Answers to Questions Submitted by Participants of the NRCS Webinar:
Amphibian and Reptile Conservation and Management

This sheet was put together in December of 2016. It will be posted with the webinar recording, so by the time you read it, the info may be outdated, particularly in regard to emerging infectious diseases. Also, as websites get updated, links change or no longer exist. Please take care to find the most recent information. Not all questions are shown on this sheet; some individuals were/will be contacted separately through email to provide answers to their questions. Thanks again for your interest!

Where is the resource sheet you refer to?
See file attached to this email.

Where do turtles sleep? On land? In the water? Do they sleep?
The answer to this question can differ both within and between species. I'll just provide a few examples. This information is obtained from Ernst et al. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, 578 pp. The 2nd edition of this book is available here.

- Eastern Box Turtles (*Terrapene carolina*) will hibernate in loose soil, vegetative debris, in mud near aquatic habitat, in stump holes, and even in mammal burrows. Depth to which they burrow varies.
- Spiny softshells (*Apalone spinifera*) use underwater hibernacula.
- Diamondback terrapins (*Malaclemys terrapin*) hibernate under mud and under banks, etc.
- Wood Turtle (*Clemmys insculpta*) hibernation spots include in deep pools, mud, beaver lodges, muskrat burrows, etc.

What is PARC's recommendations with landowners wanting to protect reptile eggs? What resources do you provide them?

- Comment from webinar participant: *We used old chicken/poultry fencing to protect pacific green sea turtle nests from feral hogs on beaches on Guam*.
- For turtle eggs, providing exclusion devices so that dogs, coyotes, raccoons, foxes, opossums, skunks, crows, and other predators cannot access the eggs is recommended. Page 16 from Habitat Management Guidelines for Amphibians and Reptiles of the Southeastern United States provides the following recommendations:
    - *Reduce the availability of human food sources (i.e., garbage).* p. 16
    - *Consider removal of subsidized predators by humane means.* p. 16
    - *Recognize that subsidized predators occur at unnaturally high population levels in some areas*. *Thus, evaluations of their behavior, effects, population sizes, and sources of subsidy could help identify ways to curb their impact on native amphibians and reptiles*. p 16
    - *Control free-roaming pets, especially dogs, in the vicinity of turtle nesting areas*. pp. 63-64
- Here is some information on turtle nest protection from Savannah River Ecology Laboratory: http://srel.uga.edu/outreach/ecoviews/ecoview100620.htm
- Also, if you watch the webinar *Conservation and Management of Amphibians and Reptiles for US National Parks in the Southeast* (in the drop-down menu on the playlist, it's the 4th webinar), Kurt Buhlmann talks about turtle nest protection in the video. I highly recommend watching the entire webinar, but if you are short on time and want to just skip to the turtle nesting protection portion, start at this point in the webinar: 1:16:22
- The Year of the Snake October Newsletter has information on building a snake hibernaculum.
- SE PARC created this really great blog on creating backyard habitats for herps.

How does the snake fungal disease spread?
From animal-to-animal contact or via contact with contaminated locations in the environment where the pathogen is present. Here is a really great snake fungal disease factsheet published by the Canadian Wildlife Health Cooperative.

How far has the snake fungal disease spread in the U.S. and what is being done to reduce the spread of the disease?
It's in states in the east and Midwest. To reduce spread, education and implementation of biosecurity protocols are helping.

What is the hotline email?
herp_disease_alert@parcplace.org For more information, visit PARC's National Disease Task Team website.

Comment: I believe the photo of humans collecting sea turtle eggs was taken at Ostional, Costa Rica. This was not poaching but was licensed. I'm unsure whether the sustainable harvest still occurs at Ostional.
Thank you for the correction! I removed the photo and we re-recorded the webinar.

- It was correct to say that illegal collection of sea turtle eggs is a threat to their conservation. This site from National Oceanic and Atmospheric Administration Fisheries states that potential threats to Leatherbacks are "Illegal egg harvest at nesting beaches outside of U.S. jurisdiction."
- This online report focused on Costa Rica (Mast, RB, BJ Hutchinson, and PE Villegas. 2014-2015. The State of the World's Sea Turtles – Sea Turtles of Costa Rica. Oceanic Society, Ross, CA. 48 pp.) cites illegal collecting of eggs as a threat to sea turtles (see p. 7).
- This journal article is entitled *Effects of Illegal Harvest of Eggs on the Population Decline of Leatherback Turtles in Las Baulas Marine National Park, Costa Rica*; the title is self-explanatory.

I saw some sites where headway is being made to change this practice, so that's good news!!

How does Bsal relate to chytrid?
Bsal is a chytrid fungus. *Batrachochytrium dendrobatidis* (or Bd for short) affects both frogs and salamanders (but more frog species have been impacted by it than salamanders). *Batrachochytrium salamandrivorans* (or Bsal) thus far has only affected salamanders. Check out this site to learn more about Bsal.

Have field test kits for Bsal been developed?
No diagnostic tests can be done in the field; swabs are taken in the field and then samples are run in the lab by polymerase chain reaction (PCR) or histology. USGS has been sampling nationwide and will continue to do so in 2017, and then publish their results. You can contact your regional Amphibian Research Monitoring Initiative (ARMI) office or the National Wildlife Health Center if you have an area or population about which you are concerned.

Do you have information on different waves of more virulent chtyrid fungus in frogs? **Thank you to Dr. Dede Olson, Research Ecologist and Team Leader for the USFS's Pacific Northwest Research Station, for providing the answer to this question!**
If the question is about a spatial wave, such as the notion that Bd is sweeping through an area, the wave of Bd hitting frogs in Central America is the best example. The attached paper by Whitfield et al. 2016 gives an overview and you can get more info from citations in that paper.

