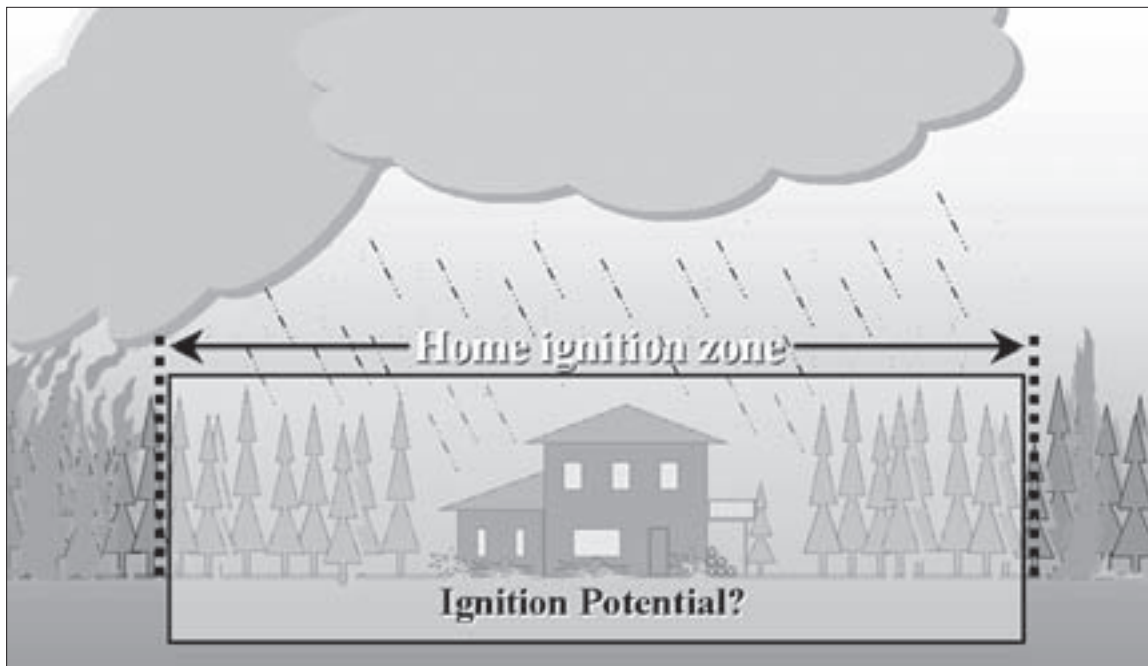


Saving Homes from Wildfires: Regulating the Home Ignition Zone

By Jack Cohen, Nan Johnson, and Lincoln Walther, AICP

Last year, almost \$1 billion was spent putting out wildfires in this country—wildfires which caused a loss of more than 800 homes and seven million acres. With severe droughts expected to continue in Florida and elsewhere, communities are facing growing wildland-urban interface problems, and frustrated officials feel that more effective land-use planning techniques can be applied to existing, new, and redeveloping areas alike.



U.S. Forest Service

A home with its immediate surroundings (about 100-150 feet from the structure) is called the Home Ignition Zone (HIZ). Many factors about the HIZ determine the potential for ignition during a wildland fire.

The wildland-urban interface (W-UI), also called the wildland-urban intermix and the I-zone, is the space where wildfires can potentially ignite homes. This issue of *Zoning News* will examine the reality of the wildland fire threat and determine how development codes can be used to save residential areas, which often suffer great losses.

