Renewing America's Food Traditions

Forgotten Fruits Manual & Manifesto
APPLES

Compiled and edited by Gary Paul Nabhan, with contributions from Kanin Routson, Ben Watson, Dan Bussey, Suzanne Nelson, Tom Burford, Jenny Trotter, and DeJa Walker

Draft Copy February 2009

Introduction

In terms of the diversity of historic fruits in America, heirloom apple varieties outnumber all other kinds of fruit combined.

First, the good news: The diversity of heirloom apples historically found in American orchards, backyards and hedgerows—upwards of 16,000 distinct named varieties—is greater than the diversity found in any other crop domesticated here or introduced to this continent.

Now, the bad news: the number of apple varieties considered to be at risk of being lost from American landscapes and tables is also greater than that for any other kind of food—fruit, vegetable, livestock breed, fish or game. There are some 129 varieties of American heritage apple varieties currently boarded onto the Slow Food U.S. Ark of Taste[1]. In the 2008 version of the North American foods at risk list in *Renewing America's Food Traditions: Saving and Savoring the Continent's Most Endangered Foods*, 108 varieties were listed as threatened or endangered in trade, that is to say, they are now only available from six or less nurseries anywhere on the continent.

The *heritage* apples which have been in commerce since 1980 are but the tip of the iceberg. The *true heirlooms* are those that have always been passed from hand to hand, generation to generation, regardless of whether they have ever been offered for sale by a commercial nursery. On top of that, we have no idea of just how many unique *feral* apples remain out in the landscape, their unique qualities yet to be discovered.

What are we going to do to reverse this trend toward the loss of variety in the marketplace for one of our most beloved fruits? How can we ensure that a generation or two from now, *Americans do not assume that a Red Delicious (or even the much-ballyhooed Honeycrisp) is everything that an apple can be* in terms of flavor, texture, keeping qualities and uses? The purpose of this booklet—half manifesto and half manual—is to help us chart a plan of action to restore apple diversity to our farms, backyard orchards, restaurants and home tables:

- It builds on the seasoned knowledge and wisdom of many heirloom apple experts, but does not assume that the solutions to this problem will come entirely from experts.

- It seeks to engage chefs, farmers' market managers and consumers as champions. If there is no market demand for such heirlooms, they will surely "die on the vine."

- It acknowledges that the growing consumer demand for hard ciders, apple wines and brandies, as well as for fresh, seasonal, artisanal, local and heritage foods, offers new markets for unique and underutilized varieties.

[1] *The Ark of Taste is Slow Food's catalogue of foods threatened by industrial standardization, the regulations of large-scale distribution and environmental damage. In an effort to cultivate consumer demand—key to agricultural conservation—only the best tasting endangered foods make it onto the Ark.*

- It aims to involve land managers of historic apple orchards and feral apple trees as allies, whether they work as land stewards in National Parks (34 percent of which have historic orchards in them!), or for land trusts, historic farms, or reservations.

- It seeks to draw attention to, and foster respect for, the many nursery men and women, arborists, orchard keepers and fruit explorers who have been maintaining historically-significant apple trees all along, so that they may feel supported in their labors.

- It raises issues about the trends and changing structure of the nursery industry, especially in an area when national "big box" chains of department stores with lawn and garden pseudo-nurseries are driving out of business many of the place-based family-owned independent nurseries.

- It proposes unprecedented public investment in both the *in situ* conservation of historic orchards and feral trees still in the landscape, and the *ex situ* propagation of heirloom varieties across a broad network of heritage orchards, local and regional nurseries, botanical gardens and arboreta, schools and land-grant universities.

- It offers a knowledge base of both traditional apple varieties and the orcharding skills needed to grow them in an ecologically sustainable manner. In doing so, it encourages the passing down of an appreciation for fruit diversity and taste to future generations, documenting and celebrating the cultural and regional folkways and recipes that are, in many respects, every bit as threatened with extinction as the apples themselves.

A Brief History of Apple Diversity in America

Before we roll up our sleeves and get our hands dirty, let us remind ourselves not only of the immensity of the task before us, but why it is so important that we unflinchingly take it on. Of all the food and beverage crops historically introduced to North America, the domesticated apple has flourished and diverged into the greatest number of distinctive varieties, heirlooms or eco-types. Let us understand how that happened. Perhaps no one has summarized this history better than Tom Burford and Ben Watson:

Although the cultivated apple (Malus x domestica) is not native to North America, it was one of the first crops brought to this continent by settlers from England and western Europe. Since the early 1600s the apple has flourished on these shores, and for many years it was considered the quintessential homestead fruit, used for fresh eating from midsummer through early spring, for drying, preserving, cider-making, and in a whole host of useful household products like cider vinegar.

The apple is inextricably linked to both the traditional rural landscape and the farm economy of America. Early colonists planted apples wherever the climate allowed, from New England to the mountains of north Georgia. Some of the earliest varieties were grafts taken from European trees, but very soon a whole new "democratic" apple revolution took hold in the United States, as seedling trees (which are genetically different from their parents) sprung up on

farms and in frontier orchards like those tended by John Chapman, the famous "Johnny Appleseed."

Only one in 10,000 chance seedlings might produce an apple whose qualities were considered worth propagating and saving for future generations. Yet because these seedling trees produced fruits that were unlike the apples they came from, new types of American apples quickly emerged, many of them unnamed varieties that were unique to a particular village, farm, or estate. In the early 1800s, American nurserymen were already offering some 100 named varieties of apples for sale; by 1850, more than 500 widely recognized varieties were being cultivated; and in 1872, Charles Downing documented close to 1,100 different kinds of apples that had originated here in America.

And yet the most widely cited estimate of apple diversity in America was published roughly a century ago. Not long after Downing's list was published, the U.S. Department of Agriculture was established; among its tasks were to document the many food varieties already found within its states and territories that might have utility for farmers; and to introduce other useful plants from other parts of the world. USDA pomologist W. H. Ragan was assigned the task of recording all the names and characteristics of apple varieties grown within the U.S. borders during the nineteenth century. Ragan's first edition of *The Nomenclature of the Apple,* released in 1905, included 6,554 uniquely-named apple varieties found in nursery catalogs and other literature printed between 1804 and 1904.

