

Ray Fernald (VA DGIF)	Mike Allen (MD Sea Grant)	Margot Cumming (CRC)	Jonathan McKnight (MD DNR)
Steven Pearson (LIISMA; NY)	Mark Lewandowski (MD DNR)	Chris Urban (PA FBC)	Jay Killian (MD DNR)
Gary Walters (PA DEP)	Tara Whitsel (USACE)	Sarah Whitney (PA SeaGrant)	Edna Stezar (DE DFW)
Scott Knoche (Morgan state)	Alexis Wasson (Penn State, student)	Ellyn Campbell (SRBC)	Melinda Fegler (Jug Bay)
Jim Julian (Penn state Altoona)	Kate Flemming (DE SeaGrant)	Geoff Smith (PA FBC)	Sandra Keppner (FWS)
Kevin Hess (PA DEP)	Shawn Miller (PA DEP)	Dustin Shaw (PA DEP)	Nick Decker (PA DCNR)
Sara Coleman (NOAA CBPO)	Sara Mirabilio (NC SeaGrant)	Sara Stahlman (PA SeaGrant)	Zachary Nea (Carroll County govt)
Ian Pfungsten (USGS)	Mark Frey (NPS)	Steve Minkkinen (US FWS)	Rob Emens (NC DEQ)
Anne Timm (USFS)	Susan Pasko (ANSTF)		

9:20 : Call to Order

- Thanks to Matt Shank with the SRBC

9:30: Analysis of Recreational Angler Vector and Associated Pathways to aid in the Prevention of Invasive Species Introductions in Mid-Atlantic Waterways (*Scott Knoche*)

- Focus on angler activity in the state of Maryland
 - Non-tidal recreation fishing opportunities represent a slight majority compared to saltwater anglers
 - This represents a major pathway for invasive species introductions
 - Personal gear
 - Boating equipment
- Project Objectives: use previously collected data to identify and rank areas at risk for distribution of invasive species
- Survey and sampling methods:
 - Random sample of 4285 people
 - Response rate: 25.1%
 - Content:
 - Where they went
 - Fishing methods that were used
 - # of people

- Target fish species
- Results:
 - ~3 out of 4 MD anglers used live bait
 - ~ 1 of 6 MD anglers used fly fishing gear
 - ~ half of anglers used boat
- Geospatial Methods:
 - Used HUC 11
 - Mapped:
 - Angler density
 - Trip density
 - Select invasive distribution
 - Self reported angler live bait use, fly fishing, boating
 - Specific Areas of Concern:
 - Gunpowder: primarily fly-fishing, so high risk of didymo transfer
 - Savage River: fly fishing destination in western MD
 - Upper Chesapeake Drainage: boating concern b/c coming from the bay and all water routes between multiple rivers
 - Deep creek Lake: popular destination
- Next Steps:
 - Final Report due 12/31
 - Future outreach to fishing groups
 - Fact sheet highlighting metrics and figures
- Questions:
 - Is there a way to take out people who take many trips to only one location?
 - Yes - this is included in the cross referencing of the density data
 - Are there questions that weren't asked in the survey, that would've been helpful?
 - Yes: asking about live bait; use of waders; if the anglers are using the resources or facilities (wader cleaning stations); if there is bait left over, how do they dispose; where do they get the live bait; how do they use connecting waterways
 - Edna Stezar: how long is the hard copy survey?
 - 12 page booklet, same survey online and in print
 - Response rate can often related to how many contacts you have with the prospective survey responders
 - Did you see differences in the response formats? Younger people taking it online, vs older people taking paper?
 - We did not track this - but we did look at ages. Older people were more likely to respond in general, but I didn't look at format directly.
 - Suggestions for source and sink design - many species look at habitat suitability and that may be a helpful component to include in future presentations.
 - Alex Wasson: we did look at this, and I could definitely include that in future presentations.

10:00: Motion to accept July meeting minutes (Ray Fernald)

- Sarah Whitney: motion to approve
- Approved by consensus

10:10: Spring meeting action items (*Ray Fenald*)

- Send in headshots for website
- Mid-Atlantic field guides are still available

10:20: Funded Projects Update (*Mike Allen*)

- Six active projects from the previous grant round
 - One project has been extended (Mid Atlantic Lake Forum scheduled for spring 2019)
- Funded two new projects (Amy Fowler and George Mirovich): started this fall

ANS Task Force update and Strategic Planning for 2019-2024 (*Susan Pasko*)

- Major focus has been revising strategic plan - what do we want to accomplish?
- Overview of ANS Task Force:
 - Established by Congress with the passage of NANPCA in 1990, re-established in 1996
 - Mission: Develop and implement a program for water of the US to prevent the intro and dispersal of ANS; to monitor, control, and study such species, and to disseminate related information
 - Composed of 13 federal and 15 ex-officio members
 - Six regional panels: Western, Great Lakes, Northeast, Mississippi River Basin, Gulf and South Atlantic, Mid-Atlantic
 - Establish committees to align with strategic plan
 - State Management Plans (receive financial support from USFWS)
 - Nevada was 44th approved plan
 - Colorado, NJ, and NH interested to develop plans
 - Each state is encouraged to regularly re-visit priorities
 - Sara Marabilio: NC has a ANS plan. Went out to public comment and everything -- just never signed by the Governor.
- Federal Advisory Committee Act: provides ANS Task Force with its core structure and ensures an open and public forum
 - Charter renewed every two years
- June 2018 meeting in Silver Spring
 - Focus on strategic planning
- October 2018: discussed refined list of goals, objectives, and strategies
 - Outline distributed October 24, draft plan anticipated mid-November
- December 12-14, 2018: Hope that all Panels participate and provide feedback on strategic plan
 - All Panel meeting December 11
 - Draft report to Congress for 2016-2017
 - Draft bylaws and committee structure
 - Breakout sessions to regine and prioritize outputs under new plan

