

Collaboration and Persistence in Preserving and Enhancing Connectivity

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Black Rock Forest
April 8, 2018

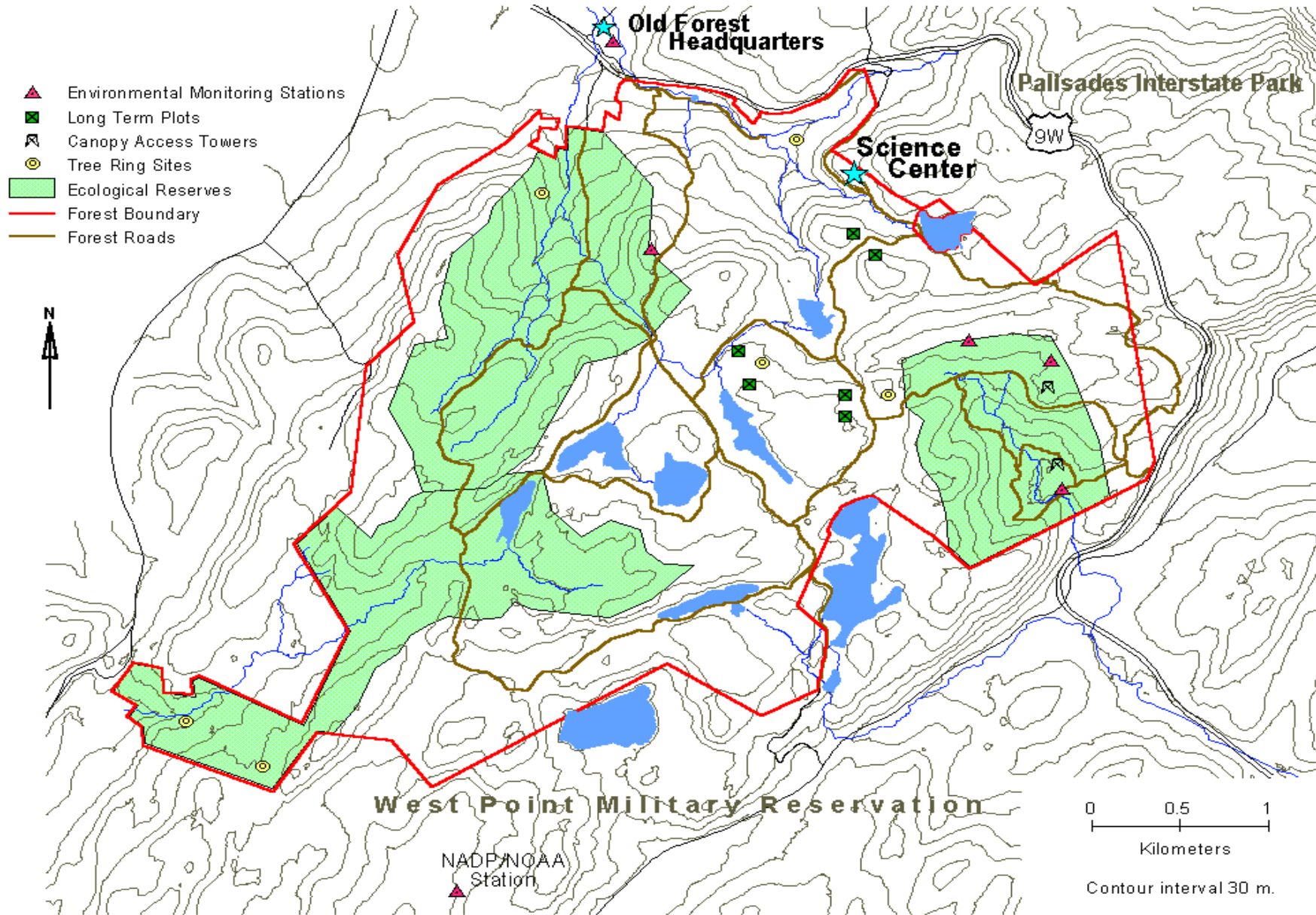
Black Rock Forest Mission

to advance scientific understanding of the natural world through research, education, and conservation

Black Rock Forest Consortium

- **Colleges and Universities-** **Barnard College**, City University of New York, **Columbia University**, New York University, Teachers College
- **Independent K-12 Schools-** Avenues: the World School, Browning School, Calhoun School, Dalton School, Metropolitan Montessori School, The School at Columbia, Spence School, Storm King School, Trevor Day School
- **Public K-12 Schools-** Cornwall Central School District, Newburgh Enlarged City School District, Urban Assembly for Applied Math and Science
- **Scientific and Cultural Institutions-** American Museum of Natural History, Central Park Conservancy, **New York-New Jersey Trail Conference**, New York City Department of Parks and Recreation

