2017

Conserving Vermont's Endangered Species through Designation of Critical Habitat

Amanda M. Ramsing-Lund
University of Vermont

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Amanda Ramsing-Lund

A thesis project submitted in partial fulfillment of the requirements for the degree of Bachelor of Arts

Environmental Program
Honors College
College of Arts and Sciences
University of Vermont

2017

Advisors:
Allan Strong, Associate Dean, RSENR
Brendan Fisher, Associate Professor, RSENR

Abstract:

Although the Endangered Species Act of 1973 is federal legislation, protection of threatened and endangered (T & E) species varies in stringency across states. H.570 (Act 145) is a Vermont law passed during the 2015-2016 legislative session that updated some of the legal protections for T & E species. Through this legislation, the State was given the authority to protect critical habitat for T & E species through the Secretary of the Agency of Natural Resources. However, the legislation did not provide an official way to designate areas as critical habitat. The purpose of this study was to design an application form for the designation of T & E critical habitat, as a supplementary document to this law. Throughout the course of this work, I collaborated with a variety of stakeholders to ensure the successful development of the form. This project ultimately informs and facilitates future actions regarding protection of habitat for endangered and threatened species in Vermont.

Keywords: Land Conservation and Stewardship, Natural Areas, Wildlife, Animals, Land Use, Policy, Vermont, Endangered Species Act (ESA), Bill H.570, Act 145, Endangered Species Committee (ESC), Scientific Advisory Groups (SAGs), Vermont Department of Fish and Wildlife (VTFWD)

Acknowledgements

I cannot express enough thanks to my Thesis advisors Dr. Allan Strong and Dr. Brendan Fisher for their continued support, guidance, and encouragement throughout the academic and personal journey that this thesis project has been. My sincerest thanks.

I offer my sincere appreciation for the time, energy, and support provided by my Thesis Defense Committee overall, including the involvement and contributions during the thesis review and defense process of my Chairperson Dr. Patricia Erickson and my additional reader, (so much more significant a role than it seems), Dr. James Murdoch.

There is no way to explain how grateful I am to have been welcomed and included by so many different individuals with whom I was fortunate enough to collaborate throughout the course of my thesis project: all of the respective members of Vermont's Scientific Advisory Groups, the Vermont Endangered Species Committee, the VT Department of Fish and Wildlife, and the other State level staff or members of additional interest groups involved with the conservation of Vermont's biodiversity and the designation of critical habitat. Thank you so very much for the invaluable input and feedback provided during the process of developing the CHD form.

The completion of this project could not have been accomplished without the unwavering emotional and financial support of my parents throughout the entirety of my academic career. Many heartfelt thanks, Mom and Dad.

Thank you to each of my friends, roommates, and peers for putting up with my sporadic, melodramatic messages and, at best, self-centered conversation abilities over the course of this year. I appreciate every thought and moment, (and car!), spared for the sake of my thesis.

Finally, thank you to the Environmental Program for providing a unique and very beneficial support system for the ENVS students completing theses, and to the Honors College for convincing me to undertake and pursue a thesis in the first place. Special shout-out to the student services advisor in the College of Arts and Sciences for helping me navigate the seemingly unending requirements involved with a tri-entity (CAS/HCOL/ENVS) thesis.

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Introduction

Legislation

The ESA was passed in 1973 and is administered by the U.S. Fish and Wildlife Service as well as the Commerce Department's National Marine Fisheries Service, which hold authority over terrestrial and marine species, respectively ("Endangered Species - Laws and Policies," n.d.). In addition to the outright protection of threatened and endangered (T & E) species of plants and animals, Congress included critical habitat provisions in the ESA specifically to promote their recovery (Baynes, 2015). Critical habitat is typically identified as any portion of habitat that is "essential to the survival and recovery of species" (Camaclang et al., 2015).

A requirement of the federal law is "to map habitat critical to a species' survival" and that generally, habitat be designated as critical for all species officially listed as threatened or endangered species (Roman, 2011; Hoekstra, 2002). Specifically included under Section 4 of the ESA is the stipulation that, all other factors considered, "a final regulation designating critical habitat of an endangered species or a threatened species shall be published concurrently with the final regulation implementing the determination that such species is endangered or threatened" ("Endangered Species Act of 1973," n.d.; "Section 4," n.d.). In other words, federal protection of habitat for T & E species should occur simultaneously with placement of the species on the endangered species list and, as such, that habitat is then considered critical. Unfortunately, due to the relative leniency of federal guidelines for endangered species management, critical habitat has only been designated for around 10% of the species listed, which fails to "effectuate" the goals of the ESA (Hoekstra, 2002; Baynes, 2015).

Species cannot be excluded from listing as endangered or threatened based on economic factors that might negatively affect stakeholders. With respect to critical habitat, though, an

important acknowledgment is made in Section 4 of the federal ESA: "The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat" ("Endangered Species Act of 1973," n.d.; "Section 4," n.d.). Although not exclusively referring to the possibility of private landownership overlapping with a critical habitat area, this does touch upon the potential for conflict and consequences. Indeed, there have been many contentious situations regarding use and management of private property which was lawfully restricted by the ESA when that land was found to serve as critical habitat for particular T & E species.

The ESA was primarily enacted to protect species, and individuals of those species, and though it mentions protection of critical habitat, it was not initially authorized to impose legal action against human-caused habitat degradation. A crucial development in this situation was the Palila vs. Hawaii Dept. of Land Natural Resources case in 1979: the Sierra Club and National Audubon Society, among others, sued the Hawaii Dept. of Land and Natural Resources on the behalf of a honeycreeper called the Palila (*Psittirostra bailleui*), seeking the Court's protection "from harm [to its habitat] caused by feral sheep and goats" that grazed vital shoots and seedlings to the point of preventing regeneration of the Palila's forest habitat ("Palila I," 1979; Salzman, 1990).

A main point of contention during the proceedings was the intended meaning and usage of the word 'take' in the ESA. The plaintiffs, on behalf of the Palila, argued that the acts of the defendants constituted "an unlawful 'taking' of the Palila," despite being less direct than an actual take of individual(s) of the species, as was initially interpreted from the ESA ("Palila I," 1979). The definition of a take includes any "harm" to a species, which the plaintiffs asserted could include "significant environmental modification or degradation" that in turn hindered wildlife

survival ("Palila I," 1979). The plaintiffs ultimately won the case through demonstration of the goats' negative impact on Palila survival through destruction of its habitat ("Palila I," 1979). This was a turning point in interpretation of the ESA. From that point on, habitat degradation qualified as a take just as removing, harming, or killing the animal directly (Salzman, 1990; Davison, 1995). Throughout many following assessments of the Palila case and other such cases, this has held true (Sidle and Bowman, 1988).

In 1982, an additional amendment to the federal act was incorporated that had implications for the designation, protections, and management of critical habitat. Under Section 10(a), habitat conservation plans (HCPs) were introduced ("Endangered Species Act of 1973," n.d.). The most important development within this amendment was that habitat critical for T & E species was no longer entirely protected beyond any possibility of alteration, but that landowners or other vested stakeholders in an area identified and designated as critical habitat could legally alter their property in the event that they submit an HCP that intends to mitigate/manage negative effects on the resident T & E species in question. This required provision of "incidental take" permits for effects on listed species in connection with otherwise lawful activities being performed in known critical habitat ("Section 4," n.d.). The goal was, and still is, to allow landowners more freedom with the use of their land, while still benefitting the species through management of important habitat.

To best benefit the species, the HCPs must be scientific in nature, not purely constructed around socioeconomic factors. That is to say, the included conservation strategies must address the biological and ecological requirements of the species as well as estimate (quantitatively) the predicted impacts the proposed "take" will have on the species (Watchman et al., 2001). With respect to the latter point, the suggested mitigation measures in the HCP must be proportionate to

the extent of the take incident. A further development of this provision occurred in the 1990s, again to reassure the landowners. The “no surprises” clause was implemented, which "guarantees HCP participants that their obligations will not change even if future circumstances change" (Langpap and Kerkvliet, 2012). Thus, if the T & E species that had been occupying their land becomes extirpated, the landowners are neither penalized nor responsible for additional management.

Despite the alleged "rigorous monitoring" required of HCPs in order to determine "the plan's actual effect on species and their habitat," some parties have worried that the HCPs have no real measure of success or failure, which eventually might result in the "tragic destruction of the very species these plans were designed to protect" (Watchman et al., 2001). These concerns are acknowledged and dispelled in the review by Langpap and Kerkvliet (see following section).

Nevertheless, if the habitat necessary for the ongoing survival of an already threatened or endangered species is not protected, it can be safely assumed that the species' populations will decline rather than remain stable or recover, which is in opposition to the overarching goal(s) of the ESA (McDonald, 1998).

Background on Critical Habitat

Numerous factors are individually and cumulatively necessary to consider when determining if a habitat area will be able to support the survival and recovery of a T & E species. These can be both "historical and ecological," and affect patterns of species distribution "at both temporal and spatial scales" (Davison, 1995; Ferrer-Sánchez and Rodríguez-Estrella, 2016). Habitat characteristics ranging from general site condition or quality to specific types and amount of vegetation must be considered when assessing a species' critical habitat needs; there is a sort of "ecological check-list" that should be considered when determining the appropriate

quality and quantity of critical habitat (Widows and Drake, 2014; Hofstetter et al., 2015). A species' persistence depends on all of its habitat requirements being met: spatial scales ranging from "local habitat features" (vegetation) to the "landscape mosaic" all function hierarchically to provide sufficient habitat quantity for both individuals and populations (Storch, 1997).

A consequence of the relationship between species and the extent of their habitat is that if that habitat is significantly reduced in area or degraded, one or multiple species will be lost (*National Research Council*, 1995; Miller, 1996). The ESA clearly addresses the fact that a primary, if not *the* primary, facet of an endangered or threatened species becoming such is the "present or threatened destruction, modification, or curtailment of its habitat or range" ("Endangered Species Act of 1973," n.d.; Sidle and Bowman, 1988). The ESA also makes it clear that the goal of protecting critical habitat is more than just protecting it for the sake of T & E species' survival, but for ultimately achieving T & E species' recovery: "There is no more important factor contributing to recovery than availability of habitat for a threatened or endangered species" (McDonald, 1998).

However, studies have found conflicting results about whether or not designation of critical habitat actually serves any benefit to the intended species, with differences usually arising from misaligned intents and practices (Camaclang et al., 2015). Hoekstra et al. (2002) concluded that "critical habitat designations have had negligible positive influence in the recovery planning process." That being said, some scientists have found that "species with [habitat designation] do appear to fare better than those without" (Roman, 2011). Partially in relation to cases such as that of the Palila, though, there has been much dispute about whether protecting critical habitat, (on private land specifically), does more harm than good for T & E species. There has been evidence that landowners sometimes purposefully degrade their land to

reduce the quality of the habitat below that required by T & E species, prior to its designation as critical habitat (Hoekstra et al., 2002). Consequently, the land would not qualify as critical habitat, and the landowner would avoid losing control over their property and its management. One argument has therefore been that it would be safer for critical habitat, and the T & E species relying upon it, not to legally designate it, but rather to invoke other protections over it that would minimize the potential for habitat degradation caused by landowners.

