Major Project:

Protecting Our Lifeline: Translational Ecology in a Wild and Scenic Watershed

Report:

A Municipal Recipe for "30 x 30" and Agricultural Land of Local Importance

Overview:

The goal of this small grant was to combine existing and emerging data, interdisciplinary expertise, and ground truthing to 1) develop a strategic protocol to identify an essential lifeline of local nature and agriculture, and 2) disseminate this protocol for feedback and subsequent local translation in a community or a watershed basin.

To establish this lifeline in a community we set a target for achieving the recent international prescription to protect "30 x 30" – a science-based goal to protect 30% of our land and water by 2030. We developed this protocol in an iterative process within a wild and scenic watershed in a suburban area, considered a potential "average" area with a final goal of 30%. Following the protocol and principles herein would be expected to produce a strategic network of much more than 30% in rural areas with significant water resources, core forests and old forests, special or imperiled habitats, corridors, and currently protected areas. Logically it would be expected to produce less than 30% in highly developed urban areas. Local high biodiversity areas with special habitats, corridors, or geological features should be much higher wherever they occur. A sufficient area must be considered to ensure ecosystem integrity and opportunities for connections.

Knowing that there will be no perfect match between the 30% identified and the 30% "protected" we recommend the initial protocol be applied to yield at least 50% in suburban area as a general goal. This is relatively straightforward by adjusting lower results with landscape "Big Data" (which allows setting thresholds) and local details (like buffering water resources) in a stepwise fashion noted below. There will be substantial overlap as layers are added; some layers may not add additional area.

Global Resources

More "big data" mapping is coming on line all the time, and major additions are expected soon. Some of these are not currently relevant to the initial area of focus. For example:

MOL.org and the Half-Earth Map at map.half-earthproject.org.

For some global mapping tools, the data for areas like CT is not great. However they are always integrating new features and updating it, and species' databases are always a work in progress. These are all living databases, and local work can integrate into the big picture. In this case you can pick a preselected area such as the state of CT.

Then you can either draw, or upload a shapefile to look at a more focused area such as a state park. Protected areas in the database are typically defined broadly as "protected from development" so more review is needed to determine if they are "wildlands," "woodlands," "farmland" or other habitat type.

Mind the "GAP"

It is critical to understand that the land and water included in the 30% for this protocol (and recommended by international scientific consensus) must be USGS "GAP 1" or "GAP 2" based on the USGS Protected Areas Database of the United States (PAD-US), the official inventory of protected open space.

GAP Status Code is a measure of management intent to protect the biodiversity that is foundational for life on earth and ecological integrity in perpetuity. GAP 1 is what most people consider a "preserve." GAP 2 lands are managed/stewarded primarily for biodiversity, with a range of interpretations. GAP 3 lands are managed for multiple uses, including conservation, recreation and extraction. GAP 4 has no mandate for biodiversity protection. At this time, 30% GAP 1 and GAP 2 is considered a minimum, globally, with additional undeveloped GAP 3 and Gap 4 land (i.e. farms, parks, working forests) also needed for ongoing stability of the biosphere and to address human needs. Adding highly maintained "parks" would be at the discretion of end users.

During discussions and upon developing this protocol, and after reviewing a number of databases, including the "Wildlands and Woodlands" dashboard, "Agricultural Land of Local Importance" was also added as part of the landscape that needs more attention. These lands are critically important to recognize as part of the lifeline, and community and regional self-sufficiency. Their additional % will vary from place to place and should be above and beyond the "30 x 30" goal for GAP 1 and GAP 2 land. The original research on the Global Safety Net identifies these lands as additional "Tier 1 Climate Stabilization" areas in New England, especially forests.

The Protocol and "Recipe"

To achieve the 30 x 30 goal we outline a logical and aspirational protocol that can apply to a municipality in general or to a specific watershed basin. The protocol was developed with the intention of applying it to a basin area in the Lower Farmington River and Salmon Brook Wild and Scenic River area.

This is because 1) it is important to note that natural resources and ecosystems do not obey town borders, they align with topography, geology, etc., and 2) a basin provides the most clear geological and biological boundaries.

We note that if the protocol is applied to a municipality, the review and documentation of natural features should extend beyond the municipal borders as relevant, and as possible extend to a local riparian zone, so that important parts and natural communities are not overlooked. All resources and steps in the protocol are not likely to be found in one area and can simply be skipped to the next step if this is the case.

Timeline and future plans:

Going forward, the plan for this project is to apply this protocol in a basin of the federally-designated Lower Farmington and Salmon Brook Wild and Scenic River watershed. We may try to seek separate funding to use this protocol in the urban-suburban Park Watershed. Comparing these two regions will help to increase the “user-friendliness” of this protocol and determine how close each area is and/or can get to “30 x 30.”

