

# Conservation of Biodiversity in Changing Climates: Moving Targets and Practical Actions

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The Nature  
Conservancy  
Protecting nature. Preserving life.

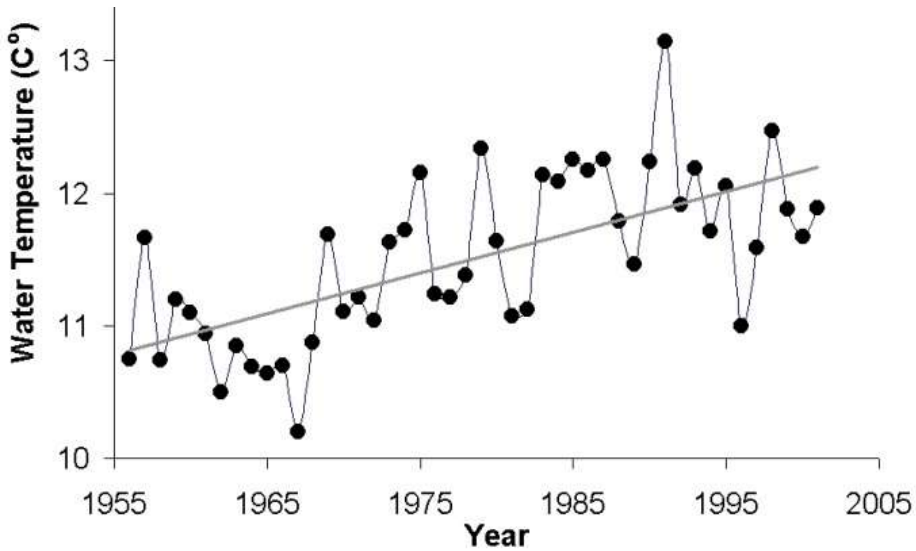
Sea Grant  
Rhode Island

Coastal Resources Center  
Department of Oceanography

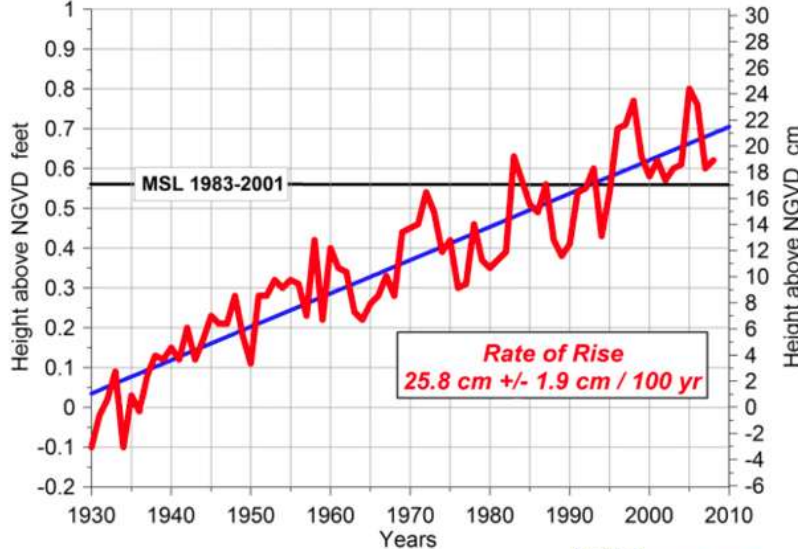
C R M C  
Coastal Resources Management Council

# Climate Change is Here

Surface Temperature  
Narragansett Bay



HISTORIC SEA-LEVEL RISE - Newport, RI

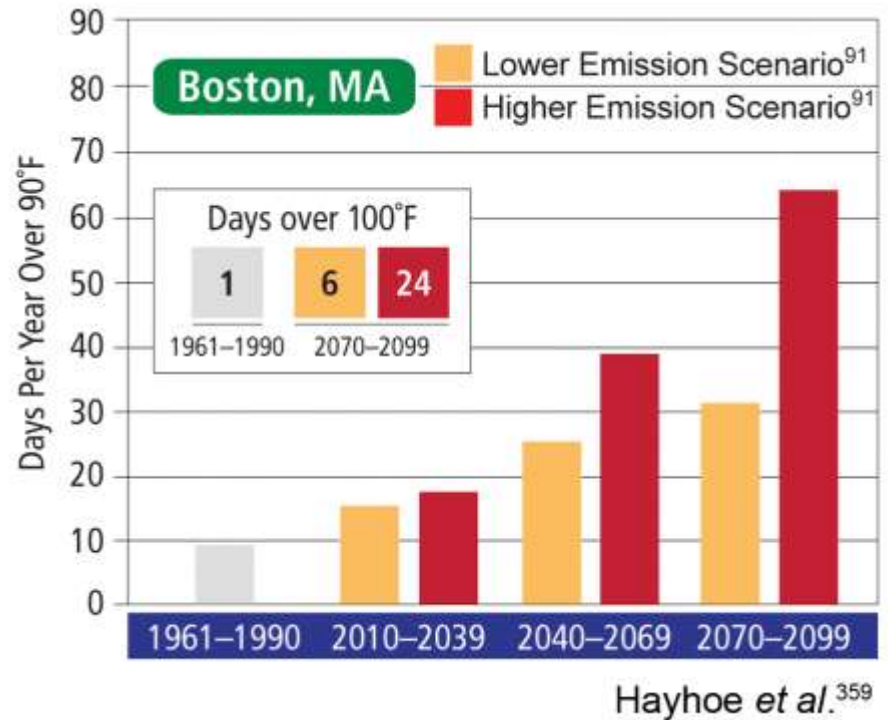
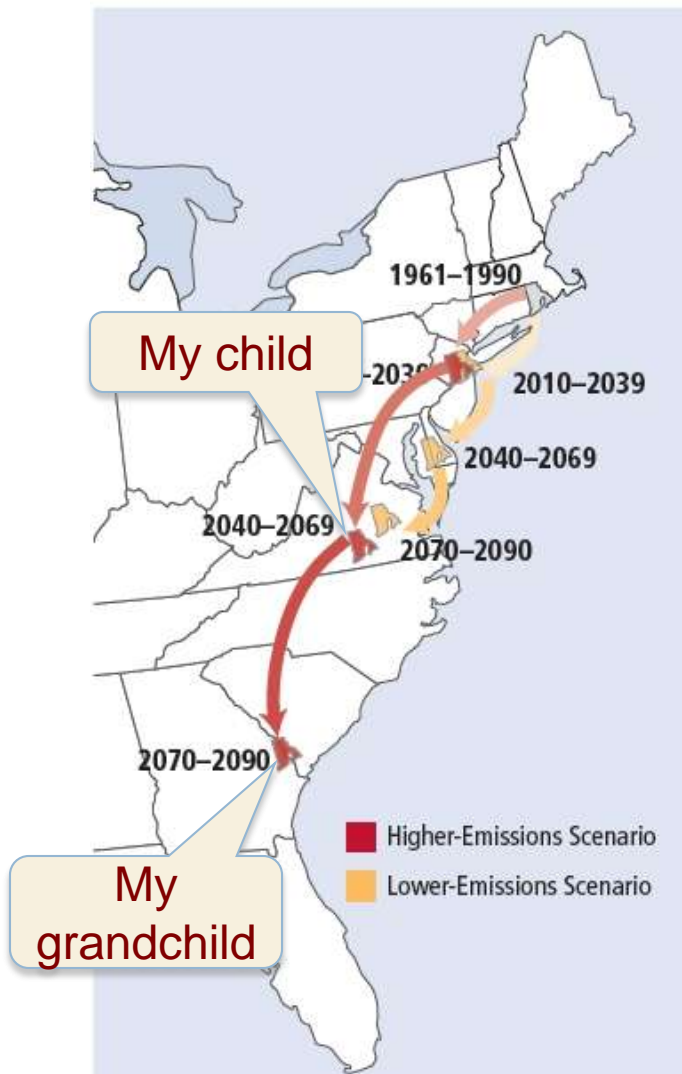


