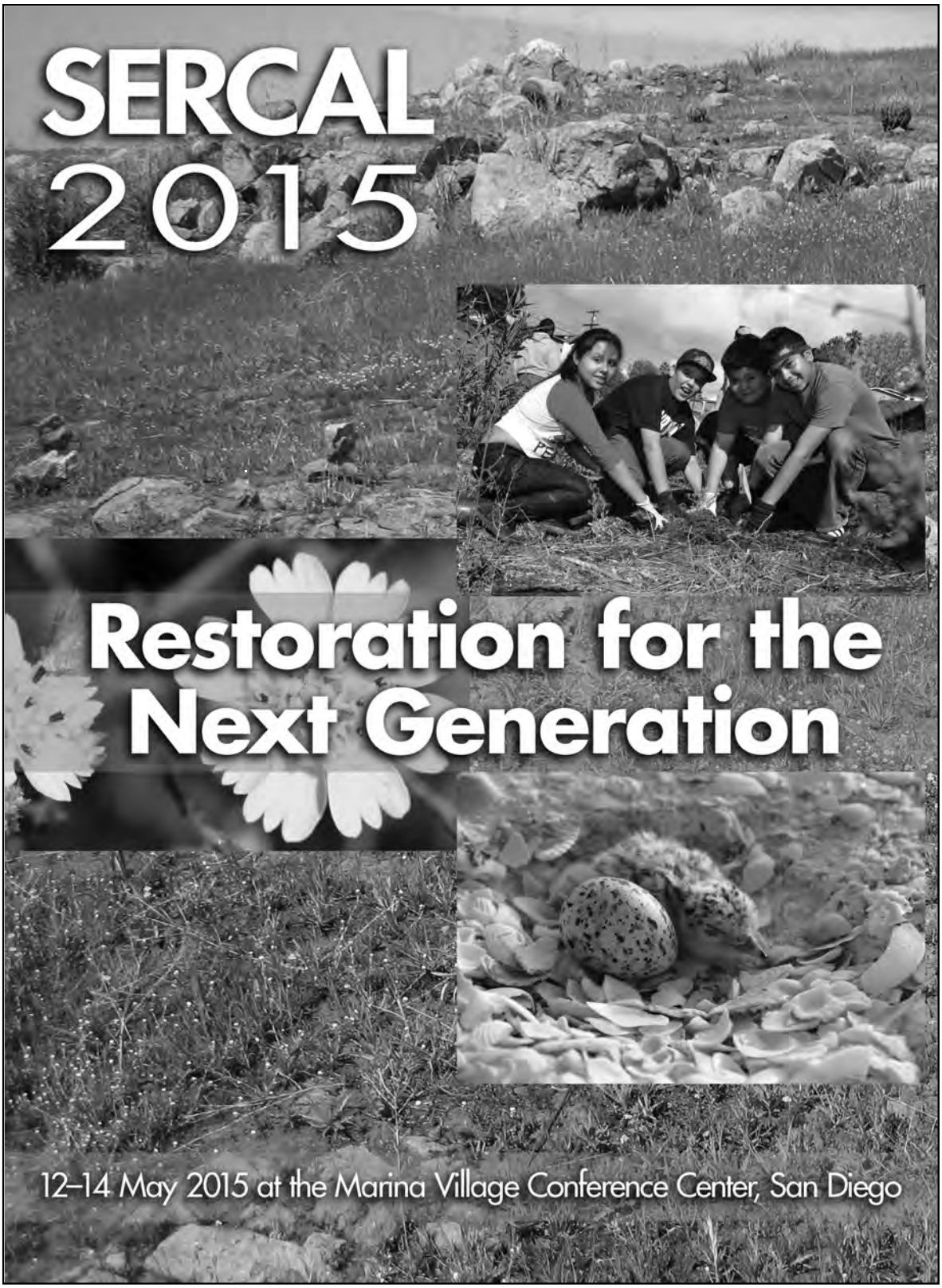

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ABSTRACTS

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Note: This Program Book was compiled by Susan Clark Coy, SERCAL Administrative Director, and Julie St. John, SERCAL Publications Director. Minor edits may have been necessary for formatting purposes. Presentation content reflects author contributions and not necessarily positions of SERCAL or its sponsors.

WETLANDS/WATERS RESTORATION

Chair: **David Shaw** *Balance Hydrologics*

Wednesday 13 May 10:00a — 12:00p, 1:00p — 3:00p and 3:15p — 5:15p *Terrace Room*

Restoring and Preserving Tidal Marsh in the Petaluma River Estuary

Leslie Allen[1] and Carl Jensen[2]

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The Sonoma-Marin Area Rail Transit District (SMART) is implementing a 70-mile long commuter rail project in phases that will connect multiple cities in the Northern San Francisco Bay Area. The project involves rehabilitating an existing freight rail line, constructing new stations, and constructing a system of multi-use pathways along the railroad alignment. To provide compensatory mitigation for tidal and freshwater ecosystems, SMART purchased the 68-acre Mira Monte Marina located in the Petaluma River baylands and directly adjacent to the railroad alignment. SMART's Mira Monte Marsh Restoration Project is restoring and enhancing approximately 14 acres of tidal marsh habitat by removing fill and tide gates, excavating new channels, planting native species and managing weeds. The project is also preserving in perpetuity 40 acres of existing high quality tidal marsh habitat that will benefit special-status species including California Ridgway's rail, California black rail, and salt marsh harvest mouse.

Reconstructing the Historical Ecology of the Lower Tijuana River Valley

Sean Baumgarten*[1], Erin Beller[1], Sam Safran[1], Robin Grossinger[1], Julio Lorda[2], Jeff Crooks[2], Eric Stein[3], Travis Longcore[4], Shawna Dark[5]

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The binational Tijuana River watershed encompasses a diverse array of habitats, including the internationally-recognized Tijuana estuary. Though many areas of the watershed remain relatively undeveloped, land and water use changes over the past 200 years have resulted in significant ecological impacts, particularly in the more urbanized areas of the lower watershed. Drawing upon a diverse set of historical data, this study reconstructed the ecological and hydrogeomorphic conditions of the lower Tijuana River valley prior to major Euro-American modification (ca. 1850) and documented major changes in habitat distribution and physical processes over this time. The river corridor, which was historically dominated by riparian scrub, today instead supports dense stands of riparian forest. This change has been driven in large part by sewage discharge and other hydrologic modifications that have increased the volume and duration of dry season flows, decreased the frequency of high-magnitude floods, and increased channel stability. The valley bottom surrounding the river corridor, which historically supported extensive seasonal wetlands, has largely been converted to drier habitat types and agricultural uses. The estuary, which historically supported large expanses of salt marsh and mudflat as well as seasonally dry salt flats, has retained much of its former extent and character, but has been altered by increased sediment input and other factors. The insights into historical landscape patterns and trajectories provided by these findings will be useful to managers and scientists seeking to develop management and restoration strategies to increase the resilience of the Tijuana River valley and estuary to future impacts.

Restoring a River Ecosystem in a Changing Climate

Carol Beahan*[1], Theresa Cody*[2], and Stephanie Heller*[2]

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The Upper Truckee River in South Lake Tahoe, California is the largest tributary to Lake Tahoe, a large pristine lake valued by visitors and residents who live and recreate along its mountain shores. The Upper Truckee is one of the largest contributors of sediment and nutrients to the lake, impacting its famed clarity which is closely linked to the $5 billion economy that the Lake supports (TRPA 2014). In partnership with the California Tahoe Conservancy, the Forest Service Lake Tahoe Basin Management Unit (LTBMU) initiated the Upper Truckee River Reach 5 Restoration Project (Project) in 2009. The Project just completed its second year of construction, creating 1.5 miles of channel to increase overbanking, improve water quality, raise groundwater levels, enhance aquatic habitat, and accommodate public recreation. With climate change predicting trends of less snow in the Sierras and under a current "Exceptional Drought" condition (NOAA 2015), these improvements become invaluable to the wildlife and people that rely on the river. By constructing the restoration with in-house crews and incorporating native materials, the LTBMU is able to save

continued

money and integrate adaptive management strategies. The LTBMU also involves the community's youth in the Project as a way of educating. Generation Green and Tahoe Basin Watershed Education Summit — both student groups — have harvested willows, filled gravel bags, and collected cross-sections and pebble counts. Additionally, undergraduate interns are conducting stream surveys and working with restoration crews. These approaches are building a better restoration project for the community and its future.

Rapid Assessment of California's Wetlands: The National Wetland Condition Assessment

Cara Clark*, Kevin O'Connor, and Sarah Stoner-Duncan

Central Coast Wetlands Group, Moss Landing Marine Laboratories, 8272 Moss Landing Rd., Moss Landing 95039; **cclark@mlml.calstate.edu**.

The California Rapid Assessment Method (CRAM) is a tool designed to assess the habitat condition of wetlands and riparian areas using four universal attributes to quantify overall condition: Buffer and Landscape Context, Hydrology, Physical Structure, and Biotic Structure. We used this tool as part of the 2011 National Wetland Condition Assessment (NWCA), in addition to the standard parameters which include: vegetation, water quality, algae, soil, the USA Rapid Assessment Method (USARAM), and buffer surveys. We examined correlations between level two (rapid) CRAM scores and level three (intensive) data collected for NWCA. Nutrient levels were significantly correlated with CRAM scores. Stressor levels were much higher in California than the nation as a whole, particularly hydrologic stressors such as ditching and damming. The range of CRAM scores from estuarine and depressional wetlands shows that estuarine wetlands are generally in better condition. USARAM results were compared to CRAM results. This study sheds light on the ecological condition of California's wetlands and the stressors that are impacting them. This will help to inform managers and decision-makers in their deliberations on wetland management. This information can be used to prioritize restoration efforts. Tools such as CRAM are also useful to quantify restoration success with monitoring before and after restoration implementation.

Santa Clara River Estuary Habitat Restoration and Enhancement Project

Chris Hammersmark*[1], Dale Meck[1], Denise Tu[1], Mike Podlech[2], and Dan Chase[3]

[1]cbec, inc. eco engineering, 2544 Industrial Blvd., West Sacramento 95691. [2]4474 Cortez Drive, Soquel 95073. [3]WRA, Inc., 2169-G East Francisco Blvd., San Rafael 94901; **c.hammersmark@cbecoeng.com**.

Located at the base of the 1,623-mi^2 Santa Clara River watershed, and nestled between Oxnard and Ventura, the Santa Clara River Estuary and surrounding areas provide habitat for several endangered species including Southern California steelhead, tidewater goby, western snowy plover, and California least tern. Adjacent to the estuary is the McGrath State Beach Campground, which at times is inundated and closed due to high water levels in the estuary resulting from effluent discharged from the Ventura Water Reclamation Facility. This project examines the feasibility of restoration and/or enhancement actions to the Santa Clara River Estuary, particularly within the 15-25 acre area currently occupied by the campground, which would be relocated further to the south. Through an open and collaborative stakeholder brainstorming process, two alternatives were developed and refined. In the development of alternatives and consideration of the needs of the native biota, a variety of habitat types including tidal slough and marsh complexes, fluvial side channels, seasonally inundated floodplains, open water lagoon and back dunes were considered. The alternatives and subsequent iterations of the alternatives were evaluated with multi-dimensional hydrodynamic, sediment transport, circulation, temperature and habitat suitability models. Conditions evaluated included various flood events, open berm tidally dominated conditions, as well as closed berm conditions. Following the alternative evaluation and refinement, a preferred alternative will be selected and a set of 30% complete construction plans will be developed, while additional funding is obtained in order to complete the planning, design, permitting and implementation phases of the project.

