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BOMBUS AFFINIS LISTED UNDER THE ESA

CORI M. ROSE

On January 11, 2017, the U.S. Fish and Wildlife Service (USFWS) published its final determination for the listing of the rusty patched bumble bee (*Bombus affinis*) pursuant to Section 4(a)(1) of the Endangered Species Act (ESA). The listing was scheduled to be effective on February 10, 2017, but experienced a slight postponement (March 21, 2017) as a result of the Presidential Executive Order which delayed all prior administration actions. With the final listing the agency released consultation guidance for both Federal agencies as well as project proponents and landowners. This guidance is applicable to USFWS Regions 3, 4, 5 and 6 and is considered "voluntary" and the species recovery planning under the Act is being led by the Midwest USFWS regional office.

Section 7 of the ESA (16. U.S.C. 1531 et. seq.) possesses two Sections that may be pertinent for the purposes of Federal agency review and evaluation. They are Section 7(a)(1) and 7(a)(2). Most environmental practitioners are more familiar with Section 7(a)(2) which requires the Federal agency to ensure that actions they authorize, fund or carry out will not jeopardize the continued existence of a listed species or result in destruction or modification to designated critical habitat. The former is directed at providing proactive multi-agency conservation and has pertinence to this listing which we will discuss later.

Now for the purpose of AMWS members the only extant known population is one in Barnstable County, Massachusetts. Thus, if you are not doing work in this county, you are unlikely to have the bumble bee show up on your IPaC website species delineation (<https://ecos.fws.gov/ipac/>), at least at this time.

In order to identify the potential for presence of *B. affinis* the USFWS used a habitat connectivity model adapted from one created for the yellow-faced bumble bee (*B. vosnesenskii*). Its purpose was to identify a zone of high potential for presence around the current observation records (2005-2016). The model assessed dispersal movements and foraging distance with consideration for land use condition and cover for a closely-related species (*B. terrestris*). The ultimate product was a zone of influence from high probability to low probability extending outward from the original observation point.

Thus those areas that are delimited as "high probability" (red area) for presence provide some target for when a Federal agency may want to consult and may also prohibit the agency from making a "no effect" determination when suitable habitat is present. Alternately, a Federal agency can make a "no effect" determination after a survey has been

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NOTES FROM THE EDITOR

The AMWS newsletter has served as a focal point for the organization to disseminate pertinent wetland-related information to our membership for over 16 years. However, with the arrival and availability of digital and social media we are finding that it continues to be more difficult to attract contributing authors. The strength and success of the AMWS newsletter, as well as the organization as a whole, is dependent upon your membership participation.

We are looking for willing authors! Some topics of interest to us at this time include rare species habitat evaluation and study techniques, climate-induced changes in hydrology influencing hydrological conditions of waterways and aquifers, and retrofitting municipal stormwater systems for habitat connectivity and green infrastructure. However, if you have an article or any idea to share, feel free to contact me by email at cori.m.rose@usace.army.mil or corirose99@gmail.com. All ideas, submissions and general comments regarding the Newsletter will be warmly received.

The tentative deadlines for submittal of an article to the AMWS Newsletter this year are:

- June 10, 2017 for the July 2017 edition;
- September 10, 2017 for the October 2017 edition;
- December 10, 2017 for the January 2018 edition;
- March 10, 2018 for the April 2018 edition.

If possible, advance notice of the intent to submit an article would be appreciated so that we can plan accordingly. Thank you, in advance, for your continued support of the AMWS Newsletter!

Cori M. Rose, PWS



MEMBERSHIP INFORMATION

AMWS is the only organization geared especially for wetlands professionals working in Massachusetts. Our members include wetland and soil scientists, hydrologists, engineers, attorneys, academics, students, and others. Members who meet the Voting Member requirements are strongly encouraged apply as such. Please see www.amws.org for membership requirements, membership information, and an application form. Annual dues are:

- \$65 for Private Sector Voting and Non-voting Members;
- \$45 for Public Sector Voting and Non-voting Members;
- \$20 for Student (Non-voting) Members;
- \$20 for Retired Voting and Non-voting Members; and
- \$360 for Corporate Membership. (Corporate Membership allows multiple individuals from one company or recognized organization to join AMWS at a reduced set rate based upon ten individuals, with a pro rata fee applied to more than ten. A separate application form should be provided for each individual.)

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PRESIDENT'S MESSAGE

MICHAEL HOWARD, PWS, CWS

As I sit in my office crafting my latest "President's Message", I note that the temperatures are finally rising; the days are a bit longer; the spring peepers are starting to peep; the male red-winged blackbirds are perched proud and stout on the cattails of their choosing; the spotted salamanders and wood frogs have begun their seasonal migrations to vernal pools; and the hometown team has returned to Fenway. Let's face it, spring in New England is a magical, if not muddy, experience. The new warmth is a welcome change from the snow and ice.

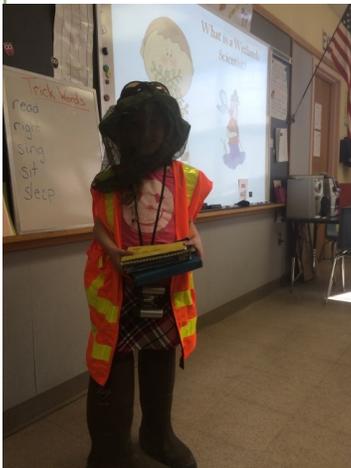
Spring is also a time for inspiration with the celebration of Earth Day in April and American Wetlands Month in May. Did you know that American Wetlands Month was created in 1991 by EPA and others to celebrate the importance of wetlands and to educate Americans about the value of wetlands as a natural resource? I wonder if the new EPA Administrator, Mr. Scott Pruitt, will be celebrating Wetlands Month this year? Perhaps we should send him some free AMWS field gear or an introductory membership into our organization to inspire him. But I digress.

In the conservation-minded spirit of Teddy Roosevelt, I am going to use my AMWS bully pulpit to challenge our membership to spread the word about the importance of wetlands and to encourage the next generation of wetland scientists to embrace and respond to the challenges that lie ahead. I ask that you share your knowledge and expertise with your children by visiting their classrooms and teaching them what a wetland is. Show off your super-excellent wetland scientist skills! Work with your children's educators to identify, care for and learn from a habitat on your local school campus. Get your family and friends out in the field to check out a vernal pool or red maple swamp on a parcel of conservation land in your community. Spend some time in the field keying out plants and pressing leaves into a homemade field guide. Grab the binoculars and start identifying those songbirds. Put the kayak or canoe in your local waterway and cruise a meandering river taking note of local wildlife and floodplain wetland systems adjoining the river banks. Check out those buttressed tree trunks and pneumatophore roots. Take some photos of varied wetland habitat types throughout the year

to demonstrate how they change and adapt from season-to-season. The point being, let's enjoy the experience of being outdoors and inspire others to work throughout the year to appreciate and value wetlands for the important benefits they provide to society.

Happy Earth Day and American Wetlands Month!

Cheers,



The author's junior wetland scientists checking out a dry vernal pool and sizing up proper field attire in the classroom! Are you feeling inspired yet?

WATERS OF THE U.S. IN THE NEWS

On January 13th the Supreme Court of the United States (SCOTUS) granted a review of a petition to hear judicial challenge to whether WOTUS cases should be heard at the level of district court. The issue that will be before the Supreme Court in the case (*National Association of Manufacturers v. Department of Defense, NAM*) is whether the 6th U.S. Circuit Court of Appeals has erroneously concluded that it has authority for judicial review of the consolidated Clean Water Act cases or whether it should be heard in distinct district courts. In case you are following this topic, you may remember that back in February 2016 the 6th Circuit U.S. Court of Appeals, in a split panel ruling (1-1-1), concluded that it had jurisdiction to review the numerous consolidated challenges to the Environmental Protection Agency/Department of Defense's 2015 controversial regulation. During the petition proceedings over 100 other parties' filed for review of intervention in the NAM process. The SCOTUS grant of review is required to determine whether the cases should be heard under the Administrative Procedures Act in district court and whether federal agency action on rulemaking is subject to multilateral judicial review.



EPA TO REPEAL CLEAN WATER RULE

At a recent Association of State Wetland Managers meeting, the Environmental Protection Agency (EPA) outlined its plans for potential changes under consideration for the definition of “Waters of the U. S.” The plan to repeal the rule is in response to the Presidential Executive Order (E.O.) on “...Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the ‘Waters of the United States’ rule.” Specifically, the E.O. directs the EPA Administrator and the Assistant Secretary of the Army for Civil Works to rescind the 2014 rule and “...consider interpreting the term ‘navigable waters’ in a manner consistent with Justice Scalia’s opinion” in the Rapanos decision. Justice Scalia’s opinion described Clean Water Act jurisdiction as relatively permanent waters and wetlands with a contiguous surface connection to relatively permanent waters. EPA proposes to rescind the rule prior to developing a replacement definition.

Staying on the topic of the Clean Water Rule above, but in an unrelated event, reporter Ariel Wittenberg wrote in an E & E News daily publication on April 27, 2017 on proceedings at the Senate Environment and Public Works Committee. At the meeting witnesses revealed that the EPA “disregarded” the Army Corps of Engineers concerns and marginalized the agency’s participation while the rule was being finalized in 2014. Information conveyed by retired Army Corps of Engineers Major General John Peabody in response to the committee indicated that EPA ignored Army Corps of Engineers staff’s “serious and significant concerns” expressed about the viability of the rule or its “factual, scientific, technical and legal basis.”

