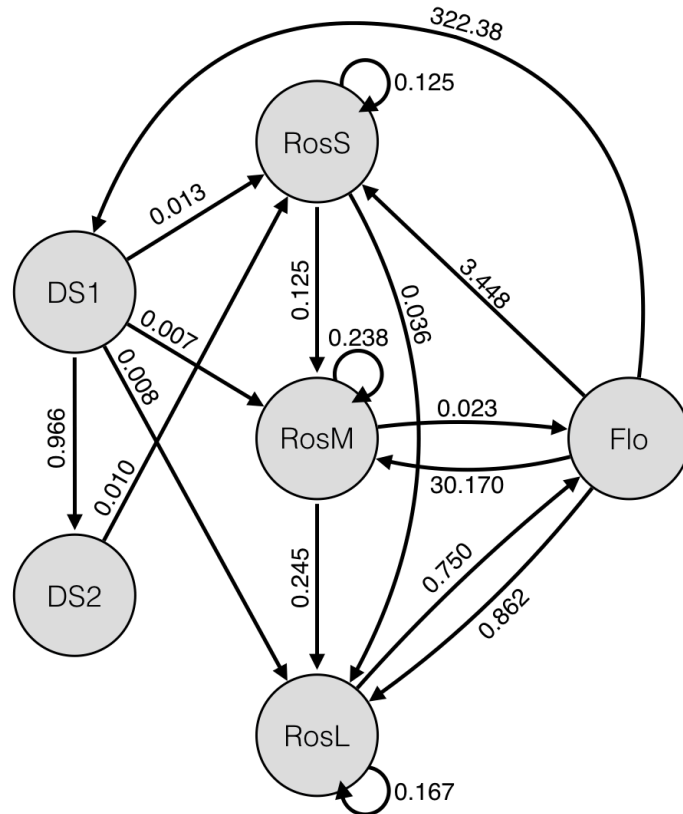


Structured Population Models—Exercise 1

Natural history and life cycle of teasel (*Dipsacus sylvestris*)

Below is the life cycle diagram for a population of the perennial, monocarpic plant teasel. The life cycle consists of six stages: (i) first-year dormant seeds, (ii) second-year dormant seeds, (iii) small rosettes, (iv) medium rosettes, (v) large rosettes, and (vi) flowering plants. Plants can grow to larger sizes or shrink to smaller size. Plants only reproduce when they are flowering through seeds—there is no vegetative or clonal reproduction. Plants flower only once and die shortly after dispersing their seeds.



- a. Convert the life cycle diagram into a stage-structured matrix population model, and calculate the stage-specific survival rates.

U – Survival & growth

		Time t					
Time t+1	DS1	DS2	RosS	RosM	RosL	Flo	
	DS1						
	DS2						
	RosS						
	RosM						
	RosL						
	Flo						
Survival							

F – Fertility

		Time t					
Time t+1		DS1	DS2	RosS	RosM	RosL	Flo
	DS1						
	DS2						
	RosS						
	RosM						
	RosL						
	Flo						

C – Clonality

		Time t					
		DS1	DS2	RosS	RosM	RosL	Flo
Time t+1	DS1						
	DS2						
	RosS						
	RosM						
	RosL						
	Flo						

A – Projection matrix

		Time t					
		DS1	DS2	RosS	RosM	RosL	Flo
Time t+1	DS1						
	DS2						
	RosS						
	RosM						
	RosL						
	Flo						

Suppose a new population is started (time=0) with 50 first-year dormant seeds and 50 second-year dormant seeds ($N_{DS1}=N_{DS2}=50$).

b. What is the total population size (N) at time=15?

c. What is the equilibrium population growth rate (λ)?

d. What is the equilibrium population size structure (w)?

Stage	Proportion
DS1	
DS2	
RosS	
RosM	
RosL	
Flo	