

1056-92-54

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Optimal Seasonal Plant Reproduction. Preliminary report.

In order for plants (or any living species) to have sustained survivability, reproduction is essential. However, because reproduction consumes energy, the plants, through evolution, are expected to have an optimal strategy for when to reproduce and how much energy should be devoted to reproduction so that the expected gain in biomass for the population is maximized. This evolutionary decision can be influenced by such factors as the plants' own growth rate, any environmental effects acting on the plants, the survival rate of adults from one season to the next, and the survivorship of seeds, to name a few.

With this in mind, we will present a stochastic optimization problem to model a local plant population which aims at finding a reproduction strategy that maximizes their expected adult biomass size for the following season. We will then solve it using methods from optimal control theory and then discuss, under this strategy, what should happen to the plants over a large number of seasons. (Received July 16, 2009)