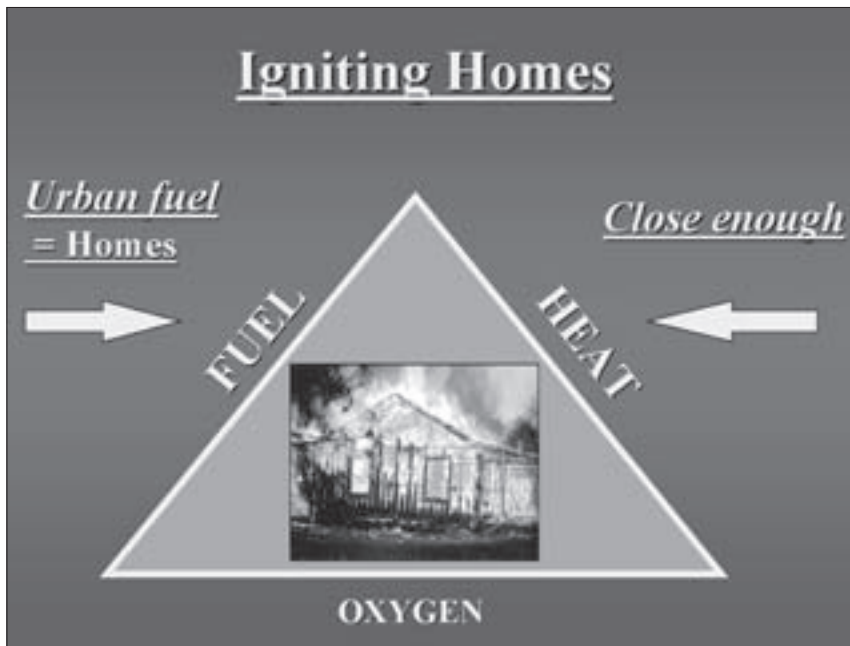
What is the Wildland Fire Threat to Homes?

The threat lies with the exposure of a residence to flames and firebrands (burning airborne materials) resulting in ignitions that produce widespread, extreme losses. If homes did not ignite

during wildfires, the W-UI problem would disappear. W-UI fires that result in significant residential losses have the following factors in common:

- Rapid fire spread within residential areas,
- Large numbers of simultaneously exposed structures,
- Overwhelmed fire-protection capabilities, and,
- Total loss of residence per structure ignited.

Although advances in firefighting technology and management have produced the most effective firefighting capabilities to date, recent W-UI fires still result in catastrophic



The Fire Triangle illustrates the ignition and combustion process. Fuels (homes) and heat (proximity of the home to flames and firebrands) are represented on two sides of the fire triangle.

losses. Severe W-UI fires can destroy whole neighborhoods in a few hours, engulfing buildings so fast that even the country's best firefighting services cannot respond quickly enough. Most structures sustain total damage in these cases; few suffer partial damage. It took just five hours for the 1993 Laguna Hills, California, fire to destroy 366 homes.

Planners must first understand the concept of structure survival and the process of home ignition before undertaking W-UI planning and mitigation. A wildland fire does not spread to a home unless it meets the fuel and heat requirements sufficient for ignition and continued combustion (see above). Recent research shows that homes do not have to ignite during wildland fires. Distance and sustained heat from, for example, trees engulfed in flames can determine whether a structure or its siding, roof, or eaves will ignite. This information helps to determine where the regulatory emphasis should be.

Ignition and the Home Ignition Zone

A home with its immediate surroundings (about 100-150 feet from the structure) is called the Home Ignition Zone

Jack Cohen is research physical scientist for the USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, Montana. His research focuses on how homes ignite during wildfires for the purpose of developing mitigation approaches.

Nan Johnson is a project review planner for the City of Boulder Planning Department. She has been working with planners and wildfire mitigation efforts over the last 10 years while working as a long-range planner for Boulder County, Colorado, and Flagstaff, Arizona. She coordinated the Wildfire Hazard Identification & Mitigation System for Boulder County.

Lincoln Walther, AICP, is a Senior Urban and Regional Planner with Continental Shelf Associates, Inc. He is the project manager on the Indian River County Comprehensive, Countywide Wildfire Mitigation Plan. Also, he serves as vice-president for Section Affairs in the Florida Chapter of the American Planning Association.

(HIZ) (see front page). Many factors about the HIZ determine the potential for ignition during a wildland fire, such as flammable wood roofs and materials like trees, grass, decks, or adjacent structures leading up to a home. Physical features, such as slope, influence fire intensity and behavior. Single- and multi-family homes, clustered developments, and subdivisions may have overlapping HIZs.

