

# What They Ate: White-winged Crossbill (*Loxia leucoptera*) food plants during the 2008-09 irruption in Pennsylvania

Rudy Keller

In fall and winter of 2008-09, White-winged Crossbills staged one of their most widespread irruptions on record in Pennsylvania, with birds reported in all 67 counties. When the magnitude of the irruption to our north became apparent in fall 2008, I wondered what all those birds would eat when they arrived, since most of their preferred boreal food plants are uncommon to rare in Pennsylvania. Knowing that many birders would search out crossbills and report them on the internet, I thought that the Pennsylvania birding listserv (PABIRDS) would be the best vehicle for collecting information on their feeding preferences. In winter and spring of 2009, I posted requests on PABIRDS for reports of conifer species on which crossbills were seen feeding, not merely perching. I offered to identify the plants from emailed photographs if observers could not do so. The response was generous and enthusiastic. Many, if not most, posts about crossbills to PABIRDS during winter and spring of 2009 contained information on their choice of food. If a post did not mention food plants, I privately emailed the observer asking for this information. I also received several private messages providing additional details. Many birders took the trouble to post, publicly and privately, photographs of feeding crossbills in which the plants could be identified. Following a brief overview of White-winged Crossbill feeding habits and food preferences, the results of the internet survey are presented below.

## White-winged Crossbill Diet

The most recent comprehensive treatment of White-winged Crossbill is the Birds of North America (BNA) account (Benkman 1992), the principal source of information for this overview. Crossbills evolved their specialized bills to exploit conifer seed crops, their essential food for most of the

year. The birds insert their mandibles into the gaps between cone scales, then pry apart the scales with a sideways movement of the jaw until the seeds can be extracted with the tongue. Birds may also tear off cone scales to get at seeds. Fallen cones uncovered by snow melt are often foraged because they may contain more seeds than those still on the trees. (In Pennsylvania in 2009, birds were photographed foraging at fallen cones of eastern hemlock, eastern white pine, white spruce, Douglas-fir, and Colorado blue spruce at various places.) The generally larger, heavier bills of Red Crossbills (*Loxia curvirostra*) are best adapted for exploiting the woodier, thicker-scaled cones of pines. The smaller, thinner bills of White-winged Crossbills work best for extracting seeds from the softer, thinner-scaled cones of spruces and larches. Their primary range is the boreal forest where these trees dominate the plant communities. Since conifer seed crops can be abundant one year and scarce the next, White-winged Crossbills regularly move across the boreal forest in search of good crops. In some years of widespread cone crop failure, the birds may stage dramatic irruptions well south of the boreal forest, as in 2008-09.

In the boreal forest from Alaska to Newfoundland, the most important

White-winged Crossbill food plants are white spruce (*Picea glauca*), black spruce (*P. mariana*) and American larch or tamarack (*Larix laricina*). A good black spruce cone crop is so important as a winter food that a lack of it may trigger crossbill exodus from an area where other conifer seeds are available. In the eastern boreal forest from the Adirondacks east to Maine and the Canadian maritime provinces, red spruce (*P. rubens*) is a key food plant. Disjunct populations in the Rocky Mountains and Cascades depend on Engelmann spruce (*P. engelmannii*). Birds in southeast Alaska depend on Sitka spruce (*P. sitchensis*). The importance of a reliable cone crop is illustrated by Benkman's calculation that the daily food requirement of a White-winged Crossbill in winter and spring is 3.8 g of conifer seeds (2600 seeds of white spruce or 3160 seeds of black spruce). To fulfill this requirement, a bird may need to forage for more than 90% of the day (Benkman 1992).