Adapted from: [http://tidesandcurrents.noaa.gov/sitrends/sitrends\\_station.shtml?stnid=8452660](http://tidesandcurrents.noaa.gov/sitrends/sitrends_station.shtml?stnid=8452660)



# Big Changes ... Soon

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# What Will Our Ecosystems Look Like?

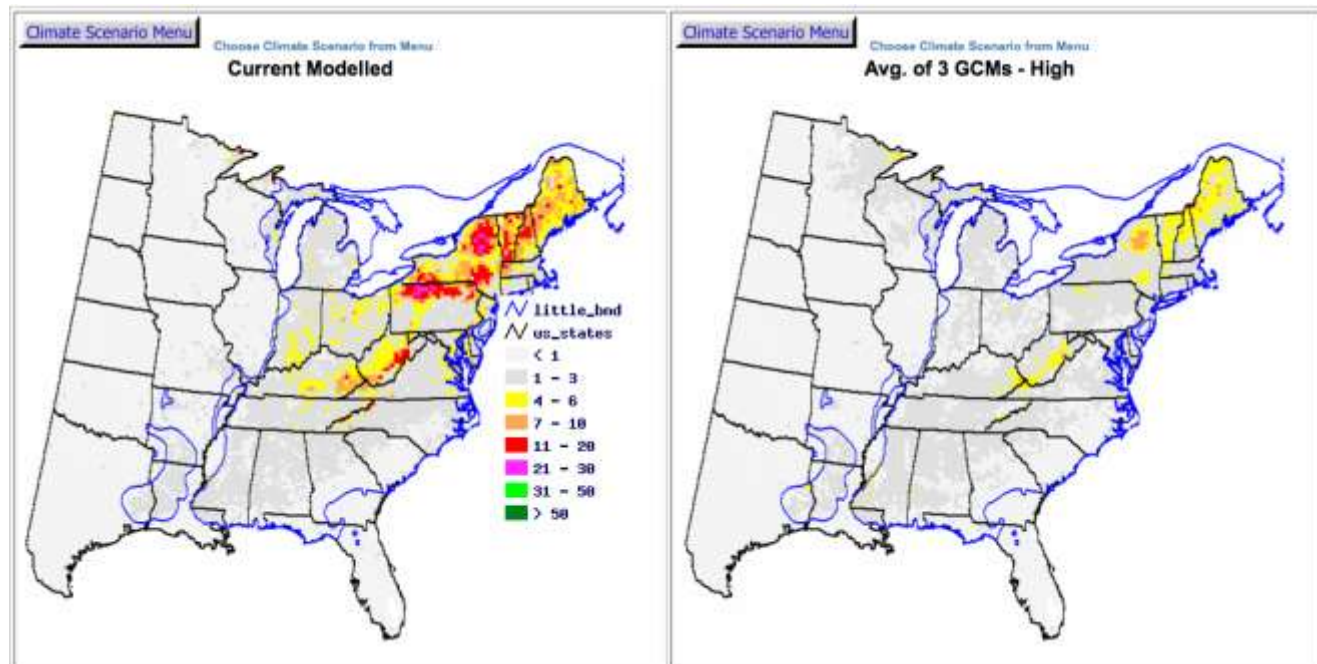
4

## American Beech Tree (*Fagus grandifolia*)



Current

Future



Prasad, A. M., L. R. Iverson., S. Matthews., M. Peters. 2007-ongoing.

# Will Our Network of Protected Lands Still Work?

5

## *Protecting Rare Species*



## *Protecting Unique Ecosystems*

# A Practical Solution

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### Conserving Biodiversity in the Face of Climate Change

Protection of native fauna and flora is one of the basic goals of most conservation organizations. This is often accomplished by conservation of sites that contain rare and endangered species and protection of habitats or landscape change and this is a natural phenomenon. Natural causes of change brought about by the arrival of new species or the loss of keystone sp

**Climate change** will exacerbate ecosystem change. As temperature animals in our ecosystems will change as well. This poses a challenge composition of the ecological communities will be rapidly changing so that it is difficult to protect the specific actors (i.e., the plants and animals) protect the stage (i.e., the physical habitat) upon which they will thrive community can assess the potential value of "the stage" to ensure the effects manifest themselves. Landscapes with a large variety of species

Conservationists work at many scales. Our project strives to inform to work at regional, national, and global scales. All are important. More protection of lands. The ELUs of a candidate site are one of many important