- Speakers on aquaculture, live release, recreational boating pathways
- Future meetings: May and November (traditionally meets twice per year)
- Questions:
 - Sara M. - NC does have a management plan, went to public comment, finalization stage in October 2016
 - Ray: New representative from WV, funded development of their state management plan several years ago
 - John McKnight: Briefing with Coast Guard: Senate Bill 140 - 400 pages long about ballast water
 - Unsure where Coast Guard stands
 - ANSTF cannot lobby
 - References: Western AIS website, Kevin from Northeast Panel (pretty active, template letter)
 - <https://www.westernais.org/regulations>
 - Kate Flemming: Task Force funds regional Panels to fund smaller projects, TF also funds states to develop management plans?
 - No - TF has no specific budget line
 - State Plans have their own budget line from USFWS (\$2 million)
 - Draft DE plan?
 - Yes, put together by DE Invasive Species Council (only terrestrial plants)
- Strategic Plan 2019-2024
 - Guiding principles: kept going back to central question, what are we trying to accomplish?
 - Looking at past activity, felt we needed to build opportunities for partnership and collaboration
 - Coordination is the primary function of the ANSTF
 - Provide resources and guidance on priorities to all agencies
 - Survey the ANS landscape, identify gaps and opportunities, make recommendations
 - Identify potential gaps in policies or authorities, raise awareness with Congress and Administration
 - Act as forum to receive recommendations from the regional panels
 - The Strategic Plan should:
 - Identify what can be accomplished as a unified organization, highlight how individual member activities roll up to national need
 - Present feasible strategies and outputs that can be implemented in the next five years
 - Past Strategic plans have been a bit 'all over the place', want to find middle ground that is ambitious but still possible
 - Member and regional Panel reporting should focus on how the work products and guidance developed under Plan have benefitted their operations
 - Six Goals (8 in last plan):

- Coordination: maximize the organization effectiveness of the ANSTF
 - Strengthen ANSTF operations to provide communication, info sharing, and decision making
 - Strengthen the capacity at state and regional levels
 - Construct a national assessment of the ANS program for US waters (asking Panels to report accomplishments and needs annually)
- Prevention: develop strategies to ID, assess, and manage the risk of ANS and their pathways to prevent new introductions
 - Evaluate and facilitate consistent science-based risk assessment, risk management, and screening
 - Coordinate actions to reduce the likelihood of ANS introduction
 - Focus on pathways
 - Develop guidance and encourage implementation of measures to manage high priority pathways and species
- Early Detection/Rapid Response: focus on developing strategies for a nationally coordinated approach
 - Facilitate survey and monitoring efforts to detect and report new sightings
 - Look at existing programs, identify highest priorities, develop citizen science programs
 - Develop processes to rapidly assess new species detections and determine appropriate management actions
 - Maintain experts database, develop decision tools and thresholds
 - Facilitate the development of capacities to respond rapidly
 - Standardizing existing plans, ID new rapid response funds
- Control/Restoration: facilitate capabilities to control established ANS populations and restore impacted habitats
 - Coordinate the development and implementation of ANS Control and Management Plans
 - Currently 10 Control and Management Plans (per species)
 - Different from state plans in that they do not receive dedicated funding from USFWS
 - Some are 20+ years old, need to review
 - Identify and communicate effective control and restoration techniques
 - Identify gaps in available control and restoration measures and encourage innovation
- Research: facilitate research to support implementing an ANS Program for waters of the US by ANSTF members, regional panels, and partners
 - Identify and prioritize research needs
 - Environmental stressors, socioeconomics
 - Facilitate research activities to assist ANS management efforts

- Track and disseminate study results to incorporate into decisions and activities
 - **Outreach and Education:** develop strategies to increase awareness and change behaviors responsible for introducing and spreading ANS
 - Evaluate ANS communication, education, and outreach efforts
 - Develop processes to share information and consistently implement ANS outreach strategies
 - Raise the profile and communicate ANSTF priorities (inreach)
 - Invasive species week in February
- Under each goal, three objectives established by goal teams with detail on how each goal will be achieved
- After five years, we want:
 - Well-informed, engaged members
 - Cooperative efforts to prevent new introductions
 - Detect new ANS and be prepared to rapidly respond
 - Efforts that suppress or eradicate ANS
 - Ongoing research to support prioritized needs
 - Consistent, coordinated outreach campaigns
- Please give feedback - deadline 12/10
 - Melida Fegler: are there resources to tap into if we are having regional events for national invasive species week?
 - Not sure what opportunities exist yet, but some could be in development for now or for the future.
 - <https://www.nisaw.org/>

11:30 : Use of eDNA to detect emergent infectious pathogens in amphibian populations
(Jim Julian)

- Goal:
 - looking for amphibian pathogens in historically infected sites
 - Exploring additional screening methods - develop sampling techniques for eDNA
 - Determine effective sampling window for detection
- Emergent infectious pathogens:
 - Ranavirus - broad species impacts (fish, reptiles, amphibians)
 - Chytrid - amphibian specific
 - Transferred through the environment, direct contact of individuals
- Utilized previous surveys of presence of pathogens
 - These previous surveys have some drawbacks including difficulty for volunteers, and mortality of individuals
 - Additionally, mortality events can happen quickly and widely - removing all possibilities of sampling
- Using eDNA methods could be a way to remedy the shortcomings of previous sampling methods
- Methods:
 - Volunteer training for 2 hrs - maps and datasheet distribution, protocol, decon methods, supplemental information on pathogens
 - Volunteer supplies <\$100 provided to each group

