EcoNet

A web based software for ecological modeling

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What is EcoNet?
How to use EcoNet?
How to enter your model?
A Model Example
Special Characters
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Methods and Parameters
What is EcoNet made of?
What are the advantages of EcoNet?

EcoNet is a web-based software for simulation and analysis of ecological network models.

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What does EcoNet do?

- Creates a graphical diagram of the model

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What does EcoNet do?

- Creates a graphical diagram of the model
- Converts the model into mathematical equation

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What does EcoNet do?

- Creates a graphical diagram of the model
- Converts the model into mathematical equation
- Solves the mathematical equations numerically

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- Creates a graphical diagram of the model
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- Plots temporal evolution of stock values

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What does EcoNet do?

- Creates a graphical diagram of the model
- Converts the model into mathematical equation
- Solves the mathematical equations numerically
- Plots temporal evolution of stock values
- Performs network analysis based on the final state of the system.

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To use EcoNet for your own model:

- Enter your model in text format

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To use EcoNet for your own model:

- Enter your model in text format
- Choose a numerical solution method

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To use EcoNet for your own model:

- Enter your model in text format
- Choose a numerical solution method
- Change default parameters if needed
- Hit «Run Model» to see the results

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EcoNet uses a flexible text format to accept models.

Because, it is:

- Quick and easy to enter
- Human readable

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EcoNet needs three information in your model:

- The model as flows between compartments

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EcoNet needs three information in your model:

- The model as flows between compartments
- A coefficient for each flow

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EcoNet needs three information in your model:

- The model as flows between compartments
- A coefficient for each flow
- Initial condition of compartment values

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- Flows
- Flow coefficients
- Initial conditions
- Optional comments

```
# A very simple model
Phyto -> Zoo c=1
Zoo -> Fish  c=.5 # Zooplankton consumption
* -> Phyto   c=3  # output
Fish -> *    c=.2 # input
Phyto=10, Zoo=1, Fish=5 # initial values
```

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- Environment «*»
- Flow «->»
- Flow coefficient assignment «c=»
- Initial condition assignment «=»
- Comment «#»

```
# A very simple model
Phyto -> Zoo c=1
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EcoNet ignores spaces and empty lines.

You can use these to make your system more readible.

```
# Enter your model here..
# Below is a simple model example

Phyto -> Zoo c=1 # consumption of Phytoplankton
Zoo -> Fish  c=.5 # consumption of Zooplankton
* -> Phyto   c=3 # outputs
Fish -> *    c=.2 # inputs

Phyto=10, Zoo=1, Fish=5 # initial stock values
```

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You can list initial conditions in the end:

```
Phyto -> Zoo c=1 # consumption of Phytoplankton
Zoo -> Fish  c=.5 # consumption of Zooplankton
* -> Phyto   c=3 # outputs
Fish -> *    c=.2 # inputs
Phyto=10, Zoo=1, Fish=5 # initial stock values
```

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```
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* -> Phyto   c=3 # outputs
Fish -> *    c=.2 # inputs
Phyto=10, Zoo=1, Fish=5 # initial stock values
```

or in the beginning:

```
Phyto=10, Zoo=1, Fish=5 # initial stock values
Phyto -> Zoo c=1 # consumption of Phytoplankton
Zoo -> Fish  c=.5 # consumption of Zooplankton
* -> Phyto   c=3 # outputs
Fish -> *    c=.2 # inputs
```

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or you can list initial conditions in between:

```
Phyto -> Zoo c=1 # consumption of Phytoplankton
Phyto=10, Zoo=1
Zoo -> Fish  c=.5 # consumption of Zooplankton
Fish=5
* -> Phyto   c=3 # outputs
Fish -> *    c=.2 # inputs
```

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or you can list initial conditions in between:

```
Phyto -> Zoo c=1 # consumption of Phytoplankton
Phyto=10, Zoo=1
Zoo -> Fish  c=.5 # consumption of Zooplankton
Fish=5
* -> Phyto   c=3 # outputs
Fish -> *    c=.2 # inputs
```

Seperate them by commas, semi-colons, or newlines:

```
Phyto=10; Zoo=1 # initial stock values
Fish=5
Phyto -> Zoo c=1 # consumption of Phytoplankton
Zoo -> Fish  c=.5 # consumption of Zooplankton
* -> Phyto   c=3 # outputs
Fish -> *    c=.2 # inputs
```

