Methodology for Grazing in Vineyard Systems

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Version: 0.4

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1 Scope and Justification

The fundamental concept driving the implementation of Environmental Stewardship methodologies is that, for certain practices related to agriculture and natural resource management, there is sufficient science-based evidence indicating the practice will have a positive impact on ecosystem function and implementation of those practices should be supported to the extent possible.

This Environmental Stewardship methodology is designed to support the use of high-density, short-duration rotational targeted sheep grazing in vineyard systems to improve ecosystem functioning through active management of the soil and herbaceous cover in the vineyard understory. As with other Environmental Stewardship methodologies, the environmental benefits are implicit in the practice. Rewards are calculated based on the adoption of the practice under specific parameters outlined below. As such, this is not an outcome-based methodology. The goal of this methodology document is to define the practice and its constraints as well as outline how the practice will be verified. This document also specifies data collection requirements inherent in Environmental Stewardship methodologies to improve our knowledge of the outlined practice.

This methodology intends to encourage the adoption of high-density, short-duration rotational sheep grazing to improve soil and ecosystem health and collect data to improve our understanding of ecosystem health benefits from this practice. The methods aim to be straightforward to understand, and the project approval process will be relatively quick compared to methodologies focused on carbon sequestration. Credits derived from this methodology will be split to reward the grazers and the vineyard owners.

Research and a long history of practice have shown that planting appropriate ground cover between rows of perennial crops results in many benefits to ecosystem health, while introducing sheep grazing as a means to control vegetative growth (de Faccio Carvalho et al. 2021) may reduce pesticide, herbicide, and fuel use, decreasing mowing, and build soil organic carbon and soil fertility (Ryschawy et al. 2021, Schoof et al. 2021, Niles et al. 2017, Brewer & Gaudin 2020). Not all these benefits can be expected in every soil and climate type. For example, in Northern California, there are only early indications of soil carbon storage and increased nutrient availability shown to be significant benefits derived from grazing alongside other environmental benefits (Brewer et al., 2023).

2 Defining the Practice

This section defines the method parameters required to qualify for *ecosystem grazing credits* using this sheep grazing in vineyard systems methodology. Project eligibility, based on this section, is summarized in the project plan template in Appendix 1. The goal of implementing this methodology is to improve ecosystem functioning within a managed vineyard system. The primary indicator is sheep grazing activity. Potential co-benefits will depend on practice implementation and site-specific edaphic and climatic characteristics but may include:

1. Improved rates of nutrient cycling and nutrient bioavailability during active growing periods (i.e., active growing periods of understory vegetation between rows and/or active vine growing periods)
2. Improved nutrient retention during less active growing periods (i.e., during dry periods in between vineyards rows and/or dormant vine periods)
3. Reductions in external inputs (i.e., pesticides, fertilizers, petroleum-based management inputs like tillage and mowing, etc.)
4. Increased soil microbial biomass
5. Improved soil structure and hydrological properties
6. Increased soil carbon storage

When following the parameters outlined within this methodology, management activities are expected to induce net positive ecosystem benefits for soil and vineyard flora and fauna. Any questions about this methodology should be directed to Regen Network at science@regen.network.

2.1 Project Characteristics

This methodology is limited to vineyard systems. For each project, the project proponent will need to provide information that describes characteristics that help to put the project and its potential into perspective. This includes pre-project and management practices (i.e., conventional, organic), current operations and site characteristics, farm goals, and how the project supports those goals. A brief statement of expected goals and outcomes from implementing this methodology must also be included.

2.2 Project and Grazing Boundaries

Grazing boundaries define the parcels or paddocks where grazing occurs and can change yearly. These grazing boundaries are used to calculate the extent of grazing and the number of credits created each year. Information about all grazed boundaries needs to be reported each year, as noted in section 2.5. The project boundary is defined at project registration to define the area within which all grazing may take place throughout the project. Non-grazing areas can be included in the project boundary for convenience. Still, the project proponent must provide documentation that the project has permission to graze throughout the entire project area. The project proponent is required to provide evidence of ownership of the land, including documentation and or attestation of land tenure or ownership as well as contractual agreements with the land owner to graze sheep on the project area. The project area has to adhere to and provide an attestation of compliance to the local laws, regulations, and other legally binding mandates directly related to Project Activities. This attestation of compliance must be uploaded in digital format to the project proponent system.