If the question is about the attributes related to differences in virulence?, here is an excerpt from a recent paper looking at the variation in virulence in Bd by Refsnider et al. (2015), attached. Their paper addresses

how Bd virulence may attenuate with time. This is now established for lab colonies, for example. "This variation in infection outcome is affected by three interacting factors: environmental conditions such as temperature (Voyles *et al.* 2012; Spitzen-Van der Sluijs *et al.* 2014), intrinsic differences in host susceptibility (*e.g.*,Bishop *et al.* 2009; Searle *et al.* 2011; Voyles *et al.* 2011; Ghal *et al.* 2012; Gervasi *et al.* 2013), and differences in virulence among *Bd* isolates (*e.g.*,Berger *et al.* 2005; Retallick and Miera 2005; Fisher *et al.* 2009; Farrer *et al.* 2011; Voyles 2011).

Comment received from a participant: Bullfrogs also carry chytrid but can survive it. **Thank you to Dr. Dede Olson, Research Ecologist and Team Leader for the USFS's Pacific Northwest Research Station, for providing a response to this comment!**
This is sometimes true and sometimes not. Bullfrogs can get the disease chytridiomycosis in some circumstances. See above quote from Refsnider et al. (2015), as it is relevant to Bullfrogs. Factors that influence results / conclusions: Under what conditions the frogs were being tested, the life stage of the animals, other stressors to which the animals had been subjected, etc. See this study as an example, but remember to consider the scope of inference / context of each study.

Anyone looking at raising/releasing Daphnia magna as a control for Chytrid in the U.S.? **Thank you to Dr. Dede Olson, Research Ecologist and Team Leader for the USFS's Pacific Northwest Research Station, for providing the answer to this question!**
I do not know that anyone has been pursuing Bd predators (Daphnia) as a Bd-control mechanism, but there is considerable interest in understanding Bd ecology outside the amphibian host.

Has anyone done any work on swabbing turtles in looking at Chytrid Fungus transmission, especially in Softshell turtle species with their soft shells? **Thank you to Dr. Dede Olson, Research Ecologist and Team Leader for the USFS's Pacific Northwest Research Station, for providing the answer to this question!**
I am not aware of any publications that report on turtles being Bd carriers. Bd infection requires keratin, so there have been exploratory studies of aquatic animals with keratin. Turtle shells do have keratin. However, they also bask, and their shells can dry, so it is possible that controls microbiota on the shell. There is work on how "water" can move around (bird feathers, etc) and transmit Bd. Wet turtles could do that, but no studies come to mind.

Is there any plan that has been discussed should a positive case of Bsal is discovered in the US?
Yes. There is a Bsal National Task Force, the coordinating structure of which was formed as part of a USGS-sponsored workshop in 2015. This link takes you to the *Bsal Task Force 2016 Annual Report*, which includes a section on the response plan. Here is a copy and paste of the Response Working Group page of the plan, which is found on page 8. Citation:

Summary: *The Response Working Group intends to serve as a resource for issues related to eradication, containment, or other management response should Bsal be detected in North America. The group is actively finalizing a Bsal Rapid Response Plan template, intended for customization by management unit or captive salamander facility, which provides guidance for suggested actions upon a salamander mortality event or confirmed Bsal detection. The plan will be made available via www.salamanderfungus.org once completed.*

Lead: *Priya Nanjappa (AFWA/PARC)*

Participants: *Michael Adams (USGS ARMI); Jenn Ballard (USFWS); Jeremy Coleman (USFWS, White-nose Syndrome National Coordinator); Evan Grant (USGS ARMI); Matt Gray (Univ of Tennessee – Knoxville); Camille Harris (USGS, Wildlife Disease Coordinator); Blake Hossack (USGS ARMI), Jonathan Kolby (James Cook University); Robert Lovich (Dept of Defense/Navy); Joe Mendelson (Zoo Atlanta); Jenny Powers (NPS); Dede Olson (USFS); Mary Kay Watry (NPS)*

Key Points: *The response team helped to develop a Rapid Response Plan (RRP) template document for agencies and institutions to customize based on their own capacities and resources. The RRP provides suggested actions to take when: 1. A mortality event involving wild salamanders is observed, but cause is*

still unknown 2. A mortality event involving captive salamanders is observed, but cause is still unknown 3. A sample during surveillance of known animals or locations returns a Bsal-positive result in either wild or captive animals, but there are no signs of mortality or visible signs of infection 4. Bsal has been confirmed in a wild population 5. Bsal has been confirmed in a captive population.

Response Progress: *The RRP is actively being finalized, with some test scenarios helping to inform and refine response processes suggested in the plan template. Once completed, it will be posted to the Bsal Task Force website, www.salamanderfungus.org.*

Response Challenges: *An initial draft of the RRP was completed in August 2015, and was reviewed by various stakeholders, including members of several standing committees within AFWA. As the comments were being integrated, the USFWS released their interim final rule listing 20 salamander genera as "injurious" under the Lacey Act. This changed some aspects of the response plan in order to make the suggested actions compliant with the rule, or to ensure that anyone using the plan would be aware of the rule and how to be compliant. In addition, there were some test scenarios of responses to potential Bsal detections that helped identify areas of weakness in the initial draft; these are being refined now to provide the best guidance possible. We do anticipate that the RRP will be a living document, where guidance will continue to be refined as new treatment, mitigation, or management opportunities become available. We will also incorporate any lessons learned when or if actual Bsal detection scenarios occur that demonstrate new or improved approaches to be integrated into the plan.*

Response Outcomes or Impacts: *The RRP, once completed, will serve as a template to increase preparedness among agencies and institutions with respect to Bsal. The guidance within is also applicable to other instances of amphibian diseases, and could potentially serve as a model for responses to other fish or wildlife diseases. After its release, the Response Working Group, in collaboration with AFWA, will distribute the plan broadly and write letters to appropriate agency officials and institutional leadership to facilitate its use, as well as to facilitate their preparedness and implementation in the event of a Bsal detection. In addition, the Response Working Group will serve as a go-to group when real world situations require expert input or consultation.*

