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San Miguel County PES Program

CWCB Grant Report

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TASK 1: PES Program Literature Review

Introduction

In 2018, The San Miguel County Board of Commissioners applied for a Water Plan Grant from the Colorado Water Conservation Board to expand and develop the Payment for Ecosystem Services (PES) program within the county. San Miguel County intends to develop an informed and innovative approach to engage landowners and agricultural producers within the county to voluntarily implement beneficial management practices for long-term water conservation, improved soil health and other ecosystem services.

Phase one of the project includes a literature review of PES programs, an analysis of relevant programs to determine the successes and failures of said programs and a synthesis of common factors, methodologies and structures of both successful and non-successful PES programs that will be utilized in the development of the San Miguel PES program going forward.

Payment for Ecosystem Service schemes are programs in which financial incentives are utilized to encourage land-managers to maintain or improve Ecosystem Services, beyond regulatory minimums (Kuhfuss et al., 2018). PES schemes seek to encourage voluntary participation of land managers and other stakeholders in creating an economic market in which the ecosystem services can be valued and measured by both parties. There are a multitude of PES projects that target different ecosystem services across temporal and spatial scales, encourage stakeholders to engage in a variety of manners, and structure the payment and regulatory systems to encourage positive results. The commonalities of these many PES projects, the applicability of PES and specific projects to the San Miguel County PES Project and key takeaways are discussed below.

Definition of Payment for Ecosystem Services

Payment for Ecosystem Services (PES) is a broad category of economically driven programs focused on maintaining or improving Ecosystem Services (ES) beyond regulatory requirements. Kuhfuss et al., define PES as “any scheme or agreement where the individuals who benefit from Ecosystem Services offer a payment to land managers in exchange for the provision of these Ecosystem Services” (Kuhfuss et al., 2018).

Within every PES scheme, four basic factors need to be considered. These program specific components include: the targeted Ecosystem Service or Services, the spatial and temporal scale of the project, the stakeholders in the project, and the structure of compensation and monitoring utilized within the project (Kuhfuss et al., 2018; Salzman et al., 2018). These factors are discussed below.

a. Ecosystem Services

Ecosystem Services can be difficult to define as there has been disagreement on nomenclature as ES has evolved (Fisher et al., 2007). Most definitions share similarities with the Millennium Ecosystem Assessment's definition, which describes ecosystem services as "the ecological characteristics, functions, or processes that directly or indirectly contribute to human wellbeing: that is, the benefits that people derive from functioning ecosystems" (Mitchell & Bellows, 2020). Under such a broad definition, ES can be further divided into four categories (Kuhfuss et al., 2018): provisioning, regulating, cultural and supporting services.

1. Provisioning services are the products obtained from the ecosystem, such as food, water, lumber, etc…, and often are the easiest to quantify economically of the four categories.
2. Regulating services are the benefits associated with regulating specific ecosystem processes and can include air quality, source water protection, carbon sequestration and hazard reduction.
3. Cultural services are the non-material benefits that humans derive from the ecosystem including recreation, heritage and aesthetic benefits.
4. Supporting services are those needed to maintain the other Ecosystem Services and include water and nutrient cycles, soil formation, etc.

b. Objective of PES projects

PES programs can differ in focus where some target one specific ES, whereas others take a more broad approach and account for multiple ES. An example of a PES program targeting one ES is The Scottish Water Drinking Water Protection Scheme. Clean water is the ES that is being traded and multiple approaches including changes to land management and infrastructure upgrades are utilized to improve the access to clean drinking water. The Forestry Grant Scheme on the other hand is a scheme in which multiple ES are targeted including: biodiversity, carbon sequestration, recreation, timber and soil and water conservation. There are positives to both approaches however making sure regulation or monitoring is achievable in schemes that have broad focus can be a challenge for some PES programs (Kuhfuss et al., 2018).

c. Scope and Context of PES projects

The scale of PES programs can vary drastically in both time and space. Temporal variations depend on the focus of the PES project and can play a large role in the overall success of the scheme. Projects focusing on longer term goals, such as carbon sequestration, would ideally be set up in perpetuity so as not to reverse the desired outcome of the PES project after the timeline expires. Whereas projects with a longer lasting outcome and/or a smaller focus, such as the rare plant study by Art Goodtimes in 2010 (Goodtimes et al., 2012). within San Miguel County, may require a more limited timeline.

Spatial variability in PES ranges from smaller scale local projects to nationally scaled projects. Selecting the appropriate scale for a PES scheme is integral to the success of the

project. Smaller local projects benefit in that there can be more direct interaction between stakeholders and trust between stakeholders can be increased. On the other hand they can suffer as transactional and operational costs can be more expensive and the project may not be ideally situated to target a specific ES. National or state scale projects can benefit from a large central bureaucracy that can reduce associated costs, target ES in ideal locations, and monitor the potential successes of the projects through pre-existing organizations or agencies. These larger scale projects potentially suffer from dissociation between stakeholders and limited local or site-specific knowledge (Kuhfuss et al., 2018; *Payments for Ecosystem Services: Getting Started*, 2008).

PES schemes can also vary in context. They can target varying ecosystems, ranging from wetlands and peatland to forest and farm lands, as well as differing land types according to land usage - i.e. land associated with agricultural, recreation, forestry, ranching, etc.

d. Stakeholders in PES

Within any PES scheme there must be, at a minimum, a seller (provider) of services, and a buyer (beneficiary) of said services. As PES follows the beneficiary pays principle, rather than the polluter pays principle, there is the basic economic assumption that the seller can do whatever they would like and an economic incentive is required for the beneficiary to reach the desired outcome (*Payments for Ecosystem Services: Getting Started*, 2008). The seller must be voluntarily willing to accept payment to engage in an activity, or stop an activity, that will preserve the ES targeted by the PES scheme. The buyer must be willing to pay for continued activity or a change in activity that will preserve or enhance the ES in which they are interested. The beneficiary does not necessarily need to be the buyer, in some cases a third party could be the buyer and receive benefits not directly related to the ES. There must be an interested buyer and an interested seller. Many PES schemes also involve intermediaries who may connect the two interested parties, manage the transaction and provide monitoring of the ES benefits (Kuhfuss et al., 2018; *Payments for Ecosystem Services: Getting Started*, 2008).

e. Structure of Compensation and Monitoring or Regulation

In defining the contractual arrangement between the provider of ES and the buyer within the PES scheme, it is important to understand the different valuation and monetary disbursement methods as well as the varying sources of financing and monitoring that will affect the PES project.

i. Fixed Price vs. Scaled Price Schemes

Two common valuation methods include fixed price and scaled price schemes. The fixed price scheme is determined by the buyer or beneficiary. The buyer sets a price for the desired ES. It is then up to the provider or seller of the ES to decide if the PES scheme works for them. This system benefits from lower transaction and administrative costs and complexities, however, this system means that some providers will be overpaid and others will opt out as the PES scheme does not fit their needs.

The other style of valuation method is the scaled price scheme. This method is commonly based on providers (sellers) determining the required monetary compensation they need to produce a desired outcome or change in practice for an ES. They produce a bid and application which are then sent to a buyer who selects the best bid or bids for the PES scheme and available funding. While this method does incur higher transactional costs than the fixed cost method, it is more cost effective for the buyer as they are paying for actual costs (Kuhfuss et al., 2018).

ii. Input vs. Output-Based Disbursement Plan

In the process of determining the value of an ES for a PES scheme, both the providers and the beneficiaries must agree on an input or an output-based disbursement plan. Input based plans remove most or all of the risk from the ES provider as they are compensated up-front for actions that have a goal of improving ES regardless of whether they actually work or if external factors reduce the efficacy of their actions. Consequently there is the potential to overpay for ES or even pay for ES that are never delivered (Kuhfuss et al., 2018).

Output-based plans place most or all of the risk on the ES provider as they are paid upon producing results or selling the ES they provide. This scheme requires an easily quantifiable and measurable ES that a provider can demonstrate in order to receive compensation. While this plan will drastically reduce the potential for overpayment for ES, it can be more difficult to attract interested providers into the PES scheme.

iii. Financing PES Programs

In addition to determining the valuation method and the disbursement schedule for a PES program, differing sources of finance can have large effects on the final PES scheme. Three overarching categories of PES structures include: user financed PES, third-party financed PES and compliance PES.

User financed PES programs include any program where direct beneficiaries of an ES directly compensate a provider for the preservation, enhancement or re-development of the ES. These beneficiaries may be individuals, companies or non-governmental organizations. Third-party financed PES programs include any program where a private organization or a governmental agency or organization who is not a direct beneficiary of the ES pays a provider for provision or enhancement of an ES on behalf of the user. Finally, compliance PES programs are schemes in which an organization or company facing regulatory obligations compensates another party for provision of an ES in exchange for an offset or credit (Salzman et al., 2018). While some PES schemes may fit directly into one of these three categories, others will appear as hybrid models that share characteristics of all three frameworks discussed above.

Current State of Payment for Ecosystem Services Schemes

Payment for Ecosystem Services (PES) programs have shown significant growth in the past few decades and are being implemented on a global scale as a market-based approach to incentivize positive environmental and ecological practices and management that fall under the categorization of Ecosystem Services (ES). In 1995, there were only three mentions of PES

within journal articles. As of 2018, over 550 active PES programs existed globally with estimated transactional value of US $36 to $42 billion dollars (Salzman et al., 2018). As the viability of PES has been demonstrated and PES programs have been implemented on a variety of scales across the globe, Salzman et al., 2018, have grouped current and previous PES programs within three overarching sectors. These sectors include 1) watershed PES, 2) biodiversity and habitat PES and 3) forest and land-use carbon PES (Salzman et al., 2018).

1. Watershed PES

As of 2018, watershed PES had proven to be the most robust of the three categories with 387 total projects, 153 of which were user financed, 203 were government financed and 31 were compliance based. Economic data from 2015 indicates that watershed PES programs were worth US $24 billion across 62 countries. Within the overarching watershed PES category, there are a variety of sub-categories including: subsidy watershed PES, collective action watershed PES, bilateral watershed PES, instream buybacks and quality trading and offsets (Salzman et al., 2018).

Subsidy watershed PES programs are government financed and as the name implies, provide a subsidy to land managers for maintaining or improving ES that directly impact the watershed (Chao et al., 2017; Salzman et al., 2018). The Sloping Lands Conversion Program, implemented by the Chinese government in 1999, is a great example of a third-party financed PES scheme in which farmers receive a stipend to revegetate steep hillsides previously used for cultivation and instead promote grassland and forest cover in the Guyuan region.

Collective action watershed PES programs work similarly to subsidy watershed programs, however the funding comes from a variety of funding sources including NGO's, government sources and individuals. The FONAG (the Fund for the Protection of Water), which is Quito's Water Conservation Fund, utilizes a trust fund approach in concert with a 1% surcharge on water bills from local breweries and electrical companies to fund forest and grassland protection in the local watershed (Joslin, 2019; Salzman et al., 2018).

Bilateral watershed PES is a program in which one beneficiary pays multiple providers for activities that benefit the payer or mitigate impacts from the payers activities. The Scottish Water Drinking Water Protection Scheme fits this designation as in this scheme, Scottish Water pays specific land owners and managers to improve infrastructure and manage land in a way that makes it cheaper and easier for Scottish Water to provide clean drinking water to its constituents (Kuhfuss et al., 2018).

Instream buybacks focus more on the acquisition of historic or unused water rights with the focus of maintaining consistent flow and minimizing diversions on a particular stretch of river. These projects are common in Australia where the Restoring the Balance Programme committed $3 billion over a decade to purchase water rights and ensure flow within the Murray-Darling Basin (Salzman et al., 2018; Wheeler & Cheesman, 2013).

Quality trading and offsets fall under compliance programs in which a buyer is able to maintain regulatory standards through paying providers to improve some specific measure of water quality in return for credits. This may include paying for other providers for actions that

could help maintain salinity, pH, suspended solids, etc.. within the watershed and offset the buyers detrimental impact.

2. *Biodiversity and Habitat PES*

Biodiversity and habitat PES sector is one of the least developed and hardest to quantify (US $2.5-8.4 billion in economic value). This sector uses offsets to ensure no net loss of biodiversity or habitat. As of 2018, 120 biodiversity and habitat PES programs existed, 16 of which were user financed and the remaining 104 were compliance based. Three subcategories of biodiversity and habitat PES include; wetlands and stream mitigation, compliance biodiversity and voluntary biodiversity offsets (Salzman et al., 2018; Wheeler & Cheesman, 2013).

Wetlands and stream mitigation is a compliance program in which a buyer can purchase mitigation credits for comparable wetlands and streams to be developed in another location to offset their impact on site. This is similar to mitigation banking and is not popular in the west due to no net loss requirements. Compliance biodiversity allows for buyers to purchase mitigation credits for specific habitat to be created off site, pay into an offset fund, or purchase biodiversity credits. Voluntary biodiversity offsets aims to get ahead of the compliance based programs and instead encourages buyers to enhance or achieve no net loss of biodiversity of habitat most often due to a sense of social responsibility or risk management for the buyer. In fact some of the voluntary projects may in actuality be pre-compliance projects in anticipation of developing a location and getting ahead of any regulatory requirements.

