Southern Rockies Landscape Conservation Cooperative
FY 2015 Applied Science and Capacity Needs

The science and capacity needs articulated below were developed during the Science Working Group's fall meeting (Sept 16-18, 2014), and are intended to support science delivery and inform decisions pertaining to on-the-ground management actions benefiting shared, focal resources of Southern Rockies LCC partners.

Summary of Recommended Capacity and Science Needs:

Capacity Needed for Science Development and Delivery

- Data Analyst; $130,000
- Data Manager/GIS Specialist; $60,000 (covered in FY 2015 by FWS and USGS)
- Science Communications; $80,000 ($40,000 covered by FWS)

Applied Science Needs and Cost Estimates

- Climate change adaptation strategies that integrate traditional knowledge(s) (TK) with western science. $100,000 - $150,000 (SRLCC).
- Define the ecological flows (quantity, timing, and temperature) needed for fish life stages and sediment transport. $75,000 (SRLCC), plus match.
- Identification of climate refugia for cutthroat trout in streams and lakes within the SRLCC. $75,000 (SRLCC).
- Identification and location of sediment sources (natural and anthropogenic) and their contribution to sediment loading in rivers, streams and reservoirs. $80,000 (SRLCC), plus match.
- Identification of the most effective and efficient riparian and floodplain restoration practices for native fish restoration. $50,000 (SRLCC), plus match.
- Synthesis and dissemination of information pertaining to limiting factors for deer populations. $75,000 (SRLCC), plus match.
- Development of tools that allow description of habitat quality, attained remotely. $0 in FY 2015.
- Improve efficiency (accuracy, cost effectiveness) in mule deer population monitoring methodology. $75,000 (SRLCC), plus match.

Total FY 2015 financial need: $750,000.

FY 2015 Science Acquisition, Development and Delivery

During the fall meeting, the Science Working Group (SWG) recognized the SRLCC is at a point where the partnership should consider placing an emphasis on funding science delivery. In previous years, the SRLCC has focused its funding primarily toward science/data acquisition to:

- Fill identified data gaps (*e.g*., wetland digitization, improving crop evapotranspiration estimates, and incorporating ecological flow needs into river simulation models);
- Develop data management and sharing platforms (*e.g.,* LC MAP and the Conservation Planning Atlas);
- Conduct vulnerability assessments (*e.g*., soil moisture and vegetation response, species and ecosystems of the Gunnison Basin, vulnerabilities of Shivwits Paiute culturally significant natural resources, and stream flows); and/or
- Support spatial analysis of connectivity (*e.g*., riparian corridors, states' Crucial Habitat Assessment Tools, and habitats on and around the Navajo Nation).

The SWG felt that the SRLCC would position itself to be of greater value to resource managers by supporting capacity that delivers, in a digestible and understandable format, the science already produced by the SRLCC. In addition, this capacity would produce syntheses (science development) based on SRLCC funded projects and the multitude of existing data-sets external to the SRLCC. These syntheses would produce spatially explicit decision support tools that identify where on the landscape conservation actions would be most effective, and/or what management actions could be taken to achieve specific objectives. The syntheses would be targeted toward focal resources in the three geographic areas identified as priorities by the Steering Committee (Green River Basin, Four Corners Area, and Upper Rio Grande Basin).

The SRLCC has been actively investing in landscape conservation science. The SWG is now recommending investing in capacity to increase delivery and use of that science. This would ensure that information and tools from SRLCC and partner science investments are available in the scales and formats needed, and that they are successfully adopted and applied by the intended users.

Recommended capacity needs for science development and delivery are (in order of need):

- Data Analyst (FTE) – lead landscape conservation design efforts in the Four Corners and Upper Rio Grande Basin focal areas; analyze ecosystem (biological and hydrological) data and develop spatially explicit models that link ecosystem parameters with landscape characteristics; deliver data and products to managers through the SRLCC's Conservation Planning Atlas, and assist partners with conservation planning for focal resources ($130,000/yr.).