Response Interactions with Other Working Groups: *The Diagnostics Working Group leadership assisted in refining the details of the RRP with respect to obtaining and confirming a Bsal detection. The Response Working Group will work with the Decision Support Working Group to develop workshops or other opportunities to assist agencies and other stakeholders in determining how best to customize the RRP for their purposes, available capacities, and resources. We are in contact with the Research and Surveillance Working Groups as well, so that we can stay on top of the latest findings that can inform or improve the RRP, and so that we can assist when response actions are needed.*

What is the best disinfectant to use on your surveying equipment and boots?
What is the best way to clean your equipment or boots to prevent spread of disease?
It depends on the pathogen, but there are some that work in most instances. There is a publication that should be available soon that I will share with you when it comes available. In the meantime, see:

NE PARC Disinfection Protocol
SE PARC Disinfection of Field Equipment and Personal Gear
Bsal Task Force Disinfection Procedures

Here are some publications on the topic of disinfectants:

- Bryan, L.K., C.A. Baldwin, M.J. Gray, and D.L. Miller. 2009. Efficacy of selected disinfectants at inactivating *Ranavirus*. Dis Aquat Organ 84:89-94.
- Johnson, M. L., L. Berger, L. Phillips, and R. Speare. 2003 Fungicidal effects of chemical disinfectants, UV light, desiccation and heat on the amphibian chytrid, *Batrachochytrium dendrobatidis*. Dis. Aquat. Organ. 57:255-260.
- Gold, K K., P.D. Reed, D.A. Bemis, D.L. Miller, M.J. Gray, and M. J. Souza. 2013. Efficacy of common disinfectants and terbinafine in inactivating the growth of *Batrachochytrium dendrobatidis*

in culture. Dis. Aquat. Organ. 107:77-81.
- Rradkowska, M., M.C. Allender, M. O'Dell, and C. Maddox. 2016. Evaluation of common disinfectants effective against *Ophidiomyces ophiodiicola*, the causative agent of snake fungal disease. J Wildlife Dis. 52:759-762.

Are there precautions that can be taken to protect herps when planning a prescribed burn?
Yes.

- See this MW PARC info sheet.
- The Southeast Habitat Management Guidelines says to avoid plowing firebreaks in bogs and wet meadows, as you will be disturbing the soil and vegetation and possibly killing herpetofauna.
- Check out two sections on fire in the webinar *Conservation and Management of Amphibians and Reptiles for US National Parks in the Southeast* (in the drop-down menu on the playlist, it's the 4th webinar): Kurt Buhlmann talks about longleaf pine savannahs (51:44-56:29) and wetlands and fire (1:07:35 to about 1:10).
- See the attached Hossack and Pilliod (2011) and the Pilliod et al. (2003) articles.
- See (copied and pasted from the link to the title):

Immediate Herpetofaunal Responses to Prescribed Burning in Wetlands of Southeastern Michigan

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Abstract
Prescribed fire is an increasingly common and effective management tool for ecological restoration of wetlands in the US Midwest. Prescribed fire is reported to have adverse effects on sensitive wetland fauna such as reptiles and amphibians, but surprisingly few empirical data are available to support management recommendations meant to protect herpetofauna from prescribed burning. We examined the effects of prescribed fires one day and one month after burning in eight wetlands across two wetland types in southeastern Michigan using abundance, species richness, and diversity of herpetofauna as metrics. Most amphibian communities returned to pre-burn levels of the three metrics by one month after the burn; reptile communities appeared to be more negatively affected by prescribed fire although sample sizes were extremely low. Response of individual species to burning was more variable; two previously detected amphibians and four previously detected reptiles were not detected by the end of the project, suggesting that some herpetofauna may respond negatively to fire while the most common species are unaffected. Only one individual of the 126 herpetofauna located in this study apparently experienced direct mortality after fire. We noted differences in species richness and diversity between wetland types that were probably attributable to differences in these metrics prior to burning. Although in some cases amphibian communities experienced few or only short-lived negative impacts of fire, we caution that fire effects are likely to be species-specific, such that prescribed burns should always be planned thoughtfully from this perspective.

Who uses the PARC Habitat management guidelines today?
Landowners, land managers, agency personnel, . . . anyone with an interest in doing their part to improve habitat for herps.

Inventory and Monitoring: Recommended Techniques for Reptiles and Amphibians - how applicable is it to Canadian provinces?
Very applicable. Check out chapter 5, which covers all species in the US and Canada.

Is there a PARCA GIS layer available? Is there a GIS layer available to identify these PARCAs on private lands? We are developing a wetland assessment rubric @ FWC and would like to use herp

"hotspots" as one of the parameters for wetland preservation/enhancement prioritization. Would it be possible to get the PARCA polygons in Florida?
I will put you in touch with the Co-chair for PARC's Joint National Steering Committee. He is currently maintaining the PARCA shapefiles.

How come we do not have any PARCAs in Nevada or most of the Great Basin?
We hope to get there in the next several years!! We are moving across the country and covering states where we are provided funding. If you know of any funding sources, we estimate that it costs about $10K per state, if only one workshop is conducted, but the larger the state, the greater the number of workshops. So the cost is $10K per state + $5K for each additional workshop.

