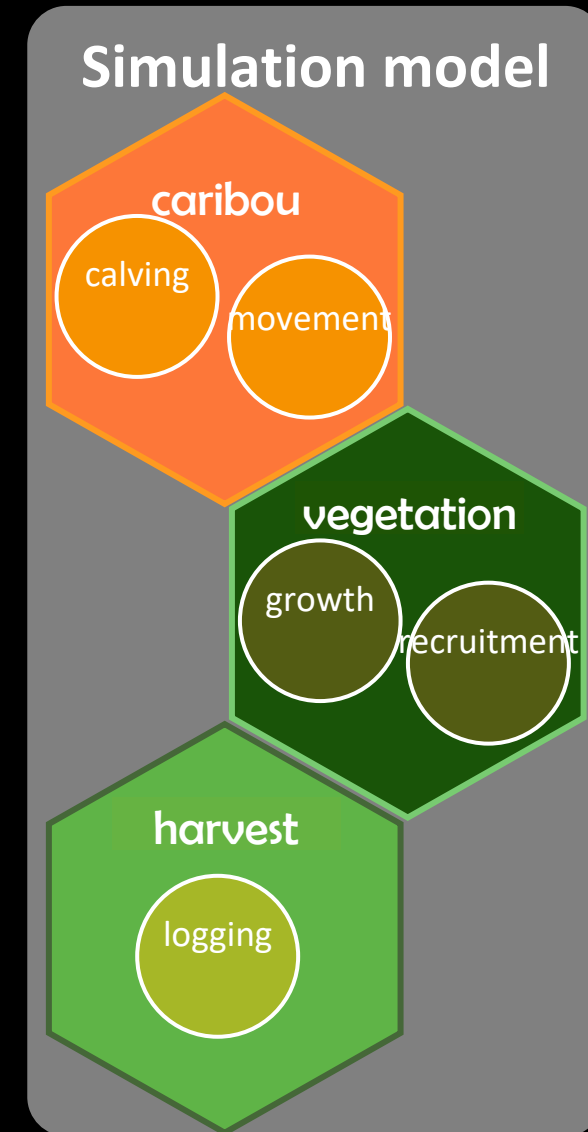# OUTLINE

1. Modules and events (recap)

2. Types of modules

3. Scheduling events

4. Event accessors

MODULES AND EVENTS (RECAP)

- A *module* is an .R script that chains operations in a particular way

- An *event* is a chunk of code (the "operations")

