

**DRAFT**

# **Andrews Community Forest An Ecological Assessment Bob Low**

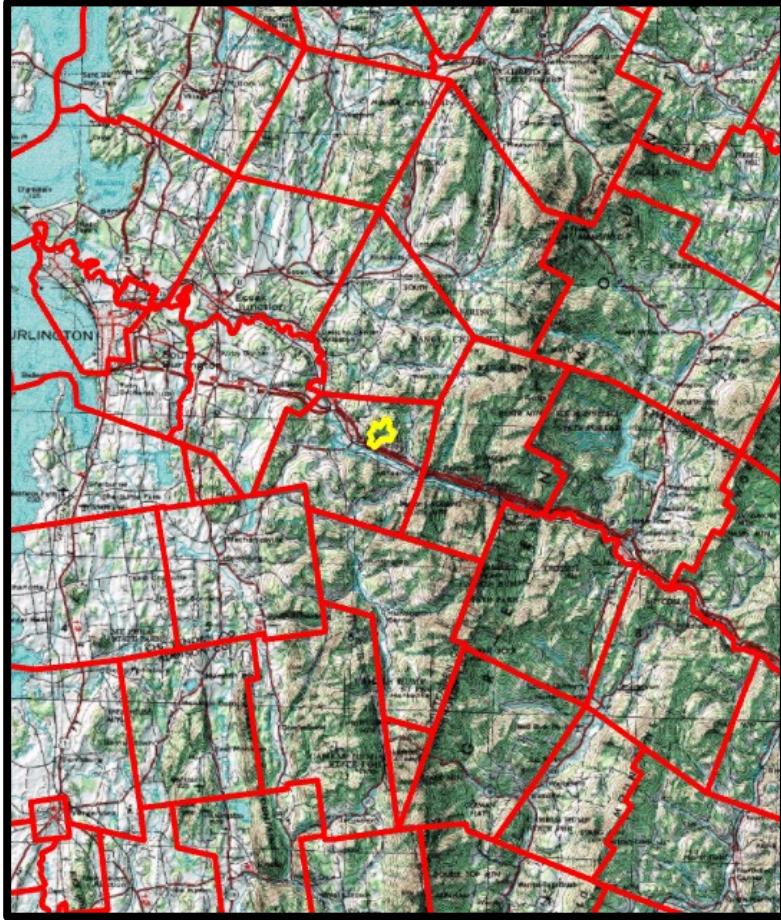
**Purpose: Map-Informed Decision-Making: Ecology, Wildlife and Forest Trails**

- **What follows is a set of maps that examines ecological / wildlife features to consider in developing a balanced approach to development of recreation in the Andrews Community Forest (ACF).**
- **The data layers have been obtained from VGIS, ANR and include the recent 2024 ANR Conservation Design update. Readers may be interested in using BioFinder to explore these maps further.**
- **These features will be presented in the context of the currently proposed trails plan. No value judgment is placed here on the proposed trail locations: the purpose rather is to examine how trail placement might affect the ecology of the Forest.**

## **Topologic Features**

**The physical landscape provides the background features in and surrounding the ACF (Figures 1-6).**

**Figure-1**



**Location Map**



**Figure-2**

# Vermont ANR Conservation Design: Physical Landscapes

**Rare** Least commonly found in Vermont. Often correspond with the presence of rare species or natural communities. Can help predict where diversity among unstudied species such as insects, plants, mosses may occur.

**Representative** Occur commonly in Vermont. Represent important interior forest blocks, connectivity blocks, or surface waters and riparian areas. In some cases, also include the forest that surrounds a rare or responsibility physical landscape.

**Responsibility**. Occur more commonly in Vermont than in other areas of the northeastern United States and adjacent Canada. Have a regional responsibility to protect.

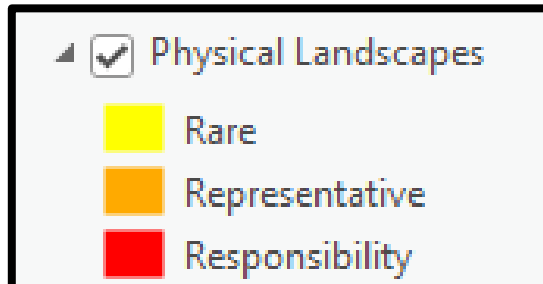
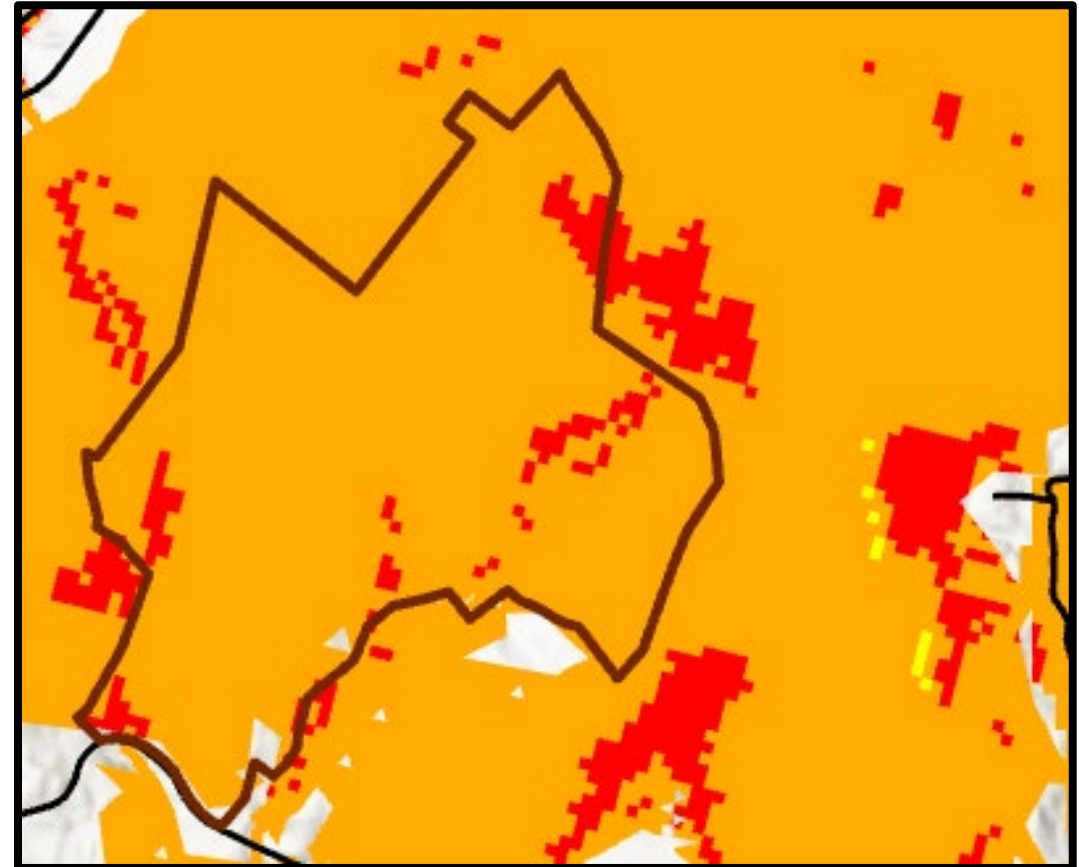
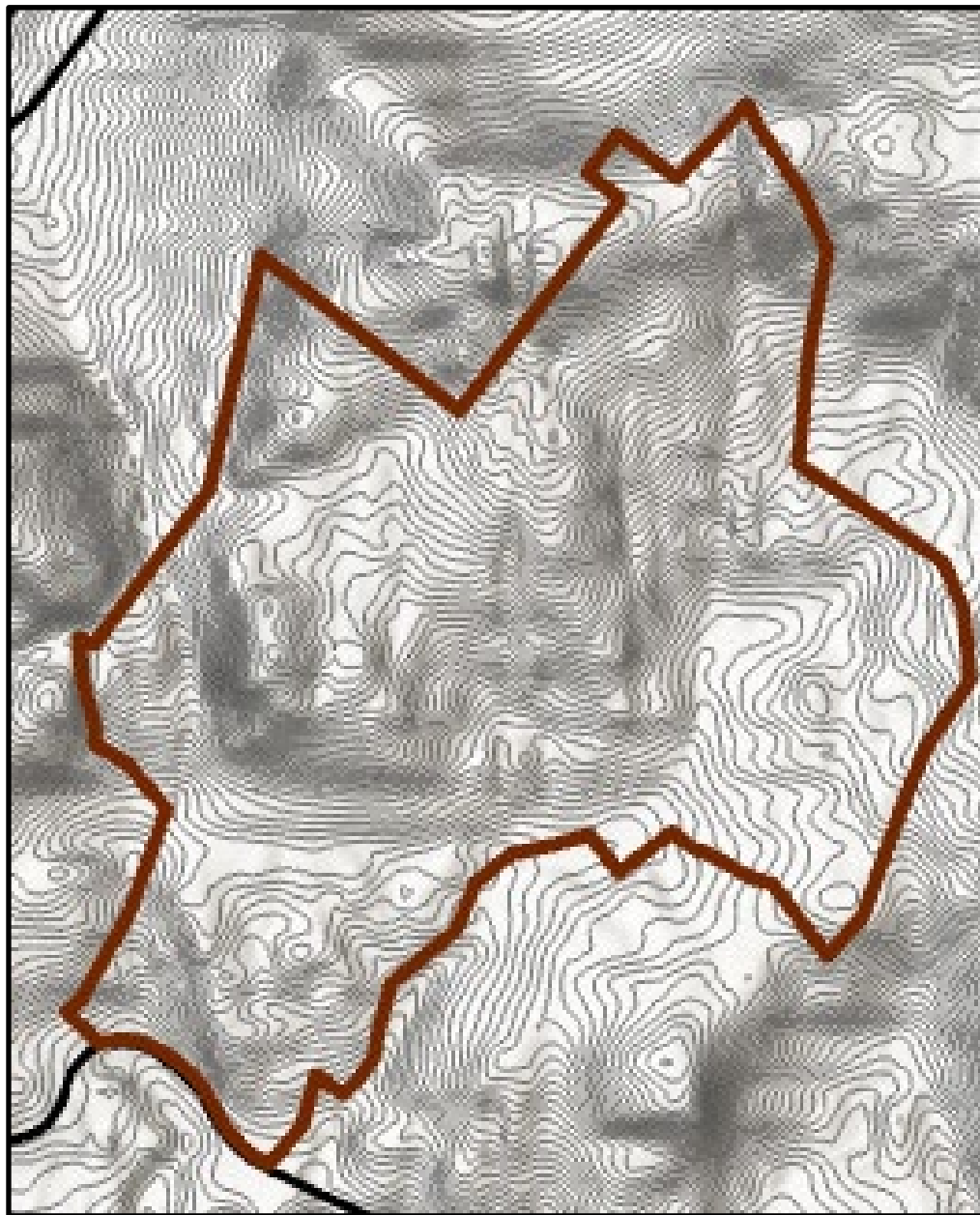
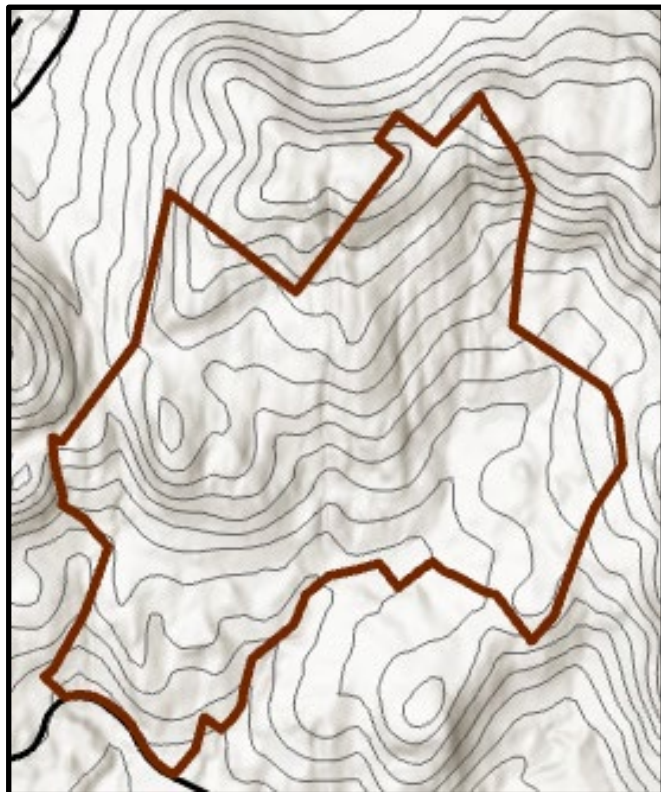


Figure-3

Contours



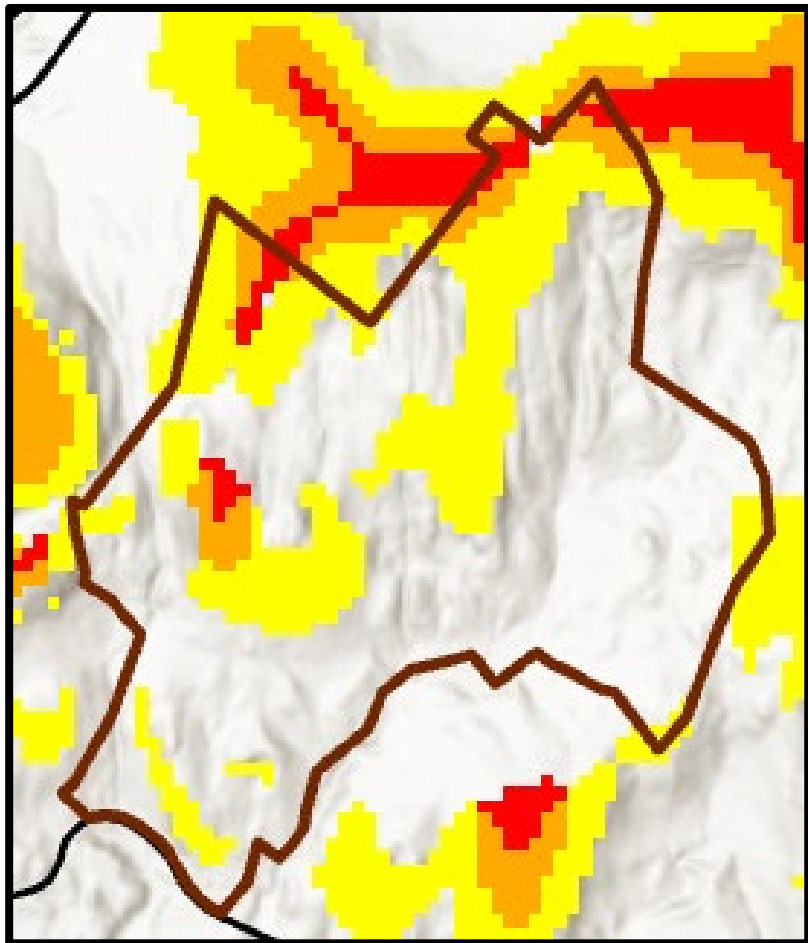
**Figure-4**

**Slopes / Ridges**

▾  landforms

VALUE

- Slope Crest / Ridge Gentle Slope
- Slope Crest / Ridge moderately Steep
- Upper Side Slope / Rounded Ridge

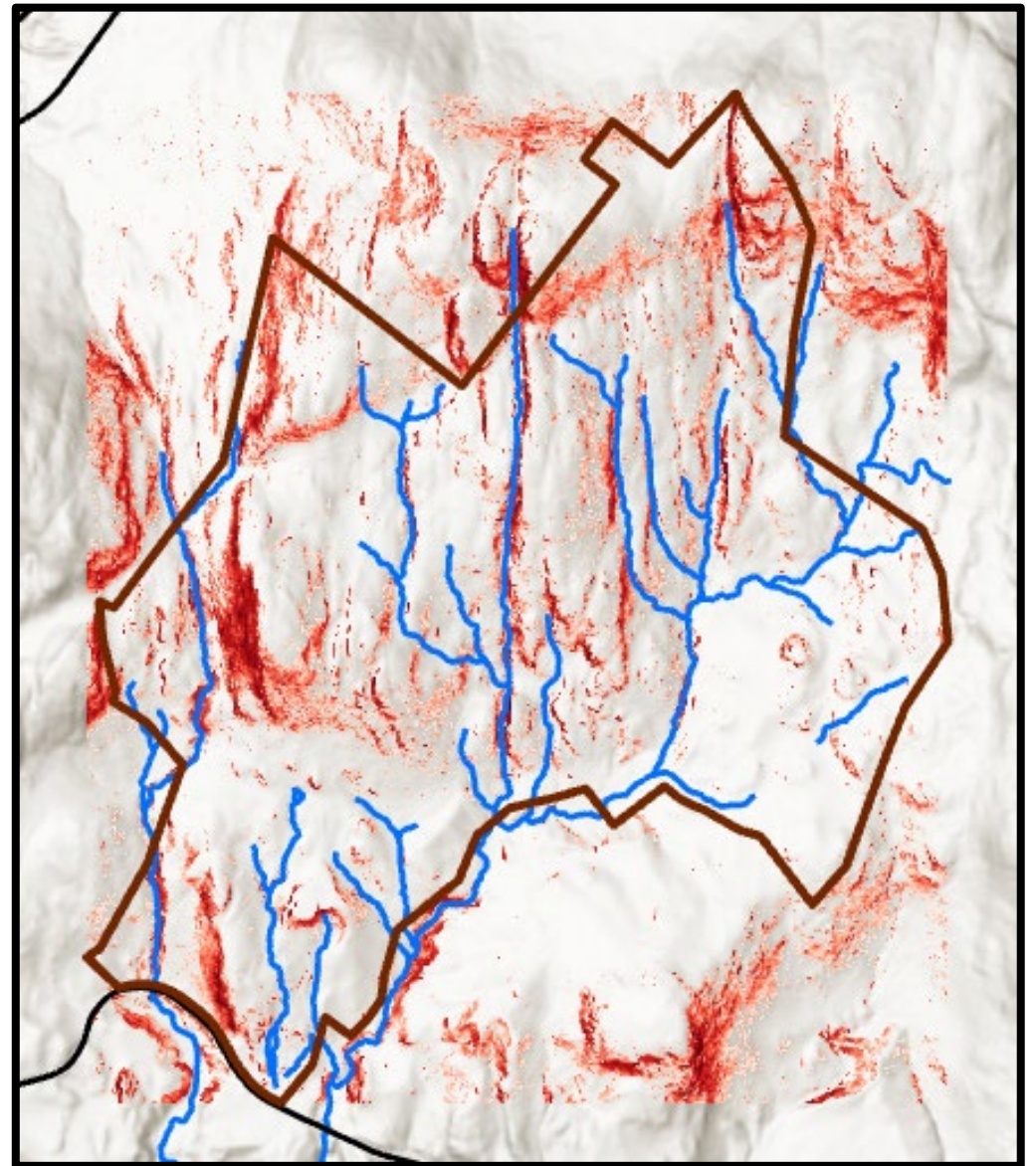


**ANR Slope Impact**

▾  SlopeImpact

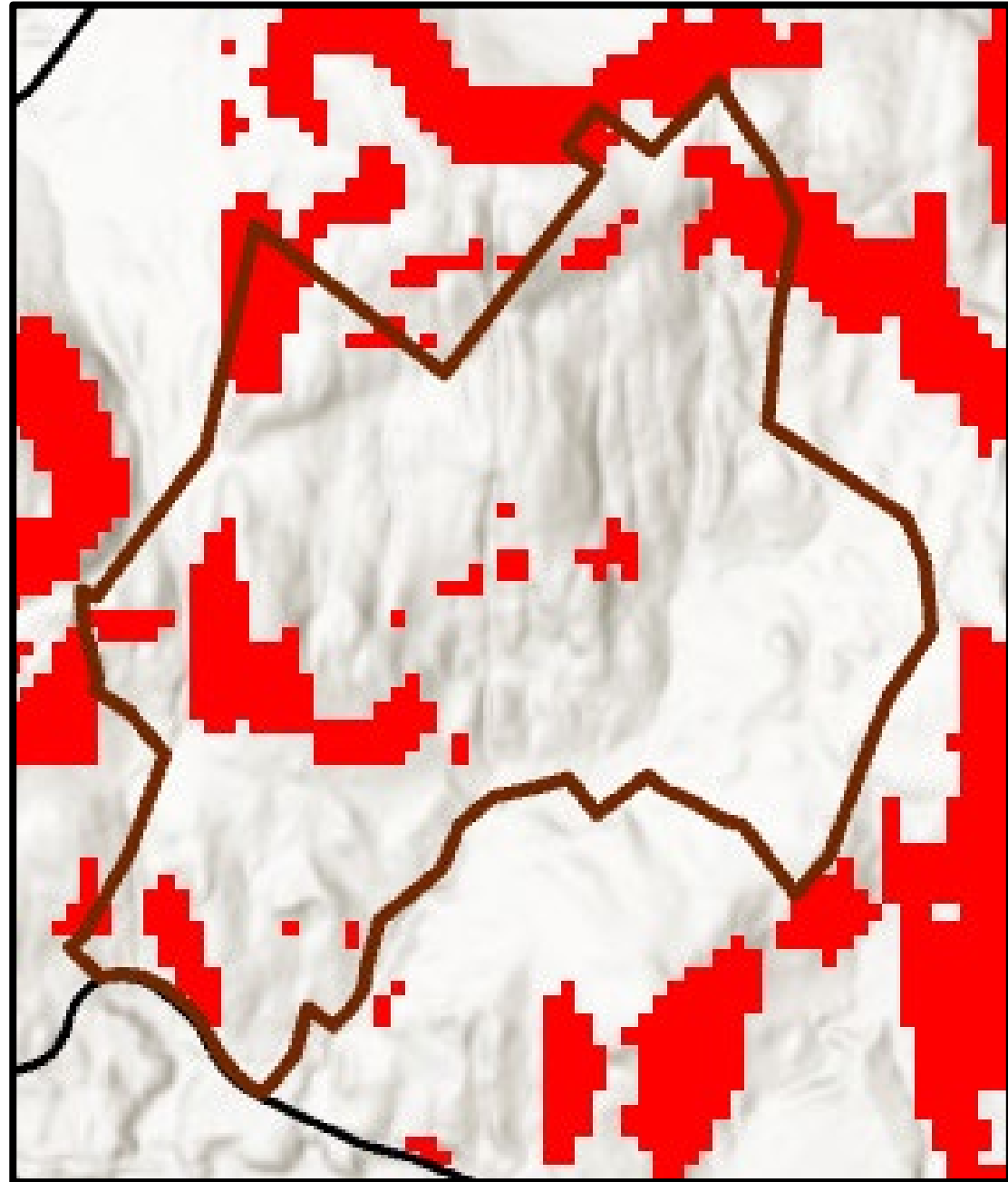
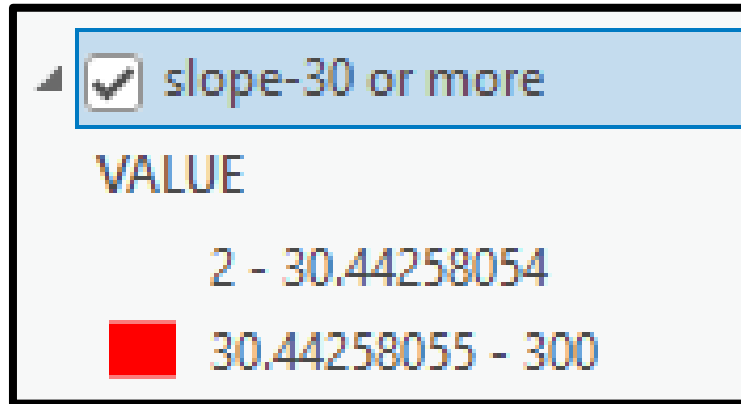
Value

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10



**Figure-5**

**Slopes 30 Degrees or more**



# Ecological Assessment

Assessing the property at landscape, intermediate and fine scale are essential to appreciating the ecological / wildlife features surrounding and within the ACF.

- **Landscape Scale: Figures 6-9**
- **Intermediate Scale: Figures 10-14**
- **Fine Scale Features: Figures 15-16**
- **Trails**
  - **Proposed trails : Figures 17-20**
  - **Proposed trails – Topologic / Ecological Context: Figures 21-28**
  - **Trail Zones Of Influence (ZOIs): Figures 29-37**
  - **Buffer - Fine Scale Ecological Features: Figures 38-50**
- **Concluding remarks**
- **Key Sources**
- **Coda**



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## Landscape Scale: Figures 6-9

As discussed by ANR with its latest iteration and by experts such as the panelists in the March 2023 ecology / trails discussion\* and Meredith Norton's recent Mad River talk\*\*, assessment of the ecological impact of human use including trails needs to begin with a broad landscape-level assessment of key ecological features. This includes wildlife habitat and connectivity. Such a large-scale analysis does not appear to have been a part of developing the trails proposals in the Management Plan.

The following landscape-scale maps were assembled based on critical ecological features identified by ANR and the RCC 2023 Panel.

Richmond possesses a tier of land highly sensitive to disturbance that provides an important North-South corridor on the East side of the Champlain Valley. Also noteworthy is the East-West connectivity with the Champlain Valley noted, for example, by Jens Hilke.

Figure 6 locates the ACF within one of ANR Conservation Design's Highest Priority Forest Blocks, showing its East-West connectivity as well. Figure 7 shows the wildlife North-South, East-West connectivity profile. A similar profile is revealed when wildlife habitat ranking is mapped (Figures 8-9).

