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PEPIN V. DIVISION OF FISHERIES AND WILDLIFE: HIGH COURT UPHOLDS HABITAT PROTECTIONS UNDER MASSACHUSETTS ENDANGERED SPECIES ACT

MICHELE A. HUNTON, ESQ. AND GLENN A. WOOD, ESQ.

On February 18, 2014, the Massachusetts Supreme Judicial Court ("SJC") issued its decision in *Pepin v. Division of Fisheries and Wildlife*, upholding the Priority Habitat regulations, which were promulgated by the Division of Fisheries and Wildlife ("DFW") to implement the Massachusetts Endangered Species Act ("MESA"), after a facial challenge to those regulations.

MESA OVERVIEW

Section 2 of MESA provides that "no person may take, possess, transport, export, process, sell or offer for sale, buy or offer to buy...any plant or animal species listed as endangered, threatened or of special concern or listed under the Federal Endangered Species Act." The term "take" is defined to include, among other things, harassing, harming, killing, and/or disrupting the nesting, breeding, feeding, or migratory activity of a protected species. To assist in determining whether a take may occur, the DFW promulgated Priority Habitat regulations which describe Priority Habitat as areas where there is the potential for a take of any endangered, threatened, or species of special concern.

Section 4 of MESA defines "Significant Habitat" as "specific areas of the Commonwealth, designated in accordance with section four, in which are found the physical or biological features important to the conservation of a threatened or endangered species population and which may require special management considerations or protection."

MESA prohibits alteration of Significant Habitat and development without a Significant Habitat Alteration Permit in a designated area. A permit can be issued if the DFW determines that "the proposed action will not reduce the viability of the significant habitat to support the threatened or endangered species." Section 4 includes protections for landowners such as requiring that, prior to designating a Significant Habitat area, the DFW must notify each property owner within the proposed area, hold a public hearing on the proposal, and record any resulting delineation on the deed of all affected parcels. Further, landowners may appeal a Significant Habitat designation or petition the DFW to purchase such habitat. However, the DFW has yet to designate any area in the Commonwealth as Significant Habitat.

Priority Habitat is defined as the "geographic extent of Habitat for State-listed Species as delineated by the Division" and is related to species occurrence records. The Priority Habitat regulations provide that a project proponent may submit a project that is located in a Priority Habitat to the DFW for review. The DFW may either determine that the project will not cause a take and proceed without further review, issue a "no take" determination, finding that the proposed project will not require a permit if certain conditions are met, or determine that the project will cause a take and require the proponent to obtain a Conservation and Management Permit. Unlike the Significant Habitat requirements, the Priority Habitat regulations do not provide

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NOTES FROM THE EDITOR

As I sit here editing what is going to be the AMWS spring newsletter for 2014 I can't help but think about a warm fire and a cup of hot cocoa. Now, tell me, what is wrong with this picture? To me this has seemed like such a long and brutal winter. I am quite ready to move on, thank you! Relief is in sight though. My three favorite harbingers of spring are here. I am serenaded by the pervasive conk-la-reel song of the red-winged blackbird (*Agelaius phoeniceus*) every morning; the wood frogs (*Lithobates sylvaticus*) are on the move (at least in Connecticut) and the small, velvety catkins of the pussy willow (*Salix discolor*) have made their appearance. Now, how about some warmth?

If you are just getting started in the field of wetland science and/or just looking for a way to get involved, we need YOU! It takes a lot of energy and motivation to make the AMWS organization as successful as it is. No experience is required. What you will receive in return is an incredible opportunity to learn from the best in the field of wetland science and to contribute to the future direction of the AMWS and the state wetland community as a whole. Come join us; write an article, participate in one of our many committees or maybe help organize an outreach or networking opportunity.

As always, we value your newsletter contributions and our contributors! If you have ideas for recurring columns or a single topical article or have ever thought about submitting an article, calendar item, book review etc. to the Newsletter, please do so. 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 deadlines for article submittal to the AMWS Newsletter are:

- June 10, 2014 for the July 2014 edition;
- September 10, 2014 for the October 2014 edition;
- December 10, 2014 for the January 2015 edition; and
- March 10, 2015 for the April 2015 edition.

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

Cori M. Rose, PWS



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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:

- \$60 for Private Sector Voting and Non-voting Members;
- \$40 for Public Sector Voting and Non-voting Members;
- \$20 for Student (Non-voting) Members;
- \$20 for Retired Voting and Non-voting Members; and
- \$325 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.)

The articles included in the AMWS Newsletters are for our reader's information. Inclusion of these articles does not imply endorsement by the AMWS.

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PRESIDENT'S MESSAGE

JOHN P. ROCKWOOD, PH.D.

As we wait for the Massachusetts Department of Environmental Protection (MassDEP) regulatory revisions for Wetlands, Water Quality Certification, and Waterways to be promulgated, I figured I would take this opportunity to look at a topic for which the regulations are not currently proposed to be changed: Densely Developed Areas (DDAs). A couple years ago, a client asked me about DDAs, and more specifically, if there were any and where are they located. The short answer is that there are eight DDAs located in seven municipalities that were designated between 1998 and 2011. We all know about DDAs, or have at least seen the term in passing, but we need to look to the applicable statutes and regulations to define this term and understand how they are designated.

When the Rivers Protection Act (RPA; An Act Providing Protection for the Rivers of the Commonwealth; c. 258 Acts of 1996, § 18) was enacted in 1996, the land located generally within 200 feet of a river's mean annual high-water line was afforded protections to be implemented through the Massachusetts Wetlands Protection Act (the Act; M.G.L. c. 131, § 40) and its regulations (the Regulations; 310 CMR 10.00). The Act, which was amended to include the requisite language of the RPA, specified certain areas which would have a 25-foot Riverfront Area rather than the standard 200-foot Riverfront Area or the 100-foot Riverfront Area in certain agricultural areas:

- Municipalities with a population of 90,000 or more or a population density of greater than 9,000 per square mile based upon the 1990 U.S. census [14 municipalities: Boston, Brockton, Cambridge, Chelsea, Everett, Fall River, Lawrence, Lowell, Malden, New Bedford, Somerville, Springfield, Winthrop and Worcester per 310 CMR 10.58(2)(a)3.a.];
- DDAs as defined in the Act and Regulations; and
- Certain specific lots located along the Charles River in Waltham and along the Neponset River in Milton as specified in the RPA and Act.

The Executive Office of Energy and Environmental Affairs (EEA) promulgated regulations at 301 CMR 10.00 on February 20, 1998 pursuant to the authority under M.G.L. c. 131, §40 as amended by St. 1996, c. 258 and by M.G.L.c. 21A, § 2 that provide a uniform process and decision standards by which municipalities with a population or population density below those specified in the Act may petition the EEA Secretary for the designation of a DDA. Notably, it is up to the municipality and not property owner(s) to petition the Secretary in accordance with 301 CMR 10.00 to seek designation of a DDA.

DDAs are defined in the RPA, Act and Regulations at 310 CMR 10.04 as:

a riverfront area that has been designated by the Secretary of the Executive Office of [Energy and] Environmental Affairs at the request of a city or town, limited to an area of 10 acres or more that is being utilized, or includes existing vacant structures or vacant lots formerly utilized as of January 1, 1944 or sooner, for intensive industrial, commercial, institutional, or residential activities or combinations of such activities, including, but not limited to the following: manufacturing, fabricating, wholesaling, warehousing, or other commercial or industrial activities; retail trade and service activities; medical and educational institutions; residential dwelling structures at a density of three or more per two acres; and mixed or combined patterns of the above. Land which is zoned for intensive use but is not utilized for such use as of January 1, 1997 shall not be designated as a densely developed area.

As I indicated above, between 1998 and 2011, a total of eight DDAs in seven municipalities have been designated by the Secretary. Unlike the designation documents and mapping for Areas of Critical Environmental Concern (ACECs) which are also the responsibility of EEA, the designation documents and mapping

for DDAs are not readily accessible on-line. When I made an attempt to track this information down, I found there was no readily apparent contact, clearinghouse or webpage for this information at either EEA or MassDEP. I must note that when I pursued this matter further, Lealdon Langley, Director of Wetlands and Waterways at MassDEP, was quite helpful and responsive and that EEA provided the requested designation documents to me in a very timely manner when asked. While certain information is available through general web searches, I should note that very limited information is available on-line for the earlier designated areas as these designations predate the materials available through the on-line Environmental Monitor archive.

Brief descriptions of the eight designated DDAs including the DDA Number, Municipality, DDA Name, Subject River(s), Riverfront Area Acreage and Date Established are as follows:

- No DDA# assigned (presumed DDA#1): Taunton; Downtown Taunton DDA; Mill River; estimated at 29 acres by MassDEP; June 9, 1998;
- No DDA# assigned (presumed DDA#2): Revere; Sales Creek DDA; Sales Creek; 50 acres; March 12, 1999;
- DDA#3: Foxborough; New Patriots Stadium DDA; Neponset River; 10.3 acres; October 23, 2000;
- DDA#4: Medford; Telecom City DDA; Malden River and Little Creek; 12 acres; May 10, 2002;
- DDA#5: Palmer; Town of Palmer DDA; Swift, Ware, Quabog and Chicopee Rivers; 375 acres (847 total acres); December 31, 2002;
- DDA#6: Taunton; Weir Village – West Water Street DDA; Taunton River; 23.59 acres; November 8, 2002;
- DDA#7: Attleboro; Downtown Attleboro DDA; Ten Mile River; 67.46 acres August 7, 2009; and
- DDA#8: Quincy; Downtown Quincy DDA; Town Brook; 39.2 acres; August 5, 2011.

property owners with advanced notice of a proposed Priority Habitat delineation nor do they require a public hearing prior to the delineation; they instead require the DFW to provide a town-based Priority Habitat map to planning boards and conservation commissions that is electronically available to the public.