- 27 ponds sampled in 3 counties - including historic presence of both pathogens, and controls
- Sampled in 3 different time periods from spring to mid-summer to help determine most effective sampling window
 - Continued to sample at ponds with mortality into late summer
- Processed samples in a lab using qPCR using FWS methods
- Results:
 - Detection rates were best in late spring for Chytrid
 - Detection rates were best in mid-summer for Ranavirus
 - No statistical differences between PI and volunteer samples
 - Strong effect on time of year and agreement
 - Sampling for Bd early in year holds up
 - Ranavirus: agreement between observers was about 73% over time period
 - Regression: probability of agreement increases with increasing virion copies in water
 - Advantage to eDNA (particularly for Ranavirus)
 - Even after mortality, RV still persists in water column (up to 60 days after initial spike)
- Conclusions
 - eDNA seems to be robust way to detect these pathogens
 - Pathogens detected at nearly all ponds with pathogen history
 - To detect pathogens with 95% confidence:
 - Bd: 3 samples in May
 - RV: 4 samples in July
 - Bd and Rv: 2 samples in May and 3 samples in July
 - Detection probabilities comparable between volunteers and PIs
- Future Applications
 - Coordinate with Mid-Atlantic region agencies and NGOs to distribute sampling kits
 - Trials to compare the relative effectiveness of filtration vs centrifugation techniques
 - Pathogen presences during Fall months and in stream connections
 - Pathogen occupancy modeling to investigate relationships with amphibian community composition
 - Some pathogens are more likely to occur in species-rich communities
- Questions:
 - You can detect some pathogens in advance of mortality event, is there any way to treat individuals? Can this occur in quick time frame?
 - No... but can detect 'hot zone' areas and adjust educational programming, reduce number of visitors, no real treatments
 - Any sites in vernal ponds? Evidence that drying of vernal pools may help rid pathogens?
 - Yes, maybe $\frac{1}{3}$ of sites dried out completely
 - Good question, but no... movement of common species moves Bd
 - Events come and go very quickly!
 - Any obvious differences in sites where you found pathogens vs where you did not?
 - Higher species richness means more likely to have pathogens
 - Some associations with Bd occurrence in wood frogs and forest canopy, opposite of other studies

- Matt S: you looked at detection probability between two different investigators, what about sampling water and organisms at the same time?
 - No, do not have same controlled sampling
 - Gut says if it's in the water column, it's at least in some animals
- Sandra: in areas where you hadn't previously had reports of pathogens, but eDNA show positive detections, can you ground-truth that?
 - Prevalence levels would be well below 5%
 - No way to go back and see if it was actually there and just missed
 - What about false positive? Certainly possible, especially in cases where you have low copy numbers for qPCR
- Field blanks/negative controls?
 - All done in the lab, put blank filter next to others being processed, then test blank (all came up negative)
 - Most likely source of contamination would be from handling filter papers

1:00pm : Monitoring to Manage: determining best population control approaches to the Northern Snakehead, *Channa argas*, in Jug Bay tidal freshwater marshes, Patuxent River (Melinda Fegler)

- Goal was to increase awareness/involvement with anglers and non-anglers
- Background:
 - Northern snakehead was first seen in MD in 2002
 - Only recently reported in Patuxent River watershed
 - Local angler sightings and reports have become more common
- Jug Bay: 43 miles up from the Bay
 - Freshwater tidal estuary system
 - Component of CB NERRS
 - Patuxent River has a large number of species present
 - Jug Bay supports local recreational and commercial fisheries as key nursery habitat
 - Designated state Important Bird Area by the National Audubon Society
- Study objectives: developing future management plan requires monitoring
 - Map hotspots of snakehead abundance at all life stages
 - Pilot a removal strategy
- Winter trawling: trawling potential wintering habitat proved difficult
 - Only one event due to abnormal weather
 - Did not find any snakehead, only 1 carp over 4"
 - Snakeheads are fast and hard to catch
 - Not a viable method for catching snakehead in the future
- UAV monitoring
 - Best when flying the UAV between 15-20ft above the surface of the water
 - Ideal conditions: bright sun, low cloud cover, low wind, low tide
 - Great tool for citizen science, easy to spot once familiar with technique
- SUP Monitoring
 - Consisted of paddle-outs with volunteers
 - SUP monitoring enabled the observation of Northern snakehead undisturbed behavior in preferred SAV habitat
 - No nests or juveniles were discovered, 29 adults were observed
 - Monitoring during low tide is more valuable than attempting multiple day periods that were originally planned
- Electrofishing
 - Removed 51 individuals (many with eggs)

- 11 confirmed males, 15 confirmed females
- Problems: river freezing, heavy rainfall
 - High waters, especially at low tide, gives snakehead more space to escape electric output and keep out of visible range
- Fishing Tournaments (all impacted by inclement weather)
 - Free community event: "How to Fish for Snakehead"
 - Panel of speakers
 - Kids' tournament winner based on number of invasive fish removed (not size)
 - Fun to teach kids how to fish correctly, impact of invasives
 - Big Bad Fishing Tourney: 32 competitors
 - Competition for largest snakehead and most brought in
 - Only 4 fish removed but connected the project team to angler community members
 - Open communication led to better understanding of anglers' opposition to taking snakehead
- Hotspot Map
 - Western Branch
 - Mattaponi Creek: only monitored once
- Total people reached:
 - Soup and Science at Jug Bay: 53 attendees
 - Over 200 volunteer hours
 - 18 participants in kids' fishing tourney
- Questions:
 - John McKnight: any pushback on harvesting and killing snakehead?
 - None from the board
 - Some pushback from angler community (when they released Facebook campaign, some men were angry over take tournament for fish)
 - Advocate for catch and release? Would have him speak again, did it thoughtfully, wanted each side to have a voice
 - Joe Bruce had 20 minutes to speak, mostly focused on how to fish for snakehead

1:30: Susceptibility of Smallmouth Bass to LMBV and potential implications (Geoff Smith)

- PA SeaGrant Funded
- LMBV: first documented in PA in 2005
 - Currently it has been isolated from several populations in the state
 - Smallmouth bass has been documented as a carrier
- Use the CADDIS approach to investigate (SeaGrant funding 2014)
 - Via lab challenge study, temperature challenge, co-infection challenge
- Results:
 - Injection study killed fish quickly in most systems, but out groups (Allegheny, Juniata) had less mortality
 - Immersion: high mortality across the board, but did differ by system
 - Also manifested differently from injection study (lesion)
 - Temp Challenge: warmer temperatures resulted in higher mortality
 - Co-infection: highest mortality in the co-infected individuals
 - Typical of environment - multiple pathogens
 - BUT cold water pathogens have negative interactions
- Discussion:
 - Smallmouth bass are susceptible to LMBV

