Interactive Game User Manual**

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March, 2025

Introduction

Welcome to the Conservation Strategies Game! This game explores different strategies for protecting land from agriculture. The game is played on a grid of land plots, each one of which is randomly assigned an Agricultural points value and a Conservation points value (which may or may not be correlated based on user input). The game consists of two teams, the Greens and the Farmers, competing to claim plots of land for conservation or agriculture.

When a human player controls the Green team they can earn conservation points in two ways: via 'Pure Strategy' or via 'Displacement-Leakage.'

⇒ Pure Strategy component: By claiming plots with high environmental values, or by claiming plots that the Farmers would have liked to claim themselves under their business-as-usual (BAU) strategy, the environmental value of the plot is added to their total conservation score.

⇒ Displacement-Leakage component: When 'leakage' is less than 100% (see below) and the Greens claim a Farmer BAU plot, the Farmers lose some of their remaining claims. In that case there may be unclaimed plots remaining after both teams have exhausted their claims, and the environmental values of these plots is further added to the Greens conservation score at the end of the game.

At the end of the game final metric are displayed and the Greens are evaluated based on:

I. Green Success (%): how well they did relative to the maximum score they could have obtained with the ideal combination of Pure-Strategy and Displacement-Leakage claims.

II. Social Welfare Loss (%): how much the total Social Welfare resulting from the final land use pattern deviated from the maximum Social Welfare obtainable from the optimal land use pattern.

*Additionality and Green Success are only reported when the human player controls the Green team and the computer controls the Farmers.
**Reference: Weinhold, Diana and Lykke E. Andersen, (2025) "Conservation Strategies in Contested Environments: Dynamic Monte Carlo Simulations and a Bolivian case study," Unpublished Manuscript.

Getting Started

When you run the game, you will initially be prompted to make a series of choices:

1. Choose the Human Role: If the Human plays the Green conservationists (default), the computer will play the Farmers, and vice versa. Note that game functionality such as setting Leakage and measuring additionality and Green Success scores can only be calculated when the human plays the Greens and the computer plays the Farmers.

2. Choose the Strategy played by the Computer: If the computer will play the Farmers, choose a strategy for the Farmers to follow when claiming plots. This strategy also determines the Farmer's Business-As-Usual (BAU) trajectory – the initial set of plots they would ideally claim if they could.

- Naive Profit Maximizer: Farmers claim plots based solely on the highest Agricultural score, ignoring the Environmental score.
- Strategic Profit Maximizer: Farmers recognize that the Greens may want to claim good agricultural plots, so they consider the Environmental score as well. They may choose plots with slightly lower Agricultural scores but higher Environmental scores to prevent environmentalists from claiming them.

If the computer will play the Greens, choose a strategy for the Greens to follow when claiming plots:

- Maximize Environmental Score: Environmentalists claim plots with the highest Environmental scores.
- Block Farmers: Environmentalists claim plots with the highest Agricultural scores to block farmers from claiming them first.
- Target Hot Spots: Conservationists claim plots with both high environmental value and high agricultural value (Environmental score x Agricultural score)

3. Choose the correlation between environmental and agricultural values: Players can select no correlation (default), a positive correlation to simulate a particular ecosystem, or a negative correlation to simulate low-quality insitutions where plots with high threat (high agricultural value) are harder to defend, leading to lower environmental values.

4. Choose the level of Leakage: "Leakage" is a term that describes the general equilibrium impact of Green conservation claims on the number of protected plots; with high leakage if Greens displace Farmers from a desired plot, the Farmers will select another plot elsewhere. With low levels of leakage, if Greens displace Farmers on a desired BAU plot, Farmers may be

constrained in their ability to go elsewhere. Leakage always equals 1 (100%) if a human is playing the Farmers since the Business-as-usual set is then undefined.

If the computer is playing the Farmer users can select one of three levels of Leakage:

- Leakage=1: (default) Any Green claims of Farmer BAU plots have no effect on the remaining Farmer claims.
- Leakage=0.5: For every two Farmer BAU plots claimed by the Greens the Farmers lose one unspent Farmer claim.
- Leakage=0: For every Farmer BAU plot claimed by the Greens, the Farmers lose one unspent Farmer claim.

5. Choose the Grid size: You may choose the size of the grid the game is played on. The recommended size is 4x4 but for longer play there are three larger sizes available.

6. Choose the Initial Claims Allocation: There are as many claim points to be allocated as there are grid plots, and one claim buys one plot.

- Equal Allocation (default):
- Political Allocation: You specify the number of total claims allocated to each team. This simulates a scenario where one group has more political or economic power.

Playing the Game

Once you have made all your choices, the game will initialize the plot grid based on your settings. The following steps will occur:

i. Initialization: The grid is populated with random (possibly correlated) Agricultural and Environmental values between approximately 1 and 20.

ii. Visualization of Initial Grid: Each plot shows the Agricultural score (bottom left in brown) and the Environmental score (top right in green). The border of each plot is either brown or green depending on its socially optimal land use (borders are grey for neutral plots with ties).

iii. Game Play: Players click on grid plots to claim them. Farmers move first, and while both teams have unused claims they alternate in claiming plots, guided by the turn indicator at the top of the game space.

iv. If the computer is playing the Farmer and Leakage<1, then every time the Green (human user) claims a plot that was in the Farmer's business-as-usual (BAU) set the Farmers may lose a remaining claim point. If Leakage=0 then the Farmers lose a claim for every

Farmer-BAU plot claimed by the Greens. If Leakage=0.5 then they lose a claim for every two Farmer-BAU plots claimed by the Greens.

v. If one team runs out of claims, the other team uses up their remaining claims by claiming any of the remaining plots.

vi. If the computer is playing the Farmers and Leakage<1 there may be unclaimed plots at the end of the game when both teams have exhausted their claims. In that case these unclaimed plots are allocated to the Greens, and their collective environmental values (the displacement-leakage component) are added to the Green's final total conservation score.

Finishing the Game

The game is over when both teams have exhausted their claims. Any remaining unclaimed plots are then allocated to the Greens. The final results are presented as Metrics and Performance numbers:

Metrics:

- **Final Green Conservation Score:** The total conservation value achieved by the plots claimed by the Greens at the end of the game. This total can be further decomposed into:
  - ⇒ A "***Pure Strategy***" component: This is the sum of the conservation values for the plots actually claimed by the Greens during the game play.
  - ⇒ A "***Displacement-Leakage***" component: When leakage<100% the Greens can gain additional plots at the end of the game from having displaced Farmers from their BAU plots.
- **Additionality***: The net conservation value of the Green's claimed plots compared to the baseline scenario where the Farmers pursue their "business-as-usual" (BAU).

Performance:

- **Welfare Loss (%):** A percentage measure of the achieved social welfare of the final land use pattern compared to the overall potential maximum social welfare that would be achieved if every plot were allocated to its highest-value use.
- **Green Success* (%):** This measures how well the Greens performed relative to a potential maximum score they could have achieved with the perfect blend of strategic claiming and Farmer-BAU displacement.

Enjoy the Conservation Strategy Game!