



NCRN Natural Resource Quarterly

WINTER 2011

Capital Region Conifers

By John Parrish

Eleven species of conifers are found in the National Capital Region Network (NCRN). They include not just pines, but also arborvitae, bald cypress, hemlock, juniper, and yew.

Conifers are cone-bearing trees and shrubs with needle-like or scale-like leaves. All conifers bear pollen and seed cones. These cones are borne on the same plant in arborvitae, bald cypress, hemlock, and pines, and on separate plants in junipers and most yews. Most seed cones are woody. However, some resemble berries, like juniper seed cones that are actually fused fleshy scales, and yew seed cones that are actually arils. Most conifers are evergreen but bald cypress and larch are deciduous. Conifers, along with cycads, ginkgo, and gnetales (e.g. ephedra) comprise the modern day gymnosperms.

Overall 16 species of conifers are native to the Potomac River watershed, but only eleven are found in the NCRN.¹ Virginia Pine and Eastern Red Cedar are the most common conifers in our region. Uncommon conifers include the Eastern Hemlock, Eastern White Pine, Pitch Pine, Table Mountain Pine, and Yellow Pine. Our rarest naturally occurring conifers are American Arborvitae, Bald Cypress, Loblolly Pine, and Canada Yew.

¹Except for the northern portion of the Baltimore-Washington Parkway, all parklands in the National Capital Region Network fall within the Potomac River watershed.

²The five species from the Potomac watershed not found in the



NPS Photo/Paradis

Pitch pine (*Pinus rigida*) at Wolf Rock in Catoclin.

The 11 Conifers of the NCRN²

Virginia Pine (*Pinus virginiana*) is our most common conifer and is well represented by stands in Prince William Forest Park (PRWI). According to Inventory and Monitoring (I&M) data, it is the second most abundant tree species in the NCRN. Virginia pine is a sun-loving early succession tree that colonizes fields and forest edges. They usually live less than 100 years and die when hardwood trees shade their canopies. I&M forest monitoring data suggests this species will decline rapidly in coming years as hardwoods ascend to the canopy. Most stands are now composed of mature trees. Unless fields are managed to allow (Continued next page)

NCRN are Balsam Fir (*Abies balsamea*), Common Juniper (*Juniperus communis*), Eastern Larch (*Larix laricina*), Red Pine (*Pinus resinosa*), and Red Spruce (*Picea rubens*). These five live to the west in the highlands of the Appalachian Plateau.

Coming to Your Park this Winter...

	ANTI*	CATO	CHOH	GWMP	HAFE	MANA	MONO	NACE	PRWI	ROCR	WOTR
Marsh Elevation Monitoring											
Macroinvertebrate Monitoring											
Water Monitoring											

Dec/Jan/Feb Activities

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- Capital Region Conifers
- Coming to Your Park this Winter...
- A Step Toward American Chestnut Restoration
- Elevated Ozone Levels in NCRN
- Precipitation & Stream Discharge in NCRN
- New Natural Resource Materials Available
- Calendar

(*Conifers from page 2*) succession to take place or large scale forest disturbances take place, regeneration will remain low. While this pine is presently secure, it will likely become far less common in the coming decades.

Eastern Red Cedar (*Juniperus virginiana*) is our second most common conifer. They are abundant in Antietam and Manassas Battlefields. Like Virginia pine, they are a sun-loving early succession species colonizing old fields and forest edges and die when hardwoods shade them out. Their future may be similar to that of Virginia Pine. Still, old-growth red cedars grow on the shale barrens at Chesapeake and Ohio Canal National Historical Park (CHOH) in Allegany County, Maryland. These ancient trees are twisted like gnarled bristlecone pines. The extremely harsh conditions of the shale barrens give the drought tolerant cedars a competitive advantage over most hardwood species.

Eastern White Pine (*Pinus strobus*) is best represented in our region on dry slopes in the western portion of CHOH in the Ridge and Valley Province. Catocin Mountain Park (CATO) also has stately specimens of this pine. Naturally occurring white pine is uncommon in the mountains and rare in the Piedmont but it is planted extensively across our region.

