Insect Ecosystem Simulation Game

Objective:

Simulate an insect community in a dynamic ecosystem by balancing population dynamics across different insect roles. Earn points by maintaining ecosystem balance and fulfilling ecosystem-specific goals.

Game Setup:

1. Establish Your Ecosystem

- Shuffle and deal **1 Ecosystem Card** to each player.
- Place it **face up** so all players can see.
- **Ecosystem Cards Include:**
  - Point bonuses for certain guilds (decomposers, pollinators, herbivores, predators, parasitoids).
  - Additional points for maintaining balanced population dynamics by the end of the round.

2. Distribute Insect Role Cards

- Deal **3 Insect Role Cards** to each player.
- Keep them in your hand until game play begins.

3. Distribute Population Chips

- Each player receives **3 population chips.** These can be used to increase population size once your insect role cards are "added" (e.g. placed face up) to your ecosystem.

Game Flow:

Start of Every Turn:

At the beginning of each player's turn, they must:

1. **Draw 1 Insect Role Card from the deck and add it to their hand.**
2. **Take 1 population chip from the communal pot and add it to their personal supply.**

Then, choose ONE of the 3 following actions:

1. Play an Insect Role Card

- Place 1 insect role card from your hand face up into your ecosystem.
- Immediately place 1 population chip from your supply onto that card.
- The insect is now active and will be included in population updates at the end of your turn.

2. Add a Population Chip

Place 1 population chip from your supply onto any insect card currently in your ecosystem.
**Hint: Adding more insects to your ecosystem is not always advantageous over strengthening the populations you already have laid out.*

3. Redistribute Population (Trade 3 for 1)

Remove 3 population chips from a single insect card in your ecosystem.
In exchange, take 1 chip and immediately place it onto a different insect card in your ecosystem.

****Environmental Change Cards****

If the card drawn at the start of your turn is an Environmental Change Card:

- Place it face up immediately.
- Resolve its effects according to the card instructions.
- Then continue your turn as normal by selecting one of the three actions above.

Balance Your Ecosystem

Maintaining Balance

- Population chips may accumulate each turn, but **your goal is not necessarily to maximize chips.** It's to maintain a balanced ecosystem.
- Each ecosystem has **balance goals** that give extra points if populations remain within ideal bounds.

Extinction

An insect role card with no or few population chips is vulnerable to extinction! If an insect card's population declines (loses a chip) when there are no chips present, that insect goes extinct, and the card must be turned face down and removed from your ecosystem.

Insect Ecosystem Simulation Game
New Player Strategy Guide

Before Your First Turn
Look at your Ecosystem Card carefully. Note which guilds (decomposers, pollinators, herbivores, predators, parasitoids) receive bonus points and whether you are rewarded for diversity (low chip numbers) or dominance (high chip numbers).

Examine your three starting insect cards. Ask yourself:
• Do I have at least one herbivore?
• Do I have a predator or parasitoid to control populations that get too high?
• Do I have a decomposer or pollinator to help fuel growth?

Turn 1: Establish a Foundation
You must draw a card and take a chip at the start of your turn. Then choose ONE action.
Decomposers and pollinators are often strong starting insects because they help fuel growth in other guilds. Herbivores are also solid early plays since they support predators and parasitoids later in the game.

*Be cautious about playing a predator or parasitoid as your very first insect. Without established herbivores or supporting guilds, these higher trophic levels may struggle to build population and can make it harder to develop a stable ecosystem.

Avoid placing too many chips on a single card during Turn 1. Early imbalance can cause predator crashes or runaway herbivores.

Turns 2 and 3: Build Interactions
By your second turn, aim to have at least two different guilds in play. Interactions create chip movement during population updates, which increases scoring potential.
General patterns to remember:
• Herbivores fuel predators and parasitoids.
• Decomposers and pollinators support other guilds.
• Too many predators without herbivores leads to decline.
• No natural enemies allow herbivores to grow quickly.

Common Early Mistakes
• Ignoring your ecosystem bonus rules.
• Over-investing chips on one insect.
• Playing predators before herbivores are established.
• Forgetting extinction rules when chips are removed.

Simple Early Game Strategy Template
Turn 1: Play one foundational insect (decomposer, pollinator, or herbivore).
Turn 2: Add a complementary guild.
Turn 3: Adjust chip placement to match your ecosystem bonus structure.

Remember: You are not trying to maximize total chips. You are trying to create a balanced system that earns bonus points.

Population Dynamics Chip Updates

At the **end of each player's turn**, population chips are adjusted based on insect roles and ecosystem balance. Follow these steps **in this order**:

Decomposer Update

For each decomposer card in your ecosystem:

- Add **1 chip** to either an **herbivore** or **pollinator** of your choice.

Pollinator Update

For each pollinator card in your ecosystem:

- Add **1 chip** to either a **decomposer** or **herbivore** of your choice.