- Route of exposure resulted in different manifestation
- Infection rates are mediated by temperature
- Co-infection causes additive effects
- Next Steps:
 - As climate change occurs, LMBV could start to affect susceptible populations of large and smallmouth bass
 - It would be helpful to explore effects on juveniles or detection in the system
 - Further information on other cintracids
- Increase outreach
 - introduction probably came from a live well bc of close fish contact
 - Decrease transportation of infected fish
 - Increase decontamination / biosecurity
- Questions:
 - Jay Killian: are there any regulations for stocking ponds?
 - Chris Urban: many non-target species get introduced incidentally
 - GS: the regulation does not fall to PA FBC - stocking ponds are usually overseen by dept of agriculture
 - Edna Stezar: does the Dept of Ag test aquaculture facilities?
 - GS: yes they do. But, because it is so temperature regulated, you may not be able to detect in the fish stocks. The testing protocols test for bacteria and virus, but often not for parasites.
 - Matt Shank: The infected smallmouth bass showed lesions - a lot of the outbreak of 2005 had bacterial lesion. What are the co-infection symptoms?
 - GS: this is "chicken and egg situation" - we don't know which came first. We are trying to go back through samples to try and find the virus in lesion samples. We didn't know to look for it at the time, so it wasn't tested in 2005. Additionally, symptoms of the eyes may be from the virus and not from anglers as originally thought.
 - Gary Walters: PA DEP has been working to fund a follow up study to confirm if the virus is causing lesions.
 - GS: When we have the results of this study, it will be easier to go back through historical samples.

1:45: Understanding spatial differences in relative abundance and growth rates of flathead catfish in the Susquehanna River (Geoff Smith)

- First found in susquehanna drainage in 2002
- Implications of introductions:
 - Entirely piscivorous = impacts on sportfish populations, conservation concerns, migratory fish
- Methods:
 - Sites throughout the lower susquehanna based on probable level of establishment
 - 10 samples points per reach, included replication
 - Baited, tandem hoop nets
- Results:
 - No statistical differences with establishment throughout the river - well established everywhere
 - Lowest reach had oldest fish, upper reaches had similar ages
- Discussion:
 - Distribution results were not expected
 - Higher CPE downstream of dams

- Not as densely populated as other invasive catfish
- Growth parameters: very rapid and variable
- Next Steps:
 - PA SeaGrant funded phase 2 to look into other drainages w/ lower populations
 - MD DNR looking into lower portion of Susquehanna
 - Other potential related topics:
 - Diet, contamination burden, detection levels, accuracy of gear, changes in growth over time, life habits
- Questions:
 - Jay Killian: are you seeing flatheads in the smaller/lower tributaries?
 - yes - smaller individuals generally, but we are seeing them. Not a lot of competition so if the habitat is there they will move into it. There isn't robust sampling in those currently, but we have been getting reports from those.
 - JK: You didn't look at any gut contents?
 - No - because they were in the nets for so long, everything would've been digested or it came from the net with them. IF looking for gut contents, it would be high effort from electrofishing. There are other studies in MD and VA that is giving good data for diet compositions.
 - JK: It would be interesting to look at Chesapeake Logperch interactions
 - GS: Yes - they are interacting and co-existing. We have some data to show that they are taking advantage of gizzard shad migrations also.
 - Edna Stezar: why do you think that they electrofishing and hoop net catch rates were different?
 - We underestimated what was there, and the electrofishing wasn't catching the very large individuals. The nets were giving a better composition of what is really there.
 - ES: what was the depths of the nets?
 - Most were under 1 meter - especially because it was a bad drought year. Max depth was 18m in Conowingo pool, mean was around 3m - most were below that though.
 - Matt Shank: how do the estimates for growth rates compare to channel cat?
 - GS: the channel catfish are so abundant, and most of the biomass is found there. The flathead catfish are larger and longer lived, but the density isn't seen.
 - Steve Pearson: Could you share your opinions on contamination?
 - GS: we don't have a lot of data yet. Our original results didn't require an advisory. After testing large individuals, there was some contamination and a 1 meal per month advisory will come out in the coming months. This is much lower than the native range (more southern) probably because the fish here are much younger.

2:00 : Pymatuning State Park hydrilla management (*Nick Decker*)

- Background:
 - Pymatuning: on PA-OH border
 - 17000 acres
 - Hydrilla discovered in lake in 2010, significant expansion observed in 2014
 - Goals:
 - limit the extent and prevalence of Hydrilla to undetectable levels of negative ecological and recreational impact (particularly limiting spread into northern part of reservoir)

- Limit probability of hydrilla population at Pymatuning from being a source for introduction to other water bodies
- Outreach:
 - courtesy boat inspection
 - In third year
 - Completed just under 6000 surveys
 - Awareness continues to increase
 - Still voluntary!
 - Invasive species disposal and wash stations
 - Part of an Eagle Scout project, at both PA and OH launches
 - Fairly well used
 - Planning to install at 2 more but much work to be done
 - Plant identification program
 - Public program held at state park's environmental classroom (only 9 people attended)
 - Public Relations
 - Facebook, newspaper articles
- Surveying and monitoring efforts
 - Trying to find tubers, difficult to make it quantitative
 - FasTests and Dye: amount of contact time needed with Fluridone is on the order of months (low dose over 90-121 days)
 - 12 monitoring sites
 - Looking for 1-2 parts per billion
 - September rake survey
 - 4th year of point-intercept survey
 - 284m spacing, areas shallower than 12ft
 - Added records generated for each observation not in the survey design
 - Confirmed Hydrilla in northern basin
 - Operational Impacts/Anecdotal information
 - August: complaints of dense aquatic vegetation
 - November: Significant outflow limitation from fragments stuck in control tower trash racks (needed to bring in divers to clear hydrilla)
- Suppression plan
 - In 2017, working through permitting
 - January: USFWS confirms plans do not pose adverse risk to mussels in Shenango River
 - 1000 acre target area
 - Limit risk of spread north of causeway
 - Maximize funding use (massive area, prioritize use)
 - Address recreational access areas
 - In actuality, funding was not as expected
 - Applied several different compounds from June to August
 - Purchased forced air system to disperse herbicides
 - Some efforts downstream to address isolated populations: hand pulling, benthic barriers
- Suppression Results
 - Within 2018 treatment areas south of causeway:
 - 27 points of confirmed Hydrilla in 2017 to 15 points in 2018 (24% reduction in frequency)
 - Points occurring are about as dense as previously
 - Outside 2018 treatment areas south of causeway

