# imagine...

## A SUSTAINABLE SUSQUEHANNA

Watershed Sciences and Engineering Program
Bucknell Center for Sustainability and the Environment

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# imagine if our watersheds are places where

*Stream in Susquehanna County, PA*

- we can *live*, *work*, and *play* in harmony with nature's resources without compromising them;
- forests *stabilize the soils* and *slow the melting of snow packs* to prevent flooding and erosion;
- soils and wetlands store water, *filter* and *clean it*, and slowly release it back to our streams and rivers;
- streams flow with water clean enough to *drink*;
- bears, elk, bobcats, and other wildlife have enough *wild space* in which to live and roam;
- *healthy water* is all that flows to the river and to the bay.

# … imagine if our farms are places that

*Farm fields in the Ridge ad Valley province of the Susquehanna.*

- grow *crops suited* to our soils, local markets, and climate;
- preserve the top soil to *absorb and retain* water and, where possible, use reclaimed water to irrigate;
- have healthy streams flowing through them with their valuable stream banks (riparian zones) *restored* with the help of the local community;
- keep farm animals *out of waterways*;
- use fertilizers, pesticides, and compost properly to *take care of the land and waterways*;
- use bioswales and constructed wetlands to capture and *clean the run off* from farmyards before it reaches the pond or stream.

# … imagine if our neighborhoods

*Constructed stormwater storage and treatment wetlands build in Lancaster, PA.*



- are connected by streams and wetlands — giving us *green corridors* to walk in and use to get to the grocery store or work;
- have trees and shrubs along stream banks that *cool* our communities and capture greenhouse gases;
- have plentiful trees to *catch the rain* and snow, so water seeps slowly into the ground instead of rushing straight into storm drains and creeks;
- have *fish in the creeks* that our kids can catch and eat;
- have sidewalks and roads that allow water to flow into the ground — *replenishing* our supply;
- are filled with *native plants* that aren't so thirsty as non-native ornamentals.

# imagine if our industries were places that

*Rail lines and iron works along the Susquehanna River at Steelton, PA. Photo: Tim Schreier (used with permission)*

- continually *collect, clean* and *reuse* water — lowering costs, reducing pressure on our water supplies and keeping our rivers clean;
- know how to *avoid impacts* on the environment and consider environmental and social costs in all operations;
- *lead the United States* in innovative technologies that reduce industry's impact on the river and its environment;
- *partner* with communities and governments to demonstrate collective water stewardship.

# imagine if the stormwater systems in our urban areas

*Collecting storm water quality samples.*
*Photo: Chesapeake Bay Commission, used with permission)*

- were of *paramount importance* to our public officials and planners;
- ensured that outlets are *filtered* to remove trash and contaminants from entering the streams;
- were reduced by retrofitting parking lots with *permeable surfaces*, to improve groundwater recharge too.
- was *separate from sewage treatment plants* so that stormwater no longer overwhelm the treatment plants, but is instead gets rerouted to constructed wetlands that can store, filter and clean the polluted water.

# … imagine if we weren't so dependent upon thermoelectric power so that

*Three Mile Island nuclear facility on the Susquehanna near Middleton, PA.*

- power generation by coal, natural gas, and nuclear would no longer be the glut of consumptive use of water in the Susquehanna River basin — 92.7%.
- we would not need to pump over 2 billion gallons each day from the Susquehanna just to convert it to steam;
- warm (even hot) water would no longer be discharged from the power plant back to the river;
- we could realistically consider alternative sources of electricity. Right now, we obtain 35.5% of its net electricity generation from nuclear power, nearly as much as the 36.1% obtained from coal.

# imagine if sewage treatment facilities in the watershed

*Sewage treatment facility in Lancaster, PA.*

- had the space and funds to be experiment with *passive treatment facilities* that don't use any electricity to operate;
- could be separated from storm water systems to *eliminate combined sewage overflows* (CSOs) from occuring during floods;
- could be upgraded with *nutrient removal technology* (NRT) and *reduce nutrient loading to the Chesapeake by 20%*;
- employed the latest technology to reduce or even *completely remove emerging contaminants*, especially pharmaceuticals, personal care products, and hormones.

# imagine if abandoned mine discharge no longer

*One of innumerable abandoned mind discharges (AMDs) in the western paret of the Susquehanna watershed.*

- impacted over 2,000 miles of streams and rivers in the Susquehanna watershed;
- made AMD the second-largest source of impairment in our region;
- destroys the fish and benthic macroinvertebrate communities in streams draining the bituminous and anthracite regions;
- ruins property values of residents in the coal regions of Pennsylvania;
- dumped toxic levels of iron, aluminum, manganese and other heavy metals in the waters of the Susquehanna;
- is an American legacy.