Fortunately, HCPs have been developed and implemented to balance the needs of landowners and the T & E species occupying their land. However, there had been no systematic analysis of the effectiveness of HCPs until 2002, at which point Langpap and Kerkvliet conducted a comprehensive review of the impact that HCPs had had on species' recovery status (Langpap and Kerkvliet, 2012). They found that "HCPs have a significant positive impact on species recovery," including a lessened likelihood of decline or extinction and an increased likelihood of achieving stable populations: as such, HCPs can be "effective in promoting the ESA's goals" (Langpap and Kerkvliet, 2012).

In addition to legal protections, and adequate enforcement, "ensuring that critical habitat identification aligns more closely with its intent will improve the accuracy of the designations and may therefore help improve the benefits to species recovery" (Camaclang, 2015). Although the foundation and purpose of both T & E listing and designation of critical habitat is biological, the social and economic aspects must also be considered and effectively addressed to promote the success of those protections, especially with respect to participation by landowners (Davison, 1995; Knapp et al., 2015). Hoekstra suggested a "standards-based system" to be used universally for designating critical habitat to "promote more effective contributions" to the protection of endangered and threatened species (Hoekstra et al., 2002). Although a truly comprehensive

system may never be fully realized, the development of a similar such system has been initiated and propelled by this very thesis.

Critical Habitat Efforts in Vermont

Under Section 6 of the ESA is the assertion that actions taken at the state level are imperative to the success of conservation efforts for listed T & E species (Salzman, 1990). The federal ESA continues to act as a safety net for species that are at critical levels, such that they will be protected even if individual states do not have an official process for critical habitat designation, however, the lack of definitive protections for critical habitat at the federal level means the best opportunities for more rigorous protections remain at the state level. Many, but not all, states have their own endangered species act or law. Although some do have state-specific habitat conservation plans or programs that involve the acquisition of land by the state government for the purpose of protecting or preserving T & E species, very few individual states have specific protections or designation processes in place for critical habitat; Vermont is unique.

Vermont's Endangered Species Law (ESL) was established in 1981 and includes ten total sections that outline matters regarding T & E species. The law is specifically entitled Title 10: Conservation and Development, Part 4: Fish and Wildlife Conservation, Chapter 123: Protection of Endangered Species (Referred to as: 10 V.S.A. Chap. 123 § 5401 - 10). The incorporated statutes cover the process of listing a species as threatened or endangered within the state, and establish the Vermont Endangered Species Committee as well as its members' advisory roles regarding Vermont's T & E species. Initially, however, this ESL did not include protections for the listed T & E species' habitat.

With the conclusion of the 2015-2016 legislative session in Vermont, a new statute under Vermont's ESL, as described by Bill H.570 (Act 145), authorizes the VT Secretary of Natural

Resources (the "Secretary") to designate critical habitat for the state's listed endangered and threatened species. The creation of this authority for the Secretary is a conservation success for Vermont, as it bolsters the state's own ESL and its protections (see H.570 (Act 145), pages 32-57); there are 105 state-endangered and 109 state-threatened species in Vermont[1] that would potentially benefit from this legislation ("Rare and Uncommon Animals of Vermont," 2017). Additionally, mirroring the case of the Palila, Act 145 includes statements about the applicability of a "take" with regard to critical habitat and asserts that any taking of critical habitat would require a Secretary-issued permit and respective fees. However, the critical habitat legislation in Act 145 does not itself clearly provide the means or guidance for actually carrying out the process of designating critical habitat.

As with the new listing of a threatened or endangered species, each time critical habitat is proposed for designation the motion must go through the rule-making process and ultimately be approved by the legislature and the Governor. Thus, following the passage of Act 145, Vermont's Endangered Species Committee realized there was a need to develop a new process for the designation of critical habitat. Soon this process took shape as the Critical Habitat Designation (CHD) form, the construction of which is the basis for this thesis.

Through work done on this project, I worked with a variety of stakeholders to develop a document that can be used to designate critical habitat for all of Vermont's T & E plant and animal species. To create this form, I followed a set of key structural and content guidelines:

1) The form must conform to the language used in H.570 (Act 145).
2) The form must be sufficiently flexible to address critical habitat needs for all taxa in Vermont (see below for more details).
3) The completed form must contain adequate evidence that the designation of proposed

[1]The Vermont Endangered and Threatened Species List as well as the various relevant definitions regarding critical habitat and its designation can be found under Title 10: Conservation And Development, specifically Chapter 123: Protection Of Endangered Species. These and other documents are located at legislature.vermont.gov, which was the primary reference for my evaluation of the relevant pieces of legislation.

critical habitat is supported by the best available science and is essential to the continued survival and recovery of the endangered or threatened species.

4) The form must maintain a sufficient level of readability to promote acceptance by each of three key constituents (the taxa-specific Scientific Advisory Groups [SAGs], the Vermont Endangered Species Committee [VESC], and the Vermont Department of Fish and Wildlife [VTFWD]).

With these guidelines in mind, I attempted to delineate the most important factors to identify for "habitats of sufficient extent and quality" (Hofstetter et al., 2015). My production of a functional, flexible form facilitates the framework promoted by Act 145, which emphasized that designation of critical habitat would benefit populations of T & E species listed in Vermont.

An important point to note: critical habitat is automatically protected through the federal ESA, *then* specific regulatory factors are addressed once the species has been listed and its habitat noted. This is contrary to Vermont's state ESL, which has created the option for actively designating critical habitat areas, but requires consideration of factors that might impact that habitat from the very initial stages of designation, potentially deterring the designation altogether. Taking this into account during the development of the CHD form was necessary for ensuring its ultimate effectiveness.

Relevant Stakeholders for this Thesis Project

There were key stakeholders involved throughout the process of creating a proposal form for critical habitat designation. Vermont's Scientific Advisory Groups (SAGs) are committees comprised of members that volunteer their time and expertise for taxa of interest. There are six SAGs: mammals, birds, invertebrates, reptiles/amphibians, fish, and flora. They are composed of a spectrum of researchers and conservationists within Vermont, and are also referred to as Species Advisory or Species Advocacy groups, though Scientific Advisory Group is the official

term/title. Each SAG has scheduled meetings throughout the course of the year, varying from one to three in total. These meetings are intended for SAG members to have the opportunity to discuss the various issues related to species in their focal taxa, whether they be rare, threatened, endangered, (RTE), or just of other interest in the context of ongoing activities and regulations in Vermont. Ultimately, after assessing and evaluating any new data or trends related to RTE species in the state, the SAGs advise the Vermont Endangered Species Committee on actions to take regarding legislature. Advice is based on biological expertise, but also from the perspective of familiarity with the socioeconomic challenges that might be faced by that species.

Creating and distributing an official application form for the designation of critical habitat would provide a resource for Vermont's six Scientific Advisory Groups to take crucial steps in conserving particular species that they oversee. If an endangered or threatened species is likely to be harmed by loss of its habitat, then the ability to designate protection of those identified habitat areas would facilitate the species' conservation and recovery.

The Vermont Endangered Species Committee (VESC) is described as the committee which advises "the secretary on all matters relating to endangered and threatened species, including whether to alter the lists of endangered and threatened species and how to protect those species," and currently includes six core members ("Endangered Species Committee," 2017). The remaining three official members are the Secretary of Agriculture, Food and Markets, the Commissioner of Fish and Wildlife, and the Commissioner of Forests, Parks and Recreation. The VESC meetings, (held two to four times a year), are crucial assemblages of not only representatives from the SAGs, but others from the VT Department of Fish and Wildlife, the Department of Agriculture, Agency of Natural Resources, and members of the public with ties to particular interest groups. These meetings provide the opportunity to review, discuss, and make

decisions about matters affecting T & E species, with regard to the various realms of activities that affect Vermont's biodiversity. My participation with the Vermont Endangered Species Committee was through collaboration with Dr. Allan Strong, who is an appointed member of the VESC.

The Vermont Department of Fish and Wildlife (VTFWD) is the governmental entity with whom I worked directly throughout the course of my thesis project. It is committed to conserving the many flora and fauna of Vermont as well as their habitats. The VTFWD is comprised of more than 130 staff members in five divisions: Administration, Fisheries, Law Enforcement, Outreach, and Wildlife. These divisions work collaboratively to fulfill their responsibilities and best preserve the natural communities of Vermont. Specifically relevant to my experiences in facilitating the development of the CHD form, the VTFWD has staff that, among the other activities of the Department, partake in "monitoring populations of rare, threatened and endangered plant and animal species and, most recently, participate in the protection of critical wildlife habitat through regulatory processes" ("About Us - Wildlife Division," n.d.). The VTFWD is one of three Departments within the Vermont Agency of Natural Resources, and is overseen by the Secretary.

One critical aspect relevant to the dynamic among, across, and between the respective SAGs, the VESC, and the VTFWD is that the actual gathering and participation of the members in each SAG is entirely voluntary, whereas the involved staff from the VTFWD are employed in their roles. Thus, serving on the VESC, while being a voluntary position, puts committee members at the intersection between assessing the best scientific data while providing recommendations to those directly serving in the conservation profession and dealing with additional aspects of conservation situations (social or political, for instance).

My role through this thesis project was to facilitate the process of developing the form for critical habitat designation by way of interacting with the main stakeholders and compiling their expertise. Ultimately I synthesized enough feedback and data to finalize a well-informed, applicable Critical Habitat Designation (CHD) form. My goal was to contribute to the continued success of Vermont's conservation efforts for T & E species, and pending the adoption of the final version of the form, I have provided an informational foundation to which the VESC can refer and use when designating critical habitat.

Methodology

When Bill H.570 (Act 145) was passed into law, it incorporated the objective to "provide a comprehensive landscape focus to conservation actions" ("Revising Vermont's Wildlife Action Plan," n.d.). I contributed to this aim through my research and compilations on critical habitat. The extent of my contributions to the existing body of work was primarily informal collaboration with Vermont's experts on the T & E species occupying Vermont, supplemented by review and synthesis of the literature on critical habitat as well as the relevant past and current legislation.

Groundwork

During the rulemaking process of moving critical habitat designation forward in the 2015-2016 legislation, experts in the T & E species community, (primarily the SAGs), assembled draft versions of what critical habitat designation would entail, portraying species-specific examples of critical habitat proposals for each taxa group (see Appendix A). These experts, in keeping with the objectives of the VESC, outlined the various components necessary to include in order to be able to sufficiently implement critical habitat protections. Expanding upon the previously mentioned findings by Hoekstra (2002), a study published last year by Duarte et al.

(2016) noted how important it is to have a "standard operating procedure" for identifying "areas of priority for habitat conservation efforts" (Duarte et al., 2016).