Eastern Hemlock (*Tsuga canadensis*) is becoming increasingly uncommon. CATO formerly had healthy stands along its streams. Hemlocks of all ages have died due to attacks from hemlock woolly adelgid (*Adelges tsugae*) and elongate hemlock scale (*Fiorinia externa*). I&M monitoring data from two plots at CATO indicate that of 35 hemlocks alive in 2006, 18 had died by 2010 and most of the 17 remaining trees



NPS Photo/Paradis

In late winter, a gentle swat to a male eastern red cedar can release a smoke-like cloud of pollen.

were severely infested with these exotic pests. Elsewhere in the region, hemlock is usually restricted to steep terrain on north facing slopes adjacent to streams. Eastern hemlock is one of the most threatened species of conifers in our region due to impacts from insect pests and global warming.

Pitch and Table Mountain Pines (*Pinus rigida* and *Pinus pungens*) are often found growing in proximity to each other (e.g. CATO, HAFE, and PRWI).

Both are fire adapted and to a large extent, fire-dependent for regeneration. Most pitch and table mountain pines in our region are old age trees. The prospect for sustaining these pines as viable components of our flora is bleak unless fire is allowed to create conditions necessary to their survival. Little, if any, regeneration is occurring with these species in the NCRN at present.

Yellow Pine (*Pinus echinata*), also known as shortleaf pine, is quite uncommon in our region. They are usually observed as sentinel trees in oak forests or as isolated trees in stands of Virginia Pine. Stately examples of this southern pine are found in PRWI and Rock Creek Park. Old field habitat and fire scorched land is necessary for regeneration to occur. Little, if any, regeneration is occurring in our region.

American Arborvitae (*Thuja occidentalis*), also known as northern white cedar is known only from limestone bluffs and cliffs along the C&O Canal in Washington County, Maryland. Some cliff-side trees are gnarled (Continued page 4)



NPS Photo/Paradis

White "woolly" ovisacs of the pest hemlock woolly adelgid are conspicuous on the underside of outermost branch tips on eastern hemlocks.

Native Conifers in NCRN Parks											
	ANTI	CATO	CHOH	GWMP	HAFE	MANA	MONO	NACE	PRWI	ROCR	WOTR
Early Successional Species											
Virginia Pine, <i>Pinus virginiana</i>	x	x	x	x	x	x	x	x	x	x	x
Eastern Red Cedar, <i>Juniperus virginiana</i>	x	x	x	x	x	x	x	x	x	x	x
Slope and Upland Species											
Eastern White Pine, <i>Pinus strobus</i>		x	x	x	x	x	x		x	x	
Eastern Hemlock, <i>Tsuga canadensis</i>		x	x	x	x	x	x		x	x	
Northern Species											
American Arborvitae, <i>Thuja occidentalis</i>			x								
Canada Yew, <i>Taxus canadensis</i>						x					
Fire-Dependent Species											
Pitch Pine, <i>Pinus rigida</i>		x	x	x	x		x	x	x	x	
Table Mountain Pine, <i>Pinus pungens</i>		x	x	x	x		x		x	x	
Southern Species											
Yellow Pine, <i>Pinus echinata</i>			x	x				x	x	x	
Bald Cypress, <i>Taxodium distichum</i>								x			
Loblolly Pine, <i>Pinus taeda</i>								x	x		
Data from NCRN I&M monitoring, NPSpecies, and observations by NCRN Botanist John Parrish.											

A Step Toward American Chestnut Tree Restoration

The NPS recently agreed to allow limited demonstration plantings of blight-tolerant American/Chinese chestnut cultivars in National Parks. Why? Thousands of towering American chestnut trees (*Castanea dentata*) once extended from Maine to Mississippi and eastern Michigan, comprising 25% of the forest and covering more than 200 million acres. But since a fatal blight decimated American chestnut populations by the 1930s, people have puzzled over how to bring back these former giants.

One tool in the restoration struggle is a chestnut cultivar that combines American and Chinese chestnut genetic material. Developed by The American Chestnut Foundation (TACF) these genetically modified cultivars are disease resistant and are approximately 94% American and 6% Chinese chestnut DNA. NPS policy permits the use of hybrids or genetically engineered plants, providing they closely approximate the species lost.

Resource managers in parks with American chestnut legacies may now propose areas for demonstration plantings. These plantings are an opportunity to develop restoration techniques and evaluate these American/Chinese hybrids while giving the public the chance to experience chestnuts and appreciate the role of science in population and landscape restoration. TACF provides the tree material for all plantings.

