The Nature Conservancy
Protecting nature. Preserving life.™

New Hampshire Chapter
22 Bridge Street, 4th Floor
Concord, NH 03301

Tel (603) 224-5853
Fax (603) 228-2459

nature.org/newhampshire

July 30, 2010

Randy Curtis
NH Fish and Game Department
11 Hazen Drive
Concord, NH 03301

Dear Mr. Curtis:

I am pleased to enclose the first annual progress report for the *Staying Connected in the Northern Appalachians* initiative. The Nature Conservancy's New Hampshire Chapter serves as the overall project manager and financial administrator for the initiative, however this report reflects the deep involvement and contributions of twenty public and private partners involved in *Staying Connected*.

Please don't hesitate to contact me if you have any questions or require additional information. Note that I will be out of the office from Aug 2-Aug 17, with very limited access to e-mail and voicemail.

Sincerely,

Mark Zankel
Deputy State Director

Cc: Steve Fuller, NH Fish and Game Department

Staying Connected in the Northern Appalachians

Interim Progress Report

Submitted by The Nature Conservancy on behalf of
the Staying Connected in the Northern Appalachians Collaboration

Submitted to the New Hampshire Fish & Game Department
and the United States Fish & Wildlife Service

Reporting Period: July 1, 2009 – June 30, 2010 Date of Report: July 30, 2010

Project 1: Securing and Restoring habitat connectivity between the Adirondacks and Tug Hill

Project Manager: Dirk Bryant – The Nature Conservancy, NY-Adirondacks Chapter

Objective
1.1 Land Protection: Secure 3,000 – 5,000 acres of key habitat 'stepping stones' in the Black River Valley
Approach
• Work with NYS to assure connectivity is a priority within Region 6. It is currently a criteria in the draft Open Space Plan, we need to do work with DEC to make sure it's an implementation focus. This might include developing connectivity-specific criteria for evaluating land protection projects.
• Develop a list of priority tracts for land protection, in consultation with DEC and THT.
• TNC will facilitate the purchase of ~1,500 acres of fee and easement lands on the Black River. We are already working with the 2 key landowners, and DEC intends to purchase fee/easement when the transaction is complete.
• THT and TNC Prospecting: build relationships with key landowners, with the objective of orchestrating State co-ops (mostly easement purchases, but also strategic fee acquisitions). Goal of optioning several of these properties (~2,000+ acres) with NYS take-out over subsequent years.
Activities Undertaken (during the reporting period)
• Integrated land ownership and protected areas data with connectivity modeling results to identify largest land owners for outreach work. Reviewing results with Tug Hill Tomorrow and Tug Hill Commission to finalize 'prospects' database for land owner outreach
• Worked with DEC and others to assure connectivity in the Black River Valley was included as a project criteria in the latest version of the NY State DEC Region 6 Open Space Plan.
• Carbone Phase II: Work is underway on a fairly complex project to protect ~1,200 acres of lands in fee and easement within a priority 'stepping stone' in the Southern Linkage, bordering the Black River. A major land owner is purchasing several key tracts to consolidate this 'stepping stone' with fee/easement eventually to be held by New York State.

- Negotiations underway with a major land owner in the Southern Linkage to protect several key tracts through a donated conservation easement. We anticipate this transaction will be completed within the next 2-3 years.

Outcomes, Results, and/or Deliverables to Date

- Draft landowner/parcel 'prospects' database (see above).
- Connectivity is included as a project criteria in DES Region 6 Open Space Plan, which will help to drive state resources toward key connectivity parcels.

Unforeseen Challenges/Issues (if any)

- As a result of the New York state budget crises, Environmental Protection Funding for land acquisition has been cut drastically in this year's budget and we expect similar cuts in years to come. Combined with reductions in funding for DEC we expect this will significantly set back the timing for State co-op land protection projects (e.g., Carbone Phase II).

Objective

1.2 Local Land Use Planning: Four priority towns integrate the goal of maintaining connectivity within local land use planning and zoning.

Approach

- Develop and package spatial datasets that integrate priority connectivity areas, land cover, land use and other relevant information which can guide local decision-making (i.e. CD ROMs, portfolio of hard-copy thematic maps).
- Develop and disseminate educational materials on why connectivity is important and guidelines on how to address connectivity objectives in local land use decision-making.
- Conduct town outreach at planning and regular town board meetings and other venues, host training sessions for local planners.

Activities Undertaken (during the reporting period)

- Produced summary report of connectivity modeling methods, results and proposed implementation strategy and disseminated this via e-mail and at meetings with local government officials and others – January 2010 and ongoing.
- Hosted briefing with local government officials, media and others to provide briefing on connectivity modeling and implementation plan results, officially 'launch' implementation phase of project – January 10, 2010.
- Produced draft maps of land cover, protected areas, roads, topography and Natural Heritage species/community occurrences for southern linkage as input to local planning discussions.
- Distributed *Make Room for Wildlife: A land use planning for the Adirondack Region* at the

Adirondack Local Government Day Conference on March 23-24, 2010.
• Published, with partners, *Make Room for Wildlife: A land use planning tool for the Tug Hill Region*, a brochure for planners and developers on appropriate land use practices that consider wildlife needs.
• Met with project partners on March 24 to develop a "menu of options" for communities to use while deciding how best to plan for connectivity and to finalize presentation for Tug Hill Local Government Conference (see below).
• Worked with partners to conduct a "community readiness analysis" to determine which communities are most likely to be ready to work with Staying Connected partners on land use planning for connectivity.
• Prepared and formally presented a Powerpoint presentation on *Make Room for Wildlife* to community planners and local government at the Tug Hill Local Government Conference on April 1, 2010 in Watertown, NY, focusing on the various options for land use planning to protect connectivity for wildlife and to gather more interest in the project.
• Held a community meeting in Boonville, NY (in the Tug Hill) on June 2, 2010 to present the menu of options and recruit communities to get more involved in Staying Connected land use planning.
• Presented to the Adirondack Research Consortium on May 19, 2010 about connectivity and land use planning in the Northeast, focusing on the Adirondacks.
Outcomes, Results, and/or Deliverables to Date
• The Nature Conservancy et al, *Adirondack – Tug Hill Connectivity Project: Planning Phase – Final Report January 15, 2010 Working Document*. A copy of this 115-page report is available upon request.
• Over 60 people attended Local Government Conference session in Tug Hill region to hear about connectivity.
• Printed 2,000 copies of *Make Room for Wildlife*
• Over 40 people attended the Adirondack Research Consortium session to hear about connectivity.
• Approximately 12 people attended the June 2 Boonville community meeting. Most communities voiced interest in further involvement; specifically conducting a community visioning session across multiple municipalities (in Stuben, Ava, and Western, NY) to conduct land use planning that protects connectivity; also interested in bringing other community leaders in the region to Florence, NY to look at existing conservation subdivision.
Unforeseen Challenges/Issues (if any)
• There is insufficient funding to support the range and extent of activity underway in this linkage.

Objective
1.3 Barrier Mitigation: NY Dept. of Transportation and town highway departments incorporate

connectivity objectives as part of planned road maintenance/upgrade work along key road segments.
Approach
• Integrate connectivity modeling results with DOT 5-year maintenance plan data to identify priority road segments to focus field assessment work.
• Along priority road segments, collect field data on species locations (i.e. winter tracking and collection of road kill data). Explore opportunities to enlist volunteer monitors for this work.
• Develop barrier mitigation plans for key road segments.
• Implementation: work with DOT on low-cost barrier mitigation alternatives that can be incorporated through planned routine maintenance
• Provide technical assistance to town/county highway departments on priority roads, and maintenance options for enhancing connectivity.
Activities Undertaken (during the reporting period)
• Hosted several meetings with DOT including an all-day field trip to outline a project to assess priority road segments for field assessment work in the Southern Linkage. Identified 3 key roads to focus work on. Field work this winter will include identifying areas of animal movement and potential for improving permeability based on topography, land cover, existing physical structures (culverts, fencing etc).
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)
• Our key DOT contact is engaged, supportive of this work and well-placed to help us take it forward. Due to Department budget cuts it has taken longer than expected to develop a work plan given they are so stretched with other commitments.

==========

Project 2: Protecting habitat connectivity between the Green Mountains and Adirondacks in the Southern Lake Champlain Valley

Project Manager: Paul Marangelo – The Nature Conservancy, Vermont Chapter

Objective
2.1 Characterize wildlife movements across key road segments. A number of key road segments along high-volume north-south roads have been identified by exiting models as connectivity fragmenting features in high-probability movement zones in the habitat linkage area. This objective reflects the need to identify specific animal crossing locations in these key segments and develop/begin implementation of strategies to mitigate the barrier effects.
Approach
• Conduct a complementary landscape modeling exercise using more sophisticated modeling techniques (FUNCONN) in order to strengthen our hypotheses regarding identification of important wildlife movement zones and road crossings via a comparative analysis with existing modeling results. Existing work modeling landscape connectivity between the Green Mountains and Adirondacks has identified an interregional high probability movement zone (Long 2007) and high-volume road segments (Austin et al 2006) impairing east-west permeability across the Southern Lake Champlain Valley for wide-ranging mammals. However, given the limitations inherent in landscape modeling approaches for assessing habitat connectivity and associated caveats on interpreting results, it is important to strengthen the analytical rigor of our existing modeling assessments with a complementary modeling assessment.
• The location of critical road crossing corridors identified by existing modeling results will be field-validated by conducting a Critical Paths for Wildlife tracking assessment for key road segments on US Rt. 7, VT Rt. 30, and VT Rt. 22a. This analysis will characterize wildlife movement patterns across key road segments, providing location-specific data on wildlife road crossing areas. This information in turn will provide the ability to propose targeted and cost-effective road barrier mitigation strategies, and will identify important land parcels in road-corridors that are currently being used by wildlife for road crossing. The results of this assessment will be used to guide land use planning and targeting of strategies to enhance permeability across major north-south roadways.
• Combine results of Critical Paths tracking assessment and landscape modeling for habitat connectivity to provide a basis for identifying both landscape-scale most probable movement corridors and key wildlife road crossing locations.
Activities Undertaken (during the reporting period)
• The FUNCONN modeling project for three wide-ranging focal species (black bear, bobcat, and fisher) was completed in June 2010 (contract report is still in progress). Moreover, a complementary modeling project not proposed in the project proposal was competed for three focal species using Circuitscape methodology.
• The Critical Paths tracking assessment work was completed (report attached; Leoniack 2010). The tracking work focused on road segments that were identified with modeling results.

Outcomes, Results, and/or Deliverables to Date

- Contract report and data for the Critical Paths project was completed in June, 2010 (Leoniack 2010). A copy of this 77-page report is available upon request.
- Analysis was completed for the FUNCONN modeling project for all three focal species. Final report expected to be available by the end of July, 2010.
- Additional connectivity modeling completed with Circuitscape with no additional expense to the project grant.
- Results from all existing connectivity modeling work were co-interpreted with the results from the Critical Paths tracking project to strengthen hypotheses about the most important wildlife crossing road segments to work on from a Green Mountains to Adirondack's habitat linkage perspective. The resulting connectivity priority ranking of these road segments were used to better define the focus and priority for Technical Assistance Community work.

Unforeseen Challenges/Issues (if any)

- FUNCONN modeling efforts ran into difficulties that had to do with an inability to adequately integrate the road segment classification schemes used in NY and VY in the models. The scale of the analysis was also, for at least one of the focal species (Black Bear), too small to yield meaningful results. However, we were able to complete a series of Circutscape models for the project at no extra cost, which in some ways were better suited to the geographic focus of our analysis and our questions.

Objective

2.2 Identify and pursue land protection opportunities. Land protection will be an important tool to maintain connectivity in the lands proximate to key road crossing segments within inter-regional high-probability movement zones.

Approach

- Identify land protection opportunities in high-probability movement zones and work with willing landowners on land conservation. The highest priority areas will be in the Rt. 7 corridor in the towns of Brandon and Pittsford in Rutland County, VT. Specifically, we will focus on identifying opportunities to add to the Pomaineville Wildlife Management Area, and approach large land-owners with key land-holdings. In NY, we will build relationships with key landowners, with the objective of protecting key tracts through partnerships with NYS DEC to acquire properties and conservation easements.

Activities Undertaken (during the reporting period)

- With the help of project partners/collaborators, we developed a list of large parcels and landowners in the wildlife corridor Rt. 7 crossing area in Brandon and Pittsford.
- Focused outreach and publicity efforts in the towns of Brandon and Pittsford as a way of raising the visibility of this issue for local landowners, with the objective of maximizing the possibility of contact

with landowners receptive to conservation that own parcels in critical locations.
• A former Girl Scout Camp in the Greens-Adirondacks linkage in Ft. Ann, NY was protected by The Conservation Fund and Open Space Institute in June 2010 (2,300 acres).
• Land protection activities closed on a 300 acre land parcel in the linkage zone at Chubbs Dock in Putnam, NY.
• Conservation easements on 3,902 acres of land in the Greens-Adirondacks linkage were transferred to NYDEC by TNC, completing the land transactions in the protection of former Finch-Pryun lands in Ft. Ann and Whitehall, NY.
• Conservation easements on 788 acres of land in the Greens-Adirondacks linkage were transferred to NYDEC by TNC, completing the land transactions in the protection of former Finch-Pryun lands in Dresden, NY.
• Linkage meeting with partners on May 21, 2010 to provide update on progress and discuss next steps.
• Participated in ongoing planning for individual meetings with key community leaders.
• Continued planning for community kick off meeting to identify other partners in the linkage area doing complementary work (initial planning has included research into approaches used in similar meetings in other linkage areas in the Staying Connected Project.)
Outcomes, Results, and/or Deliverables to Date
• Protected 300 acres of land at Chubbs Dock in Putnam NY along the shore of Lake Champlain in an important region for connectivity.
• Protected 3,902 acres in Ft Ann and Whitehall, NY via transfer of a conservation easement to NYDEC.
• 2,300 acres of a former Girls Scout camp were protected in Ft Ann, NY by The Conservation Fund and Open Space Institute in June 2010.
• Protected 788 acres in Dresden, NY via transfer of a conservation easement to NYDEC.
• WCS awarded $10,000 from the Lake Champlain Basin Grants Program to support technical assistance to community partners in this linkage. This will be used to convene other conservationists in the linkage and engage them in the land use planning element of Staying Connected.
Unforeseen Challenges/Issues (if any)
• WCS' work in this linkage area is slightly hampered by our lack of geographic proximity and lack of direct knowledge of some of the local communities and partners here. We anticipate overcoming this challenge, but it has caused a slight delay in our work getting off the ground. To help us overcome this challenge, we will reach out to targeted individuals for support and contacts.

Objective
2.3 Catalyze the incorporation of connectivity objectives by State transportation agencies. Vermont

Department of Transportation and perhaps NY Department of Transportation, depending on outputs of additional modeling effort). There is opportunity to advocate for state transportation agencies to incorporate connectivity values into any planned road maintenance/upgrade work along 3 key road segments.

Approach

- Use spatially explicit road crossing data from Critical Paths tracking assessment to identify locations to focus SAFETEA-LU Road Corridor Enhancement Funds. Funds will be sought to support the implementation of strategies to mitigate the road barrier effects of US Rt. 7.
- Participate in planning activities for road maintenance and road upgrade work for key road segments.

Activities Undertaken (during the reporting period)

- Used information from modeling and critical paths tracking work to identify important wildlife crossing locations for a road corridor planning effort on VT Rt. 22a, the second busiest road corridor in the Greens-Adirondacks habitat linkage. Wildlife connectivity information and strategies for protecting connectivity will be incorporated into recently initiated road improvement transportation planning project.

Outcomes, Results, and/or Deliverables to Date

- Information we provided to consultants and the Rutland Regional Planning Commission has been incorporated into the public input process that kicked off the road corridor planning effort.

Unforeseen Challenges/Issues (if any)

Objective

2.4 Provide technical assistance to local communities to improve local conservation planning for connectivity. Improve the knowledge and skills of local wildlife and community interest groups and stakeholders so they can more effectively plan and advocate for strategies that promote habitat connectivity, especially in locations in the vicinity of key road segments.

Approach

- Use results from combined Critical Paths tracking assessment and landscape modeling efforts to inform technical assistance to local communities. Technical assistance, featuring a community values visioning/mapping/engagement exercise, will highlight connectivity protection needs within a larger set of locally-generated conservation values and objectives. Anticipated targeted communities for technical assistance efforts will be along major North-South roadways and will include Pittsford and Brandon, VT (VT Rt. 7, and Ft Ann, NY (NY Rt. 4), with the possible additions of Hubbardton/Sudbury (VT Rt. 30) and Benson VT (VT Rt. 22a).

Activities Undertaken (during the reporting period)
• Successfully contracted with a Technical Assistance Coordinator to perform technical assistance work in the Green-Adirondacks habitat linkage.
• Within the overall habitat linkage, we participated in 8 different town planning events, which includes meeting with town select boards and planning commissions from 5 of the 11 townships on the VT side of the habitat linkage area (including both the high priority towns of Brandon and Pittsford, VT), an event for town planners hosted by the Rutland Regional Planning Commission, and a town officers training event.
• We provided wildlife and wildlife linkage information offering events (wildlife watching events, school group presentations, etc) on 5 occasions.
• We participated in an additional 3 miscellaneous events that are related to wildlife and wildlife connectivity in the linkage area.
• We developed an important working partnership with a committee that oversees management of a critical patch of habitat along Rt 7 in Brandon (Hawk Hill and the Hawk Hill Committee).
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)
• While we anticipated holding community values visioning/mapping/engagement exercises in the latter part of the project, the capacity of the Vermont Dept. of Fish and Wildlife to conduct such activities has recently been eliminated. Barring reversal of this situation, this will likely have implications for our ability to hold community values visioning workshops as described in the proposal.
• Work on the NY side has been strategically delayed to the second half of the project (commencing fall 2010) because of concerns about the local political climate regarding land conservation in key townships engendered by a controversial land protection project not related to habitat connectivity protection work.

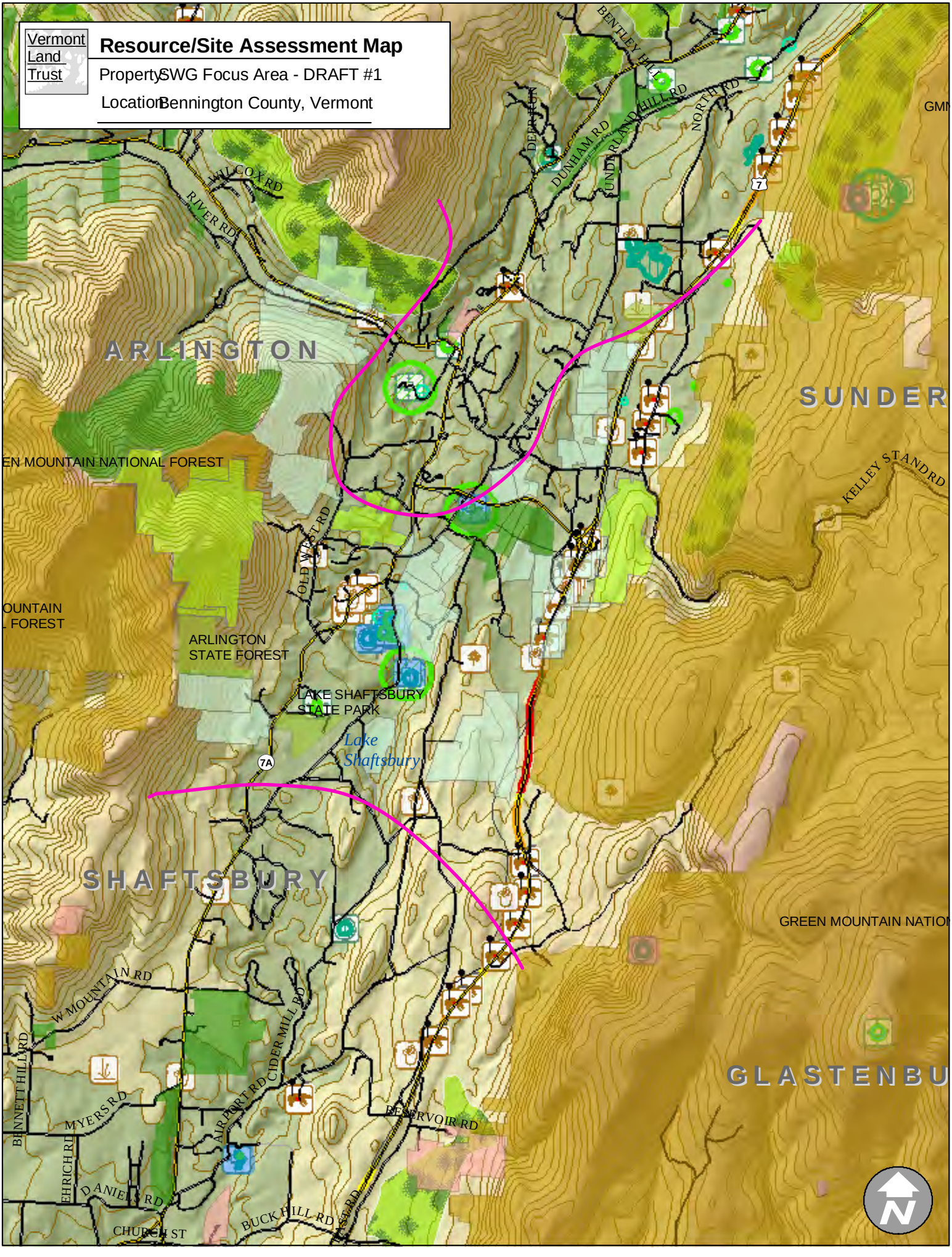
==========

Project 3: Protecting & Enhancing the Southern Green Mountains to Taconic Mountains Habitat Linkage

Project Manager: Doug Blodgett – Vermont Division of Fish and Wildlife

Objective
3.1 Land protection: Provide the technical assistance and financial support needed to help partner land trusts including the Vermont Land Trust, protect at least 750 acres around key road crossing segments and other areas of high priority, by the end of the grant period. Financial assistance will be in the form of funds for administrative costs related to land acquisition.
Approach
• In conjunction with land conservation organizations, local landowners and other stakeholders, state agencies augment the previously identified portfolio of parcels for conservation with information about their connectivity values, habitat descriptions, land values, and other key information for presentation to potential public and private funders.
• Facilitate land conservation transactions based on the interests of the funders, sellers and land conservation groups. Where needed provide financial support to pay for some administrative costs of land and easement acquisition.
Activities Undertaken (during the reporting period)
• Staff from Vermont Land Trust (VLT) and VT Fish & Wildlife have developed and refined a draft Resource/Site Assessment map for the linkage area. (see enclosed map)
• A list of high resource value parcels and landowner information has been developed.
• VLT staff have been in contact with three landowner prospects.
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)

Objective
3.2 Provide technical assistance for local land use planning: Provide technical assistance to the communities of Arlington, Dorset, and Sunderland by the end of the grant period to foster the incorporation of connectivity values and protection in town land use policies and regulations.
Approach
• Provide the technical assistance and data interpretation support needed to help local decision makers understand the conservation science tools and information available to them.


Vermont Land Trust
Resource/Site Assessment Map
Property: SWG Focus Area - DRAFT #1
Location: Bennington County, Vermont
ARLINGTON
SUNDER
SHAFTSBURY
GLASTENBU
EN MOUNTAIN NATIONAL FOREST
OUNTAIN
FOREST
ARLINGTON
STATE FOREST
LAKE SHAFTSBURY
STATE PARK
Lake
Shaftsbury
GREEN MOUNTAIN NATIO
GMN
BENTLEY HILL
DEPOT
DUNHAM RD
SUNDERLAND HILL RD
NORTH RD
7
WILCOX RD
RIVER RD
KELLEY STAND RD
OLD WEST RD
7A
W MOUNTAIN RD
BENNETT HILL RD
MYERS RD
EHRICH RD
DANIELS RD
CHURCH ST
AIRPORT RD
CIDER MILL RD
RESERVOIR RD
BUCK HILL RD
TEST RD

• Produce and disseminate technical assistance materials that help local decision makers integrate conservation science information into town plans and zoning policies to address habitat and connectivity conservation needs.
• Facilitate cooperative efforts among the towns of Arlington, Sunderland and Dorset and the Bennington Regional Planning Commissions for landscape level conservation planning at a regional scale, with a goal of developing appropriate regulatory and/or non-regulatory mechanisms to maintain and enhance habitat connectivity.
• Provide technical assistance to local organizations and individuals to help them maintain and enhance local and regional scale connectivity through opportunities such as forest plan revision process and scenic corridor assessment surveys.
• Facilitate communication among municipal, regional, non-governmental and private parties to ensure prompt action and effective decision making leading to linkage habitat conservation on both public and private lands.
Activities Undertaken (during the reporting period)
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)

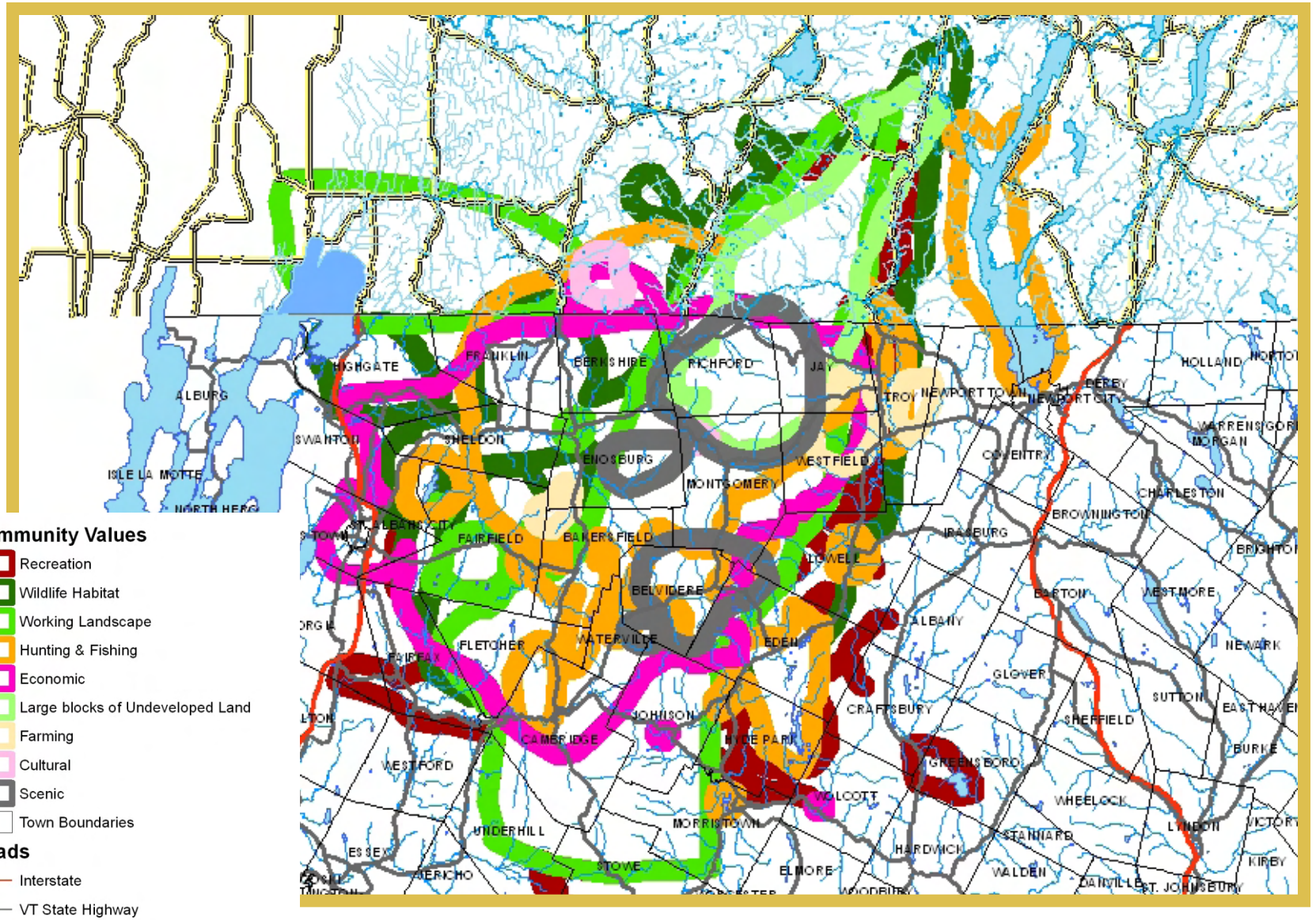
==========

Project 4: Protecting & Enhancing Habitat Linkages in the Northern Green Mountains - Phase 1

