EPA

United States
Environmental Protection
Agency

Proceedings of the Aging Americans: Impacts on Ecology and Environmental Quality Workshop

Photos: U.S. Administration on Aging

EPA/600/R-05/028
August 2004

Proceedings of the Aging Americans: Impacts on Ecology and Environmental Quality Workshop

Edited by

Patricia Bradley
U.S. Environmental Protection Agency

Eric Walbeck
Jennifer Ghiloni
Department of Commerce Interagency Agreement # DW 13939208-01
Perot Systems Government Services (PSGS)

August 10-12, 2004
Research Triangle Park, North Carolina

U.S. Environmental Protection Agency
Office of Research and Development
National Health and Environmental Effects Research Laboratory
Atlantic Ecology Division
Narragansett, Rhode Island 02882

Notice

The workshop was funded by EPA/ORD/NHEERL. These Proceedings have been subjected to EPA peer-review and approved for publication but have not been subjected to agency-level review. The views expressed in these Proceedings do not necessarily reflect the views of the Agency. Mention of trade names, products, or services does not constitute endorsement or recommendation for use. This is NHEERL contribution number AED-04-151.

The appropriate citation for this report is:

Bradley, P., E.Walbeck, and J. Ghiloni. 2005. Proceedings – Aging Americans: Impacts on Ecology and Environmental Quality Workshop. U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Atlantic Ecology Division, Narragansett, RI. EPA/600/R-05/028.

Words and phrases in Glossary are bolded the first time they appear in the text.

Abstract

The U.S. is undergoing a dramatic demographic transformation toward older adults, spearheaded by the aging Baby Boomers, but projected to last beyond the Boomer generation. There has been little discussion in the environmental community, however, about the impact of the aging society in relation to natural resource utilization and environmental quality.

In August 2004, EPA held a workshop on (1) the change in aging **demographics** over time, (2) key issues (i.e., socio-economic, geographic) affecting demographic projections, (3) the potential impacts of an aging population on natural resources and environmental quality and (4) the research needed to ensure both the desired amenities for this aging population and the protection of natural resources.

A diverse group of individuals, including human **demographers**, physicians and health officials, **ecologists**, risk assessors, **private sector** developers, consultants, and representatives from tribes and NGOs were invited to this workshop in August 2004 to discuss potential environmental impacts from an aging **population** and possible research needed to assess these environmental impacts. This workshop report is the result of these interactions.

The report is also intended to serve as a foundation for a research plan that embodies the excitement and **holistic** approach generated at the workshop to evaluate the effects of an aging population on the environment.

Key Words: Aging, Baby Boomers, Demographics, Natural Resources, Built Environment, Carrying Capacity, Ecological Risk Assessment, Gerontology, Human Ecology, Socioeconomics, Migration, Ecological Footprint.

Contents

Acknowledgements

Planning Committee:

USEPA ORD/NHEERL/MAIA
Patricia Bradley (Chair)
USEPA ORD/NCER
Diana Bauer
Bernice L. Smith
USEPA ORD/NHEERL
Steven Hedtke
Wayne Munns
Jennifer Orme-Zavaleta
USEPA ORD/NRMRL
Heriberto Cabezas
FTN Associates
Kent Thornton
University of Utah
Scott Wright

Peer Reviewers

AARP
Andrew Kochera
Florida Dept of Elder Affairs
Lisa Meyer
Revitalization Institute
Storm Cunningham
USEPA ORD
Barbara Levinson

Editors

PSGS
Jennifer Ghiloni
Eric Walbeck
USEPA ORD/NHEERL/MAIA
Patricia Bradley

Authors

East Carolina University
Don Bradley
FTN Associates
Kent Thornton
Global Footprint Network
Steven Goldfinger
Dan Moran
Mathis Wackernagel
Mike Wallace
n4a
Sandy Markwood
NIH, NIEHS
Alan Dearry
NY State Office for the Aging
Neil Lane
Jennifer Rosenbaum
PSGS
Eric Walbeck
Mary Holland
Pueblo of Acoma
Stanley Paytiamo
Pulte Homes
David Schreiner
University of Utah
Scott Wright
USEPA ORD/NHEERL/MAIA
Patricia Bradley
USEPA ORD/NHEERL
Wayne Munns
USEPA Region 6
Jonathan Hook
Wake Forest University
Charles Longino

Workshop Support

PSGS
Layout/Design: Juanita Soto-Smith
Registration/Logistics: Eric Walbeck
Supplies, Notes: Jennifer Ghiloni
USEPA, RTP
Conference Rooms: Treva Bunch

Facilitators

PSGS
Mary Holland (Groups A, 1)
FTN Associates
Kent Thornton (Groups B, 2)
USEPA ORD/NHEERL
Wayne Munns (Groups C, 3)

Footprint Video

USEPA ORD/NHEERL (Funding)
Jennifer Orme-Zavaleta
Global Footprint Network (Production)
Mike Wallace
Mathis Wackernagel

We would also like to thank the following for their support and leadership:

USEPA, Office of Aging
Kathy Sykes
USEPA ORD/NHEERL
Steve Hedtke
Hal Zenick
Hugh Tilson

Attendees

CDC
Andrea Neiman
E. Carolina University
Don Bradley
E. Tennessee State University
Tony DeLucia
FTN Associates
Kent Thornton
Global Footprint Network
Mike Wallace
n4a
Sandy Markwood
NC State Cooperative Extension
Lucille Bearon
Sarah Kirby
Sandy Wiggins
NIH, NIEHS
Alan Dearry
NY State Office for the Aging
Neal Lane
Jennifer Rosenbaum
PSGS
Jennifer Ghiloni
Mary Holland
Eric Walbeck
Pueblo of Acoma
Stanley Paytiamo
Pulte Homes
David Schreiner
University of Tennessee
Bruce Tonn
University of Utah
Scott Wright
USEPA OA
Kathy Sykes
USEPA OAQPS
Chitra Kumar
Linda Rimer
Susan Stone
USEPA OPEI
Carlton Eley
USEPA ORD/NCEA
Marsha Marsh
USEPA ORD/NCER
Diana Bauer
Bernice Smith
USEPA ORD/NERL
Megan Mehaffey
Kent Thomas
USEPA ORD/NHEERL
Andrew Geller
Steven Hedtke
Laura Jackson
Hillel Koren
Wayne Munns
John Paul
USEPA ORD/NHEERL/MAIA
Patricia Bradley
USEPA Region 6
Jonathan Hook
Wake Forest University
Charles Longino

Welcome

An Aging Population: Human Health and Environmental Effects

The world's population is aging. In 2000, for the first time, over half the U.S. population was over 35 years old. By 2030, over 20% of the population will be 65 years or older. In 2009, the first of the Baby Boomer generation will be reaching 65 years old. In anticipation of this population trend, the U.S. EPA's Office of the Administrator and Office of Research and Development launched an Aging Initiative in October, 2002 to develop research, health promotion, and senior involvement programs focused on the environment in an aging society.

As the American demographic shifts toward an aging society, how will our resource needs change? Will retirement patterns change; what are the environmental stressors associated with retirement in-place versus relocation to communities at the far edges of existing communities, expanding into rural areas and otherwise pristine areas? In August, 2004, a diverse group of individuals, including human demographers, physicians and health officials, tribal leaders, ecologists, risk assessors, private sector developers, nonprofit organizations, and consultants met to discuss potential environmental impacts from an aging population and possible research needed to assess these environmental impacts. This workshop report is the result of these interactions.

The workshop generated highly informative presentations and, because of the energy and enthusiasm of its participants, provided a unique forum for extended discussions among participants representing different stakeholders. Perhaps it was because many of the participants are part of the aging population, but we think it was because of the excitement of moving toward a holistic approach to environmental risk assessment and management that integrates social, cultural, and economic considerations with human and ecological health. We plan to use these workshop findings in conjunction with other information to prepare a research plan to evaluate the effects of an aging population on the environment that embodies such a holistic approach.

Harold Zenick, PhD
Associate Director for Health

Steven Hedtke, PhD
Acting Associate Director for Ecology

National Health and Environmental Effects Research Laboratory

Constructing a Research Agenda on Aging Americans and their Impact on Ecology and Environmental Quality

Patricia Bradley[1], Kent Thornton[2], Steven Hedtke[1], Wayne Munns[1], Scott Wright[3], Jennifer Orme-Zaveleta[1], Diana Bauer[1], and Bernice Smith[1]

[1]U.S. Environmental Protection Agency, [2]FTN Associates, and [3]University of Utah

The U.S. is undergoing a dramatic demographic transformation. In 2000, for the first time in U.S. history, more than half of the population (50.5%) was at least 35 years old, and 12.5% were 65 years or older. By mid-century, our population over 65 will have more than doubled. Since 1900, the older population has doubled every 30 years (Longino, this publication).

The factors contributing to this increase are the current reduction in birth rate, a 20-year increase in the **average life span**, and the aging of the **Baby Boomers**. Baby Boomers (Americans born between 1946 and 1964) represent the largest single sustained growth of the population in the history of the U.S. (AARP, 2004). Considerable attention has been paid to the Boomer **cohort** by demographers, **politicians**, **marketers**, and **social scientists** relative to the pervasive economic, social, and political effects of an aging society. For example, the Centers for Disease Control have identified that the growing number of older adults will dramatically increase the demands on the public health system, medical and social services, and pension systems (CDC, 2003).

There has, however, been little discussion about the impact of the aging society in relation to natural resources and environmental quality, or to the reciprocal impact of environmental conditions on the well-being of aging individuals, and collectively, an aging society (Wright and Lund, 2000).

The aging of the U.S. population represents a long-term change in the U.S. demographic profile.

In recognition of this fundamental change, the U.S. Environmental Protection Agency (EPA) is developing A National Agenda on Aging Americans and the Environment. At the invitation of EPA's Office of Research and Development (**ORD**), scientists, public health officials and other professionals in the fields of aging, demographics, health and **ecology** met on August 10-12, 2004 to share their expertise on the potential impacts a growing legion of older Americans may have on natural resources and environmental quality. The Aging Americans: Impacts on Ecology and Environmental Quality Workshop complements a workshop conducted by the National Academy of Sciences (NAS)

in December of 2002, that identified a number of research priorities for examining **human health effects** focused around types of environmental **contaminants** and **exposure routes** (e.g., **particulate matter** and air quality, water-borne infections, altered **pharmacokinetics**, and **neurotoxicity**) (USEPA 2003).

The Aging Americans: Impacts on Ecology and Environmental Quality Workshop provided a forum for information exchange on topics that included (1) the change in aging demographics over time, (2) key issues (i.e., socio-economic, geographic) affecting demographic **projections**, (3) the potential impacts of an aging population on natural resources and environmental quality, and (4) the research needed to ensure both the desired **amenities** for this aging population and the protection of natural resources.

Ecological research at EPA is structured around the **ecological risk assessment** process, which evaluates the likelihood that adverse **ecological effects** may occur as a result of **exposure** to one or more **stressors** (USEPA, 1992). The process is used to systematically evaluate and organize data, information, assumptions, and uncertainties in order to help understand and predict the relationships between stressors and ecological effects in a way that is useful for environmental decision-making (USEPA, 1998). A simplified version of the **risk assessment** framework (stressors→ exposure→ecological effects) was used to organize the workshop.

Simplified Risk Assessment Framework

Stressors →Exposure →Ecological Effects

The speakers represented various sectors—academia, federal, state and tribal organizations, non-governmental organizations, and private industry—and had a wide variety of backgrounds, including ecology, **public health**, planning, engineering, **community** design and construction, and **social sciences**. Their presentations and the subsequent **breakout group** discussions captured many different perspectives and is reflective of the multi-disciplinary approach that is needed to effectively understand and respond to the aging American population.

This chapter will provide an introduction to subsequent chapters and synthesize the state of the knowledge, as communicated during the workshop, of the potential effects of the aging population on the environment.

Demographic and Lifestyle Patterns of an Aging Population

Background information on aging Americans contributes towards better understanding of the issues. We need to better understand aging Americans. Key questions include:

- Who fits into the category of an aging American?
- How many aging Americans are there?
- What are the demographic and lifestyle patterns of aging Americans?
- Are demographic and lifestyle patterns of aging Americans distinct from the patterns of other age groups?
- How are trends expected to differ regionally?
- Do aging Americans share a common attitude about environmental issues?

Sandy Markwood, CEO of National Association of Area Agencies on Aging (**n4a**), gave the **plenary** presentation. In 2000, 12.4% of the population was aged 65 or older. By 2030, that figure will rise to 30% of the population. Currently, only 16% of older Americans are minorities, but the aging of the Baby Boomers and the growing number of older immigrants will increase that figure to 25% by 2030.

While conventional wisdom lumped the Boomers into one homogenous group, a 1998 **AARP** study revealed that Boomers were actually quite diverse—they have a wide range of socio-economic status, are much more ethnically and racially diverse than preceding generations, and have widely varying attitudes and beliefs (AARP, 1999). This diversity reflects the changing face of American society as a whole. Our research strategy, policy decisions, and educational programs must take this diversity into consideration.

The Aging population is diverse—socio-economically, ethnically, and racially, with widely varying attitudes and beliefs. This reflects the changing face of American society.

Charles Longino discussed traditional migration patterns of older Americans as they retire. Most aging Americans do not migrate to another geographic location, but rather choose to retire in place—close to family, friends, and social support networks. Eighty percent of older Americans own their own homes, and 89% want to remain in their current homes for as long as possible. However, there are increasing numbers of older adults who seek to improve their lifestyle by relocating to communities with **natural amenities** such as warmer climate and scenic beauty. Generally, they migrate from cities and suburbs by moving down the "**metropolitan hierarchy**," a pattern of moving from major metropolitan areas to smaller towns or cities (e.g., from New York City to Atlanta, or from Atlanta to Raleigh/Durham).

Older Americans tend to migrate down the "metropolitan hierarchy."

There is a breakpoint between younger senior citizens and the elderly—which occurs generally around age 75. About 26% of younger seniors have chronic health conditions. This increases to 50% by age 75, with a shift from being active to becoming frail. Scott Wright defines the two segments: the "**young-old**" who remain active and may perhaps relocate to retirement communities that are typically located in geographic areas with greater natural amenities (e.g., "gateway communities" near National/State Parks and Forests) and pastoral settings and cultural amenities (e.g., college towns), and less-active people choosing to (or with no option but to) remain ("**aging-in-place**") in their communities (the "**old-old**"). The young-old, in general, roughly corresponds to the 60-75-age bracket. The **old-old**, in general, corresponds to the 75 and older age bracket.

Over the past 50 years there has been increasing movement away from urban areas towards suburban areas. Census 2000 revealed that more than half the residents in the suburbs of major metropolitan areas are now age 35-and-older (Frey, 2003). Suburbs around sun-belt cities such as Las Vegas, Colorado Springs, Tucson and Austin are benefiting from the more affluent retirees, while northern suburbs in metros like Pittsburgh, Buffalo and Providence are

likely to face greater economic challenges in keeping up with demand for medical and social services (Frey, 2003).

As seniors age, some are forced to move due to deterioration of health or death of a spouse (Longino, 1995). Others move away from retirement communities back to their original communities or to a state where their adult children reside. This tendency is stronger for those who are widowed or over 75 (Liaw et al., 2002). City centers and **inner suburbs** make good destinations for older persons. The better off and healthy urban professional will tend to locate on the periphery, while the more disadvantaged elderly will move closer to city centers (Frey, 2000).

Seniors can be a significant economic force. More than 380,000 Americans move across state lines to retire every year. Retirement migration generates billions of dollars a year in sales of everything from real estate to health care. Florida alone derives a $3.5 billion income transfer from seniors moving into the state (Longino, this publication).

Aging Americans tend to have strong environmental values and have time to get involved in public policy and to volunteer in **environmental stewardship** and **restoration** activities (Tonn et al., 2001). Longer life spans allow people to experience the outcomes of their decisions about the environment.

The U.S. has a $1.6 trillion backlog in infrastructure restoration (ASCE, 2003). Historical patterns may not apply to Baby Boomers. Baby Boomers have catalyzed important sociological changes in the communities where they live—starting in the 1950s when they inflated the demand for schools, through the 1960s when they flooded colleges, to the 1970s and 1980s with first jobs, homes and stock market portfolios (Frey, 2003).

According to Dave Schreiner of Pulte Homes, there are currently two significant impacts on the home building market: immigrants who are now buying homes, and the graying population. Active senior adults are buying 12,000 homes per year in the U.S.; they have evolved socially, physically, and financially and are generally happy, optimistic, and have the time to enjoy themselves. Pulte Homes' Del Webb specializes in building **adult communities** with design features geared towards an active lifestyle. Many communities are designed around a golf course and include walking paths and **water features**. The aging process results in a number of physical changes, including reduced depth perception, strength and stamina. Residences and common spaces are designed with safety as a key consideration and **universal access** is incorporated throughout.

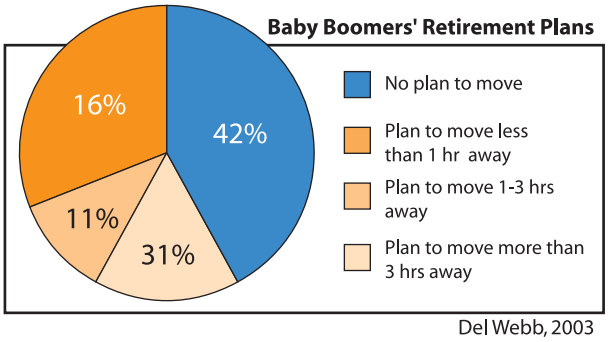


Figure 1. A 2003 survey by Del Webb revealed that 6 out of 10 Baby Boomers intend to relocate in retirement.

Seniors choose a new community based on a variety of factors. Del Webb found the top ranked factors to be low maintenance homes, aesthetic appeal, community security/safety, **recreational amenities**, and nearby supermarkets, restaurants, etc. (Del Webb, 2003). Another trend is that homes are increasing in size—by about 10% over the last 10 years. In addition, the number of second homes is increasing—typically in **environmentally sensitive areas** (Tonn et al., 2001).

Unlike younger adults who base their decisions on their income, seniors are generally living on fixed incomes, have a fixed portfolio of assets, including their home, and do not want maintenance costs to increase. Many new active adult communities are designed to provide efficient service delivery, with low operating costs.

Throughout their lives, many Baby Boomers have been physically active and as they age, they continue to want greater access to natural amenities for recreation and the health benefits of physical activity. Scott Wright presented that retiring Baby Boomers would seek high "quality of life" in geographic areas that have natural amenities and conditions that reflect a higher standard of environmental quality (e.g., less pollution, less congestion and **sprawl**). Southern coastal areas (Florida, North and South Carolina, Virginia, Texas, and California) and communities that border the western **public lands** (Arizona, Colorado, New Mexico, Nevada, and Utah) are havens for retirees seeking beautiful locations with high natural amenities (Wright et al., 2003).

Retiring Baby Boomers will seek high quality of life in geographic areas that have natural resources and higher environmental quality.

Environmental Stressors Resulting from these Patterns

Preparing for an aging society is closely linked to **Smart Growth**, **Sustainable Development**, and **Restorative Development**. The location, configuration and scale of homes and communities within a **watershed** changes risks to wildlife and **environmental sustainability**. Communities will need to consider the social and environmental amenities required by the aging society and how changes in the demand for these amenities will introduce new and additional environmental stressors or influence the temporal and spatial aspects of existing stressors. As the aging population grows, key questions include:

- How will the aging population impact demand for housing, health care, recreation and transportation?
- What stressors are associated with this demand?
- What infrastructure issues must communities address to prepare for dramatic increases in their aging populations?
- Are there any stressors unique to the aging population?

Age-related patterns of **consumption** may change substantially as Baby Boomers enter their retirement years. Specific cohorts may have unique patterns of consumption (Pebley 1998). Differences in the lifestyles of the aging population are likely to have a regional component, with areas of the country experiencing substantially different pressures on environmental resources with respect to the requirements of young-old and old-old segments of an aging population.

New communities developed to accommodate the choices of the young-old segment, for example, may expand sprawl into rural areas and areas with sensitive **ecosystems**, such as forest, wilderness and coastal areas (natural amenities). Over 50% of the U.S. population lives by the coast today and by 2025 this figure is expected to reach 75% (Culliton, 1998).

Specific cohorts of the aging population will have differences in lifestyles and these may differ regionally.

These retirees also bring with them the expectation of readily available **social amenities** such as health care, shopping and recreation along with the need for transportation, safe drinking water, **wastewater treatment** and **solid waste** disposal (**infrastructure**). Meeting these requirements adds stress to surrounding environmental systems. An alternative to this **scenario** may be to redevelop center city areas with retirement homes and communities, thus taking advantage of existing social amenities and not expanding into previously undeveloped land. However, this may also require updating, expanding, or replacing/renewing the infrastructure. Workshop attendees recommended that development in regions offering these natural amenities should be done with an eye toward sustainability.

The old-old, on the other hand, tend to age in place. As their health degrades, their health care needs will change (increased use of **pharmaceuticals** and personal care products such as adult diapers or hearing aides), increasing demands on the infrastructure of existing communities as well as the nature of stress on the environment.

A converging trend that is impacting where aging populations will live is the aging of the Nation's buildings and infrastructure. Failure to re-use buildings and/or renovate infrastructure (e.g., roads, bridges, transit, schools, drinking water systems, **wastewater**, and waste disposal) greatly decreases the ability of older urban and suburban areas to support seniors.

It appears that aging Americans will introduce few new or unique stressors, but may be the largest source of some stressors.

One such stressor is mercury from **amalgam fillings**. Each year in the U.S. an estimated 40 tons of mercury are used to prepare mercury-amalgam dental restorations. The average person with amalgam fillings excretes via urine or feces over 100 **micrograms** per day of mercury (Bjorkman et al., 1997; Ekstrand et al., 1998). After a person dies, the mercury that has accumulated in the body is released to the **environment** via either cremation or burial.

Aging Americans may tend to use pharmaceuticals at a rate higher than that of the average population. Recent studies suggest that very low quantities (e.g., parts per trillion) of some pharmaceuticals, such as antibiotics, **statin drugs**, etc. are passing through wastewater treatment plants and entering aquatic systems.

Other stressors that may be associated with aging Americans, particularly those relocating to active retirement communities and areas with natural amenities include increased water usage for homes and golf courses; additional **septic systems**; increased **pollutant transport** from increased **impervious surfaces**; increased **habitat fragmentation/loss** due to trails, universal access and development; and

increased emissions from generating increased energy (heating and cooling).

Ecological and Environmental Effects

Ecological effects are changes in natural resource and environmental condition resulting from exposure to stressors generated or modified by humans. This workshop focused particularly on those effects related to an aging American population. Key questions include:

- How do we balance the social and economic needs of older Americans with the sustainability of natural resources?
- Are the ecological and environmental effects unique to the aging population?
- Do the ecological and environmental effects vary for different segments of the aging population?

Many environmental effects are associated with the growing American population and its increased demands for resources and land-use. Alan Dearry, National Institutes of Environment Health Sciences (NIEHS) provided an overview of the **built environment** and public health. The built environment is defined as the physical structures engineered and built by people, including homes, workplaces, schools, parks, and transit systems. The built environment has both direct and indirect impacts on our environment and on public health.

Land development impacts ecological resources. Impacts include **habitat** loss and fragmentation, and degradation of water resources and water quality. Building on undeveloped land destroys and fragments habitat, displacing or eliminating wildlife communities. Increasing the amount of impervious surfaces (e.g., roads, buildings, parking lots) leads to the degradation of water quality by increasing **runoff** volume, altering regular stream flow and watershed **hydrology**, reducing **groundwater recharge**, and increasing **erosion**, stream **sedimentation**, and water acidity (USEPA, 2001). Unsustainable development may also result in **freshwater scarcity** (a major issue in the western U.S. and an emerging issue elsewhere).

Patterns of development greatly affect the level of direct environmental impacts associated with urbanization. Smart growth employs environmentally sensitive development practices, including **compact development**, reducing impervious surfaces, improving water retention, safeguarding environmentally sensitive areas, designing efficient transit networks, and enhancing the environment for non-motorized travel such as walking and bicycling.

Communities that accommodate more **infill** and **redevelopment** can greatly reduce the environmental impacts of development. One study estimates that every acre of **Brownfield** developed avoids 4.5 acres of **Greenfield** development. Infill can reduce overall impervious surface in a watershed, cut trip times and distances, provide more transportation options, help protect human health and even provide capital to upgrade infrastructure or clean up contamination (USEPA, 2004).

A transportation system that supports smart growth is pedestrian-friendly, increases accessibility, has well-connected gridded streets, provides transit opportunities, maximizes use of existing facilities, and is coordinated with the surrounding development. Less environmentally friendly transportation projects may disrupt animal habitat, damage ecosystems, degrade **wetlands**

and **source waters**, and increase storm water runoff. These transportation projects may lead to increases in emissions (resulting from increases in travel), growth in outlying areas, and impact human health (USEPA, 2004).

Sandy Markwood pointed out that safer roads, sidewalks and street crossings benefit everyone—not only seniors. Communities can be designed to be elder-friendly and promote smart growth. **Comprehensive master planning** and **zoning** needs to be changed to promote health and wellness as part of community design.

Elder-friendly designs and smart growth benefit everyone—not just seniors.

Land is static or decreasing. Sustainability practices (e.g., land-use planning, implementation of **Best Management Practices,** and watershed restoration activities) should begin in existing cities and urban areas to provide the quality of life amenities that people seek elsewhere (Wright, 2004). Restorative development involves replacing, renovating and/or reusing the built environment, and the restoration of exhausted, contaminated, and damaged natural resources (Cunningham, 2004).

The concept of ecological **carrying capacity** is important in planning for sustainability. Carrying capacity is the maximum human use load (capacity) that can be sustained (carried) by an environment without reducing its future ability to support a similar load. Carrying capacity will vary by region due to differences in resource availability and ecosystem response.

The concept of carrying capacity is important in understanding the impact an aging population may have on the environment.

Carrying capacity is of particular importance because specific population groups, such as the Young-Old may be exacting a greater demand on ecological resources because of both increasing population in specific regions and **per capita** consumption rates. Older persons who are healthy and active may spend more of their time getting exercise, hiking, visiting parks, playing golf and otherwise engaging in recreational activities. Ironically, as people move into more fragile ecosystems and natural areas, the natural features and other quality of life features that may have attracted them are lost or diminished (Wright, 2004).

There appear to be few ecological effects associated with stressors unique to the aging population. Aging Americans are using different types of pharmaceuticals, in different combinations, than those used by the population at large. These pharmaceuticals may enter the aquatic waste stream, and the effects on aquatic **biota** are currently unknown, but may include disruption or other **chronic effects**. The type and amounts of the pharmaceuticals being used by aging Americans need to be quantified.

Cremation may lead to significant mercury pollution from old style amalgam fillings in seniors. Mercury released into the environment can get into water systems, and is then transformed into a more toxic substance called **methylmercury**. Methylmercury is more easily absorbed by bacteria and small plants, which are eaten by small fish and then moves

up the **food chain**. By the time fish-eating animals (e.g., eagles, osprey, **loons**, raccoons, turtles, mink and otters) eat the larger fish, the **concentration** of methylmercury in the fish can be up to a million times higher than the surrounding water. Effects include:

- **Growth inhibition** and high **mortality** of **embryos** and **larvae** of **rainbow trout**;
- Impaired kidney function and endocrine disruption in **yellow perch** and **northern pike**;
- 50% fewer young in loons; and
- The possibility of Mercury as a contributing factor in the decline of the **Florida panther**.

Despite the apparent lack of unique stressors, the increased use of natural resources and the generation of new waste streams by the aging population may exceed the resiliency and recovery capabilities of ecological systems. Identifying the **thresholds** in stressor levels or ecological effects associated with the aging population is essential to the concept of carrying capacity.

Case Studies and the Ecological Footprint Concept

Case studies were used to present a holistic approach to aging and the environment. Neal Lane presented a unique New York State-wide effort, which began in 1998 to address the impact of the aging of the Baby Boomer cohort on issues such as housing, **long-term care**, nutrition, health, care giving, transportation, and retirement. Project 2015 was broadened in 2002, to use the idea of "broad population change" as the basis for involving all 36 state agencies in preparing for the State's future.

Governor Pataki charged the 36 participating agencies to construct, over a nine-month period, briefs that:

- assessed the impact of demographic change on their mission, products, services, constituent group, and daily operations;
- identified and prioritized the major issues that would arise for them because of these demographic changes; and
- specified action steps or strategies they would implement over the next five years to address their top three impact areas.

The briefs were organized into a unified policy document, "*Project 2015: State Agencies Prepare for the Impact of an Aging New York—White Paper for Discussion*" (NYSOFA, 2002). This document presents a practical framework for New York to prepare for the future. New York's new mode of multi-group planning around a unifying common issue established a common bond among the participating groups. It had groups working toward a common goal, encouraged sharing and collaborating among groups, produced ideas and strategies that would make the most out of the opportunities presented by the changing demographics, and promoted creativity in identifying effective ways of meeting the challenges inherent in changing demographics. New York's planning initiative can be replicated or adapted by other governments or communities that wish to accomplish these same goals.

New York's Project 2015 is a model for other states and communities.

Jonathan Hook, EPA - Region 6, spoke about Native Americans and their broad, holistic approach to the environment. They employ strategies that combine traditional Native practices with contemporary technologies. He introduced Stanley Paytiamo, who presented the second **case study** on the **sovereign Indian Nation** of the **Pueblo** of Acoma. The Pueblo of Acoma is located approximately 55 miles west of Albuquerque, New Mexico and has a population of 4,754. The Acoma people have lived in harmony with the natural environment for more than 1000 years.

Acoma culture calls for an orderly life within the natural environment. The Acoma people believe in preserving the environment so that it will continue to provide natural resources necessary for their survival. Clean water and air, good crops, and peace of body and spirit are interdependent.

The Pueblo of Acoma is an **environmentally disadvantaged** community. It has suffered, and continues to suffer, the negative environmental impacts of nearby **uranium** mining and other industrial activities that have depleted and contaminated water supplies; of faulty natural gas pipelines traversing the **reservation** to serve outside sources; and of sewage **effluent** and overflow from ineffective wastewater treatment facilities in neighboring municipalities. There are few resources to combat these problems and to correct the reservation's own waste disposal practices.

The Pueblo of Acoma has developed a 26-year Practical Vision to provide for a safer, healthier environment; preserve Acoma culture and traditional lifestyles; promote economic self-sufficiency through traditional agricultural land-use and tourism; foster greater community, civic and political awareness; and provide greater employment opportunities through education.

We must protect the earth for seven generations to come.

The Pueblo of Acoma believe we must protect the earth for seven generations to come. This philosophy makes sustainability an intergenerational issue.

A tool that may provide insight about the relationship between sustainability issues and an aging society is the **ecological footprint**. Ecological footprint calculations are based on two simple facts: we can measure most of the resources we consume and many of the wastes we generate; and these measurements can be converted to corresponding areas of productive land or sea (Wackernagel, this publication).

The average American uses 24 acres of land annually. The U.S. has the dubious distinction of having both the largest ecological footprint (6.9 billion acres) and the largest **ecological deficit** (3.1 billion acres). Americans consume 84 percent more productive land than we actually have (Venetoulis et al., 2004).

The ecological footprint is a tool that can help assess the relationship between sustainability issues and an aging society.

Currently, humanity's combined footprint is more than the Earth's capacity. We are using about a third more than nature can regenerate each year. This is undermining nature's systems, threatening its ability to sustain us. The ecological footprint shows us how much there is and how much we use, so

that we can make personal and social choices to become more sustainable. The challenge of sustainability is to find ways to create fulfilling lives while reducing our impact on the Earth. Europeans and the Japanese, with arguably better quality of life, inspire hope and can serve as **models** because they have footprints that are half the size of Americans. Dramatically more efficient use of resources and cyclical systems are necessary. It must also be realized that quality of life does not depend on large resource use (Venetoulis et al., 2004).

Quality of Life does not depend on large resource use.

Moving Towards a Research Program

The U.S. is undergoing a demographic transformation towards older adults, spearheaded by the aging Baby Boomers, but projected to last beyond the Boomer generation. While we can reasonably estimate the growth of the aging population, we are less certain about how this rapid demographic change will affect natural resource utilization, **land-use** planning, and environmental quality.

EPA is developing a research strategy based on input from this workshop. This proceedings is the starting point for a framework that links diverse lifestyles, cultures, and health status in the aging population to ecological stressors. Research will be structured along a simplified ecological risk assessment paradigm. This comprises sources of environmental stress (projected demographic and lifestyle patterns of an aging population), resulting exposure regimes (temporal and spatial changes in land-use patterns and the environmental stressors resulting from these patterns), and potential ecological effects. The strategy will also address issues of **spatial** and **temporal scale**.

Workshop participants began to develop a framework showing the linkages that relate lifestyle issues to stressors associated with an aging population. For each lifestyle issue, related stressors and potential ecological effects were identified. This framework also supported inclusion of existing information and the research needed specifically to fill gaps in our understanding. The matrix will be further expanded to address issues of scale (both spatial and temporal), as well as existing models and other pertinent information. Further dialogue is required to flesh out the framework more completely and to develop the research strategy. Collaborative relationships and partnerships among local, state and federal agencies, the private sector, **non-government organizations** (NGOs), and **stakeholders** are central to the success of the effort, and EPA will actively pursue these new relationships and partnerships.

We need to consider human and ecological health in an integrated manner.

An underlying assumption for this strategy includes the necessity to consider human and ecological health in an integrated manner. Research will therefore be interdisciplinary, including **natural scientists**, ecologists, and **engineers**, as well as **sociologists**, **economists**, **gerontologists**, demographers, **behaviorists**, **planners**, **social marketers**, and other disciplines that interact with aging populations. Collaborative relationships and partnerships among local, state and federal agencies, the private sector, NGOs, and stakeholders will be central to the success of the effort.

Research will be interdisciplinary and collaborative.

Aging Americans are very diverse with respect to lifestyles, income, cultural perspectives, and health status and **susceptibility**. Although we can continue to treat this richness as an "**uncertainty**," our understanding of the ecological effects of the aging population on natural resources and environmental quality will ultimately suffer from lack of consideration of the underlying diversity of aging Americans. Social science research is needed to understand the **mental models** and **social mindscapes** of various cohorts.

Another assumption is that impacts from the aging society are expected to vary regionally. Research is needed to characterize this variability to capture the consumption, waste, transportation, medical needs, and lifestyle patterns by cohort and geographic area and to **overlay** aging population demographic data on an eco-regional **base layer**. Research is also needed to identify built-community planning practices that can be applied to minimize environmental stressors and enhance health promotion and the quality of life for different segments of the aging population.

Impacts from the aging society are expected to vary regionally.

Limitations of this work include our understanding that ecological effects of the aging population may not be completely separable from those associated with increases in the size of the general population. Given the rapid demographic change, altered patterns of resource use may present novel challenges with respect to our ability to forecast those effects. Natural resource use and the waste streams generated by the aging population may overwhelm the ability of ecological systems to compensate for or assimilate changes in stressor levels. Research should be conducted to identify "**tipping points**"—thresholds in stressor levels or ecological effects beyond which the ecological systems change state—and the possibility that release rates, magnitudes or combinations of aging-related stressors may exceed these thresholds.

We must identify "tipping points" in stressor levels or ecological effects.

EPA will also investigate how tools such as ecological footprints and emerging fields such as **human ecology** could be applied to assess the impacts of aging Americans on ecology and environmental quality.

The Case Study or **Demonstration Project** approach will be used to investigate the effects of an aging population on the environment. The process used in each Case Study or Demonstration Project will be thoroughly documented so the process can be transferred to other areas or regions with similar issues. **Alternative futures** analyses and **future vulnerability analysis** will accompany the assessment of current vulnerabilities. EPA will continue this interactive dialogue addressing all parts of the risk assessment/**risk management** process, involving a broad range of **partners**, collaborators, and stakeholders.

The Case Study or Demonstration approach will be used to investigate the effects of an aging population on the environment.

Impact and Outcomes

Research on the effect of the growing aging population on the environment will allow the Agency to provide sound technical information to local and community-based

organizations to make informed decisions, maximize opportunities presented by an aging population, and minimize the impact of the growing aging population on the environment. ORD will partner with the **EPA Regional Offices** to facilitate collaboration with regionally specific stakeholders to develop and initiate the implementation of appropriate policies and management actions that emerge from this research. This will enhance the ability of city, county, and regional planners to meet the needs of the growing older adult population, while at the same time, enhance the quality of the environment for the current and **future generations** and contribute to "Lifelong Quality of Life."

References:

American Society of Civil Engineers. 2003. *2003 Progress Report – A Report Card for America's Infrastructure*. 2003. (January 14, 2005: *http://www.asce.org/reportcard/index.cfm?reaction=full&page=6*).

Bjorkman, L., G. Sandborgh-Englund and J. Ekstrand. 1997. Mercury in Saliva and Feces after Removal of Amalgam Fillings. *Toxicology and Applied Pharmacology* 144(1): 156-62.

Centers for Disease Control and Prevention, 2003. Trends in Aging – United States and Worldwide. *Morbidity Mortality Weekly Report* 52(06): 101-106

Culliton, T.J. 1998. Population: Distribution, Density and Growth [on-line]. Silver Spring, MD: National Oceanic and Atmospheric Administration. December 8, 1999. Available from the National Oceanic and Atmospheric Administration State of the Ocean Report: *http://state_of_coast.noaa.gov/bulletins/html/pop_01/pop.html.*

Cunningham, S. 2004. Restorative Development: How does it relate to Sustainable Development, Smart Growth, Green Building, and New Urbanism? (June 15, 2004: *http://www.revitalizationinstitute.org/Smart_Growth_&_SD.htm*).

Del Webb. 2003. Baby Boomer Report – Annual Opinion Survey. 2003. (May 19, 2004: *http://www.pulte.com/PressRoom/BabyBoomer2003Summary.pdf*).

Ekstrand, J., L. Bjorkman, C. Edlund, and G. Sandborgh-Englund. 1998. Toxicological Aspects on the Release and Systemic Uptake of Mercury from Dental Amalgam. *European Journal of Oral Sciences* 106(2 Pt 2): 678-86

Frey, W. 2000. The New Urban Demographics – Race, Space & Boomer Aging. *Brookings Review* 18(3): 20-23.

Frey, W. 2003. *Boomers and Seniors in the Suburbs: Aging Patterns in Census 2000.* Washington, DC: The Brookings Institution, Center on Urban and Metropolitan Policy, Living Cities Census Series.

Liaw, K., W. Frey and J. Lin. 2002. Location of Adult Children as an Attraction for Black and White Elderly Primary Migrants in the United States. *Environment and Planning* 34: 191-216.

Longino, C. 1995. *Retirement Migration in America.* Houston, TX: Vacation Publications, Inc.

New York State Office for the Aging. 2002. Project 2015: State Agencies Prepare for the Impact of an Aging New York—White Paper for Discussion. 2002. (May 18, 2004: *http://aging.state.ny.us/explore/project2015/report02/index.htm*).

Pebley, A. 1998. Demography and the Environment. *Demography* 35: 377-389.

Roper Starch Worldwide, Inc. 1999. "Baby boomers envision their retirement: an AARP segmentation analysis." (February 13, 2004: *http://research.aarp.org/econ/boomer_seg_prn.html*).

Roper Starch Worldwide, Inc. 2004. "Baby boomers envision their retirement II: survey of baby boomers' expectations for retirement." (February 13, 2004: *http://research.aarp.org/econ/boomers_envision.html*).

Tonn, B., G. Waidley, and C. Petrich. 2001. Policy and Practice – The Aging U.S. Population and Environmental Policy. *Journal of Environmental Planning and Management* 44(6): 851-876.

U.S. Environmental Protection Agency. 1992. *Framework for Ecological Risk Assessment*, EPA/630/R-92/001.Washington DC: U.S. Environmental Protection, Agency Risk Assessment Forum.

U.S. Environmental Protection Agency. 1998. *Guidelines for Ecological Risk Assessment*, EPA/630/R-95/002F. Washington, DC: U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment.

U.S. Environmental Protection Agency. 2001. *Our Built and Natural Environments*, EPA 231-R-01-02, Washington, DC: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency. 2004. EPA Smart Growth Strategy. 2004. (February 14, 2005: *http://www.epa.gov/smartgrowth/pdf/EPA%20Smart%20Growth%20Strategy.pdf*).

Venetoulis, J., D. Chazan and C. Gaudet. 2004. Ecological Footprint of Nations 2004. Redefining Progress, Oakland CA. March 2004. (February 13, 2005: *http://www.rprogress.org/newpubs/2004/footprintnations2004.pdf*).

Wright, S. and D. Lund. 2000. Gray and Green?: Stewardship and Sustainability in an Aging Society. *Journal of Aging Studies* 14: 229-249.

Wright, S., M. Caserta and D. Lund. 2003. Older adults' attitudes, concerns, and support for environmental issues in the New West. *The International Journal of Aging and Human Development*, 57(2): 151-179.

Wright, S. 2003. "Gray and Green? The Environmental Impact of the Aging Baby Boomer Cohort and Social Vulnerability of the Aged to Environmental Hazards." Presented at the *American Public Health Association Meeting*, San Francisco, CA. November 15-19, 2004. (Abstract: *http://apha.confex.com/apha/131am/techprogram/paper_55695.htm*)

Introduction: Demographic and Lifestyle Patterns of an Aging Population

Patricia Bradley
U.S. Environmental Protection Agency

This section focuses on the demographics of an aging American society. By 2030, the number of older Americans is expected to double to 70 million, largely as a result of the aging of the Baby Boomers. Human population size and consumption patterns are major stressors on ecosystems. Equally important is the spatial distribution of the population (where they live), since the extent of ecosystem loss and alteration is closely related to **population density**. Sustainable land-use planning must consider the implications of current and likely future trends in aging migration patterns.

Chapters in this section provide an overview of aging Americans, including social and economic status, migration patterns, and factors that influence or motivate aging Americans to migrate. Key questions include:

- Who fits into the category of aging American?
- How many aging Americans are there?
- Can aging Americans be grouped into distinct cohorts?
- What are the demographic and lifestyle patterns of aging Americans?
- Are demographic and lifestyle patterns of aging Americans distinct from the patterns of other age groups?
- How are trends expected to differ regionally?
- Do aging Americans share a common attitude about environmental issues?

Preparing for the Aging Explosion: the Impact of "Aging in Place" on America's Communities

Sandy Markwood
National Association of Area Agencies on Aging (n4a)
(Written by Eric Walbeck, PSGS)

Aging of the U.S. Population

The following presentation will be a broad overview to characterize the aging population in the U.S. There is what some call an "**Aging Explosion**" or an "**Age Wave**," reflected by the growth of the population older than 65 from one-in-eight in 2000 to one-in-five in 2030. There are currently 655 **Area Aging Agencies** to assist this growing population, many of whom do not want to admit they are getting older. Some basic statistics include:

- Since 1900, the percentage of Americans age 65 and older has more than tripled from 4.1% of the population to 12.4% in 2000.
- In 2000, there were 35 million people over the age of 65—representing one in every eight Americans.
- As the Baby Boomers age, by 2030, 70 million Americans—twice their number in 2000—will be 65 and older. At that point, older Americans will comprise 20% of the U.S. population, representing one in every 5 Americans.

And, the older population is getting older. In 2000, the 65 to 74 age group was eight times larger than in 1900 but the 74 to 84 age group was 16 times larger and the 85 and older group was 34 times larger. The National Institute on Aging predicts that **centenarians** could increase their numbers to more than 1.2 million by the middle of the century.

Counties Exceeding the U.S. Proportion 65 Years and Over by Region: 2000

Region	Total Counties	Counties exceeding U.S. proportion[1]	
		#	%
United States	3,141	2,263	72.0
Northeast	217	170	78.3
Midwest	1,055	869	82.4
South	1,424	980	68.8
West	445	244	54.8

[1] U.S. proportion 65 years and over was 12.4%

Source: U.S. Census Bureau, Census 2000 Summary File 1. *(For information on confidentiality protection, nonsampling error, and definitions, see www.census.gov/prod/cen2000/docs/sf1.pdf)*

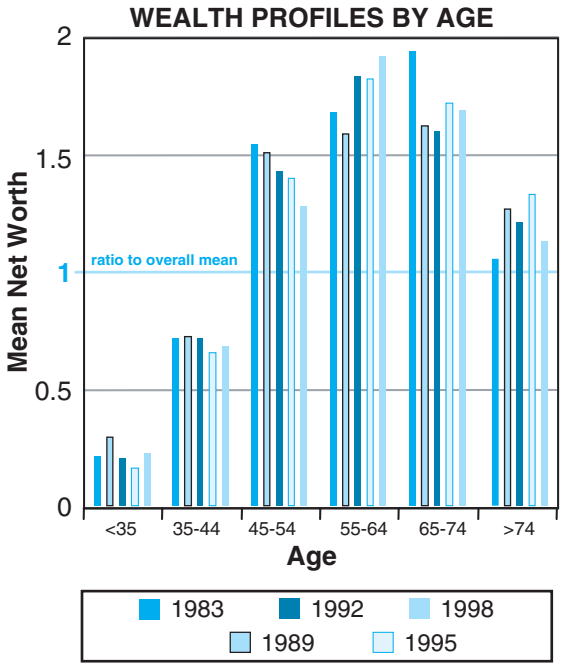
Profile of Older Americans

In addition to a growing aging population, there is a growing diversity of that population. Currently, 16.4% of the older population is comprised of minorities. By 2030, the minority populations are projected to represent 25.4% of the total 65 and older population. Between 1999 and 2030, the "white" population 65 and older is projected to increase by 81% compared to 219% for older minorities—this includes **Hispanics** (328%), **African Americans**

(131%), **American Indians**, **Eskimos and Aleuts** (147%) and **Asian and Pacific Islanders** (285%).

Income and Poverty

Currently, older Americans control the majority of wealth in the U.S. However, not all older Americans are economically well off, in 2000 nearly 17% of older adults lived in or near the poverty level. The Baby Boom generation as a whole has not planned for its retirement—average savings of Baby Boomers is $30K. The **median** family income of older homeowners was $23,409 in 2001, while the median family income of older renters was $12,233.



Health Status

With advances in medical care, older Americans are living longer and healthier lives. However, in 1999, 26.1% of older persons assessed their health as fair or poor (compared to 9.2% of all persons). Minority **elders** were most likely to rate their health as fair or poor (African-Americans 41.6% and Hispanics (35.1%). Limitations on activities of daily living due to chronic conditions increase with age. In 1998, 28.8% of 65-74 year olds reported limitations due to chronic conditions whereas over half (50.6%) of 75+ year olds reported limitations.

Housing Status

Of the 21.8 million households headed by older persons in 2001, 80% were owners and 20% were renters. About 73% of older homeowners in 2001 owned their home free and clear. In 2001, the median value of homes owned by older persons was $107,398, compared to a median home value of $123,887 for all homeowners. The median year of construction for homes occupied by older householders in 2001 was 1963, while it was 1970 for all householders. Eighty-nine percent of older adults report that they want to remain in their homes for as long as possible.

Work and Retirement

In 2000, 4.2 million (12.8%) of older Americans were in the labor force. Studies indicate that Baby Boomers want (and may need) to continue working. Many Baby Boomers report that they want to retire from their current jobs and return to work in other fields—creating markets for lifelong learning and job retraining.

Volunteerism and Civic Engagement

Forty-five percent of older adults volunteer annually, donating 1.8 billion hours of their time at an estimated value of $22.7 billion. Baby Boomers report different interests in volunteering than the current older generation—they want more meaningful work, flexible hours, expect professional management.

Arts and Cultural Activities

The arts and cultural activities are very important to older adults and there are many social benefits associated with their participation in these activities.

What Does the Aging of the Population Mean for U.S. Communities?

The dramatic rise in the numbers of older Americans will impact on every aspect of U.S. communities. The entire social, physical and fiscal fabric of communities will be affected by the coming age wave.