Other conifer seeds occasionally eaten are those of eastern white pine (*Pinus strobus*), red pine (*P. resinosa*) and Virginia pine (*P. virginiana*). In the northeast, birds prefer seeds of eastern hemlock (*Tsuga canadensis*). Seeds of true firs (*Abies*) are not often eaten because fir seedcoat resins apparently inhibit protein digestion. In June and July, when conifer seeds are scarce, birds eat spiders and insects including caterpillars such as larvae of spruce budworm and coneworm. They regularly eat grit (a behavior noted a few times in Pennsylvania in 2009) and salt, which causes many birds to be killed by motor vehicles on winter roads. Mainly south of the boreal, birds have also been recorded eating fruits and seeds of eastern redcedar (*Juniperus virginiana*), huckleberry (*Gaylussacia*), alder (*Alnus*), birch (*Betula*), cottonwood (*Populus*), sweet gum (*Liquidambar styraciflua*), sunflower (*Helianthus*), teasel (*Dipsacus*), ragweed



Image 1. White-winged Crossbill on white spruce. Beltzville State Park, Carbon, 9 January 2009. (Axel Hildebrandt)

(*Ambrosia*), sedges (*Cyperaceae*), foxtail (*Setaria*) and other grasses. In his White-winged Crossbill painting for The Birds of America, John James Audubon portrays two males and two females about to feed on fruits of what appears to be an alder. Earl Poole, in his unpublished manuscript on the birds of Pennsylvania, writes that these crossbills will "...extract seeds from frozen apples. Grimm [1952 near L. Pymatuning] observed that the birds which remained until May were feeding on the fruits of American Elm."

**Pennsylvania Observations, Winter 2008-09**

In Pennsylvania from fall 2008 through spring 2009, birders reported White-winged Crossbills feeding on at least 21 plant species plus seeds at feeders. The plants are listed in order of use by crossbills, from most to least used, with annotations. Each feeding instance for each plant species was observed at a particular location, and each of these was counted only once, even if crossbills were seen feeding at a species at a particular location many times over a long period. For example, the many reports of birds eating hemlock seeds at Washington Cemetery in Washington County over several months count as just one instance of White-winged Crossbills feeding on eastern hemlock. To have counted all feeding instances for each location would have been tedious and would have weighted results heavily in favor of plant species at frequently birded sites where crossbills were consistently easy to find. Counting each

location only once gives a clearer picture of crossbill use of each plant species statewide. In deference to brevity, individual locations are not listed. Only the number of counties reporting use of each plant species is included.

**Canada or eastern hemlock (*Tsuga canadensis*) – 55 feeding instances from 33 counties.**

The state tree of Pennsylvania grows naturally in cool, moist forests throughout, though less so in the southeast, where imported insect pests have reduced its numbers. It is widely planted as an ornamental. It has been noted as a White-winged Crossbill food plant since some of the earliest recorded irruptions in Pennsylvania (Todd 1940, Uhrich 1997). In his unpublished manuscript, Poole writes, "Leberman of Meadville...found a flock of 35 feeding on hemlock cones at Heart's Content, Warren County, as late as June 10 (1957)." In 2008-09, crossbills were reported feeding on eastern hemlock in all parts of the state south to Philadelphia. At several places, such as Washington Cemetery in Washington County and Allegheny Cemetery, Pittsburgh, flocks lingered for months to exploit this seed source. At both of these locations, birds were noted to prefer eastern hemlock to Norway and other spruces, moving to the spruces when hemlock cones became depleted (P. Brown, M. Fialkovich).

**Norway spruce (*Picea abies*) – 37 feeding instances from 25 counties.**

Norway spruce, native to Europe, is probably the most widely planted exotic conifer in the state, both on a large scale for reforestation and on a smaller scale in public and private landscapes. Many large, mature plantations grow on reservoir watersheds and other public lands. In southeastern Pennsylvania, Norway spruce produced a notably large cone crop in 2008, with some large plantations, such as those

