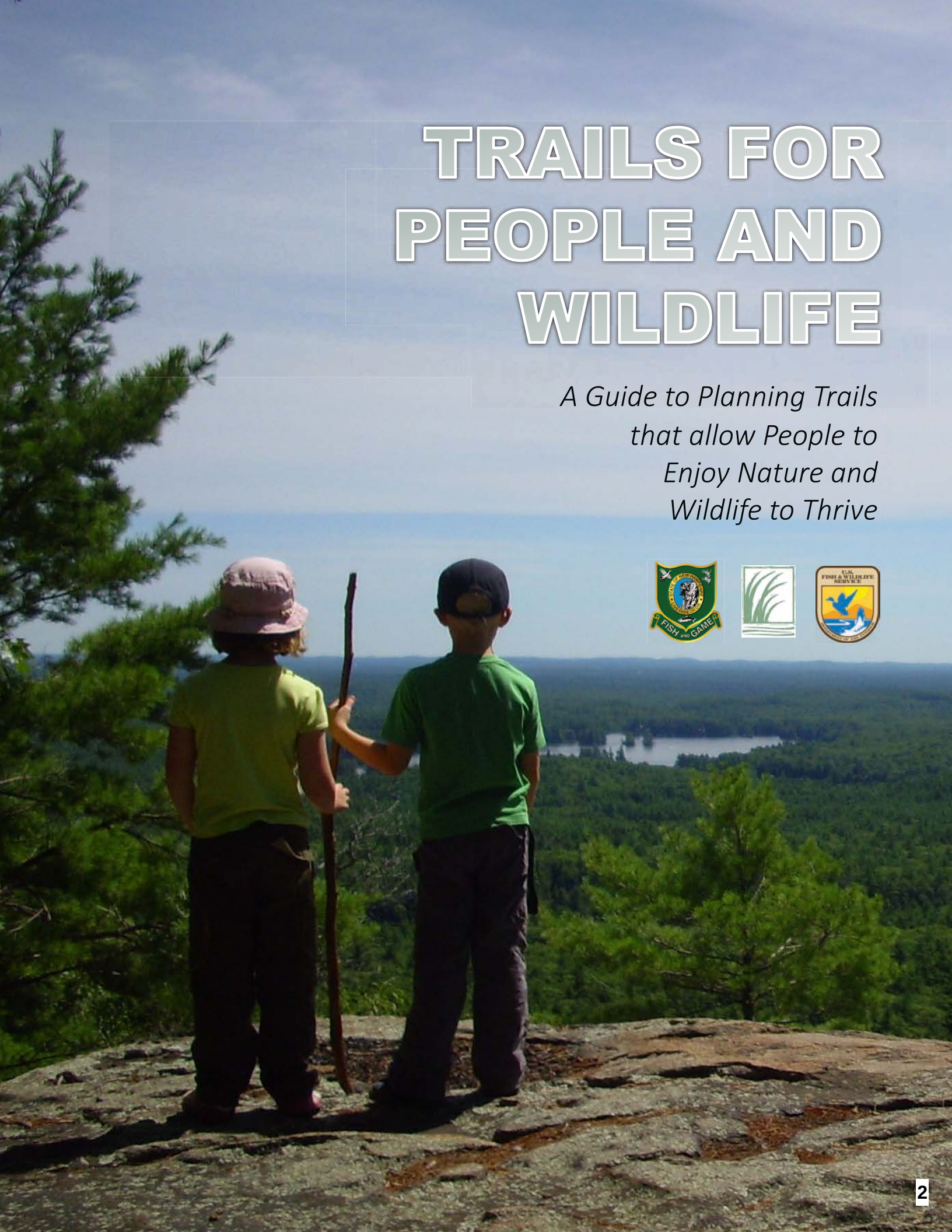
City of Biddeford
Conservation Commission
October 05, 2023 6:00 PM City Hall
Council Chambers & Zoom
https://biddeford.zoom.us/j/99836432342?pwd=Sm9ZODZnSVA3S3RnNUVIR3NpdzNSUT09
Webinar ID #998 3643 2342 Security Code #195917

Status: Emergency Meeting of the Conservation Commission, 6:00 PM, Thursday, October 5, 2023, Council Chambers & Zoom

1. **Call to Order**
2. **Discussion**
   - 2.1. BCC Position: Recreation Commission's Proposed Leash Law in Clifford Park
     trails-for-people-wildlife.pdf
     McKenney.pdf
     Impacts-of-dogs-on-wildlife-Factsheet_PNTO_Oct_-2019.pdf
     Links.pdf
     The-impact-of-dogs-on-wildlife.pdf
   - 2.2. Other Business (Time Permitting)
3. **Adjourn**



TRAILS FOR PEOPLE AND WILDLIFE

A Guide to Planning Trails that allow People to Enjoy Nature and Wildlife to Thrive

TRAILS FOR PEOPLE AND WILDLIFE

A Guide to **Planning Trails**
that allow ***People to Enjoy Nature***
and ***Wildlife to Thrive*.**

CYNTHIA D'AMBROSIO PHOTO

ACKNOWLEDGEMENTS

This “Trails for People and Wildlife” project was initiated through the Great Bay Resource Protection Partnership and developed by Katie Callahan (GIS Coordinator, New Hampshire Department of Information Technology-NH Fish and Game Department), Jim Oehler (NH Fish and Game Department, State Lands Habitat Biologist), and Rachel Stevens (Wildlife Ecologist with NH Fish and Game Department and Stewardship Coordinator with Great Bay National Estuarine Research Reserve). GIS modeling was completed by Katie Callahan. The project was funded by the US Fish and Wildlife Service with the NH Audubon Society kindly acting as fiscal agent.

The project was improved by comments from representatives of the Great Bay Resource Protection Partnership, Environmental Protection Agency, Ibis Wildlife Consulting, Lakes Region Conservation Trust, Monadnock Conservancy, National Park Service, Natural Resource Conservation Service, NH Audubon Society, NH Department of Transportation, NH Trails Bureau, Society for the Protection of NH Forests, Southeast Land Trust of NH, The Nature Conservancy, UNH Cooperative Extension, US Fish and Wildlife Service, US Forest Service, Upper Valley Trails Alliance, Washington Conservation Commission, and the White Mountain National Forest.

This guide was written by Rachel Stevens and Jim Oehler. It was edited by Haley Andreozzi (Wildlife Outreach Program Manager, UNH Cooperative Extension), Karen Bennett (Extension Forestry Professor and Specialist, UNH Cooperative Extension), Deborah Goard (Stewardship Director, Southeast Land Trust of New Hampshire) and Emily Preston (Wildlife Biologist with NH Fish and Game Department). Photos by Jim Oehler or Rachel Stevens unless otherwise noted. Cover photo by Paul Stevens. Graphics by Rachel Stevens with appreciation to the Integration and Application Network, University of Maryland Center for Environmental Science.

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WHY this GUIDE?

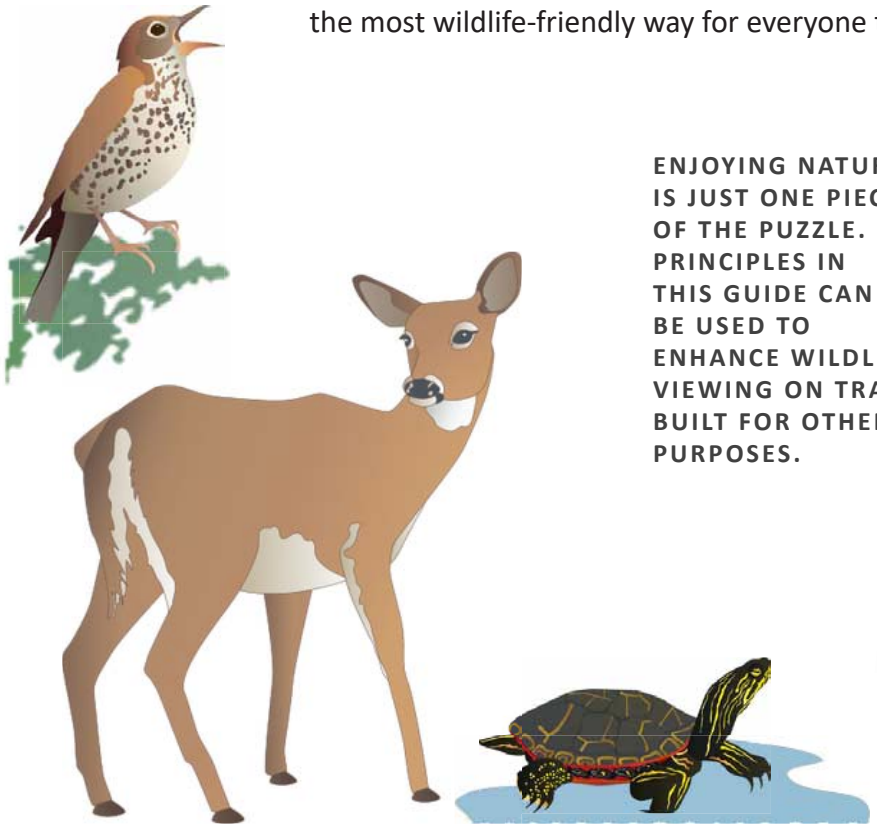
Our goal is to get people outside to enjoy nature while minimizing impacts to wildlife

Hiking, mountain biking, bird watching, and horseback riding are just some of the ways we get outside to enjoy nature and relax. However, even these seemingly low-key activities can have a negative impact on wildlife by reducing their abundance, reproductive success, or even survival.

The purpose of this guide is to help landowners, conservation groups and natural resource professionals develop a thoughtfully located network of well maintained trails that allow people to get outside to enjoy nature while minimizing disturbance to wildlife.

This guide can be used to decide where best to route new trails or to consider where it is best to maintain, reroute, or decommission existing trails.

Trails are built for many purposes, including exploring cultural history sites, going cross country skiing or mountain biking. Often a trail is used for multiple types of activity and consideration of wildlife is just one piece of the puzzle. Whatever a trail's primary purpose, the tips and statewide mapping tool described in this guide can be used to ensure it is laid out in the most wildlife-friendly way for everyone to enjoy.



ENJOYING NATURE IS JUST ONE PIECE OF THE PUZZLE. PRINCIPLES IN THIS GUIDE CAN BE USED TO ENHANCE WILDLIFE VIEWING ON TRAILS BUILT FOR OTHER PURPOSES.

TRAIL IMPACTS to WILDLIFE

TYPES OF IMPACT

There are several ways trail use may affect wildlife. The type and severity of impact will depend on the species of animal present, the season or time of day, and where the trail is located. Disturbance can include one or more of the following types;

Avoiding trails during the breeding season or harsh winter conditions is an easy way to help wildlife

Physiological
Changes in an animal's heart rate, temperature, or stress hormones.

Behavioral
Changes in foraging, vigilance or fleeing from perceived predators.

Reproductive Success
Reduction in the number of nests built, eggs laid or young born and successively raised.

Predation
Scaring an adult away leaves young vulnerable to predation. Adults may be preyed on directly.

Even though these disturbance events may be short in duration, cumulatively they can have significant long-term consequences. Disturbances are particularly impactful during harsh winter conditions, or the breeding season, when animals are already energetically stressed. Seasonal avoidance of trails during these times is an easy way to help wildlife.

CASE STUDY:
WOOD TURTLES IN CONNECTICUT

ONDREICKA/DREAMSTIME.COM

For twenty years researchers studied wood turtles (*Clemmys insculpta*) in a protected wildlife preserve in New Haven County, CT. They used mark-recapture techniques to investigate the population dynamics of 133 individual turtles.

They found turtle populations remained stable when people were restricted from the property. However, once the area was opened to recreational hiking and fishing, the number of turtles steadily declined until, in just ten years, none were left.

Investigation of the cause of the decline showed forest size and road building activity remained the same and the quality of air and water was constant. The authors concluded human recreation was behind the extirpation and that, without proper management, increasing recreational use of parks, reservoirs, and wildlife reserves will adversely affect the long-term survival of the North American wood turtle throughout the nation.

Garber and Burger. 1995. A 20-Yr Study Documenting the Relationship Between Turtle Decline and Human Recreation. Ecological Applications 5(4):1151

A TRAIL'S "CORRIDOR OF INFLUENCE"

As we explore a trail, our presence is detected by wildlife into the distance on either side of where we walk. This area is called a trail's "corridor of influence."

OUR PRESENCE CAN BE DETECTED BY WILDLIFE ON EITHER SIDE OF A TRAIL. THIS IS ITS "*CORRIDOR OF INFLUENCE.*"

The way wildlife responds to disturbance varies according to the severity of perceived danger. If the disturbance is mild they are likely to just interrupt what they are doing, such as sleeping, feeding, or finding a mate, and become "alert" to monitor the situation instead. A mild disturbance may also lead to changes in an animal's heart rate, temperature, or stress hormones. However, if an animal feels it is in imminent danger it will "flee," causing it to use precious energy as it escapes to a new locale. It may also cause an animal to abandon foraging grounds or a nest leaving young unprotected.

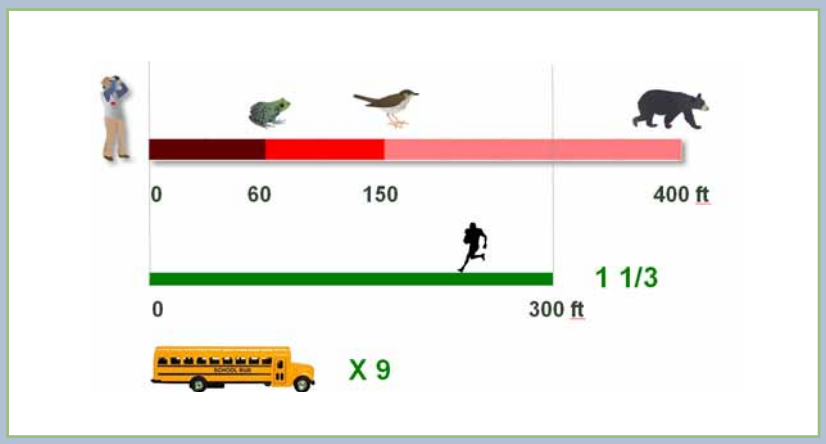
The distance at which an animal becomes alert or flees depends on the species, type of trail use, and surrounding habitat. In general, mammals are more tolerant of human presence than amphibians, reptiles or birds are. Typically, wildlife reacts to people much closer in open habitats than when trails are located in dense forest.

To determine the average corridor of influence for our region, New Hampshire Fish and Game staff did an extensive review of the scientific literature. Sixty-seven articles were used to calculate an average flight distance for amphibians and reptiles of 60 feet, to determine that birds become alert 150 feet on either side of a trail on average, and that mammals become alert to human presence at an average of 400 feet.

This 400 foot corridor of influence is equivalent to the length of one and a third football fields, or nine school buses, on either side of a trail. We can use this distance to assess any mapped network of trails and see the associated area of ground over which wildlife are likely impacted.

CORRIDOR OF INFLUENCE - DISTANCE IN NH

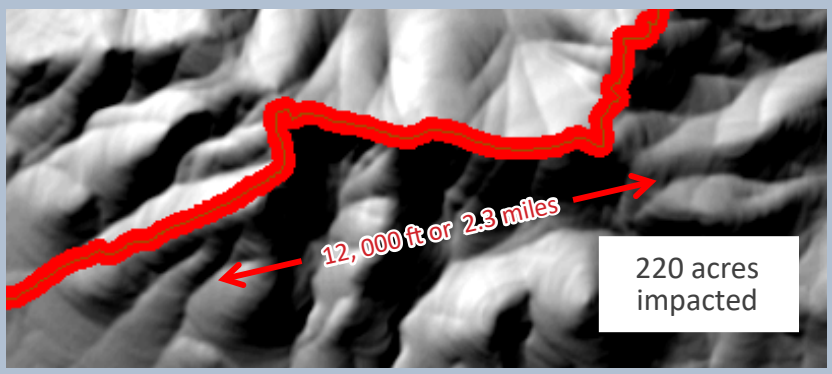
In New Hampshire, a trail's corridor of influence on wildlife is about 400 feet in each direction. This distance is equivalent to one and a third football fields, or the length of nine school buses, on either side of the trail.



CALCULATING A TRAIL'S IMPACT AREA

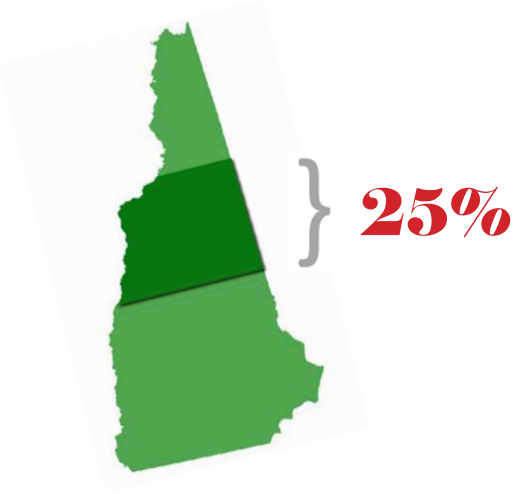
Measuring a 400 foot distance on either side of a mapped trail and multiplying it by the trail length can give us an idea of the area over which wildlife is impacted.