Assessing the Level of Loss of Apple Diversity

When Cary Fowler was co-authoring the book *Shattering* with Canadian activist Pat Roy Mooney in the 1980s, he revisited the Ragan list and compared it to then-current nursery listings of apples that he could get his hands on. Without the help of internet searches, Fowler projected that 86 percent of these pre-20th century apples had already become functionally extinct. , or at least, disappeared from the marketplace

But that is not the half of it. Over roughly the past two decades, orchard-keeper and apple historian Dan Bussey has been expanding upon Ragan's apple registry to make a more complete inventory of all named apple varieties once grown in America, carefully differentiating synonyms from unique varieties. Although the volumes in Bussey's masterwork will not begin to be released until 2010, his most recent estimate is that some 16,000 unique named varieties have been grown on American soil at one time or another.

If we are to update earlier assessments of conservation and loss of American apples, we can do it a number of different ways. One way to place the 16,000 named varieties into perspective is by comparing that number to how many apple varieties are currently being offered by U.S. and Canadian nurseries. In 2001, Kent Whealy and the staff of the Seed Savers Exchange found that 1,500 apple varieties were still currently available through nurseries in North America, including modern patented cultivars and recent introductions from other continents. By a conservative estimate, *less than one in ten apple varieties historically grown in America remain commercially available*, though that number is probably more like one in twelve.

Of course, there are other apples that have been conserved in the *ex situ* collections of federal and state government agencies, varieties that commercial nurseries may no longer maintain. The USDA-ARS collection held at the Northeast Regional Agricultural Experiment Station in Geneva, New York, holds over 2,500 apple accessions, but this number includes many wild apples from Kazakhstan and the Caucasus, as well as breeding materials and heritage apples from other countries. It is likely that less than 1,500 of those are unique American varieties. In short, there are many, many apples that are neither available in the nursery trade nor backed up in government collections.

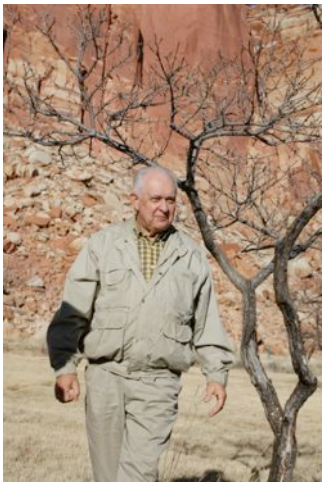
Of course, what really matters is how many apples there are out in the landscape, surviving and becoming adapted to a variety of conditions; and how many apples reach the tables of our homes, cafes, festivals and favorite restaurants.

The answer to these questions is most disturbing. The Red Delicious apple now constitutes two-thirds of the entire apple crop in the United States. Including Red Delicious, eleven varieties make up 90 percent of all the apples offered in chain grocery stores such as Safeway, Kroger, Albertson's, and Wal-Mart. After Red Delicious, the Golden Delicious, Granny Smith, McIntosh, Rome Beauty, Fuji, Jonathan, York, Gala, Idared, and Yellow Newtown apples are represented in those top eleven varieties that most American consumers know and eat as an apple.

Fortunately, not all Americans purchase all their apples at chain groceries and big-box stores. In a fine survey of apples reaching consumers via national grocery chains versus local food venues such as farmers' markets and CSAs, Goland and Bauer revealed that newly-revived local food systems are literally keeping at least seventeen additional apple varieties in the marketplace that grocery stores and convenience marts don't offer. Their study of the apples of Ohio needs to be replicated in other states and foodsheds, but it affords us a ray of hope. So does the recent growth in organic apple production, for many organic orchard-keepers maintain heritage apples in their mix. Since 1997, the number of apple-orchard acres under organic production has increased in the U.S. by more than 44 percent; ironically over the same period the

total number of acres in apple production has fallen by 20 percent! We will look more at national trends later, but there is indeed a strong counter-movement to make space for organically-grown heritage apples in our rural landscapes.

Assessing Changes in the Nursery Trade and Their Impacts on Apples



Virginia nurseryman Tom Burford training Park Service employees at Capitol Reef in historic orchard restoration

Certain insights regarding the fate of apple diversity in America can be gained by understanding what has happened to the nursery industry over the last few decades. Before the economic collapse of late 2008, statistical summaries from the USDA Agricultural Statistics Board painted a rather rosy picture of the health of the nursery industry. In 2007, the Board reported that nursery sales topped $4.65 billion in 2006, an increase of 17 percent over 2004. This income was spread over some 7,292 nurseries with sales of $10,000 or more per year, but 905 of those nursery operations had annual sales of over a million dollars, suggesting that they took from a quarter to a half of all sales.

By 1987, when there were at least 600 more nurseries in the U.S. than there are today, lawn and garden departments of large "Big Box" chain stores began to seriously compete with them. By that time, more than 32 percent of the 69 million gardening households had been "seduced" into shopping for fruit trees as well as annual plants in lawn and garden departments of mass merchandisers. K-Mart had some 2,000 garden centers selling fruit trees amidst its total of 2,200 stores, taking in some $700 million in revenues from lawn and garden sales. Wal-Mart already had gained nearly $300 million in revenues from lawn and garden departments in some 980 stores. Target, Home Depot, True Value, and Ace also featured fruit trees in their "pseudo-nurseries" within lawn and garden departments, with cashiers or other staff seldom being able to recommend anything that was locally-adapted, since the same plant materials were offered from coast to coast.

Other studies bear out that just a few mass merchandisers control most nursery sales of every kind, increasing from 18.8 percent of all wholesale revenues in 1993, to 22.1 percent by 1998. At present, mass merchandisers capture well over a quarter of retail and wholesale revenues from plant sales. In short, the dominance of Big Box lawn and garden departments means that locally-owned garden centers and mom-and-pop nurseries—which historically harbored most diversity—capture an ever smaller proportion of the total sales in fruit trees, including apples.