3. *Forest and Land Use Carbon PES*

Forest and land use carbon PES programs are widely implemented and are generally the most well-known PES programs due to their easily measurable results and widespread applicability. From 2009 to 2018, US $2.8 billion has been spent to sequester carbon and in the purchase of carbon offsets. As of 2018, there were 48 forest and land use carbon PES programs, 31 of which were government financed and 17 were compliance based. The subcategories of forest and land use carbon PES include; voluntary forest and land-use carbon market, compliance forest carbon market, REDD readiness finance, and public sector payments for performance (Salzman et al., 2018).

Voluntary forest and land-use carbon market is a category in which buyers purchase offsets in pre-regulation anticipation or due to social responsibility. There are many examples of voluntary carbon credit sales; one such program is coordinated through Moorfutures in Germany. They have been coordinating the sale and acquisition of carbon credits for peatland re-wetting on a small local scale since 2011 (Kuhfuss et al., 2018).

Compliance forest carbon market includes regulations on greenhouse gas emissions and allows for buyers to offset their emissions through purchase of credits most often within a cap-and-trade scheme. One of the largest examples of utilizing forest carbon credits within the United States is the California Greenhouse Cap-and-Trade Program. This program aims to

reduce greenhouse gas emissions through capping current emissions and reducing total permissible emissions in the state by 3% per year until the goal is met (Kim & Daniels, 2019).

The REDD readiness finance programs provide assistance for developing forest countries in anticipation of REDD (reducing emissions from deforestation and forest degradation) or REDD+ funding. This program supports countries in developing a REDD plan, implementing monitoring and reporting frameworks. Many locations that qualify for REDD funding often lack forestry budgets and are in need of capital and infrastructure upgrades to utilize the funding in an efficient and equitable way. Brazil and Indonesia are two locations in which many REDD readiness programs are in effect (Cerbu et al., 2011).

On the heels of the REDD readiness programs, the public sector payments for performance is the program in which countries can pay developing forest countries for REDD programs, typically offering payment on completion and achievement of REDD programs.

While specific projects may not perfectly sit within one of the sub-categories listed above, or even within one of the three overarching sectors, many projects mostly fit within one category or are a combination of a few categories.

Federal, State and Local PES

Within the United States a variety of PES programs are currently in operation across federal, state and local levels. They vary in scope and focus but are relevant to the development of a PES program within San Miguel County.

On the Federal level, the United States Department of Agriculture (USDA) and its subsidiary agencies, the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA) operate many of the available Federal PES programs in the US. The Farm Bill (P.L. 115-334) that was signed into law at the end of 2018 addresses a few of these programs that are operated by the NRCS and the FSA. Of note, it reauthorizes and allocates funding for the Environmental Quality Incentives Program (EQIP) as well as the Conservation Stewardship Program (CSP) for a period of ten years. The main categories of the Farm Bill that fall under a conservation focus can be largely grouped into the following categories: working lands programs, land retirement and easement programs, watershed programs, emergency programs, technical assistance and other programs.

The working lands programs account for more than half of the budget allocation within conservation spending. The two main components under the working lands program are EQIP and CSP. EQIP provides financial and technical assistance to agricultural producers and non-industrial forest managers to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, increased soil health and reduced soil erosion and sedimentation, improved or created wildlife habitat, and mitigation against drought and increasing weather volatility (Cerbu et al., 2011). Through cost sharing and technical advising, the NRCS and the producer work together to increase conservation and simultaneously improve agricultural operations. The bill will raise EQIP funding in annual increments from $1.75 billion in 2019 to $2.025 billion in 2023. The 2018 bill

also increases the funding allocation for programs focused on source water protection and water quality projects within EQIP by 10% (Stubbs, 2022).

The Conservation Stewardship Program (CSP) provides financial and technical assistance to producers to maintain and improve existing conservation systems and to adopt additional conservation activities in a comprehensive manner on a producer's entire operation (Stubbs, 2022). The goals of the program are broad and range from increasing yield and minimizing soil loss to attaining higher stewardship levels from an environmental and cost-effective standpoint.

Land retirement and easement programs encourage producers, ranchers and farmers to place permanent or long-term land-use restrictions on their private property in return for federal payments. The two main land retirement and easement programs addressed by the Farm Bill include the Conservation Reserve Program (CRP) and the Agricultural Conservation Easement Program (ACEP). The CRP provides annual rental payments to producers to replace crops on highly erodible and environmentally sensitive land with long-term resource-conserving plantings. The annual enrollment cap was increased from $24 million acres in 2019 to $27 million acres in 2023. The ACEP aims to acquire agricultural land easements that limit nonagricultural uses on productive farm or grasslands as well as acquire wetland reserve easements that protect and restore wetlands. The Farm Bill increased funding for the ACEP from $250 million in 2018 to $450 million from 2019 to 2023 (Stubbs, 2022).

In 2016, California's Healthy Soils Initiative created the Healthy Soils Program (HSP), which "provides financial assistance for implementation of conservation management practices that improve soil health, sequester carbon and reduce greenhouse gas emissions" (*California Healthy Soils Initiative*, 2024). The Healthy Soils Initiative is a collaborative effort between multiple state agencies and departments, including the California Department of Food and Agriculture, which work together to promote the development of healthy soils throughout the state. The Healthy Soils Program works directly with farmers to provide financial and technical assistance as they implement new practices. The program has awarded $98 million in grants to date (*CalCAN*, n.d.). Notably, the primary funding for the HSP comes from California's Greenhouse Gas Reduction Fund, which consists of revenue from the state's cap-and-trade program. Because this is a market-based system, the funds vary from year to year, depending on how well the auction performs. This poses challenges to the system, as the funding is inherently inconsistent and somewhat unreliable (Shobe et al., 2020). Furthermore, funding that relies on market-based systems may or may not be a viable/sustainable option into the future. The greenhouse gas benefits of the practices used in the HSP are estimated using the COMET-Planner tool, which was developed by the California Air Resources Board (CARB), CDFA, USDA, and Colorado State University. This tool utilizes a model that calculates GHG savings based on NRCS practices and localized factors including climate, soil type, crop type, and more (Shobe et al., 2020).

In 2021, Colorado Department of Agriculture's (CDA) began developing new statewide soil health programs: Saving Tomorrow's Agricultural Resources (STAR) and STAR Plus. The STAR and STAR Plus programs are a part of the Colorado Soil Health Initiative, which was developed by the Colorado Collaborative for Healthy Soils (CCHS). The CCHS was established to gather input from farming and ranching communities to help create a statewide soil health program that was as collaborative and participatory as possible (*Colorado Collaborative for Healthy Soils*, n.d.). STAR is a field rating system, which creates a standardized way of

reviewing and scoring the practices that farmers and ranchers implement on their fields. STAR Plus is a three-year program that provides funding for farmers to implement new practices on a test field, and analyzes the impacts on soil health at no cost (*Colorado STAR*, n.d.). This program allows farmers to see for themselves how implementing regenerative agricultural practices can improve the health of their soils and encourages them to expand practices from the one test field to the rest of their property.

San Miguel County originally developed a PES program in 2010, and it has since gone through several phases. The first version incentivized the surveying and protection of rare plants on private lands (*Payment for Ecosystem Services*, n.d.). The initial pilot program was a success and inspired the county to expand the PES program to include complementary environmental targets. Later, the county developed a new *Soil Health PES Project* to study soil health (soil productivity, water retention, carbon sequestration) on agricultural lands. This involved applying compost amendments and other soil improvement techniques to test plots and measuring the impacts on soil health. These programs were relatively small scale, and lost momentum after a few years. We now have the opportunity to reinvent the PES program and create a system that has the potential to be scaled up and can serve as a model for other communities.

Moving forward, it is imperative that the San Miguel County PES Program takes into account the successes and failures of previous programs with similar goals. The California Healthy Soils Program appears to align with the vision for the current San Miguel County PES Grant, and this will be a useful model in developing our own system. We must find ways to connect with the local farmers and ranchers to create motivated sellers and continue to emphasize the benefits on improving soil health for all parties involved. Additionally, we need to identify what our assessment metrics will be, and how we will create an equitable and credible payment system. Transparency is the key to any successful relationship, and our program must be clear from the start in where and how funding is allocated. Luckily, we are entering this space alongside many other organizations and agencies, and we look forward to a collaborative process as we develop this new program.

TASK 2: Local Needs Assessment & Stakeholder Involvement

The *Local Needs Assessment* identified as Task 2 in our initial grant application indicated that we would develop our program based on stakeholder outreach and feedback to foster community support and participation. We had planned to not only meet in person but also communicate via direct outreach, mailers and survey platforms. Unfortunately, due to the COVID-19 outbreak and subsequent shut-downs, we were unable to meet with the public, including San Miguel Watershed Coalition stakeholders and 4-H groups, nor could we have information booths at the San Miguel Basin Fair and Norwood Farmers Market as we had intended.

Recognizing we would not be able to structure a program based on public input, we pivoted, and turned to existing examples of functioning PES programs to find a suitable template. In 2021 we implemented a pilot PES program that included a small number of participants already involved in the regenerative agriculture space. Working with a small number of trusted landowners allowed us to design the programmatic framework and work through challenges while increasing our credibility and creating new relationships in the ranching community. By initially engaging with friendly actors who understood the mission of the program, we were able to establish the foundation for a larger-scale project to expand across the region. This turned out to be an effective method, as we expanded the program in the years that followed largely by word of mouth. The farmers and ranchers we worked with told their neighbors about the program, who then contacted us about participating.

Two portable soil moisture probes were purchased for use in the field during landowner meetings - it was determined that an array of moisture probes would only serve a single landowner and would require frequent monitoring to assure their continuing function and condition. The portable probes allow demonstration for landowners to help inform the relationship between real-time field conditions and actual numeric soil moisture values.

Weather stations were discussed during multiple BOCC worksessions and with focus groups keenly interested in helping to establish a weather station network within the San Miguel watershed. Unfortunately there are multiple practical limitations with the deployment of a weather station array - namely finding suitable locations on private property where communications infrastructure is in place and the required on-going operation and maintenance expenses of operating such an array.

With CWCB approval, SMC redirected the weather station funds to support the ongoing operation of the PES program in 2022 and 2023 - this allowed for continued engagement with landowners in ways that have strengthened the PES program for future operations.

TASK 3: PES Program Conceptualization

San Miguel County's PES program was modeled after the California Healthy Soils Program. California's program "provides financial incentives to California growers and ranchers to implement conservation management practices that sequester carbon, reduce atmospheric greenhouse gasses (GHGs), and improve soil health. Specifically, the GHGs benefits are estimated using quantification methodology and tools developed by California Air Resources Board (CARB), USDA-NRCS and CDFA and soil health improvement will be assessed by measuring soil organic matter content" (Shobe et al., 2020). Conveniently, the Natural Resource Conservation Service (NRCS) has created an Environmental Quality Incentives Program (EQIP), which lists a myriad of potential conservation practices that may be relevant to a landscape. For the San Miguel County program, we were able to use the information already provided through EQIP, and had a customized list of practices that we could draw from based on our climate and soil conditions. The NRCS has also developed the COMET-Planner tool, which allows us to calculate the amount of carbon that would be sequestered by adopting different NRCS conservation practices (*COMET-Planner*, n.d.). Using these tools, we developed a payment system for different ecosystem services based on the amount of carbon that they store in the ground. Because Colorado does not have a cap and trade program, the payment amounts we used are based on California prices.

Moreover, with funding from the CWCB grant and the county, we created a transparent payment schedule for participating landowners. These landowners are voluntarily implementing conservation practices that promote soil health and carbon sequestration, creating and maintaining ecosystem services that support the health of the land and the people in this community. The carbon sequestration also benefits the county as it contributes to offsetting emissions and therefore reaching the county's goal of becoming net-zero.

TASK 4: PES Program Establishment

In the first year of our pilot program, we worked with three farms and ranches in the county to establish the guidelines and procedures for the program going forward. Thanks to EQIP, we have a suite of conservation options that allow participation at multiple levels. These practices are adaptable, yet quantifiable, which will allow us to increase opportunities for participation across a range of production and ranching lands and measure real benefits.

Currently, our process includes talking with landowners about current practices, visiting the property, establishing which conservation practices they qualify for and which practices they could implement, mapping out the property (see Figure 1), creating an operating plan, calculating the payments, and ultimately signing a contract.

Over the first two years, the PES program effectively doubled the number of participants and largely expanded the number of acres included. Three landowners participated in the PES program in 2021, for a total of 600 acres under contract. In 2022, six landowners participated in the program, totalling 2,000 acres under contract. This resulted in $33,178 being distributed to farmers in 2021 and $39,558 in 2022. We also doubled the amount of carbon sequestration, with 135 tons of carbon dioxide equivalent sequestered in 2021 and 280 tons in 2022. The most common practice adopted in the PES program was “Prescribed Grazing”, which accounts for over 90% of the acreage under contract (see Figure 2). Soil samples were conducted on two properties, which will help farmers and ranchers establish a baseline understanding of current conditions and can be used for comparison in the future.