800 ft wide x 12,000 ft long
= 9,600,000 square ft
= 220 acres

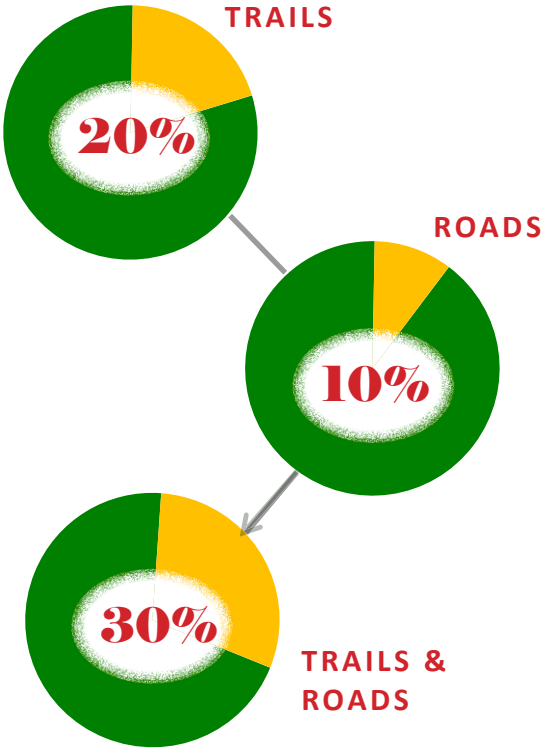


PRESENT DAY TRAILS ON PROTECTED LAND IN NEW HAMPSHIRE

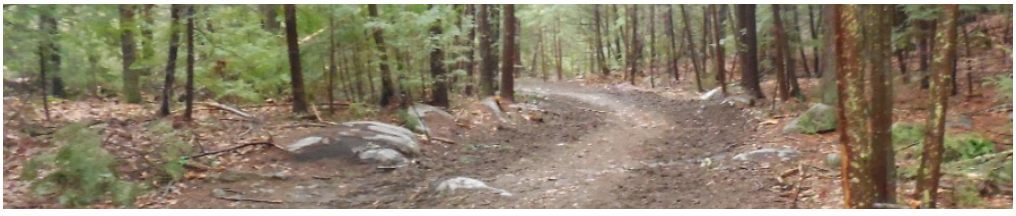
The ethic of land conservation is strong in New Hampshire. Individuals, communities, land trusts, non-profits and government agencies have worked together to protect over 1,503,606 acres statewide. That's just over an acre of protected land for every person, or one quarter of the entire state!



ONE QUARTER OF LAND IN NEW HAMPSHIRE IS PROTECTED. OF THIS, ABOUT 30% IS INFLUENCED BY EXISTING TRAILS AND ROADS.

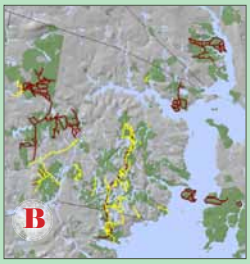


New Hampshire's protected land supports an existing network of trails and roads. Using the 400 foot corridor of influence on each side we can calculate about 293,110 acres are impacted by trails and an additional 153,450 acres by roads. This is a conservative estimate as many trails are not officially mapped so are not included in this study. It also does not include trails on private land which are likely just as prolific.

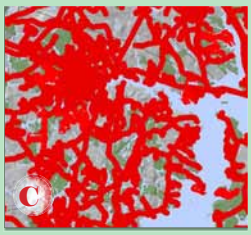


CASE STUDY:
DURHAM - WHAT LAND IS LEFT?

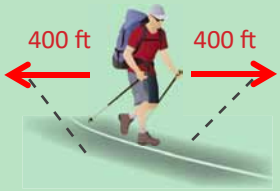
A statewide map of trails is available on the University of New Hampshire's online interactive mapping viewer "GranitView." Figure A to the left shows just those trails located on protected land in the town of Durham.



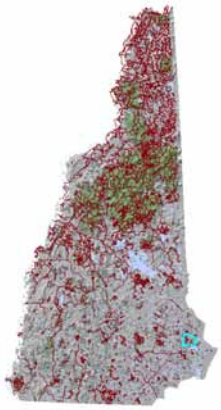
In addition to officially mapped trails, a network of unauthorized "bootleg trails" will exist. These are informal, non-designated trails created from frequent foot traffic. Figure B shows official and bootleg trails on protected land in Durham.



The largest area left in Durham where wildlife are not influenced by trails is 0.8 square miles.



If we add roads and overlay the 400 foot corridor of influence on either side, the areas shown in red in Figure C are where wildlife are impacted. The largest area left is just 0.8 square miles. In comparison, a bobcat's home range is over 30 square miles, an adult female black bear's range is about 10 square miles, and an adult male bear's can be up to 120 square miles.

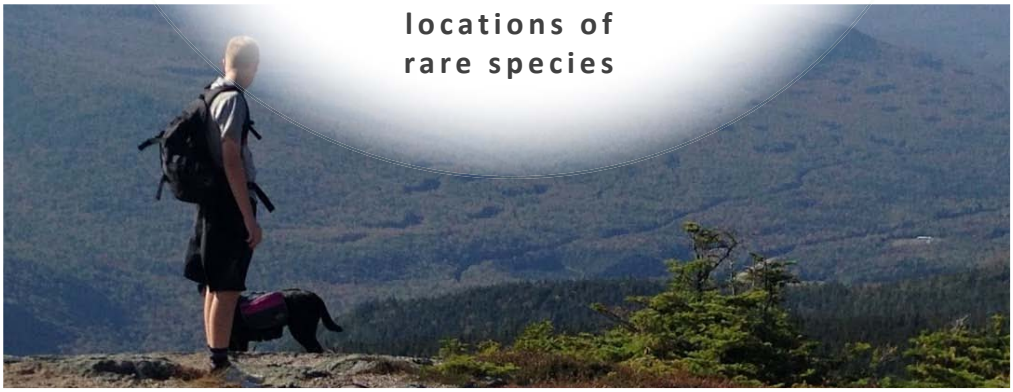


TRAIL DENSITY IS NOT PARTICULARLY HIGH IN DURHAM COMPARED TO OTHER PARTS OF THE STATE.

LOCATING TRAILS with WILDLIFE in MIND

When looking at the landscape and habitats where an existing trail is located, or where you are considering building a new trail, there are some key principles that can easily be followed that will reduce trail use impacts to wildlife.

KEY PRINCIPLES

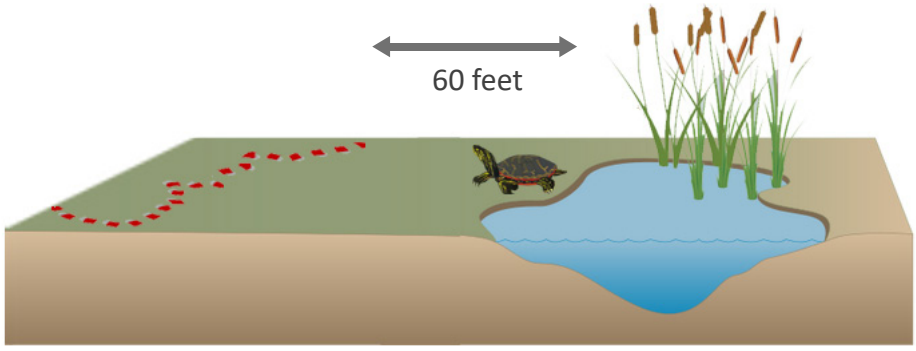


ROUTE TRAILS AWAY FROM WET AREAS

Riparian areas are the vegetated regions surrounding rivers, streams, wetlands, and other surface water bodies. They provide many ecological services including flood control and are particularly important wildlife habitat as they provide food, cover and travel pathways for many species. Routing trails away from wet areas avoids disturbance to wildlife including waterfowl and wetland birds. Minimizing disturbance is particularly important for rare species such as Blanding's and Spotted turtles. Avoiding wet areas or slopes also minimizes trail maintenance as these are commonly areas of erosion.

Avoiding wet areas or slopes protects rare wildlife and also minimizes the need for trail maintenance

ON AVERAGE, NEW HAMPSHIRE AMPHIBIANS AND REPTILES FLEE FROM AN AREA WHEN PEOPLE ARE DETECTED 60 FEET OR LESS AWAY.



AVOID STEEP SLOPES

Peregrine falcons, bobcats and rare small-footed bats are all known to raise young on steep slopes. These hard to access areas mean young are more protected from predators. Just like with wet areas, avoiding steep slopes will also reduce the need for trail maintenance.

CHRIS MARTIN/NH AUDUBON PHOTO

AVOID KNOWN LOCATIONS OF RARE SPECIES

Wildlife are often aware of us even if we think we are passing by undetected. Avoiding known locations of rare species helps minimize disturbance. Places where rare species concentrate are particularly important to avoid. Examples include bat roosts or snake hibernacula.

The NH Natural Heritage Bureau (NHB) maintains data on known locations of rare species and exemplary natural communities. The NHB DataCheck Tool allows anyone planning a project in New Hampshire that requires a permit to find out if there are NHB records in the vicinity of the project. Check out the tool online at www.nhdfl.org/Land-Conservation/Natural-Heritage-Bureau.

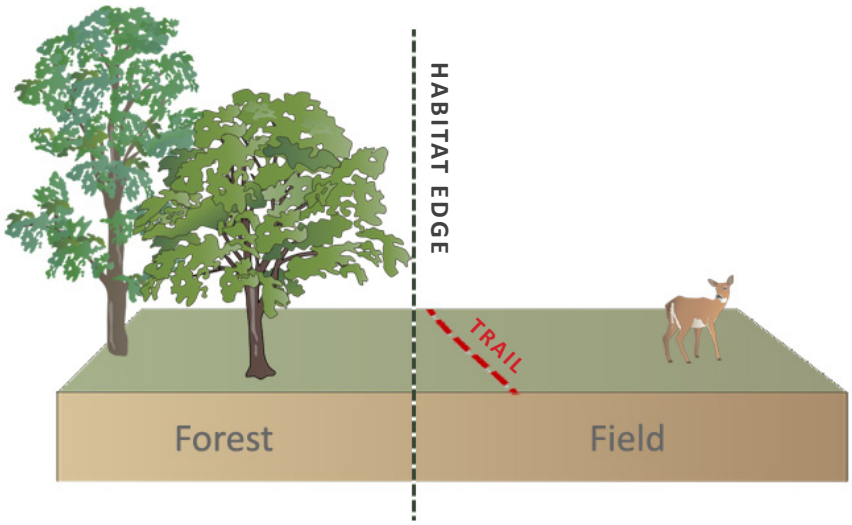
For questions about rare species in NH that are not related to a permit application, call NHB at 603-271-2214 or send an e-mail to NHB.Review@dncr.nh.gov. Talking to local landowners can also be a valuable source of information.

WILDLIFE ARE OFTEN AWARE OF US EVEN IF WE THINK WE ARE PASSING BY UNDETECTED.

In addition to the rare species tracked by NH Natural Heritage, the Trails for People and Wildlife location tool described in the next section of this booklet includes areas where heron rookeries are present and cliffs with current or historic peregrine nests. Rare plants are not included in this layer as field surveying is often a better option to find their locations.

ROUTE TRAILS ALONG HABITAT EDGES

Habitat edges occur where any two structurally different habitats meet. In New Hampshire, this can be the interface of any combination of field, forest, shrubland, pine barren, wetlands, cliffs or alpine area.



Routing trails along edges minimizes fragmentation of large blocks of habitat that support some of our less common specialist species. An example is the ovenbird which nests on the ground in forests making it, and its young, vulnerable to predation. Nesting success is far greater in the forest interior where birds are more protected away from predators such as skunks and raccoons.

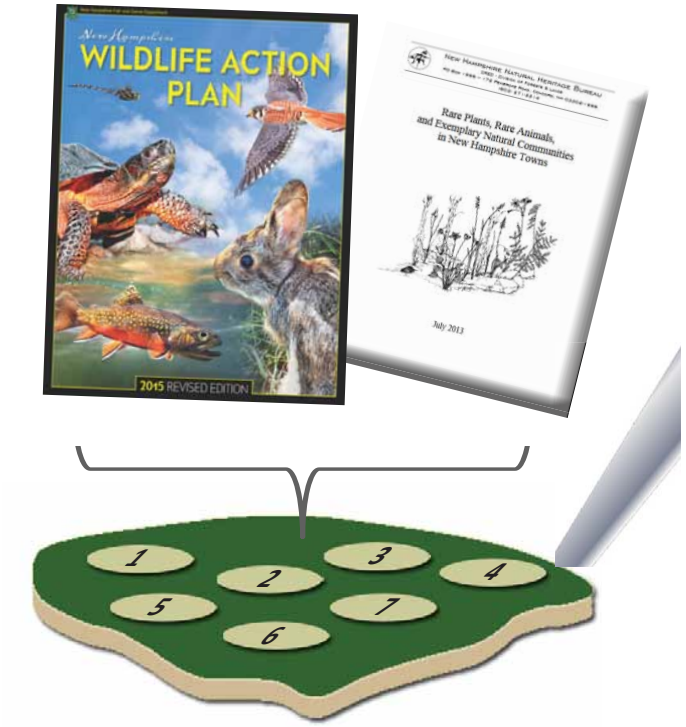
ROUTING TRAILS ALONG HABITAT EDGES PREVENTS FRAGMENTATION OF LARGE BLOCKS IMPORTANT TO SPECIALIST, AND SO LESS COMMON, SPECIES.

AREN'T HABITAT EDGES HOT SPOTS FOR BIODIVERSITY?

Traditionally it has been recognized that habitat edges are where we are likely to find the greatest diversity of species. This is correct as there is a chance we will run across wildlife associated with either of the abutting habitats. However, they are likely to be more generalist species that can make use of a diversity of habitats and less sensitive to disturbance. Routing trails along edges will protect the less common habitat specialists such as bobolinks and eastern meadow larks in grassland and New England cottontails or whip-poor-will in shrubland.

AVOID SPECIAL HABITAT TYPES

Some habitats are rare, or support wildlife that are particularly sensitive to disturbance. The most recent version of New Hampshire's Wildlife Action Plan and the Natural Heritage Bureau's list of exemplary natural communities were used to identify seven key habitat types to avoid locating trails within if possible. A list of exemplary natural communities present in each town is available at www.nhdfl.org/DRED/media/Documents/TownList-(1).pdf.



SEVEN KEY HABITATS

- EXEMPLARY NATURAL COMMUNITIES
- PINE BARRENS
- SHRUBLANDS
- WETLANDS
- ROCKY RIDGES OR TALUS SLOPES
- POORLY DRAINED SOILS
- GRAVEL PITS

University of New Hampshire Cooperative Extension staff have produced a series of habitat stewardship brochures with support from the Sustainable Forestry Initiative and the NH Fish and Game Department. These give tips on how to care for and enhance special habitats and focus on wildlife species of conservation concern associated with them. They include some of the habitats featured in this Trails for People and Wildlife project.

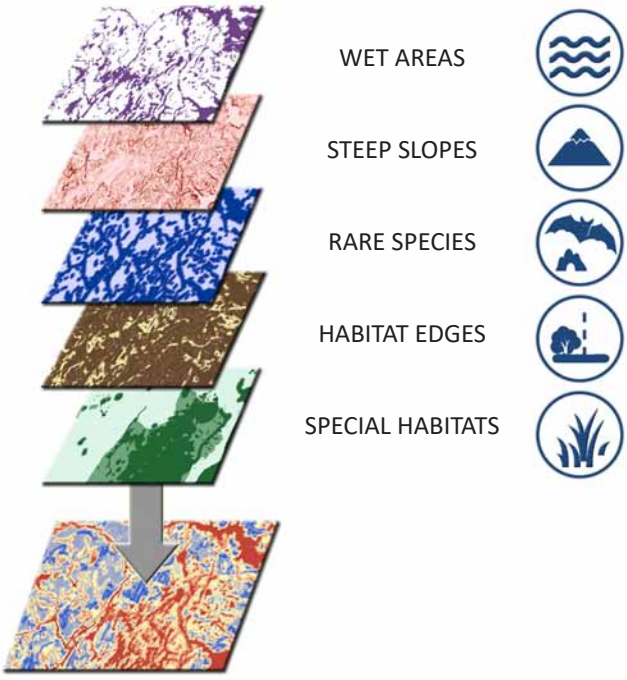
THE TRAILS FOR PEOPLE AND WILDLIFE LOCATION TOOL

HOW WAS IT CREATED?

This statewide trail location tool was developed using the "locating trails with wildlife in mind" principles overviewed in the previous section. Each principle was mapped across the entire New Hampshire landscape using a Geographic Information System (GIS). The five layers were then integrated to show where it is best to locate trails and where, if present, they may be of most impact to wildlife.