\* [https://www.youtube.com/watch?v=t\\_0H3roONCY](https://www.youtube.com/watch?v=t_0H3roONCY)

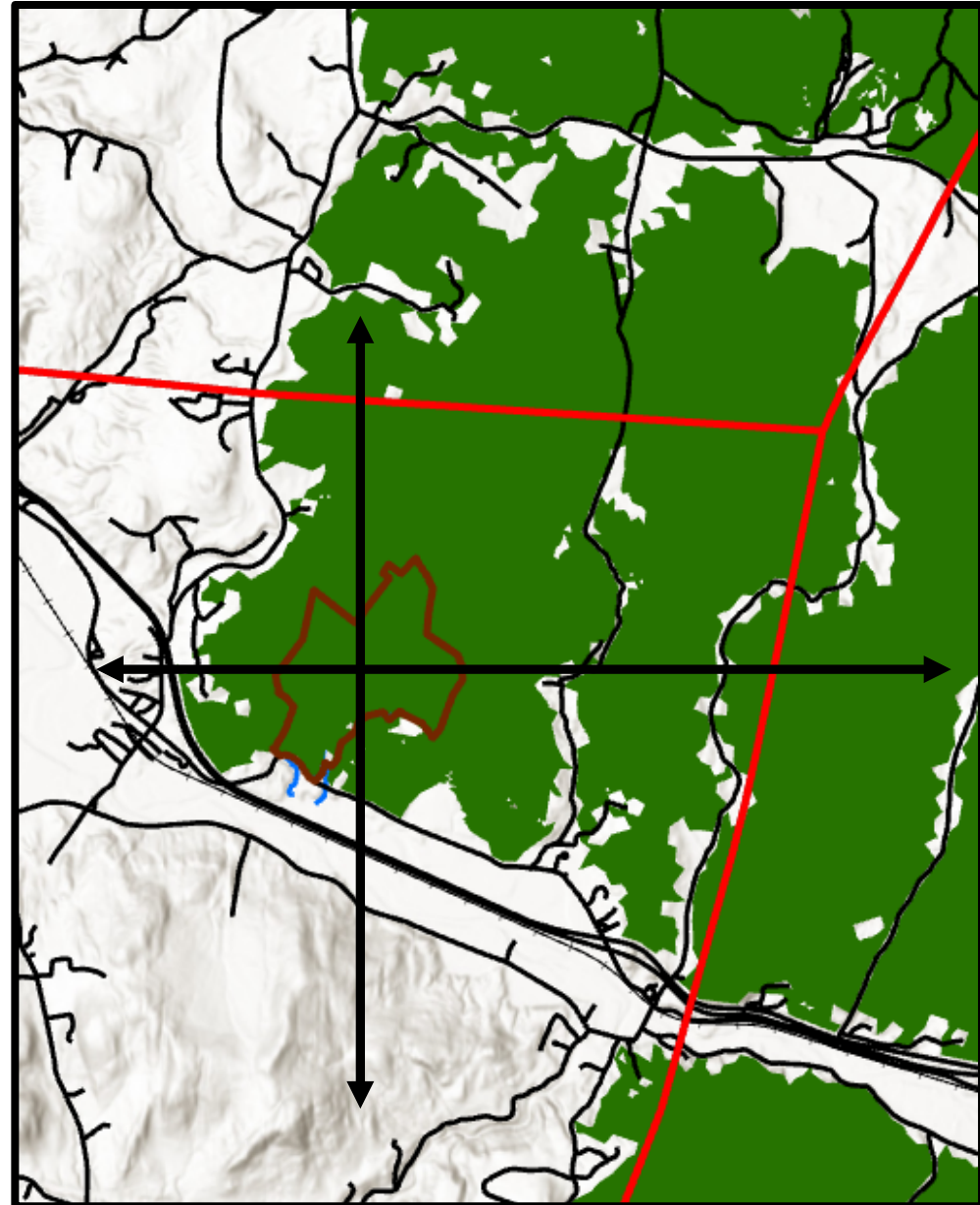
\*\* [https://archive.org/details/CRV-Wildlife\\_and\\_Trails\\_2-6-24](https://archive.org/details/CRV-Wildlife_and_Trails_2-6-24)

Figure-6

Vermont ANR Conservation Design Highest Priority Forest Blocks.

The ACF sits inside the southern end of a Highest Priority Interior Forest Block and provides East-West wildlife mobility into the Champlain Valley.

▲  Highest Priority Interior Forest Blocks  
■

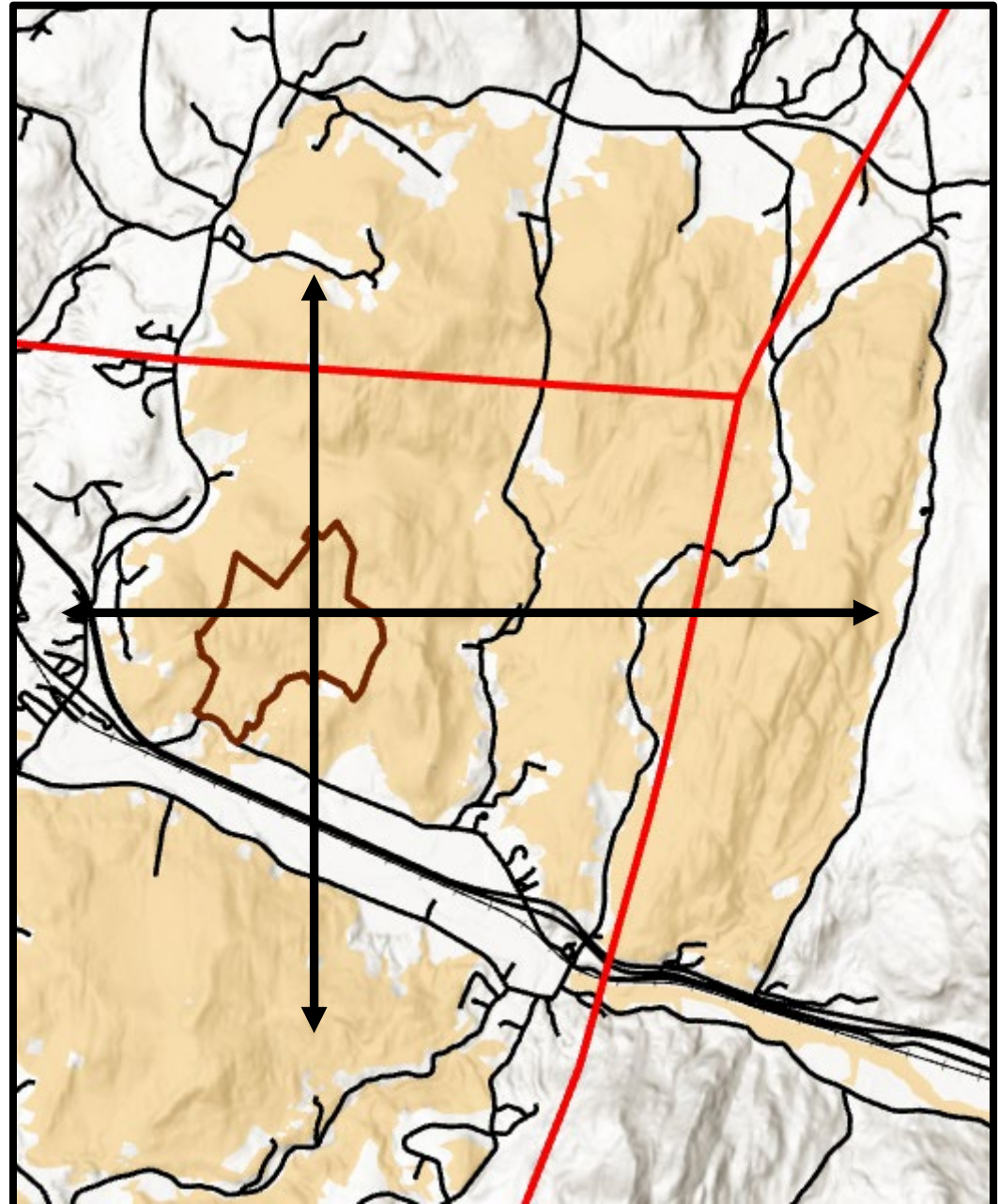


**Figure-7**

# Vermont ANR Conservation Design Priority Connectivity Blocks

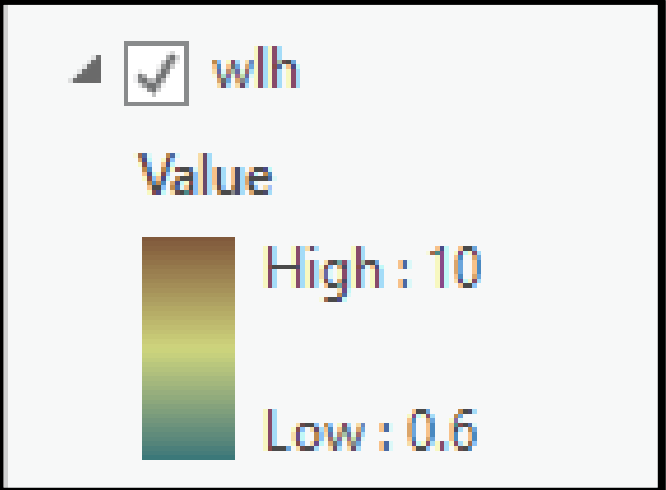
The ACF is part of a general North-South connectivity corridor as well as an East-West corridor into the Champlain Valley.

▲  Priority Connectivity Blocks

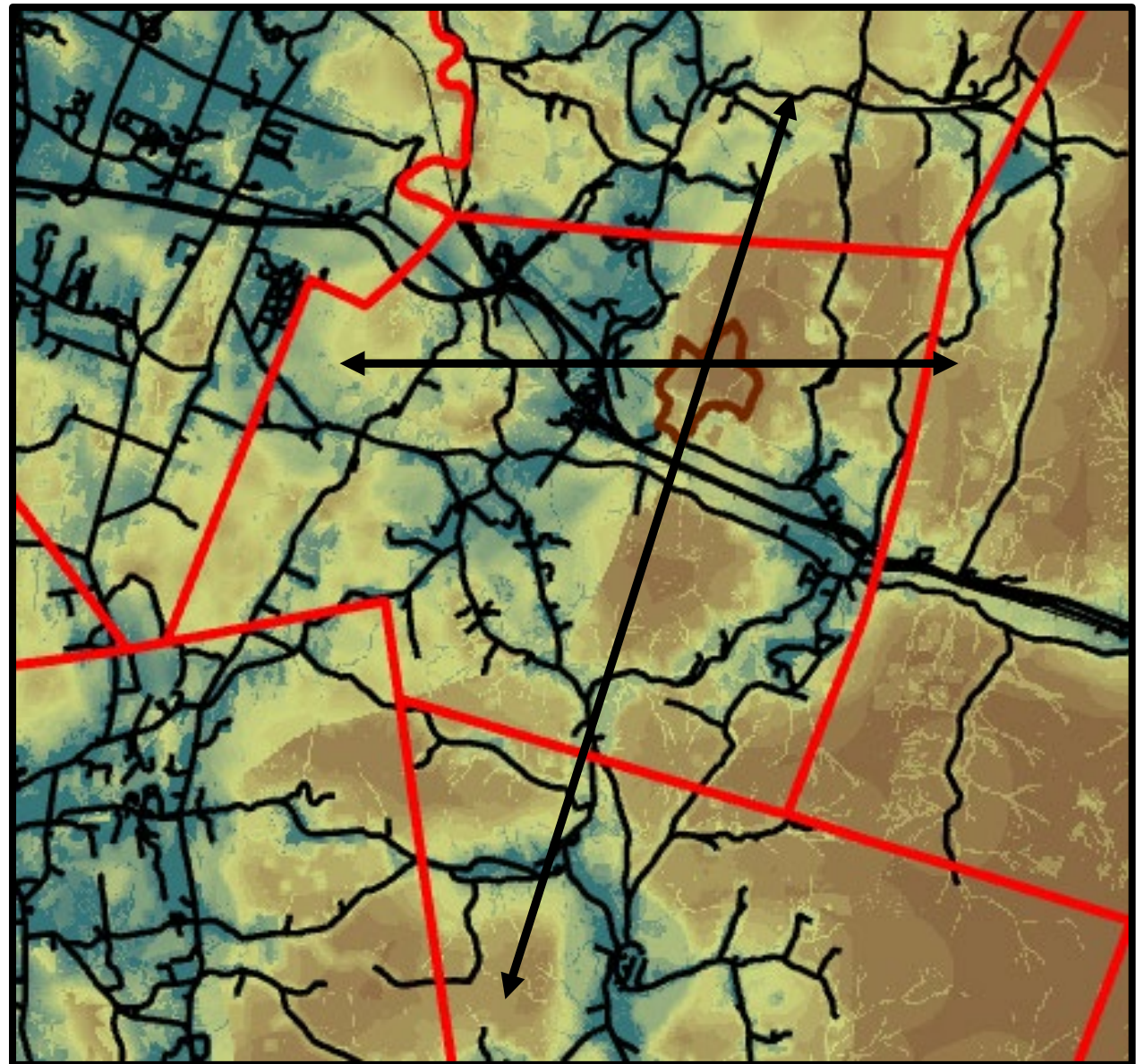


**Figure-8**

**WLH: Wildlife Habitat**



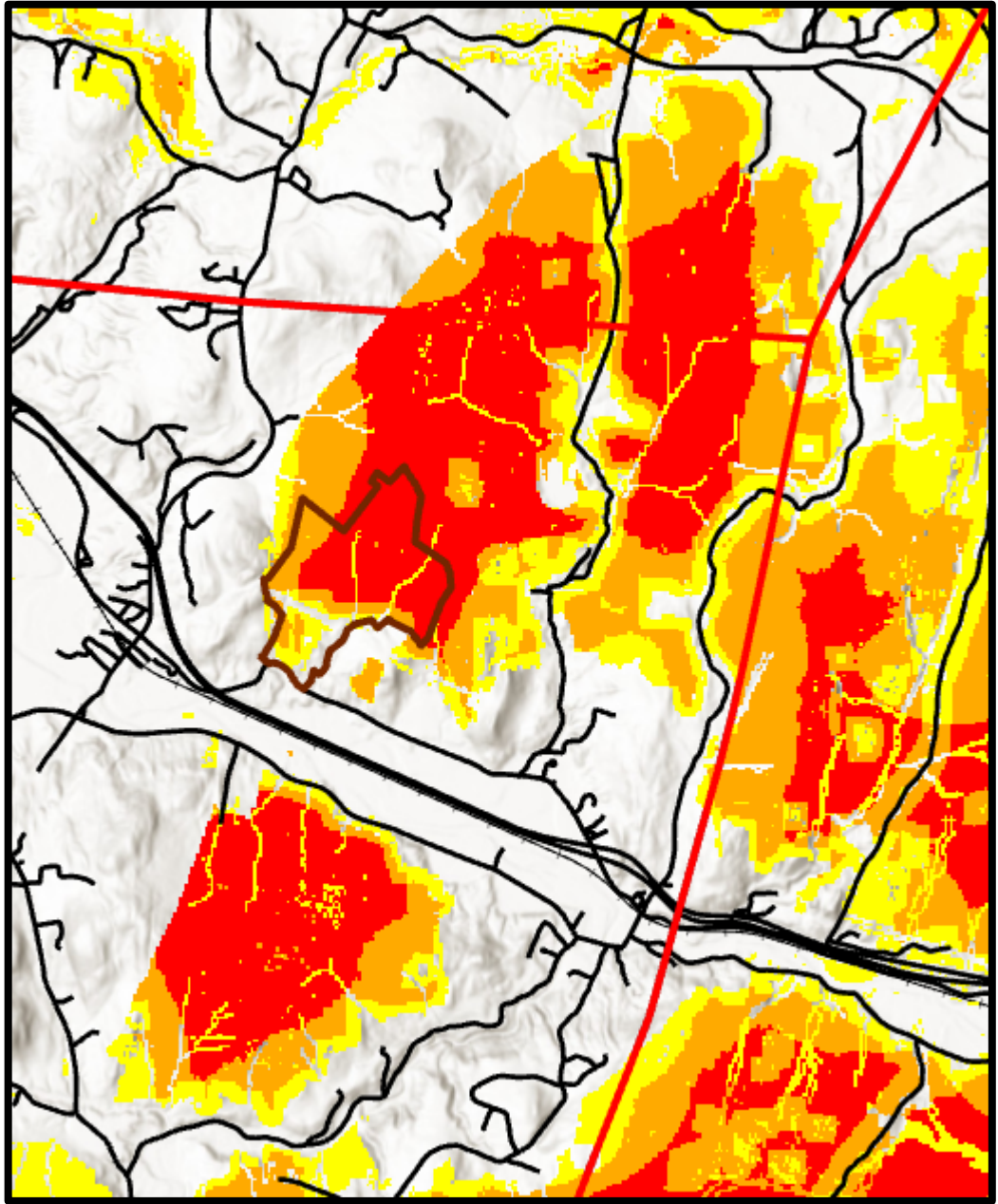
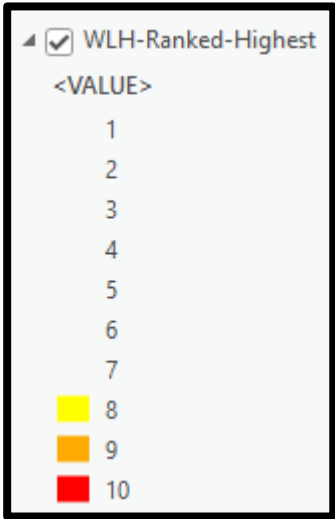
The lands these corridors traverse in the ACF are ranked very highly for the quality of their wildlife habitat.



**Figure-9**

# WLH: Wildlife Habitat Ranked

The highest habitat ranking includes the northern part of the ACF.



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## **Intermediate Scale: Figures 10-14**

- **Focusing in on the ACF at an intermediate scale, Arrowwood mapped ecologically sensitive areas (Figure 10). Additionally, the Field Naturalist Study of the Andrews Forest used what are called Heat Maps to assess different rating levels for habitat sensitivity. The strategy is similar to that used by the New Hampshire Department of Fish and Game in its report titled “Trails for People and Wildlife” (Figure 11).**
- **The 2024 ANR Conservation Design maps provide important additional insight into habitat priorities (Figures 12-14).**

Figure-10

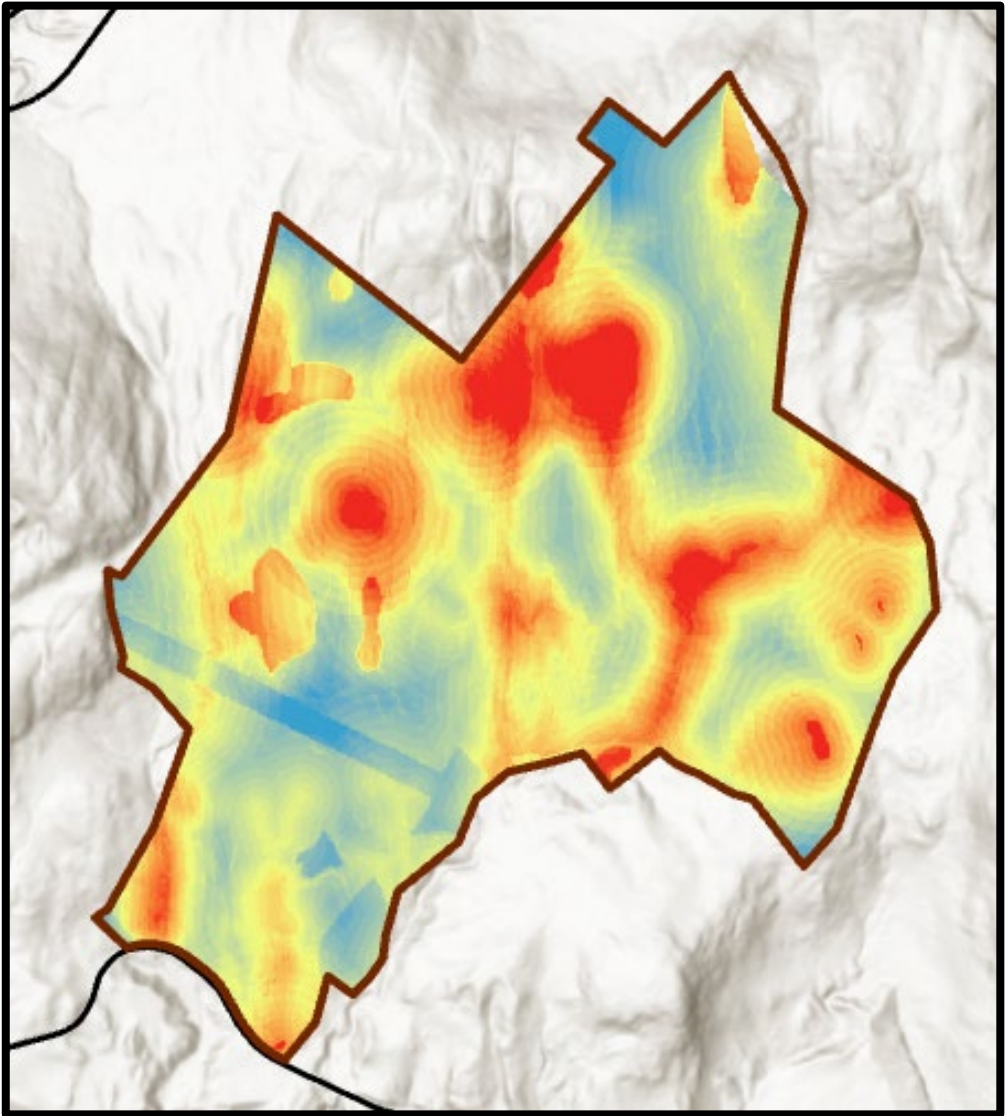
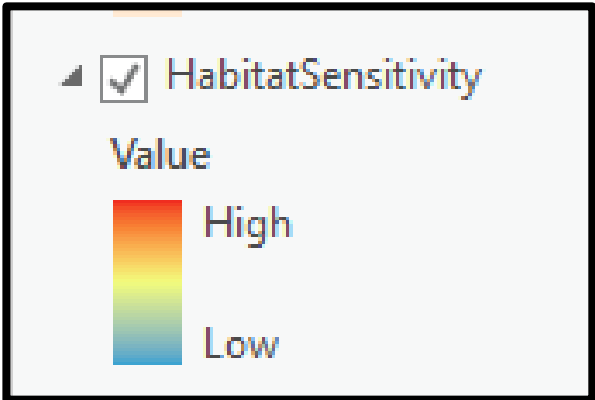
Arrowwood compiled all sensitive areas into a master layer labeled **Ecologically Sensitive**. As will be examined below, certain of these include protective buffers.

Ecologically Sensitive



**Figure-11**

**This Field Naturalist Heat Map combines a number of key ecological variables to rate habitat sensitivity.**

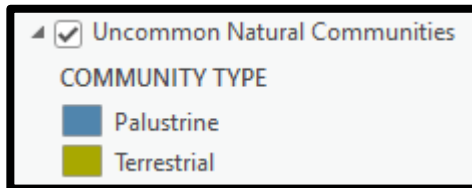




**Figure-12**

# **Vermont ANR Conservation Design Uncommon Natural Communities**

**Within the ACF are large areas composed of Uncommon Natural Communities, particularly in the northern part of the Forest.**




**Figure-13**


# Vermont ANR Conservation Design Highest Priority Natural Communities

ANR's Conservation Design prioritizes these Uncommon Natural Communities as among Vermont's highest, noting again particularly the northern part of the Forest.