Project Manager: Conrad Reining – Wildlands Network

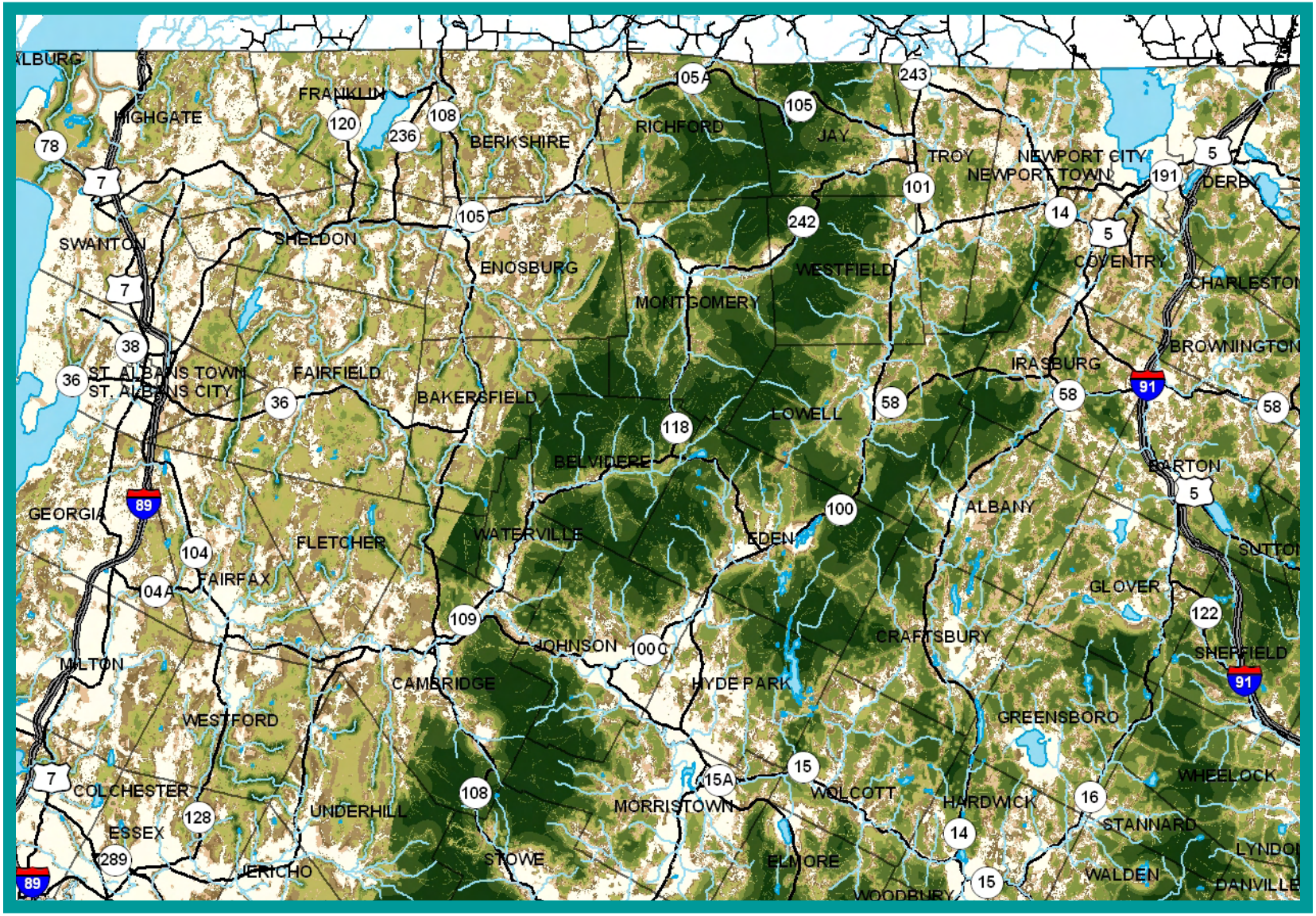
Objective
4.1 **Conservation science:** Facilitate community values mapping processes within towns in Focus Areas One and Two to identify local needs, interests, and priorities. Integrate spatial information from these mapping efforts with information developed by the Critical Paths for Wildlife project and coarse-scale spatial analyses to support land protection, land-use and transportation planning, and technical assistance to local groups.
Approach
• Complete and compile values mapping results in Focal Area 1.
• Integrate values mapping results in Focal Area 1 with results from 1) ecoregional-scale ecological importance and threat analyses; 2) the Wildlife Linkage Habitat Model and 3) Critical Paths for Wildlife, to produce a composite map of importance and threat values.
• Obtain parcel ownership data for towns in Focal Area 1 and overlay with composite importance and threat map.
• Provide results of this mapping exercise to various stakeholders, including town planning bodies, landowners, land conservation organizations, state agencies, and regional planning commissions. Stakeholders will have been informed of, and involved in, all aspects of this mapping process from its initiation.
• In Focal Area Two, carry out the same sequence of steps.
Activities Undertaken (during the reporting period)
• Completed and compiled values mapping results in Focal Area 1. The results from two values mapping events that covered the seven towns in Focal Area 1 (Richford, Enosburg, Bakersfield, Montgomery, Fletcher, Waterville and Belvidere) have been compiled into a single digital map (see enclosed map).
• The following GIS layers have been assembled for purposes of supporting land protection, land-use and transportation planning, and technical assistance to local groups: o Land use/land cover o Conservation areas o Parcel boundaries (all those that are digitized; one town is not digitized) o Town boundaries o Roads o Hydrology o Layers related to Priority Wildlife Crossing Zones
o GIS outputs of a preliminary priority parcel analysis based on factors such as connectivity and proximity to large conserved parcels. This analysis would benefit from new and updated data, as well as a refined analytical approach.

All Community Values



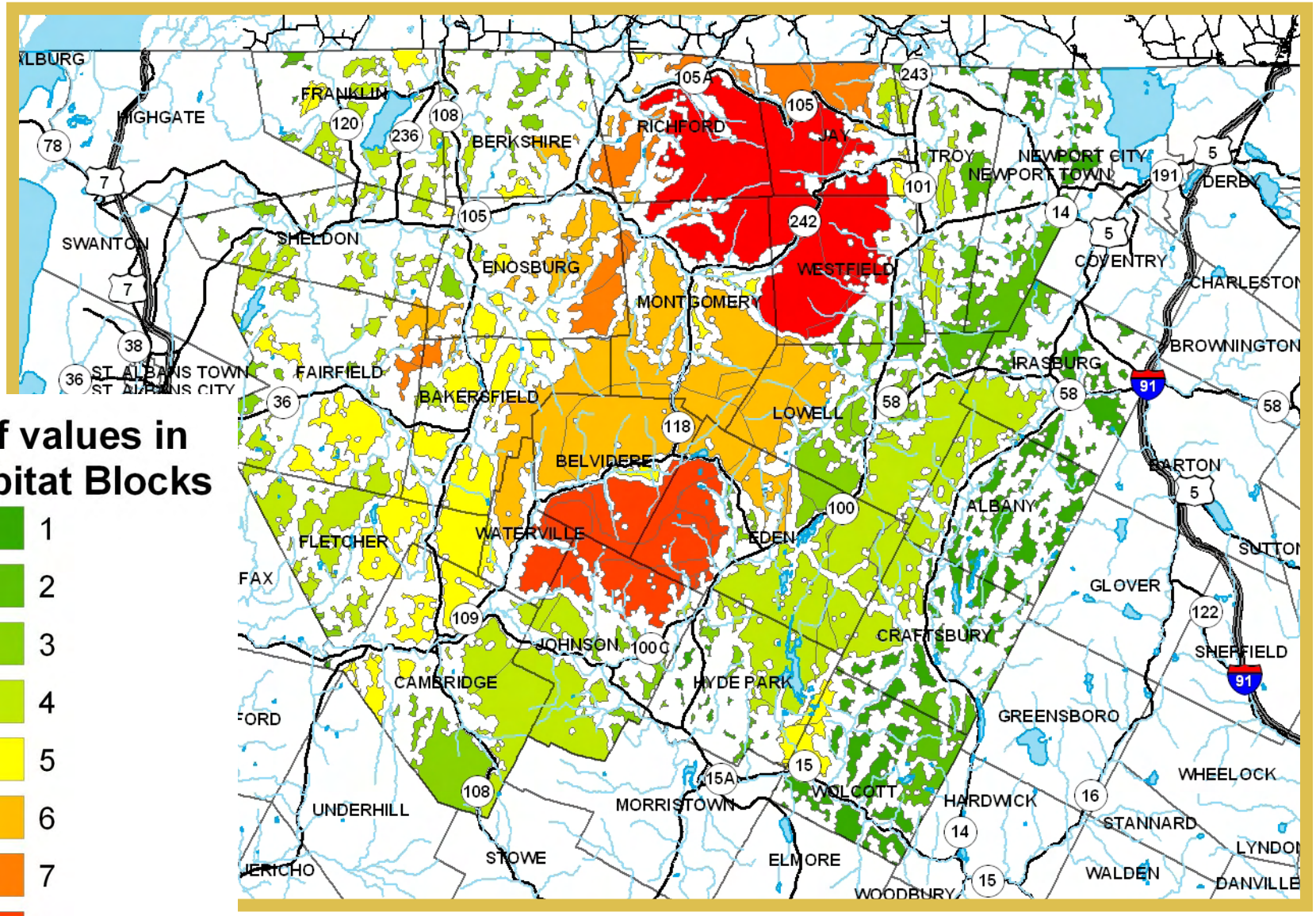
Cold Hollow-to-Canada

Wildlife Habitat Suitability



Cold Hollow-to-Canada

Number of Community Values

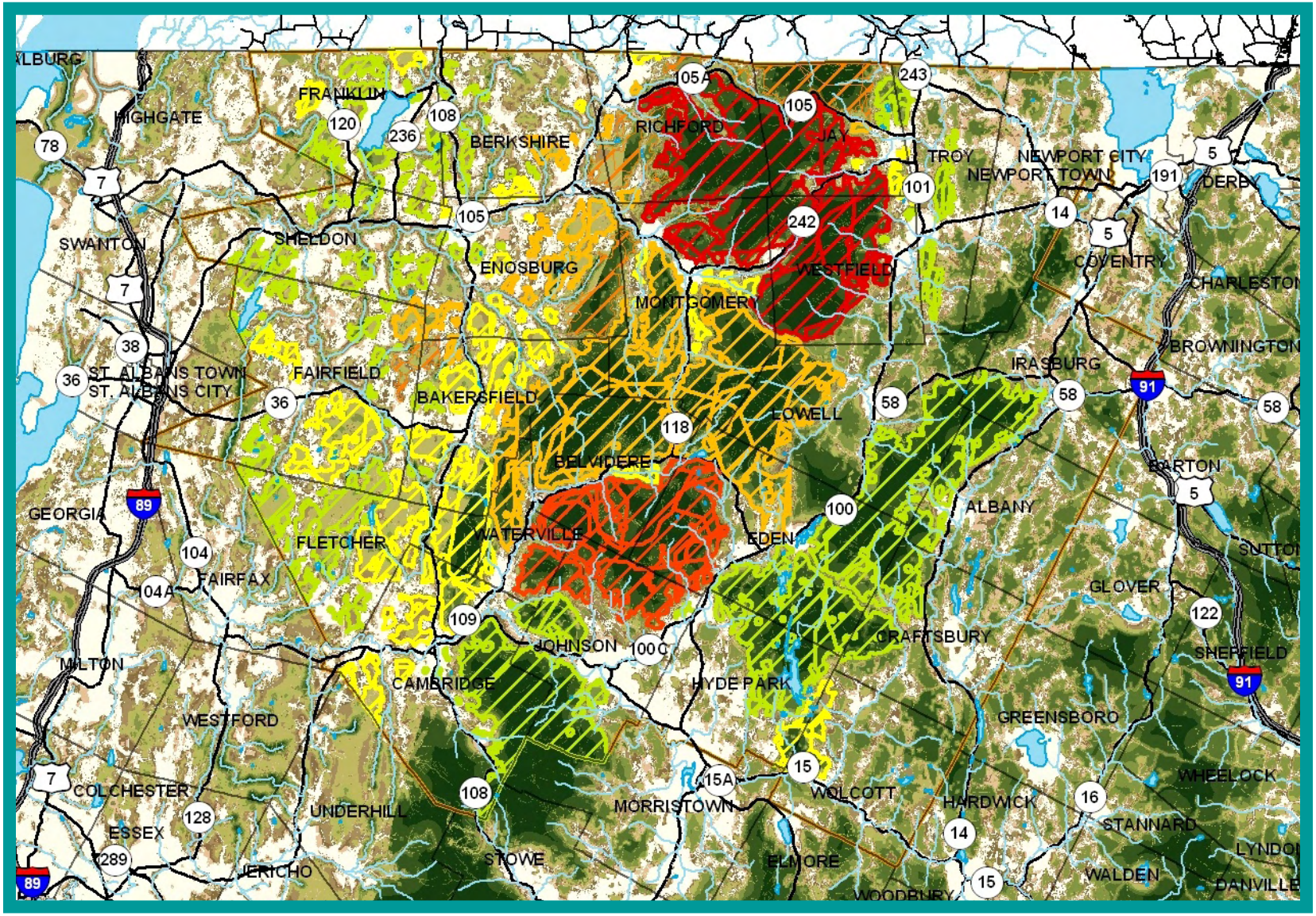


# of values in Habitat Blocks

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Cold Hollow-to-Canada

Overlap of Community Values & Wildlife hab.



Cold Hollow-to-Canada

Outcomes, Results, and/or Deliverables to Date
• Map of community values and wildlife habitat overlain for Focal Area 1 – showing that areas of most overlapping value are also areas of value to wildlife
• GIS database with relevant layers
Unforeseen Challenges/Issues (if any)
• Parcel ownership must be obtained directly from towns in Focal Areas 1 and 2. It may not be in the best interests of the Initiative for coordinators to directly obtain this information, so we are in the process of determining alternative methods of data collection.
• The VT Department of Fish and Wildlife position that was providing important planning and transportation technical assistance to this project has recently been eliminated. VT Fish and Wildlife and other Staying Connected partners are committed to moving the work forward, and are currently exploring options for delivering similar technical assistance.

Objective
4.2 **Land protection**: Provide technical assistance and financial support to help partner land trusts including the Vermont Land Trust, Trust for Public Land, Northeast Wilderness Trust and The Nature Conservancy, protect at least 9,000 acres around key road crossing segments and other areas of high priority, by the end of the grant period. Priority parcels will be identified through the ecological assessments and connectivity analyses performed in Objective 1, along with pre-existing assessments of land data in this linkage. Grant funds will be used to help cover administrative costs related to land acquisition.
Approach
• Starting with Focal Area 1, identify parcels that are of interest to a range of land conservation organizations. Because land uses vary considerably within a given focal area and because land conservation organizations have different specialties (ranging from working forest and agricultural lands to recreation, wilderness, and biodiversity protection) we anticipate that there will be a mix of land conservation groups involved based on the particular parcels identified.
• In conjunction with land conservation organizations, local landowners and other stakeholders, state agencies, and other non-profit groups, assemble a portfolio of parcels for conservation with descriptions, land values, and other key information for presentation to potential funders.
• Facilitate land conservation transactions based on the interests of landowners, funders, local communities, and land conservation groups. Where needed provide financial support to pay for some administrative costs of land and easement acquisition.
Activities Undertaken (during the reporting period)
Vermont Land Trust
• A total of 923.5 acres in the towns of Johnson and Eden have been secured in conservation

easements. See details below in Outcomes. (also see enclosed map)

- In addition, leads on 3-4 more landowners totaling about 1,000 acres are in process but are only at the very initial inquiry stage.

Trust for Public Land

- The Trust for Public Land completed all due diligence (appraisal, environmental phase I analysis) and necessary documents for closing (stewardship plan, baseline documentation, closing documents) for a conservation easement on 5,720-acre Eden Forest in Eden and Johnson, VT.

- The Trust for Public Land made progress on the conservation of 399-acre Zack Woods, a high priority project within the Northern Greens.

Northeast Wilderness Trust

- Northeast Wilderness Trust has been hired to identify various categories of lands suitable for Forever Wild conservation in the Northern Greens, prioritize the conservation importance of those lands, and provide the names and addresses of the landowners.

- Categories of lands suitable for Forever Wild conservation have been selected, and the criteria for identifying them using GIS data are being developed. The categories include:
    - Large forested blocks (2,500 acres or more) with no permanent roads
    - Lands contiguous with already conserved lands and creating the potential to establish Forever Wild areas of 2,500 acres or more when added to those conserved lands.
    - Inholdings of existing or potential Forever Wild conservation lands.
    - Areas possessing biophysical characteristics likely to support a mixture of rare and unusual species regardless of future climatic changes.
    - Known ecological "hot spots."
    - Old-growth or nearly old-growth forests capable of providing scientific baseline information or educational opportunities.

- Collection of GIS data has begun. Preliminary maps and tabular results of the analyses are expected in September 2010. Data collection and analysis is being coordinated with activities described in Objective 4.1.

Linkage (Technical Assistance) Coordinators in Focal Areas 1 and 2

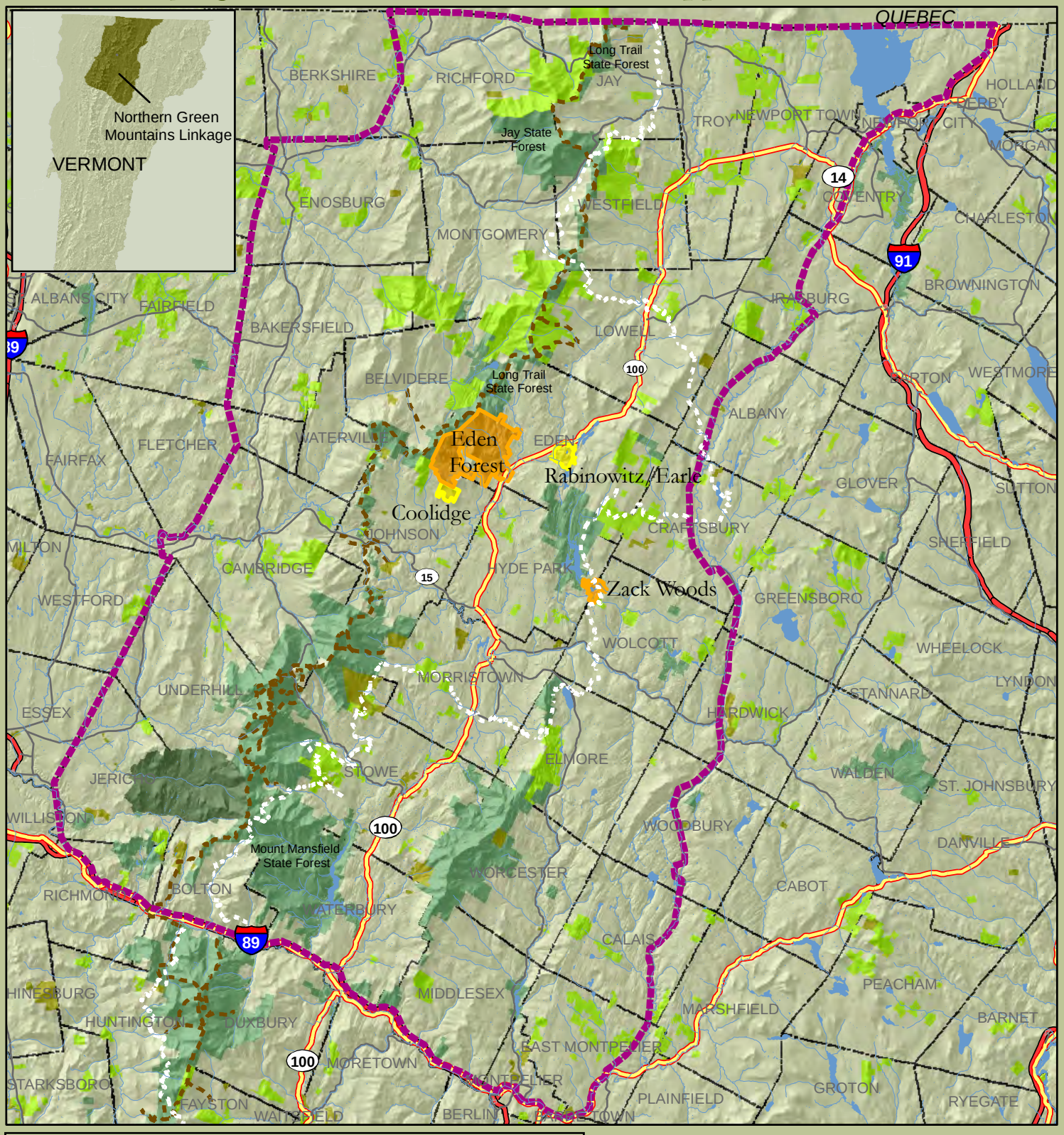
- Provided information to TPL on several properties with significant conservation values near the Canadian border.

- Working with Enosburgh Conservation Commission and Montgomery residents to draft grant proposals that, if funded, will cover associated costs of permanently conserving the town forests and commit the towns' Select Boards to donating easements.

- Worked with Cold Hollow to Canada (CHC), a local conservation collaboration that encompasses the seven towns in Focal Area 1, to place citizen-scientist tracking teams in areas where either the landowners might consider conserving their lands, or areas that have been deemed important for habitat connectivity. As data is collected, landowners will hopefully become more connected to their land and be more interested in conserving it.

- Outreach to landowners, in coordination with land trusts, on the critical role of land conservation in the protection of landscape connectivity, and the technical support available to protect and improve habitat.

Land Protected in the Northern Greens with assistance from the Staying Connected in the Northern Appalachians Initiative



Northern Green Mountains Linkage

Conservation Projects in Progress (TPL)

Donated Conservation Easements to VLT

The Long Trail

The Catamount Trail

Conserved Lands

Private

State

Federal

Municipal

0 2.5 5 10 Miles

Map created by The Trust for Public Land on July 12, 2010
Boundaries are approximate.
Catamount Trail data courtesy of the Catamount Trail Association.
All other base data from VCGI.
Information on this map is provided for purposes of discussion and visualization only.

The Trust for Public Land
CONSERVING LAND FOR PEOPLE

Vermont Land Trust
Conserving Land for the Future of Vermont

- Connecting landowners with land trust partners when landowners express an interest in conserving their land.

Outcomes, Results, and/or Deliverables to Date

Vermont Land Trust

A total of 923.5 acres in donated conservation easements have been obtained though 30 June 2010 in the Northern Green Mountains linkage, as detailed below.

Landowner	Town	Acreage	Habitats
Coolidge	Johnson	363.5	Forestland
Rabinowitz/Earle	Eden	560	Forestland, 2 rare fens, 9 acre kettle pond, and 36 acres of wetland
Totals		**923.5**	

Trust for Public Land

- Completed Eden Forest appraisal, reviewed and approved by U.S. Forest Service.
- Completed Eden Forest Environmental Phase I, reviewed and approved by State of Vermont.
- Completed Eden Forest Stewardship Plan and Baseline Documentation, currently being reviewed by the State of Vermont.
- Eden Forest Conservation Easement is expected to close by August 31st, 2010. Easement to be held by the State of Vermont.
- Completed restricted appraisal reports for 3 properties that make up Zack Woods.
- Completed title work on 2 of the properties that make up Zack Woods.
- Secured two grants (Vermont Housing & Conservation Board, Lake Champlain Basin Program) for acquisition of Zack Woods .

Linkages Coordinators in Focal Areas 1 and 2

- Contribution match language for Forest Legacy inserted into the Northern Rivers Land Trust conservation easement document of a 96 acre parcel in Wolcott bordering Zack Woods

Unforeseen Challenges/Issues (if any)

Objective
4.3 **Technical assistance for local land use planning**: Provide technical assistance to at least seven towns in Focus Areas One and four towns in Focus Area Two by the end of the grant period to foster the incorporation of connectivity values and protection in town plans and zoning ordinances.
4.4 **Technical assistance to local groups and partner organizations:** Improve technical skills and conservation knowledge of the Seven Town Steering Committee (in Focus Area 1), local conservation commissions, Missisquoi River Basin Association, Richford Wood Initiative, and other local wildlife and community interest groups so they can more effectively support implementation of a broad range of conservation activities related to wildlife and habitat connectivity.
Approach
• Provide the technical assistance and data interpretation support needed to help local decision makers understand the conservation science tools and information available to them.
• Produce and disseminate technical assistance materials that help local decision makers integrate conservation science information into town plans and zoning policies to address habitat and connectivity conservation needs.
• Facilitate cooperative efforts among towns and regional planning commissions in each focal area for habitat connectivity planning at a regional scale, with a goal of developing appropriate regulatory and/or non-regulatory mechanisms to maintain and enhance habitat connectivity.
• Provide technical assistance to local organizations and individuals to help them maintain and enhance local and regional scale connectivity through opportunities such as state forest plan revision processes and scenic corridor assessment surveys.
• Facilitate communication among municipal, regional, non-governmental and private parties to ensure prompt action and effective decision making leading to linkage habitat conservation on both public and private lands.
Activities Undertaken (during the reporting period)
Focal Area 1: Richford, Enosburg, Montgomery, Belvidere, Waterville, Fletcher, Bakersfield
• Worked with Cold Hollow to Canada collaborative (CHC) to hold “Deer of North America” event that drew over 100 attendees.
• Worked with VT Natural Resources Council (VNRC) to submit grant proposal that will enable them to provide technical support and planning expertise in coordination with CHC.
• Arranged meeting among VNRC, CHC, and SCI to plan approach to bring VNRC’s planning expertise to CHC region.
• Met with Town of Montgomery’s Planning Commission. The town then invited VNRC to help with regulatory and non-regulatory approaches to town-level conservation, including zoning by-laws.
• Land trust partners and coordinators are working with Enosburgh Conservation Commission and Montgomery residents to develop funding proposals that, if funded, will cover associated costs of conserving the towns’ town forests and commit the towns’ Select Boards to donating easements.
• Arranged UVM/SCA LANDS program to do trail project in Montgomery Town. At the end of July, a team of 3 post-college interns will design a trail network and draft an interpretive trail for the town

forest.
• Collaborated with Cold Hollow to Canada to create a newsletter and establish a website.
• Outreach to numerous individuals and organizations regarding the mission of the Staying Connected Initiative, including: o All existing conservation commissions – Bakersfield, Enosburgh, Richford and Cambridge o Montgomery Planning Commission o Northwest Regional Planning Commission
Focal Area 2: Jay, Troy, Westfield, Eden, Lowell
• Initiated project to develop interpretive nature trail in town of Lowell.
• Promoted and organized a public workshop and field trip in Lowell, VT on 5/22/10 to increase the profile of wildlife habitat connectivity as a topic of interest, and to introduce Staying Connected.
• Outreach to numerous individuals and organizations regarding the mission of the Staying Connected Initiative, including o EarthWalk Vermont, o Sterling College o Select Boards of Lowell, Westfield, Jay and Troy o Wild and Scenic River Study Committee
• Drafted press release and photo for inclusion in Barton Chronicle newspaper highlighting interpretive nature trail in Lowell and SCI.
Northern Green Mountains as whole
• Flight with John McNerney for Conrad Reining, Corrie Miller and Bob Hawk over Northern Greens. Flight provided an additional perspective on the overall linkage area, helped refine corridors and road crossings within the linkage, and provided an opportunity to obtain aerial photos, some of which have been used in communications materials.
• Outreach to numerous individuals and organizations regarding the mission of the Staying Connected Initiative, including: o Audubon Vermont o Québec Labrador Foundation o Province of Québec o Keeping Track o Vermont Coverts: Woodlands for Wildlife
• Drafted overview document explaining the Staying Connected Initiative in the Northern Green Mountains linkage.
• Contributed to the drafting of an overview document explaining the Staying Connected Initiative in Vermont as a whole.
• Contributing to a resource document on connectivity and wildlife that provides general description and definition of habitat connectivity, why animals need connectivity, threats to connectivity, and so on. The need has been identified by linkage (technical assistance) coordinators, who find that community members often want more information about what connectivity is and how it benefits wildlife.