Using Ecological Land Units – ELUs – we provide a mechanism to identify different species of plants and animals come and go as climatic conditions are very different, but ELUs help us identify landscapes that will support "How ELUs Can Guide Conservation" in the left navigation panel. An example of how ELUs might be used to identify priority conservation sites

**How ELUs Can Guide Conservation**

1. What Does Biodiversity?
2. What are ELUs?
3. Making ELUs
4. ELUs as a Planning Tool
5. Case Study: South Elmsford

**MAPS & DATA**

**RESOURCES**

**WHO WE ARE**

**HOME**



Click [here](#) to use the online mapping utility (ArcGIS.COM application)

#### Atlas-quality ELU maps

- Statewide:**
- Dominant ELUs
  - Variety of ELUs
  - Priority Protection Sites
- Zoomed-in to a small area (example of using ELUs to assess site suitability for conservation)**
- Air photo of site
  - All ELUs
  - Dominant ELUs
  - Variety of ELUs
  - Underprotected ELUs
  - Priority Protection Sites



[Download Data](#) (ESRI rasters in zipped file geodatabase, see README.txt, 26 Mb)



**Protected Land**

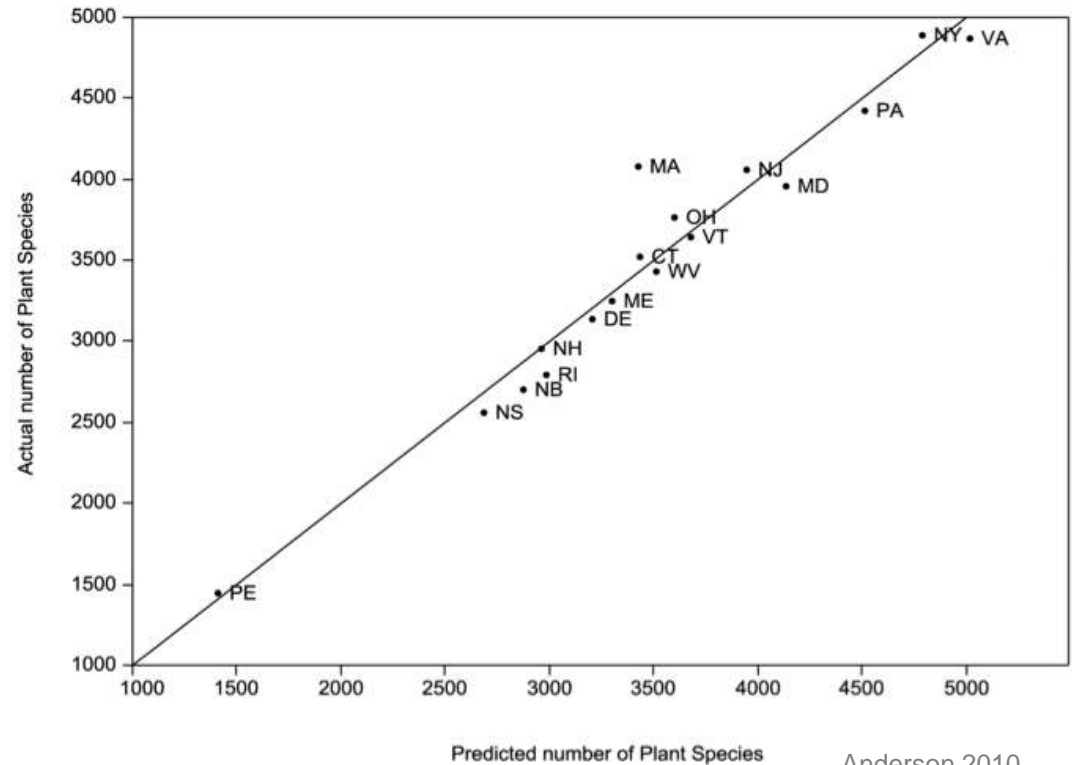
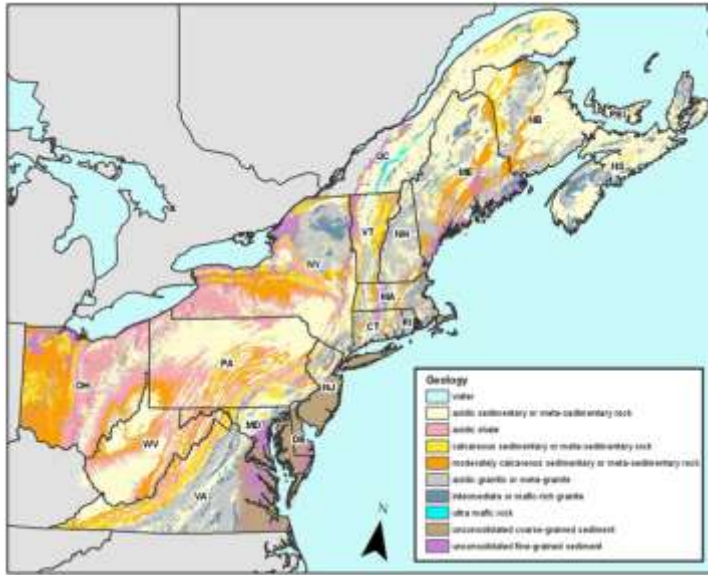
**ELU Quality**