Redefining Aging… Redefining Communities

By their sheer numbers, the aging of the Baby Boomers is resulting in:

- A new **DEFINITION** of aging (*85 is now becoming the definition of old*);
- A new **ATTITUDE** towards aging (*older Americans control the majority of the wealth in the U.S., but many want to and may need to continue to work past what was considered retirement age; because of their numbers, they have political clout and use it*);
- A new **INTEREST** in aging (*health care, housing, and advertisements— including political campaigns—are now being aimed at older Americans*).

Baby Boomers as Citizens

Baby Boomers have changed the face of U.S. society since they were in diapers and will continue to do so as they age. They are a generation that demands service; they want what they want and they want it now!

Impacts of the Aging Population on Communities

Health

Because of the increasing numbers of aging Americans, the communities they live in are faced with providing access to health care services and consumer directed care. Long-term care will have to be redirected from **institutional care** to home and community-based services and promotion of health and wellness will become part of the community design. Health disparities within these changing communities must also be addressed.

Housing

Housing will also be impacted. Existing homes may need modifications such as the addition of ramps, chair lifts, safety/grab bars, etc. Zoning changes may need to be made to allow different types of housing units within existing neighborhoods. Affordable housing options as well as assisted living facilities will have to be developed. There is also a new specialized market (niche) for the development of active adult communities.

Transportation
Highway engineers need to consider the increase of older drivers when designing streets and roads to make them safer for the older driver, including such things as larger signs, smoother curves, and less obstacles. Sidewalks and street crossings may also need to be redesigned to make them more accessible for older pedestrians. And, mobility options—transit, Paratransit[1], volunteer drivers—may need to be provided.

Land-Use Planning
Local and state planning and public works departments must now consider the older population when reviewing documents such as the **master plan**, zoning and subdivision requirements, building codes, the capital improvements plan, and the transportation plan.

Public Safety
Departments of public safety may need to revise some of their priorities to include "elder" abuse and neglect, senior scams, emergency evacuations (Homeland Security) of older and sometimes disabled adults, and emergency medical services for older Americans.

Parks and Recreation
Parks and recreation departments should also revamp their programs to promote and include intergenerational fitness and exercise and wellness activities.

Workforce Development/Education
As the population grows older many individuals have indicated that they want to, and may need to, continue to work past what was considered "normal" retirement age. This will provide a challenge to labor and education departments to provide/promote job retraining opportunities, job flexibility, lifelong learning, and retirement planning.

Volunteerism/Civic Engagement
Volunteer opportunities will need to be restructured to meet changing demands, capitalizing on the expertise of an older population.

Arts and Cultural Activities
Older adults value the presence of community arts and cultural activities and seek out opportunities for civic engagement, self expression and maintaining social interaction. This may be a challenge for some communities to provide.

Economic Development/Fiscal Impact
The aging population must be considered when governmental budgets are developed. Older adults require/desire/demand/deserve more services, but an increasing percentage is on fixed incomes and generally contribute less in taxes. Property tax relief programs and senior discounts may impact future budgets resulting in the revision of the tax structure at the local, state, and national level.

[1] Paratransit organizations expand mobility options by advocating for a fully accessible, usable, and integrated public transportation system and providing innovative community transportation services. They are usually private, nonprofit transportation companies, specializing in transportation call-center management and **public transit** operations. They provide accessible transportation services to those who need it the most—persons who are elderly or disabled or who live in rural areas without personal means of transportation.

Aging in Place/Smart Growth

Making communities "elder friendly" is a key element of Smart Growth Planning.

Aging in Place

Eighty-nine percent of older-adults report that they want to remain in their homes for as long as possible. Communities that become good places for people to grow up and to grow old result in better communities for all ages.

Preparing for aging in place results in better communities for all ages.

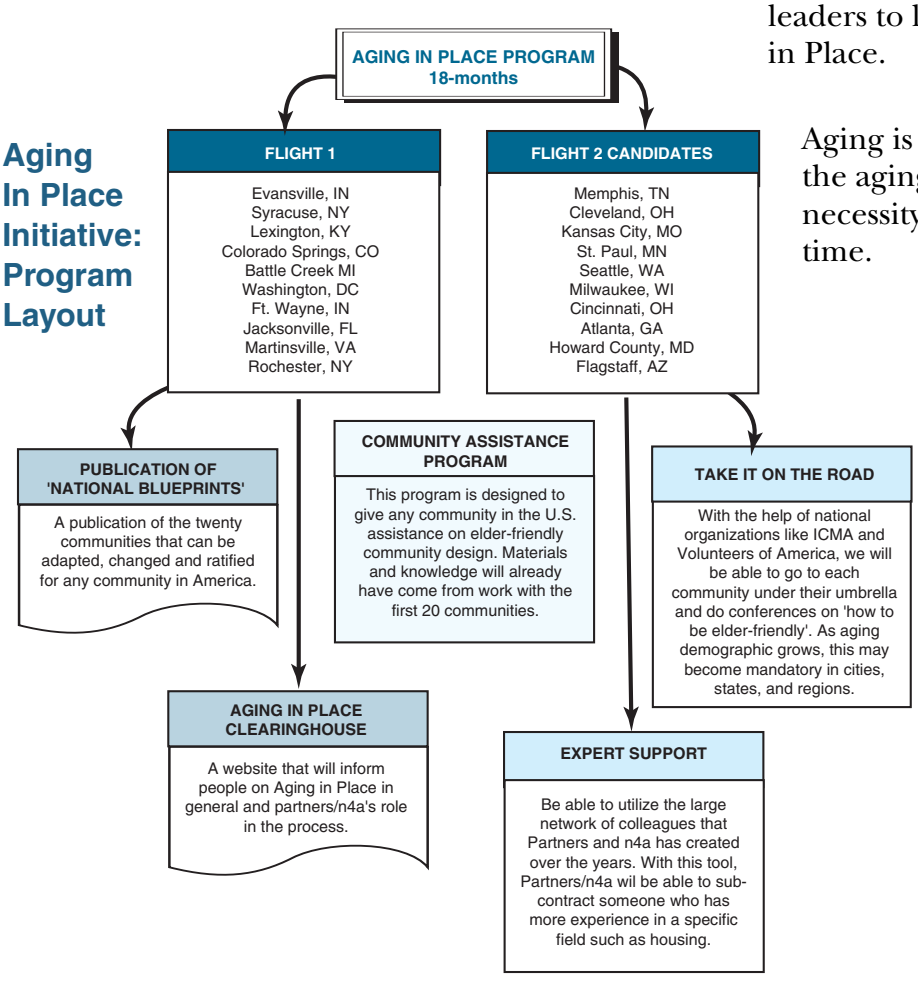
n4a/PLC Aging in Place Project

The National Association of Area Agencies on Aging and the Partners for Livable Communities (**PLC**) are working together on an aging in place initiative, which emphasizes "elder friendly" growth. This initiative will:

- Target 20 communities;
- Facilitate community dialogue on Aging in Place;
- Assist communities develop blueprints for Aging in Place;
- Provide technical assistance to move blueprints into action; and
- Develop peer networks of community leaders to lead the challenge on Aging in Place.

Aging is diverse and dynamic and the aging in place initiative will, by necessity, have to change/adapt over time.

Aging In Place Initiative: Program Layout



Issues Discussed After Presentation

- The difficulty of aging in place in the inner suburbs due to the tax structure;
- The difficulty of obtaining participation by all of the agencies involved—health, housing, transportation—and having everyone use the same terminology;
- The stages of need of those older Americans aging in place, from assistance with chores to personal care to health care.

Later-Life Migration Impacts

Charles Longino, Ph.D.[1] and Don E. Bradley, Ph.D.[2]
[1]Wake Forest University and [2]East Carolina University

Introduction

For nearly thirty years I have studied geographical mobility in later life. During this time my work has focused on theories and patterns of migration more than on the impacts of migration on the community or environment. Over the past two decades, however, some state governments have become very interested in understanding the economic impact of later life migration on their destination communities and destination states. If retirees move in large numbers to a state and spend their retirement income in that state, it could provide strength to the state economy. The money they spend would circulate and generate tax revenue for the states, as well as jobs for the local community.

Before the topic of impact can be understood, however, it is necessary to provide some background on the general phenomenon of later-life migration. We are so accustomed to thinking of geographical mobility as a labor force equilibration mechanism, getting labor redistributed as areas of the country rise or decline economically, that it is difficult to understand the function of later-life migration. In an economic context, geographical movement after retirement seems **epiphenomenal**.

When age and retirement are considered simultaneously, demographers have been quick to point out that geographical mobility is dominated by young people moving away from their parent's home and establishing a home of their own, motivated primarily either by education, jobs or marriage. When comparing age-based rates of migration, it is among young adults that mobility comes alive. In this context, later-life migration has been relatively invisible.

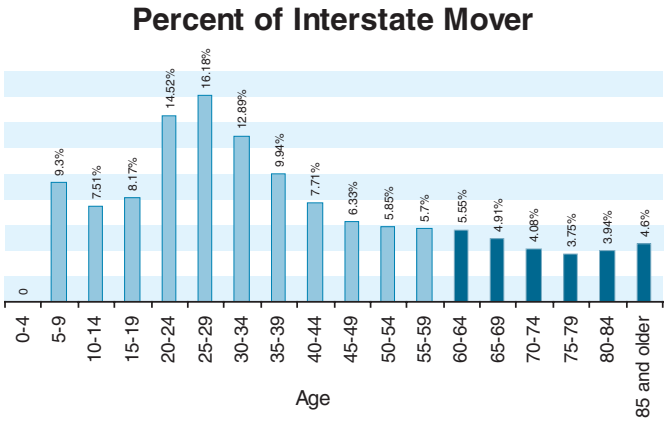


Figure 1. Age and Mobility: Interstate Migrants in the U.S., 1995-2000.

We were interested to discover that although less than 5% of the population of persons age 60+ make interstate moves during the 5 years before each census, it is their

tendency to concentrate that sets them apart from migration in the general population. **Channelization** is the term given to this phenomenon. Nearly a third of all interstate migrants move to just three states, Florida, Arizona and California, and 54% move to the top ten states out of 50, one fifth of the states. Within these states there are further concentrations so, for example, if one visits a shopping mall in some parts of Florida it seems that over half the population is over 60.

The second characteristic of later-life migration discovered in our earlier work is that retirees tend to move down the metropolitan hierarchy, from larger to smaller places. Young people tend to move up the metropolitan hierarchy in search of economic opportunity. Older people do not all move to fragile, rural environments; most move to smaller metropolitan areas.

With this as background, we can turn to the issue of migration impact.

Table 1. Ten states receiving most in-migrants age 60+ in five-year periods ending in 1980, 1990 and 2000.

	1980			1990			2000		
Rank	State	#	%	State	#	%	State	#	%
1	FL	437,040	26.3	FL	451,709	23.8	FL	401,052	19.1
2	CA	144,880	8.7	CA	131,514	6.9	AZ	134,183	6.4
3	AZ	94,600	5.7	AZ	98,756	5.2	CA	127,693	6.1
4	TX	78,480	4.7	TX	78,117	4.1	TX	101,446	4.8
5	NJ	49,400	3.0	NC	64,530	3.4	NC	77,720	3.7
6	PA	39,520	2.4	PA	57,538	3.0	GA	63,120	3.0
7	NC	39,400	2.4	NJ	49,176	2.6	NV	62,155	3.0
8	WA	35,760	2.2	WA	47,484	2.5	PA	60,082	2.9
9	IL	35,720	2.1	VA	46,554	2.4	NJ	54,425	2.6
10	NY	34,920	2.1	GA	44,475	2.3	VA	53,776	2.6
Total Interstate Migrants		1,622,120			1,901,105			2,096,841	
% of Total in Top 10 States			59.5			56.3			54.3

Migration Impact

There are several non-age based impacts. Whether or not a new resident is young or old, her presence increases the local demand for public safety and public health. In addition, population congestion increases the "hassle factor."

The issue of the impact of migration on fragile environments falls into the category of non-age based impacts. The age of migrants therefore is less important than their presence. Later-life migrants become relevant to fragile environments primarily in their ability to make a move independent of an earned income, thereby expanding the population over and above the jobs that are available to support it.

Economic Impact

The decade of the 1990s began with a spate of articles considering the economic impact of retirees at their destination. A sizable amount of annual income is transferred to and from states, concentrating in major destination states, due to retirement migration (Longino and Crown, 1990; Crown and Longino, 1991; Sastry, 1992; Serow, Friedrich and Haas, 1992).

Simultaneously, 515 rural counties where the older population was growing through migration, outperformed **nonmetropolitan area** averages for job growth (Reeder and Glasgow, 1990; Glasgow, 1991). These studies argued that older migrants had not been an excessive burden on local public service expenditures, which tended to be low in any case (Glasgow and Reeder, 1990; Glasgow, 1995), a point echoed by Joseph and Cloutier (1991) concerning rural Canadians. Voss and Fuguitt (1991) showed that in rural low-income counties in the South, new income from migrants only replaced that taken out by out-migrants. These were not the same set of counties, however, that Glasgow called "retirement counties." Hodge (1991) reported data supportive of Glasgow's analysis in his study of smaller communities in the province of British Columbia, Canada. Bennett (1992, 1993, 1996) offered strong support for Glasgow's observations in his study of high-amenity retirement counties on the Atlantic seaboard. Schneider and Green (1992) however, noted that the economic success of the retirement counties cannot be attributed simply to retirement migration alone. Rural counties, when accessible to heavily traveled **transportation corridors** and abundant with amenities, are attractive to young people as well. Deller (1995) used a regional economic model to simulate the impact of a policy of retirement recruitment on the state of Maine, showing a significant beneficial short-run economic impact. Serow (2003) warns of possible negative future long-run impacts.

Local Political Activism and Support for Public Services

The positive economic impact must be balanced against a negative political effect. Local voting studies have tended to examine the results of local school budget referenda. Using the results of school district bond elections in Florida, Button (1992) and especially McManus (1997) found that a higher percentage of elderly residents and voters in a school district are associated with lower support for schools. This finding is consistent with recent research by Simonsen and Robbins (1996), who found that citizens and senior citizens, in particular, were much less supportive of public services that they do not expect to use. This would include schools.

Impact on Community Social Structure and Values

Longino (1990) argued that **retirement enclaves** in rural counties tend to be worlds unto themselves, relatively unattached to local social structure. McHugh and Gober (2002) call them "common interest developments." Cuba (1992) even argued that on Cape Cod, the distinguishing characteristics of older migrants make them susceptible to scapegoating by nonmigrants and younger migrants.

Later studies have seen migrants as more proactive, as change agents in their communities. Rowles and Watkins (1993), for example, provide case studies of three contrasting Appalachian communities at different stages of development as retirement destinations (emergence, recognition, restructuring, and saturation). This study is refreshingly insightful because it analyzes retirement migration in a broader social context. For example, middle-class retirees are likely to band together to protect the environmental ambiance of the community. The lure of economic development through retiree recruitment, in some small towns, could have disappointing consequences for local boosters as the size and power of the older population increases.

Projecting Impact Factors Into the Future

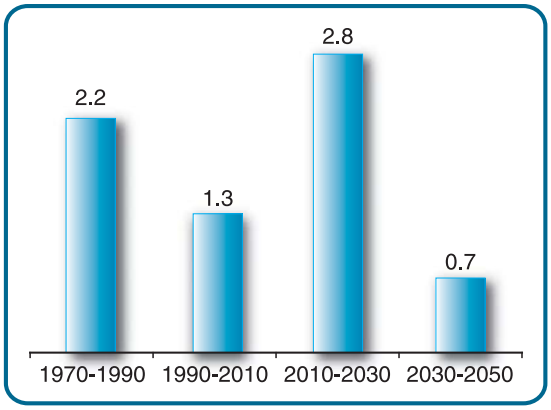
One can assume that the rates of **interstate migration** will be stable over time. The current rates have been stable since 1980. During this period, about 4.5% of persons age 60 and older made interstate moves in any 5-year period. At the time of the census in each of those three decades essentially the same proportion indicated that they had lived in a different state five years earlier. If the rates of migration are stable, then the factor that would cause the number of migrants to rise or fall would be growth in the age group. In this regard, the older population has been growing, relative to the rest of the population, for decades. In addition, in 2008 the oldest Baby Boomer will take early retirement at age 62 and begin drawing a social security retirement income. Over the next 18 years, the Baby Boom will pass through the **retirement years**. The number of later-life migrants will increase during this time, as well as their economic and social impact.

Table 2. Migration during five-year periods ending in 1960, 1970, 1980, 1990 and 2000.

Interstate Migrants

		Age 5+	Age 60+
1960	#	14,141,000	931,000
	%	9.2	4.1
1970	#	16,081,000	1,079,000
	%	9.3	3.9
1980	#	20,358,000	1,622,000
	%	9.9	4.6
1990	#	21,585,000	1,901,000
	%	9.4	4.5
2000	#	22,089,460	2,096,841
	%	8.4	4.6

Add to this growth, the fact that there will be a shift in destinations. Florida will continue to benefit from the growth in important ways. However, the growing number of migrants will cause much smaller destinations to become visible, perhaps for the first time. There are beautiful vistas in this country that attract retirees. Some of these are in ecological regions that require a delicate environmental



Source: U.S. Bureau of the Census

Figure 2 Average Annual Growth Rate of the Elderly Population: 1970-1990 to 2030-2050

balance. It is possible that the construction of new homes to accommodate the increasing retirement population will threaten the environment.

The short-term impact of retirement migration is positive. Certainly the economic impact pumps dollars into the local economy, primarily creating service jobs. The human and **social capital** that is produced through volunteering and other community activity is positive as well. Older migrants often wish to preserve the environmental beauty of their destination, thus protecting their investment, so to speak. This makes them easy allies of environmentalists seeking to preserve environmental integrity.

Longer-term impact, however, may be negative. The growth in the numbers of later-life migrants between 2008 and 2030 can be expected to put pressure on the health delivery system, on the housing industry, and on the environment. When the Baby Boomer cohort has passed through the early retirement years, there will be opportunities to convert retirement housing to other purposes, as well as a change in the service mix in retirement destinations. During this time there will not be the ever-increasing flow of retirees into the area, but a declining number. The decline in the arrival of recent retirees will make the older population seem to age more rapidly. With its aging, there will be a shift from the recreation needs of the "young old," to the health and service needs of the "old-old."

Of course one should not forget the mediating factors that may change this picture. Since the 1980 census, researchers have been aware of counterstream migration. That is, for every major stream of older migrants, for example, from New York to Miami, there is a counterstream, for example, from Miami to New York. This counterstream carries away some of the service demand generated by the aging of the older population.

Also, it should be recognized that the much larger geographically stable population will also age, so that the aging of the older migrants will not stand out and create a separate cause of alarm. The demand for health and social services for the older population will be widespread. It will be a national issue, not just a local issue.

Conclusions

The impact of older persons who migrate is complex and goes far beyond their impact on fragile environments. They have economic, political and social impacts as well. Also, their environmental impacts must be weighed against their tendency to support environmental protection in their new locations, when they become aware of such issues. Like the Dr. Seuss character, the Lorax, long-distance migrants in late life "speak for the trees."

References

Bennett, D.G. 1992. The Impact of Retirement Migration on Carteret and Brunswick Counties, N.D. *North Carolina Geographer* 1: 25-38.

Bennett, D.G. 1993. Retirement migration and economic development in high-amenity, nonmetropolitan areas. *The Journal of Applied Gerontology* 12(4): 466-481.

Bennett, D.G. 1996. Implications of retirement development in high-amenity nonmetropolitan coastal areas. *The Journal of Applied Gerontology* 15(3): 345-360.

Button, J.W. 1992. A sign of generational conflict: The impact of Florida's aging voters on local school and tax referenda. *Social Science Quarterly* 73(4): 786-797.

Crown, W.H. and C. F. Longino Jr. 1991. State and regional policy implications of elderly migration. *Journal of Aging and Social Policy* 3: 185-207.

Cuba, L.J. 1992. *The Cape Cod retirement migration study: A final report to the National Institute on Aging*. Wellesley, MA: Wellesley College.

Deller, S.C. 1995. Economic impact of retirement migration. *Economic Development Quarterly* 9(1): 25-38.

Glasgow, N.L. 1991. A place in the country. *American Demographics* 13(3): 24-30.

Glasgow, N.L. 1995. Retirement migration and the use of services in nonmetropolitan counties. *Rural Sociology* 60(2): 224-243.

Glasgow, N.L. and R.J. Reeder. 1990. Economic and fiscal implications of nonmetropolitan retirement migration. *The Journal of Applied Gerontology* 9(4): 433-451.

Hodge, G. 1991. The economic impact of retirees on smaller communities. *Research on Aging*, 13(1): 39-54.

Joseph, A.E. and D.S. Cloutier. 1991. Elderly migration and its implications for service provision in rural communities: An Ontario perspective. *Journal of Rural Studies* 7(4): 433-444.

Longino, C.F., Jr. 1990. Geographical distribution and migration. In *Handbook of aging and the social sciences, third edition,* by R.H. Binstock and L.K. George (Eds.), 45-63. San Diego, CA: Academic Press.

Longino, C.F., Jr. and W.H. Crown. 1990. Retirement migration and interstate income transfers. *The Gerontologist* 30: 784-789.

McHugh, K., P. Gober and D. Borough. 2002. The Sun City Wars. *Urban Geography* 23(7): 627-648.

McManus, S. 1997. Selling school taxes and bond issues to a generationally diverse electorate: Lessons from Florida referenda. *Government Finance Review* April: 17-22.

Reeder, R.J. and N.L. Glasgow. 1990. Non-metro retirement counties' strengths and weaknesses. *Rural Development Perspectives* 6(2): 12-17.

Rowles, G.D. and J.F. Watkins. 1993. Elderly migration and development in small communities. *Growth and Change* 24: 509-538.

Sastry, M.L. 1992. Estimating the economic impacts of elderly migration: an input-output analysis. *Growth and Change* 23(1): 54-79.

Schneider, M.J. and B.L. Green. 1992. A demographic and economic comparison of nonmetropolitan retirement and nonretirement counties in the U.S. *Journal of Applied Sociology* 9: 63-84.

Serow, W.J. 2003. Economic Consequences of Retiree Concentrations: A Review of North American Studies. *The Gerontologist* 43(6): 897-903.

Serow, W.J., K. Friedrich and W.H. Haas. 1992. Measuring the economic impact of retirement migration: The case of western North Carolina. *The Journal of Applied Gerontology* 11(2): 200-215.

Simonsen, W. and M. Robbins. 1996. Does it make any difference anymore? Competitive versus negotiated municipal bond issuance. *Public Administration Review* 56(1): 57-64.

Voss, P.R. and G.V. Fuguitt. 1991. The impact of migration on southern rural areas of chronic depression. *Rural Sociology* 56(4): 660-679.

FANBY-ism in an Aging Society: In Search of Arcadia[1] Still Searching for Paradise

Scott Wright, Ph.D.
University of Utah

"The search for environmental quality is as fundamental as the search for a higher material standard of living: in fact the former is an outgrowth of a further development of the latter."

Samuel P. Hays (1998). Explorations in Environmental History, p. 11

Preface

When examining the prospect of increased longevity in the U.S. and concomitant issues (e.g., political, economic, social) associated with demographic aging, it is *de rigueur* to bring the aging of Baby Boomers into the equation. There is already a plethora of literature on the impact and profiling of aging Baby Boomers. For the purposes of this paper, I would like to highlight two examples. In one example, Munnell (2004) has provided a contextual analysis of the Baby Boomer cohort in perspective with broader and long-term demographic trends in **fertility rates** and increased longevity. In short, Munnell has correctly identified that our nation is facing a *permanent* change in its demographic profile (toward population aging) and not simply a temporary "wave effect" of aging Baby Boomers. In other words, the traditional "pig in a python" metaphor may be a graphically provocative way of describing the "passing though" of the cohort, but it also implies that life will return to normal once the last "Boomer" dies. Instead, Munnell (2004) indicates that long after the Baby Boomers are gone—2080 appears to be the date when virtually all Boomers will have ceased to exist—an aging society will be here to stay for the long-term—well into the 22nd century. The point here is that while the Baby Boomer cohort will be the cause of rapid aging in the U.S. in the coming decades, the ultimate outcome and end result is a transformation toward a sustained aged society. Thus, any discussion of aging and environmental issues will not just be a "passing through" issue associated with the aging of the Baby Boomer cohort; rather, the **nexus** of aging and environmental issues will be a social and public health concern for all subsequent cohorts as well.

In the other example, Coughlin (1999) highlights the technology needs of aging Boomers and presents a convincing argument for considering the power and potential of technology to address the challenges of the aging process for increasing numbers of older

adults. However, Coughlin (1999) argues that after witnessing the advancements of life expectancy in the 20th century and spending billions to achieve longevity, we have not made equitable investments in the physical infrastructure necessary to ensure healthy independent living for aging individuals. In other words, living longer may not inevitably assumed to be matched by living better or simply living *well*. Coughlin (1999) is one of many scholars who highlight the need for addressing the **qualitative dimensions** of living longer in an aging society. Thus, we have to consider the pragmatic and ethical prospects of diminishing resources (economic and environmental) that may not sustain increasing numbers of people with a meaningful level of well-being and quality of life. In effect, I propose that we are at the crossroads where demographic aging, human ecology and environmental issues converge in a "drama of the **commons**" (Dietz et al., 2002; see also Freyfogle, 2003)[2] . In this case, the "commons" are represented by the "other" infrastructure which is the array of natural resources and **ecosystem services** that support and sustain human functioning[3]. While assorted publications have begun to address pervasive economic, social and political effects of an "aging society" (e.g., Morgan, 1998), there has been little discussion about the impact of the "age wave" (Dychtwald, 1990) in relation to natural resources and environmental quality. Likewise there is scant literature paid to the reciprocal impact of environmental conditions (i.e., environmental quality and environmental hazards) on the well-being of aging individuals and collectively, an aging society (see Wright, 2000; Wright, 2003). However, progress is becoming more evident, especially as EPA has begun to address the intersection of these issues. Although my research has examined many factors associated with environmental issues and aging, this paper specifically focuses on the nuances of demographics, elderly migration patterns and environmental impact. These nuances reflect the need to closely examine the diversity within aging cohorts in relation to environmental issues. As Coughlin (1999) has noted, "The aging Boomers are not the first generation to grow old; however, their absolute number will move issues associated with their aging to the top of the policy agenda." Thus, the behemoth-like profile (the **quantitative dimension**) of the age wave will have significant ramifications for contemporary and future environmental policy (Tonn et al., 2001). Yet, it is not just the absolute number of aging Boomers (the sheer magnitude) that demands our undivided attention, it is also the *variation within* the aging Boomers (the qualitative dimension) and all aging cohorts that will be the touchstone by which any and future environmental policy (i.e., the "aging initiative") should be differentiated. While it is tempting to profile the aging Boomers into a collective block and then prognosticate accordingly, this is bound to be misleading and potentially reckless. Policy directives, research projects and educational programs related to environmental issues and aging must take into account the prospective *variability and novel emerging patterns within* the Baby Boomer cohort in order to effectively target prevention and intervention measures. For the purposes of this paper, I examine one specific pattern—retirement migration—(one of many) in relation to environmental resources.

The Emergence of 21st Century Retirement Hot Spots—Not Your Father's Oldsmobile

The increased attraction of the western U.S. as a *relocation* and *retirement* destination has been demonstrated in recent **U.S. Bureau of the Census** data and in other recent publications (see Wright, 1998, 1999, 2000, 2004). For example, over the next 30 years the West is projected to grow nearly twice the national average, while the Northeast and Midwest will grow at one-half the U.S. total rate. During the 1995 to 2025 period, the South and West are expected to increase by more than 29 million persons. California is expected to be the fastest growing State from 1995 to 2025 (65%). Out of the top 10 fastest growing states, eight are in the western region. They are: California, New Mexico, Hawaii, Arizona, Nevada, Idaho, Utah, Alaska (U.S. Bureau of the Census, 1996). The Census Bureau projects that in 2020 California would have the nation's largest elderly population, with 6.6 million persons 65 and over, a 100% increase from 1993 (although it is projected Florida will continue to have the nation's highest *proportion* of state population aged 65 years and over).

The regional relocation of the elderly to the South and West has been occurring among the *younger elderly* since the 1960s and among the *older elderly* since the 1970s. In addition to the older adult migrants to these areas generally tending to be among the young-old, they have also tended to be relatively well educated and relatively well off financially. As a result, such migrants tend to rejuvenate and enrich the older population of the receiving states (Hobbs and Damon, 1996; see also Longino, 1995).

Over the decade of the 1980s, the largest percentage increases in elderly population (65 years and over) were mostly in the West, particularly the Mountain States and in the South. For example, the Mountain Division of the West region (Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah and Nevada) experienced a 42.9% increase in population 65 and over between the years 1980 to 1990 (Hobbs and Damon, 1996).

The population 65 and over is expected to double in the top seven states with the fastest growing elderly population. The States with the most rapid growth of the elderly population in rank order are Alaska, Utah, Idaho, Colorado, Nevada, Wyoming and Washington. These states are projected to have an average annual rate of growth of change for the elderly that ranges from 5.1% to 6.9% between 1995 and 2025. The Mountain region is expected to have 11.4% of their population in the elderly category by the year 2000, 12.4% by the year 2010 and 16% by the year 2020 (Hobbs and Damon, 1996). Seven states in the West region are projected to experience 100% or more change in population 65 years and over between the years 1993 to 2020 (Utah = 102.4%; Nevada = 115.6%; Arizona = 111.9%; Colorado = 108%).

While select southeastern states (e.g., Florida and Georgia) continue to draw a substantial number of migrant retirees each year, there has been an increased interest in other major destination spots in the U.S. For example, Longino and Bradley (2003) have examined preliminary estimates of the number and proportion of retirement migrants (based on Census 2000 data) and have found that the traditional leading destinations, like Florida, have declined slightly in its position over

the past two decades. Thus, Longino and Bradley (2003) have stated that "the leading destinations were spreading out, becoming slightly less concentrated." For example, Longino and Bradley (2003) noted that the **"New West"** is a rising retirement region (see also Frey, 2000). They point out that while Arizona has anchored the regional area, other states, such as Nevada, have emerged as leading destinations for older adults. It is proposed that the 21st century will be exemplified by the emergence of new areas for relocation and retirement, and that the "New West" states will become a primary site for aging Baby Boomers who decide to relocate (see also Ribesame and Robb, 1997). For example, Limerick (1997), a contributor to the *Atlas of the American West*, offers an interesting psychological motivation (with recreational opportunities and **landscape ecology** as amenities) for the allure of the "New West" for aging Baby Boomers:

> "In the outdoor sports of the New West, the dreams of the Baby Boomer childhood and the dreams of Baby Boomers middle age coincide. Performed in the **landscape** associated with televised western adventure, the vigorous outdoor exercise associated with the New West seemed to provide a postponement of aging and an extension of life itself…even if those years are going to add up anyway, Baby Boomers hold on to the option of behaving as if they are not over thirty, an option for which the New West provides an essential setting to play hide-and-go-seek with time. As much as they provide the center of the New West's economy, hiking, mountain biking, skiing, rock climbing and rafting provide the ritual by which people of a certain age have been putting up determined battle against aging…. The very term "New West" remains a Baby Boomer's dream come true…the West has received special dispensation, an option to reverse the rules of the universe. Time passes; ordinary logic reverses; and the Old West ages into the New West."

Traditional geographic areas will still attract retirees over the next several decades, but the new emerging areas will offer key amenities to aging Baby Boomers that are associated with the broad term of "quality of life," and more specifically with natural amenities (or "**natural capital**") that are associated with environmental resources (e.g., water, air, land) and conditions that reflect a higher standard of environmental quality (e.g., less pollution, less congestion and sprawl)[4]. The emerging pattern of greater numbers of people seeking geographic areas that fulfill these conditions can also create stressors and strains on the very natural resources that were the primary attraction to begin with—and as a result, can lead to a "Find a New Backyard—FANBY" dynamic of "searching for paradise" (see Rasker and Hansen, 2000). It is proposed that this dynamic will become more acute especially in the New West states and in other areas of the U.S. In effect, it points to one of many emerging intersections between an aging society and environmental issues (see Tonn et al., 2001).

In summary, the western U.S. are experiencing rapid demographic growth and this growth is projected to continue for the next three decades. In addition to the overall

demographic growth in the West, several states, including Nevada and Arizona, have been recognized as prime retirement migration destinations. Many retirement migration sites are characterized as fulfilling the need for **amenity-seeking** older adults who place a premium on quality-of-life indicators, recreational opportunities and scenic beauty of the natural landscape (Bennett, 1996). These sites are also known as "**gateway communities.**" Howe et al. (1997) have described these **Arcadian** areas this way:

> "Gateway communities—the towns and cities that border these public lands—are the destinations of choice for much of the country's migrating populace. With their scenic beauty and high quality of life, gateway communities have become a magnet for millions of Americans looking to escape the congestion, banality and faster tempo of life in the suburbs and cities. Estes Park, Colorado, gateway to Rocky Mountain National Park and St. George, Utah, gateway to Zion National Park, have become havens for retirees looking for a picturesque place to spend their golden years. During the 1980s, the population of Estes Park grew by more than 35%, St. George's population doubled."

However, rapid growth in certain geographic areas that are ecologically sensitive may not be conducive to the sustainability of natural resources and the resulting impact can be detrimental to the very qualities that would draw migrants to the area in the first place.

Migration Patterns and "Pull" Factors: The Importance of "Quality of Life"

There have been a substantial number of research publications addressing elderly mobility and the interstate migration patterns of older adults in the U.S. (Bennett, 1993; Clark et al., 1996; Hass and Serow, 1993, 1997; Newbold, 1996; Longino, 1990; Longino and Marshall, 1990). One of the major representatives of the *amenity-seeking population* (versus "**dependency migrants**") in the U.S. is associated with older adults who are involved in interstate (and intrastate) migration activities during the retirement years (see Clark et al., 1996; Hass and Serow, 1993, 2002; Longino 1995; Longino et al., 2002; Newbold, 1996; Valerio, 1997).

As Longino (1995) indicated in his benchmark book, "*Retirement Migration in America*," most older adults *do not move* to another geographic location (migrate) as retirees, rather "most people stay put when they retire." However, a significant number of older adults, seek to change their lifestyles is such a way that a change of territory is required (Longino, 1995), and most "*amenity-migrants*" are looking for settings that will afford a new and better lifestyle. Longino (1995) states:

> "Communities located on or near lakes, beaches or mountains, and those in temperate climates, have an advantage in attracting this type of migrant, who tends to be recently retired, and therefore younger, usually married and economically better off than many other retirees. Interstate migration streams to the Sun Belt are laden with amenity retirees."

What is the primary amenity that migrant retirees seek when considering relocation to a new geographic area? Longino (1995) indicated that "quality of life" is at the heart of the process in deciding where to relocate in retirement migration. Longino (1995) elaborated upon the concept "*quality of life*" as a motivator in migration patterns:

> "When we pull from the bookstore shelf one of those reference volumes that offers advice about places to retire we are only examining the most recent packaging of an old concept, *quality of life*. A geographic definition of quality of life incorporates the concept of individual well-being but focuses more on *places* than individuals… Some of the subjective goals of older migrants can be discerned from the data we have already observed. We know, for example, that climatic conditions favor Sun Belt locations. We know that there is a movement out of the most populous, presumably the most crowded, states. Moving to a place with less congestion and fewer of the problems that big cities tend to have must be attractive to many retirees. The fact that people tend to move to the rim states, most of which are on water, must imply that *there is more than climate that is attractive about the physical environment. Water and mountains, and scenic beauty in general, are traditional pulls.*" (Italics added)

What we can surmise from Longino's (1995) interpretation is that *quality of life* is very much connected to and represented by the *aesthetics of natural environment characteristics*, such as climate and scenic beauty, or as Pitt and Zube (1987) refer to as, the "**noncommodity values**" of natural environments. Although there are "**push**" **factors** such as urban congestion and crime as motivators for leaving a certain geographic area, the "**pull**" **factors** of the natural environment (Longino refers to this as the "physical environment") toward a specific geographic area may be *more* influential in the decision-making process (see also Savageau, 1995). Howe et al. (1977) also elaborate on the relationship between quality of life and the natural environment:

> "*Quality of life* is a catchall term used to describe the noneconomic amenities a community has to offer, including clean air and water, safe streets, good schools and scenic views. Although the definition of quality of life may vary from person to person, people of every ethnic and economic background place a high value on it. Surveys indicate that quality of life weighs heavily in decisions people make about where they want to live and work. Indeed, throughout the country Americans are fleeing blighted suburbs and cities in search of cleaner, greener, smaller, safer and more neighborly communities. Gateway communities are leading destinations."

The importance of the natural environment is further corroborated by Carlson et al. (1998) who conducted a study to determine factors that affect retirement migration of older persons, using Hass and Serow's (1993) "amenity" model as the framework. They focused on older migrants to the state of Idaho. Consistent with the findings of Hass

and Serow (1993, 1997), they found that attraction or "pull" factors, such as lower cost of living, lower population density, amenity opportunities and better quality of life, etc., explained more about why persons chose to immigrate, than did push factors or negative forces. For example, Carlson et al. (1998) indicated that,

> "The pull of Idaho, or their perception of what their lifestyle might be like in a predominant non-metropolitan state, was an important factor in their decision. Amenities such as *scenic beauty and outdoor recreation* were more likely to have attracted retirees than the presence of family members. The locations chosen were often areas that have outdoor amenities such as Kootenai County, which includes a resort community built around a mountain lake."

Valerio (1997) also found that when older adults are considering post-retirement moves, potential migrants weigh the amenities and **disamenities**, i.e., place characteristics, of their present location against those of other possible residential sites. Valerio (1997) has indicated that retired in-migrants are seeking areas characterized by the potential for a high standard of living in terms of "*quality*" and that economic factors are secondary considerations. Specific geographic areas that have warm climate areas are also important as this allowed the "pursuit of pleasure" and maximizing enjoyment year round. Valerio (1997) stated that,

> "By seeking out nonurbanized areas the retiree further enhances his total welfare by freeing himself from the congestion and crime potential of urban life. The rationale behind water and park amenities is obvious: more opportunities for pleasure! The retirees probably are not insisting on ocean front views and mountain vistas but are rather responding to the greater potential for enjoyable activities associated with natural resources."

Based on the works of Bennett (1996), Longino (1995), Carlson et al. (1993) and Valerio (1997), it appears that quality of life is an important **variable** for older adults in deciding where they will move, or "FANBY," in the U.S. (see also Wheeler, 1996). Furthermore, quality of life appears to be defined by retired migrants as a mosaic of amenities which include the perceptions of *increased personal space*, toward geographic areas that are less congested, *aesthetics of the natural environment*, climate and the *potential for recreation* within or nearby these natural environment areas when seeking retirement relocation sites. It is interesting to note that Hays (1998) provided a historical perspective in the role of the natural environment as a provider of amenities within our social-cultural system. Hays proposed that originally the **conservation** movement in the U.S. was dominated by the perspective of "efficient production" but in the 1960s the environmental movement superseded the conservation movement by focusing on "quality" or "amenity" rather than efficient economic development. The following statements by Hays (1995) reflect the historical transition toward the natural environment as an amenity that reflected the quality-of life-standards for most middle-class Americans.

> "New concepts arose that went beyond production to the enjoyment of life and concern for the quality of the environment necessary for that enjoyment. Air, water and land each came to be conceived of not as a commodity to be molded into a material product or as public facility for the disposal of waste, but as the environment in which people work, live and play. The "environment" was not a thing to be used for material purposes, but as the context of life and the enjoyment of life requires that the context be of one kind rather than another."
>
> "The large scale suburbanization of the 1920s and beyond is one of the first major expressions of the search for environmental amenities, for less congested surroundings, clean air and less noise,…the outward thrust from the city…led to the use of the wider countryside and remaining wildlands, the enjoyment of the environmental quality of even less congested and less environmentally degraded area. *This use was usually confined to nonoccupationally times of one's life, either vacations or in retirement years, but it gave even more extensive expression to the search for clean, quiet, less developed and more natural surroundings.*" (Italics added)

FANBY and Environmental Impact

The same quality of life amenities that served as attractions or "pulls" can suddenly diminish as growth transforms the natural landscape and brings with it the congestion of increased road-building, housing developments, services, light-industries and of course, more people to a specific area that was at one time, "less congested, safer and cleaner" (see Bennett, 1996). This evolutionary transformation has been described by Longino (1995) along with discussions of how the changes affect migration patterns:

> "So long as there is a perceived quality of life difference in the environments at origin and destination, the better quality of life will attract new residents who are retired. Retirees who moved into and have lived in a Sun Belt community for 10 or 15 years will often complain that the quality of life has declined since they arrived, and they often blame the decline on the retirees who followed them and those who keep coming. The reason they keep coming is that even in its decline, as viewed by migrant old-timers, there is still a quality of life advantage as compared with where the new migrants originated. When the difference narrows, however, it begins to choke off in-migration and generate new pressure for retirement out migration from the destination. *People who retire in Sun Belt cities sometimes subsequently move to less crowded places with greater scenic beauty, too, and feel that they have traded up on their quality of life.*" (Italics added)

As Longino (1995) and Limerick (see Ribesame and Robb, 1997) have suggested, the traditional destination sites for retirement

are beginning to serve as origin sites for secondary migration moves in order to upgrade in quality of life amenities found elsewhere ("still searching for paradise," see Brooks, 2004). The end result is that many small-town geographic areas (e.g., **exurbs**, **boomburbs**, **zoomburbs** or **micropolitan** areas) are being identified, previously "undiscovered," as retirement hot spots because they still maintain (at least for the time being) the quality of life amenities that migrant retirees are seeking. Power (1996) elaborated on this trend in the following description of magnet areas:

> "The economic geography of the United States has been transformed during the second half of the twentieth century as a result not of people passively relocating for work but, rather, actively seeking particular residential environments. How else to explain the suburbanization of U.S. metropolitan areas into World War II? For several decades suburbanization represented a move away from both employment and commercial centers. Certainly the negative aspects of living in the city—congestion, pollution, crime, ethnic conflict—spurred relocation, as did the positive aspects of suburban and exurban living: lower density, parklike settings, less social conflict. Similar motives lay behind the settlement of the desert Southwest and the Sunbelt in general. During the 1980s, while most of nonmetropolitan America suffered a depression, the economies of many rural counties with attractive landscape features experienced ongoing growth, testimony to the powerful draw of desirable living environments. *During the first half of the 1990s, recreation and retirement communities continued to lead both metropolitan and nonmetropolitan areas in economic vitality.*" (Italics added)

Of course, the evolutionary transformation of retirement "hot spots" also leads to a "domino-effect" where traditional-dominant retirement sites lose their appeal due to declining subjective and objective measures in quality of life, then putting pressure on other geographic areas to serve as *re-location sites*. Thus, the retirement hot spot development cycle all over again. In other words, the Arcadian dreamland then becomes a "victim of success" where economic growth and development transforms the natural environment and the previous amenities are mentioned nostalgically as "what it once was and used to be" (see Bennett, 1996).

Rowles and Watkins (1993) examined intraregional elderly migration patterns in the Appalachian regions of North Carolina and Kentucky and identified potential benefits and costs of migration-based development. They proposed that one of the potential costs of elderly migration-based development centered on *environmental concerns*. Bennett (1996) found that although there is a growing awareness that attracting retirees can be a beneficial economic force in high amenity nonmetropolitan counties, there are *many other implications* of retirement growth that needs to be understood for strategic planning for the future. For example, Bennett (1996) noted that planners and several of those retirees who have lived along the South Atlantic for 25 to 39 years stated that when

many older adults started moving to these coastal counties during the 1960s, these areas represented most of the remainder of the pristine coastal environments. Bennett (1996) said that:

> "Indeed, a large percentage of those who moved to these counties to retire during the past three decades did so primarily because of the *beauty of the environment*. Although few of these newcomers have seen themselves as altering—however slightly—the environment that lured them, *the sum total of the impress on nature by all the retirees, tourists and developers has been substantial*." (Italics added)

Perhaps one of the most important pieces of literature to address FANBY-ism and environmental impact is the publication, "*The Promise of Paradise: Recreational and Retirement Communities in the United States since 1950*" (Stroud, 1995). This book provides, from a geographical perspective, information about the location and size of large recreational-retirement communities and their environmental and economic impacts, beginning with the 1950s. As Stroud (1995) notes in his introduction,

> "The impact of recreational land development can be both positive and negative. Positive features include putting to use land that might otherwise be only **marginally productive**, thereby boosting rural economies by generating new tax revenues and consumer sales, stimulating the housing construction industry and providing recreational opportunities. These benefits must be weighed against the serious problems *amenity-seeking populations* bring as they move into rural areas, including the reduction of land resources, the environmental devastation of ecologically fragile land and the overtaxing of local public services." (Italics added)

However, as mentioned previously, the magnet, the natural environment, that draws people to new destinations is, ironically, often in jeopardy of being negatively transformed by the inherent developmental processes of "sprawl." Increased numbers of people, more traffic and more congestion are the results associated with rapid growth, construction and growing infrastructure of services required to support the growing industry (the economic context) of retirement living (see Bennett, 1996; Davis, 1998a, 1998b; Gersh, 1996; Romme, 1997; Stroud, 1995). In other words, these preferred *Arcadian* sites are often overwhelmed with increased numbers of others seeking the same amenities and the same ideal space. The dilemma in this **evolutionary process** is that the *Arcadian* site is then transformed into a living space that becomes reminiscent of the site-of-origin that the migrants left behind. Thus, there is the potential for the FANBY process to begin again. Power (1996) described the process:

> "The phenomenon of economic activity following and supporting people as they relocate is not necessarily positive change. At the extreme, it represents the **Daniel Boone syndrome**: people abandon the decaying urban areas of the Northeast for the fresh environments of California, which

> they proceed to "trash" before fleeing to the Pacific Northwest and from there, to the small towns of the inland West. One can interpret such shifts as a collective shunning of the social problems associated with modern urban living. ***Rather than confronting and solving problems, people move on and spread them.***" (Emphasis added)

Without a *sustainable philosophy* to guide individuals and communities in growth and land-use planning, many who select ideal retirement areas often experience a reduction in the quality-of-life indicators and the problems of unchecked growth and development have followed the older migrants to their new *Arcadian* destinations. In the never-ending quest for Arcadia (FANBY), humans are in danger of not only permanently transforming natural landscapes, but also disconnecting themselves from any degree of responsibility to the land or to their community of citizens (see Romme, 1997). In order to accommodate the influx of new arrivals, many natural environments are also targeted as space for new building developments. This encroachment process of sprawl leads to difficult decisions regarding the limitation of development and implementing land-use planning. Hays (1998) has addressed the issues of limited space and overuse in the following statement:

> "The process of suburbanization and the search for leisure and recreational experience in more natural surroundings reflect the desire to seek a higher quality of space, where natural forces are more in evidence than in developed and congested areas of settlement. In both cases the initial search for quality of space soon becomes threatened by others who seek the same amenities. At some point the experience of "too many" begins to take shape, and the concept of the carrying capacity of the land, air and water begins to form. This generates the belief that overuse can destroy the resource that one wishes to enjoy and leads to a sense of limits. If space is encroached upon by development there is less space as natural environment."

Natural environments *that are protected* from development are also vulnerable to increased human encroachment in the form of over-loading and heavy usage as recreational and/or tourist areas. Power (1996) has also made this an issue in his research on "lost landscapes and failed economies":

> "Herds of tourists can degrade the very landscape or culture to which they are drawn. America's national parks are a good example of this phenomenon. To cope with crowds, roads, lodgings and services can lead to water and air pollution as well as disrupt the landscape and its wildlife. When resort towns (or gateway communities) take off, surrounding **open space** tends to get swallowed up by condominium developments, "trophy" homes, golf courses, shopping malls and trailer parks. All of these come at a cost to the natural and cultural environments. Wildlife habitat is fragmented. The flow of effluents into the environment rises. The landscape that once drew people

> to the area is loved to death. Some natural areas are very fragile ecosystems that can tolerate only little human use."

