

**Pennsylvania Climate Change Adaptation Strategy
Natural Resources Working Group Meeting
July 29, 2010 (10:00 AM – 2:30 PM)
Topographic and Geologic Survey Learning Center, Middletown, PA**

Attendees

Nels Johnson, The Nature Conservancy (Co-Chair)
Sally Just, DCNR (Co-Chair)
James Apgar, Allegheny National Forest*
Matt Azeles, DCNR Bureau of State Parks
Greg Czarnecki, DCNR
Rob Davidson, PA Department of Agriculture
Dave Day, PA Fish and Boat Commission
Sara Gris , PA Sea Grant
Thomas Hall, DCNR Bureau of Forestry
Dave Heicher, Susquehanna River Basin Commission
Kim Hoover, DEP Climate Change Program
Diane Husic, Moravian College
Austin Kane, National Wildlife Federation*
Matt Kowalski, Western Pennsylvania Conservancy / PA Natural Heritage Program
Huang Lin, DEP Waste Management
Kathy Patnode, US Fish and Wildlife Service*
Andy Pitz, Natural Lands Trust
Greg Podniesinski, PA Natural Heritage Program
Sarah Sargent, PA Audubon*
Jessica Seminara, The Nature Conservancy
Erica Smithwick, Penn State University Department of Geography
Jessie Stockwell, DEP Climate Change Program
Jim Thorne, Natural Lands Trust
Jack Williams, PA Trout Unlimited*
Robert Witmer, DCNR Bureau of Forestry
Paul Zeph, PA Sea Grant / HAP

**- Attending by WebEx/phone*

1. WELCOME, REVIEW OF PROCESS, RISKS AND VULNERABILITIES LISTS

Initial Comments

Sally Just welcomed attendees to the second meeting of Natural Resources Working Group for the Climate Change Adaptation Strategy for Pennsylvania. Before revisiting the risks and vulnerabilities

identified at the last meeting in the four sectors, Sally explained how the Natural Resources Working Group fits into the broader Pennsylvania climate change adaptation initiative.

The PA Adaptation Process – Climate Change Action Plan

At the statewide adaptation process kick-off meeting in March, four working groups were created:

- Natural Resources;
- Public Health and Safety;
- Infrastructure; and
- Tourism and Outdoor Recreation

The working groups will hold meetings this summer and fall. The results and recommendations from these meetings will be compiled and summarized in a white paper, which will be presented in Spring 2011. The co-chairs of the working groups have met and shared results of their first meetings, as well as key issues, etc. A second meeting of the co-chairs is being scheduled.

At the last meeting, Erica Smithwick provided an overview of climate change adaptation issues and concerns, and participants created lists of risks and vulnerabilities for four sectors: forests, freshwater, agriculture and wildlife/plants.

2. EXAMPLES OF ADAPTATION TOOLS AND STRATEGIES

To inform the July 29 meeting, Sally Just and Nels Johnson put together examples of adaptation strategies from other areas to share with the group.

Chicago Climate Action Plan

The U.S. Council of Environmental Quality (CEQ) invited state agency participants to a meeting in Chicago to discuss climate change adaptation initiatives. Sally Just joined the meeting by conference call. One of the highlights was a presentation on how the city of Chicago is responding to climate change. This is a reminder that we can't forget the urban environment in adaptation planning. Sally shared some of the highlights of this meeting, with recommendations for managing climate change in cities and creating a cooling environment. In an effort to adapt, the Chicago city government has managed to reduce its energy consumption by 50% in its facilities and buildings, expanded tree plantings across the city, updated building codes to favor energy efficiency and climate-friendly construction (e.g., reflecting roof tops and pervious surfaces for parking lots), and designated neighborhood cooling centers.

<http://www.chicagoclimateaction.org/pages/adaptation/11.php>

Climate Change and Massachusetts Fish and Wildlife Report

The Massachusetts Division of Fisheries and Wildlife and the Manomet Center for Conservation Sciences released a report in April 2010 on impacts of climate change on fish and wildlife resources. The report updates the Massachusetts wildlife action plan and addresses adaptation issues most likely to be faced by planners and conservation managers now and in the future

(http://www.mass.gov/dfwele/dfw/habitat/cwcs/cwcs_climate_change_reports.htm).

