Landscape Surface

The landscape is described by a two dimensional grid. Each position in the grid has a height associated with it. In this way a three dimensional surface is defined. All landscapes used in EcoWar are wrap around which means there are no arbitrarily defined boundaries to the environment.

A water level is defined for the landscape which specifies which areas of the landscape are submerged and which are not.

Appropriate colouring and shading is given to the landscape to indicate height and water depth if the position is submerged. Also areas with dense vegetation will be shaded green.

Related topics:

Using the Landscape Display
Simulated Plant Processes
Simulated Animal Processes

Terrestrial and Aquatic Temperatures

Temperature is described simply by a percentage value. The default landscape temperature is 50%. A larger value indicates a warmer climate while a smaller value indicates a cooler environment. EcoWar allows the landscape temperature to range from about 0% to 100%.

The environments temperature will vary with altitude and water depth. At the specified water level for the landscape the temperature will be the warmest (relative to the other temperature extremes in the environment). Higher altitudes will have cooler temperatures. Mountain peaks will have the coldest climate. Increasing water depth will also result in cooler temperatures.

Related topics:

Using the Landscape Display
Simulated Plant Processes
Simulated Animal Processes

Terrestrial and Aquatic Soil Nutrients

Soil nutrients is described simply by a percentage value. The default landscape soil nutrient level is 50%. A larger value indicates more soil nutrients while a smaller value indicates less soil nutrients. EcoWar allows the soil nutrient level to range from about 0% to 100%.

The environments soil nutrient level will vary with altitude and water depth. At the specified water level for the landscape the soil nutrient level will be greatest (relative to the other soil nutrient level extremes in the environment). Higher altitudes will have less soil nutrients. Mountain peaks will have the least amount of soil nutrients. Increasing water depth will also result in less soil nutrients.

Related topics:

Using the Landscape Display
Simulated Plant Processes
Simulated Animal Processes

Simulated Plant Processes

The following processes are modelled in EcoWar. These processes are simulated for each unit of game time.

Survival

This process models plant species survival. The following factors effect the survival of a particular plant species.

Soil Nutrients

Each map position will have a certain amount of nutrients based on the current nutrient distribution heuristic. Each species of plant requires a certain amount of nutrients per unit of game time. If there is enough soil nutrients to support the plant species then there is no chance its population will decrease. If there is a portion of the total amount of nutrients required then there is a chance that the plant species population will decrease. If there is no nutrients then the plant species population will decrease.

Population density will also effect the rate of population decrease when soil nutrient are limited. The higher the plant species density when there is not enough soil nutrients the more likely the population will decrease. Low density populations will have a slightly better chance of surviving in such circumstances.

A particular map position with multiple plant species which require more nutrients then is present will result in competition for the necessary resource. Plant species which have a higher growth rate will have access to the soil nutrients pool first. Plant species with lower growth rates will be last and may only get a proportion of their nutrient requirements or none at all resulting in a population reduction.

Weather Conditions

Each plant species has an ideal temperature range. When living in an environment temperature that is inside this range the weather will not negatively effect the plant species population. When the environment temperature is outside this range there is a chance that the extreme weather conditions will reduce the population. The further the environmental temperature deviates from the plant species ideal temperature range, the more likely the population will decrease. A plant species protection attribute will reduce the effects of extreme weather conditions. The higher the plant species protection the more likely it is to survive extreme weather conditions.

Overpopulation

Plant species which are large are less likely to be able to sustain a large population. As the population increases the rate of population reductions due to overpopulation will increase. As such plant species populations will reach an equilibrium point that is appropriate for the size. Smaller plant species can support much denser populations.

Reproduction/Propagation

Each plant species has a reproduction rate. The highest reproduction rate results in the plant species reproducing every unit of game time. Lower reproduction rates result in the plant species not reproducing

on every unit of game time.

Reproduction at a particular position involves the spreading of the plant species to adjacent positions. The plant species population density has an effect on the rate of the propagation. Higher population densities have a greater chance or reproducing than lower density populations.

Related topics

Plant Species Attributes
Species Taste System

Plant Species Attributes

Habitat

This describes the type of environment the plant species can live in. It can be set to either aquatic (in water), terrestrial (on land) or both. If a plant species habitat is set to aquatic only then it can only exist in the submerged regions of the landscape. If a plant species habitat is set to terrestrial only then it can only exist on land. If a plant species habitat to set to both environments then it can only exists near coastal regions on the landscape.

Related topics:

Using the Attribute List Controls

Size

This describes the size of the plant species. The size of the plant species effects it in the following way.

Advantages:

* The larger the size the more difficult it is to destroy the plant species. Animals which feed on the plant species are less likely to cause its extinction.

Disadvantages:

* The larger the size the more soil nutrients the plant species requires to survive. In areas where soil nutrients are scarce large species are more likely to become extinct.

Related topics:

Using the Scale Control

Growth Rate

This describes how fast the plant species grows. The growth rate of a plant species effects it in the following way.

Advantages:

* Plant species with higher growth rates have access to soil nutrients first. In areas where soil nutrients are scarce a higher growth rate increases the chance of survival.

Disadvantages:

* The larger the growth rate the more soil nutrients the plant species requires.

Related topics:

Using the Scale Control

Ideal Temperature Range

This describes the environment temperature range that most suits the plant species. Plant species can survive in environmental temperatures outside this range but are more likely to die. The further the environmental temperature deviates from the plant species ideal temperature range, the more likely the species will become extinct.

Related topics:

Using the Range Control

Taste

This describes the taste of the plant species to animal species. There are ten possible tastes the plant species can have. An animal species Acquired Taste specifies what tastes it likes. If the plant species taste in within the animal species range of likeable tastes then the animal species will eat the plant species.

Related topics:

Using the Set Controls
Species Taste System

Poison

This describes the toxicity of the plant species, if any, to animal species. If an animal species eats a plant species which is toxic to it then it will die.

Related topics:

Using the Set Controls
Species Immune System

Camouflage

This describes the plant species ability to prevent itself from being noticed by animal species. The camouflage of a plant species effects it in the following way.

Advantages:

* Less chance of this plant being eaten by animal species which consider it food.

Disadvantages:

* Requires more soil nutrients to survive.

Related topics:

Using the Scale Control

Protection

This describes the effectiveness of the plant species protective layer (if any). The protection of a plant species effects it in the following way.

Advantages:

* Less chance of this plant being eaten by animal species which consider it food.

Disadvantages:

* Requires more soil nutrients to survive.

Related topics:

Using the Scale Control

Reproduction Rate

This describes how often the plant species reproduces. A high reproduction rate means the plant species can quickly multiply and increase its population.

Related topics:

Using the Scale Control

Simulated Animal Processes

The following processes are modelled in EcoWar. These processes are simulated for each unit of game time.

Encounters - Animal Species / Plant Species

If a plant species taste is within the acquired taste range of an animal species then the animal species will eat the plant species when it is present. However an animal species may find a plant species difficult to eat due to a number of factors. The plant species protection level, camouflage level and size will make it difficult to eat by some animal species. However an animal species size and some other attributes will also allow it to eats plants easier.

