



## V. CHANGING THE FORECAST FOR THE CHESAPEAKE BAY: A PLAN OF ACTION

Even though the problems posed by global warming seem daunting, practical solutions are available. By reducing global warming pollution while taking steps to help wildlife cope with some of the inevitable changes, we can ensure that the Chesapeake Bay's treasured natural heritage and sporting legacy will endure.

Effectively managing the land in the face of global warming is a major challenge for the next decade and beyond. Across the Chesapeake Bay region, officials have recognized the importance of protecting wetlands, forests, and other natural habitats from encroaching urban development and better managing already-developed and agricultural lands. Sound land use is one of the primary goals of the Chesapeake 2000 Bay Agreement. However, failure to explicitly consider global warming as part of these efforts will make it much more difficult, if not impossible, to meet conservation goals.

The time for action is now, because many of the decisions we make today—from where and how we build our homes, businesses, and highways, to how much and what kinds of energy we use—will have a significant impact on the Chesapeake Bay and its fish and wildlife for decades to come.

Policy makers in Washington, along with the governments and citizens of Maryland and Virginia, can play a critical role in advancing meaningful solutions to change the forecast for the Chesapeake Bay. This section makes recommendations in seven broad areas to accomplish that.

### 1. Reduce Global Warming Pollution and Provide New Funding for Wildlife

To help fish and wildlife in the Chesapeake Bay, we need a two-pronged approach. First, we must curb global warming pollution, thereby limiting the magnitude of changes to the climate and ecosystems. Reducing global warming pollution at a rate of 2 percent per year from current levels will significantly improve the forecast for fish and wildlife (see Box 5). This will require action by the federal government, as well as states, localities, and individuals.

But, even if we successfully reduce global warming pollution, fish and wildlife in the bay will inevitably face some impacts of global warming. There will still be some warming over the next century from greenhouse gases that are already in the atmo-



sphere and those that we will continue to emit while transitioning to new energy sources. New and enhanced restoration and adaptation strategies will be needed. To develop those effectively, fish and wildlife agencies must be given a permanent, stable, and new funding source.

For years, sportsmen have helped sustain fish and wildlife populations through the purchase of licenses and permits, as well as special excise taxes on hunting and fishing equipment. The U.S. Congress has provided some additional funding for state fish and wildlife agencies (\$61 million in 2005), but it is far short of what is needed to sustain fish and wildlife populations affected by global warming.

Programs to reduce global warming pollution should be designed to provide funds to sustain wildlife habitat and populations during the period when global warming threatens these critical resources. The leading proposals in Congress for controlling global warming pollution create a new system of permits for major emitters, often referred to as a “cap-and-trade” system. Under such a proposal, the government would auction off annual permits that allow industry to emit a certain amount of carbon dioxide and other greenhouse gases. At the end of the year, each industrial source would be required to hold permits to cover its emissions for the year. As such a system is put in place, it is critical that a portion of proceeds from the auction of emission permits be set aside to fund conservation of fish and wildlife.

Such a cap-and-trade system for regulating global warming pollution can provide a double benefit for fish and wildlife. It will help reduce the impacts of global warming and it will provide new funding for resource managers to help fish and wildlife cope with those climate changes that are inevitable. In an added benefit for the Chesapeake Bay, many of the measures that reduce global warming pollution will also reduce nitrogen emissions that are ultimately deposited in the bay.

Dedicated conservation funding will be crucial to help states develop strategies for protecting fish and wildlife from global warming, integrate fish and wildlife adaptation strategies into existing resource management plans, and carry out conservation actions. Indeed this funding could help support many of the activities recommended in this report.

#### Federal actions:

- The U.S. Congress and the administration should place mandatory limits on the nation’s global warming pollution to ensure we meet the necessary target of 80 percent reduction by 2050.
- The U.S. Congress and the administration should pass a nationwide

### **BOX 5.** *Avoiding the Worst-case Scenario*

As many as one-third of species worldwide are at risk of extinction if global temperatures reach more than 2 to 3 degrees Fahrenheit above present levels.<sup>52</sup> These extinctions will be accompanied by major changes in the structure and function of ecosystems. The only way to keep temperatures from increasing more than 2 degrees Fahrenheit in the next century is to begin taking steps immediately to reduce global warming pollution.