CHALLENGE TO THE EASTERN BOX TURTLE HABITAT DELINEATION AND MESA REGULATIONS

The Pepins, who are the owners of 36 acres of property (the “Property”) consisting of two lots of undeveloped land in Hampden, Massachusetts, seek to construct a single family home on the first lot and sell the second lot to a buyer to construct a single family home. The DFW includes the Property in a Priority Habitat Map for the Eastern Box Turtle, a species of “Special Concern.” This determination was based on a single 1991 sighting of a turtle within 200 to 300 meters of the Property by a woman who removed the turtle from the road and transported it to an Audubon Sanctuary, where a professional herpetologist confirmed that it was a female Eastern Box Turtle approximately 20-years old. The turtle was reportedly crossing the road in the early evening during the June nesting season.

In January 2007, the Pepins submitted their development proposal to the DFW, and the DFW notified them that the project was located within Eastern Box Turtle Priority Habitat, and that it had the potential to result in a “take,” requiring a Conservation and Management Permit. In May 2007, after the Pepins submitted revised plans to the DFW, the DFW found that the project did not result in a take, but required a deed restriction and conservation easement for the Property.

In September 2008, the Pepins requested reconsideration of the DFW’s delineation of the Property in a Priority Habitat Map; however, the DFW confirmed the delineation. After an appeal and adjudicatory hearing of the decision, the Director of the DFW again confirmed the delineation. The Pepins filed an action in Hampden Superior Court in September 2009. Count I of their complaint focused on a procedural issue and the Court found that the Priority Habitat delineation was properly made because the directed decision was based on the record and the Pepins had no right to cross-examination.

The challenge to MESA was brought in Count II where the Pepins sought a declaratory judgment that the DFW’s Priority Habitat regulations are facially invalid because they are contrary to and in excess of the authority granted by MESA. The Hampden Superior Court ruled in favor of the DFW on both Counts. The Pepins then appealed and the SJC heard the case on October 8, 2013.

THE PARTIES’ POSITIONS ON THE FACIAL CHALLENGE TO THE MESA REGULATIONS

The Pepins argued that the Priority Habitat program is essentially one and the same as the Significant Habitat program and that the only real difference is that the Priority Habitat regulations do not provide for the “landowner protections” (such as advanced notice of proposed habitat designations, public hearings on proposals, and recordings of the delineations on affected parcels) that the Significant Habitat statutory scheme provides. They argued that the SJC should therefore require the DFW to afford the owners of land designated as Priority Habitat the same protection as those provided to owners of land designated as Significant Habitat. The Pepins also argued that the Priority Habitat regulations improperly prevent landowners from seeking damages in court for the taking of private property for a public purpose. They further contended that the Priority Habitat regulations are void because they are beyond the scope of the authority granted to the DFW under MESA.

The crux of the DFW’s argument was that MESA’s Significant Habitat provisions and the DFW’s Priority Habitat screening regulations serve separate and distinct statutory interests and purposes. The DFW argued that MESA defines Significant Habitat as areas worthy of heightened protection and special management to assure survival for Threatened, Endangered, and Species of Special Concern. In contrast, the DFW contended that Priority Habitat is simply the extent of known habitat for all state-listed species, and that the DFW maps Priority Habitat to screen projects and provide notice to property owners that development may potentially result in a take. The DFW explained that MESA’s plain language authorizes the DFW to regulate and permit habitat impacts that cause a take.

The DFW further argued that MESA does not require that Priority Habitat mapping include the “landowner protections” mandated for Significant Habitat designation because the Priority Habitat regulations allow development to proceed while assuring certain conditions, if necessary, to protect MESA’s interests, whereas Significant Habitat regulations are designed to carve out certain areas requiring heightened protection and substantially restrict or block development. The DFW stated that most projects in Priority Habitat (including 75% in 2009) proceed as proposed without permits or restrictions. It argued that the Priority Habitat regulations are a reasonable means of implementing MESA’s take prohibition and are within the broad authority of the statute for the DFW to administer its goals. The DFW further contended that the Pepins’ argument that the Priority Habitat regulations do not provide landowners with an opportunity to file suit based on a taking of private property for public purpose is without merit because property owners do not need explicit statutory permission to file a takings claim since such a claim stems from the 5th Amendment of the Constitution.

THE SJC’S OPINION

In upholding the Priority Habitat regulations, the SJC found that “the regulations serve to implement the existing statutory provision prohibiting takes of State-listed species, which is critical to the operation of MESA as a whole,” agreeing with the DFW’s position that the Priority Habitat scheme is an appropriate means of protecting “species put in harm’s way by a project or activity that disrupts behavior essential to survival” so as to advance the overall statutory purpose of protecting listed species and their habitats “to the greatest extent possible.”

In responding to the Pepins’ argument, the SJC found that MESA’s provision for the designation and regulation of Significant Habitat does not preclude the DFW from enacting regulations to address “the more general problem of preventing takes of all State-listed species in a manner that is more tailored to individual projects and habitats.” It found that while the Priority Habitat regulations do not offer landowners comparable protections as the Significant Habitat provisions, the burdens imposed on landowners by Priority Habitat are not

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Pepin (Continued from Page 4)

comparable to those imposed by Significant Habitat. It found that the restrictive Significant Habitat provisions only allow a permit if it is found that there is no reduced viability of the Significant Habitat, whereas the Priority Habitat regulations "are designed to facilitate property development, albeit in an environmentally sensitive manner."

The SJC found that, while the conditions that may be imposed as part of the Priority Habitat review process may restrict land use in certain respects or require financial expense, the process is ultimately flexible in that it provides guidance to landowners on structuring projects "to avoid committing takes, and, in so doing, ensures them a safe harbor from liability under the statute." Rather than unconditionally prohibiting development, the Priority Habitat regulations permit takes, so long as adequate mitigation, including on-site mitigation, off-site mitigation, and/or conservation research, is provided. The SJC found that, therefore, where the Significant Habitat provisions stringently restrict development and provide landowners with robust procedural protections before doing so, "the priority habitat regulations neither constitute a comparable bar against development, nor require comparable procedural mechanisms."

The Pepin decision ensures that Massachusetts courts will continue to protect species and their habitat while providing flexibility to landowners on project design to protect them from liability.

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Restoration (Continued from Page 3)

It must be noted that only very specific areas proximate to a limited reach of the named rivers are located within the designated DDAs; I make no attempt herein to describe the extent or boundaries of these areas. The designation document for each DDA provides a detailed narrative description of the area boundary. I have provided the eight designation documents obtained from EEA to our Administrator and they will be posted on the AMWS website under the Library tab. By regulation, maps showing the boundaries of designated DDAs are to be available from EEA and from the municipalities with such designated areas. Based upon my experience, the conservation commissions in the municipalities where these areas are located might be your best source of information.

I hope that the brief descriptions of the eight designated DDAs listed above are helpful and will provide a starting point if you have a site located in or near one of these areas. I wish everyone well with their permitting endeavors.



ASSIST IN UMASS RESEARCH!

ASSISTANCE NEED FOR UMASS INVASIVE SPECIES MAPPING PROJECT

Tyler Cross, a student of Dr. Bethany Bradley at UMass Amherst is working on a project to understand the biogeography of invasive species in the Northeastern United States. Their goal is to understand and map abundances of twelve regionally important invasive species and use those distributions to predict invasion risk. The first step in making the project a reality is to determine where the target invasive species are abundant, where they're rare, and where they currently don't exist. The project needs individuals with knowledge of invasive species distribution across any spatial area (neighborhood, town, natural area) in the Northeast. If you are willing to help, Tyler will work with you to create a survey map of the area you are familiar with. Filling out the surveys is simple. The species being examined are:

Alliaria petiolata (Garlic Mustard)
Celastrus orbiculatus (Oriental Bittersweet)
Cynanchum louisea (Black Swallow-wort)
Frangula alnus (Glossy Buckthorn)
Fallopia japonica (Japanese Knotweed)
Lonicera japonica (Japanese Honeysuckle)
Lythrum salicaria (Purple Loosestrife)
Persicaria perfoliata (Mile-a-minute vine)
Anthriscus sylvestris (Wild Chervil)
Centaurea biebersteinii (Spotted Knapweed)
Microstegium vimineum (Japanese Stilt-Grass)
Senecio jacobaea (Tansy Ragwort)

If you are aware of the extent of an infestation for of any of the above species (in a neighborhood, town, or natural area) please contact Tyler at cross.tyler@gmail.com.