around L. Ontelaunee in Berks County, producing thousands of cones (R. Keller). BNA (Benkman 1992) does not list Norway spruce as a White-winged Crossbill food plant. However, twentieth century accounts include reports of its use as early as 1906 in PA (Todd 1940) and ca. 1920's in Massachusetts (Forbush & May 1955). More recently, White-winged Crossbills were confirmed breeding in Norway spruce and white spruce plantations on New York's eastern Appalachian Plateau, not far north of Pennsylvania, during the first New York breeding bird atlas, 1980-85 (McGowan & Corwin 2008). The many 2008-09 feeding reports in Pennsylvania reflect the wide availability of this food source. Some plantations hosted birds for long periods in winter (New Holland reservoir watershed, Lancaster County) and even well into spring, for example, 50 birds still at L. Ontelaunee, Berks, 5 May 2009 (M. Wlasniewski). Three times in winter 2009 in Berks County, crossbills feeding in Norway spruces were observed to supplement their seed diet with terminal and lateral spruce buds, which they deftly husked, clipped and swallowed (R. Keller). There were no reports on PABIRDS of crossbills plucking and holding down cones of Norway spruces for more efficient seed extraction, as they were seen to do with other conifer species (below). The birds may have been unable to bite off these large cones. At some of the long-used southeastern sites such as L. Ontelaunee, preferred eastern hemlock is rare and the few trees are thin and weakened from years of hemlock woolly adelgid and elongate hemlock scale feeding (R. Keller).

**Colorado blue spruce (*Picea pungens*) – 28 feeding instances from 14 counties.**

This Rocky Mountains native is occasionally planted in Pennsylvania for reforestation, but its most popular use is as an ornamental in public and private landscapes, where selections with glaucous blue-green needles are preferred. Many lawns are dotted with blue spruces. In southeastern Pennsylvania, it produced a larger than usual cone crop in 2008 (R. Keller).

Neither BNA (Benkman 1992) nor the other cited literature lists it as a White-winged Crossbill food plant. Since blue spruce is seldom found in large plantations, it presented wandering crossbills with a more



Image 2. White-winged Crossbill on Douglas-fir, Williamsport, Lycoming, 11 January 2009. (Wayne Laubscher)

scattered resource than did Norway spruce. However, its popularity as a lawn tree guaranteed that crossbills visiting a neighborhood tree would get noticed by alert birders, and many such reports came in from across the state. In Clarion County, crossbills seemed to prefer blue spruce to Norway spruce (C. Winslow). In Clarion, Clearfield and Forest Counties, crossbills strongly preferred blue spruce over as many as nine other conifer species in January, 2009 (M. Weible). Several birders observed and some photographed crossbills as they plucked cones of Colorado blue spruce, Douglas-fir, and white spruce, then held down the cones with one foot for easier seed extraction. The birds may have found the smaller cones of blue spruce easier to manipulate than the larger, heavier cones of Norway spruce and pines.

**Douglas-fir (*Pseudotsuga menziesii*) – 19 feeding instances from 15 counties.**

This native of western North America is used in Pennsylvania in much the same way as blue spruce, but is less popular. Most mature trees are found as ornamentals throughout the state. In southeastern Pennsylvania, it produced a larger than usual cone crop in 2008 (R. Keller). It is not listed as a White-winged Crossbill food plant by BNA (Benkman 1992) or the other cited literature. Douglas-fir's prominence in landscapes close to people helped visiting crossbills to get noticed. For about two weeks in January at L. Ontelaunee, crossbills fed heavily at the open cones of a few Douglas-fir trees while ignoring the more abundant but still largely closed cones of Norway spruce nearby (R. Keller). Again, the birds probably found the smaller cones of the Douglas-firs easier to manipulate and preferentially fed on them while they lasted.