Outcomes, Results, and/or Deliverables to Date
• New "wildlife-friendly" and natural resources language incorporated into Montgomery Town Plan, approved by Planning Commission, pending approval by Select Board. (see enclosed language)
• Grant for $10,000 to support expanded technical support in municipal land use planning received by VNRC.
• Cold Hollow to Canada newsletter published and website (www.coldhollowtocanada.org) established. (see Appendix 3)
• Wildlands Network awarded $5,000 by Davis Conservation Foundation for subsidies for Focal Area 2/Northern Greens East volunteers to complete Keeping Track wildlife monitoring program.
• Completed first phase of construction of Lowell Elementary School's interpretive nature trail.
• Articles published about SCI in Audubon's newsletter and TNC's e-newsletter.
• Information about Enosburgh wildlife and connectivity displayed at town meeting.
• Staying Connected overview document for Northern Green Mountains linkage completed (needs updating; Vermont-wide version is the most recent)
• Staying Connected overview document for Vermont completed. (see Appendix 2)
Unforeseen Challenges/Issues (if any)

Objective
4.5 **Increase the permeability of key roads for SGCN**: Provide technical assistance to the Vermont Agency of Transportation to enable it to incorporate connectivity improvements identified through the Critical Paths for Wildlife analyses as part of planned road maintenance/upgrade work scheduled between 2009-2014 along priority road segments.
Approach
• Inform the Vermont Agency of Transportation (VTrans) of key crossing areas identified by the Critical Paths project
• Through the joint VTrans-VFWD Wildlife Steering Committee help VTrans develop protocols that trigger project design reviews at priority wildlife crossings prior to any road maintenance or upgrades.
• Provide support to VTRANS Operations division to help ensure that road maintenance and upgrade projects in key crossing areas improve permeability for wildlife.
Activities Undertaken (during the reporting period)
• VT Fish & Wildlife Department Staff are actively engaged and communicating with the Vermont Agency of Transportation (VTRANS) through the Wildlife Steering Committee to develop protocols that trigger project design review.

Edits to the Town Plan for Montgomery as of 25 May 2010. These edits have been approved by the Planning Commission, but have not yet been approved by the Select Board.

NATURAL FEATURES (pg. 44)

Policy #6 change to: *Limit the loss of local wildlife habitat by maintaining significant features, including areas of existing contiguous forest habitat, wildlife corridors, and unique sensitive areas, and protecting such areas from development that would demonstrably reduce the ecological function of habitat on a particular parcel or on the landscape scale.*[edit expands upon the "sensitive" areas as defined previously, and defines the 'why']

Re-wording **Policy #7**: *Provide for long-term stewardship and protection of wetlands and waterways that have significant functions and values for rare species habitat, wildlife habitat, or natural communities and prevent additional loss of wetlands within the town.*

Additional Policy: *Ensure the conservation and proper stewardship of significant natural communities found within the town or area of interest.* [this is addressed in the RTE paragraph below]

Wetlands definition (Pg. 48)
Wetlands are areas of land where soils are saturated with surface or groundwater frequently enough to support specific types of vegetation that require these conditions for growth and production.
…after bullet points:
Given the importance of wetland systems and the beneficial function stated above, they should be protected from encroaching development, including roads and driveways, and disturbances harmful to wetland-dependent wildlife by restricting development and specific activities in wetlands and by maintaining and/or establishing undisturbed, naturally vegetated buffers around their edges.

(Pg. 49)
New Header to separate this portion from Wetlands discussion:

Significant Wildlife Habitat

Additional Paragraph prior to "Deer Yard": *Montgomery's residents are fortunate to share the community with a variety of animal species that depend on a variety of habitat types – and connectivity between habitats – for their survival. Maintaining viable populations of native wildlife is an important goal of town residents. To achieve this, residents and local officials should understand the habitat needs of different species, where those habitats are found in the community, and how land use and human activity can best be guided so that the function of important habitat is not diminished. Conducting an inventory of important habitats would greatly assist the town to better maintain habitat. Despite the lack of a comprehensive inventory, however, several types of significant habitat have been identified in the town.*

These include, but are not limited to, the following:

[followed by deer yards portions and black bear, with addition]

Black Bear Habitat

Black bear prefer mountainous and forested landscapes just like those found on the slopes of the Green Mountains. The location of most bear habitat is in Eastern Franklin County in towns such as Montgomery. Black bear have a significantly large home range and because of this, they're survival rate decreases when larger areas are divided up into smaller units and into isolated forestlands. When land is developed in scattered locations throughout the Town, the black bear habitat areas are decreased. *In addition to needing large blocks of unfragmented forests, bears are especially dependent on concentrated stands of mast producing trees that provide concentrated fruit or nut production.* Both deer wintering areas and productive/seasonal bear habitat cover Montgomery's landscape, unlike the landscape that is found in the western portion of Franklin County. *The town should encourage the management of these habitats—where they occur—in a manner that does not threaten the ability of the habitat to support these desired species.*

Additional paragraphs for this section on:

Rare, Threatened and Endangered Species

Threatened and endangered species are protected by Vermont's Endangered Species Law (10 V.S.A. section 5401 et. seq.) The Vermont Non-Game and Natural Areas Program maintains an inventory of the locations of rare, threatened or endangered plants, animals and natural communities. The precise locations are made available to town planners, although they are not published or made available to the general public. While the only occurrence of a RTE occurrence presently mapped in town is associated with the high elevation natural communities of the upper elevations of Jay Peak, subsequent additions to the Non-Game and Natural Areas inventory should inform planning and development decisions in town to conserve or otherwise protect those species and the habitats necessary for their continued survival.

Wildlife Travel Corridors

Travel corridors is a term used to describe land that links larger patches of core habitat within a landscape, allowing the movement, migration, and dispersal of animals and plants, which is crucial in maintaining biological diversity, and the long term viability of breeding populations in the face of climate and habitat change. Riparian habitat along streams and rivers, strips of forest cover between developed areas, and even hedgerows/fencerows all represent potential connecting habitat. Included are areas where land use and landscape features allow wildlife to move across roads to and from habitat areas (e.g., undeveloped areas with forest cover close to each side of the road). Travel corridors can serve local populations of wildlife, or species with wide ranging habitat requirements. Efforts should be made to identify and map wildlife travel corridors in town in an effort to protect these linkages between larger areas core habitat. One such linkage—already mapped by the Critical Paths project undertaken in Vermont as a Critical Crossing Zone is along Rt. 242, documented as utilized by black bear, moose, deer and fisher (as well as a number of smaller mammals).

Water Resources

As noted elsewhere in this plan, rivers and streams, riparian areas, and wetlands – including vernal pools – all provide important habitat to a number of species.

LAND USE (pg. 50)

Additional Policy: *Avoid fragmentation of large forest blocks of contiguous forests that provide both economic opportunities for landowners as well as ecological and cultural benefits to the community, including wildlife habitat, water quality maintenance and recreation*

Additional Policy: *Promote anti-spawl initiatives as a measure to maintain the appropriate use of our land resources*

Additional Policy: *Promote the enrollment of productive farm and forestland in the use value appraisal program.*

(pg. 54) Is Forestry included under Agricultural/Residential permitted uses? If not, it should be.

Additional Paragraph under Land Use:
The community recognizes the value of working lands to the regional farm and forest products economy and to the local and regional community's ability to conserve and provide stewardship for its cultural heritage and natural resource of fish, wildlife, plants, ecological systems, and the myriad public values therein. Therefore, the town will explore all reasonable and feasible opportunities to support and promote those lands that are greater than 25 acres and meet any of the following criteria – (i) enrolled in the Vermont current use program; (ii) owned by persons willing to consider the sale and application of a conservation easement; (iii) are being managed in accordance with a forest management plan that has been reviewed and approved by a professional forester, wildlife biologist, or other appropriate and related professional; or (iv) owned by persons willing to consider other non-regulatory mechanisms that promote sustainable forest management or seek to otherwise conserve the lands.

• Department staff have performed several presentations for VTRANS on habitat connectivity at district, operational and planning scales. Part of this work has been communicating Critical Paths methodology and findings and seeking greater VTRANS input on development of management plans for road sections with priority wildlife crossings.
• Work in the last year has focused on beginning to develop Best Management Practices for VTRANS staff on habitat connectivity by identifying all VTRANS activities that have an impact on habitat connectivity.
• Coordinated a group of people in Richford for discussion of Critical Paths project
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)

==========

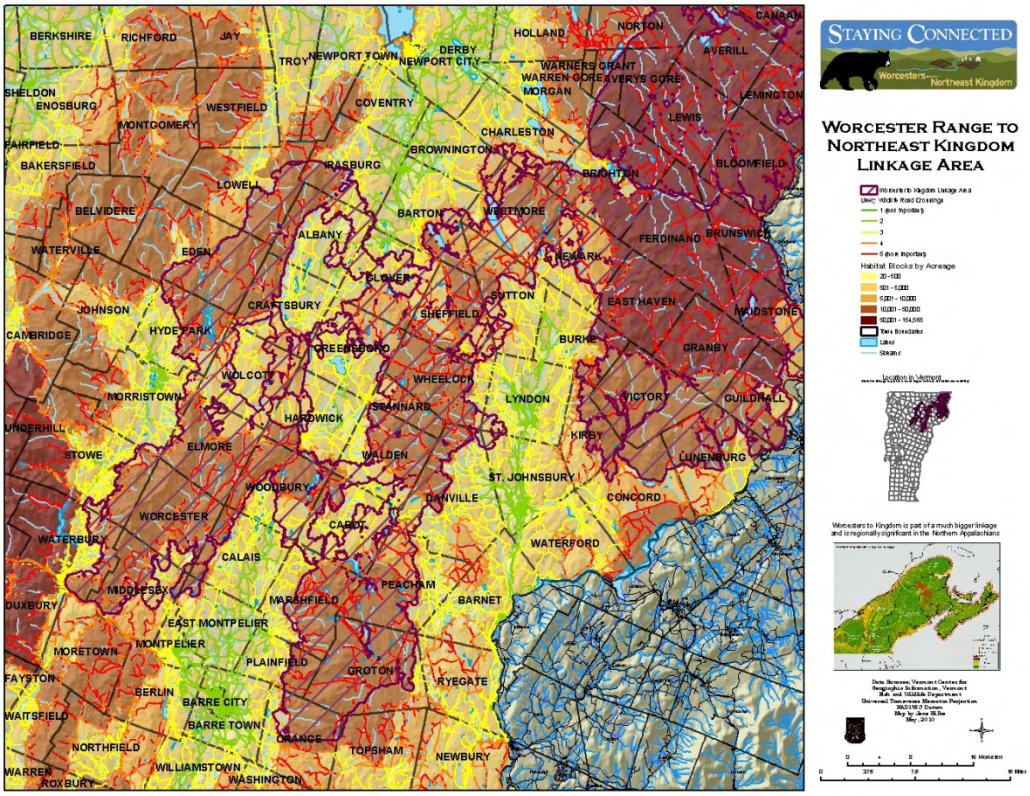
Project 5: Protecting & Enhancing the Worcester Range to Northeast Kingdom Habitat Linkage

Project Manager: Jens Hilke – Vermont Division of Fish and Wildlife

Objective
5.1 Conservation science: Facilitate community values mapping processes within towns in Focus Areas One and Two to identify local needs, interests, and priorities. Integrate spatial information from these mapping efforts with information developed by the Critical Paths for Wildlife project and coarse-scale spatial analyses to support land protection, land-use and transportation planning, and technical assistance to local groups.
Approach
• Conduct community value mapping exercises in the communities within the project area and compile values mapping results.
• Integrate values mapping results with results from 1) ecoregional-scale ecological importance • and threat analyses; 2) VFWD's Wildlife Linkage Habitat Model and 3) the Critical Paths for Wildlife project, to produce a composite map of importance and threat values.
• Obtain parcel ownership data for towns and overlay with composite importance and threat map.
• Provide results of this mapping exercise to various stakeholders, including town planning bodies, landowners, land conservation organizations, state agencies, and regional planning commissions. Stakeholders will have been informed of, and involved in, all aspects of this mapping process from its initiation.
Activities Undertaken (during the reporting period)
• Preliminary outreach and technical assistance work has begun with towns and community groups covering the entire Worcesters to Northeast Kingdom geography. This work lays the foundation of trust on which community value mapping can proceed in individual communities, particularly those communities that are unfamiliar with this type of work and hesitant to engage with out-of-town partners.
• Our kickoff symposium invited participants from at least 30 regionally-important organizations as well as town conservation and planning commissioners. It focused on determining the extent of work that is currently underway by various local partners in each of the five objective areas (Conservation Science, Land Protection, Technical Assistance for Land Use Planning, Permeability of Key Roads, and Technical Assistance to Local groups). The activity further refined work currently underway based on geographic area. With respect to Conservation Science, the activity revealed that comparatively few partners are involved in work on this objective and the spatial extent of the work performed under this objective is limited other than the wildlife linkage habitat modeling conducted by VT Fish & Wildlife Department that is linkage wide. No other partners are currently involved in community value mapping, so it remained clear that this objective for Staying Connected is appropriate and will continue as planned.
• Vt Fish & Wildlife Staff and National Wildlife Federation Staff conducted aerial surveys of the linkage area to fact check the linkage model and better understand the nature of habitat connectivity in this area. The flight and pilot were graciously provided by LightHawk International.

Outcomes, Results, and/or Deliverables to Date

- Preliminary technical assistance presentations and discussions in Waterbury, Craftsbury, Danville, and Stowe as well as Northern Rivers Land Trust (Wolcott, Craftsbury, Greensboro, Woodbury, Stannard, Hardwick, Elmore)
- Kick-Off symposium of organizational mapping based on Staying Connected Objectives and geography (See attached spreadsheet)
- VT Fish & Wildlife created a GIS model of Wildlife Linkage Habitat in the Worcesters to Kingdom geography using available land cover data (NOAA 2006) and a cost surface for wildlife movement (Vermont Land Trust 2010)



Unforeseen Challenges/Issues (if any)

- The VT Department of Fish and Wildlife position that was serving as the Project Manager for this project has recently been eliminated. VT Fish and Wildlife and other Staying Connected partners are committed to moving the work forward, and are currently exploring project management and capacity options.

Objective
5.2 **Facilitate land protection**: Provide the technical assistance needed to help partner land trusts including the Vermont Land Trust, Trust for Public Lands, Northern Rivers Land Trust, Stowe Land Trust and The Nature Conservancy, protect habitat around key road crossing segments and other areas of high priority, by the end of the grant period. Priority parcels will be identified through the ecological assessments and connectivity analyses performed in Objective one and ongoing analyses.
Approach
• Identify parcels that are of interest to a range of land conservation organizations. Because land uses vary considerably within this project area and because land conservation organizations have different specialties (ranging from working forest and agricultural lands to recreation to wilderness protection) we anticipate that there will be a mix of land conservation groups involved based on the particular parcels identified.
• In conjunction with land conservation organizations, local landowners and other stakeholders, state agencies, and other non-profit groups, assemble a portfolio of parcels for conservation with descriptions, land values, and other key information for presentation to potential public and private funders.
• Facilitate land conservation transactions based on the interests of landowners, funders, local communities, and land conservation groups. Where needed provide financial support to pay for some administrative costs of land and easement acquisition.
Activities Undertaken (during the reporting period)
• The kick-off symposium included attendees from all the land trusts working in the linkage area and the organizational mapping activity showed that some land protection work is currently underway in certain parts of the total linkage area. A detailed spreadsheet reflecting organizations and activity is available upon request.
• Prospecting work is underway by Vermont Land Trust (VLT) staff, contacting and working with willing landowners and neighborhood organizations. Additionally, VLT staff in association with the Northwoods Stewardship Center and National Wildlife Federation (Staying Connected partner co-responsible for Worcesters to Kingdom) are hosting an educational event in August 2010 to discuss conservation easements and other land protection tools with willing landowners.
Outcomes, Results, and/or Deliverables to Date
• Kick-off symposium mapped existing land protection work across the region and included long-standing organizational commitments.
• Land protection educational event at Northwoods Stewardship Center in August 2010
Unforeseen Challenges/Issues (if any)
• None

Objective

5.3 **Technical assistance for local land use planning**: Provide technical assistance to communities in the project area to foster the incorporation of connectivity values and protection in town plans and zoning ordinances.

5.4 **Technical assistance to local groups and partner organizations:** Improve technical skills and conservation knowledge of the Friends of the Worcester Range and other local wildlife and community interest groups so they can more effectively support implementation of a broad range of conservation activities related to wildlife and habitat connectivity.

Approach

- Provide the technical assistance and data interpretation support needed to help local decision makers understand the conservation science tools and information available to them.
- Produce and disseminate technical assistance materials that help local decision makers integrate conservation science information into town plans and zoning policies to address habitat and connectivity conservation needs.
- Facilitate cooperative efforts among towns and regional planning commissions in each focal area for habitat connectivity planning at a regional scale, with a goal of developing appropriate regulatory and/or non-regulatory mechanisms to maintain and enhance habitat connectivity.
- Provide technical assistance to local organizations and individuals to help them maintain and enhance local and regional scale connectivity through opportunities such as forest plan revision process and scenic corridor assessment surveys.
- Facilitate communication among municipal, regional, non-governmental and private parties to ensure prompt action and effective decision making leading to linkage habitat conservation on both public and private lands.

Activities Undertaken (during the reporting period)

- The Vermont Department of Fish & Wildlife and the National Wildlife Federation are closely partnered to deliver technical assistance to municipalities and landowners in this linkage area. Technical Assistance work has already begun in several towns and with several organizations that operate in the area to get the word out about the ongoing focus on habitat connectivity and the technical assistance offerings available to towns and landowners.

Outcomes, Results, and/or Deliverables to Date

- Kick-off symposium mapped current technical assistance work currently underway across the region

<u>Waterbury</u>

- VT Fish & Wildlife staff and National Wildlife Federation staff have met with the conservation commission to plan a non-regulatory strategy for increasing awareness about habitat connectivity in town and on the Rt 100 crossing in particular.
- VT Fish & Wildlife staff and Vermont Natural Resources Staff worked with the Planning Commission to update the Town's subdivision regulations to include habitat connectivity and to identify and protect the Rt 100 wildlife road crossing
- VT Fish & Wildlife staff provided the town with a complete set of natural resource inventory maps at

various scales and included a map that shows the linkage area and probable road crossings.
Danville • VT Fish & Wildlife staff worked with the Planning and Conservation commissions to refine language in the Town Plan related to habitat connectivity and begin to address changes in their zoning regulations.
Craftsbury • VT Fish & Wildlife staff worked with the Conservation commissions to refine language in the Town Plan related to habitat connectivity. • VT Fish & Wildlife provided the Conservation Commission with a complete set of natural resource inventory maps including one that shows the wildlife linkage area model and probable road crossings. • VT Fish & Wildlife and National Wildlife Federation staff worked with the Conservation Commission to train volunteers to discuss issues of habitat connectivity with townspeople.
Unforeseen Challenges/Issues (if any)
• The VT Department of Fish and Wildlife position that was serving as the Project Manager for this project has recently been eliminated. VT Fish and Wildlife and other Staying Connected partners are committed to moving the work forward, and are currently exploring project management and capacity options.

Objective
5.5 **Increase the permeability of key roads for SGCN**: Provide technical assistance to the Vermont Agency of Transportation to enable it to incorporate connectivity improvements identified through the Critical Paths for Wildlife analyses and conservation science data developed in objective one as part of planned road maintenance/upgrade work scheduled between 2009-2014 along priority road segments.
Approach
• Inform the Vermont Agency of Transportation (VTrans) of key crossing areas identified by the Critical Paths project
• Through the joint VTrans-VFWD Wildlife Steering Committee help VTrans develop protocols that trigger project design reviews at priority wildlife crossings prior to any road maintenance or upgrades.
• Provide support to VTRANS Operations division to help ensure that road maintenance and upgrade projects in key crossing areas improve permeability for wildlife.
Activities Undertaken (during the reporting period)
• VT Fish and Wildlife Staff drove every major road in the linkage area as a preliminary assessment of habitat connectivity in the linkage area. This data was provided to the Critical Paths contractor (See below)

• National Wildlife Federation is managing the Critical Paths II Project (Vermont State Wildlife Grant (Job T-1-7 3.15) to identify priority road crossings in the Worcesters to Kingdom linkage area with project completion in fall 2010.
• VT Fish & Wildlife staff are actively engaged and communicating with the Vermont Agency of Transportation (VTRANS) through the Wildlife Steering Committee to develop protocols that trigger project design review. Department staff have performed several presentations for VTRANS on habitat connectivity at district, operational and planning scales. Part of this work has been communicating Critical Paths methodology and findings and seeking greater VTRANS input on development of management plans for road sections with priority wildlife crossings. • Work in the last year has focused on beginning to develop Best Management Practices for VTRANS staff on habitat connectivity by identifying all VTRANS activities that have an impact on habitat connectivity.
• VT Fish & Wildlife staff reviewed plans on a repaving project on Rt 12 (within the linkage area) and made specific recommendations to VTRANS on sections of guardrails to eliminate to allow for greater movement by moose across this road section (often called “Moose Alley”).
Outcomes, Results, and/or Deliverables to Date
• Support to Operations Division to help ensure that road along the Rt 12 corridor in Elmore improves permeability for wildlife.
• Ongoing work on Critical Paths II project
• Ongoing collaboration between VT Fish & Wildlife and VTRANS on Wildlife Steering Committee
Unforeseen Challenges/Issues (if any)
• The VT Department of Fish and Wildlife position that was serving as the Project Manager for this project has recently been eliminated. VT Fish and Wildlife and other Staying Connected partners are committed to moving the work forward, and are currently exploring project management and capacity options.

==========

Project 6: Launching a Landscape Connectivity Initiative for the Northeast Kingdom (VT) – Northern NH Linkage

Project Manager: Mark Zankel – The Nature Conservancy, NH Chapter

Objective
6.1 Conservation Science: Develop spatial models to assess habitat suitability and landscape connectivity for a suite of five-six focal species across Vermont's Northeast Kingdom and the Connecticut River headwaters in northern New Hampshire. Focal species will include wide ranging SGCN such as black bear, American marten, Canada lynx, otter, mink, and moose and one or two moderately vagile species such as snowshoe hare or long-tailed weasel.
6.2 Conservation Science: Identify and map priority linkage areas that provide the best opportunities for protecting or restoring landscape connectivity between existing protected areas for the greatest number of focal species. Identify (i) tracts ('stepping stones') which, if protected, would maintain connectivity across the landscape; (ii) tracts or areas which, if restored, would enhance connectivity for focal species; and: (iii) key linkages for focusing barrier mitigation work.
Approach
• Convene Steering Committee to provide technical guidance, model review, and active involvement in strategy development. Steering Committee will include agency representatives (DOT, Fish & Game/Wildlife), academic researchers, and conservation groups (TNC, Audubon).
• Develop spatial models to assess landscape connectivity for a suite of five-to-six focal species across Vermont's Northeast Kingdom and the Connecticut River headwaters in New Hampshire. The project will utilize, adapt and refine as needed detailed species modeling that has been recently completed by New Hampshire Audubon and New Hampshire Fish & Game Department.
• Based on model results and expert input, identify priority linkage areas that provide the best opportunities for protecting or restoring landscape connectivity between existing protected areas for the greatest number of focal species.
Activities Undertaken (during the reporting period)
• A Steering Committee has been convened, consisting of representatives from VT Fish and Wildlife, Vermont Land Trust, TNC VT, TNC NH, NH Fish and Game, NH Dept of Transportation, and NH Audubon. We have also reached out to The Nature Conservancy of Canada to engage their interest in having the linkage expand northward to the Mt. Megantic area of southern Quebec.
• The Steering Committee has convened four times to discuss focal species, connectivity modeling approaches, options for wildlife tracking and field validation, and outreach to stakeholders.
• The Nature Conservancy's GIS staff has compiled base GIS data layers from VT, NH, ME, and Canada including land cover, roads, digital elevation, and hydrography. Considerable effort has gone into aligning and reconciling datasets that have some variability and inconsistencies across state and country boundaries. In addition, we have been working to reconcile differences in the cost surface modeling approach developed for NH by NH Fish & Game and NH Audubon and the one developed for VT by Vermont Land Trust and VT Fish & Wildlife.
• Connectivity modeling using Corridor Designer and Circuitscape has gotten underway for 10 focal

species including: American marten, black bear, bobcat, Canada lynx, fisher, long-tailed weasel, otter, porcupine, snowshoe hare, and wood turtle.
Outcomes, Results, and/or Deliverables to Date
• Steering Committee assembled and convening regularly.
• NH Fish and Game and TNC issued a kick-off press release, leading to front-page story in New Hampshire's Concord Monitor. (see enclosed article)
• Focal species for connectivity modeling identified.
• Base GIS data layers assembled and reconciled for VT, NH, and ME, and for Quebec Canada.
• Connectivity modeling approaches agreed upon, and differences in existing cost surfaces largely reconciled.
Unforeseen Challenges/Issues (if any)
• We have expanded the linkage to reach northward to Mt. Megantic in Quebec. This makes sense ecologically but added complexity due to the need to engage Canadian partners and the inconsistency of U.S. and Canadian GIS data layers.
• Getting agreement amongst VT and NH partners to iron out differences in existing connectivity cost surfaces has proved to be more challenging and time-consuming than we originally thought, although we are now 90%+ along the way.

Objective
6.3 Develop a *Landscape Connectivity Action Framework* for the Northeast Kingdom (VT) –Northern New Hampshire Linkage Area consisting of land protection strategies focused on protecting key parcels within key connectivity areas, restoration strategies to enhance connectivity, and barrier mitigation strategies to help reduce the potential impacts of road upgrades and new road development.
Approach
• In consultation with the Steering Committee and other key stakeholders, develop a **Landscape Connectivity Action Framework** for the Northeast Kingdom (VT) –Northern New Hampshire Linkage.
• Conduct initial field validation of priority linkage models through tracking. Hard data on animal movements are scarce. Creating such a data set will be invaluable for validating suitable habitat models and known locations where focal species and other wildlife are attempting to move across roads and other barriers.
Activities Undertaken (during the reporting period)
• *We will begin developing the action framework once the GIS models are complete. Anticipated start*

CONCORD MONITOR

THURSDAY, APRIL 23, 2009 concordmonitor.com

CONCORD, NEW HAMPSHIRE 75¢

Grant offers hope for cottontail

Federal money to help restore, link habitats

By CHELSEA CONABOY
Monitor staff

The future is looking a little brighter for New England cottontail rabbits and other at-risk species thanks to $1.72 million in federal grant money to the state Fish and Game Department.