CULVERT REPLACEMENT MUNICIPAL ASSISTANCE GRANT PROGRAM

Do you work for a Massachusetts municipality and have a degraded or aging culvert that conveys a freshwater stream with high ecological value? Know you need to replace it but don’t have enough funding to do it right? If so, this program may be for you.

The Massachusetts Department of Ecological Restoration (DER) has established a state-wide grant opportunity to help towns and public works officials replace aging infrastructure that can assist stream reconnection and enhance ecological function. This grant opportunity will support one or more of the following project phases: field data collection and technical analyses, design, permitting, and construction. Upon award, proposed work must be completed by June 30, 2018.

Typical awards will range from \$25,000 to \$200,000. Matching funds are not required; however, projects are expected to meet the Massachusetts Stream Crossing Standards. The program is contingent upon pending approval of the DER’s capital budget.

For more information about the program contact Tim Chorey, timothy.chorey@state.ma.us. Stay tuned for the grant announcement, which will be shared widely and available on COMMBUYS (www.commbuys.com) this spring.

Potential Approaches to Wetlands with a “Continuous Surface Connection”

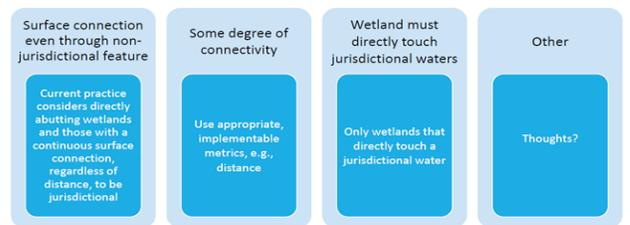


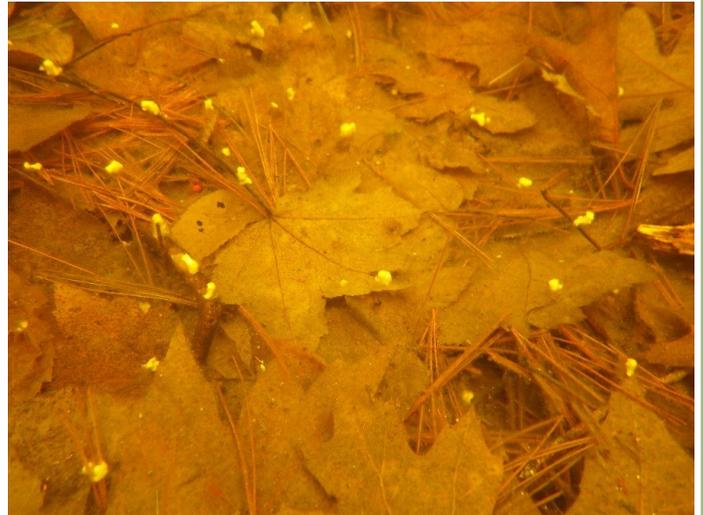
Figure 1: US EPA slides defining possible approaches to the determination of “relatively permanent” waters and “continuous surface connection” from an April 19, 2017 E.O. 13132 Federalism Consultation Meeting.

AMWS WORKSHOP: ECOLOGY AND ASSESSMENT OF MASSACHUSETTS VERNAL POOLS

BRIAN BUTLER

On April 7, 2017, Brian Butler and Scott Smyers (Oxbow Associates) presented a workshop on vernal pools (VP) with a morning classroom session at Acton Town Hall followed by an afternoon field session at nearby vernal pools.

When conversation turns to vernal pools and the milestones of the season, often it seems that adjectives relating the unusual or atypical nature of the VP season abound. Having shaken my head many times while considering the dryness, hotness, wetness, lateness, earliness or shortness of a particular breeding season, I'm inclined to admit there is no such thing as a "normal" VP season in New England, and it is time to simply accept that. I've spent enough post-midnight forays seeing nothing of note, as well as a good number that would qualify as spectacles. At the start of each night, I am rarely able to predict which category the night will fall into. I've tried to put the "Big Night" label in the appropriate receptacle where it belongs. Occasionally, there is a Big Night. More frequently, many petite nuit. The only way to hope to catch a Big Night is to put in a lot of nights, period.



Spermatophors under water. Photo courtesy of Brian Butler.

Despite yet another "weird" vernal pool season cast over New England in 2017, AMWS had a successful workshop, hosted by the Acton Natural Resources and Conservation Department. Weeks before the workshop, migrations and breeding had begun in earnest in southeastern Massachusetts and Rhode Island.

Wood frogs were chorusing in late February (an "unusual" time) during an early warm stretch of weather. But the cold temperatures returned and locked down the vernal pool breeding processes for more than three weeks. The days prior to the workshop were cold, rainy, and generally miserable - adequately rainy to inspire amphibian migration, but too cold for the recruits to muster to the eastern Massachusetts ponds in great numbers. I spent the day before the workshop with some unfortunate high school students shivering in the driving rain while we went from one local vernal pool to the next in hope of finding some exemplary eggs and invertebrates. But each pool was either over flooded or largely bereft of "volunteers."



Workshop participants Jennifer Stolz (Acton ConCom) and Marshall Dennis (Wetlands & Wildlife) collect specimens. Photo courtesy of Brian Butler.

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Fortunately, some trapping for blue-spotted salamanders to the west yielded some volunteers for “show and tell” at the workshop. And, as a Hail Mary pass, I set traps in yet another local pool before darkness the night before the workshop.

We convened with 13 AMWS members and guests on Friday morning to review a PowerPoint session on vernal pool ecology and “top secret” field techniques. Over lunch we viewed blue-spotted salamanders trapped the night before, marbled salamander larvae, and an assortment of invertebrates, along with some of the tools of the trade.

The Vernal Pool Gods looked upon us favorably for the afternoon session. The rain had ended and skies were cloudy, but not too gloomy. The smattering of traps we had set at the cemetery pool yielded a few wood frogs and spotted salamanders that were promptly released. This tiny pool was not particularly impressive, so we took a chance and marched the group to a pool to the south that I have not visited in years – hoping it would be more remarkable. At this larger, bi-lobed pool we found spermatophores, late-instar fairy shrimp, and other invertebrates. This pool afforded a more typical experience for the stalwart, rubber-clad attendees. We can only hope that next year will be ... “normal”.

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MASSDEP AND CZM PROPOSED CHANGES TO CHAPTER 91 REGULATIONS

The agencies proposed changes to the Facility of Public Accommodation (Chapter 91, Massachusetts Public Waterfront Act) and the Designated Port Area regulations. Revisions will affect 310 CMR 9.00: Waterways, 301 CMR 23.00: Review and Approval of Municipal Harbor Plans and 301 CMR 25.00: Designation of Port Areas. The purpose of the revisions is to reduce regulatory burden to coastal businesses and municipalities by providing flexibility for economic development opportunities while still maintaining the necessary coastal protections. The proposed amendments are available for review on the state website at

<http://www.mass.gov/eea/agencies/massdep/news/comment/proposed-amendments-to-dpa-fpa-and-mhp.html>.

NOTICE OF PUBLIC COMMENT PERIOD ON PRIORITY HABITAT MAPS FOR THE 14TH EDITION NATURAL HERITAGE ATLAS

321 CMR 10.12(6)

In accordance with the Massachusetts Endangered Species Act, M.G.L. c. 131A (MESA) and its implementing regulations (321 CMR 10.00), beginning on April 3, 2017, the Division of Fisheries and Wildlife will commence a 60-day comment period for the public to review and submit comments on the proposed updated version of the Priority Habitat map.

Specifically, the Division is requesting public comment on the status of areas proposed for delineation or removal as Priority Habitat regarding the physical or biological features of the habitat, or the current scope of existing development in the area.

This comment period will end on June 3, 2017. See www.mass.gov/dfw/nhesp/map-comment for more information, including the draft maps.

DRAFT Priority Habitat Map Public Viewer
This Viewer is intended to serve as both the tool for viewing the DRAFT Priority Habitat map (the map) for the 14th Edition Natural Heritage Atlas as well as an avenue to comment on the map.

- Open Comment Period April 3, 2017 – June 3, 2017
- Please note this map does not include Estimated Habitats or Certified Vernal Pools
- For more information on the Priority Habitat Comment Period, and for other comment options, please see our website

Explore the Map
Latitude: 43.87913 Longitude: -71.68189

Select Location
Specify the location for this entry by clicking/tapping the map or by using one of the following options.

Search Current Location Left On
Ex: 123 Main St, Nantucket, MA

Navigating
Viewing is intended to be at a scale of 1:25,000 using the 2013-2014 USGS aerial imagery. For ease of navigation, the street map has been provided when at larger scales.

Yellow indicates Priority Habitat

Zoom Full Screen
Pan (Click and hold)

AMWS “FOR FUN” AT CRANES BEACH PHYSICAL GEOGRAPHY OF INTERDUNAL SWALES

JOHN DICK

On April 27, 2017 wetland scientist John Dick (retired from Hancock Associates) led a “for fun” nature walk of the Dune Trail at Cranes Beach, Ipswich, Mass. to discuss wind-generated sediment transport and dune stabilization.