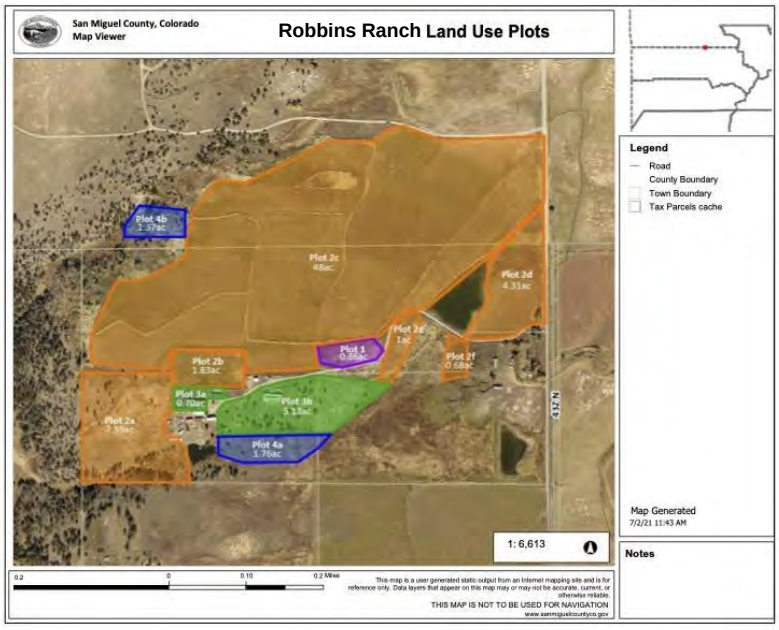

Figure 1. Property map example: Robbins Ranch Plot Map 2022. Colored plots indicate different conservation practices used on the property. Purple: Practice 342 Critical Area Planting; orange: Practice 528 Prescribed Grazing; green: Practice 550 Range Planting; and blue Practice 612 Tree/Shrub Establishment. Associated acreage is labeled on the map with each plot ID.

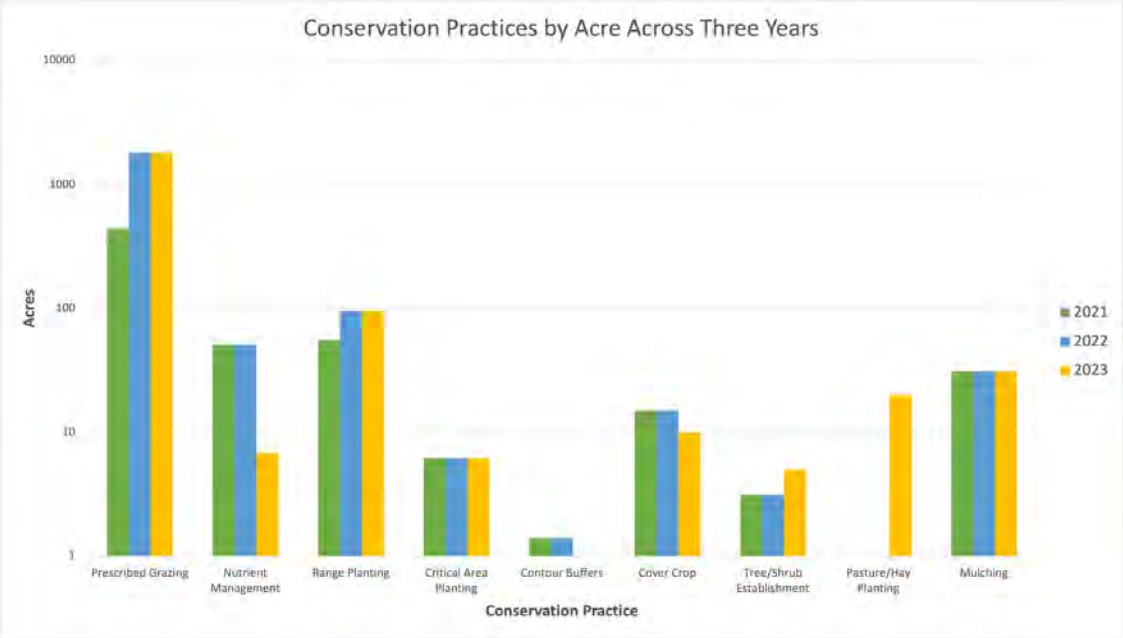

Figure 2. Practice distribution by acreage for all contracts signed in 2021, 2022, and 2023.

In the spring of 2022, the county hired Ground Up Consulting to review the PES program and make recommendations on how to improve the program as we go forward. Although recommendations included merging with Shavano Soil Conservation District (SCD) and incorporating the statewide STAR (Saving Tomorrow's Agricultural Resources) program, the county decided to continue operating the PES program as we did in 2021.

In 2023, we worked with SCD to hire Dave Dearstyne, a soil scientist and soil health enthusiast from Montrose, CO. Dave helped us conduct soil health analyses, which involved characterizing soil pits and taking soil samples, which allowed us to generate soil health reports that included much more robust feedback and recommendations for landowners. As we increase the number of farmers we are working with, we will continue to incorporate these soil health reports into our protocol.

As mentioned previously, our expansion of the program has largely been through word of mouth. While our initial partnerships have mostly been with friendly actors, the hope was that as they communicated the benefits of the program to other farmers and ranchers, we could foster new relationships with people looking to improve their soil health. We have found that participants advocating for the program has been an effective method of acquiring new landowners. In 2023, we worked with a total of 10 producers, six of which signed contracts as a part of the PES program. These were the same six producers who participated in 2022. Although we did not increase the number of contracts signed, we felt that in 2023 we greatly improved the services provided, and laid the foundation for future participation with many new landowners. Therefore, with baseline data obtained, and recommendations made, next year we hope all 10 (or more!) producers will participate fully in the PES program.

Having developed methodology that is modeled after existing PES programs and draws from protocol used in state-level soil health resources, we hope our program is transparent and easy to navigate from both the farmer and the county-side. In 2024, we will continue working with Shavano Conservation District to build greater resilience throughout our community and strengthen partnerships into the future.

TASK 5: Final Report /Summary Sheet

San Miguel County received a Water Plan Grant from the Colorado Water Conservation Board in 2018. The initial concept was the funds would go towards designing a Payment for Ecosystem Service Program to compensate agricultural producers and large landowners for long-term practices providing measurable water conservation and soil health benefits. This would have involved an analysis of existing programs and significant stakeholder participation, which would inform a final outline for what the program would look like and how we would implement it. Unfortunately, when COVID-19 hit, we were forced to change our course of action, as we could no longer rely on meeting and consulting with stakeholders. Our plans for outreach were no longer possible. We pivoted our direction and instead implemented a PES Pilot Program in 2021, which was based on an existing program in California. The current San Miguel County PES Program is action-based and utilizes a direct payment system to reward farmers for implementing practices that promote soil health. We are using carbon sequestration as our "ecosystem service," and the NRCS has developed several tools that allow us to calculate the amount of carbon stored in the soil and the associated payment based on each management practice adopted.

With California's Healthy Soils Program as a guide, and with the help of Colorado Department of Ag's EQIP program, we developed our own PES program and hit the ground running. In year one (2021), we worked with three producers who were already involved in the regenerative agriculture space and were excited to be part of the pilot program. We created protocols for operating the program, which included meeting with landowners, discussing management practices, mapping their properties and finally writing contracts. During site visits, we identified which practices were currently being used, and what practices might be implemented to promote soil health. These practices were based on the NRCS's EQIP Program, which has a range of conservation practices that promote soil health, including prescribed grazing, nutrient management, critical area planting, and pasture/hay planting. We were also able to develop a payment system utilizing the EQIP Program, which had established dollar amounts per acre based on practices adopted. The COMET-Planner Tool allowed us to calculate the amount of carbon sequestered by each practice implemented.

In year two (2022), we expanded the program to include six producers. In doing so, we effectively doubled the number of acres under contract and the amount of carbon sequestered. In year three (2023), we expanded our capacity by contracting a soil scientist named Dave Dearstyne. With 40 years of soil science under his belt, Dave provided a wealth of knowledge for us and for the landowners. Dave joined our site visits and helped us analyze soil conditions on the ground, both with soil tests and soil pits. Through these assessments and discussions with landowners, we were able to generate more comprehensive soil reports for each of our landowners. These included not only an assessment of soil health, but also suggestions as to how to improve soil conditions and productivity using regenerative practices. This allowed us to build a really strong foundation for new landowners, and we hope that all 10 participants will sign contracts as a part of the PES program next year.

Throughout this process, we did encounter challenges that forced us to change our plan of action. First and foremost, the pandemic greatly impacted our ability to conduct outreach in the way we had envisioned. With restrictions on gathering, and uncertainties around public meetings

we were unable to gather stakeholder input at local events. Once we altered our course of action and started a pilot program with a few friendly actors, we did attempt several methods of traditional outreach. For example, the county put the program on the website, printed brochures that were distributed through extension agents, county offices, and other agricultural entities. Unfortunately, these did not garner the response we had hoped, and we found that this type of outreach was not successful in our community. Instead, we focused on growing the program through word of mouth, largely relying on participating landowners to talk to their neighbors and community members. By using this method, we had a foundation of trust and credibility with local landowners, as they were recommended the program through other agricultural producers.

A third challenge we faced is simply coordinating meetings with landowners during the growing season. We cannot control the weather, and in this area there is a lot of unpredictability around precipitation, runoff, and temperature in the spring. Consequently, we have encountered delays with meetings based on field conditions being unsuitable for site visits. Once the growing season starts, producers are extremely busy trying to get things going to take full advantage of the short window they have to grow their crops. As a result, the actual signing of contracts happened later in the year than we had hoped, and this is something we are making an effort to address next year. We got a lot of work done this summer that will allow us to get a head start on drafting contracts for the coming year.

Despite encountering several challenges, we were able to successfully create a PES program in San Miguel County that has grown over the course of the past three years. With funds committed from the county, we are proud to say the program will continue into 2024. As we continue to develop the program, we hope to expand our capacity to work with more farmers and create a robust program that can serve as a model to other communities.

Appendix

A. Sample Contract

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San Miguel County
Land Use Access and Payment Agreement

This Land Use Access and Payment Agreement ("Agreement") is entered into this __3rd___ day of ____July, 2023_____, between San Miguel County, Colorado, acting by and through the County's Parks & Open Space Department, ("SMC"), as the Licensee, and __Robbins Ranch__("Landowner"), as the Licensor. Both state and agree as follows:

RECITALS

A. San Miguel County, as Licensee, desires to utilize private property located within San Miguel County for programs related to soil, water, wildlife and habitat protection ("**Land Use Protections**");

B. As part of the Land Use Protections, San Miguel County has budgeted funding to incentivize private property owners to use land in accordance with the programs established and administered by San Miguel County; and, C. The Landowner listed above, wishes to participate in the Land Use Protections for a limited period of time in accordance with the terms and obligations set forth herein, and receipt of consideration from San Miguel County. D. Landowners have 3 options to participate in this pilot program (please circle one choice - either 1, 2 or 3) -

1. Landowner already possesses a USDA Farm ID#; 2287
2. Landowner is in the process of obtaining a USDA Farm ID#;
3. Landowner chooses to opt out of either possessing and/or obtaining a USDA Farm ID#, which may then make the Landowner ineligible for future federal funding.

IN CONSIDERATION, of the promises and obligations set forth herein, and other valuable consideration received, the receipt and sufficiency of which is acknowledged and accepted, the parties hereto agree as follows:

I. **Grant of Land Access License and Plan for Eco Remediation:**

A. **Grant of Land Access.** Landowner shall grant to SMC a revocable and non-exclusive license to the duly appointed SMC administrator, agent or employee of the program, permission to enter ("**Access**") upon the Landowner's property (the **"Property**") located within San Miguel County boundaries, as described in **Exhibit "A",** for the purposes of administering a program that has been mutually agreed to between the parties for the beneficial uses of Landowner, all of which is set forth on **Exhibit A ("Land Use Plan")**. The parties, by entering into this Agreement, understand, acknowledge and agree that the terms and conditions of the Land Use Plan, and the payments thereof made by SMC, are material in nature, and that following the terms and conditions thereof, are critical for purposes of this Agreement. At all times the Land Use Plan shall be monitored by SMC, provided such monitoring and access does not interfere with Landowner's uses and rights of the Property.

B. **Compensation.** As consideration for the Landowner entering into this Agreement, SMC will pay the Landowner the amount of __$5,868__ for the use of the Landowner Property, and effective management and operations by the Landowner in conformance with the Land Use Plan. Payments by the SMC

administrator shall be in conformance with dates and deadlines and other scheduled visits by SMC with the Landowner to confirm consistency with Land Use Plan objectives. Upon completion of a scheduled visit and satisfactory compliance of Land Use Plan objectives, SMC shall release payment of funds to the Landowner. Please note that based on current SMC 2022 funding, a payment cap of $12,500. will be instituted for each participant to allow more landowners the opportunity to take part in SMC's PES program. If excess funds exist after payments are made, they may be used to compensate landowners beyond the cap if their contracts are worth more than the $12,500. figure.

C. **Verification by SMC Personnel.** Landowner and SMC shall meet in accordance with the deadlines of the Land Use Plan, to ensure goals and objectives have been met and data requested properly collected. In the event Landowner and SMC personnel have a dispute as to objectives and deadlines of the Land Use Plan and completion of tasks, the parties shall meet and confer as to the establishment of new deadlines to meet goals and objectives of the Land Use Plan and agree to payment of funds within the amendment to the Land Use Plan.

D. **Collection of Data.** In exchange for entry into this Agreement, the Landowner agrees to provide any and all necessary data, regarding soil conservation practices, irrigation, seed samples, farm practices or other such metrics as may be required and requested to SMC personnel for land use studies. SMC covenants and agrees that data collected will be for the sole use of SMC and shall not be shared with any third-parties without the consent of the Landowner. The data collected by the project will be shared with the Landowner who will be free to keep the data private or share this data with anyone of their choosing. However, the landowner should understand that SMC is subject to the Colorado Open Records Act, C.R.S. Title 24, and Article 72 Part 2 and will endeavor to respect the confidentiality of the landowner's project data but can't guarantee that such data is not subject to disclosure under applicable Colorado law.