- 16% increase in hydrilla frequency
- Assigned density for hydrilla for 2017 was 35, in 2018 was 65
- Funding Sources: DCNR, Growing Greener, ODNR
 - All expenditures were ~\$466,000
 - Majority was spent on herbicide products
 - Almost \$13,000 for survey and suppression
 - Most funds depleted
- Statewide perspective: Hydrilla found in 13 PA state parks, 26 PA counties
- Questions:
 - Anyone addressing Hydrilla at other PA state parks?
 - Do not have the resources, comes down to local drive
 - Jonathan McKnight: What's the long game at Pymatuning? Currently putting in almost half a million dollars each year...is this sustainable? Is eradication on the horizon?
 - Eradication is a long stretch, considering our ability to keep it at lowest possible levels
 - At low levels, it is easier to search and destroy small patches
 - What amount of Fluridone will you have to add? Does it persist in the environment - maybe through the winter?
 - Interested in looking at that, perhaps prior to starting next year, test for remaining fluridone
 - I expect that it would flush out by the end of the winter. It also probably has some photo-degradation properties

3:00: PA AIS Update (Chris Urban - PA Fish and Boat)

- Recent Happening:
 - Bob Morgan has retired
 - Executive director John Arway has retired
 - New ED hire: Tim Schaeffer
- New Zealand Mud Snail:
 - Increasing densities in Fisherman's Paradise
 - 2018 sightings: Little Lehigh, Fishing creek
 - Working on signage to educate public
- Snakehead:
 - Repeated reports - up to the fall line near Trenton
 - In Schuylkill, Delaware river....and others
 - Dams are stopping the upward movements
 - One recently made it through the Conowingo dam fish ladder
 - Need better data on distribution - currently coming from angler reports, or incidental catch
- PA Regulations:
 - PA Code Title 58, chapter 71 and 73: related to possession, introduction and transportation of 11 aquatic invasive species
 - Considering additional species for addition to regulations:
 - Asian clam, bloody red shrimp, chinese mitten crab, fishhook water flea, flathead catfish, NMS, red eared slider, spiny water flea
- Developing an AIS Listing Process:
 - Currently no nomination process, no technical review, no objective listing criteria
 - Potential to mimic threatened and endangered species process:
 - Petition or nomination potential
 - PA biological survey technical committee involvement

- Taxonomic specific objective criteria
 - Related to population trends and impacts
- Species documentation - life history traits and cumulative data record
- Peer review and vote before advancing to Fish and Boat Commission
- Could use same method for de-listing
- Methods is a collaborative effort with PA SeaGrant
 - Has been approved, but paperwork is moving through FWS

3:15: Quagga mussel eradication in Billmeyer Quarry, Lancaster County, PA (Ellyn Campbell)

- Quagga Mussels:
 - Native to caspian sea
 - Outcompete native mussels
 - Prolific filter feeders
 - Often used to clean water for scuba dive training
 - Differences between Quaggas and Zebra:
 - Quagga will push zebra out
 - Quaggas are bigger, colder water tolerance, softer substrate tolerance
- In PA:
 - Three locations - all scuba centers
 - Bainbridge Quarry:
 - West basin and east basin both infested
 - 29 total acres, 130 max depth
 - connected to Susquehanna by outlet
 - No Quaggas found upstream or downstream
 - eDNA was found downstream
- Consumptive Use Mitigation:
 - Lancaster County Solid Waste Management Agency bought in 2015
 - Wanted to use as consumptive use asset
 - To do this, needed to do an aquifer test which involved pumping out 60 feet into the susquehanna to see if local streams / wells were affected
 - This mass outpumping of water was a high risk to introduce quagga into the river
 - Efforts to Eradicate prior to test:
 - Earth Science labs use a biologically active form of copper
 - Self dissolving, stays dissolved - used in midwest for successful eradication
 - 3 applications, 3,575 gallons
 - Problems arose from stratification of lake -
 - Had to adjust subsequent applications to ensure that it mixed fully to the bottom
 - Monitoring results:
 - 100% mortality at day 44
 - Aquifer Tests happened fall afterwards
 - Wells did not see an effect from the drawdown
 - Fall 2018: Veliger sampling
 - No living, empty veliger shells (washed in from exposed shoreline)
 - Future Sampling:
 - Proposed spring through fall 2019 biweekly sampling

- Anticipating problems with oligotrophy happen now that there are no quagga in this system bc mostly from surface flow
- Questions:
 - Allen: Has this treatment affected any nearby wet wells?
 - EC: we haven't seen it affect the water quality. There has been some water level drawdown as the quarries were drained.
 - McKnight: will there be copper left in this system indefinitely?
 - EC: because it is biologically active, it has mostly been taken up; levels are down to negligible levels
 - Kilian: have you seen any adults? Or thought about eDNA testing?
 - EC: We will do some testing in the future
 - Cumming: Did the copper kill any of the native mussels?
 - EC: we didn't see any native species in the initial sampling. There was very little SAV either - so it didn't affect that.