- Best
- Better
- Good
- Above Avg

edc.uri.edu/elu

# Preserving the Stage, Not the Actors

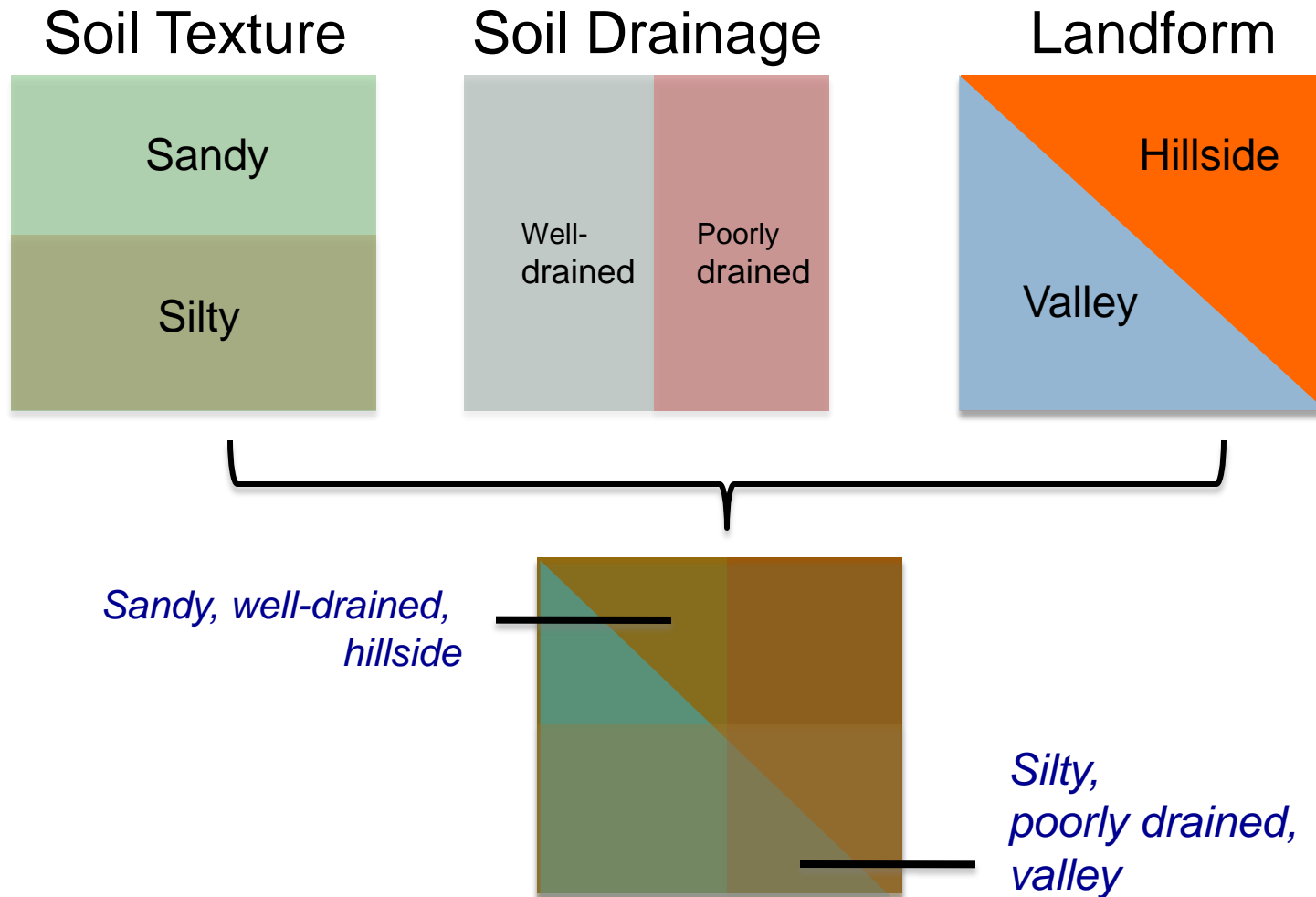
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Basic Premise: Complex, Diverse Physical Environments Support Complex, Diverse Ecological Communities

# ELUs – Ecological Land Units

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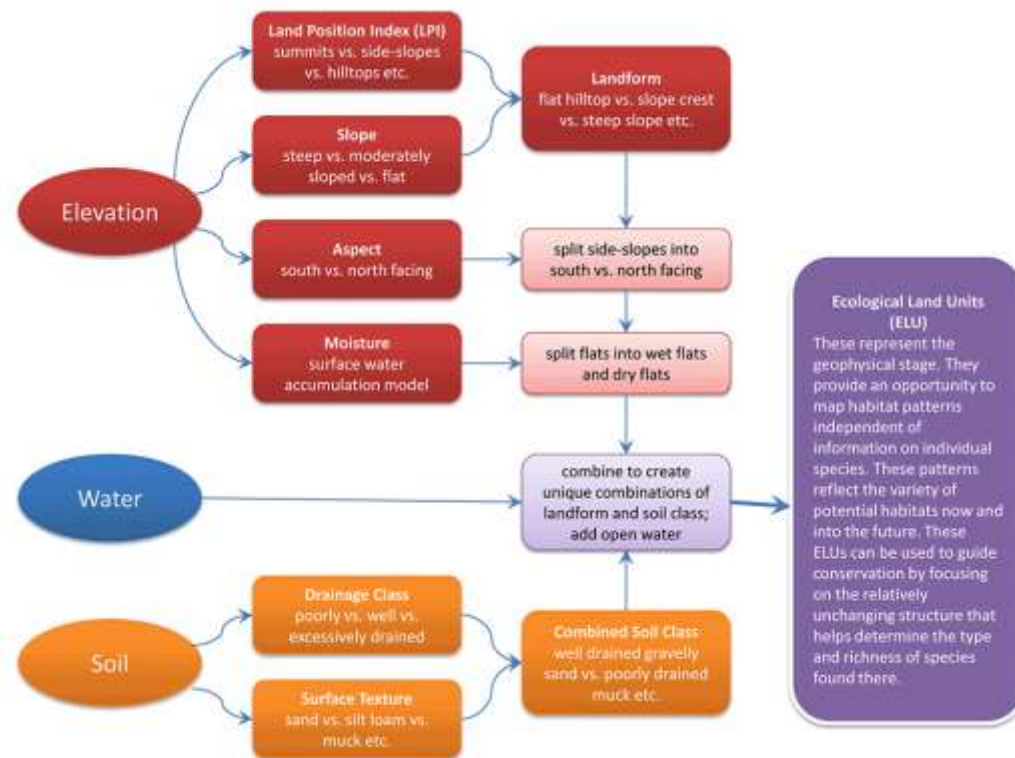