▲  Natural Communities

OBJECTID

 Highest Priority

 Priority

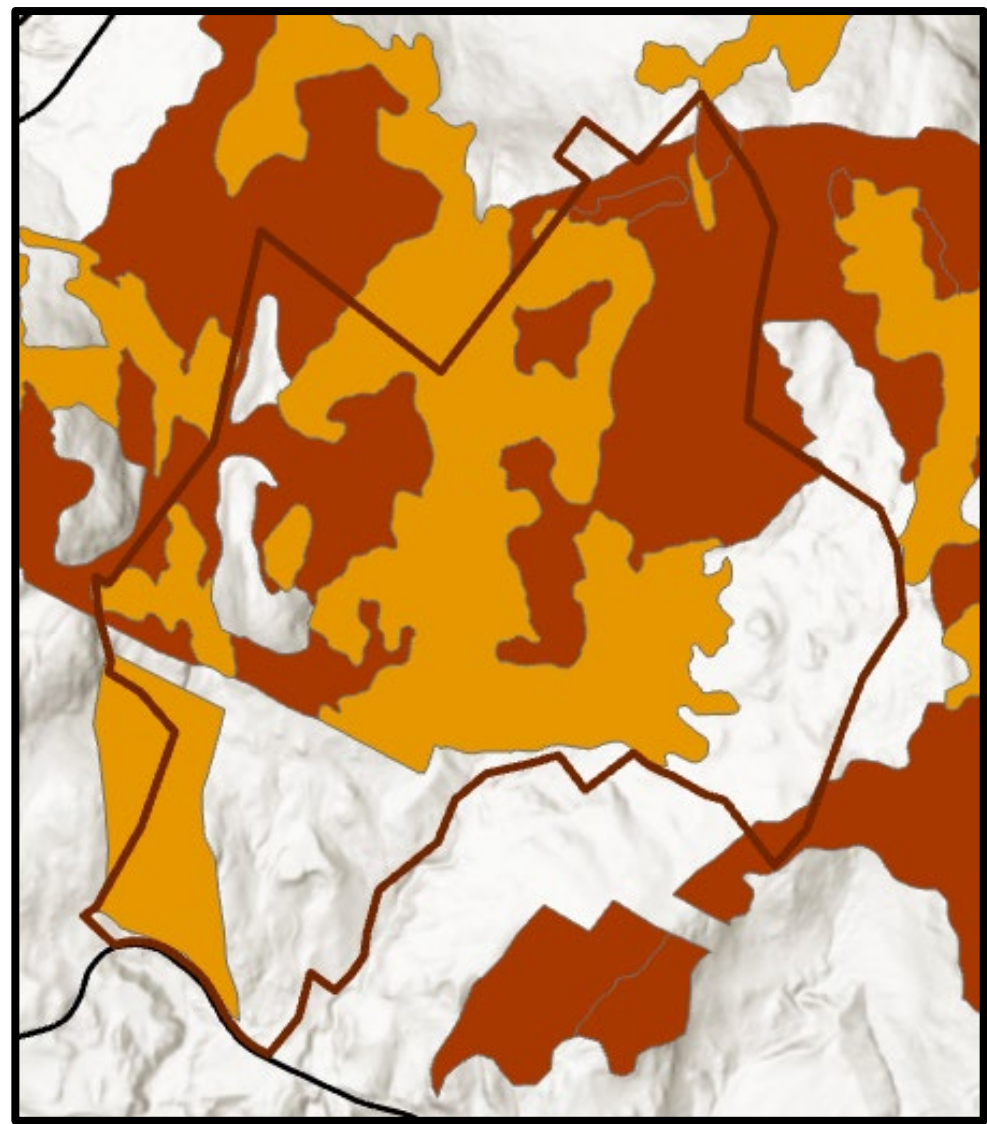


Figure-14

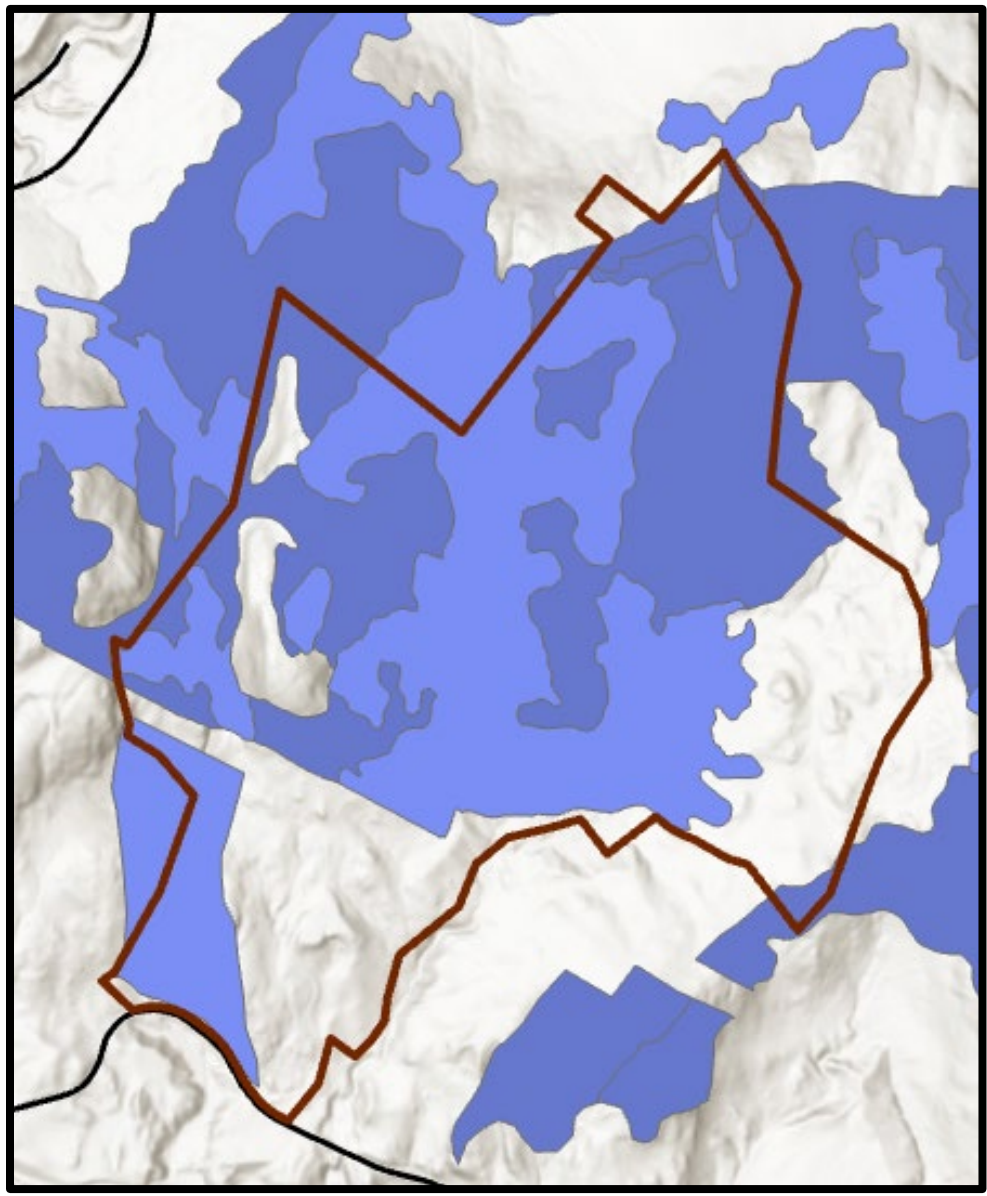
# Vermont ANR Conservation Design Habitat Priorities

ANR's Conservation Design Habitat Priorities closely match.

▲  Species Community Scale

OBJECTID

- Highest Priority
- Priority



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## **Fine Scale – Ecologically Sensitive Features (Figures 15-16)**

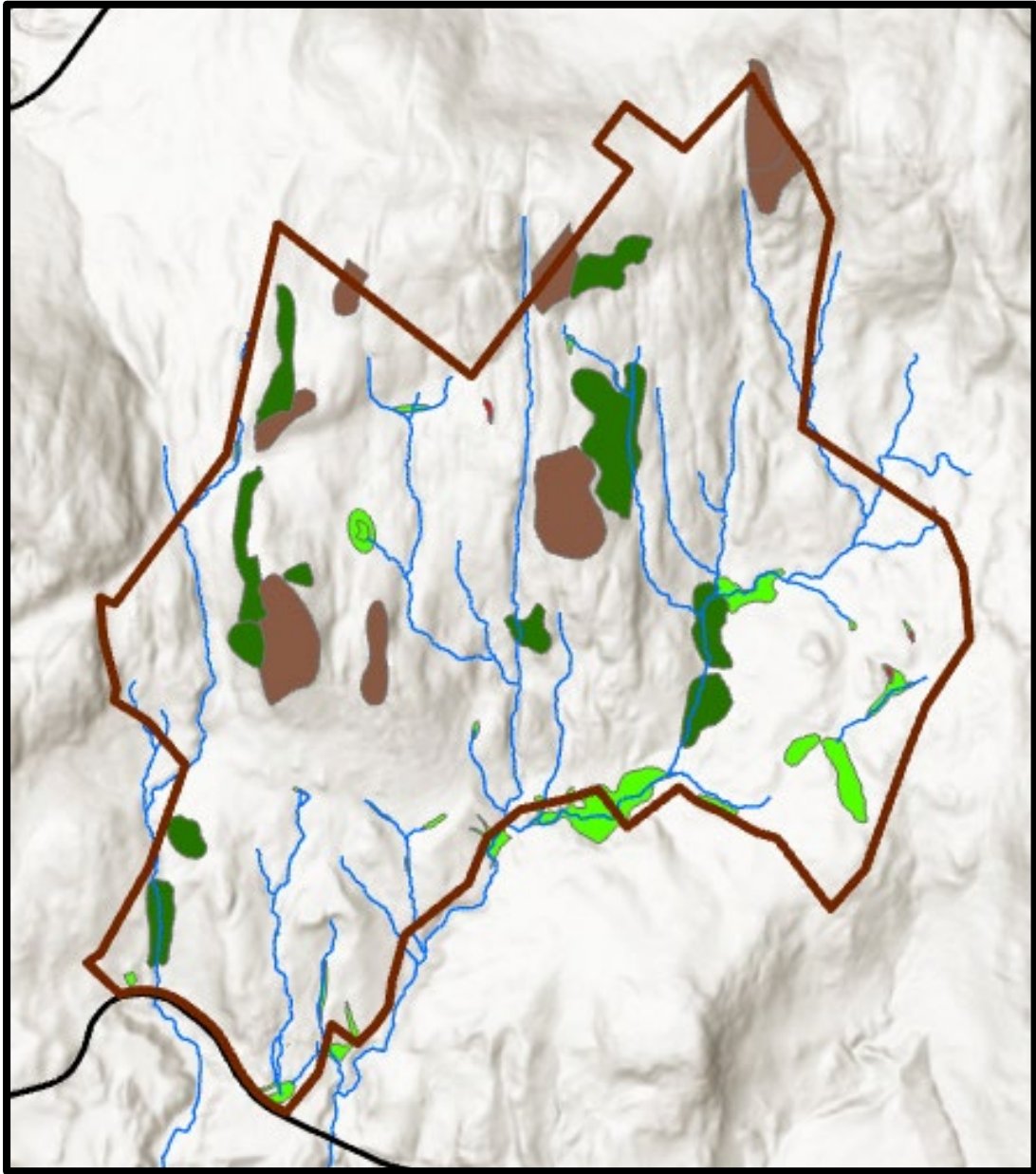
**Fine scale assessment involves identifying areas of importance for protection. Included here were the following:**

- **Streams**
- **Wildlife corridors**
- **Hemlock-Pine Forest**
- **Dry Oak Forest**
- **Mast stands**
- **Vernal pools**
- **Wetlands**

**Figure-15**

**The Ecologically Sensitive areas include the following.**

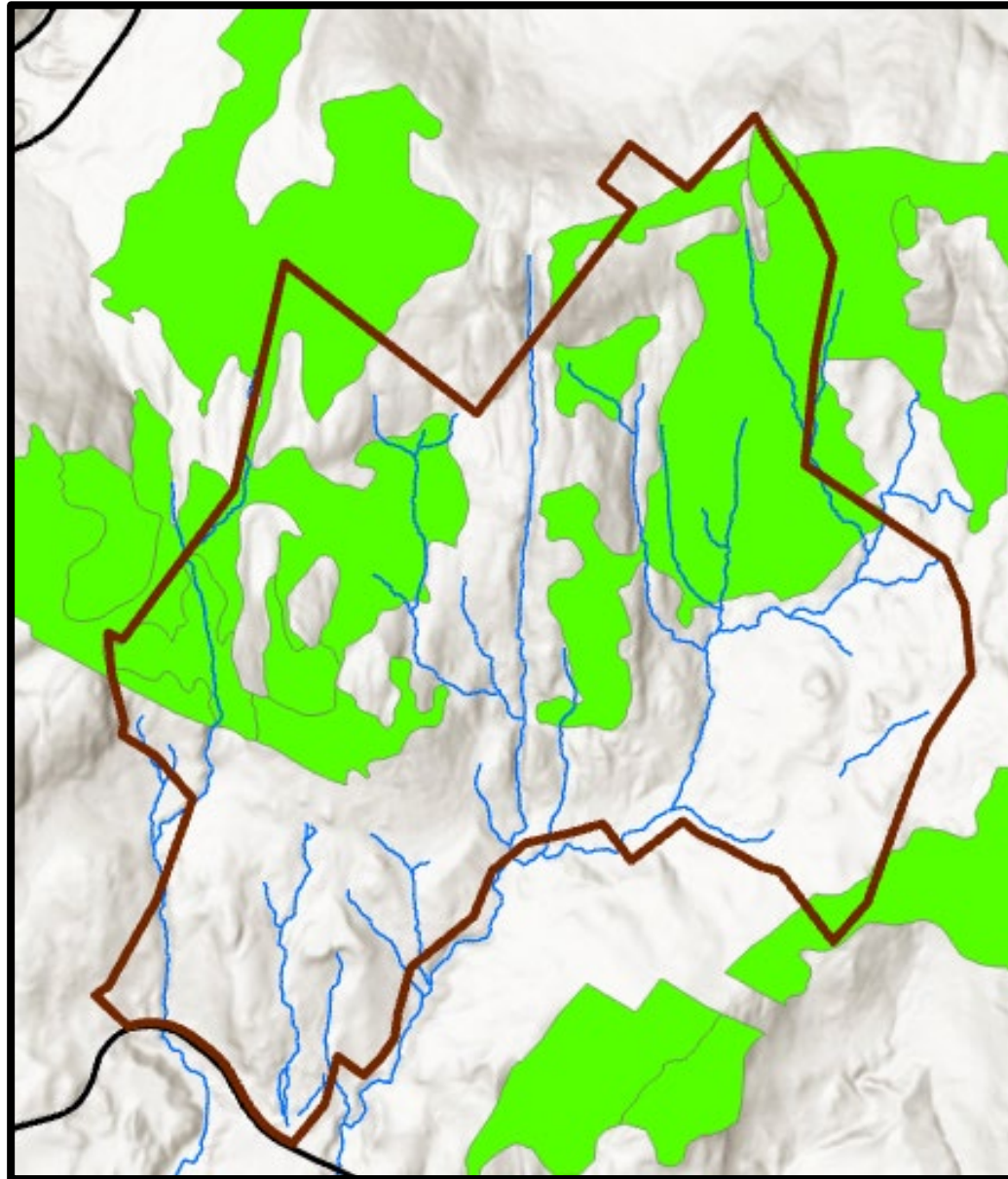
- ▲  Dry Oak Communities  

- ▲  Hemlock & Red Pine Forests  

- ▲  Wetlands  

- ▲  Vernal Pools  




**Figure-16**

**Mast Stands**

**Mast stands are an important source of acorns and other nuts to nourish wildlife.**



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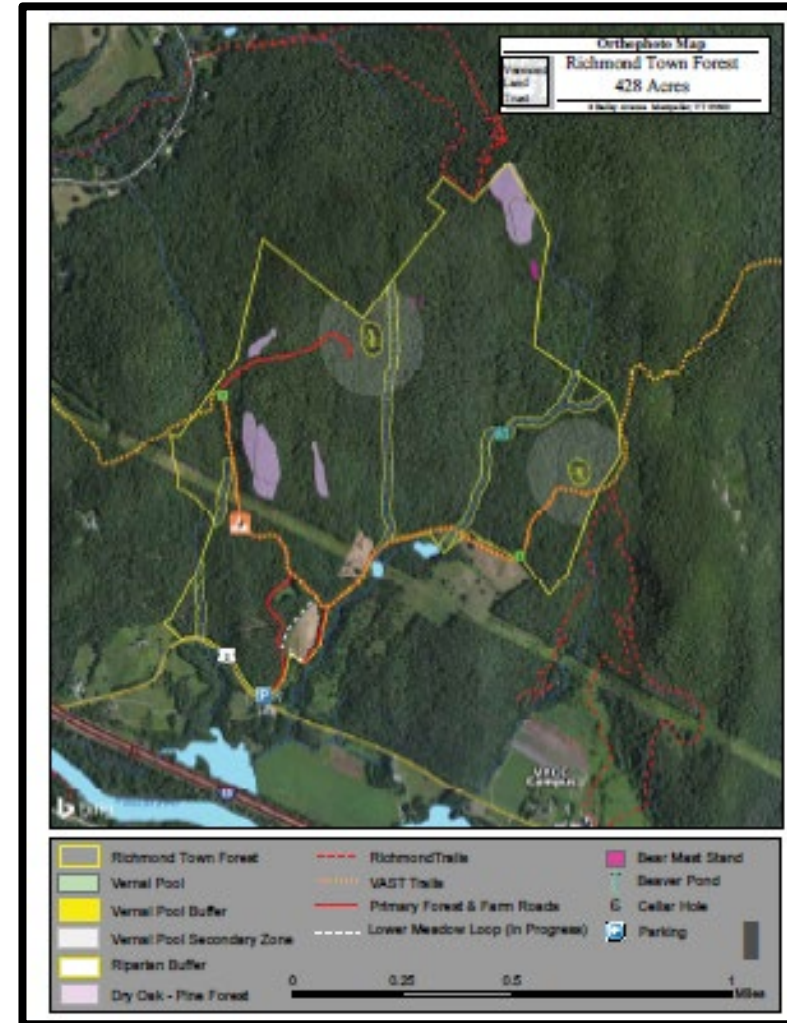
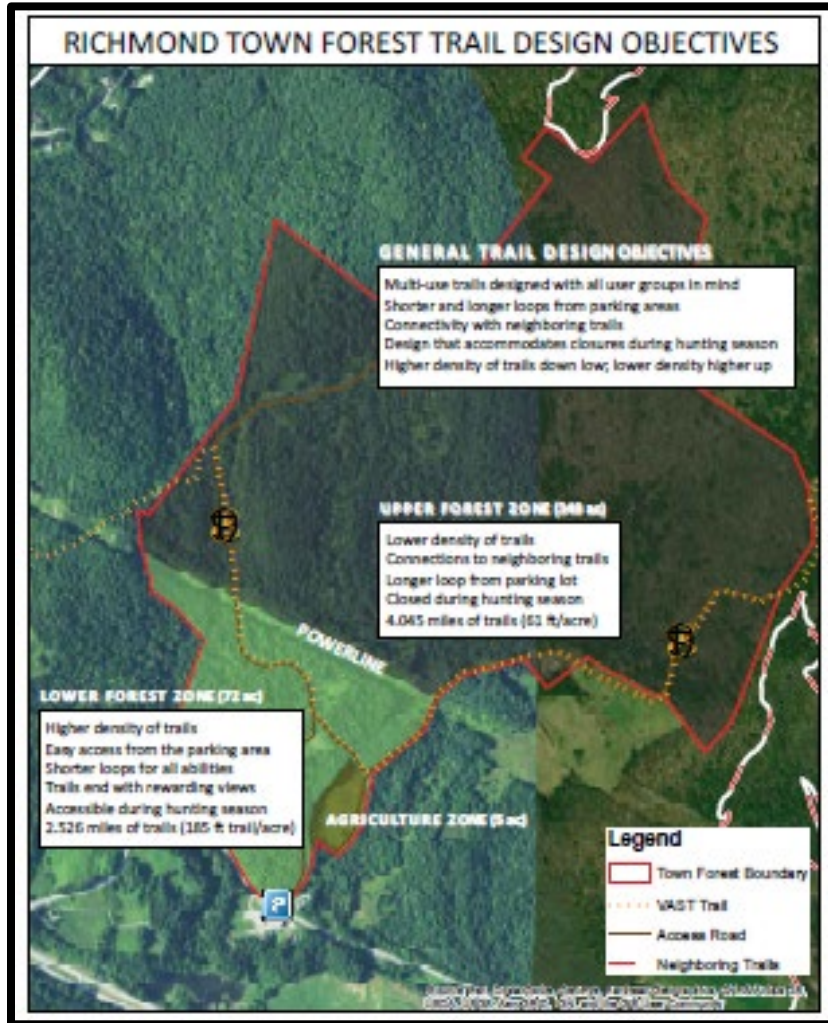
## **Trails**

**Providing recreational opportunities is stipulated in the ACF Easement. This would include trails. The issue becomes where might trails be placed to achieve a balance between ecological integrity and recreation. No value judgment is placed on the trail locations: the purpose here rather is to examine how trail placement might affect the ecology of the Forest.**

**Figures 17-20 show trails as presented in the Easement and current Management Plan.**

**Figure-17**

# Original Management Plan Site Maps

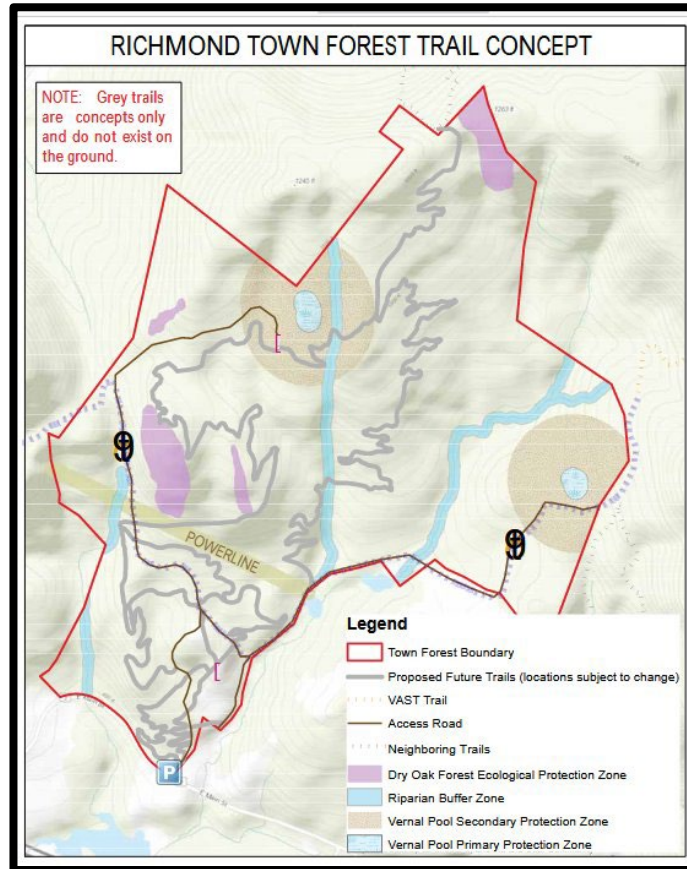


**The initial Easement and Management Plan trail objectives, noting goals (left) and the location of certain sensitive areas identified in the Easement (right).**

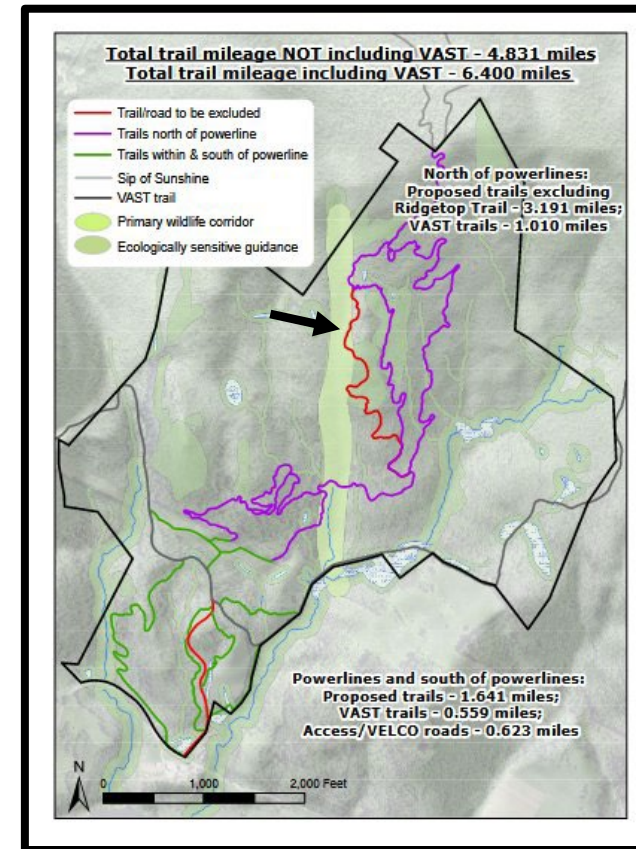


**Figure-18**

**Concept Map**



**Map: Management Plan 03/29/23**



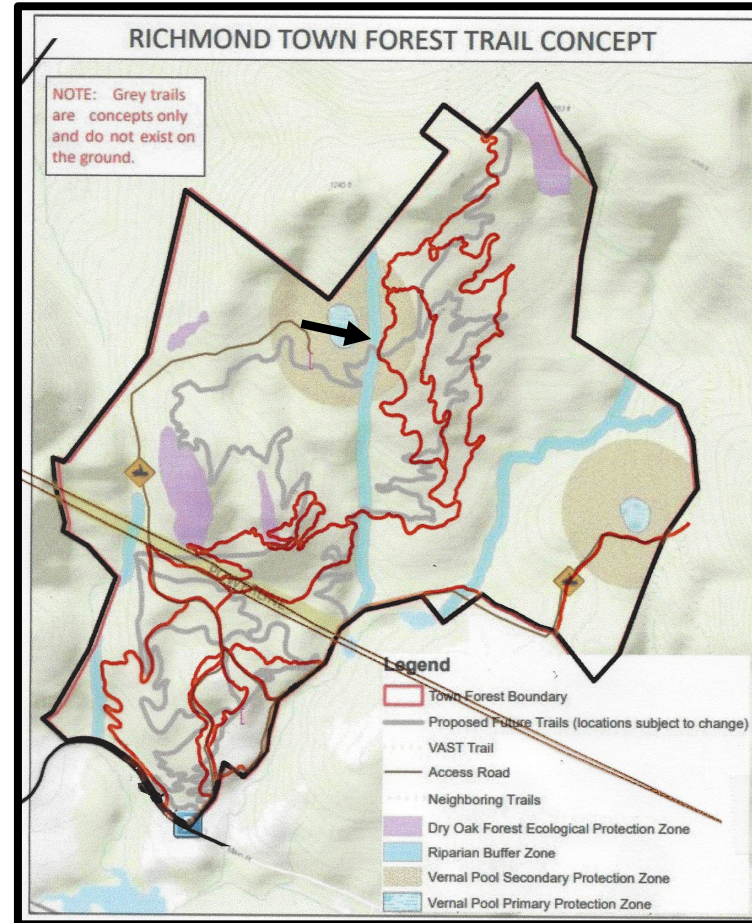
**Left: the Concept Map trails (gray) as depicted in original Management Plan.**

**Right: the initial revised trail proposal from the ACFC. An updated trail plan subsequently deleted the westernmost trail in the Northwest sector (red - left most trail in upper quadrant - arrow).**

**Noteworthy differences from the Concept Map include removal of the long-loop trail on the West side of the property and the inclusion of two additional trails in the Northwest sector above the Power line.**