To propose a planting, park managers should first consider the extent to which restoration can and should be pursued* and then follow these steps:

- Catalog existing American chestnut trees, sprouts, and habitats
- Identify area for possible demonstration planting with chestnut cultivars
- Secure approval from park superintendent
- Contact NPS Restoration Ecologist Greg Eckert at greg.eckert@nps.gov or 970-225-3594

It is the responsibility of NPS to ensure that tree planting has been evaluated in an approved NEPA (National Environmental Policy Act) document before being implement-



Above: Spring leaves of a healthy 100% American chestnut tree. **Right:** Fall leaves from a hybrid chestnut tree with 94% American and 6% Chinese DNA.



NPS Photos/Nortrup

ed, and that these activities comply with all applicable laws, regulations, policies, and guidelines.

Another way to help preserve American chestnuts is to open the tree canopy over American chestnut sprouts to allow for long-term replenishment of sprouts and the development of pollen that can be used by researchers.

The ultimate goal in restoration of the American chestnut is to have long term self-sustaining and naturally reproducing populations. It is unknown how the TACF cultivars will do in the long run—whether blight tolerance persists within planted individuals, whether there is much reproduction, or whether tolerance persists over generations. But planting these cultivars is one step towards the larger goal of helping to restore our lost giants.

Further Reading on American Chestnuts

- The American Chestnut Foundation. "Chinese vs. American Chestnut." http://www.acf.org/Tree_ID/chinamerover_02.php (accessed November 23, 2011)
- NPS. "Chestnut blight and the good virus." <http://www.nps.gov/grsm/naturescience/dff10-chestnut.htm> (accessed November 23, 2011)
- Sherald, J. 2011. National Park Service guidance on assessing the restoration of the American chestnut. <https://nriinfo.nps.gov/Reference.mvc/Profile?Code=2171772>
- Sherald, J. 2004. Restoration of the American chestnut. http://www.nature.nps.gov/yearinreview/yir2004/04_B.html

*Important Considerations for Demonstration Plantings

- Are soil conditions (pH, drainage, etc.) conducive to the growth of chestnut?
- Are existing light conditions favorable?
- Do naturally occurring American chestnuts already exist within, or near to, potential restoration sites?
- Demonstrations are advisable in open settings near visitor centers so they can be part of educational efforts. They also may be advisable in places where other natives, such as hemlocks, have been lost.
- Will existing forest be disturbed?
- What maintenance is required (watering, control of exotics, deer fencing)?
- How will success be measured?

(*Conifers from page 2*) and picturesque suggesting great age. Little is known about the stability of this relict population.

Canada Yew (*Taxus canadensis*) is known from only one site. They occur within the legislative boundary of Manassas National Battlefield (MANA) just outside the park boundary on a steep north facing slope beneath a stand of eastern hemlock. This little population is thought to be a Pleistocene relict. Deer browse and climate warming pose serious threats to this northern shrub species.

Bald Cypress (*Taxodium distichum*) occurs naturally in tidal swamps along the Potomac River at Piscataway Park and along Beck Branch next to the Baltimore-Washington Parkway. While bald cypress is certainly reproducing by seed in our region, it is also planted in some parks (e.g. Roosevelt Island). It is difficult to determine which of the naturally occurring trees are offspring of a wild lineage or offspring of cultivated trees. Regardless, this southern species is here in low numbers and climate warming may help it become better established. Of historical note, bald cypress was collected from Marshall Hall, now a part of Piscataway Park, in 1885. The collector regarded the stand of trees as “undoubtedly indigenous.” Also of interest is the famous stand of relict bald cypress trees growing at nearly the same latitude 20 miles east of Marshall Hall at Battle Creek. The NCRN sits right at the edge of the natural range of bald cypress.

Loblolly Pine (*Pinus taeda*) occurs naturally at PRWI, Piscataway Park, and along the Baltimore-Washington Park-

way. Like bald cypress, some natural occurrences may be the offspring of trees planted long ago. Loblolly pine plantations are present in many NCRN parks (e.g. ANTI, CHOH, MANA, NACE, PRWI, and ROCR). Nevertheless, native stands are present in the region in Prince George’s County, Maryland and are well documented historically in the Coastal Plain Province within the NCRN. Loblolly pine is a southern species at the northern limits of its range that may benefit from climate warming.