(i). Landowner may choose to keep information about their property and operations private by initializing here _____. If not, SMC may use the information in general outreach and results reporting. All data collected may be used by SMC for reporting, however, if the landowner wishes to remain anonymous data will be used, but not published in conjunction with any landowner information.

E. **Term.** Terms of this Agreement shall be set forth for that period of time specified in the Land Use Plan attached as **Exhibit A.** Upon completion of the terms and conditions of the Land Use Plan, this Agreement shall expire and there shall be no further obligation between the Parties.

II. Additional Provisions:

A. This Agreement contains the entire understanding of SMC and the Landowner with regard to the subject matter above. Any change or amendment to this Agreement shall only occur by agreement between the Parties. No prior term, condition, promise, representation, or understanding regarding the subject matter of this Agreement shall be of any legal force or effect unless embodied in this Agreement or in a written amendment to this agreement, mutually agreed to by

both Parties.

B. SMC and the Landowner each reserve the right to unilaterally and immediately cancel this Agreement without cause, which cancellation shall become effective immediately upon a Party providing written notification of such cancellation to the other party at the Party's address set forth below. SMC shall make any payments due the Landowner pursuant to this Agreement within 45 days of the cancellation of this Agreement.

C. SMC's privileges under this License are personal to Landowner and shall not be assignable to other persons for other uses or purposes and may only be used by SMC and Landowner as its designee, for the specific purposes authorized in this Agreement and then only in the manner specified in this Agreement. Each signatory to this Agreement hereby warrants and represents that it is duly authorized and empowered to execute this Agreement on behalf of the Party it represents.

D. To the extent allowed by law, SMC and the Landowner do hereby mutually release and hold harmless each other, including any employee or agent work as SMC's designee under this Agreement, from any and all claims, liabilities, injuries, damages, complaints and causes of action at law or in equity, that arise from the negligent and/or reckless acts or omissions of the parties to this Agreement and/or their designees. Landowner shall hold harmless SMC from and against any liability of any kind of nature, including damage to crops, forestry, or other land uses associated with the Property, unless and except in the event such damages have been caused directly by the actions of SMC employees, agents, directors and/or officers.

E. For any dispute arising or related to the terms and conditions of this Agreement, the Parties first agree to enter into non-binding mediation to resolve the dispute. If mediation proves unsuccessful, the Parties may pursue litigation in San Miguel County, State of Colorado.

F. **Insurance.** At all times during the Term of this Agreement, Landowner shall maintain insurance coverage in the amounts necessary to cover damage to the Property for the actions and work contemplated by this Agreement, and the particular actions set forth on **Exhibit A.** SMC shall not be liable for any loss of the use of the Property, and any other such damages, including loss of rent, incidental and consequential damages, or any other such damage to the Property of any kind or nature except which is caused by the direct proximity of actions of SMC.

This Agreement is effective as of the date set forth above.

San Miguel County

By: _____

_____ (name and title)

Date: _____
Address: P.O. Box 1170
333 West Colorado Avenue, 3rd Floor
Telluride, CO 81435

Landowner

By: _____

Printed Name: _____

Date: _____

Address: _____

Telephone or Email _____

Exhibit "A"
Description of Property and Land Use Plan

Robbins Ranch

2023 Payment For Ecosystem Services Project

Summary

Robbins Ranch is a 120-acre, solar-powered farm, located northwest of Telluride, Colorado.
They raise organic grass-fed poultry, turkeys, layer hens and hogs, and tend to a 1.5-acre bio-intensive vegetable garden.
Love of place and a deep concern for the soil and the health of all creatures — from micro-organisms
to humans — drive their passion for regenerative agriculture and local food sovereignty.

Owners Sarah and Tom Robbins have operated Robbins Ranch for 20 years and have embraced a regenerative approach to land management throughout the period of operation. Robbins Ranch serves as a model for other producers in San Miguel County and we are fortunate to have it as a part of our program in 2023.

Supporting Documentation

USDA Farm ID	0
IRS W-9	*W-9 is on file with SMC*
Operating Plan	*Developed June of 2023*
Contract Term	**2023**

Practices

Robbins Ranch has implemented the following practices as a part of their land management philosophy.

Practice	Practice Name	Acreage	Plot ID	Description of Area Managed
342	Critical Area	0.86 acres	1	Restoration of an old stack
528	Prescribed	63.21 acres	2a-2f	Dedicated irrigated pasture where rotational grazing occurs and intensive grazing
590	Nutrient	5.82 acres	3a, 3b	Non-irrigated pasture where chicken broiler manure is applied rather than
612	Tree/Shrub	3.13 acres +	4a, 4b	Location is in northwest and southcentral portion of the property where grassland

Payment Schedule

The following payment schedule applies to the 2023 Land Management contract between Robbins Ranch and San Miguel County.

Practice	Practice Name	Acreage/Unit	Plot ID	EQIP Payment/Unit	SMC Bonus	Total Payment
342	Critical Area	0.86	1	$443.77	$221.89	$572.46
528	Prescribed	63.21	2a-2f	$24.64	$12.32	$2,336.24
590	Nutrient	5.82	3a, 3b	$219.62	$109.81	$1,917.28
612	Tree/Shrub	3.13	4a, 4b	$183.62	$91.81	$862.10
612	Individual	100	3a	$1.20	$0.60	$180.00

TOTAL 2023 PAYMENT			**$5,868.08**
Payment 1	Upon contract execution	40% of total	$2,347.23
Payment 2	Upon mid-season review of operations	40% of total	$2,347.23
Payment 3	At year end	20% of total	$1,173.62

COMET-Planner Report: Approximate Carbon Sequestration and Greenhouse Gas Emission Reductions

Project Name: Robbins Ranch

State: Colorado

County: San Miguel

Date: 2023/6/30 14:57:17

NRCS Conservation Practices	Acreage	Carbon Dioxide	Nitrous Oxide	Methane	Total CO2 Equivalent
Restore Highly Disturbed Areas by Planting Permanent Vegetative Cover	0.86	1	0	N.E.**	1
Grazing Management to Improve Irrigated Pasture Condition	63.21	5	10	0	15
Replace Synthetic N Fertilizer with Chicken Broiler Manure on Managed Non-Irrigated Pasture	5.82	0	0	0	0
Conversion of Grasslands to a Farm Woodlot	3.13	85	N.E.**	N.E.**	85
Totals	73.02000000000001	91	10	0	101

*Negative values indicate a loss of carbon or increased emissions of greenhouse gases

**Values were not estimated due to limited data on reductions of greenhouse gas emissions from this practice

For more information on how these estimates were generated, please visit www.comet-planner.com.

Practice 342: Critical Area Planting

Plot 1 (old stackyard)

Purpose:

Plot 1 was revegetated in order to:

- Rehabilitate and revegetate degraded sites that cannot be stabilized using normal establishment techniques.

Criteria:

Plot 1 was previously a stackyard used to store hay and subsequently became a dryland area, which created physical conditions that prevented restoration and stabilization under normal establishment techniques. Over the last fifteen years Plot 1 has been revegetated with native grasses and legumes in order to rehabilitate the site. In the fall of 2020, alfalfa and ryegrass were planted as well. On occasion, layer hens have been intensively run on Plot 1 in order to improve soil health by mixing in the planted seed, aerating the soil, and adding nutrients through manure deposition.

Operation and Maintenance:

Since native species were planted, this plot has received passive management so as not to disturb wildlife and habitat areas. Over the past 15 years, the landowners have observed the conditions of the plot and planted more grasses, or allowed layer chickens to graze as needed. Plot 1 will remain fallow during 2023 to continue recovery and regrowth. Future management plans for Plot 1 parallel the historic land use pattern, and it is anticipated the site will return to seasonal grazing uses with complementary overseeding as site conditions warrant.

Practice 528: Prescribed Grazing

Plots 2a, 2b (multi-species grazing)
Plot 2c (cow pasture)
Plot 2d (intensive cow rotation)
Plots 2e, 2f (chicken grazing)

Purpose:

Prescribed grazing has been used on Plots 2a-f to achieve the following:

- Improve or maintain desired species composition and vigor of plant communities
- Improve or maintain quality and quantity of forage for grazing and browsing animals' health and productivity

- Improve or maintain surface and/or subsurface water quality and quantity
- Reduce accelerated soil erosion and maintain or improve soil condition

Criteria:
Plots 2a and 2b have been determined to be multi-species rotational grazing. Animal species include chickens, pigs, goats, and horses, which graze the area sequentially in order to manage different plant species. As these animal species have varied diets and prefer different plant species, they graze the area separately, allowing farmers to manage the plant growth and regeneration in the area. The land is in a period of deferment from October-April, when no animals are grazing. In this way, the farmers follow criteria to *"manage kind of animal, animal number, grazing distribution, length of grazing and timing of use to provide plants sufficient recovery time to meet planned objectives."*

Plot 2c is an area of flood irrigated land where 200-250 cows graze free-range from Thanksgiving to January. This area is managed more passively, with no intensive high-density grazing. Cows on both Plot 2c and 2d will have access to a pond to provide drinking water during their occupancy.

Plot 2d is set to receive rotational intensive cow grazing. In the future this will occur in the spring, before irrigation is turned on and when plants have grown from moisture acquired from winter snow melt. This year, the prescribed grazing has been delayed to the fall, assuming there is enough rain to allow the plants to grow a reasonable amount. The 4.31 acre area will be split into five 0.5-1 acre sections, with 50-75 cows grazing each section for one day before moving on to the next. The goal is to have fifty thousand pounds of cow per acre of land, which will create the proper density to graze the area and provide adequate manure to increase nutrients in the soil. Following this period of intensive grazing, cows will be moved off the land and Plot 2d will be in a period of deferment for 6-9 months, allowing plant regeneration. Through these techniques, Plot 2d fits the criteria that "*plants shall be managed by using livestock to have grazing intervals and alternating rest periods for the plants to maintain forage in a vigorous vegetative state at its optimum nutrient value for the animal category."*

Plots 2e and 2f have intensive rotational chicken grazing, using mobile chicken tractors. This technique allows layer hens to graze the areas as needed, which allows the livestock to control pests such as grasshoppers and manages the plants and forage.

In all of these areas, "*duration, intensity, frequency, and season of grazing will be applied to enhance nutrient cycling by appropriate manure distribution and nutrient uptake."* Soil tests have been done in Plot 2d, a portion of Plot 2c and are expected to be done in one of the multi-species plots as well.

Practice 590: Nutrient Management

Plot 3a (garden area)

Plot 3b (chicken grazing)

Purpose:

Plots 3a and 3b are managed to meet the following goals:

- To properly utilize manure, municipal and industrial biosolids, and other organic by-products as plant nutrient sources
- To maintain or improve the physical, chemical,and biological condition of soil.

Criteria:

Plot 3a is the garden area, which receives compost application to improve soil health. The compost applied to the area includes organic waste matter from crops and livestock, all of which is produced on site. Detailed results of soil tests can be found in attached documents. The carbon:nitrogen ratio of the compost is 25:1. The home-grown compost is applied manually and then incorporated into the soil using a rototiller, which increases nutrient uptake and decreases nutrient loss through runoff.

On Plot 3b, animal manure is the primary source of nutrients applied to this landscape. Layer chickens are free-range on this plot, providing manure to increase nutrient content of the soil and improve its overall biological and chemical condition.