When the VESC developed preliminary materials regarding the process of designating critical habitat, their approach covered basic needs of different taxa while also dealing with the justification for the selection of critical habitat, how designation might affect landowners, and assistance that the VTFWD might provide to the affected landowners. Even from that early point in development of the critical habitat designation process, it was clear how invaluable it is to have transparency and communication with landowners that might be affected (Knapp et al., 2015). Another of the considerations that came up fairly early in the process was whether particular T & E species would be more straightforward to approach, and/or benefit more from, designation of critical habitat. For instance, a threatened or endangered species that has clearly defined habitat use patterns and a limited home range would be an ideal candidate for critical habitat designation (Takekawa and Beissinger, 1989; Ferrer-Sánchez and Rodríguez-Estrella, 2016).

In developing a definitive critical habitat designation (CHD) form, I built off of this foundational work. My ultimate objectives were to tailor the CHD form to be applicable across different taxa, and to address potential socioeconomic issues while not undermining the biological evidence for designating the critical habitat.

Meetings

The main challenge in maintaining sufficient communication with Vermont's experts on T & E species was coordinating between the six SAGs and their varied meeting dates. This juggling of different schedules was part of the process, though it expressly drove the timeline of events: development of the CHD form occurred incrementally alongside the individual meetings

and discussions regarding the form. Each meeting was followed by review and integration of feedback, and in turn, further meetings about the updated draft versions of the form.

I participated in and guided a total of 10 informal discussions, during scheduled meetings or correspondences, over the course of the academic year (see Table 1). The meetings that I attended were either with members of the SAGs or the VESC, and varied in size and format from one-on-one to upwards of 20 individuals (assuming full attendance of members and other groups' representatives) at the VESC meetings. The correspondences ranged from email exchanges

Table 1: Chronological organization of meetings that occurred during the course of this thesis project and the development of the CHD form. "Virtual review" refers to the distribution of the CHD form via email for viewing, discussion and commenting by certain SAGs, either prior to or during a scheduled meeting which I could not physically attend.

Name of Group	Date of Official Meeting
Bird SAG	October 11th 2016
Invertebrate SAG (Virtual Review)	October 25th 2016
VESC	October 27th 2016
Reptile and Amphibian SAG	November 1st 2016
Flora SAG	November 15th 2016
Fish SAG (Correspondence following Virtual Review)	December 13th 2016
VESC	January 26th 2017
Mammal SAG (Virtual Review)	March 23rd 2017
Webinar	March 29th 2017
VESC	April 6th 2017

between myself, or myself and Allan, and respective SAG Chairpersons to a full webinar involving approximately 20 representatives from the scientific community.

Webinar

The webinar was unique from the SAG and VESC meetings in that its sole purpose was discussion of the CHD form. The interface used was Zoom, through the membership held by the Rubenstein School of Environment and Natural Resources (RSENR). It came with its own technological navigations and challenges, such as ensuring the session was booked at the right time (PM not AM), and for the correct amount of time to avoid overlap with other RSENR webinar sessions. To advertise the plan to host a webinar, and then coordinate its timing, (as well as who would be in attendance), I created a Doodle poll of potential dates and times for the webinar which Allan then distributed to members and associates of the SAGs as well as the VESC. From then on, I managed the responses to the poll and assessed which would be the best day and time for most participants to be able to attend the webinar. I confirmed my final decision on the date and time of the session, as well as distributed the most recent draft of the CHD form, via an email to the same persons Allan had initially contacted regarding the webinar.

In terms of chronological occurrence, the webinar session occurred after I had received and assessed input from all SAGs and before the April VESC meeting. The webinar session was facilitated by myself and Allan, with an introductory statement from Allan, followed by my section-by-section review of the form. At the end of my overview of the form, the session was opened up to questions, comments, and suggestions from the attendees.

Review and Editing after Meetings

Independent Review

Following a respective meeting or correspondence, I would review my own notes of each person's comments during the course of discussion to fully comprehend the feedback within the context of the form. Then, I reassessed the section(s) in question, remaining mindful of previous

edits and comments or concerns about those sections. I made sure to cross-reference the language I used in the CHD form with the language in Act 145 if wording was the question. Finally, I changed the aspects in which I felt confident as being the most beneficial for the form and its future use. The review and editing process was streamlined by my independent work on the CHD form: my presence at, or involvement with, each SAG or ESC meeting provided a consistent thread of knowledge about the form between and among the different discussions. In turn, along the course of the CHD form's development, I could assess all edits or changes in relation to each other.

Collaborative Review

Within a reasonable time frame following each respective meeting or correspondence I would arrange a follow up meeting with Allan to discuss and analyze prospective changes to the form and where it stood at each stage of development. Dependent on whether or not Allan had been present at the particular meeting we were discussing, (5 out of 10 times), the format of these interactions was either review of his notes in comparison to my own *or* assessment of his perspective based on questions I had following the meetings. We discussed specific comments and concerns from the people with whom I had spoken, and I ultimately addressed these points through appropriate adjustments to the form. The main function of these collaborative editing sessions was to ensure that I was not biased toward certain changes, due to my constant involvement with the form, and also that I was maintaining the best structure and content of the form within the larger picture of its role in the critical habitat designation process.

Final Review of CHD Form

I consciously reflected on species-specific contexts and characteristics that were discussed by each respective SAG in order to fully evaluate how appropriately the form

addressed various concerns. In doing so, I ensured that the CHD form was adjusted as needed in order for it to progress as a widely applicable document before moving forward to the next group review. This was a more nuanced aspect of the technical process of writing and organizing the form, but was indispensable in pursuing the end goal of the form being usable for all taxa.

When finalizing the form, I definitively reviewed all the previous versions of the form as well as double-checked the language in Act 145 once more. I also gained some final insight on the presentation of the form by reviewing the original ESA and its critical habitat portions as well. Ultimately, my finalization of the form was an acknowledgement of the fact I had accomplished as much as I personally could in the development of the CHD form, within the time frame of my thesis project as well as the limits of my specific expertise in the T & E species realm; the finalized form was in its optimal state for different experts to fill it out with example species in order to test its structure and effectiveness.

Results

The results from my work on this thesis project are organized as a collection of key points from each meeting that I attended, as seen in the following subsections.

Bird SAG Meeting

Following the development of a very rough initial draft based on one of the 10 aforementioned species-specific habitat examples previously constructed with the VESC, (see Appendix A), Allan and I attended the first SAG meeting in the scheme of my thesis project on 11 October 2016, with the Bird SAG. Allan facilitated the introduction of the first draft of the CHD form as well as the discussion about the necessary ways to move the process forward. The discussion revolved around the aspects of the form that could be made clearer by making the

structure of the content reflect other official documents such as the proposal form for listing a species on the Vermont ESA, the Species Documentation form.

The suggestions included, but were not limited to, the following. First, noting whether the proposed site is presently colonized by populations of the species or is previously occupied habitat. This note aligned with the language of Act 145, which had been overlooked on first drafting this initial version of the form. Secondly, providing the opportunity to indicate the status of the species federally as well as within the state of Vermont. The idea was that this would "raise the bar" for the species, and highlight its importance to protect through designation of critical habitat.

Thirdly, to reflect the aforementioned Species Documentation form, and in turn gain more credibility at the state level, the Bird SAG suggested restructuring the factors for justification into a checklist. A well-organized checklist provides a physical place to check off each factor (if applicable), as well as the opportunity to provide a written explanation following each factor. In relation to this section, it was noted that the References section should specify supporting documentation, and that the CHD form should be consistent in format with current materials. Finally, the Bird SAG recommended an executive summary section be included at the beginning of the document to eliminate the "too much information in front of me" effect.

After considering the group's feedback, Allan and I collaboratively edited the draft, revising it in one of the most significant ways from that point until March: the format was altered to include sections that were introduced by the Species Documentation form and set up with a checklist format for the Factors Justifying the Critical Habitat. The initial draft of the form was only 3 pages when entirely filled out (see Appendix B: First Draft), and the second version of the

form was 5 pages, and structured much more comprehensively, mirroring the already established species listing document.

Additionally, following the Bird SAG meeting, I received the remaining nine species-specific habitat examples (covering all of the six taxa groups) to be able to review them in the context of making a form that was applicable to multiple taxa. These included species such as the Indiana Bat (*Myotis sodalis*), numerous endangered freshwater mussels, and the Lake Sturgeon (*Acipenser fulvescens*), taxonomic groups that I had yet to discuss with their respective SAGs.

Invertebrate SAG Virtual Review of Form

The Invertebrate SAG (iSAG) meeting followed two weeks later, which I was unable to physically attend, but was still able to receive feedback via an electronic, track-changes version of the most recent CHD form draft. This document incorporated thoughts, comments, and concerns from the members present at the meeting, as compiled by the iSAG Chairperson.

A common theme was just beginning to emerge, in that the iSAG also asked about specific definitions of words used in the form, and whether their intended meaning had been/was determined in Act 145 (for example: "concentrated"). In reference to the newly constructed check list, one question was whether the person(s) filling out the form had to provide a response to every factor. This was one of my motivations for writing in "Unknown" and "Not applicable" in addition to "Yes" and "No" as options for answering each factor in the checklist. Subsequently, the space following each factor in the check list was indicated as a place for elaboration "if applicable."

The iSAG also inquired about who was actually able to submit the form, ("anyone or any organization?") and whether there should be a place to indicate who prepared the documentation as well as whether it was reviewed and accepted by the relevant SAG (which, in conjunction

with the October VESC and HerpSAG review, eventually led me to create an entire Signatures section for the appropriate parties). Finally, iSAG recommended including a section solely for explanation of how the proposed critical habitat was determined.

Taking this feedback into consideration, but not yet revising the form itself due to the short turn around between meetings, I moved forward with the form in that same week for discussion and review by the Vermont Endangered Species Committee on 26 October 2016.

October VESC Meeting

The intent of discussing the draft at this VESC meeting was to introduce the CHD form (the fact that it has come into existence as well as its present state) to the larger community of interest groups, including not only wildlife, but other natural resource (environmental and agricultural) representatives. There was a dual purpose in the introduction at this point, as I was also personally introduced as the individual who would be undertaking the initial development of the CHD form. The inherent value of the CHD form to the goals of the Endangered Species Committee and its members made this discussion a very crucial step in the process of facilitating and developing the form.

There were many consistencies between the SAG comments thus far and those made during this first VESC meeting. These included recommendations for a descriptive paragraph of the critical habitat ("similar to the example species listing applications,") to be incorporated, and that the form should definitely be given to the SAGs at a certain point in the process so that they can provide species-specific insights, as any and all information they have would be useful.

On the other hand, many new thoughts on the CHD form were also presented. Two important points that were suggested for inclusion were the time when the species in question was listed (federal and/or state), and whether the species is in process of being listed

concurrently with the proposal of this critical habitat designation. In turn, the VESC recommended that the Additional Materials (references) clearly offer the opportunity to include as much background biological information as possible, for the sake of the Secretary making a fully informed decision prior to considering social aspects (landowners and related management). The question of who would be able to complete this form was also answered: anyone who is eligible to ask for rule-making can submit the form, it doesn't necessarily have to originate from a SAG.

Reptile and Amphibian SAG Meeting

The meeting for the Reptile and Amphibian SAG, colloquially referred to as the "Herptile" or "Herp" SAG, occurred on 1 November 2016. Between the VESC meeting the previous week and this time, I was able to produce a new version of the form that incorporated the iSAG comments as well as those from the VESC.