The Future for Conifers in the NCRN

It is well known that the oldest living trees on earth are conifers (bristlecone pines) living in the western U.S. You may be surprised to learn that conifer species native to the eastern U.S. are capable of living to great ages too. For example, American arborvitae over 1,000 years old grow in Tennessee. Older yet are 1,500 year old bald cypress trees living in North Carolina. Red cedars over 800 years old occur in Missouri. Hemlocks over 500 years old are in Michigan. White pines over 400 years in age live in Ontario. Many pitch and yellow pines are recently documented in the eastern U.S. in excess of 300 years in age. Table mountain pines over 200 years old occur in the southern Appalachians and loblolly pines over 200 years old are found in Congaree National Park in South Carolina.

Our conifers provide important food, shelter, and habitat for a wide variety of organisms. However, little is known about conifer ages or the long-term viability of conifer species in our region. Much can be learned about climate history, cycles of regeneration, land use, and longevity from dating coniferous trees. The more knowledge we gain, the better we can understand how to manage landscapes to sustain conifer species into the future. Perhaps, someone will develop a project to aid us in this effort. Hopefully we will be able to maintain populations of conifers in the NCRN long into the future.

Data sources:

- Davis, Mary B. 1996. Eastern old-growth forests: prospects for rediscovery and recovery. Island Press.
- Knowlton, F.H. 1886. Additions to the flora of Washington and vicinity from April 1, 1884 to April 1, 1886. The Biological Society of Washington, Volume III, 1884-1886.
- Krajick, Kevin. 2003. Methuselahs in our midst. Science Magazine, Vol. 302, October 31.
- Mazzeo, Peter M. *Taxus canadensis* rediscovered in the Virginia piedmont. Castanea 36 (3), September 1971.
- Pielou, E.C. The world of northern evergreens. Cornell University Press, 1988.
- Schmit, J.P., and J.P. Campbell. 2006- (*Continued next page*)

Famous (Non-Native) DC Conifers: The National and Capitol Christmas Trees

The National Christmas Tree is a living evergreen tree planted in the Ellipse in the President’s Park. The current tree is a 26-foot Colorado blue spruce (*Picea pungens*) from a New Jersey nursery that was planted after high winter winds snapped the old tree to a 4-foot stump in February 2011.

The Capitol Christmas Tree is a cut tree that sits along the West Front of the Capitol along First Street, NW. For 2011 it is a 65-foot white fir from California’s Stanislaus National Forest (on the northeast border of Yosemite National Park). The Sierra white fir (*Abies lowiana*) was 63-feet high at harvest and is estimated to be 118-years old.

Photo: National Park Foundation



Replanting of the National Christmas Tree in 2011.

Elevated Ozone Levels in NCR

Ozone, at ground-level, is a widespread air pollutant in the National Capital Region Network (NCRN). In addition to harming human health, ozone causes considerable damage to vegetation.

Ozone injury to sensitive plants can cause visible spotting on leaves, leaf yellowing (chlorosis), and growth effects that include premature leaf loss, reduced photosynthesis, and reduced leaf, root, and total dry weights. Other factors such as levels of soil moisture, presence of other air pollutants, insects or diseases, and other environmental stresses, can reduce or magnify the extent of ozone injury.

An analysis of ozone data from 2005-2009 by the NPS Air Resources Division shows that about half of NCRN

parks have ozone levels indicating a significant risk to very sensitive plants.

To learn more, read the new NCRN Ozone re-source brief at: http://science.nature.nps.gov/im/units/ncrn/monitoring_ozone.cfm.



NPS Photo

Visible spotting from ozone damage on an ash leaflet.

Precipitation & Stream Discharge in NCR

The annual cycle of precipitation in the NCRN is shifting. When historically there was less rain in the fall, now there is more. And when there was more rain in August, now slightly less falls. In other words, seasonal variations are leveling out.

This is having an effect on stream discharge rates (the amount of water passing a given spot at a given time). However, the effect of these precipitation changes on stream discharge depends on the condition of the watershed where the precipitation landed.

- In undeveloped watersheds, periods that typically showed low flows have risen.
- In developed watersheds, there are significant increases at high flows and small decreases in low flows
- rivers that are dammed are controlled to the



Photo NPS/Paradis

Stream discharge in Rock Creek.

extent that no changes in discharge are observed.

These changes in the climate of the NCRN may affect both land and aquatic plants and animals, nutrient cycles, air quality, and more.

For more on this topic, read the new re-source brief on precipitation and stream discharge

at: http://science.nature.nps.gov/im/units/ncrn/monitoring_water_surface_dynamics.cfm.