**Figure-19**

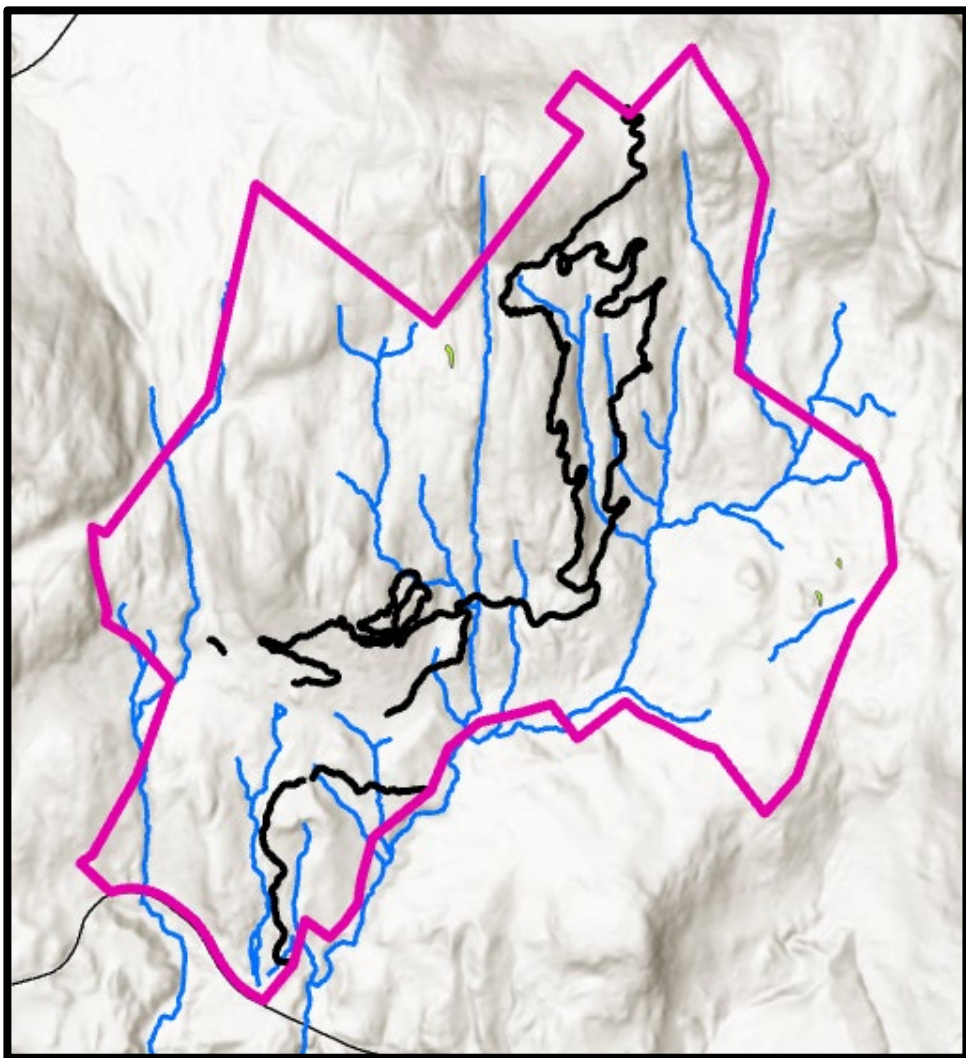
**Management Plan Maps Superimposed\***



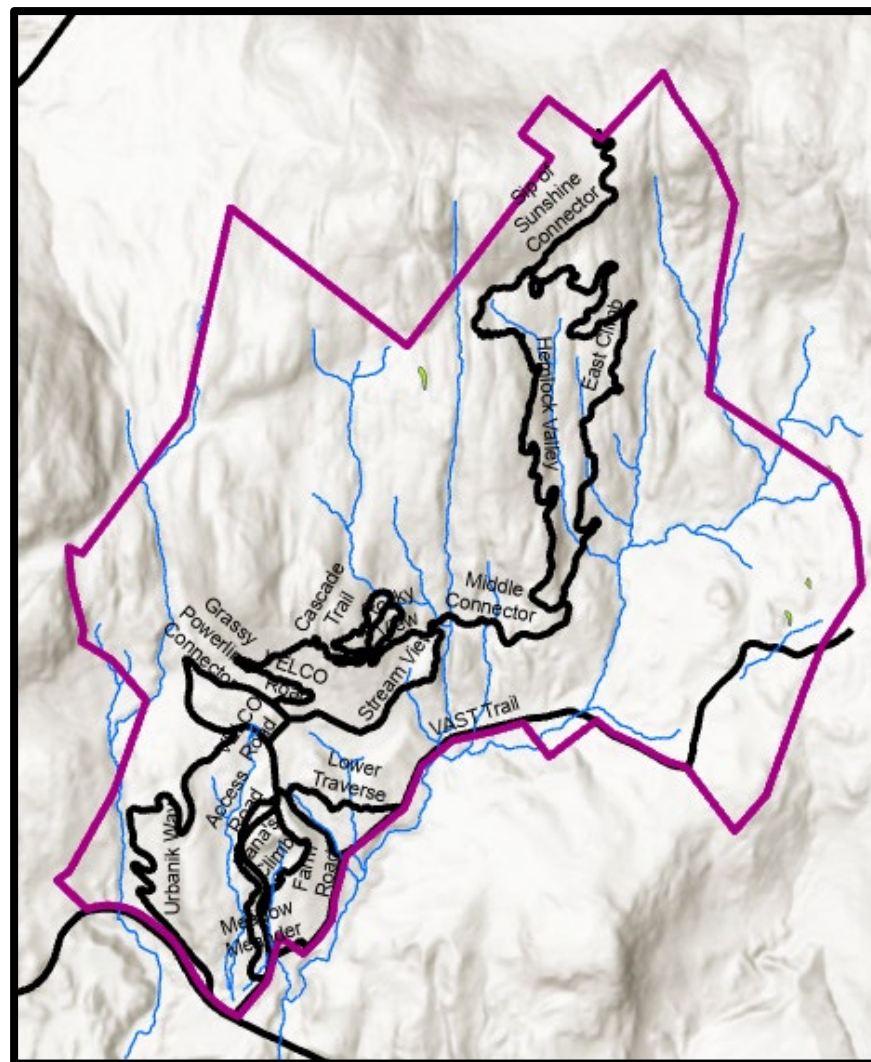
**Overlay of the original Concept Map trails (gray) and the initial trail revision (red). Again, the trail pointed out by the arrow (Ridge Top) has been removed with the current trail proposal.**

**Figure-20**

**Proposed**



**All Trails: Ridge Top trail removed**



**Proposed trails at last iteration (left) together with the full slate of proposed trails with names (right). The subsequently deleted trail in the right panel (Ridge Top) has been removed.**

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## **Trail Location Context** **Topological and Ecological Features**

**Figures 21-28 juxtapose the current trails profile against previously visited topological and ecological features.**

**Figure-21**

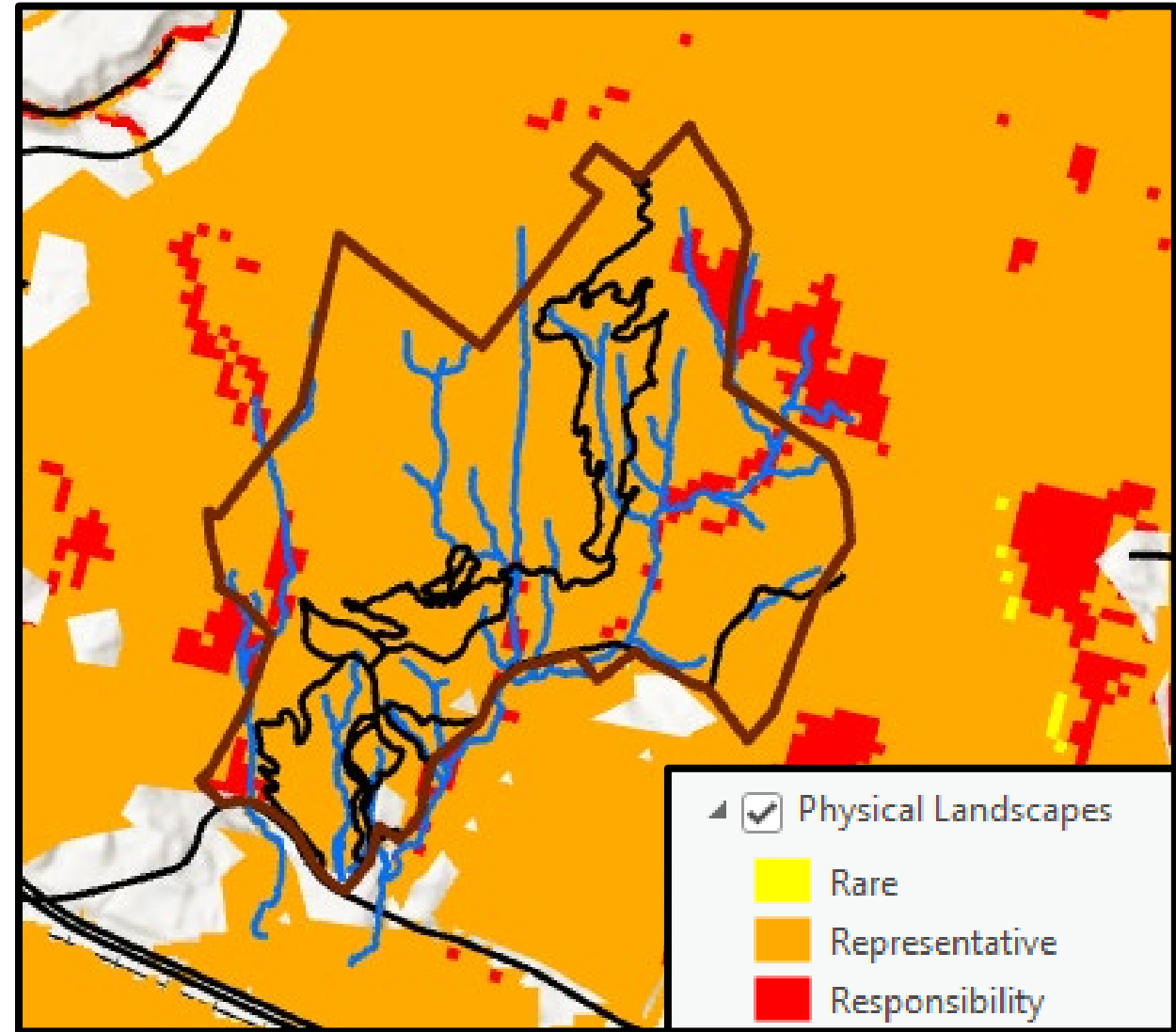
## **ANR Conservation Design: Physical Landscapes**

The trails, as is true of virtually all the ACF, are located in the Representative Landscape category.

**Rare** Least commonly found in Vermont. Often correspond with the presence of rare species or natural communities. Can help predict where diversity among unstudied species such as insects, plants, mosses may occur.

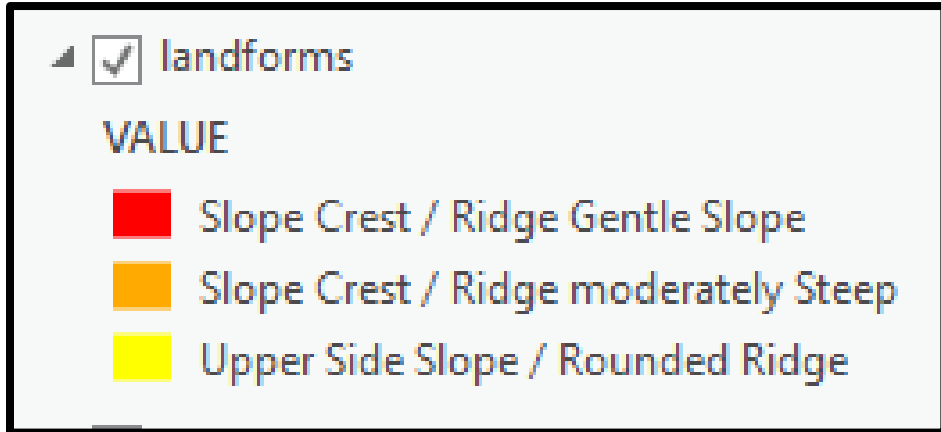
**Representative** Occur commonly in Vermont. Represent important interior forest blocks, connectivity blocks, or surface waters and riparian areas. In some cases, also include the forest that surrounds a rare or responsibility physical landscape.

**Responsibility**. Occur more commonly in Vermont than in other areas of the northeastern United States and adjacent Canada. Have a regional responsibility to protect.

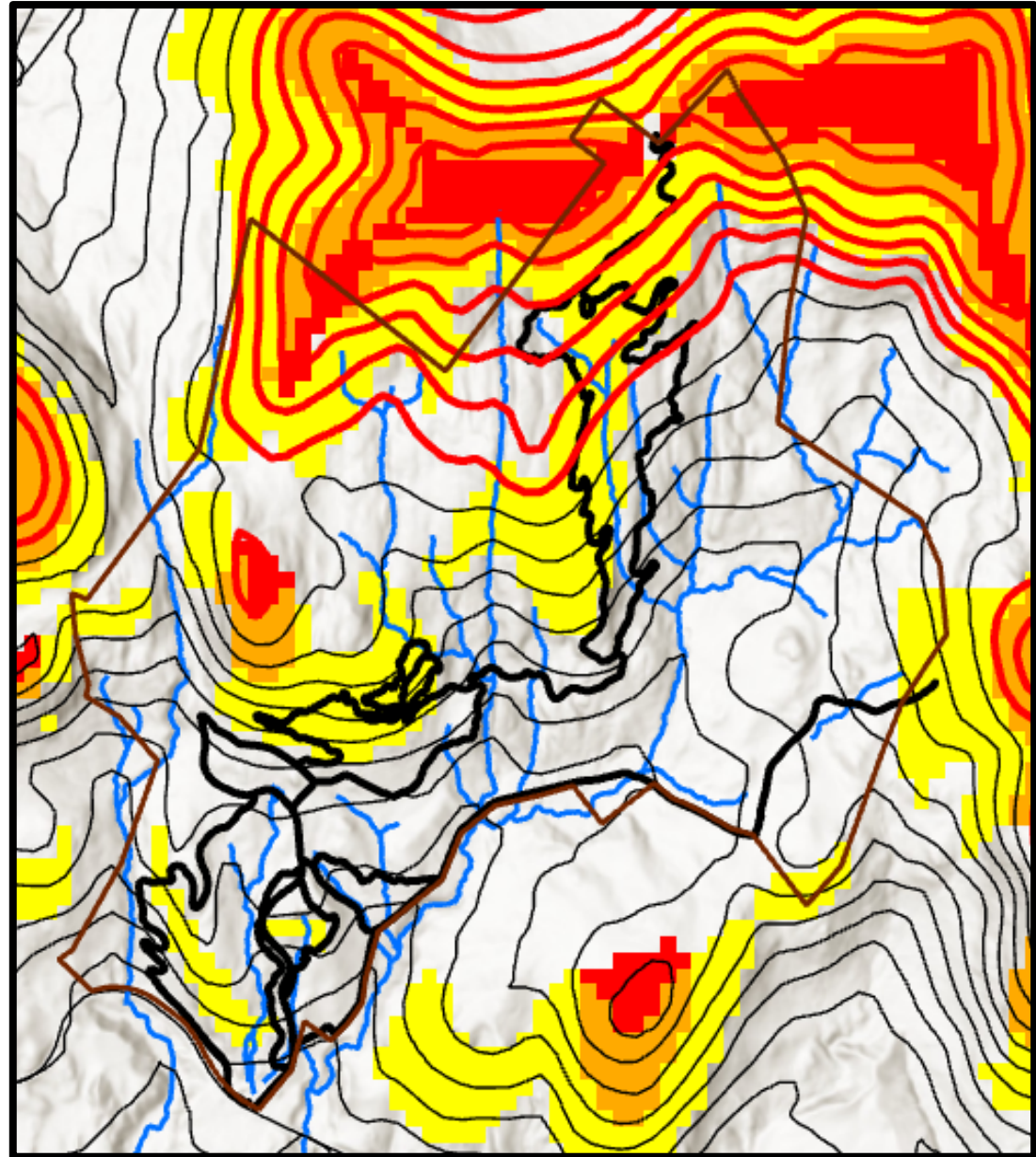


**Figure-22**

**Contours and Ridge Lines**



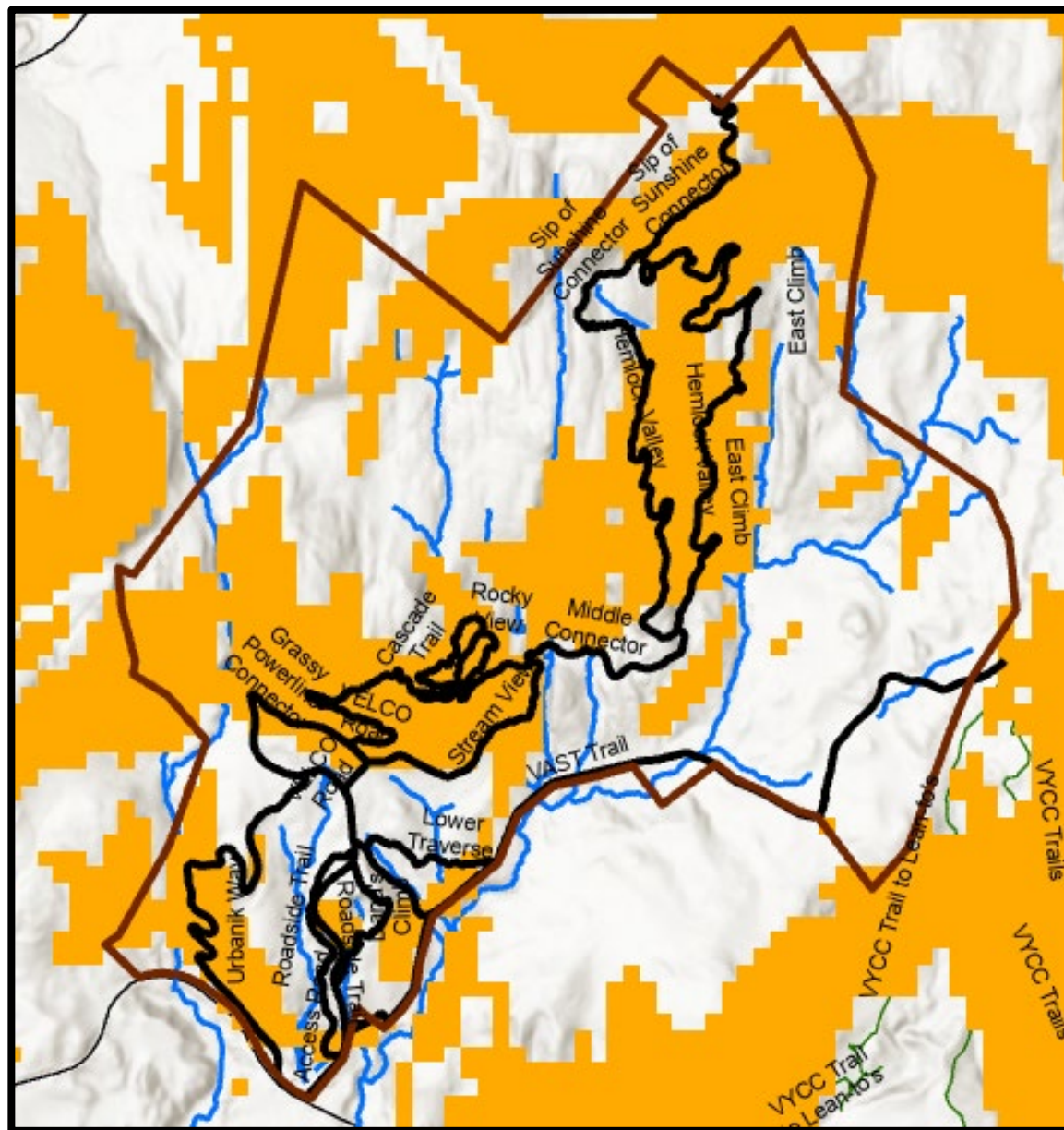
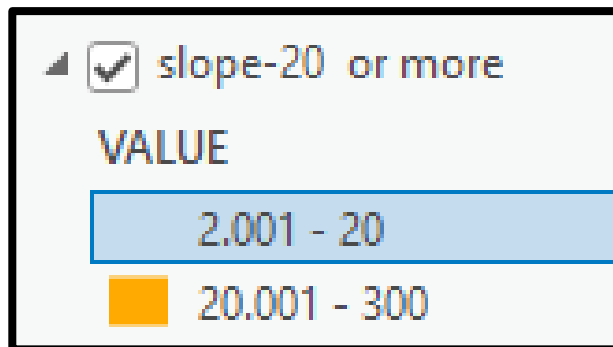
Here, the trails against the slope / crest profile together with contours. Note that, the Northern-most trails lie at or above the 900-foot contour (**red**).



**Figure-23**

**Slopes 20 Degrees or more**

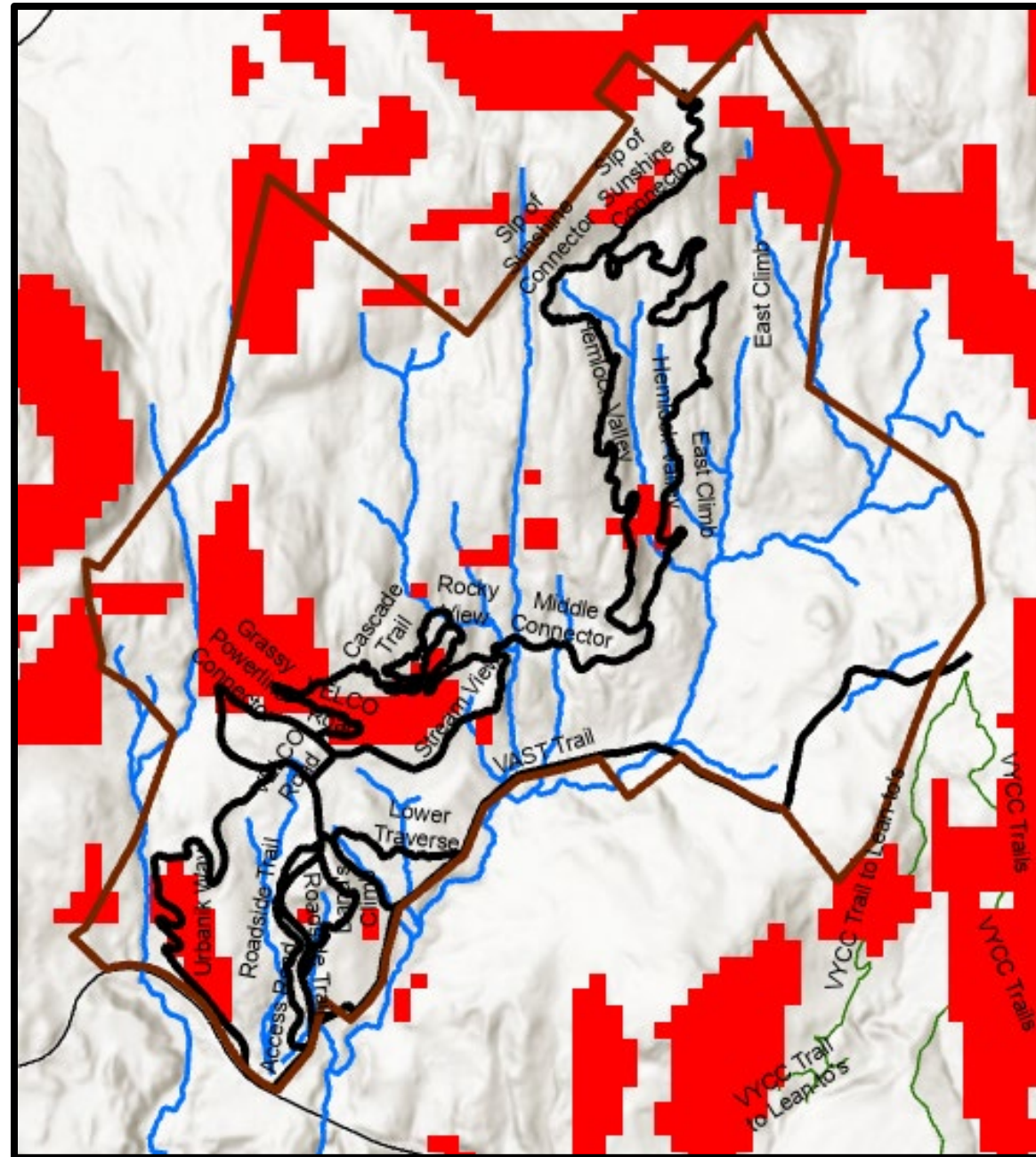
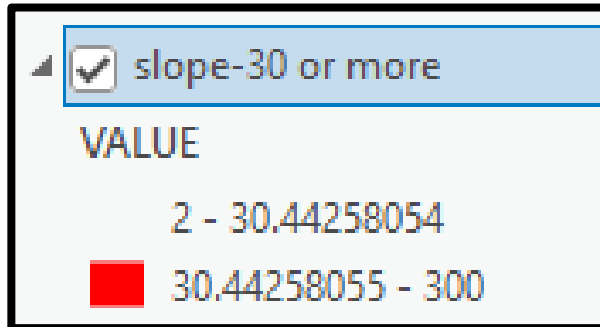
**Taking a closer look at slopes, a good portion of the trails are in areas with slopes  $\geq 20\%$ .**



**Figure-24**

**Slopes 30 Degrees or more**

Some trails may be located on slopes  $\geq 30\%$ .