Of course, fruit and nut plants represent only a small proportion (6 percent) of total nursery sales these days. By 1998, there were less than 600 authentic nursery operations in the country which specialized in selling deciduous fruit and nut trees to the public. Roughly speaking, that's about 12 local nurseries offering fruit trees per state. What that number does not tell us is how many nurseries we have lost.

To make such an estimate, we first selected some 100 American nurseries which featured most of the deciduous fruit and nut trees that were found by Whealy in 1988 and compiled in the first comprehensive survey of U.S. nursery catalogs ever accomplished. Of those 100 nurseries, only 38 percent were again documented and featured in the third edition of the *Fruit, Berry and Nut Inventory* edited by Whealy in 2001. Our recent on-line documentation suggests that either some of the nurseries "lost" in 2001 have reappeared, or were inadvertently missed in the third survey by Seed Savers Exchange. In any case, *33 percent of the American and Canadian nurseries specializing in deciduous fruit- or nut-bearing trees have gone out of business since 1988* (Table 1).

There have been additional closures of fruit tree nurseries (ones not noted in 1988), which formerly specialized in heirloom and heritage apples, as noted at the end of Table 1. We welcome any updates on the status of these and other nurseries, since internet searches are an imperfect means of documenting the current status of such horticultural businesses. At the same time, we must carefully assess the new opportunities offered by the internet to smaller, specialized, regional nurseries, both for-profit and non-profit, that are willing to promote place-based heritage apples and other fruits.

Table 1: List of changes in nurseries offering deciduous fruit and nut trees.

Nursery	**1989**	**2001**	**2009**
Adams County*	X	X	X
Ahrens'	X	0	0
Ames	X	0	0
Vernon Barnes*	X	0	0
Bear Creek*	X	0	0
Bigelow	X	X	X
Burgess	X	X	X
Buckley	X	0	0
Burnt Ridge	X	X	X
California*	X	0	0
Callahan Nursery	X	0	0
Callahan Seeds	X	X	0
Carroll Gardens	X	X	X
Carter	X	X	0
Clifty View	X	X	X
Cloud Mountain	X	X	X
C & O	X	X	X
Condon & Weller	X	X	0
L. E. Cooke	X	X	X
Country Heritage	X	0	0
Columbian Basin	X	X	0
Cumberland Valley*	X	X	X
Cummins Nursery	X	X	X
Edible Landscaping	X	X	X
Farmer Seed	X	X	X

Fedco	X	X	X
Henry Field	X	X	X
Fig Tree	X	0	X
Forestfarm	X	X	X
Four Seasons	X	X	X
Fowler	X	0	X
Gardener's Choice	X	X	X
Greenmantle*	X	X	X
Grootendorst*	X	0	0
Gurney's*	X	X	X
Haley	X	0	0
Hastings	X	0	0
Hidden Springs*	X	X	X
HollyDale/Freedom Tree	X	X	X
Ison's	X	X	X
Joyce	X	X	O
Judkins	X	0	0
J. W. Jung*	X	X	X
Kelly Bros.*	X	0	X
Forrest Keeling	X	X	X
Krider	X	0	0
Lakeland	X	0	X
Lawson's*	X	X	X
Lawyer	X	X	X
LBG	X	0	0
Henry Leuthardt*	X	X	X
Living Tree Centre*	X	0	0
Long Hungry Creek	X	0	X
Maver	X	0	0
Earl May	X	0	X
Meadow Lake	X	X	X
Mellinger's*	X	X	X
J. E. Miller*	X	X	X
Morton	X	0	X
Mt. Leo	X	0	0
National Arbor Day	X	X	0
Hans Nelson	X	0	X
New York Fruit	X	0	0
Northwoods	X	0	X
Oikos Tree	X	X	X
Orange County	X	0	X
Pacific Coast	X	0	X
Pacific Tree	X	X	0
Peaceful Valley	X	X	X
Pikes Peak	X	X	X

Pommiers Willamette	X	0	X
Pony Creek	X	0	0
ProTrees	X	0	X
Raintree*	X	X	X
Savage Farms*	X	X	X
Schumacher	X	X	X
Schmidt	X	0	0
Sherwood's	X	X	0
Sierra Gold	X	X	X
Simpson	X	X	0
Smith	X	X	X
Southmeadow*	X	X	X
Sonoma Antique/ Trees of Antiquity*	X	X	X
Stark Bros.*	X	X	X
Stanek's	X	X	X
St. Lawrence*	X	X	X
Stribling's	X	X	0
Swedburg	X	0	0
Texas Pecan	X	X	X
Tillinghast	X	0	0
Tolowa	X	0	0
Van Well*	X	X	X
Waynesboro	X	0	X
Weston	X	X	X
Whitman	X	X	X
Wilson	X	X	X
Womack*	X	X	X
Yakima	X	0	X
Other Apple Nurseries Not in 100 Survey			
Apple Branch	X	0	0
Apple Luscious	X	0	X
Applesource	X	0	0
Big Horse Creek Farm	0	0	X
Brad's Fruit Trees	X	0	0
Bluebird Orchard		X	0
Calhoun's	0	X	0
Christian Homesteading Movement	X	X	0
Inner Coast	X	0	0

Jerry's Appleseeds	X	0	0
Johnson	X	X	X
Neighbor's	X	0	X
Orchard Lane	X	0	0
Plants of the Southwest	X	X	X
Urban Homestead	X	0	0
Virginia Vintage Apple	0	X	X

* Nurseries noted as being reliable sources of heirloom apples by the National Park Service in 1982.

If we just compare the availability of a few heritage apples in 1988 with that in 2001, we see several declines in apple grower's access to the rarest, more localized varieties (Table 2). At the same time, other heritage apples such as Black Gilliflower (Sheepnose), Hubbardston Nonesuch, Ralls Genet, Sierra Beauty and Wolf River appear to be making a comeback in terms of the numbers of nurseries offering them, and may be out of the "danger zone," at least temporarily.

