

Demography: A Tool for Understanding the Wildland-Urban Interface Fire Problems¹

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Abstract: Fire managers across the nation are confronting the rapidly developing problem created by movement of people into wildland areas, increasing what has been termed the wildland-urban interface. The problem is very complex from the standpoint of fire planning and management. To plan and manage more effectively, fire managers should identify three types of interface areas, each with its own unique set of demographic factors, local land use, and fire protection problems. By examining and understanding how future trends will affect fire protection tactics and strategy in each of the interfaces, managers should be able to plan ahead--to be proactive rather than reactive in relations with the public and its leaders. To do this, however, fire managers should understand how population dynamics--demographics--influences the area that they manage.

The American people, it seems, are as mobile and restless as the desert sands. One has only to read an article on population dynamics (demographics) to appreciate how rapidly the nation's population changes. If we are to do a good job managing the forested land in what has been generally termed the "wildland-urban interface" we need to know something about these changes and how they may affect our future plans.

Almost all of us concerned with wildland management are becoming familiar with the wildland urban interface area concept. We may have seen the growing problem throughout the nation where there has been a dramatic increase during the past 10 to 15 years in the number of people moving into the wildlands (Davis 1986). While the trend toward rural living has reflected the public's appreciation of rural

land values, it has also greatly increased the number of primary residences, second homes, and retirement homes located in proximity to the nation's forests, woodlands, and watersheds (Davis and Marker ¹⁹⁸⁷; Hughes 1987a). In some areas of the nation, mobile homes seemingly spring up overnight. Vast areas of the United States now contain high-value properties intermingled with native vegetation.

Although the fire problem is often spectacular, these developing areas have other management problems that we are just beginning to appreciate. These include limited timber harvesting options, recreation pressure, and such serious threats as pollution and erosion (Rice 1987; Walt 1986). Changing patterns of population distribution have important implications for the way we manage our forests today and the way we must plan to manage them in the future. However, to understand the implications of these patterns, we first need to define the wildland-urban interface. The term can mean different things to different people.

TYPES OF INTERFACE

Almost every part of the nation has a wildland-urban interface fire problem. Interface areas can range from deserts where a flush of flammable growth follows a rain to undeveloped park land inside a major metropolitan area. Three types, each with its own demographic characteristic and land management problems have been defined (NW/UFPC 1987).

- 0 Mixed Interface or Intermix
- 0 Classic Interface
- 0 Occluded Interface

Not only are the variety and density of vegetation and size and spacing of homes and other structures variable and complex in these different interfaces, but the location and movement of people are different from one to the other, and their population trends change rapidly over time and frequently in different directions (Rogue 1985).

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The intermix

The intermix ranges from single homes or other buildings scattered throughout the wildland area to medium-sized subdivisions. Typical are summer homes, recreation homes, ranches, and farms in a wildland setting. Usually these are isolated structures surrounded by large areas of vegetation-covered land, but, this is not always true. Wintergreen, a development in the Blue Ridge Mountains of Virginia, contains 600 homes and 1,000 condominium units, yet the nearest large town or city is 40 miles away (Graff 1988). When a fire starts, the individual homes are very hard to protect because few fire agencies can provide a fire truck or two for each house that may be threatened in a major fire.

The classic interface

By far the greatest number of people live in (and are currently moving into) what can be called the classic interface. This is the area of "urban sprawl" where homes, especially new subdivisions, press against the wildland (Hughes 1987b). Fires starting in adjacent wildland areas can propagate a massive flame front during a wildfire, and numerous homes are put at risk by a single fire which sometimes overwhelms fire protection forces and water supplies. Typical examples include California's San Gabriel Mountains, Colorado's Eastern Front, and New Jersey's Pine Barrens.

The occluded interface

An occluded interface is characterized by isolated areas of wildland within an urban area. The same demographic trends that influence the classic interface affect this one. As cities grow together to make a super city, islands of undeveloped land are left behind (Engels 1985). Sometimes, these are specifically set aside as natural parks. Again, they may be steep, difficult places that are unsuitable as building sites. Frequently they present a fire threat to adjacent homeowners.

The type of intermix is not always clearcut. Small towns and villages may contain both classic and intermix areas depending upon how the "downtown" tends to mix with wildland vegetation at the city's fringes.

Variability in Fire Protection Responsibility

The fire problem is much complicated by a patchwork of legal and organizational requirements and constraints for fire protection

(Irwin 1987). For example, some States have specific legal requirements for the protection of structures in the wildland. Others have no legal responsibility and neither train their personnel nor purchase the specialized equipment needed for structure protection. Many agencies with thousands of acres of wildland within their jurisdictions may be unprepared to fight a wildland fire effectively.