3:30 Resource Overlap and potential competition between red-eared sliders and native red-bellied slider (*Steve Pearson*)

- Red eared slider turtle: typically escaped or released pets, most common turtle in the pet trade
 - Native to Mississippi River drainage
 - Known to impact other native species (ex: reduced time spent basking for European pond turtle)
- In southeastern PA, Drexel and PA FBC conducted surveys
 - Red-eared sliders were document in about half of wetlands surveyed
- Red-bellied turtle (state threatened species): native along Atlantic coast
 - Population in decline due to habitat loss, overharvest, potentially invasive species
- In 52 wetlands with historic populations, found in about half
 - All size classes
- Objectives:
 - Determine the extent of spatial overlap between wild populations of red-bellied turtles and red-eared sliders
 - Determine dietary overlaps
 - Determine if red-eared sliders inhibit growth of red-bellied turtles when resources are limited
- Study sites
 - Fort Mifflin: high pollution load, near airport
 - Silver Lake nature center: two lakes connected by creek, well-protected riparian zones
- Results: Habitat Use
 - Fort Mifflin: high extent of spatial overlap, both species utilize entire wetland
 - Silver Lake: same situation
- Dietary overlap (flushed stomachs, fecal analysis, stable isotope analysis)
 - Stable isotope analysis (organism's isotopic signatures reflect its diet)
 - Delta 13C and delta 15N
 - Different tissues metabolize at different rates
 - Examined blood plasma, red blood cells, and tail tissue
 - Results:
 - At Ft Mifflin, extensive overlaps in both C and N
 - At Silver Lake, clear partitioning of diets over time

- Feeding at different trophic levels
- Dietary component results
 - At Ft Mifflin, Ts ate Phragmites
 - At Silver Lake, both species strongly vegetarian
 - Some macroinverts
 - Red-eared sliders had 9x more animal matter
- Resource availability
 - Used ArcGIS to determine aquatic habitat at study sites, also sampled macroinvertebrates
 - Silver Lake had larger wetland area, higher species richness and species diversity
 - Invert species richness was about the same
- Competitive ability mesocosm experiments (11 weeks)
 - Altered number of turtles per tank and gave each group the same amount of resources
 - Single species groups and mixed groups
 - 21 day acclimation period
 - 7 day adjustment to feeding regime
 - Recorded behavior, took weekly growth measurements (carapace length, width, and height, plastron length, mass)
 - Linear mixed effects model
 - Results:
 - mixed species groups: red-bellied turtles grew slower in low resource groups, red-eared sliders had no differences
 - Single species: both species grew at faster rates in high resource settings, no differences in body condition between high or low resource groups
 - In low resource groups, red-bellied turtle grew slower than red-eared slider in mixed species setting
 - Ingestion rates:
 - in single species groups, both species ate the same number of pellets
 - Mixed species groups: red-bellied consumed more pellets when resources were abundant
- In summary, red-eared slider turtles do not inherently grow at a faster rate than red-bellied turtles
 - But can impact fitness of red-bellied turtles when housed in mixed species groups
 - Both species utilize entirety of habitat
 - Potential for long-term impacts on growth rates of native turtles
 - Continued introduction of red-eared sliders could impact red-bellied turtles
 - The sale of non-native species should be prohibited
 - Discouraging considering red eared sliders as “naturalized species” in PA wetlands
- Questions:
 - Coleman: Did you know the base feeding rate was? Did you experiment on levels of resources?
 - SP: yes, in the initial time periods, we did a lot of experimentation to make sure the feeding was working, and the high and low resource groups had adequate resources.

- How would this translate to adult turtles?
 - SP: Experiment like this would be difficult with adults, can't really measure growth
 - PA wetlands often have 5-6 species of turtles, could be impacts on others

4:00 : Paleolimnological investigation of *Didymosphenia geminata* in the Mid-Atlantic Region (Matt Shank)

- Didymo: single cell diatomaceous algae, causes unsightly mass on rocks when in bloom
 - Forms the mats when eutrophic conditions
 - Prefers low dissolved Phosphorus concentrations (will not form mats)
 - Impacts on stream ecology that displace native algae, macroinvertebrates, fish
 - Recreational impacts - fishing, boating
 - Origins:
 - Cercu-boreal in northern hemisphere
 - True introductions in southern hemisphere
 - Nuisance blooms uncommon in native range, but has recently been increasing
 - *paradigm shift away from invasive status - changing behavior due to climate shifts
 - Mid-Atlantic Ecology:
 - Looking at Pine Creek and PA watersheds
 - Soluble reactive phosphorus has similar effects in Mid-Atlantic
 - Origin:
 - Based on eDNA sampling, supports Didymo being an exotic invader in the Mid-Atlantic
 - Genetically, the colony in Mid Atlantic was most closely related to Colorado
 - Environmental conditions impact the prevalence
- Paleolimnological Study:
 - Presence or absence through time
 - Is there historical evidence?
 - Potential environmental drivers associated w/ historical
 - Methods:
 - Riverine impoundments - 6 w/ observed blooms downstream, 3 with no evidence
 - Used gravity coring device to collect sediment core and took subsamples
 - Used lead 210 for dating
 - P concentrations
 - Diatom analysis
 - Elemental and isotopic concentrations of C and N
 - Results:
 - Oldest sediment subsection is 1900 - Didymo cells were found beginning in 1930 (Gunpowder Reservoir) with concentrations with mixed trends
 - Discussion:
 - Cells have been in the water bodies of the Mid-Atlantic, but blooms have been dependant on environmental factors and/or cell transport
 - Instantaneous methods may not be as accurate
 - Management Implications:
 - Continue to encourage invasive species campaigns - BUT Didymo may not be a good poster child

- Nutrient enrichment has shown to decrease biomass
- Novel approaches of manipulating flow
 - Vary reservoir outflows; focus on stable / ideal temperature, light and flow
- Questions:
 - McKnight: Maryland banned felt sole waders, and when Vermont got rid of their ban - people started asking when MD would get rid of their ban. Maryland's response was that many other species could be carried with waders - your work helped to harden the political opinions to keep the felt sole ban on the books. This study had a big impact on regulatory policies. We really appreciate this study - thank you.