To have a reasonable chance of staying below 2 degrees of warming, greenhouse gases in the atmosphere need to stay below about 400-450 parts per million of carbon dioxide equivalent.<sup>53</sup> To meet this goal, the United States must reduce current carbon dioxide and other greenhouse gas emissions by about 80 percent by 2050.<sup>54</sup> Experts have concluded that this target is achievable with technologies either available or under development.



cap-and-trade bill to reduce global warming pollution, with roughly 10 percent of the revenue (from an auction of 100 percent of the permits) allocated for fish and wildlife conservation. The funding should supplement, not supplant, existing budgets for natural resource management, recognizing the new threat to fish and wildlife posed by global warming.

Maryland has taken some important steps to address global warming pollution. It joined the northeastern states' Regional-Greenhouse Gas Initiative, with a commitment to reduce carbon dioxide emissions from the state's utility companies by about 10 percent from current levels by 2019. It passed a renewable energy standard, which requires electric utilities to generate 7.5 percent of their electricity from renewable sources like solar, wind, and biomass by 2019. Recently, Maryland adopted a requirement to reduce carbon dioxide emissions from new cars sold in the state, and adopted more stringent efficiency standards for new appliances.<sup>55</sup> While much progress has been made in Maryland, more needs to be done. Virginia lawmakers have yet to act.

#### State Actions

- Maryland and Virginia should adopt a stringent carbon dioxide reduction goal of 2 percent per year, or 20 percent per decade, to achieve the necessary 80 percent reduction target by 2050.
- Maryland should strengthen its renewable energy standard to require utilities to generate at least 20 percent of electricity from renewable sources by 2020. Virginia should adopt a similar standard.





- Maryland should adopt more stringent building codes for government-owned buildings to require all new and renovated buildings to be carbon neutral by 2030. Virginia should adopt a similar standard.
- Virginia should adopt a “clean cars” bill and join the 10-state Regional Greenhouse Gas Initiative to work with neighboring states to achieve reduction in carbon dioxide emissions from power plants.

## 2. Expand State Wildlife Action Plans to Address Global Warming

In 2000, the U.S. Congress charged each state and territory with developing a wildlife conservation strategy. These Wildlife Action Plans identify at-risk species and habitats and outline the actions necessary to protect them, ultimately leading to cost-effective, proactive conservation strategies. To date, few of the plans include specific strategies to help wildlife cope with climate change.

Congress provided funding for creating and implementing these plans through the State and Tribal Wildlife Grants Program. Funds appropriated under this program are allocated according to a formula based on each state’s size and human population. The average grant in 2007 was just over \$1 million.

The Virginia Wildlife Action Plan mentions global warming as a threat to wildlife. Specifically, the plan lists the Blue Ridge Mountains and the biologically diverse Northern Ridge and Valley regions as particularly susceptible to change brought on by climate change. Several rare species and habitat types would likely be lost, including high-elevation forests, home to the endangered Carolina Northern Flying Squirrel. The current Virginia plan calls for more research, but does not include specific conservation actions that address global warming.

The Maryland Wildlife Action Plan, formally known as the Maryland Wildlife Diversity Conservation Plan, lists global warming and sea-level rise as statewide threats to wildlife. In particular, sea-level rise has contributed to the decline of the extremely rare type of floodplain forest, called a sea-level fen; the plan calls for restoring these wetlands by reintroducing northern conifers to the landscape and protecting them from ditching, draining, and water withdrawal. The Maryland plan also identifies sea-level rise as a threat to several types of coastal habitats: beaches, dunes, mudflats, and coastal plain freshwater streams. The plan calls for conserving these habitats by protecting and restoring riparian buffers, improving storm-water management systems, developing shoreline erosion control practices, and restoring native dune vegetation.

Maryland has taken an important first step to better account for global warming in its wildlife action plan. In April 2007, Governor O’Malley created the Governor’s Climate Change Commission, charged with developing a strategy to reduce the sources and impacts of global warming. The Adaptation and Response Working Group of the Commission is developing state-based adaptation measures, with an initial focus on sea-level rise. Maryland could be one of the first states in the nation to develop a state-based adaptation plan.

### State actions:

- In Maryland, continue efforts through the Governor’s Climate Change Commission to develop a wildlife adaptation strategy that identifies fish, wildlife, and habitats threatened by climate change and outlines actions to protect them.