**Larches (European larch, *Larix decidua*; Japanese larch, *L. kaempferi*; American larch or tamarack, *L. laricina*) – 14 feeding instances from 9 counties.**

European and Japanese larches differ only subtly and are difficult to tell apart, and tamarack may be used as a common name for any larch. Therefore, larches have been lumped in this report. The exotic larches are used in Pennsylvania for reforestation and are uncommonly planted as ornamentals, giving them a wider

range in the state than the native tamarack. The latter, a key food plant of White-winged Crossbills in the boreal forest, occurs infrequently in Pennsylvania in sphagnum bogs and peatlands (Rhoads & Block 2000), rare habitats in the state and rarely visited by birders. It is rarely if ever planted as an ornamental. Two-barred Crossbill (*L. l. bifasciata*), the White-winged Crossbill subspecies in Eurasia, strongly prefers larches in northern Europe and Siberia. All but one of the counties reporting feeding instances in 2008-09 are clustered in north-central and western Pennsylvania, where larches have been planted for reforestation and strip mine reclamation. Crossbills were sometimes reported lingering for extended periods over good larch cone crops. The fairly large number of reports from a limited geographical area seems to reinforce the crossbill preference for larch stated in the literature.

**Eastern white pine (*Pinus strobus*) – 12 feeding instances from 10 counties.**

Native eastern white pine is common in forests statewide and is one of the most frequently planted conifers for reforestation and ornamental use. In southeastern Pennsylvania, the cone crop was variable. Some stands had dropped their seeds by the time crossbills arrived (R. Keller). BNA (Benkman 1992) notes widespread but occasional use of eastern white pine by White-winged Crossbills. The relative paucity of feeding reports on one of the most abundant conifers in the state appears to be in keeping with the species' preference for spruces and larches.

**White spruce (*Picea glauca*) – 10 feeding instances from 10 counties.**

This key food plant of White-winged Crossbill in the boreal forest is used for reforestation in Pennsylvania, but not as commonly as Norway spruce. Except for the fruitless dwarf Alberta spruce (*P.*

*g. 'Conica'*), it is uncommonly planted as an ornamental. The few feeding reports probably reflect its limited distribution in the state. One observer thought crossbills may have fed preferentially at white over Norway spruce because the bird's small bill is better adapted to extracting seeds from the smaller cones of white spruce (D. Yeany II).

**Red spruce (*Picea rubens*) – 4 feeding instances from 4 counties.**

A key White-winged Crossbill food plant of the eastern boreal forest, red spruce is native in Pennsylvania to cool, moist woods and margins of bogs and swamps, mostly in northern counties (Rhoads & Block 2000). It is seldom planted for reforestation or as an ornamental. The few feeding reports appear to reflect its small range in a part of the state not often visited by birders. One of the four feeding reports was of birds preferentially feeding at cones of a red spruce in an abandoned Christmas tree plantation in Bucks County (A. Mirabella, H. Eskin).

**Miscellaneous Food Plants**

There were one-time reports of White-winged Crossbills feeding at cones of pitch pine (*Pinus rigida*), Crimean pine (*Pinus sp.*) and cork-barked fir (*Abies sp.*) at Graver Arboretum, Northampton County (D. Welch), and single reports of birds using Sakhalin spruce (*Picea sp.*) and Carolina hemlock (*Tsuga caroliniana*) at Haverford College, Delaware County (S. Johnson). One observer reported birds feeding at cones of red pine (*P.*



Image 3. White-winged Crossbill flock on Norway spruce, Washington Cemetery, Washington, 10 January 2009. (Cris Hamilton)



Image 4. White-winged Crossbill on eastern hemlock, Washington Cemetery, Washington, 15 January 2009. (Geoff Malosh)

*resinosa*), Scots pine (*P. sylvestris*) and Austrian pine (*P. nigra*) at unspecified locations (M. Weible). On several visits to Allegheny Cemetery, Pittsburgh, birders watched crossbills feeding on seeds of sweet gum (*Liquidambar styraciflua*), the only report of feeding on this popular shade tree. There was a single report of birds eating seeds of birch (*Betula sp.*) in Northampton County (R. Wiltraut), and one report of birds eating flowers of an unspecified tree in Washington County (R. Gallardy).