During this meeting, the SAG members discussed which species (singular or multiple) would be best for the HerpSAG to move forward with as their first attempt at designating critical habitat. The Timber Rattlesnake (*Crotalus horridus*) had been one of the preliminary species-specific habitat examples, as aforementioned. They noted the simultaneous ease yet challenge that would be presented by designating Timber Rattlesnake dens as critical habitat, as they are identifiable and decisive sites, but not necessary concentrated (as the landscape in between den sites would also prove crucial in the continued movement of the population). An additional note was at this time the HerpSAG identified a permanent member who would be interested in heading the task of a draft proposal for a specific T & E species (or multiple species), whether or not I would be able to contribute during the timeframe of my project.

Flora SAG Meeting

On 15 November 2016, the Flora SAG Meeting was held. My facilitation of the critical habitat discussion was straightforward in terms of providing an overview of the current form, and also the process thus far, however, the unique nature of the Flora group's interests for their T & E species drove the discussion in new directions. For instance, I was challenged to answer a specific concern about Section III of the form, Factors Justifying the Critical Habitat: some of the listed factors did not directly apply to the needs or characteristics of T & E flora species, and thus, by default, this SAG was given less total factors to justify the designation of critical habitat for a floral species. To address this concern, which was a point previously raised by the Invertebrate SAG, I modified the form to include the following statements: "*Note that any one of the factors listed below may serve as sufficient justification as long as there is strong supporting evidence*. The total number of factors that are addressed will vary on a case-by-case basis" (see Appendix B: Final Draft). Although this issue was not a 'fatal blow' to the form, it did suggest ways that the form might not be equally applicable to all taxa.

Fish SAG Correspondence

The most unique meeting was my one-on-one meeting with the Fish SAG Chairperson; it was the first and only instance for which I had virtually distributed the CHD form and then had an in person meeting to follow up on the feedback. By the time of our meeting, 13 December 2016, the Chairperson for the Fish SAG had graciously sent out the draft to the Fish SAG members and compiled their comments and concerns then met with me to discuss the accumulated feedback. This was specifically necessary for the Fish SAG since their next meeting would not have been until spring 2017.

The overall interests, questions, and concerns of the Fish SAG were quite intriguing, and fairly distinct from the feedback of groups I had spoken with already at this point. In particular, the sentence in Act 145 acknowledging hydrological connectivity as a valid association of otherwise separate portions of habitat highlighted a crucial boost to the likelihood of protecting T & E fish species. However, addressing the fact that fish utilize hydrological habitats in a manner unique to their taxonomic group also proved to be challenging to the content of the form itself. That is to say, one question that I did not have the familiarity with legal delineations to answer was whether a privately owned portion of land with a waterway (which serves as critical habitat) running through it qualified that aquatic habitat as being a public or private matter. (This was a concern that was raised again by the iSAG during their spring meeting at the conclusion of my project, and has yet to be definitively addressed).

January VESC Meeting

I had my materials in order so that the Critical Habitat Designation form was included on the agenda for the next VESC meeting, on 26 January 2017. With respect to the CHD form, this meeting served mainly as a check-in for the wider community of wildlife experts and other vested parties who had not had an opportunity to comment on the form since the last VESC meeting (as a result of not being involved with any of the three SAG meetings or correspondences since that time). Thus, I provided an overview of the form's development, the point it had reached, and what the process had been like between the previous meeting in October and that point in time in January.

The most promising development during this meeting was that a member of the Flora SAG confirmed they would take this most recent draft and 'run' a plant or a few plant species through it to test the process. The importance of this was strongest for the Flora group, in terms

of identifying any weaknesses in the form's adaptability to the plant taxon. However, this was also the very first attempt to actually fill out the CHD form for a T & E species in general; a pivotal moment.

Mammal SAG Virtual Review of Form

At this point in the timeframe of my project, Mammal SAG meeting had not yet occurred and the Chairperson of the Mammal SAG had not been present when I presented the form at the previous two VESC meetings. As such, this SAG had had the least input into the process, and was the last to view and review the form. I was unable to attend the meeting on 23 March 2017 but received a compilation of comments from five SAG members by way of the Mammal SAG Chairperson. I took these into special consideration since they were fairly unbiased toward the form, in contrast to other SAG members who had been able to view and review the form in their own meetings and alternating with the VESC meetings, giving them the most chances to see and remark on it during its progression.

There were two main developments following my review of the Mammal SAG's feedback. The first was that I overhauled the entire structure of the form, essentially maintaining the content, but reorganizing it in a more intuitive and user-friendly way, based on cumulative comments and my own evaluation of how the form had been perceived by various readers.

The second main development was that I added a new section: the initial heading/title was Management Considerations and Protections. The decision to add this new section, which at first was sparse and only included one or two questions, was instigated by certain conversations around management of the critical habitat area once officially designated, as well as my growing knowledge of the necessary protections that T & E species require for their continued survival and recovery (mainly, recovery plans). This decision was further supported by another reading of

Act 145 which alerted me to an aspect that I had yet to incorporate into the form: the Secretary's active consideration of the management practices in place for a species, and any possible relation of these to critical habitat.

Specifically, species whose primary threat is habitat loss or degradation (through fragmentation, pollution, etc.) often have critical habitat noted in their recovery plans, which also tend to have "a greater diversity of habitat monitoring efforts" (Widows and Drake, 2014; Pascual-Hortal and Saura, 2007; Hoekstra et al., 2002). This distinction has implications for the relevance as well as the applicability of a critical habitat designation form for different species, especially in the context of already established or newly developing recovery plans.

There are 10 approved recovery plans for T & E species in the state of Vermont, and two or three of these are outdated enough that the species which they involve have since been taken off of the state's endangered species list. I reviewed the recovery plans for certain T & E species (in particular, the Spiny Softshell Turtle and the Common Tern) to gain a deeper understanding of the species' needs and the process they had undergone thus far with respect to conservation and recovery efforts. For example, the recovery plan for the Eastern Spiny Softshell Turtle (*Apalone spinifera spinifera*) directly acknowledges the necessity of incorporating critical habitat into management considerations for the species. Here, critical habitat must directly "focus on increasing population recruitment, identifying additional critical habitat areas, protecting and enhancing habitat" as well as "relate[d] to the availability of suitable habitat for all life stages." The language of Act 145, which refers to the intended end result of designating critical habitat, directly reflects these sentiments such that successful recovery of the species depends on protection of its habitat.

In terms of other comments, besides the significant restructuring suggestions that I took, many of the points made by the Mammal SAG involved language taken directly from Act 145 that could not be altered in the ways the members recommended (for the sake of consistency). However, some statements were rephrased or elaborated for further clarity.

Webinar

A significant stage of the collaboration process with the SAG and ESC members prior to the final public review of the CHD form (at the April VESC meeting) was the webinar. The goal of the webinar was to include representatives from all of the SAGs, to receive final feedback on the format, content, and adaptability of the form for species from all six taxa. It provided the opportunity to arrange a collaborative meeting purely for the sake of discussing critical habitat designation and the form itself, rather than incorporating the CHD form as an additional agenda item on an already scheduled SAG or VESC meeting. Fortunately, although taking advantage of this opportunity to arrange a unique CHD meeting was a challenge of its own, the attempt was a success in the end: the webinar session occurred on 29 March 2017 and had 17 attendees.

My review of the form at the beginning of the webinar included not only the content of each section, but also my reasoning in making the adjustments that I had up until that point (especially since this most recent version was overhauled significantly from the last draft version that any attendees of the webinar had seen). There were many valuable suggestions toward small, but significant, details in the well-established sections of the form (such as an indication in Section V that Neighborhood development areas, etc. are included on Vermont ANR Atlas), and also key ideas for the most newly created section, Management Considerations (including this final title, changed from Management Considerations and Protections, due to the notable lack of

detailing for any protections). Following the session, I incorporated the suggested edits to the form prior to the final VESC meeting, such that the form was very near to completion.

April VESC Meeting

The third and final VESC meeting that I attended during the course of my thesis work occurred on 6 April 2017. This date was earlier than the previous year's spring meeting date, which was in the last week of April, which was a very fortunate adjustment that the Chairperson arranged in large part for my sake, for which I was grateful. The timing of this last meeting allowed me one last opportunity to present the form in its most polished state, with extensive review and incorporation of feedback from all six SAGs as well as two previous VESC meetings. Ultimately, I was able to produce the CHD form alongside the timeline of the three VESC meetings following the initial meeting (on 6 July 2016) during which the VESC identified the need for an individual to oversee the creation of such a form. At this particular meeting, those present provided final thoughts and suggestions for best fine-tuning the CHD form. One example of true fine-tuning was the unanimous agreement that I had included "Please" too many times in the document, to the point of sounding less definitive about the necessity of answering those points, and so I eliminated these from all but the most appropriate places.

My participation at the 6 April 2017 meeting concluded with the Endangered Species Committee moving to recommend acceptance by the Secretary of Natural Resources of the Critical Habitat Documentation Form I had produced, given that the edits suggested during this final discussion with the VESC were made prior to distribution.

Discussion

At the conclusion of my work on this thesis project, the Critical Habitat Designation form that I collaboratively produced was recommended by the Vermont Endangered Species

Committee for acceptance at the state level, and submitted to the Secretary of the Agency of Natural Resources. The main contribution of this thesis, aside from the actual incorporated research that contributed to the development and production of the original CHD document itself, is that it serves as a written record of that very development process. The existence of an application form that facilitates certain habitats being designated as critical is clearly an important progression for conservation efforts around particular species in Vermont. Thus, having this thesis to refer to as a timeline of events and the process will be a valuable reference for future work being done with the budding critical habitat possibilities in Vermont.

There were consequences inherent in the sequential order of the SAG meetings and, in turn, the sequential review and editing of the CHD document. The sequential nature of the CHD form's review and discussion at meetings meant the comments became more specific and finely tuned with the maturation of the document. This was a crucial aspect of the form's progression, both with respect to my own management and reassessment of the form, and even more importantly with respect to the different experiences and perceptions that the SAGs had of the document. Part of the value was derived from there being no overarching understanding and compilation of knowledge with the SAGs, whereas there was from my perspective: there was continual growth as I consistently incorporated input from each stakeholder group.

Each and all SAGs brought up, in some form or other, questions about the language used in the form: the individual words used, the phrasing, or the overall sections being included. This highlighted the tension between the actual Act's wording, when describing the Secretary's responsibilities for designation of critical habitat, and how SAGs wanted the wording to be for the purposes of the CHD form. Some points or suggestions did not ultimately make it into the form due to the difficulty of phrasing within already established language in Act 145. The

consistent guideline I adhered to for inclusion of various topics and questions was the presence of the same language in Act 145. Unfortunately, (in the eyes of many SAG members), I was limited in my ability to wordsmith, though it was for the sake of maintaining proper legality and was most important to my process to have the form mirror the language of Act 145.