Can you repeat Tom's last name, and provide Tom's contact information?
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Knowing that species are declining and becoming extinct continually and at varying rates, is there classification or rating per se of what species are more indicative of up-the-food chain negative consequences? In other words is there information on what species would be more of a red alert alarm for needed conservation to avert serious ecology consequences?
If I am understanding your question correctly, you are asking if certain species are more useful as bioindicators than others. Aquatic invertebrates are extremely useful as bioindicators, as are amphibians. Amphibians have porous skin that functions as a sort of sponge, so any sort of toxins in the environment affect them more quickly than reptiles, which don't absorb toxins through their skin. Large mammals and birds can move from an undesirable habitat quickly than small animals with limited mobility, like amphibians. Further, amphibians have relatively small home ranges and high site fidelity. The type of habitat under evaluation and the typical stressor being evaluated determine which species or taxa are used as bioindicators (e.g., grassland bird diversity, abundance, and occupancy are used to judge quality of grasslands).

If I misunderstood your question, please contact me and I will try again to answer your question.

How does PARC address bullfrogs?
PARC recommends:

- Avoiding conversion of shallow wetlands to deep, permanent ponds
- Draining ponds in late fall or winter
- Draining lakes and removing bullfrogs
- Positioning stock tanks and ponds so bullfrogs cannot easily move between them (bullfrogs can travel up to 5 miles), and design them so they can dry or be drained
- Posting educational signs that the release of bullfrogs is illegal
- Contacting your state fish and wildlife agency to see what eradication methods are appropriate and effective

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Where can I find the link for the field trip etiquette and the safe handling for herps?
http://www.mwparc.org/products/etiquette/

Do any of the habitat management guideline books address caecilians?
No, because most only deal with species in the US; however, the NW guidelines include references to Canada.

How do I become a member of PARC? Is there a fee? How does my membership help PARC and/or me?

- There is no official membership, per se. However, anyone who attends PARC meetings and participates in PARC activities is considered to be a PARC member.
- There are no associated fees.
- Being a part of PARC gains you access to a network of herpetofaunal conservation experts across the country, and into Canada and the Caribbean – federal agencies, state agencies, local governments, museums, academia, industry (forest products, energy, pet), zoos and aquaria, laboratories, environmental consultants, non-governmental organizations, etc. You get to network with others and learn about activities and projects of other professionals and members of the public. Being on the PARC listserv keeps you in the loop on emerging issues and hot topics!
- You being a part of PARC benefits the PARC network because no two PARC members have the same experience and expertise, so we look forward to you sharing your time, talent, skills, and knowledge!

Do fire ants play a role in the decline of soft shell turtles in the Hill Country , Texas? For example, killing eggs or making adults move away from nesting areas?
I don't know of studies as specific as you requested (i.e., on softshells in the Hill Country of Texas). That doesn't mean that there aren't any though. Here are some studies on effects of fire ants on turtles, including softshells. Most studies I found were in regard to impacts on sea turtles.

Diffie S, J Miller, and K. Murray. 2010. Laboratory observations of red imported fire ant (Hymenoptera: Formicidae) predation on reptilian and avian eggs. Journal of Herpetology 44: 294-296.

Abstract
Red Imported Fire Ant colonies were allowed access in the laboratory to eggs of eight reptilian and one avian species. The ants were allowed to forage on the eggs for approximately one week each after which the eggs were removed from the foraging arenas. Evaluations of the impact of fire ant foraging on the eggs were made daily, and final evaluations were made upon removal from the arenas. Red Imported Fire Ants were not able to penetrate healthy Bobwhite Quail eggs, the only avian species used in this trial. The foraging ants were able to penetrate the eggs of Diamondback Terrapins, Yellowbelly Sliders, Eastern Painted Turtles, and Loggerhead Sea Turtles but were not able to penetrate the eggs of Florida Softshell Turtles or Musk Turtles. The ants were able to enter the eggs of Burmese Pythons and Yellow Rat Snakes. Results from this study suggest Red Imported Fire Ants may have a more prominent role in the decline of native reptilian species than was previously thought. Further studies, especially in the field, are necessary to determine the true impact.

Whiting, MJ. 1994. *Pseudemys texana* (Texas River Cooter). Nesting interference. Herpetological Review 25:25.

The exotic red fire ant, Solenopsis invicta*, has been reported to have an adverse effect on both invertebrates (Porter 1990. Ecology 71:2095-2106) and vertebrates (Mount et al. 1981. J. Alabama Acad. Sci. 52: 71-78). In the case of turtles, Mount et al. (op. cit.) report several instances of hatchling turtle mortality due to fire ants; however, fire ants have not been reported to interfere with adult turtles during nest construction.*

During a herpetofaunal survey of Camp Mabry in Austin, Texas (11 June 1993), a Pseudemys texana *was discovered at ca. 1115 h, and probably had been digging for less than 1 h. At that time, the turtle was covered with ca. 150-200 fire ants. These ants were probably from two colonies located about 34 m away. Observer interference was kept to a minimum by periodically checking the turtle from a distance using binoculars. After 45 min the turtle ceased next excavation, and returned to the nearest pond ca. 100 m away. The irritation caused by the fire ants presumably prevented the* P. texana *from completing the nesting process.*

Allen CR, EA Forys, KG Rice, and DP Wojcik. 2001. Effects of fire ants (Hymenoptera: Formicidae) on hatching turtles and prevalence of fire ants on sea turtle nesting beaches in Florida. Nebraska Cooperative Fish & Wildlife Research Unit -- Staff Publications. Paper 25.
http://digitalcommons.unl.edu/ncfwrustaff/25

Abstract: *Red imported fire ants (*Solenopsis invicta *Buren) have increasingly been observed in logger-head (*Caretta caretta *L.) and green (*Chelonia mydas *L.) sea turtle nests in Florida, and in the nests of freshwater turtles. They may be attracted to the disturbance, mucous and moisture associated with turtle nesting and establish foraging tunnels into turtle nests shortly after egg-laying, thus increasing the vulnerability of hatchlings to fire ant predation. We conducted experiments on a freshwater turtle (*Pseudemys nelsoni *Carr) to determine the potential impacts of* S. invicta *on turtle hatchlings. Over 70% of hatchlings were killed by* S. invicta *during pipping or shortly after hatching. To determine the extent of* S. invicta *infestation of sea turtle nesting beaches, we sampled known nesting beaches throughout the state of Florida. Beach surveys indicated that* S. invicta *are present and often abundant on most beaches and dunes along the Florida coast.*

What resources might be available for education and outreach to encourage personnel to not kill reptiles, especially snakes?
Some links you might find to be useful:
http://www.wanderingherpetologist.com/conservation/dont-kill-snakes/
http://www.capesnakeconservation.com/getting-rid-of-snakes-is-a-bad-idea/
http://www.livingalongsidewildlife.com/2013/10/the-only-good-dog-is-dead-dog-why-it.html

Putting together talks that highlight the benefits of herps and dispel the myths and negativity surrounding them goes a long way too! Use of live specimens is also super helpful.