Table 2: Availability of selected heritage apples in the nursery trade

Heritage apple variety	**Number of nurseries offering it in 1988**	**Number of nurseries offering it in 1992**	**Number of nurseries offering it I in 2000**	**Number of nurseries now offering it on-line (2009)**
Bailey Sweet	3	2	2	0?
Buckingham Buff	1	4	3	2
Cole's Quince	3	7	4	4
Gloria Mundi	1	4	5	2
Lady Sweet	3	5	2	3
Late Strawberry	3	3	2	2
Magnum Bonum	1	2	3	3
Nickajack	-	2	4	1
Pawpaw	2	3	2	2
Shockley (Cantrell Strain)	1	3	1	2
Shiawassee Beauty	0	3	3	1
Williams	2	7	4	1
Winthrop Greening	0	1	4	1

Where Can Heirloom Apples Be Found? Apple Production vs. Apple Diversity

The ten leading states in apple production are not necessarily the ones with the greatest remaining apple diversity. Although they vary in rank in yields from year to year, the ten leading states in apple production include (in more or less descending order): Washington, California, New York, Michigan, Pennsylvania, Virginia, Ohio, North Carolina, Massachusetts, and West Virginia. We know from previous surveys that heirloom apple diversity is not very high in California and Washington—the biggest apple producers—relative to other states and regions. But which regions do have the highest diversity of heirloom and heritage apples? Although we have some clues to this question, we are interested in hearing your answers. We welcome your input, including maps, indicating where you believe there are "hotspots" of apple diversity across the American continent.

Of course, Creighton Lee Calhoun's classic *Old Southern Apples* has given us great appreciation of the number of historic varieties found in the South—particularly in Appalachia and the Piedmont—but recent interviews indicate that Mr. Calhoun has become pessimistic, or at least cautionary, that many of these will survive much longer unless extraordinary efforts are taken to rescue and maintain them. Nevertheless, Tom Brown and Tom Burford are among those apple aficionados who continue to turn up one thought-to-be-lost apple after another, so a definitive status report seems difficult to make for the entire South.

At the same time, John Bunker, Ben Watson, Christie Higginbottom and others continue to document the extant diversity of apples of New England, a region that was once nearly as rich in apples as the South. The Ohio River Valley up through the Great Lakes presents perhaps the third-greatest mother lode of apple diversity, thanks in part to the legacy of Johnny Appleseed. But again, such diversity does not remain static: we must ask not only where the areas were of historic diversity, but where are the areas that today are suffering from rapid loss of old-time apple varieties.

Given Historic Losses, Are There Still Unique Apples to Be Found? Yes! A Case Study from the Southwest

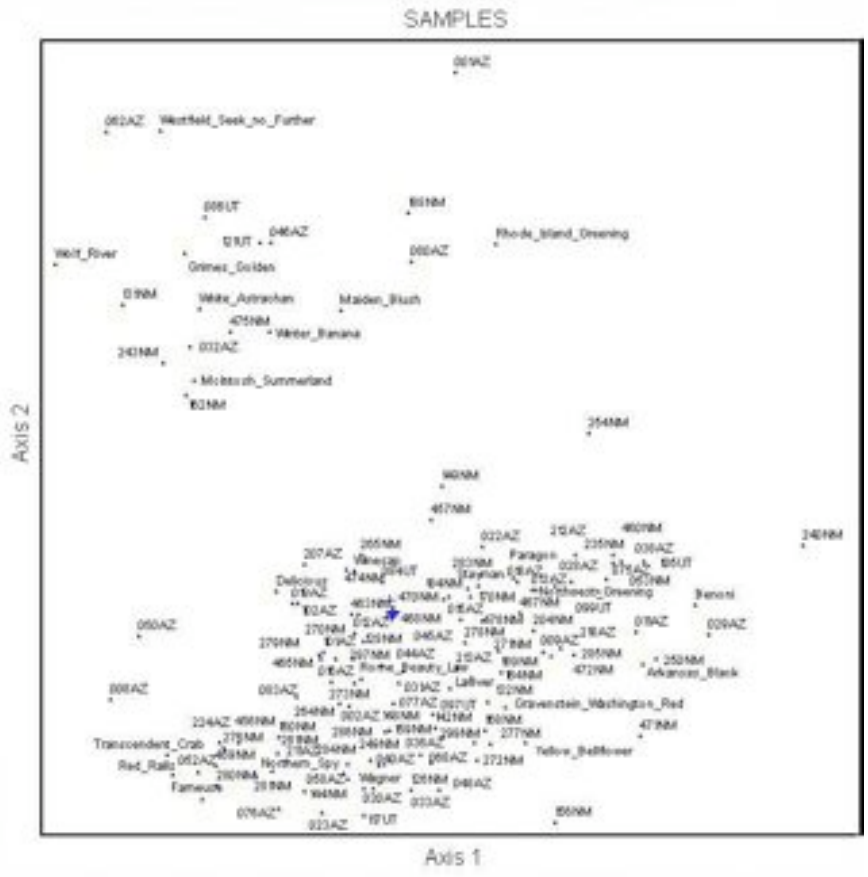
Many experts have suggested that historic and abandoned farmstead orchards dating to the early 20th century and before may harbor undiscovered feral or forgotten "heirloom" apples not found today in the nursery trade. And yet the distinctiveness of each feral, forgotten fruit has been difficult to assess. Today, however, we can use new tools to assess the diversity of apple trees growing at abandoned farmsteads and in historic orchards.

As a case in point, Kanin Routson has sought to genetically identify unknown varieties of apples in the Southwest using DNA microsatellite analysis. Apple trees were introduced to the U.S. Southwest as early as they were on the East Coast, during Hispanic settlement of the region. Spanish immigrants, priests, and explorers introduced apples into central New Mexico around Albuquerque, Manzano, and Santa Fe during the early 17th century, certainly no later than 1630. Apple trees from Eastern and Midwestern sources were also brought to the Southwest by Mormon and Anglo settlers during the latter half of the 19th and early 20th centuries.