The project area does not need to be contiguous if there are large gaps between potential grazing boundaries. It is expected that the project boundary will stay the same throughout the project. All project boundaries need to include the following attribute information:

- Project name

- Project registration date

2.3 Project Duration

The project duration defines the number of yearly crediting periods the project proponent commits to continue this grazing practice. This initial version of the methodology will allow one crediting period only. However, it is expected that future methodologies will use a minimum acceptable number of years of three and a maximum of five. The five-year maximum would be in place to reduce the risk of continuing a practice that has been revised or dropped from the registry due to poor performance or other reasons. To continue to receive credits for this grazing practice after the project duration ends, the project proponent would need to re-register the project using the most suitable methodology at that time.

2.4 Grazing Requirements and Constraints

These requirements are in place to ensure grazing adheres to the most up-to-date accepted practice standards of grazing during vine dormancy (Ryschawy et al. 2021, Schoof et al. 2021, Niles et al. 2017). The thresholds described below are from available data and input from stakeholders practicing vineyard grazing. These requirements and constraints are intended to simultaneously ensure a notably positive impact from grazing implementation while mitigating the possibility of overgrazing. These practice standards should be integrated into a custom grazing management plan that is required for a project to qualify under this methodology and must accompany the project plan. Anyone can author the grazing management plan, but the Credit Class Issuer must approve it.

2.4.1 Grazing period and frequency

Grazing must be conducted within the grazing period. A single grazing period for each year of no more than five months must be defined within the project document. The period is defined as the annual temporal window within which grazing will be permitted to qualify for grazing credits. In most cases, this will correspond with vine dormancy in a vineyard, but other timing strategies for periods are also acceptable.

Grazing frequency is the number of times separate, distinct grazing events occur throughout a grazing period. Within a grazing period, credits will only be allocated for up to two grazing events per grazing area to avoid overgrazing. If grazing occurs multiple times, these grazing events must occur at least 40 days apart from one another.

2.4.2 Herd density and grazing duration

Allowable herd density (minimum and maximum number of sheep per hectare) must be specified in the grazing management plan. Grazing with a number of sheep outside these limits will disqualify that grazing event from receiving credits since the density is unlikely to generate sufficient ecosystem benefits. Minimum stocking rates are difficult to define prescriptively and, therefore, should be determined alongside a qualified grazing management specialist (via the custom grazing management plan described in section 1.2.4) based on site-specific edaphic, climatic, and vegetation characteristics (composition and productivity).

The grazing management plan should also indicate the minimum average sward (grass) height that should remain after grazing events are completed.

While grazing density within this methodology is variable, grazing duration should remain a relatively fixed variable and, based on conversations and published recommendations (e.g., Salzer et al. n.d., Brewer et al. 2023), must occur as a short, 1-to-7-day rotation period per acre. In other words, while the number of sheep used within a given grazing area may vary, sheep grazing must be between 1 and 7 days (per acre). In cases where grazing paddocks are larger than 1 acre (0.4 ha), grazing duration may be calculated using the following formula:

*Total grazing duration (# of days) = paddock size (# of acres) * days per acre (1-7 days)*

2.5 Reporting Requirements

A template for annual monitoring reports is provided in Appendix 2. Two data sources that must accompany each annual report are photographs that document the state of each pre- and post-grazed paddock and a vector polygon file, with the attributes noted below, that documents information about all of the grazing boundaries. The grazing boundaries vector polygons must accurately represent the actual boundary within +/- 5m average accuracy for the polygon vertices. Within the project boundary, vineyard grazing areas will need to be defined to indicate precisely where each grazing event that is to be credited took place. These grazing area boundaries can differ from year-to-year. However, the grazing area perimeters must be submitted each year along with the grazing information from each grazing period. All grazing boundaries must be submitted as polygons using a common GIS data format such as ESRI Shapefile, GeoJSON, or Keyhole Markup Language. Each polygon needs to include relevant attribute data as noted below:

- Grazing start date and time
- Grazing end date and time
- # of sheep grazed
- Unique identifier (numeric or alphanumeric) for each grazing area polygon
- Sward height at the beginning of grazing
- Sward height at the end of the grazing

For each grazing area, it will be necessary to record pre- and post-grazing photographs of a portion of the grazing area. The photographs must include a measuring stick (e.g., sward stick) that illustrates sward (grass) height, the date and

time the photograph was taken, and the latitude and longitude coordinates of the camera location. In addition, these pre- and post-grazing photographs must be taken of the pasture within 24 hours before grazing starts and again within 24 hours after grazing ends for each grazing event within a grazing area. The photographs should have sufficient detail to validate the sward height recorded with the grazing area polygons. Multiple before and after photographs can be submitted (e.g., closeup of sward stick and wide-angle of the paddock) if acquired within 30 minutes. The photographs must be accurately labeled or organized so they can be easily matched to the correct grazing event and grazing area.