We expect this to be approximately a 3-year project given the level of iteration, the amount of funding available, pace of work, and the outreach needed. Overall, this project would be an ideal “case study” to publish and highlight for municipalities and other watershed organizations and wild and scenic groups. Our overarching goal is to optimize, finalize and disseminate for broader consideration and further refinement.

Below, the text in red identifies the ACTION ITEMS.

Identifying a Lifeline of Nature in Your Town – Action Items to Achieve 30 x 30		
Value	Details and rationale	Information and **Strategies**
General principles		"Recipes" for "30 x 30" - overview of ideas at a national level. Relevant details from these recipes re: **mapping for Wild and Scenic study area**: - include and expand wild and scenic river corridor where possible - add wildlife corridors

Geology	Geology is solid material above or below the soil and is the basis for ***water flow*** and ***biodiversity*** above and below ground. Connecticut has several special rock types associated with significant biodiversity, such as trap rock, limestone and basalt.	Bulletin 41: Trap Rock Ridges
Bedrock Geology	Limestone and basalt	From **UCONN/CLEAR**: layer below has all bedrock types in CT. Limestone AND Basalt will need to be selected out by the user. https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/datasets/CTDEEP::bedrock-geology/explore?location=41.499983%2C-72.761737%2C10.00 **For non_GIS users here is the bedrock geology map of CT that can be used as a reference to determine whether target rock type is in their town:** Bedrock Geological Map of Connecticut Note that this link has a zoom feature!!
Above Ground Geology	Trap rock ridge	**Establish 150 ft setback, consistent with enabling legislation where possible.** AN ACT CONCERNING PROTECTION OF RIDGELINES.

Water Resources / Wetlands	ALL water resources protected with a natural buffer according to best practice	**Inland wetland soils** https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/datasets/CTDEEP::soil-survey-geographic-database-ssurgo-inland-wetland-soils/explore?location=41.520199%2C-72.759448%2C9.96
Coastal Wetlands	NOTE: NOT RELEVANT TO STUDY AREA, included for completeness	**Tidal wetlands:** https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/datasets/CTDEEP::tidal-wetlands-1990s/explore?location=41.365530%2C-72.746835%2C10.18
	Salt marshes Estuaries	**Link above, and this one** https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/datasets/CTDEEP::salt-water-limit/explore?location=41.269841%2C-72.748018%2C10.00 will help locate marshes that are located inland or upstream from coastline when projected over an aerial photo. The critical habitat layer may have some of the marshes already mapped.
Inland Wetlands	Wetlands	**Add 100+ ft buffer-** buffer can be calculated and mapped w/ArcGIS. Ideally, identify the "ecologically critical protective" buffer. This is variable according to landscape setting, etc.

	Vernal pools/Potential vernal pools	**750+ ft buffer for confirmed pools** **Potential vernal pools require confirmation:** requires ground-truthing. Some towns (or land trusts, etc.) may have data if they were surveyed…. And ground truthing may be needed to identify more complex natural communities.
	Floodplain	**100+ ft buffer**
	Riparian zone	**100+ ft buffer**
	Headwaters	**100+ ft buffer defined by topography and seeps.** requires ground-truthing
	Intermittent stream	**100+ ft buffer** requires ground-truthing
Watercourses	Bog, Fen, Swamp, Marsh, Pond, Lake	**100+ ft buffer, break out and adjust as needed**

Habitat and Biodiversity		
Natural Diversity DataBase (NDDB)	Note that NDDB more than 20 years old need review Note that no NDDB indication does not mean nothing is there. It could mean 1) no one has ever looked; 2) nothing has been reported; 3) inconclusive. Consider adjacent NDDB and soils, water, slope etc for potential NDDB.	**All NDDB areas added** Natural Diversity Data Base Maps
Imperiled Habitats		**All habitat added with a buffer as appropriate.** Add CT Imperiled habitat and DEEP Critical Habitats (not comprehensive). These are the known features that have been mapped. Most are derived from data layers. Some ground truthed areas are included, but there are many more out there that require field work to locate as they cannot be pinpointed

		remotely by conventional means (i.e aerial photos, wetlands maps, soils maps, etc.) https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/datasets/critical-habitats/explore?location=41.527573%2C-72.675849%2C10.28
Slopes > 15%		**All habitat added** Note that % slope might be selectable from this data set. 2016 Lidar-based Contours topographic maps useful to see where steep areas are located in the landscape. This is the best go-to visual mapping tool. http://magic.lib.uconn.edu/topographic_maps.html
Areas w/o invasive plants		**All habitat added as known/possible.** **Areas with hot spots that can be easily addressed should be identified for immediate attention**
Imperiled habitats	This is older, and not "complete" but includes excellent lists of important species not found in other sources and their key habitats	**Imperiled communities** https://ctconservation.org/wp-content/uploads/Most-Imperiled-CT-Communities.pdf
Special Features		
Notable Trees	Typically a keystone element and an old and	**Added with buffer as possible, depending on location.** *(note that many trees on private land do not have locations listed)* Connecticut's Notable Trees