Routson's research involved collecting leaves from 280 apple trees growing in numerous abandoned farmsteads and historic orchards in Arizona, New Mexico, and Utah and comparing them to known varieties. The DNA from these leaves were "fingerprinted" using microsatellite analysis, one of many methods used for looking at genetic ancestry and relatedness. The fingerprints of the field samples collected were then compared to those of 110 heritage apple varieties that were the ones most likely to have been introduced into the Southwest during the late 19th to early 20th centuries. Only presumed "historic" apple trees were sampled, with sampling of seedling trees being avoided. Trees of visibly differing morphologies were sampled in each orchard to try to avoid repeat sampling of identical varieties. Tree locations were recorded using GPS coordinates and aluminum identification tags were nailed to each tree. Leaf samples were also collected in the summer and fall of 2007 and analyzed to determine ploidy levels—another clue of ancestry—in addition to the genetic fingerprints at seven microsatellite loci.

By comparing the newly-collected field samples to 110 known heritage varieties, 34 known and named varieties were successfully identified within 120 of the samples. The other 160 samples corresponded to 110 unique genotypes that were either never named, or named but not among the 110 "controls" of varieties likely to have entered the Southwest. (The term genotype is used in this context to refer to genetic individuals; because unknown samples could either be known varieties not fingerprinted in this project or local seedlings.) Varieties Ben Davis, Delicious, Grimes Golden, Jonathan, and Winesap were identified at multiple orchards in this survey, confirming their widespread availability at the time that these historic orchards were planted in the Southwest. Figure 1 shows the genetic relatedness of all samples in this study.

Figure 1: Principle component analysis of unique apple genotypes at historic Southwest orchard sites. Sample numbers and state of origin indicate unknown varieties and names are identified varieties (Routson et al., in press).



In short, high levels of varietal richness were found in these historic orchards, including ones not currently in the nursery trade. This richness also corresponded to a high proportion of unnamed genotypes. A rich diversity of extant fruit trees persists out in the landscape, but old orchards are a diminishing resource as old age and changes in land-use exact their toll on remaining trees. As the number of named varieties fingerprinted at the USDA-ARS Plant Genetic Resources Unit (Geneva, NY) increases, we may be able to identify more of the unknown genotypes. Until this is done, the unknown genotypes should be conserved and evaluated. Regions with high levels of unique varieties should be targeted for *in situ* conservation. Locally adapted cultivars should be propagated and distributed through farmers' markets and local nurseries.

While genetic technologies are thus far limited to well-endowed research institutions, this study has shown genetic fingerprinting can be a powerful tool for uncovering identities and relationships between apple varieties. As genetic analysis continues to become more thoroughly understood and more affordable, so to will its accessibility for research outside of academia. For example, one of the goals for Slow Food USA's Ark apple program, identified by Burford and Watson in 2003, was a proposal to determine the actual genetic relationship among the varieties or strains of the Limbertwig apple group, through DNA testing from a historic Tennessee

orchard. Similar local diversity testing might be undertaken in other "hot" areas like rural Main (John Bunker) or the North Carolina mountains.

Emerging Threats

Of course, particularly flavorful apple trees are rooted in particular kinds of soil, and apple traditions in particular landscapes. But as Ben Watson and Tom Burford have vividly reminded us, Americans' relationships to the landscape have been changing, and much of the terrain formerly devoted to apple orchards is now covered by asphalt, concrete, or landfills:

"The incredibly rich and diverse apple culture in America began to decline in the late 19th and early 20th centuries, chiefly as a result of westward migration away from mixed-use subsistence farms and the dramatic shift in population from the countryside to the city. And although many of the old varieties still exist today, preserved by home orchard-keepers and small-scale farmers, the emphasis years ago began to shift toward apples that could be grown in large-scale orchards, then packed and shipped to distant markets.

In the past decade the glossy but tasteless apples that once dominated the produce aisles of supermarkets (the beautiful but mealy Red Delicious is the prime example) have given way to a better-tasting, but still not very diverse or interesting selection of fruits. Gala, Braeburn, Granny Smith, and other apples imported from Washington State (or, during the off-season, from the antipodes of Chile and New Zealand) have little of the unique flavor or complexity of locally grown apples, which may be best adapted to a specific growing region, or even to the terroir of an individual orchard."

Ironically, many of the states which have had the highest apple production *and* diversity are now the very states with the greatest loss of farmlands. As the American Farmland Trust has documented, we are losing the richest, most productive farmlands (including orchards) faster than ever before, and the following apple-growing states are among the top twenty states bearing the brunt of farmland development and loss: Ohio (2), North Carolina (4), Pennsylvania (6), Virginia (11), New York (13) and California (15).

While farmland loss is one threat, the loss of traditional knowledge about apple growing, grafting and selection is another. If the average age of farmers has continued to rise over the last century, the average age of diligent orchard-keepers and seasoned nurserymen is no doubt even higher than the ever-rising average age of farmers in general. When someone claims to be an antique apple grower at a community meeting, most folks wonder whether the adjective 'antique' refers to the old-time apples or to the gray-haired grower!

Traditional knowledge about how to grow, select, graft, cook with, or otherwise use apples is in as much need of searching out and conserving as the varieties themselves. In an example from the Philippines, Virginia Nazarea proposed the idea of a cultural memory bank, the inclusion of cultural information garnered over long periods of use by communities regarding the care and use of food resources—their histories, myths, songs, recipes, and management practices—along with relevant horticultural, taxonomic and ecological information. In order to really conserve a variety, we need to know 'the human stories' about that variety, not just the genetic code.