Is there a "best" method for removing non-native turtles from a pond to help encourage the survival of native turtles?
The species you are trying to remove (its food and habits) determines the method that should be used. (I reached out to this participant directly to find out which non-native species she was trying to trap.)

Is there any public outreach information related to not dumping non-native pet turtles into the wild?

- NE PARC has a *Don't Take Me Home* poster in regard to box turtles. This first step in education is important because if it is regarded, then we don't get to the point of people having unwanted pets. They have some more box turtle education and outreach info here.
- SE PARC has a Buyer's Guide to Pet Reptiles brochure.
- SE PARC has a What to Do with Unwanted Pet Amphibians and Reptiles page.
- Some states (e.g., FL) have Exotic Pet Amnesty Days. Scroll down on the page at this link for other useful resources.
- See Guidance for Conserving Oregon's Native Turtles Including Best Management Practices: See pages 9, 10, 47, 60, and 74 (go by the page numbers as written on the actual document).
- PARC and Arizona Game and Fish Department created a Don't Turn It Loose brochure.
- Arizona Game and Fish Department has a great page on not releasing turtles as well. Scroll down to the *How You Can Help* section.
- Here's a news release that Oregon Department of Fish and Wildlife did just this past June that

contains helpful information as well.

I worked for a man who said when at the pet store he worked for, they used to release sick reptiles rather than treat them. Being that most herps are wild caught, who knows not only what exotic species were released, but what exotic diseases as well. How do we better monitor and control things like this and exotic releases into places like Florida?
See above resources. Also, such violations really need to be reported to state fish and wildlife agency law enforcement officers. In Florida, for instance, the number is 888-404-FWCC, but they also have an online reporting system, as well as a means to text a violation to this email address: Tip@MyFWC.com, the latter being particularly useful in reporting a violation when its occurring, without being heard or drawing attention to yourself.

The particular situation you described is really unfortunate. That shop owner is not only making that particular diseased individual suffer by leaving it untreated, it is perpetuating the problem to an untold number of other victims.

Does PARC support assisted migration to save populations of reptiles from climate change?
PARC does not currently have a position statement on this topic and we have not discussed it on any of our Executive Committee or Joint National Steering Committee calls. I think it would depend on details of each specific circumstance. For a topic like this, I doubt we would have a blanket statement saying whether or not we supported it. Each individual case would need to be evaluated. Questions we would ask: Is the recommendation to conducted assisted migration based on science/data? In the absence of this assisted migration, would the species become extinct or locally extirpated? What other species will be affected if $ and resources go toward this effort? Etc.

What have you found to be the best methods for engaging agricultural private land owners especially on extensive operations like ranches?
The NRCS and the Farm Service Agency are both representatives on PARC's Federal Agencies Steering Committee. We get involved with private landowners through them. Currently, Midwest PARC and National PARC are working on a Working Lands for Wildlife 2.0 proposal with NRCS state offices in Indiana, Illinois, and Ohio. We assembled a planning team that includes numerous biologists from these states. The team will develop guidance associated with conservation practices that private landowners can implement to receive technical and financial assistance for efforts that benefit Blanding's Turtles.

NRCS also contacted us in 2015 because they developed a Spring Development Conservation Practice Standard and wanted to add a brief paragraph on the importance of spring-supported habitats to amphibians in the arid West. Through this partnership we have, we collaborate on projects and meet needs where we can.

And where Priority Amphibian and Reptile Conservation Areas (PARCAs) are identified, NRCS has expressed an interest in including PARCAs in their private lands conservation programs, such that when private lands fall within PARCAs, additional credits or incentives are given when herp-friendly actions are taken in these areas.

I always have a hard time finding much information on the special status amphibian/reptile species in my state (Nevada). Does PARC have good reference suggestions or is this information just unknown?
You might try the Nevada State Wildlife Action Plan, the Nevada Natural Heritage Program (the top selection on this site will get you a list of at-risk species in the state, or further down on the page, you can find out which species are at risk by county), and the US Fish and Wildlife Agency's Endangered Species page.

In British Columbia there is quite a bit of variability between laying and hatch timing between populations of painted turtles (e.g., some lay in early spring and hatch in summer, and some lay late summer and hatch in spring).
Interesting! Thanks for sharing. The Ernst et al. (1994) book indicates variability due to latitude, environmental temperatures, drought, etc.

We (Nevada) also have lots of Wildlife Refuges and state wildlife management areas, has there been any major attempt to get the managers of these lands to be involved with PARC?
Yes, PARC includes USFWS on its Federal Agencies Steering Committee. The national rep for FWS on the FASC is the Chief of the Natural Resource Program Center, and he shares info with Biological Sciences staff, regional refuge biologists, etc. Further, I maintain a federal contact email listserv and it includes FWS biologists from around the nation. There are currently 152 biologists from FWS on that list. Finally, PARC's National States Coordinator (Priya Nanjappa) send out info to her state contacts regarding emerging issues and PARC information.