When an animal species does eat a plant species there will be a chance that the plant species population is reduced. If the animal species finds it easy to consume a plant species and is present in large numbers then there is a good chance that the plant species will experience a reduction in population.

Some plant species contain toxins which may kill an animal species if it consumes the plant species. In such cases the animal species immune system has to neutralize the plant toxin otherwise it risks a population reduction.

Encounters - Animal Species / Animal Species

For an animal species to consider another animal species food two constraints must be satisfied. Each animal species has a list of animal classes which it considers food. The first constraint is whether the other animal species class is a food class. The second constraint it the taste constraint as for plant species.

Animal species with the greatest speed are always processed first followed by the slower species. This makes it easier for faster animal species to survive since they get first access to food resources. Slower animal species will have to compensate for this effect by having tactical advantages in other areas.

Once an animal species has found a food source the encounter will begin. The large range of animal species attributes effect their ability to live in the environment in varying ways. See the related topics below for exactly what these effects are. When an animal species does eat another animal species there will be a chance that the other animal species population is reduced. If the animal species finds it easy to consume the other animal species and is present in large numbers then there is a good chance that the eaten animal species will experience a reduction in population. Some animal species classes are resistant to the effects of being fed on by other classes. Insects are a good example of this. Other animal classes are very unlikely to cause the extinction of insects by feeding of them. Only other insect species can cause such population reductions in other insect species.

Some animal species contain toxins which may kill other animal species which consumes it. In such cases the animal species immune system has to neutralize the toxin otherwise it risks a population reduction. Other animal species may have a poisonous attack ability which increases their ability to successfully feed of other animal species. However this added offensive capability is only effective if the other animal species is not immune to the effects of the poison.

Survival

Plant and Animal Nutrients

When an animal species consumes a plant species or another animal species it will receive a certain amount of nutrients. Each species of animal requires a certain amount of nutrients per unit of game time. Generally it is the animal species size which determines their nutrient intake requirements however many other attributes can effect this (see related topics below). If the animal species has consumed the amount of nutrients it requires then there is no chance its population will decrease. If a portion of the total amount of nutrients required was consumed then there is a chance that the population will decrease. If the animal species failed to find any food sources then its population will decrease.

Population density will also effect the rate of population decrease when sufficient food source are limited. The higher the animal species density when such conditions arise the more likely the population will decrease. Low density populations will have a slightly better chance of surviving in such circumstances.

Weather Conditions

Each animal species has an ideal temperature range. When living in an environment temperature that is inside this range the weather will no negative effect on the population. When the environment temperature is outside this range there is a chance that the extreme weather conditions will reduce the animal species population. The further the environmental temperature deviates from the animal species ideal temperature range, the more likely the population will decrease. An animal species protection attribute will reduce the effects of extreme weather conditions. The higher the animal species protection the more likely it is to survive extreme weather conditions.

Overpopulation

Animal species which are large are less likely to be able to sustain a large population. As the population increases the rate of population reductions due to overpopulation will increase. As such animal species populations will reach an equilibrium point that is appropriate for the size. Smaller animal species can support much denser populations.

Reproduction

Each animal species has a reproduction rate. The highest reproduction rate results in the animal species reproducing every unit of game time. Lower reproduction rates result in the animal species not reproducing on every unit of game time.

Reproduction at a particular position involves the spreading of the animal species to adjacent positions. The animal species population density has an effect on the rate of the propagation. Higher population densities have a greater chance or reproducing than lower density populations.

Related topics

Animal Species Attributes
Species Immune System
Species Taste System

Animal Species Classes

Animal species are divided into eight classes. The animal classes each have their own set of restrictions on the common animal attributes given them advantages and disadvantages over the other animal classes. In addition to these restrictions each animal class has its special abilities as describes below.

Amphibian

Body Poison

This describes the amphibians toxicity to animals species which eat it.
If the animal species immune system can't neutralize the poison it will die.

Related topics:

Using the Set Controls
Species Immune System

Arachnid

Poison

This describes the type of venom the arachnid has. The effects of the arachnid species venom can only take effect if the immune system of the other animal species can't neutralize it.

Poison Strength

If the venom is toxic to the target animal species then the poison strength attribute takes effect as follows.

Advantages:

* Increases the ability of the arachnid species to attack other animal species.
* Increases the ability of the arachnid species to defend itself.

Web Effectiveness

This describes the effectiveness of the arachnid's web. The arachnid species web effects it in the following way.

Advantages:

* Increases the arachnid species ability to attack other animal species.

Disadvantages:

* Requires more food to survive.

Related topics:

Using the Set Controls
Using the Scale Control

Species Immune System

Bird

Flight Ability

This describes the ability of the bird to fly. Flight effects the bird species in the following way.

Advantages:

* Increases the ability of the bird species to move quickly.
* Increases the ability of the bird species to attack other animal species.
* Increases the ability of the bird species to avoid attacks from other animal species.

Disadvantages:

* Requires more food to survive.

Related topics:

Using the Scale Control

Crustacean

Claws Effectiveness

This describes the effectiveness of the crustacean species claws. Claws effects the crustacean species in the following way.

Advantages:

* Increases the ability of the crustacean species to attack other animal species.
* Increases the ability of the crustacean species to defend itself against attacks from other animal species.

Disadvantages:

* Requires more food to survive.

Related topics:

Using the Scale Control

Fish

Swimming Ability

This describes the ability of the fish to swim. Swim effects the fish species in the following way.

Advantages:

* Increases the ability of the fish species to move quickly.

Disadvantages:

* Requires more food to survive.

Jaws Effectiveness

This describes the effectiveness of the fish species jaws. Jaws effects the fish species in the following way.

Advantages:

* Increases the ability of the fish to attack other animal species.

Related topics:

Using the Scale Control

Insect

Poison

This describes the type of venom the insect has. The effects of the insect species venom can only take effect if the immune system of the other animal species can't neutralize it.

Poison Strength

If the venom is toxic to the target animal species then the poison strength attribute takes effect as follows.

Advantages:

* Increases the ability of the insect species to attack other animal species.
* Increases the ability of the insect species to defend itself.

Flight Ability

This describes the ability of the insect to fly. Flight effects the insect species in the following way.

Advantages:

* Increases the ability of the insect species to move quickly.

Disadvantages:

* Requires more food to survive.

Jaws Effectiveness

This describes the effectiveness of the insect species jaws. Jaws effects the insect species in the following way.

Advantages:

* Increases the ability of the insect species to attack other animal species.

Related topics:

Using the Scale Control

Mammal

Claws Effectiveness

This describes the effectiveness of the mammal species claws. Claws effects the mammal species in the following way.

Advantages:

* Increases the ability of the mammal species to attack other animal species.

Jaws Effectiveness

This describes the effectiveness of the mammal species jaws. Jaws effects the mammal species in the following way.

Advantages:

* Increases the ability of the mammal species to attack other animal species.