SMARTPHONE APP FOR INVASIVE SPECIES DATA COLLECTION



There is a smartphone app for the Outsmart Invasive Species Project to learn about, identify and report invasive species using an iPhone or Android available for free. Thanks to a collaboration between the Center for Public Policy and Administration (CPPA) at the University of Massachusetts Amherst and the state Department of Conservation and Recreation (DCR), efforts to combat potentially devastating species are gaining momentum. Anyone with a smartphone or a digital camera can help scientists collect valuable data about invasive species throughout Massachusetts. Visit the project website at www.masswoods.net/outsmart.

Participants who have digital cameras and access to the Internet can also submit data by registering through the free Early Detection and Distribution Mapping System at <http://www.eddmaps.org/outsmart/join.cfm>

**APRIL 14 - 17,
2014**

**THE MASSDEP HAS SCHEDULED
ITS FIRST ROUND OF DEP
WORKSHOPS ON ITS REGULATORY
REVISIONS**

**LAKEVILLE, SPRINGFIELD,
WORCESTER AND BILLERICA,
MASSACHUSETTS**

**REVISIONS TO MASSDEP
WETLANDS, WATERWAYS AND
WATER QUALITY CERTIFICATION
REGULATIONS**



**APRIL 22 - 23,
2014**

**THE MASSDEP HAS SCHEDULED
PUBLIC COMMENT SESSIONS
ON PROPOSED 310 CMR 4.00
REGULATION AMENDMENTS**

**LAKEVILLE,
BOSTON AND SPRINGFIELD,
MASSACHUSETTS**

**AMENDMENTS TO TIMELY
ACTION SCHEDULE AND FEE
PROVISIONS (EFFECTIVE JUNE
20, 2014)**

After more than two years of extensive work reviewing and incorporating public comments, receiving input from advisory committees and other stakeholders, MassDEP will be promulgating wetlands and waterways regulatory revisions in early 2014. Prior to the effective date, application forms will be revised.

Contact your Regional Wetland Circuit Rider for more information and plan to attend one of these informational workshops.

April 14, 2014 (Mon.) -- Lakeville - 1:00 p.m. - 3:00 p.m.
[MassDEP Southeast Regional Office](#), Main Conference Room, 20 Riverside Drive

April 15, 2014 (Tues.) -- Springfield - 1:00 p.m. - 3:00 p.m.
[MassDEP Western Regional Office](#), 3rd floor Courtroom (NO food or drinks allowed), 436 Dwight Street

April 16, 2014 (Wed.) -- Worcester - 1:00 p.m. - 3:00 p.m.
[MassDEP Central Regional Office](#), Main Conference Room, 627 Main Street

April 17, 2014 (Thurs.) -- Billerica - 1:00 p.m. - 3:00 p.m.
[Billerica Public Library](#), Meeting Room, 15 Concord Road

You must pre-register with the appropriate Wetland Circuit Rider (below), except for the Springfield workshop. Additional workshops will follow.

Northeast: Pamela.Merrill@state.ma.us
Southeast: Christine.Odiaga@state.ma.us
Central: Nancy.Lin@state.ma.us

Additional information:

<http://www.mass.gov/eea/agencies/massdep/water/watersheds/wetlands-and-waterways-presentations-and-fact-sheets.html>

Fee Regulation Package 2014-2 includes amendments to implement MassDEP's regulatory reform initiatives and other program improvements. The proposed amendments add or delete permit fee categories; adjust permit review schedules and fee rates; clarify the applicability of fee categories; update or correct citations to provide statutory and regulatory consistency; and, delete expired fee categories or text for environmental programs for Air Quality, Hazardous Waste, Solid Waste, Water Supply, Watershed Management, Water Pollution Control, Wetlands and Waterways, and Waste Site Cleanup.

Public Hearings will be conducted under the provisions of Chapter 30A of the Massachusetts General Laws on:

April 22, 2014 (Tues.) -- Lakeville - 10:00 a.m.
[MassDEP Southeast Regional Office](#), 20 Riverside Drive, (508) 946-2700

April 23, 2014 (Weds.) -- Boston - 10:00 a.m.
[MassDEP Headquarters](#), One Winter Street, (617) 292-5500

April 23, 2014 (Weds.) -- Springfield - 2:00 p.m.
[MassDEP Western Regional Office](#), 436 Dwight Street, (413) 784-1100

Public Review Period: Testimony may be presented orally or in writing at the public hearings. In addition, written comments will be accepted at the address below until 5:00 p.m. on Monday, 5/05/14.

Please submit three copies of any written comments to: Jay Eberle, 3rd Floor, Department of Environmental Protection, One Winter Street, Boston, MA 02108. Written testimony may also be sent by email to jay.eberle@state.ma.us.

Additional information:

<http://www.mass.gov/eea/agencies/massdep/news/comment/310-cmr-4-00-timely-action-and-fees-proposed-amendments.html>

DR. AL GETS HIS WISH

BRIAN BUTLER, AMWS PAST PRESIDENT

The following nugget of information won't be seen on the six o'clock news or in any regional or local newspaper. Also you will be hard pressed to find it on the internet without at least a little determination. This is exactly why I am recounting this recent regulatory change for our membership.

For about a decade, most conversations I've had with Dr. Alan Richmond of the University of Massachusetts (UMass), and the State's preeminent herpetologist, have somehow eventually turned to the issue of our virtually unregulated snapping turtle fishery and how dangerously archaic this condition is. On December 17, 2013 the Massachusetts Fisheries and Wildlife Board convened at Division Field Headquarters to discuss regulatory changes, including significant modification to the allowances for harvests of the common snapping turtle. Also under review that snowy afternoon were changes in baitfish importation and sale and rules regarding the taking of

carp and suckers in the Commonwealth. The common snapping turtle, *Chelydra s. serpentina*, in Massachusetts has historically had, and will have for at least 2014, liberal harvest allowances for any person possessing a valid fishing license. To quote current Regulation [321 CMR 3.05(2)]:

"Snapping turtles (*Chelydra serpentina*) may be taken from January 1 to December 31, with no daily or seasonal bag limit."

Similarly, under a special permit, snapping turtles can be taken without numerical limitation in Massachusetts. Over the last three decades, snappers have been harvested from Massachusetts and adjacent states in large numbers. Although not a major industry, the few trappers that go through the effort are very effective. During our field work trapping turtles, we have repeatedly seen the residual effects of a largely uncontrolled harvest of snapping turtles

in diverse sites in Massachusetts and New Hampshire.

At various sites where we have conducted live trapping for state listed turtle species, we have found a compelling trend. In those ponds and swamps accessible from public ways, we often find our by-catch of snapping turtles is comprised of small (10-14" carapace), ten to fourteen year old animals that are readily removed from hoop nets.

This is refreshing in terms of level of effort required to tend traps, but disconcerting for the following reason. Snapping turtles, like northern turtle species, in general should show population profiles that resemble an inverted pyramid. Most of the standing population would typically be in the range of reproductive to "Methuselah" age class. For example, when we trap deep in the interior of a private site or on military installations free from public access, we might find two to five 30-40 pound behemoth snappers crammed into a single trap.



A female snapper deposits one of possibly multiple clutches of eggs, from 15 to 80 or more per clutch. With new regulations, these breeding females will be less vulnerable to collection for the turtle soup market.
Credit: B. Butler.

After witnessing this trend repeatedly over more than two decades, I am quite convinced that there is a large hole cut in the demographic fabric of much of the snapping turtle habitat in our area. Nonetheless, no one, including me, considers the snapper in immediate jeopardy (but see Passenger Pigeon). However, it seems the time for closing the regulatory gap on this species is due, if not overdue.

The domestic market for snapping turtle meat is not on par with that for sushi, and hopefully never will be. But, many thousands of our turtles have made the ride down the coast to the Mid-

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Atlantic turtle soup market and beyond. Additionally, the northeastern snappers (New York and New England) are apparently the largest individuals of the species, on average in the United States. This only adds to their desirability in dollars per pound. I have heard anecdotes that turtle farms set up elsewhere have deliberately utilized northeastern snappers for their brood stock. Whether our snappers are genetically predisposed to relative gigantism or they are far enough north, but not too far, to sort themselves out at larger sizes, I don't know.

I recall driving back from a Georgia turtle trip many years ago and deliberately taking the scenic route north. This back-road tour brought us through Blue Ball, Pennsylvania. In front of the Blue Ball Inn (since torn down, I hear) was a sandwich board: "We have Turtle Soup!" I had to go in and give it a taste. It was an interesting place; I recall the soup was brown. Also snippets of memory recall the gent with one arm playing pool, a general sense that I wanted to get out of there and a good number of snapping turtle shells nailed up on the walls behind the bar and randomly around the room, all as brown as the soup. But I make these recollections because all of those Pennsylvania snapper shells were no more than 12 or 13 inches. It is customary to hang the biggest trophies on the wall, so I presumed that 13 inches was a big turtle in those parts. In contrast 16 and 17+ inch specimens are relatively common in northern sectors not subject to prior decimation in our area.