The report recommends that Massachusetts adopt policies and practices that:

- Promote resilience – mitigate non-climate stressors, conserve existing environment, manage complexity of ecological functions;
- Implement landscape-level planning – identify and preserve corridors, improve connectivity, improve buffers;
- Promote on-the-ground management of sites and habitats: manage for resilience, and manage for rather than resist ecological change. We have to know when it is no longer beneficial to expend resources to maintain status quo and it is more effective to manage the change instead. Focused monitoring as a tool is key. There will be winners and losers; we must be vigilant in figuring out which species and where those are.
- Forested habitats: establish a mosaic of age classes and conditions, control deer, control invasives and pests, etc.
- Freshwater ecosystems: protect hydrology, regulate water use and quality. Ecological, engineering, and regulatory strategies. Restrict use of new impervious surfaces (where there would be run-off into streams / water).
- Try to prevent maladaptive societal responses – beneficial strategies for long term over immediate responses that will be detrimental in long term. For example, promote floodplain conservation and restoration instead of levees and river bank “armoring.”

US Global Change Research Program – Agricultural Impacts

The U.S. Global Change Research Program (USGCRP) coordinates and integrates federal research on changes in the global environment and their implications for society. Thirteen federal agencies are engaged in USGCRP, including the U.S. Department of Agriculture (<http://www.globalchange.gov/>).

Anticipated effects of climate change:

- Lower yields to due temp increases, ozone increases.
- Crops will lose nutritional value.
- Droughts / heavy storms will detrimentally affect yields – both crops and livestock.
- Warming will benefit weeds, diseases, insect pests.
- Cows will produce less milk as they eat less when warm.

Agricultural adaptation strategies:

- Plant earlier
- Change to resistant crops
- Reduce heat for livestock
- Irrigate / manage stormwater
- Change livestock variety to more resistant species

Climate Change in the Champlain Basin (Vermont, New York, and Quebec)

In May 2010, the Vermont and Adirondack chapters of The Nature Conservancy released a report they commissioned on climate change impacts and responses in the Lake Champlain Basin. The report brings global climate change down to the local scale in the Lake Champlain Basin and takes a pragmatic approach to lessening the impact on nature and people. The Champlain Basin is about 150 miles long in New York and Vermont, and extends into Quebec. It is near the St. Lawrence River. This is both an agricultural and forested landscape that surrounds the 110-mile long lake that separates New York and Vermont. <http://www.nature.org/wherework/northamerica/states/vermont/science/art31636.html>

Major ecological impacts on freshwater systems:

- Tributary systems:
 - earlier spring flows
 - earlier ice jams and flooding
 - warmer, less-oxygenated flows
 - differences in where fish spawn
- Wetlands and shorelines
- Near shore and offshore habitats
- Fish assemblies
- Native mussels

Social impacts:

- Both positive and negative changes in fishing and species' economic value
- Agriculture will be more productive, more variety will be able to be grown, but there may be more sedimentation, etc., which is negative for the freshwater resources in the area

Responses:

- Scientists and researchers see an increased need for monitoring: fish species that have narrow temp. ranges; lakeshore hardening – where? What is the baseline now?
- Tributary and run-off management: about 6 recommendations
- Data is 40 years old, often there has been a 15-20% increase in precipitation since the baseline. Basis of BMPs is in 1960s.
- Connectivity issue – which species are vulnerable to extirpation in the basin?
- Lake level adaptation
- Fish and mussel adaptation

Three main issues seem to be: nutrients, sediments, connectivity

Recommendations for fed / state policymakers:

- Funding issues
 - River corridor protection
 - Invasive species – barriers in place for Lake Champlain
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3. REVIEW OF PRIORITY CLIMATE CHANGE RISKS AND VULNERABILITIES

After discussing examples from other states, the Natural Resources Working Group reviewed the priority vulnerability/risk issues for each sector identified at the May 25 meeting, and adjusted those based on discussion by the group on July 29. A complete list of risks and vulnerabilities identified for each sector can be found in the May 25 Natural Resources Working Group meeting summary.

Priority Risks/Vulnerabilities for Forests

- Interactions of ecological stressors: such as storm damage, fragmentation that might leave forests with changes in microclimate along edges, pathways for invasives. Stresses already there that could be exacerbated by climate change.
- Disease/pest outbreaks: Increased vulnerability to existing pests and pathogens; new pests and pathogens introduced due to warming. Temperature is a key limiting factor for hemlock woolly adelgid, for example.
- Connectivity: risk of losing more connectivity to help mitigate climate change impacts. Connectivity: space / habitat for species runs out due to changes in habitat. Species likely to be extirpated but may be able to move if connectivity exists. Ex. migrating forest interior birds are very averse to crossing areas where there is not a complete canopy. Serious declines may become more exacerbated in the future. General gene flow issue as well – promoting genetic diversity may allow species to better adapt. Species that are isolated and not interbreeding may show more maladaptive responses.