Related topics:

Using the Scale Control

Reptile

Poison

This describes the type of venom the reptile has. The effects of the reptile species venom can only take effect if the immune system of the other animal species can't neutralize it.

Poison Strength

If the venom is toxic to the target animal species then the poison strength attribute takes effect as follows.

Advantages:

* Increases the ability of the reptile species to attack other animal species.
* Increases the ability of the reptile species to defend itself.

Claws Effectiveness

This describes the effectiveness of the reptile species claws. Claws effects the reptile species in the following way.

Advantages:

* Increases the ability of the reptile species to attack other animal species.

Jaws Effectiveness

This describes the effectiveness of the reptile species jaws. Jaws effects the reptile species in the following way.

Advantages:

* Increases the ability of the reptile species to attack other animal species.

Related topics:

Using the Set Controls
Using the Scale Control
Species Immune System

Animal Species Attributes

Habitat

This describes the type of environment the animal species can live in. It can be set to either aquatic (in water), terrestrial (on land) or both. If an animal species habitat is set to aquatic only then it can only exist in the submerged regions of the landscape. If an animal species habitat is set to terrestrial only then it can only exist on land. If an animal species habitat to set to both environments then it can only exists near coastal regions on the landscape.

Related topics:

Using the Attribute List Controls

Consume Class

This describes the general classes of animals this animal species considers food. This is the first constraint used to determine if this animal species will eat another animal species. The other constraint is taste.

Related topics:

Using the Attribute List Controls
Species Taste System

Acquired Taste

This describes the taste of food this animal species likes. There are ten possible tastes the animal species can like. It may like any number of tastes. If the plant or animal species taste in within the animal species range of likeable tastes then the animal species will eat the plant or animal species.

Related topics:

Using the Set Controls
Species Taste System

Taste

This describes the taste of the animal species to other animal species. There are ten possible tastes the animal species can have. An animal species Acquired Taste specifies what tastes it likes. If this animal species taste in within the other animal species range of likeable tastes then the other animal species will eat this animal species.

Related topics:

Using the Set Controls
Species Taste System

Immunity

This describes the what toxins the animal species is immune to. If the animal species immunity range encompasses a type of poison then it will be immune to the effects of the poison. For a better explanation of the immune system see the related topics below.

Related topics:

Using the Set Controls
Species Immune System

Sensors

This describes the effectiveness of animal species sensors (e.g. sight, hearing, smell etc.). The sensors effects the animal species in the following way.

Advantages:

* Increases the animal species ability to successfully attack other animals species.
* Increases the animal species ability to find and eat plant species.
* Increases the animal species ability to avoid attacks from other animal species.

Related topics:

Using the Scale Control

Camouflage

This describes the animal species ability to prevent itself from being noticed by other animal species. The camouflage of an animal species effects it in the following way.

Advantages:

* Increases the animal species ability to successfully attack other animal species.
* Increases the animal species ability to avoid being attacks from other animal species.

Related topics:

Using the Scale Control

Protection

This describes the effectiveness of the animal species protective layer (if any). The protection of an animal species effects it in the following way.

Advantages:

* Increases the animal species ability to minimize the effects of attacks from other animal species.
* Increases the ability of the animal species to eat plant species.

Disadvantages:

* Requires more food to survive.
* Decreases the ability of the animal species to move quickly.

Related topics:

Using the Scale Control

Size

This describes the size of the animal species. The size of the animal species effects it in the following way.

Advantages:

* Increases the ability of the animal species to attack other animal species.
* Increases the ability of the animal species to eat plant species.

Disadvantages:

* Requires more food to survive.

Related topics:

Using the Scale Control

Nutrient Storage

This describes the animal species ability to store energy as fat. The nutrient storage of an animal species effects it in the following way.

Advantages:

* Increases the animal species ability to stay alive when food becomes scarce.

Disadvantages:

* Decreases the ability of the animal species to move quickly.

Related topics:

Using the Scale Control

Base Speed

This describes the ability of the animal species to move quickly. The base speed of the animal species effects it in the following way.

Advantages:

* Increases the ability of the animal species to move quickly
* Increases the ability of the animal species to attack other animal species.

* Increases the ability of the animal species to defend itself against other animal species attacks.

Disadvantages:

* Requires more food to survive.

Related topics:

Using the Scale Control

Ideal Temperature Range

This describes the environment temperature range that most suits the animal species. Animal species can survive in environmental temperatures outside this range but are more likely to die. The further the environmental temperature deviates from the animal species ideal temperature range, the more likely the species will become extinct.

Related topics:

Using the Range Control

Reproduction Rate

This describes how often the animal species reproduces. A high reproduction rate means the animal species can quickly multiply and increase its population.

Related topics:

Using the Scale Control

Species Immune System

Animal species have immune systems that provide protection from poisons which they may come into contact with. To determine if a poison has an effect on an animal species the poison range must be compared with the immunity range.

If the animal species immunity range encompasses the poison range then the poison will have no effect. If the animal species immunity range doesn't encompasses any of the poison range then the poison will have full effect. If the animal species immunity range encompasses part of the poison range then there is a chance that the poison will have an effect. The chance of the poison taking effect is proportional to how much of the immunity range encompasses the poison range. If the poison range is mostly covered by the immunity range then there is only a small chance the poison will be effective.

The immune system comes into play in two ways. When an animal species consume a poisonous plant or animal species an immune system check must be made to determine the effects, if any, of the poison. The other way the immune system comes into play is during encounters between animal species. Some animal species have a poisonous attack that only comes into play if the target species is not immune to its effects.

Related topics:

Using the Set Controls

Species Taste System

The taste system in EcoWar determines what animal species will eat. Every species will have a taste attribute which describes its taste on a scale with ten different tastes. An animal species has an acquired taste attribute which specifies what range of tastes it likes. If a potential food source has a taste value that is within this acquired taste range then the animal species will try to eat it.

Animal species have a further restriction on what types of animal species they can eat. Each animal species has a consume class attribute which describes what animal classes they consider food.

Related topics:

Using the Set Controls

Tips on How to Create a Scenario

When creating your own ecosystem you will be introduced to the subtle complexities of balancing an ecosystem. You will usually have to create a sustainable food web which becomes a juggling act between such factors as reproduction rate and consumption rate. A full description of how all the species attributes effect their behaviour is provided in this help file however it is a lot to remember so here is a summary of what factors you should be considering when designing species.

Plants

* Depend on soil only for all their nutrients.
* Growth rate determines which plants access the nutrient pool first.
* Have a defensive ability against animals eating them.

Animals

* Depend on plants and/or animals for all their nutrients.
* Speed determines which animals get first access to food sources.
* Have an offensive ability which determines how well they can feed on other animals.
* Have a defensive ability which determines how difficult it is for other animals to feed of them.
* Have an ability to eat plants which determines how easy it is for them to consume plants.

Depending on the type of computer you want your scenario to run on, you may have to take into account the speed at which EcoWar simulates your scenario. If speed is a concern then consider the following points.

