Evelyn Cortez-Davis	LADWP

Workshop 3: July 2, 2013	
Grace Chan	Metropolitan Water District (MWD)
Paul Costa	Boeing, Santa Susana Field Laboratory
Sean Hecht	UCLA Law School
Lila Higgins	Natural History Museum
Jayne Laber	National Weather Service
Guang-yu Wang	Santa Monica Bay Restoration Commission (SMBRC)
Individual Meetings	
David Beckman	Pisces Foundation
Evan Birenbaum	Southern California Edison
Brandon Blevins	Southern California Edison
David Asti	Southern California Edison
Rupa Basu	Office of Environmental Health Hazard Assessment (OEHHA)
Charlene Contreras	Los Angeles County Department of Public Health
Angelo Bellomo	Los Angeles County Department of Public Health
Bowman Cutter	University of Pomona
Sarah Hersh	Full Court Press
Dan Cohen	Full Court Press

APPENDIX D: INDICATOR MATRIX

Index	Indicator	Metric	Source (or potential)
Healthy People	Quality of water supplies	quality/area	Los Angeles County Water Districts
	Availability of developed outdoor recreational space	parks/area	Council for Watershed Health; Trust for Public Land
	Strength of social networks	community resilience initiatives/area	Los Angeles County Department of Public Health (potential)
	Extent of urban heat island impacts	cool roofs/area; canopy width/area	Lawrence Berkeley National Laboratory
	Support for water & land initiatives	water&land initiatives/agenda	Council for Watershed Health (potential)
Healthy Economy	Cost & reliability of water & power	\$/unit; blackout/area	averages are available
	Water-energy nexus (embedded water in power, power used to manage water)	gallons/kWh; kwh/gallons	SCE; water utilities(potential)
	Adaptation planning in the watershed	more research needed	Los Angeles Regional Collaborative for Climate Action and Sustainability (potential)
	Per capita water use	average water use/day/capita	LADWP; water utilities (potential)
Healthy Ecosystems	Freshwater aquatic & riparian habitat health	safe to swim	Council for Watershed Health
	Coastal & estuarial aquatic habitat health	beach grade	Heal the Bay
	Extent of protected native landscapes	invasive species removal projects/area	Council for Watershed Health; California Invasive Plant Council; Los Angeles Weed Management Area
	Flexibility of management network	more research needed	Council for Watershed Health (potential)

ABOUT THE COUNCIL FOR WATERSHED HEALTH

Since 1996, the Council for Watershed Health has been Southern California's trusted hub for essential watershed research and analysis. The Council is uniquely able to influence and inform public policy with applied research that is reliably fair, objective and rooted in science. With a legacy of facilitation and collaboration, the Council effectively connects diverse perspectives to address timely issues of watershed significance.

The Council approaches regional sustainability through five strategic areas:

Water Resources Management

Sustainable Urban Landscapes

Open Space Conservation and Restoration

Resiliency to Climate Change

Healthy Watersheds – Healthy Communities



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