Through informal communication with all of these relevant members of the Vermont conservation community, particular fauna species arose as examples of different circumstances that might affect the success of critical habitat designation. For example, the Common Tern (*Sterna hirundo*) and Spiny Softshell Turtle (*Apalone spinifera*) have emerged as potentially straightforward and feasible options for critical habitat designation, while species such as the Bald Eagle (*Haliaeetus leucocephalus*) and Timber Rattlesnake (*Crotalus horridus*) have highlighted some of the core difficulties of enacting/designating critical habitat. The former species are more feasible due to their currently occupied habitat being easily identifiable and located mostly on land that is already owned by the state government or willing designees, and the latter species are much less feasible due to the wide ranges of habitat types and/or locations utilized by those species. These were invaluable lessons when attempting to produce a Critical Habitat Designation form that can be adapted and utilized by the whole spectrum of researchers and conservationists within the Scientific Advisory Groups for Vermont (mammals, birds, reptiles and amphibians, invertebrates, fish, and flora).

There were some consistent tensions felt by the SAGs and other stakeholders, between the biological and socioeconomic or sociopolitical aspects included on the form. A consideration that was held from the very first meeting with the Bird SAG all the way until the last conversations at the April VESC meeting, was whether to aim for the "low-hanging fruit" of critical habitat areas that would be easy and straightforward to designate, or to aim to designate

all of the known critical habitat areas at once. Aiming low would create a foundation of designated critical habitat to expand upon, both for the species that an area was designated for and for future species' designation proposals: more specifically, this question addresses the social and political aspect of the CHD process. Success of a critical habitat designation will likely depend on how thoroughly developed the process is and how familiar the legislators are with "typical" designations.

Tying in with these thoughts was the development and the final status of Section VI: B, point 1: "Please include any Rare, Threatened, or Endangered species that would also benefit from this Critical Habitat Designation along with relevant, supporting data." Numerous SAGs as well as the VESC had suggested a section that offers the chance to note awareness of any other RTE species occupying the proposed critical habitat area. The rationale was that occupation by one species should be enough to support a given designation, but a "whole suite" of present RTE species would increase the legislators' awareness of the habitat's significance. However, an important counterpoint was that although the presence of other RTE species should be addressed eventually, before dealing with management of the critical habitat, it should not limit the biological conversation specifically around the species which the CHD is primarily for.

Many of the findings during this thesis project about the difficulties of, and various considerations when, protecting critical habitat are consistent with on those federal level. However, since the federal ESA incurs automatic protection of critical habitat, and the state ESA here in Vermont now requires an active designation process, similarities exist in the dynamics between interest groups and the hierarchy of power and responsibility. In particular, a substantial portion of time was spent at each meeting discussing the different implications of designating critical habitat on private land, as included in Section V: Social, Economic, and Political Factors

(for final wording, see Appendix B: Final Draft). This is a consistent theme in that the human side (implications) of the Vermont CHD form runs parallel to the federal legislation on critical habitat: landowners will be affected by designation on their property, as they will be required to file for taking permits for any alterations to be made to their land after it has been designated as critical habitat. Hence, an underlying thread of human impacts on T & E species' critical habitat, as well as designation of critical habitat's impact on humans, is woven throughout the form and its implementation.

Workload and responsibility of the various groups and persons involved (SAGs, ESC, VTFWD) were themes that consistently emerged, no matter the taxa of the SAG or the assembly of persons at the ESC meetings. The responsibility aspect refers both to the progression of the form and in its actualization once complete. Additionally, somewhat directly related to that concern, was the consistent development of discussion around Section V, (to the point that it became known by name), ranging from whether it should be included at all to who was the specific entity expected to follow through with it. In particular, this portion of the form incited dialogue around the responsibilities of the SAGs (volunteer groups) relative to the work of the VTFWD. I eventually reworked and clarified the section sufficiently, with further research into the hierarchy of responsibility around designating critical habitat and managing the socioeconomic aspects.

There are clearly very different perspectives across and between the SAGs, the ESC, and the VTFWD and other state-level agencies. These distinct roles of the different parties came into play during the course of my research, mainly with respect to the conceptualization of the finalization and future usage of the CHD form. For example, at the conclusion of the very first review of the CHD form, the Bird SAG described the SAGs as responsible for the technical

pieces of the form, the scientific foundation, but they can still offer ideas to help the VESC, who would be tackling social pieces of enactment (and thus should be included in the process of determining how designation might affect landowners and other stakeholders). The first step is establishing the biological evidence through the SAGs, and then considering social implications is the second step. The VESC later specified that the next stage of the process following the filling out of this form is addressing and answering questions about how the designation might affect landowners. As per Act 145, this is the responsibility of the Secretary of Natural Resources.

Even with this acknowledgement of certain procedural responsibilities, there still remain some unanswered questions about roles and responsibilities (among other aspects), simply because they are not outright addressed in the language of Vermont's Act 145. Concerns that arose were both in the context of whose intellectual responsibility it would be to contribute to the document when it is being filled out, as well as who will deal with the nitty-gritty of putting the CHD form (and the actual designation) forth in the Vermont rule-making process. I could not specifically address these concerns, but through the careful and calculated construction of the CHD form, I attempted to clarify some of the responsibilities of the different parties throughout the different stages of the designation process.

Conclusions and Future Work

The Critical Habitat Designation form is at this time in review at the state level. It will not only serve as a vital tool in the undertaking and pursuit of successful critical habitat designations, but has acted as a model for a collaborative process across these engaged stakeholders. In terms of future work within Vermont, there will undoubtedly be further review, revising, and improvements made on the CHD form for it to be eligible for distribution and use

within the state. A key part of this process will likely be testing of the form by the various SAGs by filling it out for various species, as I had originally intended to attempt, but was unable to due to time limitations. As for expanding the scope of progress with critical habitat protections to other states, Vermont can serve as an example for the process of passing and enacting state level legislation around critical habitat as well as for the subsequent process of creating and utilizing an application or proposal form such as the one produced through this thesis project.

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Appendices

A. *Species-specific Habitat Examples: Created prior to this research*

Below are examples of possible Critical Habitats. Each write up includes how the habitat was selected, a justification, how designation might affect landowners and others, and assistance Vermont Fish and Wildlife Department (VFWD) might provide. By developing these examples across taxa we hope to explore how designating Critical Habitats might work. If we formally propose a Critical Habitat, it will need to go through the rulemaking process.

1

Proposed Critical Habitat Designation: Northeastern Bulrush (*Scirpus ancistrochaetus*), state and federally endangered . Critical habitat would comprise all wetlands with a hydrological or proximal connection to wetlands with known populations.

How Selected: The Northeastern Bulrush is known to move around within a beaver flowage or within a wetland complex that is hydrologically connected. The bulrush is also known to be a prolific seed banker and often reappears at sites where it has not been observed for a number of years.

Justification: Northeastern Bulrush is restricted to the two southeastern counties of Vermont: Windham and Windsor. Within Windham Co. the bulrush is known from nine towns: Athens, Brookline, Dummerston, Grafton, Newfane, Putney, Rockingham, Townshend, and Westminster. In Windsor Co. it occurs in two towns: Chester and Springfield. Northeastern Bulrush occurs in two distinct types of habitat: wetland complexes with a history of beaver use and perched swamps/vernal pools. Large wetland complexes are the primary habitat. In this setting, populations reach their greatest size, occasionally exceeding a thousand flowering culms. At any given site the population size fluctuates over time in a fairly predictable cycle. Typically the bulrush becomes evident one or two years following a drawdown of a marsh or pond,

usually a result of beaver abandonment. The bulrush colonizes exposed mudflats and can form almost a pure stand. The species is known to seedbank extremely well and presumably the colonization results from buried seeds. Gradually over time, the Northeastern bulrush declines as the mudflats become increasingly colonized by other wetland species. It may persist in small numbers or even disappear for years at a time as water levels fluctuate. Eventually beaver recolonize the wetland, and most rooted vegetation becomes flooded and declines. When water levels again drop, the cycle begins anew. Populations are able to persist in extensive beaver flowages where a number of ponds along a drainage experience hydrologic fluctuations at different intervals. This allows the bulrush to persist within the drainage and move among the ponds although populations may not be evident at any given pond depending upon the current water level and habitat suitability.

The secondary habitat is small openings within otherwise closed canopy perched swamps or vernal pools. The populations here tend to be much smaller but also more consistent in that they don't display the wide fluctuations as they do in the primary habitat. They also tend not to disappear as water levels tend to be more consistent from year to year. They are limited however, by the size of the canopy opening as the bulrush rarely flowers or sets seeds in the shade. Often the bulrush occurs in nearby pools so critical habitat would include all wetlands within a km of the known population.

How Designation Might Affect Landowners and Others:
All known populations of Northeastern Bulrush occur in wetlands that are already protected and regulated by the VT State Wetland Regulations. Any proposed impacts to wetlands or their buffers within any hydrological connection or within one km of a known population would need to be surveyed for the Northeastern bulrush during the proper season. The Natural Resources Conservation Service (NRCS) and US Army Corps of Engineers already require such a survey for any wetland impacts in any of the eleven towns with known populations.

Assistance to Landowners and Others: The biggest threat to Northeastern Bulrush in its primary habitat is destruction of dams and removal of beaver from a flowage. Most typically this is done by a town to protect a town road from flooding, but it is also done occasionally by private landowners to protect driveways or property adjacent to ponds. In such cases the VFWD would install beaver baffles in an attempt to control water levels while allowing beaver to persist at a site. This has been done at sites with known Northeastern bulrush populations with favorable results.

2_____

Proposed Critical Habitat Designation: Green Mountain Maidenhair Fern (*Adiantum viridimontanum*), state threatened. Critical habitat would entail protection of serpentine outcrops with known populations and outcrops within 10 miles of known populations.

How Selected: The Green Mountain Maidenhair fern is highly restricted in Vermont and throughout its range. It is a serpentine endemic and occurs only on serpentine outcrops in the northern portion of the state where serpentine bedrock is exposed. It was first discovered and first described in the state by a researcher from UVM who named it after the Green Mountains. It is one of only four Vermont plants that are endemic to northern New England and adjacent areas.

Justification: The Green Mountain Maidenhair fern is listed as state threatened and is globally rare. Its entire range is restricted to northern Vermont and Maine and southern Quebec. The Green Mountain Maidenhair occurs at six locations in VT, all in the north central portion of the state in three towns: Eden, Lowell, and Westfield. There are 14 populations known in Quebec, and a single occurrence known from Maine. It is listed as Division 1, the highest level of rarity, in New England Wildflower's Society's Flora Conservanda. The fern occurs only on serpentine bedrock, a rare mineral type that is high in magnesium and some heavy metals and supports a unique flora. It grows only on steep cliffs, talus slopes, and thin soils of woodlands and forest edges associated with serpentine bedrock.

By protecting the rare serpentine outcrops we can ensure the long term survival of this endemic species. Unlike most of Vermont's flora, the Green Mountain Maidenhair is restricted to only three jurisdictions, and Vermont harbors about 1/3 of the known populations. For that reason it is imperative that Vermont's populations be protected. The fern also requires adjacent, unoccupied outcrops to colonize. Protecting serpentine outcrops has the additional benefit of protecting a few other plants that are rare in the state.