- Data Manager/GIS Specialist (1 FTE) – develop and maintain project tracking database; QA/QC science products, metadata and data produced by principle investigators with SRLCC science funds; catalog data and products within established databases; maintain SRLCC data portal and Conservation Planning Atlas; use GIS to manage and process spatial data for planning, monitoring and evaluation activities within the SRLCC

($60,000/yr. - FWS and USGS contributing $60,000 in FY 2015; $30,000 is needed in FY 2016-FY 2019).

- Science Communications (1 FTE) – develop and facilitate workshops and interactive webinars; content development for science delivery via written and internet formats; synthesize website analytics ($80,000 – FWS contributing $40,000 in FY 2015-FY 2019; $40,000 is needed in FY 2015-FY 2019).

Applied science needs for focal resource decision-making:

In addition to science development and delivery, the SWG identified several specific applied science acquisition needs and data gaps. This information will support conservation decisions addressing a variety of broad-scale challenges, including water scarcity, climate change adaptation strategies, habitat restoration strategies, species distribution, and improvement of habitat assessments and monitoring methodologies.

Cultural Resources

Science Need: Climate change adaptation strategies that integrate traditional knowledge (TK) with western science.

Rationale: Tribes are vulnerable to climate change impacts because they are culturally tied to the land and natural resources and are restricted to jurisdictional boundaries. Tribes have TK that could be used to develop climate change adaptation and mitigation strategies. It is recognized that TK and/or knowledge systems are unique to each tribe. To date, there has been minimal funding available to tribes to support the documentation of TK and integrating TK into climate change adaptation plans for priority landscapes. Priority landscapes would include culturally significant landscapes (*e.g*. archaeological, cultural or spiritual sites) and natural landscapes of cultural significance (*e.g*. riparian areas that produce cottonwood and willow, aquatic systems that support native fish, or habitats that support mule deer and elk).

Plan: The SRLCC Cultural Resources Focus Group has identified a multi-year approach starting in FY 2015 to address this need. Specifically we seek assistance for tribes to: 1) document their TK for assessing climate change impacts; 2) identify their priority landscapes and/or natural resources; and 3) integrate their TK with western science in vulnerability assessments and development of adaptation strategies.

In FY 2015 we propose to:

- Collaborate with Climate Science Centers (CSC) to develop and implement workshops educating tribes on climate science and tools (GIS, models, etc.) to conduct climate vulnerability assessments on individual tribal priorities.

- Assist two - three tribes that have identified priority landscapes and/or natural resources with the documentation of their TK for assessing climate change vulnerability for these landscapes or resources.

- Support two – three tribes with modeling/GIS capacity to conduct vulnerability assessments.

In FY 2016, and beyond, the above activities will be used to drive conservation delivery decisions by tribes. This information can be used by the tribes to pursue conservation delivery grants for the implementation of conservation actions that address, mitigate, and/or abate the identified vulnerabilities. Potential sources of support include Federal agencies such as the Natural Resources Conservation Service, Bureau of Indian Affairs and Fish and Wildlife Service. Monitoring of conservation actions, and the evaluation and assessment of the outcomes would need to be an integral element in subsequent years.

Additionally, in FY 2016 and beyond, the SRLCC proposes to continue collaboration with CSCs to conduct education opportunities, and to develop vulnerability assessments for up to three interested tribes each year.

Cost: $50,000 (SRLCC) per tribe for identification of priority landscapes and conducting vulnerability assessment; plus in-kind partner contributions. Total FY 2015 SRLCC Cost $100,000 - $150,000.

Streamflows

Science Need: Define the ecological flows (quantity, timing, and temperature) needed for fish life stages and sediment transport.

Rationale: Providing reliable water supplies for people and valued environmental services is becoming increasingly difficult. The Nature Conservancy (TNC) recently completed a study for the SRLCC: *Evaluation of Decision Support Platforms & Tools for Integrated Water Management in the Colorado Basin.* The study identified several data gaps with respect to the understanding of flow needs related to important species and physical variables (sediment transport) that are generally known to drive critical ecological processes and related habitat formation and maintenance. Additionally, data regarding the coupling of water temperatures to estimated flow changes due to climate change in the UCRB big rivers and tributaries is needed.