Practice 612: Tree/Shrub Establishment

Plots 4a, 4b (woody tree planting)

Purpose:

In Plots 4a and 4b, and in part of Plot 3a, woody plants have been planted in order to

- Maintain or improve desirable plant diversity, productivity, and health by establishing woody plants.
- Create or improve habitat for desired wildlife species compatible with ecological characteristics of the site.
- Control erosion.
- Improve water quality. Reduce excess nutrients and other pollutants in runoff and groundwater.
- Sequester and store carbon.
- Restore or maintain native plant communities.
- Provide for beneficial organisms and pollinators

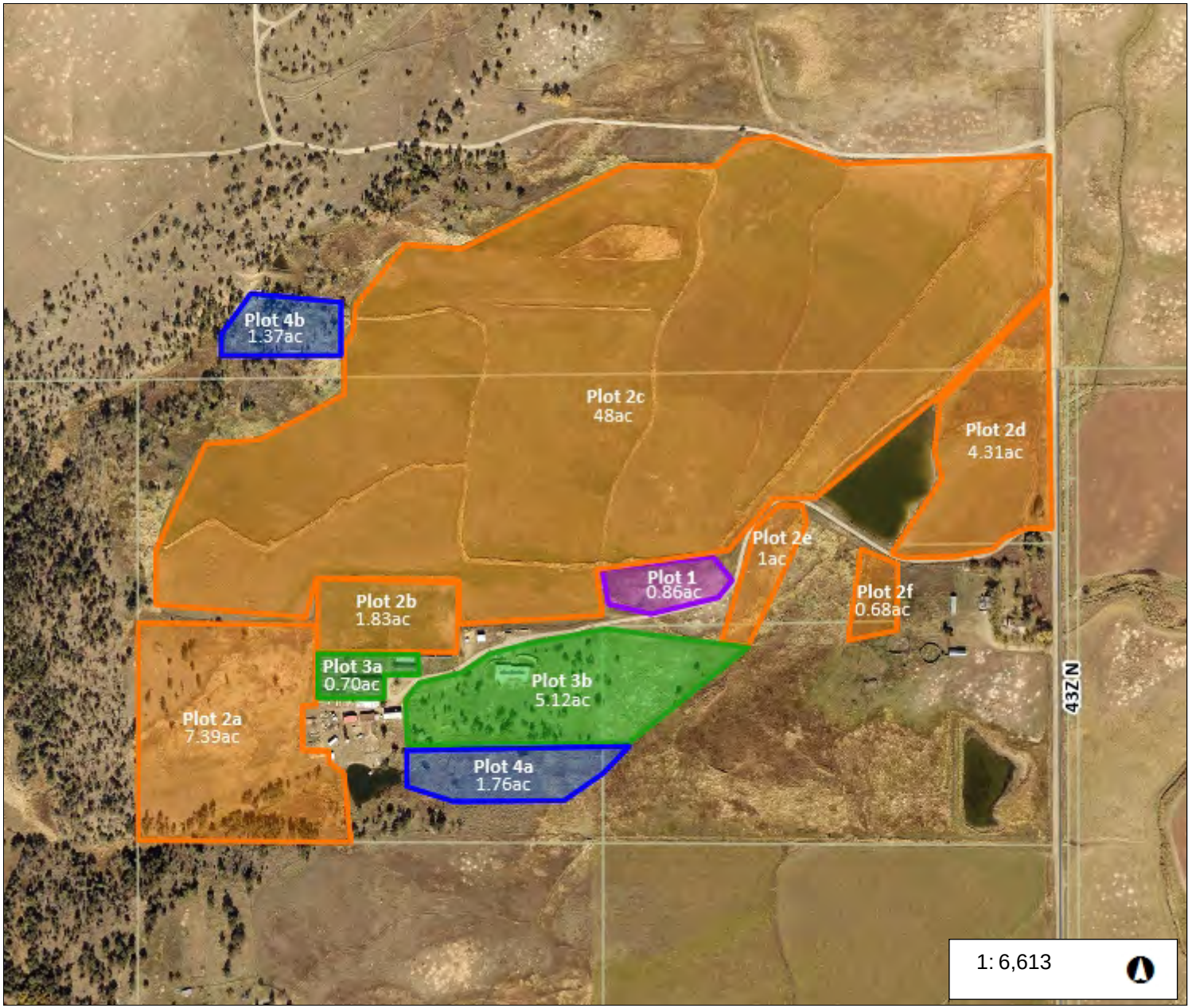
Criteria:

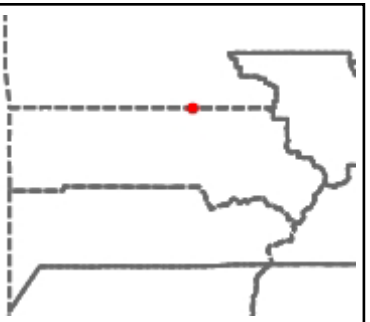
Prior to tree/shrub planting, plots 4a and 4b were sparsely populated by a few shrubs and trees, which qualifies it as an area “capable of growing woody plants.” Species planted in these plots include cottonwoods, dogwoods, lilacs and caragana, which provide a “diverse mixture of legumes and forbs to support pollinator habitat.” These plants also provide habitat for many bird species and their root systems reduce soil erosion. Overall, these trees and shrubs were planted to “*accomplish or supplement forest stand regeneration in locations where natural regeneration of desired species is not possible, or will not meet objectives.”*

In Plot 3a, 100 perennial woody plants were transplanted into one section of the garden, and will be permanently placed on the property later in the season. These were small, individually-planted trees, and included hackleberry, honeylocust, sumac, and red cedar.

San Miguel County, Colorado
Map Viewer

Robbins Ranch Land Use Plots





Legend

- Road
- County Boundary
- Town Boundary
- Tax Parcels cache

Map Generated
7/2/21 11:43 AM

Notes

0.2 0 0.10 0.2 Miles

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

www.sanmiguelcountyco.gov

B. Sample Soil Health Report

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Soil Report for Lands Owned/Managed by Sarah and Tom
Robbins Ranch October 2023

Introduction and Background

Robbins Ranch is a 120-acre regenerative farm located just outside of Norwood, Colorado. This includes a 1.5-acre vegetable garden and multiple pastures grazed by a variety of livestock including horses, goats, pigs, chickens and cows. Sarah and Tom have been participating in the PES program since 2021, and in August of 2022, soil samples were collected from this field, as well as another grazed field (2c), the garden and the compost pile.

A site visit at Robbins Ranch was conducted on May 18th, 2023 and soil health observations and data collections were made by the San Miguel County PES Program Manager, the Project Coordinator, and a Soil Scientist/Soil Health Technical Provider. In addition to soil sampling, describing a soil pit, and conducting a visual soil health assessment on Pasture 2D, a tour of some of the Robbins Ranch operations was given by owners Sarah and Tom. Robbins Ranch, in many observable ways, is operating at a high level of soil health applications and practices and is commended on being so engaged in sustainable agricultural applications on a number of agricultural land use operations. From livestock in the forms of cattle and chickens, to greenhouse management, composting, fruit trees, and perennial and annual gardening, the tools, management, and integration of the various facets of this operation show a dedication and commitment to soil health/sustainable agriculture and the highest level of land stewardship.

The current area of focus is Pasture 2D, a 4.3-acre flood-irrigated field on the east side of the property that has been managed using intensive rotational cattle grazing. The plan is to split the field into five 0.5-1 acre sections, with 50-75 cows grazing each section for one day before moving on to the next. The goal is to have fifty thousand pounds of cow per acre of land, which will create the proper density to graze the area and provide adequate manure to increase nutrients in the soil. Following this period of intensive grazing, cows will be moved off the land and this field will be in a period of deferment for 6-9 months, allowing plant regeneration. Sarah and Tom are interested in understanding the benefits and impacts of this high intensity, short duration grazing method and are using this field as an “experimental” plot. Vegetation in this field consists primarily of grasses and forbes.

Soils

The web soil survey report has the area in the project mapped as 82.3% Callan loam and 17.7% Haplaquolls, with the soil pit being located in the Callan loam zone. Callan loam soils are well drained and rated as 3e, meaning they have severe limitations that reduce the choice of plants or that require special conservation practices, or both. The main hazard for Callan loam soils is the risk of erosion unless close-growing plant cover is maintained.

Soil Profile

A soil pit was dug to 40 inches and described on the property and a box sample collected. Important features documented were a mollic horizon (0 to 10 inches) an argillic horizon (4 to 40 inches), and a calcic horizon (10 to 40 inches). The particle size control section for this soil was fine-loamy with 25% clay. The soil map unit originally mapped at this location was Callan loam. This soil observed in the soil pit was similar to Callan, the difference being that this soil had what appeared to be a buried horizon (based on clay content) and the finer soil horizons of the described soil were deeper than the soil series describes. It is mentioned that Callan has buried horizons in the official series description.

Soil Sample Report

Water Stable Aggregates - 63% - High - This was probably a result of the perennial vegetation. This measure is how well your soil is "glued" or "held" together.

Soil Respiration 183.2 - **High** - This is a measure of the living microbial activity in the soil (their breathing out) and is indicative of the carbon cycling nutrient cycling activity. This measure is somewhat qualitative in that it is greatly influenced by soil temperature and soil moisture. Field conditions at the time and date of sampling were within an optimum temperature range and moisture conditions were solid, which likely had a strong influence on the soil microbes ability to respond to a drying/wetting test. This,coupled with the fact that the soil sample was collected at the end of the growing season, probably had influence on this result.

Total Organic Matter - 6.2% - This is the percentage of the soil that is carbon (organic matter). Some organic matter is readily available while some forms of soil carbon are very stable. All organic matter positively affects such important soil properties such as nutrient holding and water retention. For every 1 percent organic matter in the soil there is approximately 11,600 pounds of carbon in the upper 6 inches per acre. So with an organic matter content of 6.2%, there is approximately 71,920 pounds of carbon per acre in the upper 6 inches of soil. There is also an increase in water holding capacity with organic matter of 20,000 gallons per acre with each 1 percent of organic matter. So with 6.2% organic matter, the soil moisture holding capacity is increased by 124,000 gallons per acre. For each one percent organic matter, the nutrient holding capacity of soil is increased by 4 to 50 times greater than the equivalent weight in clay.

Water Extractable Organic Carbon (WEOC) - 131 - Marginal (120-140) - This is the carbon most readily available for cycling by the microbes. What this indicates is that some of the

organic matter in this field is in a form not readily available for the microbiology to process. Dry soil conditions can contribute to lower numbers, causing plant growth to slow and plant exudates to lessen because there is not much need to feed the soil biology with the plants in a semi-dormant state. Another factor is soil/air temperature. Cooler temperatures result in slower plant growth and less exudate carbon (sugars) for the microbes. Sampling the end of August and not processing the samples till November might have had an effect on the microbial viability of the samples.

Microbial Active Carbon - 139.8% - High - Microbially active carbon or %MAC is how much of the WEOC pool was acted upon by the microbes measured as soil respiration. If this value is below 25% this tells you that WEOC (water extractable organic carbon) is probably not the factor limiting your soil respiration. Perhaps it is the soil's overall fertility, prolonged cold temps, or drought that is limiting microbial biomass. On the other hand, if the %MAC value is above 80% this might tell you that WEOC could become limiting to microbial respiration soon and your management focus should be on introducing more carbon into the system.Ideally, we would like to see a %MAC value between 50 and 75% for most production systems. This generally tells you that the soil has a good balance of fertility and WEOC to support microbial biomass, but you are not limited by your WEOC pool.

Water Extractable total Nitrogen - 51.2 - High (>30) - This represents the total readily active (readily processed by the microbiology) nitrogen in the system.

Water Extractable Organic Nitrogen - 6.5 - Low (<12) - The water extractable organic nitrogen or WEON represents the pool of organic N that is available to the microbes. Think of organic N as amino acids and proteins, which are linked to the carbon or food that the microbes are eating. Much in the same way we measure protein in the foodstuff for livestock, the Soil Health Assessment (SHA) is measuring the amount of protein available to the microbes. Nitrogen is needed to incorporate (build) the carbon into the microbes bodies. It is also needed by some species of microbes to trade for carbon from the plant.

Water Extractable Nitrate - 42.15 - High (>15) - These next two values represent intermediate forms in the nitrogen cycle that is available to plants.

Water Extractable Ammonium - 2.6 - Medium (1-3) - WEA came back as moderate.

Organic Carbon to Organic Nitrogen Ratio - 20.2 - Not balanced (>15) This is the balance between the WEOC and WEON. Organic C and organic N are intimately tied together, and both are required to help get the optimal function out of your soil system. A soil that has very high WEOC with little WEON has a lot of energy present for the microbes, but the quality or nutrition of that food is low. It is very important to note that there are a lot of different C:N ratios

discussed in agriculture. This particular C:N ratio is that of the water extract performed as part of the Soil Health Assessment (SHA). This ratio is not the same as the total C:N ratio of your soil or the manure or cover crop you are using or even the C:N ratio of the organic matter in your soil. Decomposition and breakdown by microbes reduces the C:N ratio of the starting material. For example, corn stover has a C:N ratio of nearly 60:1. On the other hand, the soil microbes have a C:N ratio between 10:1 and 12:1. If the corn stover is going to become part of the soil organic matter the microbes have to break it down to a ratio of nearly 10:1. They achieve this by converting carbon in the corn stover into microbial biomass and by releasing most of the carbon as CO2 (remember soil respiration). The water extract on the SHA is measuring part of this transitional process between the initial breakdown of residues and the product of more stable SOM. The higher the starting C:N ratio generally the longer it takes to accomplish this goal. This is one reason why high carbon crop residue lasts longer in your fields than low carbon residue. We can use lower C:N ratio inputs such as manure and legume/brassica cover crops or perennial legumes to help speed this process.

Laboratory Soil Health Score - 18.79 - Marginal (10-40) - The soil health score is a calculation of soil respiration, WEOC, WEON, and water extractable C:N ratio measured by the SHA. The score provides the producer a quick reference regarding the health of a soil compared to other soils under different management systems. The score can range anywhere from zero to 50, but most soils do not score higher than 30. We like to see the score above 11, but 11 is simply a starting point. Poor soil health soil is an often-tilled soil with a very narrow crop rotation while a good soil health is relatively undisturbed or native soil with a lot of diversity. It is likely that the time lapse between field sampling and laboratory analysis (Aug.vs Nov.) played a part in some of these readings and scores. It is suggested that sampling be done during the summer and lab analysis be done shortly after, to get a better handle on the functionality of this soil-veg system.

Phosphorous (P) - 58.9 - High (>25) - Phosphorus availability is strongly influenced by pH. The ideal pH for available phosphorus is around 7.0. With a test pH of 7.2, there aren't any limitations on readily available P.

Potassium (K) - 293 - High (>160)

Micronutrients - calcium, sulfur, zinc, iron, manganese, copper - all high

Visual Soil Health Assessment - A visual soil health assessment was completed. This assessment came out with a soil health score of 79 out of a possible 85. The lowest score was for earthworms (1 out of 5).