# Making ELUs Local

## ELU – Ecological Land Unit

*Areas of unique soil drainage, soil texture, & landform*

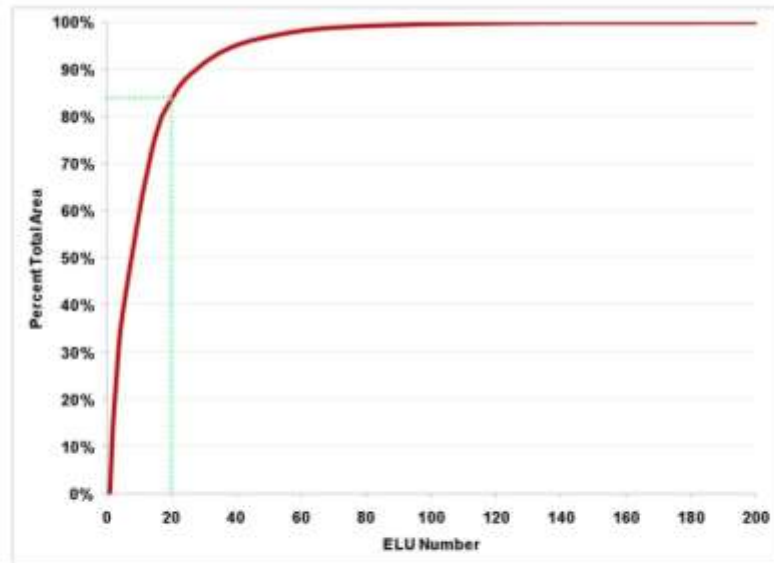
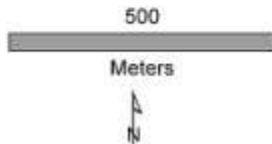
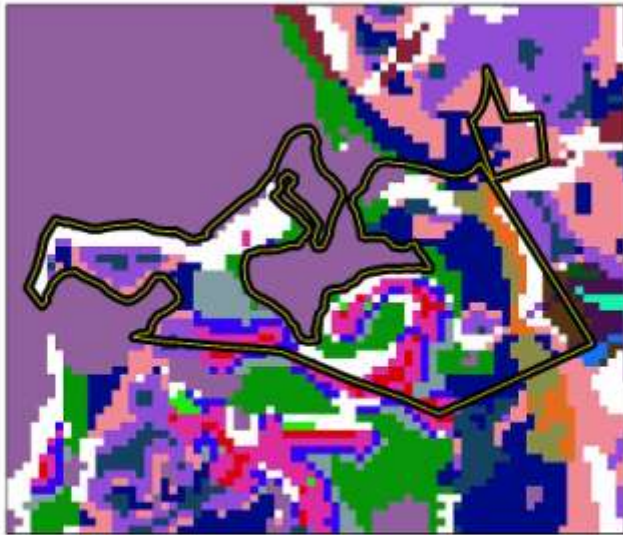
ELU Code	Description
1121	Excessively drained gravelly sand on flat hilltop
1122	Excessively drained gravelly sand on gentle slope
1123	Excessively drained gravelly sand on upper sideslope/rounded ridge
1130	Excessively drained gravelly sand on dry flat



# ELUs – Ecological Land Units

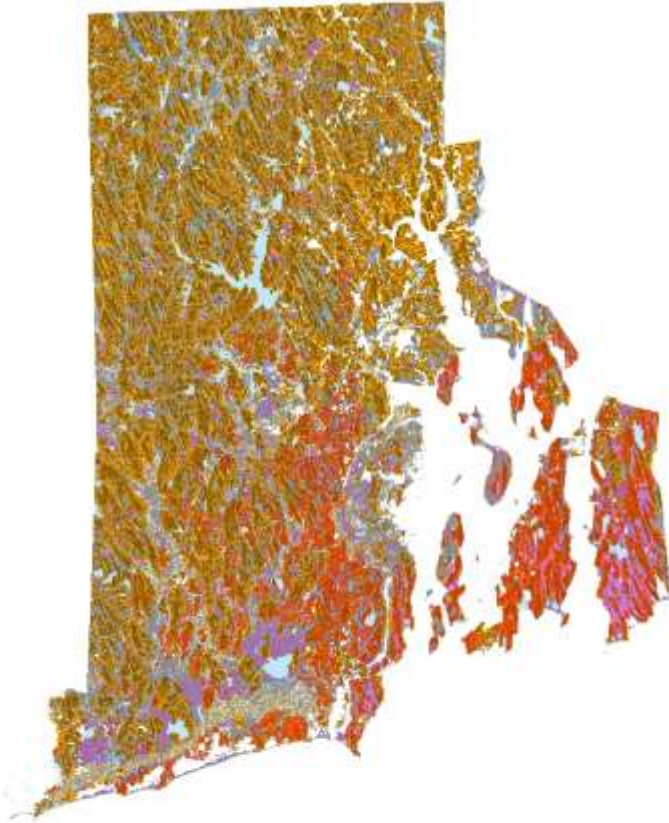
10

*204 Unique ELUs*  
*20 Dominant ELUs cover 85% of RI*



In this graph, we plot the cumulative percent area of each type of ELU in Rhode Island. ELUs are ranked from most common to most rare (left to right). The graph shows that approximately 85% of the state is covered by only 20 of the 200+ ELU types.

# Ecological Land Units for RI



## Conserving the Stage

Land Protection for Biodiversity  
in the Context of Climate Change

### Dominant ELU Types

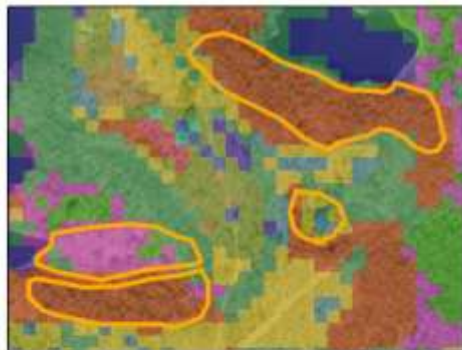
-  excessively drained gravelly sand on flat hilltop
-  excessively drained gravelly sand on gentle slope
-  excessively drained gravelly sand on upper side slope/rounded ridge
-  excessively drained gravelly sand on dry flat
-  excessively drained gravelly sand on valley/toe slope
-  well drained fine sandy loam on flat hilltop
-  well drained fine sandy loam on gentle slope
-  well drained fine sandy loam on upper sideslope/rounded ridge
-  well drained fine sandy loam on SE facing sideslope
-  well drained fine sandy loam on dry flat
-  well drained fine sandy loam on valley/toe slope
-  well drained silt loam on flat hilltop
-  well drained silt loam on gentle slope
-  well drained silt loam on dry flat
-  well drained silt loam on valley/toe slope
-  poorly drained fine sandy loam on flat hilltop
-  poorly drained fine sandy loam on gentle slope
-  poorly drained silt loam on flat hilltop
-  poorly drained muck on flat hilltop
-  water
-  other categories