As discussed earlier, many elderly migrants may use the tourist experience as a precursor to assist in the decision-making process toward permanent relocation (see Bennett, 1996; Longino, 1995). After moving to the new location, these new residents are a part of the pressure placed on local natural environments. This is not an indictment on any one age group as the culprit in creating the sprawl pattern, but there is a need to examine more closely the impact of retirement communities on natural environment resources, especially in the context of an aging society. Retirement communities, especially the ones that offer recreational opportunities, and are in relative proximity to public and private open space, and located in favorable climates offer a **microcosm** to examine the impact of a concentrated demographic population in a specific geographic area. In effect, I am proposing more research effort in the area of aging and environmental impact—in addition to and beyond the dominant template of examining economic factors and consequences (see Crown and Longino, 1991; Fagan and Longino, 1993). Rowles and Watkins (1993) have provided one of the foundational studies that broadened the scope of the impact of elderly migration beyond the economic focus and into the social and environmental domains. Bennett (1996) also considered the impact of retirement communities on environmental resources, but on a limited scale.

Similar to Bennett (1996), Rowles and Watkins (1993) and Stroud (1995) found that the impact of recreational and retirement land development can be both positive and negative. For example, Stroud (1995) identified several positive outcomes such as putting to use land that might otherwise be marginally productive, thereby boosting rural economies by generating new tax revenues and consumer sales, stimulating the housing construction industry and providing recreational opportunities. However, Stroud (1995) proposed that the *negative impact* of these projects can far outweigh any positive benefits, especially if these developments are poorly planned and designed resulting in environmental damage, social and economic problems and overtaxing of public services. Stroud (1995) indicated that there are serious problems when amenity-seeking populations move into areas when the natural environment represented by ecologically sensitive areas and where there are few land-use regulations in place. Stroud states:

> "Much of the serious impact of recreational subdivisions can be linked to their development methods and their location. Unfortunately, these subdivisions are concentrated in ecologically fragile locations, in places with aesthetically pleasing features, or in places that can be promoted for their amenities. One of the worst aspects of recreational land developments is the environmental degradation it creates in water and air resources, fish and wildlife habitat, and the aesthetic quality of large tracts of land. In addition, it creates erosion and siltation and solid waste disposal problems."

Stroud (1995) also corroborated many of the concerns that Bennett (1996), Hays (1998), Howe et al., (1997), Power (1996) and Romme (1997) have discussed in relation to changes in the ecology of the landscape due to the impact of rapid growth and development in retirement hot spot areas:

> "Recreational subdivision is concentrated in some of the nation's most aesthetically pleasing landscapes. The construction of a dense network of roads and the removal of vegetation for construction can destroy a marsh vista, intrude upon a skyline, scar a mountainside and totally disrupt the aesthetic quality of a region. Aesthetic disruption can range from the invasion of a wilderness by development to what Nantucket Islanders call loss of "charm," as small villages are transformed by growth and development (Stroud, 1995).

When many people are searching for Arcadia, discover it, and then decide to move to it, the Arcadian site is inevitably and irrevocably transformed into a "pseudo-rural landscape" (see Romme, 1997) with rapid growth and development and suburban sprawl (see also Bennett, 1996; Gersh, 1996). People find Arcadia, but over time, it can lead to "paradise lost" (see Davis, 1998; Schrag, 1998). Romme (1997) described this process, which is common in many regions of the southwestern U.S., in a geographic area in southwestern Colorado (La Plata County):

> "The present uncontrolled pattern of growth in the mountain West can be viewed as a modern "tragedy of the commons." The "commons" are resources that are used by all members of the community but are owned and protected by no one. In this sense, the commons in La Plata County consist of the sense of open space, unobstructed views, **biodiversity**, and a rural pace of life—all of which attract people to this beautiful region. At the moment, because each person is pursuing his or her own self-interest without regard for the needs of the whole community, we are rapidly and probably irreversibly destroying the things that make this part of the West a unique and satisfying place to live. The government by itself cannot prevent a tragedy of the commons. Ultimately, a great deal of responsibility falls on individual people, land owners, land developers, realtors, purchasers of new homes and others—to make individual decisions about what they do with the land that enhance and *sustain the whole community* rather than degrade it. *That community… would be recognized as including the plants, animals, soils and waters as well as the human residents and visitors."* (Italics added)

The "tragedy of the commons" has been identified throughout the U.S. (Power, 1996), in the Rocky Mountain region (Wright, 1993), specifically with Colorado's "Front Range" (see McCormick, 1998), Utah's Wasatch Front and "Wasatch Back" (see Ringholz, 1996), and in many of the gateway communities that are located near public lands (see Howe et al., 1997). For example, Bennett (1996) notes in his research:

> "The serenity and beauty of these nonmetropolitan areas has been the primary factor leading retirees to settle here (South Atlantic coastal region). Yet, over the course of their retirement years, they have witnessed such an explosion of tourism and population growth that traffic usually has far outrun road improvements. In addition, these new developments and roads have often had negative environmental impacts. Thus, the natural beauty that initially attracted them to the area has been sacrificed."

What the general public *may not* appreciate is that even if the scenic beauty is preserved and the recreational opportunities maintained, the ecological health and integrity of the biotic communities may be in jeopardy due to human activities within and around vita environmental resources. What is missing from discussions at the local, community, regional and national level is the general impact of an aging population and in particular, the demographic trends for migrant retirees to specific geographic areas of the U.S. and the resulting effects on the *natural environment* or "natural capital" (see Prugh, 1995). There is a need to consider moving the "national conversation on aging" beyond the economic, utilitarian "market perspectives" and **anthropocentric** framework, and into other areas of dialogue that include ethical duties, morals and values toward the natural environment. The fact that gerontologists need to better understand environmental issues is ironic *because it is the natural environment* that serves as not only the fundamental context for human life, but is also the primary amenity that developers use to market and attract older adults. It appears that *nature itself* is a very important criteria in determining where many seniors will relocate.

Perhaps one of the most powerful strategies to reduce environmental impact in these Arcadian communities is to prevent sprawl and the ills of urbanization from ever emerging (Gersh, 1996; Moe and Wilkie, 1997; Platt, Rowntree, and Muick, 1994). In other words, sustainability practices should begin in the cities and urban areas so that the very quality-of-life amenities that people seek "somewhere else" can be found right in their backyard, if only there was the commitment and dedication to keep it that way. The process of FANBY is certainly a strong motive for many older adults to search for *Arcadia*, but in an aging society we will need to discuss the implications of rebuilding communities in the age of sprawl, and how to address the sustainability of existing communities, instead of constantly searching for new ones. Bennett (1996) described migrant retirees' efforts to control further deterioration in the following way:

> "With adequate planning, much of the environmental damage could have been avoided. The high-income, well-educated retirees have increasingly become an influence in local government by serving on appointed committees. Some have been elected to county and municipal offices in order to try to solve traffic problems, to keep taxes from skyrocketing, and to prevent further environmental deterioration. They are more aware of the importance of the natural beauty of the area in attracting retirees and are thus more committed to balancing economic

development with environmental preservation. Although some of the retired migrants would like to "pull up the bridge behind them," most realize that both resort and retirement developments are likely to continue in these areas. But they insist that this must be accompanied by sound environmental planning."

Endnotes

[1] The title of this paper is inspired by the work of Evan Eisenberg (1998) who captured the historical essence of the human quest for the "*middle landscape*"—the mean between the ideal city (El Dorado) and the ideal wilderness (Eden)—which is represented by "*Arcadia*"—a term reflecting the desire to search for and find a geographic landscape that captures the selected qualities of both *nature and culture*. In *Arcadia*, the bridge between humanity and nature is established with ideal pastoral settings, and in contemporary U.S. this is typically made manifest through the dwelling space of small town suburbia, exurbs, or "gateway communities." These idyllic communities are often promoted and marketed as prime location sites that feature quality of life *amenities* such as recreational and leisure opportunities, scenic beauty, cultural opportunities, less congestion from traffic, minimal construction activities and favorable climatic patterns. The pastoral landscape is what the Romans called a *locus amoenus*, an "agreeable place" (with the word "amenities" from *amoenus*; see Wills, 1998). Many of these communities are in close proximity to federal and state public lands that are represented by parks, forests, rangelands, monuments, and acreage designated as "wilderness" or protected "green space" (see Culbertson, 1997; Howe et al., 1997). Sites that reflect the ideal of *Arcadia* are also typically surrounded by large tracts of private property that create "open spaces" in the traditional suburban and newer "exurbs." These natural environments are primary attractions for both tourists and people wishing to relocate and become permanent residents in proximity to such high quality environmental conditions. A significant number of elderly relocate in their retirement years and migrate to community settings that offer amenities reflective of an Arcadian middle landscape.

There is a need to more closely examine the evolutionary process of Arcadian sites before, during, and after significant development and growth takes place because, over time, the influx of more people and construction at the Arcadian site, due to its popularity, transforms it into a landscape with less amenities than before and places continued stress on the natural environment and its resources.

[2] In this context, "commons" refers to natural resources (or "natural capital," see Prugh, 1995) to which a large number of people have access (see Dietz et al., 2002). Boyce (2001) uses the interchangeable term of "natural assets." For further discussion in relation to privatization and fragmentation of the "commons," see Freyfogle (2003).

[3] Dasgupta (2001) elaborated on the notion of "ecosystem services," "Producing as it does a multitude of ecosystem services, a large part of what the natural environment offers us is a necessity. The services include maintaining a genetic library, preserving and regenerating soil, fixing nitrogen and carbon, recycling **nutrients**, controlling floods, filtering pollutants, assimilating waste, pollinating crops, operating the hydrological cycle and

maintaining the gaseous composition of the atmosphere. A number of services filter into a global context, but many are local."

[4] Amundson (2003) offers additional insight to the profile of "young-old and restless" aging Baby Boomers and lifestyle preferences. He proposes that for many Boomers there is a cult following of the concepts of "strenuosity" and "**primitivism**." "With dual-incomes and smaller families providing discretionary spending money, suburban Baby Boomer couples had the time, money and location to take up the new sport (e.g., mountain-biking). In addition, more and more of them participated in an active lifestyle to gratify ideas of self-presentation and to overcome inadequate satisfaction, in work, consumption and personal relationships." I also recommend Wrobel (2002) for a historical review of the promotion, memory and creation of the American West.

References

Amundson, M. 2003. Yellowcake to singletrack: Culture, community and identity in Moab, Utah. In *Imagining the big open: Nature, identity and play in the New West,* by L. Nicholas, E. Bapis and T. Harvey (Eds.), 151-162. Salt Lake City, UT: The University of Utah Press.

Bennett, G. 1993. Retirement migration and economic development in high-amenity, nonmetropolitan areas. J*ournal of Applied Gerontology* 12: 466-481.

Bennett, G. 1996. Implications of retirement development in high-amenity nonmetropolitan coastal areas. *The Journal of the Applied Gerontology* 15: 345-360.

Boyce, J.K. 2001. From natural resources to natural assets. *New Solutions* 11: 267-288.

Brooks, D. 2004. *On paradise drive. How we live now (and always have) in the future tense.* New York, NY: Simon and Schuster.

Carlson, J, V. Junk, L. Fox, G. Rudzitis and S. Cann. 1998. Factors affecting retirement migration to Idaho: An adaptation of the amenity retirement migration model. *The Gerontologist* 38: 18-24.

Clark, D., T. Knapp and N. White. 1996. Personal and location-specific characteristics and elderly interstate migration. *Growth and Change* 27: 327.351.

Coughlin, J.F. 1999. "Technology needs of aging boomers." *Issues in Science and Technology,* Fall 1999. *http://www.issues.org/issues/16.1/coughlin.htm*).

Crown, W. and C. Longino. 1991. State and regional policy implications of elderly migration. *Journal of Aging and Social Policy* 3(1-2): 185-207.

Dasgupta, P. 2001. *Human well-being and the natural environment.* New York, NY. Oxford University Press.

Davis, C. 1997. *Western Public Lands and Environmental Politics.* Boulder, CO: Westview Press, Harper Collins Publishers.

Davis, M. 1998a. *The Ecology of Fear.* New York, NY: Metropolitan Books, Henry Holt and Company.

Davis, M. 1998b. Las Vegas versus Nature. In *Reopening the West,* by Hal K. Rothman (Ed.). Tucson, AZ: The University of Arizona Press.

Dietz, T., N. Dolsak, E. Ostrom and P. Stern. 2002. The Drama of the commons. In *The Drama of the Commons,* by E. Ostrom, T. Dietz, N. Dolsak, P. Stern, S. Stonich and E. Weber (Eds.), Washington, DC: National Academy Press.

Eisenberg, E. 1998. *The Ecology of Eden.* New York, NY: Alfred A. Knopf.

Fagan, M. and C. Longino. 1993. Migrating retirees: A source for economic development. *Economic Development Quarterly* 7: 98-106.

Frey, W. and R. DeVol. 2000. "America's demography in the new century; Aging baby-boomers and new immigrants as major players." Policy Brief presented at the Milken Institute, Santa Monica, CA, March 8, 2000.

Freyfogle, E. 1998. *Bounded people, bounded lands: Envisioning a new land ethic.* Washington, DC: Island Press/Shearwater Books.

Gersh, J. 1996. Subdivide and conquer: Concrete, Condos and the second conquest of the American West. *The Amicus Journal* Fall: 14-20.

Haas, W. and W. Serow. 1993. Amenity retirement migration process: A model and preliminary evidence. *The Gerontologist* 33: 212-220.

Hass, W. and W. Serow. 2002. The baby boom, amenity retirement migration, and retirement communities: Will the golden age of retirement continue? *Research on Aging* 24: 150-164.

Hays, S. P. 1998. *Explorations in Environmental History.* Pittsburgh, PA: University of Pittsburgh Press.

Hobbs, F.B. and B.L. Damon. 1996. *65 + in the United States.* Current Population Reports, Special Studies P-23-190. Washington, DC: U.S. Government Printing Office.

Howe, J., E. McMahon and L. Propst. 1997. *Balancing nature and commerce in gateway communities.* Washington, DC: Island Press.

Longino, C. 1989. Migration demography and aging. *Gerontology Review* 2(1): 65-76.

Longino, C.F. 1990. Geographic distribution and migration. In *Handbook of Aging and the Social Sciences,* by R.H. Binstock and L.K. George (Eds.), 3rd Edition, 45-63. San Diego, CA: Academic Press.

Longino, C.F. 1995. *Retirement Migration in America.* Houston, TX: Vacation Publications, Inc.

Longino, C.F. 1998. Geographic Mobility and the Baby Boom. *Generations,* 22, 60-64.

Longino, C. and V. Marshall. 1990 North American research in seasonal migration. *Aging and Society* 10: 229-235.

Longino, C.F., A. Perzynski and E. Stoller. 2002. Pandora's briefcase: Unpacking the retirement migration decision. *Research on Aging* 24: 29-49.

McCormick, K. 1998. Home, Home on the Ranchette (last ditch efforts to keep Colorado's Front Range from looking like everyplace else). *Planning (APA)* 64(2): 4-8.

Munnell, A. 2004. Population aging: It's not just the baby boom. *An Issue in Brief, Center for Retirement Research at Boston Collage* April (16).

Newbold, K. 1996. Determinants of elderly interstate migration in the United States, 1985-1990. *Research on Aging* 18: 451-476.

Platt, R., R. Rowntree and P. Muick. 1994. *The Ecological City: Preserving and Restoring Urban Biodiversity.* Amherst, MA: The University of Massachusetts Press.

Power, T.M. 1996. *Lost Landscapes and Failed Economies: The Search for Value of Place.* Washington, DC: Island Press.

Prugh, T. 1995. *Natural Capital and Human Economic Survival.* Solomons, MD: ISEE Press.

Rasker, R and A. Hansen. 2000. Natural amenities and population growth in the greater Yellowstone region. *Human Ecology Review* 7(2): 30-40.

Ribesame, W.E. and J. Robb. 1997. *Atlas of the American West: Portrait of a Changing Region.* New York, NY: Center of the American West, W.W. Norton & Company.

Ringholz, R. 1996. *Paradise paved: The challenge of growth in the New West*. Salt Lake City: UT: The University of Utah Press.

Rowles, G. and J. Watkins. 1993. Elderly migration and development in small communities. *Growth-and-Change* Fall 24(4): 509-538.

Romme, W.H. 1977. Creating Pseudo-Rural Landscapes in the Mountain West. In *Landscape Ecology*, by Joan Iverson Nassauer (Ed.). Covelo, CA: Island Press.

Rothman, H. (Ed.), 1998. *Reopening the American West*. Tucson, AZ: The University of Arizona Press.

Rowles, G. and J. Watkins. 1993. Elderly migration and development in small communities. *Growth and Change* 24(4): 509-538.

Savageau, D. 1995. *Retirement Places Retired*. 4th Edition. New York, NY: MacMillan–Simon & Schuster.

Schrag, P. 1998. *Paradise Lost: California's Experience, America's Future*. New York, NY: The New Press.

Serow, W. 1990. Economic implications of retirement migration. *Journal of Applied Gerontology* 9(4): 452-463.

Stern, K. 1997. *50 Fabulous Places to Retire in America*. 2nd Edition. Franklin Lakes, NJ: Career Press.

Stroud, H. 1995. *The Promise of paradise: Recreational and retirement communities in the United States since 1950*. Baltimore, MD: Johns Hopkins University Press.

Tonn, B., G. Waidley and C. Petrich. 2001. The aging U.S. population and environmental policy. *Journal of Environmental Planning and Management* 44: 851-876.

U.S. Bureau of the Census. 1996. *Population Projections for States by Age, Sex, Race, and Hispanic Origin: 1995 to 2025*. PPL-47. Washington, DC: U.S. Bureau of the Census, Population Division.

U.S. Bureau of the Census. 1998. *Demographic Components of Population Change: July 1, 1996 to July 1, 1997, and Population Change: April 1, 1990 to July 1, 1997*, St-97-2. Washington, DC: U.S. Bureau of the Census.

Valerio, C. 1997. *Elderly Americans: Where they choose to retire*. New York, NY: Garland Publishing.

Wheeler, W. 1995. *Elderly Residential Experience: The Evolution of Places as Residences*. New York, NY: Garland Publishing.

Wills, G. 1998. The Real Arcadia. *The American Scholar* 67(3): 15-27.

Wright, S. 1998. The American west: Sustainable communities at the crossroads. *Sustainable Communities Review* 2: 32-36.

Wright, S. 1999. The FANBY dynamic: the potential and future of retirement "hot spots" in the West. *Sustainable Communities Review* 3: 6-11.

Wright, S. and D. Lund. 2000. Gray and Green?: Stewardship and sustainability in an aging society. *Journal of Aging Studies* 14: 229-249.

Wright S. 2001. Environmental policy making. *Sustainable Communities Review* 4: 56-57.

Wright, S., M.Caserta, and D. Lund. 2004. Older adults' attitudes, concerns, and support for environmental issues in the "New West." *International Journal of Aging and Human Development* 57: 153-181.

Wrobel, D. 2002. *Promised lands: Promotion, memory, and the creation of the American West*. Lawrence, KS: The University of Kansas Press.

Introduction: The Built Environment

Patricia Bradley
U.S. Environmental Protection Agency

This section focuses on the built environment. Human use of land alters the structure and functioning of ecosystems, and it alters how ecosystems interact with the atmosphere, with aquatic systems, and with surrounding land. Impacts include habitat loss and fragmentation and degradation of water resources and water quality. Building on undeveloped land destroys and fragments habitat, displacing or eliminating wildlife communities. An increase in the amount of impervious surfaces (e.g., roads, buildings, parking lots) leads to the degradation of water quality by increasing runoff volume, altering regular stream flow and watershed hydrology, reducing groundwater recharge and increasing erosion, stream sedimentation and water acidity. Unsustainable development may also result in freshwater scarcity (a major issue in the western U.S. and an emerging issue elsewhere). Aging Americans rely heavily on the amenities of the modern built environment.

Preparing for an aging society is closely linked to Smart Growth, Sustainable Development and Restorative Development, as the location, configuration and scale of homes and communities within a watershed can change risks to wildlife and environmental sustainability. Communities will need to consider the social and environmental amenities required by the aging society and how changes in the demand for these amenities will introduce new and additional environmental stressors or influence the temporal and spatial aspects of existing stressors. As the aging population grows, key questions include:

- How will the aging population impact demand for housing, health care, recreation and transportation?
- What stressors are associated with this demand?
- What infrastructure issues must communities address to prepare for dramatic increases in their aging populations?
- Are there any stressors unique to the aging population?

Impacts of Our Built Environment on Public Health

Allen Dearry

National Institute of Environmental Health Sciences
National Institutes of Health

Allen Dearry is associate director for Research Coordination, Planning and Translation, NIEHS.

We spend more than 90% of our lives indoors (National Research Council [NRC], 1981), yet we know much more about **ambient** environmental factors and health than we do about the "built environment" and health. Conceptually, the built environment includes all of the physical structures engineered and built by people—the places where we live, work and play. These edifices include our homes, workplaces, schools, parks and transportation systems. How we design and build where we live has changed dramatically over the past century. In the early 1900s, urban areas tended to be compact and communities were walkable, with a central business district and a mix of housing and services. Then, connections between urban design and health and disease were more clearly recognized and planners and public health practitioners often worked together to deal with problems related to poor sanitation and housing conditions. Increasing movement away from such urban locales over the last 50 years led to lower-density developments, segregation of land uses and extensive roadway construction. Today, this trend, sometimes referred to as "urban sprawl," is characterized by huge increases in urbanized land area and **vehicle miles traveled** (USEPA, 2001a). These changes have both direct and indirect impacts on our environment and on public health.

Changes in land-use and development patterns have contributed to habitat loss and declining water resources and quality (Soule, 1991; USEPA, 1992). Increases in impervious surfaces and attendant **surface water** runoff contribute to deterioration in availability and use of safe, clean water supplies for both recreation and consumption. For example, suburban development is associated with a rising load of **polycyclic aromatic hydrocarbons** in nearby surface water (Van Metre et al., 2000).

Increases in vehicle travel affect our environment and our health in multiple fashions. As neighborhood density decreases, vehicle miles traveled (VMT) increase (Holtzclaw et al., 2002). With more driving comes more vehicle crashes as well as pedestrian injuries and fatalities. Moreover, further VMT contribute to overall releases of air pollutants (Kennedy and Bates, 1989), which are associated with numerous adverse health outcomes (Samet et al., 2000). Additionally, **carbon dioxide** and other vehicle emissions contribute to accumulation of **greenhouse gases** in the atmosphere (USEPA, 2001b), which may ultimately impact public health by affecting the transmission and

spread of **infectious diseases** (Epstein, 2000). Our built environment also affects individual mental health as well as population-wide well-being. Housing type and quality, neighborhood quality, noise, crowding, indoor air quality and light have all been linked to personal mental health (Evans, 2003). Indirectly, the built environment may influence development and maintenance of socially supportive networks within a community. Higher levels of this type of "social capital" are associated with lower levels of morbidity and mortality (Kawachi et al., 1999). Although the connection between the built environment and social capital remains to be well established, both **walkability** and **mixed use** of neighborhoods have been reported to be related to an enhanced sense of community and social capital (Glynn, 1981; Nasar and Julian, 1995).

Perhaps the most recently publicized link between the built environment and public health relates to the occurrence of overweight and obesity in the U.S. The built environment influences weight management by affecting both food intake and energy expenditure. Communities characterized by less-dense development are associated with more vehicle travel and less walking and biking than are more densely developed communities (Frank and Pivo, 1995). Physical activity has been shown to have a salubrious effect on health and quality of life (Lee and Paffenbarger, 2000). However, only recently have investigators expanded such work to address more specifically the impact of community design not only on physical activity but also on obesity and associated **comorbidities**. One study reported that, after controlling for individual differences, those living in sprawling counties are more likely to walk less in their leisure time, weigh more and have a greater prevalence of **hypertension** than those living in more compact places (Ewing et al., 2003). Similarly, a more walkable environment has been found to be associated with higher physical activity and lower obesity levels (Salens et al., 2003). In addition, the likelihood of obesity apparently declines with increases in mixed land-use, but rises with increases in time spent in a car per day (Frank et al., 2004). To date, such work addresses important relationships but does not establish **causation**. In fact, Frank et al. (2004) pointed out that mixed land-use, while being the most important variable of the built environment related to obesity, may not exert its effect via physical activity. Hence, significant methodologic and **etiologic** research remains to be conducted to clarify such issues.

The built environment may also play a role in controlling weight by shaping food access and availability. Recent research suggests that supermarkets are more likely to be located in wealthier and predominantly white areas and that fruit and vegetable intake is positively associated with the presence of a supermarket, even after controlling for personal **socioeconomic factors** (Morland et al., 2002a, 2002b). Although the relationship between different types of eating places and dietary consumption has not been well examined, the availability, type and distribution of restaurants and the diffusion of food advertising represent other means by which the environment may affect weight **homeostasis**.

Additional research will be necessary to enable us to understand the complicated pathways and intersections linking community design, transportation and a variety of health outcomes. Such information will permit us to develop communities that promote health for both people and ecosystems rather

than dealing with the health-damaging repercussions of a poorly designed built environment (Srinivasan et al., 2003). In pursuit of this goal, it will be important to reestablish the unity of health practitioners and public planners—not only to carry out needed research at the interface of these disciplines but also to ensure that the results of such research are properly translated and applied in order to lead to tangible improvements in our living arrangements and in public health.

References

Epstein, P. 2000. Is global warming harmful to health? *Scientific American* 283: 50-57.

Evans, G.W. 2003. The built environment and mental health. *Journal of Urban Health* 80: 536-555.

Ewing, R., T. Schmid, R. Killingsworth, A. Zlot, S. Raudenbush. 2003. Relationship between urban sprawl and physical activity, obesity, and morbidity. *American Journal of Health Promotion* 18: 47-57.

Frank, L. and G. Pivo. 1995. Impacts of mixed use and density on utilization of three modes of travel: single-occupant vehicle, transit, and walking. *Transportation Research Record* 1466: 44-52.

Frank, L., M. Andresen, and T. Schmid. 2004. Obesity relationships with community design, physical activity and time spent in cars. *American Journal of Preventative Medicine*, 2004. (June 29, 2004: *http://www.ajpm-online.net/webfiles/images/journals/amepre/special.pdf*).

Glynn, T. 1981. Psychological sense of community: measurement and application. *Human Relations,* 34: 789-818.

Holtzclaw, J., R. Clear, H. Dittmar, D. Goldstein, and P. Haas. 2002. Location efficiency: neighborhood and socioeconomic characteristics determine auto ownership and use–studies in Chicago, Los Angeles, and San Francisco. *Transportation Planning and Technology* 25:1-27.

Kawachi, I., B. Kennedy and R. Wilkinson (Eds.). 1999. *Income Inequality and Health.* New York, NY. The New Press.

Kennedy, D. and R. Bates (Eds.). 1989. *Air Pollution, the Automobile, and Public Health.* Washington, DC: National Academy Press.

Lee, I. and R. Paffenbarger. 2000. Associations of light, moderate, and vigorous intensity physical activity with longevity: the Harvard Alumni Health Study. *American Journal of Epidemiology* 151: 293-299.

Morland, K., S. Wing, A. Diez-Roux, and C. Poole. 2002a. Neighborhood characteristics associated with the location of food stores and food service places. *American Journal of Preventative Medicine* 22: 23-29.

Morland, K., S. Wing and A. Roux. 2002b. The contextual effect of the local food environment on residents' diets: the Atherosclerosis Risk in Communities Study. *American Journal of Public Health* 92: 1761-1768.

Nasar, J. and D. Julian. 1995. The psychological sense of community in the neighborhood. *Journal of the American Planning Association* 61: 178-184.

National Research Council. 1981. *Indoor Air Pollutants.* Washington, DC: National Academy Press.

Salens, B., J. Sallis, J. Black and D. Chen. 2003. Neighborhood-based differences in physical activity: an environment scale evaluation. *American Journal of Public Health* 93: 1552-1558.

Samet, J., F. Dominici, F. Curriero, I. Coursac and S. Zeger. 2000. Fine particulate air pollution and mortality in 20 U.S. cities, 1987-1994. *The New England Journal of Medicine* 343: 1742-1749.

Soule, M. 1991. Land use planning wildlife maintenance. Guidelines for conserving wildlife in an urban landscape. *Journal of the American Planning Association* 57: 313-323.

Srinivasan, S., L. O'Fallon and A. Dearry. 2003. Creating healthy communities, healthy homes, healthy people: initiating a research agenda on the built environment and public health. *American Journal of Public Health* 93: 1446-1450.

U.S. Environmental Protection Agency. 2001a. *Our Built and Natural Environments.* USEPA 231-R-01-002, Washington, DC: U.S. Environmental Protection Agency, Development, Community and Environmental Division.

U.S. Environmental Protection Agency. 2001b. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-1999*, USEPA 236-R-01-001. Washington, DC: U.S. Environmental Protection Agency, Office of Atmospheric Programs.

U.S. Environmental Protection Agency. 1992. *Environmental impacts of storm water discharges–a national profile*, USEPA 841-R-92-001. Washington, DC: U.S. Environmental Protection Agency, Office of Water.

Van Metre P, Mahler B, Furlong E. 2000. Urban sprawl leaves its PAH signature. *Environmental Science and Technology*, 34: 4064-4070.

Baby Boomers' Opinions and Preferences on Retirement, Health and Fitness, Financial Preparedness and Active Adult Living Communities

David G. Schreiner
Pulte Homes, Inc.
(Written by Kent Thornton, FTN Associates)

Background

Pulte Homes is a **publicly-owned company** that specializes in developing active adult, lifestyle centered, communities. In 2001, Pulte Homes merged with Del Webb Corporation to become the largest home developer in the U.S., building about 12,000 homes a year. Pulte Home communities have been developed in 45 municipalities throughout the U.S., with additional communities being planned. The first Del Webb community, Sun City, AZ, was developed in the 1960's and has served as a model for the development of active adult communities. Pulte Homes recently received the J.D. Power and Associates Platinum Award for Excellence in Customer Satisfaction among the largest home-builder corporations.

Pulte Homes focuses on home market sector for adults in the 50-70 age bracket. About one quarter of all homes purchased each year are bought by individuals 50 years or older. The two most significant trends in the housing market are immigrant home buyers and home buyers over 50 years of age.

Active Adult Attributes

The terms, "elder," "older," "aging," are not used by Pulte. Their customers consider themselves active adults and are interested in a live-work-play setting. These individuals have evolved socially, physically, and financially, are time-rich, and are interested in maintaining their social, physical, and financial status. As part of our emphasis on customer satisfaction, we interview about 100 couples living in our active adult communities each year. About 3 hours are spent with each couple. Based on over 500 interviews, some of the attributes or characteristics we have identified with active adults are:

Social Attributes

Active adults are characterized as being happy and optimistic. They are time-rich and interested in volunteering to improve their environment. Many of the residents of our communities do not have children living with them any longer and have selected their lifestyle by choice.

Physical Attributes

Active adults no longer have the stamina or physical strength of their earlier years, but they are interested in maintaining their health so they can continue to enjoy their

lifestyle. Their eye sight is not as acute, nor are their reflexes as quick as in their earlier years. These, of course, are some of the natural processes associated with aging.

Financial Attributes

Nearly all of our active adults previously owned homes before moving to our communities. In general, their finances have moved from an income base to **asset management**. Homes represent a lifelong investment or asset. Because of the emphasis on asset management, there is a bias against any additional expenditures.

Concerns

The two greatest fears of these active adults are a **debilitating disease** and outliving their income or financial assets. These two fears, and their interest in sustaining their social, physical, and financial status are considered in the designing and planning of every Pulte active adult community.

Satisfying the Need

Pulte Homes is driven not only to satisfy customer needs, but also to provide equitable returns on the investment of its shareholders. The social, physical, and financial desires of its community residents, therefore, are used in designing and sustaining its communities.

Pulte Home communities are designed around sidewalks and golf courses. Both sidewalks and golf course offer recreational and physical exercise opportunities. The communities are buffered from highways, both for safety and for noise and air quality. Natural amenities, particularly water features, are also designed into these communities because these features are desired, aesthetically pleasing and add to property values. However, wherever possible, these water features are also designed to address **stormwater** runoff, **recycling** and **reuse** of wastewater and similar regulatory issues. Wetland creation contributes to environmental amenities on golf courses and within the community. Wetlands can be used to reduce stormwater flooding and improve stormwater quality, as well as serve to attract marsh and wetland birds for bird watching.

Efficient service delivery is an important design criteria. Managing energy, water and wastewater effectively and efficiently reduces the cost to individual homeowners, which is important for fixed income families. In general, active adult homes use less water and generate about one-third less wastewater than an average family dwelling so efficiencies can be obtained in treatment plant design.

The physical attributes of active adults are designed into each home. For example, only **lever fixtures**, no knobs, are used on doors so that wrist rotation is not required. Wall outlets are raised so that you do not have to bend to plug in lights or appliances. Every change in elevation within a home, such as going up or down steps is accommodated by transitioning from one floor covering to another, such as from hardwoods to carpets, or carpet to tile, so the change in height of the floor is evident.

Internet access, educational opportunities and classes and volunteer organizations are an integral part of all active adult communities. These individuals are time-rich and want to make a difference in environmental conservation, **stewardship** and restoration. Many communities have active programs in these three areas, including recycling electronic equipment, managing stormwater

and recreational lakes, and periodic litter pick-up days. **Stream re-meandering** was accomplished in one community, while wetland creation, and stream maintenance were projects undertaken by the Property Owners Association in other communities.

Pulte Homes is interested in participating and learning more about the effects of aging populations on the environment, as well as the complementary research project to evaluate the effects of the environment on aging populations. It's good for our communities; it's good for business.

Introduction: Regional Case Studies

Patricia Bradley[1] and Eric Walbeck[2]

[1]U.S. Environmental Protection Agency and
[2]Perot Systems Government Services

Case studies are used to present a holistic approach to aging and the environment. Case study research is a time-honored, traditional approach to the study of topics in social science and management. The purpose of the workshop case studies is to highlight successful approaches to an aging society (and the environment overall) and encourage meaningful dialog between scientists, managers, developers and other interested parties.

One of the reviewers pointed out that "net domestic immigration is out of central cities for all age groups," which is confirmed by New York's experience. But, another significant finding from the New York manuscript states, "The frail elderly tend to move back to New York for family and services."

American Native communities continue to honor and cherish their elders as important contributors to society. One such elder, Stanley Paytiamo, described the Pueblo of Acoma's environmental vision for the future. This vision is based on the well-being of all of the Acoma people and their non-Indian neighbors, not just the aging.

An ancient American Indian Proverb states:

Treat the Earth well.
It was not given to you by your parents,
It was loaned to you by your children.
We do not inherit the Earth from our Ancestors,
We borrow it from our Children.

New York State's Project 2015: Preparing for the Impact of an Aging, Diverse Population

Neal Lane
New York State Office for the Aging
(Written by Jennifer Rosenbaum)

Background

We are all becoming aware that the demographic profile of the U.S. is changing significantly. An increasingly older and more diverse population will have major impacts on the services, products, constituency make-up and day-to-day work of government, community agencies and business—presenting both challenges and opportunities for public policy makers, planners, and business and community leaders. How will we prepare for the impact of the population changes we will face in the future?

To address this question, the New York State Office for the Aging (**NYSOFA**) began Project 2015 in late 1998, forming a partnership with the State Society on Aging of New York to write a series of articles and briefs, looking at the impact of the anticipated increase in the number of older people within "aging issue areas"—such as housing, long-term care, nutrition, health, caregiving, transportation, retirement, and several other issue areas. We focused on the impact of the aging of the Baby Boomer cohort; our intent was to raise awareness of this impact, and to start a discussion around New York State about these impacts. The outcome of this effort was the publication of a document, entitled: "Project 2015: The Future of Aging in New York State: Articles and Briefs for Discussion" (NYSOFA, 2000). NYSOFA used this publication as the basis for discussions and forums across New York State.

Through these discussions, we realized that we needed to broaden our approach and look at the more complex, dynamic effect of "major demographic changes" on all age groups, on all sectors of our communities, and on communities overall, which led to the next phase of Project 2015.

In 2002, the NYSOFA designed Project 2015 as a future-oriented planning initiative to enable multiple state agencies to consider the impact of our aging, increasingly diverse population. At the direction of Governor George E. Pataki, 36 New York State agencies were guided through Project 2015, an ongoing process in planning and preparing for the future.

For this new phase of the initiative, New York took the issue of aging and broadened it, to look at the impact of the overall aging of the population on all age groups and on all sectors of the community and state. We still wanted to look at "increasing numbers

of older people," which is certainly a major demographic change, but also to look at the overall aging of our population and its cross-cutting impact on all sectors and age groups within our communities.

New York State also recognized that there would be significant impacts on communities from several aspects of diversity that are significant and increasing: foreign immigration, migration patterns of different groups into and out of the state, ethnic and racial diversity, non-traditional family structures and various population groups with disabilities.

The Demographic Imperative Nationally

A number of significant, converging trends illustrate the demographic challenges our nation will be facing in the coming years—the overall aging of our population, particularly the aging of the Baby Boomer generation into the elder boom, and our population's increasing diversity.

Age Structure:

Our country's population is getting older. In New York, for example, the State's median age increased from 30.3 years in 1970 to 32 years in 1980 and now exceeds 36 years. This increase is largely due to the aging of the Baby Boom, the leading edge of which (those born in 1946) has reached the early retirement age of 55.

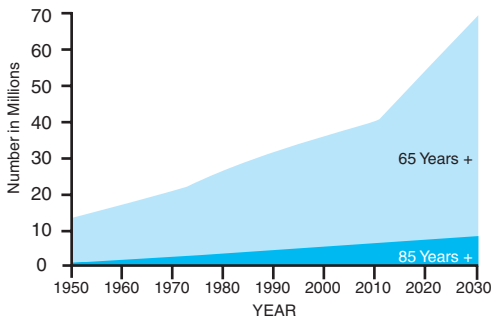
The number of older persons and their lifespan will increase dramatically over the coming 30 to 50 years. Nationally, the number of persons 65 and older in 2030 will grow to 20% of the population—one in five Americans will be over age 65. Of this group, the oldest old (85 and older) will grow to 19.4 million, representing enormous growth from 2000 (4.3 million). Older Americans also will be living longer. By the year 2050, older men will live to age 86 on average (compare to age 73 now) and older women will live to age 92 (compared to age 79 now).

Our changing demographic profile - both aging and increasing diversity - deserves our attention.

The impact will be felt on all facets of community life - especially in the coming years.

There will be three times the number of moderately or severely disabled older persons in 2040 compared to 1986 (increasing from 5.1 million to 22.6 million).

The Graying of America:
65+ Population, 1950-2030



Source: Health, 1999, U.S. Bureau of the Census

Baby Boomers:
Research shows that incoming cohorts of older persons, the "Baby Boomers," will have different needs and desires than older persons today. Boomers will be more likely than the preceding cohort to enter old age without spouses and more will be childless or parents of only children. The delay in marriage and child bearing for this cohort will mean a longer span between the generations than that experienced by today's elderly. Most women Boomers will enter old age with, like men, a work history spanning all their adult lives.

Boomers may not want to retire fully; they may have more expendable income, time and energy, and may wish to pursue other educational or workplace opportunities.

Racial, Ethnic, and Cultural Profile:
Our country's population is becoming more racially and ethnically diverse. Each state—and each locale—is different, but the trends are occurring across the country. In New York, for example, the foreign-born population increased by more than 35% between 1990 and 2000 due to the continued high level of foreign immigration. For some areas of the state (New York City and Nassau-Suffolk metropolitan areas), the **foreign-born** make up nearly 30% of the **total population**. The foreign-born population represents only 5% of the total population in the balance of New York, but has seen an increase between 1990 and 2000 of more than 13% (NYS Data Center, 2002).

- The non-white population in 2000 was 5.7 million persons or 30% of the total. This population increased by about 1 million or more than 20%.
- The Black or African American population increased by 13% to 3.2 million.
- The Asian, Hawaii and Pacific Islander population increased from 694,000 in 1990 to nearly 1.2 million in 2000. This is an increase of more than 70% and represents the most rapid increase of all major racial groups.
- The Hispanic population also grew rapidly between 1990 and 2000 increasing to 2.9 million persons.

(NYS Data Center, 2002)

For the first time ever, the 2000 Census allowed for **multi-racial** identification. The New York State descriptors that follow use the 1990 definition of a single race response compared to the combined 2000 definition of a single race response plus those responding with other combinations of races, for all ages.

The next generation of elderly people will be very different from that of the current older population. The younger, working age population is also increasingly diverse, an interactive effect with our aging population:

- Older adults, like the U.S. overall, will become increasingly diverse. Racial and ethnic elderly subgroups will represent 34% of the older population by 2050 compared to 15% in 1995.

- The number of older **Hispanics** will increase 328% between the year 2000 and 2030, the number of older Asians and Pacific Islanders will increase 185% and the number of older African Americans will increase by 131%.

Migration:

Foreign and domestic migration patterns have been significant demographic forces affecting the size and composition of the population. For example, New York State has traditionally been a high turnover state benefiting from being an entry point for large pools of foreign in-migrants, but it also has lost population through heavy domestic **out-migration** to other locations in the nation.

- Most of New York's out-migrants seek Florida and other Southern states as their destination (approximately 45% of all out-migrants).
- The highest rates of net out-migration occur among young adults (age 20 to 35) and among the middle and older ages (age 40 to 75). The frail elderly tend to move back to New York for family and services.

Project 2015—New York State's Initiative

Given these demographic changes, New York recognized both the challenges and the opportunities that will present themselves to communities because of both the aging and increasing diversity of our population and that the effects of these major demographic changes are intertwined and cannot be thought of separately. These elements are important if we are going to keep our communities as dynamic, thriving places for all people to live.

For the 2002 phase of Project 2015, New York broadened the scope of its work to consider the impact of aging and diversity and also broadened who would be involved in doing the analysis and planning to include 36 New York State cabinet agencies.

Project 2015 became a Governor's initiative in 2002; Governor Pataki charged NYSOFA

New York's Project 2015
36 Participating State Agencies

- Advocate's Office for Persons with Disabilities
- Aging
- Agriculture and Markets
- Alcohol and Substance Abuse Services
- Banking Department
- Budget
- Council on Children and Families
- Office of Children and Family Services
- Civil Service
- Consumer Protection Board
- Correctional Services
- Department of Health
- Education
- Empire State Development
- Employee Relations
- Environmental Conservation
- General Services
- Housing and Community Renewal
- Insurance
- Labor
- Mental Health
- Mental Retardation and Developmental Disabilities
- Motor Vehicles
- Parks, Recreation and Historic Preservation
- Public Service Commission
- Quality of Care for the Mentally Disabled Commission
- Real Property Services
- State Emergency Management Office
- State Police
- State University of New York
- Department of State
- Taxation and Finance
- Technology
- Temporary and Disability Assistance
- Transportation
- Veterans' Affairs

to take the lead in managing the project and charged 36 cabinet-level agencies to actively participate. New York wanted to use the idea of "broad population change" as the basis for involving the state agencies in preparing for the State's future. These changes would affect every facet of community life, having an impact across all government agencies—their missions, products and services, constituency-makeup and their day-to-day operations. Furthermore, this is a critical time for state government, as well as others, to attend to the impact of demographic change if we were, in fact, to be prepared for the future.

Planning Process

The 36 participating agencies were given a timeframe of nine months to complete the planning initiative. The Governor's office started the process with a kick-off meeting with the 36 participating state agency Commissioners in February of 2002. NYSOFA coordinated monthly meetings of the 36 agencies' Project 2015 staff, providing them with instructions, review, and technical assistance. Throughout the nine months, each agency completed the primary activity of this initiative: a written Brief. NYSOFA compiled the 36 briefs into a published policy document, and the document, representing the work of the 36 agencies, was presented to the Governor at a Symposium in October 2002.

Agency Briefs

To construct their briefs, each agency was required to:

1. Assess the impact of demographic change on their mission, products, services, constituent group and daily operations, and to identify the major issues that would arise for them because of these demographic changes.
2. Prioritize the major impact areas each agency identified, keeping the top three major impact areas for action planning.
3. Specify action steps or strategies they would implement over the next five years to address their top three impact areas.

White Paper and Results

The briefs were organized into a unified policy document (White Paper) titled, "*Project 2015: State Agencies Prepare for the Impact of an Aging New York—White Paper for Discussion*" (NYSOFA, 2002). In addition to the briefs, it includes articles about the most significant demographic and sociological changes expected in the State and an analysis and summary of the briefs. This publication has been distributed to the governors in all states, as well as to many agencies and organizations across the country.

In the analysis of the briefs, it was found that each agency's brief can stand alone as a basis for action, reflecting each agency's own mission and function. Together, the 36 Briefs present one unified policy document and a practical framework for New York to prepare for the future.

It also was recognized that the approach taken in New York State's Project 2015 provides the ability to really do business differently. Usually, if we are interested in delving into a topic or an issue of importance to inform our work, we turn to those traditionally considered "expert" in the field of study. We often use that expertise to create the framework for next steps and the work to come thereafter. For example, for issues about an aging population, we may turn to offices for the aging,

academicians and researchers specializing in **gerontology** and **geriatrics**, and the gerontological literature—and to use those individuals and the prior research to help us form the basis for framing the issues and impact areas that will be considered as we take the next steps. This approach is important and valuable, but—when considering the impact of changing population characteristics, for example—our experience led us to recognize that this approach, alone, does not go far enough.

By asking the question differently—How does our changing population affect all of us and what we all do? This (1) broadens the way we may address an issue because non-traditional others also would define the issue and impact areas from their own perspectives; (2) broadens how we define the issue, expands how we address the issue and who is involved in addressing it, and (3) changes the way others may address an issue because the impact of aging and diversity becomes incorporated into their work.

Department of Environmental Conservation (DEC)—Example of Action Steps

As one of the 36 participating agencies in Project 2015, New York's Department of Environmental Conservation (DEC) identified the following from their internal scan to assess how changing demographics may affect their policies, programs and practices:

> "DEC's basic policies will remain unchanged: protecting environmental quality; acting as stewards of land; infrastructure and natural resources; developing information systems; and building partnerships to support the environment. **It is likely that demographic changes will lead to *new approaches in building partnerships.***" (Emphasis added).

DEC has moved forward since the development of their brief, taking action steps that include building partnerships and taking new approaches (see following examples).

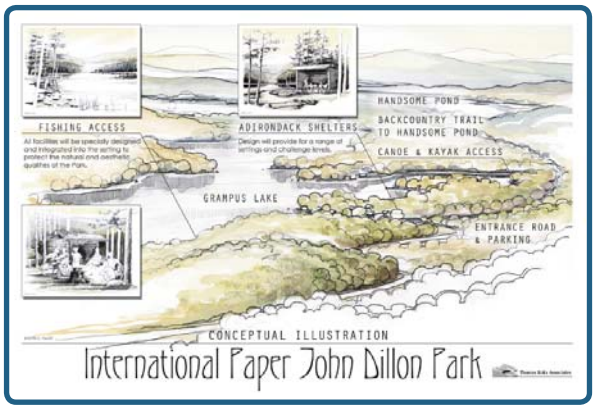
DEC Action Steps - Examples

Collaboration

- Building Public-Private Partnerships
- International Paper (IP) John Dillon Park: A Unique Outdoor Experience for People with Disabilities

On April 5, 2004, Governor George Pataki announced the protection of nearly 16,000 acres of forest lands owned by International Paper (IP) in the Adirondack Park. Under the working forest **conservation easement**, the property will remain in IP ownership. The easement will limit new industrial, commercial or residential development of the parcel and require sustainable forestry activities to protect water quality and other natural resources. The conservation easement establishes IP John Dillon Park, in honor of IP's recently retired Chairman and CEO, John Dillon.

IP John Dillon Park will provide a unique outdoor experience for people with disabilities. The main camp will provide lean-tos, sanitary facilities, parking, a canoe and kayak dock and fishing facilities all



accessible to people with disabilities. NYS DEC staff and its Accessibility Advisory Committee are assisting IP with the design of the Park. In addition, Paul Smith's College will be involved in the management of day-to-day operation of the Park that will give students a unique, hands-on learning experience in managing outdoor recreation for people with disabilities.