An Opportunity for Land-Use Regulations

California has lost many homes to wildfires, and now has the country's strictest land-use and building codes developed for fire protection. In states such as Colorado, and in northern Arizona, where environmental protection is a top quality-of-life concern, forest health projects are a high priority.

When planners understand the reality of a wildfire threat, regulation becomes a much needed goal, and saving lives, structure survival, forest health, ecosystem sustainability, and watershed protection are the most important variables to consider. This brings opportunities for creating a safer HIZ.

Land-Use and Building Codes for Wildfire Hazards

Planners must understand how land development codes differ from building codes in dealing with the wildfire problem. While each has strengths and limitations for addressing the wildfire threat to homes, too much emphasis has been placed on building codes.

Building and fire codes are important for structure survival during a wildfire because they facilitate proper construction and fire protection, but land-use and development codes deal with issues of bulk and density standards and design guidelines, which are not covered by the building code. They also provide requirements for site reviews and conditions of approval. They establish out-of-city service extensions and annexation conditions and set subdivision requirements for wildfire concerns. The codes also allow planners to balance concerns about fire protection and the building site, landscape, and structure.

Existing Development, New Development, and Redevelopment

Opportunities for wildfire mitigation through land use vary depending on the status of the development. Redeveloped areas can easily accommodate underground electric lines, different building and landscaping requirements, and improvement measures for streets and access conditions. New developments are best able to accommodate proper siting, infrastructure, building standards, and landscaping/fuel modification requirements for protection against fires. Easements and open space requirements also are easier to apply as a measure of protection in new developments. New development makes it easier to discuss urban design for wildfire concerns such as compact growth and growth boundaries.

Planners must be careful not to blindly adopt outside codes for local application. One size does not fit all! For example, tree protection ordinances from the Midwest may not be appropriate for forested areas of the West unless made compatible with forest health and structure survival goals. Other factors for which planners should be wary include: New urbanism design in forested mountainous areas, inappropriate vegetation in landscape plans, inappropriate architectural materials, clustering developments without first considering whether a structure will survive, and preserving historic structures without the ability to improve existing hazards.

Sprawling into the wildlands with more fire-prone development increases the W-UI threat. When annexing new land, approval criteria and conditions should require that new development address wildfire concerns. Vacant land offers the best opportunity to think about appropriate zoning, design, fuel management, and fire protection options.

Regulating the Home Ignition Zone and Beyond

The ultimate goal of saving homes from wildfires is to decrease homeowner dependency on traditional fire protection measures and implement better land-use planning. Some assumptions can be made:

Los Alamos, New Mexico, May 2000. Significant structure-to-structure fire spread occurred from flames and firebrands in an area of multi-family residences. The unconsumed vegetation surrounding the corridor of destruction indicates that the high fire intensities were due to the burning structures.

- Land-use regulatory tools are underutilized, have limitations, and should be accompanied by education, incentives, and homeowner responsibility;
- Regulatory tools are especially effective for W-UI fires when large numbers of structures are exposed and fire-protection service providers are overwhelmed;
- Regulatory tools vary between communities given state authority, nature of the losses, community values, and commitment;
- A home's ignition potential is determined by the HIZ;
- No single land-use tool will solve all W-UI problems, and each should be used to complement the others;
- More discussion and research is needed to evaluate the effectiveness of the planning tools used for wildfire mitigation.