The group saw a great deal of heavy mineral concentration along the spring tide line; fine, deep purple sands, stirred into ripples and drifts by the morning's high water. These minerals include a good deal of garnet and other dark rocks, segregated both by weight and by grain size from the lighter silicas and feldspars.

Wind and water have different roles in beach and dune formation, and these dark sands, like pencil sketches, show the structure of the bigger shapes. Vegetation, woody debris, animal tracks, shells and bones all entered into consideration. To the right, the bubble marks might be some sort of an invertebrate, just air moving up out of the sand or, maybe, the tracks of a beach fairy on a pogo stick.

We found no evidence of toad activity quite yet, but plenty of surface water and mosquito larvae. We wandered a considerable distance out along the dunes, finally coming out onto the beach a couple of miles from the parking lot. The walk back involved half a dozen piping plover - just in from a long flight north and not yet established on territory. We covered almost four miles that morning; the plovers a bit more, one imagines.

We will be going out again in May to take another look, so check the AMWS website for details.

John Dick, PWS (Hancock Associates, retired)



John Dick (Hancock Associates, retired) instructs Cranes Beach field walk participants on coastal ecology. Credit: Lana Seguin-Spillman



Instructor John Dick (in the water) looking for spadefoot toad activity in the dunes at Plum Island. Photo Credit: Lana Seguin-Spillman.

This photo taken at the high water mark in close proximity to the primary dune face. Photo Credit: John Dick:



PROVIDING POLLINATOR HABITAT IN WETLANDS

KELSEY K. GRAHAM

There is growing concern about the decline of pollinators worldwide. Several bumble bee species in North America have seen severe decline of up to 96% over the past few decades. A great example of this is the rusty-patched bumble bee (*Bombus affinis*), a once common species throughout the northeast, which was just included on the Federal endangered species list due to its near disappearance across its historic range.

Pollinators provide key ecosystem services that are vital to the propagation of wild plants and crucial to our agricultural system. Since so much of our ecosystem and agriculture depends upon bees and other pollinators, it is imperative that we address this decline. It has been established that one of the key drivers of pollinator decline is loss of habitat. Pollinators rely on wide-ranging habitat to provide food and nesting sites. Wetlands provide an exceptional opportunity to make these resources available to a wide array of native pollinators.

Advantage of Wetlands for Pollinators

Wetlands provide a uniquely qualified opportunity to serve the local pollinator community. Protection of wetlands provides land managers and conservationists the ability to offer areas that are currently protected from the effects of pesticides, heavy metals, and habitat disruption, all of which have been linked to pollinator decline.

Many wetlands are also closely managed. This means that managers can designate specific pollinator habitat and manage the designated area in a way that will provide the greatest benefit to pollinators, while also providing a refuge for other wildlife. Creating pollinator-friendly areas in wetlands can afford many benefits.

Wildflowers and flowering plants are appealing from a purely aesthetic point of view, and, given growing public concern over pollinators, designated pollinator habitat can serve as an education and outreach platform for stakeholders.

However, there are some challenges facing land managers when providing good pollinator habitat within wetlands (as discussed below).

Invasive Species Eradication

Invasive species can provide a unique challenge for wetland restoration. Weedy plants often outcompete native species for resources. One of the characteristics of flowering weedy plants are showy, attractive flowers that are visited by a wide range of pollinators. Purple loosestrife (*Lythrum salicaria*), an invasive species found across Massachusetts, is a well-known invasive that embodies these characteristics.

Purple loosestrife provides ample amounts of nectar, making it a popular source of food for local pollinators. Some studies show evidence that loosestrife actually aids in the pollination of other wetland species by encouraging visits by local pollinators. Other flowering plants then get “cast off” pollination benefits.

However, there is growing consensus that attraction of pollinators to loosestrife provides more costs than benefits to the local plant and pollinator community. Increased visitation by pollinators to loosestrife encourages propagation of this invasive species and provides steep competition for other pollinator-dependent wetland plants. This can lead to near monocultures of loosestrife, choking out native species. In addition, some native pollinators will not visit purple loosestrife, which means these

loosestrife monocultures may look like great pollinator habitat, but can, in fact, serve as a food desert.

Therefore, control of invasive species such as loosestrife can represent an overall net benefit to local pollinators, even though removing a food resource seems counterintuitive. But a key aspect to wetland restoration after removal of an invasive is providing sufficient resources to fill the void. Other floral resources need to be provided to supplement the abrupt removal of the invasive plant.

Providing Pollinator Habitat

Wetlands can be a great place for designated pollinator habitat. They can provide safe forage on managed land that is otherwise unusable for development, and therefore likely to remain protected.

The important features of a great pollinator habitat include: (1) use of native plants specific to your region, (2) providing plants that supply both pollen and nectar, and (3) choosing plants with a wide range of bloom periods to sustain pollinators from spring to fall.

Many native pollinator-friendly plants are suited to wetland habitat and provide abundant resources to the local pollinator community (Table 1).

Attracting a Diverse Community of Pollinators

Pollinators come in many shapes and sizes. Bees, butterflies, moths, flies, beetles and birds provide pollination services throughout New England. Butterflies are some of the most charismatic pollinators, but recent declines in the iconic monarch butterfly (*Danaus plexippus*) are troubling. The two major causes for this decline are

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degradation of their overwintering habitat in Mexico and loss of their obligate food source – milkweed. Swamp milkweed can provide a valuable resource for adult monarchs that feed on its nectar, and monarch caterpillars which feed on the leaf tissues. Swamp milkweed thrives in wet soils, and can provide a valuable resource for one of the most iconic and recognizable native pollinators.

However, for pollination services in general, no pollinator is better suited to the job than bees. Bees are the only pollinators who actively collect pollen. This makes them much more effective at moving pollen from one flower to the next, providing a reproductive advantage for the plant. Many bees also show high floral constancy, meaning they will visit the same species of flowering plant in sequence. This provides the plants with the best reproductive advantage by making sure the right pollen is transferred. In addition, bees have evolved special hairs and structures to make them efficient pollen transporters. These evolved traits allow for efficient collection and carrying of pollen, which bees bring back to their nests to feed their young.

The great diversity of flowers has captivated people throughout history. The variety of flower shapes and colors are thanks to co-evolved mutualisms with pollinators. Certain bee species have evolved specifically to collect pollen

from certain flowers. Therefore, we need a diverse array of pollinators within the community in order to maintain a diverse array of flowers. There are around 4,000 native bee species in North America. These range from generalist bees with a wide-ranging diet to specialists which depend on one or two flowering species for their food. Providing a diverse array of native flowering plants will bolster a diverse pollinator and plant community.

Nesting Sites

Maintaining a diverse community of pollinators also means providing for them throughout their life cycle. Bees range from social species like the bumble bees, which nest in colonies of between 50-400 workers, to solitary bees which nest alone. Bees are also highly variable in where they build their nests. Most native bees are solitary ground nesting bees. There also exist a wide variety of cavity-nesting bees that build their nests in pre-existing cavities or make their own, such as carpenter bees. Providing good pollinator habitat not only means providing flowers, it also means providing safe areas for bees to nest. Undisturbed soil provides habitat for ground nesting bees. Stumps, snags and pithy stems can provide valuable nest sites for cavity nesters. Grass tussocks and patches of rough, undisturbed grasses provide great homes for bumble bee colonies.

Planning Your Pollinator Habitat

There are many local resources available to land managers when planning a pollinator planting. The [USDA Natural Resources Conservation Service \(NRCS\)](#) provides both advice and financial incentives for creating pollinator habitat. The [Xerces Society](#) is a non-profit centered around pollinator conservation. Both the NRCS and Xerces provide numerous guidelines and resources focused on best practices with regard to creating and maintaining long term pollinator habitat.

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Resources

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Vaughan, M., E. Mäder, J.K. Cruz, J. Goldenetz-Dollar, K. Gill, B. Borders. 2017. *Hedgerow Planting (422) for Pollinators*. The Xerces Society for Invertebrate Conservation, Portland, OR.

Table 1: A non-exhaustive list of native, pollinator-friendly plants suitable to wetland habitats.

| Plant | Type | Bloom period | Water preference |
|---|----------------------|--------------------|--|
| Serviceberry (<i>Amelanchier arborea</i>) | Tree | March - April | Medium, good along stream and pond banks |
| Pussy willow (<i>Salix discolor</i>) | Deciduous shrub | March - April | Medium to wet |
| Silky willow (<i>Salix sericea</i>) | Deciduous shrub | March – April | Medium to wet |
| Highbush blueberry (<i>Vaccinium corymbosum</i>) | Deciduous shrub | May | Medium to wet |
| Eastern waterleaf (<i>Hydrophyllum virginianum</i>) | Herbaceous perennial | May – June | Medium to wet |
| Buttonbush (<i>Cephalanthus occidentalis</i>) | Deciduous shrub | June | Medium to wet |
| Culver’s root (<i>Veronicastrum virginicum</i>) | Herbaceous perennial | May – August | Medium to wet |
| Swamp milkweed (<i>Asclepias incarnata</i>) | Herbaceous perennial | July – August | Medium to wet |
| Joe-Pye weed (<i>Eutrochium fistulosum</i>) | Herbaceous perennial | July – September | Medium to wet |
| New England aster (<i>Symphyotrichum novae-angliae</i>) | Herbaceous perennial | August - September | Medium, tolerant of clay soil |
| Canadian goldenrod (<i>Solidago canadensis</i>) | Herbaceous perennial | August – October | Medium |

MACC ANNUAL ENVIRONMENTAL CONFERENCE: STUDENT POSTER COMPETITION A SUCCESS

MATT SCHWEISBERG

For the first time, MACC sponsored a college student poster competition at its Annual Environmental Conference (AEC). MACC solicited poster submissions from numerous colleges across Massachusetts. The solicitation suggested a variety of poster topics, including Adaptive Management for Aquatic Ecosystems in a Changing Climate; Best Management Practices for Climate Change Adaptation; Effective Communication and Stakeholder Engagement or Conservation Commission Activities and Responsibilities; Monitoring and Assessing Restored or Created Wetlands; and Wetland Monitoring & Assessment Tools in the Northeast.