Soil Health

Historically, soil has been viewed as an inert medium necessary for plant root growth and to hold nutrients. As the understanding of soil microbiology continues to expand, the importance of soil biology and the influence it has on nutrient availability, soil structure, and crop yields has led to an emphasis on understanding and implementing positive soil biological practices. Integrating our understanding of the physical, chemical and biology components of soil has led to the promotion of "soil health". This approach highlights the relationships between all three of these aspects of soil and provides guidelines for soil management and improvement. Soil health has emerged as a concept that emphasizes the need to adequately assess the biological, physical, and chemical functions of the soil, with an overall goal of guiding producers' management decisions towards achieving increased productivity, resilience, and other agroecosystem services. Soil health indicators are useful tools to assess the interaction of these three components and the functioning of the carbon cycle within the topsoil ecosystem..

Plants are the start of the carbon cycle on the planet. The ability to absorb light energy, in combination with carbon dioxide (CO2) and water, creates sugar to fuel the growth and production of the plant while releasing oxygen (O2) as a byproduct. As the roots of a plant grow and expand into the soil environment, soil roots and hairs release complex carbon compounds to aid in defense from pests and disease, fight invasive plants, and stimulate the microbial community to scavenge nutrients from the soil. Plants can release up to 40-60% of the carbohydrates created through photosynthesis to cultivate soil microbes in and around the root, known as the rhizosphere. Although research indicates that plants can release as least 90 different compounds, three major compounds have been identified: citric acid, malic acid, and oxalic acid. Each plant releases the carbohydrates necessary to create a suitable microbial community that will scavenge and release vital nutrients necessary for the continued growth of the plant. This symbiotic relationship can continue throughout the plant's life cycle and a healthy, established microbial community can easily adapt to the next plant's needs. The evaluation of the physical and biological properties is often overlooked. The biological, physical, and chemical characteristics of a soil are intertwined; impacts on any of these characteristics will impact the others. Soil biological properties are related to nutrient cycling, soil aggregation, soil stability, and soil water fate. Soil physical properties are also related to nutrient cycling, soil structure, and soil water fate. Soil chemical properties are also related to nutrient cycling as well as optimum growth conditions for microbes. Healthy soils are productive, high performing soils that depend on an active, diverse community of microbes to help efficiently cycle nutrients in the soil. If proper nutrients in the soil are maintained, production costs can be decreased, and profits improved. Above all, healthier soil can help produce healthier, more nutrient dense food.

The topsoil of our planet is the most symbiotic ecosystem on the planet. It is estimated that over ⅓ of the living species on the planet live in our topsoil ecosystem. Yet, to date, it is estimated that we have only identified 0.1% of the species. However, we are making progress in understanding the functioning of this topsoil carbon cycling system. As we understand how the system works, we can develop tools and practices to manage the soil carbon system to benefit our and our planet's needs.

Soil Health focuses on the whole system, with emphasis on the below ground carbon cycling system. This system functions through the symbiotic interchange of plants-soil biota and the cycling of plant remains. Soil Health is simply the management of this carbon cycling system, using the soil health principles as a framework to develop soil health tools to address your soil-plant carbon cycling system's needs. A healthy soil carbon system provides the strong backbone needed to base your production needs, from growing a garden, to production agriculture. From natural range systems to intensive farming for specialty crops, your healthy soil carbon system is the means for long-term, economically viable, environmentally conducive land use. Soil health insures long term sustainability for you the steward of your land and a healthy product for those who partake of the soil resource you manage.

Soil Health Principles

Soil health principles have their origin in nature. They are fundamental to understanding how our soil ecosystem is impacted by natural and man-induced occurrences/practices. The closer we come to nature or imitating nature within these SH principles, the less inputs that will be needed to maintain our soil-veg system. With the exception of livestock integration, the rest of these principles can pretty much be found wherever there are living soil-plant carbon systems. These principles provide reference to the practices we implement as we use the soil. Soil health is positively impacted when we positively impact one or more of these principles. Conversely, soil health is negatively impacted when our practices detract from one or more of these principles. There are times in our management when our management needs dictate that we use negative impact soil health practices. However it is important to keep in mind the soil health principles in order to maintain and/or regenerate our soil resource now and into the future.

1) **Keeping the ground covered**

This principle of soil health focuses on keeping the topsoil in place and the water for the plants. Continuous removal of crops, lack of a cover crop or improper rotation, overgrazing, over-use of man-made chemicals and baling crop residues exposes the surface of the soil to the sun, wind, and water. Bare soil quickly absorbs heat from the sun, which in turn increases soil temperature and evaporation rates. Lack of moisture allows soil particles such as silt and fine sands to be easily suspended by the wind and carried long distances in a dust cloud. In turn, other soil particles can bounce along the surface, dislodging other surface soil particles. Larger particles roll across the surface until the wind slows or encounters a larger object. Rain is equally as destructive. The force of a raindrop can strike the surface of the earth at speeds of 20-50 miles an hour. This force easily dislodges soil particles and destroys exposed glues that are important for soil aggregation. Smaller soil particles such as clay and silt then go into suspension, removed from our management system, and end up being transported by water into our surface water systems. Loss of aggregation decreases the amount of large pore spaces and allows dislodged clay and silt particles to clog pores. As the rain strikes the earth, the smaller soil particles clog

pores and seal the surface of the soil, preventing infiltration and increasing surface runoff. By continuously providing cover or "armoring" the soil surface, the impacts of the sun, wind, and water can be lessened. The presence of plants, both living and dead, reduce the impact of rain on the soil surface and absorb energy from the wind while capturing suspended soil from the air. In addition, covering the soil prevents the sun from reaching the soil, helping to maintain a moderate range of temperatures that is beneficial for microbial life and to maintain soil moisture. Another benefit is that weed seeds have limited sunlight which is necessary for establishment. In addition, crop residues act as an important food source and habitat for microbial life. As microbes break down residues, nutrients are converted and consumed and will be released for future plant use. In addition, keeping the ground covered makes for more efficient water use. Minimizing evaporation and maximizing transpiration makes the most efficient use of our limited water resources by activating the photosynthetic response in plants and efficiently producing our desired managed vegetation.

2) **Minimize disturbance**

Minimizing disturbance is an important part of soil health. Nature tries to minimize disturbance with the exception of a few burrowing animals. Soil disturbances sets nature's successional stage back. It also makes the soil surface more susceptible to erosion, temperature fluctuations, evaporative moisture loss, and carbon/nutrient loss.

Continuous tillage is one of the more detrimental soil practices. Tillage destroys surface soil structure. Tillage reduces and removes pore spaces, restricting water infiltration and destroying the substances that hold the soil together, leading to increased erosion potential. In addition, tillage increases the ponding of water because of reduced infiltration, depletes organic matter and allows soil to crust over and inhibit plant emergence. Tillage also has a detrimental effect on the soil microbiology, significantly reducing numbers and species of microbiota. Tillage has a severe impact on mycorrhizal fungi, an important contributor to soil health and soil-veg relationships. Continuous tillage can reduce the microbiologic function by upwards of 90%. Reduced microbiologic function contributes to reduction of nutrient density in crops.

The majority of carbon loss to the atmosphere in agricultural production comes from tillage. However, it should be noted that there are times in production management where tillage is a needed tool. If tillage is necessary, it would be a good time to consider soil additives such as compost/manures for incorporation while disturbing the soil.

3) **Keeping a living root**

Keeping a living root is another important soil health principle. Studies have shown that within 2 mm of a living plant root there are 10,000 times more bacteria present. Studies have also shown that a plant produces upwards of 40 percent or more of its carbon to feed microbes. The microbes exchange nutrients and water with the plant for food (carbon). Keeping a living root in the soil allows this symbiosis to continue for extended periods, keeping microbial systems in tack. This principle can be enhanced by perennial species, which exist as living plants in the

soil year round. In production agriculture, where there is a preponderance of annual plants grown, a mixture of cover crops can be grown to extend the living root beyond the life cycle of the cash crop.

4) **Plant diversity**

Nature doesn't like monocultures. Diversity above ground supports diversity below ground. Some of the soil microbes depend on carbon root exudates from plants. In a polyculture system, the soil microbes are receiving food from multiple different species. In contrast, in a monoculture system the soil microbes are now receiving exudates from one annual plant at a time. This is equivalent to humans eating the same food for every meal every day for approximately 60-100 days. Diverse vegetative communities interact with the microbiology and with other plants even of different species through the mycorrhizal fungal network. Diversity builds in resilience to the overall vegetative community, reducing pest and disease pressures. Different plant species are hosts to different microbial species. Different plants also have different nutrient and water requirements. Different plants also hold different niches in the ecological soil-veg system. Diversity helps to maximize ecological functioning and productivity. In cropping systems we can begin to mimic the original plant community by adding crop rotations that include all 4 crop types. Diverse crop rotations provide more biodiversity, which improves water infiltration and nutrient cycling and reduces pests and diseases

5) **Integration of livestock**

Livestock integration is the fifth soil health principle. Most commonly livestock integration is thought of as grazing animals. But this concept also includes other above ground organisms such as bees or birds, both valuable livestock for pollination and insect control. This also includes below ground livestock such as earthworms and a myriad of other valuable soil-veg dependents that perform crucial roles in soil nutrient cycling. Below ground livestock can be upwards of three to five thousand pounds of biomass per acre. Grazing animals are especially important in forage systems, especially in grassland systems. Improper grazing management has been a contributor to diminished functionality of many forage ecological systems here in the west. Proper grazing applications in these forage based systems that mimic past natural grazing patterns can be used to enhance these systems and improve production quantity and quality. Grazing areas at specific times, along with rotational herd management, allows forage species adequate recovery time. Mob grazing, as mimicking roaming buffalo herds, applies a more even approach to grazing, preventing grazing animals from targeting and putting detrimental pressure on preferred plant species.

Summary/Suggestions

For summary purposes, unless indicated otherwise, consideration is only for the Pasture 2D. Based upon the soil health sample data and calculations for this field, there is probably good available carbon in the soil-veg system. Organic matter of 6.2% is a high number for the area/soils. Based on the soil tests, it appears that much of the carbon is adequately available for use by the soil microbial system. There also was good available phosphorus. Nitrogen values were a bit jumbled, possibly caused by the sampling date. Overall nitrogen appeared to be adequate, though the Organic C to organic N ratio was out of balance. This may also be influenced by the time of year the sample was collected. It is suggested that soil sampling be done annually nearer the middle of the growing system. If it is desired, N could be added to the system. Some of the suggested practices that follow may already be in place within the Robbins Ranch management plan for this pasture.

Adding nitrogen to the system can be achieved in a couple different ways or with some combination of the practices. The first possible way is to apply commercial fertilizer. This is probably the simplest. However, there are some downsides. Applying N in this manner would likely result in this N only being available for this growing season. Also, applying commercial nitrogen fertilizer can have detrimental effects on soil biology. Anhydrous ammonia has been shown to kill soil microbiology. Significant amounts of commercial N can also negatively affect plant microbe relationship and functioning. Another way to apply N would be to apply compost. Composting amounts could be determined by getting an analysis done on the compost source and then calculating application rates to meet N requirements. The same would apply to compost teas or inoculants if one of these methods are desired. Another organic nutrient source (humates) that could be considered is a product called Richlawn and is available through Steve Hale (970-209-0126) and a company called Ferguson.

Based on the soil sample report, probably the most likely tool to utilize at this time, which would take time to develop, would be to seed legumes into the vegetative community. This could be accomplished long term by seeding perennial legumes. Some kinds and varieties to consider for irrigated pastures in this area would be Cicer milkvetch, red and white clover - variety ladino (this is a taller variety of white clover that would be better able to compete with taller vegetation), Bird's Foot Trefoil and alfalfa var Ladak.

Suggested legume mix would include 70% alfalfa, 5% birds foot trefoil, 5% red clover, 10% white clover, 10% milkvetch. Species-specific inoculants should be added to the seed at planting.It is suggested that if seeding legumes, maybe an additional grass species be included in the mix. A species to consider would be Meadow Brome var. Cash. The Meadow Brome is more drought tolerant.

Seeding can be done in the fall if there is moisture available or in the spring shortly after snowmelt to facilitate seed germination and startup. Seeding timing considerations should be given to species requirements in the mix. Applications of commercial fertilizers should be done in the spring. Other forms such as compost, compost teas, inoculants, or the rich lawn product may be done in the fall or spring. Seed mixes can be developed by consulting a seed mix company, such as Green Cover seed. They have an online cover crop calculator and a

representative in Fruita, Colorado (Phillip Franks). Alternatively, consider contacting other seed companies specializing in perennials. If a seed mix is a desired tool, it is suggested that a portion of the property be seeded to see which species establish best. Doing this to 3 to 5 acres of this parcel at a time might be the best fit. It is suggested that this seed be incorporated into the soil with minimal disturbance. There are several ways to do this without major soil disturbance (tillage). A suggested tool would be to apply the seed using a no till drill or strip till drill. Steve Woodis will be a useful contact and can be reached at 970-901-4550. Steve is also a good source for seed mixes.

The crucial part of this, besides timely application of seed, is livestock management. It is suggested that Sarah and Tom continue their present practice of mob grazing, using movable cross fencing. If interseeding is done, livestock should be utilized to overgraze a prescribed area to set back existing vegetation so that the new seed mix would be able to compete better with the existing vegetation. Grazing should then be deferred until newly seeded plants can become established. Deferment should be done for at least one growing season and if possible, two. In this case, if additional seeding is determined to be a desirable tool, dividing the field into several "paddocks" and spreading this process over several growing seasons might provide the best fit. Grazing management down the road is crucial to the continued vitality of the carbon system and probably would have the greatest long term impact of any suggested applications.