* The amount of time required to simulate one species is directly proportional to the area they occupy. A species density at a particular location makes no difference to the processing time. Try not to use too many species that occupy large portions of the landscape. You can do this by modifying the Ideal Temperature species attribute.

* Species reproduction is a time consuming task. Having many species with high reproduction rates will result in a slow simulation. Significant speed increases can be achieved if most species have average reproduction rates.

* Plant species are simulated slightly quicker than animal species. You may try to use more plants than animals if this is possible.

* Controlling the amount of space that species can occupy is a good way in which to prevent species from dominating the landscape. You may wish to create a small island on which all the species can live. This will ensure the simulation will run at a good pace. You can create your own landscape by specifying a terrain map when you create a new scenario.

* Finally, if these actions do not help you then you can always save the simulation at key points in its history and display each in turn.

Related topics:

Plant Species Attributes
Animal Species Attributes
Animal Species Classes
Species Immune System
Species Taste System
Simulated Plant Processes
Simulated Animal Processes

Using the Options Window

Begin Scenario

This option allows you to load an EcoWar scenario and begin simulating it. Once a scenario has begun it can be saved at any time and continued later with the Load Saved Simulation option. Note that a saved simulation can not be edited as a scenario.

Load Saved Simulation

This option allows you to load a previously stored EcoWar simulation and continue from the point it was saved.

New Scenario

This option allows you to create and set up a new EcoWar simulation. A new landscape is generated and then you are able to add plant and animal species to this landscape. Species attributes can be modified as appropriate with no modification restrictions.

Edit Scenario

This options allows you to edit a previously stored EcoWar scenario that was created with the New Scenario option.

Using the Landscape Parameters Window

Water Level

This option allows you to specify how much of the landscape is covered by water. A high water level results in most of the landscape being covered by water. A low water level does the opposite.

Terrain Density

This option allows you to specify how fragmented the landscape is. A high terrain density makes the landscape have many peaks and troughs closely packed together. A low terrain density usually results in a landscape with one dominant peak. The best way to understand the effects of the terrain density option is to experiment with the different settings.

Specify Terrain Map

This is an optional setting which allows you to have some control over the layout of the landscape. If you don't specify a terrain map then EcoWar will randomly generate one.

A terrain map is a guide which tells EcoWar where to put hills and mountains. A terrain map is just an image with the same dimensions as the landscapes used in EcoWar. You can create an image using any image processing package. When doing so the following restrictions should be adhered to.

* The image must be saved in Truevision Targa (TGA) file format.
* It can be an 8, 16, or 24 bit image.
* The size of the image should be 184 x 160 pixels. Larger images will be truncated and smaller images will be padded to fit the required dimensions.

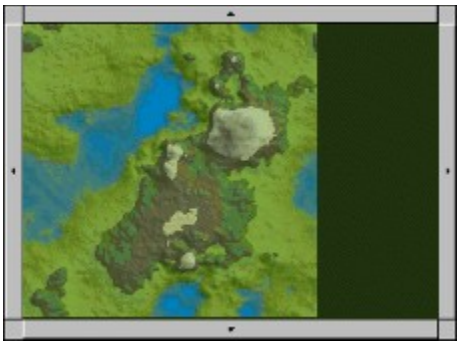
The terrain map should consist of three colours - black, grey and white. Other colours may be used but you may not get the results you want. Any areas coloured black will translate to flat low regions in the landscape. Areas coloured grey will translate to hilly regions and white areas will translate to high mountainous regions in the landscape.

To achieve best results you should select a high terrain density. This will create a landscape the most adheres to your terrain map. Using a normal terrain density makes for a more vague interpretation of your terrain map. Selecting a low terrain density will result in a landscape that probably doesn't look anything like the terrain map you specified.

Using the Landscape Display

The landscape display shows a top down view of the landscape. The terrain is shaded according to height, water depth and degree of vegetation. By default the land is shaded a yellow-brown sandy colour. As vegetation increases the land will be shaded green. Areas that are shaded darker then the rest of the landscape indicate the region occupied by the currently selected plant or animal species.

The picture below shows a typical landscape with dense vegetation. The region shaded with darker colours is the region occupied by a particular species.



To navigate around the landscape you can use the four buttons located at the edge of each side of the landscape display. These buttons have arrows which indicate the direction the landscape will scroll if the button is pressed. Note that the landscape is continuous (wrap around). This means that the bottom of the landscape continues (wraps around) at the top of the map. The same is true for the vertical edges. Species propagating past one edge will appear at the opposite edge.

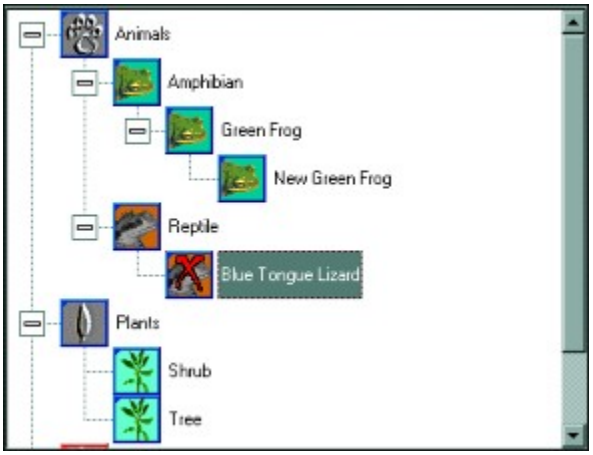
Another way to navigate the landscape is to zoom in and out at particular locations in the landscape. You can do this by pressing the LEFT mouse button to zoom in and the RIGHT mouse button to zoom out. The landscape display will automatically center itself around the current location of the mouse pointer.

Related topics:

Landscape Surface
Terrestrial and Aquatic Temperatures
Terrestrial and Aquatic Soil Nutrients

Using the Species Evolution Display

The species evolution display shows which species exist or did exist in the simulation and their relationship to one another. Species are divided into four groups - animals, plants, invading animals and invading plants. Invading species are introduced species which are competing with the established natural species for dominance of the landscape. The animal species are divided into eight animal classes - amphibian, arachnid, bird, crustacean, fish, insect, mammal and reptile. The following picture shows a typical species evolution display.



As a simulation progresses some species may become extinct. These species will be shown with a red cross on them. In the above picture the reptile species Blue Tongue Lizard has become extinct. The above picture also shows the evolutionary relationship between the amphibian species Green Frog and New Green Frog.

Pressing the RIGHT mouse button on any of the icons in the species evolutionary display will bring up a particular menu. These menus will differ depending on what mode EcoWar is in. When EcoWar is in edit mode pressing the RIGHT mouse button will bring up menus allowing you to add/remove species from the evolutionary tree. When EcoWar is in simulation mode pressing the RIGHT mouse button on a species will bring up a menu allowing you to evolve a new species from the currently selected species.

Related topics:

Plant Species Attributes
Animal Species Attributes
Animal Species Classes

Using the Graph

The graph can display three types of information - soil nutrient level, environment temperature and species population. Fluctuations in these three types of data are displayed over time. In EcoWar time represents how many simulation updates have occurred. Each time the landscape is updated the time dimension in the graphs is incremented.