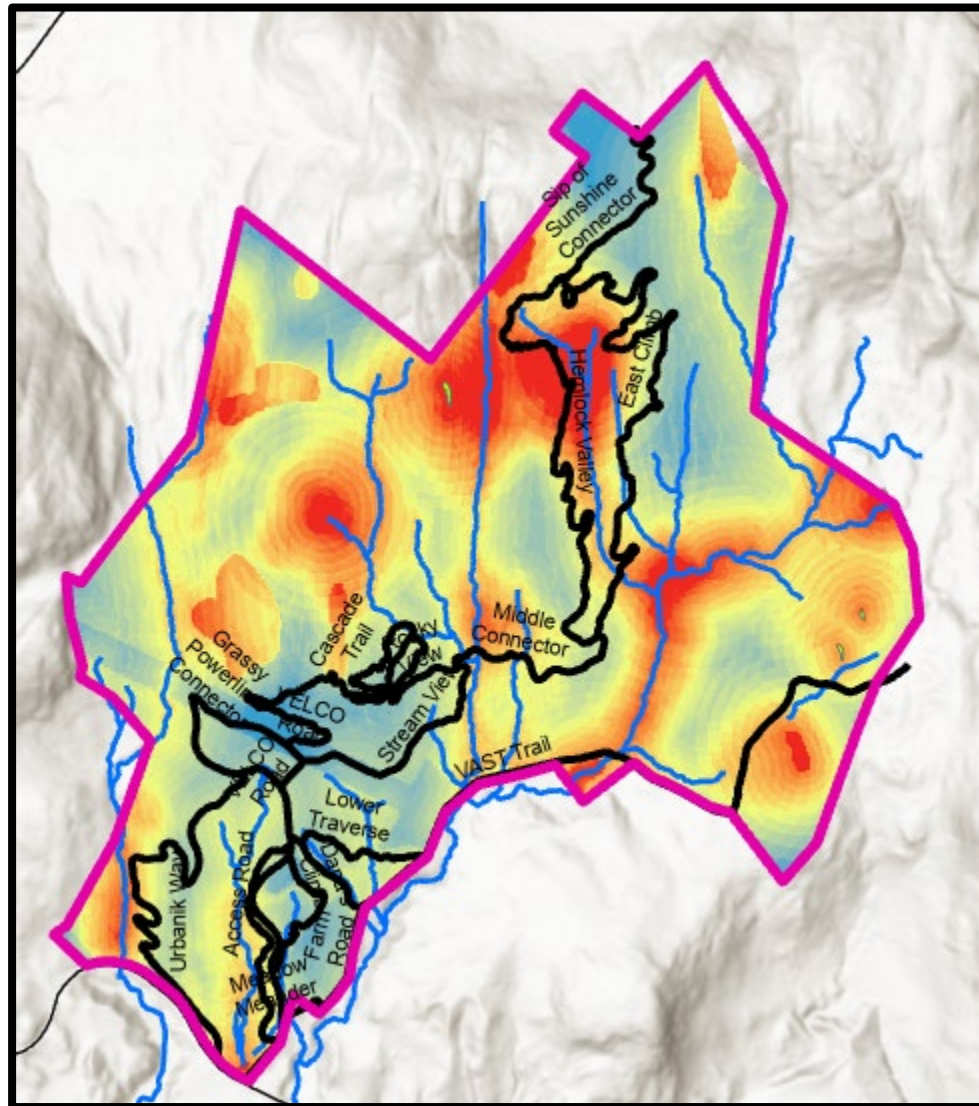
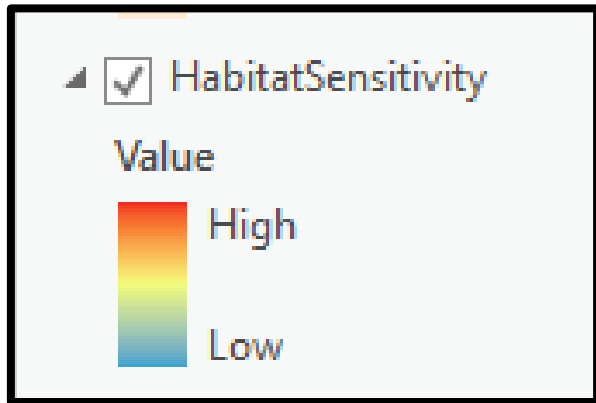




**Figure-25**

## Trails and the Field Naturalist Heat Map

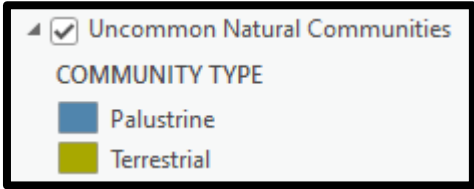
Though much of the trail system is located in areas of low habitat sensitivity in the Field Naturalist Heat map, one in particular, Hemlock Valley, is located in a high-sensitivity area.



**Figure-26**

# Trails and ANR Conservation Design Uncommon Natural Communities

Certain areas of the trail system are located in Terrestrial Uncommon Natural Communities, such as East Hill Climb (arrow).



**Figure-27**

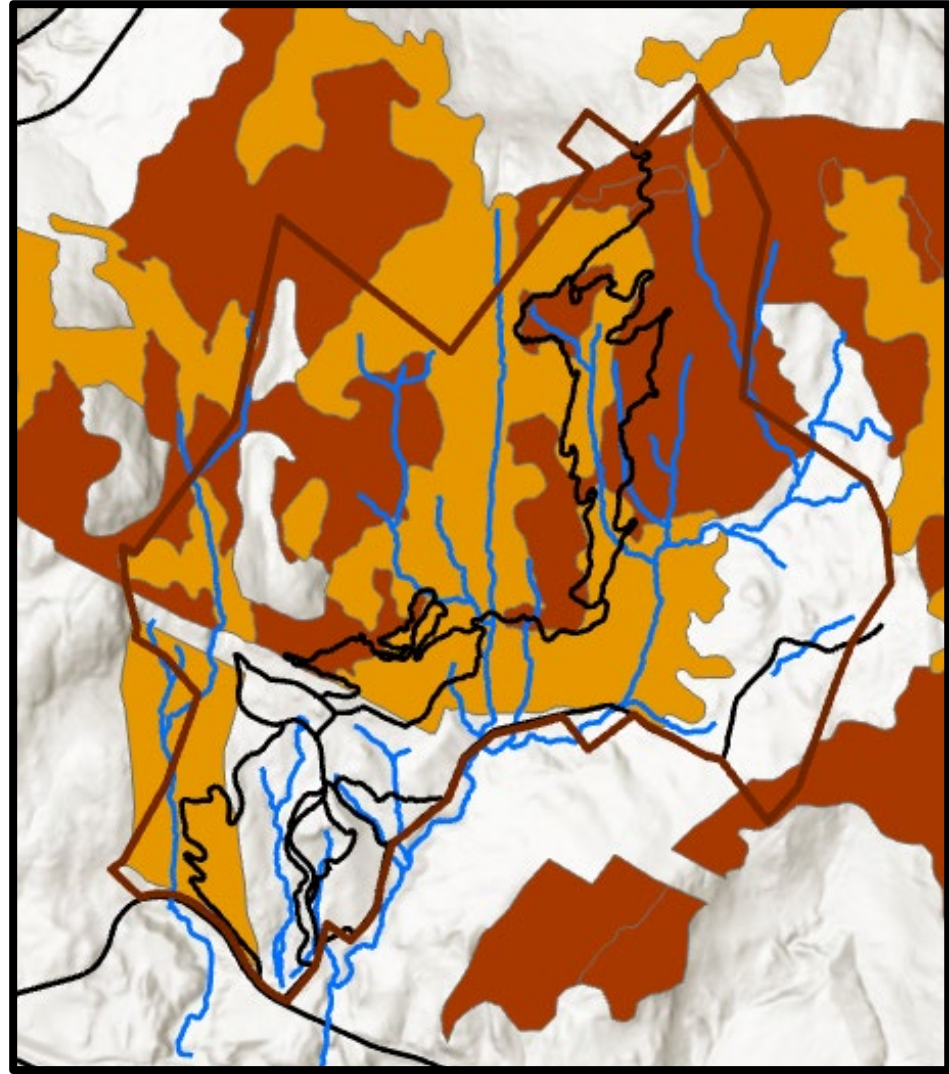
# **Trails and ANR Conservation Design** **Highest Priority Natural Communities**

**Note the similar locations where the trails are in areas with Highest Priority Natural Communities, also defined previously as Terrestrial Uncommon Natural Communities.**

▲  Natural Communities

OBJECTID

- Highest Priority
- Priority



**Figure-28**

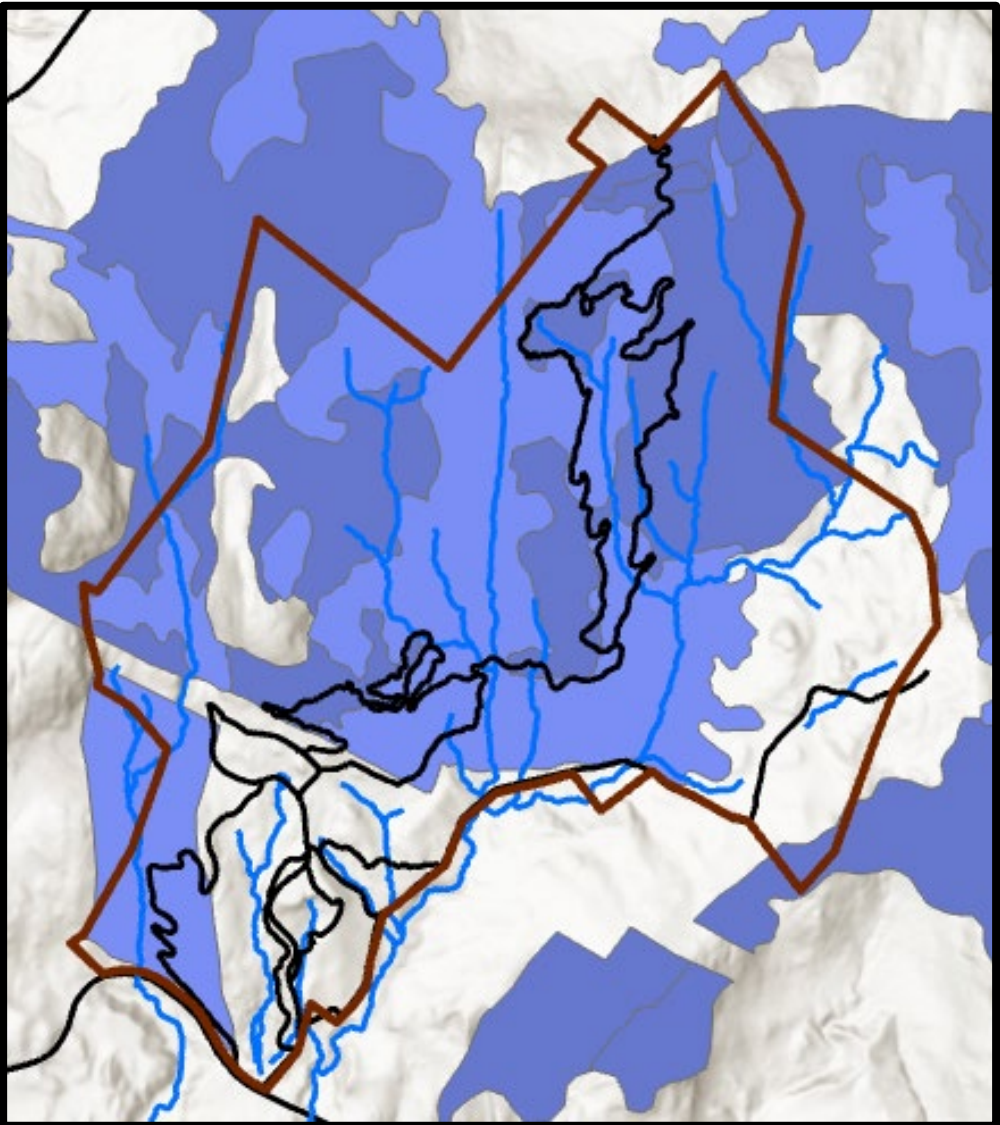
# Trails and ANR Conservation Design Habitat Priorities

The highest priority habitat areas map the same Highest Priority Natural Areas with the same trails overlap.

▲  Species Community Scale

OBJECTID

- Highest Priority
- Priority



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## Ecological Features and Human Use Zones of Influence (Figures 29-37)

Zones of Influence (ZOIs) assesses the extent of wildlife disturbance caused by trails. The Field Naturalist Study used this approach to assess the potential impact of the proposed trails on wildlife as shown in Figure-29. ZOIs of 50, 100 and 200 feet, the last described in the current Management Plan is shown in Figure 30.

This approach can be applied to fine scale ecological features identified by Arrowwood. Here will be illustrated ZOIs of 50, 100 and 200 feet (Figures 31-37).

**Figure-29**

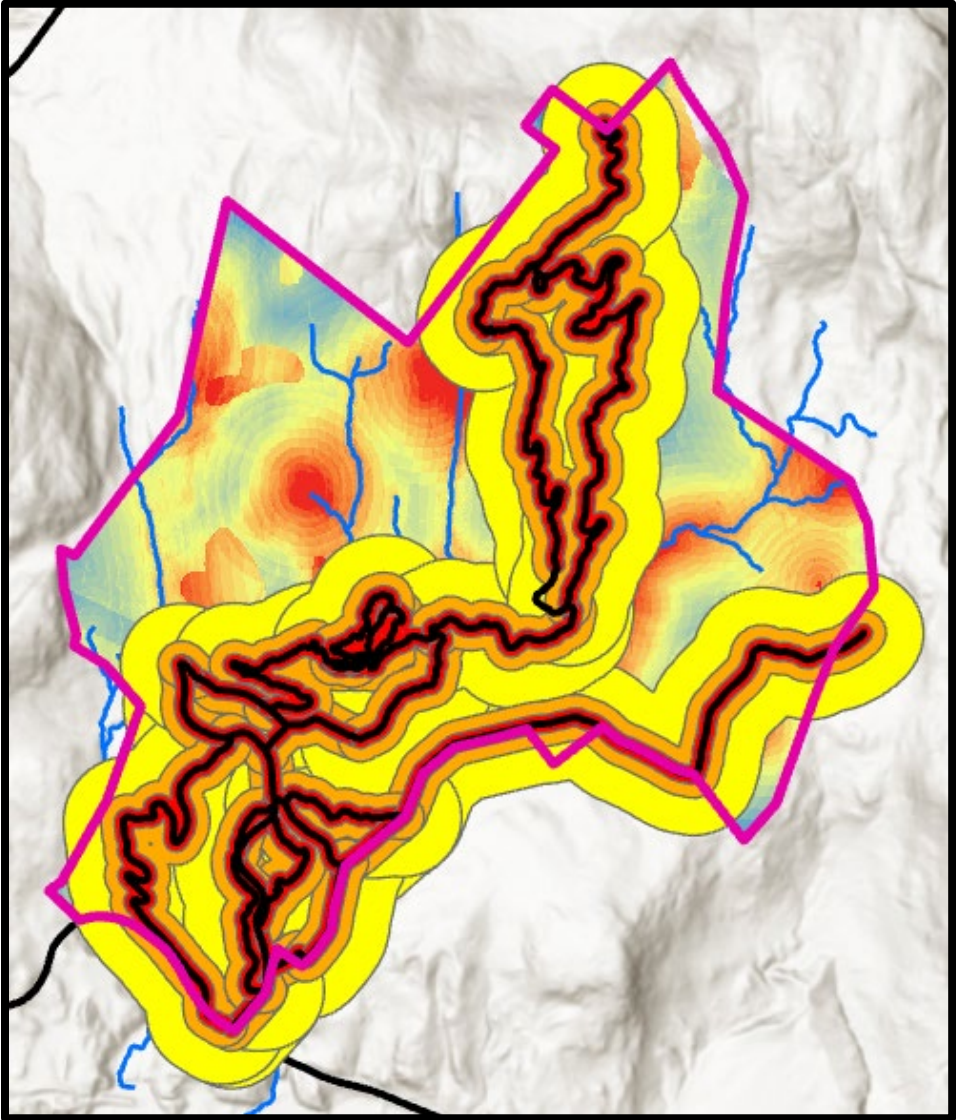
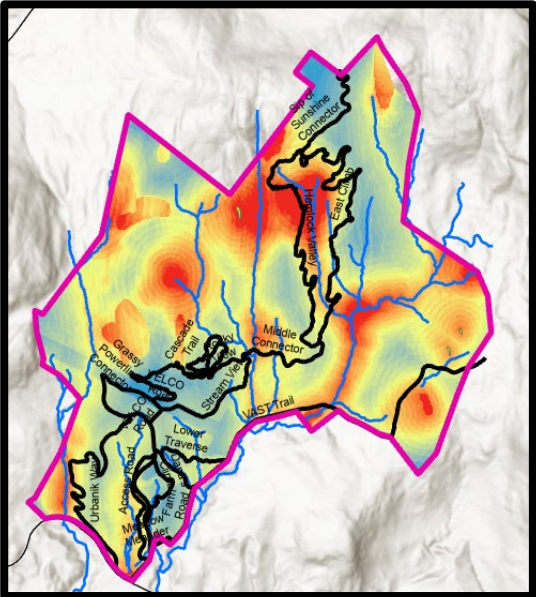
# UVM Field Naturalist Heat Map and Proposed ZOIs

The Zones Of Influence (ZOI) along trails in the north section (excluding Sip of Sunshine Connector) cover areas of highest habitat sensitivity.

**Zone of Influence**

**Distance**

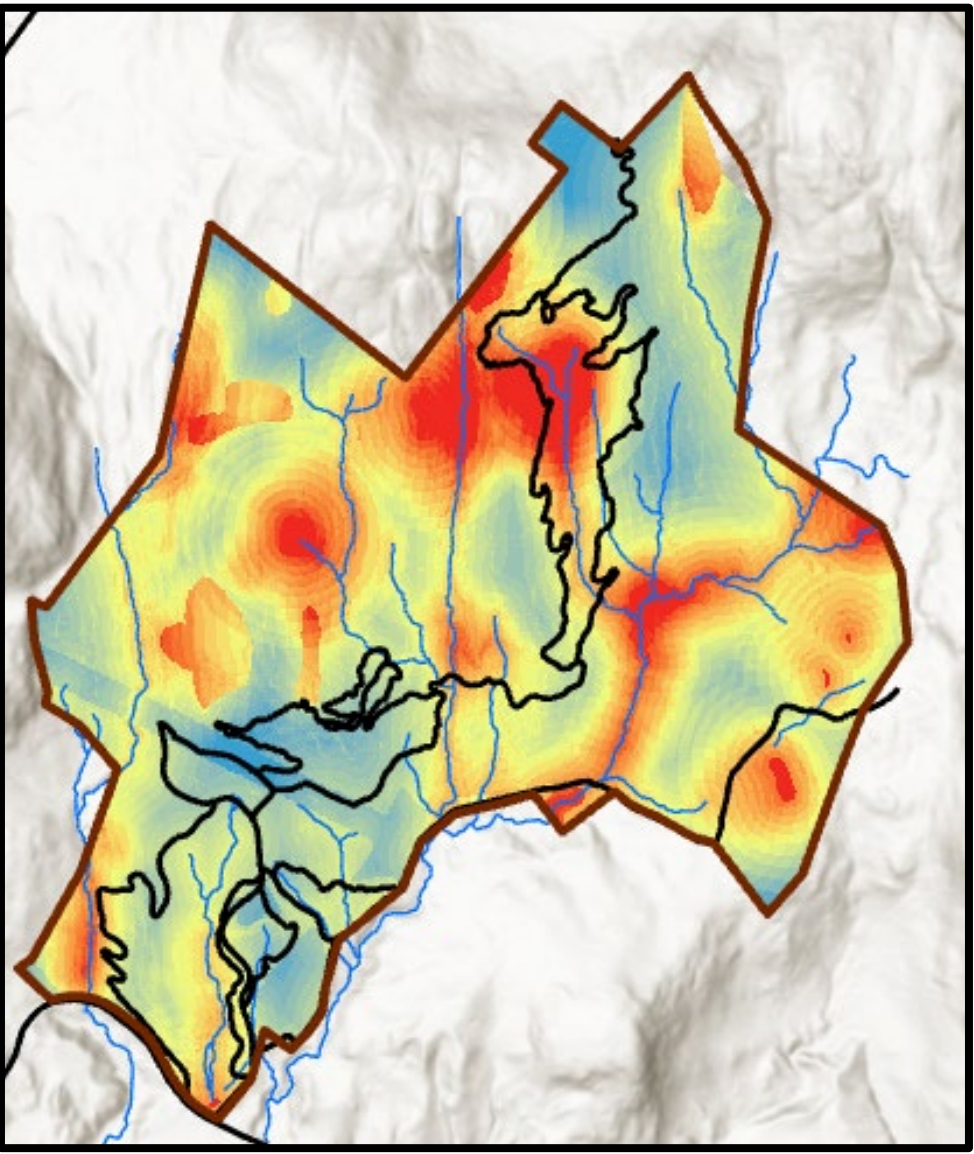
- 60 ft Birds and Herps
- 150 ft Songbird (alert)
- 400 ft Mammal (alert)



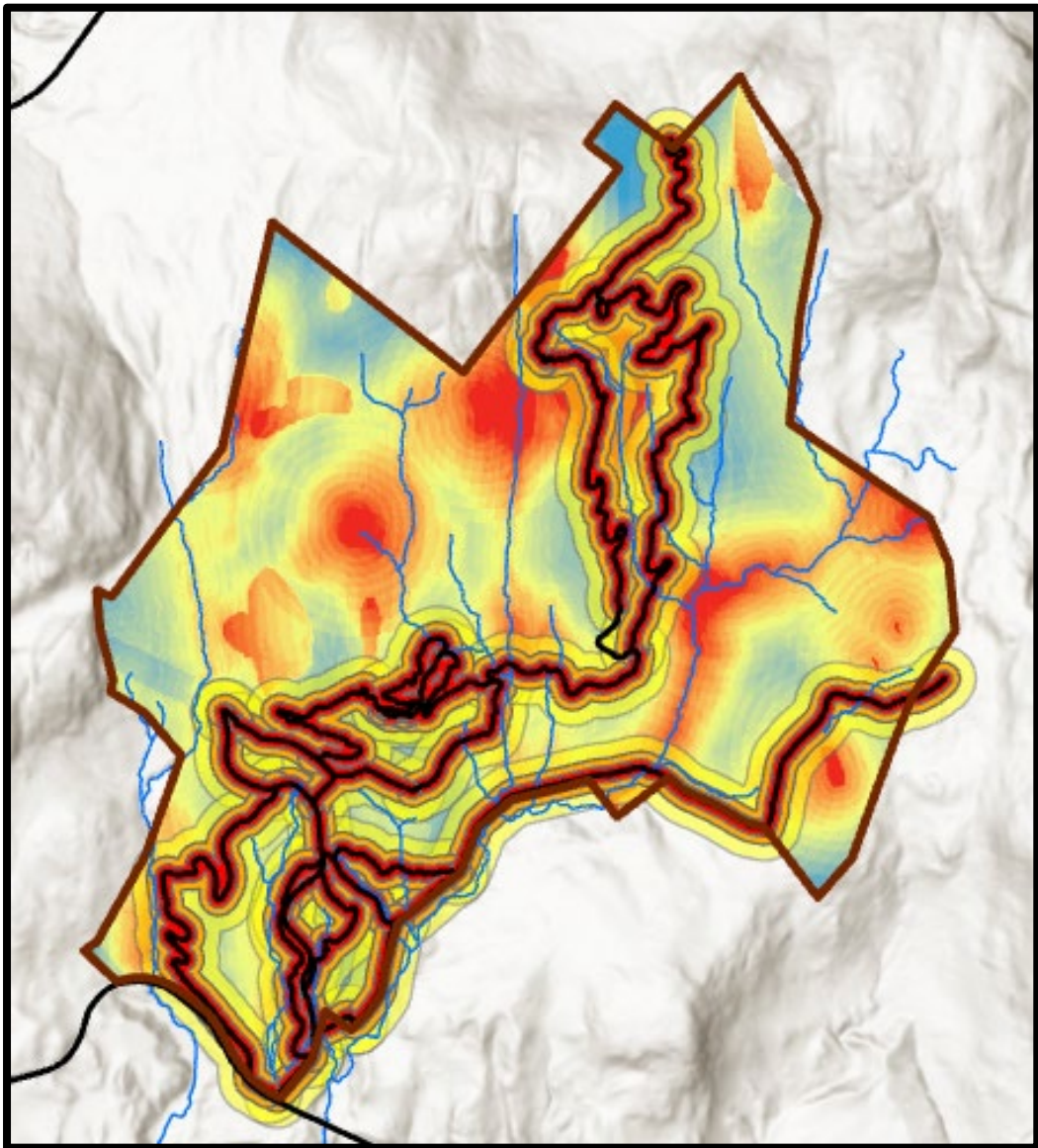
**Figure-30**

**Field Naturalist Heat Map and 50-100-200 foot ZOIs**

**Field Naturalist Heat Map with Trails**



**50 foot (red) - 100 foot (Orange) - 200 foot (Yellow)**



**Figure-31**

**Trail ZOIs: Ecological Sensitivity**  
**50 foot (red) - 100 foot (Orange) - 200 foot (Yellow)**

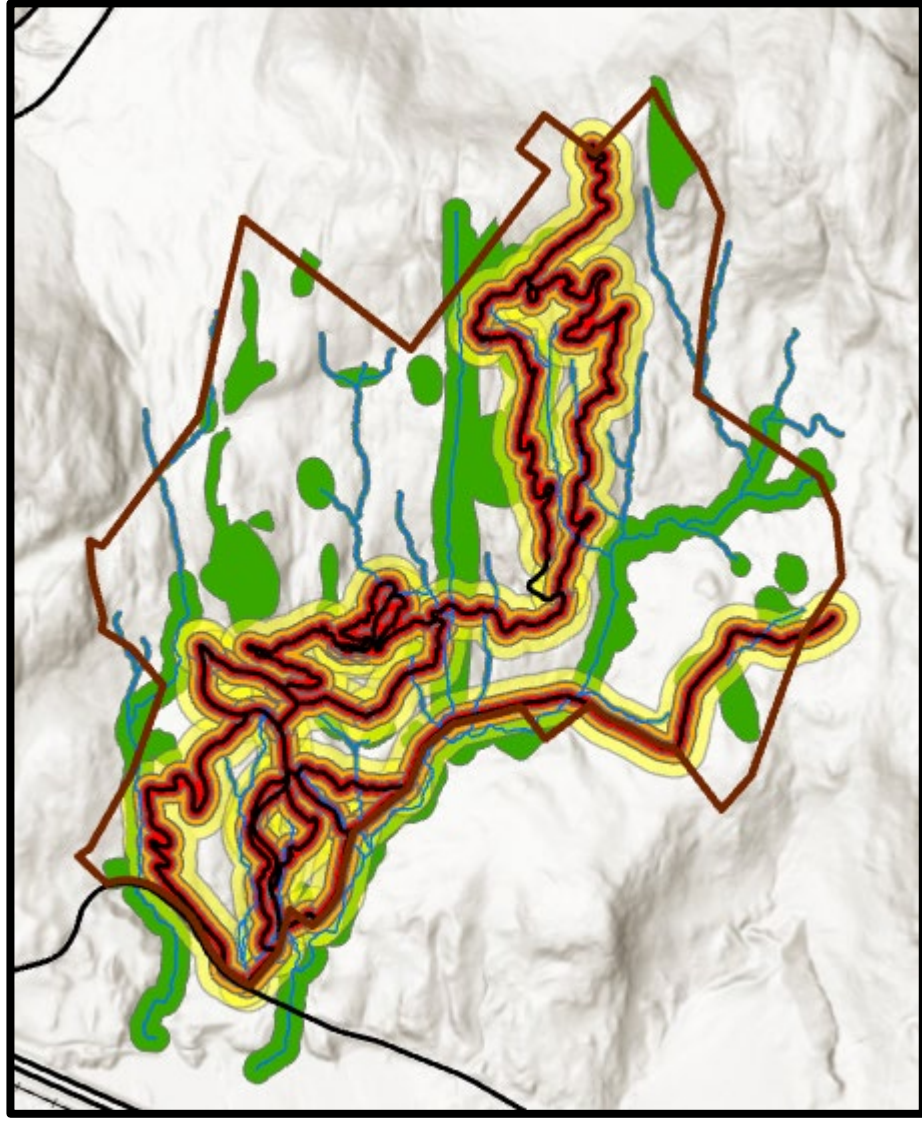
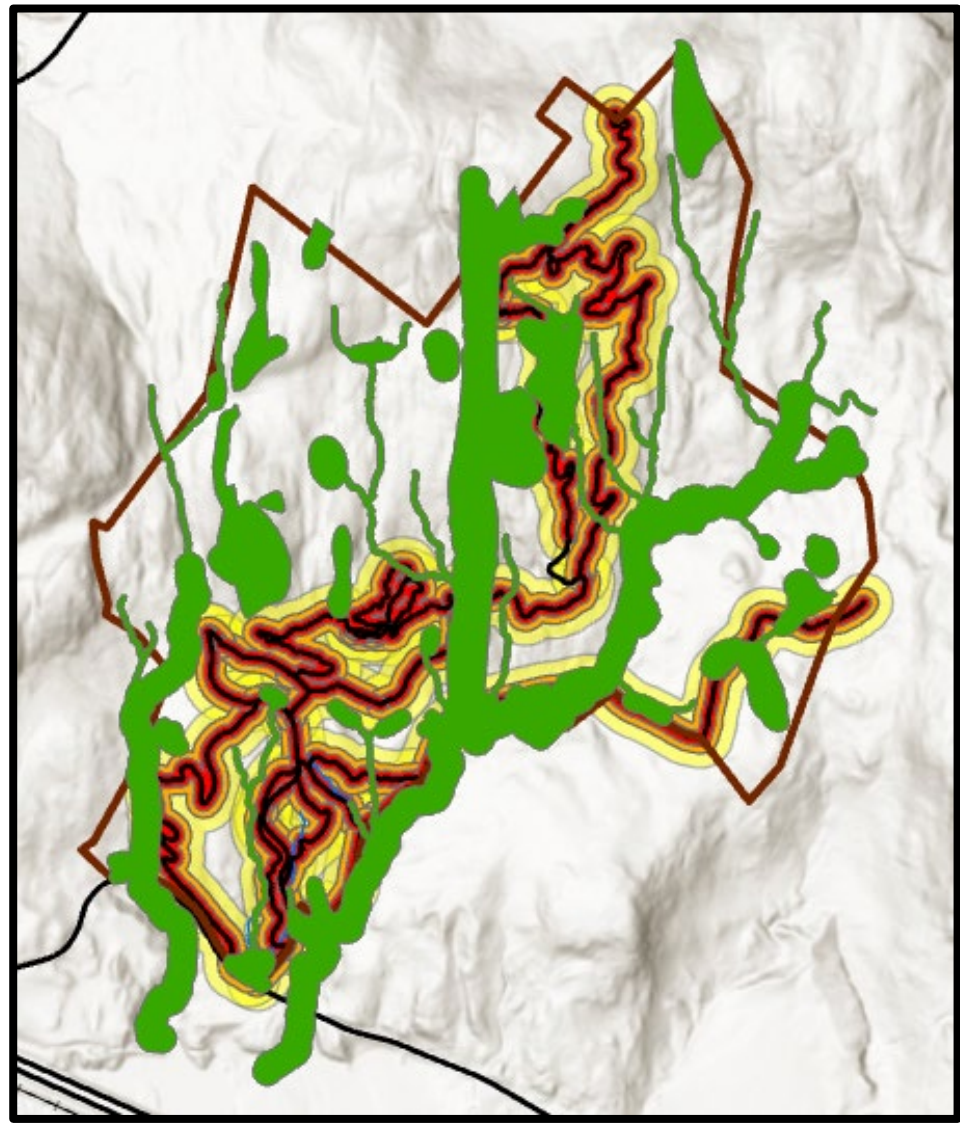