The department won two grants through a new program in which states compete for money aimed at restoring populations of threatened species and preventing the need to list them for protection under the Endangered Species Act.

The cottontail is a candidate for classification as endangered. The state has partnered with the Wildlife Management Institute to use $731,975 in grant money and a match of $315,299 in nonfederal money to restore the shrubland habitat the rabbits need in New Hampshire, Massachusetts and Connecticut.

Another grant for $992,592 in federal money, and a $719,519 match, will help jump-start a long-

See COTTONTAIL – A8

Source: New Hampshire Fish & Game; map source: NH Granit

CHARLOTTE THIBAULT / Monitor staff

COTTONTAIL

Continued from A1

term project to connect tracts of forest stretching from northern New York through the northern forest of New Hampshire and on to the Canadian Maritimes.

Both grants will be applied across state boundaries, and nonprofit partners will provide most of the matching money required. But New Hampshire Fish and Game spearheaded the applications. The agency won two of the 13 grants awarded by the U.S. Fish and Wildlife Service and nearly 20 percent of the $9 million available nationally.

Hopping habitat

The cottontail's habitat in New Hampshire used to extend the length of the Connecticut and Merrimack river valleys. Now, the rabbit is known to live along the Merrimack south of Concord and in a few communities in eastern New Hampshire.

It needs dense thickets that once had a chance to grow after floods and fires cleared sections of forest. Fire prevention and flood controls have been good for humans but bad for rabbits. In some areas, shrubland has matured into full forests. In others, development has destroyed it.

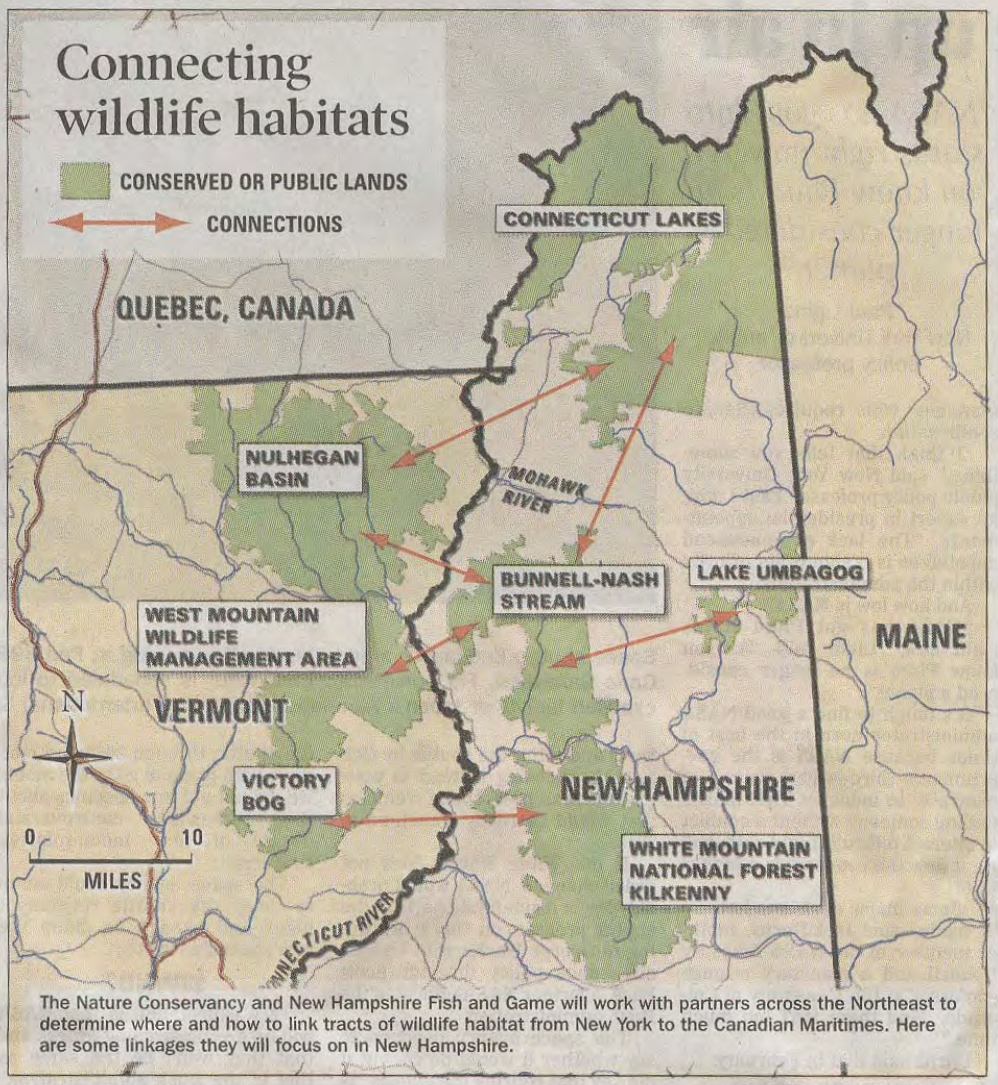
"None of us want to see a mammal go extinct in our backyards, during our lifetimes, but the New England cottontail is quickly going in that direction," said Steve Fuller, a Fish and Game biologist.

Early successional habitats, or those areas of young growth, are some of the most diverse in the Northeast. The cottontail is an indicator of their decline. The grant money will be used across the three states to identify the places with the best potential for restoration.

Scot Williamson, vice president of the Wildlife Management Institute, said his group will work with willing landowners to come up with a plan to create the habitat by clearing land so that shrubs and saplings have room to grow. The goal is to create up to 1,200 acres.

If the cottontail were listed as endangered, there could be implications for humans, too: Developing near rabbit territory could become more difficult.

Fuller said, both from a conservation perspective and an economic one, it makes sense to help the cottontail now. The goal is to make the cottontail the first species ever to be taken off the candidacy list because of conservation efforts, he said.



The Nature Conservancy and New Hampshire Fish and Game will work with partners across the Northeast to determine where and how to link tracts of wildlife habitat from New York to the Canadian Maritimes. Here are some linkages they will focus on in New Hampshire.

Source: The Nature Conservancy

CHARLOTTE THIBAULT / Monitor staff

Forest corridor

Northern New Hampshire is part of a unique ecological region of largely unfragmented forest that stretches across 80 million acres from the Tug Hill plateau in New York to the Maritime provinces. A group called 2 Countries 1 Forest has identified key areas where conservation efforts should be focused to link already protected lands and protect that massive wildlife corridor.

The new grant money, totaling $1.71 million, would build on that group's work.

Fourteen partners, led by The Nature Conservancy, will use computer modeling to identify individual parcels most in need of protection – land used heavily by "things that need a lot of room to roam," such as black bear and Canada lynx, said Mark Zankel, deputy state director for The Nature Conservancy.

They will also look for parcels where development or transportation patterns pose the biggest potential roadblocks for migrating wildlife. And they'll reach out to community planners, state transportation agencies and private landowners to educate them about the need for the wildlife corridor and how to protect it, Zankel said.

"What we really don't want is a series of islands in the Northern Forest," he said. "We want to interconnect the landscape."

Zankel said wildlife communities need a certain level of in- and out-migration to keep their gene pools healthy.

Climate change could increase the need for mobility.

"We feel pretty confident that, over time, there's going to be some changes in habitat," he said. "Some of the vegetation cover is going to change as things warm up. So species are going to have to be able to move around to adapt to those changes."

Both grants provide a somewhat rare opportunity for agencies to work across state boundaries at what Zankel called "biologically meaningful scales."

date is spring 2011.
• We have begun to develop our approach for field validation, which is expected to include targeted wildlife tracking, outreach and interviews with hunters and trackers, and road infrastructure surveys. Field validation is expected to commence in winter 2010-11.
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)

Objective
6.4 Technical Assistance: Working with a coalition of partners, initiate connectivity strategy implementation. Complete initial model validation, engage communities through a wildlife tracking program that involves local volunteers, and provide technical assistance and training to state departments of transportation and private landowners.
Approach
• Initiate landowner conservation assistance program for high resource value parcels in priority linkage areas. Convene statewide and regional land trusts, share the *Landscape Connectivity Action Framework*, and identify appropriate land trust contacts for priority tracts. Contact landowners for at least twelve priority tracts. Provide technical assistance to landowners by explaining land conservation and restoration options.
• Conduct technical assistance trainings for state DOT planners and engineers. Convene at least one training session for DOT planners and engineers. Share modeling results, transfer GIS data, and present land protection and barrier mitigation strategies in the *Landscape Connectivity Action Framework*.
Activities Undertaken (during the reporting period)
• NH Dept of Transportation (DOT) is participating in the project Steering Committee through a staffperson in its' environmental bureau. We have made initial outreach efforts to other key DOT staff and a formal meeting with the Administrators of the Bureau of the Environment, Highway Maintenance, and Bureau of Planning is being scheduled for late August/earl September.
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)

==========

Project 7: Maintaining Northwoods Connections – an initiative to conserve landscape permeability along northern Maine borders

Project Manager: Dan Coker– The Nature Conservancy, ME Chapter

Objective
7.1 Conservation Science: Develop or adapt spatial models to assess habitat suitability and landscape connectivity for a suite of five to six focal species native to mixed and coniferous forests of northern Maine. Focal species will include wide-ranging SGCN, such as Canada lynx, as well as more common species including fisher, American marten, and mink.
7.2 Conservation Science: Identify and map priority linkage areas that provide the best opportunities for protecting landscape connectivity between existing protected areas and current large unfragmented forest areas for the greatest number of focal species. Identify (i) tracts ('stepping stones') which, if protected, would maintain connectivity across the landscape and (ii) key linkages for focusing barrier mitigation work on state highways.
Approach
• Convene Beginning with Habitat Connectivity Committee to provide technical guidance, model review, and active involvement in strategy development. This Committee includes agency representatives (MDOT, MDIF&W, Maine Natural Areas Program, and State Planning Office), and conservation groups (TNC, Audubon).
• Within the 2 Key linkage areas, develop and apply spatial models to assess landscape connectivity for a suite of five-to-six northern Maine focal species. The project will utilize, adapt and refine as needed wildlife connectivity modeling currently in development for southern Maine communities and findings from the recently completed New Hampshire connectivity models and will coordinate closely with the comparable committee for Northeast Kingdom (VT) – Northern NH linkage.
• Based on model results and regional and local expert input, identify priority linkage areas that provide the best opportunities for protecting or restoring landscape connectivity between existing protected areas and large unfragmented forest blocks for the greatest number of focal species.
Activities Undertaken (during the reporting period)
• Working with ME Audubon, Maine Department of Inland Fisheries and Wildlife and other Beginning with Habitat Connectivity member groups, completed development of GIS cost surfaces for fisher, American marten, mink, wood turtle, spotted salamander, and bobcat to be used in further connectivity modeling in western Maine. This work included background literature research and extensive consultation with species experts to rate factors for each focal species, such as landcover type, distance from roads of various traffic volumes, and the role of various hydrologic features on the landscape. Using these ratings, statewide suitability rasters were developed for each species. This work contributed to a larger, statewide effort of the Maine Beginning with Habitat initiative.
• Presented focal species surface work to Maine Department of Inland Fisheries and Wildlife Research group (1/21/2010), Maine Land Trust Network Conference (5/1/2010), Maine Department of Transportation Environmental staff (5/14/2010).
• Based on riparian and wetland species GIS suitability surfaces (wood turtle and spotted

salamander), have identified draft set of Priority Road Segments for state highways of western Maine. Preliminary "Priority Road Segments" are sections of roads that have areas modeled as high quality habitat for each of the focal species on both sides of the road (i.e. places where these species are more likely to cross the road). These preliminary segments will be the basis for further road permeability analysis and study. Have begun first stage of validation and prioritization/ranking of these road segments for state highway routes 201, 27, 6/15, and 16/27 using 2009 NAIP aerial photographs and other available GIS data.
• Begun GIS work to investigate possible spatial and habitat patterns in Maine DOTs road-kill data for moose, and black bear in western Maine.
• Collected data and created maps of ownership and conservation patterns, Beginning with Habitat Focus Areas, and conservation priorities for both the western Maine and northern Maine-Gaspe linkage areas.
Outcomes, Results, and/or Deliverables to Date
• Focal Species suitability surface GIS datasets and documentation.
• Draft Priority Road Segment GIS datasets for focal species for Western Maine.
• Large format, high quality maps for northern Maine / Gaspe linkage area used for Edmundston workshop, as referenced in workshop proceedings *"Three borders Proceedings"* included as Appendix 4.
Unforeseen Challenges/Issues (if any)
• Western Maine - The primary challenge we've been grappling with in the western Maine linkage area is in our attempts to use GIS modeling to help prioritize linkage areas for connectivity. The western Maine linkage area is a very large landscape that is nearly completely forested and within which the primary human disturbances are related to forest management. It does not seem prudent or helpful, based on our current state of knowledge of species-habitat preferences, to prioritize pathways through the linkage area based on landscape conditions that are rapidly changing and difficult to capture with available GIS data. We have therefore focused our efforts thus far on the relatively permanent features of the landscape that are reliably mapped – the riparian and wetland systems (as captured in our wood turtle, mink, and spotted salamander suitability surfaces), permanent development patterns, and the major state highways of the area.
• Northern Maine – Gaspe linkage area: Instead of conducting detailed focal species modeling efforts, we have moved directly to the outreach stage, relying on more general GIS datasets such as landuse / landcover and satellite imagery to help identify potential areas for further habitat connectivity work. This was in part due to the difficulty in acquiring appropriate equivalent GIS data for Maine, New Brunswick, and Quebec and in part due to the larger need to meet with potential partners in northern Maine, and southern New Brunswick, and Quebec to: 1) Identify conservation and wildlife connectivity issues in the area; and, 2) Gauge interest and momentum for this type of work on the Canadian side of the linkage area. See attached *"Three Borders Proceedings.pdf"*

Objective
7.3 Land Protection: Work with multiple state and non-governmental partners to develop land protection strategies focused on protecting key parcels within key connectivity areas.
Approach
• In consultation with the Beginning with Habitat Steering Committee and other key stakeholders, develop and document specific land protection strategies focused primarily on securing conservation easements within key connectivity areas. Apply Threat, Opportunity, and Feasibility screens by considering parcel size, ownership patterns, development trends, and overlap with other significant natural resources such as State Wildlife Action Plan priorities, Maine Natural Areas Program element occurrences, etc.
Activities Undertaken (during the reporting period)
Not yet initiated
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)

Objective
7.4 Barrier Mitigation: Work with Maine Dept of Transportation to develop barrier mitigation strategies to take advantage of planned maintenance and road upgrades to enhance permeability and help reduce the potential impacts of road upgrades and new road development.
Approach
• In consultation with the Beginning with Habitat Steering Committee and other key Stakeholders, develop and document specific barrier mitigation opportunities that will enable the state Departments of Transportation (DOTs), local communities, and other stakeholders to reduce the impacts on wildlife connectivity of existing roads, road upgrades, and new road development. Key linkages will be ground-truthed to develop a higher resolution understanding of the current condition of the existing relevant road segment.
• Utilize Maine DOT's recently published *2008 Waterway and Wildlife Crossing Policy and Design Guide* to develop restoration strategies to guide ecological restoration necessary to enhance connectivity for focal species.
Activities Undertaken (during the reporting period)
• Presented species suitability GIS datasets to MDOT and have begun to identify and prioritize important road segments (see conservation science - objective 7.1)

Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)

Objective
7.5 Technical Assistance: Utilize the existing Beginning with Habitat partnership to guide local implementation of regional connectivity strategies within the organized towns of the two areas. Complete initial model validation, engage organized communities through Beginning with Habitat presentations specific to landscape connectivity, and provide technical assistance to landowners, town planners, and area land trusts.
7.6 Technical Assistance: Identify potential partnership opportunities in key linkage areas within adjacent Quebec and New Brunswick.
Approach
• Incorporate priority linkages into SWAP maps.
• Conduct technical assistance trainings for local public works departments and Maine DOT regional maintenance garage staff. Convene at least one training session for local and regional road crews in each connectivity focus area. Share modeling results, transfer GIS data, and present land protection and barrier mitigation strategies in the *Landscape Connectivity Action Framework*.
• Conduct outreach to the organized towns within the two linkage areas.
• Convene statewide and local land trusts, share the results of this work and seek additional input regarding feasibility and prioritization of land protection.
• Identify and interview relevant provincial agency and non-government organizations in Quebec and New Brunswick to assess potential partnership opportunities and provide results.
Activities Undertaken (during the reporting period)
• With 2 Countries 1 Forest, Nature Conservancy Canada, and Canadian Parks and Wilderness Society, conducted 2-day workshop “Three Borders, One Vision” Habitat Connectivity workshop in Edmundston New Brunswick September 16-17 2009.
Outcomes, Results, and/or Deliverables to Date
• Identification of potential partners, level of interest, and potential next steps as summarized in the Proceedings of Workshop – see attached “*Three Borders Proceedings.pdf*”
Unforeseen Challenges/Issues (if any)

==========

Project 8: Cross-Cutting Connectivity Strategies: Development of Model Easement Standards

Project Manager: Mark Zankel – The Nature Conservancy, NH Chapter

Objective
8.1 Develop and distribute model conservation easement standards and terms specific to habitat connectivity objectives at multiple scales to benefit Species of Greatest Conservation Need.
Approach
• Using information developed through suitable habitat modeling, identify the key habitat cover and structure characteristics that allow for successful wildlife movement through habitat patches.
• "Cross-walk" desired habitat characteristics into sensible, enforceable conservation easement terms including recitals, purposes, use limitations, and management plan provisions. Annotate each suggested easement provision with a brief rationale for why the provision is important for connectivity.
• Draft model easement provisions will be circulated for review by wildlife and land protection experts. Final recommendations will incorporate expert feedback, and will be broadly distributed to local land trusts, public agencies, and other partners active in land protection work within key linkage areas.
Activities Undertaken (during the reporting period)
Implementation has not yet begun for this project. We expect to begin the work in Fall 2010.
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)
Implementation of this project has been somewhat delayed due to the greater-than-anticipated time and effort required for project start-up and overall project management responsibilities (see write-up for Project 12).

==========

Project 9: Cross-Cutting Connectivity Strategies: Development of land use planning tools and materials, and a technical assistance support system to promote habitat connectivity

Project Manager: Zoe Smith – Wildlife Conservation Society

Objective
9.1 Identify best practices and land use planning tools employed by the land use planning programs of state wildlife agencies and partners in the four partnering states and produce state by state and regional land use planning guidelines and lessons learned to facilitate the integration of habitat connectivity values into local, statewide and regional land use planning across the four states to benefit Species of Greatest Conservation Need.
9.2 Develop/refine land use guidelines and tools for Adirondack, NY communities to assist in planning for wildlife connectivity.
Approach
• Assess the land use planning tools and management practices utilized by each of the partner states and other sources of land use guidance that could benefit Species of Greatest Conservation Need and the development and protection of functional habitat linkages are several scales.
• Develop case studies and lessons learned exemplifying success and shortcoming of selected tools and practices to help potential users understand the advantages and disadvantages of each tool so they can select the tools and approaches that will best their local needs.
• Work with technical assistance providers to fine-tune and field test
• Present draft best management practices and land use planning tools report at the regional connectivity conference described in project 10.
• Finalize report and make the report accessible through the internet and via paper copies across the grant region.
Activities Undertaken (during the reporting period)
• Working with partners to develop a work plan to determine what tools and assessments of land use practices would be the most useful for partners across the Staying Connected region.
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)
• The original work plan is for partners to present best land use practices across the northeastern US. We have found that some of this work exists and therefore we are examining options for the most useful information to this project. We will work with partners in VT and other states to finalize a work plan and present it to the Steering Committee.

Objective
9.3 Technical Assistance: Support the provision of technical assistance to local communities by enhancing the skills of technical assistance providers active under this grant.
Approach
• Hold six technical assistance provider telephone conference calls (three per year) to allow providers to share lessons learned, troubleshoot problems and provide support for fellow technical assistance providers working on this grant.
• Work with technical assistance providers in each of the project areas of this grant to identify high priority issues and opportunities in the development of technical assistance materials and processes. For example: how to hold meetings and develop working groups that encourages everyone to participate and feel ownership in the process; how to write effective zoning language; how to facilitate community values mapping exercises.
• Identify appropriate trainers/facilitators for each type training desired, and work with the technical assistance providers in each project area to schedule training sessions. In most cases, the training will occur as will part of meetings or workshop with the technical assistance provider and the local organizations or entities receiving the technical assistance (e.g., the trainer will facilitate the community values mapping exercise with a local planning and conservation commission. The trainer and project leader in a linkage area will work together to ensure appropriate individuals are in attendance.
Activities Undertaken (during the reporting period)
• *Not yet initiated.*
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)

==========

Project 10: Cross-Cutting Connectivity Strategies: Transportation Planning and Barrier Mitigation Models

Project Manager: Dirk Bryant – The Nature Conservancy, NY-Adirondacks Chapter

Objective
10.2 Produce guidelines and best practices for how to integrate connectivity into transportation planning and maintenance.
10.3 To assess the feasibility and usefulness of applying barrier mitigation models across the Northern Forest.
Approach
• Compile existing literature and white papers on efforts combining transportation and connectivity objectives, barrier mitigation models, and other related projects.
• Conduct interviews to provide further information on existing and past transportation planning and barrier mitigation models.
• Produce final reports including a compilation of all literature, interviews, and resulting recommendations and conclusions
Activities Undertaken (during the reporting period)
• Completed initial literature review of innovative efforts to address connectivity objectives through transportation planning and maintenance work, with a focus on the Northeastern U.S. Identified key experts to interview for information on ongoing efforts that may not be documented in existing reports/publications. Prepared draft database summarizing results.
Outcomes, Results, and/or Deliverables to Date
• Draft database summarizing results of literature review (see Appendix 5).
Unforeseen Challenges/Issues (if any)

==========

Project 11: Crosscutting Strategy Connecting Success: Monitoring, Evaluating and Sharing Connectivity Strategies in the Northern Appalachians

Project Manager: Alice Chamberlin – Two Countries, One Forest

Objective
11.1 Gather and report monitoring data.
11.2 Evaluate the delivery and effectiveness of cross-cutting community planning tool kits.
11.3 Share information on the status of conservation planning in the identified linkage areas.
Approach
• Convene and Monitoring and Evaluation Workgroup. Designate a coordinator of the MEG. The MEG Coordinator will develop a monitoring and evaluation strategy with the assistance of the MEG to be used in the linkage areas.
• The MEG coordinator will meet with the linkage leads to develop and provide a consistent framework for monitoring progress on the conservation goals in the linkage areas. The MEG coordinator will collect, synthesize and distribute information on conservation strategies across the region during grant period.
• The MEG coordinator will convene the lead partners on an ongoing basis to share information, data and strategies in the implementation of the grant. Information and data collected by the MEG will be synthesized and distributed for use in the regional workshop.
Activities Undertaken (during the reporting period)
• December 2009: Mark Zankel (TNC), Alice Chamberlin (2C,1F) and Conrad Reining (Wildlands) met with Mark Anderson (TNC) to review the Monitoring and Evaluation Group Project (MEG) and discuss ongoing efforts to measure connectivity and landscape integrity metrics across the region.
• January 2010: A letter of invitation to participate in the MEG was sent to prospective group members.
• February 2010: The Monitoring and Evaluation Group was formed: Mark Anderson (TNC), Doug Bechtel (TNC), Dirk Bryant (TNC), Alice Chamberlin (2C,1F), Dan Coker (TNC), John Kart (VT F&W), Paul Marangelo (TNC), Rose Paul (TNC), Conrad Reining (Wildlands), Zoe Smith (WCS), Tim Tear (TNC), Barbara Vickery (TNC) and Mark Zankel (TNC) make up the group.
• February 2010: An overview of the MEG was developed and circulated (see attached write-up). The group decided to convene a workshop focused on articulating clear and measurable objectives and defining potential indicators. A workshop planning team was convened including; Alice Chamberlin, Doug Bechtel, Conrad Reining, Barbara Vickery, Rose Paul and Mark Zankel.
• February- May 2010: Five conference call planning meetings were held to plan the *Staying Connected across the Northern Appalachians: Setting Goals and Measuring Progress workshop.*
• March- May 2010: Two working groups were established to develop advance materials for the workshop: 1) Conservation Targets and Key Ecological Attributes Workgroup; and 2) Measurable Objectives Workgroup.

Overview - Staying Connected Monitoring and Evaluation Workgroup
Updated 8 February 2010

Goals

The Monitoring and Evaluation Workgroup is charged with developing an efficient and meaningful set of measures through which the status of landscape connectivity in the Northern Appalachians region can be readily evaluated now and into the future, and that they can be reported in a manner that is understandable to partners, key stakeholders, and the broader public.

Strategy

- Better define specific and measurable conservation goals for landscape connectivity.
- Develop a sensible, practical, robust connectivity measures framework, including a small number of useful indicators that we have the capacity to measure (even if they are incomplete).
- Because it will be impractical to measure ecological change during the relatively brief three year period of the Staying Connected grant, our focus will be to develop the baseline (i.e., current status) of each selected measure. If we accomplish that, we will have made an important contribution.

Activities in 2010

- Establish a Monitoring and Evaluation Group (MEG) that addresses the work of all 12 projects in the Staying Connected Initiative.
- Convene meetings of *M*EG team on regular basis by phone and/or WebEx.
- Draft specific and measurable goals for connectivity conservation.
- If feasible, embed connectivity conservation goals within a larger conceptual framework as articulated by Margoluis et al.
- Convene a spring-early summer 2010 workshop to review goals for connectivity conservation, identify specific metrics tied to those goals, and agree on implementation mechanisms for developing baseline status.
- Initiate collection, synthesis, and distribution of Monitoring and Evaluation information on connectivity strategies across region.