How Designation Might Affect Landowners and Others: One of the Vermont populations is on land owned by The Nature Conservancy; the other five are privately owned. One of these is an abandoned asbestos mine which is now a hazardous waste site, and another is owned by a religious order. It is unlikely that any of the serpentine areas on these properties could be developed because of the ledges and outcrops. Development elsewhere on the property would not likely be a threat to the ferns.

Assistance to Landowners and Others: The Fish and Wildlife Department has been involved in mitigation plans for the abandoned asbestos mine. We have been in contact with two of the other owners and showed them the ferns. We have also

worked with one landowner to permit a small subdivision that did not impact the ferns.

3_____

Proposed Critical Habitat Designation: Popasquash and Rock Islands (Lake Champlain/St Albans)

How Selected: From historic and current records of nesting state endangered Common Terns.

Justification: These are the only known Common Tern nesting sites in Vermont, and on Lake Champlain. Attempts to expand the population to other nearby islands have been unsuccessful. The two islands both support colonies of terns. Others have supported lesser numbers of nesters but have not persisted.

How Designation Might Impact Landowners and Others: All human uses would be severely limited during nesting season (Late April to Mid-August).

Assistance to Landowners and Others: These islands are owned by Audubon Vermont and managed to conserve and enhance the Common Tern. We would need to discuss designation as critical habitat with the landowner before moving forward on a designation.

4_____

Proposed Critical Habitat Designation: State endangered Bald Eagle nest sites

How Selected: From current records of nesting Bald Eagles in Vermont. A current record of nests are those that have been occupied (i.e., the presence of a single adult or a pair of adult eagles, eagle eggs, or eagle chicks any time between March 15 – August 1) in at least one of the previous three years. A nest site would be proposed for removal as critical if it had not been occupied in any of the previous five years.

Justification: Until 2002, Bald Eagles had not had a documented nest in Vermont since the 1940's. The first successful Vermont nest did not occur until 2008. Since then the number of nesting eagles has grown from that single occurrence to 15 in 2015. While encouraging, this level of success is less than 40% of the minimum threshold necessary to consider delisting the species. Nest sites typically are selected on or near major lakes, ponds, and rivers. This behavioral trait limits the potential nest locations to only a small portion of the Vermont landscape which highlights the important and critical nature of this habitat.

A Bald Eagle nest is already protected by the Bald and Golden Eagle Protection Act. The Act states: "In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment." The Bald and Golden Eagle Protection Act applies to everyone, not just activities with a federal nexus.

How Designation Might Impact Landowners and Others: All human uses within 330 feet of the active nest (the nest site) would be severely limited during the nesting season (March 15 to August 1) to those that did not create an injury, death, or abandonment outcome. This would include recreational activities and pre-construction work such as surveying. Tree clearing in the immediate proximity of the nest, regardless of the time of year, would have to be evaluated by VFWD biologists before being implemented.

Activities that significantly alter or unreasonably harm the essential nesting habitat may be prohibited. Projects that may be affected include, but are not limited to: construction, installation, expansion, alteration or repair of permanent structures; agricultural management; mineral exploration and extraction; forest management; road projects and construction; shoreland alteration; utility construction; water crossing; water impoundment; aquaculture; conversion of seasonal dwelling; installation of subsurface wastewater disposal system.

In determining whether a project significantly alters or unreasonably harms essential nesting habitat, the following factors will be considered:

a. Magnitude and time of year of noise and human activity generated by the project.

b. Physical alteration to the landscape.

c. Destruction of or alteration to key habitat components such as perch trees, roost trees, and foraging areas.

d. Reduction in the seclusion of the nest site and adjacent shoreland area.

e. Demonstrated tolerance of the particular eagles to human activity and disturbance.

f. Reduction in the future suitability of the nest site to bald eagles.

Assistance to Landowners and Others: VFWD biologists would work with landowners and others who might be affected to develop an eagle nesting area management plan that seeks to meet landowner goals while protecting the integrity of the eagle nesting area.

Management prescriptions for eagle nest sites may vary depending on the behavior of an eagle pair, topography, vegetation, and surrounding land use. Rigid silvicultural approaches for general application may not be appropriate. The points to keep in mind when managing land with eagle nests are to retain the function of the nest site. Begin by identifying an undisturbed buffer of 330 feet around the nest tree. Without knowing how individual eagle pairs respond to human presence this may or may not be adequate; however, it is a good general guideline. Determine the necessity of any tree removal from this area. Tree harvesting and other activities between September 1 and January 1 are likely to be less disruptive to nesting eagles or fledglings than other times of the year. The results of any necessary harvesting must result in a condition that preserves the structure and cover values the eagle pair perceived in the first place when selecting the site. Treatment areas beyond the immediate 330 foot zone can be managed more aggressively, but keep in mind the need to retain the general characteristics of the surrounding cover. Individual trees that pose a threat to human safety, could interrupt power transmission, or create a navigation hazard need to be addressed on a case by case basis. VFWD biologists are available to assist with on-site decision making.

Here is national guidance (2007):
https://www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf

Category C. Timber Operations and Forestry Practices

• Avoid clear cutting or removal of overstory trees within 330 feet of the nest at any time.

• Avoid timber harvesting operations, including road construction and chain saw and yarding operations, during the breeding season within 660 feet of the nest. The distance may be decreased to 330 feet around alternate nests within a particular territory, including nests that were attended during the current breeding season but not used to raise young, after eggs laid in another nest within the territory have hatched.

• Selective thinning and other silviculture management practices designed to conserve or enhance habitat, including prescribed burning close to the nest tree, should be undertaken outside the breeding season. Precautions such as raking leaves and woody debris from around the nest tree should be taken to prevent crown fire or fire climbing the nest tree. If it is determined that a burn during the

breeding season would be beneficial, then, to ensure that no take or disturbance will occur, these activities should be conducted only when neither adult eagles nor young are present at the nest tree (i.e., at the beginning of, or end of, the breeding season, either before the particular nest is active or after the young have fledged from that nest). Appropriate Federal and state biologists should be consulted before any prescribed burning is conducted during the breeding season.
• Avoid construction of log transfer facilities and in-water log storage areas within 330 feet of the nest. [Note: this practice is no longer used due to state and federal water quality regulations]

5_____

Proposed Critical Habitat Designation: State endangered Timber Rattlesnake and state threatened Eastern Ratsnake den sites.

How Selected: Extant sites where these species have been documented.

Justification: The rattlesnake and ratsnake hibernacula are concentrated and identifiable habitat, necessary for survival of the species. Extant rattlesnake dens have been continually used for thousands of years and are areas to which the snakes develop obvious and very strong fidelity. In addition, the fact that these sites provide security from winter freezing conditions, securely below the frost line, along with the fidelity issue make these den sites essentially irreplaceable.

Similar to the function of vernal pools, a surrounding "life zone" is essential for survival. We might consider a 30 m/100 ft radius around the hibernacula as a buffer. Protecting some of the maternal gestating (birthing) sites is also something we need to address. This will require further discussion.

How Designation Might Impact Landowners and Others: In the case with rattlesnakes, both of our extant dens and an area around the dens are currently conserved by TNC. With ratsnakes, (beyond the co-utilized rattlesnake/ratsnake dens) only a few hibernacula are known, essentially on the shoreline of Lake Champlain.

Assistance to Landowners and Others: Discussions with affected landowner would be needed in all cases. Providing technical assistance might be a way to reduce potential for impacts to the dens sites.

6_____

Proposed Critical Habitat Designation: Hibernation sites (e.g., caves and abandoned mines) used by threatened or endangered bat species hibernacula. This

would apply to Indiana Bat, Northern Long-eared Bat, Little Brown Bat, Eastern Small-footed bat, or Tricolored Bat.

How Selected: Cave and abandoned mine sites where individuals of the species have been observed during the winter hibernation period during more than one survey event. A threshold number of bats found at a cave or mine has not yet been established.

Justification: Vermont has six species of bats that hibernate in the state by overwintering in caves and abandoned mines. Five of those six species are now listed as state threatened or endangered due to very low or decreasing populations. In addition, two of the species are federally protected under the Endangered Species Act. Due to cold winter temperatures and the lack of insects to forage on, these bat species seek very specific sites with a narrow range of stable temperatures and humidity levels in order to drop into long torpor bouts, or hibernation. Only a limited number of these sites are known to the VFWD and are used year after year, often by the same individuals. This high inter-annual site fidelity, combined with the long life-span of many species (with age records for the little brown bat of over 30 years) make the long-term conservation of these hibernation sites critical to overall survival. Habitat immediately surrounding the hibernacula is necessary for bats to roost in when they are active and highly concentrated during the fall swarm and spring emergence periods.

The relatively small number of suitable hibernation sites often hold highly concentrated numbers of bats. In addition, hibernating bats are extremely susceptible to disturbance because it takes several minutes for them to warm up enough to move around or fly away and each arousal from torpor uses up a significant amount of stored energy at a time when no food is available to replenish these fat stores.

Without protection through something like a critical habitat designation, hibernation sites may be altered in a way that 1. Changes their microclimate suitability as a hibernacula for bats, 2. Specifically entraps or excludes bats (e.g., old mine entrances sealed off), or 3. Affects suitability as fall swarm areas due to conversion of the forested area in the immediately surrounding area.

How Designation Might Impact Landowners and Others:
The designation of a hibernacula site as critical habitat would likely result in the protection of the cave or abandoned mine that could restrict certain activities that could compromise the suitability of the site as a hibernacula for bats by altering the entrance or airflow. A buffer area may be created around the site to protect the integrity of the hibernacula from threats such as flooding and would likely include

restrictions on forest conversion activities. A buffer would be included in the critical habitat designation and delineated (likely something on the order of 30 m/100 ft has been discussed)

Assistance to Landowners and Others: The VFWD has already been working with landowners who have bat hibernacula on their property. In some cases, funds have been obtained through grants or partnerships (with The Nature Conservancy (TNC), for example) to erect a bat-friendly gate around the hibernacula entrance which allows the bats to continue to use the site and maintain the current airflow, but keeps out human activity that would cause disturbance during the winter and may be of concern for safety reasons to the landowner already. In other cases, the landowner may open the gate to allow human entry during the summer. The VFWD has also created forest management guidelines for bats, and specific guidelines for Indiana bat habitat, that provide guidance to landowners on the retention and enhancement of features that are important both for avoiding direct take and for retaining habitat important to the survival of individuals and the population in Vermont. These guidelines include special attention to hibernacula and the areas directly surrounding a hibernacula.

If specific hibernacula sites were designated as critical habitat, the VFWD would once again reach out to landowners to explain the new designation, offer technical assistance, offer to conduct surveys at or around the site to determine if it is still being used by bats, and explore funding sources if a gate or other protection is recommended.

7_____

Proposed Critical Habitat Designation: State endangered Taconic Cave Amphipod cave sites.

How Selected: Sites where this subterranean species has been documented.

Justification: This small, aquatic crustacean is only known from the subterranean drainage systems of karst terrain in the Taconic Mountains of Vermont, Massachusetts, and New York (three locations known globally). This type of habitat is limited in Vermont; a single site is known for this crustacean at this time. The species is present at a site year round. It is vulnerable to degradation of groundwater quality and its habitat. Designation would likely be limited to the observed subterranean areas occupied by the species.