Simulation model

caribou

calving

movement

vegetation
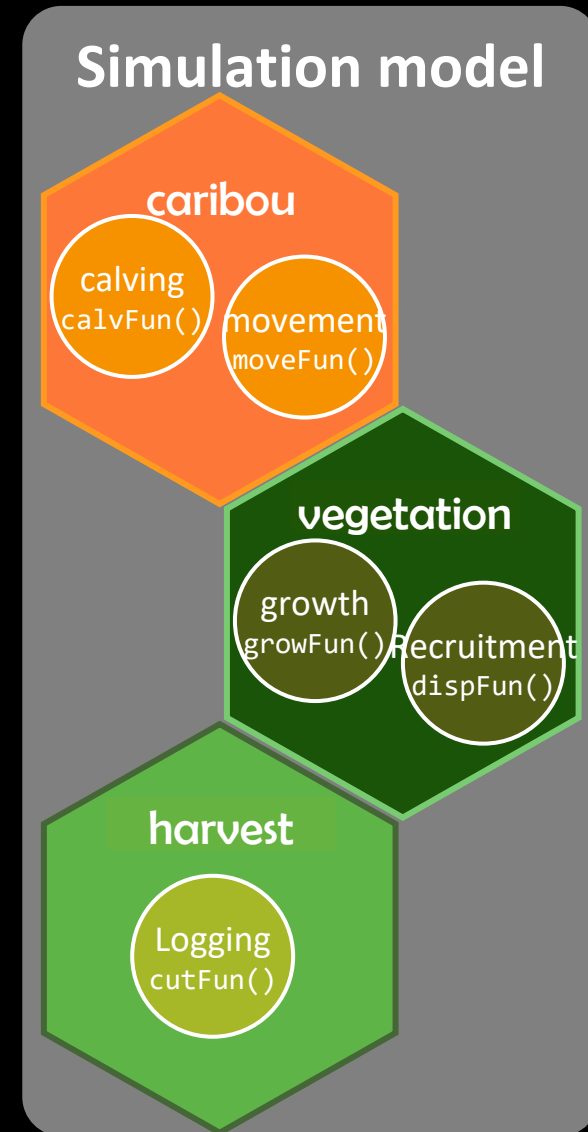
growth

recruitment

harvest

logging

MODULES AND EVENTS (RECAP)

- A *module* is an .R script that chains operations in a particular way

- An *event* is a chunk of code (the "operations")

- Events often call *functions* that execute the operations

Modules > events > functions

Simulation model

caribou
- calving
  calvFun()
- movement
  moveFun()

vegetation
- growth
  growFun()
- Recruitment
  dispFun()

harvest
- Logging
  cutFun()

MODULES AND EVENTS (RECAP)

- A *module* is an .R script that chains operations in a particular way

- An *event* is a chunk of code (the "operations")

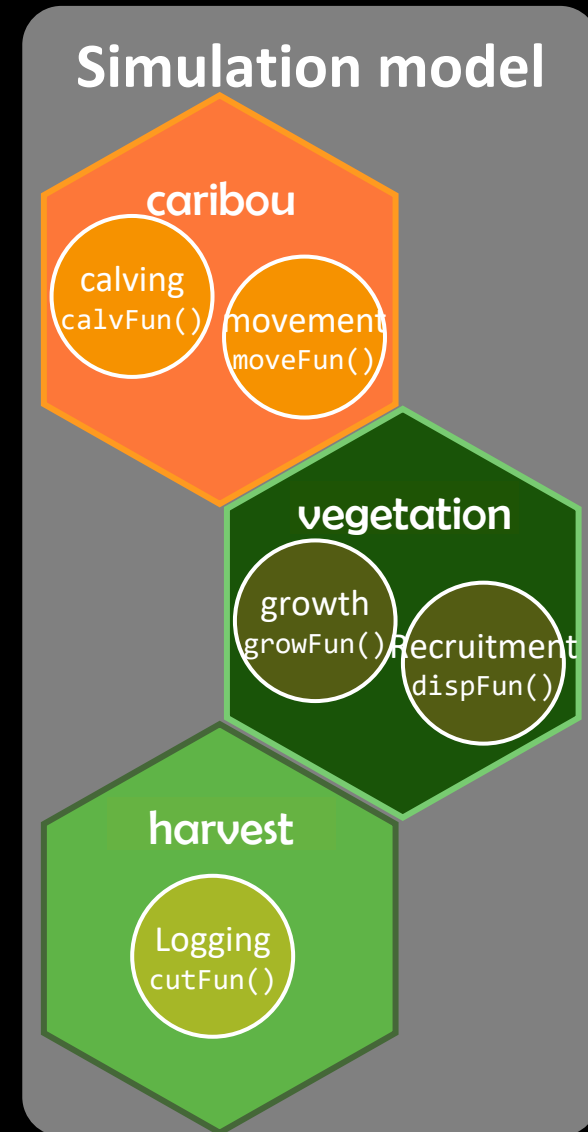- Events often call *functions* that execute the operations

- Rerun tolerant functions – caching - important for workflows

Modules > events > functions

Simulation model

caribou

calving
calvFun()

movement
moveFun()

vegetation

growth
growFun()

Recruitment
dispFun()

harvest

Logging
cutFun()

MODULES AND EVENTS (RECAP)