C. Practice Summary Table for Grant Objectives

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Practice	Conservation	Quality	Soil Health	Benefits	Language
Contour Buffer Strips (332)	X	X	X	X	the transport of sediment and other waterborne contaminants
Prescribed Grazing (528)	X	X	X	X	quantity // Improve or maintain riparian and/or watershed function //
Nutrient Management (590)		X	X	X	groundwater resources
Pasture and Hay Planting (512)		X	X	X	Reduce soil erosion // Improve water quality
Critical Area Planting (342)			X	X	wind or water // rehabilitate and revegetate degraded sites that can't
Mulching (484)	X	X	X	X	Improve the efficient use of irrigation water—insufficient water //
Tree/Shrub Establishment (612)		X	X	X	other pollutants in runoff and groundwater
Range Planting (550)	X	X	X	X	quantity // Restore hydrologic function
Cover Crop (340)	X	X	X	X	efficiency // Reduce water quality degradation by utilizing excessive
Information obtained from NRCS Conservation Practice Summary Sheets					

D. PES Presentation

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10TH ANNUAL WESTERN COLORADO SOIL HEALTH CONFERENCE

PAYMENT FOR ECOSYSTEM SERVICES

San Miguel County, CO

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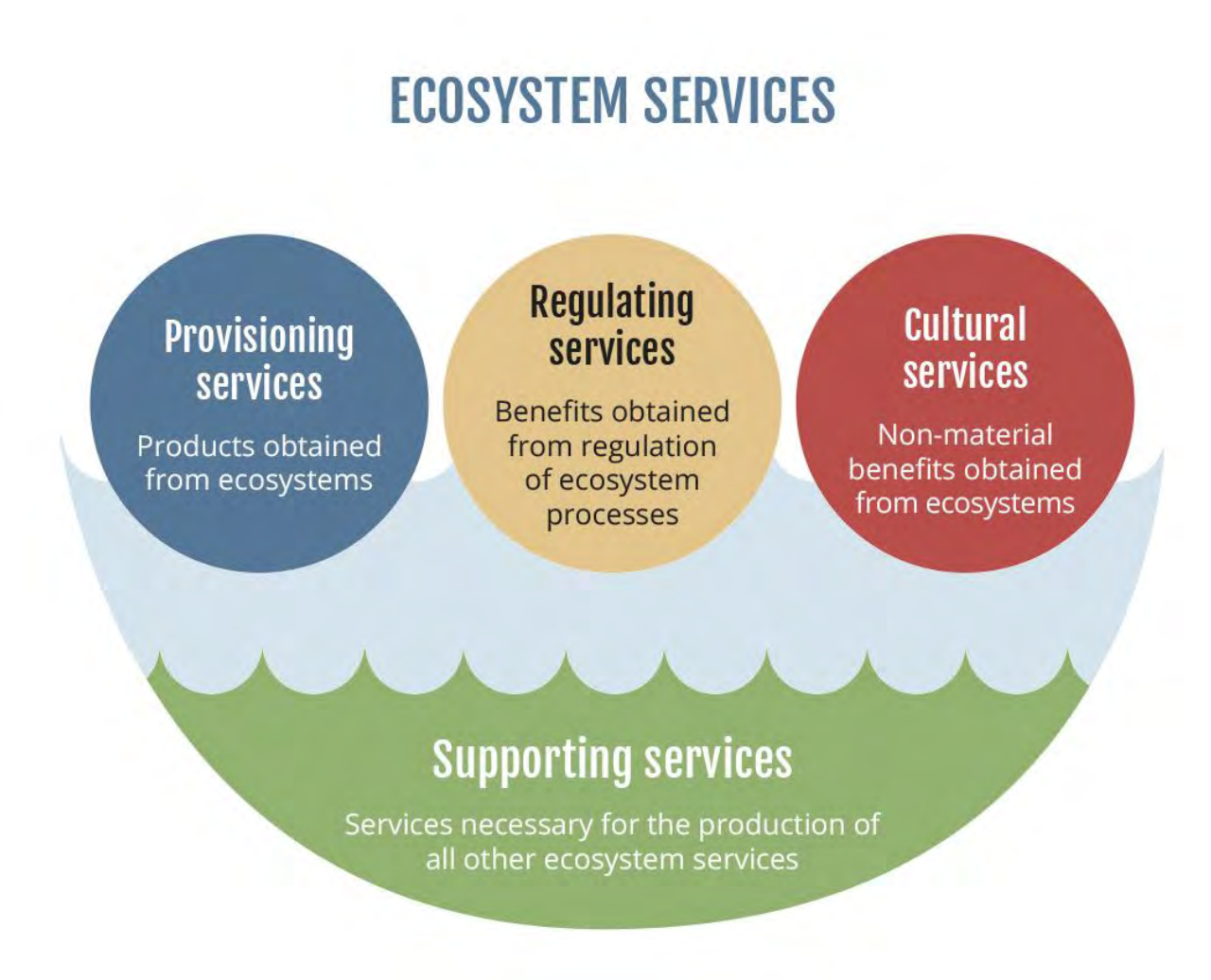
What are Ecosystem Services?

- Water
- Soil
- Carbon
- Wildlife
- Habitat



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SAN MIGUEL COUNTY PES PROGRAMS

PAYMENT FOR DEVELOPMENT RIGHTS

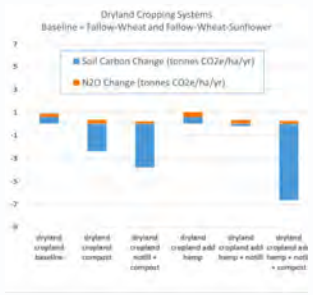
- Financial aid to offset the upfront costs of completing Conservation Easements on private property.
- Motivated by desire to preserve Agricultural and Ranching Heritage

ART GOODTIMES

- Grant from the Center For Collaborative Conservation to develop a pilot PES project compensating landowners for access for rare plant surveys.

SOIL AMENDMENT PLOT STUDY

- Voluntary participation was compensated in exchange for soil health surveys and soil amendment treatments on private lands.



GREENHOUSE GAS ASSESSMENT

- Established to quantify the baseline GHG on existing agricultural lands.
- Using baseline, project the GHG balance and opportunities

Expansion of Payment for Ecosystem Services Program

- Funding through CWCB Colorado Water Plan Grants Program for 50% of the project
- Replicable and Scalable program guidelines are desired deliverables
- Producers/Landowners will identify voluntary participation opportunities
- Incentives will encourage long-term participation
- Measurable results from implemented practices will ensure ecosystem benefits

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International Examples - China

At the core of the program is a Payment for Ecosystem Services (PES) mechanism, which rewards farmers for planting trees on sloping landscapes. To date, the country has spent more than 50 billion (USD) on the program, which includes cash incentives to 124 million farmers in 25 provinces.

Public Example - California

- Carbon offsets are a key part of California's cap-and-trade system, which sets a tightening limit on the amount of greenhouse gases that industries can emit.
- The system established specific standards for offset projects in oil refining, forestry, livestock production, rice cultivation, and coal mining, among other areas.
- To-date California has invested 11 billion in projects and programs through the Greenhouse Gas Reduction Fund.

Land Trust Example

- **Southern Plains Land Trust** – SE Colorado
  - SPLT's carbon credits are registered under the Climate Action Reserve's Grassland Protocol (projects CAR 1237, CAR 1238, CAR1299).
- **Marin Agricultural Land Trust** – Marin County, CA
  - As a part of the Marin Carbon Project (MCP) seeks to enhance carbon sequestration in rangeland, agricultural, and forest soils through applied research, demonstration and implementation in Marin County.
- **Thousand Islands Land Trust** – St. Lawrence River Valley, N.Y.
  - Forested lands are being protected to create corridors for wildlife migration across the International Border with Canada. Additional support is received from third-party donors seeking to offset their GHG output.

Private Example

- Sealaska Carbon Offset Project – Sealaska set aside 165,000 forested acres for 100 years to create a carbon bank. Sealaska receives carbon credits for allowing project lands to remain forested. Sealaska was issued carbon-offset credits through California's cap-and-trade program and will see income through the program for the next five years, but will reinvest the income so the benefits to shareholders extend for the 100 year period.
- Others: Blue Forest Conservation, Duke University

What else is happening?

Colorado

- Colorado Collaborative for Healthy Soils – Colorado Soil Health Program
- GAP Analysis – Colorado State Conservation Board
- Colorado State University – Center for Collaborative Conservation
- COMET calculation tool – on-line tool to measure the carbon capacity of different landscape types via GIS mapping.
- Delta Brick and Climate Company – “lemonade from lemons”

Federal Programs

- "FARM Bill" - The United States Department of Agriculture Farm Service Agency (FSA) oversees a number of voluntary conservation-related programs. These programs seek to reduce soil erosion, preserve/restore forests and wetlands and protect drinking water.

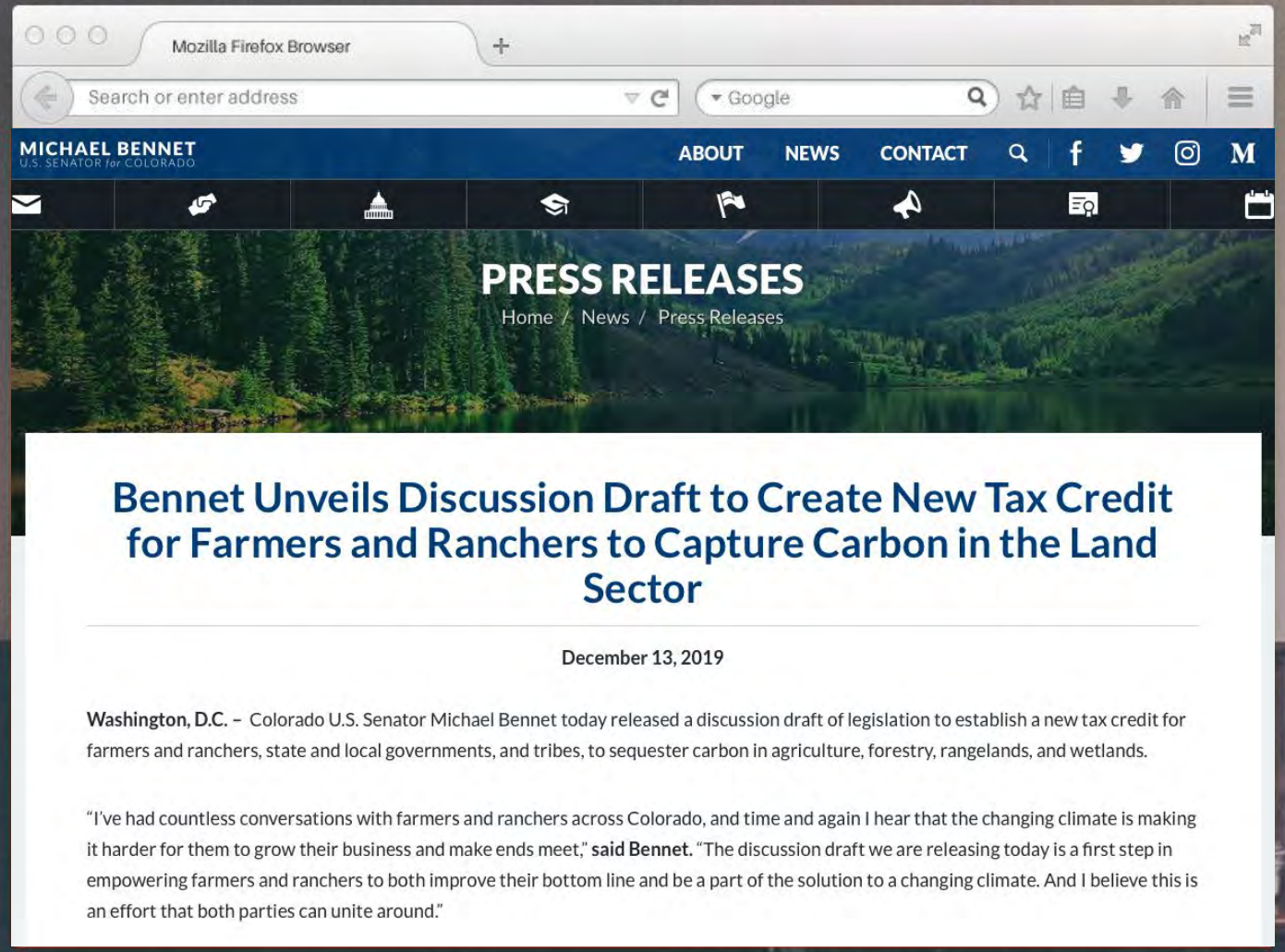
- USDA – Through USFS, NRCS, Office of Environmental Markets and the Economic Research Service, the USDA seeks to facilitate the participation of American farmers, ranchers, and forest landowners in environmental markets.