California Seep, Wet Meadow, and Riparian Restoration Using Check Dams: Lessons Learned from the Highland Andes

Brett D. Hartman

Environmental Science and Resource Management Program, California State University Channel Islands, 1 University Drive, Camarillo 93021; **brett.hartman@csuci.edu**.

Seep and wet meadow systems impacted by erosion are particularly difficult to restore. Restoring seep and wet meadow systems relies on rehabilitating groundwater resources, which can be costly and difficult to achieve. However, restoration may be possible through watershed rehabilitation that combines erosion control structures and vegetation management. I evaluated restoration success at a long-term and large-scale watershed rehabilitation and wet meadow restoration project in the highland Andes. Local communities built over 30,000 check dams, terraces, infiltration ditches, and gabions, combined with reforestation and grazing control. Results from vegetation transects and a time series (1986–2009) of Normalized Difference Vegetation Index (NDVI) indicate that extensive restoration occurred. The strongest predictor of restoration success, as measured by long-term increase in NDVI, was the number of check dams in

gullies (r=0.576; p=0.016) as these increased infiltration and promoted seep and wet meadow vegetation. Using case study examples from California, I will discuss the role of check dams in restoring wetland and riparian systems. Check dams and fiber rolls show promise for rehabilitating seep and wet meadow systems incised by gully erosion. Previous studies have also shown that check dams and weir structures can promote willow riparian vegetation in ephemeral drainages. Finally, I will discuss the regulatory implications of using check dams as restoration tools.

Benefits of Mountain Meadow Restoration in the Sierra Nevada

Owen Kubit*, PE, CFM, and Shay Overton*, PG

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The Middle Fork of the Feather River in Northern California has been subject to over 100 years of watershed impacts such as logging, mining, grazing, road construction, and housing developments. These impacts have resulted in systemic down-cutting of stream channels, significant increases in bedload, and a loss of the system's resiliency to perturbation. The Long Meadow Restoration project aimed to address these issues. The 106-acre project included restoring over 9,000 feet of perennial creek and over 2,000 feet of an ephemeral tributary. The historical land use in the meadow was cattle grazing. Large gullies had formed from erosion and altered the hydrologic and ecological functions of the meadow. The meadow was restored with the 'plug and pond' technique. The project included constructing 34 plugs and 30 ponds, and 53,000 cubic yards of native material were excavated. The total project cost was $289,000. The function of the floodplain to store shallow groundwater was restored by eliminating the bottom of the gully as the drainage elevation of the floodplain. The project decreased daily maximum water temperatures, and created cool water refugia in the bottom of the ponds. The project also improved vegetation, soil moisture, turbidity, and bank stability. Mountain meadow restoration can also regulate water supplies and benefit downstream water users, such as cities and irrigation districts, by temporarily storing waters and reducing high-flow spills at dams. Downstream water users can be important allies in helping meadow restoration projects get funding.

Clearing Regulatory Hurdles for Tidal Marsh Restoration

Gerrit Platenkamp

Environmental Science Associates, 2600 Capitol Avenue, Suite 200, Sacramento 95816; **gplatenkamp@esassoc.com**.

Government agencies are planning to restore many thousands of acres of tidal habitat in the Sacramento-San Joaquin Delta (Delta) to benefit the threatened delta smelt (*Hypomesus transpacificus*) and other threatened and endangered species. These large-scale restoration projects are subject to the same environmental regulations as other ground disturbing and in-channel projects. Compliance with environmental regulations, including ones that are meant to protect the species that the restoration projects benefit, is costly and may cause substantial project delays. Most environmental regulations generally focus on short-term impacts while insufficiently taking into account the long-term benefits of ecosystem restoration. In addition, restoration projects in the Delta are reviewed in isolation by regulatory agencies, while effects and benefits are similar among tidal marsh restoration projects, causing inefficiencies. An analysis of the application of environmental regulations to tidal wetland restoration projects revealed several causes of the misalignment, including the relatively short history of large-scale ecosystem restoration, heavy agency staff workloads, institutional inertia, lack of coordination of implementing agencies, limited engagement of the scientific community, and the complex and slow legislative process. Several existing permitting approaches are proposed, including programmatic permits (e.g., regional general wetland permits and programmatic biological opinions) and recommendations for regulatory reforms that would streamline the permitting process for ecosystem restoration projects. SERCAL should advocate for these reforms for the benefit of the next generation of restoration ecologists.

Floodplain Reconnection, Riparian Restoration, and Endangered Riparian Brush Rabbit Conservation

Andrew P. Rayburn*, Julie Rentner, Stephen Sheppard, and Jeff Holt

River Partners, 580 Vallombrosa Ave., Chico 95926; **arayburn@riverpartners.org**.

Restoration projects in California are increasingly implemented to conserve threatened and endangered wildlife species. In riparian areas targeted for floodplain reconnection, innovative strategies are required to conserve wildlife that negatively impacted by flooding. At the confluence of the San Joaquin and Tuolumne rivers, large-scale floodplain reconnection and restoration projects are underway that target the endangered riparian brush rabbit (RBR). RBR were historically found in thick, brushy cover along Central Valley rivers. Due primarily to habitat destruction, the few remaining wild populations are small, narrowly restricted to habitat fragments, and at a high risk of extinction due to demographic and environmental stochasticity. RBR were reintroduced to the San Joaquin River NWR by the Endangered Species Recovery Program as part of a controlled propagation program concomitant with large-scale habitat restoration efforts by River Partners. Since the SJRNWR experiences periodic flooding to which RBR are extremely susceptible, elevated

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refugia ("bunny mounds") were constructed to offer vegetated high ground to rabbits and other wildlife species. These mounds were planted with dense native plants to offer rabbits foraging opportunities and shelter from predators. Recent floods have demonstrated that bunny mounds increase RBR survival, and a similar approach is now underway during phased restoration of the adjacent 2,100-acre Dos Rios Ranch. A mosaic of native communities for RBR and other species is being planted across the site, and elevated refugia will ensure compatibility between RBR conservation and floodplain reconnection. This approach serves as a model for riparian restoration that is transferable to other regions and species.

Using Habitat Evolution Models as a Guide for Wetland Design

Lindsey Sheehan*[1], Nick Garrity[2], Mike Hastings[3], and David Pohl[1]

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Habitat evolution models, such as SLAMM or our in-house model, map habitat distribution over time in response to sea-level rise, accretion and erosion, and changes in freshwater inflow. While habitat evolution models are limited in the amount of detail they provide, they can offer general guidance on where to focus restoration efforts. At Los Peñasquitos lagoon, located in northern San Diego County, our in-house model is being used to examine future baseline conditions as well as several restoration concepts. The lagoon, which is impacted by urban freshwater and sediment flows, has converted over time from historic salt marsh to brackish and freshwater marsh. Modeling of existing conditions without restoration has shown that sea-level rise by itself will not restore the historic salt marsh due to the continued freshwater inputs. Additionally, the model provides a tool for evaluating restoration concepts and considering impacts and benefits over time.

Beyond Theory: Adaptive Management Plans for Restoring Wetlands

Ramona Swenson*[1] and Michelle Orr[2]

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Aquatic and wetland restoration projects are increasingly required to implement adaptive management plans to ensure and demonstrate that management policies and actions are effective. Extensive restoration of tidal wetlands is planned for the Sacramento-San Joaquin Delta. This includes 8,000 acres of tidal wetlands intended to provide habitat and food for delta smelt and juvenile salmonids, in partial fulfillment of Biological Opinion requirements to offset water project impacts. Adaptive management is a powerful framework that allows managers to take action in the face of uncertainty and learn. Effective adaptive management plans provide a scientific foundation for restoration actions; identify and prioritize key uncertainties; link project objectives clearly through design, monitoring, and management responses; outline potential management triggers and responses; and provide a governance structure for decision-making and action. But projects can face scientific, institutional, and practical challenges in applying theory. We illustrate these principles and pitfalls and provide recommendations for developing adaptive management plans, using examples from San Francisco Bay, the Delta, and Salton Sea. For landscape-scale restoration programs with goals that encompass multiple projects, such as tidal wetland restoration in the Delta, coordinated monitoring and governance at the regional scale is an important element.

The California Rapid Assessment Method (CRAM), One Tool in the Toolbox

Lindsay Teunis* and Michelle Mattson*

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Although functional and condition based assessment methods are not novel to the field of restoration, the wide range of methods available are diverse and ever evolving. For a decade, California has worked to develop a method to describe wetland condition throughout the State: the California Rapid Assessment Method (CRAM). CRAM was developed to describe the range of conditions of existing wetlands within the context of statewide reference conditions for various wetland classes and to use this tool to track the health of these systems over time. Since 2005, CRAM has been calibrated, validated with quantitative data sets, and expanded to include new wetland classes. During that same time period over 800 practitioners, including private consultants, non-profits, educational institutions, and government entities, have been trained in CRAM, and have been using the method. Perhaps most significant is the incorporation of CRAM into the regulatory setting via guidance documents such as the U.S. Army Corps of Engineer's South Pacific Division's Mitigation Ratio Checklist, Mitigation and Monitoring Guidelines, and Ecological Performance Standards, as well as a requirement of most San Diego Regional Water Quality Control Board 401 Certifications. This surge of use in both the practitioner and regulatory arenas facilitates the need to better understand the appropriate and inappropriate uses of CRAM as well as the areas where more information is needed. This presentation will share real world examples from projects throughout California where wetland condition was assessed using CRAM. In particular we will focus on impact assessment, restoration planning, and CRAM limitations.

EXPANDING RESTORATION

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Chair: **Mark Tucker** *Burns & McDonnell*

Wednesday 13 May 10:30a — 12:00p, 1:30p — 3:00p and 3:30p — 5:00p *Dockside*

Combining Research and Restoration—Collaborations' Positive Impact on Funds

Rachelle Brown

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Limiting any project is budget, whether in scientific research or ecological restoration plans. Combining labor sources can stretch these limited funds, particularly in an area as resource-laden as Southern California. If researchers know where to focus their request, they can work with restoration ecologists to obtain specimens in a resource-efficient and minimally impactful manner. One such instance was a collaboration between the Natural History Museum of Los Angeles and Adelphi University in New York. Using local volunteer labor under the supervision of the Herpetology Collections curator, we obtained specimens of the invasive Italian wall lizard (*Podarcis sicula*) from San Pedro to use in a comparative physiological study with their New York counterparts. Here are many benefits to all groups obtained at little cost—removing invasive species specimens from the ecosystem, supporting scientific research and community involvement, and minimizing unnecessary travel and labor fees. Collaborative efforts benefit many different projects, and combining labor supports multiple goals with minimum impact to project funds, allowing restoration efforts to secure more benefits from their budget.

Flood Management Benefits of Wetland Restoration

Nicholas Garrity, PE*, Andrew Collison, PhD, Lindsey Sheehan, PE, Robert Battalio, PE, Jeff Haltiner, PhD, PE

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Restoring wetland floodplains can supports multiple objectives including improved flood management, in addition to providing critical habitat, water quality functions, and public amenities. By designing restored wetlands to flood during extreme storm events, restoration projects provide the appropriate wetland hydrology to support a range of habitat functions and the opportunity to lower flood water surface levels. Examples of integrated "nature-based" wetland restoration and flood management projects show that with careful consideration of flood hydraulics, geomorphology and ecology, self-sustaining wetland ecosystems can function as low-maintenance flood management facilities in both tidal and non-tidal environments.

