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PLANT HARDINESS ZONE MAPS

PLANT hardiness zone maps have been a valuable aid to those interested in predicting the adaptability of plants to specific climatic areas. Most are isotherm maps of geographical regions, based upon average annual minimum temperatures experienced at certain weather stations over some period of years. Many hardiness zone maps are available — some cover small areas such as individual states, while others encompass entire countries. Unfortunately, many do not agree in their numbering schemes — so zone numbers assigned to individual plant species cannot be used in referring to all of the existing maps. In most cases they can be related only to the map used in assigning them. The two most widely used in this country are the Arnold Arboretum hardiness map and the Plant Hardiness Zone Map prepared by the Agricultural Research Service, United States Department of Agriculture.

Arnold Arboretum Hardiness Maps

The original map prepared at the Arnold Arboretum was published in the first edition (1927) of *Manual of Cultivated Trees and Shrubs* by Alfred Rehder. In this map, the United States and southern Canada (except for southern Florida) were divided into 8 zones characterized by 5° F. differences in lowest monthly mean temperature.

A few years later, the prototype of the present Arnold Arboretum hardiness map was prepared by Donald Wyman. It included the entire United States and was first published in his book *Hedges, Screens and Windbreaks* in 1938. This map was based on average annual minimum temperatures for the years 1895 to 1935, as published in the *Atlas of American Agriculture*, U.S. Dept. of Agriculture, in 1936. A modification appeared in the second edition of Rehder's *Manual of Cultivated Trees and Shrubs* in 1940. In that book, the southernmost part of the United States was not included and much of Canada was added, in keeping with the Manual's scope.

The Arnold Arboretum Hardiness Zone Map in use since 1949 includes the entire United States (except for Alaska and Hawaii) and southern Canada. This was first published in Wyman's *Shrubs and Vines for American Gardens*, and republished in his books *Trees for American Gardens* (1951 and 1965), *The Arnold Arboretum Garden Book* (1954), *Ground Cover Plants* (1956), and *The Saturday Morning Gardener* (1962).

1967 Arnold Arboretum Hardiness Map

The Arnold Arboretum map has just been revised and appears in its latest form in the center fold of this publication.[1]

This 1967 map differs from the previous version only in that hardiness zone lines have been re-drawn to conform to more recent weather data. The zone numbering system is unchanged — so zone numbers applied to specific plants in Rehder's manual and other publications by the Arnold Arboretum staff can be used with the new map just as well as with its predecessor.

Plant Hardiness Zone Map, U.S. Department of Agriculture

This map was issued in 1960 as Miscellaneous Publication No. 814 of the Agricultural Research Service, United States Department of Agriculture. It contains uniform zones of 10° F., and sub-zones of 5° F. Since the Arnold Arboretum map uses zones of different ranges (5°, 10°, or 15° F.), discrepancies between the two are inevitable. Unfortunately for the casual user, these inconsistencies are small enough to be overlooked, and in several instances, writers have erroneously applied the hardiness zone designations of Rehder to the U.S.D.A. map. Table I shows the relationship between the two numbering systems.

Local Hardiness Zone Maps

More detailed plant hardiness zone maps have been prepared for certain states and localities. The total area covered by such maps is still rather small. Fortunately some detailed maps use the same zone numbering system as the larger, more general maps. A good example is a recently prepared hardiness zone map of the state of Vermont.[2] This map uses the same zone numbering system as the U.S. Department of Agriculture map, but is based upon a larger number of weather stations in Vermont, so zone lines have been drawn in more detail than in the larger map. As more areas are mapped in greater detail in this way, hardiness zone maps will become increasingly useful.