After reviewing applications, eight posters were accepted for the competition. Posters were displayed at the AEC and judged by members of the MACC board of directors.

The eight accepted posters addressed the topics listed below, and the top three judged posters are indicated along with the winning presenters.

Presenters of the top three posters were offered one of the following prizes:

- a one-year membership in the MACC;
- one MACC Fundamental Unit training class; or,
- one MACC training course.

The posters were displayed for the entirety of the conference, and presenters were at their respective posters at two designated times. Several hundred conference attendees viewed the posters during the day and had the opportunity to discuss the posters with their presenters. Also, presenters attended the AEC free of charge and were able to attend workshops if they wished.

MACC plans to make this poster competition an annual event at the AEC and anticipates an increase in the number of accepted posters displayed.

- Winner: Climate Change Adaptation Tools for Conservation Commissions in Inland Communities – with or without a Wetlands Bylaw

Camila Connolly and Chaz Kelsch (Harvard Law School);

- Winner: Using Indices of Biological Integrity to Evaluate the Efficacy of Floristic Quality Assessment for Wetlands in Massachusetts

Carolyn Gorss (UMass-Amherst);

- Winner: The Mill River Monitoring Project

Maya Hayden (Smith College);

- Monks and Land Conservation in Massachusetts: Monitoring the St. Mary's Monastery Conservation Restriction

Eric Pasay, Sam de Garis, Rose Watts (Clark University);

- Conservation Restrictions as a Tool for Wetland and Watercourse Preservation Case Study: King Farm, Petersham, Massachusetts

Sophia Graybill (Clark University);

- The Effects of Paradise Pond Sediment Management on Freshwater Wetlands

Sarita Quimpo Chiu (Smith College);

- Wetlands and Streams: Monitoring and Assessment Tools in Petersham, Massachusetts

Jimmy Keough and Lauren Ducat (Clark University); and,

- Small-Scale Land Conservation Balancing Large-Scale Hydrological Challenges and Human Needs

Gia Coleman, Sarah Maloney, Jessica McDermott (Clark University).

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NEW ENGLAND WILDFLOWER SOCIETY CERTIFICATES IN NATIVE PLANT STUDIES

CORI M. ROSE



A recurring theme from this quarter's newsletter is the importance of pollinators to both our food supply and natural ecosystem services. In the article on the Endangered Species Act listing of the rusty patched bumble bee, we learned from the U.S. Fish and Wildlife Service that the delineation of critical habitat for the species requires identification of the physical or biological features that are essential to the species' conservation. Furthermore, it has been established that one of the key drivers of pollinator decline is loss of habitat. One of the unknowns is how the species recovery relies upon geographically and spatially integrated habitat which must include a variety of native plant pollen and nectar sources.

Finally, Kelsey Graham explained why wetlands provide an exceptional opportunity to make these resources available to a wide array of native pollinators.

Massachusetts wetlands are already protected by both federal and state regulation, thus further management of wetlands for threatened and endangered species provides a unique opportunity to offer a safe and

undisrupted environment free from insecticides, herbicides and habitat degradation. Such an effort requires knowledge of a wide variety of native plants, their functional attributes of interest to both generalist and specialist pollinators and their role in the vegetated community. Well how does one learn this? You might want to begin with a certificate in field botany earned from New England Wild Flower Society (NEWFS) at Garden in the Woods, Framingham, Massachusetts.

The Core curriculum includes various native plant-oriented training opportunities such as plant field identification techniques, New England plant communities, wildflowers of New England and botanical inventory methods. Next, you combine the Core classes with a selection from the dozens of field botany elective choices such as plant form and function, natural community survey techniques, plants and their pollinators or pros and cons of assisted plant migration. Add in requirements for botanical field studies such as at Hobb's Fern Sanctuary, Maple Hill Wildlife Management Area, or Chickering Bog Natural Area. Finally, mix in an advanced curriculum requirement and native plant community service with NEWFS or another plant conservation-oriented organization and you are well on your way. Thus, I recommend that you check out this uniquely individual NEWFS program at the [Field Botany Curriculum homepage](#). If this looks intriguing to you, I suggest registering for their free [Certificate Orientation Webinar](#) or trying one of their online courses, live or on-demand webinars at the [Online Learning Portal](#).

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CALENDAR AND AMWS WORKSHOPS

**MAY 21, 2017
SPADEFoot TOAD
COASTAL VERNAL POOL ECOLOGY
CRANES BEACH, IPSWICH, MASSACHUSETTS**

Join wetland scientist John Dick (retired from Hancock Associates) to explore coastal vernal pool ecology, with an emphasis on spadefoot toad habitat. Save the date as there will be more information to come on the AMWS website at http://www.amws.org/upcoming_workshops.html.

**JUNE 5-8, 2017
SOCIETY OF WETLAND SCIENTISTS
ANNUAL MEETING
SAN JUAN, PUERTO RICO**

Registration is open for the 2017 Annual Meeting "*Celebrating Wetland Diversity Across the Landscape: Mountains to Mangroves.*" The program will highlight the interdisciplinary nature of wetland science and practice, how wetlands function, and how protection and restoration play a significant role in the health of our ecosystems and society. The importance of using sound science to inform management strategies and enhance environmental values to society will also be emphasized. For more information, see <http://www.swsannualmeeting.org/>.

**JUNE 4-9, 2017
SOCIETY FOR FRESHWATER SCIENCE
ANNUAL MEETING
DESIGNING OUR FRESHWATER FUTURES
RALEIGH, NORTH CAROLINA**

This year's meeting will explore how freshwater science can help imagine and implement solutions to the complex set of problems that plague freshwater ecosystems. As part of this year's theme, SFS is challenging its membership to inspire the public by sharing stories about the wonders of freshwater ecosystems; inform stakeholders about the threats to and possibilities for future freshwater management; and insert scientific knowledge into real-time policy decisions, management actions, and technological innovations that will ultimately determine the future of freshwater. More information will be available at <http://sfsannualmeeting.org/>.

**SEPTEMBER 12, 2017
NEIWPC ESTUARY RESEARCH WORKSHOP
COASTAL INSTITUTE AT URI
NARRAGANSETT, RHODE ISLAND**

This year's New England Interstate Water Pollution Control Commission research workshop intends to bring together researchers, administrators and advocates who conduct or oversee estuary research and monitoring to focus on nutrients that are potentially limiting in, and detrimental to, the northeast's estuaries. The workshop promises to focus on phosphorus limitation in estuaries and discuss the relative importance of nitrogen versus phosphorus in controlling eutrophication. NEIWPC is seeking abstracts for presentations and posters which must be submitted by May 31, 2017. For more information and to stay up to date with the workshop planning go to <http://www.neiwpc.org/research/erw.asp>.

**NOVEMBER 5-9, 2017
COASTAL AND ESTUARINE RESEARCH FEDERATION
RHODE ISLAND CONVENTION CENTER
PROVIDENCE, RHODE ISLAND**

This will be the 24th biennial conference for CERF and the selected theme for the conference in New England will be *Coastal Science Inflection Point: Celebrating Successes, Learning from Challenges*. The meeting will bring scientists and students from around the world together to exchange information and ideas about the science and management of coastal ecosystems. Registration for the conference is now open. The deadline for student travel award application is August 4, 2017. For more information or to register go to <http://www.erf.org/cerf-2017-biennial-conference>.

NOTICE: The intent of the Calendar is to provide timely information on conferences and courses to our membership. Mention of a particular conference, course, or company in the Calendar does not imply endorsement by AMWS.

For the most current information on upcoming AMWS Workshops in 2017, go to www.amws.org



Photo Credit: Mike Seekamp

DEALING WITH BEAVERS

Massachusetts beaver expert Mike Callahan recently started a nonprofit group called The Beaver Institute. Its mission is to be a catalyst advancing beaver management by providing technical and financial assistance to landowners experiencing beaver conflicts, supporting scientific beaver research, training beaver professionals, and increasing public awareness of the beaver's keystone role in the environment.

Among the planned scientific research is a peer-reviewed, comprehensive beaver management follow-up study to his 2003 and 2005 reports. These were published in the AMWS newsletter, and continue to get reader response. Mike is now looking for any graduate students and/or professors who might be interested in participating in this update.

Please contact: mike@beaversolutions.com

FREE WETLAND SCIENCE GEAR FROM RETIRING PROFESSIONAL

Long-time AMWS member Chuck Dauchy from Leverett, Massachusetts has retired from wetland science and is offering free gear to someone who is new to the field. Specifically, he has boxes of flagging, some soil augers and probes, and a tile spade. To contact him: dauchy.ch@gmail.com or (413) 548-8005.