Environmental hydraulics analysis methods for designing nature-based flood management projects combine applied geomorphology and hydraulic analysis to inform an understanding of the physical processes that support aquatic ecosystems. Hydraulic analysis is conducted in the context of the broader physical processes that naturally shape channels and wetlands. Key considerations include corridor width, geomorphic or dynamic stability, hydrology that supports both flood conveyance and sustains the desired ecology — providing the design level of flood management at all stages of the project life-cycle, functioning with a reasonable life-cycle cost and level of maintenance once established, and accommodation for future uncertainty due to climate change.

A Community-Based Approach to Evaluating Restoration Success

Alonso González Cabello*[1], Lindsey Cavallaro*[1], Cecilia Meyer Lovell[1], and Marc Doalson[2]

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In 2012, San Diego Gas & Electric Company (SDG&E) finalized the construction of a 500-kilovolt electric transmission line that extends 117 miles from Imperial County to southwestern San Diego County in southern California. The Project's 5-year restoration program requires that temporary impact areas within sensitive habitats affected by construction of the Project be restored to preconstruction conditions. Community Based Multivariate Analyses (i.e Non-metric Multidimensional Scaling [nMDS] and Analysis of Similarities [ANOSIM]) were used to identify restoration trends in native communities based on preconstruction and Year 1 and Year 2 post-construction native species cover data. Similarities in composition of native plant communities among restoration areas appear to be driven by location, rather than the restoration progression phase. The bioregion-based native plant community analyses show a temporal trend that follows the expected restoration progression for most vegetation types. A considerable change in community composition is evident between preconstruction and Year 1 data, followed by a smaller opposed change between Year 1 and Year 2, suggesting a trend toward preconstruction conditions. While it is assumed that Year 2 extreme drought conditions likely had a major effect on

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the restoration dynamics of native communities throughout the Project alignment — mainly by reducing the magnitude of change between Year 1 and Year 2 — the true effects of the drought on the native plant communities will likely only be evident later in the restoration process. Utilizing community based multivariate analysis, such as nMDS, is a unique tool for evaluating whether restoration sites are approximating their pre-impact conditions.

Restoration Creates a 'School-shed' in Los Angeles' Ballona Creek Watershed

Margot Griswold* and Stacey Vigallon

Los Angeles Audubon Society, 3791 Wade Street, Los Angeles 90066; **mgriswold@landiq.com**.

Los Angeles Audubon Society (LAAS) staff uses habitat restoration as the backbone of a Science, Technology, Engineering, Arts, and Mathematics (STEAM) curriculum within urban core elementary, middle and high schools in the Los Angeles Unified School District. Restoration and creation of school-yard habitats is at the heart of our strategies that engage students from a variety of scholastic backgrounds in STEAM activities. Staff of LAAS develop. High school students develop and teach STEAM curriculum to elementary and middle school students centered around habitat restoration projects. Projects are ongoing at Venice and Dockweiler State Beaches for Least Tern and Snowy Plover habitat protection, at Ballona Wetlands, and within the Baldwin Hills Scenic Overlooks State Park where all students participate in the Great Back Yard Bird Count each year. The program includes curriculum on soil and plants, pollinators, birds and reptiles, and science illustration. Our curricula and programs connect students with the concept of a watershed and restoration in the context of their schoolyard and to the larger Ballona Creek Watershed, from downtown Los Angeles to the Pacific Ocean. Preliminary results from this School-shed type STEAM program have demonstrated dramatic increases in science and math proficiency in elementary school students, and high level of college acceptance for high school students relative to their peers. Most importantly, alumni of the program are returning as college graduates to grow the program.

Results-Driven Conservation: Engaging Tomorrow's Leaders Today

Kyle Gunderman

American Conservation Experience (ACE), 333 Soquel Ave., Santa Cruz 95062; **kgunderman@usaconservation.org**.

American Conservation Experience (ACE) is a non-profit organization dedicated to providing rewarding environmental service opportunities that harness the idealism and energy of a volunteer labor force to help restore America's public lands. Through our five branches (conservation corps, conservation volunteers, emerging professionals internship corps, conservation vacations, and corporate conservation service projects) ACE effectively bridges the gap between education and real world application. This is accomplished through projects in some of our highest profile national treasures, including the Grand Canyon, Catalina Island, Lake Tahoe, and Smoky Mountain National Park. As of 2015 ACE has expanded into Puerto Rico. In 2014 alone, ACE provided 453 18-25 year olds the knowledge and skills needed to pursue conservation careers. Of those, 372 were AmeriCorps Volunteers. With these projects, ACE is helping to usher in a new level of engagement and awareness in the leaders of tomorrow. In order to understand the impact of our work, ACE routinely tracks objective data such as the miles of new trail constructed each season (8.71 mi in CA), or hours served by our members (104,350), but must also focus on softer data related to human lives. Through social media outlets we are gaining ever increasing insights into the human side of our programs and are able to adapt our offerings accordingly. This talk will focus on outcomes of past projects with an emphasis on California, engagement and education of volunteers in upcoming projects, and emerging outcomes of our non-traditional conservation corps.

Restoring Landfills for Erosion Control Without Establishing Habitat

Meagan Olson

RECON Environmental, Inc., San Diego, 92101; **molson@reconenvironmental.com**.

Landfills are a necessary component of society, they are present in all cities, urban or rural, and are adjacent to a diverse array of land uses. In San Diego County, several landfills are located adjacent to open space where sensitive habitats, plants, and wildlife reside. Upon closure, the ultimate goal for these landfills is not to restore the landfill cap to native habitat but to prevent erosion and provide native vegetative cover that increases evapotranspiration rates while reducing infiltration of rain water into the landfill cap. To complicate things, the shallow landfill cap prevents the establishment of many deep rooting native species and it is often undesirable to establish habitat due to future maintenance needs. However, by incorporating some innovative restoration techniques and a select native plant palette, the post-closure landfill goals can be achieved. This talk looks at three landfills located within San Diego County that utilized various restoration techniques and discusses the lessons learned.

Vegetation Development on Sand Dunes for Control of Fugitive Dust

Carla Scheidlinger

Amec Foster Wheeler Environment & Infrastructure, Inc., 9210 Sky Park Court #200, San Diego 92123; **carla.scheidlinger@amecfw.com**.

Great Basin Unified Air Pollution Control District developed a strategy for the control of fugitive dust from a recently formed (less than 100 years old) sand dune complex on the north shore of the Owens Lake in Inyo County, California. The project involves the placement of straw bales in a random configuration that mimics the distribution of naturally occurring shrubs in an adjacent location on the dunes, with native shrubs planted with the bales. There are three shrubs installed with each bale, including allscale (*Atriplex polycarpa*), shadscale (*A. confertifolia*), Parry saltbush (*A. parryii*), inkweed (*Sueda moquinii*), and greasewood (*Sarcobatus vermiculatus*). A pilot project with a test configuration showed 90% control of fugitive dust during the first year, with survivorship of plants about 65%, and with at least 95% of the bales with at least one surviving plant. The full-scale project is currently being implemented on 177 acres of the dunes, using 90,000 straw bales and 270,000 plants. Planting arrays including greasewood or inkweed are caged to reduce herbivory pressure. Access to the dunes is restricted to All Terrain Vehicles (ATVs) without developed roads due to sensitive cultural resources. Irrigation is done by hand, utilizing hoses connecting to a temporary above-ground water delivery system supplied by a local municipal well. Early results indicate high survivorship of the plants installed in winter 2015, and effectiveness of the bales in providing interim dust control

Saddleback College: Training the Next Generation of Restoration Professionals

Matt Yurko

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Saddleback College (Mission Viejo, CA) is a regional leader in ecological restoration training. Students can earn a certificate in Ecological Restoration, preparing them for work in government, consulting, or non-profit work. The purpose of the program is to provide students with the skills necessary to be successful in obtaining employment in the field. An equal goal is to provide highly employable restoration professionals for the growing number of employers requiring knowledge and experience in ecological restoration. This session will present the current status of the certificate program and solicit feedback from current professionals regarding the restoration skills that successful students "must have" when entering the restoration work force.

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URBAN RESTORATION

Co-Chairs: **Will Spangler** *H.T. Harvey & Associates*
Jeannine Ross *RECON Environmental*

Wednesday 13 May 10:30a — 12:00p, 1:30p — 3:00p & 3:30p — 5:00p *Starboard*

Los Angeles Audubon's Baldwin Hills Restoration for the Birds and People

Margot Griswold*[1,2], Stacey Vigallon[1], Melissa Riedel-Lerke[2], and Travis Brooks[2].

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Urban habitat restoration is the backbone of the Los Angeles Audubon Society's (LAAS) environmental education program in the Baldwin Hills. Set within some of the most park-poor areas of Los Angeles, restoration is at the heart of our strategies that engage high school and post-secondary students from a variety of scholastic backgrounds in meaningful environmental science research projects and community stewardship activities. Staff of LAAS and students work with restoration professionals from Land IQ to acquire skills in vegetation mapping and monitoring as well as the ecology of native seeds/plants. Students then help lead community restoration events. Projects are ongoing within the Baldwin Hills Scenic Overlooks State Park for restoration of coastal sage and cactus scrub. Pampas grass removal and coastal sage scrub restoration in nearby Kenneth Hahn State Recreation Area is also underway. The program uses current science-based, site-specific research to guide the restoration projects using native seed and plants. We use a variety of methods for site preparation, planting and/or seeding depending on each restoration site. To date, students and community volunteers are working to restore approximately 10 acres by the end of 2015, with another 10 acres planned by 2018. Our goal is to provide habitat for the Coastal California Gnatcatcher (*Polioptila californica*) and Coastal Cactus Wren (*Campylorhynchus brunneicapillus*) as well as associated reptiles and small mammals over an additional 40 acres. These small steps in urban restoration have created a diverse community of land stewards at both urban parks.

Coastal Cactus Wren Habitat Restoration in an Urban Setting

Julia Groebner* and Dick Rol*

AECOM, 401 West A Street, Suite 1200, San Diego 92101; **Julia.Groebner@aecom.com**, **Dick.Rol@aecom.com**.

Over the past 6 years, Groundwork San Diego-Chollas Creek (Groundwork) and AECOM have worked to enhance and expand habitat for the coastal California gnatcatcher (*Polioptila californica californica*) and an isolated, relictual population of the coastal cactus wren (*Campylorhynchus brunneicapillus*) in two urban canyons in San Diego, California. Encanto Canyon supports small populations of cactus wren and California gnatcatcher in high quality habitat, while the adjoining Radio Canyon is highly disturbed, dominated by nonnative plant species, and was previously unoccupied by these sensitive bird species. The project, which was funded by San Diego Association of Governments under the Transnet Environmental Mitigation Program, aims to increase the local populations of these bird species while offering a unique opportunity for students and residents within the surrounding communities to improve their community, learn about environmental issues, and prepare for careers in science. The project has implemented 17 acres of maritime succulent scrub and coastal sage scrub restoration, supported by baseline biological surveys of both canyons and annual protocol cactus wren and California gnatcatcher surveys within the occupied habitat and restoration areas. Professional restoration ecologists implemented the work while training Groundwork staff in native plant propagation techniques and restoration methods. Groundwork organized hundreds of student and community volunteers to assist with propagation, install plants, remove exotic species, and implement student-led science projects. The presentation will discuss key strategies and methods used to maximize the reach of grant funds, share innovative nest box trials, and provide insights from working with volunteers in urban habitat restoration.

Coast Live Oak Woodland Creation on the Santa Anita Sediment Placement Site

Richard B. Lewis III

BonTerra Psomas, 225 South Lake Avenue, Suite 1000, Pasadena 91101; **richard.lewis@psomas.com**.