Herbivore Update

For each herbivore card in your ecosystem:

- **If no predators or parasitoids are in your ecosystem:** Add **1 chip** to each herbivore card.
- **If predators or parasitoids are present in your ecosystem:** Remove **1 chip** from each herbivore per predator/parasitoid **chip**.

Predator Update

For each predator card in your ecosystem:

- Add **1 chip** to the predator card for each herbivore card in your ecosystem with **> 2 chips.**
- Remove **1 chip** from the predator card for each herbivore card in your ecosystem with **< 2 chips**.

Parasitoid Update

For each parasitoid **chip** in your ecosystem:

- Remove **1 chip** from an insect card of your choice.

End of Game Scoring

After 10 rounds, calculate final point values for your ecosystem.

Points Calculation

1. **Chips on Insect Cards:**
   1 chip = 1 point
2. **Ecosystem Balance Bonus:**
   Gain additional points if your ecosystem achieves balance goals by the end of the round.
3. **Guild Bonuses:**
   Some ecosystems grant **bonus points** for certain guilds (e.g., more points for a specific pollinator in a tropical rainforest).

Winning the Game:

Record your final tally for the round with the scorekeeper. Whoever has the highest point value wins the round!

Ecosystem-Specific Bonus Points

Temperate Forest – Encourage Diversity

- **+5 points** for each card with **< 3 chips**.
- **Double points** per card for "temperate" insects:
  - **Lady Beetle** (Predator)
  - **Aphid** (Herbivore)
  - **Bumblebee** (Pollinator)
  - **Praying Mantis** (Predator)

Freshwater Wetland – Favor Aquatic and Balanced Roles

- **Double points** for "aquatic" insects:
  - **Dragonfly Nymph** (Predator)
  - **Orchid Bee** (Pollinator)
  - **Leaf Beetle** (Herbivore)
  - **Wedge Beetle** (Parasitoid)
- **Double points** for decomposers and predators.

Alpine Tundra – Limit Diversity and Favor Specialists

- **+5 points** for each insect card with **> 5 chips**.
- **Double points** per card for "tundra" insects:
  - **Honeybee** (Pollinator)
  - **Fall Armyworm** (Herbivore)
  - **Tachinid Fly** (Parasitoid)
  - **Roach** (Decomposer)

Arid Desert – Limit Diversity, Favor Survivors

- **+5 points** per insect card with **> 5 chips**.
- **Double points** per card for "desert" insects:
  - **Bumblebee** (Pollinator)
  - **Grasshopper** (Herbivore)
  - **Army Ants** (Predator)
  - **Dung Beetle** (Decomposer)

Tropical Rainforest – Encourage Diversity

- **+5 points** per card with **< 3 chips**.
- **Double points** per card for "tropical" insects:
  - **Chocolate Midge** (Pollinator)
  - **Leafcutter Ants** (Herbivore & Mutualist)
  - **Parasitoid Wasp** (Parasitoid)
  - **Termites** (Decomposer)

Agricultural Field – Prevent Pest Outbreaks

- **+5 points** per herbivore card with **< 3 chips**.
- **Double points** for every predator and parasitoid card

Insect Ecosystem Simulation Game

Final Score Sheet

Player Name	Population Points	Ecosystem Bonus Points	Total Score

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Insect Ecosystem Simulation Post-Game Reflection Questions

Part 1: Understanding Insect Roles

1. How did different insect guilds (e.g., decomposers, pollinators, herbivores, predators, parasitoids) contribute to population dynamics (adding/removing chips) in your ecosystem?

2. Which insect guild(s) were the hardest to manage in your ecosystem? Why?

3. Did you notice any patterns in how population dynamics influenced the success or failure of certain guilds?

Part 2: Ecosystem Management & Strategy

4. What strategies did you use to maintain balance in your ecosystem?

5. Were there any unexpected challenges caused by the environment change cards? How did you respond?

6. What insights did this game give you about the importance of insect biodiversity and ecosystem services?

7. Any suggestions to improve the game or what to name it?

Ecosystem

Tropical Rainforest

High biodiversity.
Stable weather conditions.
Pollination-driven.

Decomposer

Cockroach (Blattidae)

Key Impact: organic waste removal and nutrient cycling.
Interactions: indirectly benefits herbivores via soil health.

Herbivore

Grasshopper (Acrididae)

Key Impact: regulates plant populations through feeding.
Interactions: provides food source for predators.

Pollinator

Honeybee (Apidae)

Key Impact: increases agricultural yield and biodiversity.
Interactions: supports herbivores by ensuring plant growth.

Ecosystem

Agricultural Field

High pest pressure.
Plant monoculture.
Pesticide risk.

Decomposer

Dung Beetle (Scarabaeidae)

Key Impact: enhances nutirent availability for plants.
Interactions: supports herbivores by maintaining fertile soil.