The Tool Box

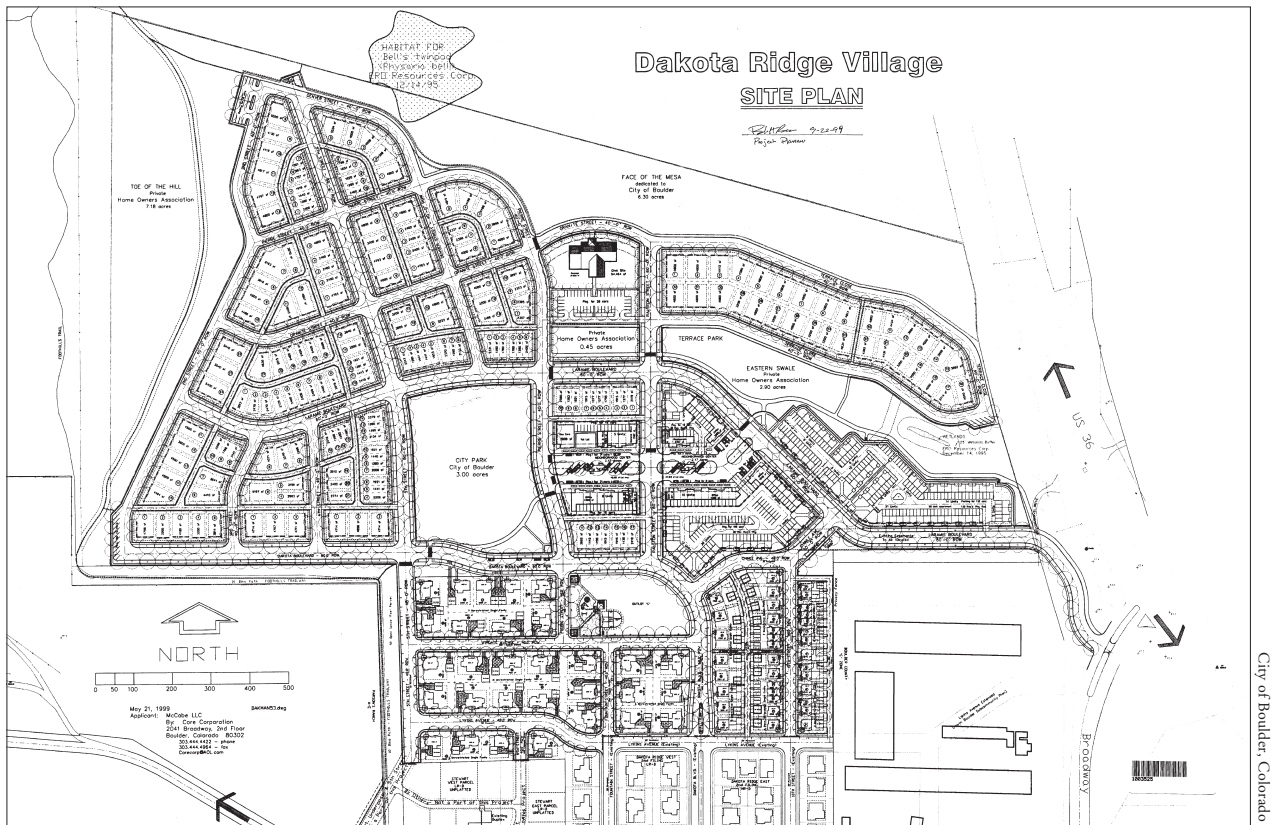
Overlay Zone District. A wildfire hazard overlay zone is a useful tool for planners in fire-prone areas because they allow for very specific needs, much like an Airport Influence Overlay Zone. The overlay can help to identify where home ignition potential is greatest and help to regulate the factors that influence fire behavior and make the likelihood of fire occurrence more probable.

Bulk and Lot Size. For more densely populated areas or small lot subdivisions, yard setbacks can keep homes a "safe" distance apart, as can increasing the minimum lot size. The survival potential of clustered or multi-family developments may be increased by combining better building standards and sufficient setbacks within the HIZ. In Los Alamos, New Mexico, fire flames and firebrands from burning homes actually ignited the fires on adjacent properties (see below). The wildfire contributed to the ignition source but did not engulf the residential area.

Setback distance and lot size should be based on the HIZ needs and adjusted for sloped areas. Steeper slopes will increase the HIZ area because flame lengths will be greater and provide a closer source of ignition. Open space will create an area where vegetation can be managed within the HIZ.