Governor's April 5, 2004, Press Release:

> ***Governor Announces Protection of Nearly 16,000 Acres in Adirondacks. This initiative incorporates design features for universal access and creates options for recreational activity and enjoyment (and improved health) for people with disabilities, elders, and ultimately, for all citizens.***

DEC: New Approaches—Elders as Volunteers

The DEC also has identified an array of opportunities for older New Yorkers to contribute to the health and maintenance of our natural resources. According to DEC, volunteer opportunities give senior citizens occasion to participate in recreational activities that promote physical activity and a healthy lifestyle, along with a variety of social events. Examples of volunteer opportunities through DEC include:

- Nature instructors at the Department's Environmental Education Centers.
- Greeters at Environmental Education Centers.
- Adopt A Natural Resource—organizations and individuals can volunteer to help conserve a local natural resource.

By volunteering, seniors can create a legacy by giving back to their community while at the same time their community can return their "gift of service" with appreciation of their efforts.

Guide to New York's Initiative

Sharing New York's Experience

New York is interested in sharing what we did with others. Throughout the nine-month state government action planning initiative, the process of designing and implementing Project 2015, and the perceptions of the agencies' leaders and staff who participated in the project, were documented in a joint effort by the NYSOFA and the University at Albany's Center for Excellence in Aging Services. Throughout the initiative, several methods were used by the Center to collect information for the Guide: (1) in-depth interviews and focus groups of selected agency leaders and key staff who

participated in Project 2015; (2) in-depth interviews of NYSOFA's agency leaders and members of the Project 2015 Management Team; (3) a personal interview with the Governor's oversight staff to Project 2015; (4) observation at several of the regularly scheduled Project 2015 interagency work group meetings; and (5) observation at the day-long Governor's Project 2015 Symposium.

This information was used to develop "Project 2015: Guide to New York State Government's Planning Initiative" (NYSOFA, 2003). The Guide describes the entire Project 2015 initiative and identifies the core elements of success in this initiative. It provides information about the overall design, management, and implementation of Project 2015, and can be used by government and community leaders who are seeking to engage in a multi-agency or community-wide planning process to develop action steps around a common issue.

Project 2015 Guide: Core Elements of Success

Analysis by the NYSOFA's Project 2015 lead staff determined that certain factors assured the success of Project 2015. Without these core elements, the initiative would not have been as successful and could not have been completed within the allotted time frame. The entire listing of 19 core elements are included in the Guide; by way of example, below are several of the components that can be characterized as core elements of success of the Project 2015 planning initiative—but all 19 were considered necessary for the initiative to proceed successfully:

Executive Leadership

There was ongoing, direct leadership and involvement of the top executive. For New York State's Project 2015, this was the Governor.

Clear Purpose and Goals

The purpose and goals of Project 2015 were very clearly stated in the initial charge to the Commissioners. The purpose and goals were fully defined and described for agencies' designees to the project and project work staff at the first interagency work group meeting.

Common Issue

While the participating agencies have disparate missions, products, and consumer constituencies, the issue addressed by Project 2015 (the impact of demographic change) was common across all agencies and formed a common basis for deliberation.

Make it Manageable

To complete the work of Project 2015 within the stated time frame and keep the agencies on track, both the project's products and time line were divided into manageable pieces. Specific directions and an assigned due date accompanied each piece. This kept participants from feeling overwhelmed by the total responsibilities involved and eliminated time slippage.

Technical Assistance Provided

Directions and technical assistance were provided at monthly group meetings. However, four members of the NYSOFA Project 2015 Management Team were each paired with nine specific agencies to respond quickly to agencies on an

individual basis regarding any issues and problems that emerged as the agencies moved through the initiative's process. These pairings remained constant throughout the nine-month period.

Think Outside the Box

When assembling agencies into small groups for joint activities, agencies were not grouped by traditional themes/missions (such as health, human services, infrastructure, economic development, etc.). Instead, agencies were randomly assigned for small-group activities and multiple work staff from any one agency were dispersed among tables for large-group discussions. This resulted in (1) cross-sharing of information among agencies that had not generally done so before, (2) understanding the overlap that exists among all agencies, and (3) stimulation of non-traditional collaborative efforts.

Summary

New York's communities are not alone in experiencing profound shifts in the make-up of their **resident populations**. The populations of communities, states and countries across the world are aging, and all are experiencing a change in the proportion of younger-aged citizens relative to the proportion of older citizens. Immigration patterns in the U.S., including the in-migration of people from foreign countries and movement of these populations between states, have dramatically increased both the diversity of many states' populations and the number of residents who speak little or no English. These shifts in our demographic profile present opportunities (skills, talents, a pool of new workers, etc.) and challenges (fewer caregivers, educational needs, communication gaps, etc.).

An analysis of the Project 2015 initiative found that multi-group planning, in concert, around a unifying common issue, and in a cohesive, organized manner: (1) established a common bond among the participating groups, (2) had groups working toward a common goal, (3) encouraged sharing and collaborating among groups that had not occurred before, (4) produced ideas and strategies that would make the most out of the opportunities presented by the changing demographics, and (5) promoted creativity in identifying effective ways of meeting the challenges inherent in changing demographics.

New York's planning initiative can be replicated or adapted by other governments or communities that wish to accomplish these same goals.

Manuscript by:

Jennifer Rosenbaum, New York State Office for the Aging, Project 2015 Coordinator

Presented by:

Neal Lane, Acting Director, New York State Office for the Aging (August 10, 2004 EPA Aging Americans Workshop)

Photographs:

New York State Office for the Aging and Erie County (NY) Department of Senior Services.

New York State Department of Environmental Conservation: Adopt a Natural Resource, International Paper/Universal Access.

References

New York State Data Center, Empire State Development, 2002. *http://www.nylovesbiz.com/nysdc/default.asp*

New York State Office for the Aging. 2000. Project 2015: The Future of Aging in New York State—Articles and Briefs for Discussion. *http://www.aging.state.ny.us/news/letter/an010409.htm*

New York State Office for the Aging. 2002. Project 2015: State Agencies Prepare for the Impact of an Aging New York—White Paper for Discussion. *http://www.aging.state.ny.us/explore/project2015/report02/index.htm*

New York State Office for the Aging. 2003. Project 2015: Guide to New York State Government's Planning Initiative. *http://www.aging.state.ny.us*

Elders' Importance

Jonathan Hook
Office of Environmental Justice and Tribal Affairs
U.S. Environmental Protection Agency, Region 6

American Indian elders are held in high esteem in their communities. They are perceived to be links with the wisdom and cultural inheritance of many generations of ancestors. Because **Native peoples** have a sacred and reverential relationship with the environment, **indigenous** elders provide a unique resource for better understanding the world around us. This includes not only the nurturing gifts provided by the environment, but also our responsibilities as caretakers. As Native peoples increasingly interact with EPA through various tribal environmental programs, the agency receives glimpses into the uniquely **symbiotic** relationship between American Indians and Mother Earth. The broad, holistic approach to environmental protection is apparent in strategies and activities that intertwine traditional Native practices with contemporary technologies. For example, Louie Hena is on the **Tribal Council** of the Pueblo of Tesuque. He has developed a 500 year environmental plan, which forms the basis for his "**permaculture**" course. EPA has provided some funding for this hands-on educational activity that brings Native youth from throughout North America together to study high elevation agriculture and soil retention in the New Mexico mountains.

Permaculture Course at Picuris Pueblo

Mr. Hena also recently was asked, along with four other elders, to address EPA's Indian Program Policy Council in Washington, D.C. about the necessity of protecting traditional lifeways. He focused on how everything is cyclical, and about how we must recognize and protect the patterns in our environment.

Louie Hena's IPPC Presentation

Indian environmental programs struggle to function on barebones financial resources, yet are able to accomplish amazing results. The comment most frequently heard from recent headquarters visitors to Region 6 Indian communities was "we never knew the extent of the need, nor can we believe how much is being done with so few resources." The greatest resource, however, is one often forgotten by dominant society bureaucracies: our elders. Native communities continue to honor and cherish these communal gems, and EPA would do well to follow their example.

Another elder having a profound impact on Indian Country environmental protection is Stanley Paytiamo. Mr. Paytiamo is a former governor of Acoma Pueblo. He is chairman of the Tribal Water Rights Commission and the Tribal HAZMAT Safety Committee. For his many years of service, Mr. Paytiamo was recently awarded the Janice Stevens Environmental Protection Award by the 66 tribes in EPA Region 6.

Stanley Paytiamo will address the Pueblo of Acoma's environmental vision in the next presentation. He is a persistent advocate for increased funding of tribal environmental programs. He recently spoke at New Mexico Environmental Department's Environmental Justice Listening Session at Acoma Pueblo. Embodying the direct link between ancestors and future generations, Stanley Paytiamo is a model for all those pursuing environmental protection.

The Pueblo of Acoma's Environmental Vision

Stanley Paytiamo
Pueblo of Acoma

By 2030, the number of older Americans is expected to double to 70 million, largely as a result of the aging of the World War II Baby Boomers. As the aging population grows, there are questions on how this population will change needs for housing, health care, recreation and transportation and how communities and states can prepare for these shifts.

The mission of the Pueblo of Acoma Environmental Protection Office is to safeguard human health and quality of life by protecting and enhancing the environment.

> *"For me it's the challenge—the challenge to try to beat myself and do better than I did in the past. I try to keep in mind not what I have accomplished but what I have to try to accomplish in the future."*
>
> *— Jackie Joyner-Kersee*

Environmental Setting

The Pueblo of Acoma is located approximately 55 miles west of Albuquerque, NM; along Interstate 40. The closest city is Grants, NM that lies on the western edge of the Pueblo reservation boundary. The Pueblo of Acoma is relatively large in comparison to the other 20 pueblos of New Mexico, with a population of 4,754. Approximately 2,000 persons live on the **land grant** with a land base of approximately 431,664 acres (674 sq. miles). The original Spanish land grant given to the Pueblo of Acoma was made on September 20, 1689.

The Pueblo of Acoma is made up of eight small villages that include Acomita, West Village, Mesa Hill, Skyline, McCartys, Anzac, Alaska, Shutivaville, and the 1,000 year old Acoma village, "Sky City." Farming occurs mainly on lands adjacent to the Rio San Jose. There are approximately 1,014 acres of irrigated farmland. The remainder, and by far the greater portion, of the Pueblo lands are semiarid, at high altitude and on a **continental shelf** that passes to the west of the Pueblo of Acoma. These lands consist of mountains, valleys, expansive plains and high buttes or mesas. The lands vary substantially in elevation and **gradient**, ranging from high elevations of 8,600 feet to low elevations of 5,800 feet above sea level. Similarly, the sloping land varies with abrupt grades that are nearly vertical and large level expanses of land, with grades as low as 2-3%.

The Acoma people have practiced ceremonies for the good of all since time immemorial. These practices and beliefs are taught and pursued only through **oratories**, prayer, songs and dance. They call for an orderly life within the natural environment such

as clean water and air, good crops and peace of body and spirit. Many believe in a spiritual life and the natural environment that embraces and nurtures them. Today, many tribal societies exist within the Pueblo of Acoma. These societies and their religious ceremonies coincide with important celestial time calendars. The religious ceremonies acknowledge and express gratitude for nature's gifts of land, water and life.

Climate

Precipitation at the San Fidel National Weather Service station averaged 9.66 inches (245.3 mm) per year over 44 years, (New Mexico State Engineer Office, 1956b; U.S. Department Commerce [US DOC], 1955-74). Precipitation measured during this study was fairly uniformly distributed. About half of the yearly precipitation results from **convective storms** during July, August, September and October. Mean-annual temperature at the San Fidel weather station was 51.4°F (10.76°C) for 38 years of record (New Mexico State Engineer Office, 1956a; US DOC, 1955-74, various pages). Summer highs occasionally go over 100°F (37.74°C) and winter lows occasionally drop below 0°F (-17.76° C), at this station. Pan evaporation on the Pueblo of Acoma probably averages about the same as that measured at the National Weather Service Station in Los Lunas, which is about 50 miles (80 km) to the east. Here evaporation is usually between 70 to 75 inches (177.8 and 190.5 cm) per year.

Traditional History

Traditional knowledge is no longer reinforced on a daily basis. The language has been a vital aspect of the Acoma Pueblo since time immemorial; all members of the Native Communities must realize its importance to the community and support intensification of the Bilingual Program. Formerly, as a rural community, the Pueblo of Acoma economy emphasized the need for Pueblo members to practice traditional ways of cooking, butchering, hunting, planting, harvesting and sharing. In the past, there was mutual respect for one another and our elders, as well as self-respect. Today, there is a lack of respect for our leaders, our parents—courteous greetings and exchanges are less frequent, therefore traditional means for transmitting stories, songs and original legends are rapidly fading.

The native way of life is a spiritual way; staying close to spirit through prayers, sacred songs and sacred ceremonies. Spirit is through all of life given by the creator. It is important to tell the truth. Peoples' lives could depend on it. Children are taught to be honest. We have concern for one another—caring what happens and helping children grow up in a good way. Why keep on having children when you can't care for them? Some of our people don't want to send their parents to Old Age homes. We have extended families and they take care of their parents. "When I was a child they took care of me so I want to take care of my parents." In the end, some do end up at homes for the aging. The children and families usually complain the nursing staff is limited. When the children make visits the parents want to go home with them.

We are grateful for the continued support of our promising youth to attain their degrees in higher education for the benefit of their Tribal communities, now and in the future.

Traditional Concerns

Sadly, traditions and customs are breaking down. The tribe does not allow members to speak on certain subjects to allow non-Indians to better understand the culture. In fact, non-Indians will never understand, because this takes a lifetime to learn. Tribes do things and treat the following differently: Christmas trees, funeral items, shoes, clothing, ashes, sale of bottled water, credits for air, air-space, emergency preparedness, disaster drills, the future, "ownership" of space and visitation of Indian shrines (non-Indians and women are not allowed). Indian people have respect for all things and believe there are widespread consequences otherwise. There are strict rules to follow—things should be left alone. The Pueblo of Acoma has existed for over 1000 years—maybe due to obeying and respecting the laws of Mother Earth.

> *"As an Indian person, my view of the world is that Mother Earth is Sacred. It's difficult for me to use the term "environment," the term "ecology." To me, it's Mother Earth and she is Sacred, if she is not healthy, if the beings, sustaining from her, the people, the animals, the wildlife, the water, the air, everything that belongs to Mother Earth if that is not protected, if that is not taken care of in the proper way with respect; well, what are we here for then? Mother Earth is Sacred."*
>
> — *Unknown young woman*

An understanding of the people is basic to community development. The Acoma people, of all the people of this country, have been able to strongly maintain their cultural, ethnic and historic characteristics in the face of **Anglo-American** domination. It is these very characteristics that are now often advocated to the public-at-large as a means of ending the destruction of our environment through appropriate respect for our natural surroundings. The Pueblo of Acoma, rather than destroying the environment, have lived in harmony with nature and have preserved the quality of the environment. The Acoma people have maintained their traditions and culture and Anglo-American society has much to learn from us. Until recently, the American government never condescended to consider the environment as a major focal point of their policy. Instead, the policy has been one of dominating the environment rather than of compatibility with it. Today, let us hope that, in spite of the Anglo-American values imposed upon us, we will maintain this strong tradition and appreciation of nature and that this strong culture of the Indian can, in turn, be absorbed by non-Indian people so that their appreciation and respect for nature will grow.

Let us understand that inter-relationships between the Indian and western Anglo-American culture have been relatively short (300–400 years), while Acoma people have lived in this environment for more than 1000 years. These cultures which have come together are not only different in language and racial characteristics, they are diverse to the extent that they are on a different continued existence…the western culture based on profit and domination of the environment…the Indian culture related to the natural environment which, due to the harsh landscape, requires deep respect and knowledge of the natural environment to survive.

The Pueblo of Acoma (Aak'Um'Eetra) heritage is important, not only to the continued strength and pride of the Acoma people, but to the entire country and the western world.

Our Overall Goal

The overall goal of the Acoma culture is to encourage and maintain the continuance of the Acoma cultural, ethnic and historic characteristics, not only as a point of historic interest but as a living, viable attitude which has application to every-day life and to the well-being of the Acoma people and their non-Indian neighbors.

The Pueblo of Acoma has developed a 26-year Practical Vision that includes:

- A safer Acoma,
- Health promotion and maintenance,
- Togetherness through education,
- Preservation of culture through education,
- Political awareness,
- Economic self-sufficiency through tourism,
- Promotion of traditional land-use,
- Return to restorative agriculture,
- Preservation of traditional lifestyles,
- Community and civic involvement,
- Greater employment opportunities through education.

All of these issues pertain to all of the people in the Pueblo, but some pertain more specifically to the aging population, which will be discussed later. Additionally, there are underlying contradictions that may be barriers to obtaining this vision. They include:

- Varied interpretations of private versus community land-use,
- Alienation from the political system,
- Unwillingness to take risk in economic ventures,
- Limited personal and community involvement in education,
- Conflict in values regarding tradition,
- Unwillingness to invest in community participation and communications.

Goals Pertaining to the Acoma Vision

Mental and Physical Health

The Acoma health goal is to provide for healthy conditions and the good of all Acoma people through the maintenance of a pollution-free environment and the provision of a comprehensive health-care system available to all Acoma residents. This includes informational, curative and rehabilitative mental and physical health services, available to all Acoma residents. Facilities and services should be located on the reservation or nearby wherever possible.

Human Services (Welfare)

Many Acoma people depend substantially on welfare. A welfare system must be convenient, it must be adequate to meet the needs, it must encourage rather than destroy initiative, and individuality must be achieved and maintained.

Public Safety, Law Enforcement and Correction

All citizens are entitled to equal and reasonable protection under the law. This goal should include the protection of the rights, property and privileges of all citizens through efficient and expeditious

administration of justice through the police and the judiciary system.

Housing

All Acoma people must be allowed to live in an environment that meets all federal regulatory housing standards. The right to a comfortable and stable housing structure can be achieved by upgrading all substandard housing.

Parks, Recreation and Open Space

Provision of an interrelated system of parks, recreational facilities, open-space and programs for the Acoma people is a primary consideration. Secondarily, it should compliment the tourist and commercial recreation activities of the Pueblo of Acoma.

Land-Use, Transportation and Utilities

Development of an overall land-use plan to insure compatibility among various usages is another necessity. The land-use plan shall include the natural attributes of land, such as soils, **topography**, availability of moisture and fertility and shall reflect our concern for our natural resources as part of the Economic and Cultural Resources of the Acoma people. The rights of the people to live as individuals with minimal adverse effect upon the environment shall be a major concern of land-use planning.

Cultural, Ethnic and Historic

Continuance of the Acoma culture must be encouraged and maintained, not only as a point of historic interest but a living, viable attitude that has application to everyday life, and to the well-being of the Acoma people, as well as their non-Indian neighbors.

Environment, Ecology, Pollution and Population

The natural resources of Acoma lands must be preserved and enhanced through recognition of the delicate ecological balance that exists between a person and his or her environment. Those portions of Pueblo lands that may be threatened by development must be preserved.

Vision for Our Aging Americans

Twenty, thirty, fifty and even 150 years from now, as an Aging American, leader, parent, grandparent, and citizen of your Tribe, what kind of society do you want? What to do next? What are you as an Aging American going to do the next working day towards fulfilling your vision?

DECIDE
COMMUNICATE IT (make it known)
ACT ON IT

- Persuade People
- Excite People
- Develop Commitment
- Consistently Act On It
- Evaluate It
- Do it!

To support the Pueblo of Acoma 26-Year Practical Vision and the aging population of Acoma, a comprehensive health plan was proposed to be developed by 2030. That plan would include:

Environmental Health Services

Improve the quality of life through reduced risk factors in the environment that lead to death, disability or illness.

Community and School Health Education
Prepare tribal members with knowledgeable skills and attitudes for decision-making regarding the protection of their health.

Accidents
Lessen morbidity and morality due to accidents, expand a total tribal safety program due to accidents.

Alcoholism
Reduce factors that lead to substance abuse, especially alcoholism.

Nutrition
- Improve the nutrition status of tribal members.
- Special supplemental food programs to:
  - Reduce the incidents of dental caries by poor eating habits.
  - Provide nutritious meals each day to the 319 Acoma elderly at the center meal site.
- Establish educational programs that will reduce the incidence of obesity.
- Encourage the use of natural and cultural foods.

Contract and Health Services
Maintain the present quality of medical care service, increasing the variety where possible.

Elderly Care/Youth Programs
Enhance the status of the elderly and youth as valuable members of the tribe.

- Increase safety practices, reduce hazards.
- Develop adequate housing facilities (50 units).
- Provide needed medical services.
- Provide transportation as needed: two mini-buses for the handicapped and staff.
- Develop a multi-purpose center that will provide nutritional, leisure and social activities for the senior citizens and youth.
- Seek employee opportunities for the elderly.
- Develop an elderly day-care home.
- Develop a local and regional elderly nursing home to be located north of ACL Hospital.

Pueblo of Acoma Environmental Protection Agency (AEPA):

On October 1, 1994, the Pueblo of Acoma Environmental Protection Agency (AEPA) was created within the Tribal Council and Administration to coordinate waste management and environmental activities. AEPA's responsibility has now been expanded to deal with all environmental concerns (hazardous waste, air and water quality, pollution prevention, etc.) and is in the process of seeking funding to administer these programs through the General Assistance Program (GAP) grant, and any other identified sources of funding. AEPA is structured to provide technical assistance on environmental issues for the Tribe. The traditional Pueblo perspective of the environment emphasizes the vital importance of living as one with all the elements of the earth. It is the mission of the AEPA to incorporate the values of the Pueblo way of life as the environmental concerns of the tribe.

One major concern for the Pueblo of Acoma is the lack of codes or **ordinances** to address environmental violations or prevent pollution. The Governor of Acoma created a committee called the Acoma Legislative Committee that is currently reviewing the Law and Order Codes. All recommendations will then be made to the Acoma Tribal Council which will make the final decisions on what laws to amend or add.

The People of Acoma believe in the importance of preserving the environment so that it will continue to provide natural resources such as clean water and land that is necessary for their survival. But, like many other Indian tribes, the Pueblo people do not have a formal infrastructure to regulate the environment (Mother Earth). It is important that the community is educated and aware of what "regulation of the environment" means while still encouraging preservation through spirituality and religion.

With the population expansion of the Pueblo of Acoma, there is an increased potential of danger of contamination of the **ground water** and surface water because the existing sewage facilities are inadequate to meet the growing needs of the Pueblo. Currently there are no certified Operations and Maintenance Operators to manage the six wastewater treatment sites on Pueblo lands. Four of the lagoons are located close to the Rio San Jose Basin, and the main facultative lagoon is overburdened. It has been found that some homes on Acoma lands are equipped with septic tanks that are considered substandard. Leach fields associated with septic tank systems are a source of pollution in the Rio San Jose Valley.

Hazardous waste is another concern for the Pueblo of Acoma. With the assistance of EPA, the Acoma Tribal Administration, Pueblo Office of Environmental Protection (POEP)/ **Superfund** has been able to identify several sites that qualify for the Comprehensive Environmental Response, Compensation and Liability Act (**CERCLA**) of 1980, also known as Superfund, investigation. These potentially hazardous sites may pose a threat to human health and the environment.

Current solid waste management practices also pose potential risks to human health and the environment. The 19 Pueblos of New Mexico were ordered to close all dumps and landfills in compliance with Resource Conservation and Recovery Act (**RCRA**) requirements, and to construct a landfill or transfer station that abides by RCRA standards, by October 9, 1998. The Pueblo of Acoma worked with the U.S. **Indian Health Service** (IHS) to construct a transfer station and to implement a sound solid waste management system to benefit the Pueblo people project. It was completed in 1997 and opened on October 9, 1998. It took the Pueblo one year to open the transfer station due to lack of funding. On-site workshops were held to inform the Pueblo's people of the closing of the landfills and opening of the transfer station. Since then, new vehicles have been purchased and solid waste is picked up on a regular basis. The Pueblo is still closing old illegal sites, but the U.S. Congress has never funded the closings.

Impacts on the Environment

It is impossible, of course, to know what all the impacts of any given decision will be. There is no easy answer. Every tribe will have to develop a system for analyzing decisions that works for it. A basic check list might include the following elements:

(1) What is the need?

(2) How will proposed actions meet the need?

(3) Are there alternative ways of meeting the need: what are they?

(4) How does the proposed action relate to the overall goals of the tribe?

(5) What will it cost? Include all related costs in the planning. If the tribe decides it needs an elderly home or museum (a popular and legitimate need), the cost of the building itself is only the beginning. For example, if the Pueblo of Acoma can estimate the cost for the building, from the first architectural drawings until its completion on the site, what other things should be considered?

a. If grants or contributions are used to support the elderly home or museum, will a fundraiser also be necessary? If tribal funds are used, the merits of the elderly home or museum must be weighed against other tribal needs.

b. Related Costs. Will outsiders be attracted to the reservation because of the new facility? Will additional parking be needed? What effect will this have on roads, traffic, and the habits of the people in the community? Who will provide policing? Will the children of the community still be safe? Will there be additional costs associated with trash removal?

This action would change the complexion of the reservation. The Acoma people are not accustomed to having outsiders in the center. Many religious activities are closed to outsiders. If there is federal funding, everyone would have access to an elderly home. Is an elderly center really needed? These are hard choices.

(6) What is the economic impact of the proposed action? Will it provide new jobs for the community? Or will outsiders be hired? Will the new jobs require skills or demand salaries out of line with the current economic structure? With the increasing number of tribal programs a tribe is now employing many more people that are probably better paid than the majority of the community. The tribal employees receive all the benefits that the rest of the community receives.

(7) What is the environmental impact on the community? What will it do to the air and water quality? What about the water quantity? The people in the community may want and need a new elderly home or museum, but if increased water usage no longer allows flushing the toilets and requires hauling drinking water, it may not have been a wise choice.

Cost and Benefits

With the extraction of natural resources, the question of who pays for the benefits is very crucial and far ranging. Minerals have a way of showing up on lands which have, in the past, been used to graze cattle or sheep or in some cases where villages have stood for generations. There is no question that the revenue from the minerals and the jobs that will come from the mining operations are badly needed. Several hundred people may be employed by the mining operation at $6 to $15 an hour. The tribe may receive several million dollars a year from the revenue. But

what about the sheepherders and cattlemen who are deprived of making a living? And the homes where their families lived forever. What about the people who live in that village? What about the noise, the traffic, and the air and water pollution—the **health hazards** that result from those activities that we know very little about? What about the possibility the miners or the people nearby will develop cancer or that their children or their children's children will have birth defects years from now as a result of the mining? Those are costs, too. And what about the potential of causing air pollution as far away as Albuquerque? Mining and milling of uranium in the Grants mineral belt in New Mexico is causing air and water pollution and traffic problems for a hundred or more miles on either side of it. Where do the responsibilities begin and end?

What about the tribe where both the timber and fish are important to the economy? Improper, un-thoughtful or untimely logging methods may clog streams where the salmon spawn and cut off the fishermen's livelihood. **Herbicide** use is a very proper part of commercial timber management that may have a devastating effect on the fish and animals who share the area. Or, they may kill plants traditionally used for medicine, basket-making, or other purposes.

No one can blame administrators for not being able to answer all the questions or even for making the wrong decision sometimes. But future generations will judge harshly those who never ASKED the questions.

Future

The Pueblo of Acoma is a sovereign Indian nation, recognized as such by the federal government of the United States of America, Mexico and Spain. The Pueblo, in the exercise of its tribal sovereignty remains organized in accordance with the oral Pueblo tradition. Therefore, it is not required to submit annual reports to the State of New Mexico or any other government.

The government of the Pueblo of Acoma is very democratic, and a high percentage of Pueblo members participate in major decisions that affect the Tribe. Environmental issues are integral parts of all efforts to improve the quality of life. The Tribal Council is the governing body of the Pueblo. The Council has the power to develop and enforce tribal Laws, including laws governing environmental quality, and to seek financial assistance from the U.S. government. The Council has the authority to request treatment as a State, be recognized by EPA, and to authorize appropriate management and protection of the natural resources (water, land, etc.) within its lands.

The Acoma People govern in a consensus manner and have practiced ceremonies for the good of all since time immemorial. These practices and beliefs are taught and pursued only through oratories, prayer, songs, and dance. They call for an orderly life within the natural environment such as a call for clean water and air, good crops, and peace of body and spirit. The People of Acoma believe in the importance of preserving the environment so that it will continue to provide natural resources necessary for their survival.
The greatest challenge currently facing the Pueblo is the need to modify past habits and

to develop a confidence in controlling its own economic future. To accomplish this, major efforts will be necessary concerning organizational and systems development, further Tribal venture development, work force and vocational training, and development of community investment and financing strategies.

While it would be premature to expect the Pueblo to sever its current dependence on federal dollars to support its own efforts, a major goal of the Pueblo, over the long-term, will be to decrease the importance of this dependency. It is hoped this can be achieved by establishing a track record of success and by reinventing the rewards of that success into expanded economic initiatives on the Pueblo Land Grant and Reservation.

The reservation is environmentally impacted by numerous significant threats: contamination from nearby uranium mining operations; naturally occurring uranium and radon; sewage effluent from Grants, NM; open dumps; pueblo wastewater; and pesticide contamination from livestock. Human health statistics; fish, frog and snake kills in rivers and riverbeds; low flying air craft during cultural activities; and U.S. trespassing in outer space without tribal permission all present cause for concern. It is our natural reaction that the transportation of all hazardous waste across Indian lands worries us very much.

The entire Pueblo of Acoma is rightfully considered an environmentally disadvantaged community. It has suffered, and continues to suffer, the negative environmental impacts of nearby uranium mining and other industrial activities that have depleted and contaminated water supplies; of faulty natural gas pipelines traversing the reservation to serve outside sources; and of sewage effluent and overflow from ineffective wastewater treatment facilities in neighboring municipalities. There are few resources to combat these problems and to correct the reservation's own waste disposal practices. Therefore, the Pueblo itself is the "disadvantaged community."

The Tribe's annual determination of its environmental agenda, its Environmental Needs Assessment, and the resulting follow-up, require a significant, on-going master plan. Other overall environmental planning activities that are occurring include water issues, wastewater and solid waste management practices and air quality assessments.

Through the land you can see where the Indian people have faced the challenge and have instituted change. Not all change has been good. More employment opportunities need to be developed for people on our lands. Never again should our people be forced to live outside our lands because there are insufficient employment opportunities, or be forced to sit at home weaving baskets, weaving rugs, making jewelry, herding sheep, making pottery, etc., because of a lack of other skills or knowledge.

We must work hand-in-hand towards Indian control and development of Indian resources. Too little has been accomplished so far. Indian leaders have tried diligently to drive home the message in Washington and throughout the country. We have been taken for granted far too long. Our patience is at an end.

It is time we acted to follow the principles of our founding fathers who wrote in the constitution, we must "Promote the General Welfare." We want to contribute to meeting America's goals of economic growth and

stability, but not at the sacrifice of that which we respect: our land and our needs. Because we compete in a national and even global market, we must be sensitive to its realities, but we must insist that those who come from outside our lands respect our laws, our traditions, our people and our land.

Treat the earth well.

It was not given to you by your parents,

It was loaned to you by your children.

We do not inherit the Earth from our Ancestors,

We borrow it from our Children.

- Ancient Indian Proverb

ALBUQUERQUE AREA COMBINED TOTALS			SERVICE POPULATION ON OR NEAR RESERVATION													
				Age Distribution			Labor Force					Total Employed				
Agency/Tribe/Reservation	State/s	Tribal Enrollment (A)	Total Indian Resident Service Population (1)+(2)+(3)	Age <16 (1)	Age 16-64 (2)	Age >65+ (3)	Not Available for Work (4)	Available for Work or Total Workforce (4)	Number Employed (6)	Number not Employed (7)	Unemployed as % of Labor Force (8)	Public (9)	Private (10)	Total (11)	Employed but Below Poverty Guidelines #	Employed but Below Poverty Guidelines %
Jicarella Agency																
Jicarilla Apache Tribe	NM	3,264	3,937	1,529	2,264	144	0	2,408	2,054	354	15%	511	1,543	2,054	292	14%
Laguna Agency																
Pueblo of Laguna	NM	7,268	5,454	1,447	3,517	490	0	4,007	2,865	1,142	29%	933	1,932	2,865	1,095	38%
Mescalero Apache Agency																
Mescalero Apache Tribe	NM	3,716	4,019	1,646	2,290	83	0	2,373	2,186	187	8%	785	1,401	2,186	597	27%
Northern Pueblos Agency																
Pueblo of Nambe	NM	633	417	164	239	14	0	253	197	56	22%	147	50	197	31	16%
Pueblo of Picuris	NM	339	349	65	226	58	0	284	175	109	38%	100	75	175	22	13%
Pueblo of Pojoaque	NM	298	298	153	137	8	0	145	130	15	10%	50	80	130	25	19%
Santa Clara Pueblo	NM	2,240	2,432	491	1,788	153	644	1297	367	930	72%	162	205	367	38	10%
Pueblo of San Juan	NM	2,464	2,500	740	1,466	294	0	1,760	1,599	161	6%	950	649	1,599	421	26%
Pueblo of San Ildefonso	NM	606	685	177	461	47	0	508	387	121	24%	183	204	387	60	16%
Pueblo of Taos	NM	2,104	2,792	1,008	1,482	302	0	1,784	947	837	47%	465	482	947	270	29%
Pueblo of Tesuque	NM	397	397	131	234	32	0	266	212	54	20%	182	30	212	24	11%
Ramah Navajo Agency																
Ramah Navajo	NM	2,239	2,494	940	1,391	163	0	1,554	893	661	43%	765	128	893	308	34%
Southern Pueblos Agency																
Pueblo of Acoma	NM	6,344	2,923	866	1,716	341	0	2,057	1,233	824	40%	698	535	1,233	448	36%
Pueblo of Chochiti	NM	1,187	1,319	326	870	123	0	993	928	65	7%	674	254	928	201	22%
Pueblo of Jemez	NM	3,033	3,362	860	2,318	184	0	2,502	1,458	1,044	42%	931	527	1,458	420	29%
Pueblo of Isleta	NM	4,890	4,890	1,224	3,109	557	1,224	2,442	2,253	189	8%	980	1,273	2,253	496	22%
Pueblo of San Filipe	NM	3,156	3,112	985	1,936	191	271	1,856	1,401	455	34%	611	790	1,401	313	22%
Pueblo of Sandia	NM	466	400	96	269	35	0	304	292	12	4%	72	220	292	33	11%
Pueblo of Santa Ana	NM	689	607	175	378	54	0	432	393	39	9%	136	257	393	71	18%
Pueblo of Santo Domingo	NM	4,298	4,472	1,440	2,780	252	107	2,925	2,033	892	30%	1,579	454	2,033	499	25%
Pueblo of Zia	NM	771	898	258	593	47	0	640	572	68	11%	246	326	572	209	37%
Ysleta Del Sur Pueblo of TX	TX	1,214	778	250	493	35	0	528	466	62	12%	123	343	466	58	12%
Southern Ute Agency																
Southern Ute Indian Tribe	CO	1,335	2,897	424	2,418	55	0	2,473	1,952	521	21%	1,051	901	1,952	102	5%
Ute Mountain Ute Agency																
Ute Mountain Tribe	CO	1,960	1,603	595	943	65	155	853	580	273	32%	358	222	580	183	32%
Zuni Agency																
Zuni Tribe of the Zuni Reservation	NM	9,281	9,634	3,414	5,703	517	0	6,220	3,298	2,922	47%	2,224	1,074	3,298	1,233	37%
TOTAL		**64,192**	**62,669**	**19,404**	**39,021**	**4,244**	**2,401**	**40,864**	**28,871**	**11,993**	**29%**	**14,916**	**13,955**	**28,871**	**7,449**	**26%**

Introduction: Tools

Patricia Bradley
U.S. Environmental Protection Agency

The ecological footprint is one tool that may provide insight about the relationship between sustainability issues and an aging society. Ecological footprint calculations are based on the idea that most of the resources consumed and many of the wastes generated by humans can be measured and these measurements can be converted to corresponding areas of productive land or sea. The ecological footprint provides a tool for cities and regions to prepare for an aging society in a more sustainable manner.

Ecological Footprint Accounting: Comparing Resource Availability With an Economy's Resource Demand

Mathis Wackernagel, Ph.D., Dan Moran, Steven Goldfinger, Ph.D., and Mike Wallace
Global Footprint Network

*The **Global Footprint Network** is advancing the science of sustainability. It increases the effectiveness and reach of the Ecological Footprint by strengthening the Footprint community, standardizing the tool and building wide support for bringing human demands in line with Earth's limited resources. More on the science behind the Ecological Footprint and examples of how it has been used to advance sustainability can be found on the website: www.FootprintNetwork.org.*

Why Track Resource Consumption and Natural Capital?

Sustainability promises rewarding lives for all, now and in the future. Natural capital—nature's goods and services—is not the only ingredient in this vision. But without this type of capital —without healthy food, energy for mobility and heat, fiber for paper, clothing and shelter, fresh air and clean water—sustainability is impossible. This is why careful management of natural capital is central to current and future human well-being. Sustainability thus depends on protecting natural capital from systematic overuse; otherwise nature will no longer be able to provide society with these basic services.

How well are we using natural capital? Without measurements, we are blind and cannot effectively manage these essential natural resources. To take care of our natural capital, we must know how much we have and how much we use. This is no different from any financially responsible household, business, or government using accounts to keep track of its income and spending. To protect our natural assets, we need accounts that keep track of humanity's demands on nature and nature's supply of ecological resources.

Ecological Footprint Accounts: Capturing Human Demand on Nature

Ecological Footprint accounts are like **balance sheets**. They document for any given population the area of biologically productive land and sea required to produce the **renewable resources** this population consumes and to assimilate the waste it generates,

using prevailing technology. In other words, Ecological Footprints document the extent to which human communities stay within the **regenerative capacity** of the **biosphere** and who uses each portion of this capacity (Wackernagel and Rees, 1996).

Such biophysical resource accounting is possible because resources and waste flows can be tracked and because most of these flows can be associated with the **biologically productive area** required to maintain them. Thus, the Ecological Footprint of a community is the area of biologically productive land and sea required to produce the resources this community consumes and to assimilate the wastes it generates, given prevailing technology. This area is expressed in **global acres**—adjusted acres that represent the average yield of all bioproductive areas on Earth. Since people use resources from all over the world and pollute far away places with their wastes, the Ecological Footprint accounts for these areas wherever they happen to be located on the planet.

Ecological Footprint Results

For each given year, Ecological Footprints compare **human demand** on nature with nature's regenerative capacity. Recent calculations, published in World Wildlife Fund for Nature International's (WWF) *Living Planet Report 2002* (WWF, 2002), show that the average Canadian required 22 global average acres to provide for his or her consumption. If everyone on Earth consumed at this level, we would need four additional planets. The average Italian lived on a Footprint less than half that size (9.4 global acres). The average Mexican occupies 6.2 global acres, the average Indian lives on about one-fourth of that. The global average demand is 5.7 global acres per person (for more countries see table 1 on following page).

In contrast, the current supply of biologically productive land and sea on this planet adds up to 4.7 acres per person. Less is available per person if we allocate some of this area to the other species which also depend on it. Providing space for other species is necessary if we want to maintain the biodiversity that may be essential for the health and stability of the biosphere.

Comparing supply and demand, we see that humanity's Ecological Footprint exceeds the Earth's **biocapacity** by over 20% (5.7 [global acres/cap]/4.7 [global acres/cap]=1.2). In other words, it takes more than one year and two months to regenerate the resources humanity consumes in one year. Global demand began outpacing supply only recently, beginning in the late 1970s or early 1980s. In 1961, for example, it took only 0.5 years to regenerate what was used in that year, as shown in the figure below (Wackernagel et al., 2002).

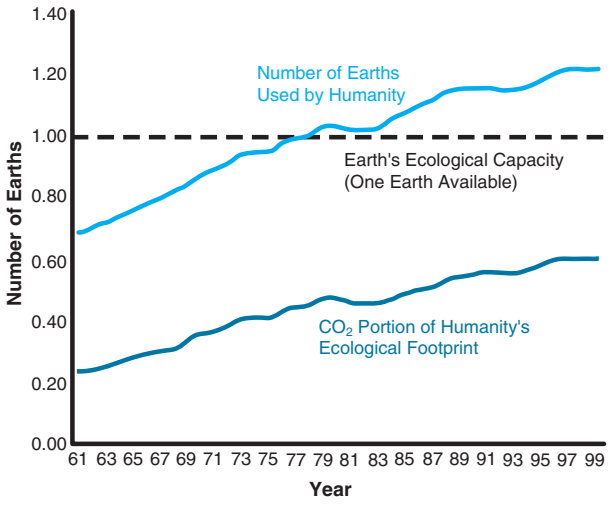


Figure 1. Today's Ecological Footprint exceeds Earth's biological capacity.

Table 1. Comparison of the Ecological Footprint and the Biological Capacity of selected countries.

	Population [millions]	Ecological Footprint global acres/cap	Biological Capacity global acres/cap	Ecological Deficit (-) or Reserve (+) global acres/cap
WORLD	**5,979**	**5.7**	**4.7**	**-1.0**
Argentina	37	7.4	16.6	8.9
Australia	19	18.8	36.1	17.3
Brazil	168	5.9	14.8	8.9
Canada	31	21.7	35.1	13.3
China	1,272	3.7	2.5	-1.2
Egypt	67	3.7	2.0	-1.7
France	59	13.1	7.2	-5.9
Germany	82	11.6	4.2	-7.4
India	993	2.0	1.7	-0.2
Indonesia	209	2.7	4.4	1.7
Italy	58	9.4	3.0	-6.7
Japan	127	11.9	1.7	-10.1
Korea, Rep.	46	8.2	1.7	-6.4
Mexico	97	6.2	4.2	-2.0
Netherlands	16	11.9	2.0	-9.9
Pakistan	138	1.5	1.0	-0.5
Philippines	74	3.0	1.5	-1.5
Russian Federation	146	11.1	11.9	1.0
Sweden	9	16.6	18.0	1.5
Thailand	62	3.7	3.5	-0.5
United Kingdom	60	13.1	4.0	-9.1
United States	280	24.0	13.1	-10.9
Combined	***4,049***	***6.2***	***4.7***	***-1.5***

In the last column, negative numbers indicate an ecological deficit, positive numbers an ecological reserve. All results are expressed in global hectares, hectares of biologically productive space with world-average productivity.

Note that numbers may not always add up due to rounding. These Ecological Footprint results are based on 1999 data. (WWF, Living Planet Report 2002)

Overshoot and Ecological Deficit

It is possible to exceed global biocapacity because trees can be harvested faster than they regrow, fisheries can be depleted more rapidly than they restock and carbon dioxide (CO_2) can be emitted into the atmosphere more quickly than ecosystems can sequester it. With humanity's current demand on nature, ecological deficit, or "**overshoot**," is no longer merely a local but a global phenomenon. We are now consuming not only nature's interest,

but also invading the principle. Overshoot causes the **liquidation** of natural capital: carbon accumulates in the atmosphere, fisheries collapse, deforestation spreads, biodiversity is lost and freshwater becomes scarce. Efficiency gains have helped to some extent: humanity's Ecological Footprint has grown slower than economic activities. Still, human demand on nature has steadily risen to a level where the human economy is now in global ecological overshoot.

Applications of Ecological Footprint Accounts

The Ecological Footprint can be applied at scales ranging from single products to organizations, cities, regions, nations and humanity as a whole. It can be used to help budget limited natural capital. It also makes clear the four complementary ways in which ecological deficits can be reduced or eliminated:

(1) Use resource-efficient technology that reduces the demand on natural capital;
(2) Reduce human consumption while preserving people's quality of life, for example reduce on the need for **fossil fuels** by making cities pedestrian friendly;
(3) Lower the size of the human family in equitable and humane ways so that total consumption decreases even if per capita demand remains unchanged; and,
(4) Invest in natural capital, for example by implementing **resource extraction** methods that increase rather than compromise the land's biological productivity, thereby increasing supply.

There have been Footprint applications on every continent. Global and national accounts have been reported in headlines worldwide and over 100 cities or regions have assessed their Ecological Footprint (see Table 2 and discussion in next section). In California, Sonoma County's Footprint project *Time to Lighten Up* has inspired all cities of the county to sign up for the Climate Saver Initiative of the International Council for Local Environmental Initiatives (ICLEI). Wales has adopted the Ecological Footprint as its headline indicator. WWF International, one of the world's most influential conservation organizations, uses the Ecological Footprint in its communication and policy work for advancing conservation and sustainability. Government agencies, particularly in Europe, have studied the implication of Ecological Footprint results and have reexamined the significance of carrying capacity. A number of national ministers have repeatedly used the concept, including French President Jacques Chirac in his speech to the World Summit on Sustainable Development in Johannesburg. Even larger **media** outlets are picking up the ideas: *The Economist* titled its July 2002 insert on the global environment "How many planets?", based on a Footprint assessment that showed it would take three planet Earths if all people lived Organization for Economic Cooperation and Development (OECD) lifestyles.

Table 2. Ecological Footprint Applications for Urban Development

Ecological Footprint analysis serves a wide range of urban development projects. The communication benefits are obvious since Footprint results can be directly compared to national and global assessments, and thus provide a benchmark for assessing the achievements of policy or design choices for developments. But it also supports decision-making in support of Footprint reduction opportunities. The biggest and most cost-effective opportunities present themselves in the design process. Many strategies enhance the ecological performance of developments, including:

- Building design and layout (e.g., North-South orientation, **natural lighting,** ease of pedestrian access);
- Energy use (e.g., through technologies, such as energy efficiency, solar energy use, and insulation; and by design that encourages lifestyle changes);
- Urban form and density (e.g., closeness to public transportation, clustering, integration of recreational, work and living areas);
- Transportation and lifestyle strategies (e.g., reduction strategies and mode shift such as to public transportation, reduced availability of parking spots, pedestrian and bicycle paths, reduction in transportation needs);
- Material use (e.g., non-toxic, local construction material, sustainable harvested and certified timber);
- Waste management and material stewardship (e.g., availability of **composting**, reuse, recycling);
- Food availability (e.g., provision of growing areas for community gardens, spaces that encourage **farmers' markets** and local shops);
- Development costs (e.g., affordability as a resource saving strategy since every $ additional investment has a Footprint for generating these financial resources).

Well designed developments can achieve energy and resource savings. Using fewer resources results in less carbon dioxide and pollutant emissions. Considerations include architectural design that leverages natural lighting and reduces artificial lighting, North-South building orientation, water collection that re-uses grey water for landscaping, insulation that reduces heating/cooling needs, energy efficient light bulbs and appliances, etc.

There are many quality-of-life benefits of compact, eco-friendly cities, including advantages for human health and well-being. For example, increased exercise by residents (in Amsterdam, 25% of all journeys are by bicycle and levels of obesity are much lower than in London); enhanced sense of community created by increased public spaces and street life; enhanced sense of safety which comes from interactive communities; reduction in motor noise; reduction in traffic accidents (a major cause of death in many cities); reduction in respiratory disease (20,000 deaths each year in the UK are attributable to air pollution); increased availability of locally produced, organically grown food; and an improved local economy (James and Desai, 2003).

Specific examples of Footprints applied to urban developments are:

Walker, L. and W.E. Rees, 1997: Urban density and ecological footprints: An analysis of Canadian households. In: Eco-city Dimensions: Healthy Communities, Healthy Planet, M. Roseland (ed.), New Society, Gabriola Island, B.C.

(Continued on following page)

Table 2 (continued). Ecological Footprint Applications for Urban Development

John Barrett et al., 2003, Sustainability Rating for Homes—The Ecological Footprint Component. Report to BioRegional Development Group. Stockholm Environment Institute, York, United Kingdom.