Monitoring and Evaluation Group

	Name	Geography	Affiliation	Email	Phone
	Confirmed				
1	Mark Anderson	All 4 states	TNC	manderson@tnc.org	(617) 542-1908 x.215
2	Doug Bechtel	New Hampshire	TNC	dbechtel@tnc.org	(603) 224-5853 x.16
3	Dirk Bryant	New York	ANC	dbryant@tnc.org	(518) 576-2082 ext. 114
4	Alice Chamberlin	All 4 states	2C1Forest	alice.chamberlin@2c1forest.org	(603) 456-3239
5	Dan Coker	Maine	TNC	dcoker@tnc.org	(207) 373-5256
6	Jon Kart	Vermont, 4 states	VTFW Agency	jon.kart@state.vt.us	(802) 241-3652
7	Rose Paul	Vermont	TNC	rpaul@tnc.org	(802) 229-4425
8	Conrad Reining	All 4 states	Wildlands Network	conrad@wildlandsnetwork.org	(802) 785-2838
9	Zoe Smith	New York	WCS	zsmith@wcs.org	(518) 891-8872
10	Tim Tear	New York, possibly all states	TNC	ttear@tnc.org	(518) 690-7855
11	Barbara Vickery	Maine	TNC	bvickery@tnc.org	(207) 729-5181 x210
12	Mark Zankel	All 4 states	TNC	mzankel@tnc.org	(603)224-5853
13	Paul Marangelo	NY, VT	TNC	pmarangelo@tnc.org	(802) 265-8645 x22
14	Barbara Charry	Maine	Maine Audubon	bcharry@maineaudubon.org	

- May 26-27, 2010: Workshop was held at the Highland Center at Crawford Notch, NH. Nineteen participants representing NY, VT, NH, ME and Canadian partners attended. *Staying Connected across the Northern Appalachians: Setting Goals and Measuring Progress* Workshop goals included: 1) Review of conservation targets and key ecological attributes as they relate to connectivity in the Northern Appalachians; 2) Review, discussion and agreement on goals and SMART (specific, measurable, attainable, realistic, and timely) objectives for landscape connectivity in the Northern Appalachians Ecoregion; 3) Review, discussion, and preliminary agreement on a set of sensible, practical, robust connectivity measures including useful indicators that we have the capacity to measure. Clarification of what each measure does and does not tell us about the status of landscape connectivity and the effectiveness of connectivity conservation strategies at differing spatial scales. (see attached workshop agenda)

Outcomes, Results, and/or Deliverables to Date

- Draft papers were developed for workshop participants including:
  - Proposed Focal Species and Key Ecological Attributes for Staying Connected
  - Setting Measurable Objectives for Terrestrial Connectivity in the Northern Appalachians
  - Landscape Linkage Objectives and Metrics
- Significant progress was made during the workshop on defining key concepts and terms; understanding the key attributes of the landscape that support and detract from connectivity; and drafting measurable objectives.
- Workshop notes are currently being collated and will be distributed to participants in Aug 2010.
- Participants established four workgroups to address key issues that arose at the workshop and to continue developing the measures framework. These include: 1) Defining key terms and concepts; 2) Refining habitat structure attributes and objectives for linkage areas; 3) Refining road barrier attributes and objectives; and 4) Establishing a common practice for delineating the boundaries of linkage areas. Workgroup reports are due in the fall of 2010.

Unforeseen Challenges/Issues (if any)

- Scientifically rigorous conservation for connectivity is a relatively new undertaking, especially in the northeast. We are adapting concepts developed elsewhere, and developing new concepts relevant to connectivity in the Northern Appalachians. We are seeking out meaningful measures of progress that will be both efficient and practically feasible, thereby enhancing the likelihood that they will actually get measured!
- An unanticipated benefit is that we are being pushed to define connectivity goals in a very precise way so that proper monitoring measures can be implemented. This need for precise goals, in turn, should help with how we talk about the goals of the initiative with various audiences and should sharpen the focus of implementation partners.

Objective
11.4 Synthesize and report lessons learned
11.5 Present emerging information on planning for connectivity conservation and resiliency in the face

of climate change.
11.6 Develop recommendations for ongoing local and regional conservation strategies
11.7 Provide a forum for information on multi-state SWG implementation progress.
Approach
• Confirm Date and matching funds for workshop. Develop agenda. Confirm speakers and facilitators.
• Prepare materials and media outreach. Engage workshop coordinator.
• Coordinate and host workshop.
Activities Undertaken (during the reporting period)
Planning for the 2011 conference will begin in Fall 2010.
Outcomes, Results, and/or Deliverables to Date
Unforeseen Challenges/Issues (if any)

==========

Staying Connected across the Northern Appalachians:
Setting Goals and Measuring Progress

Highland Center at Crawford Notch,
New Hampshire.
Wednesday, May 26th - Thursday, May 27th 2010

Agenda

Wednesday, May 26, 2010

10:30am	Check-in and Registration	
11:00-11:15am	**Welcome and overview:** 1. The Staying Connected Initiative 2. Why is it important for us to have Goals, Monitoring and Evaluation for the Staying Connected Initiative and, more broadly, for connectivity in the Northern Appalachians.	Mark Zankel, TNC, New Hampshire
11:15-12:00pm	**Introduction to goals and overall plan of the workshop:** 1. What outcomes do we hope to achieve? 2. How will we achieve them in two days? 3. Overview of connectivity vision and multiple scales. 4. Definition of terms - conceptual and spatial.	Barbara Vickery, TNC, Maine
12:00-12:30pm	**Round robin 1-minute self introductions:** 1. How is your work addressing connectivity? 2. What do you hope to get out of the meeting?	Conrad Reining, The Wildlands Network
12:30-1:30pm	**Buffet Lunch**	
1:30-2:00pm	**Targets and why we choose them:** 1. Potential focal species. 2. The criteria used to select them. 3. Targets that we did not choose. 4. The forest system target.	Rose Paul, TNC, Vermont Doug Bechtel, TNC, New Hampshire
2:00-3:00pm	**Key ecological attributes of and stresses to targets:** 1. What is a key ecological attribute? 2. Are there key attributes that we are missing or that are not so relevant? 3. Have we identified the most important sources of stress to those attributes In this landscape?	Rose Paul Doug Bechtel
3:00-3:15pm	**Break**	
3:15-3:45pm	**Measurable connectivity objectives:** 1. How do we approach devising measurable objectives? 2. How we derived a straw proposal based on targets, key ecological attributes, and thresholds.	Barbara Vickery
3:45-5:00pm	**Discussion of connectivity objectives for linkages:** 1. Abating threat, 2. Restoring and maintaining functional connectivity, 3. Can we apply or amend these to work for landscape matrix objectives as well?	Doug Bechtel
5:00-6:00pm	**Social hour**	
6:00-7:00pm	**Dinner**	
7:00-8:00pm	**Presentation and discussion** on multiple landscape metrics relevant to connectivity that have been derived or assembled by TNC for the Eastern region	Mark Anderson, TNC, Eastern Region Division
8:00-9:00pm	**Social hour**	

Thursday, May 27, 2010

7:00-8:00am	**Breakfast**	
8:00-9:30am	**Reprise on objectives:** Break-out sessions to discuss, clarify, and improve draft objectives	Group 1. Doug Bechtel Group 2. Barbara Vickery
9:30-9:45am	**Break**	
9:45-10:00am	**Integrate and resolve results of breakout sessions on objectives**	Barbara Vickery Doug Bechtel
10:00am-12:00pm	**Selecting Indicators:** 1. ID possible ways to measure landscape structural connectivity and evidence of animal dispersal relating to the objectives 2. Assess utility, relevance, practicality and efficiency of possible indicators. 3. Prioritize and select	Doug Bechtel
12:00-1:00pm	**Lunch**	
1:00-2:00pm	**Implementation of a Measures Program:** 1. Who will measure and report? 2. Who else do we need to engage in this discussion? 3. How do we institutionalize selected indicators?	Conrad Reining
2:00-3:00pm	Wrap up and next steps Workshop evaluation	Mark Zankel

Thank you to our Staying Connected Workshop Planning Partners!

Two Countries One Forest | Deux Pays Une Forêt

The Nature Conservancy
Protecting nature. Preserving life.™

WILDLANDS NETWORK
RECONNECTING NATURE IN NORTH AMERICA

WILDLIFE CONSERVATION SOCIETY

Project 12: Overarching Project Management–Ensuring Timely and Effective Implementation, Coordination, and Shared Learning across this Four-State Effort

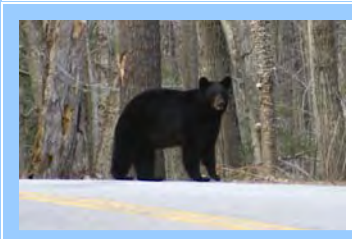
Project Manager: Mark Zankel – The Nature Conservancy, NH Chapter

Objective
12.1 Ensure sound and efficient financial management of grant funds.
12.2 Ensure all grant requirements are met and deliverables are completed and submitted in a timely fashion.
12.3 Foster efficient, climate-friendly coordination and communication among project partners across the four states to optimize the implementation of grant components, the collective learning resulting from these efforts, and the opportunities for leveraging new support for future initiatives.
Approach
• TNC will assign a Project Manager.
• The Project Manager will work with project partners and grant administration staff from TNC, NH Fish & Game Department, and US Fish & Wildlife Service over the course of the grant period to coordinate financial management of grant funds and to ensure that all grant deliverables (progress reports, invoices, interim and final reports) are submitted on time for all linkage projects and cross-cutting strategies.
• The Project Manager will coordinate regular and ongoing communications of the ad hoc overarching four-state steering committee, which includes the project leaders for each of the linkages and cross-cutting strategies and other key staff from the partner organizations. This will include convening regular (approximately bi-monthly) conference calls and/or "virtual" meetings (e.g., WebEx or video-conferencing services) for status reporting on the various projects and discussion of issues, opportunities, and lessons learned to inform each others' efforts. Holding these meetings "remotely" will enhance efficiency and cost-effectiveness, and will reduce the carbon footprint associated with grant implementation. The Project Manager and steering committee may also meet periodically (e.g., annually) in person if the benefits of such face-to-face interaction are determined to outweigh the costs in time, resources, and carbon output.
• Coordinated the submission of a major grant proposal to the WCS Wildlife Action Opportunities Fund (sponsored by the Doris Duke Foundation) on behalf of the SCNA initiative, to match and leverage federal SWG funds. WCS awarded $193,000 grant to the project.
Activities Undertaken (during the reporting period)
• The first year of the project has served as the start-up period for the Staying Connected Initiative. The NH Fish and Game Department re-granted most of the federal SWG funds and project manager responsibility to The Nature Conservancy's New Hampshire Chapter. The Nature Conservancy assigned Mark Zankel, Deputy State Director, to assume overall project management responsibilities.
• One of our first activities was to form a multi-partner Steering Committee to provide oversight and guidance; to ensure that ideas, tools, and strategies are shared across the initiative; and to discuss and resolve cross-cutting issues. The Steering Committee consists of the overall SCNA Project

Manager (Mark Zankel, NH TNC), the project managers for each linkage and cross-cutting strategy (Dirk Bryant, NY TNC; Conrad Reining, Wildlands Network; Paul Marangelo, VT TNC; Doug Blodgett, VTF&W; Jens Hilke, VTF&W; Dan Coker, ME TNC; Zoe Smith, WCS; and Alice Chamberlin, 2C,1F), and a Vermont TNC staffperson (Phil Huffman, VT TNC) that is helping to coordinate across multiple linkage projects in Vermont.
• The SCNA Project Manager has convened monthly Steering Committee conference calls to discuss and resolve cross-cutting issues including internal and external communications, outreach materials, branding, contracting, information management, measures and evaluation, etc. The Project Manager has prepared and distributed a summary of each conference call including agenda items, key discussion points, decisions, and action items. Regular communication is also being facilitated through a listserv.
• The Nature Conservancy developed and executed sub-contracts and sub-awards with ten different project partners across four states including: Tug Hill Tomorrow, Wildlife Conservation Society, Wildland Network, Northeast Wilderness Trust, Vermont Land Trust, Trust for Public Land, National Wildlife Federation, New Hampshire Audubon, Maine Audubon, and Two Countries, One Forest (2C,1F). The Conservancy developed a template federal sub-award and a parallel template sub-contract, and has also developed template financial reporting forms to meet federal standards and help ensure consistency across the project.
• In December 2009, we convened a very informative webinar for all Staying Connected partners during which five GIS connectivity modeling approaches were presented and discussed: Corridor Builder, Least Cost Pathway, FunConn, Circuitscape, and Resistant Kernal Analysis. Presenters focused on the strengths, limitations, and technical requirements of each approach. A summary table outlining these considerations was developed.
• The Steering Committee worked together to put together a 2-page project overview and associated map for use in stakeholder outreach.
• The Steering Committee worked with a marketing consultant hired by National Wildlife Federation to develop a Staying Connected logo, tagline, and other branding tools.
• The Steering Committee researched and agreed upon a password-protected, web-based platform (Basecamp) for project management, document storage, and internal communications. The Staying Connected Initiative has established the platform on Basecamp (see http://basecamphq.com/) and each project has its' own page, materials, information, and allowed participants.
• The Steering Committee has developed an agreed-upon approach to establish a public website for Staying Connected. The website will allow project managers and participants to share information with the general public, especially in the linkage areas where there is a high degree of community engagement and technical assistance. The website – www.stayingconnectedinitiative.org – is under development and will be launched in Fall 2010.
• The SCNA Project Manager developed a progress report template for all project partners to utilize in the preparation of narrative progress reports.
• $193,000 private grant awarded to the SCNA Initiative, matching federal SWG funds.
Outcomes, Results, and/or Deliverables to Date
• Sub-grant established between NH Fish and Game (recipient of competitive SWG award) and NH

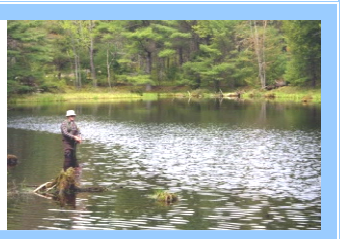
TNC.
• Established a multi-partner Steering Committee consisting of the overall Staying Connected project manager and the project managers for each linkage and cross-cutting strategy.
• Developed and executed sub-contracts and sub-awards with ten different project partners across four states.
• Financial reporting templates developed and distributed to all sub-awardees and sub-contractors.
• Summary table developed comparing GIS connectivity modeling approaches. (see Appendix 6).
• Developed a 2-page project overview and associated map for use in stakeholder outreach (see Appendix 1).
• Staying Connected logo (see below), tagline, and other branding tools completed and distributed to all partners for use in publications, outreach materials, and presentations. 
• Project reporting template developed and distributed.
Unforeseen Challenges/Issues (if any)
• In an effort to keep the project management budget to a minimum, we significantly underestimated the amount of time and resources needed to complete many of the overarching project management tasks, particularly: development and execution of so many contracts and sub-awards; ongoing coordination with SCNA partners; and working through the full suite of start-up questions and issues that arose due to the magnitude, scale, complexity, and number of partners engaged in this effort.
• Project partners did not budget sufficient time and resources for external communications, messaging, and outreach. Given the number of communities and stakeholders we must reach, we are seeking more efficient and effective means of getting our message and information out (e.g., 2-page overview, website). Press releases and articles are being shared across the partnership.

APPENDIX 1: STAYING CONNECTED OVERVIEW



The Staying Connected Initiative

Sustaining landscape connections across the Northern Appalachians



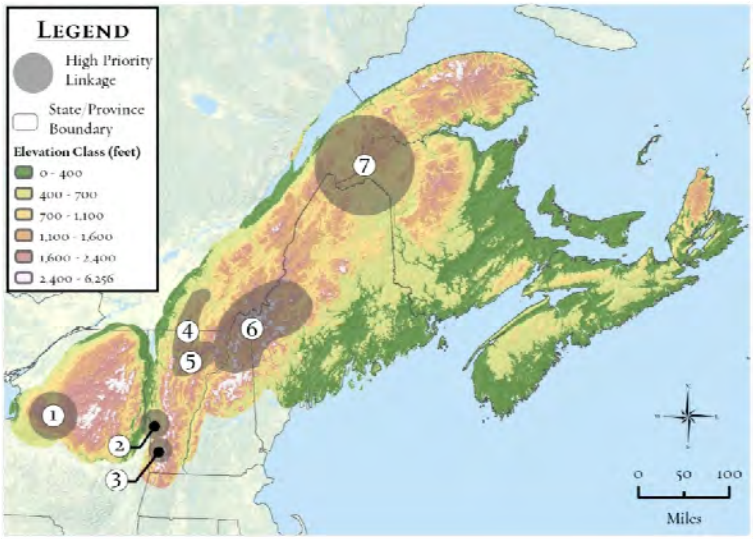
What is the Staying Connected Initiative?

Staying Connected is a new initiative to help safeguard wide-ranging and forest-dwelling wildlife such as bear, moose, lynx, marten and bobcat from the impacts of habitat fragmentation and climate change by maintaining and restoring landscape connections across the Northern Appalachians region.

What is the Staying Connected Initiative doing?

Staying Connected is helping individuals and communities to choose actions that will sustain wildlife and local community values such as hunting, fishing, and other outdoor recreation in a rapidly changing world. The initiative focuses on seven priority areas across the Northern Appalachians where landscape connections for wildlife movement are at risk due to development and roads:

① Tug Hill Plateau ⇔ Adirondack Mountains (NY)
② Adirondack Mountains ⇔ Green Mountains (NY-VT)
③ Taconic Mountains ⇔ Southern Green Mountains (NY-VT)
④ Northern Green Mountains (VT-Canada)
⑤ Worcester Range ⇔ Northeast Kingdom (VT)
⑥ Northeast Kingdom ⇔ Northern NH ⇔ Western Maine Mountains (VT-NH-ME)
⑦ Maine's North Woods ⇔ Quebec's Gaspe Peninsula (ME-Canada)



Within these landscapes, project partners and communities are identifying the key areas of local connectivity – or linkages - that allow wildlife to successfully move through intact and fragmented landscapes. We are engaging landowners, organizations and municipalities to protect, restore, maintain, and enhance habitat blocks and the connections among them. And we are working with state transportation agencies and local communities to reduce the dangers to wildlife seeking to cross well-traveled roads.

Why does this work matter?

The Northern Appalachians region, also known in the U.S. as the "Northern Forest," is one of the most intact temperate broadleaf forests in the world. Spanning two countries, four states, four provinces and 80-million acres, it provides a home for more than five million people, as well as rare alpine vegetation, many at-risk species, old-growth forests, very large blocks of unfragmented forest, and high quality rivers. Canada lynx, black bear, and other wide-ranging species still have the opportunity to roam freely across much of the area. Nevertheless, the Northern Appalachians are hardly immune to the significant challenges posed by fragmentation and climate change. Recent scientific analysis coordinated by the bi-national Two Countries, One Forest collaborative reveals that the region risks being separated into a series of disconnected

ecological islands — isolating wildlife populations and limiting their ability to migrate and adapt in response to a changing climate. Many species of wildlife need to move around to meet their basic life needs, such as to find food and breeding areas, for migration between winter and summer habitats, or to disperse from an overcrowded territory. Large carnivores such as black bears can range up to 10 miles (16.1 km) in a single day, and up to 40 miles (64.4 km) over the course of a season, while even smaller predators like fishers can cover three or four miles a day.

To sustain healthy populations of wide-ranging mammals and other wildlife, we must maintain large areas of core habitat as well as the areas of land that link those core habitats. Consequently, "landscape connectivity" – the degree to which the landscape allows animals to move between patches of suitable habitat to meet their life needs - has emerged as a paramount conservation need. ***Staying Connected*** is a large-scale, coordinated initiative aimed squarely at taking action in response to this challenge. Roads, development, and people are here to stay. But with sound science, solid partnerships, and local ingenuity, we can keep the Northern Appalachians connected for wildlife and for people, today and into the future.

How is Staying Connected funded?

Staying Connected is one of only 12 projects funded nationwide in 2009 through the U.S. Fish & Wildlife Service's Competitive State Wildlife Grants Program – the country's core program for preventing wildlife from becoming endangered in every state. Additional funding comes from the Wildlife Conservation Society's Wildlife Action Opportunities Fund, established with support from the Doris Duke Charitable Foundation, and from project partners. With these commitments, ***Staying Connected*** is able to launch the partnership, fund core operations, and initiate conservation actions through early 2012. Maintaining and restoring landscape connections across the Northern Forest is a much longer-term effort, however, and success will require greater capacity, additional funding and expanded partnerships.

Who is involved with Staying Connected?

Staying Connected is a collaboration of twenty public and private entities working together to maintain landscape connections across the northern forest region. The Nature Conservancy's New Hampshire Chapter serves as the fiscal agent and overall project manager for the initiative. Partners include:

Maine Audubon
Maine Department of Inland Fisheries & Wildlife
Maine Department of Transportation
National Wildlife Federation
New Hampshire Audubon
New Hampshire Department of Transportation
New Hampshire Fish & Game Department
New York Department of Environmental Conservation
New York Department of Transportation
Northeast Wilderness Trust
The Nature Conservancy (NY, VT, NH, & ME)
Trust for Public Land
Tug Hill Commission
Tug Hill Tomorrow
Two Countries, One Forest
Vermont Agency of Transportation
Vermont Department of Fish & Wildlife
Vermont Land Trust
Wildlands Network
Wildlife Conservation Society

We invite you to "Stay Connected" by supporting community activities that value wildlife and wild places; link up conservation lands; promote hunting, fishing and outdoor recreation; and protect our extraordinary quality of life in the Northern Appalachians.

Map prepared by The Nature Conservancy, NH Chapter
Photo credits: Black bear (Eric Aldrich), Fisherman (Eric Aldrich), Bobcat (Paul Bolduc)

APPENDIX 2: STAYING CONNECTED OVERVIEW FOCUSED ON VERMONT

Staying Connected




What is special about where *you* live?

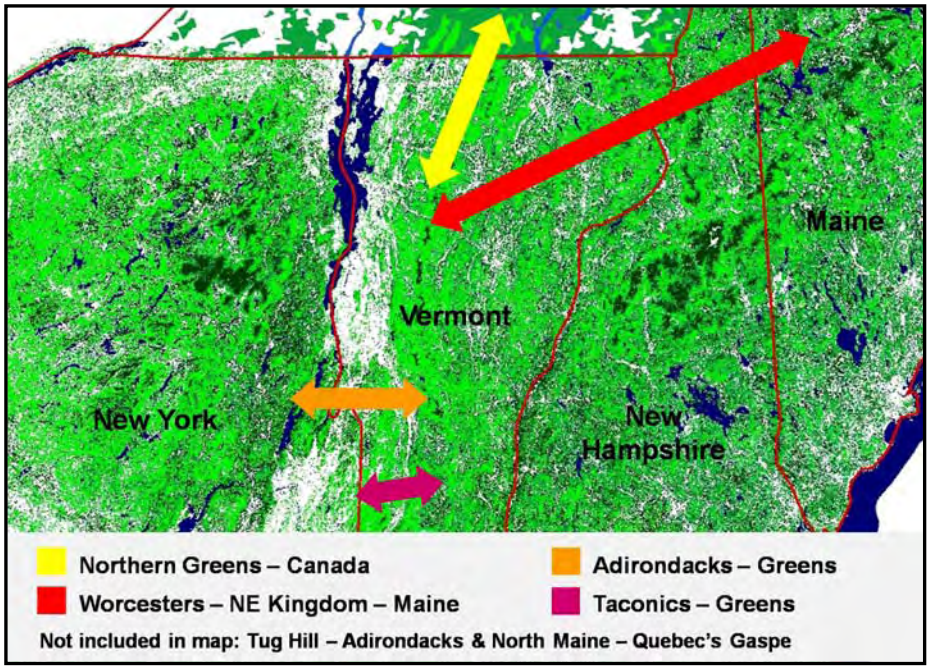
Time and again, people point to forests and wildlife when sharing what they love and value in our communities. Young and old, natives and newcomers, well-to-do and just scraping by, everyone seems to share this passion. Indeed, our natural resources define our quality of life. Clear air and clean water keep our families healthy; forests provide countless recreation opportunities (including hiking, hunting, fishing, photography, and snowmobiling); and the forest products, agriculture and tourism industries anchor our local economy. In Vermont, wildlife associated recreation alone generates more than $400 million in revenues annually.

The Staying Connected Initiative is a partnership of local, state and national organizations and agencies working with communities to encourage the stewardship of these precious resources.

At the crossroads...

Just as healthy local economies often require healthy regional economies, healthy local wildlife populations require healthy regional populations. Year in and year out, we see wildlife outside our doors because of the high quality habitat across the region.

We live at the crossroads of an extensive wildlife habitat network spanning the northeastern United States and southeastern Canada—from New York's Tug Hill Plateau and Adirondacks, across Vermont, New Hampshire and Maine, and north to Québec's Gaspé Peninsula and the Canadian Maritime Provinces.



Four regionally important wildlife connections

What's a wildlife network? It's the combination of blocks of forest and connecting lands that many animals need for sufficient food, cover, and access to mates. The forest blocks provide prime wildlife habitat while the connecting lands—often small forest and woodland patches, wetlands and river corridors—allow wildlife movement across the landscape between larger forested blocks.

We live at the crossroads of an extensive wildlife habitat network

A changing landscape

Our forests have mostly re-grown from intensive clearing in the 1800s. In response, wildlife that were once nearly gone from the state have returned. But now, modern development in the form of new roads and scattered development is fragmenting our forests in ways more difficult to reverse. The result is increasingly isolated "islands."

Wildlife and the changing landscape

While squirrels, blue jays and raccoons thrive in our backyards, many wildlife species, including black bear, moose, bobcat and fisher, will not survive over the long term in small forest patches. These species and many more need to move freely across the landscape to survive—between summer and winter food sources, to find mates, and in response to environmental changes. For this reason, in the face of increasing habitat fragmentation, the connections between larger patches of forest and between different habitats are critical for healthy wildlife populations.

People and the changing landscape

Because our communities were built on a strong connection to the land, we can see the effects of increasing forest fragmentation. Fewer jobs tie us to the land and we have fewer opportunities to connect with nature and our region's history – we are losing farms and farmers, logging is more difficult with decreasing lot sizes, and hikers, hunters and snowmobilers encounter challenges gaining access to land.

The Staying Connected Initiative—linking it all together

Staying Connected seeks to connect landscapes for communities of wildlife *and* people. We are working with municipalities, citizens and partner organizations to maintain, enhance and restore landscape connections across our region. While wildlife habitat is our primary focus, we seek to collaborate with those interested in maintaining a healthy landscape for related purposes as well. By tailoring our efforts to each community's needs, interests, and values, we offer a variety of tools and support. These may include:

- Raising awareness about local natural history, wildlife needs and movement patterns, and other land-based topics through community events
- Identifying local wildlife movement areas and improving key wildlife road crossings
- Assisting landowners interested in protecting or managing their land for the benefit of wildlife and other natural resources
- Providing technical assistance to municipalities interested in maintaining landscape connections

If you are interested in wildlife and maintaining connections to the land, or simply want to learn more about Staying Connected, please visit: www.StayingConnectedInitiative.org

Staying Connected has received initial support through generous grants from the U.S. Fish and Wildlife Service's Competitive State Wildlife Grants Program and the Wildlife Conservation Society's Wildlife Action Opportunities Fund provided by the Doris Duke Charitable Foundation

APPENDIX 3: PROJECT 4 –
COLD HOLLOW TO CANADA FOREST CONNECTIONS

Connections

The newsletter of Cold Hollow to Canada Forest Link: Summer 2010

Cold Hollow to Canada's First Newsletter

Welcome to the first edition of Cold Hollow to Canada's quarterly newsletter, *Connections*. We're pleased to be able to bring these articles to all of you who have attended our programs or otherwise shared our interest in stewarding this region's forests for present and future generations of human, plant, and wild animal life.

The Cold Hollow Mountains

Cold Hollow to Canada Forest Link (CHC) is a partnership of community members working together toward the common goal of positive land stewardship and wildlife habitat conservation through education and outreach and coordination among local conservation and planning commissions, public entities, and non-profit organizations. CHC grew from a gathering of community members representing seven towns in the Northern Green Mountains in the fall of 2008. The meeting was the start of a discussion about the place where we live, what it means to us, and how we might be able to protect the parts of it that we love.

Since this initial gathering we have organized a steering committee with representation from five of seven towns in our project area, assisted Bakersfield and Richford in developing conservation commissions, organized the Keeping Track Monitoring Program that is sending its first teams of citizen scientists into the woods this summer, and hosted a handful of educational presentations. We're excited to report that this past spring the steering committee elected Charlie Hancock, a private consulting forester from Montgomery, as our first official chairperson and began creation of this newsletter and a website (both are now published!).

The newsletter title refers to the core of our mission—connecting people to the landscape and connecting forests and habitat for wildlife and people. Furthermore, our hope for this newsletter is that it keeps all of us connected to one another as stewards of this place we love.

We hope you enjoy our newsletter, visit our website (www.coldhollowtocanada.org) and stay involved in our communities – the future of this special place is up to us!