- In Virginia, develop a wildlife adaptation strategy that identifies fish, wildlife, and habitats threatened by climate change and outlines actions to protect them.
- In both states, incorporate adaptation measures related to climate change in the State Wildlife Action Plan.

### 3. Expand State-Based Funding for Maryland and Virginia Conservation Activities

Despite more than three decades of conservation and restoration activities, the Chesapeake Bay ecosystem is still stressed due to pollution, over-fishing, and coastal development. Moving ahead, global warming could significantly alter the bay's habi-

#### **BOX 6.** *Blue Crab*

Crabbing is a popular recreational activity and the Chesapeake Bay's single largest commercial fishery, with more than 50 percent of the nation's annual blue crab harvest coming from the bay.<sup>49</sup>

As with other species, determining how climate change will impact the blue crab population is a complex puzzle. Because blue crab growth is inhibited by cold winter weather in the Chesapeake Bay region—forcing crabs to burrow in the bay's mud until warmer weather returns—warmer winters could actually extend the growing season and lead to population increases.<sup>50</sup>

But, other global warming factors are likely to inhibit the blue crab population in the bay. For example, eelgrass, which provides juvenile blue crabs with important habitat, would face significant danger if water temperatures exceed its tolerance levels.<sup>51</sup> Without suitable nursery habitat, the Chesapeake Bay blue crab population would be expected to decline even in the face of more favorable warmer winters.

As global warming affects the Chesapeake Bay ecosystem it will be important that the blue crab population be carefully studied and harvest levels adjusted as conditions dictate.





tats, further disrupting its ability to support the fish and wildlife for which it is best known.

Reducing environmental stressors like nutrient overload, habitat loss, and fragmentation will make the system healthier and help wildlife survive the impacts of global warming. At the same time, new efforts are required to specifically address the habitat changes that global warming is likely to bring. These new activities will require new funding.

Conservation activities in both Maryland and Virginia are supported by a combination of special revenues—mostly from the sale of hunting and fishing licenses and taxes on sales of watercraft and equipment used in hunting and fishing—state general fund appropriations, and federal support. However, the funds available to the Maryland and Virginia agencies that handle conservation, fisheries, environment, and planning are insufficient to meet the current conservation challenges, much less the new challenges posed by global warming.

Furthermore agencies in both states face budgetary uncertainty from year to year. It is not uncommon that the special revenues supposedly dedicated for fish and wildlife conservation are redirected to other unrelated efforts. In Maryland, for example, funds dedicated for land acquisition in Program Open Space have often been redirected to other uses, hampering the effectiveness of the program. Such funding uncertainty will constrain agencies from pursuing new programs to address global warming.

Finally, the states should provide more accountability for their conservation spending to assure the public that such spending is effective. To that end, Maryland has recently begun the BayStat initiative to track Chesapeake Bay restoration activities.<sup>56</sup> BayStat will help ensure that existing and new funding is well spent.

**State actions:**

- Legislatures in Virginia and Maryland should ensure that conservation agencies receive adequate, dedicated funding each year to meet existing conservation goals and to address the new challenge of global warming. The legislatures also should reduce reliance on the annual appropriations process and provide more long-term budgeting certainty.

TOP RIGHT, USFWS; BOTTOM LEFT, NOAA



## 4. Adapt Waterfowl and Fish Management Practices

Waterfowl and fish migration patterns are shifting, and populations are changing in response to global warming, affecting which species frequent the Chesapeake Bay and when they are present. Indeed, global warming will have broad, interconnected impacts on entire marine ecosystems. Effective management will mean addressing the health of the habitat as a whole, rather than one species at a time. Yet, most fisheries management plans focus on single-species management and do not consider the inter-related impacts of climate change. An ecosystem management approach would be more effective and allow for better consideration of long-term changes such as those brought on by global warming.

If we fail to address global warming, shifts in waterfowl and fish migration patterns and declines in some species may also force resource managers to consider making adjustments to hunting and fishing seasons to ensure the long-term viability of species. The management approach will need to take into consideration year-to-year conditions as well as longer-term climate trends. For example, the delayed migration of waterfowl due to warming winters may force government officials to delay the opening of the annual waterfowl season.

