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globals [ill-deaths total-deaths]

turtles-own [
  energy ;; for keeping track of when the turtle is ready to reproduce and when it will die
of starvation
  sick  ;; for keeping track of turtle health
  time-sick ;; time in ticks since last becoming sick
  ]

to setup
  clear-all
  setup-patches
  setup-turtles
  reset-ticks
end

to setup-patches
  ask patches [ set pcolor green ]
end

to setup-turtles
  create-turtles number     ;; uses the value of the number slider to create turtles
  ask turtles [
    setxy random-xcor random-ycor
    set color yellow
    set sick false ;; initially healthy
    ]
  ask one-of turtles [set color red set sick true] ;; select a turtle at random to be sick
end

to go
  if ticks >= 500 [ stop ] ;; stop after 500 ticks
  move-turtles
  eat-grass
  check-disease
  check-death
  reproduce
  regrow-grass
  tick                    ;; increment the tick counter and update the plot
end

to move-turtles
  ask turtles [
    right random 360
    forward 1
    set energy energy - 1  ;; when the turtle moves it looses one unit of energy
  ]
```

```
end

to eat-grass
  ask turtles [
    if pcolor = green [
      set pcolor black
           ;; the value of energy-from-grass slider is added to energy
      set energy (energy + energy-from-grass)
    ]
  ifelse show-energy?
    [ set label energy ] ;; the label is set to be the value of the energy
    [ set label "" ]     ;; the label is set to an empty text value
  ]
end

to reproduce
  ask turtles [
    if energy > birth-energy [
    set energy energy - birth-energy  ;; take away birth-energy to give birth
    hatch 1 [ set energy birth-energy ;; give this birth-energy to the offspring
              set sick false          ;; born healthy
              set color yellow
              ]
    ]
  ]
end

to check-death
  ask turtles [
    if energy <= 0 [
      set total-deaths total-deaths + 1
      die ] ;; removes the turtle if it has no energy left
  ]
end

to regrow-grass
  ask patches [ ;; 3 out of 100 times, the patch color is set to green
    if random 100 < 3 [ set pcolor green ]
  ]
end

to check-disease
  ask turtles [
    ifelse sick
    [  ;; if sick
      set time-sick time-sick + 1
      if time-sick >= illness-length [
```

```
      set ill-deaths ill-deaths + 1
      set total-deaths total-deaths + 1
      die ]]
    [ ;; if not sick
      let x min-one-of other turtles in-radius 3 [distance myself]
      if (x != nobody) and ([sick] of x) [
      set color red
      set sick true
      set time-sick 0 ]]
  ]
end
```