The sustainable consumption unit of the Stockholm Environment Institute in York which produced this report has led a number of other studies of cities or regions (*http://www.york.ac.uk/inst/sei/IS/sustain.html*). They also contributed, with BioRegional, to a WWF-UK report called *One Planet Living in the Thames Gateway* which identifies Footprint saving potentials for greener urban developments. The report is available at: *www.wwf.org.uk/filelibrary/pdf/thamesgateway.pdf*.

Bill Dunster, UK's leading ecological architect, uses the Footprint as the context for his designs. More on his work can be found at *www.zedfactory.com*.

Case Study: Calculating London's Ecological Footprint

There may well be over one hundred Ecological Footprint studies for cities, ranging from student projects to comprehensive analyses of a metropolitan area's demand on nature. London, for instance, has already gone through three rounds. In 1995, urban sustainability expert Herbert Girardet estimated that the UK capital's Footprint was 125 times the size of the city itself. In other words, in order to function, London required an area the size of the entire productive land surface of the UK to provide all the resources the city uses and to dispose of its pollutants and waste.

In 2000, under the leadership of Mayor Ken Livingstone, London commissioned a more detailed Ecological Footprint study called City Limits. The report, sponsored by organizations including the Chartered Institution of Wastes Management, the Institution of Civil Engineers (ICE) and the Biffaward Programme on Sustainable Resource Use, was produced by Best Foot Forward and launched in September 2002. Results for this city and its 7 million inhabitants are available at:

http://www.citylimitslondon.com

To respond to the challenges identified by the City Limits report, London Remade, a business membership organization supported by over 300 of the capital's major businesses and higher education institutions, wanted to analyze possible steps for reducing London's Footprint. In collaboration with London First, a waste management partnership, it commissioned consulting companies WSP Environmental and Natural Strategies to identify the reduction potential in a project called Toward Sustainable London: Reducing the Capital's Ecological Footprint. The first of four reports, Determining London's Ecological Footprint and Priority Impact Areas for Action, is available at:
http://www.londonremade.com/lr_footprinting.asp

Performing and Ecological Footprint Analysis is a well-documented and understood practice. Table 3 gives an overview of a possible process.

Table 3. Summary of a potential Footprint Campaign for a local government or local group.

Preparations

- Identify budget
- Recruit a project team and a coordinator (on staff)
- Set the context and write the project specifications

Communication

- Create an e-list of people interested in the Footprint project including community activists, academics, elected officials, media contacts, etc This list is used for sending out project updates and invitations to events
- Hold a public meeting to announce project
- Establish an engaging website
- Work with local media to publicize project progress and results, providing them materials

Calculation

- Train own staff or contract with qualified consultant or nongovernmental organization (NGO) to measure city's Ecological Footprint in a way consistent with emerging standards
- Gather local data for the calculations

Explore opportunities for cross-cutting initiatives

- Start identifying with planning staff new opportunities for advancing sustainability strategies in transport-ation, energy and land-use planning using the Footprint as a communication tool

Engage the public

- Hold public working meetings to discuss the calculations and identify limitations and opportunities for city
- Write meeting report for participants and city staff

Publicize Results

- Write a report with project results. Print copies and distribute to conference attendees, elected officials, etc. Also, post report on the web
- Hold a conference to unveil the results of the calculation and discuss the results and next steps
- Make presentations about project results to civic groups, appointed and elected governmental bodies, etc

When estimating resources needs: include outside support as well as the time and resources used by city staff for analysis as well as other activities such as organizing events, engaging with local press and developing mailing lists.

National and Regional Applications

A number of national and regional Footprint studies have contributed to policy discussions, some in close cooperation with government agencies. For example:

- ***Wales (pop. 2,900,000).*** The National Assembly for Wales adopted the Ecological Footprint as their headline indicator for sustainability in March of 2001, making Wales the first nation to do so. The first report was commissioned through WWF-Cymru and executed by Best Foot Forward. This report details Welsh energy, transportation and materials management. It can be found at: *http://www.wwf-uk.org/filelibrary/pdf/walesfootprint.pdf.*

- ***The State of Victoria, Australia (pop. 4,650,000)***. EPA Victoria, the lead state agency responsible for protecting the environment, established a series of pilot projects in 2002 in partnership with a wide range of organizations and businesses to further investigate the practical applications of the Ecological Footprint to promote sustainability. See *www.epa.vic.gov.au/eco-footprint.* The campaign is expanding its reach for 2004.

- ***Sonoma County, California (30 miles north of San Francisco, pop. 495,000).*** Under a grant from EPA, Sustainable Sonoma County, a local NGO, used the Ecological Footprint as the foundation of a 2002 campaign. By inviting wide public participation and comment on the study before it was released, it was able to generate strong local buy-in. As a result, the launch of the study got county-wide media coverage and built the groundwork for a subsequent campaign. The latter resulted in all municipalities of Sonoma County committing simultaneously to reduce their CO_2 emissions by 20%, making it the first U.S. county to do so. To meet this commitment, they established programs that track progress towards meeting their reduction goal. The Sonoma Footprint study is available at: *www.sustainablesonoma.org/projects/scefootprint.html*

An Indicator for "Strong" and "Weak" Sustainability

By monitoring human use of renewable natural capital, Ecological Footprint accounts provide guidance for sustainability: a Footprint smaller than the available biocapacity is a necessary condition for "strong sustainability," a stance which asserts that securing people's well-being necessitates maintaining natural capital.

Some argue that "strong sustainability" is too stringent since technology and knowledge can compensate for lost **ecological assets**. While this can be debated, even managing for "weak sustainability" requires reliable accounting of assets. Hence, by measuring the overall supply of and human demand on regenerative capacity, the Ecological Footprint serves as an ideal tool for tracking progress, setting targets and driving policies for sustainability.

What's in it for Governments and Regions?

Ecological Footprint accounts allow governments to track a city's or region's demand on natural capital and to compare this demand with the amount of natural capital actually available. The accounts also give governments the ability to answer more specific questions about the distribution of these demands within their economy. For example, Footprint accounts reveal the ecological demand associated with residential consumption, the production of value-added products or the generation of exports; or they help assess the ecological capacity embodied in the imports upon which a region depends. This can help in understanding the region's constraints or future liabilities in comparison with other regions of the world and in identifying opportunities to defend or improve the local quality of life.

Footprint accounts help governments become more specific about sustainability in a number of ways. The accounts provide a common language and a clearly defined methodology that can be used to support training of staff and to communicate about sustainability issues with other levels of government or with the public. Footprint accounts add value to existing data sets on production, trade and environmental performance by providing a comprehensive way to interpret them. For instance, the accounts can help guide "**environmental management systems**" by offering a framework for gathering and organizing data, setting targets and tracking progress. The accounts can also serve environmental reporting requirements and inform strategic decision making for regional economic development.

In addition, monitoring demand and supply of natural capital allows governments to:

- Build a region's competitiveness by monitoring ecological deficits, since over time these deficits could become an increasing economic liability;
- Stay aligned with the business community's increasing focus on sustainability as a way to decrease future vulnerability;
- Manage common assets more effectively. Without an effective **metric**, these assets are typically valued at zero or less and their contribution to society is not systematically assessed nor included in strategic planning;
- Have access to an early warning device for long-term security that recognizes emerging scarcities and identifies global trends;
- Monitor the combined impact of ecological pressures that are more typically evaluated independently, such as **climate change**, fisheries collapse, loss of cropland, forestry overharvesting and urban sprawl;
- Identify local and global possibilities for climate change mitigation and examine the trade-offs between different approaches to atmospheric CO_2 reduction; and
- Test policy options for future viability and possible unintended consequences. For instance, it supports urban design processes, opens dialogue with stakeholders, helps manage expectations, provides a platform for sustainability management systems, supports training for sustainability,

allows for ecological risk assessments, explain past successes more effectively.

Without regional resource accounting, countries can easily overlook or fail to realize the extent of these kinds of opportunities and threats. The Ecological Footprint, a comprehensive, science-based resource accounting system that compares people's use of nature with nature's ability to regenerate, helps eliminate this blind spot.

References

Mathis Wackernagel, and William E. Rees, *Our Ecological Footprint: Reducing Human Impact on the Earth*. New Society Publishers, Gabriola Island. 1996.

World Wildlife Fund for Nature International (WWF), UNEP World Conservation Monitoring Centre, Redefining Progress, with the Center for Sustainability Studies, 2002, *Living Planet Report 2002*, WWF, Gland, Switzerland.

Mathis Wackernagel, Niels B. Schulz, Diana Deumling, Alejandro Callejas Linares, Martin Jenkins, Valerie Kapos, Chad Monfreda, Jonathan Loh, Norman Myers, Richard Norgaard, and Jørgen Randers, "Tracking the ecological overshoot of the human economy," *Proc. Natl. Acad. Sci.* USA, Vol. 99, Issue 14, 9266-9271, July 9, 2002.

James, Nick and Pooran Desai. 2003. One Planet Living in the Thames Gateway, A WWF-UK One Million Sustainable Homes Campaign Report by the BioRegional Development Group, SEI and WWF UK, June 2003. *www.wwf.org.uk/filelibrary/pdf/thamesgateway.pdf*

Introduction: Breakout Sessions

Patricia Bradley[1] and Eric Walbeck[2]

[1]U.S. Environmental Protection Agency and
[2]Perot Systems Government Services

Consistent with standard risk assessment approaches, workshop breakout discussions (Focal Area Breakout Groups) were structured to focus on: A) projected demographic and lifestyle patterns of an aging population (sources of environmental stress), B) temporal and spatial changes in land-use and environmental stressors resulting from these patterns (exposure) and C) likely effects resulting from changing land-use and exposure regimes on natural resources and environmental quality (effects). Considerations of expected variation in lifestyles and regional differences are important to all three issues. Each breakout group was asked to identify and discuss existing information important to their respective portion of this simplified risk paradigm and to identify the significant knowledge gaps in the data, methods and models needed to address that portion. Bridging these gaps (once prioritized) will be the primary goal of ORD's ecological research program relative to the impacts of the aging population.

Workshop participants were assigned to one of the three focal breakout groups. Each breakout group consisted of both experts and stakeholders, and was led and facilitated by a workshop representative. One volunteer from each group captured the salient issues, information, and discussion points on flip charts. This material was used to support the breakout group's plenary presentation on the last day of the workshop. The deliberations and plenary presentations of each group were structured to:

- Identify issues salient to the group's focal area,
- Identify known sources of information (data, methods, and models) salient to the group's focal area,
- Identify significant gaps in that information that are needed to understand the ecological risks associated with an aging population,
- Suggest research (data collection, method, and model development) to bridge the significant gaps,
- Provide a sense of priority with respect to research needs.

The original focal area breakout groups were rearranged so that individuals from each focal group were represented in each of the Interactions/ Linkages Breakout Groups. These sessions concentrated on interactions and linkages among the themes developed in the focal groups.

The facilitator for each session ensured that the critical issues and discussion points were captured at the end of each session. These critical captures contributed directly to the final summary session of the Workshop and to these Workshop Proceedings and provided input for the "Post Workshop Considerations for Research and New Directions" and "Synthesis" sections that follow.

Summary: Focal Area Breakout Group A

Mary Holland (Facilitator)
Perot Systems Government Services

Projected Demographic and Lifestyle Patterns of an Aging Population (Sources of Environmental Stress)

Charge and Approach

Focal Group A was asked to identify existing information and gaps in that information relative to expected trends in the numbers and lifestyles of the aging population. Specific questions addressed included:

- Is there sufficient information to forecast lifestyle behaviors of an aging population? If not, what information is missing and how can we capture it? Where is the information that does exist?
- How are trends expected to differ regionally?
- What research is critically needed to develop a more complete understanding of expected demographic and lifestyle trends?
- In what ways can the young-old and old-old serve as a resource for environmental protection and related research?

Focal Group A included national research and practitioner experts on demographic and lifestyle trends of an aging U.S. population, so the Group drew on its knowledge about existing information and gaps. It was also suggested that there might be a more systematic survey of existing information.

Availability of Information

Focal Group A tackled the fundamental question: *Is there sufficient information to forecast lifestyle behaviors of an aging population?* The initial conclusion was "Yes"—a qualified yes. There was some discussion of how you can ever really know if there was sufficient information. One recurring issue throughout the Group and workshop discussion was whether enough information exists regarding how tail-end Boomers will age in the future. It is widely expected that this cohort will behave unpredictably. This phenomenon underscores the need for a dynamic approach to lifestyle research. Ken Dychtwald was noted as an author (*Age Wave*) who has devoted his career to understanding the lifestyle, marketing, financial, healthcare and workforce implications of the "age wave"—or aging Baby Boomers.

Focal Group A discussed some of the issues associated with analyzing the demographic and lifestyle trends of the aging population. The Group felt that an important element of understanding demographic and lifestyle trends is to have an across-the-board look at trends. Yet, one fundamental issue highlighted by the group was appreciating the diversity of cohort behavior; the "aging population"

does not behave in a homogenous fashion. Census data were cited as an important source for understanding trends. Focal Group A discussed the various ways that you could segment the data. For example, analysis could focus on income level, consumption patterns, race, religious and cultural backgrounds, or political attitudes. The Ecological Footprint (explained in the plenary session) is likely to differ across different segments.

Focal Group A considered the analysis that would examine the full cycle from lifestyle trend to consequences to project effects. For example, the Group discussed doing a **life-cycle assessment** on different consumption patterns, such as pharmaceutical use. Focal Group A also discussed the importance of understanding the consequences of certain group behavior, for example, the food chain impact of **subsistence fishing** or the rate of pedestrian accidents related to an increased number of older drivers.

Missing Information

After a general discussion of the availability of lifestyle and demographic data, the Group **brainstormed** what types of information are missing. The need for projections and modeling topped Focal Group A's list. The Group discussed the "futurist" approach—using the **Delphi method**, which is a way of collecting and distilling the forecasts of a group of experts while ensuring that neither individual bias nor "group think" prevails in the final assessment. A suggested resource for projections is *The Art of the Long View: Planning for the Future in an Uncertain World*, by Peter Schwartz, which outlines the use of scenario exercises to develop future visions upon which to base decisions. Modeling could integrate variables such as income, education, health and the likelihood of moving. **Dynamic systems modeling** was applied in reforming New York State's long-term care system.

Focal Group A also discussed the fundamental issue of how to define aging. Various institutions define and collect aging data based on different thresholds. New definitions of aging based on cultural and ethnic considerations might be useful.

Focal Group A also discussed the potential value of pinpointing environmental attitudes to location, in order to better predict behavior. However, large datasets are hard to break down geographically. So the Group felt it would be extremely valuable to augment those types of databases with targeted surveys or case studies that can offer in-depth looks at various facets of lifestyle trends among an aging population. For example, this multi-level research may help to more closely examine choices related to aging in place or choosing a retirement community.

Focal Group A discussed at length how to capture **attitudinal** data both to predict behavior and to educate aging Americans about the impact of lifestyle choices. As one ages and moves, does one experience a loss of concern about environmental issues—perhaps related to a loss of identity with place? Do people really not care about other people and countries? The Group discussed how to appeal to aging Americans' potential interest in establishing a legacy. To that end, research might examine the overarching psychology and commonwealth motivation that leads some to embrace a stewardship legacy ethic. Research on individuals' civic

engagement over their lifespan may be valuable to understand how to encourage more choices that consider the common good.

The Group wanted to better understand how to market successfully to an aging population, with a view to "environmental marketing" to effect behavior changes. The group felt effective marketing would appeal to self-interest. For example, energy consumption demand may be lowered more effectively by a "low-cost" versus an "energy-efficient" appeal to older Americans—same potential result, but different approach. One challenge addressed by the Group was how to make quality more appealing than quantity. Related research might help to better understand some consumption practices, including a preference for outsized space. The Group discussed some personal experiences with high-demand neighborhoods that had smaller homes but a highly desirable community spirit.

The Group discussed capturing success stories, by searching for environmental model cities or developments, such as Dewees Island, South Carolina, which is considered one of the best examples of ecological development. They also talked about identifying and sharing elements of retirement communities that have incorporated environmentally sensitive practices. Comparative research of countries with high standards of living—such as Japan, Sweden and Norway—was also discussed.

Existing Information

Focal Group A brainstormed some of the existing data sources and authorities on demographics and lifestyle trends of an aging population. Census data are a key source of lifestyle and demographic data. William Frey, a visiting fellow at the Brookings Institution, is well regarded for his Census extrapolations. Among his work is an article that was included in the workshop handouts, published by The Brookings Institution Center on Urban and Metropolitan Policy: *Boomers and Seniors in the Suburbs: Aging Patterns in Census 2000.*

Focal Group A discussed a number of surveys and other data sources that focus on various aspects of demographics relevant to understanding an aging population. For some of the surveys, EPA could fund an add-on module to target data collection towards the impact of aging Americans on ecology and environmental quality. Those sources are listed in Table 1 (see following page).

The Group discussed how to capture disability data, which may have some **correlation** to whether or not older Americans age in place. Census data capture some measure of disability. Physicians also capture accessibility information (e.g., stair use information) which might be aggregated.

Several **market surveys** are conducted by different entities, including, for example, AARP, social service agencies, and insurance companies. Pulte Homes Del Webb group, for example, does extensive research on preferences and behaviors of aging Americans, though its research is proprietary information.

Table 1. Surveys and other data sources that focus on various aspects of demographics relevant to understanding an aging population.

DATA SOURCE	INVESTIGATOR	DESCRIPTION
EPA National Time Use Surveys	Dr. John Robinson, University of Maryland, College Park	Tracks time spent by individuals on various tasks/ activities.
Gerontology Surveys	Census Bureau, Administration on Aging, CDC, and others	Collection of surveys regarding all aspects of aging.
Americans' Changing Lives Project	University of Michigan	Longitudinal study of the relationships between aging, health, and social conditions, started in 1986.
Health and Retirement Study	University of Michigan	Biannual survey that paints an emerging portrait of an aging America's physical and mental health, insurance coverage, financial status, family support systems, labor market status, and retirument planning.
Public Health Information Network (PHIN)	Centers for Disease Control (CDC)	Framework to enable consistent exchange of response, health, and disease tracking data between public health partners.
Summary Health Statistics - health measures for U.S. population	CDC, National Center for Health Statistics	Collection of health surveys and data collection systems, data categorized by health topics and/or demographics.
National Survey of Family Growth	CDC, National Center for Health Statistics	Interviews including questions on schooling, work, marriage and divorce, having and raising children (including contraceptive use, infertility, and parenting), and related medical care.
National Health and Nutrition Examination Survey (NHANES)	CDC, National Center for Health Statistics	Periodic survey of health and nutrition trends, including laboratory analyses of select chemicals in the population.
National Health Interview Survey (NHIS)	CDC, National Center for Health Statistics	Continuous nationwide survey; data collected through personal household interviews; ongoing and special health topics.
Consumer Expenditure Survey (CE)	U.S. Department of Labor, Bureau of Labor Statistics	Quarterly interview survey and the Diary survey—that provide information on the buying habits of American consumers.
Occupational Employment Statistics Survey (OES)	U.S. Department of Labor, Bureau of Labor Statistics	Annual mail survey measuring occupational employment and wage rates for wage and salary workers in non-farm establishments, by industry.
Survey of Income and Program Participation (SIPP)	U.S. Census Bureau	Continuing survey, with monthly interviews; collects source and amount of income, labor force information, program participation and eligibility data, and general demographic characteristics; core section plus topical modules.
General Social Survey	University of Chicago, National Opinion Research Center (NORC)	Started in 1972. Assesses social changes in contemporary America through a standard core of demographic and attitudinal variables, plus topics of special interest.

Regional Differences

Focal Group A began to address the question of how trends are expected to differ regionally. Participants acknowledged regional differences and similarities in trends. When New York State looks at trends in New York City versus Upstate New York, they find that big cities upstate have comparable trends to New York City. Immigrants are attracted to urban areas.

Rather than citing specific examples at length, the Group's focus quickly shifted to discussing the current availability of regional data—and the differing definitions of regions across institutions that capture and analyze demographic data. Typically, **geopolitical boundaries** are used to define regions. The EPA, for example, administers programs and often has data grouped according to ten standard federal region configurations in the U.S. Those studying aging demographics often find boundaries that are subsets of, or cross federal regions most useful in analyzing trends. For example, based on his analysis of 2000 Census data, William Frey has identified three regions: The "**New Sunbelt**" (13 fast growing states, mainly in the Southeast and West); "The Melting Pot" (9 states attracting most of the immigrant population); and "The **Heartland**" (28 states and the District of Columbia, which have the largest share of the nation's older and blue collar population and experience slower growth rates).

Further, the focus of this workshop is examining the relationship between demographic trends of the aging population and impact on ecology and environmental quality. Geopolitical boundaries may not correspond to ecological issues. Focal Group A discussed the desirability of collecting or analyzing data by **ecoregion**. Bailey or Omernick are sources of defined ecoregions. Focal Group A suggested doing a layered regional analysis, using an ecoregion base foundation—and overlaying with demographics. Overlay factors could include percentage growth vs. proportion of population; waves of immigrants; percent of older adults migrating; and regional carrying capacity to respond. Educational translations would be important for people to digest and use these ecoregion assessments. It was noted that in the West, for example, water is the "gorilla" issue; ecoregion assessments would help highlight key issues and contributing factors underscoring this issue.
Focal Group A felt a "region" reflects different culture, resources, climate, affordability and "prettiness." Those factors are behind regional migration trends.

Research Needs to Understand Demographic And Lifestyle Trends

Focal Group A prioritized key themes of its discussion to make recommendations for research needed to better understand the demographic and lifestyle trends of an aging population. Dr. Scott Wright felt it was important to put the group's recommendations in context; he proposed, and the Group adopted the following preface for Focal Group A's recommendations.

> Preface: *We have many good datasets in regard to demographic and lifestyle trends of the aging population. Current forecast data for behavior and lifestyles of aging cohorts are available and somewhat accessible—but may not be reliable or designed to answer key questions. Proceed with caution when using such data for policy decisions—and adjust data over time.*

Focal Area Group A's recommendations for research are:

- Use multi-dimensional studies—breadth and depth provide a fuller understanding, e.g., analysis of large data sets coupled with case studies.
- Collaborate with others for diverse points of view, methods, and sources. Run a "Delphi" (futurist exercise) with those collaborators.
- Capture consumption, medical needs and lifestyle patterns by cohort and geographic area to assess probable

impacts (e.g., energy, water, footprint) of greatest concern.
- Overlay aging population demographic data on an ecoregion base layer.
- Understand aging population's motivation/attitudes toward the environment (why certain choices are made), with the goal of informing environmental marketing (education re: impacts) toward achieving a "Stewardship Legacy."
- Develop models to predict future aging population migration patterns and lifestyle choices.
- Develop a decision support tool that integrates different personal factors and reflects trade-offs of various lifestyle choices, including environmental impact. Engage "life coaches" and agencies for aging, among others, in this effort.
- Explore external factors (e.g., traffic, air pollution) affecting the choice to migrate or stay in place.
- Identify key add-ons to existing survey research efforts, including CDC's research surveys.
- Explore collected, but publicly unavailable data (e.g., gerontology survey "activities form" administered by physicians); acknowledge caveats (i.e., potentially **skewed** by "in-crisis," well-educated, insured sample).

Aging Population as a Resource for Environmental Protection and Related Research

Focal Group A considered some of the positive ways in which an aging population could impact ecology and environmental quality by applying their skills and time to volunteering, educating and monitoring. In general, the Group felt that it was important to provide for meaningful volunteer engagement—by matching skills and awareness with better volunteer roles for environmental protection. The Group noted several existing programs that could be better tapped, adapted or expanded, including:

- Expand EPA's Senior Environmental Employees (**SEE**) Program; revamp the SEE Program for problem-solving, comparable to the **Civilian Conservation Corps**—Environmental "**VISTA**" or "Senior Environmental Corps"; expand to other agencies—U.S. Department of the Interior (**DOI**), U.S. Department of Agriculture (**USDA**), National Oceanic and Atmospheric Administration (**NOAA**).
- Institute an older adults environmental monitoring program based on **GLOBE**—a youth education and science program sponsored by a governmental partnership.
- Utilize the **Environmental Alliance for Senior Involvement** (EASI).
- Develop educators through existing programs (e.g., tapping **Extension Service Master Gardeners**).
- Recruit bird watching organizations to perform biological surveys.

Focal Group A also suggested that oral and visual (e.g., family photo archives) histories from older adults can help characterize environmental history and trends (e.g., visibility). Other suggestions included establishing peer mentoring and training civic committee participants.

Summary: Focal Area Breakout Group B

Kent Thornton (Facilitator)
FTN Associates

Changing Land-Use and Environmental Stressors (Exposure)

Focal Area Group B focused on identifying existing information and gaps in that information relative to predicting how pressures on natural resources and environment quality will change as the two population segments (young-old and old-old) grow. Consideration was given to the social and environmental amenities required by these segments, and how changes in the demand for these amenities will introduce new and additional environmental stressors or influence the temporal and spatial aspects of existing stressors.

Summary

The original charge for Focal Area Breakout Group B was to address four questions related to changing land-use and environmental stressors:

1. Is there sufficient information to predict patterns of land-use by the two population segments? If not, what information is missing and how can we capture it? Where is the information that does exist?
2. What new environmental stresses are expected as the result of changes in land-use and the increased demand for social and environmental amenities?
3. What infrastructure issues must communities address to prepare for dramatic increases in their aging population?
4. What research is critically needed to develop a more complete understanding of expected patterns of land-use and environmental stressors? Are ecological footprints a useful tool for this assessment?

Focal Group B focused on the stressor link between sources and effects in the ecological risk assessment paradigm. The answers to the questions posed above were embedded in the discussion, but it was difficult for the Group to specifically address stressors without some understanding of the specific sources of stressors and specific environmental effects. The following summary highlights the excellent discussion that occurred in the Breakout Group.

1. Environmental Issues and Information Sources

Brain-storming was conducted to identify environmental issues and information sources. Some of the issues included:

- Use, disposal, and treatment of water
- Vehicle emissions contributing particulates and **ozone** precursors

- Development within sensitive coastal and mountain areas, resulting in fragmented habitat and increased impervious area

Additional issues are listed in Table 1.

Many of the issues were not specific to an aging population, but an aging population will contribute to these issues. One of the research areas might be the relative contribution of an aging population to various stressors. Some stressors might be aggravated, while others might be ameliorated. For example, migration trends of older adults might result in farmland in smaller metropolitan areas being purchased for development. Other effects may occur if alternative crops are raised in the future because of preferences of an aging population. One suggestion was to investigate future trends in agricultural markets because agricultural activities contribute significant loads of **sediment**, nutrients, and **pesticides** to aquatic ecosystems.

Table 1. Potential environmental issues or stressors associated with an aging population. (For many issues, the relative contribution from an aging population would be considered, as these are not issues associated solely with aging populations).

Water

- Distribution and infrastructure in both existing and new communities
- Change in usage—domestic and commercial (e.g., golf courses)
- Treatment for pharmaceuticals
- Failing treatment systems in rural communities
- Discharge of pharmaceuticals and by-products
- Water re-use, recycling
- Increased number of package treatment plants
- Additional septic systems
- Increased pollutant transport from increased impervious surfaces
- Disposal, leaching of hazardous chemicals from electronic waste

Land

- Increased waste-adult diapers, electronic equipment, disposable medical equipment
- Increased habitat fragmentation—trails, universal access, development
- Urban sprawl
- Increased congestion
- Increased impervious area
- Increased flooding, runoff
- Increased waste from domestic pets, wildlife (e.g., geese on golf courses)
- Fragile environment disturbance (Coastal dunes, shores, barrier islands, **Montane** ecosystems, Arid ecosystems)

Air

- Vehicle emissions
- Increased emissions from generating increased energy (heating, cooling)
- Haze, decreased visibility
- Ozone damage to **terrestrial** ecosystems

Some of the information sources included:

- Sonoran Institute
- Urban Land Institute
- National Association of Home Builders (NAHB)
- EPA's Aging Initiative

Additional information sources are listed in Table 2.

The Group agreed the list of information sources might be almost endless. Many of the organizations listed, however, have evaluated characteristics of an aging population, investigated or researched **green technology**, or can provide information on specific stressors in different geographic areas. Intel Corporation, for example, is investigating the impacts of technology on an aging population. The Urban Land Institute has a Council on Aging to evaluate alternative building designs and hardware for older adults.

Recommendation: Rather than continue to brain-storm on multiple issues and information sources, the group recommended that a literature search be conducted and a matrix developed that cross-references issues, scale, information sources, models, and other pertinent information needed to assess the effects of an aging population on the environment.

Recommendation: Another recommend-ation from this discussion was that new types and forms of partnerships need to be developed and pursued in the future. There is no them versus us; there is only us. These partnerships should include the private sector, NGOs, and local, state, and federal agencies.

2. Scale

The scale at which these studies might be conducted to maximize the utility of the results was a topic raised in this Breakout Group. A national or regional scale was not considered appropriate for research because most decisions are not made at this scale, the tools and techniques to project the effects of an aging population are too uncertain, and the issues and processes are too complex at this scale. Most decisions are made at a local scale, and there are multiple techniques, procedures, agencies and institutions working at this scale.

Recommendation: It was also recommended that a **meta-analysis** of multiple local scale studies on aging, environmental impacts, ancillary transportation, energy, infrastructure, etc., be conducted to determine if there are certain factors that are common among all or most of these local scale issues.

The Sustainable Environment for Quality of Life (**SEQL**) initiative was suggested to be an ideal scale. It is a two-state (North Carolina-South Carolina), 15 county, 85 **municipality** area that is considering the impacts of air and water quality on the population and environment. This initiative presents an opportunity to **leverage** on-going funds, information, resources, and researchers, and has many of the population and environmental issues related to the effects of an aging population on the environment.

Recommendation: Because there is currently considerable research and emphasis at the local scale, it was recommended that EPA focus its research at a scale smaller than a region (i.e., multi-state EPA Regions), but large enough to consider the cumulative impact of local decisions.

3. Case Studies & Demonstration Projects

The SEQL initiative represented a good case study or demonstration project with the right issues and at the right scale.

Table 2. Selected sources and type of information.

Source	Type of Information
Urban Land Institute	Real estate and urban development – councils on aging
National Association of Home Builders	Seniors housing news, information on building trends
Sonoran Institute	Conservation information and stakeholders in the West
National Association of Area Agencies on Aging	Information programs on aging adult population
National Institute of Environmental Health Sciences	Information on environmental risks, stressors, hazards to humans
California Center for Land Recycling	Information on reducing urban sprawl and repairing fractured communities
Center for Inclusive Design and Environmental Access	Information on designing facilities for universal access, safety, reducing environmental impacts from development
Smart Growth Network	Policies, practices to reduce urban sprawl and promote green technology and environmental planning
National Park Service	Practices, policies, regulations for low impact trails and facilities
USDA Forest Service	Information on designing low impact recreational practices
Trust for Public Land	Information on land management and land conservation for recreation, spiritual nourishment, and improvement of health and quality of life for American communities
UC-Riverside CE-CERT (College of Engineering Center for Environmental Research and Technology)	Think tank on issues such as traffic, urban planning, and air quality, including industrial, academic, and government partnerships
Brookings Institution	Think tank with interests in cities and suburbs, demographics, economics, environment, and social policy
The Nature Conservancy	Conservation through design, including targeting areas, land management, stream restoration, public-private partnerships
American Institute of Architects	Creation of a better built environment, including green technology, open spaces, planning, and economic analyses
Texas Transportation Institute	Transportation planning and Smart Growth for improving neighborhood design
Electric Power Research Institute (EPRI)	Economic benefits from environmental management of transmission line easements
EPA Collaborative Science and Technology Network for Sustainability	EPA grants program for environmental protection approaches that are systems-oriented, forward-looking and preventative
CERES (Coalition for Environmentally Responsible Economies)	Supports and encourages industry and private sector businesses to embrace corporate-level, voluntary social and sustainable programs
NICE (Northeast International Committee on Energy)	Conferences, coalitions on energy production through electric restructuring, natural gas development, and resource and infrastructure development

Recommendation: It was recommended by the Group that a Case Study or Demonstration Project approach be used to investigate the effects of an aging population on the environment.

It was suggested that additional case studies and demonstration projects be sought in other areas, such as the **Great Lakes**. A Great Lakes study would not only provide a northern contrast for the southern SEQL study, but also incorporate international considerations. East-West Case Studies or Demonstration Projects should also be sought. Two different types of communities should be considered—new developments and existing communities with built infrastructure. The key is to document the process used in conducting the Case Studies or Demonstration Projects so the process can be transferred to other regions or studies. Each area will have its own unique characteristics, but the process for investigating environmental effects should be similar regardless of the region. Each of these Case Studies or Demonstration Projects should be viewed as laboratories for partnerships.

Recommendation: The process used in each Case Study or Demonstration Project should be documented so the process can be transferred to other areas or regions with similar issues.

These Case Studies or Demonstration Projects should assess not just the current stressors and vulnerabilities of ecological systems, but should also assess future vulnerabilities. One option might be to assume that policies important to an aging population, such as affordable prescription drugs or universal access to natural amenities, will be promulgated and assess the environmental impacts of these policies. Other options might be to evaluate the potential environmental impacts of **wellness programs** that sustain the activities of active adults, greater mobility, greater use of natural areas, more golf courses, etc. within existing, built communities, and new developments.

Recommendation: Alternative futures analyses and future vulnerability analyses should accompany the assessment of current vulnerabilities.

4. Economics and Integrated Studies

A key aspect of all studies is to integrate the economic costs and benefits of the environmental impacts and management actions. One potential approach for assessing economic costs and benefits would be to conduct a business model analysis of each of these communities—new development and existing infrastructure. This would provide a link between environmental and economic costs and benefits, and contribute a cost-effective evaluation of proposed technology, regulations, policies, and laws. It would provide documentation that green technology is both cost-effective and profitable for developers and planners. This could be accomplished by developing partnerships with the private sector or institutions such as the National Association of Home Builders or Urban Land Institute, who would have the information and expertise to conduct these business model assessments.

In addition, the effects of existing regulations, policies, ordinances, zoning, etc. should be evaluated to assess their relative contribution to promoting sprawl. For

example, some zoning ordinances and **covenants** require no more than three homes per acre and 30% green space within communities. The EPA Smart Growth Program has begun to investigate the contribution of federal, state, and local policies and regulations to urban sprawl.

Recommendation: A business model analysis should be considered to establish economic-environmental linkages and document the cost-effectiveness and profitability of various green technologies. These analyses might also consider the contribution of regulations and policies to urban sprawl and assess the cost-effectiveness of alternative policies recommended by the EPA Smart Growth Program.

5. Partnerships and Facilitation

It was recognized that facilitating the process will be a critical aspect of the Case Studies or Demonstration Projects. A partnership among EPA ORD, Regional Offices, and NGOs could significantly enhance this facilitation process. The EPA Regions work directly with the States and NGOs, and could facilitate the process of gathering the needed information and identifying the appropriate stakeholders, as well as contribute insight on specific social issues of concern. ORD can develop the appropriate tools and procedures, and document the process. The Regions can help facilitate the process and move toward implementation of the tools, procedures, and management practices, as well as contribute directly to the usability of these tools, procedures, and practices. Partnerships within EPA are the first step, but there are existing vehicles for improving communication and interaction among stakeholders. Most active adult lifestyle communities have a community association or property owners association that has a newsletter, periodic meetings, and networks established within the community. Partnering with these organizations and similar NGOs, such as watershed associations, can help facilitate communication and contributions. These partnerships should be pursued as part of the Aging Americans: Impacts on Ecology and Environmental Quality research program.

Recommendation: ORD should enter into a partnership with EPA Regions for each Case Study/Demonstration Project, with the Regions facilitating the interaction and communication with stakeholders, contributing to the development of the process, and initiating the implementation of appropriate policies and management actions emerging from the process.

Summary: Focal Area Breakout Group C

Wayne Munns (Facilitator)
U.S. Environmental Protection Agency

Effects of Aging Americans on Natural Resources and Environmental Quality

Charge and Approach

Focal Area Group C considered the ecological effects that aging Americans may have on natural resources and environmental quality. More specifically, Focal Area Group C was asked to identify existing information and gaps in that information relative to understanding the effects of an aging population, the associated changes in land-use patterns and environmental stressors on the environment, and what this means relative to critically needed research. Specific questions addressed included:

- Is there specific information to predict the environmental effects of changing land-use and demands for social, environmental and infrastructural amenities by different segments of the aging population? If not, what information is missing and how can we capture it? Where is the information that does exist?
- What do we know about the environmental effects of land-use and stressors relative to the lifestyles of an aging population?
- What research is critically needed to develop a more complete understanding of environmental effects of aging population-related land-use and environmental stressors?
- What built-community planning practices can be applied to minimize environmental stressors and enhance the quality of life for different segments of the aging population?

In the context of the simplified risk paradigm (see Figure 1- top row, following page), ecological effects are considered to be the changes in natural resource and environmental condition that result from exposure to stressors generated or modified by the aging population. Examples of such effects might include impacts on aquatic life and wildlife due to changes in water quality and quantity, impacts on **native wildlife** due to altered habitats, or modification of the aesthetic quality of landscapes. To facilitate understanding of the relationships among sources, stressors and effects associated with the aging population, the Group considered a simple conceptual model that helped us visualize how the expected increase in active older Americans could affect the quality of surface waters (Figure 1 - bottom row). In this conceptualization, new retirement communities, perhaps built in the arid southwest, are considered to be potential sources of a variety of environmental stressors. In particular, chemicals associated with lawn care products (pesticides, fertilizers)

might be expected to increase in surface waters relative to background levels as these products are applied to golf courses associated with retirement communities. Such changes in stressor (chemical and nutrient) concentrations might result in the adverse ecological effects of aquatic organism **toxicity** or **eutrophication**. This conceptualization helped us focus discussion on potential ecological effects, and clarified informational needs relative to the sources and stressors components of the risk paradigm.

helped the group to explore the types and levels of effects that might result from relative extremes in the behaviors and lifestyles of the aging population.

Lifestyle Issues and Stressors Unique to the Aging Cohort

With an expanded appreciation of the term "effects" and the categorization of lifestyle as background, Focal Group C approached its charge by first trying to identify lifestyle issues that are at least

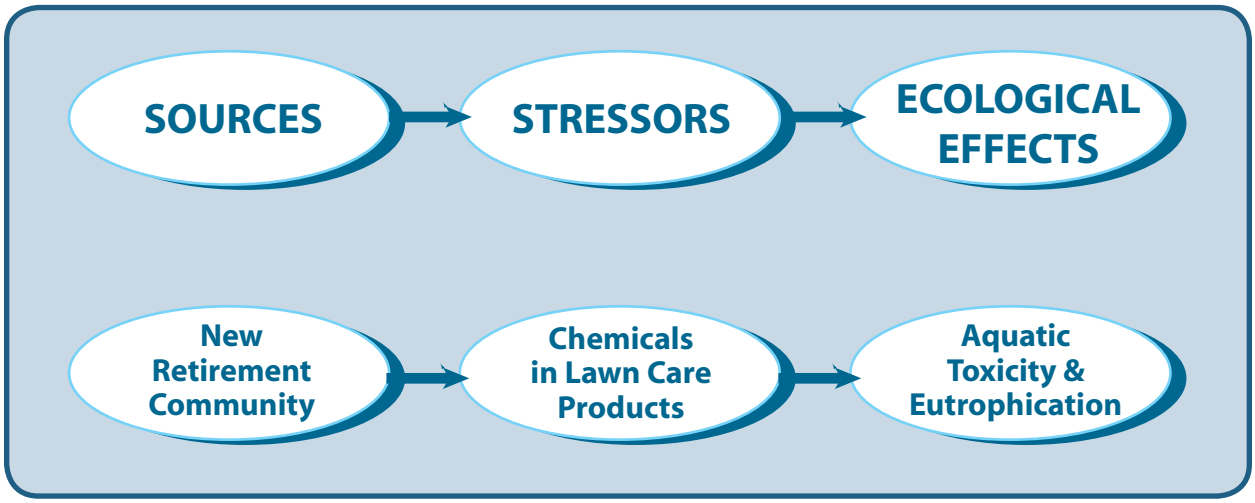


Figure 1. Simplified risk paradigm (top) and conceptual model (bottom) relating aging-related sources and stressors to ecological effects. Group C focused on potential ecological effects of aging population-related stressors.

To help structure the deliberations, we initially considered two broad segments of aging Americans: the "young-old"—individuals who remain active and perhaps relocate to retirement communities which are typically located in geographic areas with greater natural amenities (e.g., "gateway communities" near National/State Parks and Forests) and cultural amenities (e.g., college towns), and the "old-old"—less active people choosing to (or with no option but to) remain in their current communities. While recognizing the potential dangers associated with the crudeness of this distinction, it

somewhat unique to the aging population. Many of the environmental effects potentially associated with the increasing aging demographic might simply be functions of increasing numbers of people in the general population. That is, the growing total American population in and of itself will create increasing demands for resources, expanding uses of landscapes, and so on. Delineation of effects related to increases in the cohort of aging Americans from those associated with the general phenomenon of increased total population size helped to sharpen

our focus on issues specific to the aging population. Recognizing that the other Focal Area Groups were charged more specifically with understanding sources and stressors, Focal Group C brainstormed aging-related lifestyle issues with some consideration of variation among lifestyle segments (Table 1). Examples of these include differences in the types and patterns of use of pharmaceuticals, differences in mobility and access requirements and transportation needs (e.g., more sidewalks), and potential increases in energy use (heating, outdoor lighting) associated with comfort choices. The Group used this understanding to identify the changes in waste streams and environmental stressors that might be attributed to aging Americans (Table 1 on page 112).

After much discussion, the Group concluded that almost all considerations about stressors associated with these lifestyle issues reflect changes in magnitude and quantity—the aging cohort likely will introduce few stressors uniquely. There may be, however, some exceptions to this. For example, aging Americans are expected to use different types of pharmaceutical products, perhaps in different combinations, than those used by the general population at large. This may result in novel chemicals or combinations of chemicals in aquatic waste streams, with unknown resulting effects. Older Americans likely also would utilize different consumer goods in differing quantities compared to that of the general population. This use would result in somewhat unique stressors entering the waste stream, including **durable** (e.g., walkers, canes, wheelchairs) and **non-durable** (e.g., incontinence garments, hearing aide batteries) medical goods. Many communities may not be prepared for such changes in their waste streams, or for the increased demand for ancillary services (transportation, health care, etc.) imposed by increases in the aging cohort. Additionally, for young-old Americans, increases in **disposable income** and flexibility with respect to housing location relative to historic job centers may result in increasing development pressures in areas previously unutilized (e.g., the rural west). Even in these cases, however, the Group was hard-pressed to identify stressors that are truly unique to the aging cohort.

Despite this apparent lack of unique stressors, natural resource use and the waste streams generated by the aging population may overwhelm the ability of ecological systems to compensate for or assimilate changes in stressor levels. Group C discussed the concept of "tipping points"—thresholds in stressor levels or ecological effects beyond which the ecological systems change state—and the possibility that release rates, magnitudes or quantities of aging-related stressors may exceed these thresholds. Although the concept of "tipping points" is straightforward to grasp, identifying their existence and importance as related to aging-related stressors may add a challenging new dimension to the research needed to understand the ecological effects of the aging population.

Not all lifestyle issues necessarily would result in increased environmental stress and pressures on natural resources. For example, the Group considered the possibility that differences in the environmental ethic of

Table 1. Lifestyle issues and stressors associated with the aging population.

Lifestyle Issue	Relevant Aging Segment	Potential Stressors
Pharmaceutical types and use patterns	Both young-old and old-old	Unique chemicals, including potential endocrine disruptors, in increased amounts and different combinations in waste water streams
Land development patterns	Young-old	Altered habitats; disruption of migration corridors; changes in water quality and quantity
Built environment in-fill	Old-old	Increased sprawl; exacerbation of "urban heat island" phenomenon
Mobility and access amenities; transportation infrastructure	Both young-old and old-old	Increased sprawl due to single-level housing; more sidewalks leading to more impervious surface; increased roadways leading to habitat fragmentation and road runoff; increased amounts of transportation-related chemicals (e.g., golf cart battery chemicals) in waste streams
Durable and non-durable medical goods usage	Both young-old and old-old	Increased bulk of durable and non-durable products in landfills (e.g., batteries, eye glasses, walkers, wheelchairs, canes, adult incontinence garments); increased amounts of uncommon metals (e.g., titanium, mercury from batteries) in waste streams; stressors associated with resource extraction and manufacturing
Health service usage	Both young-old and old-old	Increased land development (e.g., new health care facilities); increased amounts of non-durable medical goods in waste streams
Increased disposable income	Young-old	Increased stressors associated with recreational patterns and demands on environment (e.g., land use disruptions, golf course chemicals)
Energy use related to comfort choices	Both young-old and old-old	Increased use of resources related to energy use; light pollution in newly developed areas

aging Americans (particularly the young-old) relative to the population at-large might even result in a net benefit to the environment. Building from the belief structures and examples described during the plenary presentations, it may be reasonable to assume that portions of the aging population would act individually and collectively to minimize environmental impacts or even enhance environmental quality, at least in their local communities. Increased volunteerism and elective changes in consumer patterns may result in environmental legacies that are positive relative to those of other age groups in the general population.

Existing Information and Research Needs for Understanding Ecological Effects

Focal Area Group B next focused on ecological effects likely produced by lifestyle-related stressors. The time available did not allow comprehensive deliberation of all possible direct and indirect effects, and it was acknowledged that our list of stressors might be incomplete relative to the outcome of Focal Area Group B's discussion. We also acknowledged that effects associated with many of the lifestyle characteristics of the young-old segment shared commonalities with those of new community development and sprawl in general, but that effects associated with the old-old (aging-in-place) segment would be much more challenging to elucidate.

This discussion was facilitated by completion of matrices or tables that relate selected lifestyle issues, through their associated stressors, to possible ecological effects. This structure also supported deliberation of existing information and the research needed specifically to fill gaps in our understanding. In describing research needs, we avoided defining the specific approaches that should be taken, considering this more appropriately to be a task undertaken by Agency research planners (but see below). Further, our analysis would benefit from more comprehensive considerations of the lifestyle issues, stressors and possible ecological effects related to the aging population issue. The results of this exercise are given in Table 2.

Although Table 2 is self-explanatory, working through one of the "rows" might be instructional. For the pharmaceutical types and use patterns lifestyle issue, primary stressors were considered to be biologically-active chemicals in surface and drinking water. A variety of ecological effects could result from exposure to these chemicals, given sufficient concentrations or combinations, including changes in the productivity and health of aquatic life and wildlife. For example, exposure to **endocrine disrupting chemicals** might alter **hormonal processes** in individual fish, affecting rates of development and reproduction. When sufficiently severe, such effects may impact the dynamics of the exposed population(s), changes which could cascade through food webs such that the chemicals cause indirect effects on aquatic community structure and function. Key gaps in our understanding were identified relative to the types and quantities of chemicals entering wastewater streams, the effectiveness of wastewater treatment in removing or reducing chemical concentrations, and exposure-response relationships among those chemicals and relevant biological responses. In risk language, the first two of these gaps are issues of exposure, whereas the last is one of ecological effects. Finally, the first-order research needed to fill these gaps is characterization of waste streams before and after treatment, and quantification of exposure-response relations for key biological and ecological responses.

Table 2. Lifestyle issues and stressors associated with the aging population.

Lifestyle Issue	Stressors	Potential Ecological Effects	Availability of Information	Research Need
Pharmaceutical types and use patterns (including new pharmaceuticals from plants)	• Chemicals in surface waters • Endangered species harvesting	• Changes in productivity and health of aquatic life and wildlife • Species extinctions	• Gap-nature and quantity of chemical input • Gap-effectiveness of waste water treatment • Gap-exposure-response relationships of key biological responses • Rates of harvest and extinctions	• Exposure information for relevant chemicals • Quantitative exposure-response relationships for relevant chemicals and key biological and ecological responses • Information about harvest rates and impacts of harvesting on plant species sustainability
Land development patterns – new communities	• Habitat alteration • Lawn care chemicals • Stressors associated with impervious surfaces (increased runoff, heat islands)	• Changes in wildlife populations • Changes in biodiversity • Changes in productivity • Changes in eutrophication status • Increased toxicity • Changes in aquatic populations • Changes in water body aesthetics • Changes in eutrophication status • Increased toxicity • Changes in aquatic populations	• For all stressors and effects, quite a bit is known and substantial additional research is currently underway	• For all stressors and effects, predictive models

Table 2 (Continued). Lifestyle issues and stressors associated with the aging population.