### State and Regional Actions:

- The Atlantic States Marine Fisheries Commission, the Mid-Atlantic Fisheries Management Council, the Virginia Marine Resources Commission, the Maryland Fisheries Service, and the Chesapeake Bay Program should move towards an ecosystem approach for managing fisheries in Chesapeake Bay. State and regional marine fisheries management plans should consider how climate change will affect fisheries.
- As species populations shift in response to global warming, fisheries managers should consider adjusting fishing regulations.
- The delayed migration of waterfowl due to warming winters may force government officials to delay the opening of the annual waterfowl hunting season.



## 5. Discourage Extensive Coastal Development and Armoring of Shorelines

Sea-level rise should be a major consideration in the region's coastal development plans. Maryland has taken an important first step by establishing a state-wide Sea-level Rise Response Strategy, which has laid out a number of recommended actions.<sup>57</sup> To be successful, however, actions should be coordinated throughout the region.

The best ways to improve the ability of our coasts to withstand sea-level rise are to enhance the natural defenses provided by wetlands, barrier islands, and reefs; support the natural replenishment of sediments from rivers and beaches; and protect inland buffers to enable habitats to migrate. Whenever possible, resource managers and land-use planners should steer away from structural approaches such as seawalls and bulkheads for coastal protection. Coastal armoring hinders the ability of habitats to migrate inland as sea levels rise, preventing coastal wetlands from replenishing themselves through sediment buildup.

In addition, the region should discourage development in vulnerable areas. For example, both Maryland and Virginia currently designate that new development can not take place within a 100-foot buffer surrounding ecologically critical areas. This size buffer may not be sufficient as erosion and inundation rates accelerate due to sea-level rise, threatening habitats farther inland.<sup>58</sup>

### Federal Actions:

- The U.S. Congress should reauthorize the Coastal Zone Management Act to require relevant state agencies to consider sea-level rise in coastal management plans to qualify for federal funding; prohibit federal subsidization of infrastructure development and coastal armoring in ecologically sensitive areas; and encourage public and private land acquisition of coastal habitats and upland buffers.
- The Federal Emergency Management Agency should remap potential hazard areas in coastal zones to reflect anticipated sea-level rise, taking into account potential storm surge impacts, and establish policies to reduce or eliminate federal flood insurance for new construction and rebuilding in high-risk areas.





- The U.S. Congress should expand the Coastal Barrier Resources system to discourage new development in areas needed to buffer natural resources and existing development from sea-level rise. Such areas should be denied federal subsidies such as federal flood insurance, disaster relief, and loans for sewer, water, and highway construction.

#### State and Local Actions:

- Maryland and Virginia should enact new legislation requiring local governments to consider sea-level rise when amending their plans for coastal land use, open space, wetland protection policies, and other relevant activities.
- The Virginia Marine Resources Commission and the Maryland Department of Natural Resources in conjunction with the Maryland Department of the Environment should develop state tidal wetlands conservation and restoration plans that promote designation of wetland migration corridors and remove and discourage use of hard shoreline erosion structures in coastal marsh environments.



- The Maryland Department of Natural Resources should expand Maryland's Critical Area buffer designation and the Virginia Department of Conservation and Recreation should expand Virginia's Resources Protection Area buffer designations beyond the current 100-foot requirement to accommodate impacts of sea-level rise. States should also expand enforcement of current regulations and prevent any attempts to weaken these provisions in relevant legislation.
- State and local agencies should establish policies such as rolling easements or mandatory setbacks to discourage new development in vulnerable coastal areas.



## 6. Account for Global Warming in Land Conservation and Habitat Protection Efforts

Numerous land conservation efforts are currently underway to restore and protect the Chesapeake Bay's habitats and the species they support. Bay-protection efforts have included limiting suburban sprawl, reflecting the fact that such development contributes to habitat fragmentation and destruction, air pollution, and water quality degradation. Many of these efforts will also make the region's coastal wetlands and other natural habitats more resistant to the effects of global warming. For example, habitat restoration and de-fragmentation along with open-space protection will allow wildlife to move more easily to new locations as climate shifts push them out of their current homes.

But it is also critically important for decision makers to explicitly account for global warming as they develop strategies for land conservation, habitat protection, and restoration. For example, while both Maryland and Virginia have a number of state-based land conservation programs—including Maryland's Program Open Space, the Virginia Land Conservation Foundation, and the Virginia Outdoors Foundation—neither state currently considers the impacts of global warming when assessing ecologically critical habitats for possible acquisition. Nor do the states' current land-use planning measures adequately consider the longer-term threats from global warming in their habitat-protection requirements. Maryland's Green Infrastructure criteria are a step in the right direction, but future revisions will need to consider global warming explicitly.