For the record, the largest snapping turtle was captured here, in Worcester County, Massachusetts. It measured in at 18.5 inches. All those stories of three-foot shelled snappers biting through the canoe, popping a car tire, eating a hat or snapping a broomstick – all bunk. Yes, bunk, but a credit to the ferocity of appearance that evolution has bestowed upon snapping turtles.

Without additional elaboration or anecdote, suffice it to say that snapping turtles cannot sustain unlimited, or even moderately limited, harvest over the long-term. The further north they live, the more this becomes true. A well-executed Canadian study determined that a skilled otter who had learned the technique to attack and kill hibernating snappers, almost without doubt put that population



A snapper caught in the open. Their "stand-our-ground" policy, hissing and lunging make them appear much larger in our minds than a yard stick would verify. Credit: B. Butler.

on an inescapable population spiral from which it cannot possibly rebound, barring almost bizarrely fortuitous conditions, for a few lucky decades. We are not that much south of, or warmer than, that population.

And so, following comments from myself, Dr. Al and a few others, the Fisheries and Wildlife Board voted to amend the regulations regarding the harvest of snapping turtles. The new regulations will not take effect until the 2015 season, so one more year of limitless harvest potential remains.

Although not published yet, the text of the language, reportedly voted upon and accepted without amendment, is as follows:

321 CMR 3.05

(5) Common snapping turtles (*Chelydra serpentina*) that measure at least 12 inches in straight-line carapace length may be taken by hand, dip net or gaff, up to a limit of 2 per day, or in possession for personal use by licensed fishermen of 2 per day. Snapping turtles may not be taken from May 1 to July 16.

(6) No reptile or amphibian may be taken from the wild in Massachusetts for purposes of sale. No reptile or amphibian may be taken with a firearm.

These new regulations eliminate the taking of animals during the nesting season at which time large, egg-laden females are easily taken from road shoulders and other terrestrial localities. It also eliminates the commercial harvest in its entirety. With the tremendous demand for turtles and turtle products in Asian markets, this latter measure is dearly needed. I have seen photographs of snapping turtles (from North America) in overseas markets, alongside numerous other U.S. species. Transport logistics and costs don't seem to dissuade the collection and sale of our turtles to cultures that, in the absence of regulatory protection, have wiped out their own supplies of native turtles.

These regulations will at least put our law enforcement and judicial systems in the position to act if our turtles become just a little too desirable to those beyond Massachusetts' borders.

PROPOSED RULE FOR PUBLIC COMMENT -- DEFINING THE SCOPE OF WATERS PROTECTED UNDER THE CLEAN WATER ACT

JOHN P. ROCKWOOD, PH.D., PWS

In the January 2014 AMWS Newsletter, I provided a discussion of the proposed rule that was submitted late last year to the Office of Management and Budget (OMB) for interagency review. On March 25, 2014, the Environmental Protection Agency (EPA) and Army Corps of Engineers (Corps) released for public comment a revised proposed rule which is some 370 pages in length which defines the scope of waters protected under the Clean Water Act (CWA). The purposes of this article are simply to provide the current version of the definition of "waters of the United States" (WOUS), identify the major differences from the prior proposed rule and to identify where you can obtain and comment on the proposed rule.

At the time of this writing, the unofficial revised proposed rule, upon which this article is based, is available at http://www2.epa.gov/uswaters?inf_contact_key=906d0a5f9021a3962587013f5b7648f9c1326e3d3decab19f4b8e3fca58ed1ac; following publication in the Federal Register, the official version of this proposed rule will be available at the above link on the EPA website. Comments will be accepted following the procedures detailed at the above link for a 90-day period following publication in the Federal Register. AMWS is interested in your opinion on the proposed rule. If you submit comments, please provide a copy to AMWS at administrator@amws.org.

Under the revised proposed rule, the EPA and the Corps have attempted to clarify the definition of WOUS. The revised proposed rule would, when finalized, replace the text at 33 CFR 328.3 (a) through (c) and at 40 CFR 230.3(s) and (t) as well as other places within 40 CFR including Sections 110.1, 112.2, 116.3, 117.1, 122.2, 232.2, 300.5, part 300 Appendix E, 302.3, and 401.11 with the italicized text below:

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 et. seq. and its implementing regulations, subject to the exclusions in paragraph (b)

of this section, the term "waters of the United States" means:

- (1) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
 - (2) All interstate waters, including interstate wetlands;
 - (3) The territorial seas;
 - (4) All impoundments of waters identified in paragraphs (a) (1) through (3) and (5) of this section;
 - (5) All tributaries of waters identified in paragraphs (a)(1) through (4) of this section;
 - (6) All waters, including wetlands, adjacent to a water identified in paragraphs (a)(1) through (5) of this section; and
 - (7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (a)(1) through (3) of this section.
- The major changes made in paragraph (a) above were to make the section more self-referential. Section (a)(4) was apparently limited by changing 'otherwise defined as waters of the United States under this definition' to 'identified in paragraphs (a) (1) through (3) and (5) of this section.' Section (a)(5) which addresses tributaries was expanded by changing 'identified in paragraphs (1) through (3) of this section' to 'identified in paragraphs (a)(1) through (4) of this section.'
- (b) The following are not "waters of the United States"
- notwithstanding whether they meet the terms of paragraphs (a) (1) through (7) of this section --
 - (1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.
 - (2) Prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act the final authority regarding Clean Water Act jurisdiction remains with EPA.
 - (3) Ditches that are excavated wholly in uplands, drain only uplands, and have less than perennial flow.
 - (4) Ditches that do not contribute flow, either directly or through another water, to a water identified in paragraphs (a)(1) through (4) of this section.
 - (5) The following features:
 - (i) artificially irrigated areas that would revert to upland should application of irrigation water to that area cease;
 - (ii) artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing;
 - (iii) artificial reflecting pools or swimming pools created by excavating and/or diking dry land;
 - (iv) small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons;

- (v) water-filled depressions created incidental to construction activity;
- (vi) groundwater, including groundwater drained through subsurface drainage systems; and
- (vii) gullies and rills and non-wetland swales.

One important clarification clause which seems to give additional weight to paragraph (b) is found in the opening sentence: ‘notwithstanding whether they meet the terms of paragraphs (a)(1) through (7) of this section.’ Otherwise, except for some modest revisions, the majority of the changes in paragraph (b) above are formatting and re-ordering revisions. Section (b)(3) was renumbered as (b)(5) and was changed from a semicolon delimited list of non-jurisdictional features to a more accessible numbered list; Section (b)(5)(vi) was expanded to include groundwater in general, not just groundwater drained through subsurface drainage systems; and the term ‘puddle’ was deleted. Section (b)(4) was renumbered as (b)(3) and was revised to change ‘drain only uplands or non-jurisdictional waters’ to ‘drain only uplands’ and ‘have no more than ephemeral flow’ to ‘have less than perennial flow.’ Section (b)(5) was renumbered as (b)(4) and was revised to change ‘through other waterbodies’ to ‘through another water’ and ‘identified in paragraphs (a)(1) through (a)(3) of this section’ was expanded to ‘identified in paragraphs (a)(1) to (4) of this section.’

Section (c) of the WOUS definition includes definitions of the terms adjacent, neighboring, riparian area, floodplain, tributary, wetlands, and significant nexus. The terms adjacent, floodplain and wetlands are unchanged from the previously reviewed proposed rule and are not repeated here. Limited changes were made to the definitions of neighboring and riparian area and more significant changes were made to the definitions of tributary and significant nexus. The revised definitions and changes for these four terms are as follows.

- (2) Neighboring: The term neighboring, for purposes of the term “adjacent” in this section, includes waters located within the riparian area or floodplain of a

water identified in paragraphs (a) (1) through (5) of this section, or waters with a shallow subsurface hydrologic connection or confined surface hydrologic connection to such a jurisdictional water.

This definition was revised largely by changing ‘a surface or shallow subsurface hydrologic connection’ to ‘a shallow subsurface hydrologic connection or a confined surface hydrologic connection.’

(3) Riparian area: The term riparian area means an area bordering a water where surface or subsurface hydrology directly influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

This definition was tightened by changing ‘surface or subsurface hydrology influence’ to ‘surface or subsurface hydrology directly influence.’

(5) Tributary: The term tributary means a water physically characterized by the presence of a bed and banks and ordinary high water mark, as defined at 33 CFR § 328.3(e), which contributes flow, either directly or through another water, to a water identified in paragraphs (a)(1) through (4) of this section. In addition, wetlands, lakes, and ponds are tributaries (even if they lack a bed and banks or ordinary high water mark) if they contribute flow, either directly or through another water to a water identified in paragraphs (a)(1) through (3) of this section. A water that otherwise qualifies as a tributary under this definition does not lose its status as a tributary if, for any length, there are one or more man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or along the run of a stream, debris piles, boulder fields, or a stream that flows underground) so long as a bed and banks and an ordinary high water mark can be

identified upstream of the break. A tributary, including wetlands, can be a natural, man-altered, or man-made water and includes waters such as rivers, streams, lakes, ponds, impoundments, canals, and ditches not excluded in paragraphs (b)(3) or(4) of this section.