Lifestyle Issue	Stressors	Potential Ecological Effects	Availability of Information	Research Need
Durable and non-durable medical goods usage	• Landfill space requirements • Chemicals leaching from landfills • Stressors associated with resource extraction and manufacturing	• Changes in ecosystem goods & services	• Gap-production rates • Gap-re-use rates • Gap-unique disposal requirements	• Source and exposure information for relevant wastes and associated chemicals • Quantitative exposure-response relationships for relevant stressors and key biological & ecological responses
Energy use related to comfort choices	• Power plant emissions • Changes in cooling water usage • Changes in temperatures of surface waters (cooling effluent) • Light pollution • Nitrogen and mercury deposition	For various combinations of stressors: • Effects associated with global change • Changes in forest health • Changes in wildlife behavior, migration and population dynamics • Changes in health of aquatic life • Changes in eutrophication status	• For all stressors & effects, quite a bit is known and substantial additional research is currently underway • Gap-energy use rates & patterns of aging population relative to general population	• For all stressors & effects, predictive models • Data on energy use rates & patterns of aging population
Mobility and access amenities; transportation infrastructure	• Vehicle emissions • Roads as habitat alteration • Stressors associated with impervious surfaces (increased runoff, heat islands) • Stressors associated with increased fuel consumption • Chemicals associated with unique modes of transportation (e.g., mercury from golf carts)	For various combinations of stressors: • Changes in primary productivity • Disruption of wildlife migration, movement, & population dynamics • Changes in eutrophication status • Changes in toxicity • Changes in aquatic populations	• For all stressors & effects, quite a bit is known and substantial additional research is currently underway • Gap-patterns of transportation use by aging population	• For all stressors & effects, predictive models • Data on patterns of transportation use by aging population

Following completion of Table 2, the Group developed a common sense of priorities of research needs. Two factors were considered relative to priority: 1) the perceived importance of the ecological effect relative to the overall issue of the increasing aging population, and 2) the degree to which the research would fill a critical knowledge gap. The results of this prioritization are reflected in the order of lifestyle issues given in Table 2.

Over the course of our discussions, certain generic projects or approaches were identified that might be particular effective for filling key knowledge gaps in application of the simplified risk paradigm. Specifically, valuable information about resource and environmental uses by aging Americans could be obtained through a "market basket" analysis of purchased products and environmental amenity use. Such an analysis might also contribute information about the waste streams and stressors generated by individuals and communities. **Latitudinal comparisons**, both between elder communities (say, in Florida or the west) and those of the general population, and among societies with differing demographics (say, between the U.S. and Sweden, where the aging phenomenon is being realized today), could provide insights into differences in resource use and environmental impacts that would further define these issues for the aging population. Additionally, such comparisons might facilitate identification of approaches taken by other groups and societies to ameliorate the adverse effects of shifting demographics. Finally, various ecological footprint analyses of elder communities and even individual seniors, when compared with the results of similar analyses for communities from the general population and different age groups, could be instructive about resource needs and usage.

Coda

In final analysis, the ecological effects of the aging population may not be completely separable from those associated with increases in the size of the general population. Yet, patterns of resource use and the magnitudes and combinations of certain aging-related stressors may present novel challenges with respect to our ability to forecast those effects. Through a structured analysis of lifestyle issues, stressors and ecological effects, Focal Area Group C identified some key areas of research needed to enhance ability to assess risks associated with the aging of America. This information will help to inform development of EPA's ecological effects research agenda.

Two important insights emerged (or rather, re-emerged) over the course of our deliberations. The first was the confirmation that complex issues such as this one are best approached through interactive consideration of all aspects of the risk assessment/risk management process. We struggled a fair amount with, and put substantial time into, consideration of the stressors expected to be associated with aging population. Further, largely missing from our discussion was identification of the specific actions that could be taken to prevent or mitigate the effects associated with the aging population, although the results of the research identified here will help to provide additional knowledge about the effectiveness of such actions. A more interactive dialogue addressing all parts of the process, and involving a broad range

of partners, collaborators and stakeholders, likely would have yielded more comprehensive understanding.

The second insight was that aging Americans are very diverse with respect to lifestyles, cultural perspectives, and health status and susceptibility. Categorization of the aging cohort into young-old and old-old segments conveniently facilitated parts of the deliberation, but we recognized that such a scheme may miss the richness reflected in older Americans. Although we can continue to treat this richness as an "uncertainty," our understanding of the ecological effects of the aging population on natural resources and environmental quality will ultimately suffer from lack of consideration of the underlying diversity of aging Americans.

Summary: Interactions/Linkages Breakout Group 1

Mary Holland (Facilitator)
Perot Systems Government Services

Interactions/Linkages Group 1 volunteers from the three Focal Area Breakout Groups summarized their prior breakout group's discussion for Interactions/Linkages Group 1 colleagues. The Group then discussed interactions and linkages among the themes discussed by Focal Area Groups A, B and C.

Discussion

Interactions/Linkages Group 1 was inspired by the work that Focal Area Group C had done already to make linkages from sources of environmental stress to exposure to effects (Group C's initial charge). Focal Area Group C had found it difficult to discuss effects without backing into what unique (compared to the general population) sources of stress might be introduced by older adults. Focal Area Group C developed a matrix laying out the simplified risk paradigm and prioritized its findings (see Summary: Focal Area Breakout Group C). Interactions/Linkages Group 1 endorsed Focal Area Group C's linkage discussion/work and recommended that EPA should work with a multi-disciplinary group to review and add details to Focal Area Group C's matrix framework.

Visualization was discussed as a tool to add depth to understanding the matrix framework. For example, illustrations could help bring to life and communicate the potential pathways of effects. EPA could look at, for example, pharmaceuticals, in conjunction with the migration of older adults to Florida, in conjunction with a fragile ecosystem. Another tool that can add depth to understanding the pathway of effects is case studies. Florida could be a fertile ground for case studies. One possible research model for investigating the ecological effects of the aging population's pharmaceutical use and disposal is the approach to studying the ecological effects of **CAFO**s—concentrated animal feeding operations—by estimating loading of pollutants and their consequent concentrations in various media and predicting their effects.

Interactions/Linkages Group 1 discussed the potential water, soil, and air quality effects of burials—presumably at higher demand among an aging population. Different cultural and religious practices may have varying impacts. Japan was cited as an example where land is scarce, so cremation has become a common practice there compared to the U.S., where related air quality and ash disposal concerns, in addition to cultural practices, may make widespread cremation less viable. The Group listed a few approaches that may mitigate potential land burial effects, but would require further evaluation to assess their overall environmental and social impact. Those approaches include: development of a land-

sustaining burial industry; **green cemeteries**; and reef creation from burials at sea.

The Group discussed whether all the potentially affected parties, including the aging population itself, really understand the implications of the actions of an aging U.S. population. The Group wondered if communities were aware of and ready to manage the impacts of in-migration trends? Florida was noted as a state that wants that aging population and is actively marketing to attract seniors. Redistribution often disrupts and replaces the existing population (e.g., local fishermen in coastal communities live elsewhere due to escalating coastal living costs and so travel further to sell their catch). On the other hand, service demands may create more jobs.

Interactions/Linkages Group 1 talked about ways to communicate with older adults about the resource impacts caused by retirement communities. The concept of developing decision-support tools to assist with considering and balancing lifestyle choices to lessen environmental effects was endorsed. Factors that could be considered include amenities for different retirement living circumstances (e.g., walking opportunities may lead to reduced car use). The Group suggested augmenting existing decision-support tools with environmental considerations for everyone, not just for older people. The success of decision-support tools requires education to understand their value and learn how to use them.

The group also endorsed the notion that volunteerism and environmental stewardship embraced by older adults could have positive environmental effects.

Group 1 underscored two key themes:

- As EPA pursues research to better understand the impact of aging Americans on ecology and environmental quality, it should use multi-disciplinary teams (grant preference to consortiums), comprising:
  - Gerontologists
  - Demographers
  - Economists
  - Sociologists
  - Planners
  - Geographers
  - Ecologists
  - **Architects**
  - Citizen-stakeholders
- Many things that are good for the aging population are good for other groups; we should embrace a new motto/ paradigm—***Lifelong Quality of Life***. An added benefit to this approach is getting around the aversion of some aging Americans to identifying with the label—"aging."

Summary: Interactions/Linkages Breakout Group 2

Kent Thornton (Facilitator)
FTN Associates

The discussion focused primarily on the conclusions reached in Focal Area Breakout Groups. Following these conclusions, Interactions/Linkages Group 2 identified five questions that will need to be addressed through research.

1. What stressors are specific to an aging population?

The Effects Group (Focal Area Breakout Group C) had identified some stressors that might be specific to an aging population, but in many instances, the stressors associated with an aging population are similar to those of any other population cohort. The desire for natural environmental amenities, while not unique to an aging population, can result in the development of active adult communities in fragile environments that are particularly susceptible to human activities. Studying aging adults provides information germane to other population cohorts and increases our understanding of human activity-environmental linkages.

2. What proportion of stressors are contributed by an aging population?

If many of the stressors are similar for an aging population as compared to other population cohorts, how important is it to understand the contribution from this particular population segment? In many cases, it is the relative magnitude of a growing adult population that is needed to assess the potential effects of an aging population on the environment. The proportion of the aging adult population is expected to double by 2030. One question is whether the relative contribution of stressors and effects will reflect this population trend. To understand these differences, it is important to assess the relative contribution from an aging population. In addition, one of the needs of social marketing or other intervention approaches to reduce these stressors is an understanding of the relative contribution of a particular population segment. Different intervention approaches will be used for different population segments, such as teenagers, young adults, or active adults.

3. What effects are specific to an aging population?

Group C had discussed this question extensively and identified a few effects that might be specific to an aging population (see Summary: Focal Area Breakout Group C). In general, Group C thought the effects of an aging population were indistinguishable from those of other population cohorts. For example, the effects of development of active adult communities are associated more with development than with an aging population. Many active adult communities are similarly designed and it might be possible to more readily modify these designs if cost-effective,

environmentally friendly development alternatives were identified and demonstrated. Designing these alternatives requires an understanding of the environmental effects from this population segment.

4. What is the value of information on this issue?

If the stressors and effects associated with an aging population are similar to those from other population cohorts, what is the value of information on one specific cohort? In general, most of the information on the effects of various stressors has been assessed independent of any consideration of population segment or cohort. If this research is to complement the human health research, it will be important to understand not only the effects of the environment on a particular sentinel or **susceptible population** cohort, but also the effects of that **sentinel cohort** on the environment. In most instances, we are not able to answer this question because we have not factored demographics into our analyses. Focusing on the active adult population segments permits the development of approaches and methods useful in partitioning the effects of other population cohorts on the environment.

5. How will economics interface with these effects as money is transferred from income generation to asset management?

One of the differences between aging adult populations and other population segments that was stated at the workshop is the transfer from income generation to asset management after retirement. We have little insight or information on what the consequences for environmental conservation, stewardship, or restoration are from this economic transition. Emphasis on an aging population provides an opportunity to develop not only linkages between economics and ecology, but also between ecology and societal beliefs and values and how these linkages affect environment management and policy.

Summary: Interactions/Linkages Breakout Group 3

Wayne Munns (Facilitator)
U.S. Environmental Protection Agency

The original Focal Area Breakout Groups focused individually upon the separate components of the simplified risk paradigm—sources, stressors and ecological effects. As recognized in those earlier discussions, a more interactive and comprehensive dialogue involving all aspects of the risk assessment/risk management process is necessary to appreciate the interactions and linkages among its various components. Understanding these linkages may be critical to identifying the research needed to prepare the Nation for the aging population.

Interactions/Linkages Group 3 initiated dialogue by reviewing both the charge for the session and the results of the deliberations of the earlier focal area groups. The ensuing discussion emphasized the importance of framing the aging Americans issue with the broadest of perspectives, and reaffirmed the desirability to involve a number of disciplines in that effort. In addition to ecologists, health scientists and environmental decision-makers, representatives of the social sciences, economists, community planners and others will need to contribute to the process. Interactions/Linkages Group 3 also acknowledged the value of considering prevention and mitigation of potential ecological impacts in thinking through the problem.

Our deliberations highlighted the importance of recognizing the diversity of lifestyles, and requirements for social, health, transportation and environmental amenities of Americans in the aging population. Although simplifying generalizations might help research planners to frame the issues broadly, clarifying the full array of potential ecological effects likely will require that this diversity be acknowledged explicitly. Given the scope of this issue, and the expertise generally available to EPA, the Group felt that collaboration with external partners will be needed to support further research planning exercises.

Also acknowledged were the nuances associated with spatial aspects of the problem. Regional and local differences in **demography**, migration patterns, social values, existing infrastructure and even the background of resource availability and condition, all will influence how stressors associated with the aging population might affect environmental quality. Thus, knowledge of national trends likely will be insufficient to inform the process of understanding potential local effects, and therefore identification of outstanding research needs. In many cases, a national perspective may even be misleading. This suggests an important linkage issue to be the interactions among sources, stressors and potential ecological effects across spatial scale.

While identifying few new research needs emerging from interactions/Linkages among sources, stressors and effects, the discussion in Group 3 did clarify the importance of understanding the factors that affect individual decisions to change lifestyle and living arrangements. Such choices determine migration patterns, influence future requirements for both existing and new infrastructure, and affect local waste streams, thereby affecting the nature and likelihood of ecological effects. Substantial research may be needed to resolve these factors to a level sufficient to support prediction of future trends in the lifestyles of aging Americans.

Post Workshop Considerations for Research and New Directions

Wayne Munns
U.S. Environmental Protection Agency

Additional issues and suggestions were offered during the peer review of the draft workshop proceedings, sparked by the issue-defining papers and the reports of the breakout groups. Although some of these fell outside the intended scope of the workshop, many provided further insights and emphasized specific research needs. These are summarized following the organizational structure of the workshop to provide additional input to the Agency's research planning process. This section concludes with a brief description of how the Agency will use the information communicated in this report to develop its ecological research program to help prepare the Nation for the environmental effects of an aging American population.

Additional Issues and Research Needs

Demographic and Lifestyle Patterns

Patterns of movement by older Americans and descriptions of their lifestyles may be more complicated than the "old-old" and "young-old" dichotomy used to structure parts of the workshop deliberations. Evidence suggests that most moves by elders are local, with up to 75% of relocations occurring within the same county or state. Proximity of family, familiar neighborhoods and convenient services such as transportation, shopping and medical centers, city centers and inner suburbs can be attractive features for many older Americans regardless of their level of activity. The importance of these attractions, and the prevalence of **"reverse migration"** (in which older Americans leave active retirement communities to "return home"), need to be understood to predict future demographic and lifestyle patterns.

Another factor potentially influencing the residential choices of elders is, ironically, the aging of the Nation's built environment. Failure to reuse and renovate buildings, redevelop brownfields and modernize urban infrastructure will greatly decrease the ability of older urban and suburban centers to entice or absorb relocating seniors. Deficiencies in the ability of existing cities to provide the housing and amenities demanded by aging Americans could influence future patterns of migration profoundly. An evaluation of trends expected in urban decay and revitalization, perhaps characterized by region of the country, would inform predictions of migration patterns of older adults.

As a final issue relevant to demographic and lifestyle patterns, assumptions made in the workshop about what elders value,

and the amenities they seek, requires substantiation. For example, alternative practices of health care and medicine may become more attractive as elders experience new ailments associated with aging. Access to such amenities may be limited in smaller (or perhaps newer) communities, influencing decisions about where to live. Additional information will be needed to enhance understanding of the cultural, social, economic and other factors that influence the lifestyle choices made by older Americans.

Changing Land-use and Environmental Stressors

Recent evidence suggests retirees are seeking self-employment and volunteer opportunities with a trend away from new development, frontier development and urban sprawl. Actions taken to slow rates of new development and its impacts (e.g., smart designs) may not be effective in the long run, as land-use change and its damaging effects are only slowed. Forward-looking revitalization strategies for urban and suburban landscapes that focus on adaptive reuse and brownfield redevelopment may be better options for providing the housing capacity and amenities required by the increasing aging population. The associated socioeconomic revitalization, based on restoring natural, built and cultural assets, could lead to increased capacities and quality of life in existing communities, as well as renewal of their natural resources. Although these issues likely are not unique to an aging population, research may be needed to support development of strategies for renewing capacities of developed landscapes and restoring the natural resources damaged by past activity. Research is also needed to evaluate changes in land-use and environmental stressors associated with different options of redevelopment. Workshop discussions identified the pharmaceutical uses of older adults as potentially important environmental stressors. Certain chemicals (perhaps in new combinations) likely will enter surface waters and groundwater at increasing rates near retirement communities and centers of residence by elders. Closed water treatment and supply systems may provide an engineering solution to help control the introduction of pharmaceuticals to the environmental. Consistent with a theme of restoration and reconstruction, piloting and testing of closed systems in smaller retirement communities could inform the engineering research needed to develop such systems for larger communities.

In addition to the increased environmental loading of certain pharmaceuticals posited during the workshop, a chemical stressor associated somewhat uniquely with older Americans is the mercury found in oldstyle amalgam fillings. Cremation may release this mercury into the air, potentially exposing wildlife as well as humans in communities with large elder populations. Research to evaluate this exposure pathway as a significant incremental source of ecological risk might focus in areas like the State of Florida, which is expected to have a large proportion of older Americans and has an ongoing concern about elevated environmental mercury concentrations. Similarly, increased numbers of cremations and the added pressure for cemetery space may impact air quality and land-use negatively.

Effects on Natural Resources and Environmental Quality

The effects of low concentrations (parts per trillion) of some pharmaceuticals, such as statin drugs, on aquatic organisms are virtually unknown. In addition to their possible endocrine disrupting effects, exposure to these chemicals may produce a variety of chronic effects heretofore unknown. This emphasizes the need to develop better understanding of the mechanisms of action and resulting ecological effects of pharmaceuticals used by older Americans. Again, Florida, which has indicated it welcomes such research, and other states and regions with high densities of older Americans may provide good opportunities for case studies and focused research.

Stressor-response models and relationships were identified as important research needs during the workshop. Most often, these needs were couched in terms of specific stressors and key ecological responses. More broadly, however, there may be predictive and diagnostic value in stressor-response relationships constructed of aggregate measures of stress, relating the intensity of human land-use to adverse ecological effects. Aggregate measures like the Landscape-Development Intensity Index of Brown and Vivas (2004) might be useful in this regard. Quantitative descriptions of such relationships could be used to support development of mechanisms, models and policies for implementing changes that will prevent or mitigate the effects of stressors associated with the aging population. It has also been suggested that the Revitalization Institute may be a source of integrated revitalization strategies to increase capacity and quality of life in existing communities, as well as renewing natural resources.

As a final note, not all ecological effects associated with the aging population are expected to be adverse. The apparent willingness of (at least some fraction of) retirees to contribute to urban revitalization through self-employment and voluntary service, when combined with an increased demand for urban centers, might be harnessed to effect future redevelopment of urban brownfields and **greyfields** that results in a positive effect on urban environmental quality. Similar volunteerism and stewardship by elders in new and developing communities may help both to minimize and mitigate the patterns of adverse effects of the aging population on natural resources and environmental quality.

Next Steps

As described in the Introduction, the issues, information and research needs illuminated by the Workshop are intended to inform the Agency about the ecological research needed to help prepare the Nation for the aging of the American population. These proceedings will be delivered to EPA's ORD to support focused discussions of research goals, priorities, approaches, measures of performance and workforce and resource needs. Planning activities will cross-walk the Agency's research capabilities and capacities with the priority science-based needs to identify the most significant contributions EPA can make with our intramural workforce. This planning also will support communication of research needs to our partners and collaborators, and may be used to develop grant solicitations. Similar planning exercises have been completed for research

supporting understanding of the effects of the environmental on the health of aging Americans.

Synthesis

Kent Thornton
FTN Associates

Background

Three drivers of environmental effects are:

- Population Change
- Climate Change
- **Natural Disturbance**

This workshop focused on the possible first driver; specifically, the impacts from an aging population on ecology and environmental quality. The overarching message from the workshop speakers and participants was that the aging population is a permanent global trend, not just a bubble from the aging Baby Boomer population in the U.S. Some of the characteristics of the aging U.S. population are:

- The number of aging Americans is increasing. In 2000, 12.5% were 65 years or older. By 2030, 20% of the population will be 65 years or older.
- This aging population is very diverse—economically, socially and ethnically.
- Aging attitudes among Latinos, Asians, African Americans, Native Americans, and Anglos are very different.
- This population is re-defining retirement, with 80% indicating they plan to work at least part-time in retirement.
- This population enjoys and wants natural amenities.
- Almost half (49%) indicate they plan to devote more time to community service or volunteer activities after retirement. However, they also expect these activities to be managed in a professional manner, provide meaningful work and allow flexible hours.

Foundation for a Research Plan

Three foundational principles emerged from presentations and discussion that should underlie a research effort to assess the effects of an aging population on the environment. The research effort must:

- Be holistic
- Be integrated
- Emphasize sustainability

It must be holistic in assuming that humans are part of, not apart from, the environment. Human and ecological health are inextricably linked and this research effort should complement the EPA ORD Human Health Initiative of the National Agenda on the Environment and the Aging. It must be integrated from an ecological risk assessment and management perspective, linking sources→stressors→effects→management. Finally, it must emphasize sustainability. It was suggested the project adopt the Native American philosophy of protecting the environment for seven generations to come.

QUESTION ORIENTATION

A number of questions were raised during the workshop discussions that can be categorized under a set of five general questions the research initiative might consider addressing.

1. How big is the problem? (Extent and magnitude)
   What are the relative contributions of an aging population to environmental impacts?
2. Is it getting better or worse? (Trends)
   What are the population trends in different areas of the U.S?
3. What is causing it? (Causation)
   What factors associated with the aging population are contributing to environmental impacts?
4. What can be done about it? (Management)
   What management practices, policies, ordinances, etc. might be effective in controlling these impacts?
5. Are the management practices making a difference? (Performance Evaluation)
   How effective are these practices in controlling environmental impacts?

New Paradigms for Assessing and Managing Impacts of an Aging Population

The impacts of an aging population will potentially affect every societal sector:

- Housing
- Land-Use
- Transportation
- Safety
- Water Quality
- Air Quality
- Volunteerism
- Parks and Recreation
- Work Force Development
- Public/Private Education
- Waste Generation/Disposal
- Civic Engagement
- Arts and Culture
- Economic Development

Environmental assessments and management practices will need to focus on indirect, cascading effects from multiple sources and multiple stressors. There is no magic bullet or single pathway for controlling and managing environmental impacts and risks. In addition, the issues are and will be multi-media, not single media, therefore, multi-media interactions/controls will need to be incorporated into management actions.

New partners and collaborative relationships will be needed to address the impacts of an aging population. Local, state and federal agencies; the private sector; NGOs; and stakeholders all need to be included. Greater facilitation and coalition-building will be required to address future environmental issues.

Ecological Risk Assessment/ Management Linkages

Breakout Groups initially discussed the three segments of the ecological risk assessment paradigm: Sources, Stressors, and Effects. Following these discussions, Focal Area

Breakout Group A, B and C participants were redistributed (so that each letter group was represented) among Interactions/Linkages Groups 1, 2 and 3 to discuss the linkages and interactions among Sources, Stressors, and Effects. A preliminary list of research needs arising from the workshop is shown in Table 1 and briefly discussed in this section.

A. Demographic and Lifestyle Trends (Sources)

The demographic and lifestyle trends presented and discussed at the workshop focused on two cohorts of aging adults. Almost 90% of aging adults stated they did not plan to move from their community in the future, or if they moved, it would be nearby. Thus we have one aging population cohort living in existing communities with a built infrastructure. The other cohort of the aging population is interested in moving to active adult communities that promote active lifestyles. This second cohort of the aging population lives in new developments, typically in areas with fragile environments. Both cohorts wanted to enjoy areas with natural amenities.

Existing Communities, Built Environment

Given that 50% of the current U.S. population lives within 50 miles of the ocean or the Great Lakes, we expect that a significant portion of the aging population (primarily those that do not plan to move after retirement) will live in urban, suburban and rural areas near the coast. These areas are currently experiencing environmental impacts from congestion, aging or overloaded infrastructure, sea level rise, salt-water intrusion, eutrophication and similar issues. It will be important to determine which coastal areas are currently vulnerable, and which areas might become vulnerable in the future, to effectively manage impacts of the aging population (it was suggested during the review process that Restore America's Estuaries is an NGO that could help with this research). Vulnerable areas would include those with natural amenities that have the potential to be affected by increased use and universal access.

New Developments

Retirement migration patterns for that segment of the aging population that is planning to move, are part of a decreasing metropolitan hierarchy pattern. In the decreasing metropolitan hierarchy pattern, individuals who live in large metropolitan urban/suburban areas generally move to a similar urban/suburban setting, but in smaller metropolitan areas with natural amenities. In many instances, particularly in the West, desirable retirement destinations are near fragile environments (arid or montane ecosystems). These retirement migration patterns could promote urban sprawl in smaller metropolitan areas that currently do not have ordinances, policies, or regulations to control sprawl. Ironically, in some instances, city policies, ordinances, or regulations actually promote sprawl and inhibit implementing **green technology** (e.g., no more than 3 homes per acre; 30% green space). Increased service areas also tend to develop around new residential developments for retirees, such as facilities to care for individuals who require assisted living or some other form of permanent care.

General Characteristics of Both Communities

Both aging population cohorts are interested in experiencing and accessing natural amenities. However, aging adults

Table 1. Research Needs to Better Understand the Effects of an Aging Population on the Environment.

1. Demographic and Lifestyle Trends (Sources)	2. Changing Land-Use and Environmental Stressors
Conduct life cycle assessments of consumption patterns of various adult cohorts. Conduct targeted, geographic surveys to identify the factors and criteria influencing why individuals migrate and how destinations are selected. Design targeted, geographic surveys of lifestyle, behavior and attitudes, including commonwealth motivation on environmental stewardship. Compute population demographics and statistics within an ecoregional frame. Perform Delphi exercise to project future lifestyle trends and demographic changes. Develop models to predict future aging population migration patterns based on socioeconomic attributes to inform social marketing for a "Stewardship Legacy." Develop a decision support system that integrates various personal factors, environmental impacts, and lifestyle choices. Explore effects of infrastructure issues (e.g., roads, water distribution, etc.), air/water quality and similar factors affecting choices to stay in place or move. Coordinate, complement, and supplement on-going surveys, monitoring networks of other agencies, such as CDC, with complementary missions.	Conduct literature reviews on multiple issues and develop a matrix to cross-reference issues, scale, information sources, models and similar pertinent data. Project migration patterns and trends for coastal areas and sensitive natural areas. Conduct meso-scale (2-3 state area, multiple counties) studies of multiple stressors and their interactions as a function of different population cohorts. Conduct meta-analysis study of local-scale studies to identify common sources, stressors and effects of different population cohorts on the environment. Fund comparative case studies or demonstration projects of an aging population in different geographic regions. Conduct alternative futures and future vulnerability assessments for coastal areas and sensitive natural areas expected to experience increased population growth. Use business model analyses to establish economic-environmental linkages and document the costs and benefits of various green technologies compared to urban sprawl. Assess the effects of current policies, regulations, and ordinances, particularly those related to land use decisions (e.g., zoning, covenants), on environmental quality.
3. Effects on Natural Resources and Environmental Quality	**4. Management Considerations**
Identify and assess which effects on the environment are unique to an aging population. Assess the effects of increased pharmaceutical use and their interaction with other stressors. Develop models for predicting and assessing the effects of an aging population on the health of aquatic life and wildlife. Develop procedures for establishing thresholds or "tipping points" for ecological effects based on synergistic and antagonistic interactions among multiple stressors. Emphasize those stressors associated with an aging population. Compare the ecological footprints of different aging adult cohorts, particularly the "stay-in-place" versus the "mobile." Assess the effects of universal access to sensitive or fragile environments, particularly habitat alteration, on aquatic life and wildlife. Assess the effects of pharmaceuticals and durable/non-durable medical goods on ecosystem goods and services.	Conduct sociological studies to identify the mental models of environmental stewardship for different aging cohorts. Document the costs and benefits of conservation, restoration and stewardship management activities, and their relative contribution to Quality of Life metrics. Develop social marketing approaches for environmental stewardship comparable to social marketing programs for improving human health. Determine the inter-relationships of ecological, social/cultural and economic factors in achieving EPA's mission of protecting human health and the environment. Document the interactions between human health and the environmental quality. Assess the effects of social choices and asset (versus income) management on willingness to support conservation, restoration, and stewardship of aquatic and terrestrial ecosystems. Assess the potential for urban revitalization and restoration to attract an aging population and reduce environmental effects of urban sprawl and associated factors.

are transferring their finances from income to asset management. Under asset management fixed future costs are preferred, with no surprises or cost increases. Being able to demonstrate and link the cost-effectiveness and benefits of environmental amenities and green technology will become even more important for approval of public or private funds for ecosystem conservation, restoration and management when dealing with large aging populations practising asset management. Targeted, geographic surveys of lifestyle, behavior and attitudes toward the environment and environmental stewardship should be considered. These surveys might be coupled with life-cycle assessments of consumption patterns, particularly pharmaceuticals. Specific research projects were identified by Focal Area Group A and are included in their Breakout Group Summary.

B. Changing Land-Use and Environmental Stressors

Many of the stressors associated with an aging population are similar, if not identical, to current stressors from land-use patterns, development, urban sprawl, and increased impervious surface contributed by all population sectors. There may be some stressors that are unique to an aging population. However, the contribution of an aging population to these stressors is unknown. In addition, it is unknown if these stressors are likely to change in the future. Given the history of new stressors emerging, it is likely that new stressors will be discovered and the effects of existing stressors might change. Therefore, the ORD may need to focus on developing and documenting tools for assessing and managing existing stressors, while developing new tools for emerging issues. Multiple tools will likely be required to address stressors ranging from coastal to arid ecosystems. Having a flexible and transferable assessment and management process will ensure that similar approaches, models, procedures, and tools can be used to assess existing and emerging stressors throughout the U.S.

Scale is an issue in prioritizing research and development for assessing and managing the effects of an aging population. Workshop participants thought a standard EPA region encompassing five to seven states was too large and complex for developing useful near-term tools and approaches. In addition, the Regional Vulnerability Assessment (**ReVA**) Program is developing tools at this scale. The local scale is where decisions are being made daily, but there are already many tools, approaches, procedures, ordinances, etc. available for application at the local scale. A meta-analysis of multiple, local scale studies, however, might identify sources, stressors, or effects that are common among local communities or municipalities. Working at a scale between the local scale and the scale of an EPA region would be desirable because it would provide insight into the cumulative effects of local decisions. Workshop participants considered the scale of the SEQL initiative to be appropriate for research and development for assessing and managing the effects of an aging population. SEQL is an interstate initiative between North and South Carolina, in which 15 counties and 85 municipalities are addressing issues of air and water pollution, transportation, energy and quality of life.

Because the SEQL initiative is on-going, involves multiple stakeholders, is multi-media and is also addressing infrastructure issues

of transportation and energy, we believe research funds could be leveraged quickly to also address the effects of an aging population on the environment in this region. The SEQL study area is experiencing retirement migration and new developments for active retired adults, in addition to having a significant aging-in-place population.

A case study or demonstration project approach should be considered for other areas of the U.S., such as the Great Lakes region. Working in the Great Lakes would bring in international issues in addition to interstate issues. Florida is another potential location for a demonstration project or case study. Similar case studies or demonstration projects should be pursued in the East and the West. For each case study, a business model to evaluate the cost-effectiveness of the management practices (pervious surfaces, water reuse), existing ordinances, regulations, and policies and provide economic-environmental linkages needed to demonstrate their cost-effectiveness and profitability.

C. Effects on Natural Resources and Environmental Quality

As with the stressors, the effects of an aging population on natural resources and environmental quality will likely be similar, if not identical, to current effects. Some of the effects of an aging population will occur because of development, such as habitat fragmentation, biodiversity change, **invasive species** introductions and increased runoff. Some effects from increased pharmaceuticals might be unique to an aging population, but the increased medication of adolescents for asthma, **Attention Deficit Disorder** (ADD), etc., might make it difficult to partition environmental effects of pharmaceuticals by age cohorts. Differentiation of pharmaceuticals from different population segments and their effects should be assessed.

Increased development in fragile environments might lead to irreversible changes in some of these ecosystems. Little is known about ecological thresholds for irreversible ecological change in many of these ecosystems.

The Ecological Footprint concept and programs might be useful in partitioning or assessing changes in resource utilization and lifestyle by age. Workshop participants thought the ecological footprint concept should be considered in future research and assessment activities.

D. Management Considerations

In addition to ecological considerations, an aging population is likely to also be a political, economic and social force that will affect management decisions.

Political

Several presenters noted that the aging population is becoming an increasingly important voting block in elections. In addition, this cohort has time to become involved in political activities, and actively support advocacy positions.

Economic

Currently, older adults control the majority of the wealth in the U.S. As stated previously, many Baby Boomers do not plan to retire, but plan to work at least part time after they reach retirement age. However, with retirement, funds are typically transferred from income to

asset management. Asset management emphasizes **fixed costs**, no cost increases and no surprises. Without clear documentation of the cost-effectiveness and benefits of ecological conservation, restoration and management, as well as urban revitalization and restoration, it might be difficult to implement desired management practices if they increase costs for aging Americans. It was stated by several workshop participants that all sectors benefit from environmental improvement, even if improvements are aimed at an aging population.

Social

Understanding the mental models and social mindscapes of various aging population cohorts (including very different attitudes on aging among Latinos, Asians, African Americans, Native Americans, and Anglos) will be important in being able to communicate effectively. The overall aging cohort has time available not just for political involvement, but also volunteer activities that benefit the environment. Social marketing has been effective in changing behaviors related to smoking, drunk drivers,and similar social causes. It can also be an effective approach for increasing awareness about sustainability issues (e.g., conveying the Native American message that we don't inherit the environment from our ancestors, we borrow it from our children), and recruiting volunteers from the aging population to work for environmental causes.

Additional Considerations and Opportunities

Workshop participants were nearly unanimous in stating that development of collaborative relationships and partnerships needs to be central to this initiative. Developing and fostering new partnerships among local, state and federal agencies; the private sector; NGOs; and stakeholders is a feature that needs to be incorporated in all future research and management programs.

In addition, this initiative must be interdisciplinary and include not just natural scientists, ecologists and engineers, but also sociologists, economists, gerontologists, demographers, behaviorists, planners, social marketers and other disciplinary specialists that deal with aging populations that have traditionally not been involved in ecological research projects.

This initiative must consider the economic linkages between important ecological and management endpoints so the costs and benefits of various management practices can be assessed.

This initiative offers opportunities:

- To add humans to the equation and improve risk assessment and management through demographic and population movement pattern analysis.
- To leverage on-going studies, such as SEQL, that are at an appropriate scale, are interstate, multi-media, and include other considerations such as transportation and energy. Adding an

aging population assessment to these studies should be an effective use of funds.

- For ORD to develop and document the process for conducting assessments of changing demographic and lifestyle patterns on the environment.
- For ORD to enter into a partnership with EPA Regions for implementation and facilitation of the process, including engaging and communicating with stakeholders.
- To utilize existing ORD programs and research that will benefit this initiative:
  - Environmental Monitoring and Assessment Program (**EMAP**) can determine the current status of each region and monitor these regions to evaluate and assess the performance of implemented management practices.
  - ReVA is involved as a partner in the SEQL initiative and can assess current vulnerabilities and project future vulnerabilities.
  - National Risk Management Research Laboratory (NRMRL) is developing risk management practices that can be implemented and evaluated as part of this initiative.

In conclusion, the workshop not only accomplished its objectives, but also engaged participants in lively discussion throughout the workshop. This initiative will complement the Human Health initiative, both providing and benefiting from supplemental information.

Appendix A: Workshop Agenda

Day 1

Tuesday, August 10, 2004

8:00 **Registration** (Room C114)

8:30 **Welcome and Goals of Workshop**
Patricia Bradley, EPA MAIA, and Kent Thornton, FTN Associates

9:00 **Plenary Address** (Broad Overview)
Sandy Markwood, National Association of Area Agencies on Aging (n4a)

9:45 ***The Built Environment and Public Health*** **-** Allen Dearry, National Institutes of Health

10:30 **Break**

10:45 ***Ecological Footprints,*** *Video presentation*, Ecological Footprint Network, Dr. Mathis Wackernagel, Introduction by Mike Wallace, Ecological Footprint Network

11:45 ***Baby Boomers Opinions and Preferences on Retirement, Health and Fitness, Financial Preparedness and Active Adult Living Communities*** **-** Dave Schreiner, Pulte Homes

12:30 **Lunch** (buffet lunch and film) ***Gitga'ata Spring Harvest*** (25 minutes)
Introduction by Bernice Smith

1:30 **Criteria used by Aging—Socio-Economic and Nature-Based**

Later-life Migration Impacts **-** Charles Longino, Wake Forest University
FANBY-ism in an Aging Society - In Search of Arcadia—Still Searching for Paradise **-** Scott Wright, University of Utah

3:00 **Break**

3:15 **Case Examples for Aging in Place**

Preparing for the Impact of an Aging, Diverse Population: Connections to Environment **-** Neal Lane, NY State Office for the Aging
Elders Importance **-** Dr. Jonathan Hook, EPA
How Adults Aging in Place Interact with the Natural Environment
Stanley Paytiamo, Acoma Pueblo

5:00 **Adjourn**

Day 2

Wednesday, August 11, 2004

9:00 – 9:15 **Critical Captures from Day 1 (Room C-111C)**
Kent Thornton

9:15 **Break-out Sessions**
Patricia Bradley

Consistent with standard risk assessment approaches, we've structured workshop breakout discussions to focus on: a) projected demographic and lifestyle patterns of an aging population (sources of environmental stress), b) temporal and spatial changes in land-use and environmental stressors resulting from these patterns (exposure), and c) likely effects resulting from changing land-use and exposure regimes (effects). Considerations of expected variation in lifestyles and regional differences are important to all three issues. Each breakout group is asked to identify and discuss existing information important to their respective portion of this simplified risk paradigm, and to identify the significant knowledge gaps in the data, methods and models needed to address that portion. Bridging these gaps (once prioritized) will be the primary goal of ORD's ecological research program relative to the impacts of the aging population.

FACILITATORS

Focal area A (sources of environmental stress) - Mary Holland/PSGS

Focal area B (exposure) - Kent Thornton/FTN Associates

Focal area C (effects) - Wayne Munns/EPA

9:15-9:30 **Instructions to Focal Breakout Groups**

Workshop participants will be assigned to one of the three focal area breakout groups. Each breakout group will consist of both experts and stakeholders, and will be led and facilitated by a workshop representative. One volunteer from each group will capture salient issues, information, and discussion points on flip charts. This material will be used to support the breakout group's plenary presentation on the last day of the workshop. The deliberations and plenary presentations of each group should be structured to:

- *Identify issues salient to the group's focal area.*
- *Identify known sources of information (data, methods, and models) salient to the group's focal area.*
- *Identify significant gaps in that information that are needed to understand the ecological risks associated with an aging population.*

Day 2 (continued)

Wednesday, August 11, 2004

- *Suggest research (data collection, method, and model development) to bridge the significant gaps.*
- *Provide a sense of priority with respect to research needs.*

Instructions and specific questions for each Focal Area can be found on pages 17-20 and will be presented by the facilitator for each group. For the first two sessions (morning and early afternoon), each group will address the questions related specifically to their Focal Area.

9:30 – 11:30 **Focal Area Breakout Groups** (address questions related specifically to assigned theme)

11:30-12:30 **Lunch** (on your own)

12:30-2:00 **Focal Area Breakout Groups** (continue morning discussions)

2:00-2:30 **Summarize Focal Area Group Discussions** (to be used for Day 3 Reporting Out)

2:30-3:00 **Break**

In the last session the groups will be mixed so that individuals from each Focal Area will be in all of the groups. This session will concentrate on interactions and linkages among the themes.

3:00-4:30 **Interactions/Linkages Breakout Groups**

4:30-5:00 **Summarize Interactions/Linkages Group Discussions** (to be used for Day 3 Reporting Out)

The facilitator for each session will ensure that the critical issues and discussion points are captured at the end of each session. These critical captures will contribute directly to the Workshop Proceedings and provide input for the synthesis/fusion presentation.

5:00 **Adjourn**

Day 3

Thursday, August 12, 2004

9:00	Presentations of Breakout Groups
9:00-9:20	Focal Area A – sources of environmental stress
9:20-9:40	Focal Area B – exposure
9:40-10:00	Focal Area C – effects
10:00-10:20	Discussion
10:20-10:30	Interactions/Linkages Group 1
10:30-10:40	Interactions/Linkages Group 2
10:40-10:50	Interactions/Linkages Group 3
10:50-11:15	Discussion
11:15	Synthesis/Fusion
12:00	Summary, Action Items, Wrap-Up
1:00	Adjourn

Appendix B: Attendees

Bauer, Diana *
bauer.diana@epa.gov
202-343-9759
USEPA ORD/NCER
Ariel Rios Building - 8722R
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Bearon, Lucille
luci_bearon@ncsu.edu
919-515-9146
NC State Cooperative Extension
Dept. of Family & Consumer Sciences
Campus Box 7605
Raleigh, NC 27695-7605

Bradley, Don
bradleyd@mail.ecu.edu
252-328-4838
E. Carolina University
East 5th Street
Greenville, NC 27858-4353

Bradley, Patricia *
bradley.patricia@epa.gov
410-305-2744
USEPA Mid-Atlantic Integrated Assessment
701 Mapes Road
Ft Meade, MD 20755-5350

Dearry, Allen **
dearry@niehs.nih.gov
919-541-3068
NIH, National Institute of Environmental Health Sciences
111 Alexander Drive
P.O. Box 12233
Research Triangle Park, NC 27709

DeLucia, Tony
oneajdone@msn.com
423-439-6202
E.Tennessee State University
Quillen College of Medicine
Box 70571
Johnson City, TN 37614

Eley, Carlton
eley.carlton@epa.gov
202-566-2841
USEPA OPEI
Ariel Rios Building
1200 Pennsylvania Ave, NW
Washington, DC 20460

Geller, Andrew
geller.Andrew@epa.gov
919-541-4208
USEPA ORD/NHEERL
MD B105-05
RTP, NC 27711

Ghiloni, Jennifer ****
jennifer.ghiloni@psgs.com
781-544-3063
PSGS
Mill Wharf Plaza
Suite 208
Scituate, MA 02066

Hedtke, Steven *
hedtke.steven@epa.gov
919-541-0479
USEPA ORD/NHEERL
MD B205-01
RTP, NC 27711

Holland, Mary ***
mary.holland@psgs.com
410-551-2799
Perot Systems Government Services
7929 Barnhill Circle
Severn, MD 21144

Hook, Jonathan **
hook.jonathan@epa.gov
214-665-8069
USEPA Region 6
1445 Ross Avenue
Suite 1200
Dallas TX 75202-2733

Jackson, Laura
jackson.laura@epa.gov
919-541-3088
USEPA ORD/NHEERL
MD B205-01
RTP, NC 27711

Kirby, Sarah
sarah_kirby@ncsu.edu
919-515-9154
NC State Cooperative Extension
Dept. of Family & Consumer Sciences
Campus Box 7605
Raleigh, NC 27695-7605

Koren, Hillel
koren.hillel@epa.gov
919-966-9791
USEPA ORD/NHEERL
MD 58C
RTP, NC 27711

*** Planning Committee | ** Guest Speaker | *** Facilitator | **** Workshop Support Staff**

Kumar, Chitra
kumar.chitra@epa.gov
919-541-2990
USEPA OAQPS
MD C339-01
RTP, NC 27711

Lane, Neal **
neal.lane@ofa.state.ny.us
418-474-7012
NY State Office for the Aging
Executive Offices
Agency Building 2
Empire State Plaza
Albany, NY 12223-1250

Longino, Charles **
longino@wfu.edu
336-758-4665
Wake Forest University
Reynolda Gerontology Program
Wake Forest University
P.O. Box 7808
Winston-Salem, NC 27109

Markwood, Sandy **
SMarkwood@n4a.org
202-872-0888
National Assoc. of Area
Agencies
on Aging
1730 Rhode Island Ave., NW
Suite 1200
Washington, DC 20036

Marsh, Marsha
marsh.marsha@epa.gov
919-541-2542
USEPA ORD/NCEA
MD E343-03
RTP, NC 27711

Mehaffey, Megan
mehaffey.megan@epa.gov
919-541-4205
USEPA ORD/NERL
MD E243-05
RTP, NC 27711

Munns, Wayne * **
munns.wayne@epa.gov
401-782-3017
USEPA ORD/NHEERL
27 Tarzwell Drive
Narragansett, RI 02882

Neiman, Andrea
AFN1@CDC.GOV
770-488-6051
U.S. Centers for Disease
Control and Prevention
Mailstop K-46
4770 Buford Highway NE
Atlanta, GA 30341

Paytiamo, Stanley **
tribalepa@puebloofacoma.org
505-552-6604
Acoma Pueblo
Pueblo of Acoma
P.O. Box 309
Acoma Pueblo, NM 87034

Paul, John
paul.john@epa.gov
919-541-3160
USEPA ORD/NHEERL
MD B205-01
RTP, NC 27711

Rimer, Linda
rimer.linda@epa.gov
919-541-0785
USEPA OAQPS
MD C539-01
RTP, NC 27711

Rosenbaum, Jennifer
jennifer.rosenbaum@ofa.state.ny.us
518-473-4936
NY State Office for the Aging
Executive Offices
Agency Building 2
Empire State Plaza
Albany, NY 12223-1250

Schreiner, Dave **
dave.schreiner@pulte.com
480-391-6206
Pulte Homes
15333 N. Pima Road
Suite 300
Scottsdale, AZ 85260

Smith, Bernice L. *
smith.bernicel@epa.gov
202-343-9766
USEPA ORD/NCER
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Stone, Susan
stone.susan@epa.gov
919-541-1146
USEPA OAQPS
MD C539-01
RTP, NC 27711

*** Planning Committee | ** Guest Speaker | *** Facilitator | **** Workshop Support Staff**

Sykes, Kathy
sykes.kathy@epa.gov
202-564-3651
USEPA, OA
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Tonn, Bruce
btonn@utk.edu
865-974-5227
University of Tennessee
Ste 108, Hoskins Library
Knoxville, TN 37996-4015

Wiggins, Sandy
Sandy_Wiggins@ncsu.edu
919-515-9155
NC State Cooperative Extension
Dept. of Family & Consumer Sciences
Campus Box 7605
Raleigh, NC 27695-7605

Thomas, Kent
thomas.kent@epa.gov
919-541-7939
USEPA ORD/NERL
National Exposure Research Lab
MD E205-04
RTP, NC 27711

Walbeck, Eric ****
eric.walbeck@psgs.com or
walbeck.eric@epa.gov
410-305-2760
PSGS
c/o MAIA
701 Mapes Road
Ft Meade, MD 20755-5350

Wright, Scott * **
scott.wright@nurs.utah.edu
801-585-9542
University of Utah
College of Nursing
10 South 2000 East
Salt Lake City, UT 84112-5880

Thornton, Kent * ***
kwt@ftn-assoc.com
501-225-7779
FTN Associates
#3 Innwood Circle, Ste. 220
Little Rock, AR 72211-2449

Wallace, Mike **
mike@footprintnetwork.org
510-839-8879
Global Footprint Network
1050 Warfield Ave.
Oakland, CA 94610-1612

*** Planning Committee | ** Guest Speaker | *** Facilitator | **** Workshop Support Staff**

Appendix C: Reading List

Bechtel, R. and Churchman, A. 2002. *Handbook of environmental psychology*. New York, NY: John Wiley & Sons, Inc.