Priority Risks/Vulnerabilities for Freshwater

- Thermal change to aquatic systems: amount of habitat for cold-water species will shrink, but there may be strategies that can help mitigate this – riparian forests, limestone seeps?
- Altered hydrology – flashier systems: floods, drought, erosion, etc. Aquifer depletion.
- Riparian corridor condition: will we continue to see degradation, or can we start reversing these trends and promote riparian health?
- Groundwater recharge : key issue for ecological flows and human needs

- Flow changes : difference between this and altered hydrology? Shallow vs. deep ground water issues. How does periodicity of different flows affect the habitat, species, etc.?

Priority Risks/Vulnerabilities for Agriculture

- Increased need for water: evapotranspiration issue. 6 inches of rain, yet the Susquehanna river has never gone above 4 feet – the reason is all the hot weather we are having. Imagine water issues if we keep seeing increased average summer temperatures.
- Changes in agricultural production: crops and livestock typical of PA today may need to be significantly different 20 years from now.
- Pest / invasive species management: will be huge issues. More and more pests and pathogens will thrive in warmer, wetter conditions.

Priority Risks/Vulnerabilities for Wildlife/Plants

- Species/habitat vulnerability: which species have low tolerance to climate change?
- Community composition: how will the species composition of natural and human dominated habitats change?
- Food chain disruption: for example, upwelling of cold water is becoming less frequent in marine systems and is leading to less productivity. 500,000 readings from around the world correlated to amount of phytoplankton in the oceans.
- Invasive species and pathogens
- Genetic diversity: isolated populations more vulnerable to extirpation

Priority Risks/Vulnerabilities Across Sectors

- Shifts in habitat or agricultural species composition
- Interactions of stressors: atmospheric deposition; interactions of disturbances
- Movement / connectivity
- Hydrologic alterations
- Genetic diversity
- Impact on soil chemistry and composition
- Outreach, education and engagement
- Land use changes

4. SECTOR GROUP DISCUSSIONS ON ADAPTATION ACTIONS

Before breaking into sector groups, the larger group discussed criteria that could be used to help identify and to prioritize actions that could address the risks/vulnerabilities (reviewed above).

- Identify risks/vulnerabilities for your sector
- Immediate vs. long term solutions
- Categories:
 - Ecological Actions
 - Engineering Actions
 - Regulatory Actions
 - Social Actions
- Efficient/cost-benefit: recognizing fiscal environment and world we live in, clear cost effectiveness, multiple benefits
- Tractable
 - Practical
 - Co-benefits: trees on pastureland (carbon sink, shade cattle, tree crops like nuts and fruit species)
 - Synergy with public thought – what are their concerns that we can appeal to to gain support (do not necessarily need to put this in context of climate change adaptation). Terms we use: flooding, hazards, etc. Public safety, cost-savings, etc. Hook to townships – more environmentally-friendly management

AGRICULTURE

(Kim Hoover, Rob Davidson, Matt Azeles, Huang Lin, Jim Thorne)

KEY ISSUE: Increased Need for Water

POSSIBLE ACTIONS (priority actions underlined):

Capture storm water from a variety of sources – cisterns, rain barrels, storm water retention basins, etc.

Water recycling

Use greywater

Roof gardens

Targeted (drip) or “smart” irrigation systems

KEY ISSUE: Increased invasive species, including pests and pathogens

POSSIBLE ACTIONS (priority actions underlined):

Learn about management strategies for invasive species (including pests/pathogens) from states where they are already established

Make invasive species (e.g., multiflora rose, autumn olive) valuable as a biofuel or animal feed

Develop, evaluate, and promote use of pest control measures, such as biocontrols, that don't contribute to climate change

KEY ISSUE: Changes in agricultural production and practices

POSSIBLE ACTIONS (priority actions underlined):

Create incentives to boost local agricultural production and reduce emissions from transportation

Promote use of no-till farming practices to save fuel and reduce erosion

Expand technical assistance programs to help farmers make decisions about crops and production practices (e.g., Penn State Ag. Extension, NRCS, County Conservation Districts, county extension agents)

KEY ISSUE: Changes in land use

POSSIBLE ACTIONS (priority actions underlined):

Integrate agriculture into Smart Growth strategies

Revise land use regulations to permit more small-scale agricultural enterprises (e.g., vegetable production, honey production)

Expand regional planning initiatives, especially in agricultural areas, with focus on agricultural security zones