This definition was revised by swapping the second and third sentences and generally substituting the word ‘water’ or ‘waters’ for ‘waterbody,’ ‘water body’ or ‘waterbodies,’ as appropriate, in all four sentences of the definition. This is consistent with the view that a wetland can be found to be adjacent to a tributary wetland, not just a tributary waterbody. The first sentence was also revised to add a regulatory citation for the term ordinary high water mark [33 CFR § 328.3(e)] and changed by expanding ‘identified in paragraphs (a)(1) through (a)(3) of this section’ to ‘identified in paragraphs (a)(1) through (4) of this section.’ The second sentence was revised to expand ‘wetlands are tributaries’ to ‘wetlands, lakes, and ponds are tributaries.’ The third sentence was limited by changing ‘identified upstream or downstream of the break’ to ‘identified upstream of the break.’ Lastly, the fourth sentence was revised to update the references for non-jurisdictional ditches [i.e., changing ‘(b)(4) or (5)’ to ‘(b)(3) or (4)’].

(7) Significant nexus: The term significant nexus means that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to the nearest water identified in paragraphs (a) (1) through (3) of this section), significantly affects the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. For an effect to be significant, it must be more than speculative or insubstantial. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or sufficiently close to a “water of the United States” so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or

Continued on Page 11

biological integrity of a water identified in paragraphs (a)(1) through (3) of this section.

The definition of significant nexus was expanded from two to three sentences in an apparent effort to try to clarify the level of interaction necessary for a water to affect the chemical, physical or biological integrity of the nearest applicable water. The two major changes in the first sentence, other than a general change in sentence structure, relate to the inclusion of the term ‘significantly affects’ in the place of ‘more than a speculative or insubstantial effect’ and the phrase ‘nearest water identified in paragraphs (a)(1) through (3) of this section.’ The prior version, in defining the scope of similarly situated waters, did not limit the scope to the watershed draining to the nearest applicable water, but potentially more broadly to the watershed draining to an applicable water. The new second sentence gets the all important phrase ‘more than speculative or insubstantial’ back into the definition by simply stating that for an effect to be significant on the chemical, physical or biological integrity of an applicable water, the effect must be more than speculative or insubstantial.

A more detailed analysis of the final rule, once issued, will be included in a future AMWS Newsletter. While it remains the professed intent and purpose of the proposed rule to provide needed clarity, it is the author’s continued opinion that the level of uncertainty in the revised proposed rule combined with the introduction of additional undefined terms remains problematic. To be effective, regulations must be clearly written to allow for uniform application by both regulators and the regulated community. It is hoped that significant public comments on this version of the proposed rule will cause the EPA and Corps to at least partially address the underlying deficiencies in the rule.

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INTEGRATING LANDSCAPE-BASED ECOLOGICAL ASSESSMENT WITH INTENSIVE FIELD METHODOLOGIES TO MONITOR WETLAND CONDITION IN MASSACHUSETTS

SCOTT JACKSON

The U.S. Environmental Protection Agency (EPA) has been encouraging states to develop and implement wetland assessment and monitoring programs. The objective is to create programs in all states that can assess and report on the condition of wetlands as “waters of the United States.” EPA guidance recommends a three level approach. A level one assessment is landscape-based and traditionally uses Geographic Information System (GIS) data and models to assess the condition or integrity of wetlands based on surrounding land use and anthropogenic stressors likely to affect those wetlands. Rapid Assessment Methodologies (RAMs) represent level two and typically involve a single field visit to document indicators of condition or stressors that might be affecting wetland condition. The third level of assessment involves intensive field methods that generally involve multiple site visits and detailed (often expensive) assessments of soils, hydrology and multiple biological taxa. The challenge for any state is to determine how to best integrate these three levels into a comprehensive assessment and monitoring program covering the diversity of wetlands found in that state.

In 2007 the Massachusetts Department of Environmental Protection (MassDEP), the Massachusetts Office of Coastal Zone Management (CZM) and the University of Massachusetts Amherst (UMass) began collaborating on a comprehensive wetlands assessment and monitoring program for the state. At that time UMass had already been working on a landscape-based assessment tool (Conservation Assessment and Prioritization System or “CAPS”) that was well suited as a level one assessment methodology. CZM had developed a RAM for salt marshes. Consequently, there were a couple of building blocks for a comprehensive program, but there was much work still to be done.

It was decided to work on development of level three, intensive field methodologies. The rationale for this decision was recognition that both level one (CAPS) and level two assessments (RAMs) don’t assess wetland condition directly, but are models that predict wetland condition based on an evaluation of stressors in the environment. Before investing a lot of confidence in these models it would be a good idea to test them using indicators of wetland condition assessed in the field. Although this sounds good in theory it is actually a tricky thing to implement in practice.

When identifying possible indicators of wetland conditions, be they abiotic (soils, hydrology) or biological (plants, algae, invertebrates), you need to have some reference standard for what it means to be a wetland in good condition. The traditional approach has been to identify reference wetlands that are “minimally disturbed” by human activities but in some cases have to be based on a standard of “least disturbed” because pristine wetlands simply aren’t available. The approach also contains a certain amount of circular reasoning. Wetlands that lack observable stressors are assumed to be in good condition; the characteristics of those wetlands are then used to test models based on the presence or absence of observable stressors.

With these limitations in mind, we set out to collect biological information for three wetland/aquatic ecosystems (salt marshes, forested wetlands and wadeable streams) in order to test and improve CAPS models of ecological integrity. CAPS is a computer program and an approach for conducting landscape-based ecological assessments based on a suite of metrics, most of which are models of specific ecological stressors (e.g., nutrient enrichment, road salt, impervious surfaces, fragmentation). Metrics are selected, parameterized and

combined in models specific for each ecological community (e.g., forest, shrub swamp, coastal beach, salt marsh) that we can effectively map. The output of these models is an Index of Ecological Integrity (IEI) ranging from zero (low integrity) to one (highest integrity). It is also possible to use the CAPS metrics to analyze any particular stressor separate from the overall integrity model. For more information about CAPS visit our web site: www.umasscaps.org.

Rather than use a reference condition that relies on wetlands in relatively pristine environments we used the CAPS IEI gradient as a “generalized stressor gradient” with high IEI scores representing low stress and low IEI scores indicating high impact from anthropogenic stressors. In this way we could utilize the full range of the stressor gradient as a reference for identifying indicators of wetland condition. We hypothesized that, if the IEI gradient was “real,” then we would expect to find a gradient of biological indicators in wetlands that correlated with this predicted integrity gradient. Further, we ought to be able to detect relationships between biological gradients and specific stressor metrics. Thus we set out to see if we could construct functional Indices of Biotic Integrity (IBIs) based on IEI and metric scores generated by CAPS.

MassDEP already had a robust dataset of macroinvertebrate samples collected as part of their regular assessment program for wadeable streams. The MassDEP data provided information on 294 taxa at 490 sites spread across the state that were then used to develop CAPS-based IBIs. Further, there are a large number of published IBIs for streams, the results from which we used to test the IBIs derived from CAPS models.

Building on their experience developing a salt marsh RAM, biologists from CZM (working in collaboration with MassDEP and UMass) developed an intensive field assessment methodology for these coastal wetlands. We have come to refer to these level three methodologies as “Site Level Assessment Methods” or “SLAMs”. The salt marsh SLAM focuses on vegetation and macroinvertebrates sampled using a variety of methods (auger, D-net sweeps, and quadrat). At the time when we conducted our statistical analyses and IBI development, 130 salt marsh sites had been evaluated yielding information on 107 taxa.

UMass took the lead in developing a “site level assessment method” for forested wetlands. The forested wetland SLAM cast the broadest net in terms of major taxa groups, sampling algae (diatoms),

bryophytes (mosses and liverworts), vascular plants, epiphytic macro-lichens and macroinvertebrates (including earthworms). The SLAM methodology was implemented at a total of 219 sites in the Concord, Chicopee and Miller’s River watersheds. These assessments yielded information on 842 taxa (379 vascular plants, 113 bryophytes, 32 lichens, 157 diatoms and 161 macroinvertebrates).