Bennett, G. 1993. Retirement migration and economic development in high-amenity, nonmetropolitan areas. *The Journal of Applied Gerontology* 12: 466-481.

Bennett, G. 1996. Implications of retirement development in high-amenity nonmetropolitan coastal areas. *The Journal of Applied Gerontology* 15: 345-360.

Carlson, J.V., F.L. Funk, G. Rudzitis and S. Cann. 1998. Factors affecting retirement migration to Idaho: an adaptation of the amenity retirement migration model. *The Gerontologist* 38: 18-24.

Chambers, N., C. Simmons and M. Wackernagel. 2000. Sharing nature's interest: ecological footprints as an indicator for sustainability. London: Earthscan Publications Ltd.

Cunningham, S. 2002. The restoration economy: The Greatest New Growth Frontier: Immediate and Emerging Opportunities for Businesses, Communities, and Investors. Berret-Koehler Publishers, San Francisco, California.

Cunningham, S. 2004. Restorative Development: How does it Relate to Sustainable Development, Smart Growth, Green Building, and New Urbanism? (June 15, 2004: *http://www.revitalizationinstitute.org/Smart_Growth_&_SD.htm)*

Dasgupta, P. 2001. *Human well-being and the natural environment*. New York, NY: Oxford University Press.

Del Webb. 2003. *Baby boomer report—annual opinion survey*. Bloomfield Hills, MI: Del Webb.

Department of Environmental Conservation. 2002. "State agencies prepare for the impact of an aging New York White paper for discussion." 2002. (May 18, 2004: *http://aging.state.ny.us/explore/project2015/report02/index.htm*).

Department of Health and Human Services, Centers for Disease Control and Prevention. 2003. Trends in aging—United States and worldwide. *Morbidity and Mortality Weekly Report* 52(6).

Directorate General for Research, Division Industry, Research, Energy, Environment, and Scientific and Technological Options Assessment (STOA). 2001. "Ecological footprinting. Commissioned by the European Parliament." 2003. (February 13, 2004: *http://www.europarl.eu.int/stoa/publi/pdf/00-09-03_en.pdf*).

Federal Interagency Forum on Aging-Related Statistics. 2000. *Older Americans 2000: key indicators of well-being*. Washington, DC: Federal Interagency Forum on Aging-Related Statistics.

Ferraro, P.J. 2001. Global Habitat Protection: Limitations of Development Interventions and the Role for Conservation Performance Payments. *Conservation Biology* 15 (4): 1-12.

Frey, W.H. 2003. *Boomers and seniors in the suburbs: aging patterns in Census 2000*. Washington, DC: The Brookings Institution, Center on Urban and Metropolitan Policy.

Fri, R., R. Harootyan and J. Takeuchi (Eds). 1993. Aging of the U.S. population: economic and environmental implications. In *Proceedings of an invitational workshop conducted by American Association of Retired Persons (Forecasting & Environmental Scanning Department—Research Division) and Resources for the Future*, Washington, DC.

Henetz, P. 2004. Utah, west lure shifting populace. *The Salt Lake Tribune*, 10 March.

Ingman, S., X. Pei, C. Ekstrom, H. Friedsam and K. Bartlett (Eds). 1995. *An aging population, an aging planet, and a sustainable future*. Denton, TX: Texas Institute for Research and Education on Aging.

Kweon, B., W. Sullivan and A. Wiley.1998. Green common spaces and the social integration of inner-city older adults. *Environment and Behavior* 30: 832-858.

Klinenberg, R. 2002. *Heat Wave: A social autopsy of disaster in Chicago*. Chicago, IL: The University of Chicago Press.

Lawton, A.H. and T.A. Rich. 1968. Ecology and gerontology: an introduction. *The Gerontologist*, 8: 76-77.

Libby, L.W. 2004. "Federal, State and Local

Programs to Protect Farmland." *What the Public Values About Farm and Ranch Land.* State College, PA: Northeast Center for Rural Development, 2004.

Longino, C.F., A.T. Perzynski and E.P. Stoller. 2002. Pandora's briefcase: unpacking the retirement migration decision. *Research on Aging* 24: 29-49.

Longino, C.F., Jr. and R. Alan Fox. 1995. *Retirement migration in America: an analysis of the size, trends, and economic impact of the country's newest growth industry.* Houston, TX: Vacation Publications, Inc.

Longino, C.F., Jr. 1997. On the move: the new migration patterns of older Americans. *Innovations in Aging* 26: 23-26.

Ngo, E.B. 2001. When disasters and age collide: reviewing the vulnerability of the elderly. *Natural Hazards Review* May: 80-89.

Novella, W.D. 2002. "Helping aging boomers to age in place." Presented at the *National Association of Home Builders, 2002 Seniors Housing Symposium,* Orlando, FL, May 1, 2002.

Redefining Progress. 2002. "Ecological footprint accounts: moving sustainability from concept to measurable goal." 2002. (February 13, 2004: *http://www.redefiningprogress.org/programs/sustainability/ef/efbrochure.pdf*).

Redefining Progress. 2002. "Your ecological footprint: moving sustainability from abstract concept to concrete goal." 2002. (February 13, 2004: *http://www.redefiningprogress.org/publications/wssd_brochure.pdf*).

Redefining Progress and Earth Day Network. 2002. "Sustainability starts in your community—a community indicators guide." April 2002. (February 13, 2004: *http://www.redefiningprogress.org/publications/ciguide.pdf*).

Roodman, M.D. and N, Lenseen. 1995. *A building revolution: how ecology and health concerns are transforming construction*, Worldwatch paper #124. Washington, DC: Worldwatch Institute.

Roper Starch Worldwide, Inc. 1999. "Baby boomers envision their retirement: an AARP segmentation analysis." (February 13, 2004: *http://research.aarp.org/econ/boomer_seg_prn.html*).

Roper Starch Worldwide, Inc. 2004. "Baby boomers envision their retirement II: survey of baby boomers' expectations for retirement." (February 13, 2004: *http://research.aarp.org/econ/boomers_envision.html*).

Smart, T. 2001. "Not acting their age." June 10, 2001. (February 13, 2004: *http://www.usnews.com/usnews/biztech/articles/010604/retire.h*tm).

SRI Consulting Business Intelligence. 2002. *Aging boomers: a marketing perspective—marketing messages and strategies for boomers' later years.* Menlo Park, CA: SRI Consulting Business Intelligence.

Stoneman, J. and R. Jones. 1997. Residential landscapes: their contribution to the quality of older people's lives. *Activities, Adaptation & Aging* 22: 17-26.

Stroud, H. 1995. *The promise of paradise: recreational and retirement communities in the United States since 1950.* Baltimore, MD: Johns Hopkins University Press.

Sustainable Sonoma County with Redefining Progress. 2002. "Time to lighten up? Report on the Sonoma County footprint project." April 2002. (February 13, 2004: *http://www.sustainablesonoma.org/projects/footprintreport/scfpweb.pdf*).

Talbot, J. and R. Kaplan. 1991. Benefits of nearby nature for elderly apartment residents. *International Journal of Aging and Human Development* 33: 199-130.

Thomas, N. and H. Soliman. 2002. Preventable tragedies: heat disaster and the elderly. *Journal of Gerontological Social Work* 38: 53-66.

Tonn, B., G. Waidley and C. Petrich. 2001. The Aging U.S. Population and Environmental Policy. *Journal of Environmental Planning and Management* 44(6): 851-876.

U.S. Department of Transportation. 2003. *Safe mobility for a maturing society: challenges and opportunities.* Washington, DC: U.S. Department of Transportation.

U.S. Environmental Protection Agency. 2004. *EPA smart growth strategy.* Washington, DC: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency. 2004. *Draft national agenda for the environment and the aging*. Washington, DC: U.S. Environmental Protection Agency, Aging Initiative.

U.S. Environmental Protection Agency. 2004. *Aging and the environment: A research framework, Draft Report*. Washington, DC: U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Laboratory.

U.S. Environmental Protection Agency. 2003. *EPA's smart growth INDEX in 20 pilot communities: using GIS sketch modeling to advance smart growth*. Washington, DC: U.S. Environmental Protection Agency, Office of Policy, Economics, and Innovation, Development, Community, and Environment Division.

Wackernagel, M. 1997. "Framing the sustainability crisis: getting from concern to action." October 1997. (May 13, 2004: *http://www.sdri.ubc.ca/documents/Framing_the_Sustainability_Crisis.doc*).

Wackernagel, M. and E.R. William. 1996. *Our ecological footprint: reducing human impact on the Earth*. Gabriola Island, BC: New Society Publishers.

Wackernagel, M., C. Monfreda and D. Deumling. "Ecological footprint of nations—November 2002 update: how much nature do they use? How much nature do they have?" November 25, 2002. (February 13, 2004: *http://www.redefiningprogress.org/media/releases/021125_efnations.html*).

Wackernagel, M., N. Schulz, D. Deumling, A. Linares, M. Jenkins, V. Kapos, C. Monfreda, J. Loh, N. Myers, N. Norgaard and J. Randers. 2002. Tracking the ecological overshoot of the human economy. National Academy of Science, USA, 99 (14): 9266-9271. [online] (February 13, 2004: *http://www.pnas.org/cgi/content/abstract/142033699v1)*.

Wackernagel, M. 2001. "Advancing sustainable resource management: using ecological footprint analysis for problem formulation, policy development, and communication." (February 13, 2004: *http://europa.eu.int/comm/environment/enveco/waste/wackernagel.pdf*).

Worldwatch Institute. 2004. "Press release: State of the World 2004: Consumption by the numbers." (February 13, 2004: *http://www.worldwatch.org/press/news/2004/01/07*).

Wright, S. 1999. The FANBY dynamic: The potential and future of retirement "hot spots" in the West. *Sustainable Communities Review* 3: 6-11.

Wright, S., M. Caserta and D. Lund. 2003. Older adult's attitudes, concerns, and support for environmental issues in the "New West." *International Journal of Aging and Human Development* 57(2): 153-181.

Wright, S., and Lund, D. 2000. Gray and green?: stewardship and sustainability in an aging society. *Journal of Aging Studies* 14: 229-249.

Websites of Interest:

- AARP: *http://research.aarp.org/general/beyond_50.html*
- American Institute of Architects, Committee on the Environment (COTE): *www.aia.org/cote*
- American Society on Aging: *www.asaging.org*
- The Brookings Institution: *www.brook.edu*
- California Center for Land Recycling: *www.cclr.org*
- Coalition for Environmentally Responsible Economies (CERES): *www.ceres.org*
- Earth Day Network & Redefining Progress: h*ttp://Myfootprint.org*
- Electric Power Research Institute (EPRI): *www.epri.com*
- Environmental Alliance for Senior Involvement (EASI): *www.easi.org*
- The GLOBE Program: *www.globe.gov*
- Institute on Aging & Environment: *www.uwm.edu/Dept/IAE*
- **Landpool** Administrators: *www.landpooling.com/LandpoolAdministratorsOverview.pdf*

- National Association of Area Agencies on Aging (n4a): *www.n4a.org*
- National Association of Home Builders: *www.nahb.org*
- National Institute of Environmental Health Sciences: *www.niehs.gov*
- National Park Service, Rivers, Trails, & Conservation Assistance Program: *www.ncrc.nps.gov/rtca*
- Nature Conservancy: *www.nature.org*
- Population Connection: *www.KidFriendlyCities.org*
- Restore America's Estuaries: *www.estuaries.org*
- The Retirement Living Information Center, Inc.: *www.retirementliving.com*
- The Revitilization Institute: *www.revitilization.org*
- Smart Growth Network: *www.smartgrowth.org*
- The Society for Human Ecology: *www.societyforhumanecology.org*
- Sonoran Institute: *www.sonoran.org*
- Texas Transportation Institute: *http://tti.tamu.edu*
- The Trust for Public Land: *www.tpl.org*
- University of Buffalo, Center for Inclusive Design & Environmental Access (IDeA): *www.ap.buffalo.edu/idea*
- University of California, Center for Environmental Research & Technology: *www.cert.ucr.edu*
- University of Chicago National Opinion Research Center (NORC): *www.norc.uchicago.edu*
- University of Maryland, Scientific Research on the Internet: *www.webuse.umd.edu/data_des.htm*
- Urban Land Institute: *www.uli.org*
- U.S. Census Bureau: *www.census.gov*
- U.S. Centers for Disease Control:
  - National Center for Health Statistics: *www.cdc.gov/nchs*
  - Public Health Information Network (PHIN): *www.cdc.gov/phin*
- U.S. Department of Health & Human Services, Administration on Aging: *www.aoa.dhhs.gov*
- U.S. Department of Labor, Bureau of Labor Statistics: *www.bls.gov*
- U.S. Environmental Protection Agency:
  - Aging Initiative: *www.epa.gov/aging/index.htm*
  - Science and Technology Network for Sustainability: *http://es.epa.gov/ncer/rfa/2004/2004_collab_science.html*
  - Senior Environmental Employment Program (SEE): *www.epa.gov/epahrist/see/brochure*
  - Smart Growth Program: *www.epa.gov/smartgrowth*

Appendix D: Glossary

AARP (American Association of Retired Persons) – A nonprofit, nonpartisan membership organization dedicated to making life better for people 50 and over.

Adult Communities – Communities designed to attract active retirees by offering social activities, recreational facilities, and services of interest to those of retirement age. These developments might consist of single-family (detached) dwellings, manufactured (mobile) home parks, condominiums, apartments and other types of dwellings.

African Americans – The term "African American," as originally coined, refers to only those descended from a relative handful of black, colonial indentured servants and the estimated 10 to 11 million Africans who arrived in the U.S. as slaves. In slightly broader usage, the term also includes black, West Indian immigrants, whose African ancestors also survived the Middle Passage. "African American" generally does not include Afro-Latinos, who tend to use the term "Latino" or "Hispanic," or to recent African immigrants, who usually adopt country-of-origin identifiers. However, the term can properly be applied to nearly all black citizens of the U.S. Despite its literal meaning, the term is not normally considered to include white Americans of South African or North African origin; skin color is considered an essential feature of the definition.

Age Wave – Refers to the transformation of the massive Baby Boom generation into the largest proportional elderly population in human history (Dychtwald, 1990).

Aging Explosion – Refers to the rapidly growing older population.

Aging-in-Place – Seniors remaining in the homes and neighborhoods they have lived in for many years.

Alternative Futures – Considered by many to be the core concept of futures studies. Suggests that individuals, groups, cultures etc., are not set on a deterministic path to a single unitary future but, by using their powers of foresight and decision-making, can select from a wide range of future trajectories and outcomes (Slaughter, 1996, Knowledge Base Of Futures Studies).

Amalgam Fillings – Mercury, mixed with gold and silver and other materials is used as a dental filling. The mercury in dental amalgams can gently leach out from the fillings into the body. Mercury released into the environment is converted into methyl mercury by bacteria. The methyl mercury will then build up in the tissues of fish and shellfish. Humans (and other animals) may also be poisoned by eating these fish or shellfish.

Ambient – Completely enveloping (e.g., "the ambient air;" "ambient sound;" "the ambient temperature").

Amenities – Features that enhance and add to the value or desirability of real estate although the feature is not essential to the property's use. Natural amenities include a pleasant or desirable location near water, scenic views of the surrounding area, etc. Man-made amenities include swimming pools, tennis courts, clubhouses, and other recreational facilities.

Amenity-Seeking – Individuals who relocate to areas that offer a new and better lifestyle.

American Indians – The indigenous inhabitants of the Americas prior to the European colonization, and their modern descendants. This term comprises a large number of distinct tribes, states, and ethnic groups, many of them still enduring as political communities. Also known as Native Americans, First Nations, Alaskan Natives, and Indigenous Peoples of America.

Anglo-American – An American who was born in England or whose ancestors were English.

Anthropocentric – Human-centered; "our anthropocentric view of the world."

Arcadia – A term reflecting the desire to search for and find a geographic landscape that captures the selected qualities of both nature and culture. In Arcadia, the bridge between humanity and nature is established with ideal pastoral settings, and in contemporary U.S. this is typically made manifest through the dwelling space of small town suburbia, exurbs, or gateway communities. These idyllic landscapes are often promoted and marketed as prime location sites that feature quality of life amenities such as recreational and leisure opportunities, scenic beauty, cultural opportunities, less congestion from traffic, minimal construction activities, and favorable climatic patterns.

Architect – Design buildings and other structures. In addition to considering the way these buildings and structures look, they also make sure they are functional, safe, economical, and suit the needs of the people who use them.

Area Aging Agencies – Nonprofit organizations established in 1975 by the Older Americans Act. Each

state has area aging agencies that provide services directly to older persons or contract with other public or private agencies to administer programs.

Asian and Pacific Islanders – Persons who call the U.S. their home and trace their ancestry to countries from the Asian continent and subcontinent and islands within the Pacific Rim. Asian and Pacific Americans come from many national backgrounds, speak many different languages, and encompass a wide variety of physical and social characteristics.

Asset Management – Refers to special policies and programs designed to preserve the value of assets, such as stock or investments.

Attention-Deficit Disorder (ADD) – A term used to describe a pattern of behaviors found together in a significant number of children and adults. Like other disorders, ADD is associated with mild, moderate, and severe problems. The behavioral characteristics of ADD include short attention span, trouble concentrating, distractibility, and poor impulse control. Hyperactivity may also be present in some children, but not all children with ADD are hyperactive.

Attitudinal – Relating to attitude.

Average Life Span – The average of a group of individuals' length of life from birth to death.

Baby Boomer – Someone born between the years 1946 and 1964.

Balance Sheet – A statement of the assets, liabilities, and net worth of a company at a given point in time. The basic relationship illustrated by a balanced sheet is that assets minus liabilities are equal to net worth. Or alternatively, assets are equal to liabilities plus net worth. This is one of two financial statements for an entity. The other is an income statement, which reports the revenues, expenses, and profit over a period of time.

Base Layer – The first layer in a Geographic Information System (GIS). Aerial photography or even high resolution satellite imagery often serve as the base layer.

Behaviorist – A scientist who investigates the behavior of animals objectively and who attempts to relate his observations together in a theoretical system that does not include concepts borrowed from introspection and mental philosophy. More specifically, a psychologist who studies learning and related phenomena.

Best Management Practices – Structural, nonstructural, and managerial techniques recognized to be the most effective and practical means to reduce surface water and ground water contamination while still allowing the productive use of resources.

Biocapacity – The supply or amount of productive space of land and water.

Biodiversity – The variety and variability among living organisms and the ecosystems in which they occur. Biodiversity includes the number of different items and their relative frequencies; these items are organized at many levels, ranging from complete ecosystems to the biochemical structures that are the molecular basis of heredity. Thus, biodiversity encompasses expressions of the relative abundances of different ecosystems, species, and genes.

Biologically Productive Area – The land and water area that is biologically productive. A typical indicator of biological productivity is the annual accumulation of biomass (the total mass of living matter in a given unit area) of an ecosystem.

Biosphere – The part of the earth and its atmosphere in which living organisms exist or that is capable of supporting life.

Biota – The animals, plants, and microbes that live in a particular location or region.

Boomburbs – Fast-growing suburban cities with populations of more than 100,000.

Brainstorming – A group problem-solving technique in which members sit around and let fly with ideas and possible solutions to a problem.

Breakout Groups – A term used to describe the division of a gathering of people into smaller clusters. It is a means of rapidly and actively gathering a large amount of newly generated information that can be reported back to a large audience. A breakout group may range in size from 4 to 15 people. If the meeting facility is adaptable and there is sufficient time in the program, there really is no limit to the number of breakout groups. Each group needs a scribe, a reporter, and a facilitator. Once divided, each group responds to a question or completes an activity. Following an allocated amount of time, everyone reassembles to hear all of the small groups present summaries of their discussions.

Brownfield – Abandoned, idled, or under-used industrial and commercial facilities/sites where

expansion or redevelopment is complicated by real or perceived environmental contamination. They can be in urban, suburban, or rural areas. EPA's Brownfields initiative helps communities mitigate potential health risks and restore the economic viability of such areas or properties.

Built Environment – The expression built environment recognizes that much of the physical world in which humans function and thrive has been intentionally created; is something aesthetically and functionally shared; and functions as an organism in the consumption of resources, disposal of wastes, and facilitation of productive enterprise within its bounds. The built environment includes all of the physical structures engineered and built by people, including our homes, workplaces, schools, parks, and transportation systems.

CAFO (Concentrated Animal Feeding Operation) – A lot or facility (other than an aquatic animal production facility) where the following conditions are met: More than 1,000 animal units (AU) have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12 month period, and crops, vegetation, forage growth or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.

> *1 AU = 1 slaughter or feeder, or 0.7 mature dairy cattle (whether milk or dry cows), or 2.5 swine over 55 lbs., or 0.5 horses, or 10 sheep or lambs, or 30 laying hens, or 100 broiler chickens, or 55 turkeys, or 5 ducks.*

Carbon Dioxide – Greenhouse gas produced through respiration and the decomposition of organic substances. Combustion of fossil fuels is primarily responsible for increased atmospheric concentrations of this gas.

Carrying Capacity – The maximum population size of a given species that an area can support without reducing its ability to support that same species in the future. In the human context, William Catton defines it as the maximum "load" (population x per capita impact) that can safely and persistently be imposed on the environment by people.

Case Study – An exploration of a "bounded system" or a case over time through detailed, in-depth data collection involving multiple sources of information rich in context. Case study research excels at bringing us to an understanding of a complex issue or object and can extend experience or add strength to what is already known through previous research. Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships. Researchers have used the case study research method for many years across a variety of disciplines.

Causation – A "cause and effect" relationship exists wherever a change in one variable (the independent variable) induces change in another (the dependent variable). Causal factors in sociology include individual motivation as well as many external influences on human behavior that often go unrecognized.

Centenarian – A person who has attained the age of 100 years or more. The term is associated with longevity due to the fact that average life expectancies across the world are still far from 100.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) – Commonly known as Superfund, was enacted by Congress on December 11, 1980. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. Over five years, $1.6 billion was collected and the tax went to a trust fund for cleaning up abandoned or uncontrolled hazardous waste sites. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites; provided for liability of persons responsible for releases of hazardous waste at these sites; and established a trust fund to provide for cleanup when no responsible party could be identified.

Channelization – The term given to the tendency of persons age 60+ who make interstate moves to concentrate geographically. Nearly a third of all interstate migrants move to just 3 states – Florida, Arizona and California, and 54% move to the top ten states out of 50. Within these states there is further concentration into specific communities. For example, if one visits a shopping mall in some parts of Florida, it seems over half the population is over 60.

Chronic Effect – An adverse effect on a human or animal in which symptoms recur frequently or develop slowly over a long period of time.

Civilian Conservation Corps (CCC) – A program created in President Franklin Delano Roosevelt's first month in office (on March 31, 1933). The CCC was an interdepartmental work and relief program that sent young, unemployed men from the cities to work on conservation projects in rural areas at a dollar a day. The Labor Department's role was to recruit participants

in the program. To do this, the employment service was hastily beefed up and mobilized. Within a week there was organized within it a National Re-Employment Service to handle recruitment. In a short time there were 250,000 young enrollees working in CCC camps all around the country. One of the most successful and well-received New Deal programs; when the CCC disbanded in 1942 several million young men had participated.

Climate Change (also referred to as "global climate change") – The term "climate change" is sometimes used to refer to all forms of climatic inconsistency, but because the Earth's climate is never static, the term is more properly used to imply a significant change from one climatic condition to another. In some cases, "climate change" has been used synonymously with the term, "global warming;" scientists however, tend to use the term in the wider sense to also include natural changes in climate.

Cohort – An aggregation of people having a common characteristic, (e.g., the time period in which they were born).

Common Interest Development (CID) – A type of housing which combines the individual ownership of private dwellings with the shared ownership of common facilities. The common facilities can range from roads and water systems to clubhouses, swimming pools and even 18-hole golf courses. CIDs provide a system of self-governance through a community association, sometimes called a homeowner association. The association has the authority to enforce special rules called CC&Rs (covenants, conditions and restrictions) and to raise money through regular and special assessments.

Commons – Refers to natural resources to which a large number of people have access. Each of us has the obligation to keep the commons in good shape—we all have a "permanent" stake in it. This does not preclude personal profit, but personal profit is no longer the focus. Each of us must focus on his responsibility to others—regardless of what others are doing. An individual is not allowed to say, "Since I'm only one of many people contributing to the problem, I'm not responsible. After all, even without me, the damage would have occurred and if I was the only one doing the activity it wouldn't have been enough damage to have mattered." When each individual recognizes his true place in the world and assumes personal responsibility for his actions, there need never be another tragedy of the commons.

Community – The assemblage of populations of plants and animals (including humans) that interact with each other and their environment. The community is shaped by populations and their geographic range, the types of areas they inhabit, species diversity, species interactions, and the flow of energy and nutrients through the community.

Comorbidity – The condition of having two or more diseases at the same time.

Compact Development – A pattern of land development with sufficient density of development and proximity between uses and activities to encourage pedestrian movement and efficient provision of public facilities and services. Lot sizes, typically, are much smaller; can be clustered or grouped, requiring far less infrastructure, including impervious (paved) surfaces; and, more recently, are designed to look like more traditional concepts of neighborhoods (new urbanism).

Composting – The controlled biological decomposition of organic material in the presence of air to form a humus-like material.

Comprehensive Master Plan – A plan prepared by a planning commission to guide future land use and infrastructure decisions in the community according to the procedures and requirements of the applicable planning enabling act. A Master Plan has a long-term focus of at least twenty years; is required to be reviewed periodically; and includes analysis, recommendations, and proposals for the community's population, economy, housing, transportation, community facilities, services, and future land use.

Concentration – The relative amount of a substance mixed with another substance. An example is five parts per million of carbon monoxide in air.

Conservation – Preserving and renewing, when possible, human and natural resources. The use, protection, and improvement of natural resources according to principles that will ensure their highest economic or social benefits.

Conservation Easement – A voluntary binding legal agreement between a private landowner and a municipal agency or qualified non-profit corporation to restrict the development, management, or use of the land in order to protect conservation values such as biodiversity, water quality, wildlife habitat or carbon sequestration. The agency or non-profit corporation holds the interest and is empowered to enforce its restrictions against the current landowner and all subsequent owners of the land. A perpetual

conservation easement usually grants conservation and management rights to a party in perpetuity.

Consumption – Refers to all the goods and services used by people. This includes purchased commodities at the household level (such as food, clothing, and utilities), the goods and services paid for by the government (such as defense, education, social services, and health care), and the resources consumed by businesses to increase their assets (such as business equipment and housing).

Contaminant – Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on air, water, or soil.

Continental Shelf – The zone around the continents extending from the low-water mark seaward, typically ending in steep slope to the depths of the ocean floor.

Convective Storms (also thunderstorms) – In general, a local storm, invariably produced by a cumulonimbus cloud and always accompanied by lightning and thunder, usually with strong gusts of wind, heavy rain, and sometimes with hail. It is usually of short duration, seldom over two hours for any one storm. A thunderstorm is a consequence of atmospheric instability and constitutes, loosely, an overturning of air layers in order to achieve a more stable density stratification. A strong convective updraft is a distinguishing feature of this storm in its early phases. A strong downdraft in a column of precipitation marks its dissipating stages. Thunderstorms often build to altitudes of 40,000–50,000 ft in midlatitudes and to even greater heights in the Tropics; only the great stability of the lower stratosphere limits their upward growth. A unique quality of thunderstorms is their striking electrical activity. In U.S. weather observing procedure, a thunderstorm is reported whenever thunder is heard at the station; it is reported on regularly scheduled observations if thunder is heard within 15 minutes preceding the observation. Thunderstorms are reported as light, medium, or heavy according to 1) the nature of the lightning and thunder; 2) the type and intensity of the precipitation, if any; 3) the speed and gustiness of the wind; 4) the appearance of the clouds; and 5) the effect upon surface temperature. From the viewpoint of the synoptic meteorologist, thunderstorms may be classified by the nature of the overall weather situation, such as airmass thunderstorm, frontal thunderstorm, and squall-line thunderstorm.

Correlation – The relationship between two variables in which they vary together--say a correlation between the income of parents and reading ability among primary school children. Statistical correlation can vary from -1 to 1 (a 0 indicates no correlation between the variables). A positive correlation between two variables exists where a high score on one variable is associated with a high score on the other. A negative correlation is where a high score on one variable is associated with a low score on the other.

Covenant – A signed written agreement between two or more parties to perform some action.

Daniel Boone Syndrome – A psychological syndrome where an individual feels trapped when their existence becomes routine. They need to escape, and go in search of something better, believing that they will find it over the next hill. An extreme example is that of people abandoning the decaying urban areas of the Northeast for the “fresh” environments of California, which they proceed to “trash” before fleeing to the Pacific Northwest and from there, to the small towns of the inland West. Once can interpret such shifts as a collective shunning of the social problems associated with modern urban living. Rather than confronting and solving problems, people move on and spread them.

de Rigueur – Strictly required by the current fashion or by etiquette.

Debilitating Disease – A disease that impairs an individual’s strength and vitality.

Delphi Method – Based on a structured process for collecting and distilling knowledge from a group of experts by means of a series of questionnaires interspersed with controlled opinion feedback (Adler and Ziglio, 1996). According to Helmer (1977) Delphi represents a useful communication device among a group of experts and thus facilitates the formation of a group judgment.

Demographer – A scientist who studies the growth and density of populations and their vital statistics.

Demographics – Statistics representing the composition and range of a given population. This may include such elements as age, gender, education, income, computer experience, occupation, nationality, and migration patterns.

Demography – The scientific study of human population--including size, growth, movement, density, and composition.

Demonstration Project – A relatively self-contained, small-scale capital investment or technical assistance

project which is implemented in order to "demonstrate" in practice how a particular type of problem can be addressed in a participatory way. It is an effective mechanism to forge partnerships between public, private and (especially) community sectors, developing new ways of working together, and learning by doing whilst generating tangible results on the ground.

Dependency Migrants – Typically forced to move due to deterioration of health and financial resources or the loss of a spouse.

Disamenities – Covers a wide range of potential negative economic impacts on residential and other properties. Environmental disamenities include superfund and hazardous waste sites, solid waste landfills, overhead power lines, pipelines, storage tanks, and railroad tracks.

Disposable Income – The amount of income left to an individual after all necessary expenses are paid (e.g., taxes, mortgage or rent, car payment and insurance).

DOI – U.S. Department of Interior.

Durable Goods – Manufactured items with a normal life expectancy of three years or more. Automobiles, furniture, household appliances and mobile homes are examples. Because of their nature, expenditures for durable goods are generally postponable, consequently, durable goods sales are a more volatile component of consumer expenditures.

Dynamic Systems Modeling – Mathematical models that analyze and predict a system's behavior that evolves over time, often in a manner that can be represented by differential equations.

Ecological – Relating to the inter-relationships of organisms and their environment.

Ecological Assets – Tangible commodities (e.g., planted city trees, forests, wetlands, streams, riparian corridors and species, shrub beds, and turf grass areas) that have greater inherent value than traditional real estate valuation.

Ecological Deficit – The amount by which the ecological footprint of a population (e.g., country or region) exceeds the biological capacity of the space available to that population. The national ecological deficit measures the amount by which the country's footprint (plus the country's share of biodiversity responsibility) exceeds the ecological capacity of that nation.

Ecological Effects – Changes that alter valued structural or functional characteristics of ecosystems or their components.

Ecological Exposure – Exposure of a non-human organism to a stressor (such as toxic chemicals).

Ecological Footprint – The land and water area that is required to support a defined human population and material standard indefinitely, using prevailing technology.

Ecological Processes – The actions or events that link organisms (including humans) and their environment such as disturbance, successional development, nutrient cycling, carbon sequestration, productivity, and decay.

Ecological Reserve – A sanctuary consisting of contiguous, diverse habitats, within which uses are subject to conditions, restrictions, and prohibitions. These restrictions are intended to minimize human influences and to sustain unique or representative parts of the natural environment.

Ecological Risk Assessment – The application of a formal framework, analytical process, or model to estimate the effects of human action(s) on a natural resource and to interpret the significance of those effects in light of the uncertainties identified in each component of the assessment process. Such analysis includes initial problem formulation, characterizations of exposure and ecological effects, and risk characterization.

Environmental Sustainability – Maintenance of ecosystem components and functions for future generations.

Ecologist – A scientist who studies inter-relationships between living things and their environments.

Ecology – The study of the inter-relationships between organisms and their natural environment.

Economist – An individual who has received extensive training in economic theories, applications, and analysis and whose primary employment involves the research, teaching, consulting, and other applications of this economic training.

Ecoregion – A relatively homogeneous geographic area perceived by simultaneously analyzing a combination of causal and integrative factors including land surface form, soils, land-uses, and potential natural vegetation. Ecoregions are generally

considered to be the regions of relative homogeneity in ecological systems or in relationships between organisms and their environments.

Ecosystem – The plant and animal communities in an area together with the non-living physical environment that supports them. Ecosystems have physically defined boundaries, but they are also dynamic; their boundaries and constituents can change over time. They can import and export materials and energy; and thus can interact with and influence other ecosystems. They can also vary widely in size.

Ecosystem Services – The transformation of a set of natural assets (soil, plants and animals, air and water) into things that we value. For example, when fungi, worms and bacteria transform the raw "ingredients" of sunlight, carbon and nitrogen into fertile soil this transformation is an ecosystem service. Some examples of ecosystem services that come from nature include: pollination; fulfillment of people's cultural, spiritual and intellectual needs; regulation of climate; insect pest control; maintenance and provision of genetic resources; maintenance and regeneration of habitat; provision of shade and shelter; prevention of soil erosion; maintenance of soil fertility; maintenance of soil health; maintenance of healthy waterways; water filtration; regulation of river flows and groundwater levels; and waste absorption and breakdown.

Effluent – Any material that flows outward from something; examples include wastewater from treatment plants and water discharged into streams from abandoned coal mines.

Elder – An older person. In many cultures the elders are seen as chiefs or heads of the community and are treated with respect and honor.

EMAP – EPA's Environmental Monitoring and Assessment Program.

Embryo – This term is applied to the earliest stages of development of a plant or animal. The embryo is generally contained in another structure, the seed, egg, or uterus.

Endocrine Disrupting Chemicals – Chemical substances, sometimes called environmental estrogens, both from natural sources and man made, that if present in the body at the right concentration and at the right time, can adversely effect hormone balance or disrupt normal function in the organs that hormones regulate. By EPA's working definition, endocrine disruptors "interfere with the synthesis, secretion, transport, binding, action, or elimination of natural hormones in the body that are responsible for the maintenance of homeostasis (normal cell metabolism), reproduction, development, and/or behavior." Many endocrine disruptors are thought to mimic hormones. They have chemical properties similar to hormones that allow binding to hormone specific receptors on the cells of target organs. However, endocrine disruptor chemistry varies greatly, as does potency—the effectiveness in binding and "turning on" the response. Most endocrine disruptors have very low potency, as their chemistry is significantly different from the hormones they mimic. Lower potency means that a greater amount of endocrine disruptor is required to elicit the same response of the hormone they mimic. In addition to potency, the potential for a hormone-like effect depends on dose. For all known endocrine disruptors there is some dose, below which there will be no effect. At doses slightly above this threshold some endocrine disruptors elicit a beneficial effect, whereas at higher doses the effect is adverse (harmful).

Endocrine System – The group of organs that produce hormones and excrete them into the blood stream through which they travel to the tissues that use them. The major organs that make up the human endocrine system are the hypothalamus, pituitary, thyroid, parathyroids, adrenals, pineal body, and the reproductive glands, which include the ovaries and testes. The pancreas is also part of this hormone-secreting system, even though it is also associated with the digestive system because it also produces and secretes digestive enzymes. Although the endocrine glands are the body's main hormone producers, some non-endocrine organs —such as the brain, heart, lungs, kidneys, liver, thymus, skin, and placenta—also produce and release hormones.

Engineer – A person who is trained in and uses technological and scientific knowledge to solve practical problems. The discipline is divided into a number of specialties, such as civil, mechanical, chemical, electronic, environmental, aerospace, electrical, and industrial engineering.

Environment – The sum of all external conditions affecting the life, development and survival of an organism.

Environmental Alliance for Senior Involvement (EASI) – Founded in 1991 through a partnership with The American Association of Retired People (AARP) and EPA. In the ensuing years it has begun to fulfill its mission of building, promoting, and utilizing the environmental ethic, expertise, and commitment

of older persons to expand citizen involvement in protecting and caring for our environment for present and future generations. Through establishment of its EASI Senior Environment Corps (SECs) across the country, in partnership with such groups as AmeriCorps, Retired and Senior Volunteer Programs, and various state, federal, corporate, and foundation organizations, EASI enables and encourages senior volunteer participation in enhancing their communities environmentally.

Environmental Management System (EMS) – The part of an overall management system which includes structure, planning activities, responsibilities, practices, procurements, processes and resources for developing, implementing, achieving, reviewing and maintaining an environmental policy. Such a system is the procedure put in place to ensure the control of the environmental impact of a company's products and services. Many companies have informal Environmental Management Systems in place with an increasing number choosing to go through the process of formal recognition to achieving certification such as ISO 14001.

Environmentally Disadvantaged – An area within two miles of the borders of a site on which a waste management facility is proposed to be constructed and that meets specified criteria concerning minority populations, poverty, and existing hazardous or solid waste facilities or hazardous waste sites.

Environmentally Sensitive Areas (ESAs) – Particular parts of the countryside where the landscape, wildlife and historic interest are of national importance. ESAs are highly valued for their scenic beauty, for the habitats they provide for plants and wildlife, and for the many important ecosystems services they provide.

Environmental Stewardship – Initiatives that rely on responsible use, self-restraint and cooperation between stakeholders, as opposed to legislated measures. The voluntary programs establish incentives to stimulate the development and implementation of programs that use pollution prevention and innovative approaches to meet and exceed regulatory requirements. These programs seek to reduce the impact on the environment beyond measures required by any permit or rule, producing a better environment, conserving natural resources and resulting in long-term economic benefits.

EPA Regional Offices – EPA has ten regional offices, each of which is responsible for several states and territories. A Regional Office is responsible for the execution of the Agency's programs in its states.

Epiphenomenal – 1) A secondary phenomenon that results from and accompanies another: "*Exploitation of one social class or ethnic group by another [is] an epiphenomenon of real differences in power between social groups*" (Harper's). 2) *Pathology*. An additional condition or symptom in the course of a disease, not necessarily connected with the disease.

Erosion – The process of soil and nutrient loss that leads to a decline in the ability of the land to support life. Can also be used metaphorically to refer to depletion (e.g., of natural capital).

Eskimos and Aleuts – Are Native Americans. Both peoples are racially similar to Siberian people, and their languages are from the same language family. In their migrations from across the bridge that connected Asia and North America, Eskimos settled in the Arctic region of the continent. The Aleuts inhabited the Aleutian Islands, a chain of rugged, volcanic islands west of the tip of the Alaskan Peninsula.

Ethnicity – The classification of a population that shares common characteristics, such as religion, traditions, culture, language, custom, social viewpoint, and tribal or national origin.

Etiology – The causes or origin of a disease or disorder; the study of the factors that cause disease and the method of their introduction to the host.

Eutrophication – A condition in an aquatic ecosystem where high nutrient concentrations stimulate blooms of algae (e.g., phytoplankton). These excess nutrients can lead to a condition in which prolonged blooms of algae deprive light and oxygen from other organisms while turning waterways green and foul smelling. Algal decomposition may lower dissolved oxygen concentrations. Although eutrophication is a natural process in the aging of lakes and some estuaries, it can be accelerated by both point and nonpoint sources of nutrients.

Evolutionary Process – The process of change in the traits of organisms or populations over time. Evolution, through the process of natural selection, can lead to the formation of new species.

Exposure – The amount of radiation or pollutant present in a given environment that represents a potential health threat to living organisms.

Exposure Route – The way a chemical or pollutant enters an organism after contact; i.e. by ingestion, inhalation, or dermal absorption.

Extension Service Master Gardeners – A program and training conducted by county extension offices. The training provides gardeners with the opportunity to improve their horticultural knowledge and skills and then share their experience with the public through organized volunteer activities. The program topics covered include: botany, plant problem diagnosis, soils, ornamentals, pest management, fruits, vegetables, and plant propagation.

Exurbs – The expression "Exurbs" was coined in the 1950s to describe the ring of prosperous rural communities beyond the suburbs that, due to availability via the new high-speed limited-access highways, were becoming dormitory communities for an urban area. Earlier exurbs had been reached through commuter rail and parkway systems, with classic examples towards the end of Philadelphia's Main Line and in Upper Westchester County, New York.

FANBY (Find a New Backyard) – The phenomenon of people seeking geographic areas that are associated with high quality of life (e.g., natural amenities, less pollution, less congestion and sprawl). As greater numbers of people relocate to these areas, they create stressors and strains on the very natural resources that were the primary attraction to begin with.

Farmers' Markets – Markets usually held outside where farmers can sell their produce to the public. Products at such markets are renowned for being locally grown, very fresh, and sold directly to the public, without going through a middleman. Farmers' markets often feature additive-free and organic produce.

Fertility Rate – The average number of liveborn children produced by women of childbearing age in a particular society.

Fixed Costs – In general, cost that does not change with changes in the quantity of output produced. Fixed cost is incurred whether or not any output is produced. The same fixed cost is incurred at any and all output levels.

Florida Panther – The Florida panther is a highly endangered subspecies of mountain lion. The Florida panther was once common in western Texas and throughout the southeastern states, but is now found only in Florida. Their habitat includes cypress swamps, pine, and hardwood hammock forests. Only 30 to 50 individuals survive today.

Food Chain – A succession of organisms in an ecological community that constitutes a continuation of food energy from one organism to another as each consumes a lower member and in turn is preyed upon by a higher member.

Foreign Born – Foreign by birth; not native to the country in which one resides.

Fossil Fuel – Fuel derived from ancient organic remains; e.g. peat, coal, crude oil, and natural gas.

Freshwater Scarcity – Occurs when the amount of water withdrawn from lakes, rivers or groundwater is so great that water supplies are no longer adequate to satisfy all human or ecosystem requirements, bringing about increased competition among potential demands. Scarcity is likely to occur sooner in regions where the per capita availability of water is low to start with, and with high population growth. It becomes more serious if demand per capita is growing owing to changes in consumption patterns.

Future Generations – Refers to the future people who will come after us who presently have no voice but who are directly affected by our actions and lack of action. The focus of a developing, world-wide effort to redress numerous oversights created by short-term thinking.

Future Vulnerability – Future susceptibility to degradation or damage from adverse factors or influences.

Gateway Communities – The towns and cities that border public lands.

Geopolitical Boundaries – Regional boundaries based on geology and/or politics (e.g., state, county, municipality).

Geriatrics – A branch of medicine devoted to the study, understanding and treatment of illnesses and diseases associated with aging.

Gerontologist – A specialist in the study of aging.

Gerontology – The multi-disciplinary study of aging that encompasses the biological, psychological, sociological, health, and economic aspects of aging.

Global Acres – Acres that have been adjusted according to global average biomass (i.e., total mass of living matter within a given unit of environmental area) productivity so that they can be compared meaningfully across regions.

GLOBE – A worldwide hands-on, primary and secondary school-based education and science program. GLOBE encourages students to measure aspects of their local environment and report their results over the Internet. Data from schools around the world are then available for students to use in a wide range of projects and activities. GLOBE is a cooperative effort of schools, led in the U.S. by a Federal interagency program supported by NASA, NSF and the U.S. State Department, in partnership with colleges and universities, state and local school systems, and non-government organizations. Internationally, GLOBE is a partnership between the U.S. and over 100 other countries.

Gradient – Ratio of change, such as the rate of change of temperature with height. Also the slope of a line on a graph. A steep gradient exists when the rate of change is rapid.

Great Lakes – The five connected lakes along the border of the U.S. and Canada. They are Lake Ontario, Lake Erie, Lake Superior, Lake Michigan, and Lake Huron.

Green Cemeteries – Help conserve land, water and other resources. Embalming, metal caskets and concrete burial vaults are prohibited. Instead, biodegradable caskets, usually made of wood or cardboard, or burial shrouds of natural fibers are used. Green cemetery graves are placed randomly throughout a woodland or meadow, and marked only in natural ways, with the planting of a tree or shrub, or the placement of a flat indigenous stone, which may or may not be engraved. Burial locations are mapped with a GIS (geographic information system), so future generations can locate an ancestor's final resting place.

Green Infrastructure – Urban, suburban and rural natural areas, such as greenways, parks, trails, waterways, wetlands, woodlands, and wildlife habitats. These areas support native species, maintain ecological processes, sustain air and water resources, and contribute to the health and quality of life of people and the sustainability of communities.

Green Technology – A technology that offers a more environmentally friendly solution compared to an existing technology.

Greenfield – Those sites, in both rural and urban areas, which have not experienced previous development. It also includes forestry and agricultural land and buildings, as well as previously developed sites that have now blended into the natural landscape over time.

Greenhouse Gas – A gas, such as carbon dioxide or methane, which contributes to potential climate change.

Greyfields – A term coined by Andreas Duany, are those developed lands that have become obsolescent. Obsolescence results when the uses for which they were originally developed have begun to depart, surrounding community development is incompatible, infrastructure standards have changed, or the market demand for land-use has changed, but the site cannot adjust.

Ground Water – The supply of fresh water found beneath the Earth's surface, usually in aquifers, which supply wells and springs. Because ground water is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants or leaking underground storage tanks.

Groundwater Recharge – The process whereby infiltrating rain, snowmelt or surface water enters and replenishes the ground water stores.

Growth Inhibition – A substance that inhibits the growth of an organism. The inhibitory effect can range from mild inhibition (growth retardation) to severe inhibition or death (toxic reaction). Two plant growth regulators that may act as inhibitors are ethylene and abscisic acid. The concentration of the inhibitor, the length of exposure to it, and the relative susceptibility of the organisms exposed to the inhibitor, are all important factors which determine the extent of the inhibitory effect.

Habitat – The environment in which an individual, population, community or species lives.

Habitat Fragmentation – The piecemeal disassembly of terrestrial habitats into discontinuous, oftentimes isolated, patches as a consequence of development. Its adverse effects are cumulative and not immediately noticeable. Habitat fragmentation stems from habitat loss.

Habitat Loss – The outright destruction of habitat, such as filling a wetland or channelizing a section of stream. Its impacts upon biological communities are immediate and catastrophic.

Health Hazard – A chemical, mixture of chemicals or a pathogen for which there is statistically significant

evidence, based on at least one study conducted in accordance with established scientific principles that acute or chronic effects may occur in exposed individuals.

Heartland – Twenty-nine states (including DC) that have in common relatively modest growth levels and populations that are largely white or white and African American. Heartland states comprise thirty nine percent of the U.S. population. They include all northeastern and Midwestern states that are not classed as "Melting Pots," and selected southern and western states that are lagging in population growth. It is eighty-one percent white and twelve percent black, where blacks are primarily located in the region's industrial cities. Only about fourteen percent of the nation's Asian and Hispanic 1990s gains came to the Heartland, but this small infusion of minorities helped to stem losses in several of its declining cities (Frey, 2000).

Herbicide – Chemicals used to kill undesirable vegetation.

Hispanics – Hispanics or Latinos are persons of Mexican, Puerto Rican, Cuban, Central and South American, and other or unknown Latin American or Spanish origins. Persons of Hispanic origin may be of any race.

Holistic – Of, concerned with, or dealing with wholes or integrated systems rather than with their parts. With respect to environmental issues, the term most typically describes an analytical and planning approach that examines and considers the inter-related linkages and interdependencies of a socioeconomic system with resource use, pollution, environmental impacts, and preservation of an entire ecosystem.

Homeostasis – (1) An important process or mechanisms of an organism (perhaps biotic community) for regulation (perhaps pre-disposed self-regulation) toward a constant or standard condition. All communities, except possibly the very simplest types, appear to contain regulatory mechanisms that enable them to adjust to the changing conditions of their physical environments. (2) The maintenance of a high degree of uniformity in functions of an organism or interactions of individuals in a population or community under changing environmental conditions. The constant function or status that results from the capabilities of organisms to make compensatory adjustments.

