Finale

- Execution speed
- Additional features and tools
- Special versions
- Support for model applications

Execution speed is an issue...

- Run time ∝ (number of fish x number of cells)
- Things you can do:
  - ➢Don't use more, smaller cells than necessary
  - ➢Set the superindividual parameters carefully
  - ➢Use the highest possible `world-resolution` (cm per NetLogo "patch")
  - ➢Check partial results for problems
  - ➢Get a new computer, and remember that it has nothing better to do
    - Faster execution
    - More runs at once

Additional features (1): Multiple trout / salmon species

- InSTREAM and InSALMO can represent multiple species:
  - ➢Individuals of all species compete and interact
  - ➢Species differ only via parameter values
  - ➢Adding or changing species is easy:
    - Modify the parameter file to define species
    - Revise the initial population file

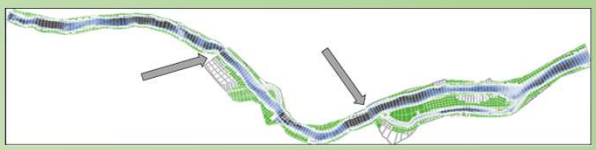
Defining a new species in the parameter file

```
; Trout and redd parameters
set species-list              (list "Rainbow" "Brown" "Cutthroat")
set trout-display-color       (list  red       brown   green )
set trout-capture-R1          (list    1.3     1.3     1.3    )
set trout-capture-R9          (list    0.4     0.4     0.4    )
set trout-cmax-A              (list    0.628   0.628   0.628  )
set trout-cmax-B              (list    0.7     0.7     0.7    )

...

set trout-spawn-start-day     (list    time:create "4/1"  time:create "10/15"  time:create "4/15" )
set trout-spawn-end-day       (list    time:create "6/30" time:create  "1/15"  time:create "5/30" )

...

set redd-devel-A              (list    0.0     0.00313  -0.000253)
set redd-devel-B              (list    0.00126   0.0000307 0.00134 )
set redd-devel-C              (list    0.0000372 0.0000934  0.0000321)
```

Additional features (2): Multiple stream reaches

- Simulations can represent a chain or network of stream reaches
- Each reach has its own habitat parameter values and time-series inputs
  - ➢Food availability, predation risks, etc.
  - ➢Flow, temperature turbidity

Spatial input is assembled in GIS



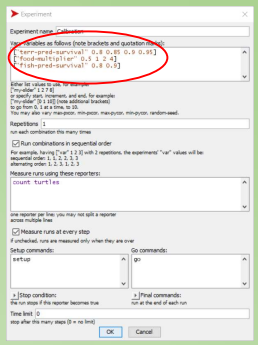
- Distances between reaches are ignored

Each reach has its own input files and parameter values

```
; Reach parameters -- lists with one value per reach
;; Reach initialization parameters
set reach-names              (list "Upstream" "Middle" "Downstream")

set time-series-input-files  (list "UpperReaches-TimeSeriesInput.csv"
                             "UpperReaches-TimeSeriesInput.csv"
                             "DownstreamReach-TimeSeriesInput.csv")
...

;; Reach-scale habitat parameters
set reach-drift-concs           (list 5.0E-10  5.0E-10  5.0E-10)
set reach-search-prods          (list 1.0E-5   1.0E-5   1.0E-5)
set reach-shelter-speed-fracs   (list 0.3      0.3      0.3)
set reach-prey-energy-densities (list 2500     2500     2500)
...
```

Additional features (3): BehaviorSpace experiment manager

24+ runs in parallel

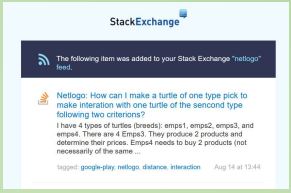


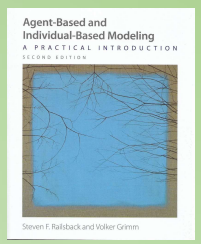
Special versions and modifications

- InSTREAM-SD/InSALMO-SD for peaking hydropower:
  - Additional time steps when flow or temperature changes within a day
- InSALMO for juveniles only
- Isolated pools: Fish can move among cells only if they are connected by water
- Spatially explicit redd scour: Hydraulic model's shear stress output is used to predict scour potential in each cell
- Angling mortality, with:
  - Fishing pressure that varies by season, fish size, etc.
  - Regulations that differ among species
- InSTREAM-GEN (D. Ayllón) with evolution

User support for NetLogo

- NetLogo has a very large user community and many resources
  - User forums
  - Tutorials
  - Books, classes





User support for InSTREAM and InSALMO

- We:
  - Keep currect versions, notices, etc. on the web site
  - Answer questions etc. from users
  - Sometimes loan out study sites
  - Are potentially available as consultants

Don't panic! It's all in the User Manual

`https://ecomodel.humboldt.edu`