Map of the Black Rock Forest Field Station



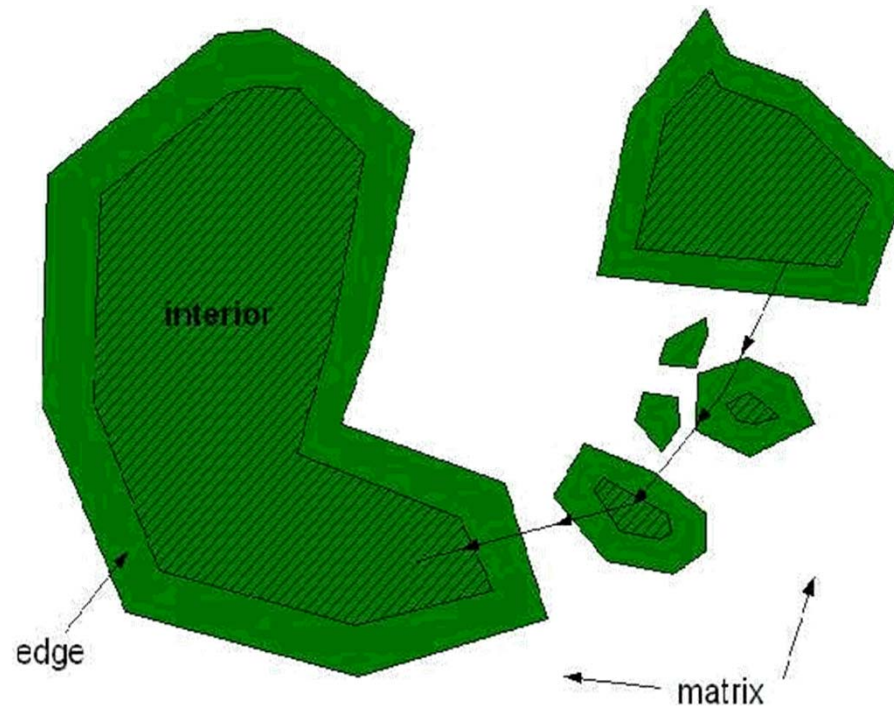
Preserve and enhance ecological connectivity to overcome effects of fragmentation

Consequences of Fragmentation

- High edge:interior habitat ratio
- Increased human-wildlife conflicts
- Smaller population sizes
 - Reduced recruitment through immigration
 - More vulnerable to random catastrophic events
 - Loss of genetic diversity and higher rate of inbreeding
- Losses of species and biological diversity

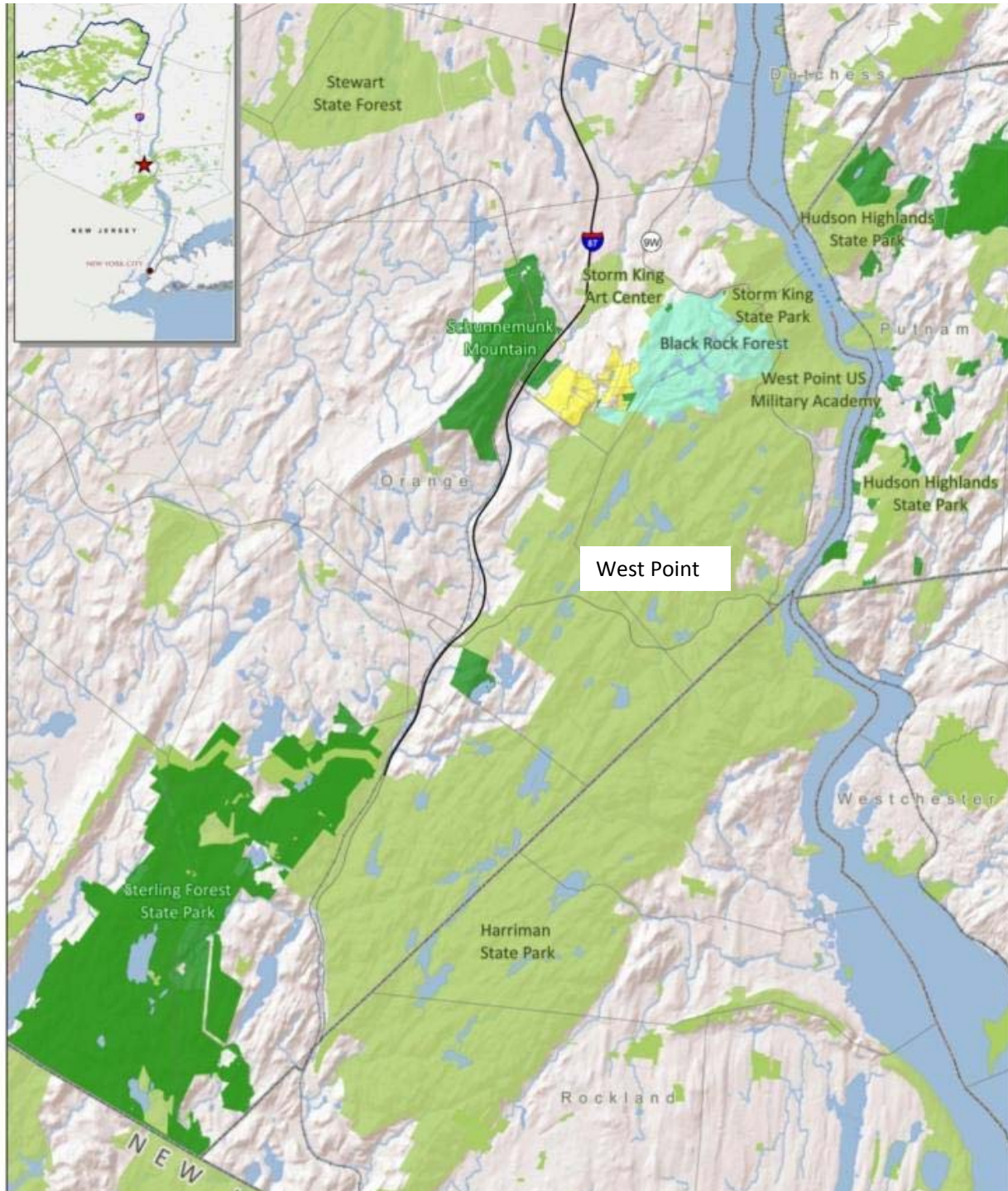
Fragmentation leads to species loss: Small isolated fragments cannot support many species- but this can be overcome with ecological connectivity