	established biodiverse microhabitat**.**	
Old forests and core/interior forest	Big data resources under refinement and development;	**Add core forest / interior forest** **Add carbon-dense forest, region-specific** Frontiers | Mature and old-growth forests contribute to large-scale conservation targets in the conterminous United States (frontiersin.org) Forest maturity map (matureforests.org) Maturity model inputs (matureforests.org)
Biodiversity Hotspots	Potential and actual; Based on soil, slope, other features (i.e. talus)	**Added with buffer 100+ ft as possible;** Areas not included already
Cold water habitat sites & cold water-supporting drainage basins	Critical for native brook trout and other species	**ADD cold water fisheries.** https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/datasets/CTDEEP::cold-water-habitat-sites/explore?location=41.614445%2C-72.663566%2C10.03&showTable=true **and** https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/datasets/CTDEEP::cold-water-supporting-drainage-basin/explore?location=41.614833%2C-72.663566%2C10.36

Protected Land and Water		**All added if GAP 1 or GAP 2** **See database. GAP 1 and GAP 2 are possible unless designated as permanent agricultural working land (farms, forests - see below)**
Resilience/Refugia		**Add any areas not already included, via:** Resilient Land
Corridors and Connections		**Added and additional connections identified as possible:** **Use 1 meter new mapping tool:** **NOAA High Resolution Land Cover For Connecticut | Center for Land Use Education and Research**
INTERIM CHECKPOINT	**INTERIM CHECKPOINT**	**INTERIM CHECKPOINT**
COMPREHENSIVE ASPIRATIONAL LIFELINE	ADD TOTAL of **areas identified**	**FINALIZE as MAP A** This is the raw data and the % of the study area (town, basin) should be WELL OVER

		50% for rural areas, at least 50% for suburban/rural, and at least 20% for urban. **IF NOT, increase buffers for water resources, and intact/ invasive-free areas as possible; revisit buffers and threshold for carbon-dense forests**
REMOVE DEVELOPED AREAS		**SUBTRACT currently developed areas** **FINALIZE as MAP B** This is the current potential network for GAP 1 / GAP 2 The potential should still well over 50% rural, 30-50% suburban, 10-20% urban **If not, ADD as noted above.**
INTERIM CHECKPOINT	**INTERIM CHECKPOINT**	**INTERIM CHECKPOINT**
Additional land of importance: *Locally Important Farmland and Other Working Land*		**Once MAP B is finalized ADD -** 1) **Working land under easement (agricultural, i.e. farm or working forest, GAP 3 or 4)** 2) **Additional land targeted for preservation with protection level TBD** **FINALIZE as MAP C** **(this will be combined actual and potential, GAP 1-4):**

		MAP C is the final roadmap of public and private land and water that should be afforded higher protection (GAP 1 or 2) or targeted for protection. **Strategies for additional land could be areas suitable for restoration, depaving, reducing built "footprint," etc.**

Caveats and Summary:

Note that this protocol is a living document with additional data sources to be added.

In developing this protocol we used a logical flow of values and a combination of "big data" and national, state and local databases. While all layers are useful, landscape-level spatial conservation approaches can lack sufficient details and data (i.e., high-resolution biodiversity data, ecological "quality," status of protected areas, progressive or current human impacts, specific areas needing restoration). In short, local knowledge is needed. Going forward, we intend to add ways to help prioritize and groundtruth these findings.

Further iterations, and applying it very specifically to pilot regions, will achieve the ultimate goal of bringing science-based translational protocols to communities and make them accessible to planners and similar professionals. This will enable generally trained professionals to put translational ecology into local action, thereby benefiting the planet while strengthening their own community and environment. Video taping of the process of generating a "case study" may be informative to understand the process in real time.

In sum, we engaged in a robust and interactive process to reach this point and welcome feedback. We also submit this report with a disclaimer that we cannot be confident that the protocol will identify everything of importance.This is part of the iteration, and we welcome feedback on both edits and outright omissions.

Public Dissemination:

Susan Masino, PhD will be presenting parts of this protocol formally to the Simsbury Open Space Commission and in a major session at the Annual CACIWC conference on October 29, 2022 in a session titled *"Landscape PLanning for Mental Health"* and a similar session at the CT Land Conservation Council (CLCC) in March 2023.

Over the next year we hope to incorporate feedback and, in particular, reach out to a range of additional professionals and disciplines (planners, engineer, conservation professionals, educators) to refine the usability and then apply the protocol in at least two different cases for public dissemination. A combination of the protocol and the case-studies of translational ecology will provide ground truthing, and we will then seek more peer review.

Respectfully submitted,

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