A draft model was reviewed by trail planning and wildlife experts at a special workshop before creating the final version. Comments from members of the following organizations improved the trail location tool:

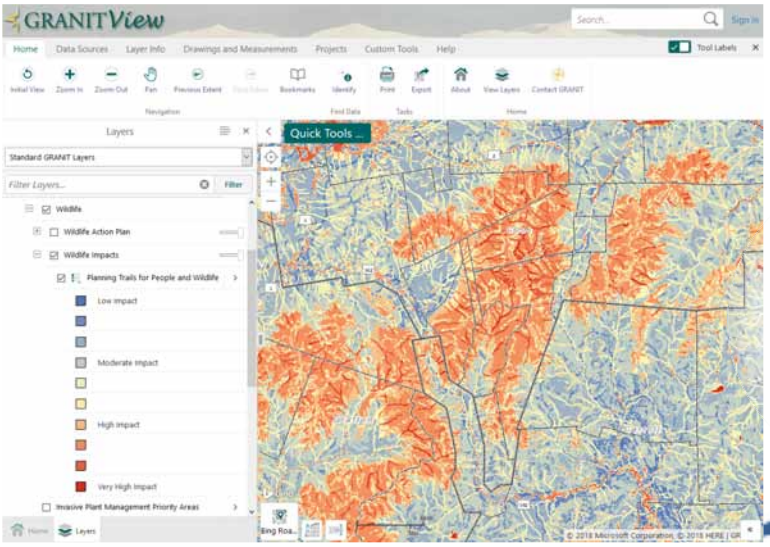
- The Great Bay Resource Protection Partnership
- Environmental Protection Agency
- Ibis Wildlife Consulting
- Lakes Region Conservation Trust
- Monadnock Conservancy
- National Park Service
- Natural Resource Conservation Service
- NH Audubon
- NH Department of Transportation
- NH Trails Bureau
- Society for the Protection of NH Forests
- Southeast Land Trust of NH
- The Nature Conservancy
- UNH Cooperative Extension
- US Fish and Wildlife Service
- US Forest Service
- Upper Valley Trails Alliance
- Washington Conservation Commission
- White Mountain National Forest



MULTIPLE FEATURES CAN BE MAPPED ACROSS OUR NEW HAMPSHIRE LANDSCAPE. WHEN INTEGRATED TOGETHER THEY CREATE AN OVERALL MAP THAT SHOWS US WHERE TRAILS CAN BE ROUTED TO LEAST IMPACT WILDLIFE AND ALLOW PEOPLE TO ENJOY NATURE.

PUTTING IT ALL TOGETHER: HOW TO INTERPRET MAPS

The trail location tool is displayed as a "heat map." Simply put, the warmer the color, the higher impact on wildlife if a trail passes through, so avoiding red areas is particularly important. When planning a trail system, the goal is to "follow the blue" as much as possible to find the best route that minimizes impacts to wildlife while getting people outside to explore and interact with nature.



"FOLLOW THE BLUE"
to find the best route for a trail that minimizes impacts to wildlife

WHERE CAN WE FIND THE TRAIL LOCATION TOOL?

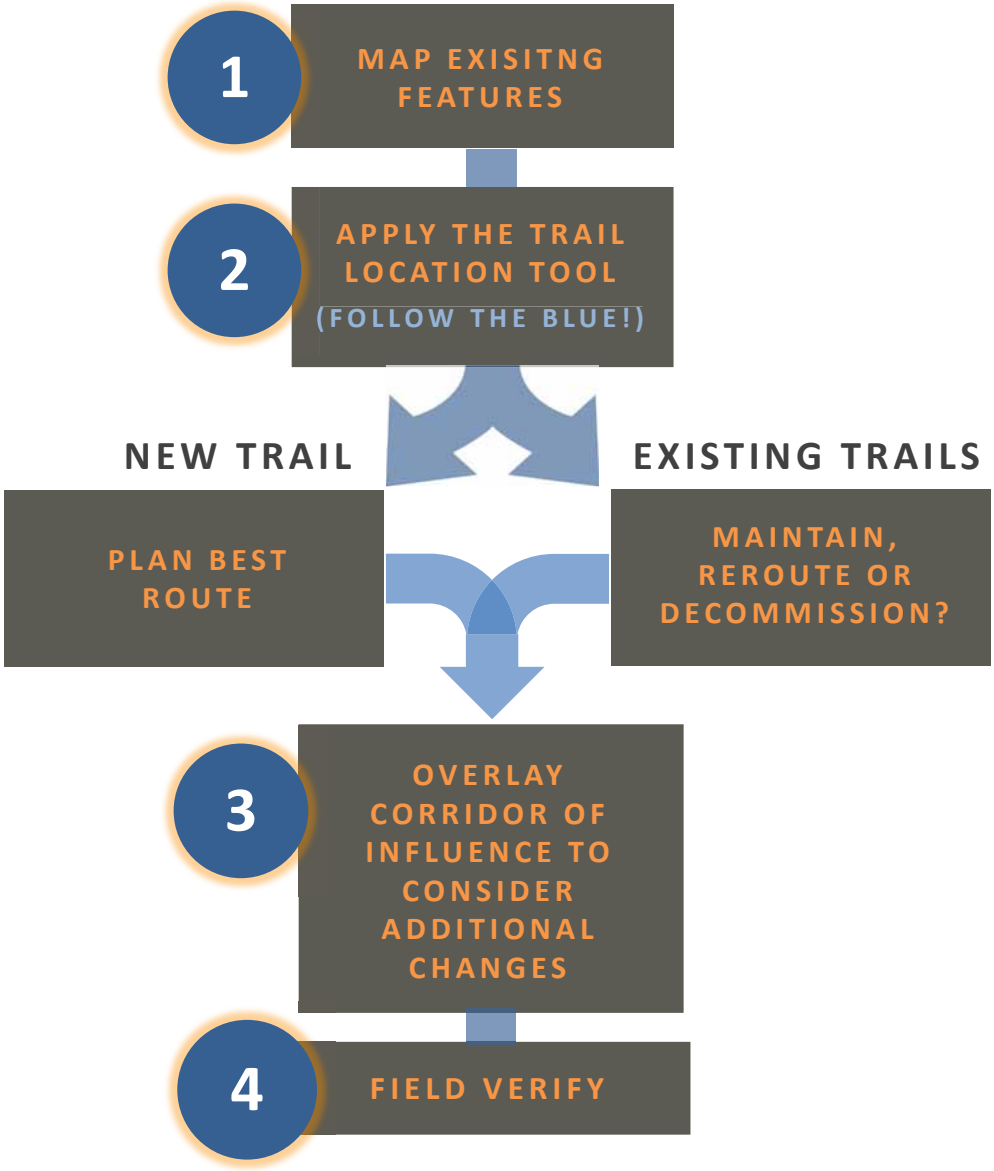
GRANITView granitview.unh.edu

The University of New Hampshire's online mapping service "GRANITView" provides free access to GIS tools through the internet. The Trails for People and Wildlife location tool is available as a clickable layer within this easy-to-use web application. GRANITView allows us to create customized maps that can be zoomed to a specific area of interest, for example a parcel of conservation land, town forest, or schoolyard. Users can search for data and display it in multiple ways. Customized maps can be printed and shared with others in "pdf" format. In addition to displaying data, there are tools to navigate around, and interact with, those data layers. Acreages can be calculated, coordinates plotted, and lines, polygons and text added. A very useful feature is that your own GPS data, collected in the field, can be brought in and added to the map. The data display structure is hierarchical so the trail location tool is found by clicking the "Environment and Conservation" menu, then "Wildlife" menu, then "Planning Trails for People and Wildlife" layer.

For GIS users, the Trails for People and Wildlife coverage is available for download in raster format from NH GRANIT, the state's GIS clearinghouse. Use the data discovery tool to search for the word "trails" to locate it. GIS technical data notes and a compilation of literature used to create this project are included as part of the download.

USING THE TRAIL LOCATION TOOL: AN OVERVIEW

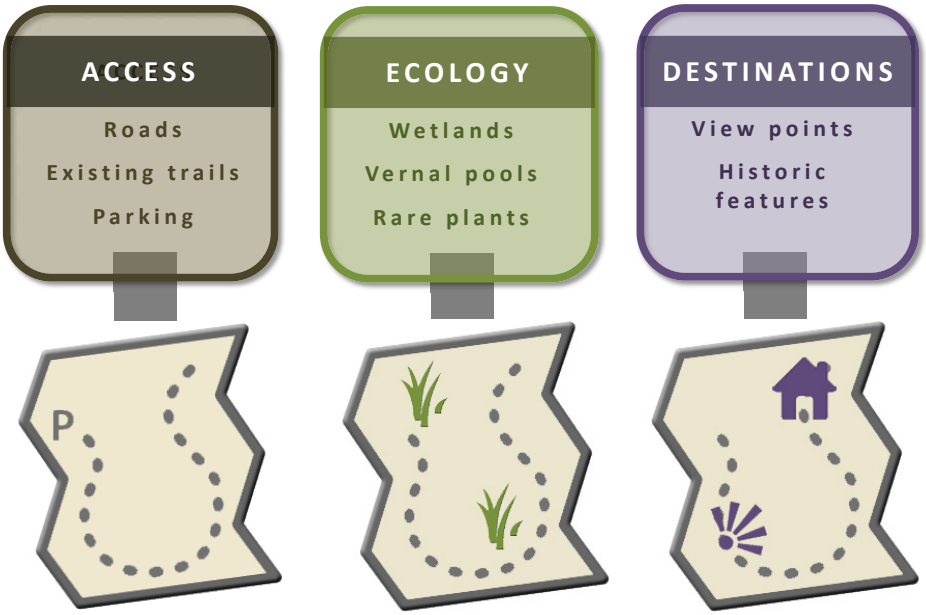
Both planning new trails and assessing existing trail networks follow a similar process shown in the summary diagram below. Numbered steps are shown in more detail in the next section.



USING THE TRAIL LOCATION TOOL: IN MORE DETAIL

1

Map Existing Features Of The Property



Exploring your property and mapping key features is the first step to planning a new trail system, or to assessing an existing one. Anything of interest to you or your organization can be mapped, but key categories of information are existing access points, local ecological features that may have been missed by GIS mapping, and any destination points you would like to guide visitors to, such as a gorgeous view or an old cellar hole.

2

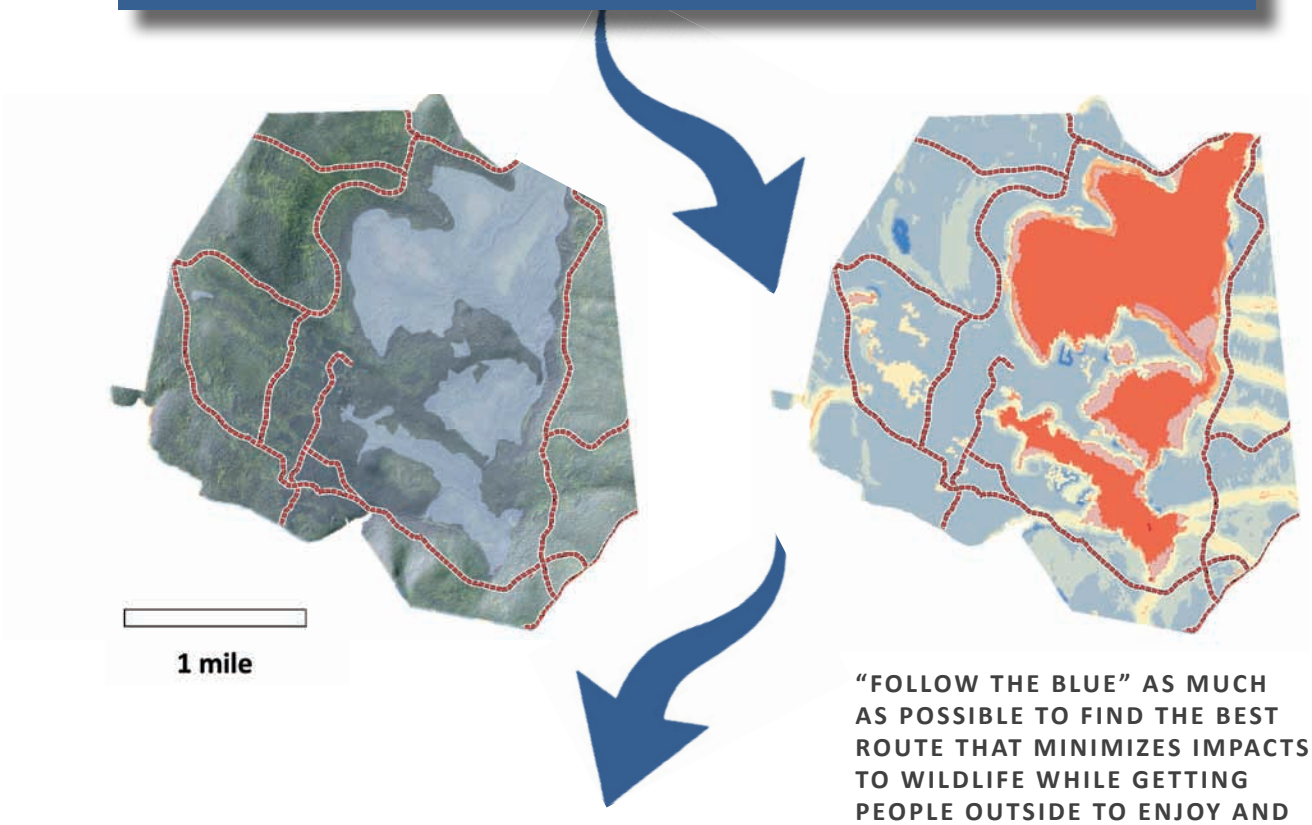
Apply The Trails for People and Wildlife Location Tool

Once your key features have been mapped they can be marked on the Trails for People and Wildlife location map to allow you to choose the best routes to connect them. In general, features in the “access” and those in the “destinations” categories will be navigated to and those in the “ecology” category avoided.

i. Planning New Trails

When planning a new trail system, the goal is to route it on as cold a color as possible and to avoid areas shown in red. In general, people prefer loop rather than "there and back" trails. Designing your new trail network with this in mind can prevent bootleg trails being created in the future.

Whenever possible "follow the blue"

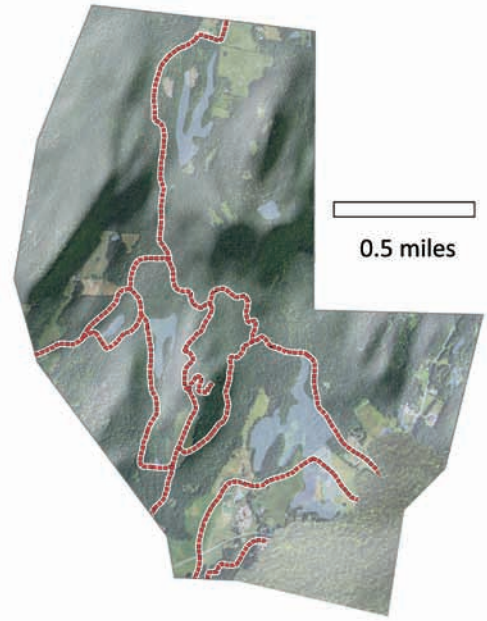


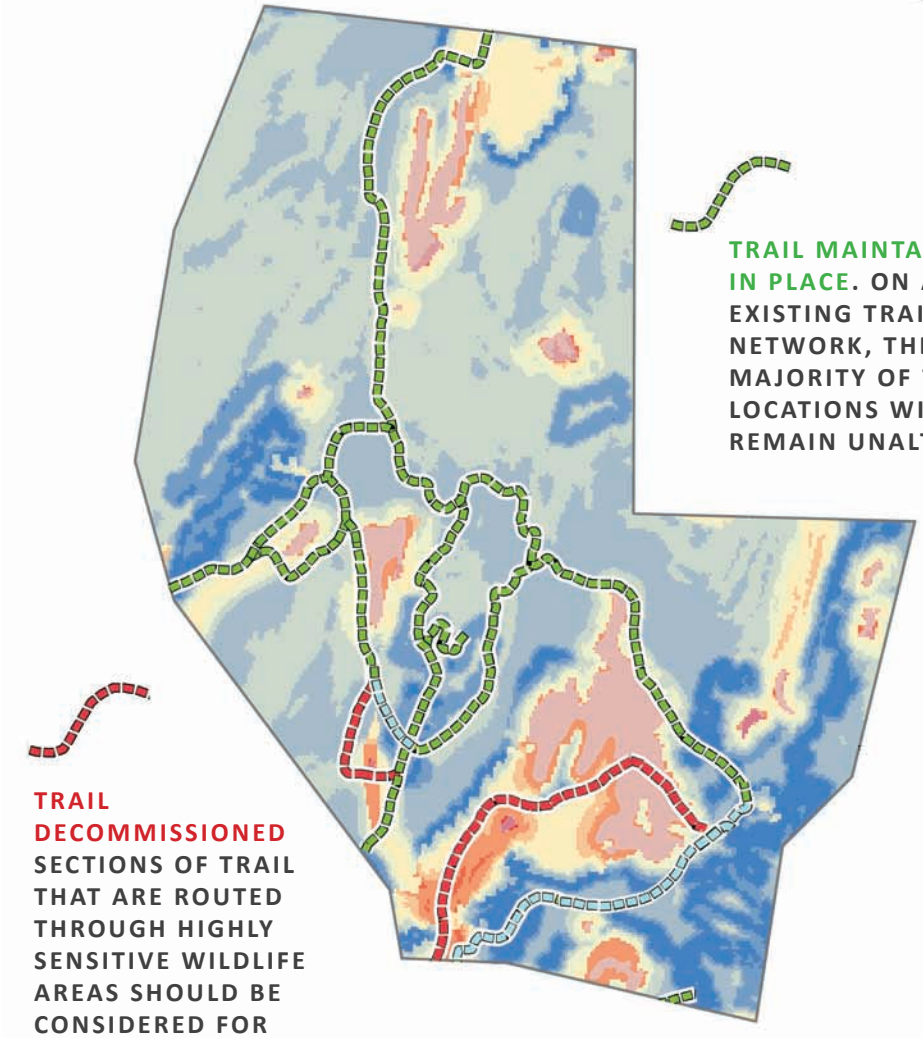
"FOLLOW THE BLUE" AS MUCH AS POSSIBLE TO FIND THE BEST ROUTE THAT MINIMIZES IMPACTS TO WILDLIFE WHILE GETTING PEOPLE OUTSIDE TO ENJOY AND INTERACT WITH NATURE.

ii. Evaluating Existing Trails

As New Hampshire's Trail Bureau says in their guide to trail construction and maintenance "*just because a trail already exists doesn't mean it's in a good location. Some trails and old roads were never designed for the use they are receiving.*" For this reason, it is just as important to use the Trails for People and Wildlife location tool to assess existing trails as it is when planning new trails. The tool can be used to evaluate each section of existing trail allowing you to decide whether to maintain its current location, whether to reroute, or even decommission that section.