There were five reports of crossbills visiting feeders in three counties, with none of the birds settling in for extended stays in the manner of other irruptive finches. Their specialized bills apparently make them less efficient than other cardueline finches at husking non-conifer seeds (Benkman 1992). The literature (cited and uncited) of past irruptions is sprinkled with similar feeder reports. Observers contributing food preference information to a Cornell Laboratory of Ornithology citizen science project on winter finches reported that crossbills were seen at feeders less than 20% of the time and feeding at conifers more than 80 % of the time, and were the least likely of the winter finches to visit feeders (birdsource).

## Conclusion

This impromptu, informal and unscientific survey of internet using Pennsylvania birders revealed many interesting details about food plant use by White-winged Crossbills in Pennsylvania in 2008-09. It reinforced the widely known and published preference of irruptive crossbills for eastern hemlock in the northeast. The

survey also appeared to reinforce the known preference of the birds for spruces and larches over pines. It showed that these birds will readily forage at cones of exotic spruces, larches and Douglas-fir when their preferred boreal food plants are uncommon or unavailable.

Of the exotic conifers, White-winged Crossbills made especially wide use of abundant Norway spruce, not noted as a food plant in BNA, but widely used also in New York state. The birds' extensive use of Colorado blue spruce and Douglas-fir, though predictable, was not noted in the past in cited literature. (A more complete literature search than that done for this report might reveal more uses of these and other introduced conifers by White-winged Crossbills in the eastern US). The survey also presents some evidence that crossbills may have preferred the smaller cones of eastern hemlock, Colorado blue spruce and Douglas-fir over the larger, presumably more unwieldy and perhaps more tightly closed cones of Norway spruce when they had a choice.

I would like to thank contributors to the PABIRDS list serve for including White-winged Crossbill feeding information in their posts. The survey results show the value of the internet for gathering useful and interesting information about birds that might otherwise go unrecorded.

## Cited Literature

- Benkman, Craig W. 1992. White-winged Crossbill (*Loxia leucoptera*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Laboratory of Ornithology: Retrieved from The Birds of North America Online: <<http://bna.birds.cornell.edu/bna/species/027>>
- Forbush, Edward Howe and John Bichard May 1955. A Natural History of American Birds of Eastern and Central North

America. Bramhall House, New York.

McGowan, Kevin J. and Kimberley Corwin 2008. The Second Atlas of Breeding Birds in New York State. Comstock Publishing Associates, Ithaca, NY.

McWilliams, Gerald M. and Daniel W. Brauning 2000. The Birds of Pennsylvania. Comstock Publishing Associates, Ithaca, NY.

Poole, Earl L., unpublished manuscript of the birds of Pennsylvania. Courtesy of Frank Haas.

Rhoads, Ann Fowler and Timothy A. Block 2000. The Plants of Pennsylvania, An Illustrated Manual. The University of Pennsylvania Press, Philadelphia.

Todd, W. E. Clyde 1940. Birds of Western Pennsylvania. University of Pittsburgh Press, Pittsburgh.

Uhrich, William R., Ed. 1997. A Century of Bird Life in Berks County, Pennsylvania. Reading Eagle Press, Reading, PA.

Birdsource:  
<[www.birdsource.org/winfin/wffoodpref.htm](http://www.birdsource.org/winfin/wffoodpref.htm)>

The Pennsylvania Birding listserv (PABIRDS):  
<<http://list.audubon.org/archives/pabirds.html>>

71 Lutz Road  
Boyertown, PA 19512  
[rckeller@dejazzd.com](mailto:rckeller@dejazzd.com)

*Rudy Keller is past president of PSO and serves as Berks County compiler for Pennsylvania Birds magazine. For 17 years he was a horticulturist with the Temple University Ambler Landscape Arboretum. He has a longstanding interest in the food plant preferences of birds.*