Module types

- Not formally enforced in SpaDES, but useful to think about

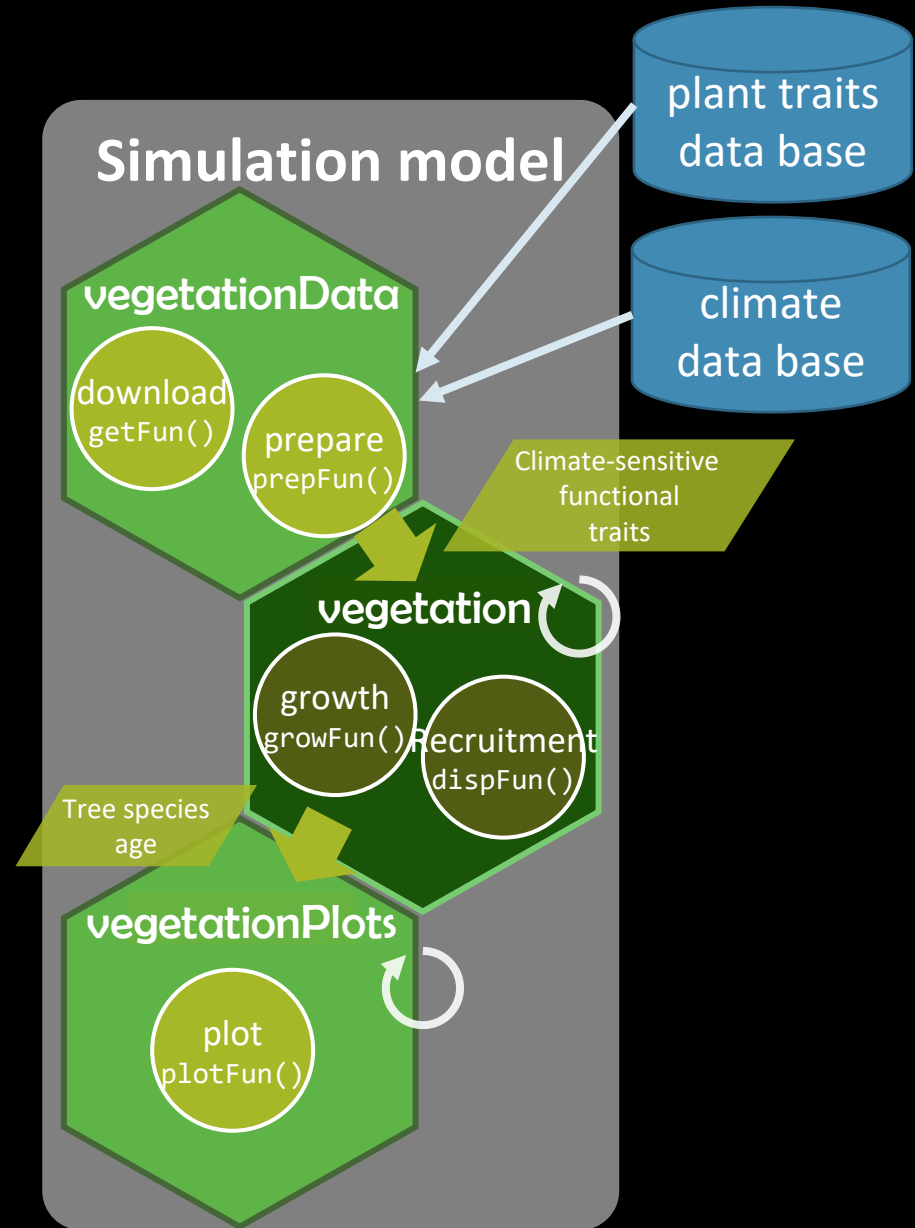| **Static**	**VS.**	**Dynamic**
(no time dependence)		(time dependence)

- Data preparation modules
- Parameter estimation/calibration modules
- GIS modules
- Data visualization modules
- Validation modules
- ...

- landscape simulation modules (e.g., wildfire, vegetation change)
- wildlife population modules with/without Markov dependency
- Data Visualization used iteratively (e.g. plot every year)
- Statistical forecasting models
- ...