In this example, the majority of an 11 mile trail network “follows the blue” when overlaid on the trail location map. This means those trails are of minimal impact to wildlife and can be maintained in place unaltered. They are shown in green in the diagram below. The two sections of trail shown in red go through areas of particularly high impact to wildlife so should be decommissioned if possible. In this case there are opportunities close by to create two new trail sections, shown in blue, to reroute traffic away from wildlife “hot spots” and still maintain nice hiking loops.



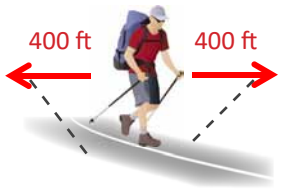


TRAIL MAINTAINED IN PLACE. ON AN EXISTING TRAIL NETWORK, THE MAJORITY OF TRAIL LOCATIONS WILL LIKELY REMAIN UNALTERED.

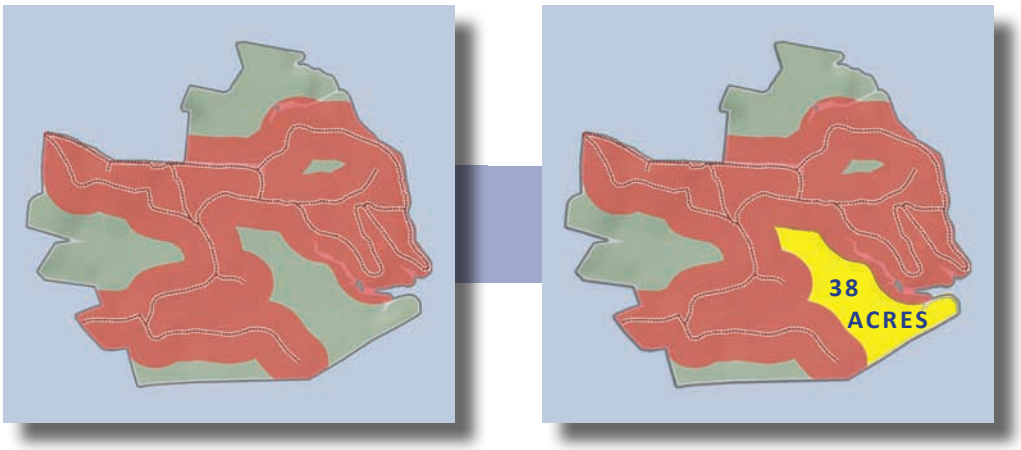
TRAIL REROUTED OR CREATED. NEW TRAILS MAY BE BUILT TO GUIDE TRAFFIC AWAY FROM PARTICULARLY SENSITIVE WILDLIFE AREAS.

TRAIL DECOMMISSIONED SECTIONS OF TRAIL THAT ARE ROUTED THROUGH HIGHLY SENSITIVE WILDLIFE AREAS SHOULD BE CONSIDERED FOR DECOMMISSIONING OR REROUTING

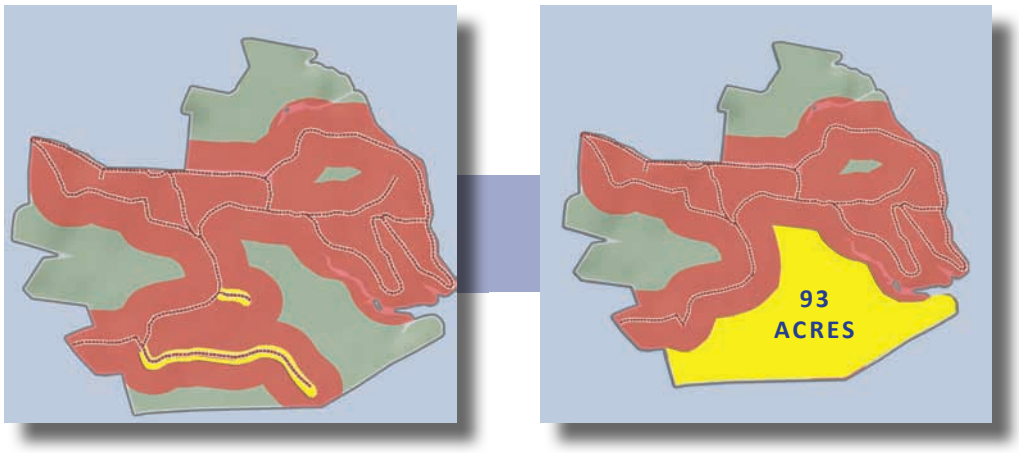
3 Overlay the Corridor of Influence



An important step when evaluating a trail network is to assess its corridor of influence. By overlaying a 400 foot buffer on either side of each trail you can see what part of the land is left for wildlife to carry out their behavior undisturbed.



There are 4.6 miles of existing trails on this example property which influence 267 acres, or 68%, of the entire property. The largest uninfluenced area, shown in yellow, is 38 acres.



The two spur trails highlighted are together 0.5 miles long, just 10% of the entire trail network. If these are closed, it would expand the area largely uninfluenced by trail traffic to 93 acres, almost 2½ times the original while still providing extensive opportunities for visitors to recreate.

4 Verify Your Plan with a Field Visit

ALL THE PLANNING IN THE WORLD DOESN'T BEAT "BOOTS ON THE GROUND." REMEMBER TO VERIFY YOUR PLAN WITH A FIELD VISIT.

Although the resolution of maps we create these days can be impressive, nothing gives us as much information as getting boots on the ground with a field visit. There may be special features, such as a deer yard or bear den, located near your planned route that had been missed during mapping. Alternatively, there may be negative features, such as an old farm dump close to a scenic vista you had planned to lead visitors to, that may cause you to reroute the trail.

In addition to the key principles of planning trails with wildlife in mind, that is avoiding wet areas, steep slopes, rare species, and special habitat types, and routing trails along habitat edges, there are the several other things to keep in mind from a wildlife perspective while field-checking your planned trail route.

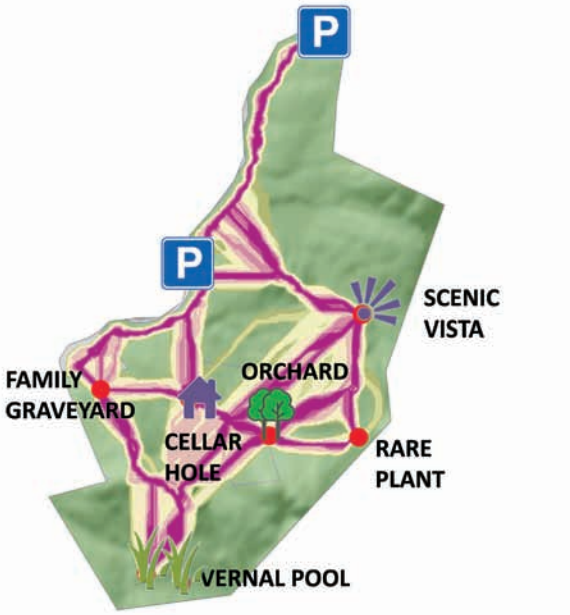
If a view of a water body, such as a beaver pond or river, is desired it is much better to have a spur trail lead up to a specific view point than it is to have a trail that travels along, or around, that water body. People still see the water and all its beauty, but there are many areas wildlife can remain undisturbed. Maintaining a vegetated buffer of *at least* 100 feet between a trail and water body is highly recommended.

A variety of frogs and salamander species lay their eggs in vernal pools. If dogs are allowed to swim in these pools, eggs can be ruptured and developing embryos killed. For this reason, maintaining a buffer of at least 100 feet around vernal pools is also highly recommended.

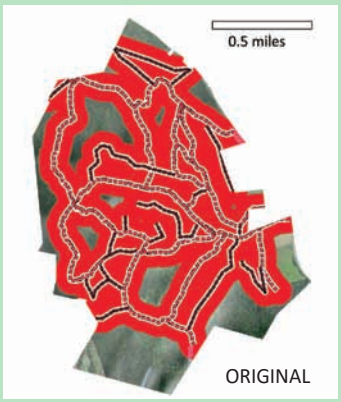
Creating a visual and sound buffer by locating trails and especially supporting facilities, such as kiosks and parking areas, in places where they can be screened by vegetation or topography frequently increases the amount of disturbance wildlife will tolerate.

Linkage Mapper

If you are a GIS user, a helpful tool when designing a trail network is "Linkage Mapper," a free ArcGIS extension. It can be used to automatically find the best alternative routes to connect destination spots by finding least-cost pathways across the landscape. You can choose from the suite of routes Linkage Mapper generates and select which options make the best sense to create a new trail network that connects the destination points you have chosen to feature on that property.



REALITY CHECK: SOME TRAILS, EVEN IN HIGH IMPACT AREAS, DON'T MAKE SENSE TO MOVE

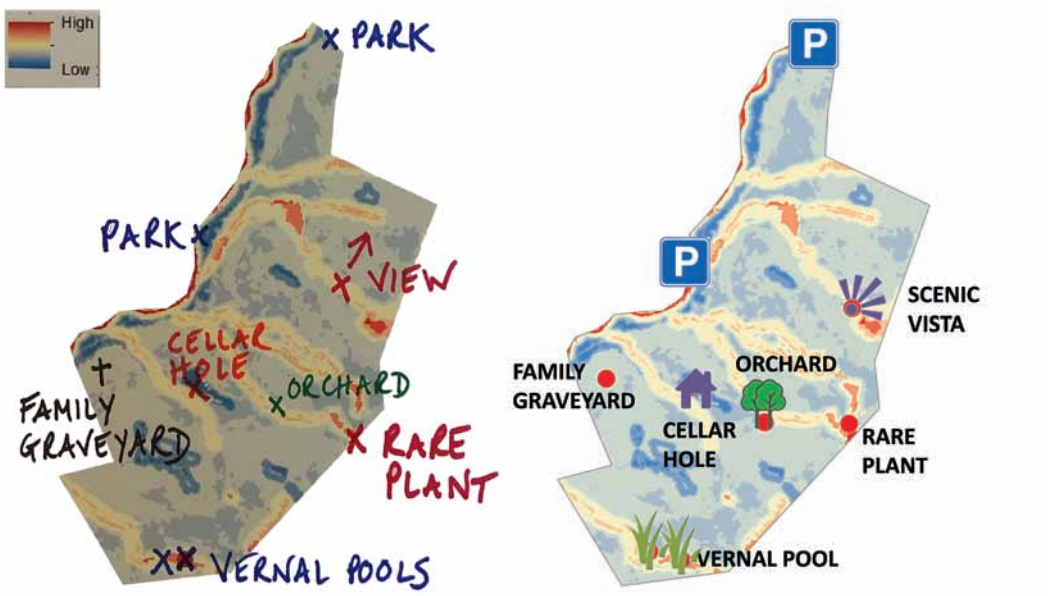


NH Fish and Game Department's 1,056 acre Lower Shaker Wildlife Management Area is a well-loved piece of conservation land located in Enfield, NH. It had an extensive network of trails with a corridor of influence that covered 73% of the entire property. Since the network was so dense several trails were closed, reducing the area impacted by 21%. Some of the trails that were left open are actually in areas of high impact to wildlife but were historic roads built by the Shakers. These well developed roads would be largely unfeasible to close so in this case a balance between cultural significance and ecology was chosen.

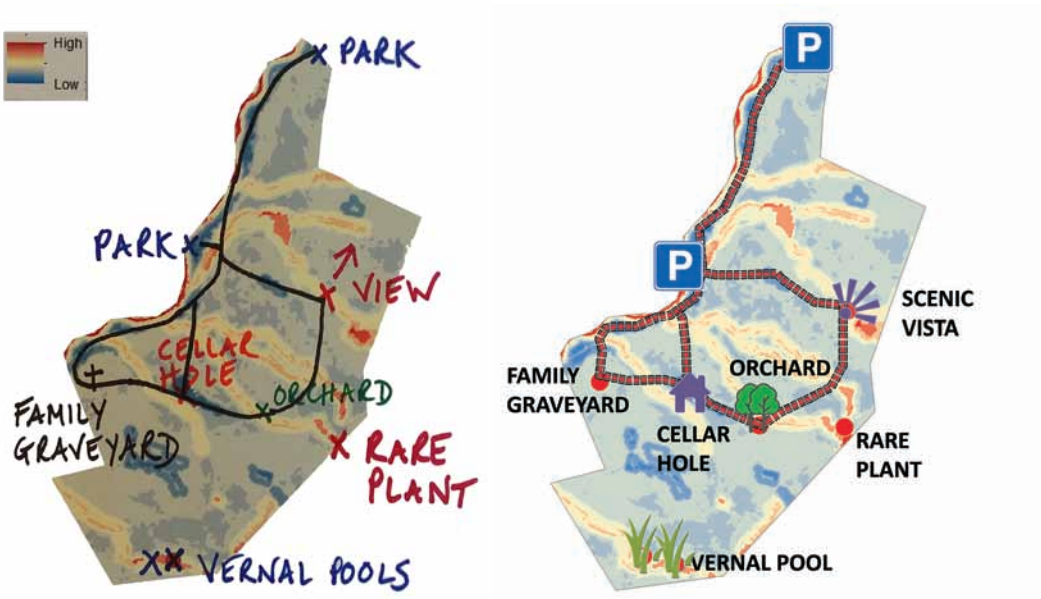
Summary: Each Step Can be Done by Hand or Digitally

Mapping can be as low tech or high tech as you choose to make it. Planning can literally be a table top exercise using pen and a printed Trails for People and Wildlife map, or everything can be done digitally.

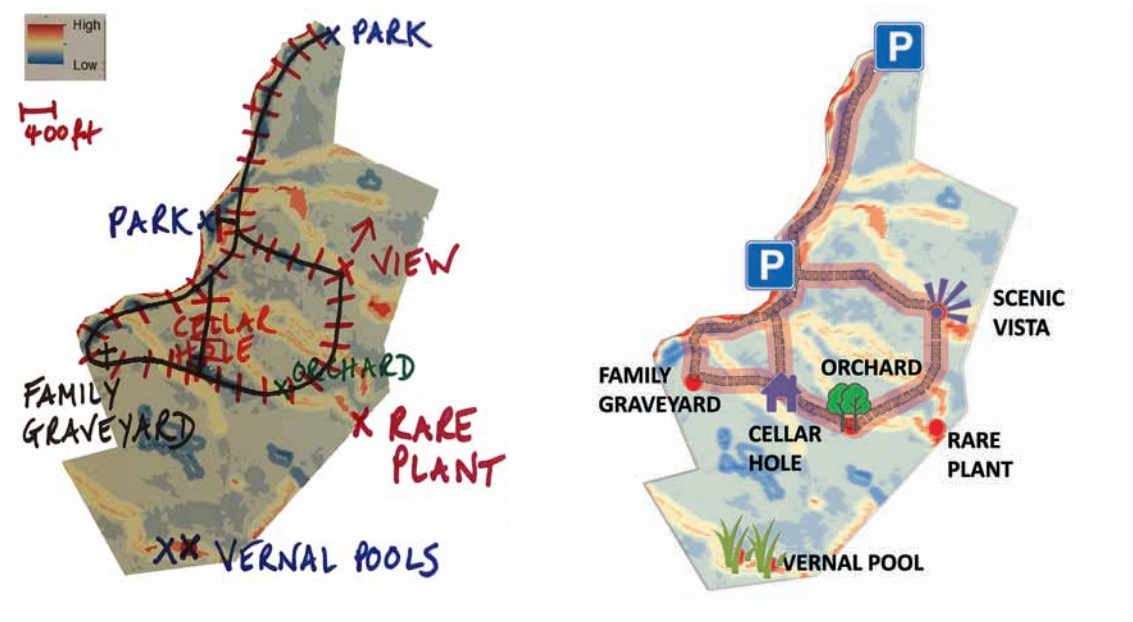
1 Map Existing Features



2 Apply the Trail Location Tool



3 Overlay the Corridor of Influence



4 Verify Your Plan with a Field Visit

OTHER ASPECTS OF SMART TRAIL PLANNING

WHAT TYPES OF RECREATIONAL USE?