How Designation Might Impact Landowners and Others: The one known Vermont site appears to be owned by a town. There is a gravel pit nearby downhill. This cave is visited by spelunkers and appears on the VT Cavers website. It is also a

white-nosed syndrome site, with Little Brown Bat present. Designation of the cave would prohibit any activities that degrade the quality/quantity of the aquatic cave habitat or groundwater feeding that system. This may be more easily dealt with regarding cavers (restricted areas, educational materials). We would need to determine how and the extent to which we would be regulating activities that could alter groundwater quality and quantity.

Assistance to Landowners and Others: Providing technical assistance and education would be a good way for us to reduce potential for impacts. People know more about bats now, but few if any would be aware of the presence of Taconic Cave Amphipod. Helping cavers know why they should avoid impacting this species' habitat would make them better stewards. We would need to explore how existing state programs and water regulations might protect the cave system ground water from being negatively impacted.

8_____

Proposed Critical Habitat Designation: River and lake habitat supporting listed freshwater mussels. This would apply to Fluted-shell (Lasmigona costata), Fragile Papershell (Leptodea fragilis), Black Sandshell (Ligumia recta), Giant Floater (Pyganodon grandis), Pink Heelsplitter (Potamilus alatus), Cylindrical Papershell (Anodontoides ferussacianus), Pocketbook (Lampsilis ovata), Brook Floater (Alasmidonta varicosa), Dwarf Wedgemussel (Alasmidonta heterodon), and Eastern Pearlshell (Margaritifera margaritifera).

How Selected: River sections known to support moderate to high densities ($\geq$ 1 mussel per 5.0 square meters) of these listed mussels.

Justification: These species occupied limited riverine habitat in Vermont, as well as limited near-shore areas of Lake Champlain. Several of these mussels are limited or nearly so to portions of Lake Champlain tributaries downstream of the first falls (which is usually the site of a hydroelectric dam). This includes seven of the ten species. The Brook Floater is known from a single population in southeastern Vermont, found in the West River. The Dwarf Wedgemussel occurs only in the Connecticut River and a short section in lower-most Black River (Springfield). The Eastern Pearlshell occurs in coldwater, riverine habitat in a few locations scattered around the state. Freshwater mussels are one of the most endangered groups of aquatic species in North America, largely due to habitat alteration. These species require stable substrate to anchor in, and some species have particular requirements for the types of substrates they can occupy (such as sand, gravel). Changes to the

river or lake bed can change habitat to the extent that a mussel species is no longer able to inhabit an area. This can include direct impacts, such as placement of large stone along streams, and indirect impacts, such as the covering of mussel habitat by silt due to erosion farther upstream. Freshwater mussels also depend on fish, which act as temporary hosts for the harmless, tiny mussel larvae during their early stage of development. Some mussels use only one or few fish species for this part of their life cycle, so the habitat must also remain suitable for these fish as well in order to maintain mussel populations. Some dams on the lower portions of Lake Champlain tributaries prevent the migration of host fishes from the lake, resulting in the loss of these local mussel populations upstream of these dams.

How Designation Might Affect Landowners and Others: These species all occur within waters of the State of Vermont, although they occupy the stream and lake bottoms. Portions of water bodies that support low densities of listed mussel populations (< 1 mussel per 5 square meters) would not be designated as critical habitat. The designation of a stream or lake section would limit the alteration of mussel habitat by fill or removal of materials within or adjacent to the water body. Activities that create direct or indirect impacts through habitat loss, degradation, or disturbance would be affected.

Assistance to Landowners and Others: The VFWD provides technical assistance to landowners and others on projects that would impact freshwater mussel habitats.

9_____

Proposed Critical Habitat Designation: Spawning habitat for the state endangered Lake Sturgeon (*Acipenser fulvescens*).

How Selected: Historic spawning sites in tributaries to Lake Champlain including the Missisquoi, Lamoille and Winooski rivers and Otter Creek.

Justification: Lake Sturgeon prefer spawning in fast, shallow, water with rocky substrates. Lake Sturgeon migrate from Lake Champlain to spawning grounds in tributaries from late April to mid- June.
Loss of spawning habitat may be a major factor in the inability of some sturgeon populations to recover in North America. Dams on tributaries block migration to upstream spawning and nursery habitats. Dams built at the natural upstream limit of sturgeon migration can also reduce spawning habitat downstream of the dam by disrupting natural flow regimes and/or reducing the recruitment of rubble and cobble to spawning sites downstream of the dam.

Multiple dams have been built on all the tributaries to Lake Champlain used by lake sturgeon for spawning. The Missisquoi and Lamoille rivers have had dams built that block sturgeon migration to historic spawning sites resulting in substantial reductions in the amount of available spawning and nursery habitat. The dams on the Winooski River and Otter Creek are most likely built at the upstream extent of sturgeon migration but may still have impacts on sturgeon spawning success by altering flows and the recruitment of spawning substrate.

How Designation Might Affect Landowners and Others: Lake Sturgeon spawning sites are located in public waters of the state which are regulated by a number of existing programs including but not limited to stream alteration regulations, Federal Energy Regulatory Commission licensing requirements for hydro-electric facilities and Army Corp of Engineers regulations. The new designation should have minimal impacts on the landowners and business's proposing development at these sites because they are already closely regulated.

Assistance to Landowners and Others: The VFWD provides technical assistance to landowners or organizations on projects that would impact Lake Sturgeon spawning habitats.

10_____

Proposed Critical Habitat Designation: State threatened Spiny Softshell Turtle communal nesting sites and communal wintering sites

How Selected: Sites where at least three nests in a single year have been documented or wintering sites with multiple turtles.

Justification: Nesting along the shore of Lake Champlain is limited by widespread development and human activity to the point that the dynamic creation of new deposits of shale pebble and sand beaches suitable for turtle nesting are likely limited. This is further limited by the need for the suitable nesting substrate to receive adequate sunlight to incubate the eggs for several months (May/June – August/Sept). The threshold of three nests does not include dispersed single or pairs of nests laid by prospecting female softshells that find some new shale/sand deposits or attempt nesting on beaches that have human activity. Numbers of softshell nests documented at communal sites currently range from 9-70 nests. We have knowledge of several sites with only one known nest. In one case we know of two nests and suspect more might be found. As a practical matter we manage the communal sites and hope the loners succeed from time to time. We monitor sites for several years before determining only single nests found. We believe female nesters have site fidelity but

will switch locations when one site is unavailable (e.g., high lake level during June). Documenting the number of nests is the high count based on several years of monitoring and may not include all nests that are actually laid.

We presently only know of three communal wintering sites. These underwater hibernacula are critical to the survival of Spiny Softshell Turtles that spend half the year underwater at wintering sites. Their physiology changes so they can survive on dissolved oxygen in the water column that they absorb through their skin. In addition to sufficient dissolved oxygen, sites need to be protected from ice scour and other disturbances that could threaten their survival or impact the maturation of eggs developing in the larger females (male turtles are smaller).

How Designation Might Impact Landowners and Others: Three communal nesting sites are known from state-owned shorelines. One is known from a privately owned, undeveloped beach and we work cooperatively with the owner. Designation of Critical Habitat potentially puts more restrictions on landowners who have been good stewards of their shoreline properties from a wildlife perspective. We would carefully determine the number of nests over several years because some nests go undiscovered (may not hatch out due to drowning or emergence hole is not detected - especially on a sand beach). We are attempting to focus on the fewer number of nesting locations that have a relatively larger conservation importance to the Vermont population of the listed species. However, we risk not protecting sites that are just starting to develop or only support a very few nests.

The designation of a nesting site would likely prohibit changing the depositional/erosion dynamic of the shoreline by limiting cement/rock walls and jetties, construction of permanent structures, and leaving boats and equipment on nesting substrate or otherwise covering the needed nesting substrate.

The communal wintering sites are all located in deep water that protects the turtles from ice scour so the habitats are public waters. Marina and other development in the water have the potential to impact this critical habitat

Assistance to Landowners and Others: We might be able to zone the beach so a portion is developed, say with a permanent dock, but other sections managed for nesting. At one private site we are allowed to manage a portion of the shoreline and leave another section available for people. The turtles do not always realize where this demarcation is. One of the reasons the owner partners with us is we control skunks and raccoons that are a concern to their operations. We have a similar arrangement with the Vermont Forest, Parks and Recreation Department (VFPR) at a state park where we cordon off a portion of the beach for turtles and the rest is open for

swimming/picnicking. This is the compromise reasonable stewards have accepted. We have tried to convince another private landowners/lawyer to manage a portion of his beach for softshells. Although he likes the turtles he is wary of setting aside any portion of his relatively small frontage.

We know the locations of the few communal wintering sites and we should be able to advise potential proponents of development that would threaten critical wintering habitats for the Spiny Softshell Turtle to avoid impacts. Survey work in advance of construction is often done for aquatic habitats.

B. *CHD Form Draft(s)*

First Draft (11 October 2016):

Proposal for the Designation of Critical Habitat

Species: Northeastern Bulrush (*Scirpus ancistrochaetus*).

Critical habitat is defined as a delineated area within the geographical area occupied by the species that:

- has identifiable and concentrated physical or biological features that are decisive to survival of a population, and
- is necessary for conservation or recovery, and
- may require special management considerations or protection.

Please explain how the proposed area meets the definition of identifiable and concentrated physical or biological features that are decisive to survival of this population.

Please explain how the proposed area is necessary for the conservation and recovery of this species or is decisive to its survival.

The following factors may be included in the justification of why this proposed area should be designated as critical habitat:

It is necessary for:
Space for individual and population growth of the listed species;

Food, water, air, light, minerals, or other nutritional or physiological requirements of the listed species;
Cover or shelter for the listed species;
Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; migration corridors; and overwintering;

Current protection does not address:
The present or threatened destruction, degradation, fragmentation, modification, or curtailment of the range or habitat of the listed species;
The adequacy of existing regulation;
Actions relating to the listed species carried out or about to be carried out by any governmental agency or any other person who may affect the listed species;
Cumulative impacts;
Natural or human-made factors affecting the continued existence of the listed species.

The Northeastern Bulrush is known to move around within a beaver flowage or within a wetland complex that is hydrologically connected. The bulrush is also known to be a prolific seed banker and often reappears at sites where it has not been observed for a number of years.

Northeastern bulrush is restricted to the two southeastern counties of Vermont: Windham and Windsor. Within Windham Co. the bulrush is known from nine towns: Athens, Brookline, Dummerston, Grafton, Newfane, Putney, Rockingham, Townshend, and Westminster. In Windsor Co. it occurs in two towns: Chester and Springfield. Northeastern bulrush occurs in two distinct types of habitat: wetland complexes with a history of beaver use and perched swamps/vernal pools. Large wetland complexes are the primary habitat. In this setting, populations reach their greatest size, occasionally exceeding a thousand flowering culms. At any given site the population size fluctuates over time in a fairly predictable cycle. Typically, the bulrush becomes evident one or two years following a drawdown of a marsh or pond, usually a result of beaver abandonment. The bulrush colonizes exposed mudflats and can form almost a pure stand. The species is known to seedbank extremely well and presumably the colonization results from buried seeds. Gradually over time, the Northeastern bulrush declines as the mudflats become increasingly colonized by other wetland species. It may persist in small numbers or even disappear for years at a time as water levels fluctuate. Eventually beaver recolonize the wetland, and most rooted vegetation becomes flooded and declines. When water levels again drop, the cycle begins anew. Populations are able to persist in extensive beaver flowages where a number of ponds along a drainage experience hydrologic fluctuations at different intervals. This allows the bulrush to persist within the drainage and move among the ponds although populations may not be evident at any given pond depending upon the current water level and habitat suitability.