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You can write flow coefficients next to flows:

```
Phyto -> Zoo c=1 # consumption of Phytoplankton
Zoo -> Fish  c=.5 # consumption of Zooplankton
* -> Phyto   c=3 # outputs
Fish -> *    c=.2 # inputs
Phyto=10, Zoo=1, Fish=5 # initial stock values
```

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* -> Phyto   c=3 # outputs
Fish -> *    c=.2 # inputs
Phyto=10, Zoo=1, Fish=5 # initial stock values
```

or all in one line:

```
Phyto -> Zoo # consumption of Phytoplankton
Zoo -> Fish  # consumption of Zooplankton
* -> Phyto   # outputs
Fish -> *    # inputs
c=1 c=.5 c=3 c=.2
Phyto=10, Zoo=1, Fish=5 # initial stock valuess
```

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Or you can write them anywhere:

```
c=1
Phyto -> Zoo # consumption of Phytoplankton
c=.5, c=3
Zoo -> Fish  # consumption of Zooplankton
* -> Phyto   # outputs
Fish -> *    # inputs
Phyto=10, Zoo=1, Fish=5 # initial stock values
c=.2
```

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Or you can write them anywhere:

```
c=1
Phyto -> Zoo # consumption of Phytoplankton
c=.5, c=3
Zoo -> Fish  # consumption of Zooplankton
* -> Phyto   # outputs
Fish -> *    # inputs
Phyto=10, Zoo=1, Fish=5 # initial stock values
c=.2
```

Same is true for flows:

```
Phyto -> Zoo c=1, Zoo -> Fish c=.5
* -> Phyto c=3, Fish -> * c=.2
Phyto=10, Zoo=1, Fish=5
```

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Even the following is accepted:

```
Phyto -> Zoo, Zoo -> Fish, * -> Phyto, Fish -> *
c=1, c=.2; c=4, c=2; Phyto=10, Zoo=1; Fish=5
```

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Even the following is accepted:

```
Phyto -> Zoo, Zoo -> Fish, * -> Phyto, Fish -> *
c=1, c=.2; c=4, c=2; Phyto=10, Zoo=1; Fish=5
```

and the following as well:

```
#parameters
c=1, c=.2; c=4, c=2; Phyto=10, Zoo=1; Fish=5
# flows
Phyto -> Zoo, Zoo -> Fish, * -> Phyto, Fish -> *
```

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- 4^{th} order Runge-Kutta Method
  - Total time - Step Size - Output Resolution
- Adaptive Runge-Kutta-Fehlberg Algorithm
  - Maximum time - Sensitivity - Output Resolution
- Stochastic Solver (Langevin Equation derived from Fokker-Planck)
  - Total time - Step Size - Output Resolution
- Discrete Particle Method (Gillespie's algorithm)
  - Total time - (Step Size) - Output Resolution

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- A set of interacting codes based on:
  - **C++ codes**: Computing intensive processes (simulations)
  - **Linux/Unix shell scripts**: Interaction and communication among separate modules
  - **Awk, Sed and Grep**: Parsing of human input
  - **Graphviz**: Forming network graphs
  - **CGI**: Web interface (under development)

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EcoNet is:

- extremely modular and flexible.
- fast and efficient by design; combines the power of several software.
- web-based, no installation is necessary.
- easy to use.
- uses recent sophisticated numerical methods.
- brings the model and results closer together.
- forms an artificial experimental environment where deeper aspects of ecological networks can be identified and studied.

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- uses recent sophisticated numerical methods.
- brings the model and results closer together.
- forms an artificial experimental environment where deeper aspects of ecological networks can be identified and studied.

What are the advantages of EcoNet?

What is EcoNet?
How to use EcoNet?
How to enter your model?
A Model Example
Special Characters
Flexibility
Flexibility
Flexibility
Flexibility
Flexibility
Flexibility
Methods and Parameters
What is EcoNet made of?
What are the advantages of EcoNet?

EcoNet is:

- extremely modular and flexible.
- fast and efficient by design; combines the power of several software.
- web-based, no installation is necessary.
- easy to use.
- uses recent sophisticated numerical methods.
- brings the model and results closer together.
- forms an artificial experimental environment where deeper aspects of ecological networks can be identified and studied.