WEBINARS AND DIGITAL LEARNING AND TRAINING OPPORTUNITIES

The opportunities for digital collaboration and learning are better than ever without the mileage. For example, did you know that the USFWS National Conservation Training Center has webinar series and topics on items such as Landscape Conservation Design, Critical Writing and Thinking, Native Aquatic Species Restoration, Geospatial Technology and more? Take advantage of some of these opportunities today (and don't forget about the online archives!):

JUNE 8, 2017 (2 to 3 pm ET) **USFWS/NOAA RESTORATION SERIES**

Large Scale Coastal Tidal Marsh and Barrier Beach Restoration at Prime Hook National Wildlife Refuge

SFWS staff will discuss the complex restoration approach used to recover from Hurricane Sandy and to build resilience in 4,000 acres of former freshwater impoundments. <https://training.fws.gov/topic/online-training/webinars/index.html>. http://www.awra.org/webinars/index.html?utm_source=October+2016+Connections&utm_campaign=2016+October+Connections&utm_medium=email.

JULY 23-29, 2017 **EAGLE HILL NATURAL HISTORY SCIENCE SEMINARS** **Wetland Identification and Delineation**

Join Matt Schweisberg (Wetland Strategies and Solutions, LLC) and Joe Homer (USDA-NRCS, retired) for a week-long intensive course on the identification and delineation of wetlands. For this and other excellent training opportunities related to aquatic resources, go to <https://www.eaglehill.us/programs/nhs/nhs-calendar.shtml>.

AUGUST 13-19, 2017 **EAGLE HILL NATURAL HISTORY SCIENCE SEMINARS** **Tidal Marsh Restoration:** **A Traveling Course from Rhode Island to Maine**

Join Susan Adamowicz (USFWS) and David Burdick (UNH) traveling workshop to provide hands-on examination of a variety of restoration techniques and use of different functional assessment tools to evaluate restoration performance. Fundamental processes that structure and determine function and resilience of each example of marsh restoration will be emphasized to help understand the techniques used and their outcome. For this and other excellent educational opportunities go to <https://www.eaglehill.us/programs/nhs/nhs-calendar.shtml>.

September 13, 2017 **NEIWPCC ESTUARY RESEARCH WORKSHOP** **Limiting Factors Beyond Nitrogen** **University of Rhode Island, The Coastal Institute at URI**

This workshop will focus on nutrients (emphasis on phosphorus) that are potentially limiting, and detrimental to, the Northeast's estuaries. Workshop participants will include researchers, administrators, and advocates who conduct or oversee estuary research and monitoring. NEIWPCC is currently seeking abstracts, which must be submitted by May 31, 2017. For more information go to: <http://www.neiwpcc.org/research/erw.asp>.

completed and species absence is documented, provided that the survey meets USFWS protocol. This procedure, however, can be time consuming and costly as it will usually involve interagency coordination between the Federal agency, USFWS and the qualified biologists that will be conducting the survey. Of significance though is the very finite period of applicability (within one year of proposed work) if work is delayed or extends beyond a one year period.

The Section 7 *B. affinis* guidance outlines a “suggested” approach for a Federal agency to screen for a project’s “potential affect”. The steps include:

- 1) Determine if the proposed Federal activity’s action area overlaps with the species’ high potential zone. This will involve use of the USFWS IPaC planning tool and will result in the creation of an “official species list” and associated USFWS consultation tracking number. Here the applicant/agent can assist the Federal agency by providing it with a shapefile of the project property boundary.

One thing to note here is that it is the responsibility of the Federal agency to determine the “Action Area,” not the USFWS and not the project proponent. In general the Federal agency will use the ESA Interagency Regulations at 50 CFR Part 402 and the Action Area will usually include all areas affected directly, or indirectly, by the effects of the Federal work when compared to an environmental baseline of interrelated or interdependent past, present and anticipated future impacts. However, there is some limitation for broadening the scope of the action area where there is no physical causal relationship or cumulative

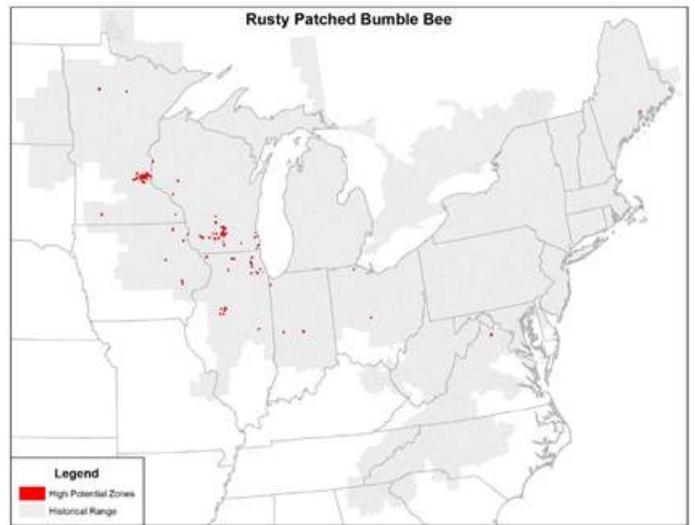


Figure 1. Areas where there is evidence for the likely persistence of the rusty patched bumble bee in the United States (highlighted in red to increase visibility), based on the habitat model (described below) and on species survey data compiled from

Photo 1: USFWS depiction of current “extant” populations

Federal control between the regulated activity and the impact on the species.

- 2) Determine if suitable habitat is likely to be present.

The guidance does rule out some areas that are not likely to be potential *B. affinis* habitat including permanently flooded/open water, paved areas, monoculture agriculture/row crops, frequently mowed areas such as lawns and roadsides and forested areas where invasive shrubs are dominant and spring ephemeral flowers are absent.

Although wetlands can be ruled out for potential overwintering or nesting habitat, these resources are still provide an important contribution to foraging habitat, especially if they are located in proximity to suitable overwintering or nesting areas.

Identifying the potential presence of suitable overwintering and nesting habitat is likely to be problematic for many Federal agencies, due to the scarcity of species-specific information on the rusty patched bumble bee.

So, what does suitable habitat look like? Through the Federal listing, the species assessment and the guidance document we can glean the following:

High probability for foraging habitat will include:

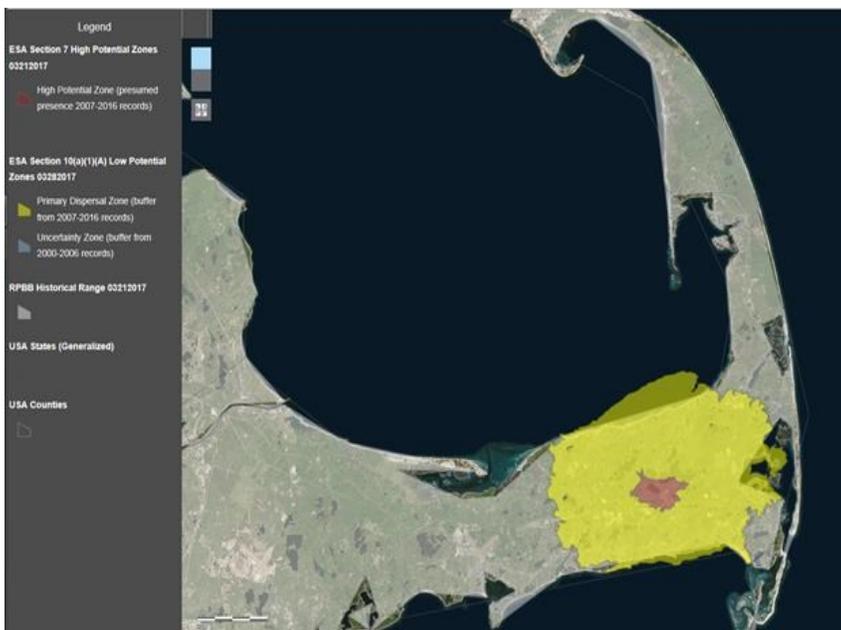


Photo 2: Depiction of high potential habitat zone in Barnstable County, Massachusetts

Continued on Page 15

- Diverse and abundant flowering plant species within 0.6 miles of possible nesting sites
- Early-blooming spring flowers such as woodland spring ephemerals
- Later season-long access to pollen and nectar sources in open areas

High probability nesting and overwintering:

- Loose soils along forested edges and near open fields
 - Compost piles or mole hills
 - Soft soil under leaf litter
 - Un-compacted and sometimes sandy moss-covered soils on northwest exposures
- 3) Determine if the Federal activity will result in exposure to one or more stressors, and if so, determine how the *B. affinis* may respond to the stressors.

The list of stressors believed to affect the species is found in the June 2016 Species Status Assessment and discussed in the agency guidance as they pertain to man-induced activities. They include development and land clearing activities, use of insecticides and pesticides, land management, presence of commercial bumble bees and honey bees. These will need to be considered in terms of population risk factors such as small population dynamics, climate change, pathogens and synergistic effects, in which most Federal agencies lack pertinent expertise. Thus, where the agency is unable to make a no affect (negative) determination based upon absence of habitat and their regulatory authority, they will mostly likely be required to work with regional USFWS staff to assess whether – and how – their action is likely to affect the species and key habitat features. Although this assessment process is the responsibility of Federal agencies their ability to complete the process successfully could be limited.