Simulation model

plant traits data base

climate data base

vegetationData
download getFun()
prepare prepFun()

Climate-sensitive functional traits

vegetation
growth growFun()
Recruitment dispFun()

Tree species age
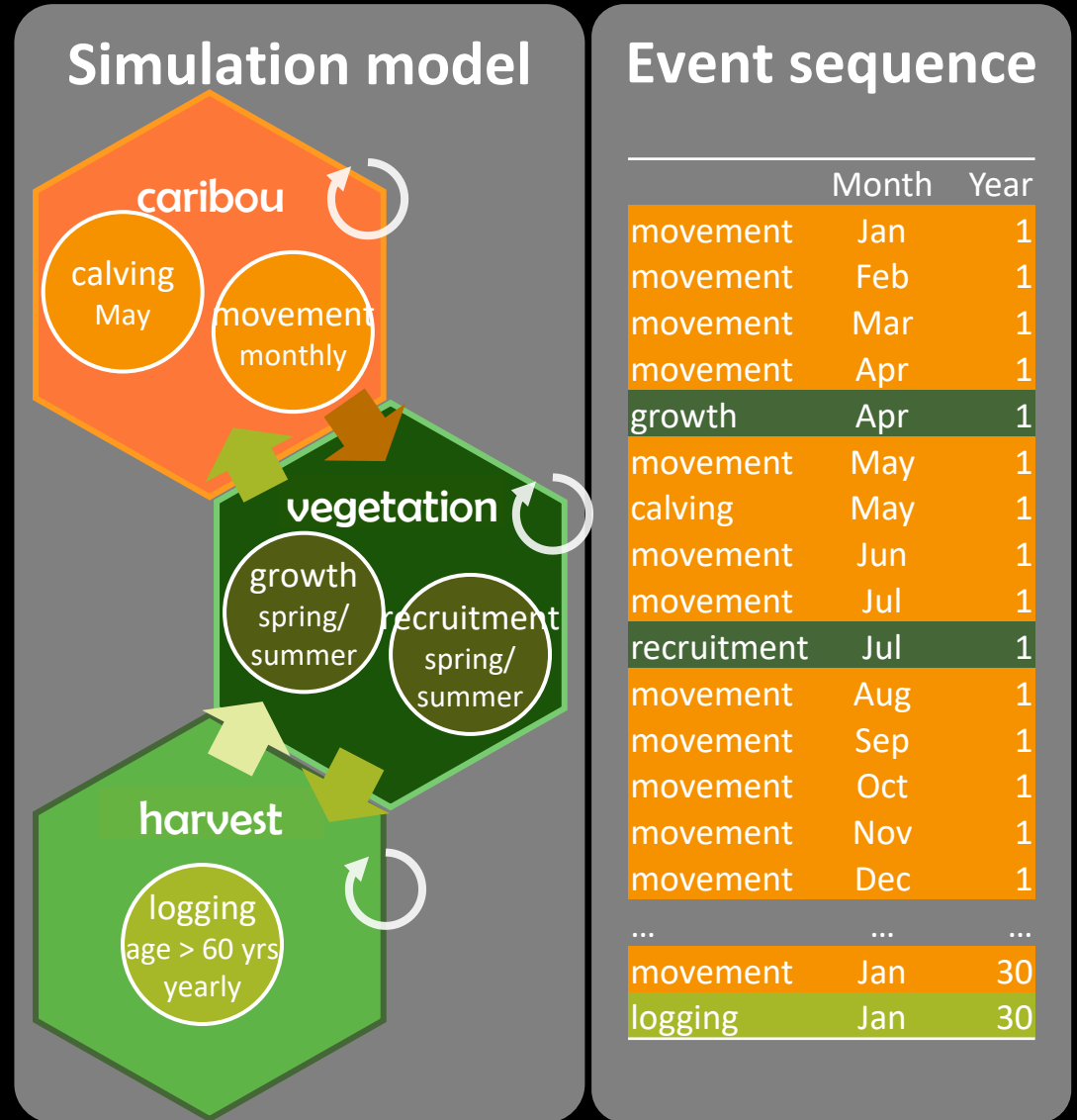
vegetationPlots
plot plotFun()

EVENT SCHEDULING

Ask yourself:

• Does this operation need to be repeated?

• How often/when?