You can select the graph you wish to be displayed by pressing one of the select graph buttons located in the toolbar.

Soil Nutrient Level Graph

The level of nutrients in the soil is described as a percentage value. A high percentage means there is a lot of soil nutrients. A low percentage means there is little soil nutrients. You can change the level of nutrients in the soil by pressing the soil nutrient level modification buttons located in the toolbar.

Temperature Level Graph

The environment temperature is described as a percentage value. A high percentage means the environment temperature is hot. A low percentage means the environment temperature is cold. You can change the temperature level by pressing the temperature level modification buttons located in the toolbar.

Species Population Graph

When a plant or animal species is selected its population graph will be displayed. Species populations will vary a lot from species to species and over time. The vertical axis will automatically change its scaling to best fit the data points to be displayed. You should always check the axis scaling when comparing population graphs.

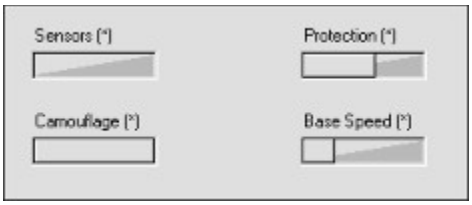
Species populations are only an indication of how much landscape area a particular species occupies. They only roughly resemble population sizes that would be observed in a real environment. The exact species population is not as important as the species population changes over time and the difference in population sizes between species.

Related topics:

Landscape Surface
Terrestrial and Aquatic Temperatures
Terrestrial and Aquatic Soil Nutrients

Using the Scale Control

The scale control displays the magnitude of a particular variable. Each scale control has a title associated with it which describes the variable it is representing. Underneath the title is a graphical display of the value of this variable. A rectangle is drawn in the scale control to indicate the current value of the variable. The rectangle begins on the left of the control and increases in size according to the magnitude of the variable. If the value of the variable is small then a small rectangle will be drawn of the left of the control. If the value is large then the rectangle will extend to the right of the control. The following picture shows some typical scale controls used in EcoWar.



In the above picture the Sensors variable it set to its minimum value indicated by no rectangle being drawn in the control. The Protection variable has a value about half of the maximum value it could have. The Camouflage variable is set to its maximum value. The Base Speed variable has a value about a quarter of the maximum value it could have. To gain a better understanding of what these controls represent see the related links below.

When allowed, the value of the variable being represented can be modified. This is simply done by pressing the LEFT mouse button in the controls display area. If the mouse pointer is to the right of the rectangle then the value of the variable will be increased. If the mouse pointer is on the rectangle then the value of the variable will be decreased.

Pressing the RIGHT mouse button on the control activates a context sensitive help describing what the variable represents.

The scale control has three modes of operation - display, limited edit and full edit. In display mode the title of the control consists only of its name. In this mode the value of the variable being represented cannot be modified.

In limited edit mode the title of the control consists of its name and is followed by a number in brackets e.g. (2). In this mode the value of the variable being represented can be modified but only as many times as indicated by the number following the control title. As modifications are made the modification count will decrease until it reaches zero. Trying to modify the variables value further will cause the control to reset itself to the state it was in before editing began.

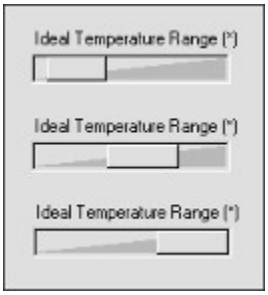
In full edit mode the title of the control consists of its name and is followed by an asterisk in brackets as in the above picture. In this mode you can edit the value of the variable as much as required.

Related topics:

Plant Species Attributes
Animal Species Attributes

Using the Range Control

The range control displays a variables sub-range. Each range control has a title associated with it which describes the variable it is representing. Underneath the title is a graphical display of the sub-range of this variable. A rectangle is drawn in the range control to indicate the current sub-range of the variable. The left of the control is always the range minimum and the right of the control is the maximum. The rectangle begins at the sub-range minimum and extends to the right as indicated by the sub-range maximum. The following picture shows some typical range controls used in EcoWar.



In the above picture the first Ideal Temperature Range shows a sub-range encompassing some of the coldest temperatures possible. The second Ideal Temperature Range shows a sub-range which encompasses a moderate set of temperatures. The third Ideal Temperature Range encompasses the hottest temperatures. To gain a better understanding of what these controls represent see the related links below.

When allowed, the sub-range of the variable being represented can be modified. This is simply done by pressing the LEFT mouse button in the controls display area. If the mouse pointer is to the left of the rectangle then the sub-range minimum will be decreased. If the mouse pointer is to the right of the rectangle then the sub-range maximum will be increased. Pressing the LEFT mouse button when the mouse pointer is on the rectangle will cause the sub-range to shorten depending on whether the minimum or maximum is closer.

Pressing the RIGHT mouse button on the control activates a context sensitive help describing what the variable represents.

The range control has three modes of operation - display, limited edit and full edit. In display mode the title of the control consists only of its name. In this mode the value of the variable being represented cannot be modified.

In limited edit mode the title of the control consists of its name and is followed by a number in brackets e.g. (2). In this mode the value of the variable being represented can be modified but only as many times as indicated by the number following the control title. As modifications are made the modification count will decrease until it reaches zero. Trying to modify the variables value further will cause the control to reset itself to the state it was in before editing began.

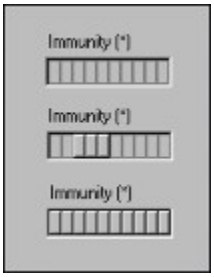
In full edit mode the title of the control consists of its name and is followed by an asterisk in brackets as in the above picture. In this mode you can edit the value of the variable as much as required.

Related topics:

Plant Species Attributes
Animal Species Attributes

Using the Set Controls

Set controls are similar to range controls except they have a fixed set of possible values (10 in the case of EcoWar). Their operation is also similar to the range control however a set control displays its data differently to make it easier to understand. Each set control has a title associated with it which describes the variable it is representing. Underneath the title is a graphical display of the current subset of this variable. Each element in the set is represented by a rectangle which is either 3D or flat depending on whether or not it is selected. The following picture shows one type of set control used in EcoWar.



This type of set control can display a range of elements currently set. In the first example the Immunity set has no element indicated by all element positions being flat. The second Immunity set has three of the possible ten elements in its subset. The final example shows an Immunity set which has all elements in its subset. To gain a better understanding of what these controls represent see the related links below.

When allowed, the value of the variable being represented can be modified. This is simply done by pressing the LEFT mouse button in the controls display area. Each element position is toggled on or off whenever it is pressed. However there are restrictions on which elements can be toggled at any one time. Only those positions adjacent to the subset minimum and maximum can be toggled as well as the elements at the minimum and maximum. To gain a better understanding of what these controls represent see the related links below.

Pressing the RIGHT mouse button on the control activates a context sensitive help describing what the variable represents.

The second type of set control allows a variable to only have one element as its subset. The following picture shows a set control of this type.