Management activities within grazing boundaries over the previous year, such as soil amendments and pesticides, should be noted in the report submitted at the end of the grazing period. Specific details such as the amounts and timing of these activities are optional, but a brief explanation about the need for the activities must be included. Although not required, it would be useful to have information about how the grazing impacted management activities compared to conventional vineyard management.

A monitoring report with the information mentioned above must be submitted to the Credit Class Issuer by the project proponent within 90 days of the end of the grazing period detailing grazing events during that grazing period. The monitoring report must include the project reference number, project proponent contact information, photographs with accurate time stamps and labels documenting each grazing event, and grazing event data stored as attributes in a polygon GIS file noted in section 1.2.1.

2.5.1 Missing data in the monitoring report

Grazing area polygons that are missing, not accurately digitized, contain topology errors, or that lack start or end date/time information will be eliminated from credit calculations. We will allow 10% of the grazing area polygons not to have associated start and end photographs if sward height is recorded. If more than 10% of the grazing area polygons do not have associated photographs in the smallest area, polygons from the missing photographs set will be eliminated from credit calculations until the 10% threshold is met. Once the threshold is met, the polygons that were not reviewed can be used to calculate credits for the period.

3 Verification of Practices

Verification of documented grazing events will be managed by the methodology developer (RND, PBC) using the polygon grazing claims data submitted with the report. The verification process uses Sentinel 2 satellite imagery to confirm or deny that grazing occurred as documented in the monitoring report. If the polygon data are unsuitable for analysis, the project proponent will be notified, and the issues will need to be resolved and resubmitted within 30 days of notification. Failure to do so will result in forfeiting credits for that grazing period, as noted in section 1.2.4.1.

The project proponent will be notified of the verification outcome, and once the project proponent approves the outcome, the credit issuance process will begin.

Example R and Google Earth Engine scripts for verifying grazing claims using PlanetScope imagery can be found in this GitHub repository:
https://github.com/regen-network/open-science/tree/master/Fibershed

3.1 Disagreements Between the Verifier and Project Documents

When the verifier does not agree with grazing records in a grazing monitoring report, the project proponent will be notified. The project proponent will have 30 days to respond, providing additional evidence of specific grazing events that are being contested. Failure to provide sufficient proof of grazing will result in forfeiting the credits associated with that particular grazing event.

Regen Registry reserves the right to conduct oversight activities of verification performance participating verifiers. Oversight activities are conducted to ensure an adequate level of quality control and are intended to supplement accreditation body oversight and audit processes.

4 Ancillary data collection and analysis

This methodology incorporates collecting data relevant to assessing the impact of the methodology on the vineyard environment with the intent of improving our knowledge of regenerative practices and their impact on the environment. Data collection will be supported by setting aside 15% of the credit value specifically for data collection and analysis. These data will only be used to monitor the environment and will be used to improve our knowledge of the relationship between

this grazing practice and environmental outcomes. These data will not directly impact the value of the credits generated from applying this methodology. Data collection intends to expand our knowledge of how the practice impacts ecosystem function, especially the soil ecosystem.

4.1 Data Collection

Details related to data collection for knowledge generation will be required in the project document. Those details include the person or organization the project proponent will partner with to collect data as well as where the data will be stored, how it will be licensed, and who will be responsible for analyzing the data. A brief justification of the specific data being collected should also be included. In most cases, data related to the practice will be collected by the shepherds and processed by the project verifier. Data collected to learn more about the relationship between this grazing practice and resulting environmental outcomes will typically be handled by a third-party such as an educational institution or research organization.

Money to support data collection will be provided from a fund designed to manage Environmental Stewardship data collection. This fund will be replenished using the 15% allocation for data collection and analysis when credits are sold. All data collection plans will be reviewed by a group from the organization or individual that governs the data collection fund. In the near term, that organization or individual will likely be the project proponent. Still, in the future, the responsibility of managing data collection funds will likely be handled by community organizations such as decentralized autonomous organizations.

Since money from credits required to support data collection will not be available until well after a grazing period is complete, and also because the measurable impacts of the project might take time, the project proponent must agree to permit data to be collected for at least 18 months after the project duration is complete. Eventually, a fund will be established to support baseline data collection before a project practice begins. When that is available, the 18-month requirement noted above will not be required.