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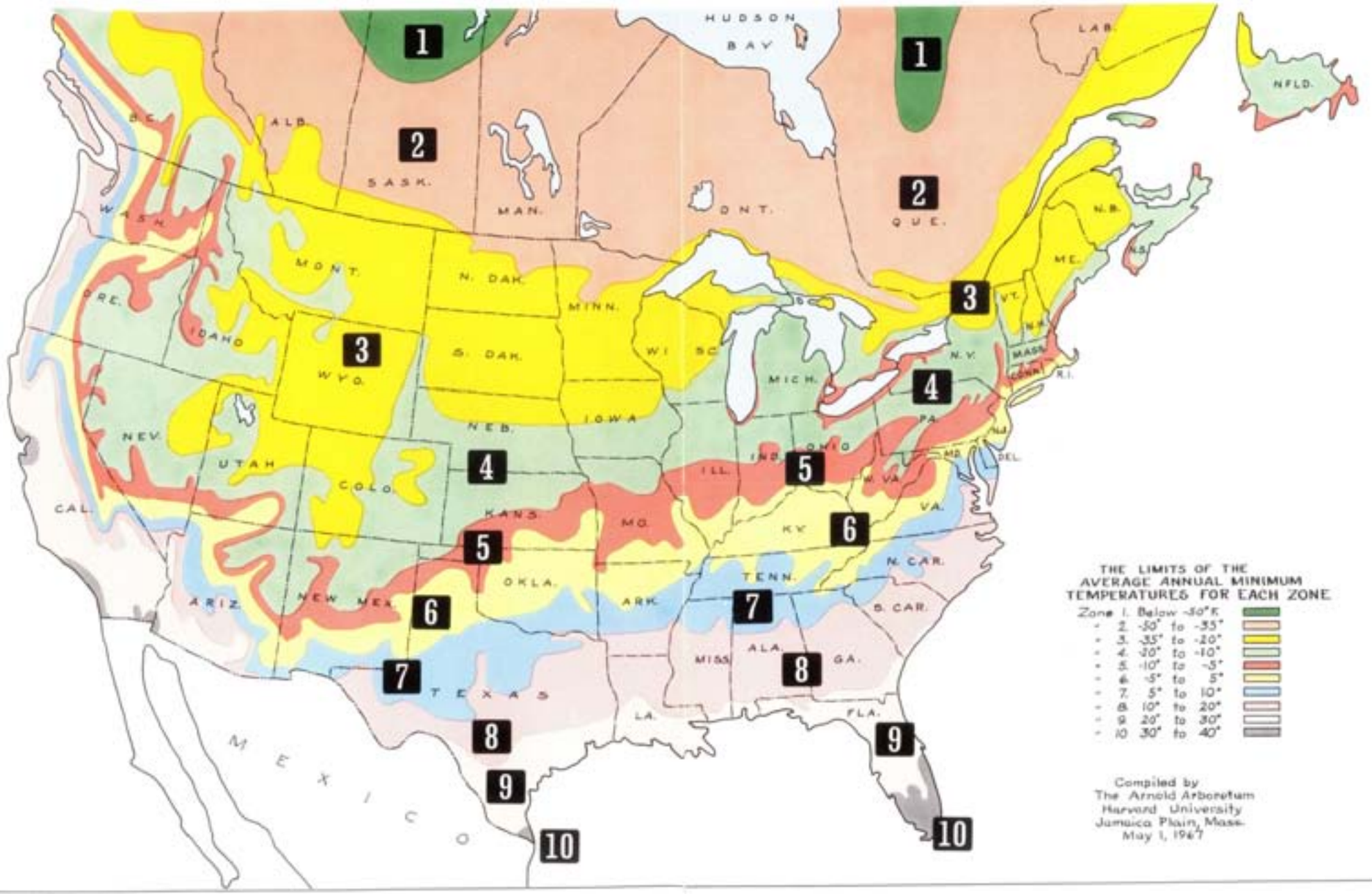
[1] Additional copies of this map are available from the Arnold Arboretum at 10¢ each, postpaid.

[2] Hopp, R.J. and R.E. Lautzenheiser. 1966. Extreme winter temperatures in Vermont. University of Vermont Agricultural Experiment Station Bulletin 648, 19 pp.

HARDINESS ZONES of the UNITED STATES and CANADA



THE LIMITS OF THE AVERAGE ANNUAL MINIMUM TEMPERATURES FOR EACH ZONE

Zone 1.	Below -50°F.			
" 2.	-50°	to	-35°	
" 3.	-35°	to	-20°	
" 4.	-20°	to	-10°	
" 5.	-10°	to	-5°	
" 6.	-5°	to	5°	
" 7.	5°	to	10°	
" 8.	10°	to	20°	
" 9.	20°	to	30°	
" 10.	30°	to	40°	

Compiled by
The Arnold Arboretum
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TABLE I

Arnold Arboretum Hardiness Zone	Range of Average Annual Minimum Temperature (°F)	United States Department of Agriculture Hardiness Zone
1	Below −50	1
2	−50 to −45	2a
	−45 to −40	2b
	−40 to −35	3a
3	−35 to −30	3b
	−30 to −25	4a
	−25 to −20	4b
4	−20 to −15	5a
	−15 to −10	5b
5	−10 to −5	6a
6	−5 to 0	6b
	0 to 5	7a
7	5 to 10	7b
8	10 to 15	8a
	15 to 20	8b
9	20 to 25	9a
	25 to 30	9b
10	30 to 35	10a
	35 to 40	10b

Canadian Plant Hardiness Map

The Canadian Plant Hardiness Map, released this year by the Canada Department of Agriculture, covers all but the far northern parts of Canada. This map represents a new approach in that it is an attempt to describe hardiness zones in terms of the whole complex of environmental factors that contribute to severity of climate, rather than in terms of a single factor such as average annual minimum temperature. To as great an extent as possible, actual observations of plant adaptability have played a part in describing hardiness zones.

Direct comparisons between this map and those prepared in the United States are not valid, because of the different criteria used in describing hardiness zones.

The Future

It appears that the business of preparing hardiness zone maps and assigning plants to their proper zones is still in the experimental stage. Hopefully, we may eventually see wide adoption of a single hardiness zone map for the United States, for North America, or even for the northern hemisphere. If this is some day accomplished, the problem of assigning realistic zone numbers to specific plants will still remain. The ability to match plants with zones over wide regions will be the ultimate test of any map, and many more careful observations will have to be made before this can be done with most of our present trees and shrubs. Meanwhile the existing maps will continue to be useful. But to use them most effectively we must recognize their differences and use published zone references only with the right map.

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