The best way to stay in contact with what's going on in PARC is to get on your region's mailing list, to sign up to get info from the PARC listserv, and to get on either mine or Priya's mailing lists.

What do you like most about your job?
Learning from and being around top professionals in the field. It's been a privilege to serve in this position and I am really grateful for the tremendous opportunity.

I work in southeast Colorado with the Conservation Reserve Program (CRP) - are there any practices/seeding considerations you might recommend to make CRP better for herps? ***Thank you to Jennifer Anderson-Cruz, State Biologist for Illinois, for providing the answer to this question!!***

Below is a web link to a page I developed while in Iowa that covers planning considerations for herp habitat restoration/management. Between this webpage and the *Habitat Management Guidelines for Amphibians and Reptiles of the Southwestern United States*, you may find what you're looking for in general terms. You should contact your NRCS county field office for site specific or seeding guidance. If the field office feels they don't have the purview or specialized expertise to address the inquiry, they'll contact higher-ups and outside experts to pull them into the fold.

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ia/newsroom/factsheets/?cid=nrcs142p2_008529

I am a biologist with the MN NRCS, and I focus on wetland restoration easement work with primary goals targeted for waterfowl. Therefore, the majority of restorations focus on shallow seasonal/temporary type of wetlands. Knowing the importance of wetland complexes, especially in regards to the biphasic lifestyles of the regional herps in MN, I find myself in unique but complicated scenario. For the purpose of waterfowl, it would be ideal to have many shallow seasonal/temporary wetlands. However, for the local herps, it would be ideal to have more permanent and semi-permanent wetlands for those species that overwinter underwater, such as northern leopard frogs and tiger salamanders. Do you have any good reference for successful wetland complexes in terms of different wetland types? For instance, maximum distances from overwintering wetlands to seasonal/temporary breeding wetlands? I would really like to start adding secondary values towards herps. ***Thank you to Jennifer Anderson-Cruz, State Biologist for Illinois, for providing the answer to this question!!***

Please look at the question below and its answer; they may provide some useful information. This site contains information that will be helpful to you as well. It's a site that Jennifer created for Iowa, but it will have information applicable to MN as well. The recommendation is to construct wetlands in a mosaic patter of varying shape, depth, and proximity to benefit the widest array of species.

Permanent wetlands benefit diving ducks as well (Canvasback, Redhead, Bufflehead, Lesser Scaup, Common Goldeneye are all found in Minnesota).

And while permanent wetlands are used by the herp species you mentioned, some herp species (e.g., Blue-spotted Salamanders) prefer fish-free and bullfrog-free seasonal wetlands.

*****Thank you to John Moriarty, Senior Manager of Wildlife for Three Rivers Conservation District in Minnesota, for also providing an answer to this question!*****

Most Minnesota amphibians over winter in the uplands. The only species that overwinter in the water in the farmland portion of MN are Northern Leopard Frogs and Green Frogs. They both use wetlands and lakes that maintain adequate oxygen so that they do not winter kill. All species, expect Green Frogs use temporary and seasonal wetlands or fish free permanent wetlands for breeding. Northern Leopard Frogs will travel up to a mile from their overwintering sites to breeding and feeding areas. Efforts to restore temporary and seasonal wetlands will have a greater impact on amphibians then deeper wetlands will.

What are some successful tactics that you have seen NRCS employees use to get private landowners/partners interested in herp conservation? Especially in areas where habitat management is not commonly a top priority of land owners. ***Thank you to Jennifer Anderson-Cruz, State Biologist for Illinois, for providing the answer to this question!!***
Find a local landowner people admire/respect (a peer) who is interested in the topic and get them involved. If you can get them to perform management or install practices on their land and then use that as a demo for other people in the community to conceive what it looks like. Talk about that landowner's experience in your education and outreach. Government employees can provide expertise, but it won't compare with what members of the public hear from a local person they trust.

Think of a landscape concept, cumulative effects, and the different folks with whom you are working - how is that restoration and management working out across all the properties across a landscape scale?

Also, put the right things in the right places. Do not try to force a property to be something it's not. For example, you wouldn't want to put a deep water wetland at a site that you have to excavate and put a water control structure that requires a lot of maintenance and that has a high chance of failure or it won't last very long. Thoughts of how natural or sustainable should factor into site selection, program and priorities. Take Blanding's Turtles for example - one site might be perfect for nesting, but not wetland restoration, so on that property, focus on nesting. A neighbor down the road might have property that would be better for development of a wetland.

If you could only promote one activity (or habit) for your average citizen to aid in herp conservation efforts, what would it be? ***Thank you to Dr. JJ Apodaca, Co-chair of PARC's Joint National Steering Committee and Professor of Conservation Biology, for providing an answer to this question.***

Protecting and restoring wetlands.

*****Thank you to Priya Nanjappa, PARC's National States Coordinator, for providing an answer to this question!*****

Maximizing use of native vegetation in their yards, using higher mower blade heights, and minimizing their

chemical footprint – using less lawn herbicides, being mindful of the chemicals they use at home that ultimately get in the water, following label guidelines when chemical applications are necessary and using them judiciously rather than in broadcast applications.

*****SEE ANSWER TO THE "What are some successful tactics that you have seen NRCS employees use to get private landowners/partners interested in Herp conservation? Especially in areas where habitat management is not commonly a top priority of land owners." QUESTION TOO!!*****

How can we get PARC involved in Ohio? How can we bring it in to get it rolling?
Good news – PARC is already involved in Ohio! Ohio is included in MW PARC. MW PARC uses a Google group to keep in touch with members. Here is a link to the forum where you can go to get information, or go to this site to get updates sent to your email address.

Ohio is in the midst of becoming a new state chapter of PARC!!! They had their first meeting this past summer. Please sign up for emails here, and this site also has a link to their Facebook page.