- NRCS – Efforts started as a part of the 2007 Farm Bill. Emphasis is on Environmental Markets and Conservation Finance. Our vision: ***"Developing new revenue streams and sources of private capital for agricultural producers and rural economies by attracting non-Federal funding to private lands conservation."***

Federal Proposal

Bennet sponsored discussion draft would:

1. Create a tax credit for up to 30% of the cost of enrollment in a program,
2. Create a dollar/ton rate for carbon sequestered



San Miguel County

Expansion of Payment for Ecosystem Services Program

Task 1 – PES Program Literature Review

Task 2 – Local Needs Assessment

Task 3 – PES Program Conceptualization

Task 4 – PES Program Establishment

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San Miguel County

Expansion of Payment for Ecosystem Services Program

- **Task 1 – PES Program Literature Review**

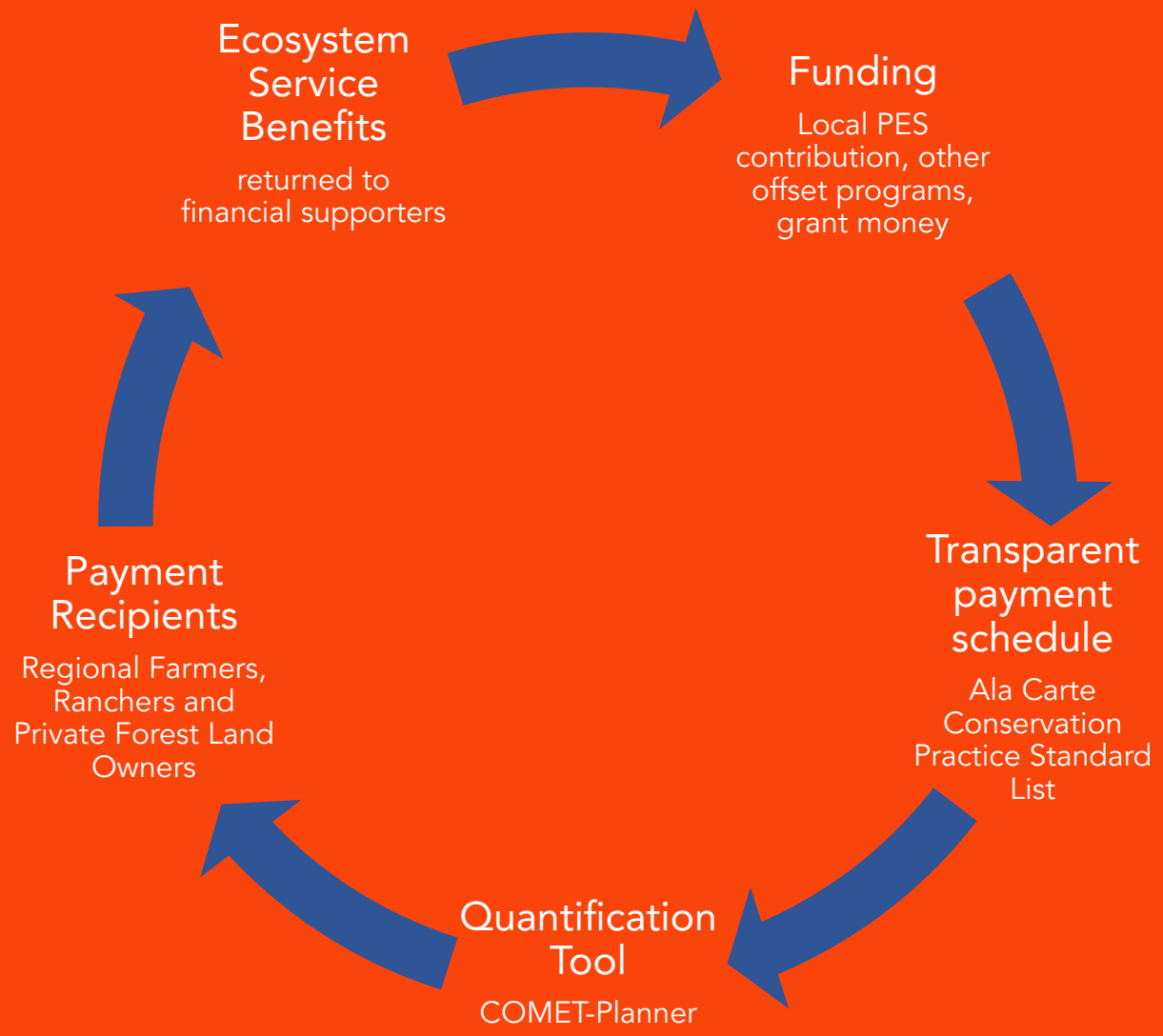
**Targeting end of March for "white paper" deliverable

- **Task 2 – Local Needs Assessment**

Outreach to stakeholder groups over next 30-45 days including Extension Agents, Water Companies, CO-OP groups and other "ad-hoc" committees

- **Task 3 – PES Program Conceptualization**
- **Task 4 – PES Program Establishment**

San Miguel County Payment for Ecosystem Services Tasks 3 & 4



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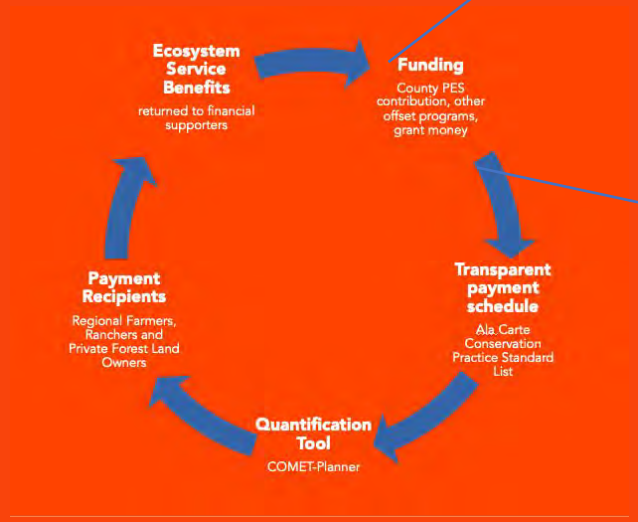
San Miguel County Payment for Ecosystem Services Tasks 3 & 4



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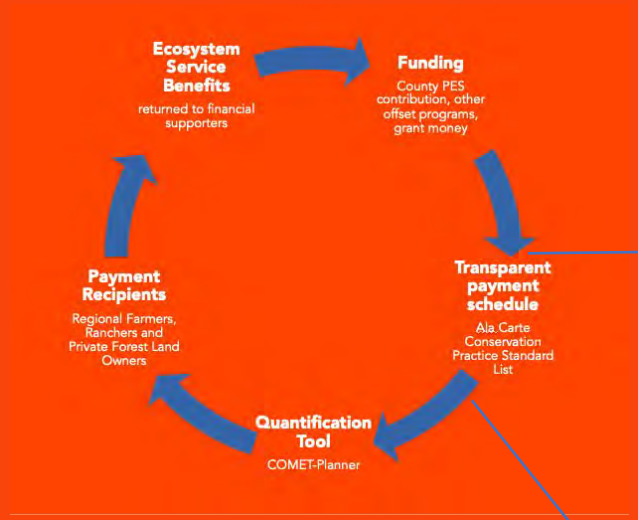
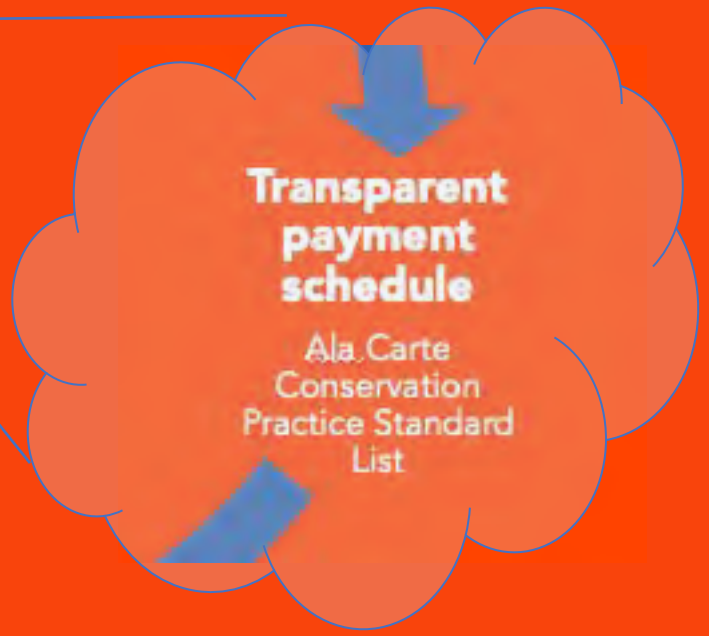
San Miguel County Payment for Ecosystem Services Tasks 3 & 4





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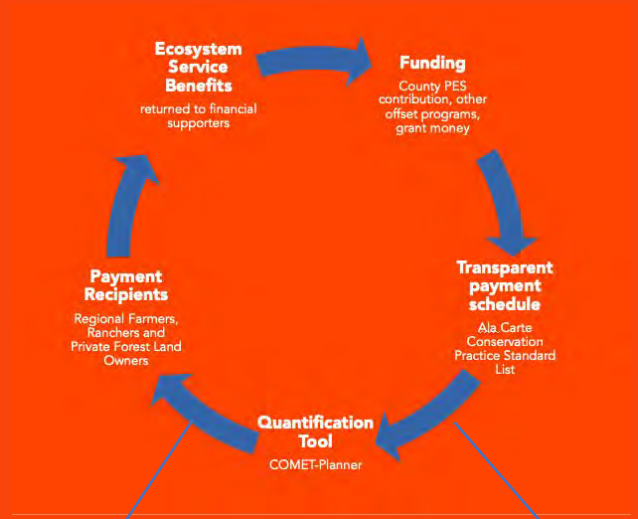
San Miguel County Payment for Ecosystem Services Tasks 3 & 4



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San Miguel County Payment for Ecosystem Services Tasks 3 & 4

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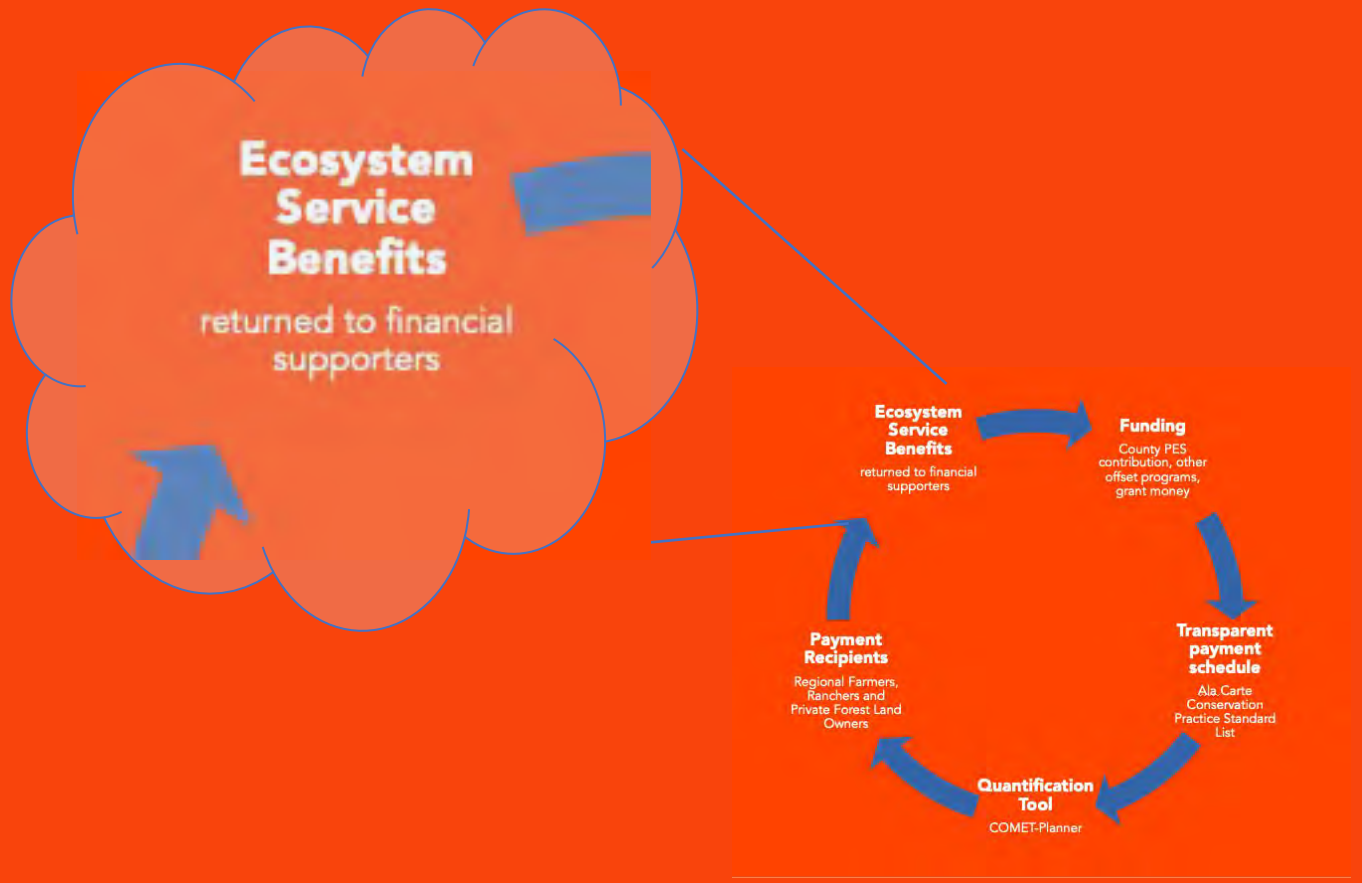

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Questions to Consider?

- Is there an appetite for this type of program?
- Where do the challenges and opportunities lie?
- What type of tools from Local, State or Federal Governments do Producers need to commit to this type of program?
- What niches can you identify where you might want to participate?
- Do you see this as a step towards long-term production and sustainability?
- Do you know of any neighbors participating in a similar program?

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