When allowed, the value of the variable being represented can be modified. This is simply done by pressing the LEFT mouse button in the controls display area. Each element position is toggled on or off whenever it is pressed. However there are restrictions on which elements can be toggled at any one time. Only those positions adjacent to the subset minimum and maximum can be toggled as well as the elements at the minimum and maximum. Note however that when a new element is toggle on then the other element that was previously on will automatically be turned off. To gain a better understanding of what these controls represent see the related links below.

Pressing the RIGHT mouse button on the control activates a context sensitive help describing what the variable represents.

The set controls have three modes of operation - display, limited edit and full edit. In display mode the title of the control consists only of its name. In this mode the value of the variable being represented cannot be modified.

In limited edit mode the title of the control consists of its name and is followed by a number in brackets e.g. (2). In this mode the value of the variable being represented can be modified but only as many times as indicated by the number following the control title. As modifications are made the modification count will decrease until it reaches zero. Trying to modify the variables value further will cause the control to reset itself to the state it was in before editing began.

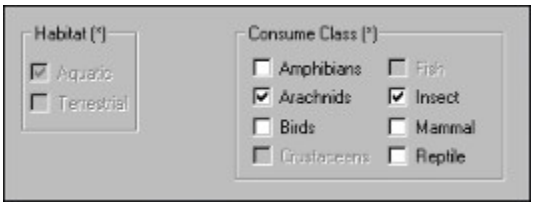
In full edit mode the title of the control consists of its name and is followed by an asterisk in brackets as in the above picture. In this mode you can edit the value of the variable as much as required.

Related topics:

Plant Species Attributes
Animal Species Attributes
Species Immune System
Species Taste System

Using the Attribute List Controls

Attribute list controls display a list of named attributes which are either on or off. Each attribute list control has a title associated with it which describes the variable it is representing. Underneath the title is a graphical display of the state of each item in the attribute list. The following picture shows the two types of attribute list controls used in EcoWar.



Items in a list which are ticked are active. Greyed items cannot be modified even when in an edit mode. These items stay in the state they are preset to. In the case of Habitat controls one item in the set must always be selected. This restriction will be enforced so you may not always be able to change the state of an item in the attribute list. In the above example the Habitat variable is set to Aquatic only and cannot be changed. The Consume Class variable has Arachnids and insects set only.

When allowed, the state of items in an attribute list can be modified. This is simply done by pressing the LEFT mouse button in the items display area. Each item is toggled on or off whenever it is pressed unless there are edit restrictions active which do not allow a certain change. To gain a better understanding of what these controls represent see the related links below.

Pressing the RIGHT mouse button on the control activates a context sensitive help describing what the variable represents.

The attribute list controls have three modes of operation - display, limited edit and full edit. In display mode the title of the control consists only of its name. In this mode the value of the variable being represented cannot be modified.

In limited edit mode the title of the control consists of its name and is followed by a number in brackets e.g. (2). In this mode the value of the variable being represented can be modified but only as many times as indicated by the number following the control title. As modifications are made the modification count will decrease until it reaches zero. Trying to modify the variables value further will cause the control to reset itself to the state it was in before editing began.

In full edit mode the title of the control consists of its name and is followed by an asterisk in brackets as in the above picture. In this mode you can edit the value of the variable as much as required.

Related topics:

Plant Species Attributes
Animal Species Attributes
Animal Species Classes

What is EcoWar?

Description

EcoWar is a simple ecosystem simulator that allows the user to learn about how different plant and animal species interact with each other. Each plant and animal species is described by a set of attributes which determine their behaviour and capabilities within the environment. By observing species interactions the user can gain an understanding of important environmental concepts such as biodiversity and evolution. They can also gain an understanding of how the introduction of new species can effect an existing ecosystem. EcoWar can be used as a passive educational tool by allowing the user to only observe what is happening in the environment. It can also be used as an active educational medium by requiring the user to interact with the environment.

Worksheets and Scenarios

Included are eleven scenarios which allow the user to explore many aspects concerning the interaction of species and ecosystem management. Each scenario comes with a worksheet which the user can work through to gain the most out of the lesson. These worksheets can be printed out and filled in while the user is working with EcoWar. These worksheets are included elsewhere in this help file (Look at Help Contents - EcoWar Worksheets).

User Interaction

While the simulator is running the user can change the environment and evolve new species. The user can change the average temperature across the landscape making a warmer or cooler climate. They can also change the amount of nutrients available in the soil of the landscape. Such changes will be reflected in the behaviour of the plant and animal species present.

The user can also evolve new species of plants and animals from existing species. The evolution process involves creating a new species which inherits the attributes of its parent species. The user can then modify the new species attributes to a limited extent. This new species then has similar properties to its parent species but with a few modifications which, if the user has chosen wisely, makes for a better adapted species.

The user can also create their own ecosystems which allow them to understand the complexity of even simple ecosystems. By creating their own ecosystems the user also gains an appreciation of how fragile an ecosystem can be and how only slight changes in the environment can have drastic effects.

How can I use EcoWar?

EcoWar can be used as an educational tool at home or in the classroom. Since EcoWar simulates ecosystems it can be used to show many of the processes present in them. The user can not only observe what is happening in an ecosystem but can also interact with it which can give additional insight into the natural processes working in an ecosystem. The following are some of the ways in which EcoWar can be used.

* Show how plant and animal species interact with each other to form a stable ecosystem. EcoWar shows how population decreases must be balanced by population increases for all species to coexist in an environment.

* Show how fragile an ecosystem can be. By removing one species from a food web or introducing a new species the ecosystem collapses.

* Gain an understanding of some of the issues involved in biological control. When the user has to introduce a species of their own to remove another species they will understand the importance of making sure their species doesn't negatively effect the natural species. At the same time they must select the best set of attributes for their species so that it will achieve its primary objective.

* Gain an understanding of evolutionary principles. The user can evolve their own plant and animal species from existing species. The new species will inherit the characteristics of its parent species and the user will be allowed to modify them slightly making for a new but different species.

* Show the effects of global warming or cooling on the plant and animal species present. During a simulation the user can raise or lower the average temperature across the landscape causing the populations of the species present to change accordingly.

* Gain an appreciation of how complex and fragile an ecosystem can be. The user can create their own ecosystems which highlights many of the issues relating to species interaction and sustainable systems.

* Gain an understanding of how evolving species can adapt to changes in the environment. Evolving new species can be made to thrive in the new environment allowing the ecosystem to continue existing.

* Show the effects of changing the amount of soil nutrients across the landscape. During a simulation the user can raise or lower the average amount of soil nutrients across the landscape causing the populations of the plant species present to change accordingly.

* Show the good and bad effects of introducing species to an ecosystem. Introducing a highly developed species into an ecosystem can have drastic effects on the ecosystem. Alternatively introducing a species which is designed to remove another species can help restore an ecosystem to its original state.

* Show the benefits of biodiversity in an ecosystem. Ecosystems with many species will be less prone to a complete collapse when new species are introduced into it.