Other threats loom on the horizon. There are at least fifteen major diseases and pest species which attack and kill apple trees; some of the strains are undoubtedly getting more virulent and spreading to growing regions where they had previously been only minor problems. For instance, fireblight was not considered a major apple disease in the Great Lakes region until the 1980s, but a number of episodes of fireblight have since reached epidemic proportions in that region, damaging or destroying many young trees.

Genetic engineering or the use of transgenic technologies first allowed the transfer of foreign genes to apples in 1989, and such biotechnological manipulation of the apple genome is now being accomplished in a number of labs around the world. The first field trials of GMO apples were conducted in 1992, and there have now been additional trials not only in the U.S., but in Great Britain and New Zealand as well. Although apple breeders are quick to assert that environmental and food safety precautions are being taken, and that their products may increase disease and pest resistance in apples, the proof will be in the (apple) pudding.

How to Avert Further Losses and Return More Apples to Our Food System

We are not merely concerned about saving apple genes for future plant breeders; if that were our goal, we would simply sample apple rootstocks, seeds and shoots, culture them in test tubes, and not care whether the trees themselves persisted in orchards or the flavors reached our tables. Instead, we are talking about the biological, cultural and culinary restoration of apple diversity in America, so that many apples are accessible to all, not just to the research community or to the elite gourmet. Because there are many threats to apple diversity, there is reason to employ a mix of strategies to conserve, restore and revive them. Let's look at the range of strategies and why we might use them.

In Situ Conservation of Apple Diversity

This set of strategies keeps particular apple varieties connected to their place of origin, adaptation and cultural tradition. *In situ* or on site means that they stay on the farms and in the foodsheds where they are best known, and perhaps where their finest flavors accrue. *In situ* conservation can be done in several ways:

1. Showing both economic and moral support for growers (like Bill Moretz of Moretz's Mountain Orchard) who already provide a great variety of old-time apples through

offering community-supported agriculture (CSA) shares to his neighbors near Boone, North Carolina.

2. Ensuring that historic orchard lands are not developed, but are protected through conservation easements or deed-and-covenant restrictions that local land trusts can assist and support.

3. Promoting the establishment of new orchards with local heirlooms and new cideries in areas where older orchards are declining.

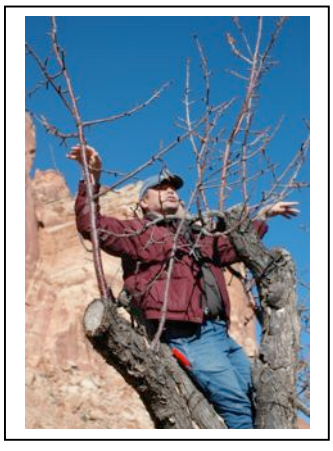
4. Taking cuttings from older, senescent trees and grafting these onto rootstock or established trees to maintain the same varieties in the same historic orchard, or others nearby.

5. Promoting local scion wood exchanges each spring, as John Bunker of Fedco has done at the Maine Organic Farmers and Gardeners Association (MOFGA) fairgrounds in Unity, Maine.

6. Mapping and describing historic orchards in on-line or published directories, as John Bunker has done in his book, *Not Far From the Tree*, and as Kanin Routson, Gary Nabhan and Suzanne Nelson have done through the Southwest Regis-Tree program originally established through Native Seeds/SEARCH's collaboration with other organizations. Descriptions of varieties identified in the Southwest can be found at: http://www.environment.nau.edu/Land%20Projects/Regis-Tree_Fruit_and_Nut_descriptions.pdf. See Appendix 1 for a sample recording sheet for documenting historic orchards.

7. Ensuring that local schools, nurseries, historical societies, parks and botanical gardens not only grow but feature the stories of these heritage fruits. As a model, none could be better than the North Carolina collaboration among the Lakewood Elementary School students, Slow Food Triangle, the Center for Environmental Farming Systems, SEEDS, and David Vernon's Century Farm Orchard, where four hundred varieties of Southern apples are actively conserved in an orchard maintained by the Vernons for more than a century.

8. Working with county zoning departments, land trusts and citizens' groups to reduce development pressures on apple-growing areas.



Dan Bussey explaining how to care for an historic tree.

Ex Situ Conservation of Apple Diversity

Safeguarding apples or other heirlooms away from their areas and communities of origin may be a prudent "back-up" strategy in areas of rapid development and loss, but not necessarily a long-term solution. There are several ways this may be done:

Kanin Routson - grafting

1. Rescuing scionwood from trees soon to be bulldozed or axed, as Tom Brown, Gordon Tooley, Bill Mortez and others have done for years. When permissions allow, this can lead to sharing that scionwood with other apple experts, the USDA ARS program in Geneva, New York, the Seed Savers Exchange, North American Fruit Explorers (NAFEX) or other national conservation programs.

2. Ensuring that nurseries and orchards with commitments to heirloom apples receive such plant materials for propagation, as the networks fostered by Creighton Lee Calhoun and Tom Burford have done.

3. Placing grafted trees out in protected and managed landscapes such as National Parks, National Heritage Areas, arboreta or other public places.

4. Developing on-line or other means of collecting and storing the traditional knowledge associated with individual varieties, creating a 'cultural memory bank' along the lines of that proposed by Virginia Nazarea in her work with sweet potato conservation in the Philippines. Information should include historical information, how they are grown, grafted and managed, documentation of specific resistance or susceptibility to diseases/insects, cooking/uses, recipes, etc.

5. Recognizing and/or establishing a network of key regional American Heritage Orchards that will grow and maintain regional priority-conservation varieties of apples (as well as other forgotten fruit and nut varieties), as well as locating, propagating and growing out local feral apples, evaluating them for their potential usefulness, and for their natural pest or disease resistance.

grafting

Tom Burford teaching in the orchard.

How Do You Find Possible Sites Where Unique Apples Might Remain?