After deciding on the location of your trail network, an important next step is to decide what types of recreational use will be allowed on both the trail and the surrounding property. Two major decisions are whether to permit wheeled vehicles, such as mountain bikes and ATVs, and whether to allow hunting, a long-time tradition in our state.

Under state law, properties must be posted using durable signs with any words describing a prohibited activity in letters at least 2 inches high. Signs are required to include the property owner's name and address, must be no further than 100 yards apart, and also be posted at all commonly used entrances. If your property is posted, you can still allow others to hunt if you give them verbal or written permission.

The owner of the property is ultimately responsible for deciding what types of recreational use are permitted. It is important any choices be compatible with property deed language and any other legal restrictions that apply. Posting allowable use signs at trailheads and other access points is a key step in managing trails that are open to the public. New Hampshire Fish and Game Department's Landowner Relations Program has fourteen different types of sign that are available to indicate what types of activities are allowed in an area. Phone 603-271-1137, or visit or visit www.wildlife.state.nh.us/landshare/ols.html for more information.

When installing signs it is good etiquette to use aluminum nails or screws so there is no danger of chainsaw "kick back" if a future forestry operation takes place. It is also a good idea to leave the nail head protruding about a quarter inch to allow for tree growth.

TRAIL ACCESSIBILITY

Trail width, slope, substrate type and compaction are all important in determining how many different types of user-groups can navigate a trail system. Building a network or section of trail that is accessible to wheelchairs also allows strollers to be pushed easily. The U.S. Forest Service is a leader in giving guidance on how to create universally accessible trails and Northeast Passage, based out of UNH in Durham, rents adaptive equipment that helps people explore even the most rugged of trails.

A LEASH LOAN SYSTEM HAS BEEN WORKING WELL IN NEWMARKET.

DOGS AND TRAILS

Getting outside with our pet dogs is a daily treat and a good way to enjoy our natural surroundings. However, it makes sense to keep dogs on a leash, at least during the spring breeding season. The Nature Conservancy has a "leash loan" system at their Lubberland Creek Preserve in Newmarket. Dog leashes are available to pick up at the trailhead, use while on the trail, and drop off at the end of a walk.

KEEPING DOGS ON A LEASH DURING GROUND NESTING BIRD SEASON (MID MARCH THROUGH MID JULY) IS AN EASY WAY TO LIMIT DISTURBANCE DURING THIS CRITICAL PERIOD.

TRAIL CLOSURE

If you decide to close a section of trail, posting with a sign explaining why this choice was made can be helpful. Side spurs to the "Sweet Trail" in Newmarket and Durham were recently closed and posted with the sign below. Removing trail markers and blazing, along with brushing in the trail with logs and other woody material can be effective. Planting the trail opening with saplings from other parts of the property will create a longer term solution. Tree and shrub seedlings grown at the NH State Forest Nursery in Boscawen can be a great option for planting trail openings too. Their goal is to provide customers with the highest quality, bare-root seedlings for forestry, conservation and education purposes at reasonable prices.

You are entering an

Ecologically Sensitive Area

Trail maintenance and clearing beyond this sign is prohibited. Please enjoy the Sweet Trail and other marked trails in this area. They were carefully designed to balance the impacts to wildlife with public enjoyment and recreation. Let's work together to best protect the rare species and important wildlife habitats that make this place special.

Thank you for your cooperation,

from the Land Stewards of this protected landscape.

CONSIDER SEASONAL CLOSURES

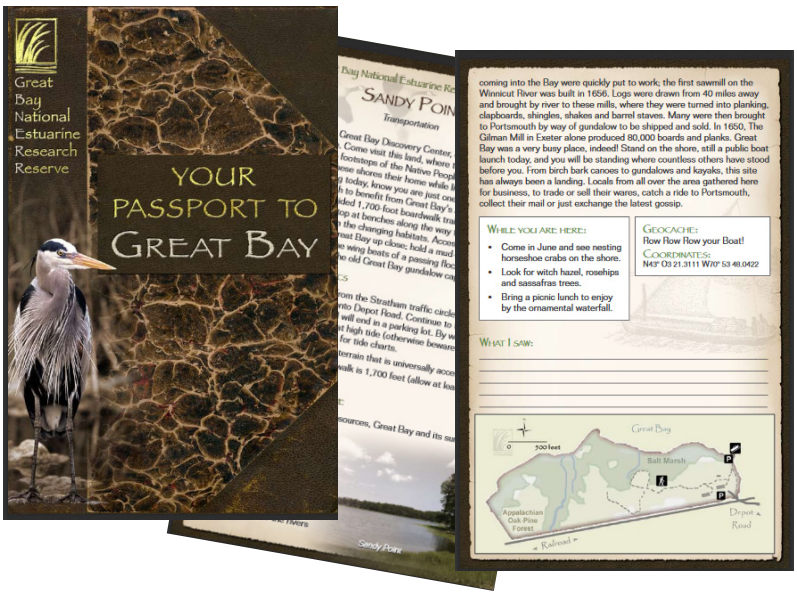
Wildlife are usually most sensitive to disturbance during their breeding season. Young have limited mobility and adults are energetically stressed as they try to find food for both themselves and their offspring. For this reason it may make sense to close a section of trail seasonally. Grassland nesting birds are particularly sensitive as the surrounding vegetation does not provide a visual or sound buffer between their nest and recreational trail use. If sufficient resources are not available to enforce a trail closure during wildlife-sensitive seasons, consider rerouting the trail. Winter is another time of year when wildlife are more energetically stressed. For this reason it is a good idea to route trails away from deer yards and hibernation sites.

PUBLICIZING YOUR TRAIL

It can be amazing how quickly people discover a new trail based just on local knowledge and word of mouth. Installing a trailhead kiosk can provide information about the route and also draws peoples' attention. In addition, you may want to create a printed trail guide, although more and more frequently conservation groups are relying on digital versions instead. There are many websites and apps that can be used to publicize your trail. One that UNH Cooperative Extension currently recommends is "TrailFinder". It can be found at www.trailfinder.info and only includes trails sanctioned by the owner of the land it is routed across.

Although printed and online trail guides are popular, not everyone is a visual learner so an audio trail could be created. The Society for Protection of NH Forests has developed a website that uses the GPS function on your smart phone to audibly notify that you have reached a feature along the trail about which you can read more about.

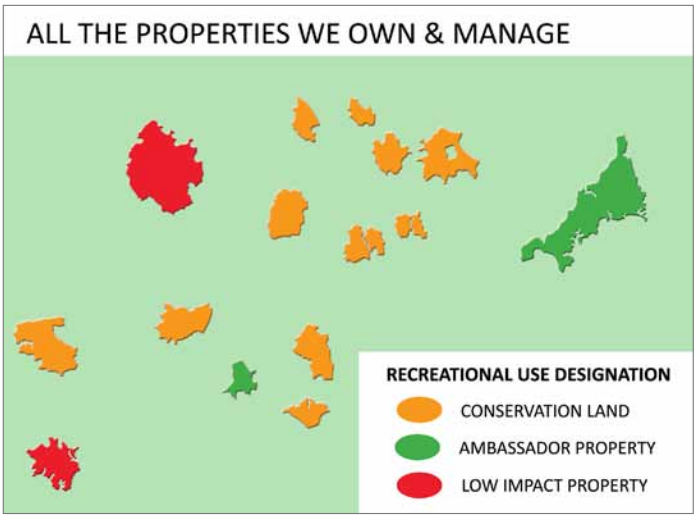
A GUIDE TO KEY NH FISH AND GAME PROPERTIES WITHIN GREAT BAY NATIONAL ESTUARINE RESEARCH RESERVE CAN BE FOUND ONLINE AT GREATBAY.ORG/DOCUMENTS/GREATBAYPASSPORT.PDF



TRAILS FROM A COMMUNITY PERSPECTIVE

PLAN YOUR TRAIL NETWORK OVER MULTIPLE PROPERTIES

When planning a trail network, it is most effective to evaluate all properties in a region that are under one ownership at the same time. For example, all town conservation areas or all properties owned by a land trust, other non-profit, or government agency. Good land stewardship balances public access and maintenance of ecological integrity. This can be done by varying the density and intensity of use of trail systems on different properties depending on the sensitivity of natural features each supports. Some properties will lend themselves to being high recreational use "ambassador" areas with a well-publicized, and well-maintained, network of trails. Others that support particularly sensitive wildlife, plants, or natural communities are usually best with few, or no trails and remaining less publicized. Considering the entire suite of properties under an individual's or organization's management at the same time makes it possible to develop a strategic plan with different tracts having varying levels of public use.



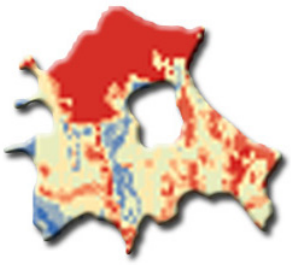
GOOD LAND STEWARDSHIP BALANCES PUBLIC ACCESS WITH ECOLOGICAL INTEGRITY. ENCOURAGING TRAIL USE ON KEY AMBASSADOR PROPERTIES WHILE LEAVING SOME PROPERTIES WITH FEW, OR NO TRAILS IS A GOOD WAY TO ACHIEVE THIS.

USE THE TRAILS FOR PEOPLE AND WILDLIFE TOOL

The Trails for People and Wildlife tool is a good way to start exploring which properties may be best to support different levels of recreational use. In general, those with the most blue areas are good candidates to be designated as ambassador properties as they are the places that trails will impact wildlife least. Properties dominated by areas

of red, representing wildlife impact hot spots, are the most ecologically sensitive so ideally will be left as undisturbed as possible.

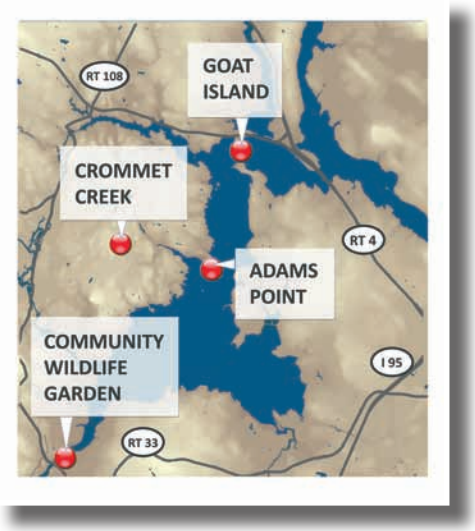
PROPERTIES THAT ARE MAINLY BLUE ARE GOOD CANDIDATES TO BECOME HIGHLY PUBLICIZED AMBASSADOR PROPERTIES.



THOSE THAT ARE MAINLY RED WILL IDEALLY BE LEFT AS UNDISTURBED AS POSSIBLE.

On properties that you have decided to create or maintain a trail system, each section can be evaluated using the Trails for People and Wildlife map for that area. As always, new trails will ideally be routed away from red wildlife hot spots and "follow the blue" as much as possible. Existing trails can be evaluated as to whether it is best for them to remain in place, be rerouted, or decommissioned.

Planning the best locations for trails recognizes the reality of social pressure and politics. Occasionally very popular high-use trails that have been open to the public for generations may not make sense to close, even if it would be best to do so from a wildlife perspective. Integrating such reality checks into your plan allows you to create a trail network that is more sustainable for the long-term and supported by most community members.



NH FISH AND GAME AMBASSADOR PROPERTIES AROUND GREAT BAY.

CONCENTRATE PUBLIC USE ON A FEW TRAILS RATHER THAN DISPERSING OVER MANY

Dispersing public access over a wide area may reduce the need for trail maintenance as each section is likely to receive less use. However, concentrating public access on fewer trails is usually better for wildlife as, over time, they will either move away to other areas or habituate to human presence, depending on each species' tolerance of people. Fewer trails means there are more areas wildlife can go about their activity undisturbed.

MATCH THE AMOUNT OF TRAILS AND INFRASTRUCTURE WITH THE RESOURCES YOU HAVE TO MAINTAIN THEM

A FOCUSED NETWORK OF WELL-MAINTAINED TRAILS SUPPORTS BOTH SAFE PASSAGE FOR PEOPLE AND MINIMIZES DISTURBANCE TO WILDLIFE.

Having fewer trails that are used more frequently allows land managers to focus available resources. This can be the volunteer time, funding, equipment or infrastructure needed to create trails and maintain them in the long term. A focused network of well-maintained trails allows safe and enjoyable passage for people and minimizes disturbance to wildlife at the same time. More frequently trafficked trails tend to be prone to fewer stewardship issues, such as dumping, trash or vandalism.

PUT YOUR PLAN IN WRITING

Once your suite of properties has been evaluated and a plan for recreational use created, write it down. This will ensure it has longevity and the same strategy is maintained as new staff and volunteers come on board. Consider integrating the trail plan into your community natural resource inventory. It often makes sense to involve both conservation commission and recreation committee members as you develop it. Create a summary of your plan and communicate it to people and organizations that are relevant in your community whether it be a planning board, Regional Planning Commission, ecological consultant or trail user group.

PROMOTE EXISTING TRAILS

Guided walks, talks in schools, retirement communities and other venues can all help promote the network of existing trails in your community. For the reasons described in this guide it is not ecologically, or financially, wise to create new trails on every piece of conservation land acquired. Sometimes encouraging people to explore and love trails that have already been built is a much better approach.

MODEL CONSERVATION EASEMENT LANGUAGE

The Deerfield Conservation Commission is a forward thinking group. They developed language for use in new conservation easements they acquire that addresses best management practices for trails and balances the social and ecological needs of trail use.

LOCATING TRAILS:

Trails: Trails may be located, cleared, constructed, and maintained, provided these trails are consistent with the Purposes of this Easement and NH Fish and Game methodology for planning and managing "Trails for People and Wildlife" (www.wildnh.com/trails) or other equivalent science based methodology, including:

a) Keep unfragmented trail-free areas as large as possible

b) Avoid small patches of high quality or special habitats

c) Avoid riparian areas and permanent features in the landscape that serve as important wildlife corridors

d) Avoid locations of rare wildlife

Recreation Trail Management Plan Required. Any and all recreation trail construction maintenance and relocation shall follow a written Recreation Trail Management Plan consistent with this Easement, items (a)-(d) above, and approved in advance and in writing by the Grantee.

Construction and maintenance shall conform to best practices recommended by:

a) Appalachian Mountain Club or similar trail-maintaining organization (for reference, see The Complete Guide to Trail Building and Maintenance, C. Demrow, D. Salisbury, Appalachian Mountain Club, or similar successor publication)

b) NH State Parks Best Management Practices manual https://www.nhstateparks.org/uploads/pdf/BMP-Manual.pdf or similar successor publication and shall be constructed and maintained consistent with requirements of the Management Plan.

Trail making and management activities shall be carried out in accordance with all applicable local, state and federal laws and regulations, and in accordance with current, generally accepted best management practices for the sites, soils and terrain of the Property. Trail design and construction shall be supervised by a licensed professional forester, a certified wildlife biologist, or other qualified person approved in advance and in writing by the Grantee.

GETTING YOUR PROJECT ON THE GROUND

NH BUREAU OF TRAILS

The NH Bureau of Trails publishes the "New Hampshire Trail Construction and Maintenance Manual." It is an excellent guide designed to be helpful to anyone looking to maintain or build new trails. It includes techniques for erosion control, information on permitting, and considerations for installing culverts and bridges on trails. It is available online for free download.

In addition to this publication, the Bureau of Trails offers grants for trail construction, support for clubs, and gives guidance on trail maintenance and etiquette. They also publish information about laws for ATVing and snowmobiling along with Recreational Use Statues including landowner liability and legal posting of land.

UNH COOPERATIVE EXTENSION: NATURE GROUPIE

UNH Cooperative Extension runs the "Nature Groupie" program which encourages outdoor enthusiasts to volunteer for nature in New England. Their online calendar advertises volunteer work days. They also have a series of manuals including "Trail Maintenance for Volunteers: A Training Guide." They publish a directory of trail building professionals and have a tool loan library for stewardship projects.