Thank you,

CHC Steering Committee

Inside this issue:

Keeping Track of Wildlife	2
Emerald Ash Borer	3
Reflections on "Favorites"...	4
Conservation in Bakersfield	5
Staying Connected	6
Upcoming Events	7

Special points of interest:

- If you'd like to be more involved with CHC, consider representing your town on our Steering Committee
- Wildlife trackers wanted! See p. 2
- If you'd like more information or to be added to our email list, please email us at <info @coldhollowtocanada.org>

Edits and layout by Corrie Miller

Keeping Track of Wildlife

Five Tracking Teams Embark

Last October seventeen people from our region began a mammal tracking training course through Keeping Track, a non-profit organization in Huntington whose mission is to inspire community participation in the long-term stewardship of wildlife habitat. Sponsored by Cold Hollow to Canada, this in-depth training prepares local citizens to become "citizen scientists" as they learn to observe and document sign and tracks of focal mammals. This year's group has successfully completed six field training days (exploring our forests and those in Jericho) and two evening classes. They embark this summer on monitoring ventures in their own backyards across Bakersfield, Enosburgh, Montgomery and Richford.

CHC has learned about the value of Keeping Track programs from our partners across the border in Canada who have been offering annual trainings for the past seven years as part of an ongoing monitoring project. Taught by Susan Morse, an internationally recognized ecologist, tracker, and hunter, the Keeping Track Monitoring Program educates and engages people about wildlife species and the habitat they need to be healthy. The scientific training allows local people to collect data that can be a vital indicator of the ecological health of the whole landscape and can be used by local planning commissions as well as land trusts. Furthermore, learning about the animals with whom we share our forests connects us to the landscape in a special way.

CHC trackers huddled around Sue...and the fire—photo by Annette Goyne

CHC trackers following tracks that followed a stream—photo by JoAnne Wazny

SEEKING MAMMAL TRACKERS!

You too can become a skilled tracker. Cold Hollow to Canada is sponsoring a second year of mammal tracking training through Keeping Track and is **now seeking interested trackers for the 2010-2011 training group**. The training includes six field days and two evening classes and the full cost is $395 (CHC has a grant from Patagonia that can defray some of the costs for individuals who need assistance). The field dates are Oct 10, Dec 11, 2010 and Jan 8, 29, Feb 13, April 10, 2011 while the evening classes are Dec 13, 2010 and April 11, 2011 (*Note*: it is possible to make up a class if there is a conflict). This upcoming year four Canadian trackers will be joining our group, and we look forward to getting to know one another and explore future cooperative efforts and data sharing.

Because you only see what you know to look for, this training is a great opportunity to open your eyes to the world of wildlife around you. Sue Morse's knowledge and insight will amaze you, and even the most experienced woods-person will see the forest through a new lens. Just ask anyone from the first class! If you'd like more information or to register, contact Nancy Patch at nancpatch@earthlink.net.

CHC Steering Committee:	
Bakersfield	Dorothy Allard
Enosburgh	Nancy Patch
Fletcher	Ed Lidster
Montgomery	Charlie Hancock, chair
Richford	Bill McGroarty Lenny Tamulonis

Purple Boxes and Green Beetles: the Emerald Ash Borer

by Charlie Hancock—CHC Steering Committee, Montgomery

By now most of us have seen those purple boxes that line our highways and byways, tucked up in roadside trees like awkward bird houses or bat boxes. These boxes are being deployed as part of a national survey by the US Dept of Agriculture in partnership with state organizations like Vermont's Dept of Forest, Parks and Recreation as a detection tool to monitor Emerald Ash Borer (EAB) infestations and locate potential beetle populations. Approximately 75,000 traps are being deployed in 49 states, with 480 in Vermont spread across 11 counties. The traps are hung from ash trees and baited, with oils naturally produced by stressed trees, to lure EAB to boxes lined with a sticky material that traps them in place. The trap is not the *solution* to this potential problem, but a tool for *detection*. These traps will be up until fall, with survey crews making sample-collecting rounds starting mid-summer.

EAB larva, exit hole and adult beetle
photos from Pennsylvania Dept of Conservation & Natural Resources

So what's the problem with EAB? The beetle is a non-native insect discovered in Michigan in 2002, which has since been documented in 11 states, as well as Ontario and Quebec. Since its arrival in the US it has killed tens of millions of ash trees and caused millions of dollars of economic damage to landowners and municipalities. Adult beetles are metallic green, and about ½" long. They lay their eggs in ash tree bark and larvae bore their way through the bark and cambium, disrupting water and nutrient flow. Larvae overwinter in the tree and emerge the following June. Although difficult to see, the beetle leaves a "D" shaped exit hole in the bark, about 1/8" in diameter. This attack causes crown dieback in the tree, and sometimes heavy sprouting of suckers while the tree struggles to survive. The end result is almost always mortality.

To slow the spread of the pest, we can't modify the EAB behavior, but we can modify *HUMAN* behavior. A single EAB can fly up to ½ mile, which isn't really that far. Humans—however—can cover a much greater distance when we travel to go camping or to the cabin. This is the most common dispersal method for EAB—the transportation of firewood with the larvae or adult present under the bark. If you must transport firewood, limit it to within a 50 mile radius. The last thing you want is to pick up little green hitchhikers that won't even throw in for gas. **To be on the safe side pack hot dogs, not firewood.**

To learn more about the Emerald Ash Borer, attend the July 17 workshop at the library in Richford (see Calendar, p. 7)

Reflections on "Favorite" Animals

by Bill McGroarty—CHC Steering Committee, Richford

While trying to come up with an appropriate topic to write about in this – our first edition of the CHC newsletter – I came across an article in the Summer 2010 edition of *Tricycle* magazine written by Rick Bass. Bass, the author of some 25 books, lives in northern Montana where he has long been active in efforts to protect the last roadless lands in the Yaak Valley. Bass's article, entitled "Totem Animals," has to do with every child's challenge – deciding their favorite animal. His answer to this question touches on what we – the CHC group – are all about. He describes this youthful interest in animals as "those childhood days of talismanic fervor, and the security to be gotten by holding in one's heart an emblem of something brave, fierce, powerful and free – something as invulnerable as the child is vulnerable." I can't help but think that this vulnerability he speaks of, and the need for "emblems of bravery, power and freedom" extends well past childhood.

We who are fortunate enough to live in Vermont know that the animals we share our beautiful state with represent much more than the number of hunting licenses sold or tourist dollars they may attract. At some very deep level they help define us and the place in which we live. How would the disappearance of many of these animals and much of the habitat needed for their existence affect us and the perception we have of ourselves as Vermonters? Bass addresses this question thusly:

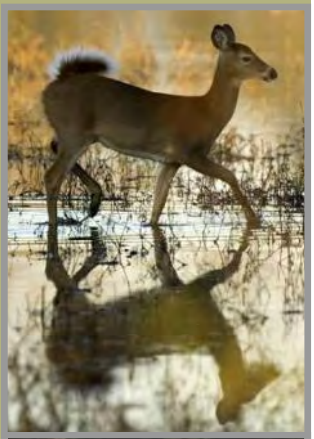
> Considering the current wave of worldwide species extinction – which is occurring at an even greater pace than the post-asteroid die-off of the dinosaurs – can be a cause of depression. Estimates are that in the coming century, one species in four will vanish...This world-vanishing, then, can be another thing to worry about, beyond the individual's ability to control. The best that any of us can do in this regard, I think, is to celebrate the integrity of species other than our own while they are here, and to demand the protection of the habitats that formed them, the clay from which they were all sculpted.

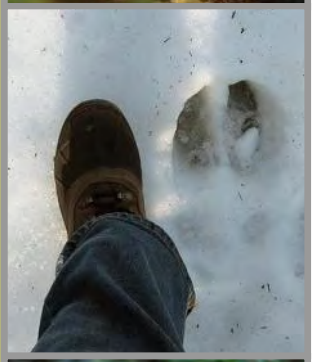
The article ends by returning to answer the initial question: what is you favorite animal? His response is "I don't have a favorite animal anymore, but I have a favorite landscape – the Yaak Valley of northwest Montana…It's a place where not a single species has gone extinct – where every animal that was present at the end of the last Ice Age is still here." Although we can't quite make that claim here in our "favorite landscape," CHC does believe that our home range – the Cold Hollow Mountains to the Canadian border – can contribute to slowing, and possibly stopping the extinction calamity that is forecast by many worldwide.

Bass concludes by saying of a favorite animal:

> I can't choose…They are all interconnected, each has shaped and helped sculpt the other, each is a part of all the others, and I love them all. Each carries a part of the other, each and all are interdependent upon all the others.

Throw us into that equation and it tells you why we at CHC are doing what we are doing.





Conservation Commission Corner: Bakersfield

by Dorothy J. Allard—CHC Steering Committee & Bakersfield Conservation Commission

Conservation Commission Seeks Funds for Town Park

The Bakersfield Conservation Commission (BCC) was formed in March of 2009. One of its first projects has been the acquisition of a parcel of land in the center of the village for a town park.

A four-acre parcel that once held the local doctor's residence was for sale. Larry Krygier, a member of the Conservation Commission and long-time town resident, recognized its potential: the land was centrally located, there was easy access from the elementary school, and it had a number of interesting natural habitats that could be explored. Not only that, it contained a circa 1890s barn with historical significance--all that remained after the doctor's house burned late in the 20th century.

With no money in its coffers, the BCC acted quickly to form the Bakersfield Community Conservation Corporation, a 501(c)3 organization with the express mandate to raise funds to purchase the property. A few donations and loans from townspeople made it possible for the purchase to go through at the end of 2009, with the BCCC making a down payment to the former landowner who now holds the mortgage.

Bakersfield citizens clean up the Town Park on May 1

Since the first of the year, we have been scrambling to find the rest of the funds before the end of 2010, when we must repay the original property owner. A grant request to the Vermont Housing and Conservation Board was successful and will provide two-thirds the cost of the land acquisition. Merchants Bank Foundation also made a donation. A quarter-acre piece of the property will be sold to an adjoining landowner; the proceeds will go toward the rest of the parcel. Many townspeople have donated to the cause. Funds are being sought from several other foundations and we are scheduling several fundraising events. An additional loan from a local trust fund may give us a little more time to find the rest of the money.

What's next for the Bakersfield Town Park project? Our Town Park Committee is currently working on a management plan for the property. Eventually we hope to have a recreational trail with links to other trails in town, a visitor's center and meeting space in the barn, and a gazebo for musical happenings. On May 1, we organized a park clean-up day. About 30 people came to pick up trash, clip brush, and rake leaves (see photo). Everyone is excited about the project and looking forward to their new town park!

Brownie Scouts enjoy hot dogs after helping clean up Park on May 1 (left)

Artist impression of future Bakersfield Town Park by Forrest Dunnavant (right)

Photo by Conrad Reining

Did you know you live in an important wildlife corridor?

by Corrie Miller—Staying Connected Initiative

It sounds funny when you think about the vast seven-town region that comprises Cold Hollow to Canada's focal area as a wildlife corridor. I think that's because, for most of us, "wildlife corridor" brings to mind the image of a single, one-lane pathway funneling animals between one place and another. While this understanding is useful when considering populated areas that offer few options for wildlife movement, it's less useful to us in the Cold Hollow to Canada region where we are fortunate to have acre upon acre of forested habitat. Here, then, when contemplating corridors, you generally can zoom out the focus of your image, as if it's a Google Map, and think about a *network* of large blocks of un-interrupted forest *as well as* the lands connecting the blocks (like small forest patches, wetlands or waterways). This habitat network helps large animals move freely across the landscape. At this *zoomed-out* scale, the swath of forestland flanking the Northern Green Mountains is an important wildlife corridor between the Southern Greens and the Sutton Mountains in Québec. **Our region is one of only six important linkages that, together, connect wildlife habitat across the entire Northern Forest – from western New York to Canada and Maine.**

Why is it important for wildlife to have connected habitat? For starters, many animals have different needs during summer and winter months. Moose, for example, use lowland wetlands during the summer and upland forests in winter and must travel between the two in spring and fall. Connected habitat also allows genetic flow, ensuring that inbreeding doesn't become a problem and that healthy populations persist. And furthermore, when food, shelter, and mates are difficult to find in one place, animals must roam elsewhere to meet their needs.

Of course, wildlife are not the only inhabitants in our area; we live here, too. Nevertheless, in Vermont, our communities are heavily influenced by the natural landscape. In addition to feeling at home surrounded by forests and enjoying activities like hunting, hiking, and snowmobiling, the Vermont economy is strengthened by intact forests, particularly the forest products and tourism industries.

As part of the *Staying Connected Initiative,* I am working with communities in the Cold Hollow to Canada region to find ways of maintaining existing habitat connectivity while also protecting other values (hiking, hunting, forestry, land access, etc…) that you identify. I've been teaming with local municipalities, citizens and partner organizations (like CHC) to help raise awareness about wildlife needs and movement patterns, assist landowners in protecting or managing their land for the benefit of wildlife, and provide technical assistance to municipalities interested in maintaining landscape connections.

If you are interested in wildlife and maintaining this important habitat corridor, or you simply want to learn more about Staying Connected, please feel free to contact me at corrie.e.miller@gmail.com.

STAYING CONNECTED
Northern Greens ..... Canada


Photo by JoAnne Wazny


Photo by Annette Goyne

Calendar of Upcoming Events

Bakersfield Conservation Commission

Meets the last Thursday of every month at 7:00 PM in the Town Hall Building, 40 East Bakersfield Road, Bakersfield.

Enosburg Conservation Commission

Meets the fourth Monday of every month at 7:30 PM in the Emergency Services Building, 83 Sampsonville Road (Rte 105), Enosburg Falls.

Richford Conservation Committee

Meets the first Thursday of the month in the upstairs conference room of the Arvin A. Brown Public Library, 88 Main Street, Richford.

Wild and Scenic River Study Committee

Meets the third Thursday of each month from 7:00 PM to 9:00 PM. Locations vary so contact 802-393-0076 or visit www.vtwsr.org for more information. Next meeting is July 15 in Lowell.

Paddle the Missisquoi—from Richford to East Berkshire

June 26, 10:00 AM to 2:00 PM with the Wild and Scenic River Study Committee. To learn more, call Shana Stewart at 802-393-0076.

Walk in the Woods: Forest Bird Habitat Assessment

July 10, 8:30 AM to 12:00 PM at Clover Hill Tree Farm, South Strafford. Sponsored by Vermont Woodlands Association, Audubon Vermont, and the Vermont Department of Forests, Parks & Recreation. More information at www.vermontwoodlands.org.

Bird Banding Demonstration

July 16 and July 23, 7:00 AM to 9:00 AM at the Green Mountain Audubon Center, 255 Sherman Hollow Road, Huntington. Sponsored by Audubon Vermont. Donations accepted. More information at 802-434-3068.

July and August Bird Monitoring Walks

July 10 and August 14, 7:00 AM to 9:00 AM at the Green Mountain Audubon Center, 255 Sherman Hollow Road, Huntington. No charge, donations accepted. More information at 802-434-3068.

Invasive Insect Workshop and Visual Survey – Asian Longhorned Beetle and Emerald Ash Borer

July 17, 9:00 AM to 12:00 PM at Arvin A. Brown Public Library, 88 Main St., Richford. Sponsored by the Richford Conservation Commission. For more information contact Rhonda Mace at 802-505-0200 or rhonda.mace@state.vt.us.

Conservation and Wildlife Corridors in the NE Kingdom, The Staying Connected Initiative: Worcesters-NE Kingdom

July 29, 7:00 PM to 9:00 PM at the NorthWoods Stewardship Center, East Charleston. Sponsored by the National Wildlife Federation, Vermont Land Trust, and NorthWoods Stewardship Center. There is a $5 fee. More information from www.northwoodscenter.org.

Elysian Hills: A Woodlot for Life

July 31, 9:30 AM to 3:00 PM at Elysian Hills Farm, 209 Knapp Road, Dummerston. Bill and Mary Lou Schmidt discuss forest management, invasive species, and their wildlife management plan. Sponsored by Vermont Coverts and the Vermont Land Trust. For more information see www.elysianhillsfarm.com.

APPENDIX 4: PROJECT 7 –
PROCEEDINGS FROM THREE BORDERS MEETING

Three Borders, One Vision Workshop

September 16-17, 2009, Edmundston, New Brunswick

Report to Participants

Workshop Overview

Two Countries, *One Forest* (2C1Forest) approached our partners Canadian Parks and Wilderness Society (CPAWS) New Brunswick Chapter, The Nature Conservancy, Maine Chapter (TNC-Maine) and Nature Conservancy Canada (NCC) to organise a workshop in the three borders region of Maine, Bas-St-Laurent and Gaspésie, Quebec, and north-western New-Brunswick. This area has been identified by Two Countries, *One Forest*'s Science Team as one of the five priority landscape linkages requiring connectivity in the Northern Appalachian/Acadian ecoregion. With the generous support of the Davis Conservation Foundation, the partners convened a small group of people with knowledge and interest in conservation in the three borders region (*See Appendix A for workshop agenda*). The workshop was held at the University of Moncton in Edmundston, New Brunswick.

The first day included presentations by 2C1Forest, CPAWS New Brunswick, TNC-Maine and Nature Conservancy Canada. The purpose of the first day was to introduce participants, highlight the importance of the linkage area and identify threats to the region. Additionally, participants discussed definitions of conservation connectivity and available tools for implementing connectivity.

The second day participants worked in small groups with maps of the region to identify important conservation areas and, based on local knowledge, the potential corridors for connectivity across borders. Tables were assigned to assure geographic diversity and bilingual communication in each group.

The maps developed at each table were combined to create a single map that identifies potential corridors and core areas for conservation and connectivity. A group discussion followed to address the differences and similarities in each group's map and identify challenges for conservation in the three borders region. Further discussion explored where conservation organizations should focus their efforts and where obstacles for species movement currently exist in the region or are under development, such as the potential barrier created by the expansion of Highway 185 in Quebec. Participants exchanged views on conservation connectivity and the realities of working on conservation in their area of the three borders region.

The workshop concluded with a session identifying additional stakeholders, and partners, critical local issues, next steps and champions for conservation work in the region. The participants left the workshop expecting follow-up actions by the organisers, and committed to staying involved in cross-border conservation efforts in the three borders region.

Workshop Outcomes

Issues and Opportunities

Participants identified various issues that impact the potential for cross-border connectivity and conservation in the three borders region. While issues related to the realities of individual jurisdictions were raised, most concerns have applicability across all jurisdictions. These are issues that must be addressed if conservation work is going to be successful in the three borders region. Participants stressed that conservation work in the three borders region must recognize the cultural, jurisdictional and economic differences, as well as the environmental and historical similarities we share.

Issues of Immediate Conservation Concern

- Impact of monoculture plantations (in both the agriculture and forestry industry),
- Impact of even-age ecosystems (due to clear cutting and other industrial activities),
- Expansion of human infrastructure (highways) and in particular the expansion and improvement of Highway 185 in Quebec,

- Loss of landscape permeability (due to human infrastructure – industry, housing, commercial development).

Opportunities for Conservation Action

- Taking advantage of the window of timing to influence policies being developed and implemented in Quebec and New Brunswick on public lands' forest management and protected areas to ensure that these policies include the changes that are needed for conservation management;
- Developing policies that address landscape permeability across broader connecting lands, rather than choosing a few corridor locations;
- Acknowledging and working with the reality of the landscape, people and animals;
- Reflecting the values of diverse stakeholders in the region;
- Highlighting the perspective that to sustain local socio-economic needs the three borders region requires consideration of biodiversity and connectivity for the well-being of species, people and local opportunities;
- Including rivers and water bodies in planning for connectivity (conserving the lands around them and expanded habitat cores along them);
- Learning and including the local knowledge of historical species migration paths, and
- Connecting diverse ecosystems even if not obvious as a corridor.

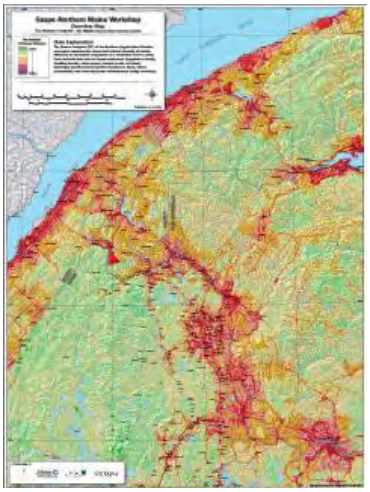
Considerations for Connectivity

During the second day participants worked in small groups to identify important areas of conservation and potential areas of connectivity. The participants had four maps that showed various landscape features and scientific information to support their discussions on the potential conservation cores and corridors that could be the focus of cross-border conservation efforts. All maps were produced by The Nature Conservancy, Maine Chapter. Many of the datasets used to make these maps are available from the 2C1Forest data warehouse: http://www.2c1forest.org/atlas/datawarehouse.html

Map 1. Satellite Overview and lands secured from development.

Map1 shows a mosaic of satellite imagery provided by ESRI ArcGIS Online that provides a good overview of the region, general land use and development patterns, roads, and general topography. It also includes shading (light green and dark green) depicting lands that are currently secured from development – that is, lands that are permanently protected from conversion to non-natural land cover. This secured lands data was collected by TNC U.S., Service New Brunswick, and the Nature Conservancy of Canada. Darker green shading indicates lands that are in permanent nature preserve / wilderness protection. Lighter green areas are lands that are subject to various levels of extractive uses, including logging and/or mining.

Map 2. Human Footprint of the three borders region.



Map2 shows the Human Footprint dataset as developed by the Wildlife Conservation Society of Canada (WCS) for the Northern Appalachian / Acadian Ecoregion. The Human footprint is a gradient of the human influence on the landscape and on this map, is shaded from green (least influence) to red (highest influence). The gradient is based on population density, dwelling density, urban areas, roads, rail lines, land use, dams, mines, and energy infrastructure. This dataset is great at highlighting fragmentation and impediments to habitat connectivity.

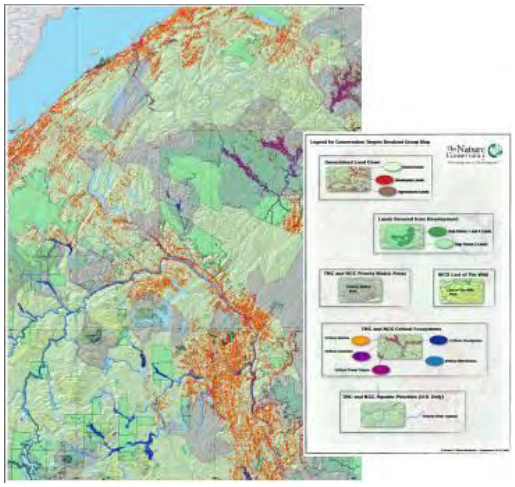
Map 3. Local Connectedness of the three borders region.

Map3 shows DRAFT information being developed by The Nature Conservancy (U.S. Eastern Region). Darker green areas are more 'connected' to their surroundings than lighter green areas. It is a good map for highlighting areas of the landscape that are still relatively connected (i.e. not fragmented). It is primarily based on land cover and roads information. Roads, major water bodies, place names, and hill shading are displayed along with the primary information. At the time of the workshop, the local connectedness information was DRAFT and should therefore not be used for purposes other than that of an illustrative tool for the workshop participants.

Map 4. Satellite Imagery and Air Photo Zoom-In.

Map4 shows a mosaic of various satellite imagery and aerial photos for the heart of the three borders region. It was designed to provide workshop participants with a more detailed look at roads, land use and forestry patterns and specific features on the landscape. It is a combination of the "best-available" imagery for the region – the highest resolution, most recent data available, including: ESRI ArcGIS Online 15m satellite imagery, Geobase Canada Panchromatic SPOT Imagery (2005-2010), and U.S. NAIP 2007 Air photos (Maine).

Map 5. Conservation Priorities and General Land cover.



Map5 was designed to provide the workshop breakout groups with a starting point to mark up with their conservation priorities and connectivity scenarios. It highlights conservation priorities from The Nature Conservancy / Nature Conservancy Canada, Wildlife Conservation Society, and Nature Trust New Brunswick. Priorities portrayed include Priority Matrix Areas (TNC and NCC), Last of the Wild areas (WCS), Critical Ecosystems (TNC and NCC), and U.S. Aquatic Priorities (TNC and NCC). This map also includes a background of general land cover (light green, brown, brown, and orange).

After the mapping exercise, participants came together as one group to discuss the differences and similarities in their maps. This helped identify the major considerations that lead participants to choose the potential conservation connectivity corridors in the three borders region.

The following points were considered during the exercise:

- Linking the existing protected areas near or in the region (Mount Carleton Provincial Park, NB, Parc national du lac Temiscouata, QC, and Baxter State Park, Maine);
- Taking prompt advantage of current opportunities (development plans, policies, land purchases, public attention);
- Timing of conservation efforts with infrastructure and development planning timelines;
- Looking at natural landscape features as barriers or as pathways (depending on the species discussed and the points of view);
- Noticing the challenges to connectivity efforts by the lack of adequate fully protected lands in the region;
- Recognising the challenge of determining connectivity at the local scale give the various human uses in the three borders region (agriculture, human settlement, forestry on private land, industrial freehold and public land);

- Looking at opportunity for cross-border collaboration and conservation given current and future jurisdictional policies, and learning from the differences;
- Looking at public and private land challenges and opportunities, and considering where known lands for sales and land swaps are coming up;
- Identifying the location of existing conservation efforts by local groups;
- Looking at human barriers to connectivity (habitat fragmentation, highways and settlements); and
- Pursuing a series of potential options for corridors in various cardinal directions (N, E, S, and W) to connect to areas *beyond* the maps.

Conceptual Map: As a conclusion to the mapping exercise, the breakout group maps were synthesized into a conceptual picture of what connectivity might look like in the three borders region. This map is NOT the solution to connectivity in the region, but, is a starting point for further discussion and scientific inquiry.

Potential Actions that Support Conservation Planning in the Three Borders Region

After the mapping session participants identified a comprehensive list of potential actions that would help support conservation planning in the three borders region. The list was narrowed in the last session of the workshop "Next Steps-Moving Conservation Forward".

Data, Information and Local Knowledge

- Identify and prioritize the species and ecosystems that should be the focus of conservation and connectivity efforts in the region;
- Identify biological and scientific data on the ecology of species and ecosystems of interest;
- Identify available land cover data (where are the natural forests, the plantations, the agricultural fields) and land ecology data (ecosystems);

- Obtain information on migration and movement of specific species considering their needs in time and space;
- Identify and quantify threats to specific species;
- Determine the barriers to connectivity for specific species;
- Gather data on changes predicted to occur with climate change;
- Understand the tools for conservation and connectivity that are available in each jurisdiction of the three borders region and how to use them;
- Implement a modeling project for the region using information and examples from other areas in the ecoregion and elsewhere;
- Collect information from local sources (outfitters, trappers, hunters, anglers, farmers, government, first nations, users, forest industries);

Communication, Coordination and Outreach

- Share the data from the workshop and participants' work (using online methods, 2C1Forest website, maps, discussion notes, conceptual map, and so on);
- Participants to gather information and data that can be of use to other participants and organisers to address their challenges as identified in the workshop or to help implement the next steps. This includes collecting info from colleagues to increase efficiency;
- Provide more opportunities and time to discuss and understand the three borders region in detail and the relationships of the stakeholders;
- Hold another workshop, but with broader community representation and diverse stakeholders to start building a local network around this subject;
- Develop baseline documents or provide baseline information that will facilitate approaching other groups or advancing the next steps;
- Set deadlines and timelines for group actions;
- Determine the best timing to approach stakeholders (private owners, forest industries, government, outfitters, and so on);
- Develop communication among participants, groups, communities, government and media.
- Work on setting flexible GIS coordinates for the identified potential cores and corridors of the three borders region in the conceptual map drawn at the workshop;
- Provide information (in the form of a document or other format) of what resources each participant has to contribute to the effort of the group (data provider, fund provider, networking provider, advocacy provider, media provider);

Stakeholders in the Three Borders Region

After identifying a wide range of potential actions that support conservation planning, participants were asked to identify the stakeholders in the region. Participants agreed that before involving new stakeholders, additional baseline information for conservation connectivity in the three borders region should be identified; the message to convey to the respective stakeholders must be clear and the timing of when to approach them strategic. Participants recognized that stakeholders who have the capacity to contribute resources, data, knowledge or technology should be approached as soon as possible.