Most Californians are aware of the southern California fire problem. Examples are the Bel Air Fire in 1961 in which 484 homes were destroyed; and the 1980 "Panorama Fire" in which 286 homes were burned and four people killed. However, the worst interface disaster confronted by modern fire protection agencies occurred during the Maine fires of 1947. In a series of late fall fires, 16 persons lost their lives and 2,500 were made homeless: nine communities were leveled or practically wiped out, and four other communities suffered extensive damage. One witness describes the roads as "crowded with people, livestock, cars, teams, and wheelbarrows fleeing before the fire." At one town--Bar Harbor--fleeing residents had to be rescued by Coast Guard, Navy, and private boats in a Dunkerque-like operation (Wilkins 1948).

The problem is truly national in scope--Florida's Palm Coast Fire in which 99 homes were lost (Abt and others 1987) and a 1987 fire near Spokane in which 24 homes were lost are recent examples. The worst year in this decade from a structure fire standpoint was 1985. By the end of the year, over 83,000 wildfires had burned almost 3 million acres, destroyed or damaged 1,400 structures and dwellings, caused the deaths of 44 civilians and firefighters, and cost the Federal, State, local fire agencies, and private industry over 400 million dollars in firefighting costs (NW/UPFC 1987).

With the more or less steady increase in population, we can only expect the loss to increase unless specific concrete steps are taken to change the situation. The nationwide concern for this problem cannot be over-emphasized. In addition to many States, the USDA Forest Service considers it a "major issue" and has joined in a partnership with U.S. Fire Administration and National Fire Protection Association in sponsoring the national "Wildfire Strikes Home" initiative.

DEMOGRAPHY

Demography is the discipline that seeks a statistical description of human population and its distribution with respect to (1) structure (the number of the population; its composition

by sex, age, and marital status; statistics of families, and so on) at a given date, and (2) events (births, deaths, marriages and termination of marriage) that take place within the population over a given period (Pressat 1972).

The demography of the wildland-urban interface

Who are the new interface residents? The people moving into the interface are a varied group. In one locality the newcomers were found to include five categories (Herbers 1986; Sweeney 1979):

- 0 Commuters, more and more of whom are willing to travel long distances from a mountain setting to jobs in urban areas.
- 0 The retired, who want to trade in urban problems such as crime and smog for a remote and more peaceful home in the mountains or foothills.
- 0 Younger dropouts from the urban rat race. Many of these with families want to raise their children in a simpler, less pressured lifestyle, away from the problems of city schools and rush-hour traffic jams.
- 0 Older, more successful corporate executives who wish to exchange long hours spent in often well-paying jobs for even longer hours spent launching their own small businesses.
- 0 The poor, who may find that it is the only place they can afford to live. Often a home (or mobile home) in the wildland is far less expensive than similar accommodations in more developed places.

Part of the reason for this growth is that the postwar "baby boom" generation has reached the age of achieving a relatively high level of education and affluence. Growing up during the "ecological revolution" of the 1960's and early 1970's, many in this group are attracted to the interface as a good place to own a home and raise a family (Herbers 1986). Forest Service planners seeking acceptance of their forest plan know that this group has characterized itself as being concerned with environmental issues.

Other major reasons include improved transportation and communication. Superhighways and interstate routes have enabled people to live in outlying areas and commute to a job in the city (Bradshaw 1987; Engels and Forstall 1985; Long and others 1983). Some people believe they can escape crime and pollution problems by moving to a more rural setting. However, as suburban areas age--particularly the

classic and occluded interfaces--they may take on the characteristics of the inner city, with its poverty and ethnic problems (Newitt 1983). It is very important for a wildland manager to identify the demographic mix of people and tailor management strategies accordingly. The manager must also be aware of projections and trends in order to deal effectively with these diverse publics.

Trends

For most of our history, this nation's cities have grown at the expense of rural areas. However, from the mid-1940's to the late 1970's there was a widespread reversal of this trend. Hastened by the baby boom, there was a population shift from urban to nonmetropolitan (suburban and rural) living. The result has been a major increase in the number of people who have moved into or adjacent to our nation's forests and woodland areas (Kloppenborg 1983; Scapiro 1980). In these areas, urban development interfaces (or intermixes) with wild or undeveloped land. Most people have moved into this area for the amenity values or for economic reasons unrelated to traditional rural land uses, such as forestry or farming.

California Example

As a close-at-home example of these trends, California has long appealed to American movers (Sanders 1987). By the late 1960's, however, the number of States from which California gained migrants had fallen, and it began to lose migrants to Oregon, Washington, and Nevada, as well as to Oklahoma and Virginia. Between 1975 and 1980, California had net losses in migration exchanges with all 10 of its western migration partners. But this net loss of 420,000 people to these 10 other States was offset by a net gain of 534,000 people from the rest of the country, chiefly from the Northeast and Midwest.