Figure-32

**Trail ZOIs: Wildlife Corridor**  
**50 foot (red) - 100 Foot (Orange) - 200 Foot (Yellow)**

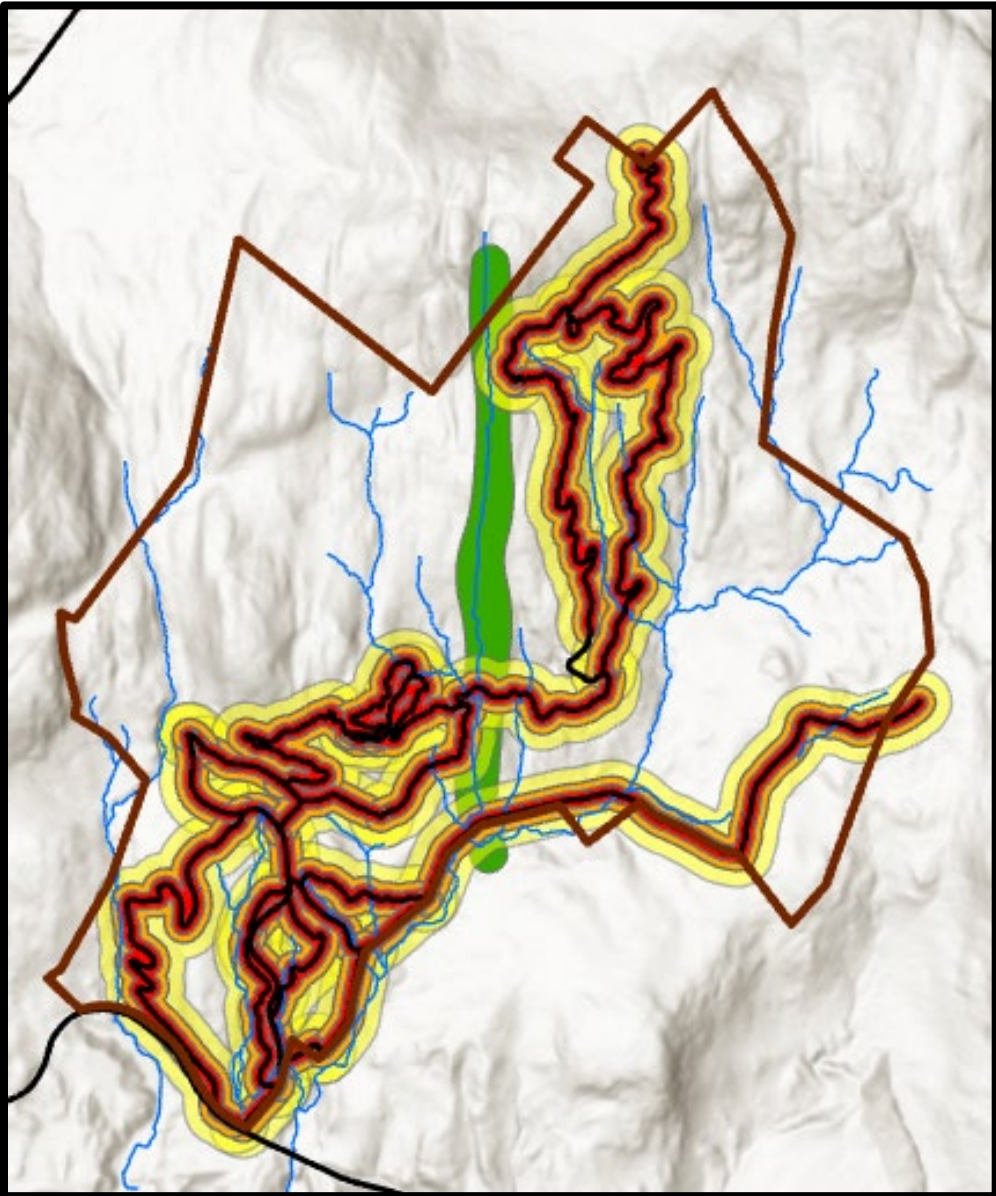


Figure-33

**Trail ZOIs: Dry Oak Communities**  
**50 foot (red) - 100 Foot (Orange) - 200 Foot (Yellow)**

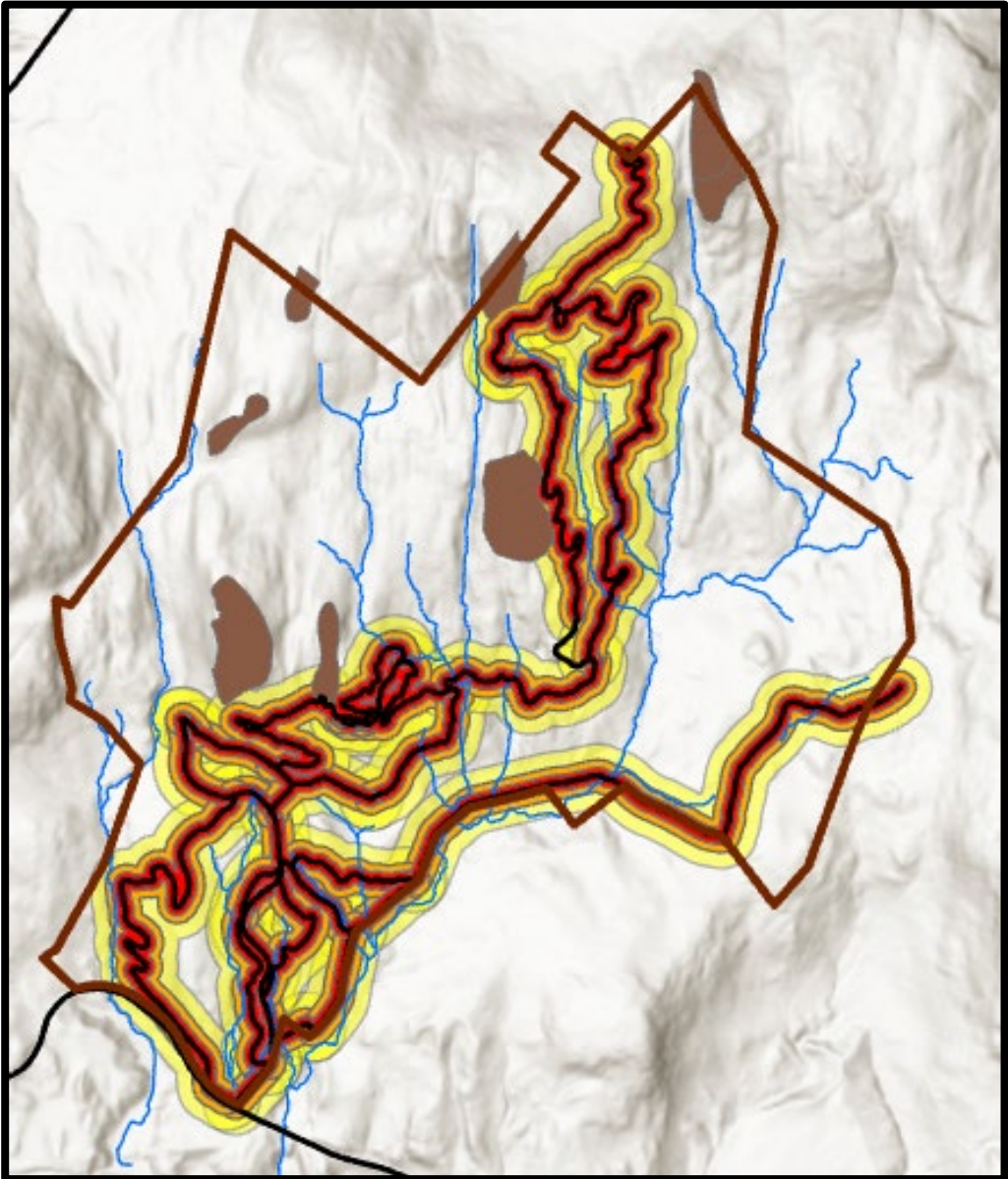


Figure-34

**Trail ZOIs: Hemlock / Red Pine Forests**  
50 foot (red) - 100 foot (Orange) - 200 foot (Yellow)

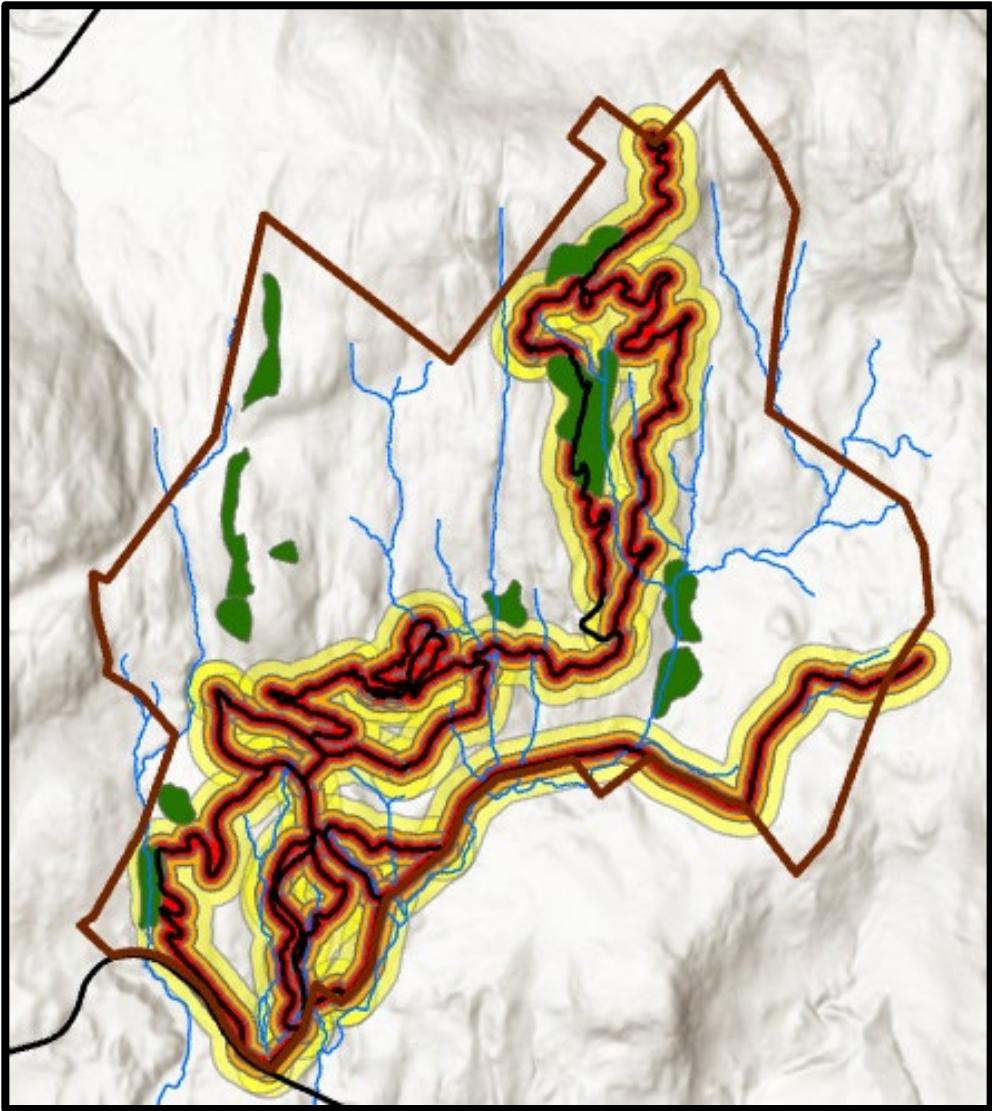
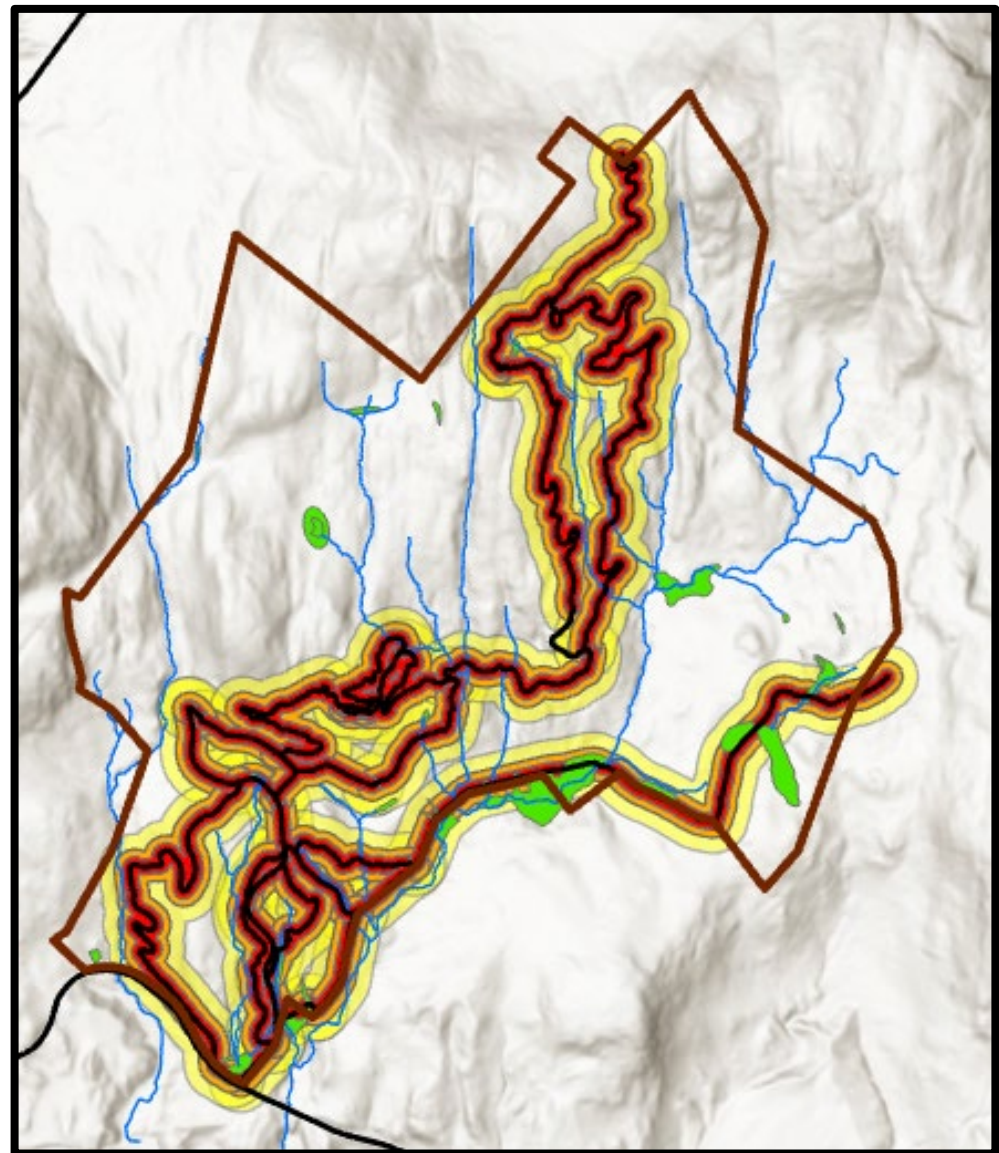


Figure-35

# Trail ZOIs: Wetlands

50 foot (red) - 100 foot (Orange) - 200 foot (Yellow)



**Figure-36**

**Trail ZOIs: Vernal Pools (arrows)  
50 foot (red) - 100 foot (Orange) - 200 foot (Yellow)**

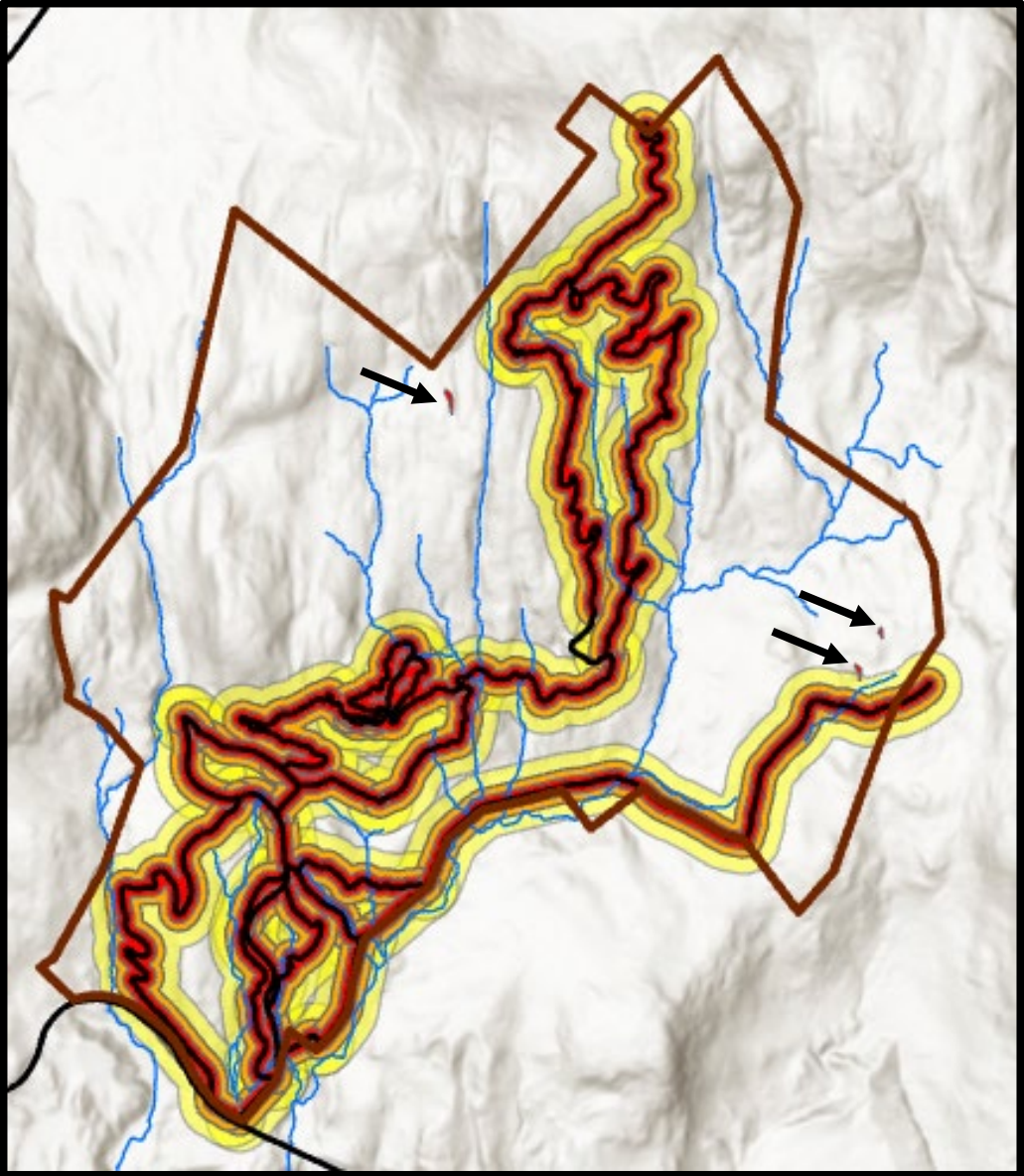
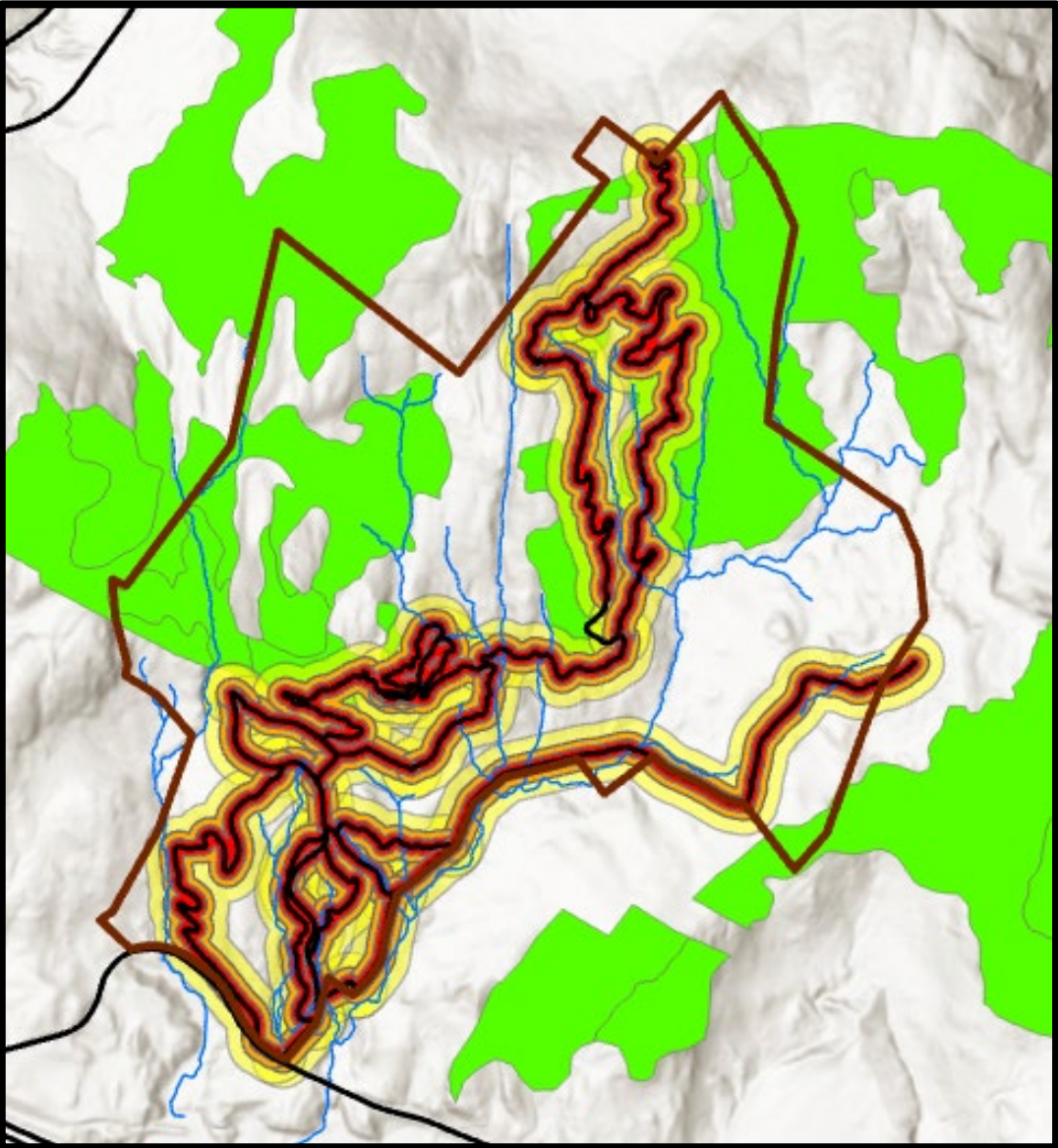