The County of Los Angeles Department of Public Works is creating 8.0 acres of oak woodland and sage scrub habitat on a sediment placement site in the City of Arcadia. The program includes local plant and seed materials (Sub-Watershed), and many tons of salvaged coarse woody debris (large trunks), placed snags, and boulder assemblages, initiating ecological processes that would not otherwise occur for many years. Designed spiraling drainages convey off-site inflows to optimize storm water percolation, doubling incident precipitation. Several inches of native duff was ripped into the soil (sediment) to a depth of at least two feet. The temporary irrigation system includes overhead sprinklers and individual bubblers for each oak tree. Acorns were collected from more than 50 trees to capture genetic diversity. Conserved oak leaf mulch was applied to the planting sites, with temporary caging and shade cloth. A temporary 8-foot exclusionary fence was also constructed at the

perimeter to reduce herbivory impacts to seedlings/saplings. Plant materials installation started in January 2014 and was completed in December 2014. The palette includes rare oaks and several fern species, and directly-planted rooted cuttings of shrubs and perennials. To-date (February 2015), 100% of the oak planting sites contain live/healthy oaks; 100+ native plant species, and 50+ vertebrate wildlife species (and many invertebrate spp.) have been observed on the site, including acorn woodpeckers successfully nesting in the placed snags. There is a 7 to 10 year biological monitoring/sampling protocol including existing woodland/scrub reference sites and statistical vegetation diversity analyses.

Innovative Remediation and Habitat Restoration Approaches on Corporate Lands

Mark S. Laska, Ph.D. and Jill McGrady, Ph.D.*

Great Ecology, 1020 Prospect Street Suite 310, La Jolla 92037; **jmcgrady@greatecology.com**.

Corporate landowners successfully manage complex remediation and restoration projects on contaminated sites using best industry practices that focus on connectivity to the habitat, partnership with the community and stakeholders, and innovative ecological approaches. The Woodbridge Waterfront Park in New Jersey is a compelling case study that applied these practices. The corporate landowner was required to remediate contaminants while mitigating approximately 50 acres of wetland habitat on this 185-acre site. Ecologists and remedial engineers collaborated early to satisfy regulatory requirements and design a successful project. Post permitting, the integrated team expanded to include a general contractor. This project was successful because we identified the final site use and restoration goals early, and developed an innovative remediation and restoration strategy that united the community, environmental advocacy groups, and stakeholders in full partnership. The innovative mitigation design saved the client $50 million in compensatory regulatory charges and returned public connectivity to the Raritan River.

Community Involvement and Long-Term Mitigation Success

Barry Nerhus*[1] and Matt Yurko[2]

[1]Endemic Environmental Services, Inc., 17202 Gothard Street, Unit 9, Huntington Beach 92647; **bnerhus@endemicenvironmental.net**.
[2]California Coastal Commission: Community-Based Restoration and Education Program, 600 Shellmaker Road, Newport Beach 92660; **myurko@coastal.ca.gov**.

Mitigation projects are often left to fend for themselves after success criteria have been met. Without funding or volunteer efforts to continue land management, mitigation project degradation can result due to reinvasion of non-native perennials, vandalism, and trash accumulation. Integrating the local community into a mitigation project can offer an avenue to long-term project success. Community volunteers are often experienced with land stewardship including maintenance and monitoring activities. Volunteers tend to look after projects in which they're involved increasing ownership and reducing the chances for damage from vandalism. Through careful planning and some training, you can amplify the positive results of your project beyond its end date. In this presentation, we'll recapitulate and update information from our presentation at the 2014 SERCAL conference in Santa Rosa.

Watershed Avengers: Growing Environmental Stewards through Urban Restoration

Carla Pisbe

Ocean Discovery Institute, 2211 Pacific Beach Dr. San Diego 92105; **Cpisbe@oceanDI.org**

Ocean Discovery Institute has found success growing tomorrow's environmental stewards through restoration of a significantly degraded urban canyon in the Pueblo watershed located in City Heights, CA. Four distinct canyons bisect this urban community and offer abundant access to the natural environment. However for decades, these canyons have been neglected, used as dumping grounds, and the urban/natural interface posed safety risks for residents. The canyons weave through the community offering a connection to the watershed within walking distance of all schools and residences, and providing a platform for the development of a community where people learn, enjoy, and steward their resources, and young people are prepared to become tomorrow's leaders. To that end, we have implemented *Watershed Avengers* for the past seven years. *Watershed Avengers* engages young people, their families, and community members in science education and restoration activities that are relevant in their neighborhood. Through event participation and leadership trainings, there has been a significant transformation in this urban canyon and increased community ownership to steward this local natural resource. Explore Ocean Discovery's model, lessons learned in facing the challenges of community-based restoration in urban settings, and effective practices in preparing the next generation of science and conservation workforce and stewards.

An Integrated Approach to Coastal Wetland and Riparian Restoration

Wesley Salter

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Lower Buck Gully Canyon, situated on the southern California coastline, has experienced a multitude of challenges,

continued

including habitat conversion, instability, and excessive dry-weather flows, which have led to the degradation of storm water quality and natural resources. Once an ephemeral system, an increase in impervious surfaces due to the almost entirely built-out drainage area, Buck Gully transitioned to a perennial system plagued with exotic plants and animals. Faced with these challenges, in a proactive project approach, the city of Newport Beach developed a team of civil and environmental engineers, surface water hydrology and water quality experts, natural resources experts, geologists, regulatory permitting experts and planners, to study the channel and recommend solutions in order to protect the health of the canyon and existing development. Implemented solutions consisted of subsurface flow wetlands, rock-gabion control structures, bend-way weirs, exotics removal, and installation of native plants. Early water quality monitoring results show an 80% decrease in fecal coliform and other lower constituent levels once water filters through the project site. The stability of the channel has allowed for a variety of species to take hold, ranging from early grass species for erosion control to understory/streamside species and tree species like willow, sycamore and cottonwood. As an urban stream restoration project, the water quality benefits go beyond the Canyon, extending to Little Corona Beach and the Pacific Ocean.

From Parking Lot to Functioning Habitat: Del Mar Fairgrounds Restoration

Lindsay Teunis*[1], Garrett Avery*[2], and Aaron Andrews*[2]

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This is the story of a group of small projects with big dreams: to restore a century-old dirt parking lot to a hydrologically-complex, tidally-influenced saltmarsh surrounded by upland habitat while maintaining public trail access along the San Dieguito River. Two individually designed restoration projects, each appropriate in their own way and fully permitted for implementation, were consolidated into one effort as part of the construction contract. As a result, new opportunities were possible, but they had to be designed and approved with unheard-of speed. How does one modify 3.6 non-contiguous acres of a heavily-used dirt parking lot back to a tidally-influenced salt marsh with transitional upland habitat while sustainably managing 14,000 cubic yards of excavated material? How does one minimize impacts to client operations and boardwalk users while maximizing tidal exchange and protecting new sites from adjacent land uses? How does one obtain permits while empowering resource agencies and local interest groups to become project allies? With the full support of our client, the 22nd District Agricultural Association, the grading contractor, and our team of restoration ecologists and landscape architects, we developed a collaborative solution that was embraced by local interest groups and agencies. Our collaborative effort facilitated a conceptual plan that was drawn and permitted (via amendments) in under 90 days, resulting in a cost-effective use of excavated material that enhances the natural appearance of the sites, increases buffer function, and improves trail user experience, all while avoiding offsite export of soil to the landfill.

Urban Riparian Forest Restoration in San Diego County: A Multi-benefit Approach

Heyo Tjarks*[1], Michael Rogner[1], Kurt Roblek[2], and Andrew P. Rayburn[1]

[1]River Partners, 1080 Gunpowder Point Drive, Chula Vista 91910; **htjarks@riverpartners.org**. [2]U.S. Fish and Wildlife Service, 301 Caspian Way, Imperial Beach 91932.

Urban riparian ecosystems have been severely degraded throughout California due to habitat conversion for development and the subsequent increase in impervious surface area which alters waterway hydrology and geomorphology. In order to successfully restore degraded urban riparian areas, River Partners integrates horticulture, hydrology, geomorphology, vegetation and wildlife ecology, and project goals from funders, landowners, and the local community. For example, we have restored 55 acres of riparian forest along the Otay River within the San Diego Bay National Wildlife Refuge. The surrounding area has a population of >250,000 people from the cities of Chula Vista and Imperial Beach. Within two years of beginning the restoration in 2012, the project has successfully improved habitat for the endangered least Bell's vireo (*Vireo bellii pusillus*) and a multitude of other resident and migratory wildlife species. The project has also improved recreational opportunities for the local community by incorporating a trail system linking the Bay Shore Bikeway to the Otay Valley Regional Park. Additionally, the project has reconnected the Otay River to its historic floodplain, improving flood safety, reducing sediment transport, and protecting the San Diego Bay from non-point source pollution. Lastly, River Partners has partnered with multiple local agencies, organizations, and schools in order to promote community-based environmental stewardship and to use the area as an outdoor classroom for local students. By using a multi-benefit approach in urban areas, it is possible to restore wildlife habitat, increase local recreational and educational opportunities, and also enhance the provision of ecological services.

MITIGATION BANKS

Chair: **Mark Young** *Westervelt*

Thursday 14 May 8:30a — 10:00a, 10:30a — 12:00p, and 1:30p — 3:00p *Starboard*

Spatial Analysis of Mitigation Bank Service Areas and Permitting Trends

Krystel Bell, Senior Project Manager

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This presentation will discuss and graphically depict historic Clean Water Act 404 permitted losses of waters of the U.S. within portions of California for the purpose of identifying those areas experiencing the greatest impact pressures and gaps in existing mitigation bank service areas. The presentation will aid mitigation bankers and Regulators by providing a process by which to determine service areas and future mitigation bank locations. Data from the US Army Corps of Engineer's ORM database will be analyzed to identify high, moderate, and low density historic permit areas and projected permit demand areas, overlain with other datasets such as impaired streams, endangered species recovery areas, and existing mitigation bank service areas. This data will be used to aid in the analysis and spark discussion on how to best locate future mitigation banks. We will seek input from the audience on what information would be most helpful in this analysis as a foundation for future analyses and in order to provide the best information to state and federal agencies, the public, and the mitigation banking industry.

Implementing the 2008 Mitigation Rule — Banks, Fee Programs and Permittee Responsible

Therese O'Rourke Bradford, Chief

South Coast Branch, Regulatory Division, US Army Corps of Engineers, Los Angeles District, 5900 La Place Court, Suite 100, Carlsbad 92008; **therese.o.bradford@usace.army.mil**.

Implementation of the 2008 Mitigation Rule is improving mitigation and better conserving waters and wetland resources throughout the country. Important areas to be conserved and restored are being purchased and improved. The San Luis Rey Mitigation Bank exemplifies federal and state agency conservation priorities realized through the public/private partnership of the Mitigation Bank. The California Department of Fish and Wildlife lands host the Rancho Jamul bank, allowing mitigation credit while restoring state lands. The Coachella Valley In-Lieu Fee Program leverages the Coachella Valley Multiple Species Habitat Conservation Plan and improves desert dry wash and other desert waters. Advanced Permittee-Responsible Mitigation is allowing for larger-scale, more meaningful mitigation projects. Although bankers tend to focus on creating private Banks, working with government agencies and non-profits to create and implement In-Lieu Fee and Permittee Responsible mitigation is a mostly unexplored option that could provide needed mitigation, optimize current land preservation, and guide cities and non-profits through an unknown process. Optimizing conserved land, finding flexibility within the Rule and capitalizing on experience of Bankers can improve mitigation options, minimize economic risk, and streamline permit processing.