Will the recent T&E listing of the Eastern Massasauga Rattlesnake impact PARC's focus?

PARC works to conserve all amphibians and reptiles, regardless of conservation status, so no, our focus will not shift based on this species' listing.

What are your thoughts on the Flat-tailed Horned Lizard not being protected recently in California?
The Flat-tailed Horned Lizard Rangewide Management Strategy Interagency Coordinating Committee is a partnership of federal and state agencies working together within California, Arizona, and northern Mexico to manage and conserve this species. They are held to developing only 1% of their land areas as signatories to the Rangewide Management Strategy for the species, and have not exceeded this allowance for 20 years since implementation.

Many years of monitoring data by dozens of herpetologists in California showed that there are hundreds of thousands of this species in the state. A detailed analysis by California Department of Fish and Wildlife showed that listing of this species was not warranted in the state; this lizard species is not in danger of going extinct and so do not meet the definition of "Endangered" under California's Endangered Species Act. Rangewide annual monitoring will continue to maintain a pulse on the species' status and numbers. Similarly, a few years ago, there was a federal decision not to list this species under the ESA.

It is a conservation victory that these dedicated partnership efforts and their accompanying conservation measures have precluded a listing of the species. Some laud it as the most robust voluntary conservation agreement for a reptile in existence. Listing is a last resort, and like hospice for a species. It means that either conservation measures have not been employed, or that they have not been sufficiently successful.

It is important to note though that when the Flat-tailed Horned Lizard reverts back to being classified as a species of special concern in CA, it will still receive protection. It will be illegal to take this species without a permit. Take of any native reptile in the state is illegal without a permit, with some exceptions.

For more information:
https://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/FTHL/Rangewide_Plan_Final_FTHL.pdf

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Coming from NYSDEC Biologists, how do we start a PARC chapter in NY?

Here is a copy and paste from PARC's Operations Manual regarding the process required to start a state chapter, and I will email you separately with the NE PARC Co-chair contact info.

State and Local PARC Chapters Purpose and Structure

There are many reasons to form a PARC state or local chapter (chapter), including local needs and issues concerning herpetofauna that can be addressed and will benefit PARC's mission via local actions and other related reasons. The procedures for establishing new chapters include:

A. Interested partners from a specific state or local within a state must submit a proposal to their Regional co-chairs expressing their desire to establish a new chapter.
B. Regional co-chairs present this proposal to the Regional Steering Committee (RSC) [In this case it would be NE PARC's Regional Steering Committee.] for discussion during a regional meeting or conference call.
C. The RSC evaluates proposal based on how well it meets a standardized set of criteria (see below).
D. The RSC votes to approve or reject proposal.
E. If proposal is approved by the RSC, the Regional co-chairs present the approved proposal to the JNSC for comment.
F. If proposal is rejected, the proposal is sent back to the proposing entities with explanation and options to resubmit.

Standardized Criteria for Creation of a New PARC Subgroup

A. Demonstrated Need

1. Interested partners from a specific state or local within a state must prepare and submit to their Regional Co-chairs a clear and concise discussion of how the state or local would benefit from having its own PARC chapter and how the current structure of their Regional would benefit from having a chapter (e.g. increased number of smaller, more localized meetings, issues related only to that state or local, etc.).
2. Interested partners from a specific state or local must prepare and submit to their Regional Co-chairs a summary of current, local herpetofauna issues that currently are not being addressed by PARC (e.g. lack of attendance of key personnel at meetings due to travel costs) and how the creation of a PARC chapter would better address the PARC's mission.

B. Demonstrated State and Local Support

Proposals to establish a new PARC state or local chapter must:

a. Demonstrate that the new chapter will have at least one chair, and each chair or co-chair must provide documentation that their respective employer endorses support for at least one (1) two-year term that allows for some time on the job to complete tasks associated with PARC and support to cover incidental costs such as postage, phone calls, travel to attend meetings, etc.;
b. Demonstrate that the state or local has representation from a variety of partners (e.g., government agencies, academia, industry, zoos, parks and wildlife areas, non-profit organizations, etc.), some of which have provided written endorsement regarding the benefits of establishing a PARC chapter and their contributions to thereto;
c. Provide letters from current and potential PARC members within the state or local that demonstrate a commitment to attend meetings and participate in chapter task teams, etc.; and
d. Provide a list of possible meeting locations or venues that offer financial and/or logistical support for meetings (e.g., use of academic facilities for a reduced rate, a local or state club that would be willing to organize and host a meeting, sponsors, etc.).

C. Roles and Responsibilities

1. Each chapter and its leadership have the freedom to determine the best structure and communication plan that fits their state or local partners.

2. Chapters may create a steering committee, or Advisory Board, which functions similarly to their RSC.
3. Each chapter steering committee will be led by one chair or two co-chairs and will devise the structure and procedures that best meet the need of their state or local partners.
4. At least one chair or co-chair from each chapter must serve as an active member of their RSC
5. Chapter chairs and co-chairs must play a crucial role in communicating the needs and efforts of the chapter to their RSC, and subsequently to the JNSC, and assist in the step-down of national and regional PARC objectives and in providing feedback to the RSC and JNSC on how to improve broad-scale objectives and strategies.
6. Chapter steering committees must focus on developing strategies and implementing actions to conserve amphibians, reptiles, and their habitats in their respective state or specific region within a state.
7. Communications:

a. State and local chapters foster communication, coordination, and cooperation among agencies, organizations, academic institutions, industry, and individuals interested in conserving herpetofauna within their respective state or local chapter region.
b. In general, there should be frequent and open communication within chapters and their RSC and with their constituents, representative agencies/organizations, or partners regarding issues that pertain to (or are discussed by) the chapter. Chapter chairs shall determine appropriate means and frequency of communications to best suit their membership, and should bring forth issues from and carry back discussion information to their respective constituents, representative agency/organization, and partners.