What's a Resource Brief again? -- It's a short description of a regional natural resource, why it's important, its current status, and a description of any current I&M monitoring. See http://science.nature.nps.gov/im/units/ncrn/outreach_communication.cfm.

Park Acronyms

ANTI = Antietam National Battlefield
CATO = Catoctin Mountain Park
CHOH = Chesapeake & Ohio Canal National Historical Park
GWMP = George Washington Memorial Parkway
HAFE = Harpers Ferry National Historical Park
MANA = Manassas National Battlefield Park
MONO = Monocacy National Battlefield
NACE = National Capital Parks - East
NCRN = National Capital Region Network
NAMA = National Mall and Memorial Parks
PRWI = Prince William Forest Park
ROCR = Rock Creek Park
WOTR = Wolf Trap National Park for the Performing Arts

(*Conifers continued*) 2010. National Capital Region Network forest vegetation monitoring reports 2006-2010. Natural Resource Data Series NPS/NCRN/NRDS, National Park Service, Fort Collins, Colorado.
Shreve, F., M.A. Chrysler, F.H. Blodgett, and F.W. Besley. 1910. The plant life of Maryland. Maryland Weather Survey Special Publication Vol. 111, Johns Hopkins University Press, Baltimore.

New Natural Resource Materials

Two new reports on NCRN park sensitivity to acidification and nutrients enrichment. The reports evaluate the sensitivity of NCRN parks to 1) acidification effects from atmospheric sulfur and nitrogen deposition and 2) to nutrient enrichment effects from atmospheric nitrogen deposition. Both are available through the IRMA (Integrated Resource Management Applications) data center and at http://science.nature.nps.gov/im/units/ncrn/monitoring_wetdep.cfm.

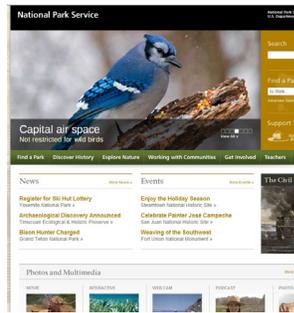


NPS Photo

Deer management articles from the Wildlife Society Bulletin are available on the NCRN Natural Resources sharepoint site (as shared documents in the wildlife folder): <http://inpnrcrop.nps.doi.net:8094/default.aspx>. Articles include: 15 Years of Urban Deer Management; CPR for Urban Deer Management;

Efficacy of GnRH Immunocontraception in New Jersey;

Health Effects of GnRH Immunocontraception in New Jersey; Overabundant Suburban Deer; Invertebrates, and Spread of Stiltgrass; Road Bias and Deer Density Estimates at 2 National Parks in Maryland; and Urban Deer Management in Pennsylvania.



During November 2011, NPS.gov featured NCRN bird information!

Summaries of NCRN bird data were featured from November 12 to 18 on the NPS.gov website. The feature, "Capital air space: Not restricted for wild birds" linked directly to bird resource briefs on NCRN's outreach & communications page: http://science.nature.nps.gov/im/units/ncrn/outreach_communication.cfm.

Calendar

2011
DECEMBER

- 1. Maryland Water Monitoring Council. North Linthicum, MD. www.marylandwatermonitoring.org.
- 16-18. Virginia Native Plant Society 2011 Meeting. Manassas, VA. <http://www.vnps.org/>.

2012
JANUARY

- 10-13. USDA Interagency Research Forum on Invasive Spe-

cies. Annapolis, MD. www.nrs.fs.fed.us/disturbance/invasive_species/interagency_forum

19. NAT (Natural Resources Advisory Team) Meeting. ROCR.

MARCH

20. Spotlight on National Park Resources. Frederick Community College.

APRIL

19. NAT (Natural Resources Advisory Team) Meeting. CHOH.

National Capital Region Network Inventory & Monitoring (NCRN I&M) Staff:

Program Manager: Patrick Campbell
 Botanist: John Parrish
 Data Manager: Geoff Sanders
 GIS Specialist: Mark Lehman
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 Hydrologic Technician: Tonya Watts
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Visit NCRN I&M online at:
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 Twitter: <https://twitter.com/#!/NPSCaptlAreaSci>
 Sharepoint: <http://imnetsharepoint/NCRN/default.aspx>

NCRN Natural Resource Quarterly offers updates on the status of park natural resources and Inventory and Monitoring (I&M) "vital signs" for the NPS National Capital Region Network (NCRN).

Questions or comments? Contact Megan Nortrup by email or at 202-342-1443 x214.