UNH COOPERATIVE EXTENSION: COUNTY FORESTERS

Cooperative Extension County Foresters are a wealth of information. They can offer advice about best trail location and many other aspects of natural resource management. Contact information is available from the UNH Cooperative Extension Forestry Information Center at forest.info@unh.edu, or by using the information below;

Belknap County
64 Court Street
Laconia, NH 03246
603-527-5475

Carroll County
73 Main Street, PO Box 1480
Conway, NH 03818
603-447-3834

Cheshire County
33 West Street
Keene, NH 03431
603-352-4550

Coos County
629A Main Street
Lancaster, NH 03584
603-788-4961

Grafton County
3855 Dartmouth College Hwy, Box 5
North Haverhill, NH 03774
603-787-6944

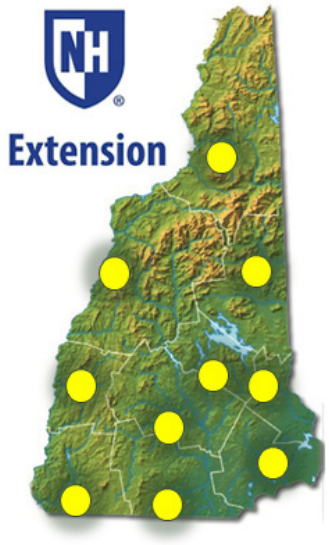
Hillsborough County
329 Mast Road, Suite 101
Goffstown, NH 03045
603-641-6060

Merrimack County
315 Daniel Webster Highway
Boscawen, NH 03303
603-796-2151

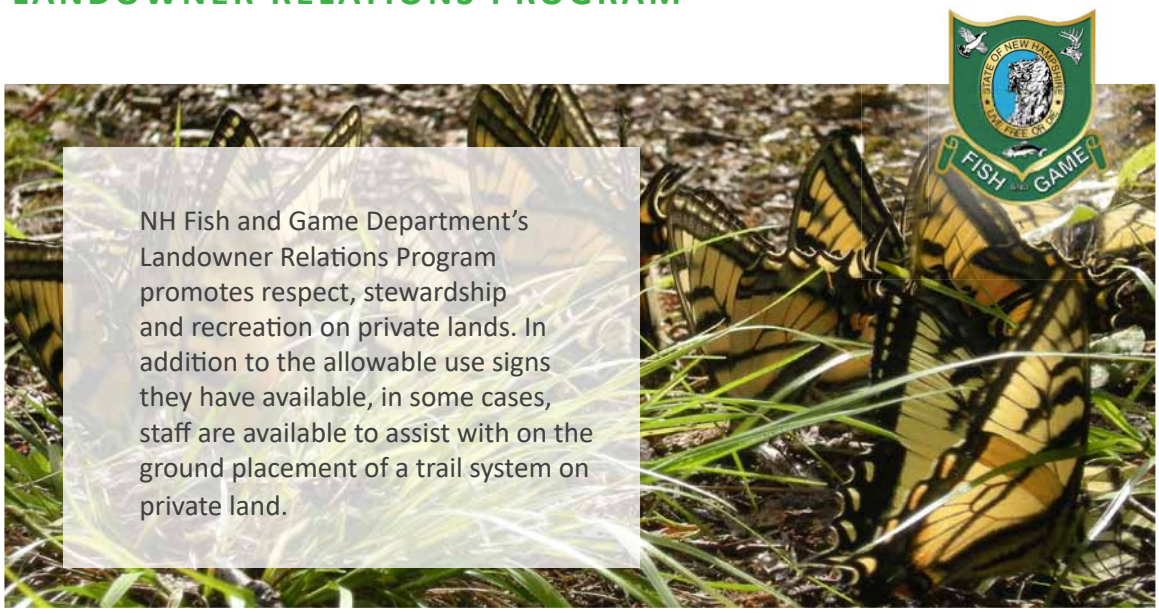
Rockingham County
113 North Road
Brentwood, NH 03833
603-679-5616

Strafford County
268 County Farm Road
Dover, NH 03820
603-749-4445

Sullivan County
24 Main Street
Newport, NH 03773
603-863-9200



NH FISH AND GAME DEPARTMENT LANDOWNER RELATIONS PROGRAM



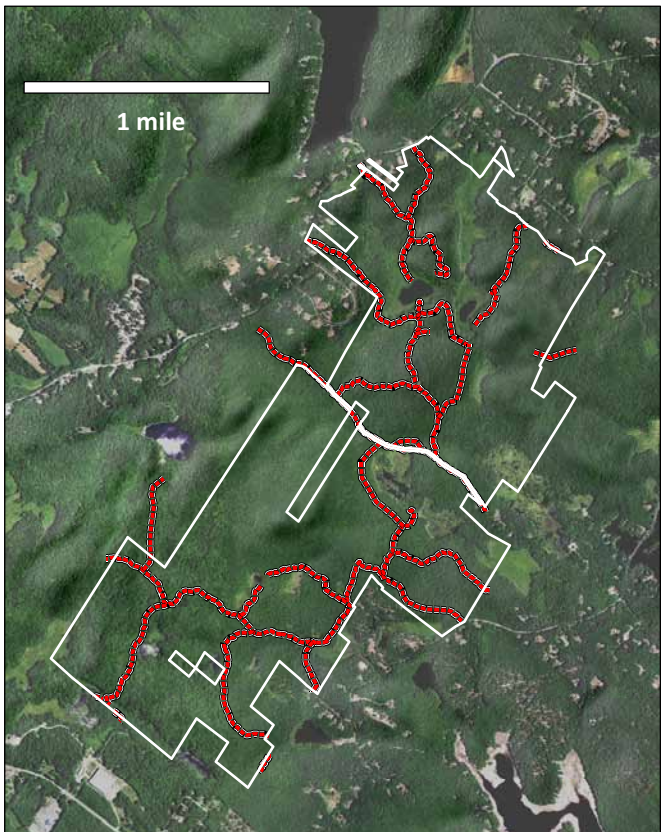
NH Fish and Game Department's Landowner Relations Program promotes respect, stewardship and recreation on private lands. In addition to the allowable use signs they have available, in some cases, staff are available to assist with on the ground placement of a trail system on private land.

STONEHOUSE FOREST: A REAL-WORLD CASE STUDY

A recreation trail management plan was recently prepared by Ibis Wildlife Consulting for Stonehouse Forest in Barrington and Nottingham. The 1,535 acre property is owned by the Southeast Land Trust of New Hampshire with a conservation easement held by the NH Fish and Game Department and a third party interest held by the town of Barrington. Additionally, the purchase of the land included an Executory Interest to the Land and Community Heritage Investment Program which provided funds to acquire the land. The property is the largest undeveloped tract in Barrington and is important habitat for many wildlife species including turtles, bear and red fox.

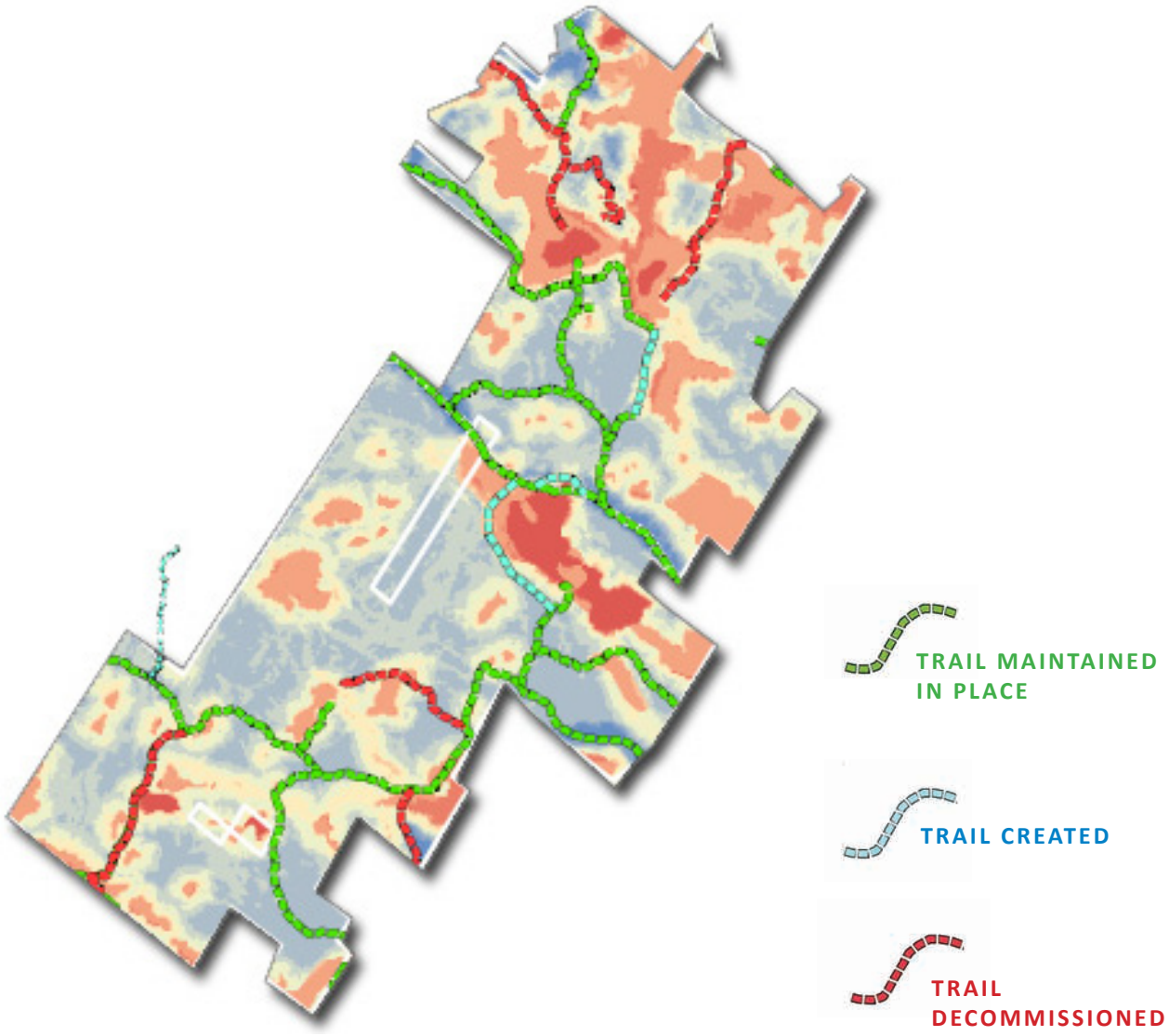
EXISTING TRAILS

When placed into conservation in 2017, Stonehouse Forest had 10.4 miles of existing woods roads and trails that varied in width from approximately one foot to ten feet. This included a Class VI public right-of-way that provides a scenic view of a large beaver wetland close to the center of the property.



STONEHOUSE FOREST IS THE LARGEST UNDEVELOPED TRACT IN BARRINGTON. WHEN PLACED INTO CONSERVATION 10.4 MILES OF EXISTING WOODS ROADS AND TRAILS WERE PRESENT.

Using the trails for people and wildlife map for that area, applying the 400 foot corridor of influence buffer to trails, along with local documentation of vernal pools, it was decided to maintain over seven miles of existing trail, create three new sections of trail totalling approximately one mile, and decommission three point six miles of trail.



Sections of trail that were decommissioned included those that crossed large wetlands or ponds in order to protect water quality, natural communities and wildlife habitat. Other stretches closed were those in high value wildlife habitat and trails without specific destinations or multiple trails that led to the same destination. Finally, sections were closed to help reduce habitat fragmentation, to protect significant peatland and an oak-mountain laurel natural community, and to avoid disturbance to neighboring properties.

To enhance visitor enjoyment and knowledge about the property two permeable surface parking areas, each with an information kiosk, are planned. To help protect water quality and maintain safe passable trails Southeast Land Trust will engage volunteers and recreational user groups to assist in upgrading trails, building bridges, and installing other public access infrastructure.

Five different types of use are allowed on sections of the trail shown on the map on the opposite page;

Pink trails are multi-use including pedestrians, mountain bikes, snowmobiles, and horseback riding.

White trails are multi-use including pedestrians, mountain bikes, and snowmobiles.

Yellow trails are pedestrian and mountain bikes with no snowmobiles or horses.

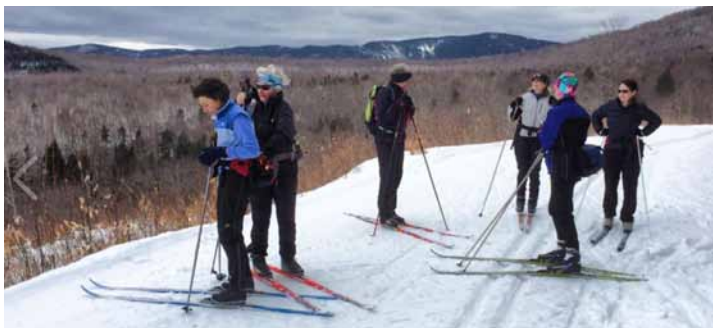
Red trails are pedestrian only.

The green woods roads are for management access onto the property by Southeast Land Trust and its contractors.

Finally a schedule of trail maintenance and monitoring was put together;

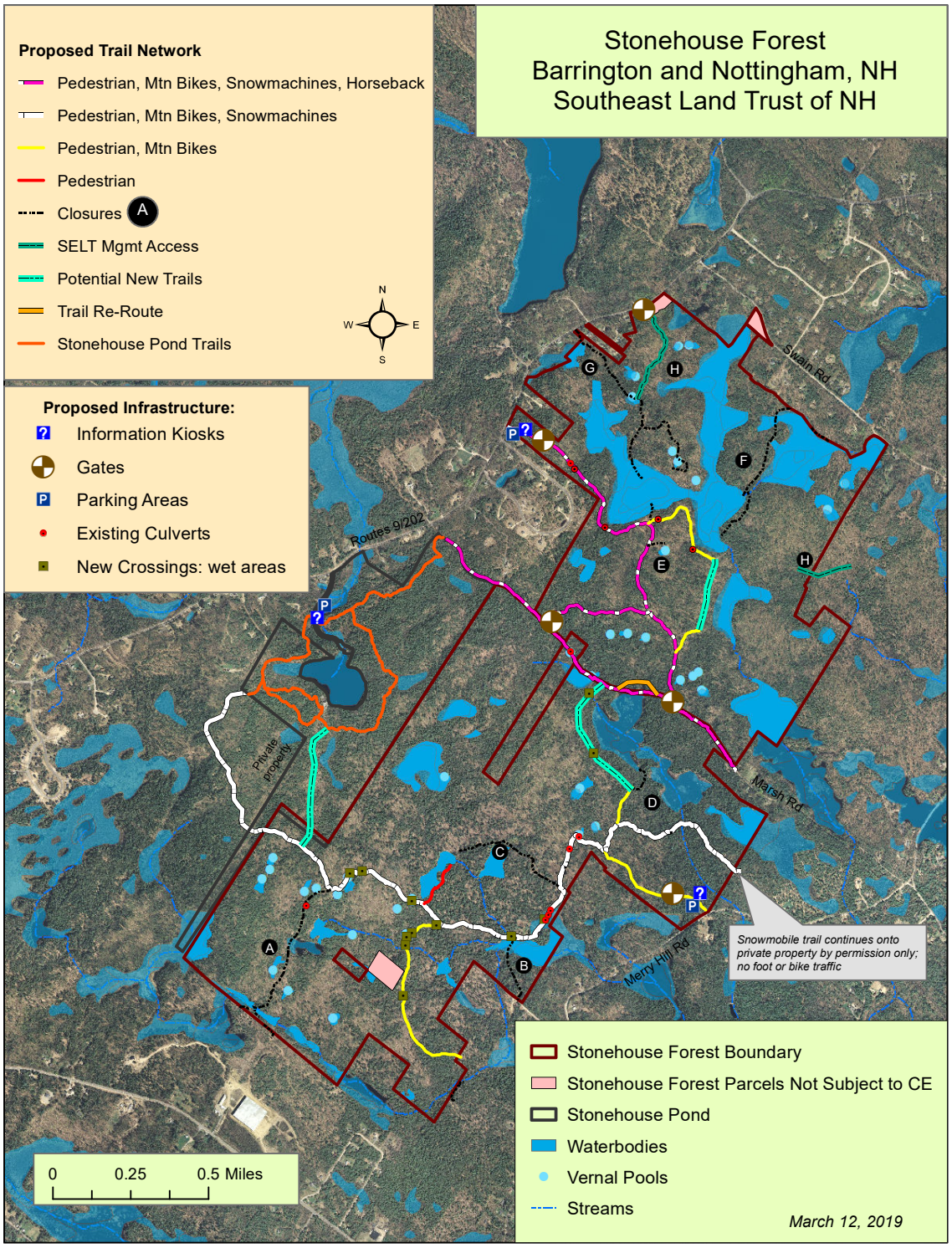
Activity	Description	Schedule
Trail Mowing	Rotary tractor mower	2x per year
Plow out parking area in winter	Snowplowing	Dependent on annual budgets
Property monitoring	Assess trail conditions for signs of erosion, tree falls, other mgmt. issues	Annual
Boundary maintenance	Monitor boundary	Annual
Recreation Plan Update	Plan Update	Every 10 years = 2028

Planning for regular maintenance of trails and associated infrastructure is a cost effective approach to property management as it is likely to catch problems before they become catastrophic and expensive to repair.