Patch/Matrix/Corridor (PMC)



Strategies to preserve and enhance ecological connectivity

- Maintain connectivity where you have it- prevent creation of new barriers to movement
- Enhance connections that have become degraded
- Re-establish connectivity where it has been lost



The beginning of our collaboration

- Began proposing work on ecological connectivity and corridors 1997
- Identified at-risk species from previous knowledge base and ongoing research in forest
- Developed overall goal: preserve and enhance ecological connectivity in area between Black Rock Forest and Schunnemunk State Park
- Core partnership formed in 2009
- Various names, generally termed the Highlands Ecological Connectivity project

Core Collaborators



**OPEN SPACE
INSTITUTE**



ORANGE COUNTY
LAND TRUST 

The logo for Orange County Land Trust features the text "ORANGE COUNTY" in a gold serif font above "LAND TRUST" in a dark green serif font. To the right is a circular icon with an orange sun and green hills.

Other partners, collaborators, stakeholders



**STORM KING
ART CENTER**



Plus municipalities, highway departments, and conservation councils

Target Species for the Highlands Connectivity project

Class Mammalia

Black Bear- *Ursus americana* (*Ursidae*)
Bobcat- *Lynx rufus* (*Felidae*)
American Mink- *Neovison vison* (*Mustelidae*)
Fisher- *Martes pennant* (*Mustelidae*)
River Otter- *Lontra canadensis* (*Mustelidae*)
Gray Fox- *Urocyon cinereoargenteus* (*Canidae*)
Coyote- *Canis latrans* (*Canidae*)
Indiana Bat- *Myotis sodalis* (EN) (*Order Chiroptera*)

Class Aves

Cerulean warbler- *Setophaga cerulean**** (SC) (*Parulidae*)
Wood thrush- *Hylocichla mustelina*** (*Turdidae*)
Worm-eating warbler- *Helmitheros vermivorus*** (*Parulidae*)
Acadian flycatcher- *Empidonax virescens* (*Tyrannidae*)
Scarlet tanager- *Piranga olivacea** (*Cardinalidae*)
Eastern wood peewee- *Contopus virens** (*Tyrannidae*)
Hooded warbler- *Wilsonia citrine** (*Parulidae*)
Ovenbird- *Seiurus aurocapillus* (*Parulidae*)
Black-throated blue warbler- *Dendroica caerulescens** (*Parulidae*)
Black and white warbler- *Mniotilta varia** (*Parulidae*)
Louisiana waterthrush- *Parkesia motacilla** (*Parulidae*)
Red-shouldered hawk- *Buteo lineatus* (*Accipitridae*)
Sharp-shinned hawk- *Accipiter striatus*** (SC) (*Accipitridae*)
Barred owl- *Strix varia* (*Strigidae*)
Piliated woodpecker- *Dryocopus pileatus* (*Picidae*)
Hairy woodpecker- *Picoides villosus* (*Picidae*)
Brown creeper- *Certhia americana* (*Certhiidae*)
Yellow throated vireo- *Vireo flavifrons* (*Vireonidae*)
Northern parula- *Setophaga americana* (*Parulidae*)

Class Reptilia

Timber Rattlesnake- *Crotalus horridus* (TH) (*Viperidae*)
Copperhead- *Agkistrodon contortrix* (*Viperidae*)
Eastern hognose- *Heterodon platirhinos* (SC) (*Colubridae*)
Five lined skink- *Eumeces fasciatus* (*Scincidae*)
Spotted Turtle- *Clemmys guttata* (SC) (*Emydidae*)
Eastern Box Turtle- *Terrapene carolina* (carolina) (SC) (*Emydidae*)
Wood Turtle- *Glyptemys insculpta* (SC) (*Emydidae*)

Class Amphibia

Blue-spotted Salamander- *Ambystoma laterale* (SC) (*Ambystomatidae*)
Spotted Salamander- *Ambystoma maculatum* (SC) (*Ambystomatidae*)
Marbled Salamander- *Ambystoma opacum* (SC) (*Ambystomatidae*)
Wood Frog- *Rana sylvatica* (*Ranidae*)
Eastern Spadefoot toad- *Scaphiopus holbrookii* (SC) (*Scaphiopodidae*)