Fact #1

# nature is the best teacher

## the best architect, and the best engineer when it comes to storing, treating, and filtering our water

Rivers and lakes require certain amounts of water at different times of the year to protect natural ecosystem functions like cleaning river beds and fish rearing. In areas with is a lot of human demand for water, there is competition among users and environmental needs.

The protection of aquatic habitat is essential to maintaining biodiversity in the province. Stream health should be considered first so watersheds remain healthy and we reverse the decline evident in many of our rivers and streams.

*Beaver crosses a lake in the Roaring Creek watershed*

*We can improve the way our water laws protect stream flows, fish, wildlife, and aquatic habitats. The allocation of water for ecosystem needs will generate opportunities for fisheries, recreation, and tourism throughout the Susquehanna River and the Chesapeake Bay.*

### Nature's Lessons

1 Water is the basis of life on Earth; nothing can survive without it.

2 All water is part of a single whole: glaciers, snow, lakes, rivers, streams, rainwater, and groundwater are all part of the same great water cycle.

3 Water has no substitutes in most of its uses.

4 Water is renewable from year to year, but there is a finite supply.

5 Water should be kept on the land as long as possible.

6 The trees in our forests capture, store, and use water that would otherwise run off the land too quickly.

Fact #2

# our climate is changing

We must begin working and investing to help communities adapt to our changing climate. Changing temperatures and precipitation patterns are already affecting our weather, water cycles, and ecology. Climate change is impacting our forests, ecosystems, water levels, infrastructure, agriculture, industry, and recreational opportunities. Risks of flooding, sea level rise, and storm surges pose new threats for human health, safety, and property. Warmer temperatures and drier conditions are compounding insect infestations, wildfire threats, and increasing drought risk.

*Hurricane Irene, August 2011*

We need to design our communities to adapt to our changing climate while thinking long-term to revitalize our natural systems.

Climate change will have broad impacts across the Susquehanna region. This presents opportunities to share ideas and work together with other provinces on common challenges around water.

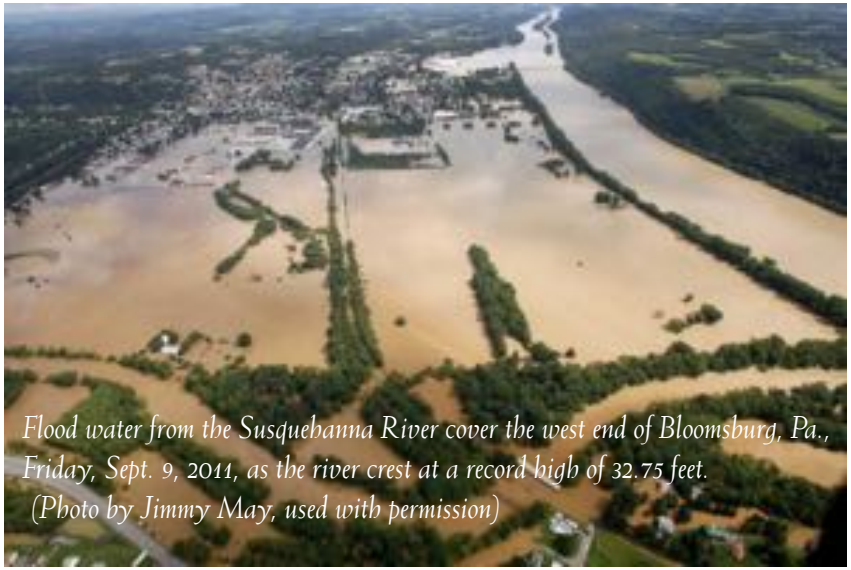
Healthy riparian zones can effectively store carbon dioxide, put water vapor back into the air, and help slow global warming. Government will integrate this water plan with its climate action plan to reflect the essential role healthy lakes, rivers, streams, wetlands, and riparian zones can play in:

- storing carbon in plants and soils,
- releasing water vapor to naturally cool landscapes,
- buffering the effects of extreme weather events, and
- storing and providing water during times of drought.