System Requirements

Software

EcoWar is a native Windows 95 application and as such can only be run under Windows 95 or a 100% compatible operating system.

Hardware

Minimum system requirements

* 8 Mb RAM
* 486DX4 100 processor or compatible
* 8-bit (256 colour) graphics mode
* 640 x 480 screen resolution

Recommended system to run EcoWar

* 16 Mb RAM
* Pentium processor or compatible
* 16-bit (64k colours) graphics mode or any other direct colour mode
* 800 x 600 screen resolution

How to Register

EcoWar is distributed as a shareware product. The shareware concept promotes the free use and distribution of the product for evaluation purposes. If you decide to continue using the product then you should register the program. Registration allows the software author to continue the development of the product and to provide customer support for any difficulties they may have with the product.

EcoWar is a fully enabled version of the product with no annoying limitations. The shareware version only has a window that occasionally pops up to prompt you to register the product. Registering EcoWar will remove this window allowing you to use the product uninterrupted. Only registered users will be provided with customer support from the author.

Registration involves obtaining a special code which will disable the shareware registration prompt. After you have purchased EcoWar you will be provided with a registration code.

You can purchase EcoWar with your credit card through the shareware distribution sites listed below.

ShareIt! -	http://www.shareit.com/
Qwerks -	http://www.qwerks.com/

Once you have your registration code you can register your copy(s) of EcoWar by selecting the Register option in the Options menu.

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EcoWar Worksheets

To allow EcoWar to be used immediately 11 scenarios are provided. Each is setup to explore different aspects of the environment. Below is a list of the available worksheets.

Worksheet 1 - The Poisonous Toady
Worksheet 2 - Introduced Predator
Worksheet 3 - Ocean Invasion
Worksheet 4 - Dinosaur Extinction
Worksheet 5 - Population Dynamics
Worksheet 6 - Weed Control
Worksheet 7 - Biodiversity
Worksheet 8 - Island Disaster
Worksheet 9 - Pest Control
Worksheet 10 - Climate Change
Worksheet 11 - Genesis

Worksheet 1 - The Poisonous Toady

File: The Poisonous Toady.SCN
Help : Start EcoWar and at the options window select the "Begin Scenario" button. Open the file "The Poisonous Toady.SCN"

Objectives

To understand the indirect effects a foreign species can have on an ecosystem.

Description

In this scenario a poisonous toad has been introduced to an ecosystem. The toad is poisonous if it is eaten. This is a problem for the local mammal species since it thinks that the toad species is a new food source.

Watch what happens to the local mammal species.

Task 1

Observe the mammal species.

What is happening to the distribution of the mammal species over time?
Help: Select the species in the evolution tree window in the top right. Examine the species distribution on the landscape. Areas it occupies will be shaded.

Has the population of the mammal species changed? Why?
(Hint: Let the simulation run for a while allowing the population to stabilise. Then observe any long term changes to the population.)

Task 2

Determine the cause of the change in the mammal species distribution.
Which animal species is occupying the area the mammal once lived in?
(Hint : Try selecting different animal species and observe there distribution on the map.)

Why is the introduced species reducing the mammal species population?
(Hint: Look at what the mammal likes to eat)
Help: Compare the mammal species "Acquired Taste" attribute to the toads "Taste" attribute. For more information on any attribute just press the RIGHT mouse button on that attribute.

Body poisons

Task 3

What happens to the mammal species after the toad has spread across the entire landscape?

Stabilise hint

Worksheet 2 - Introduced Predator

File: Introduced Predator.SCN
Help : Start EcoWar and at the options window select the "Begin Scenario" button. Open the file "Introduced Predator.SCN"

Objectives

To understand the direct effects a foreign species can have on an ecosystem.

Description

In this simple ecosystem there exists two natural animal species and a plant species.

An animal species has been introduced from another ecosystem which is a highly developed predator. The natural species cannot compete with it.

Task1

Observe what is happening to the local animal species.
What is happening to the distribution of the mammal species?

What is happening to the distribution of the reptile species?

Task 2

Observe what is happening to the introduced species.
What is happening to the distribution of the introduced species?
(Hint : Let the simulation run a while to get a good idea of the habitat it prefers.)

Why doesn't the introduced species live in the mountains?
(Hint : Look at the introduced species "Ideal Temperature Range" attribute.)
Help : You can get more information on any attribute by pressing the RIGHT mouse button on that attribute.

Task 3

Why are the local mammal and reptile species populations decreasing?
(Hint: Look at what the introduced species likes to eat.)
Help: Compare the introduced species "Acquired Taste" attribute to the other species "Taste" attribute.

Task 4

Let the introduced species spread across the entire landscape. What happens to the natural mammal and reptile species? Why?

Worksheet 3 - Ocean Invasion

File: Ocean Invasion.SCN
Help : Start EcoWar and at the options window select the "Begin Scenario" button. Open the file "Ocean Invasion.SCN"

Objectives

To understand the direct effects a foreign species can have on an ecosystem.

Description

A gluttonous, all consuming fish has emerged from the ocean depths and is set to consume everything in its path!

Will the existing ecosystem survive?

Task1

What is happening to the distribution of the local plant and animal species?
(Hint : not all the species are effected by the introduced species.)

Task 2

Observe what is happening to the introduced species.
What is happening to the distribution of the introduced species?
(Hint : Let the simulation run a while to see some long term effects.)

Why is the introduced species dying in some regions?

Task 3

Let the introduced species spread across the entire landscape. Do the natural species survive? Why?

Worksheet 4 - Dinosaur Extinction

File: Dinosaur Extinction.SIM
Help : Start EcoWar and at the options window select the "Load Saved Simulation" button. Open the file "Dinosaur Extinction.SIM"

Objectives

To understand the effects of climate change on ecosystems.

Description

The dinosaurs in this scenario are adapted to living in a warm, tropical climate. However the climate has suddenly changed and is now becoming very cold.

Watch what happens to the dinosaurs and to the small population of mammals which are adapted to cooler weather conditions.

Task 1

Why are the dinosaurs dying?
(Hint : Look at the dinosaur species "Ideal Temperature Range" attribute.)

Task 2

What happens to the distribution of the plant species?
(Hint : Restart the simulation so you can see the plant species as they were when the climate was warm.)

Task 3

Observe the mammal species.
Initially, where does the mammal species live? Why?

What is happening to the mammal species as the climate becomes cooler? Why?

Worksheet 5 - Population Dynamics

File: Population Dynamics.SIM
Help : Start EcoWar and at the options window select the "Load Saved Simulation" button. Open the file "Population Dynamics.SIM"

Objectives

To understand the effects of limited resources on competing species.

To understand how species populations can change.

To understand how ecosystems stabilize.

Description

In this simulation a number of species have evolve in adjacent valleys. The species populations are in a constant state of flux due to resource limitations. The global environment is warming which also has an effect on the species.

Task 1

Why is the plant species living in only some areas of the landscape?
(Hint : How do the insects survive ?)

Task 2

Observe the long term species population trends.
(Hint : Let the simulation run for a while and find out whose eating what.)
What happens to the "Common Ancestor Insect" ? Why?