Where the requirement to consult is labeled “voluntary” it implies that if a Federal agency does not consult there is no consequence. However, the ESA regulation itself says otherwise. If a Federal action may affect a listed species or its critical habitat, the responsible agency must enter into consultation with the Service unless it can document that the species is not present or that an activity will have “no effect”.

- 4) Incorporate conservation measures to avoid and minimize impacts to *B. affinis*.

It appears that through this “voluntary” consultation process the USFWS hopes to extend opportunities to conserve



Photo 3: Common nest sites for the rusty-patched bumble bee above and below ground. Credit: Bumblebee Conservation Trust.

habitat for the rusty patched bumble bee in, and near, high potential zones through use of Section 7(a)(1), rather than the more frequently used vehicle of 7(a)(2). This will include extensive use of multi-agency state and Federal partnerships and agency directives to land management programs. Their objective is to use the habitat model to identify primary dispersal areas (depicted in green in the figure below) that may be enhanced to provide opportunity for a more resilient population.

The guidance document correctly concludes that Federal agencies have a wide range of opportunity within their respective authorities to proactively contribute to conservation of the rusty patched bumble bee. This is especially true if the agency holds title to, or some level of authority over, a significant amount of land that may overlap with the range of

Continued on Page 16

the species. Some examples include the Bureau of Land Management, the Federal Highway Administration and the U.S. Army Corps of Engineers. Thus the Guidance specifically targets conservation recommendations for land management to restore and enhance floral diversity and abundance on public lands, address unnecessary pesticide use and program management of Federal land leases for commercial pollinator controls.

The May 19, 2015 “National Strategy to Promote the Health of Honey Bees and Other Pollinators” was designed to fill this role by seeking the restoration and enhancement of seven million acres of land for pollinators over a five year period through Federal actions and public-private partnerships. The foundation of this effort was a White House order establishing a Federal pollinator health taskforce and a subsequent [“Pollinator Partnership Action Plan”](#). This was paired with a report by U.S. Department of Agriculture and U.S. Department of Interior for “Pollinator-Friendly Best Management Practices for [Federal Lands](#)”.

I found that many of the participating Federal agencies have adopted measures and practices within their purview to address the dire status of pollinators nationwide. For example, the Department of Defense (DOD) is one of many Federal agencies actively participating on the White House pollinator task force. The DOD has a [September 5, 2014 policy memorandum](#) for management prescriptions for Federal lands and it has included pollinators in its new DOD Natural Resources Strategic Plan. As a DOD agency, I was also pleasantly surprised to find that the U.S. Army Corps of Engineers is also active on this front with its own agency [Pollinator Protection Plan](#) to assist the national effort and it has incorporated many measures into amendments to its 1996 Engineer Regulations on Environmental Stewardship and Maintenance Policies.

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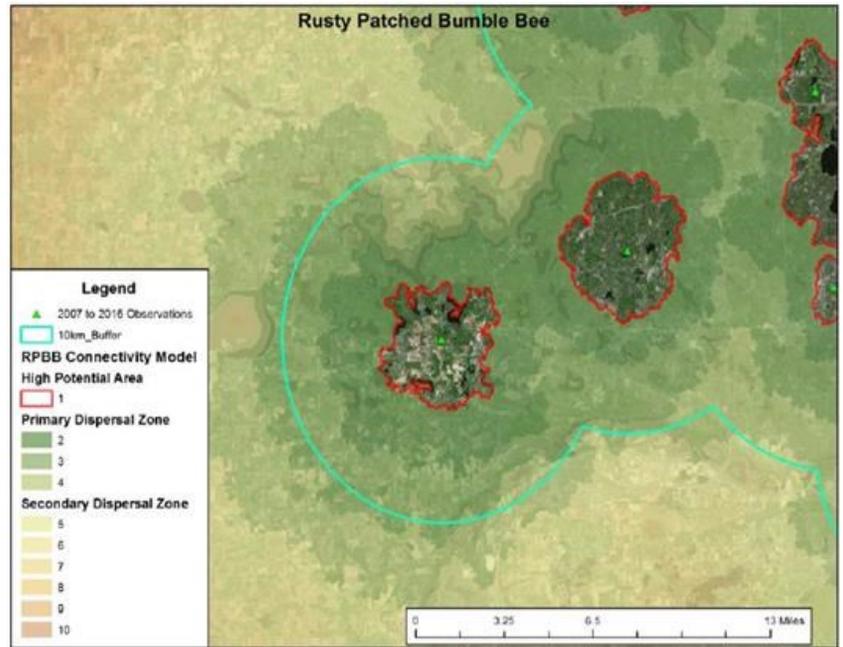


Figure 5. An example of high potential zones for rusty patched bumble bee (outlined in red), based on the habitat model described above and on species survey data compiled through 2016 (U.S. Fish and Wildlife Service Rusty Patched Bumble Bee Unpublished Geodatabase). The shaded connectivity model highlights additional areas with potential to connect existing populations; the areas with the highest potential for connectivity/suitable habitat are shown in shades of green and the least suitable areas shown in shades of brown and red.

Photo 4: USFWS 2016 figure from March 21, 2017
Federal agency consultation guidance.

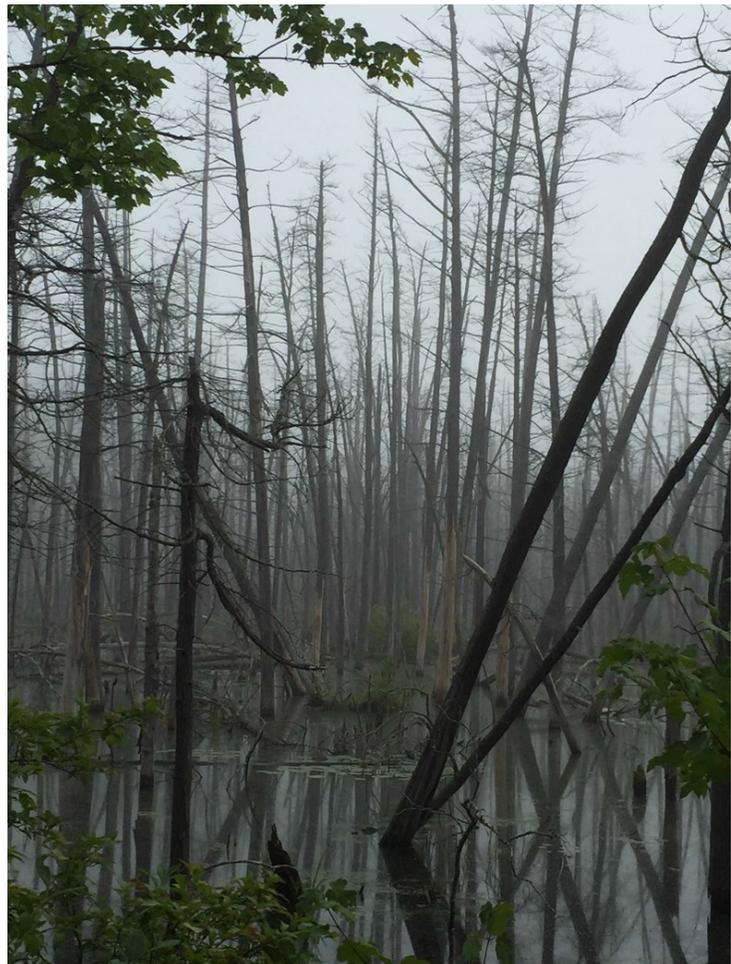


Photo Credit: Mike Seekamp

WHAT HAPPENED TO THE RUSTY-PATCHED BUMBLE BEE?

CORI M. ROSE



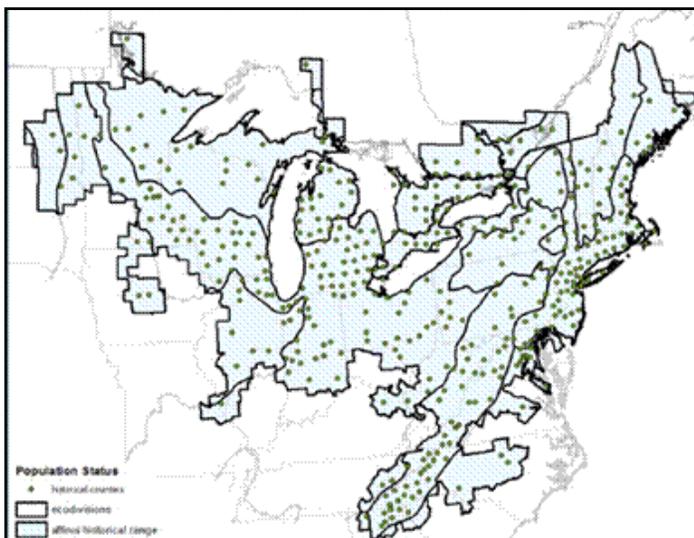
A rusty-patched bumble bee worker. Credit: Dan Mullen, Creative Commons.

As mentioned in this edition's related article the U.S. Fish and Wildlife Service (USFWS) listed the Rusty Patched Bumble Bee (*Bombus affinis*) under Section 4(a)(1) of the Endangered Species Act (ESA) on January 11, 2017 with an effective date of March 21, 2017.