MOULTRIE



CAMERA 1

03 FEB 2018 11:20 am



17°C



04/14/2015

12:58PM

MUNSON





Some of What We've Done

- Study of bird communities leading to Audubon IBA designation
- Conduct and direct research- new conservation science fund!
- Estimated resilience on a parcel by parcel basis
 - Compared with The Nature Conservancy Data
- Landowner interviews
- Ensured connectivity mentioned in Town Strategic Plan
- Conservation easements and fee purchases
- 2012 Analysis of bridges and culverts for wildlife suitability (I-87, NY-32, Mineral Springs/Smith Clove Roads)
- Disseminate information- website, newsletters, presentations
- Maintain partnerships
- 2016 conservation easement over entire Black Rock Forest

Landowner Surveys



Working with communities: Town of Cornwall Master Plan 2012

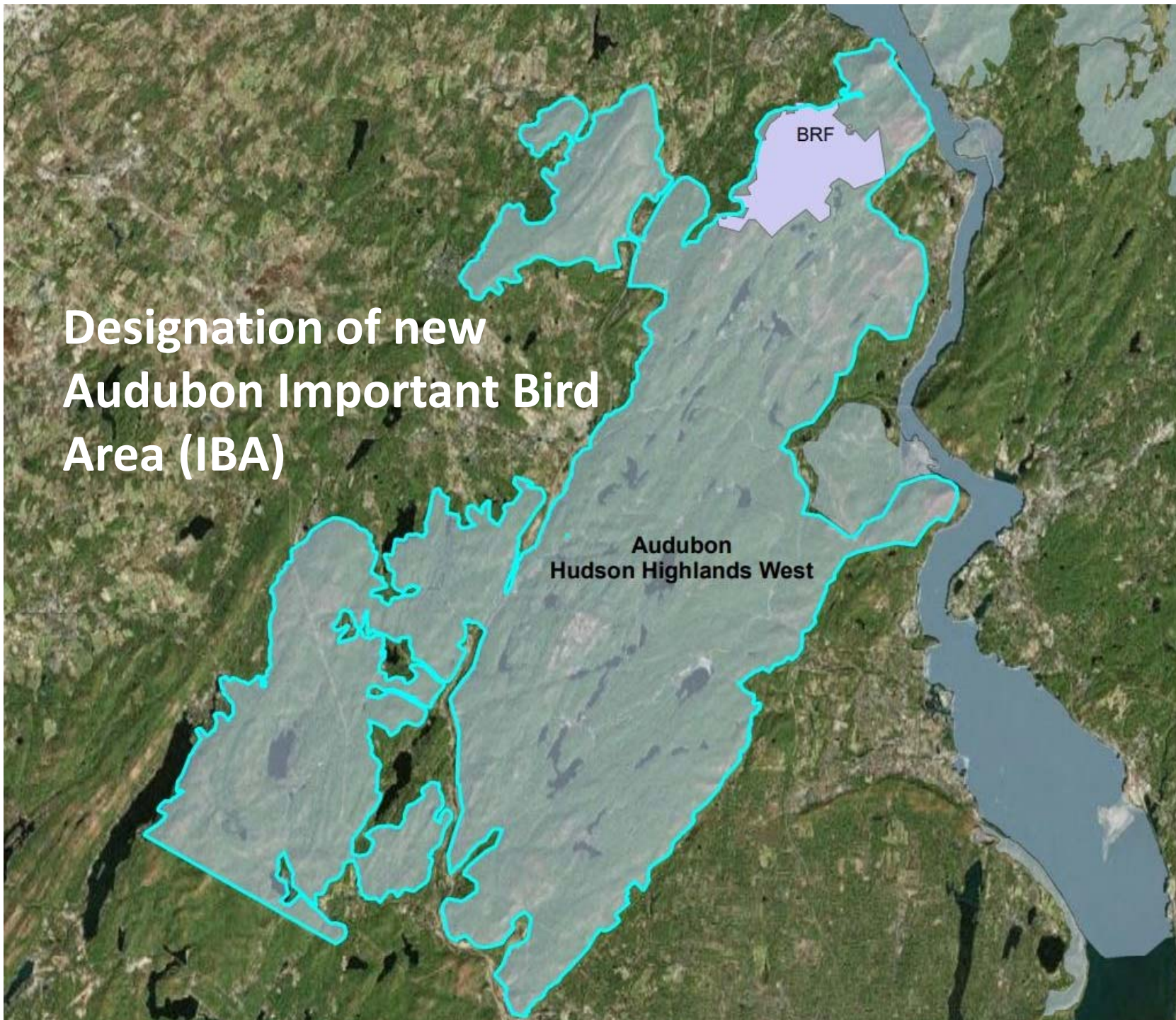
“Agricultural lands and uses would include riding academies and arenas, farm stands and commercial uses as part of a farm operation related to antiques, arts and crafts and ancillary food items not necessarily raised on the farm. All Ridge Preservation overlay areas would be in either the MCR or ARR districts. **Protection of wildlife corridors will be encouraged on, but will not be limited to, these lands.**”