Plan: The SRLCC will address this science need, starting in FY 2015, in the Green River Basin. The species, life stages, and priority rivers/streams will be identified as part of the SRLCC's Green River Basin Landscape Conservation Design (LCD) project. Also as part of the LCD project, we will identify the ecological flow needs of certain native fish life stages and sediment transport in the Green River Basin. In subsequent years we propose identifying the ecological flow needs of certain native fish life stages and sediment transport in the Upper Rio Grande Basin and Four Corners geographic focus areas. We envision these subsequent year efforts to develop in collaboration with, and support of the San Juan River Recovery Program, several previously funded SRLCC projects (*e.g.*, Watershed Restoration in Jemez Mountains/Valles Caldera; Riparian Obligate Vulnerability Assessments in the Rio Grande Basin; and Improving ET/Crop Coefficients), and Reclamation's proposed Rio Grande Basin Study.

Cost: $75,000 (SRLCC), plus match, in FY 2015.

Native Fish

***Science Needs**:* Identification of climate refugia for cutthroat trout in streams and lakes within the SRLCC.

Rationale: Current studies are working to identify potential refuge stream and lake habitats in the upper Colorado River Basin above Lake Powell for warmwater species of concern –roundtail chub, bluehead sucker, and flannelmouth sucker - and the Colorado River cutthroat trout. Additional information and identification of coldwater refugia for Rio Grande Cutthroat trout and Bonneville cutthroat trout is needed. Both of these species have been considered for listing under the Endangered Species Act and the southernmost populations are believed to be especially at risk where stream flows may be diminished or warmed to levels that will not sustain the fish. Increased knowledge of the status and trends of cutthroat trout thermal habitats and vulnerability to climate driven changes in temperature or stochastic events would enable resource decision-makers to plan today's management actions for a future that includes climate change.

Plan: In FY 2015, identify climate refugia for Rio Grande cutthroat trout. In FY 2016, identify climate refugia for Bonneville cutthroat trout.

Cost: $75,000 (SRLCC) in FY 2015.

Science Need: Identification and location of sediment sources (natural and anthropogenic) and their contribution to sediment loading in rivers, streams and reservoirs.

Rationale: Multiple entities are conducting stream and riparian habitat restoration efforts to restore native fish populations. Information on the sources of sediment production and the amount of sediment being produced by each source is necessary to better understand the relationship between landscape-scale ecosystem drivers (fire, large-scale invasive species removal, recreation, oil and gas development, and grazing) and sediment loading in rivers, streams and reservoirs. An improved understanding of the sources of sediment production and the contribution of each source to total sediment load would enable resource decision-makers to better locate and design restoration activities to improve water quality, reduce sediment loading to reservoirs, and improve native fish habitats.

Plan: The SRLCC will address this science need, starting in FY 2015, in the Green River Basin. Identifying and quantifying sources of sediment loading to rivers and streams will be conducted as part of the SRLCC's Green River Basin LCD project. In subsequent years we propose identifying and quantifying sources of sediment loading to rivers and streams in the Upper Rio Grande Basin and Four Corners geographic focus areas. We envision these subsequent efforts to develop in collaboration with, and support of the San Juan River Recovery Program, several previously funded SRLCC projects (e.g., Watershed Restoration in Jemez Mountains/Valles Caldera; Riparian Obligate Vulnerability Assessments in the Rio Grande Basin; and Improving ET/Crop Coefficients), and Reclamation's proposed Rio Grande Basin Study.

Cost: $80,000 (SRLCC), plus match, in FY 2015.

Science Need: Identification of the most effective and efficient riparian and floodplain restoration practices for native fish restoration.

Rationale: A host of land managers are working to restore native/desirable vegetation to degraded, often invasive species-impacted sites within riparian corridors and directly adjacent uplands throughout the western United States. These restoration efforts are a challenge for a variety of reasons (*e.g*. significant amounts of woody debris following invasive species treatment, secondary invasive species to manage, limited water availability, saline soils, and ongoing disturbance), and managers often find their restoration efforts resulting in large areas of bare ground or establishment of less than ideal plant species. Under these conditions, land managers can also find themselves forced to reprioritize/revise their original restoration goals from restoring a site to 'ideal conditions' (which might naturally support native fish habitat) to what they feel are more realistic and attainable goals, especially when faced with limited time and resources for restoring a given site. Information to support decisions on the most effective and efficient restoration practices for restoring riparian and floodplain communities is needed.