Unfortunately, I perceive the listing of this species as a rather gloomy prediction of things to come. Since the 1990's the species has gone from widely common in the northcentral and northeast region (31 states) to the very dubious distinction of being the first bumble bee to be granted ESA status. It is also the first bee to be listed in the continental United States (there are currently seven species of Hawaiian yellow-faced bees on the list). Its listing status, however, may be too little, too late as there have been warning signs about population declines since the 1990's. Additionally, the bee has been listed in Canada under its Species at Risk Act since 2010 and it has already been added to the International Union for Conservation of Nature (IUCN) "red list" as "critically-endangered". What follows is a brief summary of what is known about this species and its current status.

ABOUT *BOMBUS AFFINIS*

The species is highly social, forming colonies of up to one-thousand individuals, a colony size which is somewhat large for



Map of historic county distribution of *Bombus affinis*.
Credit: USFWS, 2016

the Genus. A colony will include a single queen with female workers and males. Like most bumble bees their morphology is variable dependent upon whether an individual is a queen or worker, male or female. The queen will be largest at between 20 and 22 mm in length and 9-11 mm in width, while the workers will be two-thirds to half that size. Identifying the queen of this species is difficult, however, because only the female workers and the males possess the rusty reddish patch on the abdomen that the species is named for.

A queen lives for only about three months and her progeny (known as a gyne or new foundress), which is destined to become the next year's queen, will overwinter. The foundress will hibernate alone in the soil, usually underground. Through the long winter she will survive on her reserved body fat. Of interest, the queen of this species is usually the earliest bumble bee to be seen in the early-spring. When she emerges, she will need to feed on nectar from early-spring flowers in order to survive, the find a suitable nest site and produce her first brood of eggs (fertilized from the previous fall). Her search for a suitable nest site is often observed (if you are looking for it) and is identified by a low-flying zig-zag pattern of flight where she investigates underground holes, rodent cavities and clumps of grasses with decomposing organic material. Nesting locations are likely to include fields and grasslands, ditches, wetlands and roadsides but little is actually known about the individual species' preferences and much about *B. affinis* has been inferred from research on related bumble bee species.

Bumble bees are dependent upon three different types of habitat within a proximal geographic area for foraging (nectar and pollen from diverse and abundant flowers throughout the season), nesting (nearby high quality floral resources) and hibernating. This makes them, and the rusty patched bumble bee in particular, extremely vulnerable. Because their life cycle is annual, only a queen is capable of establishing the next colony. Consequently, the success of the species will be dependent upon queen production. This is where major environmental uncertainty takes over, because, production of potential queens is dependent upon the amount of nectar and pollen that can be gathered by mid-summer.

Continued on Page 18

An interesting factoid about bumble bees is that the different species have variable length tongues, and *B. affinis* is not the Gene Simmons of bumble bees; that is, the species has a very short tongue. This physical feature affects its ability to obtain nectar from certain types of flowers (or all of the nectar that could be available to one with a longer tongue), but it also provides the species with the ability to use a greater variety of plants. It is also known to be a “nectar robber” whereby the individuals will pierce the bottom of a flower’s petals to access the nectar. There has been some preliminary research that indicates that some bumble bees are rapidly evolving shorter tongues in response to climate change and the resultant die-off or temporal shift of bloom time for longer-tube flowers. Thus, many short-tongued bumble bees may have an energetic advantage, though this doesn’t seem to be the case for *B. affinis* (at least at this time). At the population level the species needs an adequate number and spatial diversity of healthy colonies to be resilient to biological and physical impacts. Currently, *B. affinis* status significantly reduces its ability to withstand specific stressors such as habitat loss and degradation, climate change, pesticides and pathogens.

The USFWS’s June 2016 rusty patched bumble bee status assessment suggests

that more than one stressor is likely to be responsible for the species’ rapid decline. The document provides a very detailed look at the factors that are more than likely responsible. These include pathogens, climate change, small population dynamics and synergistic effects. For expediency, I provide a quick summary below of the two that are most likely within our power to change as professional environmental practitioners.

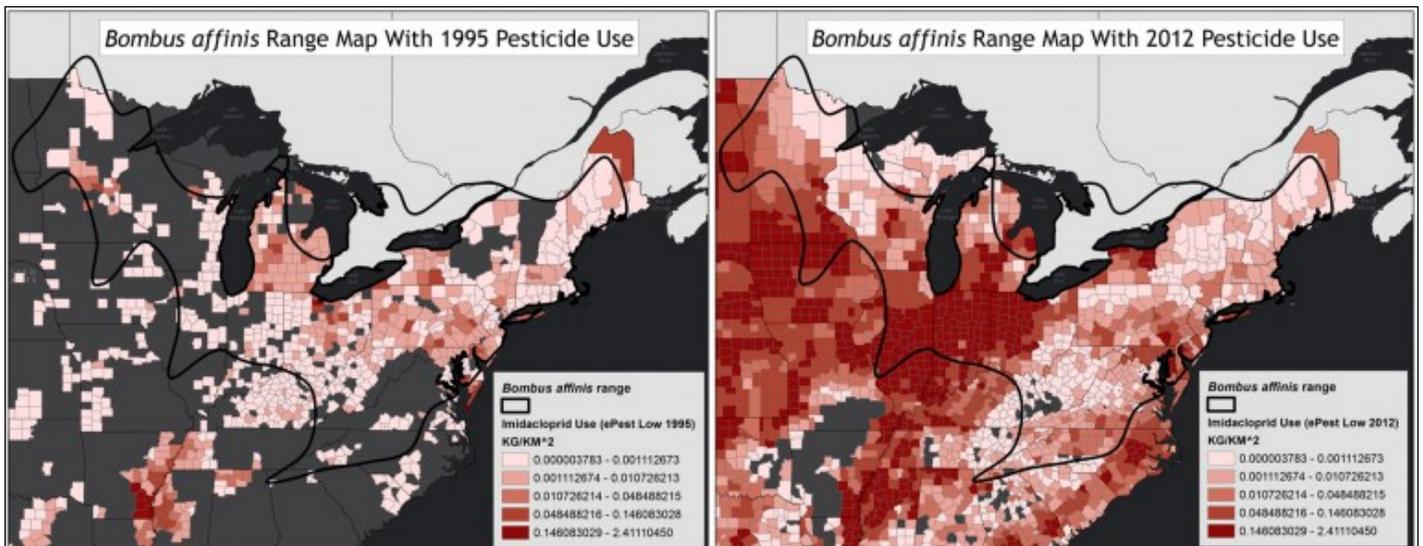
PESTICIDES/NEONICOTINOIDS

Many pesticides are regularly used to control our environment for purposes such as agriculture, horticulture, urban and rural landscape maintenance, and yes, even invasive plant control in wetlands (glyphosate, 2-4-D, fluridone, triclopyr, imazapyr, endothal, diquat, etc.). Thus, native bees including *B. affinis*, are exposed to a multitude of fungicides, insecticides and herbicides. Both herbicides and insecticides have been documented to directly impact bees. Maybe some of you remember hearing about a mass die off of bumble bees in a mall parking lot in Oregon a few years ago. Ultimately, the event was determined to be the largest on record, killing over 55,000 wild bumble bees (potentially hundreds of colonies). However, it has not been the only one. The culprit in this and

subsequent documented events was an insecticide known as dinotefuran, a neonicotinoid (“neonic”) usually marketed as “Safari”. It was found to have been sprayed on urban trees in the late-winter or early-spring to combat aphids. If it had not applied in an urban environment where the result could be observed, no one would have been the wiser.

This class of insecticides affects the central nervous system causing paralysis and, ultimately, death. One study in Colorado bees revealed 19 different pesticides in just 54 samples! A more comprehensive risk assessment identified a total of 161 pesticides in bee hives, of which 124 of them were present within pollen, 95 of them in wax and 77 in honey or nectar (<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0094482>) suggesting that indirect and cumulative effects are also likely. One summary of recent research suggests an immune suppression link which is I recommend : <http://www.theorganicview.com/environment/dr-sanchez-bayo-discusses-new-neonicotinoid-research/>.

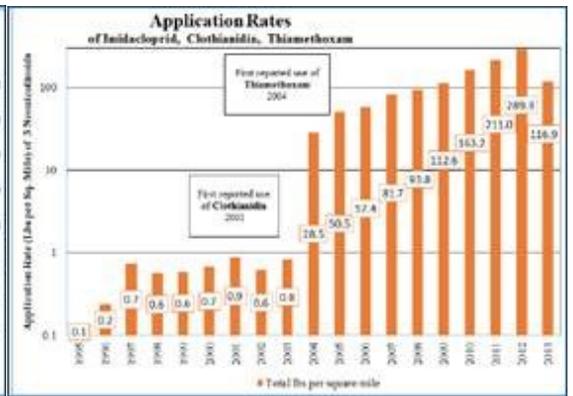
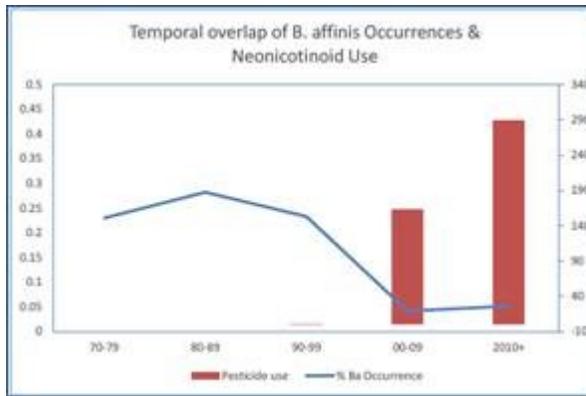
The most common was the neonic (thiamethoxam). All of the neonic pesticides were registered after 1984 and not subject to re-registration or subsequent evaluation.