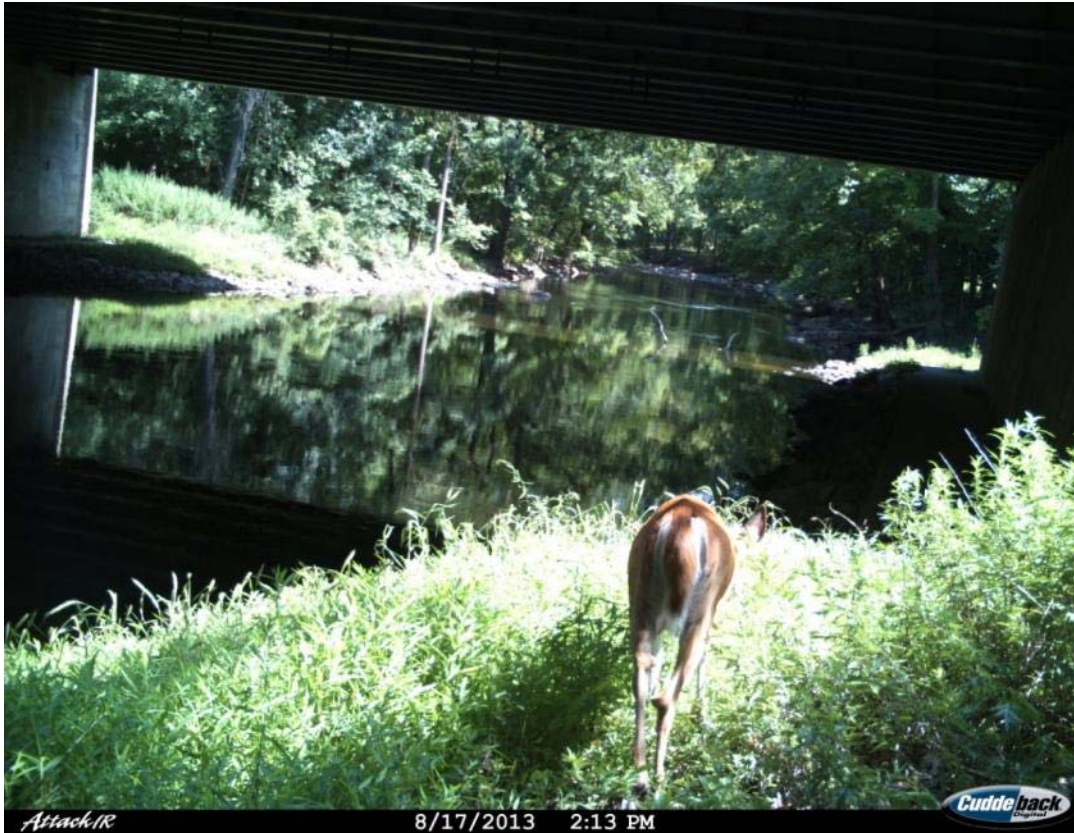
“Preservation of wildlife and significant wildlife habitats is integral to the natural beauty and character of the Town, as well as to the quality of life of its inhabitants. To do so, the Town must regularly review the status of the existing habitats, biodiversity and **endeavor to maintain ecological connectivity between wildlife corridors**, particularly in light of land use policy.”