Given that you have an interest in conserving apple diversity *in situ* or *ex situ*, how do you find unique apples worthy of that investment? Every fruit explorer has his or her own methods, but some of the best have been compiled by John Bunker in his charming book, *Not Far from the Tree.* By using old maps, aerial photographs and land survey records, John has been able to relocate the sites where apple orchards historically occurred around Palermo, Maine. In some cases, descendants of the original orchard-keepers are still alive, and oral histories of the varieties planted might be gained from these local residents. In other cases, elderly neighbors remember being given gifts of apples or even stealing some away in their own back pockets; some remember the specific trees or rows from which the best apples (and particular named ones) arose.

But lacking contact with anyone who knew the particular orchard in that detail, there is another way to "triangulate" on the identities of apples in a given historic orchard. Oftentimes, orchard-keepers would submit their best apples for blue ribbon competitions at county or state fairs, or note their availability in newspaper ads. By diving into such historic records in local or county archives, you can develop a list of potential varieties that might still be located in that family's orchard(s). Returning to the orchard during fruiting, with pictures and descriptions of those varieties in hand, may be your best option.

Of course, some of these searches have fortuitous twists and turns. John Bunker has also put out "wanted posters" in counties where he knows "lost apples" once grew. Seeing such posters in post offices and community centers, many old-timers have helped John relocate varieties believed by many to have been extirpated. An orchard of these rediscovered fruits now adorns the MOFGA fairgrounds in Unity, Maine.

In the Southwest, abandoned and historic orchards or orchard remnants were identified using both published historical documentation but also by searching within the national park system, which now includes many old homesteads and farmsteads. The Southwest Regis-Tree project was initiated in the late 1980s by Native Seeds/SEARCH in order to identify and document orchards where remaining trees were likely descendant from those established by Spanish missionaries and Mormon, Mexican and other pioneers and settlers. These trees or orchards are nominated to the Regis-Tree program by filling out a simple survey form (Appendix 1.). A catalog of nominated orchards, oases or individual trees is currently managed by Native

Seeds/SEARCH staff members and collaborators, and will soon be available on the Native Seeds/SEARCH website.

Strategies for Sampling Apples from Farmstead Orchards

Once you've found apples worthy of collection from historic orchards, we recommend collecting as much site-specific information and oral history documentation as possible, to be conserved along with the apples themselves. The steps of collecting apple scion wood include documentation through field notes, maps and permissions, photographs, and collecting scion or bud wood from the trees for later grafting.

Documentation

Proper field notes should include:

1. Directions to the site. Record clear directions for returning to the site. Useful descriptors include roads, mileage, landmarks, and a sketch-drawn map.
2. Describe the Orchard. Write a brief description and sketch a map of the orchard. If possible, record the GPS position of the orchard and note the settings of the GPS (standard settings include: hh°mm′ss″ in WGS1984 or UTM NAD1983 or UTM NAD1927). Nailing aluminum tags to individual trees is one of the most effective methods for identifying trees on return visits.
3. Write field notes describing the ownership of the orchard, the condition and approximate age of the orchard, number of trees, species, and varieties present. In addition, if the trees have fruit, describe the fruits size, color, shape, texture and flavor. If there are oral histories or written documentation of the orchard, this should also be recorded or referenced in the field notes. Record additional, site-specific field notes from interviews and observations.
4. Photograph close-ups of the fruit, profiles of the fruit trees, and landscapes of the orchards for long-term documentation.

Proper oral histories should include:

1. Name, address and other relevant contact information for person(s) interviewed.
2. Digital or other media recording of interviewee, including recording of their agreement to be interviewed. Include date, time and location of interview. The name of the interviewer should also be recorded at this time.
3. A signed agreement between interviewee and interviewer regarding the treatment and final use of the information collected during the interview. Release forms or a Memorandum of Understanding can be used. Copies should be provided both to the interviewee and individual or entity to which the information is being 'donated'.

Sampling apples

To avoid repeat sampling of identical varieties, and 'rescuing' common varieties like Red Delicious, visit the trees while in fruit prior to collecting any scion wood. Select trees with visible graft scars whenever possible. This is also a good opportunity to note characteristics of the trees and fruit that may aid in later varietal identification. If the trees are in poor condition and are not producing fruit, grafting cuttings onto mature trees and/or genetic analysis of the vegetative tissue will later aid in identification.

Collecting scion material is straight-forward for healthy trees, but can problematic for dying ones that have but a few short branchlets remaining. In late winter, collect dormant scion wood and keep it damp and cold until grafting in the spring. This is easily achieved be wrapping the labeled cuttings in damp paper towels, and storing them in multiple layers of plastic Ziploc bags in the refrigerator. Cuttings will last longer if lightly frozen (0°C), but the freezer is too cold and will kill the dormant tissue. The ideal scion for splice grafting consists of an un-branched shoot of the previous summer's growth, 1/8th to 3/16th inch in diameter, and eight inches to a foot in length. Ideally, collect cuttings from the outside edges of the canopy.

Avoid suckers or water sprouts from near the base of grafted trees, though they are sometimes the only available source materials. Trees that are in really poor condition usually lack suitable grafting material and are more difficult to successfully graft. Graft the cuttings in spring when the rootstock begins to break bud. The whip graft is standard and effective, though other types of grafting are suitable. In arid regions, it is advisable to cover the newly grafted scion with a plastic bag to increase the humidity until the cutting begins to grow. Remove the bag slowly by first puncturing it when the cutting has leafed out and has begun to grow. Label the grafted trees with aluminum tags.

Check in and care for your adopted apple on a regular basis. It may be the only of its kind left in the world.

Cultural and Culinary Restoration of Apple Diversity

Apples are not like pandas or spotted owls; they may also be endangered, but they are meant to be eaten or drunk! We will know when they have recovered when they are offered on the table or in the keg at apple tastings, community feasts and cider festivals, and when America has as many *routes des cidres* as it has culinary tours along wine trails.

Ben Watson and Tom Burford have laid out both some goals and some means to ensure the cultural and culinary restoration of apple diversity:

- Celebrate the incredible diversity of taste and form that is represented by these classic American apples at tastings and cider festivals.