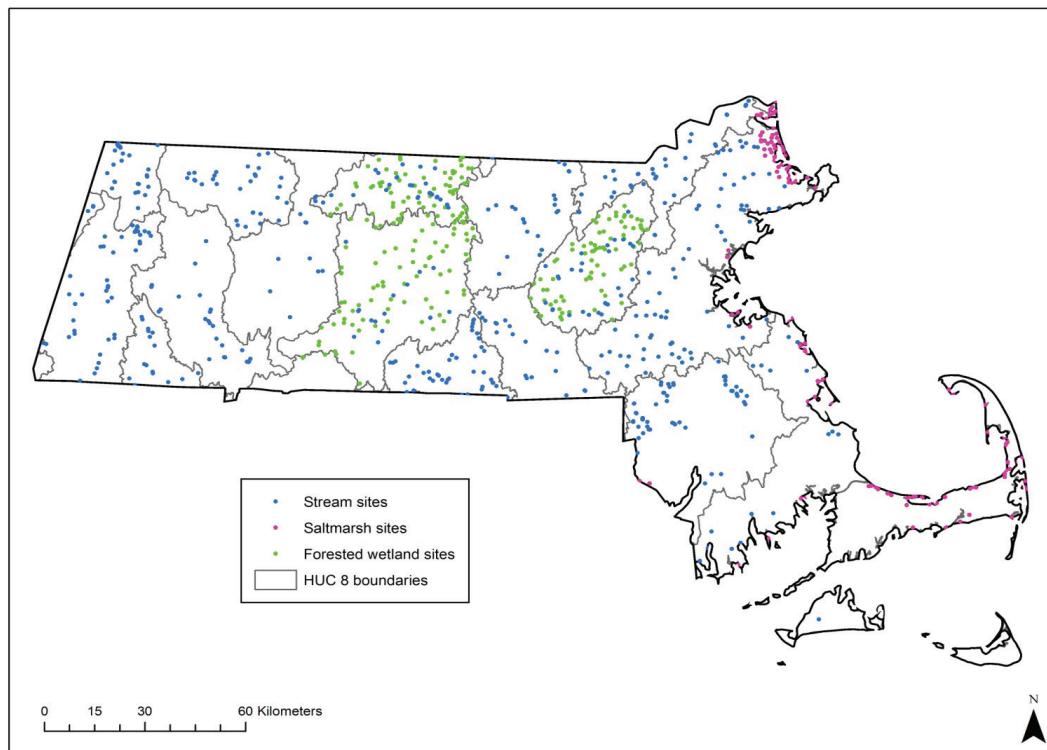
Sampling locations (sites) in forested wetlands ($n=219$), salt marshes ($n=130$) and wadeable freshwater streams ($n=490$) in Massachusetts used to develop Indices of Biotic Integrity (“IBIs”).

Data collected in the field were subjected to a battery of sophisticated statistical analyses to discover relationships that might exist between particular taxa and IEI and/or metric gradients. Advanced modeling approaches selected taxa for use in IBIs and multiple validation procedures were used to prevent overfitting models and spurious results.

The process yielded some very interesting observations. First, taxa included in IBIs were not necessarily adapted to either highly disturbed or pristine sites. Many taxa showed a tendency to be

either more or less abundant (either can serve as a good indicator) at intermediate IEI or metric scores. Second, the relationships between taxa abundance and IEI or metric gradients were often weak. However, combining many taxa with weak relationships can yield IBIs that are quite robust. Finally, it was possible to construct valid IBIs both for IEI and for metrics. Those IBIs that we considered significant had cross-validated coefficients of concordance ranging from 0.50 to 0.89.

In forested wetlands we produced valid IBIs for IEI and the following metrics: nutrient enrichment, road salt, road sediment, habitat loss, watershed habitat loss, similarity, connectedness, aquatic connectedness, non-



native invasive worms, non-native invasive plants, edge predators, road traffic, microclimate alterations and the amount of impervious cover within the 100-foot buffer zone. We were less successful in developing IBIs for salt marshes, probably because a larger sample size is needed to make up for the relatively low number of taxa found in these environments. We were able to construct valid IBIs for IEI as well as for connectedness and the amount of impervious cover within the 100-foot buffer zone.

The large number of sites and taxa from wadeable streams yielded strong IBIs for IEI and the following metrics: watershed imperviousness, nutrient enrichment, road sediment, habitat loss, watershed habitat loss, connectedness and aquatic connectedness. We tested our suite of IBIs for wadeable streams against 31 independently developed and published biotic metrics. The results corroborated the validity of our stressor metrics and the IBIs derived from them.

The work involved in developing robust and useful methods for assessing wetland conditions continues. Since our IBI analyses were initially conducted, CZM (with assistance from MassDEP) has assessed an additional 45 salt marsh sites and more assessments are planned. It is our expectation that as the number of sites increases the more successful we will be in developing salt marsh IBIs. An additional 39 forested wetlands sites were assessed in the Taunton River watershed, bringing the total number of sites for this wetland type up to 258 and expanding the geographic scope of the assessment to include southeastern Massachusetts. Fieldwork in 2014 and 2015 will focus on forested wetlands at sites west of the Connecticut River. Much of this continued sampling is aimed at evaluating how robust IBIs are for assessing forested wetlands across the full range of geographic settings in Massachusetts.

In examining the results of IBI development and testing for forested wetlands, we observed that IBIs developed using only vascular plants performed almost as well (coefficient of concordance=0.79) as IBIs developed using all available taxa (0.81). This suggests that by focusing solely on vascular plants the SLAM for

forested wetlands can be simplified and made more affordable and logically easier to implement. This observation may not hold for other wetland types. Macroinvertebrates performed very well in wadeable streams and in salt marshes macroinvertebrates generally out-performed vascular plants for IBI development.

This field season we will begin sampling vascular plants in shrub swamps to initiate development of IBIs for this wetland type. We are also developing customized software that will make it feasible for others to use assessment methodologies developed as part of this collaborative project and implement our IBIs for evaluating wetland condition.

The three-way collaboration among MassDEP, MA CZM and UMass Amherst has proven to be quite productive. Much of the work has been funded by EPA via Wetlands Program Development Grants. It has provided an opportunity to test and improve CAPS metrics and models and enhance the credibility of this landscape-based modeling approach. The level one assessment (CAPS) provides comprehensive assessments of wetland condition for all wetlands in Massachusetts. The SLAMs and IBIs provide opportunities to assess individual wetlands to investigate site-specific issues or problems and track the performance of wetland restoration and mitigation sites.

It is anticipated that over time we will be able to simplify the SLAM procedures enough to create credible rapid assessment methodologies (RAMs) thereby incorporating all three EPA levels into the Massachusetts Wetlands Assessment and Monitoring Program. To get a report describing the development of IBIs, as well as other reports on wetlands assessment and monitoring, go to the "Documents & Reports" tab on the UMASS CAPS website (www.umasscaps.org) or visit the MassDEP web site.

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EMERALD ASH-BORER (EAB) BIOLOGICAL CONTROL WASP (*Spathius argil*) ESTABLISHED IN MINNESTOA

Emerald ash borer, commonly shortened to EAB, was first discovered in Michigan in 2002. EAB larvae, feeding on the inner bark of ash trees, have killed tens of millions of ash trees in southeastern Michigan, and tens of millions more in 20 U.S. states and two Canadian provinces.

The wasp has been found reproducing in MN, OH, IN, IL, MD, NY, and TN, and, more locally it has been released in Dalton, MA.

Link to the news:
<http://www.startribune.com/local/minneapolis/235415261.html>



Emerald Ash Borer (*Agrilus planipennis*)
Source: U.S. Forest Service



Biological Control Wasp (*Spathius argil*)
Source: U.S. Department of Agriculture

US ARMY CORPS OF ENGINEERS, NEW ENGLAND DISTRICT WETLAND FUNCTIONAL ASSESSMENT

PAUL MINKIN, PH.D., PWS, CSE

The US Army Corps of Engineers, New England District (New England District), is developing a new quantitative functional assessment methodology to replace the qualitative "Highway Methodology Workbook Supplement - Wetland Functions and Values - a Descriptive Approach" that has been used since the mid-1990s. The move to a more quantitative method is designed to bring the New England District more in line with Corps of Engineers functional assessment methods nationally and have a method that fits better with the debit/credit concepts found in the Mitigation Rule (Compensatory Mitigation for Losses of Aquatic Resources; Final Rule 4/10/08; 33 CFR Parts 325 and 332). In addition, a new methodology can incorporate the past two decades of knowledge gained on aquatic resource functions.

An interagency team led by the New England District is developing the methodology. Development started with review of existing functional assessment methods to see what could meet the present needs. After examining many existing methods, including the "Highway Methodology Workbook Supplement," methods from various New England states, and the Hydrogeomorphic (or HGM) methods supported by the Corps nationally, the New England District decided to use NovaWet as the base method from which to build. NovaWet was developed by Ralph Tiner at the US Fish & Wildlife Service (for use in Nova Scotia, Canada) and was based on his review of the many assessment methods available, taking the best from each.

The methodology is currently in the early stages of development, so few specific details are included here, as they are likely to change during development. However, there are some basic parts of the methodology that have been established. The base classification system that is being used follows NWI+, which is an enhanced National Wetland Inventory that incorporates wetland landscape position, landform, water flow path, and waterbody

type descriptors. With these new descriptors, NWI+ identifies possible functions of the aquatic resource based on the classification. This allows for a two-level approach to functional assessment. The first level, for planning-level studies, identifies likely functions of particular aquatic resources based on the classification and remote sensing. The second level is based on site data collection and would be more accurate for evaluating the functions of specific aquatic resources.

This methodology is meant to be a true functional assessment, not a condition assessment (though some elements of condition will be incorporated into the biota support functions) and does not lump goods and services into functions. "Functions" are the basic chemical, biological, and physical processes that the aquatic resource performs. "Goods and services" (previously referred to as "values") are the benefits humans recognize as deriving from these functions. There will be three main suites of functions and then several individual functions within each suite. The three main function suites are Water Quality Maintenance, Hydrologic Integrity, and Biota Support. Individual functions and variables to represent those functions are currently being evaluated.