**Designation of new
Audubon Important Bird
Area (IBA)**

**Audubon
Hudson Highlands West**

BRF



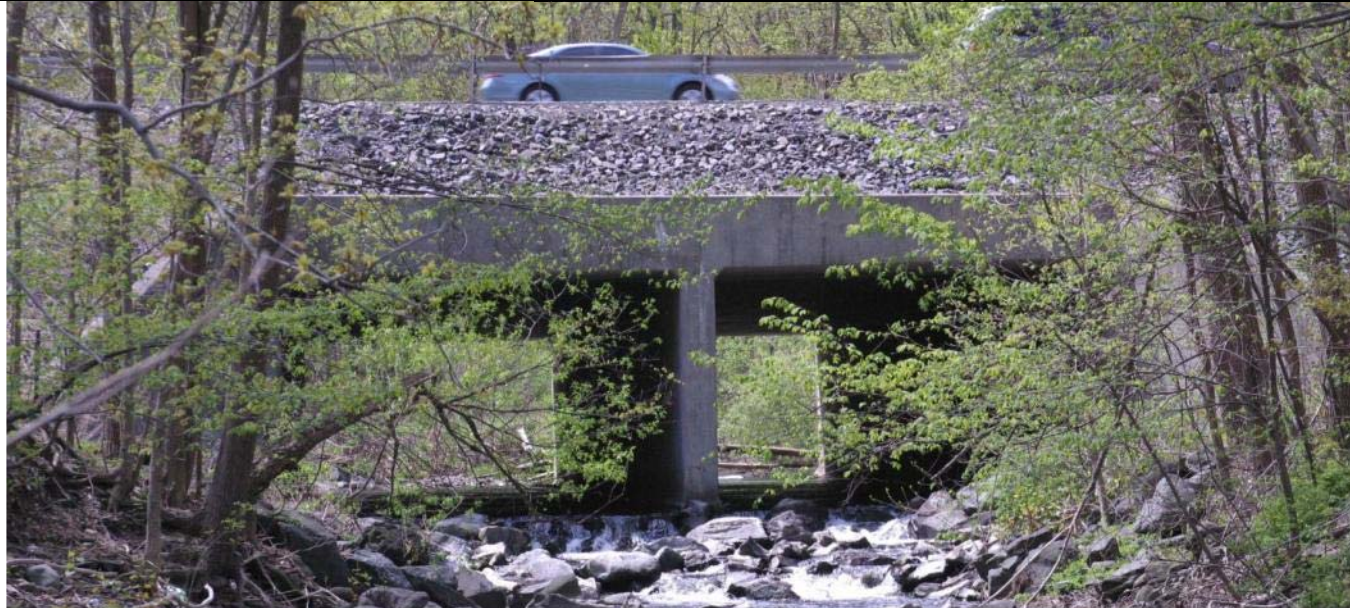


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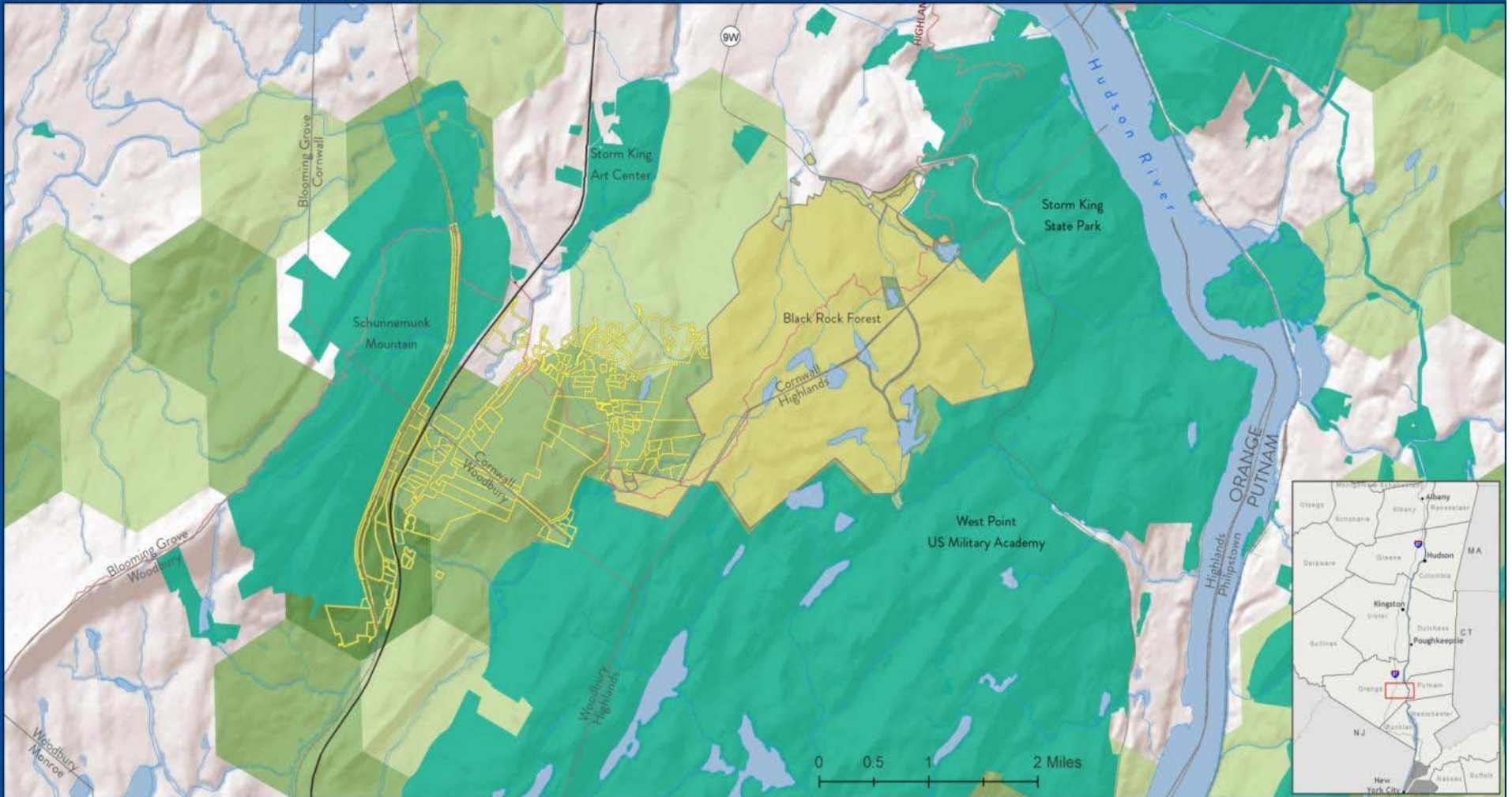
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Hudson Highlands Connectivity Project Focus Area



Map Key

- Black Rock Forest Preserve
- Protected Land
- Highlands Trail
- Unprotected Parcels > 2 acres