WENDY CLARK PHOTO

The Stonehouse Forest recreational trail management plan is a great example of how to develop a thoughtfully located network of well maintained trails that allow people to get outside to enjoy nature while minimizing disturbance to wildlife. Balancing both needs will help maintain the biodiversity and character of the state we love to live in.



ELLEN SNYDER MAP

NOTES

CHRIS COSTELLO PHOTO

New Hampshire

FISH AND GAME

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wildnh.com/trails

Good morning,

I wanted to take the time to send a quick (well probably not so quick email) about the Dogs in Clifford Park Issue and address the email from Councilor Mills. I had planned to attend this evening, but it may be my only chance to see one of my daughter's last softball games (I have not been to one yet this year!) so that is pretty important. Carl Walsh is unfortunately not able to attend, and I was supposed to be there in his absence.

The first thing I want to note is that no one is advocating for banning dogs from Clifford Park. This has never even been brought up in discussion. We want Clifford Park to be a dog-friendly environment for families to enjoy and recreate together.

Secondly, I would push back a bit on Councilor Mill's notion that this is only one complaint. In the information provided to you including a facebook thread, there are many people describing their encounters with off-leash dogs in Clifford Park. This is only stemming from one thread, and there have been others in the past

One thing I have found during my time on the Rec Commission is Facebook is where people talk about these types of issues. They rarely get reported to Rec, PW or PD. I actively monitor many of the local Facebook groups so that I can try to keep a pulse on what is happening, the needs and wants of community members, and issues that need to be addressed. Recently we found out about a broken swing at Clifford Park because someone posted it on Facebook. This was not reported in any other fashion, and I was able to work with Carl to get PW out there to address it. We also found out about a desire for an accessible swing through a Facebook post. I have also been able to keep a pulse on things happening at Dog Park and other parks in the area, and this has led to discussions and action by the commission.

The Commission had been discussing this for quite a few years now, and during the covid years, were able to give this a dry run, limiting dogs to being on leash to support social distancing efforts. It went well, and I am not aware of any complaints about the restriction of keeping dogs on leashes during the time

After those restrictions ended, we took up the discussion again and were unanimously in support of keeping dogs on leashes in Clifford Park. Everyone on the commission is in agreement that this is the right decision for the park and ALL its users. Since the park's revitalization, there is more activity than ever in the park. Hikers, bikers, runners, snowshoers, families with strollers, and kids reading story

walks. And of course, our four-legged friends! All this activity is one of the reasons why we feel having dogs on leashes is the best decision. Not everyone is a fan of dogs, and being approached by an off-leash dog can be a frightening experience. Runners and bikers can excite/scare an off-leash dog, especially when coming up fast around a corner or over a hill. This could cause a dangerous situation with collisions as well. We also considered the encounters of leashed/unleashed dogs. This too can be problematic and cause issues between the dogs. There are also issues with plants and wildlife. Dogs, even trained dogs, can attack or chase wildlife.. Dog poop (although it is supposed to be picked up, many leave it in the woods) can also deter other animals can spread diseases and parasites. The presence of dogs causes wildlife to move away, temporarily or permanently reducing the amount of available habitat in which to feed, breed and rest. Animals become less active during the day to avoid dog interactions. Furthermore, the scent of dogs repels wildlife and the effects remain after the dogs are gone. https://www.protectnatureto.org/wp-content/uploads/2019/10/Impacts-of-dogs-on-wildlife-Factsheet_PNTO_Oct_-2019.pdf. By limiting dogs to being on a leash, we are helping to keep them on the trail, and limiting their impact on plant and wildlife. We need to be good stewards of this beautiful natural resource!

On a personal note, my family is a dog-loving family. We currently have three dogs and have had up to four in the past. We frequently visit Clifford Park. One of our dogs is a very highly trained German Shepherd. She is voiced trained and stays by your side when off-leash. Whenever we bring her to Clifford, she is always on a leash. We feel it is the responsible thing to do, and the dogs should be on a leash at all times in the Park. We actually had a pretty scary encounter ourselves a few years back, where another dog who was off leash, and obviously not able to be controlled by its owner charged our kids and dog. Thankfully the incident ended without anyone getting hurt, but the kids were definitely scared, and the owner of that particular dog did not seem bothered by what their dog had done.

I hope I have provided some insight into how and why the Commission has come to this recommendation, and hope you will support this change in Clifford Park. This decision has not come lightly and comes after years of discussion and hearing from park users like the ones you see in the facebook post. We all feel this is the best decision for all users of the park. Please feel free to reach out if you have any questions, 590-1355

Joseph McKenney

Chair, Biddeford Recreation Commission

Joseph.mckenney@biddefordmaine.org

207-590-1355

Factsheet: IMPACTS OF DOGS ON WILDLIFE

Excerpts from research publications, literature reviews and science commentary

Compiled by **ProtectNatureTO –** a coalition of over 20 nature- and stewardship-based organizations advocating for the protection of wildlife and natural areas across the City of Toronto.

Introduction

Excerpt from:

Impacts of dogs on wildlife and water quality: A literature review

by Lori Hennings, Senior Natural Resource Scientist, Portland, 2016
https://www.researchgate.net/publication/301800852_Impacts_of_dogs_on_wildlife_and_water_quality

In summary, people and their dogs disturb wildlife, and people are not always aware of or willing to acknowledge the significance of their own impacts. Wildlife perceive dogs as predators. Dogs subject wildlife to physical and temporal displacement from habitat, and dog scent repels wildlife with lingering impacts. Dogs disturb wildlife which can induce long-term stress, impact animals' immune systems and reduce reproduction. Dogs spread disease to and outright kill wildlife. People with dogs are much more detrimental to wildlife than people alone; off leash dogs are worse; and off-trail impacts are highest.

Urban wildlife is subject to many human-induced stressors including habitat loss, degraded and fragmented habitat, impacts from a variety of user groups, roads, trails, infrastructure, noise and light pollution.

Impacts include:

1. Physical and temporal displacement – The presence of dogs causes wildlife to move away, temporarily or permanently reducing the amount of available habitat in which to feed, breed and rest. Animals become less active during the day to avoid dog interactions. Furthermore, the scent of dogs repels wildlife and the effects remain after the dogs are gone.

2. Disturbance and stress response – Animals are alarmed and cease their routine activities. This increases the amount of energy they use, while simultaneously reducing their opportunities to feed. Repeated stress causes long-term impacts on wildlife including reduced reproduction and growth, suppressed immune system and increased vulnerability to disease and parasites.

3. Indirect and direct mortality – Dogs transmit diseases (such as canine distemper and rabies) to and from wildlife. Loose dogs kill wildlife.

4. Human disease and water quality impacts – Dog waste pollutes water and transmits harmful parasites and diseases to people.

> *"The evidence that dogs negatively impact wildlife is overwhelming. It is clear that people with dogs – on leash or off – are much more detrimental to wildlife than people without dogs. Dogs (Canis lupus familiaris) are considered to be a subspecies of wolves (Canis lupus), and wildlife perceive dogs as predators." – Lori Hennings*

Disturbance and stress

Four-legged friend or foe? Dog walking displaces native birds from natural areas

By Peter B Banks and Jessica V Bryant, University of New South Wales, published in Biology Letters in December 2007
http://rsbl.royalsocietypublishing.org/content/3/6/611
This 2007 study compared 45 sites where dog-walking was allowed with 45 sites where dog-walking was prohibited in the urban fringe of Sydney, Australia.

Dog walking is among the world's most popular recreational activities, attracting millions of people to natural areas each year with diverse benefits to human and canine health. But conservation managers often ban dog walking from natural areas fearing that wildlife will see dogs as potential predators and abandon their natural habitats, resulting in outcry at the restricted access to public land.

Here we show that dog walking in woodland leads to a 35% reduction in bird diversity and 41% reduction in abundance, both in areas where dog walking is common and where dogs are prohibited. These results argue against access by dog walkers to sensitive conservation areas.

The dramatic reduction in bird diversity and abundance in response to dog walking has immediate implications for other popular recreational activities pursued by humans. This includes bird watching and ecotourism where visitor satisfaction shows a strong relationship to numbers of species seen.

It is also possible that the particular sensitivity of ground dwelling birds to dog walking may lead to a cascade of potential behavioural changes in birds with implications for their local conservation.

> *"Dog walking caused a 41% reduction in numbers of bird individuals detected and a 35% reduction in species richness"*
> *Peter Banks & Jessica Bryant*

Effects of human activity on the foraging behavior of sanderlings

By Katie Thomas and colleagues, California State University, Monterey Bay Institute for Earth Systems Science and Policy, published in Biological Conservation, 2003
https://www.researchgate.net/publication/240370318_Effects_of_human_activity_on_the_foraging_behavior_of_Sanderlings_Calidris_alba

Urbanization and coastal development has dramatically reduced the beach habitat available for foraging shorebirds worldwide. Observations conducted on two central California beaches from January through May and September through December of 1999 showed that the number and activity of people significantly reduced the amount of time sanderlings spent foraging.

Field observations (n = 488) indicated that number of people, type of activity, free running dogs and proximity of people can significantly reduce the time that sanderlings spend consuming prey. These four variables also had a statistically significant effect on the distances that sanderlings moved.

Based on these results, policy recommendations for minimizing the impact of human beach activities on foraging shorebirds include (1) people maintain a minimum distance of 30 m from areas where shorebirds concentrate and (2) strict enforcement of leash laws at primary bird foraging sites.

> *"The most significant negative factor was the presence of free running dogs on the beach"*
> *Katie Thomas*

The effects of dogs on wildlife communities

By Benjamin Lenth and colleagues, Colorado State University, published in Natural Areas Journal, 2008.
https://www.researchgate.net/publication/232663987_The_Effects_of_Dogs_on_Wildlife_Communities
This study compared levels of activity of wildlife in areas that prohibited dogs with areas that allowed dogs. Wildlife activity was measured using five methods in Boulder, Colorado, Parks and Open Space.

Wildlife species that are sensitive to recreational disturbance are generally most sensitive to unpredictable spatial and temporal patterns of disturbance. Predictable activities, such as recreation restricted to trails, may allow wildlife to habituate to those activities. The spatial behavior of dogs off-leash is unpredictable; and when dogs wander off-trail, they are more likely to elicit flushing responses.

We found wildlife species that are preyed upon by native canids demonstrated sensitivity to the presence of domestic dogs. The appearance and behavior of dogs are similar to wild canids, and ungulates and small mammals may perceive dogs as such. Mule deer and small mammals were both less active in the presence of dogs, and both are typical prey of wolves, coyotes, and foxes throughout their evolutionary history.

Ecological impact of humans and dogs on wildlife in protected areas in eastern North America

By Arielle Parsons and colleagues, North Carolina Museum of Natural Sciences, published in Biological Conservation, 2016
https://www.sciencedirect.com/science/article/abs/pii/S0006320716303603

The establishment of protected areas is a key strategy for preserving biodiversity. However, human use of protected areas can cause disturbance to wildlife, especially in areas that allow hunting and if humans are accompanied by dogs.

We used citizen-science run camera traps to investigate how humans, dogs and coyotes used 33 protected areas in eastern North America and analyzed behavioral responses by three prey species: white-tailed deer, eastern gray squirrel and northern raccoon. We obtained 52,863 detections of native wildlife, 162,418 detections of dogs over 42,874 camera nights.

Most dogs were on the trail, and 89% of off-trail dogs were accompanied by humans. Prey avoided dogs, humans and coyotes temporally, but did not avoid them spatially or greatly increase vigilance. Our results indicate that humans are perceived as a greater risk than coyotes and this increases when dogs accompany their owners.

We found that dog management was effective: prohibiting dogs in protected areas reduced their use of an area by a factor of 10 and leash laws increased leashing rates by 21%. Although millions of dogs use natural areas in North America each year, regulations enacted by protected areas combined with responsible management of dog behavior greatly reduce the ecological impact of man's best friend.

"Disturbance of wildlife by recreationists may provoke anti-predator responses such as fleeing, increasing vigilance, and changes in habitat use" *Arielle Parsons*

Direct mortality

The ecological 'pawprint' of domestic dogs is much greater than previously realized

By Tim Doherty and colleagues, Centre for Integrative Biology, Deakin University, published in Biological Conservation, 2017
https://www.researchgate.net/publication/316503371_The_global_impacts_of_domestic_dogs_on_threatened_vertebrates and online https://phys.org/news/2017-05-ecological-pawprint-domestic-dogs-greater.html

Humans and their canine companions share many close bonds. Wolves were the first animal domesticated by people, sometime between 15,000 and 50,000 years ago. There are now an estimated 1 billion domestic dogs across their near-global distribution. Our latest research reveals that the ecological 'pawprint' of domestic dogs is much greater than previously realized.

Aside from simply killing animals, dogs can harm wildlife in other ways, such as spreading disease, interbreeding with other canids, competing for resources such as food or shelter, and causing disturbances by chasing or harassment.

Using the IUCN Red List of Threatened Species, we counted how many species are negatively affected by dogs, assessed the prevalence of different types of impacts, and identified regions with the greatest number of affected species. We found dogs are implicated in the extinction of at least 11 species, and a known or potential threat to an additional 188 threatened species worldwide.

"These numbers place dogs in the number three spot after cats and rodents as the world's most damaging invasive mammalian predators." *Tim Doherty*

Bark in the Park: A review of domestic dogs in parks

By Michael Weston and colleagues, Centre for Integrative Ecology, Deakin University, published in Environmental Management, 2014
https://www.researchgate.net/publication/263586401_Bark_in_the_Park_A_Review_of_Domestic_Dogs_in_Parks

Of the studies examining the effect of dogs on wildlife (n = 67), 19 have investigated the effects of dogs preying on wildlife. Thirteen of these studies report observing either direct predation or strong evidence of predation by dogs, whereas the other six studies mention predation as the end result due to excessive disturbance caused by dogs.

Overwhelmingly, these studies report chasing and killing of prey by dogs, but none report eventual consumption of prey. Direct mortality is reported infrequently in the literature, but sometimes may be substantial; in addition to ground dwelling mammals and flying birds, at least one flightless bird (cassowary) and one arboreal mammal that climbs to the ground to move between trees (koala) suffered dog-related losses significant enough to constitute a conservation problem.

"The main threat from dogs is predation. Even if prey escapes from a dog attack, they waste large amounts of energy fleeing the dogs, leaving them exhausted and vulnerable to other predators" *Rebecca Lovell*

https://mresbec.wordpress.com/2018/11/22/is-wildlife-the-underdog-the-overlooked-impact-of-mans-best-friend/

Disease transmission

Fido, Fluffy and wildlife conservation: The environmental consequences of domesticated animals

By William Twardek and colleagues, Carleton University, published in Environmental Reviews, 2017
https://www.researchgate.net/publication/318039244_Fido_Fluffy_and_wildlife_conservation_The_environmental_consequences_of_domesticated_animals
In 2017, researchers at Carleton University reviewed over 300 papers on the impacts of domestic dogs and cats on wildlife conservation worldwide.

Multi-host pathogens such as canine distemper virus (CDV), rabies virus, canine parvovirus (CPV) and canine adenoviruses (CAV) can be transmitted from domestic dogs to wild species.

CDV is a lethal and highly contagious virus transmitted by domestic dogs through bodily fluids either directly, indirectly in food or waste products in the environment, or through aerosol droplets. Domestic dogs are implicated in the spread of CDV to foxes, badgers and wolves. Additionally, long-term research on lions in the Serengeti suggests that major CDV outbreaks in domestic dogs were initially responsible for infections in lions, but other wildlife species became hosts that then maintained the pathogen's prevalence in the long term.

Domestic dogs and cats may also be a source of rabies to wildlife. Rabies is spread through the saliva of an infected dog or cat when it bites another individual. Dogs are suggested to have transmitted rabies to at least 10 species of wild carnivores including the endangered African wild dog.

Policies and Education

"Many dog walkers who visit nature reserves with their pets are unaware of the potential negative impacts on wildlife.

Understanding the harm dogs cause should encourage more responsible behavior: staying marked paths and keeping dogs on leads within sensitive conservation areas are important steps in protecting wildlife." *Is wildlife the underdog? The overlooked impact of man's best friend By Rebecca Lovell, 2018*

https://mresbec.wordpress.com/2018/11/22/is-wildlife-the-underdog-the-overlooked-impact-of-mans-best-friend/

Dogs are more than wet kisses and tail wags: domestic dogs as invasive species

By G. Zapata-Rios, published in Animal Conservation, 2018 https://zslpublications.onlinelibrary.wiley.com/doi/10.1111/acv.12440

Problems with domestic dogs are not new, but many of their impacts as invasive species have been overlooked until fairly recently. As predators, dog populations have significant impacts on native species, and as a consequence have the potential to alter ecosystem structure and function in priority conservation areas. They also can compete with native predators for prey, cause losses to livestock, and transmit disease. Thus, the impacts of domestic dogs can be much more far-reaching than previously thought.A series of policy measures are required to successfully address the problem of domestic dogs as an invasive species. The scope of policy measures should be to control and manage free-ranging and feral dog populations. Policy should be based on three main premises**:** invasive domestic dogs pose serious ecological impacts and human health problems because the impacts of invasive domestic dogs are linked to human population density and human activities, control of domestic dogs has to be accompanied by changes in human behavior to be effective and, the promotion of responsible dog ownership can significantly reduce the number of free-ranging and feral dogs, and the extension and intensity of their negative impacts.