Hormonal Processes – Body processes influenced by hormones that happen slowly (such as growth of bone and other body tissues, milk production in women who are breastfeeding, and ovulation and the menstrual cycle in women).

Human Demand – Human use of natural resources for growing crops, grazing animals, harvesting timber, accommodating infrastructure, absorbing CO2 produced by burning fossil fuels, and marine fishing.

Human Ecology – An academic discipline that deals with the relationship between humans and their (natural) environment. Human ecology investigates how humans and human societies interact with nature and with their environment. Human ecology views human communities and human populations as part of the ecosystem of earth.

Human Health – A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. The health of a whole community or population is reflected in measurements of disease incidence and prevalence, age-specific death rates, and life expectancy.

Human Health Effect – A change in health condition (i.e., reproductive, developmental, behavioral, neurological, and immunologic) brought about by a cause or agent (e.g., environmental toxins).

Hydrology – The science of water relating to occurrence, properties, distribution, circulation and transport of water.

Hypertension – Also known as high blood pressure. A disease characterized by blood pressure above 160/95. Individuals with high blood pressure are at risk for kidney disease, heart disease and stroke. Hypertension can be treated with medication, exercise, and diet.

Impervious Surface – Impervious surfaces are mainly constructed surfaces—rooftops, sidewalks, roads, and parking lots—covered by impenetrable materials such as asphalt, concrete, brick, and stone. These materials seal surfaces, repel water and prevent precipitation and melt water from infiltrating soils. Soils compacted by urban development are also highly impervious.

Indian Health Service (IHS) – Provides comprehensive health services through IHS and tribally contracted hospitals, health centers, school health centers, and health stations. Health services provided include medical, dental, and environmental health programs. Special program concentrations are in disease prevention and health promotion, alcoholism, substance abuse, suicide, accidents,

maternal and child health, nutrition, and public health services.

Indigenous – Native to an area, occurring naturally.

Infectious Disease – Disease resulting from presence of disease-causing organisms or agents, such as bacteria, viruses and parasitic worms which is transmittable directly or indirectly by a person, animal, arthropod, or through the agency of an intermediate hose, vector, or the inanimate environment to another person.

Infill – A compact form of development that utilizes vacant urban land areas within the existing boundaries of a city, rather than development at the fringes that can consume farmlands, wetlands, and other resource lands.

Infrastructure – Those systems under public ownership, or operated or maintained for public benefit that are necessary to support development, maintenance, and redevelopment and to protect the public health, safety, and welfare. Infrastructure includes capital improvement projects such as transportation systems (including sidewalks, bike paths, and wheelchair access), water supplies, sewage collection and treatment, and other services that involve a capital expenditure.

Inner Suburbs – Older suburbs that ring Chicago, Cleveland, Philadelphia, Seattle, Miami, San Francisco and other big cities. Like the inner cities before them, the nation's inner suburbs are becoming rundown, unfashionable and obsolete. Shopping centers are boarded up. The aluminum-sided houses seem worn and cramped. Factories have closed, and businesses and people have moved farther out to burgeoning "edge cities" with their bigger houses, wider yards, fancier malls and glistening office parks.

Institutional Care – A set of health care, personal care and social services required by persons who have lost, or never acquired, some degree of functional capacity (e.g., the chronically ill, aged, disabled, or retarded) in long-term institutional care such as that provided in nursing homes, homes for the retarded and mental hospitals.

Interstate Migration – A move that has its origin in one state and its destination in another.

Intrastate Migration – A move that has its origin, destination and entire transportation within a single state.

Invasive Species – Native or non-native plants, animals, and other organisms (e.g., microbes) which threaten ecosystems, habitats or species through unrestrained population growth.

Land Grant – A gift of land made by the government for projects such as roads, railroads, or especially academic institutions. In the past (the 1700s), they were given for the purpose of establishing settlements, missions, and farms. During the 1800s, four out of five of the transcontinental railroads in the U.S. were built using land grants, as was the Canadian Pacific Railway. Regarding academia, the Morrill Acts of 1862 and 1890 have given nearly 100 U.S. colleges and universities acres of public land, which in turn were sold by the institutions and the proceeds placed into endowment funds to provide them financial support in creating and sustaining agricultural and mechanical academic programs.

Landpooling – Market-based techniques that acknowledge the development value of some farmlands and help the farmer participate in those gains. They are private enterprises that must function within a general structure of growth management institutions that protect the public interest. Experience is limited to several cases in Europe and Australia.

Landscape – The traits, patterns, and structure of a specific geographic area, including its biological composition, its physical environment, and its anthropogenic or social patterns. An area where interacting ecosystems are grouped and repeated in similar form.

Landscape Ecology – The study of the distribution patterns of communities and ecosystems, the ecological processes that affect those patterns, and changes in pattern and process over time.

Land-use – The way land is developed and used in terms of the kinds of anthropogenic activities that occur (e.g., agriculture, residential areas, industrial areas).

Larvae – Refers to the juvenile stage of most invertebrates, amphibians, and fish, which all hatch from eggs. It is unlike the adult in form and is usually incapable of sexual reproduction. It develops into the adult by undergoing metamorphosis. Examples are the tadpoles of frogs or caterpillars of butterflies.

Latitudinal Comparisons – Comparisons of populations between different geographic zones (e.g., temperate and tropical, Florida and the western U.S., or the U.S. and Sweden).

Lever Fixtures – A lever has the same function as a knob, except it is longer and thinner. To open a door, levers are pushed down. Besides the decorative uses of a lever, they are also used in applications where someone is handicapped, and cannot grasp a knob very well.

Leverage – Using given resources in such a way that the potential positive or negative outcome is magnified. A method of grant making practiced by some foundations and individual donors. Leverage occurs when a small amount of money is given with the express purpose of attracting funding from other sources or of providing the organization with the tools it needs to raise other kinds of funds; sometimes known as the "multiplier effect."

Life Coach – A counselor who applies mentoring, values assessment, behavior modification, behavior modeling, goal-setting, and other techniques in assisting clients in transitions in their personal life and in the process of self-actualization. Life coaching draws from a number of disciplines, including sociology, psychology, career counseling, and numerous other types of counseling. Coaches tend to specialize in one or more of several areas: career coaching, transition coaching, life or personal coaching, executive coaching, small business coaching, and organizational or corporate coaching. Some life coaches extend their services beyond the personal into interpersonal, familial, and organizational realms, advising clients on the best methods of maximizing effectiveness in these areas as well.

Life-Cycle Assessment (LCA) – A process to evaluate the environmental burdens associated with a product, process, or activity by identifying and quantifying energy and material used and wastes released to the environment; to assess the impact of those energy and material uses and releases to the environment; and to identify and evaluate opportunities to affect environmental improvements. LCA addresses environmental impacts under study in the areas of ecological health, human health, and resource depletion. It does not address economic considerations or social effects. Additionally, like all other scientific models, LCA is a simplification of the physical system and cannot claim to provide an absolute and complete representation of every environmental interaction.

Liquidation – The process of converting stock or other assets into cash.

Long-Term Care – Services that are provided in a setting other than an acute care unit of a Hospital. Long-term Care may include Skilled Nursing Care, Intermediate Care, Custodial Care, Nursing Facility Care, Alternate Facility Care, Home Care, Home Health Care, Adult Day Care, and Respite Care.

Loons – Loons are powerful, streamlined birds with red eyes, greenish-black head, long tapered beak and black and white checkerboard plumage. There are five species of loons that exist in the northern hemisphere: the common loon, Pacific loon, Arctic loon, yellow-billed loon, and the red-throated loon.

Marginally Productive Land – Land that is unproductive for human use (e.g., covered by ice, with unsuitable soil condition or lacks water).

Market Survey – The collection and analysis of data from potential sources to determine the capability of satisfying a requirement. The testing of the marketplace may range from written or telephone contact with knowledgeable experts regarding similar requirements, to the more formal Request for Information.

Marketer – A person whose job involves persuading consumers to buy what producers want to sell.

Master Plan, Comprehensive Plan, or Future Land Use Plan – These are three of many common terms used to describe a plan prepared by a planning commission to guide future land use and infrastructure decisions in the community according to the procedures and requirements of the applicable planning enabling act. A plan prepared under these acts has a long-term focus of at least twenty years; is required to be reviewed at least once every five years; and includes analysis, recommendations, and proposals for the community's population, economy, housing, transportation, community facilities, services, and future land use.

Media – One of the major categories of material found in the physical environment that surrounds or contacts organisms, e.g., surface water, ground water, soil, or air, and through which chemicals or pollutants can move and reach the organisms.

Median – The middle data value in a set of observations. To find the median, re-order the data from smallest to largest and find the middle observation; that is the median. If there is an even number of observations, then there will be two middle values; in that case, the average of those two middle values is the median.

Melting Pot – The nine states that comprise the Melting Pot (AK, CA, FL, HI, IL, NJ, NY, NM, and TX) contain 41% of the population. More importantly, 74% of the nation's Asian and Hispanic origin populations live in these states. These states grew 13% in the 1990's, with 76% of the growth coming from Asians and Hispanics. The suburbs in the melting pot states are almost as diverse as the urban cities in these areas. The suburbs and cities in the melting pot states will have more in common with other cities and suburbs in the melting pot than with cities and suburbs in other regions of the country due to their diversity. In addition to immigration, the out migration of middle class Anglos and African Americans from these states has affected their population mix. These populations are being replaced by middle class Asians and Hispanics whose families actually have stronger family structures and more "traditional values" than their predecessors in these communities (Frey, 2001).

Mental Model – An individual's existing understanding and interpretation about themselves, others, the environment, and the things with which they interact, which is formed and reformed on the basis of experiences, beliefs, values, socio-cultural histories, and prior perceptions. Our mental models affect how we interpret new concepts and events. Very often we are not consciously aware of our mental models or the effects they have on our behavior.

Meta-Analysis – Research on the research. More than a literature review, meta-analysis looks for different methodologies and measures from different people or institutions that have published research on a particular topic. After a multitude of studies on a particular subject have been reviewed, meta-analysis enables the researcher to combine the results of several studies (using quantifiable data) in order to arrive at a conclusion on the topic. A researcher systematically inventories current research on a given topic and integrates the theories to arrive at a conclusion that is the sum of all the research he/she analyzed.

Methylmercury – An organic form of mercury that is highly toxic and is the main culprit in mercury poisoning. Methylmercury is easily absorbed into the living tissue of aquatic organisms, is not easily eliminated, and therefore accumulates in fish that are predators. The degree to which mercury is transformed into methylmercury and transferred up the food chain through bioaccumulation depends on factors such as water chemistry and the complexity of the food web. Methylmercury is highly toxic to mammals, including people, and causes a number of adverse effects. The brain is the most sensitive organ. The population at highest risk is the children of women who consume large amounts of fish and seafood during pregnancy. The risk to that population is likely to be sufficient to result in an increase in the number of children who have to struggle to keep up in school and who might require remedial classes or special education because of brain damage.

Metric – Often used interchangeably with measurements. However, it is helpful to separate these definitions. Metrics are the various parameters or ways of looking at a process that is to be measured. Metrics define what is to be measured.

Metropolitan Hierarchy – A growing recognition of a hierarchy of smaller cities and towns within some large metropolitan areas. The hierarchy moves from large cities to smaller cities, and from large suburban areas to smaller suburban areas.

Metropolitan Statistical Area (MSA) – A county or group of contiguous counties that contains at least one urbanized center of 50,000 or more population. In addition to the county or counties that contain all or part of the urbanized area, the MSA may contain other counties that are metropolitan in character and that are economically and socially integrated with the main city. In New England, cities and towns, rather than counties, are used to define MSAs. Counties that are not within an MSA are considered to be nonmetropolitan (OMB).

Microcosm – A miniature model of something.

Microgram – One-millionth of a gram. One gram is about one twenty-eighth of an ounce.

Micropolitan Statistical Area – A non-metropolitan county or group of contiguous nonmetropolitan counties that contains an urban cluster of 10,000 to 49,000 persons. A Micropolitan statistical area may include surrounding counties if there are strong economic ties between the counties, based on commuting patterns. In New England, cities and towns, rather than counties, are used to define Micropolitan statistical areas. Nonmetropolitan counties that are not classified as part of a Micropolitan statistical area are considered nonmicropolitan (OMB).

Mixed Use Development – A tract of land with two or more different uses (e.g., residential, office, manufacturing, retail, public, or entertainment). It may also include different housing types and price ranges.

Model – A representation of reality used to simulate a process, understand a situation, predict an outcome, or analyze a problem.

Montane – 1) Of, growing in, or inhabiting mountain areas. 2) The biogeographic zone of relatively moist cool upland slopes below timberline. It is characterized by large evergreen trees as a dominant life form.

Morbidity – The rate of disease or proportion of diseased people in a population. In common clinical usage, any disease state, including diagnosis and complications is referred to as morbidity.

Mortality – A measure of the incidence of deaths in a given population.

Multi-racial – The terms multiracial, biracial and mixed-race describe people whose ancestors are not of a single race. (Biracial strictly refers to those with ancestors from exactly two races). One example might be a person with an Asian mother and African father. Another might be the Mestizo people of Mexico (and other Latin American countries) who are descended from Spanish and indigenous ancestors. It is sometimes a matter of opinion if people are mixed-race, because races themselves are not clearly defined. This has caused some problems for census-takers.

Municipality – A city, borough, town, township, county, institution district, or village that enjoys self-government in local matters.

n4a (National Association of Area Aging Agencies) – The umbrella organization for the 655 area agencies on aging (AAAs) and more than 230 Title VI Native American aging programs in the U.S. Through its presence in Washington, D.C., n4a advocates on behalf of the local aging agencies to ensure that needed resources and support services are available to older Americans. The fundamental mission of the AAAs and Title VI programs is to provide services which make it possible for older individuals to remain in their home, thereby preserving their independence and dignity. These agencies coordinate and support a wide range of home- and community-based services, including information and referral, home-delivered and congregate meals, transportation, employment services, senior centers, adult day care and a long-term care ombudsman program.

Native Peoples – Also known as indigenous communities, peoples and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing in those territories, or parts of them.

Native Wildlife – A broad term that includes nondomesticated vertebrates, especially mammals, birds, and fish that are native to a particular geographic area.

Natural Amenity – An attribute of the physical environment (as opposed to the social or economic environment) that enhances a location as a place of residence.

Natural Capital – Nature's goods and services (e.g., healthy food, energy for mobility and heat, fiber for paper, clothing and shelter, fresh air, and clean water).

Natural Disturbance – A disturbance (e.g. fire, insect outbreak, flood) that is caused by nature rather than human actions.

Natural Lighting – A method of bringing natural sunlight into buildings.

Natural Scientists – Scientists who study the physical, nonhuman aspects of the Earth and the universe around us. Natural sciences include Astronomy, Biology, Chemistry, Earth Science, Ecology, Geology and Physics.

Neurotoxicity – The quality of being destructive of or poisonous to the tissues of the nervous system.

New Sunbelt – An area of 13 states that contains only about 20% of the population. It includes the states growing the fastest by domestic migration. These areas are particularly growing in young adults and retiree populations. Also in this region, the fastest growing areas are suburbs, exurbs and smaller metro areas. States in the New Sunbelt include AZ, CO, DE, GA, ID, NC, NV, OR, SC, TN, UT, VA, WA (Frey, 2001).

New West – the mountainous areas of the West (Utah, Nevada, Colorado).

Nexus – Link: the means of connection between things linked in series.

NOAA – National Oceanographic and Atmospheric Administration.

Noncommodity Values – Benefits that cannot be packaged and sold, such as wilderness, aesthetics, appreciating and protecting nature, providing wildlife habitat, and providing opportunities for personal recreation (as opposed to commodities such as timber and minerals).

Nondurable good – A good bought by consumers that tends to last for less than a year. Common

examples are food and clothing. The notable thing about nondurable goods is that consumers tend to continue buying them regardless of the ups and downs of the business cycle.

Non-Government Organization (NGO) – A non-profit group or association organized outside of institutionalized political structures to realize particular social objectives (such as environmental protection) or serve particular constituencies (such as indigenous peoples). NGO activities range from research, information distribution, training, local organization, and community service to legal advocacy, lobbying for legislative change, and civil disobedience. NGO's range in size from small groups within a particular community to huge membership groups with a national or international scope.

Nonmetropolitan Areas – Areas that are outside the boundaries of metro areas and have no cities with as many as 50,000 residents.

Northern Pike – An elongated fish capable of growing more than three feet long and weighing greater than twenty pounds. The range of the northern pike is extensive, having a range greater than any other freshwater gamefish. Pike can be found throughout the northern half of North America. Pike prefer clear, shallow, vegetated areas of lakes and larger rivers. Pike are rarely found in areas lacking stumps, aquatic vegetation, or other cover.

Nutrients – Essential inorganic chemicals (e.g., nitrogen and phosphorus) needed by plants for growth. Excessive amounts of nutrients (eutrophication) can lead to degradation of water quality by promoting excessive growth, accumulation, and subsequent decay of plants, especially algae (phytoplankton).

NYSOFA (New York State Office for the Aging) – The designated State Unit on Aging under the Older Americans Act of 1965. NYSOFA helps older New Yorkers to be as independent as possible for as long as possible through advocacy, development and delivery of cost-effective policies, programs and services which support and empower the elderly and their families, in partnership with the network of public and private organizations which serve them.

Old-Old – A sub-group of the elderly population that researchers often use to refer to persons 85 years old and older.

Open Space – Any open land that is predominantly lacking in built structural development. Open space includes natural areas, wetlands and open water, wildlife habitats, areas of managed production of resources such as farmlands and grazing areas, open areas requiring special management or regulation to protect public health and safety, and outdoor recreational areas. The term "open space" does not imply public access or ownership.

Oratory – Addressing an audience formally (usually a long and rhetorical address and often pompous); "he loved the sound of his own oratory."

ORD – EPA's Office of Research and Development.

Ordinance – A written regulation or law enacted by the legislative body of a county, city or town regulating such matters as zoning, building, safety, matters of municipality, etc.

Out-migration – To move out of one community, region, or country in order to reside in another.

Outside the Box – To think differently. Thinking outside the box requires different attributes that include: Willingness to take new perspectives to day-to-day work; openness to do different things and to do things differently; focusing on the value of finding new ideas and acting on them; striving to create value in new ways; listening to others; and supporting and respecting others when they come up with new ideas. Out-of-the box thinking requires openness to new ways of seeing the world and a willingness to explore. Out-of-the box thinkers know that new ideas need nurturing and support. They also know that having an idea is good but acting on it is more important. Results are what count.

Overlay – In traditional cartography, a drawing or graphic compilation of geographically related data symbolized on transparent or translucent material, usually in register with a base map. One or more overlays of information in register combine to form a map manuscript. In automated cartography, overlays will normally be digital map files which can be registered and combined to form a complete map.

Overshoot – The extent to which a population exceeds the carrying capacity of its environment.

Ozone – Found in two layers of the atmosphere, the stratosphere and the troposphere. In the stratosphere (the atmospheric layer 7 to 10 miles or more above the earth's surface) ozone is a natural form of oxygen that provides a protective layer shielding the earth from ultraviolet radiation. In the troposphere (the layer extending up 7 to 10 miles from the earth's surface), ozone is a chemical oxidant and major component

of photochemical smog. It can seriously impair the respiratory system and is one of the most widespread of all the criteria pollutants for which the Clean Air Act required EPA to set standards. Ozone in the troposphere is produced through complex chemical reactions of nitrogen oxides, which are among the primary pollutants emitted by combustion sources; hydrocarbons, released into the atmosphere through the combustion, handling and processing of petroleum products; and sunlight.

Paratransit – A demand-responsive system that applies to a variety of smaller, flexibly scheduled and routed transportation services using low-capacity vehicles. Primarily used by persons for whom use of standard mass transit services is difficult or impossible (e.g., individuals with disabilities and senior citizens).

Particulate Matter – Any material that exists as solid or liquid in the atmosphere that is less than 10 microns. Particulate matter may be in the form of fly ash, soot, dust, fog, fumes etc. Sources of particulate matter include diesel trucks and power plants.

Partners – Organizations or individuals who work cooperatively to achieve mutually agreed upon objectives and intermediate results and to secure stakeholder participation. Partners include non-governmental organizations, universities, federal, state and local government agencies, professional and business associations, and private businesses.

Partners for Livable Communities (PLC) – A non-profit leadership organization working to improve the livability of communities by promoting quality of life, economic development, and social equity. Since its founding in 1977, PLC has helped communities set a common vision for the future, discover and use new resources for community and economic development and build public/private coalitions to further their goals. PLC promotes livable communities through technical assistance, leadership training, workshops, charettes, research and publications. More than 1,200 individuals and groups from local, state, national, international, public and private and media organizations make up PLCs' resource network and share innovative ideas on livability and community improvement.

Per Capita – A Latin phrase literally meaning "by heads," and translated as "for each person." It is a common unit for expressing data in statistics. A country's per capita personal income, for example, is the average personal income per person.

Permaculture – A sustainable farming method that strives to create a naturally balanced ecosystem that feeds the farmer's needs while being self-sustaining. The method takes edible landscaping a few steps further: not only does it feed the farmer; its goal is also to provide fuel, materials for shelter and home, and habitat for livestock. Native plant species are used whenever possible and when they are not, species are chosen for their compatibility with the local environment.

Permitted uses – Exceptions built into a zoning category that permit certain uses within the category, without any further required proceedings. For example, a single-family residential district (an R-1 zone) may permit, by exception, the development of a day care center, a park, or a school.

Pesticides – A general term used to describe chemical substances that are used to destroy or control insect or plant pests.

Pharmaceuticals – Substances that are aimed to cure, prevent, or recognize diseases and relieve pains through their application in the organism.

Pharmacokinetics – Refers to the study of the metabolism and action of drugs, with particular emphasis on the time required for absorption, duration of action, distribution in the body, and excretion.

Planner – Anyone who plans, e.g., a city planner, economic planner, public health planner, social planner, or landscape planner. One whose profession consists of identifying community needs, resources and the means to reduce the difference between a desired or imagined condition and the present status. One who assist citizens in making decisions on programs, and methods to create a physical, economic, and social environment in which the human conditions, activities, and benefits desired by the members of the community may flourish.

Plenary – Plenary carries with it the meaning of full, complete, or entire. In terms of a meeting or workshop, it means an open session, where all attendees are present.

Politician – A person engaged in politics, especially party politics, professionally or otherwise. Often, a person holding or seeking political office.

Pollutant Transport – The movement of pollutants, by the wind or water, long distances from the original emission sources. Pollutant transport is an important issue because it creates regional pollution problems, rather than simply affecting the local area where the pollutant is emitted.

Polycyclic Aromatic Hydrocarbons (PAHs) – Any of a class of carcinogenic organic molecules that consist of three or more rings containing carbon and hydrogen and that are commonly produced by fossil fuel combustion. Examples of polycyclic aromatic hydrocarbons are naphthalene, anthracene, phenanthrene, pyrene, benzopyrene, and coronene.

Population – 1. All of the people inhabiting a specified area. 2. The total number of inhabitants constituting a particular race, class, or group in a specified area. 3. *Ecology*. All the organisms that constitute a specific group or occur in a specified habitat. 4. *Statistics*. The set of individuals, items, or data from which a statistical sample is taken. Also called *universe*.

Population Density – Is usually expressed in terms of items or organisms per unit area. For human beings, population density is the number of persons per unit of area (which may include or exclude inland water), though it may also be expressed in relation to habitable, inhabited, productive (or potentially productive) or cultivated area. It is frequently measured in persons per square mile or persons per square kilometer or hectare, which can be obtained simply by dividing the number of persons by the land area measured in square miles or in square kilometers or hectares. Commonly this may be calculated for a county, city, country or the entire world. In the country articles the density is based on land area.

Primitivism – A wild or unrefined state.

Private Sector – A short-cut term that combines the households and businesses in the economy into a single group. This term should be contrasted directly with public sector, which is a comparable short-cut term for government. The distinction between private sector and public sector reflects the two basic methods of answering the three questions of allocation--markets and government. Markets make use of private ownership and control of resources (hence the term "private" sector) for voluntary allocation decisions.

Projections – Different ways of projecting the surface of the globe onto a flat screen or sheet of paper. The choice of a projection can influence how the world is perceived. Different projections possess different qualities, including accuracy in terms of Area, Direction or Distance.

Public Health – The science and practice of protecting and improving the health of a community, as by preventive medicine, health education, control of communicable diseases, application of sanitary measures, and monitoring of environmental hazards. The three core public health functions are: the assessment and monitoring of the health of communities and populations at risk to identify health problems and priorities; the formulation of public policies designed to solve identified local and national health problems and priorities; and to assure that all populations have access to appropriate and cost-effective care, including health promotion and disease prevention services, and evaluation of the effectiveness of that care.

Public Lands – Land owned by the federal government but not reserved for any special purpose, e.g., for a park or a military reservation. Public land is also called land in the public domain. Except in Texas, which made retention of its public lands one of the conditions for joining the Union, there are no state public lands. Seven of the original states ceded their western lands to the federal government when they entered the Union. Additional public land was acquired with the Louisiana Purchase (1803), Florida (1819), Oregon (1846), the Mexican Cession (1848), the Gadsden Purchase (1853), and Alaska (1867). Almost as soon as public land was acquired the federal government began to dispose of it through grants to states, railroad companies, settlers (see Homestead Act, 1862), colleges (see land-grant colleges and universities), and cash sales. It was charged that large companies frequently acquired extensive holdings by dishonest means, and many of the new owners obtained considerable revenue by selling the land. A reaction to this easy policy set in toward the end of the 19th century and steps were taken to ensure the conservation of natural resources by withdrawing public lands from sale. Thereafter the government leased such land for grazing, lumbering, mining, the harnessing of waterpower, and other purposes, while maintaining regulatory control. By the 1970s there was considerable controversy over the need to make the best use of the public land's valuable resources while still preserving the land for future use and expanded recreational activities. Most of the nation's remaining public land is in the western part of the country, about half of it in Alaska.

Public Sector – That part of economic and administrative life that deals with the delivery of goods and services by and for the government, whether national, regional or local/municipal. Examples of public sector activity range from delivering social security, administering urban planning and organizing national defenses.

Public Transit – A public transportation system using buses, subways, light rail, commuter rail, monorail,

passenger ferry boats, trolleys, inclined railways, or people movers. An effective public transit system provides convenient, low-cost mobility for people who cannot, or choose not to, drive a motor vehicle.

Publicly-Owned Company – A company that is owned by shareholders and is publicly traded.

Pueblo [Spanish for "town," "village," "settlement," "people" or "nation"] – An Indian village in the American Southwest. A member of any of about two dozen Native American peoples. Probably derives from the practice of most ancient Southwestern cultures and many modern American Indian tribes to call themselves "the people" in their own language.

Pull Factors – Events or features that pull people towards another area (and so are perceived as good). Examples of pull factors influencing senior migration include: recreation amenities; climate and terrain preferences; availability of support services; opportunities for social or community participation; location of family; and ambience (including such other factors as more rural environment or smaller population size).

Push Factors – Events or features of the place in which people live that are pushing them away from that area (and so are perceived as bad). Examples of push factors influencing senior migration include: retirement; desire to get away from cold weather; personal health/ health care needs; life disruptions or critical events; financial considerations; housing needs; neighborhood conditions and socioeconomic status.

Qualitative Dimensions – Related to quality, a subjective analysis.

Quality of Life – A term used to describe the noneconomic amenities a community has to offer, including clean air and water, safe streets, good schools, and scenic views. Retired migrants appear to define quality of life as a mosaic of amenities which include the perception of increased personal space, toward geographic areas that are less congested, aesthetics of the natural environment, climate, and the potential for recreation nearby.

Quantitative Dimensions – Related to quantity, value, or amount.

Rainbow Trout – A species of freshwater fish belonging to the salmon family, typically 12-18 inches in length. This trout is an olive-green color with heavy black spotting over the length of the body. The adult fish has a red-colored stripe along the lateral line, from the gills to the tail. Rainbow trout in lakes are usually lighter colored or a more silvery color than those in streams.

RCRA (Resource Conservation and Recovery Act) – 42 U.S.C. s/s 6901 et seq. (1976), gave EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes.

Recreational Amenities – Features that increase attractiveness or value, especially of a piece of real estate or a geographic location (e.g., clubhouse, pools, covered picnic areas for family gatherings, lots of open space, golf, fitness centers, and jogging/hiking/walking/ biking trails).

Recycle/Reuse – Minimizing waste generation by recovering and reprocessing usable products that might otherwise become waste (i.e. recycling of aluminum cans, paper, and bottles, etc.).

Redevelopment – Renovation of a previously developed parcel of land or building site in order to allow a new or more-viable use or uses to replace the previous land-use. These sites typically are found in urban areas that previously had experienced economic and physical deterioration, but that now are the focus of renewal efforts.

Regenerative Capacity – A measure of the ability to re-establish on a new, usually improved, basis or make new or like new.

Renewable Resource – A natural resource that can be increased either automatically through the natural forces of the environment or through actions undertaken by people. The quantities of renewable resources are not fixed and thus the amounts available for use tomorrow can be increased. Efficient use of renewable resources requires a balance between the rate of use and the rate of renewal. It is possible to efficiently use renewable resources indefinitely. However, such resources can also be exhausted if the rate of use exceeds the rate of renewal. Common examples of renewable resources are plant life, animal life, clean air, and clean water.

Reservation – Public land set-aside in trust for the use of Native Americans.

Resident population – Includes persons whose usual place of residence (that is, the place where one usually lives and sleeps) is one of the 50 states or the District

of Columbia. It includes members of the Armed Forces stationed in the U.S. and their families. It excludes international military, naval and diplomatic personnel and their families located in this country and residing in embassies or similar quarters. Also excluded are international workers and international students living in this country and Americans living abroad. The resident population is the denominator for calculating birth and death rates and incidence of disease.

Resource Extraction – Refers to the practice of locating, acquiring and selling any resource, but typically a natural resource (e.g., mining ore, cutting trees for timber, and commercial fishing).

Restoration – The practice of returning an object or building to its appearance at a particular time period. Restoration may include the removal of additions and alterations made after the particular time period, and reconstruction of missing earlier features. Ecosystem restoration involves the repair of ecological damage to an ecosystem so that it is close to the natural condition prior to a disturbance and it can function as a normal self-regulating system. This is done through processes such as chemical cleanups, revegetation, and the reintroduction of native species.

Restorative Development – A fast-growing economic sector that restores value to a piece of property, a neighborhood or a community. Restorative development includes eight component industries: four that primarily restore the natural environment (ecosystems, watersheds, fisheries, and farms), plus four that mainly restore the built environment (brownfields, infrastructure, heritage, and disasters/ wars).

Retirement Enclaves – Communities designed for seniors who are active, healthy and able to live without assistance. They generally consist of homes, condominiums, town houses, apartments, and/or mobile and motor homes where residents maintain an independent lifestyle. Some communities offer only minimal services such as building and grounds maintenance, and security. The residential units may be rented on a monthly basis or owned as condominiums or cooperatives. Basically they are no different from other residential enclaves except that there is an age restriction (over 55) or an age target.

Retirement Years – The years after an individual stops working, generally starting between 55 and 70, and continuing until death.

Reuse – Practices that find alternate uses or alternate avenues for use of an item rather than expending energy to dispose it or alter its form by recycling or composting. Examples would be donating used books and magazines to a nursing home, using the fronts of Christmas cards to make new cards, using plastic margarine tubs to hold leftovers or craft supplies, donating clothing to charity.

ReVA – EPA's Regional Vulnerability Assessment Program.

Reverse Migration – Describes the phenomenon of older Americans leaving retirement communities to return back to their original home community.

Risk Assessment – The process of establishing information regarding acceptable levels of a risk and/or levels of risk for an individual, group, society, or the environment.

Risk Management – The process of evaluating and selecting alternative regulatory and non-regulatory responses to risk. The selection process necessarily requires the consideration of legal, economic, and behavioral factors.

Runoff – The flow of water, usually from precipitation, which is not absorbed into the ground. It flows across the land and eventually runs to stream channels, lakes, oceans, or depressions or lowpoints in the Earth's surface. The characteristics that affect the rate of runoff include rainfall duration and intensity as well as the ground's slope, soil type, and ground cover. Runoff can pick up pollutants from the air and land, carrying them into the streams, lakes, etc.

Scale – Extent covered by a study or data set; typically used to refer to time (temporal scale) or geography (spatial scale).

Scenario – A technical term usually used to describe an image of the future deliberately crafted for planning or foresight purposes. It should be rooted in identifiable trends or emerging issues data that are extrapolated and organized using an explicit theory of social change. It should describe how changes created the particular future present out of the past, and offer a vivid, provocative, accessible picture of how the future present differs from today. Scenarios are often evaluated in terms of plausibility and probability; they should contain both opportunities and threats – they are statements of possible future outcomes.

Sediment – Mud, sand, silt, clay, shell debris, and other particles that settle on the bottom of rivers, lakes, estuaries, and oceans.

Sedimentation – The removal, transport, and deposition of detached sediment particles by wind or water.

SEE Program – EPA's Senior Environmental Employment Program established under Public Law 98-313 to allow the EPA to award grants to, or enter into Cooperative Agreements with nonprofit organizations (grantees) (designated by the Secretary of Labor under Title V of the Older Americans Act of 1965) to provide technical assistance to federal, state, and/or local environmental agencies for projects of pollution, prevention, abatement, and control. The grantees then recruit program participants (enrollees) matching their skills to temporary assignments, which may be full time or part-time. An enrollee is an individual, at least 55 years of age, who is enrolled under such a grant or Cooperative Agreement, and who is engaged in providing technical assistance to EPA, and other federal, state or local agencies. The program is not intended to, and does not compete with the Civil Service hiring or compensation systems. Enrollees are used to support, not supplant, federal employees.

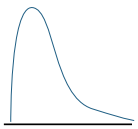
Sentinel Cohort – A group of individuals having a statistical factor (such as age) in common in a demographic or epidemiological study in which effects from environmental contaminant(s) may be interpreted as indicators of similar disturbances in other groups.

Sentinel Species – A species in which effects from environmental contaminant(s) may be interpreted as indicators of similar disturbances in other species (e.g., the "canary in the mine").

Septic System – An on-site system designed to treat and dispose of domestic sewage. A typical septic system consists of a tank that receives waste from a residence or business and a system of tile lines or a pit for disposal of the liquid effluent (sludge) that remains after decomposition of the solids by bacteria in the sewage effluent.

Skewed – A skewed distribution is not symmetric. That is, it has different shapes on each side of the median.

For example:



Smart Growth – A more sustainable and holistic model for urban growth that aims to limit low-density development on the urban fringe while creating more livable neighborhoods in urban and suburban areas. A key component of smart growth is focusing new medium and high density development in compact areas near frequent and reliable public transportation, so that people who live, work, shop, or visit the neighborhood will have viable options besides a private car.

Social Amenities – Features that contribute to the attractiveness of a piece of real estate or a geographic location such as parks, school health facilities, sanitary facilities, libraries, social welfare, public transportation and water.

Social Capital – Refers to the connection among individuals and the relationships that can be economically valuable. Social networks that include people who trust and assist each other can be a powerful asset. Social capital is a key component to building and maintaining democracy. The term "capital" is used by analogy with other forms of economic capital, as social capital is argued to have similar (although less measurable) benefits, and as a result is now considered by institutions such as the World Bank in deciding policy.

Social Marketers – Use the same marketing principles that were being used to sell products to consumers to "sell" ideas, attitudes and behaviors. Kotler and Andreasen define social marketing as "differing from other areas of marketing only with respect to the objectives of the marketer and his or her organization. Social marketing seeks to influence social behaviors not to benefit the marketer, but to benefit the target audience and the general society." This technique has been used extensively in international health programs, especially for contraceptives and oral rehydration therapy (ORT), and is being used with more frequency in the U.S. for such diverse topics as drug abuse, heart disease and organ donation.

Social Mindscapes – Mental models that are held by communities or cultures. The mental models are similar in concept to landscapes in that they contain an array of individual mental models (individual owner land-use) that collectively define the beliefs, norms, and mores of the community or culture. The term was coined by E. Zerubavel.

Social Sciences – The study of human society and individual relationships in and to society. Social sciences include sociology, psychology, anthropology, economics, and political science.

Social Scientist – Social scientists study all aspects of society—from past events and achievements to human behavior and relationships among groups. Their research provides insights that help us understand different ways in which individuals and groups make decisions, exercise power, and respond to change. Through their studies and analyses, social scientists suggest solutions to social, business, personal, governmental, and environmental problems. Social science occupations include anthropologists, archaeologists, geographers, historians, political scientists, sociologists, economists, market and survey researchers, psychologists, and urban and regional planners.

Socioeconomic Factors – Include ethnicity, sense of community, personal income, education level, and occupation.

Sociologist – A social scientist that studies the institutions and development of human society.

Solid Waste – Non-liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes also include sewage sludge, agricultural refuse, demolition wastes, and mining residues. Technically, solid waste also refers to liquids and gases in containers.

Source Waters – The source of drinking water in your community, whether it is from ground or surface water.

Sovereign Indian Nation – Indian tribes are distinct political entities—governments with executive, legislative, and judicial powers. Members of the tribes may be citizens of both their Indian nation and the U.S. Sovereignty is an internationally recognized power of a nation to govern itself. The framers of the U.S. Constitution specifically recognized the sovereignty of Indian tribes. In Article 1, section 8, clause 3 of the Constitution, Congress is identified as the governmental branch authorized to regulate commerce with "foreign nations, among the several states, and with the Indian tribes." The Supreme Court reaffirmed this legal and political standing of Indian nations in a set of three 19th Century court decisions known as the Marshall Trilogy. These cases serve as cornerstones to understanding Indian sovereignty in the U.S. political system as a clearly defined legal status that has constitutional standing.

Spatial Scale – Provides a "shorthand" form for discussing relative lengths, areas, distances and sizes. Examples of different scales are: local, regional, continental and global.

Sprawl – Unplanned development of open land.

Stakeholder – Any organization, governmental entity, or individual that has a stake in or may be impacted by a given approach to environmental regulation, pollution prevention, energy conservation, etc.

Statin Drug – A class of drugs that lowers the level of cholesterol in the blood by reducing the production of cholesterol by the liver. Statins block the enzyme in the liver that is responsible for making cholesterol. This enzyme is called hydroxy-methylglutaryl-coenzyme A reductase (HMG-CoA reductase for short). Scientifically, statins are called HMG-CoA reductase inhibitors. Cholesterol is critical to the normal function of every cell in the body. However, it also contributes to the development of atherosclerosis, a condition in which cholesterol-containing plaques form within the arteries. These plaques block the arteries and reduce the flow of blood to the tissues the arteries supply. When plaques rupture, a blood clot forms on the plaque, thereby further blocking the artery and reducing the flow of blood. When blood flow is reduced sufficiently in the arteries that supply blood to the heart, the result is angina (chest pain) or a heart attack. If the clot occurs on plaques in the brain, the result is a stroke. Clots occurring on plaques in the leg cause intermittent claudication (pain in the legs while walking). By reducing the production of cholesterol, statins are able to reduce the formation of new plaques and occasionally can reduce the size of plaques that already exist. In addition, through mechanisms that are not well understood, statins also stabilize plaques and make them less prone to rupturing and forming clots.

Stewardship – The concept of land as a resource, our responsibility to wisely manage that resource, and our responsibility to preserve and protect the condition of that resource for future generations.

Stormwater – Runoff from streets, parking lots, parks, as well as agricultural and urban areas into a water body.

Stream Re-Meandering – Returning channelized and straightened streams to their natural, meandering, sinuous forms. The U.S. Army Corps of Engineers uses the term remeandering extensively in Florida, where they have been returning the St. Johns and other rivers to their natural form. Stream power studies have identified equations that can be used to describe

what the sinuosity should be for various streams based on slope, geology and soils, watershed size and gradient, etc.

Stressor – Any physical, chemical, or biological entity that can induce an adverse response (or stress).

Subsistence Fishing – Fishing activity solely to provide fish for personal or family consumption and not for sale or exchange, but does not include recreational fishing.

Superfund – The better-known name for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) passed by Congress in 1980. Under this law, parties found responsible for polluting a site must clean up the contamination or reimburse the EPA for doing so. Liability is strict, retroactive, joint and several.

Surface Water – Water found over the land surface in rivers, streams, creeks, lakes, ponds, marshes, or oceans.

Susceptibility – The inability to withstand a specific environmental or chemical stress, disease, specified pest or pathogen.

Susceptible Population – Certain subgroups of the population may be more susceptible to the toxic effects of environmental contaminants or to particular infectious diseases. These may include children (<6 years old), pregnant women, the elderly, and people with pre-existing diseases.

Sustainable Development – Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable Environment for Quality of life (SEQL) – A 2-state (North Carolina-South Carolina), 15 county, 85 municipality area that is considering the impacts of air and water quality on the population and environment.

Symbiotic – A phenomenon where two different organisms live together in a mutually beneficial relationship. Both organisms provide each other with food, protection, or some other survival need. The most famous example is the anemone and clownfish. The anemone provides protection to the clownfish within its stinging tentacles, and the clownfish provides the anemone with scraps of food.

Temporal Scale – Duration or period of time. Ecosystem response to a stressor may occur very slowly, e.g., over decades or centuries, or organisms may suffer immediate effects. For example, the temporal scale for ecosystems may be: seconds (photosynthesis, prokaryotic reproduction); weeks (recolonization from upstream after a fire); years (revegetation after a fire); or decades (global climate change, revegetation after landslides or volcanization).

Terrestrial ecosystem – An integrated representation of the ecological relationship between climate, soil and vegetation (e.g., arid, grassland, and forest ecosystems.

Threshold – The dose or exposure level below which a significant adverse effect is not expected.

Tipping Points – Thresholds in stressor levels or ecological effects beyond which the ecological systems change state.

Topography – The configuration of a surface area including its relief, or relative elevations, and position of its natural and manmade features.

Total Population – The population of the U.S. including all members of the Armed Forces living in foreign countries, Puerto Rico, Guam, and the U.S. Virgin Islands. Other Americans living abroad (for example civilian Federal employees and dependents of members of the Armed Forces or other Federal employees) are not included.

Toxicity – The degree to which a substance or mixture of substances can harm humans or animals. Acute toxicity involves harmful effects in an organism through a single or short-term exposure. Chronic toxicity is the ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for the entire life of the exposed organism.

Transportation Corridor – A geographic area that is defined by major highway and rail facilities, and major flows of travel. Transportation corridors are identified for the purpose of analyzing the patterns and flows of traffic between origins and destinations.

Tribal Council – The elected body of officials charged with responsibility for managing the government and related affairs of the tribal nation. The tribal council is comprised of tribal members who are elected to their positions, and are responsible for drafting and maintaining the ordinances which govern the tribe and its business. The tribal council may be the entity to approve for ordinances that allow loan programs to be made available to tribal members.

Uncertainty – A lack of knowledge about certain factors in a study which can reduce the confidence in conclusions drawn from data in that study; it is opposed to variability which is a result of true variation in characteristics of the environment; and risk, which refers to a situation in which an individual knows the possible outcomes that will occur and the probability of each outcome occurring. Uncertainty refers to a situation in which the individual is ignorant of all the possible outcomes, the probability associated with known outcomes, or both.

Universal Access – Simplifies life for everyone by making products, communications and the built environment more usable by as many people as possible at little or no extra cost. Universal Design benefits people of all ages and abilities.

Uranium – A very heavy (dense) metal which can be used as an abundant source of concentrated energy. Uranium was apparently formed in super novae about 6.6 billion years ago. While it is not common in the solar system, today its radioactive decay provides the main source of heat inside the earth, causing convection and continental drift. Its melting point is 1132°C. The chemical symbol for uranium is U.

U.S. Bureau of the Census – Collects and publishes demographic data about the population of the U.S.

U.S. Department of Agriculture (USDA) – Administers programs that provide services to farmers (including research and soil conservation and efforts to stabilize the farming economy).

Variable – A characteristic that varies in value or magnitude along which an object, individual or group may be categorized, such as income or age.

Vehicle Miles Traveled (VMT) – A measure of the extent of motor vehicle operation; the total number of vehicle miles traveled within a specific geographic area over a given period of time.

VISTA (Volunteers in Service to America) – A program that places individuals with community-based agencies to help find long-term solutions to the problems caused by urban and rural poverty.

Visualization – The art or science of transforming information to a form "comprehensible" by the sense of sight. Visualization is broadly associated with graphical display in the form of pictures (printed or photo), workstation displays, or video.

Vulnerability – Susceptibility to degradation or damage from adverse factors or influences.

Vulnerability Analysis – Assessment of elements in the community that are susceptible to damage from various stressors.

Walkability – Areas that are walkable and are safe, comfortable, interesting and accessible. They offer amenities such as wide sidewalks, attractive storefronts that face the sidewalk, shade, shelter and a sense of spatial enclosure provided through landscaping and streetscape elements. These areas are inviting to pedestrians for shopping, recreation and relaxation.

Walkable – Refers to a single route, or a system of routes, between points that is relatively short, barrier-free, interesting, safe, well-lighted and comfortable, inviting pedestrian travel.

Wastewater – The used water and solids from a community (including used water from industrial processes) that flow to a treatment plant. Stormwater, surface water, and groundwater infiltration also may be included in the wastewater that enters a wastewater treatment plant. The term sewage usually refers to household wastes, but this word is being replaced by the term wastewater.

Wastewater Treatment – Any of the mechanical, chemical or biological processes used to modify the quality of wastewater in order to make it more compatible or acceptable to humans and the environment.

Water Feature – Either still or moving water (e.g., fountains, streams, waterspouts, waterfalls, formal or informal ponds, bogs, wetlands, or container water gardens).

Watershed – The area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake or groundwater.

Wellness Programs – Programs designed to educate individuals or groups about the connection between good health habits and quality of life. These programs focus on achieving health benefits through positive changes in physical, psychological or social areas of life.

Wetland – A type of ecosystem, generally occurring between upland and deepwater areas, that provides many important functions, including fish and wildlife habitat, flood protection, erosion control, water quality

maintenance, and recreational opportunities. A wetland is an area that is covered by water or has water-saturated soil during a portion of the growing season. In general, it is often considered the transitional area between permanently wet and dry environments.

Yellow perch – Generally a freshwater fish, but have adapted to the estuarine waters of Chesapeake Bay and have historically been reported in all of its major tributaries and streams. Their general coloring tends to be brassy green to golden yellow on their sides and white to yellow on their belly. Their most distinguishing feature is 6-8 dark vertical bands that are found across their back and sides. Their anal, pelvic, and pectoral fins are red to orange, with these colors being brightest in males during the spawning season. These fish are also characterized by having a dorsal fin that is completely divided into a spiny portion and a separate soft-rayed portion, and an anal fin with two long and slender spines. On the Atlantic coast, yellow perch range from South Carolina north to Nova Scotia. They can also be found west through the southern Hudson Bay region to Saskatchewan, and south to the northern half of the Mississippi drainage.

Young-Old – A sub-group of the elderly population that researchers often use to refer to persons between 65 and 74 years old.

Zoning – The ability of local governments to specify the use of private property in order to control development within designated areas of land. For example, some areas of a neighborhood may be designated only for residential use and others for commercial use such as stores, gas stations, etc.

Zoomburb – A city in the suburbs growing faster than a boomburb.

United States
Environmental Protection
Agency

Please make all necessary changes on the below label, detach or copy, and return to the address in the upper left-hand corner.

If you do not wish to receive these reports, CHECK HERE ☐; detach, or copy this cover, and return to the address in the upper left-hand corner.

PRESORTED STANDARD
POSTAGE & FEES PAID
EPA
PERMIT No. G-35

United States
Environmental Protection Agency
Office of Research
and Development
Fort Meade, MD 20755-5350

Official Business
Penalty for Private Use
$300

EPA/600/R-05/028
August 2004