Examples of the data types that can be collected for a project are total organic soil carbon, microbial biomass, dissolved organic carbon, bulk density, and water-holding capacity.

4.2 Partner Institution and Data Analysis

Regen Registry will assist to the extent practical to help project proponents find partner institutions for data collection and analysis services. Regardless of how these partners are identified, there must be a written commitment from service providers in the project document as well as a commitment that all data will be licensed with an open access license and that all data will be hosted so that it is easily discoverable and accessible by other researchers. The organization responsible for data collection and analysis will likely handle data storage and licensing. Still, in either case, this information should be included in the project document.

5 Credit Calculation and Issuance

The credit unit for this methodology is kilo-sheep-hour. The number of kilo-sheep-hour credits from the vineyard sheep grazing credit class will be calculated within 15 days after the annual grazing report is verified.

5.1 Calulating the number of credits

Sheep hours for each grazing event (one herd in one grazing area) will be calculated by multiplying the number of sheep in the grazing area by the number of hours grazed. The total kilo-sheep-hours is calculated by adding all the sheep hours from each grazing area and dividing that sum by 1000.

kilo-sheep-hours = # of sheep * hours grazed / 1000

A calculation will also be made to determine if the density of sheep meets the requirement noted in section 2.4.2.

5.2 Issuing and selling credits

Credits will be issued annually throughout the crediting term within one month after claims in the grazing report have been verified and any disputes resolved. Issued credits will be made available to the project proponent. A unique characteristic of this methodology is that earned credits will be divided between grazers and vineyard owners. The exact split is negotiable and will vary geographically based on the supply and demand dynamics between grazers and vineyard owners. In the

United States, we propose using a 65%/35% split, respectively, for grazers and vineyard owners since the demand for grazers is high and strong incentives are expected to stimulate growth. This split must be stated in the project document. The project proponent will distribute funds for data collection and the grazer and vineyard owner.

Credits shall be sold after issuance ex-post. See the Regen Registry Program Guide v 1.0 (https://regen-registry.s3.amazonaws.com/Regen+Registry+Program+Guide.pdf) for information related to purchasing and selling credits.

6 Definitions

Additional definitions can be found in the Regen Network Registry Guide: https://registry.regen.network/v/regen-registry-handbook/regen-registry-overview/users

Credit - Credits are issued in Credit Batches in either a tradable or retired state. The owner of tradable credits can send, retire, or cancel the credits at any time. Tradable credits are only fungible with credits from the same credit batch. Retiring a credit is permanent. Canceled credits are credits that have moved to another registry.

Credit Class Issuer - The credit class issuers are the addresses with the authority to issue credit batches under the given credit class. The list of credit class issuers is defined when the credit class is created, and only the admin can update the list after the credit class is created.

Crediting Period - A crediting period is one season of grazing events.

Crediting Term - The finite length of time for which a Project Plan is effective, and during which a project can generate credits.

Ecosystem Function – Ecological processes such as nutrients, organic matter, and energy flows work together to benefit the environment.

Environmental Stewardship Initiative – An initiative within Regen Network that encourages the development of methodologies to create projects that generate ecocredits to support the adoption of holistic regenerative practices. An integral

component of Environment Stewardship projects is data collection to improve our knowledge of how specific practices impact ecosystem function.

Grazing Period – The contiguous range of dates when grazing is permitted to generate credits from this methodology.

High-Density, Short-Duration Rotational Targeted Grazing – This is a grazing practice where a relatively high density of animals is grazed for relatively short periods, usually a few days, before being moved to a new area. Other practices that qualify as high-density, short-duration rotational targeted grazing include intensive rotational grazing, high stock density grazing, and Holistic Planned Grazing.

Project Proponent - The Land Owner, Project Developer, or Earth Steward registering a project on Regen Registry that holds responsibility for managing the project. This is also the individual contractually signing off on the Project Plan. Project Proponents include but are not limited to entities that can demonstrate Project ownership. For the avoidance of doubt, where an individual executes this representation in their capacity as an authorized office holder of the organization who is the project proponent, this representation is made by the organization.

Project Registration Date - The official date when a project commences.

Verifier - A third-party individual or organization approved by the Project Proponent to provide validation and/or verification services for the project that is not the monitor contracted to execute the verification requirements stipulated in a given Credit Class.

7 Acknowledgements

8 Bibliography

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9 Appendices

Appendix 1 - Project Plan Template

View the template using this link.

Appendix 2 - Template for annual monitoring report for grazing events

View the template using this [link](#).