Not long ago Oregon residents sported bumper stickers asking Californians to visit but not to stay. Now such fears have been allayed because Oregon is once again exporting people to California. Between 1984 and 1985, California gained migrants from Oregon and Washington, reflecting the decline in the logging industry and rising unemployment in the Northwest.

So far in the 1980's, only 2 of California's 10 migration partners in the West continue to be net importers of Californians. Between 1984 and 1985, these 10 States sent a net of 19,000 people to California. This is a mere trickle, however, compared to the 420,000 migrants that California lost to these States between 1975 and 1980.

Demographic projections aside, local populations respond to the ebb and flow of local

economics. Falling lumber prices and farm losses can wipe out a decade of demographic momentum, while a new business can rekindle a stagnant population. Keeping up with these changes is vital to local planners, school administrators--as well as the forest or fire manager (Sternlieb and others 1982).

DEMOGRAPHY AS A PLANNING TOOL

How can demography help us predict these change so that we can plan ahead for them? While projections of the need for governmental services, including fire protection, road construction, and water development may be well developed in the classic and occluded interfaces because of the proximity of metropolitan areas; however, this is rarely true for the intermix. Fire managers should have this information so that they can plan and budget for their organizations. They should know how population projections and land development plans relate to critical fuels and steep terrain so they can work "before the fact" with community planners and land developers. They should know something about the ethnic and cultural background of anticipated new residents so they can better tailor prevention efforts.

Data useful for demographic analysis exists only rarely in official statistics in the specific form that it is needed. The peculiar character of the specific problems raised frequently requires the collection of appropriate information through special inquiries or surveys. This is particularly true of the small towns comprising the intermix.

Sources of Information

For the United States, there are two primary sources of demographic data. The first of these is the comprehensive reports of the census population, which tabulates data assembled each 10 years since 1790. The latest of these enumerations was made in 1980, and most of the published results have been made available (Kennedy and others 1987).

The population census provides a portrait at a given instant of a population that is constantly changing under the influence of the events--births, deaths, and migrations--that occur in it. Thus the census measures the size of the population by sex, age, marital status, education and so on at the date of the census. The various kinds of information that have been collected can be combined in many ways, and they can concern an entire country, or some given part of the country (region, State, county, or city). Little by little, the field of investigation has been extended to include groupings much smaller and more specific than the usual national or regional aggregates. These broader studies cover not only small

administrative or other units (cities, villages, natural regions), but also human categories that are not territorially well defined (for example wildland-urban residents). The Census Bureau is now gearing up for the 1990 survey--its largest ever.

The second fundamental source are the annual publications issued by the National Center for Health Statistics, which tabulates data on births and deaths. Departments of public health in most of the States also publish vital statistical data for their respective States, some of them slightly earlier and in somewhat greater detail than those given in the reports issued by the National Center for Health Statistics. For more general demographic material, the Statistical Abstract of the United States, issued annually by the Government Printing Office, is a convenient and reliable source of information.

How demographic information will be used

The most dramatic innovation of the 1990 census is the automated mapping system known as TIGER (Topologically Integrated Geographic Encoding and Referencing), which will enable the Census Bureau, working with the U.S. Geological Survey, to develop computerized maps covering the entire United States (Keane 1988). The TIGER process uses geographical information system (GIS) technology, that translates the intersection of boundaries of one type of information--census related information for example--with information from another geographic feature. It will be possible to overlay population density maps with vegetation type, slope class, and aspect to produce fire risk and hazard maps. The next step will be development of population projection models that will predict risk and hazard 5 or more years into the future. Next will be the use of one of several existing fire spread models to overlay the population projection, with areas that will have a statistical probability of burning in future fires. Thus, a fire manager will be able to display to local policy and planning officials detailed information on the areas likely to be threatened by future wildfires and the homes and population that will be at risk unless mitigation measures are taken.

Land managers will be able to use GIS developed maps, containing demographic information, to predict where a growing population will impact on their fire protection strategies and timber, recreation, and other land management plans.

Demographic training and skills

Demographers are trained to conduct surveys, estimate small-area populations, and prepare demographic reports. Most are employed

to make market surveys and projections for retail business--the location of a new shopping center for example (Stephen 1988). Demographers should have a strong background in statistics and computer modeling, and the ability to "crunch" large amounts of data. They should be well aware of the great wealth of existing information. Many are familiar with geographic information systems, a field that the Forest Service is rapidly applying. Computer skills should include both computer programming, including writing new programs for specific analysis, and expertise in using statistical packages such as SPSS and SAS.

By examining and understanding how future population trends will affect fire protection tactics and strategy in each of the interfaces, managers should be able to plan ahead-to be proactive rather than reactive in relations with the public and its leaders in managing the wildland-urban interface and its forestry and fire problems.

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