Agricultural lands play an important role in providing habitat for some waterfowl species, such as mallards and Canada geese. Accordingly, sportsmen and women have worked closely with the agricultural community, helping pass initiatives in the federal Farm Bill that provide incentives for wetlands and associated upland habitat conservation (such as the Wetland Reserve Program and the Conservation Reserve Program). Ensuring that these habitats are available is even more important as the region continues to face added pressures on coastal wetlands, seagrass beds, and other natural habitats due to global warming. However, the Farm Bill conservation programs are currently under-funded. In Fiscal Year 2004, for example, three out of every four applications to participate in Farm Bill conservation programs administered by the Natural Resources Conservation Service were rejected due to lack of funds.<sup>59</sup> At the same time, the conservation rates paid to land owners are not always keeping pace with increasing land values.



#### Federal Actions:

- The U.S. Congress should significantly expand funding for the conservation provisions of the Farm Bill, including the Conservation Reserve Program, the Wetlands Reserve Program, the Conservation Security Program, the Grasslands Reserve Program, and the Wildlife Habitat Incentives Program. These provisions should include greater incentives for maintaining coastal and riparian buffers in response to increased runoff and sea-level rise.

#### State Actions:

- Land conservation agencies and foundations in Maryland and Virginia should develop improved criteria for identifying ecologically critical lands, in particular considering how sea-level rise and other climate changes will hurt habitats, and seek opportunities to acquire or better manage these lands.
- Maryland and Virginia should ensure that the Farm Bill conservation programs preserve existing commitments and encourage new enrollments. This may involve adjusting the rates paid to land owners or finding efficient ways to restore relatively small parcels, such as buffers along streams.

## 7. Redouble Efforts to Manage Storm-water Runoff into the Chesapeake Bay

As the region faces greater extremes in precipitation events, including heavier rainfall and the possibility of more-intense coastal storms, improving storm-water management will be critical to meeting important goals to reduce eutrophication in the Chesapeake Bay. This is particularly important as the region considers denser development and redevelopment projects in the interest of smart growth.

Significant efforts are being made in the region to improve storm-water and wastewater management, including new legislation in Maryland to develop more effective storm-water environmental site design. The state has also identified storm-water retrofits as a priority for funding under its Green Fund proposal. Similar efforts are warranted in Virginia, where current funding for the Virginia Water Quality Improvement Fund is inadequate.

In both states and across the region, however, storm-water managers must seriously consider the likelihood of heavier precipitation and more runoff problems due to global warming. For both new developments and redevelopment projects, it is critical to incorporate non-structural, preventive measures employed through land-use planning and educational programs, in addition to the structural fixes, such as water treatment systems for large point sources, that have been emphasized in the past. Promoting more flexible strategies and moving development away from sensitive areas can also help handle precipitation extremes. In addition, reducing runoff flows over impervious surfaces such as roads and parking lots can help moderate high water temperatures in tidal creeks and marshes, a problem that is likely to be exacerbated by global warming.<sup>60</sup>

The region must also establish runoff-reduction goals that account for greater extremes than are reflected in historic trends. For example, even where technological solutions to storm-water management are warranted (e.g., retrofitting culverts and storm drains), it will be prudent to consider expanding the capacity today rather than being faced with having to re-invest in further



retrofits in the coming decades. Several actions at the federal and state levels will help improve storm-water management in the region to more effectively deal with the added pressures from global warming.

#### Federal Actions:

- The U.S. Environmental Protection Agency should revise its storm-water management rules under the Clean Water Act to discourage construction in or near coastal and stream riparian buffers, wetlands, and other sensitive areas.

#### State and Local Actions:

- Virginia should develop a dedicated funding source for sewage and wastewater treatment upgrades and provide sufficient funding to the Virginia Water Quality Improvement Fund.
- Both Virginia and Maryland (through its Green Fund) should increase support of non-structural approaches to storm-water management (i.e., preventive measures incorporated in land-use and development planning rather than technological fixes of point-source pollution) and require consideration of greater extremes in precipitation events due to global warming.
- Both Virginia and Maryland should consider stricter storm-water permits to steer development away from coastal and stream buffer areas, wetlands, and other sensitive lands.