Figure-37

# Trail ZOIs: Mast Stands

50 foot (red) - 100 foot (Orange) - 200 foot (Yellow)



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## Ecological Features and Human Use Buffers (Figures 38-50)

**An additional approach is to provide buffers around areas of ecological importance. These can be of a variety of widths and distribution depending on the feature in question. Features can include landscape elements such as streams in addition to specific ecological features such as wetland, vernal pools dry oak forests and the like.**

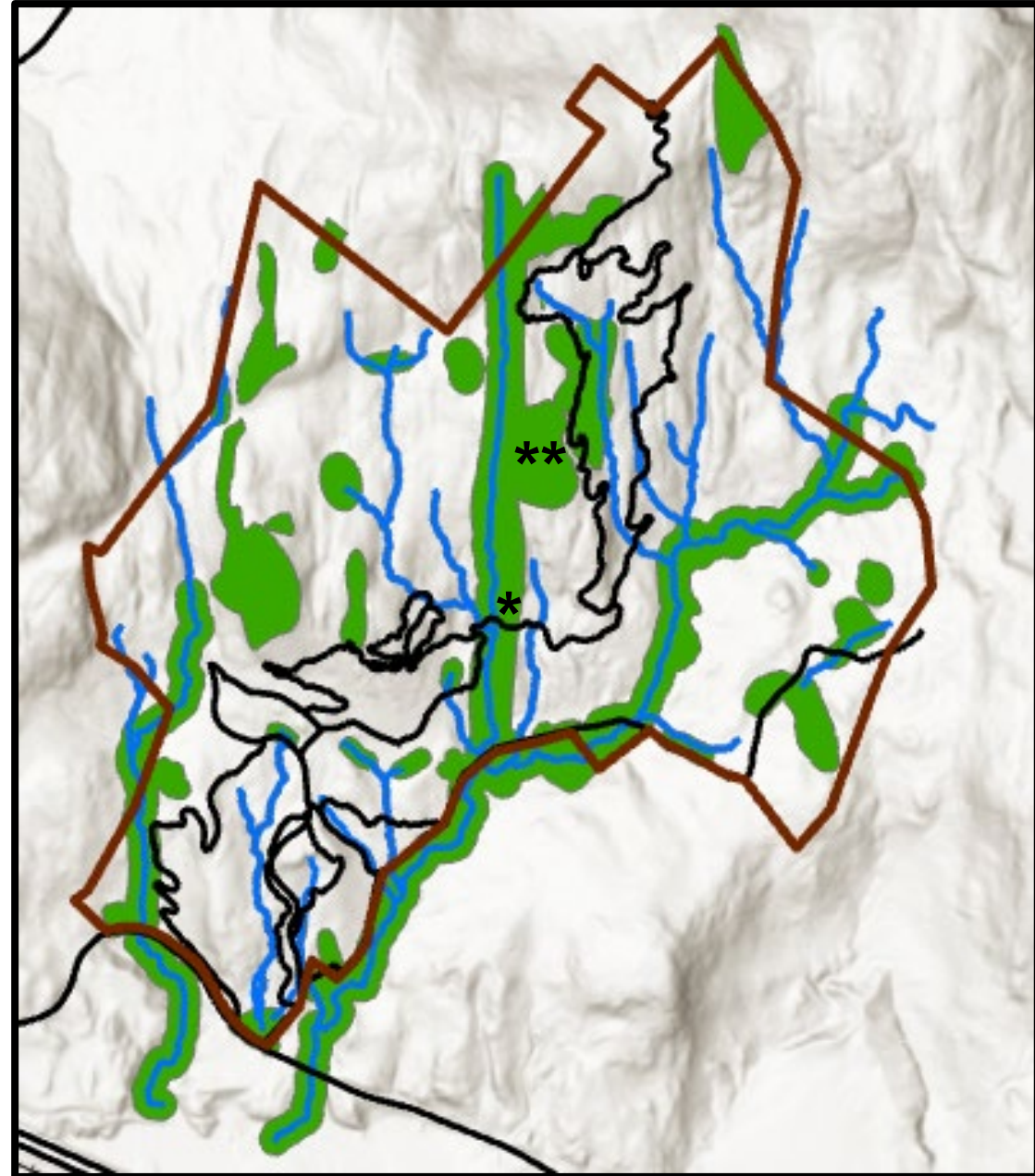
**Arrowwood has indicated that the Sensitivity Map includes buffers around some ecological features but not others. Specifically, buffers were provided for vernal pools (100-feet) wetlands (50 feet) and streams (perennial- 100 feet; intermittent 20 feet).**

**As discussed below there do not appear to be buffers for the Wildlife Corridor, Dry Oak Communities and Hemlock / Red Pine Forests. This needs to be verified.**

**Figure-38**

**Ecologically Sensitive Areas and Proposed Trails**

The currently proposed trails cover ecologically sensitive areas at certain locations, most notably crossing the wildlife corridor (\*) and Hemlock Vally trail (\*\*)





**Figure-39**

**Ecologically Sensitive Areas and Existing Trails**

**Existing trails/ roads also traverse sensitive areas.**



**Figure-40**

**Stream Buffers**

Buffers are included for streams: 100 feet for perennial streams (e.g. single arrow)  
20 feet for intermittent streams (e.g. double arrow).

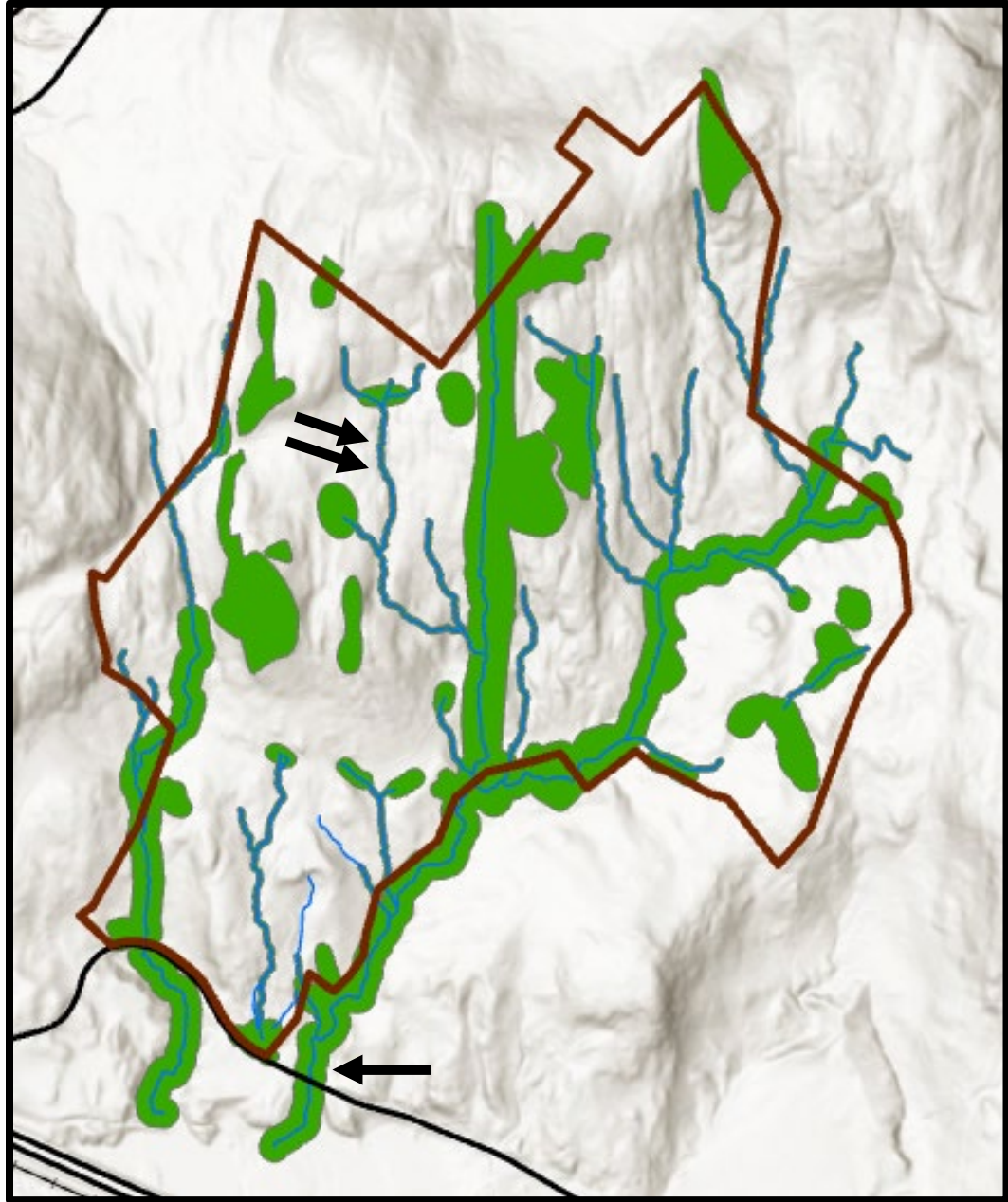
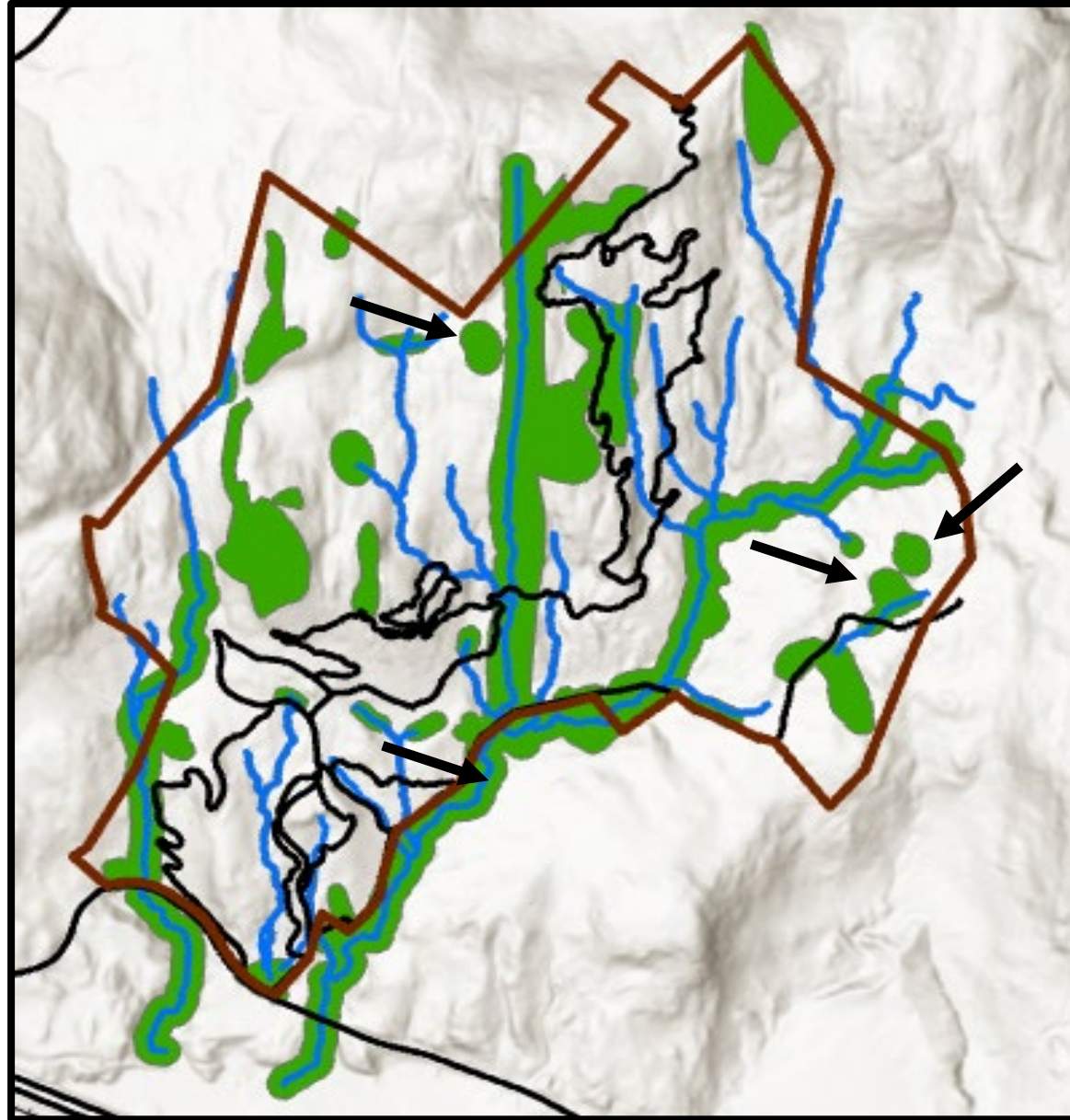


Figure-41

Vernal Pools

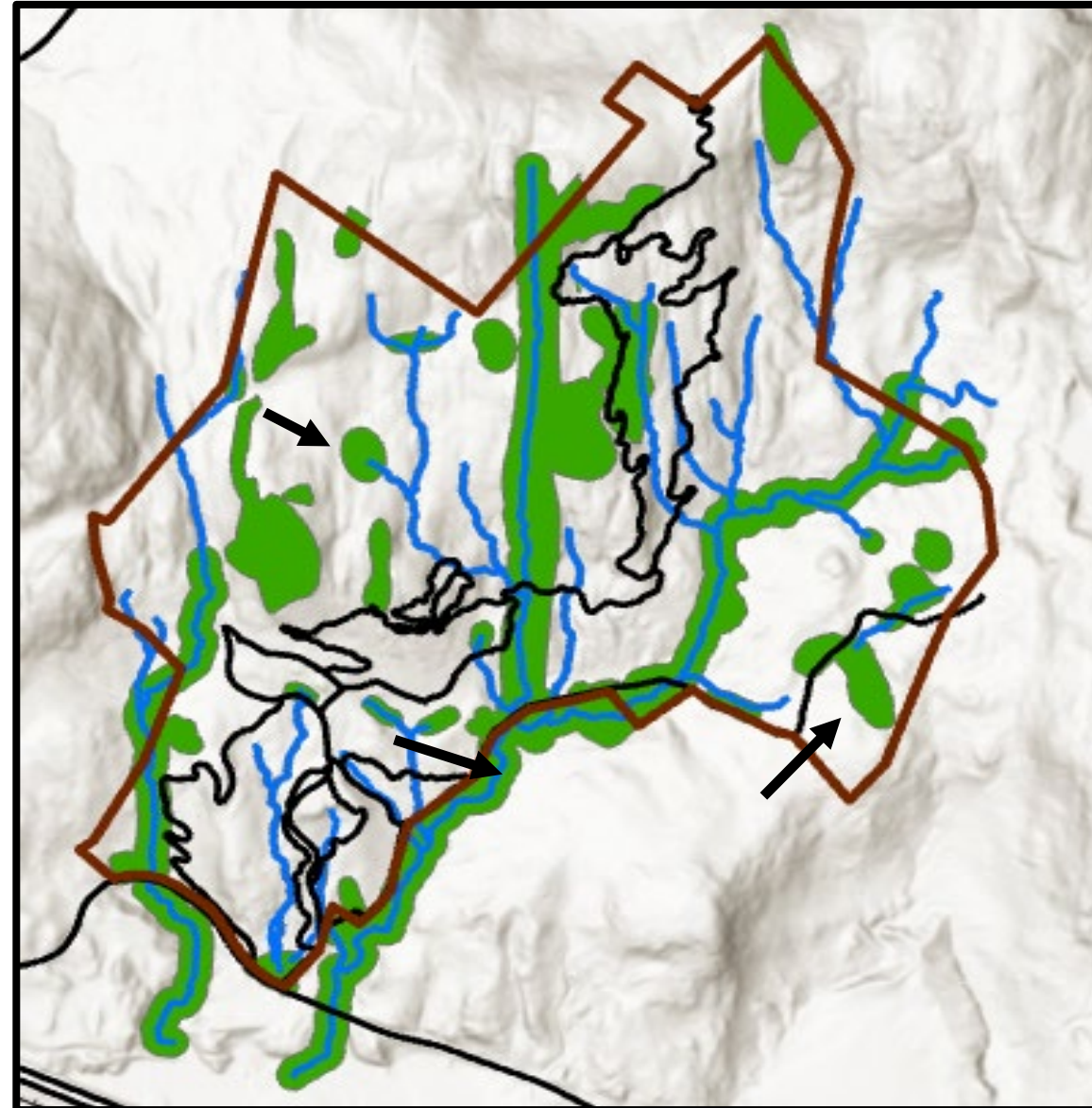
A100-foot buffer was set for vernal pools (arrows).



**Figure-42**

**Wetlands**

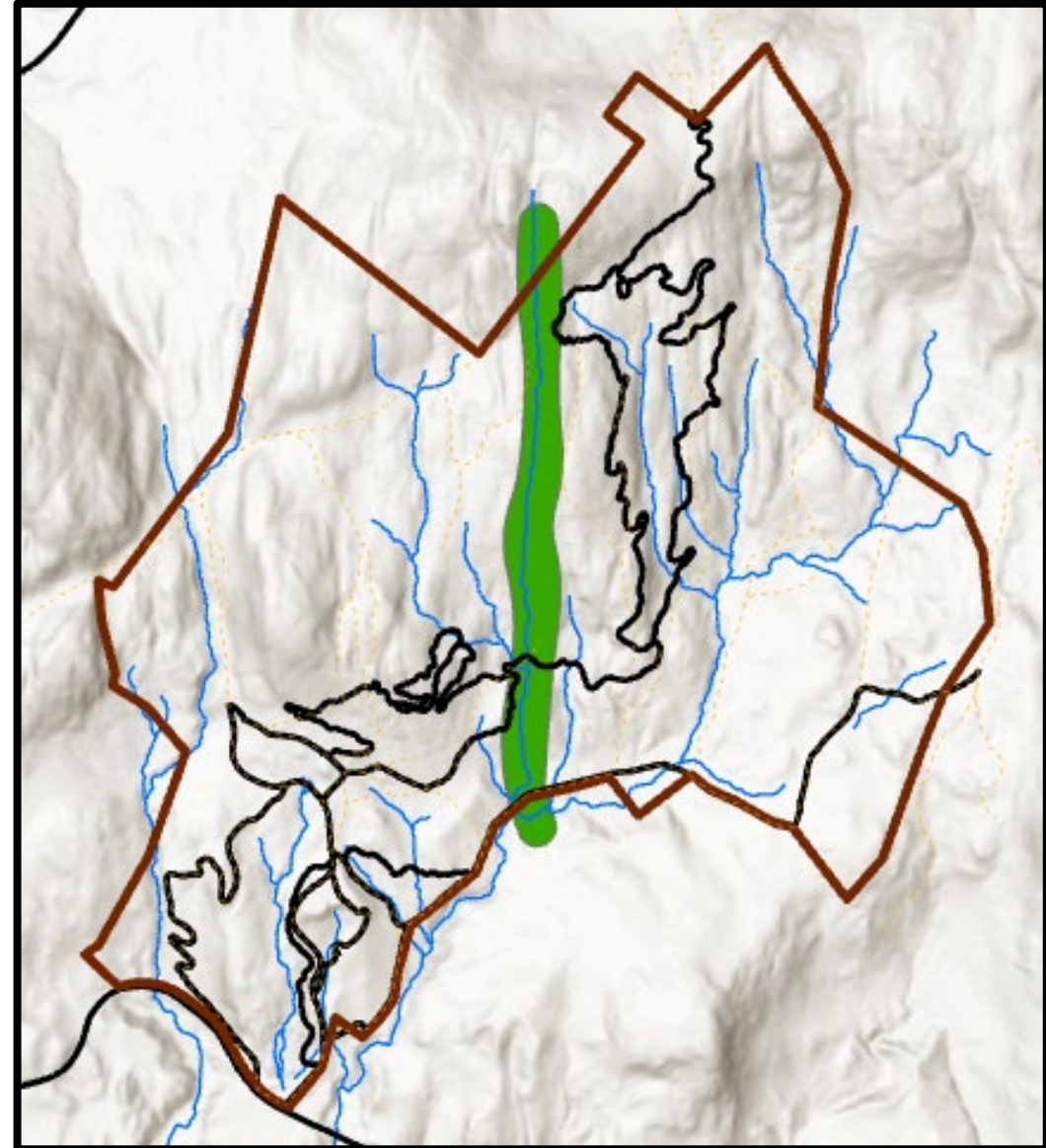
**Wetlands are provided a 50-foot buffer, some illustrated with arrows.**



**Figure-43**

**The Wildlife Corridor**

the wildlife corridor is not symmetric with the stream. It would appear from the contour maps that the corridor follows the top of the stream bank, though that needs to be ascertained with Arrowood. Until otherwise ascertained, the implication at this point is that the wildlife corridor is not buffered.



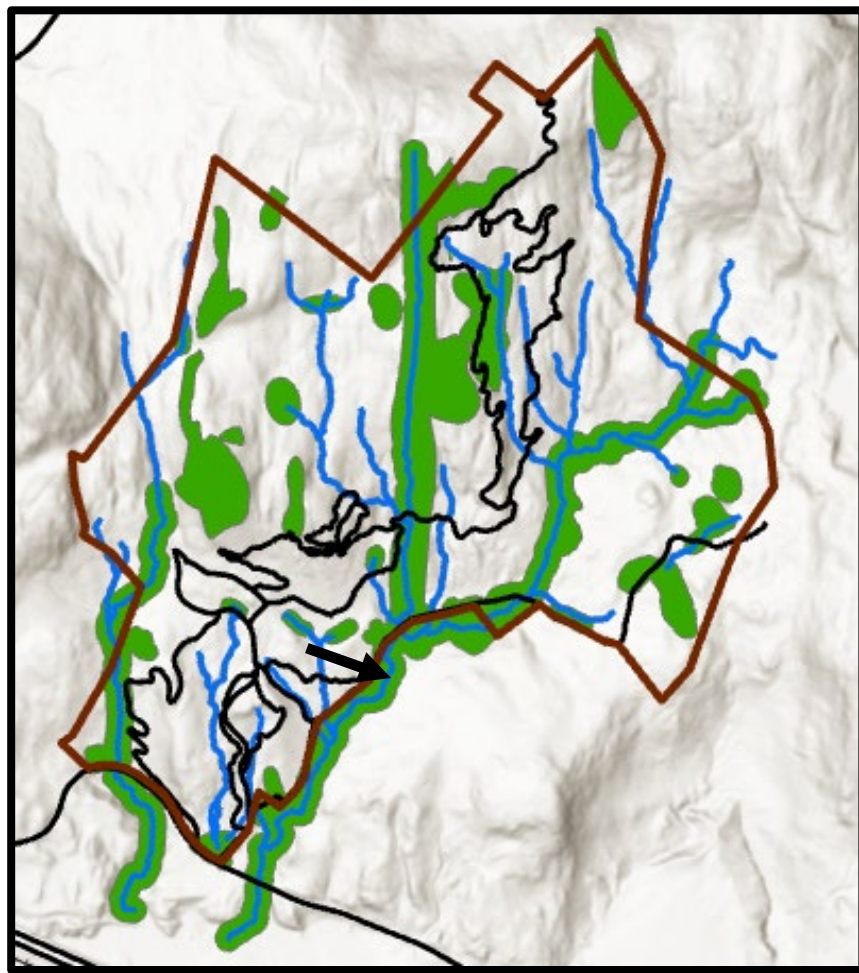
**Figure-44**

# **Dry Oak Communities**

**Ecological Sensitivity Map.**

**Dry Oak Communities.**

There is a match of Dry Oak Communities with the corresponding areas in the Sensitivity map. That implies no buffer. Again, requiring verification.