Outreach should include:

- State and Provincial departments of natural resources,
- Environment Ministers,
- Municipalités Régionales de Comptés (MRC) of the Bas-St-Laurent and Gaspé areas of Quebec,
- Quebec's Conseil Régional des Élus,
- Municipal or township governments,
- Tourism department and associations,
- First Nations,
- Regional and/or national biology researchers,
- Academic resource people, (University of Maine, Fort Kent, Université de Moncton, Edmunston Campus, New Brunswick)
- Non-governmental organisations, (conservation and others)
- Watershed groups,
- Transportation planners
- Federal, State and Provincial transportation departments,
- Congrès Mondiale Acadien,
- Provincial, State and National agricultural associations, (Federation of agriculture)
- State and Provincial government departments linked to fish and wildlife, agriculture, and environment,
- Maine Department of Inland Fisheries and Wildlife,
- Outfitters, trappers, hunters and anglers, (associations and individuals)

- Forestry industry, (Begin, Rampag, Irving)
- Private Woodlot Owners, (and associations)
- Youth,
- Naturalists,
- Trail groups,
- Recreational Groups.

Two local groups were identified as important partners in the next steps. These are the Resource Conservation Department of Maine and the Comité d'aménagement rural du Nord Ouest (CARNO) of New Brunswick.

The list of stake holders provides guidance regarding who needs to be approached, involved or kept informed if conservation efforts are going to be successful in the three border region.

Next Steps- Moving Conservation Forward in the Three Borders Region

In conclusion, participants narrowed the list of next steps for moving conservation forward in the three borders region to the following actions:

- Participants committed to providing resources and support for each other to the extent possible.
- The organising committee will publish the workshop proceedings.
- 2C1Forest will guide and set deadlines for participants' follow-up.
- Participants agreed to answer the following questions:
    1. What information, data, resources or contacts do you need to move forward on the next steps?
    2. What information, data, resources and contacts do you have that can be shared?
    3. What are the priorities and opportunities in your area of the three borders region?
- 2C1Forest will gather this information, process it, and send it back to the group in a useful format to help the participants plan and implement the next steps.
- 2C1Forest will explore organising a second workshop or roundtable.

2C1Forest and its partners work on conservation connectivity across borders. Our organization is pleased to support next steps and actions in the three borders region that can be achieved through the network of knowledge and connections available through the 2C1Forest collaboration. 2C1Forest is indebted to the support of it partners and recognizes that the long-term achievement of a connected and healthy ecoregion depends on individuals, like the participants of the Three Borders, One Vision Workshop, who take to heart the commitment to include conservation and cross-border collaboration in their work and daily lives. The engagement of communities and local participants in our work is a crucial element to successful conservation and cross-border connectivity.

If you would like more information about the Three Borders, One Vision workshop or would like to be involved in this project or the work of Two Countries, *One Forest*, please contact Alice Chamberlin, Executive Director, alice.chamberlin@2c1forest.org, or visit www.2c1forest.org.

APPENDIX 5: PROJECT 10 – CONNECTIVITY AND TRANSPORTATION LITERATURE REVIEW (TO DATE)

Title	Author	Purpose	Study Location	Who	Source	Notes	Status
The Use of Habitat Suitability Indices (HSIs) for Evaluating Impacts to, and Assessing Mitigation for, Terrestrial Wildlife Habitat for Transportation Projects	Author: Rick Black	to quantify and qualify the terrestrial wildlife habitat a proposed 35-mile highway might impact	Utah	NEPA, Utah State Division of Wildlife Resource Agency, U.S. Fish and Wildlife	ICOET 2007 Proceedings		Only overview printed
Effects of the Configuration of Road Networks on Landscape Connectivity	Jochen A.G. Jaeger	develop a new method for landscape connectivity with variable barrier strengths into effective mesh size & efficient crossing structures			ICOET 2007 Proceedings		Only overview printed
Integrating Habitat Fragmentation Analysis into Transportation Planning Using Effective Mesh Size Landscape Metric	Evan H. Girvetz, Alison M. Berry, James H. Thorne, and Jochen A.G. Jaeger	Calculate mesh size to asses the level of landscape fragmentation and how that may impact 2 species: mule deer and mtn. lion.	Entire State of California		ICOET 2007 Proceedings		Only overview printed
Using Tools to Support Decision-Making for Multiple Benefits in Transportation and Conservation	Shara Howie, Kimberly Majerus, and Shari Schaftlein	a discussion of the approaches used in the workshops to bring together transportation and environmental practitioners to link conservation and transportation planning	Arizona, Arkansas, Colorado	FHWA Headquarters Project Development and Environmental Review Office, FHWA Division Offices, state departments of transportation, NatureServe, and Defenders of Wildlife	ICOET 2007 Proceedings		Only overview printed
Incorporating Road-Mortality Hotspot Modeling and Connectivity Analysis into Road Mitigation Planning in Ontario, Canada	Kari E. Gunson, David Ireland, Fred Schueler	Develop GIS habitat mapping model to identify mortality hotspots, and combining hotspots with natural heritage systems to incorporate landscape connectivity. Prioritize areas for mitigation.	Ontario, Canada	Ontario Road ecology Group: non-gov, gov, scientists, educators and transportation planners	ICOET 2009 Proceedings	Give figures on time and money	Full copy printed
Are We There Yet? A Case for Spatially Explicit Linkage Modeling for Integrative Conservation Planning	Julia Kintsch, Connor Bailey	To provide practical spatially explicit data for linkages- detail oriented: Corridor Design methodology: free GIS tool	Colorado		ICOET 2009 Proceedings		Full copy printed

Factors influencing the Effectiveness of Wildlife Underpasses in Banff National Park, Alberta, Canada	Anthony P. Clevenger, Nigel Waltho	To Test whether wildlife crossing structures serve large mammals equally- modeled responses to 14 variables related to underpass structure, landscape features, and human activity.	Banff National Park, Alberta, Canada	Conservation Biology, Vol. 14., No. 1 (Feb., 2000), pp. 47-56	Used radio telemetry, pellet counts, and habitat-suitability indices.	Full copy printed
Landscape Connectivity: A Graph-Theoretic Perspective	Dean Urban, Timothy Keitt	Developed a general set of analysis using a hypothetical landscape mosaic of habitat patches in a non-habitat matrix- then applied it to Mexican Spotted Owl		Ecology, Vol. 82, No. 5 (May, 2001), pp. 1205-1218		Only overview printed
A Graph-Theory Framework for Evaluating Landscape Connectivity and Conservation Planning	Emily S. Minor, Dean L. Urban	Used graph theory to characterize multiple aspects of landscape connectivity in a habitat network	North Carolina Piedmont	Conservation Biology, Vol. 22, No. 2 (Apr., 2008), pp. 297-307	Abstract only available	Not printed
Incorporating Habitat Use in Model of Fauna Fatalities on Roads	Erin Roger, Daniel Ramp	Aimed to highlight the benefit of using habitat use to improve the accuracy of predictive road fatality models- using wombats	Snowy Mnts Highway, southern New South Wales, Australia	Diversity and Distributions, Vol. 15, No. 2 (Mar., 2009), pp. 222-231	Abstract only available	Not printed
GIS-Generated, Expert-Based Models for Identifying Wildlife Habitat Linkages and Planning Mitigation Passages	Anthony P. Clevenger, Jack Wierzchowski, Bryan Chruszcz, Kari Gunson	Three black bear habitat models in the context of GIS to identify linkage areas across a major highway- one model based on empirical habitat data, the two others (opinion-based and literature based) based on expert information.	Between Yellowstone and Canadian Border	Conservation Biology, Vol. 16, No. 2, (Apr., 2002), pp. 503-514		Full copy printed
Use of Empirically Derived Source-Destination Models to Map Regional Conservation Corridors	Samual A. Cushman, Kevin S. McKelvey, Michael K. Schwartz	A new method that combines empirically derived landscape resistant maps and least cost path analysis between multiple source and destination locations to assess habitat isolation and identify corridors and barriers to organism movt for American Black Bears	Between Yellowstone and Canadian Border	Conservation Biology, Vol. 23, No. 2, (Apr., 2009), pp. 368-376	methods are generic and can be applied to virtually any species for which maps of landscape resistance can be developed	Full copy printed

Effects of Road Fencing on Population Persistence	Jochen A.G. Jaeger, Lenore Fahrig	examined the trade off fences have of decreasing mortality but increasing barriers with a stochastic, spatially explicit, individual-based model of population dynamics			Conservation Biology, Vol. 18, No. 6 (Dec., 2004), pp. 1651-1657		Not printed
Using Boundary-Detection Methods to Assess Conservation Corridors	John DiBari	Boundary detection techniques were used to assess the robustness of least-cost path and corridor analysis created to identify movt for grizzly bears. Boundaries were tested to see whether they were statistically unusual and tested for boundary continuity using a graph theoretic approach.	interior temperate rainforest of western Canada and northwestern U.S.		Journal of Conservation Planning, Vol. 5, (2009), pp. 15-27	May help to identify landscape features that effect connectivity	Not printed
The Functional Linkage Index: A Metric for Measuring Connectivity among Habitat Patches Using Least-Cost Distances	Jeff P. Lin	A new metric for measuring connectivity among groups of patches. Based on the concept of proximity index, but incorporated the use of least-cost distances and more robust measures of habitat value.			Journal of Conservation Planning, Vol. 5, (2009), pp. 28-37	A publicly available tool developed for the use in ESRI's ArcGIS 9.2 or 9.3.	Not printed
Assessing Wildlife Habitat Connectivity in the Interstate 90 Snoqualmie Pass Corridor, Washington. U.S. Forest Service, Wenatchee, Washington	Shingleton, Peter et al.	GIS least-cost path modeling of landscape patterns to identify linkage areas, GIS analysis of ungulate road kill patterns	Washington	U.S. Forest Service, Wenatchee, Washington	U.S. Forest Service, Wenatchee, Washington		Full copy in Dirk's files
A GIS-Based Identification of Potentially Significant Wildlife Habitat Associated with Roads in Vermont	Austin, John M et al.	To develop a GIS based analysis using landscape-scale data to identify or predict the location of potentially significant WLHs associated with state roads throughout Vermont.	Vermont		ICOET 2005 Proceedings	Also made a database for all wildlife road mortality, wildlife crossings, and related habitat data.	Full copy in Dirk's files
Integrating Conservation and Transportation Planning		TNC identified three general types of conservation planning and hexagons were used to create maps to illustrate areas in Pennsylvania important to biodiversity and how it relates to transportation planning.	Pennsylvania	TNC	TNC, 2006		Full copy in Dirk's files

A Comparison-Shopper's Guide to Connectivity Metrics	Justin M. Calabrese and William F. Fagan	A description of connectivity concepts that focus on a data-dependent framework for classifying connectivity metrics as opposed to the more controversial methods that focus on theoretical issues. Highlights the costs and benefits of using such alternative methods.		Department of Biology, University of Maryland	The Ecological Society of America	Full copy in Michelle's files
Linking Colorado's Landscapes: A Statewide Assessment of Wildlife Linkages Phase 1 Report		A large report with project description, focal species, connectivity modeling, priority linkage selection, future research, and lessons learned.	Colorado	Southern Rockies Ecosystem Project	Southern Rockies Ecosystem Project	Full copy in Michelle's files

Title	Author	Purpose	Study Location	Who	Source	Notes	Status
Developing Fauna-Friendly Transport Structures: Analysis of the Impact of Specific Road Engineering Structures on Wildlife Mortality and Mobility	Christof Elmiger & Marguerite Trocme	Examined all structures such as drainage, curbs, gullies, culverts, noise barriers, lighting and retaining walls to identify hazards and solutions. Certain solutions have been tested on a local scale.			ICOET 2007 Proceedings		Only overview printed
Developing the "Integrated Transportation and Ecological Enhancements for Montana" (ITEEM) Process: Applying the Eco-Logical Approach	Amanda Hardy and Ted Burch	First effort to apply Eco-Logical guidelines created by federal multi-agency team in considering alternative approaches	Montana	an interagency working group	ICOET 2007 Proceedings		Only overview printed
North American Decision Guidelines for Mitigating Roads for Wildlife	John Bissonette	Interactive Website with clearly written guidelines for crossing structures, monitoring effectiveness, and maintenance including 7 studies.	North America		ICOET 2007 Proceedings	www.wildlifeandroads.org	Only overview printed
Construction of a Highway Section Within a White-Tailed Deer Winter Yard Near Quebec City, Canada: Mitigation Measures, Monitoring, and Preliminary Results	Yves Leblanc, Jacques Belanger, Sylvie Desjardins	The new highway incorporated an unprecedented number of mitigation measures to maintain connectivity- including fences, underpasses, and bridges.	Quebec, Canada		ICOET 2007 Proceedings		Only overview printed
The Evolution of Wildlife Exclusion Systems on Highways in British Columbia	Leonard E. Sielecki	Specialized fencing and related structures designed to safely protect wildlife by recognizing species specific behavioral, physical, and anatomical characteristics.	British Columbia	BCMoT	ICOET 2007 Proceedings	continually reviewing the designs and components in an ongoing effort to improve them.	Only overview printed
Role of Fencing in Promoting Wildlife Underpass Use and Highway Permeability	Norris L. Dodd and Susan Boe	comparison of before and after fencing was put in to link 4 wildlife underpasses and three bridges	Arizona		ICOET 2007 Proceedings		Only overview printed

Wildlife Mitigation and Human Safety for Sterling Highway MP58-79, Kenai Peninsula, Alaska	Richard Ernst, Jess Selinger, Jim Childers, Dale Lewis, Gary Olson	To reconstruct a section of highway within a refuge with high moose- vehicle collisions while increasing connectivity- describes study and interim results from 2005-2006	Sterling Highway in Alaska	Federal Highway Administration, Alaska Departments of Transportation and Public Facilities, Fish and Game, Public Safety, The Alaska Moose Federation, and the U.S. Fish and Wildlife Service.	ICOET 2007 Proceedings		Only overview printed
New Concepts in Wildlife Habitat Linkage Assessments to Focus Mitigation Measures and Reduce Wildlife Crossing Costs	William C. Ruediger, Ken and Robin Wall	Describes successful wildlife linkage assessments in Utah and Idaho with recommendations to reduce costs and effective crossing structures.	Utah and Idaho	DOT engineers, resource agency professionals, highway maintenance, personal, and GIS modeling	ICOET 2009 Proceedings		Full copy printed
Bozeman Pass Wildlife Pre-and Post-Fence Monitoring Project	April C. Craighead, Frank L. Craighead, Lauren Oechsli	Before and after monitoring of 2 miles of wildlife fencing, cattle guards, and landscape design modification into the reconstruction of a Rail Link overpass, a wildlife fence, and four jump-outs.	Bozeman Pass, Montana		ICOET 2009 Proceedings	Suggest low cost fences alone can be added to help direct animals through existing structures	Full copy printed
Evaluation of an Animal-Activated Highway Crosswalk Integrated with Retrofit Fencing Applications	Norris L. Dodd, Jeffery W. Gagnon, Raymond E. Schweinsburg	Evaluated the efficacy of 4km of retrofit fencing integrated with an animal-activated detection system to reduce collisions and maintain permeability. Fences funneled animals to 2 underpasses and a bridge, signs alerted drivers	Arizona		ICOET 2009 Proceedings		Full copy printed
Drainage Culverts as Habitat Linkages and Factors Affecting Passage by Mammals	Anthony P. Clevenger, Nigel Waltho	Investigate culverts used by small and medium sized mammals with expected passage frequencies and species performance indices. Measured effects of traffic volume, noise levels, and road width, and structural variables.	Banff National Park, Alberta, Canada		Journal of Applied Ecology, Vol. 38, No. 6 (Dec., 2001), pp. 1340-1349		Not Printed

Effects of Road Fencing on Population Persistence	Jochen A.G. Jaeger, Lenore Fahrig	examined the trade off fences have of decreasing mortality but increasing barriers with a stochastic, spatially explicit, individual-based model of population dynamics			Conservation Biology, Vol. 18, No. 6 (Dec., 2004), pp. 1651-1657	Recommend the use of fences when traffic is so high that animals almost never succeed in crossing or species is of concern. They discourage fences if population is stable or species need access to both sides- unless used with crossing structure.	Not Printed
Forks in the Road: Choices in Procedures for Designing Wildland Linkages	Paul Beier, Daniel R. Majka, Wayne D. Spencer	A roadmap of 16 choices and assumptions in designing linkages. Recommend serving multiple species and ecological processes, explicitly including models of uncertainty. There is room for substantial improvement in procedures in relation to climate change and other conservation goals.			Conservation Biology, Vol. 22, No. 4 (Aug., 2008), pp. 836-851		Full copy printed
Critical Paths: Enhancing Road Permeability for Wildlife in Vermont	Leoniak, George et al	Prioritize road crossing areas with GIS modeling and field research with strategies to increase permeability of sites and specific management plans to increase connectivity.	Vermont	Assist Vermont's State Wildlife Action Plan (SWAP)	Dirk's Hard Copy Files. 2009.		Full copy in Dirk's files
Assessing Wildlife Habitat Connectivity in the Interstate 90 Snoqualmie Pass Corridor, Washington. U.S. Forest Service, Wenatchee, Washington	Shingleton, Peter et al.	GIS least-cost path modeling of landscape patterns to identify linkage areas, GIS analysis of ungulate road kill patterns	Washington	U.S. Forest Service, Wenatchee, Washington	U.S. Forest Service, Wenatchee, Washington.		Full copy in Dirk's files
Home on the Range: A Corridor for Wildlife	Dean, Cordeila	An article about a Zoologist for the World Wildlife Funs and their efforts to mitigate transportation effects in wildlife in Banff National Park.	Banff National Park, Alberta, Canada	New York Times	New York Times, 2006.		Full copy in Dirk's files
The Missing Linkages Project: Restoring Wildland Connectivity to Southern California	Spencer, Wayne	Selected 15 priority linkages with 12-20 focal species per linkage, researched the needs of these species, obtained spatial and field data, and made detailed recommendations for creating highway crossing structures.	South Coast Ecoregion in California		ICOET Proceedings.		Full copy in Dirk's files

Evaluation of Wildlife Crossing Structures: Their Use and Effectiveness	Hartmann, Maureen	Discusses different highway mitigation techniques and the lack of data and ambiguity concerning their effectiveness with several case studies.		Wildlands CPR, Missoula, MT	Wildlands CPR, Missoula, MT.	Full copy in Dirk's files
The Ecological Effects of Roads- Or- The Road to Destruction	Noss, Reed	Reviews the ecological effects of different types of roads and roadside development and the direct as well as indirect effects in community structure and ecological processes. Also recommendations for mitigation efforts.		Wildlands CPR, Missoula, MT	Wildlands CPR, Missoula, MT.	Full copy in Dirk's files
Quick Fixes: Working Together to Address Herptile Road Mortality in New York State	Nelson, Debra et al.	NYSDOT's innovative responses to citizens concerns about herptile mortality: specifically 2 projects with crossing structures and culverts.	New York State	NYSDOT, Suny ESF and private citizens	ICOET 2005 Proceedings	Full copy in Michelle's files
Management Considerations for Designing Carnivore Highway Crossings	Bill Ruediger	Covers basic steps for carnivore crossings including: relationship building, planning areas for wildlife crossings, selecting appropriate crossings, and monitoring the effectiveness.		Wildlife Consulting Resources contracted by USDA Forest Service Wildlife, Fish and Watershed Unit		Full copy in Michelle's files
Mitigating Potential Impacts of Hertile Habitat Loss and Fragmentation From New Roadway Construction in Southern New York State	Ed Samanns and Sebastian Zacharias	Mitigation plan for the spotted turtle and Jefferson salamander. Includes replacing wetland habitat and vernal pools and constructing underpasses in priority areas based on numerous ecological considerations	Southern New York State	NYSDEC, NYSDOT, NYTA and the Louis Berger Group	ICOET 2003 Proceedings	Full copy in Michelle's files
Ecological Considerations in the Design of River and Stream Crossings	Scott D. Jackson	Highlights the growing concern about the role of road crossings, especially culverts- in altering habitat and disrupting river and stream continuity. Suggest new design to enhance both crossing value and ecosystem processes.		Department of Natural Resources Conservation, University of Massachusetts, Amherst, Mass.	ICOET 2003 Proceedings	Full copy in Michelle's files
Draft Guidelines for Development of Conservation Alternative Mowing Plans for Interstate, Expressway and Parkway Roads	Kurt Weiskotten	Overview and recommendations for alternative mowing along roadsides to promote wildlife use of habitats, particularly foraging and nesting habitat for grassland birds, while maintaining a safe and aesthetic roadside for travelers.	New York State	NYSDOT	ICOET 2003 Proceedings	Full copy in Michelle's files

Safe Passage: A User's Guide to Developing Effective Highway Crossings for Carnivores and Other Wildlife	Bill Ruediger	A pamphlet with guides on building relationships, determining linkages, connectivity planning, mitigation measures, monitoring, and species specific info.		several state depts., non-governmental organizations, federal agencies, state wildlife agencies and academic institutions	Wildlife Consulting Resources	Full copy in Michelle's files
Linking Colorado's Landscapes Phase II Report: Linkage Assessment Methodology		A large report following up on the previous one: covering wildlife linkage assessments, data collection and field assessments, recommended mitigation measures, flawed measures, and cost estimates.	Colorado	Southern Rockies Ecosystem Project	Southern Rockies Ecosystem Project	Full copy in Michelle's files

Title	Author	Purpose	Study Location	Who	Source	Notes	Status
Application of Ecological Assessments to Regional and Statewide Transportation Planning	Joseph Burns	Considers the value of ecological assessments and components of those assessments which may offer the greatest value to transportation planners.			ICOET 2007 Proceedings		Only overview printed
Linking Statewide Connectivity Planning to Highway Mitigation: Taking the Next Step in Linking Colorado's Landscapes	Julia Kintsch	To identify, prioritize and assess wildlife linkages.	Colorado	Colorado DOT, FHWA, Southern Rockies Ecosystems Project	ICOET 2007 Proceedings		Only overview printed
Wildlife Connectivity Across Utah's Highways	Paul W. West	Workshop to indentify major sections of highways that disrupt connectivity. 64 locations identified and prioritized based on professional opinions and experiences of biologists familiar with area.	Utah	Utah DOT, Utah Division of Wildlife Resources, U.S. Forest Service, U.S. Fish and Wildlife Service, and several private consulting and conservation groups.	ICOET 2007 Proceedings		Only overview printed
Wildlife Mitigation and Human Safety for Sterling Highway MP58-79, Kenai Peninsula, Alaska	Richard Ernst, Jess Selinger, Jim Childers, Dale Lewis, Gary Olson	To reconstruct a section of highway within a refuge with high moose- vehicle collisions while increasing connectivity- describes study and interim results from 2005-2006	Sterling Highway in Alaska	Federal Highway Administration, Alaska Departments of Transportation and Public Facilities, Fish and Game, Public Safety, The Alaska Moose Federation, and the U.S. Fish and Wildlife Service.	ICOET 2007 Proceedings		Only overview printed
Habitat, Highway Features, and Animal-Vehicle Collision Locations as Indicators of Wildlife Crossing Hotspots	Sarah Barnum, Kurt Rinehart and Mark Elbroch	Tracking was used to record geo-referenced crossing data for GIS. Variations in landscape scale habitat composition were correlated with variations in wildlife crossing rates at the landscape scale. Diff. species showed diff. affinities for the roadside at this scale.	New Hampshire		ICOET 2007 Proceedings	Over 7000 track sets were recorded from 22 species from Dec. 05-May-06.	Only overview printed

Utilizing a Multi-Technique, Multi-Taxa Approach to Monitoring Wildlife Passageways on the Bennington Bypass in Southern VT.	Mark A. Bellis, Scott D. Jackson, Curtice R. Griffin, Paige Warren, and Alan O. Thompson	Monitor existing crossing structures and assess their effectiveness and movts at structures and surrounding landscapes with techniques including: small mammal trapping, track beds/plates, remote camera sensing, snow tracking, road kill surveys, roadside track beds, amphibian recording devices, snake pit tagging, and observational studies.	Southern Vermont	Bennington Bypass Project	ICOET 2007 Proceedings	GOOD STUDY	Only overview printed
Incorporating Road-Mortality Hotspot Modeling and Connectivity Analysis into Road Mitigation Planning in Ontario, Canada	Kari E. Gunson, David Ireland, Fred Schueler	Develop GIS habitat mapping model to identify mortality hotspots, and combining hotspots with natural heritage systems to incorporate landscape connectivity. Prioritize areas for mitigation.	Ontario, Canada	Ontario Road ecology Group: non-gov, gov, scientists, educators and transportation planners	ICOET 2009 Proceedings	Give figures on time and money	Full copy printed
New Concepts in Wildlife Habitat Linkage Assessments to Focus Mitigation Measures and Reduce Wildlife Crossing Costs	William C. Ruediger, Ken and Robin Wall	Describes successful wildlife linkage assessments in Utah and Idaho with recommendations to reduce costs and effective crossing structures.	Utah and Idaho	DOT engineers, resource agency professionals, highway maintenance, personal, and GIS modeling	ICOET 2009 Proceedings		Full copy printed
Using Global Positioning System Technology to Determine Wildlife Crossing Structure Placement and Evaluating Their Success in Arizona, USA	Jeffery W. Gagnon, Norris L. Dodd, Susan Boe, Raymond E. Schweinsburg	To locate passage structures and funnel fencing for wildlife and to evaluate their effectiveness through GPS. Fitted >500 animals with gps collars to determine crossing structure placement, during construction behavior, and post-construction responses.	Arizona	Arizona's Game and Fish Department, DOT, Federal Highway Administration and various federal land agencies.	ICOET 2009 Proceedings		Full copy printed
Bozeman Pass Wildlife Pre- and Post-Fence Monitoring Project	April C. Craighead, Frank L. Craighead, Lauren Oechsli	Began collecting data in 2001 on collisions and where they would best be mitigated. Before and after monitoring of 2 miles of wildlife fencing, cattle guards, and landscape design modification into the reconstruction of a Rail Link overpass, a wildlife fence, and four jump-outs.	Bozeman Pass, Montana	CERI	ICOET 2009 Proceedings	Suggest low cost fences alone can be added to help direct animals through existing structures	Full copy printed
Conserving Connectivity: Some Lessons from Mountain Lions in Southern California	Scott A. Morrison, Walter M. Boyce	Examined mammalian predator use of 21 riparian corridors of different widths, and adjacent vineyards. They used unbaited, remotely triggered cameras to determine occurrence.	Sonoma County, California		Conservation Biology, Vol. 23, No. 2 (Apr., 2009), pp. 275-285	Could only find abstract available	Only overview printed