What happens to the "Valley 1 Insect"? Why?

What happens to the "Valley 2 Insect"? Why?

What happens to the "Eagle"? Why?

What happens to the plant species? Why?

Task 3

Does the ecosystem eventually stabilize?

Worksheet 6 - Weed Control

File: Weed Control.SCN
Help : Start EcoWar and at the options window select the "Begin Scenario" button. Open the file "Weed Control.SCN"

Objectives

To understand the adverse effects of introducing a foreign species to an ecosystem.

To understand the benefits of introducing a foreign species into an ecosystem.

Description

In this scenario the Prickly Pear is a plant species that was introduced a while ago and has established itself in the natural ecosystem. However it has damaged the fragile ecological balance of the natural environment and must be removed.

To do this some scientists have introduced an insect that only eats the Prickly Pear and will remove it from the landscape without harming the natural species.

Task 1

Determine the effect the "Prickly Pear" plant species is having on the ecosystem.
What initially happens to the shrub and tree population?

What happens to the shrub population after a while? Why?
(Hint: There is a limited amount of soil nutrients for the plant species.)

Task 2

Determine the effect the moth species is having on the ecosystem.
What is happening to the "Prickly Pear" plant species? Why?

What is happening to the tree species? Why?

Task 3

Observe the results of this plant control experiment?
Has the "Prickly Pear" species been totally eradicated? Why?

What happened to the moth species?

Was the plant control experiment successful?

Worksheet 7 - Biodiversity

File : Biodiversity.SIM
Help : Start EcoWar and at the options window select the "Load Saved Simulation" button. Open the file "Biodiversity.SIM"

Objectives

To understand the benefits of biodiversity.

To understand how geographical isolation allows evolution to explore different evolutionary paths.

Description

This simulation shows the importance of biodiversity in an ecosystem. There are three islands which all have a common ancestor plant species.

Over time two of the islands evolved new plant species from the parent species. The third island evolved no new species.

Task 1

Observe what happens on island 1.
What effect is the introduced mammal species having on the "Common Ancestor Plant" species? Why?

Why are the two evolved plant species able to survive with the mammal species present?

Task 2

Observe what happens on island 2.
Why doesn't the introduced mammal species spread across the whole island?
(Hint: Are one of the plants poisonous to the mammal?)

What eventually happens to the introduced species? Why?
(Hint : Let the simulation run a while)

Task 3

Observe what happens on island 3.
What eventually happens to the introduced species? Why?
(Hint : Let the simulation run a while)

What happens to the "Common Ancestor Plant" species? Why?
(Hint : Let the simulation run a while)

Task 4

Why is biodiversity important?

Worksheet 8 - Island Disaster

File: Island Disaster.SCN
Help : Start EcoWar and at the options window select the "Begin Scenario" button. Open the file "Island Disaster.SCN"

Objectives

To understand the adverse effects of introducing a foreign species to an ecosystem.

To understand how evolution can produce species that may be better suited to an environment.

To understand some of the issues involved in natural pest control.

Description

A mad scientist living on a remote island has been overcome by his own creations! He was working on new spider species with enhanced capabilities. But the spiders escaped and ate him and are now threatening to spread across the entire island.

See if you can stop the invading spider species by evolving new insect species that will feed on it.

Task 1

Determine the effect the introduced spider species is having on the ecosystem.
What effect is the spider species having on the local reptile species?

What is happening to the bird species? Why?
(Hint: What does the bird feed on?)

Task 2

Why should the introduced spider species be removed from the ecosystem?

Task 3

Determine how to remove the spider species.
Why is an insect species most likely to remove the spider species?
(Hint: Humans have never been able to cause the extinction of a common insect species)

What attributes of the existing insect species must be modified/enhanced so that it will feed on the spider species? (Hint : Look at the classes of animals it eats and what its acquired taste is)

Task 4

Evolve one or more new insect species that will remove the spider from the ecosystem.
(Hint : You may wish to start the simulation again so you can attack the spider species while it is still

localized.)
Help : To evolve a species click the RIGHT mouse button on the species icon you wish to evolve and select the "Evolve New Species" popup menu option. You may need to make your insect species quite ferocious by increasing such attributes as "Jaws effectiveness", "Poison" and "Poison Strength". You can position your species by pressing the species position button in the toolbar and selecting a point in the landscape. When you have finished modifying your creation press the button with the green tick in the toolbar to continue the simulation.

Do your evolved species have any side effects on other species in the ecosystem other than the spider species?

Worksheet 9 - Pest Control

File: Pest Control.SCN
Help : Start EcoWar and at the options window select the "Begin Scenario" button. Open the file "Pest Control.SCN"

Objectives

To understand the adverse effects of introducing a foreign species to an ecosystem.

To understand some of the issues involved in natural pest control.

Description

In this scenario a species of venomous snake has entered the natural ecosystem and is feeding on the local mammal population.

Introduce your own specially designed species to remove the snake species. Make sure your species doesn't adversely effect the natural environment.

Task 1

Determine the effect the introduced reptile species is having on the ecosystem.
What effect is the snake species having on the local mammal species? Why?

Task 2

Determine how to remove the snake species.
What class of animal(s) would be appropriate to remove the snake species?

What characteristics should your species possess to achieve its purpose? Remember it should not adversely effect the local mammal species.
(Hint : It should only eat reptile species and be tough to beat in combat.)

Task 3

Introduce your own species to remove the snake species.
(Hint : You may wish to start the simulation again so you can attack the snake species while it is still localized.)
Help : To introduce an animal species click the RIGHT mouse button on the "Introduced Animals" icon and insert an animal class. Then insert a species by clicking the RIGHT mouse button on the species class icon you just inserted. You can position your species by pressing the species position button in the toolbar and selecting a point in the landscape. When you have finished designing your species press the button with the green tick in the toolbar to continue the simulation.

Worksheet 10 - Climate Change

File: Climate Change.SIM
Help : Start EcoWar and at the options window select the "Load Saved Simulation" button. Open the file "Climate Change.SIM"

Objectives

To understand the effect of climate change on an ecosystem.

To understand how newly evolved species can be better adapted to an environment.

Description

The environment has become cooler and the local species are not as well adapted to the environment as they once were. Such conditions could result in their extinction.

Evolve new species that are better suited to the colder climate.

Task 1

Observe what happens to the species currently present.
What happens to the crustacean and insect species? Why?

What happens to the mammal species? Why?

What happens to the plant species? Why?

Task 2

Evolve a new plant species that will be better suited to the cooler climate.

Task 3

Evolve a new mammal species that will be better suited to the cooler climate.

Worksheet 11 - Genesis

File: Genesis.SCN
Help : Start EcoWar and at the options window select the "Begin Scenario" button. Open the file "Genesis.SCN"

Objectives

To understand how an ecosystem can evolve.

Description

This is your opportunity to develop an ecosystem. You have a primeval landscape that you can manipulate.

Task 1

Evolve or introduce new species of plants and animals and try to develop a balanced ecosystem. Good Luck!