The secondary habitat is small openings within otherwise closed canopy perched swamps or vernal pools. The populations here tend to be much smaller but also more consistent in that they don't

display the wide fluctuations as they do in the primary habitat. They also tend not to disappear as water levels tend to be more consistent from year to year. They are limited however, by the size of the canopy opening as the bulrush rarely flowers or sets seeds in the shade. Often the bulrush occurs in nearby pools so critical habitat would include all wetlands within a km of the known population.

Please provide a brief description of the site proposed critical habitat designation: All wetlands with a hydrological or proximal connection to wetlands with known populations.

Map showing proposed critical habitat (please include a shape file with the proposal):

Does the proposed critical habitat include:

Designated downtown or village centers	Y N
Designated growth center	Y N
Designated new town center	Y N
Designated neighborhood development	Y N

Is the species currently found within the area proposed for critical habitat? Y N

How Designation Might Affect Landowners and other stakeholders:
All known populations of Northeastern Bulrush occur in wetlands that are already protected and regulated by the VT State Wetland Regulations. Any proposed impacts to wetlands or their buffers within any hydrological connection or within one km of a known population would need to be surveyed for the Northeastern bulrush during the proper season. The Natural Resources Conservation Service (NRCS) and US Army Corps of Engineers already require such a survey for any wetland impacts in any of the eleven towns with known populations.

Assistance to Landowners: *The biggest threat to Northeastern bulrush in its primary habitat is destruction of dams and removal of beaver from a flowage. Most typically this is done by a town to protect a town road from flooding, but it is also done occasionally by private landowners to protect driveways or property adjacent to ponds. In such cases the VFWD would install beaver baffles in an attempt to control water levels while allowing beaver to persist at a site. This has been done at sites with known Northeastern bulrush populations with favorable results.*

Comments from the Vermont Fish and Wildlife Department:

References:

Final Draft (17 April 2017):

Proposal for Critical Habitat Designation

STATE OF VERMONT ENDANGERED SPECIES COMMITTEE

This form is designed to assess whether the area proposed for critical habitat designation meets the legal definition of critical habitat and to provide guidance on the feasibility of designation.

In Act 145, critical habitat is defined as a delineated area within the geographical area currently or historically occupied by the species that:

Has identifiable and concentrated physical or biological features that are decisive to the survival of a population,
AND
is necessary for conservation or recovery,
AND
may require special management considerations or protection.

Document Outline:

I. Species Background Information

II. Geographic Extent of Proposed Critical Habitat
- A. Primary Information
- B. Current or Historic Occupation?

III. Is critical habitat necessary for conservation or recovery?
- A. Factors (1-10) justifying this assessment

IV. Management Considerations

V. Social, Economic, and Political Factors
- A. Potential overlap with designated growth and development areas
- B. Effect on landowners and other stakeholders

VI. Supplementary Documentation and Data
- A. Additional materials
  - 1. References: Species' life history
  - 2. References: Habitat quality, reasons it's critical, etc.
  - 3. Other additional materials
- B. Additional information
  - 1. Additional species
  - 2. Other relevant information

VII. Signatures

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Please provide a brief (< 1 page) executive summary of the proposal.

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I. Species Background Information

1. Scientific Name:
2. Common Name:
3. Species Code (*Department use only*):
4. Current Vermont Status (and date listed):
5. Federal Status:
6. Is critical habitat being proposed concurrently with a T & E listing? _____Y _____N
7. Surrounding State & Provincial Status:
   Maine:
   New Hampshire:
   Massachusetts:
   New York:
   Quebec:

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II. Geographic Extent of Proposed Critical Habitat

Critical habitat must be composed of physical or biological features that are identifiable, concentrated, and decisive to the survival and recovery of a population of the species at any stage of its life cycle.

A. Provide:

1. A general description of critical habitat for this species.

2. A map showing the proposed critical habitat AND geo-referenced data files supporting the proposal (for species that are at potential risk for illegal takes, spatial data will be redacted and only released upon specific request by an approved user).

3. A list of the counties and towns in which critical habitat is proposed.

4. A description of how the proposed area of critical habitat meets the criteria of "identifiable and concentrated."

5. Justification for why this critical habitat is "decisive to the continued survival and recovery of a population of the species at any stage of its life cycle."

6. A description of the reasoning behind, and the process of, identifying and delineating the precise geographical area for potential designation as critical habitat (Relevant references can be attached in Section VI: Part A).

Note that negative impacts made on the critical habitat following its designation will be considered a take and any premeditated actions causing such negative impacts will require the filing for and issuance of a permit (negative impacts including, but not limited to, disturbance and degradation with respect to changes from the condition of critical habitat at the time of designation).

B. Is the proposed critical habitat currently or historically occupied by the species?

In Act 145, critical habitat that is delineated outside the area occupied by the species **at the time of listing** must have been historically occupied by the species; OR contain hydrologically connected habitat OR is directly adjacent to occupied habitat (*in addition to* the core legal requirements that the habitat has identifiable and concentrated physical or biological features that are decisive to survival of a population AND is necessary for conservation or recovery of the species).

Is the species currently found within the entire area proposed for critical habitat?

_____Yes _____No

If No, please elaborate based on the language in Act 145 noted above.

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III. The proposed critical habitat must be necessary for the conservation or recovery of this species.

Use the following list of factors, where applicable, to justify that the critical habitat being proposed is decisive to the survival and recovery of the listed species at any stage of its life cycle. *Note that any one of the factors listed below may serve as sufficient justification as long as there is strong supporting evidence.* The total number of factors that are addressed will vary on a case-by-case basis.

A. Factors Justifying the Critical Habitat

Biological or Life History based Factors

1. Is the proposed critical habitat necessary for space for individual and population growth?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable*.

2. Is the proposed critical habitat necessary for food, water, air, light, minerals, or other nutritional or physiological requirements?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable* (detail in the context of specific requirements).

3. Is the proposed critical habitat necessary for cover or shelter?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable*.

4. Is the proposed critical habitat necessary for sites for breeding, reproduction, rearing of offspring, or germination?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable*.

5. Is the proposed critical habitat necessary as sites for seed dispersal, migration corridors, or overwintering?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable*.

Legal or Regulatory Factors

6. Is the proposed critical habitat necessary for the conservation or recovery of this species because of the present or threatened destruction, degradation, fragmentation, modification, or curtailment of the range or habitat of the listed species[1]?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable*.

7. Is the proposed critical habitat necessary for the conservation or recovery of this species because existing regulation alone is inadequate?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable*.

8. Is the proposed critical habitat necessary for the conservation or recovery of this species due to actions relating to the listed species[1] that have already been carried out, or are about to be carried out, by any governmental agency or any other person, which may negatively affect the listed species[1]?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable.*

9. Is the proposed critical habitat necessary for the conservation or recovery of this species because of cumulative impacts (over a prolonged time period) or otherwise multiple stressors?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable*.

10. Is the proposed critical habitat necessary for the conservation and recovery of this species because other natural or human-made factors will affect the continued existence of the listed species[1]?

_____Yes _____No _____ Not Applicable _____Unknown

Please elaborate *if applicable*.

[1]This proposal can be made concurrently with a T & E listing for the species. Therefore, the species may not already be listed, but the aforementioned factors still serve as justification during the critical habitat designation process.

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IV. Management Considerations

Does the species have an approved recovery plan?

_____Yes _____No _____Unknown

If Yes:

Provide the full title of the recovery plan: _____

Date approved: _____

Is this designation consistent with the goals set forth in the approved recovery plan?

_____Yes _____No _____Unknown

Please elaborate *if applicable.*

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V. Social, Economic, and Political Factors

A. Potential overlap with designated growth or development areas

Refer to local zoning maps of the area being proposed for Critical Habitat Designation prior to filling out the following section. (Note that these are designated data layers on the Vermont ANR Atlas).

Does the proposed critical habitat include:

Designated downtown or village centers Y N U

Critical habitat cannot be designated in downtown or village centers, so these areas must be removed from the final designation.

Designated growth center Y N U

Designated new town center Y N U

Designated neighborhood development Y N U

Designation of critical habitat in growth centers, new town centers, or neighborhood development will require consultation with state and/or local government, to be coordinated by the Secretary.

B. Effect on landowners and other stakeholders

Note that the Secretary shall notify and consult with appropriate State and Federal agencies, affected landowners, any municipality where the proposed designation is located, and any interested persons at least 60 days prior to commencement of rulemaking, as well as making all reasonable efforts to work cooperatively with affected landowners.

Will designation of critical habitat affect landowners and other stakeholders?

_____Yes _____No _____Unknown

If critical habitat is located on private land, have those landowners been contacted?

_____Yes _____No _____Unknown

If Yes, is the landowner willing to designate their property as critical habitat?

_____Yes _____No _____Unknown

Describe examples of activities that would negatively impact the proposed critical habitat.

Please provide a list of agencies and programs of which you are aware that might be able to provide assistance to landowners (management, financial, consulting, etc.).

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VI. Supplementary Documentation and Data

A. Additional materials

1. Provide a list of references for any relevant reports or papers regarding the life history of the species in question.
2. Provide a list of references for any relevant reports or papers regarding the habitat to be designated for the species in question.
3. Provide any additional materials that support this proposal for critical habitat designation (and please also include an explanation of these materials).

B. Is there any additional information not aforementioned that would be relevant to evaluating whether the proposed area should be designated as critical habitat?

1. Please include any Rare, Threatened, or Endangered species that would also benefit from this Critical Habitat Designation along with relevant, supporting data.

2. Other relevant information that supports the designation of critical habitat:

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VII. Signatures

Submitted by:

Print Name: _____ Signature: _____

Date: _____

Affiliation(s): _____

Reviewed by the appropriate Scientific Advisory Group? _____Yes _____No

If Yes:

- Recommendation to Approve: _____
  - Justification: _____

- Request for modifications prior to moving forward: _____Yes _____No
  Comments about modifications: _____

  _____

  _____

- Recommendation to Deny: _____
  - Justification: _____

SAG Chairperson

Print Name: _____ Signature: _____

Date: _____

Reviewed by the Vermont Endangered Species Committee? _____Yes _____No

If Yes:

- Recommendation to Approve: _____
  - Justification: _____

- Request for modifications prior to moving forward: _____Yes _____No
  Comments about modifications: _____

  _____

  _____

- Recommendation to Deny: _____
  - Justification: _____

ESC Chairperson

Print Name: _____ Signature: _____

Date: _____