For more information please contact  
Kevin Ruddock at [kruddock@tnc.org](mailto:kruddock@tnc.org)

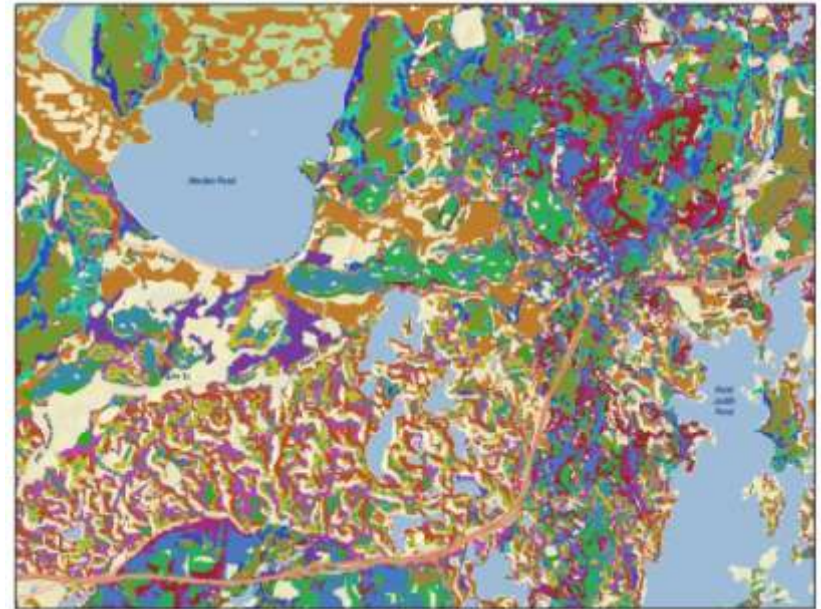
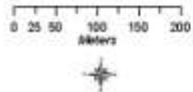
# ELUs and Plant Community Types



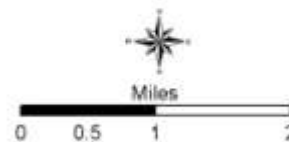
Distinct vegetation communities in upland areas in the Matunuck Hills Kettle Ponds landscape



ELU's show approximate demarcation of the different vegetation communities



ELUs of the Matunuck Hills South Kingstown

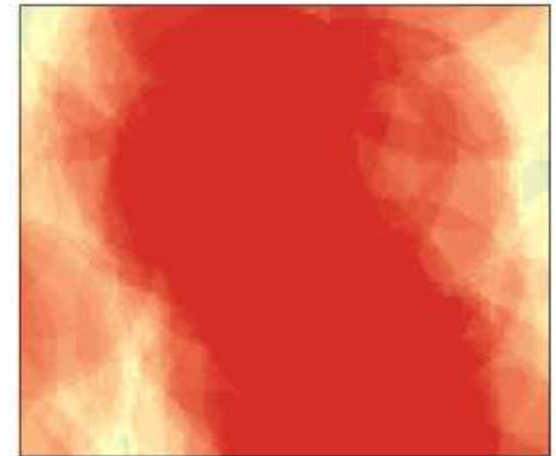


ELU Type Code	Color
1132	Light Green
1121	Dark Green
1122	Purple
1123	Orange
1130	Blue
2432	Light Green
2422	Light Green
2423	Light Green
2424	Blue
2430	Light Green
2432	Light Green
2521	Blue
2522	Purple
2530	Light Green
2532	Red
3421	Purple
3422	Light Green
3521	Blue
3621	Orange

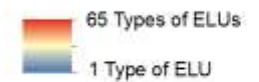
# Mapping ELU Variety



Unique ELUs



# Kinds ELUs Within 1,500 Feet



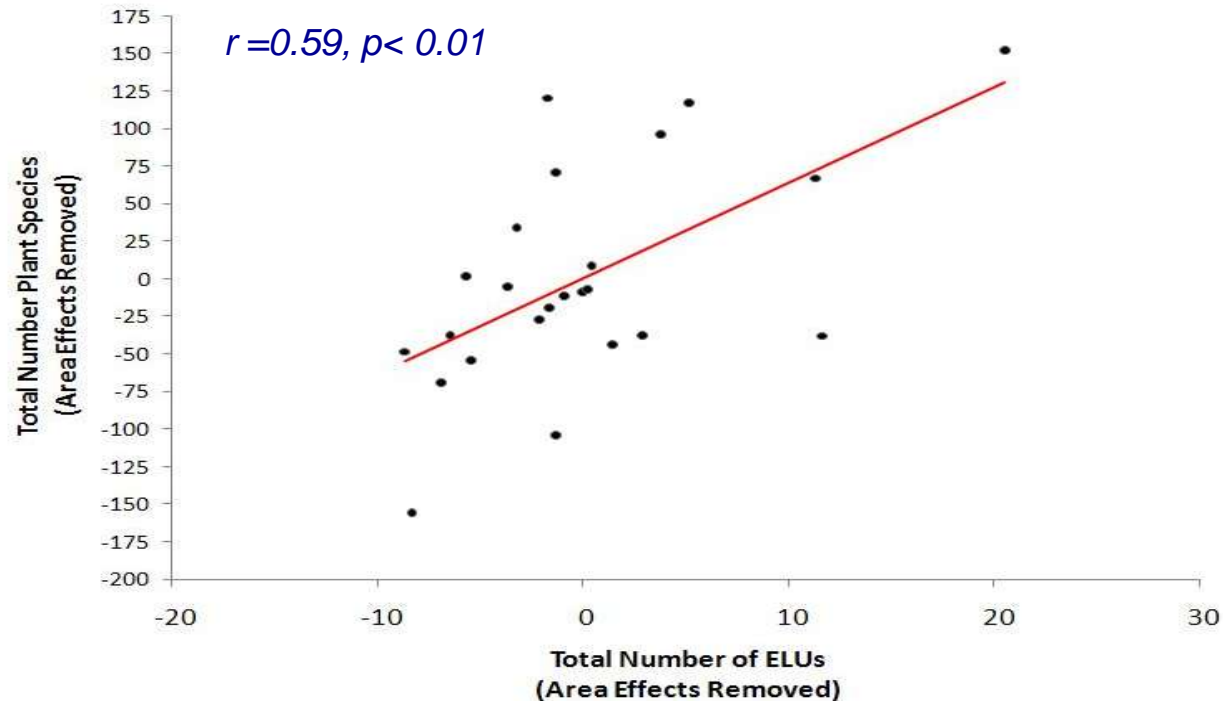
# Does ELU Variety = High Biodiversity: Testing the Hypothesis