Moosa Creek Mitigation Bank Geomorphic Design and Hydraulic Analysis

Chris Campbell*[1], Sridhar Ponangi*[1], Sam Diaz[1], Amanda McCarthy[2], and Ingrid Morken[2]

[1]cbec inc. eco engineering, 2544 Industrial Boulevard, West Sacramento 95691; **c.campbell@cbecoeng.com**, **s.ponangi@cbecoeng.com**, **s.diaz@cbecoeng.com**. [2]WRA Environmental Consultants, 2169-G East Francisco Blvd, San Rafael 94901; **mccarthy@wra-ca.com**, **morken@wra-ca.com**.

The confluence of San Luis Rey River and Moosa Creek, located approximately 12 miles northeast of Oceanside, San Diego, CA, offers opportunities for floodplain connectivity and habitat restoration. San Luis Rey Downs Enterprises, LLC, proposes to develop the Moosa Creek Mitigation Bank at this confluence to rehabilitate and re-establish wetlands, riparian floodplain, and upland buffer regulated under Section 404 of the Clean Water Act. In addition to wetland and stream resources, the mitigation bank is proposed to provide mitigation credits for species listed under both the federal and California Endangered Species Acts (ESA & CESA), including the coastal California gnatcatcher, least Bell's vireo, southwestern willow flycatcher, and arroyo toad. The design for the mitigation bank attempts to balance the habitat goals with the hydrogeomorphic processes present in Moosa Creek and the San Luis Rey River, which can be achieved through grading activities that increase channel complexity and promote floodplain connectivity, and through planting of native vegetation communities. cbec, inc. assisted WRA in developing the mitigation bank design by assessing the geomorphic and hydraulic feasibility of the conceptual grading and planting plans. The design for Moosa Creek includes alternating single and multi-threaded compound channels with interspersed wetland depressions. Enhancements along the San Luis Rey River include excavation of a floodplain terrace with a high flow bypass channel, removal of the left bank flood berm, and creation of an upland spoil mound feature. We present the design rationale and constraints,

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hydrodynamic model development and findings that form the basis of design.

What Makes A Successful Bank? Proof is in the Performance

Charles Holland

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Westervelt Ecological Services is actively entitling or has received IRT approval of 9 mitigation banks since the issuance of the 2008 mitigation rule. During the past 7 years, we've experienced numerous adjustments and improvements to the banking process: refinement of regulatory policy, greater collaboration on design and performance tracking, and increased focus on non-biological technical factors (e.g., mineral rights). This presentation will use the Van Vleck Ranch Mitigation Bank and Cosumnes Floodplain Mitigation Bank (both approved in 2009) as case studies of what's worked, what hasn't, and what is yet to come. These banks were some of the first approved nationwide under the 2008 mitigation rule, and are nearing or have achieved their performance standards and full-credit release.

Application of Permittee-Responsible Mitigation for a San Francisco Bay Area Commuter Rail Project

Carl Jensen

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To provide compensatory wetland mitigation for Sonoma Marin Area Rail Transit (SMART) District's 70-mile long commuter rail project, SMART purchased the 68-acre Mira Monte Marina along the Petaluma River. The project involves restoring and enhancing approximately 14 acres of tidal marsh habitat and preservation of 40 acres of high quality tidal marsh habitat. Because of the phasing of the SMART construction projects, impacts to aquatic resources will occur over several years and through separate regulatory agency permits from the U.S. Army Corps of Engineers (USACE) and Regional Water Quality Control Board which require compensatory mitigation. For the Mira Monte Marsh Restoration Project to provide compensatory mitigation for SMART over this time frame and for multiple permit actions, a mechanism was needed to quantify and keep track of the available mitigation acreage, as well as to ensure the long-term management and monitoring of the site. With the assistance of ICF International, SMART successfully introduced the concept of advance permittee-responsible mitigation to the San Francisco District of the USACE. The advance permittee-responsible mitigation concept was pioneered by the Seattle District of the USACE in partnership with the Washington State Department of Ecology and Department of Fish and Wildlife, which provides a vehicle for public agencies to establish a 'single-user bank' for compensatory mitigation purposes.

New California Department of Fish and Wildlife Banking Regulations. How are They Working in Southern California?

David Lawhead

CA Dept. of Fish and Wildlife, South Coast Region, 3883 Ruffin Rd., San Diego 92123; **david.lawhead@wildlife.ca.gov**

The CA Dept. of Fish and Wildlife (CDFW) has been engaged in conservation and mitigation banking in southern California since the mid-1990s, but new State regulations were enacted in January 2013 which changed the CDFW's process for approving banks (Fish and Game Code Section 1797-1799.1). To make the program self-supporting, the CDFW now has fee requirements for Bank Sponsors that wish to make CDFW a party to a banking agreement. Specific timelines have also been established to govern CDFW review and completion of the different steps in the bank development process. CDFW has developed supplemental guidelines to clarify requirements under the new regulations. Despite some challenges and delays for banks that began the approval processing before the new regulations took effect, new approved banks are now coming on-line. Within the South Coast Region, as of February 2015, four banks have been established under the new regulations. In addition, another six banks are in process, with a projected approval date of sometime in 2015.

San Luis Rey Mitigation Bank: Reconnecting an Urban River

Jeff Novak* and Cindy Tambini*

Wildlands, 3855 Atherton Rd, Rocklin 95765; **jnovak@wildlandsinc.com**, **ctambini@wildlandsinc.com**.

The San Luis Rey River Mitigation Bank will provide 53.84 acres of restored floodplain and riparian habitat in the city of Oceanside in San Diego County. The goal is to restore a channelized section of river between two existing restored properties in a suburban and productive agricultural area. Grading approximately 700,000 cubic yards will reconnect the floodplain and realign the channel, restoring self-sustaining fluvial processes onsite to accommodate current and future flood flows, and fill an existing restoration gap. The Bank will provide compensatory mitigation that may be required by USACE and/or CDFW for unavoidable impacts to wetlands and waters. Restoration of the floodplain and riparian corridor is likely to also provide habitat for state and federally listed species including arroyo toad, least Bell's vireo, and southwestern willow flycatcher. Currently under construction, the bank is owned by Wildlands, and therefore all phases of the project including market analysis, land acquisition, entitlement, permitting, construction, and long-term monitoring and management are managed by

Wildlands' diverse in-house team. This presentation will describe not only the restoration, but also the process of banking from initial land acquisition to long-term management and stewardship.

Colusa Basin Mitigation Bank

Sridhar Ponangi*[1], Chris Campbell*[1], Chris Bowles[1], and Mark Young[2]

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The Giant Garter Snake (GGS) is listed as threatened and regulated under both the federal and California Endangered Species Acts (ESA & CESA). Colusa Basin Mitigation Bank, developed by Westervelt Ecological Services (WES), is approved to provide mitigation credits to offset unavoidable impacts to the Giant Garter Snake (GGS) and seasonal wetlands, regulated under Section 404 of the Clean Water Act. The project is approximately 160 acres in area and is located near the southeast corner of Colusa National Wildlife Refuge with a well-documented population of the Giant Garter Snake.The eastern edge of the project property runs along the centerline of the Colusa Trough. The project involves re-grading and planting vegetation within the designated floodway of Colusa Trough to create GGS and wetland features such as Open Water, Perennial Marsh, Semi-Permanent Marsh, and Upland Berms with Refugia, and required an encroachment permit. Phase 1 was constructed in summer of 2013 and Phase 2 is slated for construction in summer of 2015. In support of WES's Encroachment Permit to the Central Valley Flood Protection Board (CVFPB), cbec, inc. eco engineering (cbec) has conducted a Flood Impact Assessment of the proposed project. A key component of the assessment was the development of a hydraulic model to assess the potential impacts to water levels during the design flood event due to the construction of the project. The mitigation bank design, hydraulic assessment approach and results of the analysis are presented.

Programmatic Mitigation Banking at the Port of Los Angeles

Kat Pricket*[1], Kathryn Curtis,[1] Lena DeSantis[2], and Jack Malone[2]

[1]Port of Los Angeles, Environmental Management Division, 425 S. Palos Verdes St., San Pedro 90731; **kprickett@portla.org**. [2]Anchor QEA, LLC, 27201 Puerta Real, Suite 350, Mission Viejo 92691.

The Port of Los Angeles (Port), working with an interagency review team (IRT) — including the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the National Marine Fisheries Service, and U.S. Fish and Wildlife Service — and the Los Angeles Harbor District (LAHD) has developed a programmatic umbrella mitigation banking agreement (UMBA) to facilitate compliance with current Clean Water Act compensatory mitigation regulations. The UMBA recognizes the dynamic nature of the Port's mitigation needs and establishes a broad mitigation service area extending outside of the Port's boundaries. LAHD and the IRT have also developed a mitigation banking handbook that serves as a reference for Port staff when establishing new bank sites. Bank Enabling Instruments (BEIs) for future sites will be developed in accordance with the terms of the UMBA and will detail site-specific monitoring, success criteria, and credit release schedules. The first of these BEIs has been developed to focus on mitigation projects within the harbor. LAHD and the IRT collaborated to resolve a number of challenges in developing this mitigation approach, including compliance with State tidelands trust requirements, satisfying the mitigation requirements of multiple agencies, and reconciling technical mitigation goals and the requirements of legal agreements. The large-scale, programmatic, multi-habitat mitigation program should provide a flexible approach for addressing potential impacts and mitigation opportunities while supporting the goal of no net loss of aquatic functions and services as a result of LAHD's ongoing capital development projects.

RIBITS — Regulatory In-lieu Fee and Bank Information Tracking System

Richard J. Van Sant III, Senior Project Manager

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RIBITS is a user-friendly, online database developed in collaboration with multiple federal agencies in order to create a centralized tool for the management of mitigation banks, conservation banks, and In-lieu fee (ILF) programs. RIBITS is a national database that houses information on the mitigation banking process including applicable regulations; various policy and guidance documents from the Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and state and local wildlife agencies; templates, and assessment tools, in addition to tracking the availability and sale of mitigation banking and ILF credits. RIBITS allows users to find information on specific mitigation banks or ILFs; such as the Banking Enabling Instrument (BEI), credit ledger, photographs, and annual inspection reports; the availability of mitigation bank or ILF credits within a specific geographic area, or the availability of credits based on specific habitat types. The database has created a more consistent and transparent method for the management and tracking of mitigation banks and ILFs.

continued

Connecting Land Management Implementation with Entitlement Agreements in the Banking Process

Mark Young

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Mitigation and Conservation Banking requires both a long-term management plan (LTMP) and a non-wasting endowment fund to operate & finance stewardship for the Mitigation or Conservation Bank after the performance standards have been met. For Conservation Banks, the performance standards could be a simple as recording a conservation easement and funding the endowment, so the LTMP would start after the 3-year fund maturation period. For Mitigation Banks, performance standards may take several more years to be completed, so the implementation of the LTMP may not start for up to a decade or more. Dove-tailing interim operations and maintenance into the LTMP can assist in outlining future stewardship needs and funding requirements. Early coordination with prospective land managers and conservation easement and endowment fund holders will reduce the amount of future potential conflicts during the LTMP operation.

5 RESTORATION FOR SPECIAL-STATUS PLANT SPECIES

Chair: **Cecilia Meyer Lovell** *AECOM*

Thursday 14 May 8:30a — 10:00a, 10:30a — 12:00p, and 1:30p — 3:00p *Starboard*

Restoration of Spreading Navarretia within Vernal Pool Habitat

Raquel Atik

RECON Environmental, 1927 5th Avenue, San Diego 92101; **ratik@reconenvironmental.com**.