All events in these modules need to be repeated

- Events in *caribou* and *vegetation* are scheduled monthly/yearly no matter what

- The event in *harvest* depends on the state of an object (minimum tree age)

Simulation model

caribou — calving May, movement monthly

vegetation — growth spring/summer, recruitment spring/summer

harvest — logging age > 60 yrs yearly

Event sequence

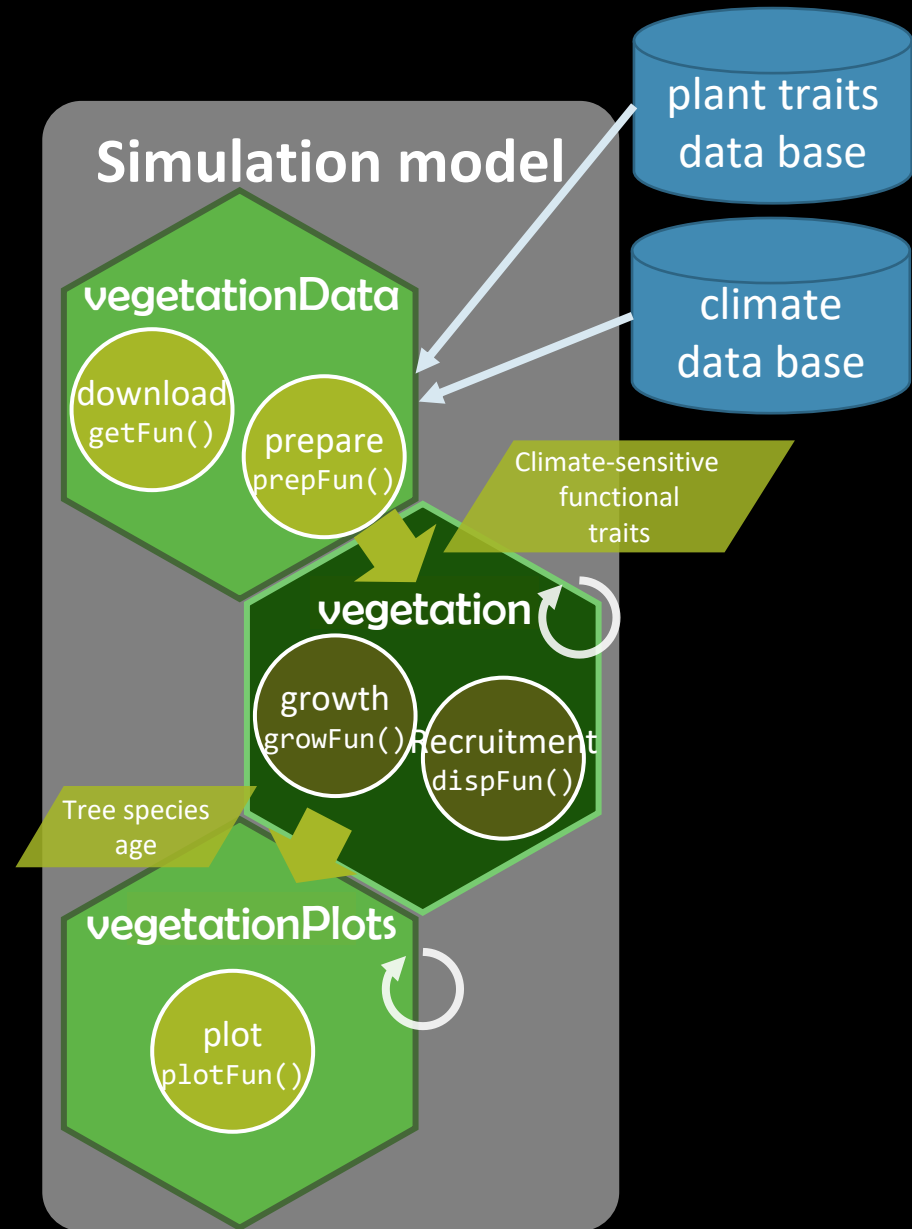|	Month	Year
movement	Jan	1
movement	Feb	1
movement	Mar	1
movement	Apr	1
growth	Apr	1
movement	May	1
calving	May	1
movement	Jun	1
movement	Jul	1
recruitment	Jul	1
movement	Aug	1
movement	Sep	1
movement	Oct	1
movement	Nov	1
movement	Dec	1
…	…	…
movement	Jan	30
logging	Jan	30

EVENT SCHEDULING

Ask yourself:

- Does this operation need to be repeated?