Discussion on Possible Agriculture Adaptation Actions

- Talked extensively about changes in production in large group there is a need for increased technical assistance. Farmers will need help in changing production; advice on how to change crops, breeds, etc. Cooperative Extensions – partner with Dept of Ag and DEP, NRCS, etc. Need to get technical assistance on the ground.
- Water – use recycled water. Where does run-off go? Greywater from treatment facilities – can we re-use that for irrigation? Clearly there are some opportunities there.
- Invasives and pests – opportunities to make them a valuable, productive component.
- Developing biofuel policies – take multiflora rose and autumn olive. Get farmers to harvest them and use them for cellulosic ethanol. But do not encourage planting these invasive species for biofuels.
- Pests we'll be dealing with 20 years from now may be pests they are dealing with in VA today; how to make use of lessons learned.
- Land-use regulations – 2500 planners in local government; how do we develop a more regional approach?
- Technologically and economically feasible – cross-cutting for agricultural and other strategies.

FRESHWATER

(David Heicher, David Day, Andy Pitz, Jessica Seminara)

KEY ISSUE: Thermal Changes to Rivers, Streams and Lakes

POSSIBLE ACTIONS (priority actions underlined):

Identify and protect refugia for different aquatic habitats and species

Protect and restore forest cover in riparian areas through easements, CREP, WRP, etc.

Expand or revise current minimum riparian buffer zones to better protect thermal conditions on size class 1 and 2 streams

Update and install storm water BMPs

Develop a regional or statewide water temperature monitoring system

Develop and use ecological flow thresholds to manage withdrawals so they do not increase thermal stress on sensitive species and habitats

KEY ISSUE: Altered Hydrology

POSSIBLE ACTIONS (priority actions underlined):

Revise storm water regulations to accommodate increase in precipitation and runoff

Restrict use of impervious surfaces in key watershed areas

Restore floodplain wetlands and forest areas to reduce runoff amounts and rates

Require accommodation of increased flow and need for fish/wildlife passage in new and rehabilitated bridges and culverts

Increase protection and buffers for springs, seeps, vernal pools and known infiltration zones.
Prioritize those with stronger hydrologic sources

KEY ISSUE: Declining Riparian Condition

POSSIBLE ACTIONS (priority actions underlined):

Evaluate tree species to replace loss of eastern hemlocks in riparian areas

Restrict sale of invasive species in nursery trade

Manual removal of invasive plants in sensitive riparian areas

Evaluate planting of more southern riparian species to out compete new invasive infestations

Evaluate pathogens that might be new threats to riparian habitats and assess possible biocontrol options

KEY ISSUE: Changes in Natural Flow Regimes

POSSIBLE ACTIONS (priority actions underlined):

Identify threshold ecological flow requirements for aquatic sensitive species (e.g., TNC/SRBC ecological flows project)

Conduct low flow impact studies on key species and habitats

Improve knowledge about key factors promoting recolonization by extirpated fish and mussels

Educate recreational fisherman on the importance of ecological flows

Identify and protect refugia for flow sensitive species in each basin

Increase monitoring of fish, invertebrate and mussel communities before and after changes in flow regimes

Identify critical habitat needs and life cycles for fish and mussel species to better target protection and management actions

Evaluate water requirements for new energy development (gas, biomass, nuclear)

KEY ISSUE: Changes in Water Quality and Chemistry

POSSIBLE ACTIONS (priority actions underlined):

Protect, restore, and create wetlands to improve water quality

Increase monitoring of water quality issues and correlate to climate and water temperature data

Expand efforts to identify and remove large “legacy” sediment deposits in floodplains across Pennsylvania

Tighten restrictions on use, handling, and transport of toxic chemicals and produced waters from hydraulic fracturing for natural gas development

KEY ISSUE: Changes in Groundwater Use and Recharge

POSSIBLE ACTIONS (priority actions underlined):

Regulate withdrawal and consumptive uses consistent with changes in groundwater recharge

Build more diverse groundwater and surface water withdrawal sources to maintain flexibility to meet human and ecological needs during droughts

Increase water fees to encourage more sustainable water uses, especially during drought periods

Promote more expansive source water and groundwater infiltration zone protection by local governments and land trusts

Encourage homeowners and farmers to use rainwater catchment systems to lower demand for groundwater and surface water withdrawals

Discussion on Possible Freshwater Adaptation Actions

- Water quality and chemistry: not only quantity but also quality will be seriously affected
- Sediment management as umbrella term – reducing, removing legacy sediments (Walter and Marris F&M – selling as soil supplements)
- Flow changes / affecting biota: need to understand flow regimes and life cycles; low-flow monitoring, protecting refugia with goal of using knowledge to inform protection and manage
- Use and regulation to inform planning and building: regulatory incentives such as those being implemented in Philadelphia; conjunctive use (flexible planning)

FORESTS

(Erica Smithwick, Tom Hall, Robert Witmer, Paul Zeph)