As noted above, the interagency workgroup is currently working on fleshing out the functions to be included and assessing appropriate variables. Once a working draft has been developed, this will be released for public comment and field testing, possibly later this year. After incorporation of comments and field testing results, a "final version" will be put into use. It is intended, however, that this methodology be open for periodic review and updating to keep it current with the state of the science.

The
Highway
Methodology
Workbook
Supplement



US Army Corps
of Engineers
New England District

Wetland Functions and Values
A Descriptive Approach

Independent from the development of the functional assessment methodology effort, the New England District is working on developing far less encompassing assessment methods for streams and vernal pools. These are not true functional assessments, but will be used more to determine project impacts and identify appropriate compensatory mitigation. These will be included in the New England District Mitigation Guidance update, also going on this year.

All of these assessment methods are intended for New England District functional assessment and/or determining mitigation requirements. The New England District is not requiring other federal, state, or tribal entities to use these methods for their regulatory programs. As we have done with previous assessment methods, these new methodologies will be required only when they are determined to be necessary for a specific project, not for every project or permit application.

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CALENDAR AND AMWS WORKSHOPS

For the most current information on upcoming 2014 AMWS Workshops, go to www.amws.org.

APRIL 25-26, 2014

DESIGNING FOR SUCCESS: ECOLOGICAL RESTORATION IN TIMES OF CHANGE, HAMPSHIRE COLLEGE, AMHERST MASSACHUSETTS
The Society of Ecological Restoration's New England Chapter Board announces Designing for Success: Ecological Restoration in Times of Change, a conference to be held April 25– 26 2014 at Hampshire College in Amherst, Massachusetts. The conference will be co-sponsored by SER-NE and The Conway Shool. Feel free to visit SER-NE's website for more information. Register at <http://designingforsuccess-ecologicalrestoration.eventbrite.com>.

APRIL 29-30, 2014

**NEIWPCC 25TH NON-POINT SOURCE POLLUTION CONFERENCE
NEWPORT HARBOR HOTEL, NEWPORT, RHODE ISLAND**
The New England Interstate Water Pollution Control Commission will hold the 25th annual Nonpoint Source Pollution Conference in Newport, Rhode Island. This year, the conference will feature three plenary sessions focused on "common cents" and the economics of greening stormwater and NPS management, two concurrent technical sessions covering a variety of nonpoint source issues, and an optional field trip visiting a recent and ongoing exemplary project in the Newport area. This conference is the premier forum in the Northeast for sharing information and improving communication on nonpoint source pollution issues and projects. Registration is available on the [NEIWPCC website](http://www.neiwpcc.org).

MAY 1-3, 2014

**NEW ENGLAND ESTUARINE RESEARCH SOCIETY SPRING MEETING
SALEM WATERFRONT HOTEL, SALEM, MASSACHUSETTS**
The annual NEERS meeting will include a special symposium on "Salt marsh restoration in New England: Where have we been and where are we going?" in addition to sessions on Estuarine Physical and Biogeochemical Processes; Ecology of Tidal Marshes; and Assessment, Protection, and Management at Watershed and Regional Scales, just to name a few. Registration is now open and will close on Thursday, April 10, 2014. Register at the [NEERS website](http://www.neers.org).

MAY 1, 2014

**SWS NEW ENGLAND CHAPTER ANNUAL TECHNICAL CONFERENCE
COLLEGE OF THE HOLY CROSS, WORCESTER, MASSACHUSETTS**
The Society of Wetland Scientists - New England Chapter will be holding its annual technical conference for the first time since 2006. The theme for this conference will be "Wetland Assessment and Mitigation." Topics will include forest floodplain and tidal wetland restoration responses to global climate change, landscape and local level functional assessment, and mitigation success. Researchers interested in presenting the results of their research in poster format, or other pertinent presentations should contact the event organizers c/o Paul McManus (pmcmanus@ecotecinc.com). On-line registration will be available through the [SWS Registration Link](http://www.sws.org).

MAY 9, 2014

**MASS DEP REVISED REGULATIONS FOR RESTORATION PROJECTS
AND BONUS PRESENTATION ON SOLAR ARRAYS
IN OR NEAR WETLANDS**

DIVISION OF NATURAL RESOURCES, CONCORD MASSACHUSETTS
Lealdon Langley (MassDEP's Dir. of Wetlands & Waterways) and Beth Lambert (Aquatic Habitat Restoration Program Manager, Div. of Ecological Restoration, Mass Fish & Game) will provide an overview of the new MassDEP regulations for restoration projects, including the pre-application process, project planning process, and sediment quality (re-use of sediment for restoration, physical and chemical sediment characterization, chemical contamination and regulatory standards for re-use, regulatory changes to facilitate restoration, fluvial processes). Also presented will be a Q&A discussionon solar arrays in or near wetlands. Information on this half-day workshop can be found on the [AMWS website](http://www.amws.org), under "Workshops".

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 2014 AMWS Workshops, go to www.amws.org.

MAY 15-17, 2014

**3RD SYMPOSIUM ON URBANIZATION AND STREAM ECOLOGY
CROWNE PLAZA PORTLAND-DOWNTOWN, PORTLAND, OREGON**
SUSE3 is a meeting of stream ecologists held approximately every five years aiming to further the scientific study of stream ecosystems in urban landscapes. The theme of SUSE3 will be mechanisms: both in the broad sense of landscape-scale drivers of ecological change and in the detailed sense of small-scale drivers of in-stream biotic response. At the broad scale, the symposium aims to further our understanding of variation in dominant mechanisms in different regions of the globe. More information and registration materials can be found on the [SUSE3 website](http://www.suse3.org).

THE FIRST EVER JOINT AQUATIC SCIENCES MEETING (JASM)

PORTLAND CONVENTION CENTER, PORTLAND, OREGON
"Bridging Genes to Ecosystems: Aquatic Science at a Time of Rapid Change" is the theme for a historic joint meeting of four of the leading aquatic scientific societies: Association for the Sciences of Limnology and Oceanography (ASLO), Phycological Society of America (PSA), Society for Freshwater Science (SFS), and Society of Wetland Scientists (SWS). For more information, please contact The Schneider Group at 254-776-3550 or by email at LacyKC@sgmeet.com.

JUNE 28, 2014

**ON THE BOARDWALKS: PLANTS AND COMMUNITIES
OF ESHQUA AND CRESCENTI BOGS**

ESHQUA AND CRESCENTI BOGS, HARTLAND, VERMONT

Eshqua Bog is a rich, calcareous fen well known for its orchid populations, including showy lady's-slipper, white bog orchid, and northern green orchid, and its great diversity of other wildflowers, ferns, grasses, sedges, and shrubs. Philbrick-Criscenti Bog is a classic acidic sphagnum bog with stands of black spruce and tamarack bordering a large open mat with pitcher plants, sundews, cotton grass, wild calla, and horned bladderwort as well as a variety of heath plants, including leatherleaf, sheep laurel, bog rosemary, and cranberry, many of which will be blooming in late June. You will compare the flora of both systems, as well as the plant communities of the very different upland forests that surround these exceptional wetlands. Register on the New England Wildflower Society website at <http://www.newenglandwild.org/learn/catalog/fdt5008>.

JULY 17, 2014

WETLAND PLANT IDENTIFICATION

GARDEN IN THE WOODS, FRAMINGHAM, MASSACHUSETTS

This is a workshop by Garden in the Woods, Framingham, Mass. with New England Wildflower Society Senior Botanist Ted Elliman. Explore a variety of wetland community types, their ecology, and their common indicator species. Following a brief lecture, we'll visit wetland habitats, including a red maple swamp, a floodplain marsh, and a pond. While in the field, we will take advantage of the season by observing ferns, sedges, and various aquatic species, as well as shrubs and trees. Bring a hand lens, lunch, water, and come prepared for wet feet in the field. Register on the New England Wildflower Society website at <http://www.newfs.org/learn/catalog/wet1000>.

SEPTEMBER 19, 2014 (FRIDAY); RAIN DATE OCTOBER 3, 2014 A SECOND LOOK AT U.S. FIELD INDICATORS OF HYDRIC SOILS IN MASSACHUSETTS 9:00 A.M. - 5:00 P.M.

TBD: CHELMSFORD OR LINCOLN, MASSACHUSETTS

The focus of this all-day, advanced soil workshop is on the field--documenting and interpreting soil conditions and hydrology. This is a similar workshop to the one held in the Bridgewater area in 2012, and is intended to be both a refresher in using federal methodology and an opportunity to "fill in the blanks" with what may have been missed the first round. This workshop is geared toward wetland scientists, soil scientists and soil evaluators who want to take their knowledge to the next level. For more info, see www.amws.org/upcoming_workshops.html.

MAY 31 –JUNE 4, 2015

SOCIETY OF WETLAND SCIENTISTS INTERNATIONAL ANNUAL MEETING

RHODE ISLAND CONVENTION CENTER, PROVIDENCE, RHODE ISLAND
SAVE THE DATE! The New England Chapter of the Society of Wetland Scientists is pleased to announce that our region will host the 2015 International Annual Meeting of the Society of Wetland Scientists. The theme of the meeting is "Changing Climate, Changing Wetlands: Climate Impacts to Wetlands and the Role of Wetlands in Climate Change Adaptation and Carbon Mitigation."