- How often/when?

Not all events in these modules need to be repeated

- Events in *vegetation* and *vegetationPlots* are scheduled yearly no matter what

- The events in *vegetationData* only need to be executed once at the start of the workflow
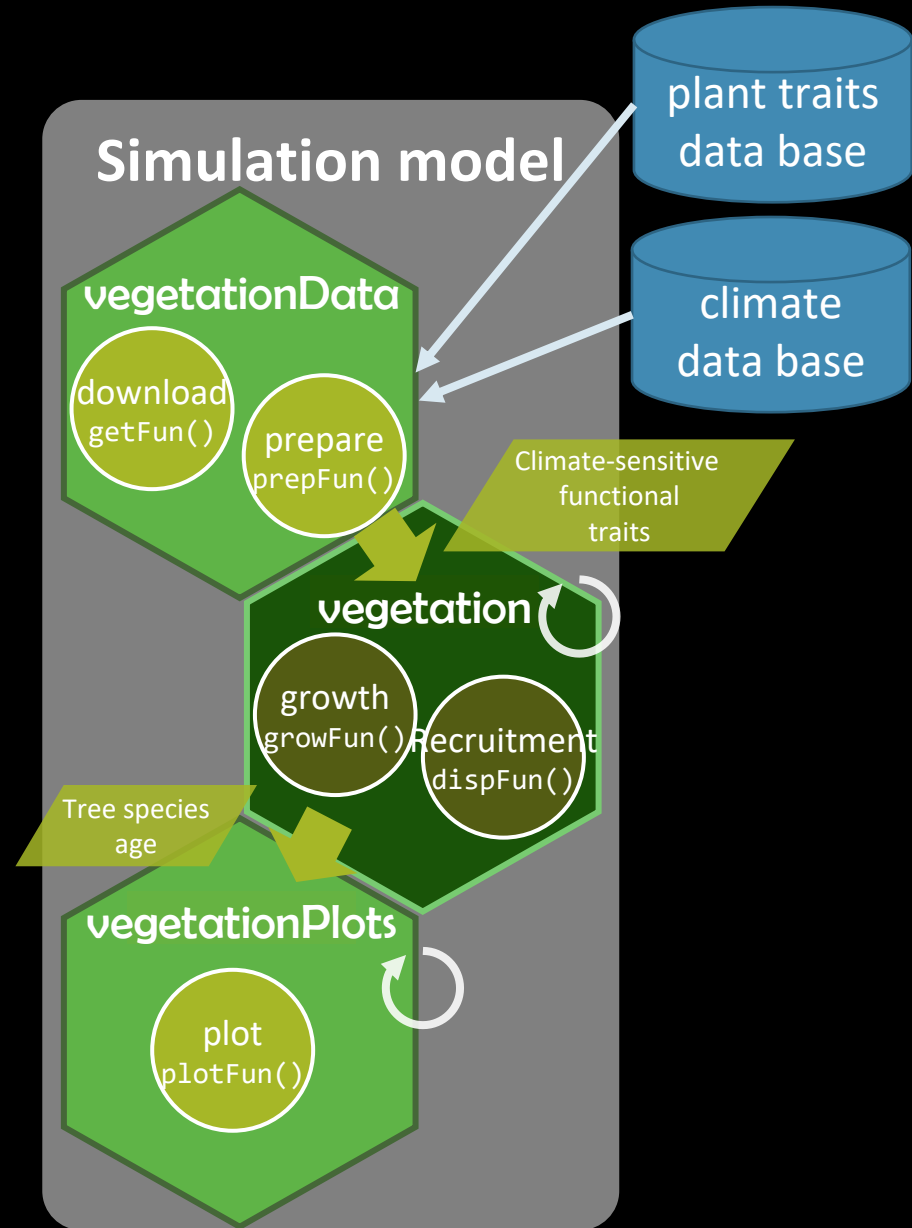
EVENT SCHEDULING

Ask yourself:

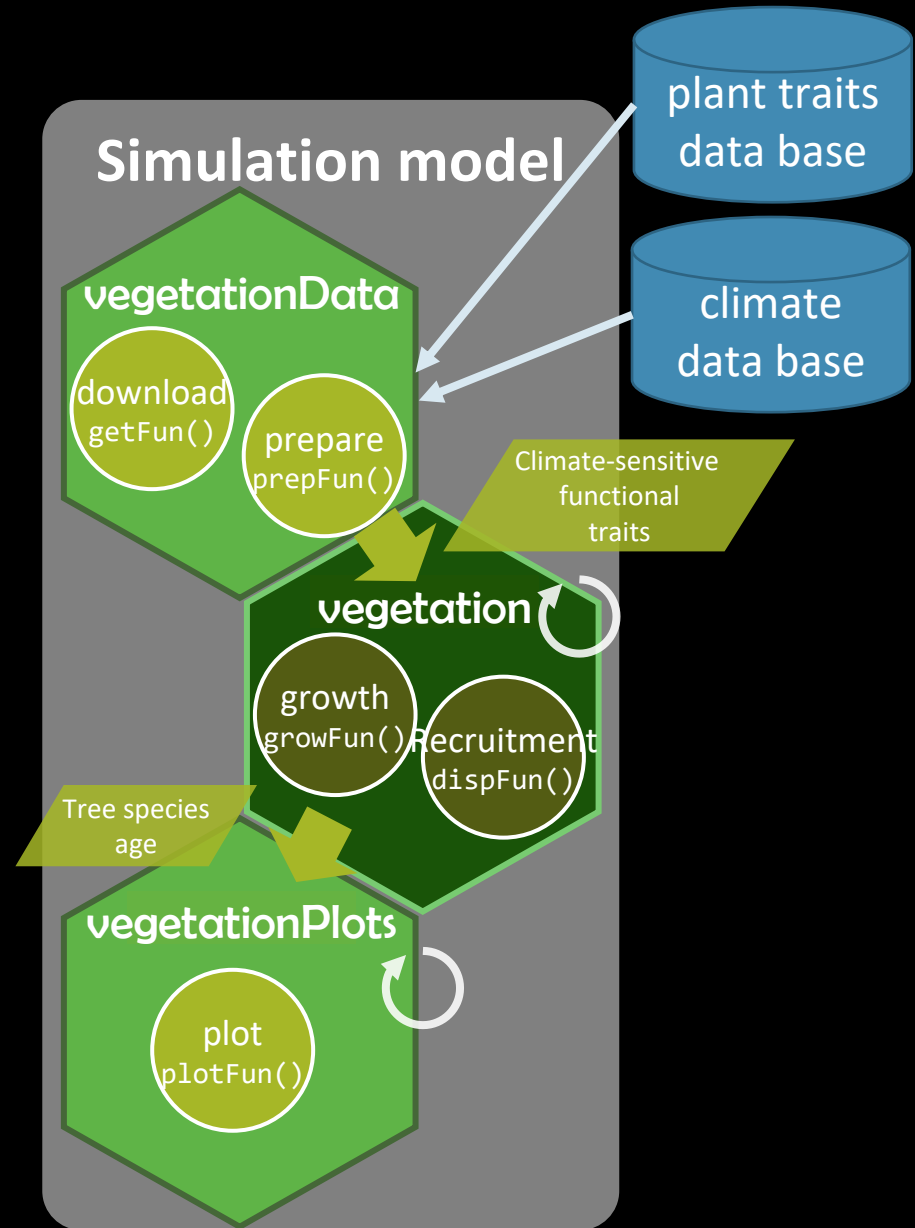- Does this operation need to be repeated?

- How often/when?

Once we know the answers we can set up event scheduling in the <module>.R

EVENT ACCESSORS

The sim keeps a log of all the scheduled and completed Events

`SpaDES.core` accessor functions let you access these logs

TIME TO LOOK AT SOME CODE

➡️ Robust and nimble scientific workflows, using SpaDES

Workshop Agenda

This is a *hands-on* workshop

Please **ask questions**, share your troubles and successes

Last 15 min of each WOYO is for discussion

We are always available via **Teams chat**