KEY ISSUE: Connectivity

POSSIBLE ACTIONS (priority actions underlined):

Identify biggest regional scale barriers to biotic movement in PA

Identify resilient landscapes (e.g., TNC resiliency network to preserve the “stage”)

Connect existing ecological hubs (or resilient landscapes) at multiple scales – “core” areas representing range of environmental conditions connected by migratory pathways for plants and animals

Build a network of riparian and ridge-top corridors

Prioritize protection of high elevation and “northern tier” (e.g., boreal?) habitats

Improve protection and management of existing priority conservation areas (e.g., “Conservation Opportunity Areas” identified by WPC)

Promote tax incentives that reward private landowners for protecting or restoring critical connectivity habitats

Expand old-growth management system from BOF lands to other public lands to increase carbon storage and provide more resilient interior forest conditions

Don't ignore connectivity in urban and agricultural landscapes.

Require revegetation of newly cleared gas well pads, especially in forest connectivity areas

KEY ISSUE: Interactions of Stressors

POSSIBLE ACTIONS (priority actions underlined):

Expand capacity of resource management agencies to monitor, model, and survey critical ecological indicators that can be used to improve adaptive management by public and private landowners

Fire

Expand use of prescribed fire to diminish fuel build-up and promote fire-dependent (oak-pine barrens) and fire-facilitated (oak-hickory forests) ecosystems

Expand monitoring of ecological response to prescribed and wild fires

Use monitoring data and forest simulation models to develop future forest scenarios

Insects

Evaluate most likely new insect and pathogen threats and develop risk map for future insect stresses

Learn about insect and pathogen management strategies from states that currently have insects/pathogens likely to move into PA

Reverse bio-simplification of PA forests caused by interacting stresses (high grading, too many deer, not enough fire, acid deposition)

Atmospheric Deposition

Assess potential interaction of increased biomass harvesting with areas vulnerable to cat ion leaching from atmospheric deposition

Discussions on Possible Forest Adaptation Actions

- Disturbances and stressors: contributions and differences between large forested areas, urban areas; high / low density population areas. Monitoring and documenting disturbance events across the landscape and developing systems to project management systems and document changes as we see them occurring.
- Link with ongoing landscape classification activities across agencies.
- Connectivity:
 - Get multiple land use ownerships involved in monitoring.
 - Identify resilient landscapes.
 - Identify economic and other incentives for landowners to buy in.
- Data collection, assembly – agricultural, water components important here as well. Tie monitoring efforts of all sectors together in key areas, i.e., fire hazards in certain areas will correlate to drought data as monitored by water resource agencies.

WILDLIFE/PLANTS

(Diane Husic, Greg Czarnecki, Sara Gris , Matt Kowalski, Greg Podniesinski)

KEY ISSUE: Species vulnerability to climate change

POSSIBLE ACTIONS (priority actions underlined):

Complete climate vulnerability assessment by PA Natural Heritage Program

Locate existing or collect new data to establish baseline conditions for vulnerable species

Evaluate climate sensitivity of timber species and evaluate management changes that would improve survival or regeneration under climate scenarios (e.g., harvest mature black cherry now to encourage wider regeneration while conditions are still favorable)

Identify how vulnerable or ecologically valuable species are moving – vectors, rates of movement, characteristics of connectivity pathways, etc.

Engage universities, community colleges, and environmental groups in research and monitoring networks across the state

Identify key ecological components of connectivity pathways

Establish central database for vulnerable and ecologically valuable species

Discussions on Possible Wildlife/Plant Adaptation Actions

- Assessment of current conditions: locate and integrate baseline data from ongoing monitoring efforts and data mining. Figure out best way to get data and do monitoring.
- Identify priority species and habitats at risk to help allocate resources effectively.
- Develop uniform database and monitoring system and engage multiple agencies, institutions, etc. to monitor species.
- Identify corridors.
- Identify native, invasive and exotic species and identify which are moving, to impede movement of invasives, introduce exotics as needed to help adapt to climate change.
- Use data to determine priorities and strategies for management and conservation. On a cyclical basis look at monitoring data to see how we are doing with management and conservation actions.
- Sustainability – cross-cutting goal. This term has resonance with many constituencies.

5. NEXT STEPS

Our October 15th meeting will be a longer meeting. We will focus on details of actions recommended today (i.e., who, what, when, where, how much, etc.). We will break down these actions into really specific, actionable items.

It is suggested that we put the lists into a table so that they are in a similar format. Highlight ideas that are pretty specific and would be easy to break down into actionable items. We will also classify actions that are immediate vs. longer term.