Herbivore

Aphid (Aphididae)

Key Impact: can damage crops and transmit plant pathogens.
Interactions: attracts parasitoids and predators.

Pollinator

Bumblebee (Apidae)

Key Impact: maintains genetic diversity among plants.
Interactions: supports herbivores by ensuring plant growth.

Ecosystem

Arid Desert

Extreme weather conditions.
Water/vegetation scarcity.
Desert-adapted species.

Decomposer

Carrion Beetle (Silphidae)

Key Impact: enhances nutirent availability for plants.
Interactions: supports herbivores by maintaining fertile soil.

Herbivore

Leaf Beetle (Chrysomelidae)

Key Impact: affects plant growth and reproduction.
Interactions: attracts parasitoids and predators.

Pollinator

Chocolate Midge (Ceratopogonidae)

Key Impact: facilitates cacao production.
Interactions: supports herbivores, sensitive to changes in climate.

Ecosystem

Freshwater Wetland

Aquatic-adapted species. Enriched with detritivores and predators.

Parasitoid

Parasitoid Wasp (Braconidae)

Key Impact: biological control of agricultural pests.
Interactions: reduces herbivore numbers, benefitting plants.

Predator

Lady Beetle (Coccinellidae)

Key Impact: suppresses pest populations (e.g. aphids).
Interactions:protects plants from excessive herbivory.

Environment Change

Climate Change

Impact: disrupts pollination, faovrs generalist species.
Effect: Pollinator populations decrease by 1 chip.

Ecosystem

Temperate Forest

Seasonal weather variation. High insect diversity. Overwintering is common.

Parasitoid

Parasitoid Fly (Tachinidae)

Key Impact: parasitizes herbivores, reducing pest density.
Interactions: indirectly benefits other herbivores by reducing competition.

Predator

Dragonfly Nymph (Libellulidae)

Key Impact: regulates aquatic insect populations.
Interactions: influences aquatic ecosystem stability.

Environment Change

Pesticide Application

Impact: kills predators, parasitoids, and pollinators.
Effect: Predators, parasitoids, and pollinators decline by 2 chips.

Ecosystem

Alpine Tundra

Low temps and thin air limit diversity. Short summers favor fast insect development times. cold-adapted herbivores, pollinators, and decomposers

Parasitoid

Wedge Beetle (Ripiphoridae)

Key Impact: regulates bee populations by parasitizing their larvae.
Interactions: controls pollinator populations.

Predator

Praying Mantis (Mantidae)

Key Impact: reduces herbivore populations.
Interactions: controls insect abundance, maintaining balance.

Environment Change

Invasive Predator Introduction

Impact: increases predation, reduces herbivores and decomposers.
Effect: herbivores and decomposers decline by 1 chip.

Herbivore

Leafcutter Ants (Formicidae)

Key Impact: promotes decomposition by breaking down plant material.
Interactions: provides food for predators and scavengers.

Environment Change

Urbanization

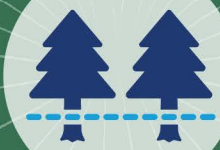
Impact: habitat loss reduces pollinators and herbivores.
Effect: Herbivores and pollinators decline by 1 chip.

Environment Change

Colony Collapse Disorder

Impact: pollinators decrease due to pesticides, habitat loss, and disease.
Effect: Pollinator decline by 2 chips.

Environment Change



Habitat Fragmentation

Impact: reduces specialist species, favors generalists.
Effect: Pollinators and parasitoids decline by 2 chips.

Herbivore

Fall Armyworm (Noctuidae)

Key Impact: causes significant crop damage.
Interactions: attracts parasitoids and predators.

Decomposer

Termites (Termitidae)

Key Impact: breaks down organic matter, enriching soil nutrients.
Interactions: influences plant growth indirectly, food source for predators.

Environment Change

Pathogen Outbreak

Impact: pathogen spreads through herbivore populations
Effect: Herbivores decline by 1 chip.

Environment Change

Flooding

Impact: aquatic habitats change, leading to displacement.
Effect: reduce aquatic insects by 2 chips. Increase decomposers by 1 chip.

Pollinator

Orchid Bee (Apidae)

Key Impact: supports plant reproduction and genetic diversity.
Interactions: indirectly provides resources to herbivores.

Predator

Army Ants (Formicidae)

Key Impact: controls insect populations.
Interactions: indirectly benefit decomposers by disturbing leaf litter.

Environment Change

GM Crop Introduction

Impact: Pest populations reduced.
Effect: Herbivores reduced by 2 chips. Predators and parasitoids reduced by 1 chip.

Environment Change

Drought Conditions

Impact: herbivore populations spike.
Effect: herbivores increase by 2 chips. Predators and parasitoids increase by 1 chip.