Plan: We propose to meet this science need in FY 2018 by synthesizing and building upon previously funded (and others completed by FY 2018) SRLCC projects that address riparian vegetation restoration and establishment (e.g., Decision Support Tool for Riparian Restoration planning on the Colorado and Dolores Rivers; Effects of Biocontrol and Restoration on Wildlife along the Virgin River; and An Evaluation of Freemont Cottonwood Stand Dynamics). This information will enable State, Tribal and Federal agencies, and other watershed stakeholders, to enhance river restoration efforts for native fish. A synthesis of current knowledge, identification of knowledge gaps and additional research is needed to determine the most effective and efficient restoration practices for riparian, and floodplain communities.

Cost: No cost in FY 2015.

Mule Deer

Science Need: A) Synthesis and dissemination of information pertaining to limiting factors for deer populations; B) Refine the process for estimating biological carrying capacity of available, year-round deer habitat.

Rationale: Knowledge of the factors that limit mule deer populations is needed to inform management actions, including harvest levels and manipulation of habitat. Several agencies have undertaken research into limiting factors of mule deer. Managers agree that the relative number and importance of individual factors likely vary across the species range, but a synthesis of this information is lacking, and additional research is needed. A document that encapsulates knowledge of what limits mule deer populations will become a useful reference tool for managers throughout the SRLCC. In addition, managers have a need to refine their understanding of biological carrying capacity for mule deer range on a year round basis. Knowledge of the relative contribution of summer, transitional, and winter ranges to the capability of habitat to support deer, factoring in other ungulate stocking rates (wild and domestic), will improve managers' abilities to set realistic population objectives, and to justify harvest strategies to control herd size.

Plan: We propose to collaborate with the Western Association of Fish and Wildlife Agencies Mule Deer Working Group to develop a scope of work, and solicit proposals. Science need A) would be initiated in FY 2015, while B) would be initiated in FY 2016.

Cost: $75,000 (SRLCC), plus match, in FY15.

Science Need: Development of applied science tools that use remotely sensed data to enable resource decision-makers to characterize habitat quality at a landscape scale.

Rationale: Managers can identify habitat characteristics that correspond to suitable mule deer habitat on the ground; however, the need exists to identify these characteristics remotely in order to develop predictive habitat models at broad scales. These models can be used by decision makers for planning (where to focus resources on conservation and restoration) and by managers to monitor changes in habitat quality, quantity and connectivity. Advances in remote sensing platforms (e.g., lidar) and spatial data analysis may provide such tools.

Plan: It is unclear if the above described remote sensing tools can be developed to the degree that it would be sufficiently accurate and useful to decision makers. Thus we propose to further investigate through entities such as Utah State University (GIS lab), NASA (remote sensing platforms and programs), WAFWA Mule Deer Working Group, etc. to better identify a feasible scope of work to address this need in future funding cycles.

Cost: None in FY 2015.

Science Need: Improve the efficiency, accuracy, and cost effectiveness of monitoring mule deer populations.

Rationale: Mule deer population management in many jurisdictions relies on modeling of population size and sex/age composition following aerial or ground counts and classification (male:female; fawn:doe ratios) of groups of deer. This approach is costly to management agencies, and intensive sampling efforts (by counting larger percentages of herds) are frequently used to improve the robustness of the modeling process. Increased costs of fuel, contracted flight time, and competing demands for biologists' attention, and budget restrictions due to declining revenue have substantially increased the cost of gaining herd composition data. Alternative sampling approaches (e.g., stratified, random quadrat) and consequent statistical approaches to modeling (e.g., estimating detection or sightability probabilities) may increase efficiency and reduce the level of field sampling efforts. In addition, development of different approaches to assessing population status (size and composition) may also generate significant cost savings for management agencies. This need may best be fulfilled through a set of field experiments.

Plan: We propose to collaborate with the Western Association of Fish and Wildlife Agencies Mule Deer Working Group to develop a scope of work, and solicit proposals.

Cost: $75,000 (SRLCC), plus match, in FY 2015.