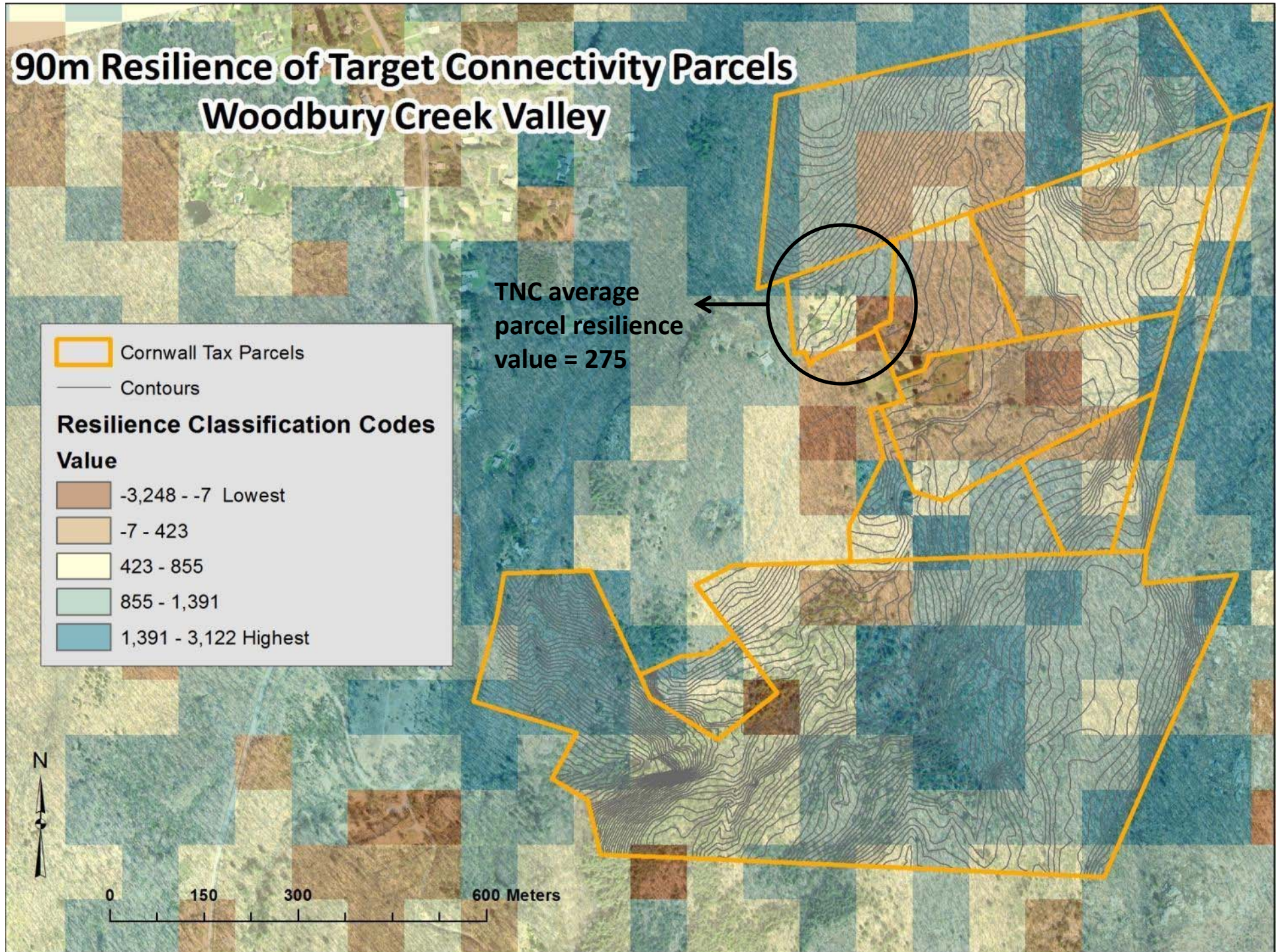
Resiliency Score

- Far Above Average
- Above Average
- Slightly Above Average



Source: Resiliency data from The Nature Conservancy, Parcel data from Orange County, Basemap from ESRI
 Map created by Open Space Institute, February 2014