- Introduce professional chefs and home cooks alike to the different uses for apples in the kitchen. Each apple has its own unique organoleptic qualities and is best suited for eating out of hand, for pies and pastries, for drying or preserving, or for applesauce, cidermaking, or other uses.

- Educate consumers about the concept of locally grown fruit, and the proposition (once well known, but largely forgotten) that a wide range of local apples can be enjoyed from late summer through early spring, and that some varieties even improve after a few months of proper storage. In other words, we intend to demonstrate that local apples need not be seen as a short-lived seasonal crop, but can contribute to a strong local farm-based economy.

- Act as advocates for those small-scale, local, and family orchards that still survive in the face of development pressures and low commodity prices due to foreign and domestic competition. We recommend that these small-scale orchard-keepers adopt a diverse selection of regional varieties and help to reestablish them in local markets at a price that will support local growers and farm laborers.

- Support the creation of new apple orchards and the restoration of old or neglected orchards wherever possible. Use as a model the Slow Food New York City chapter's Green Newtown Pippin Apple Project, which supplied apple scion wood to the Cummins Nursery for grafting and then donated 85 trees to New York state farms. Those farms are now selling Green

Newtown Pippin apples—a variety that originated in New York City—to NYC farmers' market customers. Slow Food USA is promoting this "adopt a food" model to its volunteer chapters around the country. Slow Food chapters and other volunteer groups can help bring place-based endangered foods back to the table by encouraging more producers to grow the food, chefs to serve it, and retailers to sell it.

- Promote the concepts and practices of organic orchard-keeping as outlined by Michael Phillips, and encourage its early adoption by "hard cider" orchards which need not worry so much about the cosmetic qualities of their apples. At the same time, recognize that growers in some regions may find it difficult to immediately or completely abandon chemical applications. Encourage all growers to follow a low-spray or integrated pest management (IPM) program in their orchards, and to experiment with new and innovative cultural techniques that in time may eliminate the need for even these limited chemical applications.

- Encourage orchardists at all levels to learn the once commonplace skill of fruit tree grafting and to establish on-site nurseries for the propagation of their own trees as an economic benefit, for the maintenance and dissemination of known varieties, and for the general enhancement of orchard-keeping.

- Work with growers and historians in your community to nominate your local heirloom apples for boarding onto the Slow Food Ark of Taste. The proliferation of nurseries offering Ark apple varieties as trees or cuttings for sale will accelerate the volume production of fruit for the marketplace. More information about the Ark of Taste can be found at: http://www.slowfoodusa.org/index.php/programs/details/ark_of_taste/

Fortunately, the economic prospects for heirloom apples are, in many ways, better than they have been in over a century. For one thing, the rapid growth of cider, apple wine and brandy micro-enterprises is making room for distinctive, tannin-rich, bitter-sweet and bitter-sharp flavors for the first time in decades. Hard cider-making guides written by Ben Watson and Annie Proulx have encouraged greater experimentation with heirloom apple blends, and discouraged use of commoditized apple juice concentrate. Once hard cider was commercially reintroduced to America in the early 1990s, there has been astonishing growth in artisanal cideries, their supporting orchards, and in consumer demand. In 1987, fewer than 120,000 cases of hard cider were consumed in the U.S., but a decade later, hard cider consumption had risen twenty-fold, to more than 2.7 million cases sold. By 2001, more than 4.6 million cases were sold, and the next year, the 5 million mark was passed. In 2007, sales of hard cider sustained a 200 percent year over year growth, and many new cideries have appeared on the East and West Coasts and in the Upper Great Lakes.

In addition to a half dozen nationally-distributed brands of hard cider, regional, local, organic and exclusively heirloom-oriented cideries have proliferated. The Cider Days festival in north-central Massachusetts is but one of several events that brings together the many cider-makers of the U.S. and Canada to promote the diversity of culinary uses of heirloom apples. While hard ciders are now following the paths blazed by artisanal beers and micro-distilled whiskies and vodkas, there are also more modest markets opening up for apple wine, spiced sweet ciders, and carbonated apple beverages.

These are not the only trends favoring a renaissance for heirloom apples in many regions of North America. Interest in organic, artisanal, hand-crafted and place-based heritage foods has never been higher. Sales of organic fruits, for example, have been growing by an estimated 12 percent per year! Heirloom apple growers can build on these interests. Chefs are willing to help them match the right apple with a specific use for which it is unsurpassed. For years, orchard-keepers of diverse apples just didn't get much respect, but perhaps their time has come again.

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For More Information

Gary Paul Nabhan – www.garynabhan.com
Native Seeds/SEARCH – www.nativeseeds.org
Slow Food USA – www.slowfoodusa.org

Final version of this publication will include photo credits and additional contact information.

We appreciate all help to further edit and expand this document. Send feedback and comments to Gary Nabhan - gpnabhan@email.arizona.edu

Appendix 1. Regional Regis-Tree Nomination Form

~ To Honor Our Heritage of Useful Perennial Plants ~

Name of Site/Feature: _____

Date Submitted: _____

Photo submitted? _____ Map Submitted? _____ Articles Attached? _____

Perennial Species Present: _____

Nominator Name: _____ Phone: _____

Address: _____

City/State/Zip: _____

Visual Description of Nominated Heirloom(s)): _____

_____

_____

_____

_____

Location of Heirloom (include map & GISed UTMs): _____

_____

Ownership of Land where Heirloom is Located:_____

_____

Describe how the Plant(s) have been (or could be) utilized: _____

_____

_____

_____

List Estimated Age of the Plant/Orchard:_____

Are there any oral or written histories that include mention of this Heirloom? *If yes, please include or describe them on a separate sheet attached to this form.* _____

Is there currently public access to the Heirloom? If no, would the landowner be willing to provide for public access?

_____

Describe the access or lack of access: _____

_____

_____

Would the owner be willing to share propagation materials with others? _____

List the reasons your nomination should be included in the Southwest Regis-Tree of Useful Perennials and Historic Orchards: _____

_____

_____

_____

_____

Return form to: [contact information for local coordinator or coordinating body]