Restoration of a vernal pool complex, located on the U.S. Marine Corps Base Camp Pendleton, is currently occurring to restore and enhance habitat for spreading navarretia (*Navarretia fossalis*), a federally listed species. Based on previous monitoring data, one vernal pool on-site had spreading navarretia present, with approximately 72 individuals observed in 2008. However, from 2012 through 2014, there were no observations of this species. With spreading navarretia seed bank presumably present in one vernal pool, enhancement of this population occurred through soil translocation work into five enhanced/restored vernal pools. To achieve this, soil blocks were taken from areas where spreading navarretia had historically been observed, and was systematically placed into the restored/enhanced vernal pools. Translocation work occurred in December 2013, and by April 2014 (a drought year), 377 spreading navarretia plants were detected in three of the restored vernal pools. Methods of the translocation work and results of the monitoring will be presented.

Habitat Restoration and Enhancement for Two Rare Clay Endemic Plants

Mark Dodero* and Anna Bennett

RECON Environmental Inc. San Diego 92101; **mdodero@reconenvironmental.com**.

Otay tarplant (*Deinandra conjugens*) and San Diego thornmint (*Acanthomintha ilicifolia*) are federally listed threatened and state listed endangered annual species. Both species are clay soil endemics with a limited range in San Diego County and northern Baja California. Populations of both species are substantially declining throughout San Diego County due to urban development, habitat disturbance, and invasion of non-native species. Our goals for this grant-funded restoration and enhancement project, located in the City of Chula Vista, included intensive control to reduce non-native annuals and perennial weeds that are invading the native grassland and clay lens habitat, planting native grasses in areas of low native cover, and collecting and dispersing seeds of the target species to increase the size of Otay tarplant and San Diego thornmint populations and other sensitive plants species. Restoration methods we selected for the project included the use of weed whips to cut and then remove dried weedy thatch, with follow-up herbicide spraying during the growing season to reduce the dominance of non-natives. Our monitoring program includes annual relevé vegetation sampling to assess changes in non-native and native cover, detailed mapping, conducting population estimates of tarplant and thornmint, and observing and photographing potential pollinators. Populations of Otay tarplant and San Diego thornmint increased over

the baseline condition in the first two years of the project. Severe drought limited the population numbers in the third year (2014). Control of non-native plants has benefitted the rare plant populations due to reduced competition for water and light.

Salvage, Transplant, and Restoration of San Diego Ambrosia (*Ambrosia pumilla*) at Jeffries Ranch in San Diego County

Scott McMillan* and Lindsey Cavallaro

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In 1996, a San Diego Gas and Electric Company (SDG&E) gas line repair project across the San Luis Rey River in San Diego County impacted the federally endangered San Diego ambrosia (SDA) (*Ambrosia pumilla*). Approximately 150 SDA plants were salvaged and taken to a native nursery for storage and maintenance. SDA is known from less than 15 viable populations, most of which occur along the alluvial terraces of rivers and drainages. The identification of a suitable transplant site proved difficult, as site options along the San Luis Rey River were limited. After multiple unsuccessful attempts to identify an available transplant site, available habitat at Jefferies Ranch was finally identified and approved for the transplantation effort in 2011. During this 15-ear span, the SDA plants were successfully maintained in a native plant nursery and propagated through cuttings. By 2011, a total of 450 plants were ready for transplant; 350 were planted initially and 100 were kept in the event that remedial planting was needed. Following planting, the population was subject to a 3-year maintenance and monitoring program. Initial transplantation proved successful after Year 1 of monitoring, so the remaining 100 plants were planted at the mitigation site in 2012. After 3 years of site access control, weed control, and monitoring, the transplantation and restoration effort exceed all success criteria; the SDA transplant population achieved over 90% survivorship and an increased site cover of over 450%, and the estimated number of plants increased from 350 to over 2,000 individuals.

Special-Status Plant Restoration Case Study: Federally Endangered Coachella Valley Milk-vetch

Cecilia Meyer Lovell*[1], Scott McMillan[1], Linda Robb*[2], Genevieve Cross[2], Paul Yamazaki[2], and Billy Sale[3]

[1]AECOM, 401 West A Street, Suite 1200, San Diego 92101; **Cecilia.MeyerLovell@aecom.com**. [2]Southern California Edison, 6 Pointe Drive, Brea 92821. [3]Rancho Santa Ana Botanic Garden, 1500 N College Ave, Claremont 91711.

What makes a plant rare? Sometimes plants are naturally rare, sometimes plants are rare because of a change in their environment. Often rare plants have specific habitat requirements, such as specialization to a particular soil or rock substrate, population isolation, or specific mutualistic relationships with other organisms. Understanding the mechanisms factoring into the reasons for a plant's rarity are key to successfully restoring rare plant species. Southern California Edison (SCE) is working with AECOM to restore Coachella Valley milk-vetch (CVMV) (*Astragalus lentiginosus* var. *coachellae*) to a single location where an individual was affected during construction of the Devers to Palo Verde Transmission Line Project in 2013. CVMV is rare because of its specialized habitat requirements — it is primarily found on loose, aeolian or fluvial sand systems located on dunes or flats — and the ongoing threat of urbanization in the Coachella Valley. AECOM, in coordination with SCE and the Rancho Santa Ana Botanic Garden, is factoring in key habitat requirements for this species when propagating individuals to transplant back into appropriate habitat along SCE's right-of-way. CVMV seed was collected within the SCE right-of-way with agency permission. Approximately 20 individuals are currently being grown at the Garden in two different soil mediums (100% potting soil and 50% native soil/50% potting soil) and two different containers (tree liners and 1-gallon containers). The CVMV individuals are expected to be transplanted back into the field in March 2015. We will share the results of this effort and identify lessons learned for this important endangered plant species.

Scaling down: Landscape-Scale Restoration Planning in the South Delta

Jessica Olson*, Eric Ginney, and Gerrit Platenkamp

Environmental Science Associates, 2600 Capitol Avenue, Suite 200, Sacramento, 95816; **jessieolson@gmail.com**.

There are considerable challenges in translating the species- and landscape-level restoration goals of a large-scale planning effort, such as the Bay Delta Conservation Plan (BDCP), into a conceptual restoration plan for a portion of that landscape that meets specific biological restoration objectives and acreage targets for covered species and habitats—while also accounting for site-specific constraints, water quality and water operations, and other important considerations such as flood management. When a restoration project involves changing the flood management system, water supply and quality, then restoration design becomes significantly more complicated. This project defines a methodology for restoration planning in this context. Specifically, this project builds off of BDCP (which focuses across the entire estuary) within a more-focused 300,000-acre planning area in the southern portion of the Sacramento-San Joaquin Delta. The target habitats for this conceptual restoration plan include tidal freshwater emergent wetland, valley/foothill riparian, and seasonal floodplains. Ten special-status plant and

continued

animal species are targeted for restoration and enhancement in the South Delta, underscoring the importance of this project. The project includes (1) development of ecogeomorphic conceptual models to describe key processes of the site (past, present, and potential future context, including climate change); (2) a restoration suitability assessment to identify suitable areas for restoration, and (3) a conceptual restoration plan which defines the potential future habitat configuration and proposed restoration actions within a 23,000-acre restoration footprint. The integrated, interdisciplinary planning effort yielded a footprint that also provides significant flood risk reduction for the Stockton-Lathrop urban area.

Restoring Special-Status Plants for SDG&E's Sunrise Powerlink Transmission Project

Eric Piehel*[1], Marc Doalson[2], Cecilia Meyer Lovell[1], and James Prine[1]

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Restoring special-status plants requires constant adaptive management and innovation due to their rarity and often specific habitat requirements. San Diego Gas & Elecrtic's (SDG&E) Sunrise Powerlink, a split 230kV and 500kV transmission line that extends from the deserts of Imperial County over the mountains to western San Diego County, conveys electricity from renewable energy facilities. The project is responsible for restoring 6 special-status plants within the project's 232 restoration areas, totaling 308 acres. Special-status plant species being restored in restoration areas include: Jacumba milk-vetch (*Astragalus douglasii* var. *perstrictus*), Payson's caulanthus (*Caulanthus simulans*), sticky geraea (*Geraea viscida*), San Diego gumplant (*Grindelia hirsutula* var. *hallii*), desert beauty (*Linanthus bellus*), and hairy stickleaf (*Mentzelia hirsutissima*). Methods have included selecting restoration areas with appropriate soil and microclimatic conditions, seed collection, seed cleaning and storage, hand seeding, seed bulking, maintenance of nonnative species, establishing enhancement areas near existing populations, and erosion control and restricting unauthorized access, as needed. After Year 1, substantial progress was made toward restoring these 6 special-status species. Success rates ranged from 63% to 82% of the individuals required for mitigation. Continued progress was made in Year 2 for the perennial special-status species, with one of the species, Jacumba milk-vetch (*Astragalus douglasii* var. *perstrictus*) meeting final success standards. However, Year 2 observations of the annual special-status species did not demonstrate progress from Year 1. Germination of special-status plants, in Year 2 was affected by the severe drought conditions in 2013/2014. Data from Year 3 (spring 2015) will also be presented.

Preventing the Introduction of Invasive Plant Pathogens into Restoration Planting Sites

Karen Suslow*[1] and Kathy Kosta[2]

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Successful, sustainable restoration projects are the foundation of SERCAL. How do we educate the next generation of restoration practitioners to fully understand the repercussions of outplanting native plants infected with invasive plant pathogens into riparian areas and jeopardizing the integrity of the restoration environment? Root rotting plant pathogens such as *Phytophthora* exist worldwide. In 2012, a new plant pathogen, *P. tentaculata*, was discovered for the first time in North America in a California watershed outplanting of native plants. In 2009, USDA Plant Epidemiology and Risk Analysis Laboratory published a list ranking *P. tentaculata* #5 risk threat of the 29 exotic species of *Phytophthora* not established in the contiguous United States. The list of prioritized *Phytophthora* species was generated using multiple criteria including knowledge of host range, geographic distribution, potential economic and environmental impacts, and potential pathways of plants imported into the United States.

Within a short period of time, the pathogen has now been found in five native plant nurseries in five California counties. Over the past decade, the ornamental nursery industry in conjunction with researchers and state and Federal regulators have created a Best Management Practices document for growers which is being implemented in multiple states nationwide as part of a Systems Approach for managing pests and pathogens in the horticultural supply chain. This same BMP program is being embraced by the Central California Native Plant Nursery Network. Learn how and why native plant nurseries are interested in implementing BMPs to protect their plants and safeguard the native environment.

Santa Ana River Arundo Removal Project: Why Does "Enhancement" Matter?

Lindsay Teunis*[1] and Alonso González Cabello*[2]

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As with most Southern California watersheds, the Santa Ana River has been inundated with noxious invasive species including *Arundo donax* (giant reed), *Tamarix* spp. (tamarisk), *Lepidium latifolium* (perennial pepperweed), and

other invasive annuals. Each of these invasives can facilitate a unique set of problems for the watershed, including modification of fire regimes, water draw down, exclusion of native plants, and degradation of wildlife habitat. Unlike many of its neighboring watersheds, the Santa Ana River has been part of an aggressive program designed to tackle the enhancement of the river. A portion of the work has been funded by the U.S. Army Corps of Engineers as mitigation for impacts to riparian and floodplain habitat resulting from flood control efforts. This presentation focuses on a 250-acre invasive removal project that began in 2009 and is now ending its 5-year monitoring program. This project, although large in size, is still considered "enhancement" from a regulatory perspective as no substantial grading was needed. Enhancement often results in lower mitigation value. However, with initial arundo densities ranging from 40 to 85 percent, modifications to the landscape was substantial and the need for "enhancement" was critical. We will share our results and overall restoration approach to meeting success standards, including passive and active restoration. We will share key results of the habitat monitoring program including bird community, endangered least Bell's vireo, vegetation community, and stream condition (California Rapid Assessment Method [CRAM]) monitoring and analysis. In addition we will discuss some of the lessons learned.