90m Resilience of Target Connectivity Parcels Woodbury Creek Valley



Highlands Ecological Connectivity Project

Schunnamunk State Park

OSI

OCLT Easement

Black Rock Forest

BRF

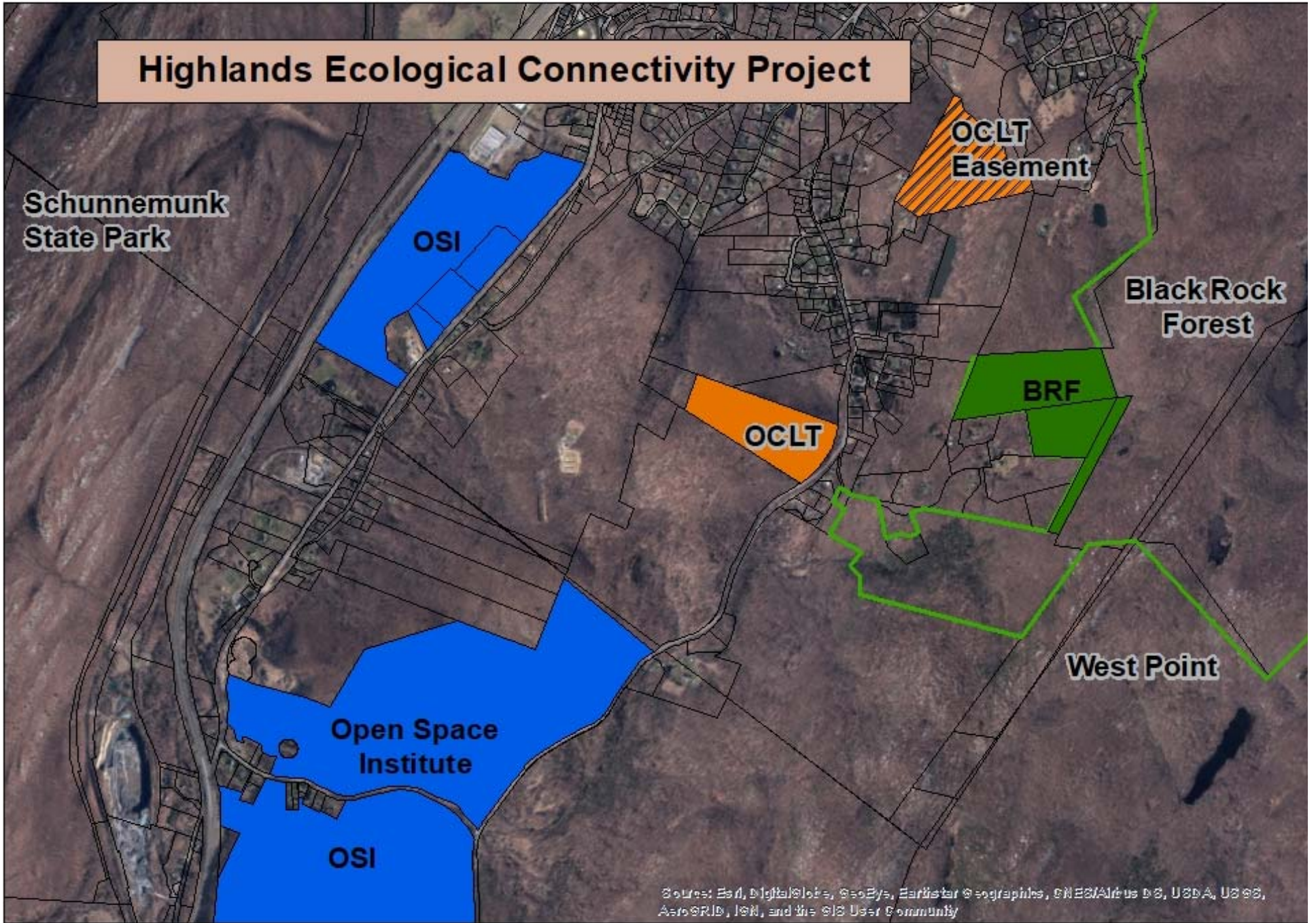
OCLT

West Point

Open Space Institute

OSI

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Some Future Directions

- With NY-NJ Trail Conference and OCLT/OSI- expanded and secure recreational trail network
- With OSI and OCLT- priority targeted easements and fee purchases
- With HHLT- Work with municipalities to integrate ecological planning into strategic planning, zoning, etc
- With OCLT and OSI- negotiate with Fish and Game Club on trail passage and conservation easement
- With Columbia- employ mammal/connectivity expert Scott LaPoint to study fisher movement and connectivity, and do least-cost path analysis and circuit theory modeling to determine most important corridor routes
- Genetic analyses with Beier and Gregory to determine where populations are isolated or not
- Outreach to Thruway authorities, DOT and others to discuss barrier mitigation strategies including improved highway crossing structures to reduce vehicle/wildlife collisions
- Design of crossing structures for both wildlife and humans (larger size!)

Multi-Use Crossing Structures



Figure 36. Photo. Human use lane and vegetated strip on multi-use overpass (Credit: Marcel Huijser).



Figure 40. Photo. Wide span viaduct designed to conserve floodplain (Credit: Tony Clevenger).



5. Photo. Multi-use underpass in The Netherlands retrofitted for human use and wildlife passage (Credit: Marcel Huijser).



Figure 23. Dutch box culvert modified with ledge for wildlife.

We want to connect!



Key Themes and Suggestions

Science, Collaboration, Persistence

- Build from scientific knowledge, principles, and seek continual science input and new information
- Use existing datasets and resources, scaled to your area
- Create a clear and achievable goal that resonates
- Form partnerships with organizations with similar or at least overlapping goals: partnerships are the only way to make advances in connectivity!
- Partnerships need ongoing leadership, or at least coordination
- Must involve local landowners, community, municipalities
- Embrace the human component: what do people get out of this?
- Connectivity projects almost always involve dealing with roads as barriers so working with transportation departments will be necessary
- Commit for the long term- did I mention persistence?