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## Plant Diversity



## 24 ASRI Bioreserves

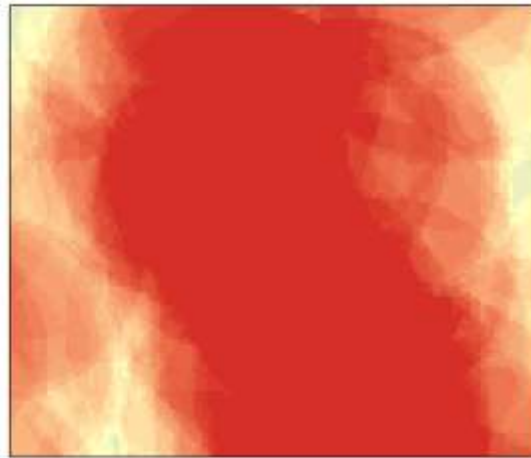


*N = 24 Bioreserves*

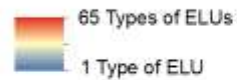
*Mean Bioreserve Area = 13.4 Ha (Range 1 – 45 Ha)*

*Mean # Plant Species = 215*

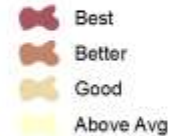
# Mapping ELU Variety: A Simple Guide



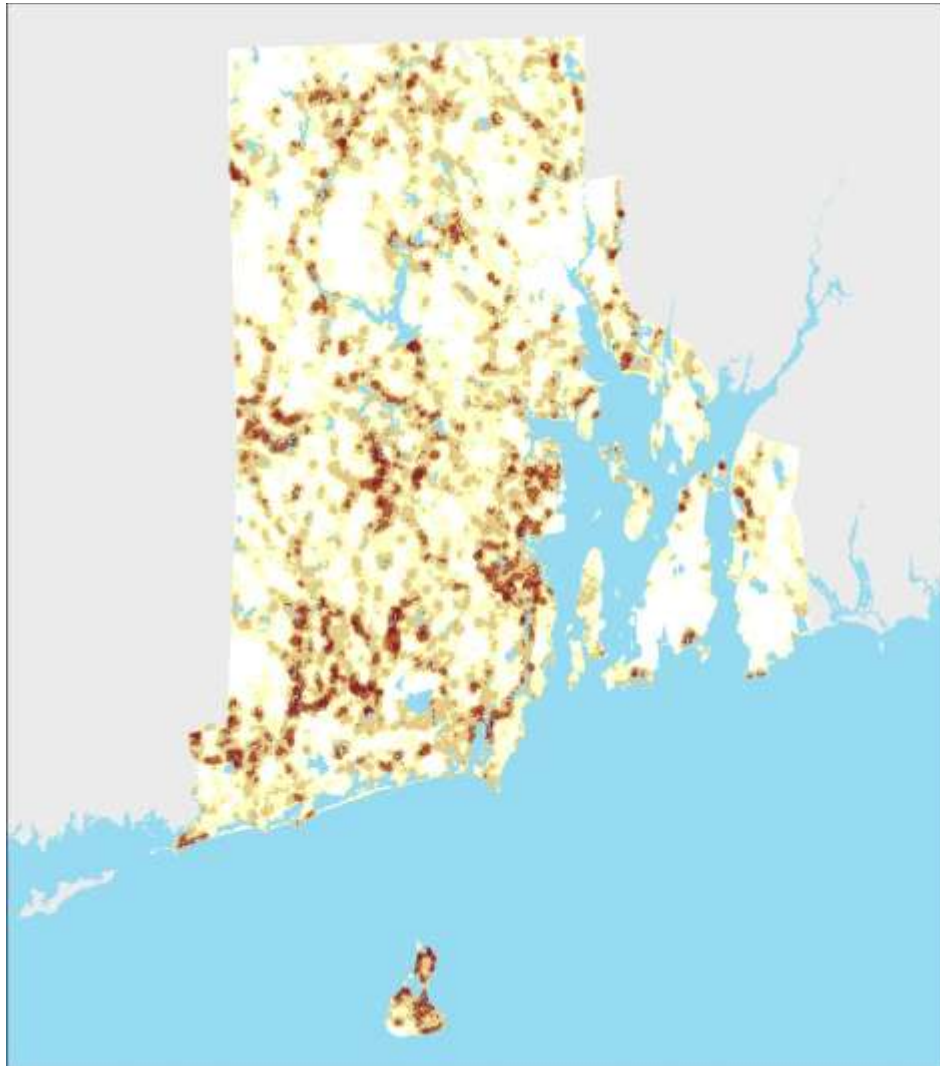
# Kinds ELUs Within 1,500 Feet



ELU Variety Categories  
(SD Units Away From RI Mean)

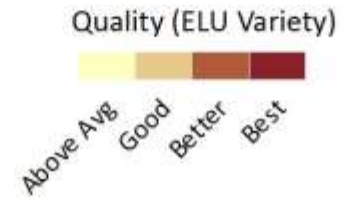


# A Statewide View



## Conserving the Stage

Land Protection for Biodiversity  
in the Context of Climate Change



For more information please contact  
Kevin Ruddock at [kruddock@nrc.org](mailto:kruddock@nrc.org)