Extended timeline of Pacific cordgrass (*Spartina foliosa*) establishment in San Dieguito Lagoon

Terressa Whitaker

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Pacific cordgrass (*Spartina foliosa*) is one of the most temperamental wetland plant species to successfully restore. A case study of Pacific cordgrass establishment in San Dieguito Lagoon, in San Diego California, shows a very clear pattern of immediate die back followed by regrowth and recruitment that should be taken into consideration when planning Pacific cordgrass restoration projects. Because Pacific cordgrass plants are rhizomatous plants, it is possible for live rhizomes exist beneath the surface even where no growth can be seen. Observations made at San Dieguito Lagoon were immediate mortality of nearly all aboveground biomass followed by slow emergence of new leaf blades. Apparent survival four to six months after initial planting was less than 20 percent. However after three years, regrowth and natural recruitment increased total populations in the lagoon to more than 25 times the original planting.

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GRASSLANDS RESTORATION

Chair: **Andrew Rayburn** *River Partners & CNGA Board of Directors*

Thursday 14 May 8:30a — 10:00a, 10:30a — 12:00p, and 1:30p — 3:00p *Dockside*

Invasive Species Management Effects on Grassland Restoration Outcomes

Elise S. Gornish*[1], John Anderson[2], Jaymee Marty[3], and Corey Shake[4]

[1]University of California, Davis. [2]Hedgerow Farms. [3]Marty Ecological Consulting. [4]Point Blue Conservation Science.

Invasive species and ecological restoration are strongly linked as management of one underpins control of the other. However, these two issues are often considered independently, restricting the ability of managers to forecast restoration outcomes within reasonable bounds of uncertainty. We initiated a seeding experiment in a degraded grassland system to understand how invasive species management choice affects restoration success. On a 750-acre ranch in Yolo County, CA, in replicate blocks, we drill-seeded a mix of native perennial grasses into fields that experienced different invasive species management, including: burning, grazing by sheep, burning + grazing, grazing + herbicide, and burning + grazing + herbicide. We estimated the cover of seeded natives and volunteer invasives across all sites. Invasive plant species were reduced across treated fields, compared to controls, but the types of invasives that dominated each field differed, depending on management type. We also found that native species cover was dependent on management choice, perhaps driven by invasive species identity. This work can facilitate successful management of California grassland systems by enhancing the translation of quantitative science into prescriptive land management practices.

Retaining and Rebuilding Ecosystem Functions in the Roadside Landscape

Jim Hanson

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The roadside right-of-way often frames our view of California's scenic landscapes

continued

and the built environment. Scenic quality has always been an important part of the state economy. Yet, there is an even broader set of ecosystem services linked to scenic quality that could be realized by retaining and rebuilding a moderate level of ecosystem functioning in the roadside right-of-way. A practical vision for the roadside landscape starts by understanding the complexity of the roadside environment and leads to choices about what is desirable and possible. Roadside plantings within the developed environment are subject to drastically disturbed soils, traffic winds, heat, frequent disturbance, and air and rainwater runoff pollutants. Wildland roadsides are subject to visual and ecological degradation from invasive weeds and typically have fewer management resources allocated. Despite these constraints there are means, reasons, and a historical precedent for retaining ecosystem functions on wildland roadsides and rebuilding them along developed ones. Native plant community restoration and management is integral to this endeavor; native grassland community revegetation and conservation is often a cornerstone element. The task is made possible by an emerging body of knowledge on California native plant community composition and soil regeneration, as well as widely accessible mapping tools. Drawing upon current research and roadside projects, a model for retaining and rebuilding ecological functions along the roadside is presented, as well as a need to update public policy to manage the roadside and other rights of way for broadened public and environmental benefits.

Native Grassland Restoration Using Grazers as Seed Dispersers

Brett D. Hartman

Environmental Science and Resource Management Program. California State University Channel Islands, 1 University Drive, Camarillo 93021; **brett.hartman@csuci.edu**.

Steep topography and sensitive habitat types limit the potential of existing methods to restore perennial grasslands in California. Mechanized approaches that rely on repeated disking (i.e. "grow-and-kill"), drill seeding, planting plugs, and intensive weeding can produce relatively successful and predictable results. However, machinery can only be used in flat or gently sloping areas such as abandoned agricultural lands or on constructed slopes. These techniques are not appropriate for steeply sloping terrain, or in sensitive habitats such as oak-woodland savannas and vernal pool complexes. Grassland restoration in these settings requires an ecosystem management approach. Previous research has shown that low intensity grazing, rest-rotation grazing, and prescribed burns can enhance existing perennial grassland ecosystems. In areas dominated by exotic grasses and forbs, domestic grazers can be used to introduce native species. I propose a method based on sowing seed in grasslands, and letting the animals browse and remove non-native biomass, dimple the seed into the soil, and add organic matter. I will compare three project examples, including grassland restoration in the Central Valley (repeated disking and seeding), serpentine grassland management in the Santa Clara Valley (low intensity grazing), and needlegrass grassland restoration in the Southern Coast Ranges (grazers as dispersal agents). I will also discuss cases where native seed was added to animal feed to disperse seed over large areas (Costa Rica and Australia), and present preliminary conclusions on stocking rates, grazing period, and characteristics of native grass and forb species that may respond well to grazing dispersal.

Rangeland Restoration at Mitsui Ranch: Fire, Grazing, and Direct Seeding

Andrew P. Rayburn[1]*, Jeffery Wilcox[2], and Sasha Berleman[3]

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The Sonoma Mountain Ranch Preservation Foundation (SMRPF) owns and operates the Mitsui Ranch, a 632-acre property at the top of Sonoma Mountain in Sonoma County that is the headwaters source for four streams: Copeland Creek, Lichau Creek, Lynch Creek, and Carriger Creek. Copeland Creek feeds the Russian River drainage and the other three feed San Pablo Bay via Sonoma Creek or the Petaluma River. Beginning with a 5-acre site along Copeland Creek, restoration is now underway to create a perennial-dominated grassland system throughout the existing 550 acres of exotic annual grassland that has resulted from 150 years of poor grazing practices. We hypothesize that restoration will enhance soil quality, forage provision for livestock, wildlife habitat, and other ecosystem services. Site preparation was conducted in 2013 and 2014, including a combination of managed grazing and summer prescribed burning to control exotic species. A diverse mix of nine native grass species, weighted towards those hypothesized to provide good forage for livestock, was drill-seeded in early 2015. Native forbs will also be added in the coming years. The site is being managed via flash grazing within a rotational grazing framework, designed to promote seeded native species. Data are being collected to assess restoration effects on soil, seedbanks, native and exotic annual plant communities, and forage for livestock. This restoration effort will establish a foundation for continued research on the interplay between sustainable grazing practices and rangeland restoration, and also serve

as a model for future restoration at Mitsui Ranch and the surrounding region.

Efficacy of Exotic Control Strategies for Restoring Coastal Prairie Grasses

Karen Holl[1], Elizabeth Howard[2], Timothy Brown[2], Robert Chan[1], Tara de Silva*[1], E. Tyler Mann[3], Jamie Russell[1], and Will Spangler*[2]

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Restoration in Mediterranean-climate grasslands is strongly impeded by lack of native propagules and competition with exotic grasses and forbs. We report on a study testing several methods for exotic plant control combined with planting native grasses in former agricultural land in coastal California. We compared tarping (shading out recently germinated seedlings with black plastic) once, tarping twice, topsoil removal, herbicide (glyphosate), and a control treatment in factorial combinations with or without wood mulch. Into each treatment we planted three native perennial grass species and monitored plant survival and cover for three growing seasons. Survival of grass species was high in all treatments, but significantly lower in unmulched soil removal and control treatments in the first two years. In the first two growing seasons, mulch, tarping, and herbicide were all effective in enhancing native grass cover and reducing exotic grass cover, but by the third growing season the treatment effects had mostly converged. Our results suggest that tarping once in the fall following the first rains and mulching are effective methods for reducing cover of exotic grasses during the early stages of coastal prairie restoration, but that longer term monitoring is needed to evaluate the efficacy of restoration efforts. In this presentation we will also discuss how the most appropriate approach to controlling exotics to restore specific grassland sites will depend not only on the effectiveness, but also on relative costs, site constraints, and opportunities.

Herbicide and Seed Addition Promote Native Cover in Non-native Grassland

Matthew Sutton*[1,2], Miguel Macias[1], and Darren Sandquist[1]

[1]Department of Biological Science, California State University, Fullerton. [2]Laguna Canyon Foundation, PO Box 4895, Laguna Beach; **matt@lagunacanyon.org**.

Exotic annual grasses colonize disturbed habitats and inhibit the recruitment and re-establishment of the previously dominant native species. In a disturbed ecosystem on Catalina Island, there are patches of dying Island scrub oak which are being replaced by exotic annual grassland. In one transforming oak stand on Catalina Island we tested the effect of two restoration techniques on the recruitment of common native oak understory species. We hypothesized that control of exotic annual grasses with grass-specific herbicide and seed addition would increase native understory cover and native richness. Although there was seasonal fluctuation in the effectiveness of the restoration techniques, overall, these treatments tended to positively affect native species responses and adversely affect annual grass responses. Grass-specific herbicide reduced exotic annual grass cover in both 2009 and 2010, but had a strong positive effect on native cover and richness during the wetter year of 2010. In the drier year (2009), seed addition exhibited a stronger effect on native cover and richness. Building on these findings, land managers with Orange County Parks and the Laguna Canyon Foundation are conducting restoration trials to test whether or not the additive effects of seed addition and properly timed herbicide application at a low rate inhibit non-native grasses and promote native forbs, perennial grasses and shrubs in a non-native annual grassland that has a lengthy history of cattle grazing.

Interactions of Summer Watering and Fire to Reduce Annual Grass Cover in a Restored Grassland

Kristina Wolf* and Truman P. Young

Department of Plant Sciences, 2227 PES, Mail Stop 1, University of California, Davis, 95616; **kmwolf@ucdavis.edu**.

California's native grasslands have been largely replaced by exotic annual grasses. Management of invasive annual grasses is important to reduce weed seedbanks and competitive pressure, and increase perennial grass success. Previous experiments revealed that summer watering treatments, no matter how intensive, did not produce long-term results in terms of percent cover of weedy annual plants in the following growing season. This experiment tested combinations of summer watering and fire. I applied six replicates of five summer watering treatments of different frequencies, timing, and amounts to restored native grass pasture in Davis, CA in August 2012. This was followed shortly thereafter by fire, which top-killed all plants on the site. Both annual and perennial grasses germinated or resumed growth within one week after the fire. I monitored exotic grass seedling emergence and native perennial grass growth weekly through December following the fire, and annual and perennial cover at peak flowering after commencement of natural rains, to determine if combinations of watering and fire reduced annual grass cover in the short term as well as in the subsequent growing season. Final results for all treatments will be presented, and compared with parallel watering-only experiments.

continued

Multiple Initial Trajectories in Grassland Restoration

Truman P. Young*[1,2], Katie Stubie[1], and Jennifer Balachowski[1,2]

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Restoration practitioners are aware that their projects may yield variable outcomes. Many of these may be attributable to variation in initial management (e.g., differences in weed control, seed mixes, planting order), while others may be due to site effects and year effects, even if site preparation and installation are identical. We asked, 'How important are year effects and site effects for generating different initial restoration outcomes?' We examined how year effects and site effects interact with temporal priority in restoration by installing otherwise identical restoration-style plantings (with and without priority effects) across three geographic sites and four planting years. In addition to confirming the power of priority effects in restoration, initial results demonstrate strong temporal and spatial differences in the outcome of these restoration experiments that are generally maintained at least through the initial years of their implementation. We discuss the implications of these results for restoration planning and for assisted migration in light of climate change projections.