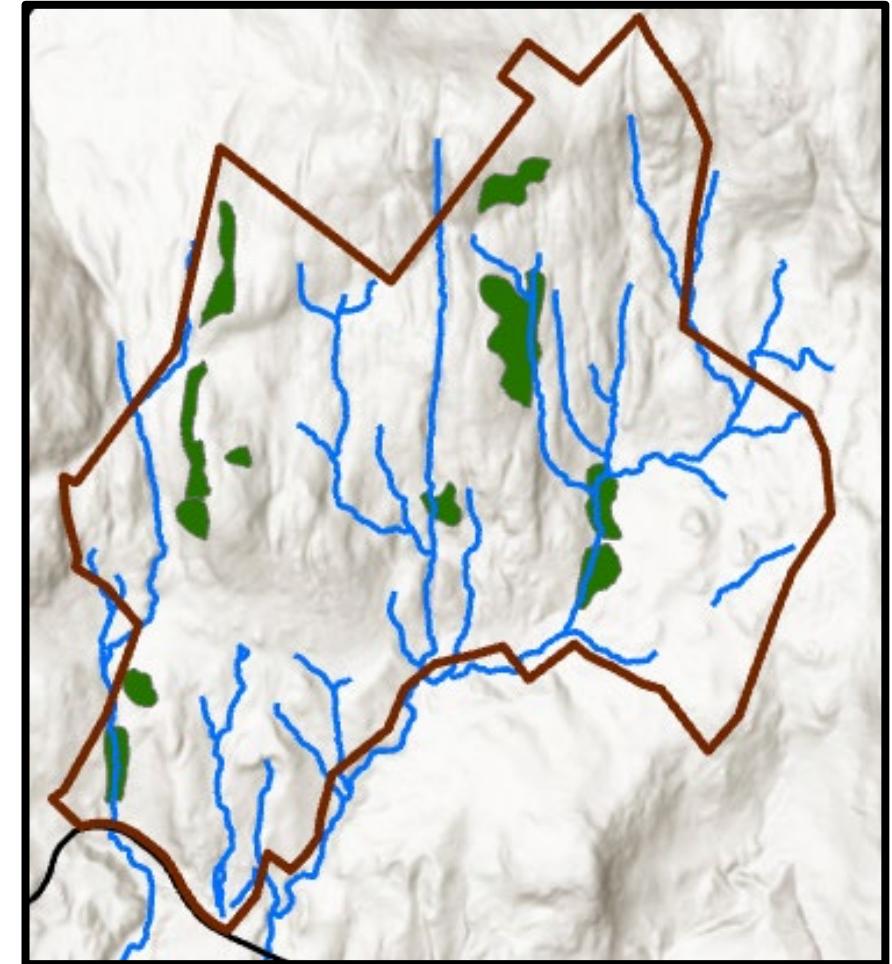
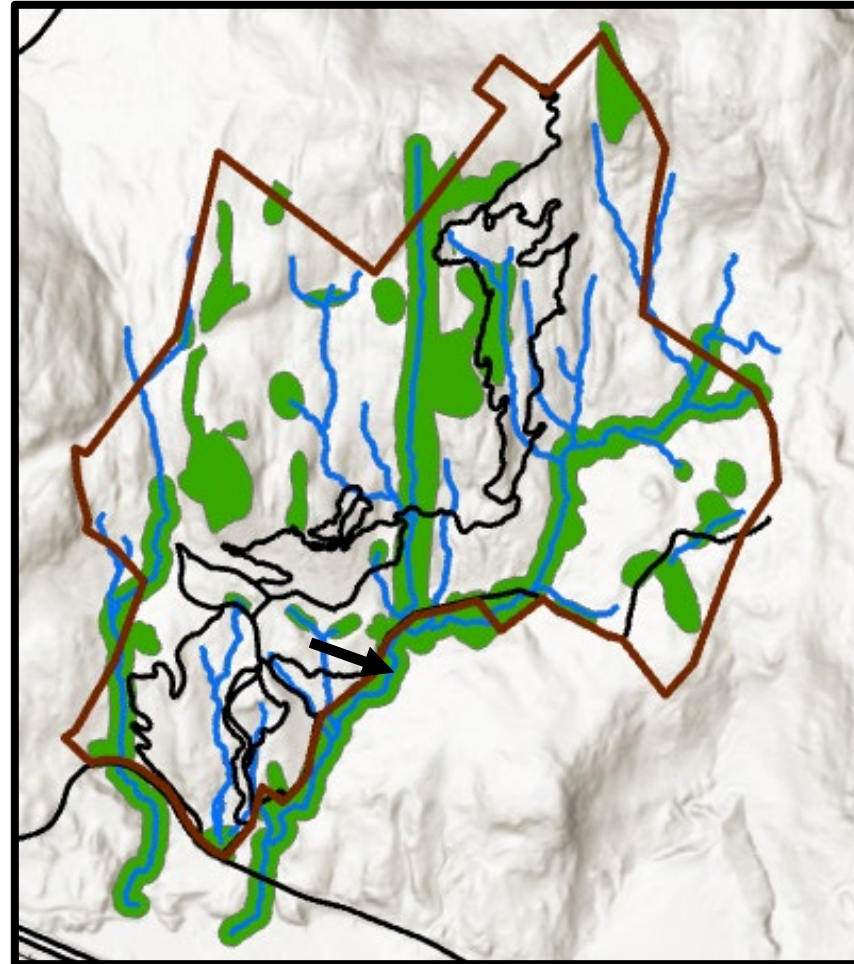
**Figure-45**

# **Hemlock / Red Pine Forests**

**Ecological Sensitivity Map.**

**Hemlock / Red Pine Forests**

The same for Hemlock / red pine forest: a match as best can be visualized.



# Combined Dry Oak Communities and Hemlock / Red Pine Forests

Ecological Sensitivity Map.

Dr Oak / Hemlock / Red Pine

Clearer when the two features are combined.

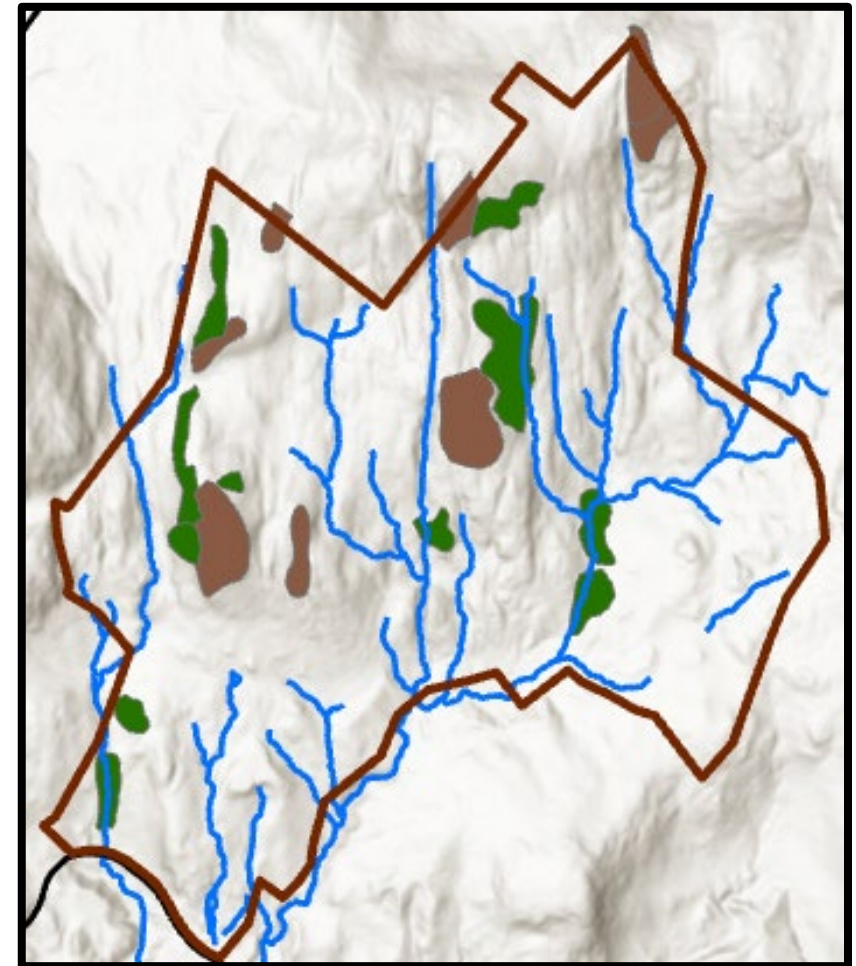
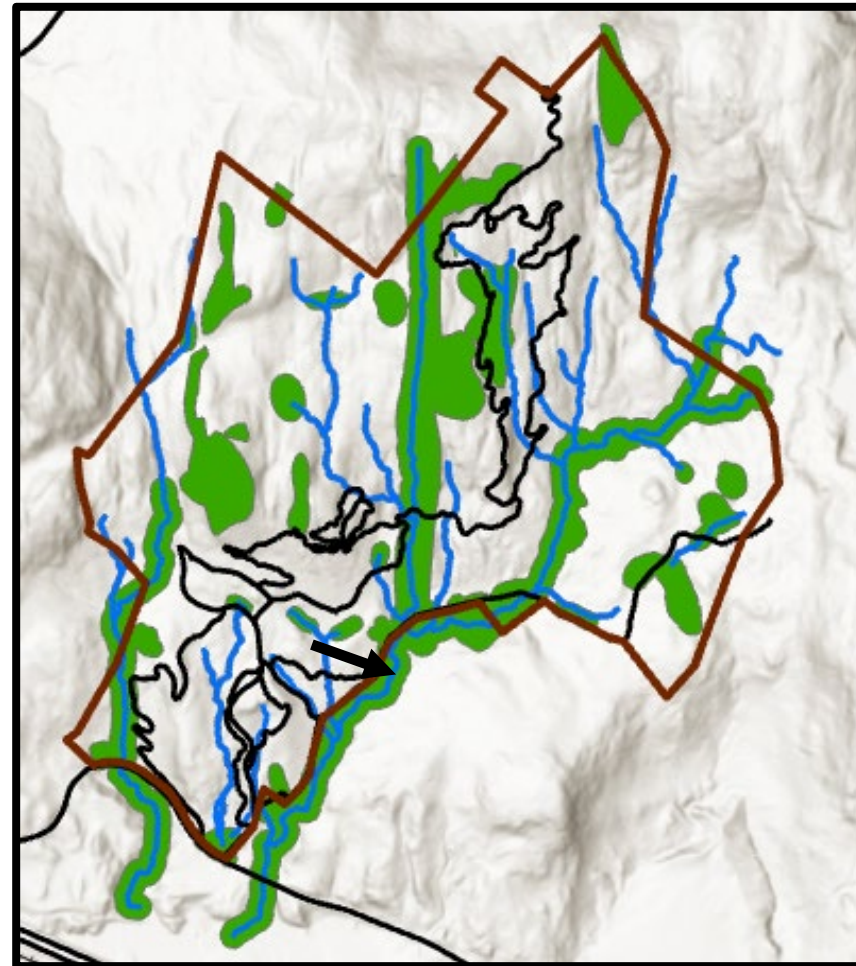


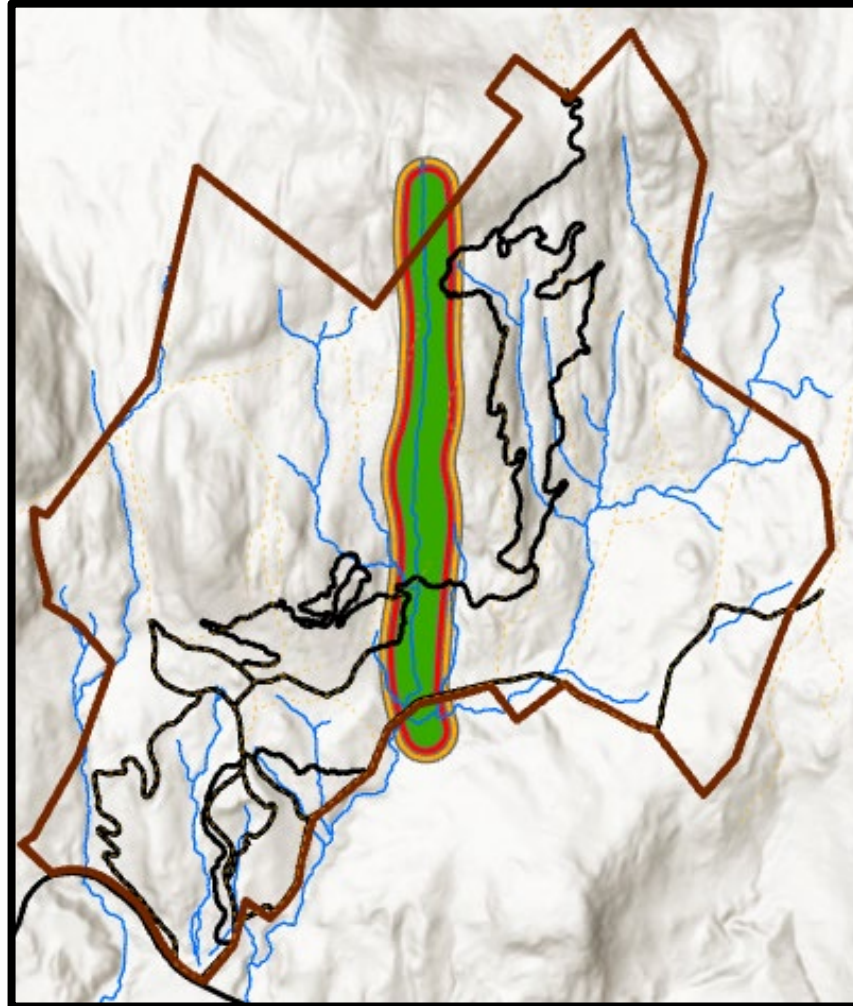


Figure-47

## Buffers around the Wildlife Corridor What would they look like look like?

50- (red) / 100- (Orange) foot Buffer

It is not clear at this time that the wildlife corridor was buffered. Here is what that might look like.

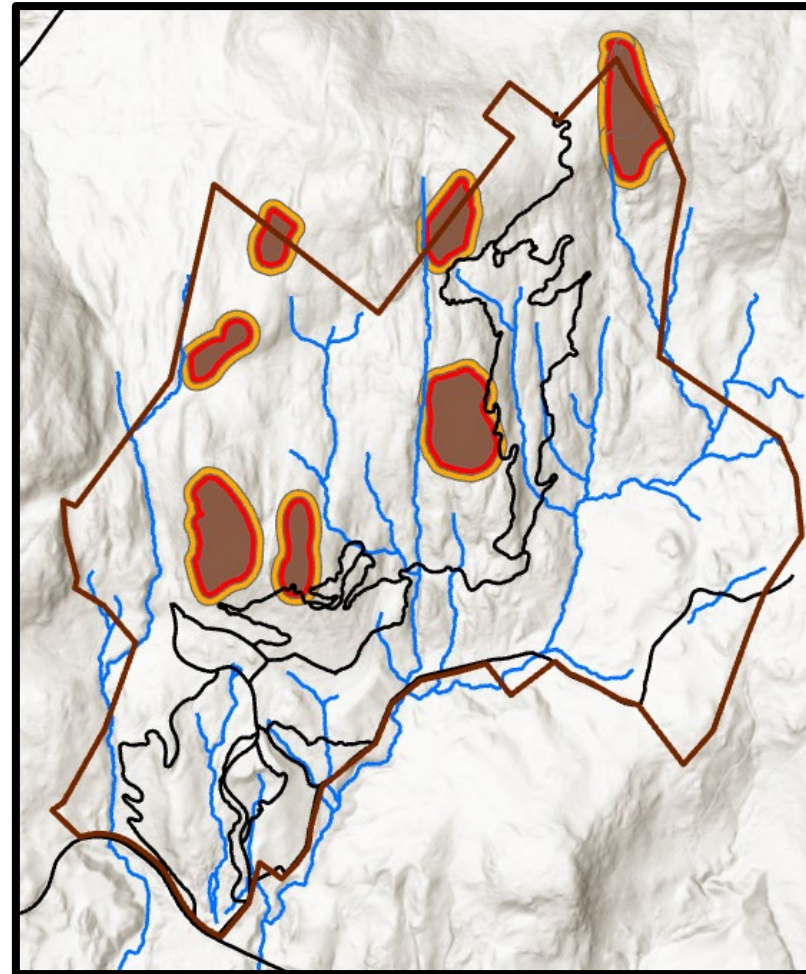


**Figure-48**

## **Buffers around Dry Oak Communities**

**50 (red)- / 100 orange)- foot Buffer**

**Highly sensitive Dry Oak areas are in close proximity to trails at several locations. Some encroachment with buffers.**



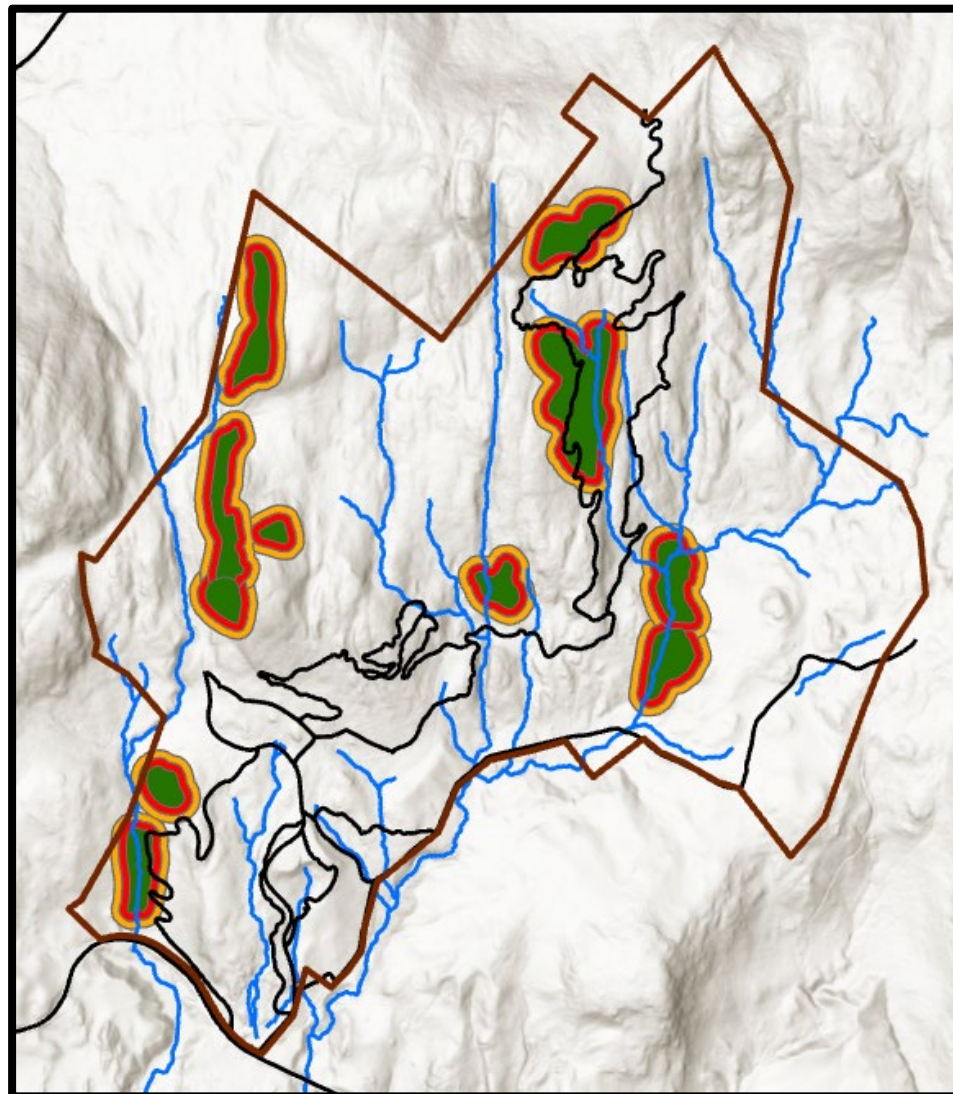
**Highly sensitive Dry Oak areas are in close proximity to trails at several locations. From the UVM Field Naturalist study: “An abundance of food in the form of red and white oak acorns, pinecone seeds, lowbush blueberries, and huckleberries make this natural community a wildlife hotspot for bear, turkey, ruffed grouse, squirrels, mice and chipmunks.”**

**Figure-49**

# **Buffers around Hemlock / Red Pine Forests**

**50 (red)- / 100 (orange)- foot Buffer**

**Buffers for Hemlock / Red Pine Forests noting in one case one trail, Hemlock Valley, with a trail courses directly through.**

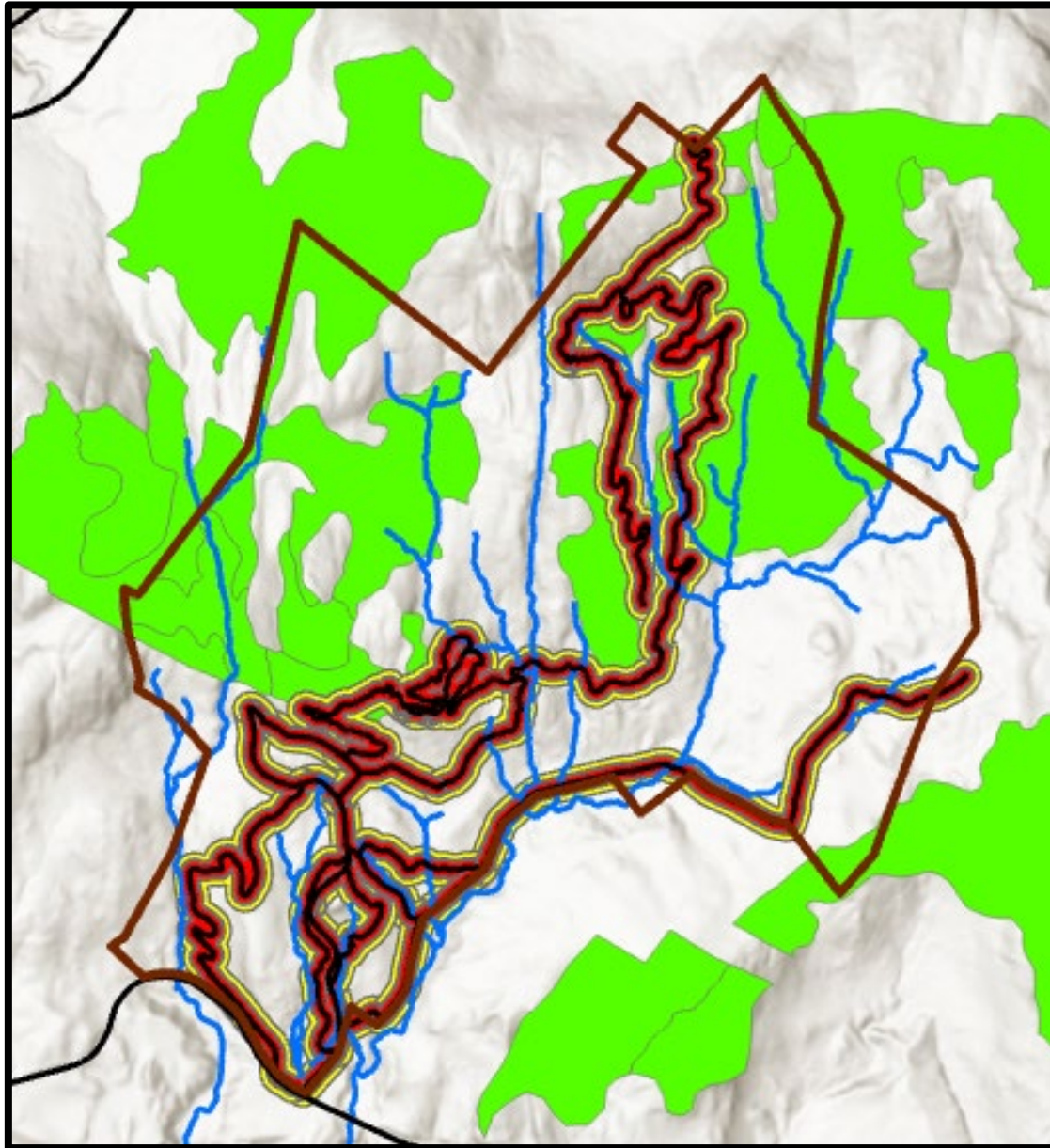


**Hemlock / Red Pine Forests are especially important to deer, particularly in the winter.**

**Figure-50**

## **Mast Stands**

**Mast stands, an important source of acorns and other nuts impinge on trails in several locations.**



**DRAFT**

## Concluding Remarks

- The goal of this work in progress was not to provide recommendations but rather to guide them. The maps have been provided as a visual guide to the location of ecologically sensitive areas.
- Multiple sources have been used to compile these illustrations. See Key Sources below.
- Trail Zones Of Influence (ZOIs) illustrate potential impact of trail use. How broad they should be and how they should be used remains for discussion.
- Buffers around ecologically sensitive features serve as a mechanism for protection are illustrated. Again, their application remains for discussion.

Maps showing different width buffers for individual ecologically-sensitive features and showing different ZOIs can be easily drawn up as needed as they may be useful in guiding decision-making.

## Concluding Remarks Cont'd

- It would appear that the greatest potential for conflicts is in the Northeastern area.
- Though potential conflicts are fewer in the Southwest area below the Power Line, these also should be examined.
- A key goal is to effect a balance between ecological impact balanced and the opportunities for recreational uses.

## Key Sources

- **ACF Conservation Easement**
- **Original and Draft Management Plan (03/29/23)**
- **Naughton: Wildlife & Recreation: Understanding and Managing Effects of Trail use on Wildlife**  
<https://streaming.uvm.edu/watch/41780/wildlife-trail-recreation-understanding-managing-and-monitoring-recreation-effects/>
- **Glynn, et al. Landscape Analysis and Wildlife in the Andrews Community Forest, Richmond, Vermont, UVM Field naturalist Study**
- **Arrowwood: Forests, Wildlife & Communities: Science to Action**
- **VCGI: <https://maps.vermont.gov/vcgi/html5viewer/?viewer=vtmapviewer>**
- **ANR: <https://geodata.vermont.gov/>**
- **BioFinder: <https://anrmaps.vermont.gov/websites/BioFinder/>**
- **2024 ANR Conservation Design update:**  
[https://anrmaps.vermont.gov/arcgis/rest/services/EGC\\_Services/MAP\\_ANR\\_VCDSPECIESCOMMUNITYSCALE\\_WM\\_NOCACHE/MapServer](https://anrmaps.vermont.gov/arcgis/rest/services/EGC_Services/MAP_ANR_VCDSPECIESCOMMUNITYSCALE_WM_NOCACHE/MapServer)

## Coda

There is an emerging and now substantial literature regarding the interactions between wildlife and recreation and strategies regarding how to strike a balance. This includes the concepts of Zones Of Influence and Buffers. A sample of the literature is provided below.

- Hennings, L. (2017). Hiking, mountain hiking and equestrian use in natural areas: A recreation ecology literature review.  
[https://www.researchgate.net/publication/320084633\\_Hiking\\_mountain\\_biking\\_and\\_equestrian\\_use\\_in\\_natural\\_areas\\_A\\_recreation\\_ecology\\_literature\\_review](https://www.researchgate.net/publication/320084633_Hiking_mountain_biking_and_equestrian_use_in_natural_areas_A_recreation_ecology_literature_review)
- Larson, CL, et al. (2016). Effects of Recreation on Animals Revealed as Widespread through Global Systematic Review. PLoS ONE 11(12):  
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0167259>
- Naughton: Wildlife & Recreation: Understanding and Managing Effects of Trail use on Wildlife  
<https://streaming.uvm.edu/watch/41780/wildlife-trail-recreation-understanding-managing-and-monitoring-recreation-effects/>
- Oehler, J. Trails for people and Wildlife. <https://www.wildlife.nh.gov/sites/g/files/ehbemt746/files/inline-documents/sonh/trails-for-people-wildlife.pdf>
- Taylor, AR, Knight, RL. (2003). Wildlife Responses to Recreation and Associated Visitor Perceptions.  
[https://doi.org/10.1890/1051-0761\(2003\)13\[951:WRTRAA\]2.0.CO;2](https://doi.org/10.1890/1051-0761(2003)13[951:WRTRAA]2.0.CO;2)