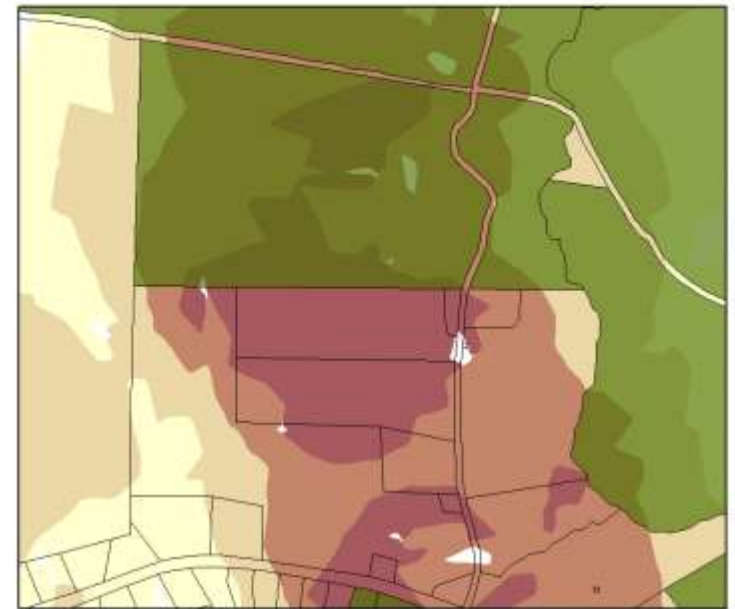
# ELUs and Conservation Planning at a Parcel Scale

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ELU one of many criteria

Use in combination with other  
criteria (size, corridors)

Disturbance, invasives, pests,  
pathogens can trump ELU  
effects



**Conservation Planning**



# Getting the Word Out

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<http://www.edc.uri.edu/elu>



# Getting the Word Out

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**Biodiversity, Land Protection, and Climate Change: Conserving the Stage**

### Conserving Biodiversity in the Face of Climate Change

Protection of native fauna and flora is one of the basic goals of most conservation organizations. This is often accomplished by conservation of sites that contain rare and endangered species and protection of habitats or landscapes that are known to be important for plants and animals. Over the long term, ecosystems change and this is a natural phenomenon. Natural causes of change are disturbances such as fire, flood, drought, and wind; diseases and pathogens; and changes brought about by the arrival of new species or the loss of keystone species.

**Climate change will exacerbate ecosystem change.** As temperatures increase, weather patterns change, and sea levels rise, the composition of plants and animals in our ecosystems will change as well. This poses a challenge for conservationists – how do you protect habitats for plants and animals when the composition of the ecological communities will be rapidly changing over the next century? Mark Anderson, the regional scientist for The Nature Conservancy, argues that it is difficult to protect the specific actors (i.e., the plants and animals) because we do not know who they will be as climate change effects occur, but we can protect the stage (i.e., the physical habitat) upon which they will thrive. Therefore, the purpose of this project is to establish a process where the conservation community can assess the potential value of "the stage" to ensure that we be able to maintain rich communities of native plants and animals as climate change effects manifest themselves. Landscapes with a large variety of species tend to be resilient to disturbance and able to deliver important ecosystem services.

Conservationists work at many scales. Our project strives to inform local conservationists who work at the parcel scale (10's-100's of acres). Other conservationists work at regional, national, and global scales. All are important. Moreover, other criteria must inform conservation decisions such as the size and connectedness of protected lands. The ELUs of a candidate site are one of many important factors to consider.

Using Ecological Land Units – ELUs – we provide a mechanism to identify properties that will be important in protecting biodiversity now and into the future as different species of plants and animals come and go as climatic conditions change. It is uncertain what particular species will occupy specific habitats when climates are very different, but ELUs help us identify landscapes that will support rich biodiversity in changing climates. To learn about our process, view the pages in the "How ELUs Can Guide Conservation" in the left navigation panel. We have used the Town of South Kingstown and the [South Kingstown Land Trust](#) as an example of how ELUs might be used to identify priority conservation areas.

**How ELUs Can Guide Conservation**

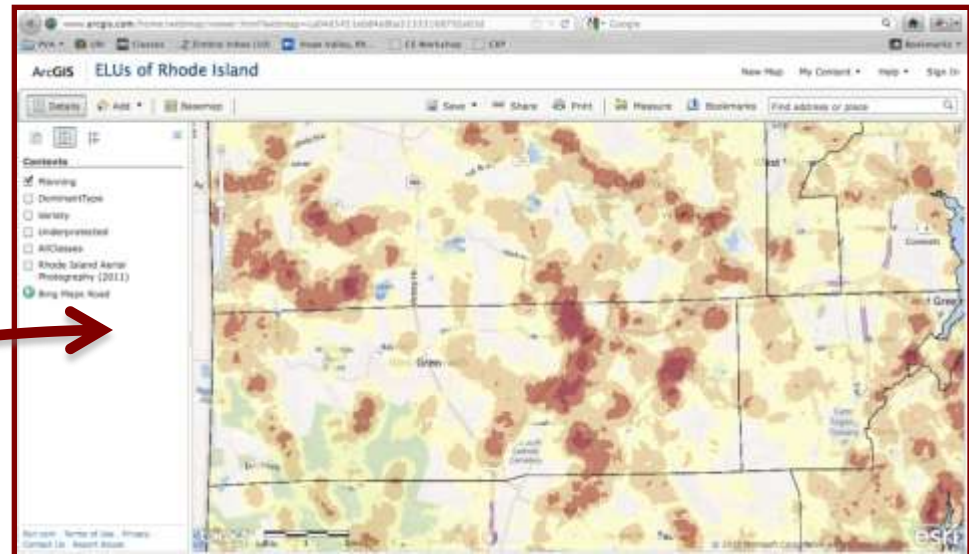
- 1. What Causes Biodiversity?
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Click here to use mapping utility (ArcGIS COM application)

**Atlas-quality ELU maps**

**Statewide:**

- Dominant ELUs
- Variety of ELUs
- Priority Protection Sites

**Zoomed in to a small area (example of using ELUs to assess site suitability for conservation):**

- All areas of site
- All ELUs
- Dominant ELUs
- Variety of ELUs
- Underrepresented ELUs
- Priority Protection Sites

Download Data (SHP rasters in zipped file geodatabase, see README.txt, 26 Mb)

**DOWNLOAD**

<http://www.edc.uri.edu/elu>

# Building a GIS Community

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Thanks!!

Lynn & Shane

RIGIS, NEURISA, Applied Geographics,  
Mapping and Planning Services,  
New England GeoSystems, Brown U