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POSTER SESSION

Wednesday 13 May 9:00a — Thursday 14 May 3:00p *Baja Room*
with Hosted Reception Wednesday 14 May 5:00–7:00p

South County Grasslands Project: Experimental Design for Habitat Restoration Study

Travis Brooks

Land IQ, 3791 Wade St., Los Angeles 90066; **tbrooks@landiq.com**.

The South San Diego County Land Managers (USFWS, CDFW, BLM, Sweetwater Reservoir Authority, City of San Diego) have collaborated with Land IQ, Conservation Biology Institute (CBI) and The Nature Conservancy (TNC) to develop landscape-scale management priorities and research questions for the restoration of grasslands in what is known as the South County Grasslands Project. In Phase 1 of the Project, landscape-scale management visions were developed for forbland and grasslands management, including focus on Otay tarplant (*Deinandra conjugens*) and Quino checkerspot butterfly (*Euphydryas editha quino*). These species and habitats are identified as high priorities in the recently published Management Strategic Plan (MSP) for Conserved lands in Western San Diego County. In Phase 2, we designed a restoration experiment to inform the development of Best Management Practices (BMPs) for habitat restoration. Methods incorporated in the experimental design include prescribed burn, mowing, hand equipment (i.e. weed eater), herbicide, hand seeding and drill seeding. I will present the experimental design of the restoration experiment, which was installed across eight sites and three different land managers. Site preparation began in fall 2013 and will continue through spring 2015. Support for the Project has been provided by the SANDAG TransNet Environmental Mitigation Program, in-kind support from TNC and the South County Land Managers, and volunteers through the Earth Discovery Institute.

Upland Habitat Restoration and Enhancement in a Non-Irrigated Site

Travis Brooks

Land IQ, 3791 Wade St., Los Angeles 90066; **tbrooks@landiq.com**.

Lack of water for supplemental irrigation is a limiting factor for restoration projects that rely upon transplanted nursery stock and short timelines, especially in California's summer-dry Mediterranean climate. And even in places with access to water, population growth and climate change is increasing the cost and reducing the availability of irrigation water. Habitat restoration can be successful in a non-irrigated site when it is based on principles of adaptive management for site preparation over multiple years and re-vegetation with ecologically diverse seed palettes. Land IQ designed and is currently implementing 55 acres of upland habitat restoration and enhancement at the San Diego Gas & Electric (SDG&E) Lakeside Ranch Mitigation Property, acquired for impacts due to the Sunrise Powerlink Project. Site preparation began in 2012, and the entire site was seeded by fall 2014. The composition and total cover of non-natives shifted over three years of site preparation, resulting in corresponding increases in bare ground and native cover, especially native annual cover. The cost per acre for implementation of a non-irrigated site will be compared with the cost of restoration strategies that required nursery plants and irrigation systems.

Integrating Restoration into River Park Design

Kate Connor*[1] and Deirdre Brosnihan[2]

[1]RECON Environmental Inc., 2033 East Grant Road, Tucson, AZ 85719; **kconnor@reconenvironmental.com**. [2]Pima County Regional Flood Control, 97 E Congress St, Tucson, AZ 85701.

Pima County Regional Flood Control in Tucson, Arizona, typically creates river parks to provide erosion protection and recreation opportunities. However at Paseo de las Iglesias River Park on the Santa Cruz River, ecosystem restoration is also a primary focus. This ecosystem restoration includes: providing environmental awareness sensitivity training to all contractors working onsite, preserving native plant and animal species and their habitats, protecting sensitive and special action species, removing invasive plant and animal species, as well as planting over 10,000 native trees, shrubs, cacti and perennials that create four different vegetation zones.

Treating Runoff Using California Native Plants as Biofilters

Lea Corkidi*[1,2], Donald J. Merhaut[2], María Esther Sánchez-Coronado[3], Maren Mochizuki[2], Toan Khuong[2], Julie P. Newman[4], Oleg Daugovish[4], Ben Faber[4], José de Soto[5], Arturo A. Keller[6], Jeff Bohn[7] and Mike Evans[7]

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The use of different types of vegetated buffers is one of the Best Management Practices that has been recommended for filtering the excess of fertilizers and other pollutants from urban and agricultural runoff. Bioswales, filter strips and constructed wetlands, reduce the movement of sediment and the delivery of various contaminants to water systems. However, their effectiveness depends on several factors such as runoff flow, climate, soils, vegetation cover and plant species. Our goal was to analyze the ability of different California native plants to optimize the function of vegetated buffers to reduce nitrogen (N) and phosphorus (P) runoff and leaching. We compared the growth response and nutrient uptake efficiency of two sedges (*Carex pansa* and *Carex praegracilis*), two rushes (*Juncus patens* and *Juncus xiphioides*), and two grasses (*Muhlenbergia rigens* and *Sporobolus airoides*) that were grown with different rates of nitrogen. These species were chosen because they tolerate different periods of inundation as well as summer drought, which are common conditions experienced by plants in vegetated buffers of Southern California. Our results show significant differences in biomass production, content and concentration of shoot N and P, and patterns of biomass allocation that could influence the contribution of different species for nutrient removal, suggesting that proper plant selection can optimize the function of vegetated buffers to mitigate N and P runoff and leaching.

Ushahidi: Using Innovative Technology to Link Environmental Sewardship, Local Environmental Policy Making, and Management

Bemmy Maharramov*[1] , Carla Pisbe[2] , Empress El-Aton[2], Cuauhtemoc Soria[2], Manuel Ramirez[2], Josecruz Morales[2], Tsega Weldemariam[2], Maximotto Palafox[2], Roslaia Gallardo[2], and Jose Tamayo[2]

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This case study examines Ocean Discovery's process of launching an "app" called "Ushahidi" to address the complex socio-environmental issues (e.g. graffiti, encampments, and dumping) facing urban canyons. The app allows users to monitor and report these issues to appropriate responding agencies. ODI has worked with key stakeholders to cater the app to fit the needs of their community with the goals of: 1) empowering community members to report canyon issues; 2)enabling agencies to respond to canyon issues; and 3) informing decision making to transform canyons. The objective of this study is to shed light on how this app — in combination with ODI's other environmental stewardship activities — facilitates sustained environmental stewardship and the subsequent implications for local environmental management and policy making. While data is still being collected and analyzed, preliminary themes emerging include 1) corroboration that education is a strong strategy for gaining entry and securing community participation; 2) urban settings can be emblematic of a social-ecological systems approach; and 3) this compelling idea of "making the invisible visible", whereby the community canyon cleanups have made visible "green" spaces that were previously more or less invisible from a community stewardship, management and policy perspective. The continuation of this work is expected to reveal innovative strategies for management and policy actions that promote the integration of nature into urban settings for healthier social-ecological landscapes that benefit human well-being.

continued

Building Upon STEM Requirements to Promote Native Bee Habitat Restoration

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While recent focus has been on colony collapse of honey bees and the effects this would mean for our agricultural production, the state of California should rather emphasize the significance of our 4,000 species of native bees and the steps we should take to ensure their survival. Native bees vary by types of agriculture they pollinate as to whether they are solitary or social. An essential part of our ecosystems, natives can pollinate over 200 times more plants than their honey counterparts. Concentrating on a portion of the various species of natives, actions can be more easily taken to restore and provide proper habitats. The most effective step to be carried out is the prevention of environmental deterioration by the education of younger generations. Promoting STEM programs in schools needs to be taken a step further in order for kids to take ownership of the environment they will inherit from us. This would include curriculum more focused on the current state of the environment and the necessity of native bee survival for our ecosystem as a whole. Initially, based on my own experience teaching science, it would be encouraged for third to fourth grade levels to participate in a native plant garden at their school. With lessons to promote identification of native plant species, the garden would serve both educational purposes as well as habitats for native bees. Ultimately, the project would be providing habitats for bees on their travels throughout California, with the potential of developing into a wider community project.

Training the Next Generation in the Mattole River Watershed

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For over 30 years, the Mattole Restoration Council (MRC) has been training local community members, students and practioners on the methods and techniques of ecological restoration. This has been achieved through a variety of approaches that target multiple age groups. In class and field, environmental education is offered to students in elementary and high schools within the Mattole watershed through the Mattole Ecological Education Program. In high school and college, local students are offered hands-on training in ecological restoration through paid internships focused on environmental stewardship and native ecosystem restoration. College-level students are also offered hands on training in ecology and ecological restoration that is a accredited by Humboldt State University through the MRC's Mattole Field Institute. The Good Roads Clear Creeks Program targets local equipment operators and landowners and provides job training in heavy equipment operation and using best management practices for road building, sediment control, invasive plant removal, and riparian restoration. Through these programs, the MRC has reached over 1,000 students and landowners, hosted over 200 high school and college internships, and trained over 20 local equipment operators. All of these programs combined allow for Mattole watershed residents to receive training in ecological restoration and ecology from kindergarten through college and beyond.

Ecological Misconceptions: A Barrier to Urban Restoration in Cismontane California

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Urban restoration has immense potential for expanding natural habitat and preserving native flora and fauna in coastal southern California. However, unlike in undeveloped and rural areas, urban restoration efforts have to coexist with large numbers of neighbors. Without the support of the local population, any restoration effort will not survive in the long term, assuming it is even allowed to begin in the first place. Unfortunately, I have found that many people in southern California have little knowledge of the local ecology and often what they believe about local ecology is simply not accurate. While creating a restoration plan for the native plant garden at Saddleback College, a minor non-traditional restoration effort, I encountered concern from stakeholders based solely on such misconceptions. Here I will outline some of the common misconceptions I have encountered, how they can negatively impact restoration efforts, and how to overcome such misconceptions both in the context of restoration and otherwise.

City to Sea Citizen Science: Creating a Model to Engage Underrepresented Minorities in Citizen Science

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In the past two decades, citizen science has been shown to be a powerful tool to build STEM literacy and decision-making skills in participants, increase the body of scientific knowledge, and inform conservation and management practices. Citizen science has recently become a focal point of growth for the informal science education community; however the latest literature review found little research on how these projects can specifically engage underrepresented minority groups. Ocean Discovery Institute (ODI) is developing a community citizen science program model that targets engaging underrepresented minority groups in science research in their local, urban canyons. During the first half of this study, ODI developed, piloted, and enhanced a model that provides guided experiences and interactions with scientists to increase interest in and knowledge of science and among community participants while generating scientific information focused on understanding the patterns and pathways of debris through the watershed. Surveys conducted revealed patterns related to sources of debris (stormwater versus littering) and showed the majority of debris was plastics. During the second half of the study (October-May 2015) we are focusing specifically on plastics and recruiting community members to participate in all aspects of the scientific research from field work to data analysis to dissemination. We will share the innovative model, lessons learned, scientific results to date, and the challenges still underway.

If you had ventured into Swan Canyon circa 2007, you probably would not have found yourself enjoying a serene nature experience. A few other things, however, you probably would have found — a tire, for instance, or maybe a discarded sofa. And that wouldn't have been the worst of it. Today however, thanks to Ocean Discovery Institute's Watershed Avengers program, the City Heights community has restored Swan Canyon back to its natural beauty… and reclaimed the power of possibility for all ages. "The best part is that through restoring these natural areas, we are able to simultaneously restore our communities," reflects City Heights native and Ocean Discovery Institute alumni Sonya Vargas. — Excerpted from an article by Mike Klitzing in the Spring 2015 issue of Ecesis.