SEAWEED AQUACULTURE: BIOEXTRACTION OF NUTRIENTS TO REDUCE EUTROPHICATION

GEORGE P. KRAEMER, JANG K. KIM, AND CHARLES YARISH

Like many other estuaries and coastal regions, Long Island Sound suffers from anthropogenic eutrophication. This phenomenon, the addition of nutrients to the system as a result of human activities, is a consequence of the human alteration of the nitrogen cycle on a global scale. In coastal waters and estuaries primary production by phytoplankton, seaweeds, and seagrasses is generally limited by the availability of dissolved inorganic nitrogen, present as nitrate, nitrite, and ammonium. The sources of the inorganic nitrogen added into coastal waters and estuaries are several: fertilizer run-off from residences, agriculture, septic seep into groundwater, fossil fuel combustion, and wastewater treatment plant discharges.

The ecological consequences are also varied. Eutrophication can lead to blooms of harmful (toxin-producing) microalgae, and the onshore accumulation of excess seaweed – one need only think back to the sailing events of the 2008 Olympics in Qingdao, China for a an example of this impact¹. In addition, the sinking of algae to the bottom in shallow waters delivers biomass to microbes, with decomposition consuming oxygen, leading to hypoxia and anoxia. This has become a regular late summer feature of estuaries in the U.S., including Long Island Sound, Chesapeake Bay, Neuse River, and along coastal areas throughout the U.S. The “Dead Zone” off the mouth of the Mississippi River is the most famous example of this. In all cases, ecological impacts also translate into economic impacts, from reductions in fisheries yield to man-hours consumed cleaning beaches of accumulated seaweed.

Estuaries and coastal zones are some of the most important regional economic drivers. Long Island Sound, for example, contributes eight to nine billion dollars

in revenue each year to the local economies². Coastal resource managers have become increasingly drawn into watershed management in efforts to reduce eutrophication and its concomitant impacts, and protect coastal economies. In many areas of the northeast, a high degree of development and high population densities preclude large scale land use

the Sound.

In 2013 hypoxia covered roughly 81 mi² for a period of more than two months, the second smallest hypoxic area during the past 27 years⁴. It is likely that sediments at the bottom of Long Island Sound contain a reservoir of nitrogen that maintains the elevated nutrient status and occurrence of hypoxia⁵. What are needed are additional tools in the suite of approaches to nutrient and consequently eutrophication reduction.



Left: Gracilaria harvest after 2 weeks of growth at the Bronx River Estuary site (in foreground Purchase college Student, John Delgado and background Rocking the Boat student, Gianmarco Bocchini). Photo credit: J.K. Kim and C. Yarish.

changes that could reduce nutrient inputs. Within 50 miles of its shores, Long Island Sound is home to more than 20 million people³.

These high population densities translate into large eutrophication pressures. Strategies for reducing nutrient input include programs to educate homeowners to the action-at-a-distance effects of over-fertilization of suburban lawns, conversion of septic systems to sewerage, and upgrading of wastewater treatment plants to augment microbial denitrification prior to water discharge. These efforts all cost money, and though demonstrably effective in reducing inorganic nitrogen inputs over the past 25 years, have not eliminated hypoxia in the western arm of

Through growth of seaweeds, dissolved nutrients are removed and concentrated in algal biomass which is then harvested, effectively removing nutrients from the aquatic system.

Bioextraction is not envisioned as a replacement for any of the current nutrient or eutrophication mitigation strategies. Rather, it gives another point of attack, and is an approach with subsidiary benefits. Once harvested from aquaculture systems, algal biomass has the potential for many uses. Depending on the species cultured and siting of farm systems, biomass may be sold

4 http://www.ct.gov/deep/lib/deep/water/lis_water_quality/hypoxia/2013_season_review.pdf

5 e.g., Lai & Lam (2008) Marine Pollution Bulletin, Vol. 57, Issues 6–12, pp. 349–356

6 Dillehay et al. (2008) Science, Vol. 320 no. 5877 pp. 784–786.

7 e.g., Likens (2010) River Ecosystem Ecology: A Global Perspective, Elsevier Pub., 424 p.

Continued on Page 17

1 <http://www.nytimes.com/2008/07/01/world/asia/01algae.html>

for direct consumption as human food¹. In addition, biomass may also become part of a feed for fish, shrimp, chicken, cattle, etc. Biomass unsold for consumption has potential use as a source of cosmeceutical and nutraceuticals compounds, and cell wall phycocolloids (agars, carrageenans or alginates). Anything remaining has potential value as feedstock for organic fertilizers and/or biofuels. These ancillary revenue sources help make seaweed bioextraction a more attractive, economically viable option.

Seaweed aquaculture is not a “one size fits all” strategy. Native seaweed species differ in phycocolloid chemistry and quantity, ability to sequester nitrogen, growth rate, and life history malleability². In fact, seasonality of growth varies among species, necessitating a sort of crop rotation. *Gracilaria tikvahiae*, for example, is a red, agar-producing seaweed that grows well during warmer months (water temperature greater than 15°C) in temperate ecosystems. Under optimal conditions, this species may grow at more than 16% per day, and accumulate nitrogen at up to 6% per gram of dry tissue. The sugar kelp, *Saccharina latissima*, is a brown, algaean-producing seaweed growing when temperatures are less than about 15°C. After out-planting juvenile kelp (<1mm), the sugar kelp can grow up to 3.0 m in length with a yield of over 18 kilograms fresh weight per meter of line after 5 months (December-May). The sugar kelp accumulates nitrogen up to 3% on a dry weight basis, depending on location.

Recent studies in the Long Island Sound and the Bronx River estuaries, supported by the Connecticut Sea Grant College Program, the U.S. EPA Long Island Sound Study's Long Island Sound Futures Fund, New York State Attorney General's Bronx River Watershed Initiative Grant Program and National Fish and Wildlife Foundation estimated that the biomass yields of *Gracilaria tikvahiae* and the sugar kelp were up to 21 and 62 metric tons fresh weight per hectare, respectively.

The aquacultured *Gracilaria tikvahiae* in a hypothetical one hectare farm can remove



Right: Bren Smith, owner of the Thimble Island Oyster Co. harvests sugar kelp grown at a site off the Thimble Islands, Branford, CT. Smith is the first commercial seaweed grower in Long Island Sound. Photo credit: R. Gautreau.

up to 145 kilograms of nitrogen during a 120 days growing season (July – October). Since these estimates only encompass part of the full May-October growing season, total realized bioextraction would be much greater. The greatest extraction, a function of ambient temperature, light, and N concentration, will likely occur during May-July. The sugar kelp can remove up to 183 kilograms nitrogen per hectare, during the winter spring growing season. The economic value of N removal, if incorporated into a N trading program³, would be as high as \$1,600 per hectare for *Gracilaria tikvahiae* and \$2,020 per hectare for the sugar kelp. These values would represent additional income for seaweed aquaculturalists beyond the value of seaweed products.

The bottom line is that seaweed aquaculture removes inorganic nutrients from seawater in a fashion similar to land-based wetlands; nutrients that could otherwise fuel the growth of potentially harmful microalgal and nuisance macroalgal blooms. And, since a fraction of biomass eventually reaches the base of the water column, bloom prevention through bioextraction will help reduce bottom water hypoxia, and eventually draw down nutrients stored in the

sediment reservoir. Seaweed aquaculture could be a cost effective, affordable and equitable solution to remove inorganic nutrients in urbanized coastal systems. Seaweed aquaculture, therefore, could be included as part of a suite of management tools to minimize nutrient impacts in urbanized coastal waters, while providing a new business opportunities for seaweed aquaculturalists in the United States⁴.

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1 <http://today.uconn.edu/blog/2013/08/from-the-lab-to-the-dinner-table-kelp/>

2 <http://seagrant.uconn.edu/publications/aquaculture/handbook.pdf>

3 http://www.ct.gov/deep/lib/deep/water/municipal_wastewater/nitrogen_report_2012.pdf

4 http://water.epa.gov/resource_performance/performance/upload/OW_End_of_Year_BPFY2012_Report.pdf

KISS A TURTLE?

Why you should never kiss a snapping turtle! As reported by the Daily Mail Reporter on March 8, 2014, a “pet owner hospitalized after a show of affection backfires. A Fujian man wanted to give the turtle a goodbye kiss before he released it into the wild.” This is definitely not a good idea for the pet owner, the turtle or the native turtle population.

HAVE YOU SEEN THE NORTHEAST OCEAN DATA PORTAL?

Northeast Ocean Data is a decision support and information system for people engaged in ocean planning in the region from the Gulf of Maine to Long Island Sound. The website provides access to data, interactive maps, tools, and other information needed for decision making. The primary audiences for this effort include regional managers, ocean stakeholders, and technical staff. The Northeast Ocean Data website builds on existing efforts in the region and provides additional capacity for both state- and regional-level ocean planning. The portal can be accessed by going to: <http://northeastoceandata.org/>.



The screenshot shows a news article from MailOnline titled "Why you should never kiss a snapping turtle: Pet owner hospitalised after show of affection backfires". The article includes a photo of a man kissing a large snapping turtle. The page also features a sidebar for the Sochi Winter Olympics and social media links.



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