4:30 MAPAIS Leadership Elections (*Sarah Whitney*)

- Thank you to the current leadership - Ray Fernald and Mike Allen
- Nominations:
 - Chair: Jay Kilian (MD DNR)
 - Vice-Chair: Edna Stetzar (DENREC)
- Discussion:
 - Matt Shank: Both are exemplary candidates
 - Ray: Thank you to Mark Lewandowski for also volunteering, stepped aside to ensure that there is agency variety
 - Sarah Whitney: We aim to move the leadership through the watershed and around different agencies
 - Motion by: Jonathan McKnight; Second by Chris Urban
 - All in favor
- **Approved**

4:45 : Adjourn

Thursday 11/15:

9:30: Grant Updates:

- No cost extension on last grant bc \$4800 left over
- New 5 year grant starting now too
- Funding for travel for incoming chair and vice chair to attend ANSTF
- Remaining funds for food and meeting arrangements
- MD SeaGrant gets 26% overhead - that comes out of the total

Ideas for new Panel Projects:

- Lake forum in planning
 - Lewandowski: May need help with logistics and speaker recruitment
 - Dates: April would be best time for park managers but will check and decide with Jay and Edna
 - Keep in mind AMAAB meeting when scheduling
- Leadership transfer meeting to happen in next few months
 - Mike and Ray will transfer important files

Using eDna to detect early stages of the invasion of a destructive freshwater snail (*Ed Levri*)

- New Zealand Mud Snail:
 - Multiple clonal populations (US1, US2, US3)
 - Populations found in the west and east

- Why so successful as invader?
 - Ecological generalist - wide range of environmental gradients
 - Broad environmental tolerance
 - High reproductive rates bc asexual
 - Can survive periods of desiccation
 - Can exist at very high densities
 - Enemy release - nematode parasites that keep them in check in New Zealand not found in north america / not many predators that target these snails
 - Behavioral adaptations that encourage spreading
- Effects:
 - Competition with native grazers
 - Negatively impacts on predator populations b/c not very digestible
 - Alter native food webs
 - Alter C and N cycles
- Eastern US Introductions in mid-90s
 - Same as a clone found in Europe
 - Probably introduced from ballast water from shipping industry
- Spread to 4 of the 5 great lakes; moving into tributaries
- PA invasion
 - Spring creek watershed found in 2013
 - More related to the western US clone
- Efforts to genetically track the population differences between great lakes and stream populations
 - Still distinct: streams are US1, Great Lakes are US2
- Goal: early detection of populations before they become established
 - It is common to only find populations after they have become well established and are potentially a source for additional populations
 - 1) determine effectiveness of eDNA and qPCR for early detection
 - 2) determine extent of spread in PA and NY (largely unfinished bc process is intensive)
- Methods:
 - Water sample collection in March and May
 - March: determine if NZMS could be detected
 - May: use the method to attempt to detect new populations
 - Sampled sites based on popular fishing locations
 - 75% amplification rate meant a positive for DNA
- Results:
 - The large amount of time it took to process samples resulted in a reduced number of sites
 - So focused on objective 1 to determine effectiveness of eDNA for early detection
 - Detection of NZMS was possible through qPCR, but high level of contamination so decontamination methods were very important
- Conclusion;
 - Successful detection is possible
- Next Steps:
 - Broad sampling of Mid-Atlantic watershed
- Questions:
 - Jonathan McKnight: what the fix?

- EL: there may not be a fix - no successful eradication efforts. Education is key to stopping the spread. Chemical efforts may not be effective because of behavioral traits and asexual nature - populations can rebound relatively quickly.
- JM: what does the population look like post crash?
- EL: There are some places where they have passed that threshold and crashed, but it seems like there is a very high peak, crash and a low level persistence. Many places in PA seem to be continuing to increase in population size.

Assessing the risk of future AIS establishment in PA using the USFWS Ramp Tool (Sara Stahlman)

- Two major stressors: AIS and climate change
- What to expect in Pennsylvania?
 - Overall climate is getting warmer (rapid warming in last two decades)
 - PA has warmed more than half a degree (F) in last century
 - 5-50% increase in overall average annual precipitation in last century
 - Increases in extreme climate events along with heavy rain and storms
- What does climate change mean for invasions? Invasive species respond to climate change differently than native species
 - transport/introduction mechanisms: more pathways, better chance of surviving
 - Heat waves and drought can decrease biotic resistance
 - Geographic linkages: for example, melting sea ice may mean new shipping/transportation routes
 - Altered distribution of existing invasive species
 - Altered impact of existing invasive species
- We need to think about control strategies
 - More aggressive and expansive control methods may be needed
- Implications for AIS management in PA
 - The future of management will involve new tools developed from research that integrates climate change and invasive species
 - How will specific invasive species behave under altered climate conditions?
 - Which new species may emerge as invasive?
- Based on 3 existing studies
 - Thesis
 - Granberg in Wisconsin
 - Faulkner
- What species should be considered high risk?
 - STAIR: which traits allow a species to transition from introduced to established?
 - First step was to obtain list of potential species (not currently in PA)
 - No intentionally stocked species
 - No hybrids
 - Ended up with 118 species
- Risk Assessment Mapping Program (developed by USFWS)
 - Runs in ArcGIS
 - Also uses 16 climate variables and Climatch algorithms
 - Uses more weather stations than Climatch
 - Includes current and future climate scenarios
 - Analogue states (states with similar climate to PA)
 - RAMP creates a species profile by directly obtaining records from GBIF
 - Pre-selection of species current range

- Can ID and remove outliers (most difficult step)
- Once satisfied with pre-selection, choose a target range, choose a climate scenario, and run the match
- Ex: vermiculated sailfin catfish
 - Currently in SA, Mexico, and southern US
 - Under current climate scenario, medium risk
 - Future scenario (RCP 8.5 in 2070), high risk
- Limitations:
 - Distribution changes of invasive species are difficult to relate to climate
 - The rate at which species spread depends on many system and species-specific factors
 - Provides a first 'filter' to get a more manageable number of species
 - Records pulled from GBIF may be difficult to QA/QC
- Hope is that this work may assist natural resource managers to be proactive
 - Current state management plan does not include climate change considerations
- Questions:
 - Anne Timm: What data or parameters were used to define weather/climate in the RAMP?
 - SS: Incorporated climate scenarios into program, models were already included. First time around, Sara did it by hand. Second round included 16 variables (temperature, precipitation)
 - Steve Pearson: a single source was available, how easy is it to incorporate other datasets?
 - SS: Pretty easy - using Excel sheet or other database can incorporate data to RAMP via ArcGIS

