ON THE ROAD TO RECOVERY

—Acid rain and the Adirondacks

By Kevin L. Civerolo and Karen M. Roy

It has been approximately 40 years since acid rain first headlined as a problem in the Adirondacks. And while we've seen a lot of negative impacts due to acid precipitation—from die-offs of large numbers of trees to sensitive fish species like the brook trout disappearing from affected waters—there's been much improvement in recent years. In fact, in the past five years, all indications are that the Adirondack ecosystem may be on the road to recovery from the effects of acid rain.

A by-product of fossil fuel combustion from automobiles, factories, coal-fired power plants, and other sources, acid rain (or more appropriately called "acid deposition" since it also includes snow, sleet, fog, clouds, and gases and particles that fall to the earth) has caused significant environmental harm. And the effects aren't just local; emissions of sulfur dioxide and nitrogen oxides undergo complex reactions in the atmosphere and can be carried by the winds for hundreds of miles. In New York State and many other parts of the country, it was becoming clear by the 1960s that acid deposition was having devastating impacts on forests, soils, surface waters, and many of the forms of life that depend on these resources for food and habitat.

The Adirondack Mountains were particularly affected by acid deposition. The region is downwind of many pollution sources, receives high rates of precipitation, and its higher peaks are often surrounded by clouds and fog which are generally more acidic than rain. Soils, stripped of important nutrients from decades of acid deposition, were less able to sustain healthy plant life. As a result, ecologically and economically important tree species such as red spruce and sugar maple experienced noticeable symptoms of decline and scattered die-offs (particularly at high elevations) in the 1970s and 1980s. Lakes and streams became unnaturally acidic, and species began to disappear. Researchers warned that melting snow combined with heavy spring storms

John Bulmer

were an additional serious threat. These "spring surges" concentrate the release of pollutants into the water; acidity sharply increases before tapering off, leaving aquatic organisms no time to adapt.

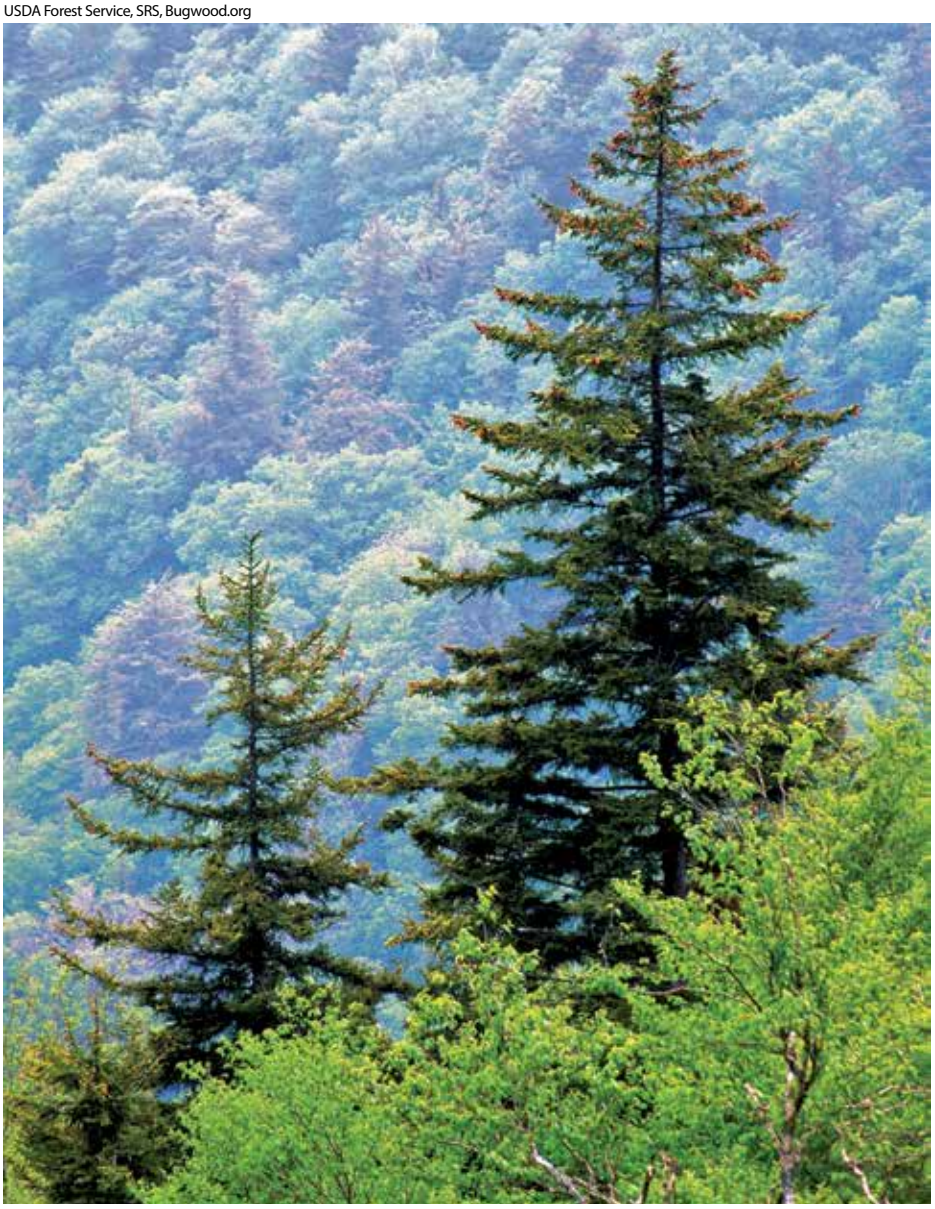
Scientists found that acidified soils, lakes and streams also foster the accumulation of toxic forms of aluminum and mercury, resulting in declining fish populations and higher levels of mercury in those fish that do survive. The concern was equally grave in forests and high mountain areas where soils are thin or poorly buffered and acid clouds and fog can release additional pollutants. Plants and animals in these areas (like Bicknell's thrush) are affected when the health of their habitat is compromised.