Comparison of the use of a single insecticide, imidacloprid, between 1995 and 2012. Credit: Xerces Society

Continued on Page 19

It was probably not lost on most that the widespread use of such systemic toxins did not occur until the late 1990's, coincident with the rapid decline in bee populations. Consequently, following the release of a Presidential Memorandum in 2014



Not overwhelming evidence but certainly suspect. Credit: USFWS analysis using USGS data.

and the “National Strategy to Promote the Health of Honey Bees and Other Pollinators” in 2015, registration review on the entire class of neonicotinoid insecticides was reopened by the Environmental Protection Agency (EPA).

These insecticides are currently being evaluated for both pollinator and human health risks. The EPA recently released the first four pollinator-only assessments for public comment on January 12, 2017 and its schedule for review of all is available on its Pollinator Protection page at <https://www.epa.gov/pollinator-protection/schedule-review-neonicotinoid-pesticides>. How this effort will be affected by future budget scenarios for the EPA is uncertain, to say the least.

HABITAT LOSS/DEGRADATION

The rusty patched bumble bee historically resided in native grasslands, something which we have very little of left in the northeast. In New England a combination of loss to development and temporal conversion of grassland to dense forest has fragmented or eliminated much of the open late-season habitat that would have been available for this species. They are mostly considered a habitat “generalist” which means that they can adapt to a wide range of environmental conditions and the species is known to forage from many plants. Studies of the Genus in the United Kingdom and Canada suggest that the queens might use open canopy woodland if it possesses a floristically diverse

understory. It is very likely that here in New England, like in northern climes, she will rely on spring woodland ephemerals, which would normally be expected to flower before leaf-out of canopy species. If we add climatic seasonal variability to the loss of vegetative diversity resulting from invasive monocultures and land development, analysis of impact from habitat loss is far from simple.

USFWS CONCLUSION ON STATUS

So in its listing the USFWS concluded that “the species is vulnerable to extinction even without further external stressors acting upon the remaining population”. The agency posits that risk of extinction is currently high because the number of remaining populations is small (all but two have ten or fewer individuals) and the species’ range is severely reduced. The report states that it’s “range has been reduced by 87 percent, with an 88 percent decrease in the number of populations known historically.” The listing goes on further to summarize that of the 103 known current populations, 96 percent have been documented by five or fewer individual bees; only one population has had more than 30 individuals observed in any given year. Even with the population bottleneck, pathogenic concerns as a result of fungi, bacteria, parasites and viruses persist and pesticide use, including insecticides, with both lethal and sub-lethal consequences, continues to increase. And if all of that weren’t enough, ongoing fragmentation of habitat continues

(including conversion of native habitats to agricultural monocultures).

Although the listing indicates that designation of critical habitat may be beneficial to the species, the USFWS concluded that critical habitat cannot be designated per the ESA regulation because information to perform the analysis of the impacts of the habitat designation is lacking. The letter of regulation requires that the needs of the species be sufficiently understood in order to document (i.e. justify) a particular area’s listing for use as critical habitat. However, I would not be surprised if critical habitat were to be identified at the Barnstable County site at some point in the near future.

HOW THIS ALL RELATES TO WETLANDS

So the question remains, other than federal protection and consultation under regulation, what can environmental practitioners’ do to aid the species?

- 1) As individuals and employed specialists we can ensure that our project designs for compensatory mitigation in wetlands (and in upland open spaces) include a variety of early-spring blooming flowers that can assist the queen of this species in energy recovery and reproduction.

Some good examples of early flowering spring plants in addition to our native maples (*Acer sp.*) include pussy willow

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(*Salix discolor*), rhododendrons/ rosebay/ azalea (*R. maximum*, *R. prinophyllum* and *R. canadense*), marsh marigold (*Caltha palustris*), chokecherry (*Prunus virginiana*), eastern redbud (*Cercis canadensis*), blueberry (*Vaccinium sp.*), American false hellebore (*Veratrum viride*), shadbush/serviceberry (*Amelanchier spp.*), golden currant (*Ribes aureum*), false nettle (*Boehmeria cylindrica*), cherry & plum (*Prunus sp.* including *P. maritime*, *P. pensylvanica* and *P. virginiana*), American birds-foot trefoil (*Lotus unifolius*), Solomon's seal (*Polygonum pubescens*), false Solomon's seal (*Mianthemum racemosum*), false heather (*Hudsonia tomentosa*), spring-beauty (*Claytonia sp.*), spring forget-me-not (*Myosotis verna*), squirrel-corn (*Dicentra canadensis*), etc.

2) Seek to incorporate warm-season grasses and wild flower meadows in upland conservation areas proposed as a result of development and protect them with easements that include active steward and management practices for the benefit of all pollinators. This includes habitat corridors through developed areas and adjacent to roadways.

3) Work within your home town and/or with your school systems to lobby for development of "pocket parks" that include early-successional habitat and

forage sources for native pollinators. Remember, not all parks need to possess green turf grass and educational learning opportunities abound when these areas are managed for habitat connectivity purposes!

4) Assist the U.S. Fish and Wildlife in the collection of data about *B. affinis* presence within its range. These days much of the best scientific information available is collected through citizen science portals. As wetland practitioners we spend a significant amount of time outdoors. That is potentially a lot of pictures of bumble bees that could identify the presence of *B. affinis* or otherwise inform on the presence of other bumble bee species with similarly declining populations. Try <http://www.bumblebeewatch.org/>.

You can learn how to identify *B. affinis* from the other species of bumble bees that occur in our region. The Xerces society has produced an easy to use guide for this purpose which can be downloaded from www.xerces.org/wp-content/uploads/2009/02/affinis_pocketguide.pdf.

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Editor Note: Following completion of this article, the Boston Globe and Washington Post published stories as a result of the current Environmental Protection Agency decision to reverse the use of Dow Chemical's Chlorpyrifos, an organophosphate pesticide, on food. The chemical was prohibited after peer-reviewed studies from the National Academies of Science found that even small exposure can affect children's brain development and a University of California Berkeley study discovered that 87 percent of umbilical cord blood tested contained detectable levels of Chlorpyrifos. The analysis also included overwhelming documentation during its reevaluation that it, and related organophosphate pesticides malathion and diazinon, pose a risk to nearly every species that was studied (1,778 plants and animals), including critically endangered or threatened species of frogs, fish, birds, and mammals. Organophosphorus gas was originally developed as a chemical weapon by Nazi Germany, but now its constituent Chlorpyrifos is used on apples, cherries, citrus fruits and other crops. The company has requested that the EPA terminate reevaluation of organophosphate pesticides, especially Chlorpyrifos, as it sells an estimated five million pounds of the agricultural pesticide annually.

Historic range of *Bombus affinis*
The rusty-patched bumble bee was once common in the eastern United States and the upper Midwest. They can still occasionally be found in isolated patches, but *B. affinis* has disappeared from most of its former range in recent years. Your efforts to search for this bee will help document their current range. The Xerces Society and its members studying declining bumble bees will use this information to promote conservation of remaining *B. affinis* populations.

Other common bumblebees of eastern North America
There are around 20 bumble bee species present in eastern North America. Females of some of the most commonly found bees are pictured here. Some species pictured have varieties with different coloration.
For more identification information, visit www.discoverlife.org and www.bugguide.net.

POCKET GUIDE TO IDENTIFYING THE RUSTY PATCHED BUMBLE BEE BOMBUS AFFINIS
www.xerces.org/bumblebees
THE XERCES SOCIETY FOR INVERTEBRATE CONSERVATION

Male or female?
Males have 6 abdominal segments; 5 in males. Females have 12 abdominal segments; 13 in females. Female hind legs are wider than male hind legs.

Identifying *Bombus affinis*
Workers and males have a distinctive rusty brown patch on the front half of their second abdominal segment. The hair on their heads is mostly black. On the thorax, black hair extends from a white patch in the middle of the thorax out towards the wings and centrally in a narrow V towards the rear.

Similar bees with yellow at the rear of the second abdominal segment
Bombus vigintus worker, *Bombus crotchus* male (crotchus bee), *Bombus lucorum*, *Bombus impatiens*.

Similar bees without yellow at the rear of the second abdominal segment
Bombus agrorum, *Bombus terrestris*, *Bombus pennsylvanicus*, *Bombus fervidus*, *Bombus ovatus*, *Bombus pennsylvanicus*, *Bombus fervidus*, *Bombus terrestris*, *Bombus crotchus* (crotchus bee).

Queen
Queens are similar to workers, except they are larger in size and do not have the rusty patch on the abdomen.

Yellow-headed long-faced bee and **Black-headed short-faced bee**
Bombus griseocollis

Current observations of individuals/extant populations of *Bombus affinis*. Credit: Xerces Society.