Fact #3

# rivers need room to meaner

The Susquehanna is one of the most flood prone rivers in the United States, largely due to our province's climate and geography. Flooding of the river and stream valleys are a natural geomorphic process that is essential to the health of the valley ecosystem. High waters help rebuild floodplain soils, maintain wildlife habitat, and restore groundwater supplies.



*Flood water from the Susquehanna River cover the west end of Bloomsburg, Pa., Friday, Sept. 9, 2011, as the river crest at a record high of 32.75 feet. (Photo by Jimmy May, used with permission)*

To help communities respond to floods and minimize property damage during floods, local government and regional planners should closely re-examine local zoning and development plans to shift communities away from streams and rivers to allow the streams to flood and shift..

Concentrating on floodplain management and structural flood protection is *not* stainable over the long term. New design standards for buildings in flood-prone areas and flood protection infrastructure need to be developed that reflect increasing flood risk. Effective ways of helping communities better manage the risk of more frequent floods include:

- avoiding re-building in flood prone areas,
- allowing room for rivers to meander,
- improving flood protection infrastructure, and
- adopting flood proofing measures.

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Fact #4

# green development makes sense

*Lancaster County "green team" meeting*

To estimate the true cost of a development project, the entire life of the project and its impacts must be considered. In the past, communities were developed when water was regarded as a 'free good' of little or no value. That is no longer so.

New thinking about development leads to new benefits. These include more green spaces, more water and fish in the streams, improved community vitality, reduced demand for water, and reduced expenditure on infrastructure.

To recognize these extra benefits, government needs to provide incentives to developments that store more greenhouse gases by restoring sections of streams or wetlands.

It won't be easy to always make the best choices for our communities, but if we all work together we will balance social, economic and environmental values in our community plans.

*The city of Lancaster, PA has adopted Green Infrastructure Plan is to provide more livable, sustainable neighborhoods for City residents and to reduce combined sewer overflows and nutrients*

Fact #5

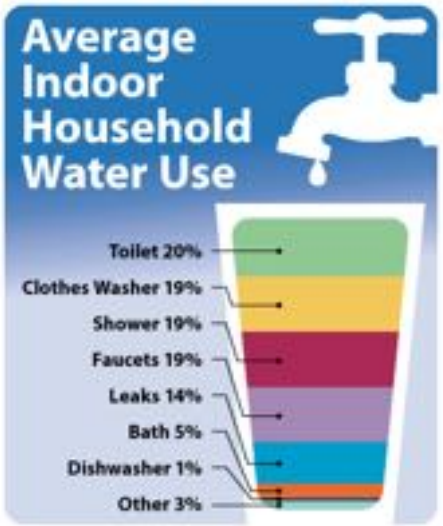
# we need to use water responsibly

Did you know we drink less than three percent of the municipally-treated water we use? The rest goes down the drain, down the toilet, or is used to wash our cars and water our gardens. This is both expensive and wasteful.

By adopting water-efficient practices and technologies, countries in Europe have reduced their water consumption to a third of what we use. In the Susquehanna watershed, public officials and planners in Lancaster County are now implementing conservation planning, water metering, green buildings, and water efficiency requirements in plumbing codes to show how successfully we can cut our water use, energy bills, and help the environment.

Households are installing purple pipes as a second set of plumbing that captures rainwater and recycles leftover water from the dishes, washing and showers. This "recycled" water is then used for flushing toilets and watering gardens, saving the best water for drinking and taking less from the river or aquifer.

Together we will find ways to ease future water tensions that's fair for everyone, including new users. Equitable allocation of water will improve the certainty of access to water for social, economic, and environmental needs. The days of taking our "unlimited" supply of water for granted are over.



Fact #6

# we need to honor native traditions and knowledge

Native American have kept a strong spiritual connection to the watershed; in fact, many localities still bear their names. The holistic connectedness between ecosystems and watersheds is closely aligned with long-standing Native American values and thought.

Aside from drinking and sanitation in their homes, healthy water is also important to traditional bathing ceremonies, transport, food and medicinal plant gathering and the health of animals and plants.

*Replica of native Susquehannock home and dug-out canoe.*

And like all communities, water is an important economic resource too. The Haudenosaunee, ("People of the Long House"). or Iroquois Confederacy have been observing and collecting wisdom on water and ecological change for generations. Wisdom about water is woven into cultural their rules and practices for resource management, as well as native stories and ceremonies. Their traditional ecological knowledge can be a valuable assett to water science, governance, and policy.

Building a new relationship and facilitating two-way knowledge sharing will help governments and communities learn about, respect and uphold what is important to them.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