Environmental DNA and Northern Snakehead (*Meredith Bartron*)

- Using qPCR can target a specific species using eDNA methods
 - Replication of a targeted region of DNA with species specific markers
 - Helps to reduce false amplification or amplification of an incorrect species
- In Fall 2017: Lamar Fish Technology Center had a request to develop genetic support for eDNA monitoring of snakehead
 - Started marker validation process:
 - Data quality is dependant on appropriate marker design and testing of marker
 - Various steps of obtaining tissues, developing primers, and checking accuracy
 - Design markers in multiple regions of DNA to ensure detection
 - Important to sample multiple individuals throughout the range to capture the genetic variety within the species
 - Supplement with publically available sequence data online
 - Also want to consider other closely related species that may create false positive
 - Cross check amplification process with sets of known species
 - Use DNA concentration gradients to determine marker sensitivity
 - Analysis of Field Samples:
 - Field samples have various additional environmental variables that may affect the effectiveness

- Use known positive and negative sources to see the actual performance of field samples
- Sampling Results:
 - All field samples from requesting agencies were negative
 - It was beneficial to have developed a marker
- Other NEFC Projects:
 - Additional marker development for AIS, native, introduced species
 - eDNA “BMPs”, protocols, and training development
 - Evaluation of methods
 - Monitoring and assessments
 - Meta-bacoding evaluation and applications (multiple species per sample)
- Comments:
 - Anne Timm: were you using samples from the snakehead native ranges?
 - MB: yes - we got some museum samples from multiple locations and multiple species that are not native to the US. We are also reaching out to colleagues overseas.

Wrap Up Comments:

- Jay Kilian: Thank you to Ray and Mike for the work you have done for the past 4 years. I look forward to the next 2 years.
- Jonathan McKNight: thank you to Margot for your hard work!!!! And Matt Shank for the facility and the support on the ground.

11:15: Adjourn

Overall Action Items:

- Send headshots for panel membership webpage to Margot (cumming.margot@epa.gov)
- Stay tuned for final ANSTF strategic plan to be released (early 2019)
- Lake Forum Planning: pick date, start planning logistics
- Schedule leadership transfer meeting

State Updates:

- **VA DGIF: Ray Fernald**

- Feral hogs are still a priority bc they are affecting aquatic habitats
- Nutria: new population moving up Meherrin river system, working to get monitoring in this system
- Snakehead symposium: happened over the summer
 - Invasion of the James system has happened, moving south
- Zebra mussel: monitoring is happening, but no populations have been detected in over 10 years. Targeting lake associations, but statewide watercraft inspection / decontamination program is not feasible.
 - Looking forward to spring 2019 lake forum
 - Shank: what kind of monitoring is happening?
 - Monitoring in areas where they are known to be downstream, especially at state borders - not formal or statewide
- Looking to expand programs statewide by splitting into plant and animal coordinators of AIS
- Chesapeake Nutria Eradication Program:
 - Maryland population has been eradicated - hasn't been seen in 3 years
 - Moving to biomonitoring and phasing out
 - Currently have trained nutria dogs - but if no plan for APHIS to fund it, it will probably be disbanded
 - **It would be useful to start planning to transfer MD capacity to VA**
 - Currently political climate may be amenable to funding such an effort
 - Fernald: would be great to get funding to address existing population. Would be good to coordinate efforts for moving program. However, most of the incoming population is coming from NC, where there are minimal control efforts

MD Fish and Wildlife: Steve Minkkinen

Josh Newhard conducted his graduate research surveying the fish populations in the Blackwater River. This river has subsequently been colonized with Northern Snakeheads. Josh is re-surveying the river in the hopes of determining what impacts snakeheads are having on fish populations in the river.

Delaware Update

State Aquatic Invasive Species Plan – Division of Fish and Wildlife will partner with Delaware SeaGrant and the Delaware Invasive Species Council to draft a plan, meeting in December to discuss path forward

New invasions

- Ø Confirmed catch of a Northern Snakehead in Mudmill Pond (state owned public pond) –the dam at the pond is the first upstream impediment on the Choptank River (tributary of Chesapeake Bay). The low profile of the dam coupled with high water levels from precipitation may have enabled breach of dam.
- Ø 1 Koi confirmed in Massey Mill Pond – Leipsic River watershed – trib of Delaware Bay
- Ø 1 Red Swamp Crayfish in Lums Pond - Chesapeake and Delaware Canal watershed – Delaware River basin; first confirmed occurrence in this watershed

Delaware Invasive Species Council

- Ø In process of updating State Invasive Species list – the current list only has plants – will update with aquatic taxa; legislators will consider the list regulatory although at present it is not
- Ø Initiated a small grants program (\$1,000) modeled after MAP-AIS. Targeting invasive species removals, outreach efforts, small scale research. Received 4 submission, 3 of which are bamboo removal projects. One is an outreach event with a featured speaker. Review/decision on approval taking place in December.

Media/Outreach

- Ø Cabela's/Basspro exhibit at Christiana store (northern part of DE - receives customers from PA, MD, DE, NJ) - worked with design team to create signage for Northern Snakehead and Blue Catfish exhibits which will include taxidermy specimens
- Ø State run Nature Centers & Aquatic Resources Education program – working with these groups to disseminate information to the public – distributed zebra mussel & mitten crab 'alert' cards
- Ø Created an invasive fish web app that will allow the public to report catches (photo confirmation required) & provide location details; should be live in time to put a side bar or QR code in the 2019 Fishing Guide

NOAA Chesapeake Bay Program Office: From Sara Coleman

I wanted to bring to your attention to two documents recently released from the Invasive Catfish Task Force (ICTF) of the Sustainable Fisheries GIT at the Chesapeake Bay Program. One is an updated version of the seven management recommendations proposed by the ICTF in 2014. The second is a summary of the science symposium held in November 2017 at VCU Rice Rivers Center. This symposium focused on sharing the latest research on catfish diet, population dynamics, movement ecology, and contaminant burdens. Please feel free to distribute!

Both reports can be found under publications on the Invasive Catfish Task Force [page](#).