Is there training or resources that discuss ways to develop/protect herp habitat while discouraging mosquito habitat in the same general area?

For your state (Indiana), you could check out page 48 in the Habitat Management Guidelines for Amphibians and Reptiles of the Midwestern United States.

Are western pond turtles predators of CA red-legged frogs?
They are generalist feeders; their varied diet occasionally includes tadpoles and adult *Rana*.

Can you discuss the degree to which herps are indicators of ecosystem health?
Their use as bioindicators is well documented. Here are some sources that may be of interest:

(1) Stafford, D.P., F.W. Plapp, and R.R. Fleet. 1976. Snakes as indicators of environmental contamination: relation of detoxifying enzymes and pesticide residues to species occurrence in three aquatic ecosystems. Archives of Environmental Contamination and Toxicology 5: 15-27.
(2) Corn, P.S. and R.B. Bury. 1989. Logging in western Oregon: responses of headwater habitats and stream amphibians. Forest Ecology and Management 29:39-57.
(3) Welsh, Jr. H.H. and L.M. Ollivier. 1998. Stream amphibians as indicators of ecosystem stress: a case study from California's Redwoods. Ecological Applications 8: 1118-1132.
(4) Lowe, W.H. and D.T. Bolger. 2002. Local and landscape-scale predictors of salamander abundance in New Hampshire headwater streams. Conservation Biology 16:183-193.
(5) Manolis, S.C., G.J. Webb, and A.R.C. Britton. 2002. Crocodiles and other reptiles: bioindicators of pollution. Pp. 65-69 *In* The Finniss River: A Natural Laboratory of Mining Impacts – Past, Present and Future. ANSTO: Sydney.
(6) Southerland, M.T., R.E. Jung, D.P. Baxter, I.C. Chellman, G. Mercurio and J.H. Volstad. 2004 Stream salamanders as indicators of stream quality in Maryland, USA. Applied Herpetology 2: 23-46.

Do conservation buffers such as riparian filter strips and riparian forest buffers present a risk to amphibians because of the potential to concentrate pesticides in the buffers?
No because buffers are established OUTSIDE OF the core habitat. They benefit amphibians by preventing runoff in the form of sediment, or pollutants, like pesticides, herbicides, and fertilizers, from reaching water bodies that are used by amphibians. Sometimes runoff is in the form of elevated nutrient levels from fertilizers, for example, and when these nutrients enter aquatic systems, they can cause algal blooms and decrease the amount of dissolved oxygen in the water, which can negatively affect tadpole and egg development. Sediment from runoff can also coat amphibian eggs and reduce oxygen exchange. Core terrestrial habitats should include year-round habitat needed by herps, in other words, habitat for when they forage, when they breed, when they overwinter, etc.

Abstract from Semlitsch, RD. 2008. Differentiating migration and dispersal processes for pond-breeding amphibians. The Journal of Wildlife Management 72: 260-267:

Understanding the movement of animals is critical to many aspects of conservation such as spread of emerging disease, proliferation of invasive species, changes in land-use patterns, and responses to global climate change. Movement processes are especially important for amphibian management and conservation as species declines and extinctions worldwide become ever more apparent. To better integrate behavioral and ecological data on amphibian movements with our use of spatially explicit demographic models and guide effective conservation solutions, I present 1) a synopsis of the literature regarding behavior, ecology, and evolution of movement in pond-breeding amphibians possessing biphasic life cycles to distinguish between migration and dispersal processes, 2) a working hypothesis of juvenile-based dispersal, and a discussion of conservation issues that follow from distinguishing the spatial and temporal movements of amphibians at different scales. I define amphibian migration as intrapopulational, round-trip movements toward and away from aquatic breeding sites. Population-level management, in general, can be focused on spatial scales of <1.0 km with attention focused on adult population and juveniles that remain near the natal wetland. I define amphibian dispersal as interpopulational, unidirectional movements from natal sites to other breeding sites. Metapopulation- or landscape-level management can be focused on movements among populations at spatial scales >1.0-10.0 km and on importance of terrestrial connectivity. The ultimate goal of conservation for amphibians should be long-term regional persistence by addressing management issues at both local and metapopulation scales.

Abstract from Steen et al. 2012. Terrestrial habitat requirements of nesting freshwater turtles. Biological Conservation 150: 121-128:

Because particular life history traits affect species vulnerability to development pressures, cross-species summaries of life history traits are useful for generating management guidelines. Conservation of aquatic turtles, many members of which are regionally or globally imperiled, requires knowing the extent of upland habitat used for nesting. Therefore, we compiled distances that nests and gravid females had been observed from wetlands. Based on records of > 8000 nests and gravid female records compiled for 31 species in the United States and Canada, the distances that encompass 95% of nests vary dramatically among genera and populations, from just 8 m for Malaclemys *to nearly 1400 m for* Trachemys*. Widths of core areas to encompass varying fractions of nesting populations (based on mean maxima across all genera) were estimated as: 50% coverage = 93 m, 75% = 154 m, 90% = 198 m, 95% = 232 m, 100% = 942 m. Approx-imately 6–98 m is required to encompass each consecutive 10% segment of a nesting population up to 90% coverage; thereafter, ca. 424 m is required to encompass the remaining 10%. Many genera require modest terrestrial areas (<200 m zones) for 95% nest coverage (*Actinemys, Apalone, Chelydra, Chrysemys, Clemmys, Glyptemys, Graptemys, Macrochelys, Malaclemys, Pseudemys, Sternotherus*), whereas other genera require larger zones (*Deirochelys, Emydoidea, Kinosternon, Trachemys*). Our results represent planning tar-gets for conserving sufficient areas of uplands around wetlands to ensure protection of turtle nesting sites, migrating adult female turtles, and dispersing turtle hatchlings.*