Over the past four decades, it became clear that the damaging effects of acid deposition on forests, agriculture, and soils needed to be documented. So, a consortium of federal and state agencies and academia established the first acid deposition network in the U.S.: the National Atmospheric Deposition Program (NADP). The first NADP sites were established in 1978 and included Huntington Forest in the Adirondacks. In the mid-1980s, the DEC Division of Air Resources began independently monitoring acid deposition

Jeff Nadler

Bicknell's thrush

USDA Forest Service, SRS, Bugwood.org



Acid rain killed many red spruce trees in the Adirondacks in the 1970s and 1980s.

at additional sites across the state, from Niagara Falls to remote locations in the Adirondacks, to the New York City metropolitan area and Long Island.

Instrumentation technology has vastly improved since those early years, and DEC is in the process of transitioning its deposition sites to join the NADP network. This will ensure consistent, efficient monitoring both statewide and nationwide, and will continue tracking progress toward healthier lakes, streams and forests. As of December 2012, DEC has converted three sites in the Adirondacks to the NADP network: Wanakena, Paul Smiths College, and Piseco Lake. Later this year, sampling sites in the Buffalo, Rochester and New York City areas will also be converted, resulting in a total of 17 NADP sites across New York.

Throughout the years, New York's commitment to addressing the problem of acid deposition has remained steadfast. As a result of passage of state and federal legislation that targets large pollution sources like coal-fired power plants, emissions of sulfur dioxide and nitrogen oxides from these sources are approximately 80% lower now than they were in 1990. Acid

DEC photo

A DEC staffer checks the equipment at one of the acid rain monitoring stations.

deposition levels across New York have declined by a factor of two or more, which in turn has led to decreases in acidity and toxic aluminum levels in a number of Adirondack lakes in recent years.

Perhaps due, at least in part, to this progress, many people think of acid rain as a "problem of the past." But this is not the case. Although acid deposition is considerably lower in New York than it was several decades ago, and many Adirondack lakes have improved, some lakes continue to be impaired. In addition, there appears to be more of a delay in biological recovery. Not all lakes in the region have recovered sufficiently for fish populations to be sustainable. Biological damage continues in a number of lakes and even more so in streams. A recent study supported by NYS Energy Research and Development Authority and conducted by the U.S. Geological Survey, DEC and the Adirondack Lake Survey Corporation showed more than one-third of streams in the east-central and more than two-thirds in the western Adirondacks had acidity levels harmful to fish and other organisms.

DEC photo

As we continue to tackle the issue of acid deposition, we must be mindful of other uncertainties and challenges that face us. For instance, how will manufacturing, transportation and energy sectors—sources of the pollutants that cause acid rain—change in the coming decades? Or how will pollution emissions from Asia and other parts of the world affect air quality here? And how might projected changes in precipitation patterns or frequency of drought or severe storms affect acidic deposition? These are important questions in the fight to alleviate acid deposition, and the best way to be objective about what to do is to have adequate and reputable datasets publically available to examine and interpret. In New York State we are fortunate to host several state and national agencies, academic institutions, and non-governmental organizations that contribute to assuring that essential monitoring is in place. Armed with these datasets, we can continue to manage the problem and protect these world-class ecosystems for generations to come.

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Susan Shafer

Learn more about acid rain in New York State:

April 2008 *Conservationist—Acid Rain Rain Go Away* by Shannon Brescher Shea

Acid deposition monitoring: **http://nadp.sws.uiuc.edu**

Adirondack Lakes Survey Corporation: **www.adirondacklakessurvey.org**

New York State DOH fish consumption advisories: **http://www.health.ny.gov/fish**

National Acid Precipitation Assessment Program Report to Congress 2011: **http://ny.water.usgs.gov/projects/NAPAP/**

NYSERDA Environmental Monitoring, Evaluation, and Protection Program: **www.nyserda.ny.gov/Environmental-Research/EMEP.aspx**