Education is probably the most important element of a policy designed to reduce the impacts of invasive domestic dogs.

"In addition, communication programs need to be developed to educate and engage people about the ecological impacts of domestic dogs on native species and their potential impacts on human health.

How people perceive dog-wildlife interactions will be fundamental for managing the extent to which dogs are allowed to roam freely. If people see such interactions as a problem, then it would be easier to address the issue and minimize the impacts that dogs have on native ecosystems." *G. Zapata-Rios*

Fido, Fluffy and Wildlife Conservation

By William Twardek and colleagues, Carleton University http://blog.cdnsciencepub.com/fido-fluffy-and-wildlife-conservation-the-impact-of-pets-on-the-environment/

The strong relationship that owners have with their pets can influence people's beliefs and attitudes towards wildlife.

Ownership of a pet can increase the time people spend in nature which corresponds to decreased fear of wild animals, as well as greater understanding, appreciation, and connectedness towards nature. Overall, positive attitudes towards nature increase the likelihood that pet owners will engage in environmentally respectful behaviours and will be concerned about environmental issues.

"Keeping control of the dog on a leash, allowing off-leash time only in designated areas, and being mindful of wildlife will all reduce the direct impact of dogs" *William Twardek*

https://www.thenatureinstitute.org/wp-content/uploads/2019/02/The-impact-of-dogs-on-wildlife.pdf

https://www.wellsreserve.org/blog/consternation-over-canines

https://www.wellsreserve.org/blog/who-let-the-dogs-out-warning-partial-nudity

https://www.gazettenet.com/environment-dog-leash-14716757

https://www.theatlantic.com/science/archive/2019/07/humans-predators-mountain-lions-landscape-of-fear/594187/

https://www.maine.gov/dacf/parks/camping/reservations/pets.shtml

The impacts of dogs on wildlife and water quality: A literature review

Compiled by Lori Hennings for the Portland, Oregon Metro Parks District, April 2016

SUMMARY

Any human related activity can disturb wildlife. In order to meet The Nature Institute's dual goals of protecting natural resources and providing access to nature, TNI has tried to strategically locate trails in less sensitive habitat and to ensure that human activity is as non-disruptive as possible. Part of that strategy has been to allow public access, while limiting certain activities such as bringing dogs into natural areas.

The evidence that dogs negatively impact wildlife is overwhelming. It is clear that people with dogs – on leash or off – are much more detrimental to wildlife than people without dogs. Dogs (Canis lupus familiaris) are considered to be a subspecies of wolves (Canis lupus), and wildlife perceive dogs as predators. (30) Impacts include:

1. **Physical and temporal displacement** – The presence of dogs causes wildlife to move away, temporarily or permanently reducing the amount of available habitat in which to feed, breed and rest. Animals become less active during the day to avoid dog interactions. Furthermore, the scent of dogs repels wildlife and the effects remain after the dogs are gone.

2. **Disturbance and stress response** – Animals are alarmed and cease their routine activities. This increases the amount of energy they use, while simultaneously reducing their opportunities to feed. Repeated stress causes long-term impacts on wildlife including reduced reproduction and growth, suppressed immune system and increased vulnerability to disease and parasites.

3. **Indirect and direct mortality** – Dogs transmit diseases (such as canine distemper and rabies) to and from wildlife. Loose dogs kill wildlife.

4. **Human disease and water quality impacts** - Dog waste pollutes water and transmits harmful parasites and diseases to people.

INTRODUCTION

The Nature Institute owns 450 acres of natural areas, most of which is designated Illinois Nature Preserve and does not allow dogs or other pets on these lands. Exceptions include service animals. The mission of the Illinois Nature Preserves Commission (INPC) is to assist private and public landowners in protecting high quality natural areas and habitats of endangered and threatened species; in perpetuity, through voluntary dedication or registration of such lands into the Illinois Nature Preserves System. The Commission promotes the preservation of these significant lands and provides leadership in their stewardship, management and protection.

Portaland Metro Parks staff examined 54 peerreviewed scientific journal articles and several research reports relating to the impacts of dogs in natural areas, including numerous literature reviews on the impacts of various types of recreation on wildlife and habitat. (10, 28, 42,54,61,63, 65,68,71,73,77) The

Nature Institute is sharing this literature review with the purpose of educating our users on the reason for policies that are in place. The results of the literature review are summarized below.

PHYSICAL AND TEMPORAL DISPLACEMENT

Displacement may be the most significant impact due to the amount of habitat affected. The presence of dogs causes most wildlife to move away from an area, which temporarily or permanently reduces the amount of functionally available habitat to wildlife. The research is clear that people with dogs disturb wildlife more than humans alone.(5,10,33,38,39,41,44,61,68,69) These effects reduce a natural area's carrying capacity for wildlife, and also reduces wildlife viewing experiences for visitors.

Studies on a variety of wildlife in many countries and settings demonstrate that dogs along trails and in natural areas significantly alter wildlife behavior. (9,33,39,41,49,53,58) A 2011 literature review found negative dog effects in all 11 papers that examined such effects.(65) Studies demonstrate dog-specific impacts on reptiles,(29,31,48) shorebirds and waterfowl,(24,32,51,69) songbirds,(5,9,10) small mammals,(33,39,56) deer, elk and bighorn sheep,(4,36,38,44,49,59,63) and carnivores.(22,33,52,58)

A study in France found that two hikers disturbed an area of 3.7 hectares walking near wild sheep, whereas two hikers with dogs disturbed 7.5 hectares around the sheep.(41) In Chicago, migratory songbirds were less abundant in yards with dogs.(9) Dog walking in Australian woodlands led to a 35% reduction in bird diversity and a 41% reduction in the overall number of birds.(5) The same study showed some disturbance of birds by humans, but typically less than half that induced by dogs.

Studies in California and Colorado showed that bobcats avoided areas where dogs were present, including spatial displacement(22,33,52) and temporal displacement in which bobcats switched to night time for most activities.(22) The Colorado study also demonstrated significantly lower deer activity near trails specifically in areas that allowed dogs, and this effect extended at least 100 meters off-trail.(33) This negative effect was also true for small mammals including squirrels, rabbits, chipmunks and mice, with the impact extending at least 50 meters off-trail.

Evidence suggests that some wildlife species can habituate to certain predictable, non-threatening disturbances such as people walking on a trail in a natural area; this effectively lowers the stress response. Part of this adaptation may be due to wildlife learning what is and isn't a threat, and also avoidance of hunters.(19,55,63,70) Habituated animals still react, but amount of habitat affected is not as large.(55,56,63,70) However, dogs – especially off-leash dogs – may prevent wildlife habituation because wildlife consistently see them as predators. Dog-specific disturbance has been studied for birds, with no evidence of habituation even with leashed dogs, even where dog-walking was frequent; this effect was much weaker for people without dogs.(5)

Even the scent of dog urine or feces can trigger wildlife to avoid an area. Therefore, the impacts of dog presence can linger long after the dog is gone, even days later. One literature review found that predator odors caused escape, avoidance, freezing, and altered behavior in a large suite of wildlife species including scores of amphibian, reptile, bird, and mammal species from other studies.(30) The scent of domestic dogs has been shown to repel American beaver (Castor Canadensis), mountain beaver

(Aplodontia rufa), deer (Odocoileus species), elk (Cerus elaphus), and a wide variety of wildlife native to other countries.(20,30) Mountain beaver cause economic damage to young tree stands in the Pacific Northwest, and foresters are considering using dog urine as a repellant.(20) An experimental study demonstrated that dog feces are an effective repellent for sheep, with no habituation observed over seven successive days. (1)

One Colorado study showed mixed effects of dogs on wildlife.(44) The study compared effects of pedestrians alone, pedestrians with leashed dogs and unleashed dogs alone on grassland birds. Vesper Sparrows (Pooecetes gramineus) and Western Meadowlarks (Sturnella neglecta) waited until dogs were closest to flush – that is, they fly or run away. This could be an attempt to remain undetected against the greatest threat, but could also mean that these bird species perceive humans as a greater threat than dogs. However, the same study found strong dog-specific impacts on mule deer in woodlands. A literature review found that ungulates (deer, elk and sheep) had stronger flight responses in open habitats compared to forested habitats.(63) Unlike small ground-nesting songbirds, larger animals would have no cover and could easily be seen in open habitats. The disturbance effects of off-leash dogs are stronger than on-leash and substantially expand the amount of wildlife habitat affected, (32,59,63,69) and the unpredictability of off-leash dogs may prevent wildlife habituation in large areas of habitat. (5,10,32,61,69) The negative effects are increased even further when dogs and people venture off-trail, probably because their behavior is less predictable.(44,67) Offleash dogs are likely to reduce the number and types of wildlife in large areas of habitat. A Colorado study found off-leash dogs ventured up to 85 meters from the trail, although this result was from 1 square meter plots covering a very small percentage of the area. (33) Remote cameras in another study documented the same dog 1.5 miles apart in the same day. (61) In Utah, mule deer showed a 96% probability of flushing within 100 meters of recreationists located off trails; their probability of flushing did not drop to 70% until the deer were 390 meters from the recreationists.(67) A California shorebird study found that off-leash dogs were a disproportionate source of disturbance, and that plovers did not habituate to disturbance; birds were disturbed once every 27 minutes on weekends.(32)

To illustrate the potential of dogs to displace wildlife Metro staff explored two well-known local park examples that allow dogs on leash. Forest Park is one of the largest urban parks in the U.S. and was always intended to connect urban dwellers with nature; people have been walking their dogs there since before the park's 1948 dedication. Forest Park covers 5,172 acres of forest, including approximately 80 miles of trails and service. Using a very conservative 25-meter buffer around mapped trails to represent the "human + dog on leash" area of disturbance and assuming 100% compliance with leash rules, the area affected would be 1,406 acres – that's 28% of the entire park. In 651-acre Tryon Creek Natural Area, 207 acres of land (32%) is within 25 meters of a trail.

DISTURBANCE AND STRESS RESPONSE

Stress response is the functional response of an animal to an external stressor, such as seasonal changes in temperature and food availability or sudden disturbance. (3) Specific stress hormones are released to enable the animal to physically respond to the stressor. Acute stress response, when an animal reacts to an immediate situation, can benefit an animal by triggering it to respond appropriately to a threat.

However, chronic stress such as repeated disturbances over time may reduce wildlife health, reproduction, growth, impair the immune system and increase vulnerability to parasites and diseases.(16,27,75)

Dogs cause wildlife to be more alert, which reduces feeding, sleeping, grooming and breeding activities and wastes vital energy stores that may mean life or death when resources are low, such as during winter or reproduction.(8,32,40,41,69) Animals release stress hormones and their heart rates elevate in response.(3,27,37,38) When stress becomes too high, animals may flush, freeze, or hide. (26,30)

Several studies document that disturbance reduces reproductive success for some wildlife species. (11,35,40,50,63) Numerous studies found that female deer and elk, and deer and elk groups with young offspring, show greater flight responses to human disturbances than other groups.(63) Stress hormones may cause male songbirds to reduce their territorial defense, females to reduce feeding of their young, nestlings to have reduced weight and poor immune systems, and adult birds to abandon nests.(11,34,35,76) A Colorado study showed that elk repeatedly approached by humans had fewer young. (50) Although research is lacking on whether dogs specifically reduce the reproductive success of wildlife, the fact that humans with dogs create much stronger disturbance effects than without dogs (5,33,38,41,44,61,68,69) implies that these stress effects would be magnified if people had dogs with them.

INDIRECT AND DIRECT MORTALITY

Dogs chase and kill many wildlife species including reptiles, small mammals, deer and foxes.(12,13,29,31,48,58,62) A Canadian study found that domestic dogs were one of the top three predators that killed white-tailed deer fawns.(4) In northern Idaho winter deer grounds, an Idaho Fish and Game conservation officer witnessed or received reports of 39 incidents of dogs chasing deer, directly resulting in the deaths of at least 12 animals.(36) A study in southern Chile revealed that domestic dogs preyed on most of the mammal species present in the study area.(60) A 2014 literature review of dogs in parks identified 19 studies that investigated the effects of dogs preying on wildlife.(73) Of these, 13 reported observing or finding strong evidence of dog predation on wildlife. The Audubon Society of Portland's Wildlife Care Center took in 1,681 known "dog-caught" injured animals from 1987 through March 2016. (2)

Dogs transmit diseases to wildlife and vice versa including rabies, Giardia, distemper and parvovirus. (18,23,66,74) A Mexico City study concluded that feral dogs continually transmitted parvovirus, toxoplasmosis and rabies to wildlife including opossums, ringtails, skunks, weasels and squirrels.(66) Large carnivores such as cougars are especially vulnerable to domestic dog diseases including canine distemper.(74)

HUMAN DISEASE AND WATER QUALITY IMPACTS

Feces are often delivered to waterways through stormwater. (57) The average dog produces ½ to ¾ pound of fecal matter each day – a hundred dogs can produce more than 500 pounds of waste per week. (45) The Oregon Department of Environmental Quality identifies pet waste as a significant

contributor to one of the region's most ubiquitous and serious pollutants, E. coli bacteria. Contact with E. coli-polluted water can make people sick. Because dog waste can be a relatively simple source to reduce or eliminate exposure to E. coli, DEQ considers reducing or eliminating dog waste an important action item in jurisdictions' clean water implementation plans for the Willamette Basin watershed.(47)

Humans can catch parasites and diseases such as hookworms (causes rash), roundworms (may cause vision loss in small children, rash, fever, or cough) and salmonella (causes gastrointestinal illness) from dog waste. (7,57) Aside from potential illnesses, dog waste can negatively affect visitors' experience in a natural area.

Several examples illustrate local dog impacts. A Clean Water Services DNA study found that dog waste alone accounts for an average of 13% of fecal bacteria in stream study sites in the Tualatin River Basin.(17) Off-leash dog walking is documented to cause erosion in Portland's Marshall Park, creating sediment problems in stream water. (15) In 2014 Portland school administrators expressed concern because playgrounds had become "a minefield for animal waste" from people using school grounds as after hours, off-leash dog parks, threatening the health of school children.(21) The City of Gresham found extremely high levels of E. coli bacteria in water quality samples of a very specific stretch of a stream, where dog feces were found along stream banks behind several yards with dogs.

BELIEF, BEHAVIOR AND REALITY

People do not always take responsibility for their impacts on wildlife. Several studies demonstrate that natural area visitors, including dog owners, often don't believe they are having much of an effect on wildlife, or assign blame to different user groups rather than accepting responsibility themselves. (6,64,67,68) Some natural area visitors assume that when they see wildlife, it means that they are not disturbing the animals – or worse, that because they didn't see any wildlife, they didn't disturb any. (64)

For example, in Utah, about half of recreational visitors surveyed did not believe that recreation was having a negative impact on wildlife; of those that did, each user group blamed other groups for the strongest impacts.(67) In Austria, 56% of people surveyed at a national park agreed that wildlife is in general disturbed by human activity.(64) However, only 12% believed that they had disturbed wildlife in their visit that day, and dog-walkers ranked their activities as less disturbing than other user groups' activities. When asking different user groups to rate the impacts of overall human disturbance on wildlife, dog-walkers rated the impacts the lowest, at 2.6 out of 5 possible impact points.

Surveys indicate that many dog owners desire fewer restrictions, while non-dog owners often feel the opposite.(72,73) However dog owners don't always follow the rules, and some dog owners allow their dogs to run free in leash-only natural areas.(32,52,73) In a Santa Barbara study, only 21% of dogs were leashed despite posted leash requirements. (32) And despite regulations and claims to the contrary, dog owners often don't pick up their dog's waste. (6,32) An English study revealed that although 95% of visitors claimed to pick up their dog's waste only 19-46% actually did so, depending on location within the park.(6)

DISCUSSION

In summary, people and their dogs disturb wildlife, and people are not always aware of or willing to acknowledge the significance of their own impacts. Wildlife perceive dogs as predators. Dogs subject wildlife to physical and temporal displacement from habitat, and dog scent repels wildlife with lingering impacts. Dogs disturb wildlife which can induce long-term stress, impact animals' immune system and reduce reproduction. Dogs spread disease to and outright kill wildlife. People with dogs are much more detrimental to wildlife than people alone; off-leash dogs are worse; and off-trail impacts are the highest (Figure 1).

Urban wildlife is subjected to many human-induced stressors including habitat loss, degraded and fragmented habitat, impacts from a variety of user groups, roads, trails, infrastructure, noise and light pollution.(26) These stressors will increase with population size.

The Nature Institute upholds the no pet policy, because scientific research shows that domestic animals have an impact on wildlife. There are many places in the Metro East area where dogs are welcome on the trails. The Nature Institute and the wildlife that live here thank you for abiding by this unpopular policy.

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