Critical Paths: Enhancing Road Permeability for Wildlife in Vermont	Leoniak, George et al	Prioritize road crossing areas with GIS modeling and field research with strategies to increase permeability of sites and specific management plans to increase connectivity.	Vermont	Assist Vermont's State Wildlife Action Plan (SWAP)	Dirk's Hard Copy Files. 2009.		Full copy in Dirk's files
A GIS-Based Identification of Potentially Significant Wildlife Habitat Associated with Roads in Vermont	Austin, John M et al.	To develop a GIS based analysis using landscape-scale data to identify or predict the location of potentially significant WLHs associated with state roads throughout Vermont.	Vermont		ICOET 2005 Proceedings	Also made a database for all wildlife road mortality, wildlife crossings, and related habitat data.	Full copy in Dirk's files
The Missing Linkages Project: Restoring Wildland Connectivity to Southern California	Spencer, Wayne	Selected 15 priority linkages with 12-20 focal species per linkage, researched the needs of these species, obtained spatial and field data, and made detailed recommendations for creating highway crossing structures.	South Coast Ecoregion in California		ICOET Proceedings.		Full copy in Dirk's files
Management Considerations for Designing Carnivore Highway Crossings	Bill Ruediger	Covers basic steps for carnivore crossings including: relationship building, planning areas for wildlife crossings, selecting appropriate crossings, and monitoring the effectiveness.		Wildlife Consulting Resources contracted by USDA Forest Service Wildlife, Fish and Watershed Unit			Full copy in Michelle's files
Mitigating Potential Impacts of Hertile Habitat Loss and Fragmentation From New Roadway Construction in Southern New York State	Ed Samanns and Sebastian Zacharias	Mitigation plan for the spotted turtle and Jefferson salamander. Includes replacing wetland habitat and vernal pools and constructing underpasses in priority areas based on numerous ecological considerations	Southern New York State	NYSDEC, NYSDOT, NYTA and the Louis Berger Group	ICOET 2003 Proceedings		Full copy in Michelle's files
A Rapid Assessment Process for Determining Potential Wildlife, Fish and Plant Linkages for Highways	Bill Ruediger and John Lloyd	Developed and tested a rapid assessment of fish and wildlife linkages for 29 species. Utilized ecological GIS data, land ownership patterns, conservation easements, and species occurrences. Reviewed 200 miles in less than 2 days to identify priority areas.	Highway 93 in Western Montana	interagency group of local wildlife and fish experts, county, state and federal agencies and non-profit conservation interests.	ICOET 2003 Proceedings		Full copy in Michelle's files

A Summary of Deer Vehicle Accident Information in NYS Department of Transportation	Kyle Williams	A summary of deer vehicle accidents, history of reduction efforts and other options to set the foundation for increased Department awareness, discussion and proactive action.	New York State	NYSDOT Environmental Analysis Bureau	NYSDOT Environmental Analysis Bureau, Updated March 2007	Full copy in Michelle's files
Safe Passage: A User's Guide to Developing Effective Highway Crossings for Carnivores and Other Wildlife	Bill Ruediger	A pamphlet with guides on building relationships, determining linkages, connectivity planning, mitigation measures, monitoring, and species specific info.		several state depts., non-governmental organizations, federal agencies, state wildlife agencies and academic institutions	Wildlife Consulting Resources	Full copy in Michelle's files
An Assessment of Wildlife and Fish Habitat Linkages on Highway 93- Western Montana	Bill Ruediger and John Lloyd	An in depth study on identifying habitat linkages along Highway 93 in Montana	Montana: Highway 93	USDA Forest Service, USDI Fish and Wildlife Service, Confederated Salish and Kootenai Tribe, Rocky Mountain Elk Foundation, Montana Fish, Wildlife and Parks, MTDOT, Geodata Services, The University of Montana	2004	Full copy in Michelle's files
An Assessment of Wildlife Habitat Linkages on US 6 from I-5 to I-70, Utah	Bill Ruediger et. al	An in depth assessment on identifying habitat linkages on US 6 in Utah	Utah: US 6	Utah DOT, Utah Division of Wildlife Resources, Manti-La Sal National Forest, Uinta National Forest, Bureau of Land Management, U.S. Fish and Wildlife Service, and Utah State University	Utah DOT 2/1/2007	Full copy in Michelle's files
Functional Connectivity in Fragmented Landscapes	Thomas A. Scott and Michael Allen	A paper advocating for an expansion in the definition and understanding of functional connectivity to be viewed as "the rate of movement needed to achieve a population or ecosystem goal within a preserve or fragment, regardless of the mechanism used to achieve the movement", not just "the extent of movement in corridors".		Center for Conservation Biology, University of California	Center for Conservation Biology, University of California	Full copy in Michelle's files
Linking Colorado's Landscapes: A Statewide Assessment of Wildlife Linkages Phase 1 Report		A large report with project description, focal species, connectivity modeling, priority linkage selection, future research, and lessons learned.	Colorado	Southern Rockies Ecosystem Project	Southern Rockies Ecosystem Project	Full copy in Michelle's files

Linking Colorado's Landscapes Phase II Report: Linkage Assessment Methodology	A large report following up on the previous one: covering wildlife linkage assessments, data collection and field assessments, recommended mitigation measures, flawed measures, and cost estimates.	Colorado	Southern Rockies Ecosystem Project	Southern Rockies Ecosystem Project	Full copy in Michelle's files

Title	Author	Purpose	Study Location	Who	Source	Notes	Satus
Conserving the Connections: A Nationwide Inventory of State-Based Habitat Connectivity Analysis	Jesse Feinberg	reviewed all states to identify those working with connectivity and transportation planning. Goal to facilitate interagency cooperation to benefit conservation and transportation. Gives overview of all states completing analysis or project planning.	All U.S.	Defenders of Wildlife	ICOET 2007 Proceedings		Only overview printed
Measuring the Success of Wildlife Linkage Efforts	Christopher Servheen, Rebecca Shoemaker, and Pat Basting	Encourage multiple methods to measure success to provide quantitative and qualitative values. Factors should include biological impacts, economic impacts, public safety measures, social influence and acceptance, and political.			ICOET 2007 Proceedings		Only overview printed
North American Decision Guidelines for Mitigating Roads for Wildlife	John Bissonette	Interactive Website with clearly written guidelines for crossing structures, monitoring effectiveness, and maintenance including 7 studies.	North America		ICOET 2007 Proceedings	www.wildlifeandroads.org	Only overview printed
Overcoming the Barrier Effect of Roads- How effective are Mitigation Strategies? An International Review of the Use and Effectiveness of Underpasses and Overpasses Designed to Increase the Permeability of Roads for Wildlife	Rodney van der Ree, Edgar van der Grift, Cristina Mata and Francisco Suarez	Reviewed scientific rigour and methodology of 123 studies. The effectiveness of mitigation measures to reduce risk of population extinction remains unclear. Propose a clear distinction be made between "use" and "effectiveness" of structures. Many studies show structures are used but it is unclear how effective they are at increasing permeability etc.	International		ICOET 2007 Proceedings		Only overview printed
Construction of a Highway Section Within a White-Tailed Deer Winter Yard Near Quebec City, Canada: Mitigation Measures, Monitoring, and Preliminary Results	Yves Leblanc, Jacques Belanger, Sylvie Desjardins	The new highway incorporated an unprecedented number of mitigation measures to maintain connectivity- including fences, underpasses, and bridges, and measured the use and effects of them afterwards.	Quebec, Canada		ICOET 2007 Proceedings		Only overview printed
Role of Fencing in Promoting Wildlife Underpass Use and Highway Permeability	Norris L. Dodd and Susan Boe	comparison of before and after fencing was put in to link 4 wildlife underpasses and three bridges	Arizona		ICOET 2007 Proceedings		Only overview printed

Title	Author	Purpose	Study Location	Who	Source	Notes	Satus
The Use of Existing Mitigation Measures by Amphibians, Reptiles, and Small to Medium-Size Mammals in Hungary: Crossing Structures Can Function As Multiple Species-Oriented Measures	Miklos Puky, Janos Farkas, Maria Toth Ronkay	Selected mitigation crossing structures to study their use. Day and night visits with the use of reptile shedded skins, droppings, footprints, baited traps, hair traps and road kills.	Hungary		ICOET 2007 Proceedings	Tunnel system lowered amphibian road kills by 90%	Only overview printed
Utilizing a Multi-Technique, Multi-Taxa Approach to Monitoring Wildlife Passageways on the Bennington Bypass in Southern VT.	Mark A. Bellis, Scott D. Jackson, Curtice R. Griffin, Paige Warren, and Alan O. Thompson	Monitor existing crossing structures and assess their effectiveness and movts at structures and surrounding landscapes with techniques including: small mammal trapping, track beds/plates, remote camera sensing, snow tracking, road kill surveys, roadside track beds, amphibian recording devices, snake pit tagging, and observational studies.	Southern Vermont	Bennington Bypass Project	ICOET 2007 Proceedings	GOOD STUDY	Only overview printed
Are Non-Wildlife Underpasses Effective Passages for Wildlife?	Andreas Seiler and Mattias Olsson	Measured the effectiveness of 57 underpasses for connectivity by moose, deer, fox, badger, and hares. Looked at the influence of passage dimensions, design, landscapes, and disturbances.	Sweden		ICOET 2009 Proceedings	Ungulates were more sensitive to underpass dimensions than medium sized carnivores and hares. Openness, traffic within underpass, and distance to forest cover were all strong predictors for usage. Only a minor proportion of underpasses provide effective passages to deer and smaller species, and only very few to moose.	Full copy printed
Idaho Statewide Wildlife/ Transportation Database	Brent J. Inghram, Gregg Servheen, and Greg Burak	A statewide inventory of wildlife linkage areas in relation to the state highway system. Each area identified additional study needs and actions. Used rapid assessment tech., collision data, and first hand knowledge.	Idaho		ICOET 2009 Proceedings	Presented as a GIS database available to transportation planners, resource agencies, and the public.	Full copy printed

Title	Author	Purpose	Study Location	Who	Source	Notes	Satus
Using Global Positioning System Technology to Determine Wildlife Crossing Structure Placement and Evaluating Their Success in Arizona, USA	Jeffery W. Gagnon, Norris L. Dodd, Susan Boe, Raymond E. Schweinsburg	To locate passage structures and funnel fencing for wildlife and to evaluate their effectiveness through GPS. Fitted >500 animals with gps collars to determine crossing structure placement, during construction behavior, and post-construction responses.	Arizona	Arizona's Game and Fish Department, DOT, Federal Highway Administration and various federal land agencies.	ICOET 2009 Proceedings		Full copy printed
Bozeman Pass Wildlife Pre-and Post-Fence Monitoring Project	April C. Craighead, Frank L. Craighead, Lauren Oechsli	Began collecting data in 2001 on collisions and where they would best be mitigated. Before and after monitoring of 2 miles of wildlife fencing, cattle guards, and landscape design modification into the reconstruction of a Rail Link overpass, a wildlife fence, and four jump-outs.	Bozeman Pass, Montana	CERI	ICOET 2009 Proceedings	Suggest low cost fences alone can be added to help direct animals through existing structures	Full copy printed
A Quantitative Comparison of the Reliability of Animal Detection Systems and Recommended Requirements for System Reliability	Marcel P. Huijser, Tiffany D.H. Allen, Matt Blank, Mark C. Greenwood, Shaowei Wang	Testing reliability of animal detection systems that alert drivers when wildlife are nearby or crossing highways. Compared 9 different systems	Montana		ICOET 2009 Proceedings	Some systems were more accurate than others and quite useful, but researchers commented that the robustness of these systems may have to be improved before the systems can be deployed on a large scale when taking into account installation, operation and maintenance.	Full copy printed
Evaluation of an Animal-Activated Highway Crosswalk Integrated with Retrofit Fencing Applications	Norris L. Dodd, Jeffery W. Gagnon, Raymond E. Schweinsburg	Evaluated the efficacy of 4km of retrofit fencing integrated with an animal-activated detection system to reduce collisions and maintain permeability. Fences funneled animals to 2 underpasses and a bridge, signs alerted drivers	Arizona		ICOET 2009 Proceedings		Full copy printed
The Economics of Mitigation and Cost-Effective Strategies	Marcel P. Huijser, John W. Duffield, Anthony P. Clevenger, Robert J. Ament, Pat T. McGowen	To provide justification of mitigation spending as an example of cost-benefit analysis of reducing vehicle collisions where mitigation strategies have been proven effective. Calculated the costs associated with a deer or elk- vehicle collision , and set threshold values for when individual mitigation measures start generating economic benefits in excess of costs.	Canada		ICOET 2009 Proceedings		Full copy printed

Title	Author	Purpose	Study Location	Who	Source	Notes	Satus
Factors influencing the Effectiveness of Wildlife Underpasses in Banff National Park, Alberta, Canada	Anthony P. Clevenger, Nigel Waltho	To Test whether wildlife crossing structures serve large mammals equally- modeled responses to 14 variables related to underpass structure, landscape features, and human activity.	Banff National Park, Alberta, Canada		Conservation Biology, Vol. 14., No. 1 (Feb., 2000), pp. 47-56	Used radio telemetry, pellet counts, and habitat-suitability indices.	Full copy printed
Drainage Culverts as Habitat Linkages and Factors Affecting Passage by Mammals	Anthony P. Clevenger, Nigel Waltho	Investigate culverts used by small and medium sized mammals with expected passage frequencies and species performance indices. Measured effects of traffic volume, noise levels, and road width, and structural variables.	Banff National Park, Alberta, Canada		Journal of Applied Ecology, Vol. 38, No. 6 (Dec., 2001), pp. 1340-1349		Only overview printed
Ability of Wildlife Overpasses to Provide Connectivity and Prevent Genetic Isolation	Luca Corlatti, Klaus Hacklander, Fredy Frey-Roos	Reviewed research on wildlife overpasses in the context of genetic effectiveness to provide connectivity to isolated patches. Data is lacking on effectiveness of such structures, and the use itself of overpasses does not appear sufficient to assess effectiveness from a genetic viewpoint.			Conservation Biology, Vol. 23, No. 3 (Jun., 2009), pp. 548-556	No evidence that overpasses address the genetic issue yet.	Full copy printed
Using Boundary-Detection Methods to Assess Conservation Corridors	John DiBari	Boundary detection techniques were used to assess the robustness of least-cost path and corridor analysis created to identify movt for grizzly bears. Boundaries were tested to see whether they were statistically unusual and tested for boundary continuity using a graph theoretic approach.	interior temperate rainforest of western Canada and northwestern U.S.		Journal of Conservation Planning, Vol. 5, (2009), pp. 15-27	May help to identify landscape features that effect connectivity	Only overview printed
Wildlife Crossings in North America: The State of the Science and Practice	Cramer, Dr. P.C. and Bissonette, Dr. John A.	The results from a phone survey of 250 transportation professionals and practice and science of road ecology. A summary of North American efforts to mitigate road effects, including # of crossing structures and the wide-trend of neglect with maintenance.	U.S. and Canada	National Cooperative Highway Research Program	ICOET 2005 Proceedings.		Full copy in Dirk's files
Evaluation of Wildlife Crossing Structures: Their Use and Effectiveness	Hartmann, Maureen	Discusses different highway mitigation techniques and the lack of data and ambiguity concerning their effectiveness with several case studies.		Wildlands CPR, Missoula, MT	Wildlands CPR, Missoula, MT.		Full copy in Dirk's files

Title	Author	Purpose	Study Location	Who	Source	Notes	Satus
Habitat Connectivity and Rural Context Sensitive Design: A Synthesis of Practice	McGowen, Patrick, P.E.	To synthesize the abundance of information related to transportation applicable to transportation planners at the MT. Dept. of Transportation. Does not include recommendations or guidelines, but rather case studies and practices of other states related to sustainable transportation in Montana.	Synthesis of other states for Montana's use	Western Transportation Institute	Western Transportation Institute.		Full copy in Dirk's files
Guide to Transportation Planning and Projects Affecting Wildlife in the U.S. Northern Rockies		Identifies the effects of highways on wildlife, the transportation systems and management, the planning process for transportation, the role of public participation, and the laws and regulations for making your case for transportation mitigation projects to benefit wildlife connectivity	U.S. Northern Rockies	American Wildlands	American Wildlands.		Full copy in Dirk's files
Management Considerations for Designing Carnivore Highway Crossings	Bill Ruediger	Covers basic steps for carnivore crossings including: relationship building, planning areas for wildlife crossings, selecting appropriate crossings, and monitoring the effectiveness.		Wildlife Consulting Resources contracted by USDA Forest Service Wildlife, Fish and Watershed Unit			Full copy in Michelle's files
Safe Passage: A User's Guide to Developing Effective Highway Crossings for Carnivores and Other Wildlife	Bill Ruediger	A pamphlet with guides on building relationships, determining linkages, connectivity planning, mitigation measures, monitoring, and species specific info.		several state depts., non-governmental organizations, federal agencies, state wildlife agencies and academic institutions	Wildlife Consulting Resources		Full copy in Michelle's files
Linking Colorado's Landscapes Phase II Report: Linkage Assessment Methodology		A large report following up on the previous one: covering wildlife linkage assessments, data collection and field assessments, recommended mitigation measures, flawed measures, and cost estimates.	Colorado	Southern Rockies Ecosystem Project	Southern Rockies Ecosystem Project		Full copy in Michelle's files

Title	Author	Purpose	Study Location	Who	Source	Notes	Status
Road Watch in the Pass: Web Based Citizen Involvement in Wildlife Data Collection	Tracy Lee, Dr. Mike Quinn, Danah Duke	Documenting wildlife observations along a highway pass to provide a framework for mitigation. Submit observations with interactive web-based tool, phone hotline, or with systematic surveys.	Canadian Rockies		ICOET 2009 Proceedings	Has been successful in connecting citizens, researchers, volunteers and decision makers. Mapping software is freely distributed and accessible thus allowing programmers to access and modify the code to meet their needs.	Full copy printed
Motorists as Citizen Scientists: The Benefits of a Wildlife Reporting Website	Angelica V. Kociolek, Marcel P. Huijser, Doug Garlarus, Dylan W. Taylor, Julia Kintsch	A wildlife reporting website for citizens for dead or alive animals. Helps with placement of mitigation efforts .		Western Transportation Institute	ICOET 2009 Proceedings	Since 2008, website has been modified for 2 similar projects in Montana and Colorado and has boosted data collection and helped with mitigation measures.	Full copy printed
Can Citizen Science Represent Wildlife Activity Along Highways? Validating a Monitoring Program	Kylie Paul, Jon Graham, Len Broberg, Michael S. Quinn, Marcel Huijser	Critiqued citizen science observations (specifically Road Watch in The Pass) and concluded that it was limited in its ability to make some statistical conclusions, but despite these problems, the spatial distribution of citizen's observations corresponded with the systematic datasheet, and other important differences were not significant.			ICOET 2009 Proceedings	They recommend several modifications to enhance the use of citizen science.	Full copy printed
Maine Audubon Wildlife Road Watch		Website for citizen observations and interactive maps	Maine	Maine Audubon Wildlife Road Watch	http://www.wildlifecrossing.net/maine/map/wildlife		

Title Page	Organization	Purpose	Location	URL	Notes
Maine Audubon Wildlife Road Watch	"	Website for citizen observations and interactive maps	Maine	http://www.wildlifecrossing.net/maine/map/wildlife	
Wildlife Protection and Habitat Connectivity	University of Florida's Landscape Ecology Program	GIS computer model that captures, manipulates, displays, and combines spatial information such as hydrology, land-use, species distribution, and existing roads and greenways that will help	Florida	http://www.fhwa.dot.gov/environment/hconnect/index.htm	
Idaho: Idaho Transportation/Wildlife Database	Idaho Transportation Dept, Idaho Fish and Game, and partner organizations.	Allow access and review of wildlife linkage areas along state and federal highways. Data was collected through a state-wide study of linkage areas utilizing rapid assessment techniques and holding a series of workshops to pool knowledge. GIS computer model refined and plotted data resulting in large scale depictions of habitats and linkage areas.	Idaho	http://www.environment.fhwa.dot.gov/ecosystems/eei/id09.asp	
Maryland: U.S. 301 Waldorf Area Transportation Improvements Project	Maryland State Highway Administration	To promote actions that extend beyond required mitigation and meet environmental stewardship objectives. They developed a list of priority areas for restoring or sustaining natural systems with a focus on watersheds. Agencies agreed to utilize this same list in selecting required mitigation actions for transportation projects.	Maryland	http://www.environment.fhwa.dot.gov/ecosystems/eei/md09_301.asp	
Oregon: Wildlife Movement Strategy	Oregon Department of Fish and Wildlife and Oregon Department of Transportation	Develop a wildlife movt. Strategy that identifies priorities for animal movement and provides technical guidance for wildlife passage improvements.	Oregon	http://www.environment.fhwa.dot.gov/ecosystems/eei/or09_wild.asp	
Beginning with Habitat	Collaboration of federal, state and local agencies, and non- governmental organizations	Habitat based approach to conserving wildlife and plant habitat. Compile habitat info from multiple sources and integrate it to one package to make it accessible to towns and organizations. Each town is provided with maps and tools to implement habitat conservation.	Maine	http://www.beginningwithhabitat.org	
Identifying the Best Locations Along Highways to Provide Safe Crossing Opportunities for Wildlife	Colorado Department of Transportation	A manual to aid highway planners in managing wildlife crossings by describing highway and landscape variables that designers should consider when choosing best locations for mitigation that helps medium- and large-sized mammals cross highways safely.	Colorado	http://www.coloradodot.info/programs/research/pdfs/2003/wildlifecrossing.pdf/view	
Road Ecology Center	University of California, Davis	Brings together researchers and policy makers from ecology and transportation to design sustainable transportation systems based on an understanding of the impact of roads on natural landscapes and human communities.	California	http://roadecology.ucdavis.edu/	

The Northeast Transportation & Wildlife Conference: Summary and Strategic Directions	hosted by the Vermont Agency of Transportation (VTrans), Vermont Department of Fish and Wildlife, and the National Wildlife Federation	Two day conference to share successes and identify new opportunities to better integrate conservation and transportation. Focused on projects within Vermont, New Hampshire, and Maine.	Vermont, New Hampshire, and Maine	http://environment.transportation.org/pdf/proj_delivery_stream/ntwc_final_report.pdf
Eco-Kare International	Eco-Kare International	federally incorporated company established in 2009 in response to an increasing demand for green infrastructure. Specialize in effective transportation planning and cost-effective mitigation design (ie structures such as overpasses and underpasses, fencing, wildlife warning signage, and animal detection systems to meet the environmental and safety objectives of road development projects).	Toronto, Canada	http://eco-kare.com/index.html

APPENDIX 6: PROJECT 12 -
COMPARISON OF CONNECTIVITY GIS MODELING APPROACHES

Comparison of Modeling Approaches:

	Least Cost Path	FunConn	Corridor Designer	Circuitscape
Developed By	ESRI	Colorado State University, STARMAP	CorridorDesign	
Summary	Identifies the least costly route for an organism to move from one destination to another	Assess the landscape based on animal perception. Graph theory considers all habitat patches and distance/ barriers between them to identify most important connections and patches.	A suite of ArcGIS tools to identify and evaluate corridors between fragmented habitat blocks	Using Electric Circuit Theory to predict patterns of flow in heterogeneous landscapes • Predict Flow Between multiple "Nodes" • Consider effects of all possible pathways simultaneously
Inputs	1. Habitat Suitability Grid (land cover, elevation, hrydrography) 2. Barriers Grid (defined by transportation network)	**I. Habitat Quality Raster** 1. Habitat preferences 2. Resource threshold 3. Minimum patch size 4. Patch structure 5. Disturbance (reclass table) 6. Aggregation Factor **II. Define functional patches** 1. Habitat quality raster (**I**) 2. Minimum patch size 3. Patch foraging radius 4. Core habitat percentage (default at 0.1) 5. Resource quality threshold **III. Build Landscape Network** 1. Functional patches raster (**II**) 2. Land cover with disturbance - Use disturbance reclass table already created (land cover with roads, etc. burned) 3. Land cover permeability table - Ranks how easily an organism can move through a habitat.	**Create Habitat Suitability Model** 1. Distance from Roads 2. Elevation 3. Land cover 4. Topographic Position 5. Weights assigned to each of the above 4 habitat factors 6. Patch size information **Create Habitat Patch Map** 1. Habitat Suitability Model (HSM) 2. Average HSM for perceptual range 3. Habitat patch quality threshold 4. Minimum breeding size (ha) 5. Minimum population patch size (ha) **Create Corridor Model** 1. HSM 2. Average HSM for perceptual range 3. Habitat patch quality threshold 4. Minimum breeding size (ha) 5. Minimum population patch size (ha)	Inputs to Curcuitscape as ASCII Files (Grids) 1. Nodes (points or polygons) 2. Resistance Surface (Cost Surface) 3. Optional - Matrix (lookup table) to limit which nodes are "connected" in the circuit
Software Requirements	ArcGIS v9.x , Spatial Analyst	ArcGIS v9.1, ArcInfo & Spatial Analyst	ArcGIS 9.1-9.3, Spatial Analyst, Python 2.1 or newer	Standalone application.
Strengths	• Runs solely off ArcGIS with Spatial Analyst • May be more useful for conceptually depicting movement zones (Marangelo) • Identifies paths/corridors between two locations (Users can use lines or polygons as starting and ending points so this is not strictly true. If you choose each cell for the path type it will create a path for each pixel).	• Set of ArcToolbox tools with step by step modeling approach. • Incorporates habitat patches into connectivity results. • Once patch's are created all directions are considered when creating the corridors and linkages. • Corridors and linkages can be compared to determine which is the most "efficient" by creating a minimum spanning tree.	• Set of ArcToolbox tools with relatively simple step by step modeling approach. • Incorporates habitat patches into connectivity results • Usable following download, no identified special software or hardware requirements • Good tutorial available • Current TNC employee developed so we can probably get help somewhat easily	• Offers greater potential to identify multiple movement zones • Better at identifying true pinchpoints than Least Cost Path (Marangelo) • May be a better tool for identifying specific on-the-ground conservation objectives – greater spatial resolution (than Least Cost Path, Marangelo) • Current TNC employee developed so we can probably get help somewhat easily • Can (in-theory) derive measures of connectivity based on "resistance distance" and "commute times" • Theoretically based on "random walk", not a cumulative mathematical cost algorithm
Limitations	Doesn't incorporate habitat patches into least cost pathways/corridors The quality of your cost surface can make a huge difference in how well Least Cost Path works. If you have a community habitat layer instead of broad landcover types the model can be much more accurate. Also including slope, aspect and other geomorphic features can help depending on species.	Requires ArcGIS v9.1. Variables (such as patch composition) can have enormous influence on model results. Major limitation is getting inputs like patch size and home range distances that scientists can agree upon. The range of data values we had from our interviews made deciding which input value to use quite difficult.	Point A to B focused, doesn't consider making multiple connections in single model run.	Stand alone application – doesn't run in ArcGIS. Probably will require investment in new hardware (needs lots of RAM). Current Limitations identified by ME: • 1 – 2 million cells in Windows, regardless of RAM • Up to ~25 million cells w/ 12GB of RAM in Linux. More RAM = more cells possible • Number of nodes independent of RAM, but time becomes a limiting factor with many nodes Based on Katie's experience, Windows XP (3Ghz 4GB RAM) works fine with under 1 million cells, multiple nodes (55 nodes, 40 min processing time). Can batch for a larger study area.
Hardware Suggestions				RAM intensive. May need to go to Linux for RAM utilization. ME using a 64-bit pc with dual core 3GHz processor, 12 GB RAM, running Ubuntu 9.1 (free) Limitation: 1 – 6 million cells NH study area: ~ 8 million cells at 30 meter resolution
Publications			http://corridordesign.org/downloads	http://www.circuitscape.org/Circuitscape/Pubs.html