Nonconformity Standards. Nonconforming structures, lots, and uses may hinder wildfire mitigation efforts. If a nonconforming





Dakota Ridge Village site plan. A new urban design confronting wildfire concerns.

home is damaged by a fire, it may have to be rebuilt to its prior state, excepting of any newly adopted codes. There may be a problem, however, if the code permits building features not in line with fire-resistant goals and standards to be replaced with the same kinds of facade materials or in the same building style.

Development Reviews: Criteria, Conditions, Standards. Site plans and application requirements should be used to review the HIZ in more detail. A checklist of criteria for the development review process should say that the development is consistent with the wildfire hazard overlay zone and/or that it minimizes the wildfire threat. Architecture, landscaping, and infrastructure plans are often a requirement of such reviews and should address the HIZ. Conditions of approval can further control the development, focusing on the project site. Provisions for maintenance also can be useful.

Design Guidelines. Many communities struggle to get design guidelines adopted for residential development. If possible, use guidelines to address the ignition potential within the HIZ. Do not let the guidelines limit the flexibility needed to achieve a fire-safe design. Workshops such as FIREWISE, sponsored by the National Fire Protection Association (www.firewise.org), are held around the country to help planners generate better ideas for design guidelines. Planners should take caution, however, when imposing historic preservation guidelines; guidelines that are appropriate in town may not be appropriate for those in the W/UI.

Administrative Reviews and Variances. Modifications (however minor) to previous reviews and variance reviews provide opportunities to improve fire mitigation within the HIZ. Setback variances should address those aspects of a lot that do not conflict with the HIZ.

Subdivision Regulations. W/UI concerns should be dealt with very closely in subdivision regulations. Requirements can vary greatly, so use the goals of home survival in the HIZ as the basis for meeting them. Lot design and size, siting away from dangerous topographic features which place development at higher risk; open space and fuel management areas; building, landscape, and infrastructure design; and fire protection requirements are all valuable components to improving the survival potential of homes.

The plan shown above illustrates how street design improved the HIZ of the Dakota Ridge subdivision in Boulder, Colorado. In the original plans, one of the main roads placed the backyards adjacent to fire-prone open space. A revised plan now has the road on the outer perimeter of the development separating the homes' front yard from the open space. This increased the separation distance of fuels within the HIZ and improves the likelihood that the homes will survive a wildfire.

Reconstruction After the Fire

Communities that have experienced wildfire disasters find the task of reconstruction overwhelming. Building permits and development reviews are often pushed through quickly in order to rebuild and get people back in their homes and businesses. Unfortunately, this can lead to emergency ordinances that shorten or even eliminate the reconstruction's monitoring and review process; and thus, lost opportunities to improve. Planners should prepare for this by determining community needs for rebuilding before the disaster occurs. Consult the APA/FEMA publication *Planning for Post-Disaster Recovery and Reconstruction* for more information.

Case Studies for Design and Zoning

Colorado. Colorado's booming population growth has impacted the wildlands because of large homes and subdivisions. Several disastrous wildfires and recent pressure from the governor to address wildfires in the state's growth program have several cities and counties making changes to land-use plans and development codes, and even mapping hazards and risk areas. These communities have done significant community outreach to educate public officials and residents on the W-UI problems. Rural jurisdictions still attempt change largely through building code amendments.

Larimer County uses a wildfire hazard area map to implement wildfire hazard mitigation requirements for new construction. Application requirements in the county's land-use code include the submittal of a wildfire mitigation plan. The code also has review criteria, standards and guidelines, and fuel management requirements for development in fire-prone areas. Variances are prohibited in these areas, and a mitigation plan and conditions of approval must be included in the development agreement. Other sections of the code address fire service issues and road access standards.

Boulder County, which seeks to retain its rural character through large, 35-acre minimum lot zoning, combines building and land-use codes. New subdivisions in mountainous areas do not occur and individual lots are put through a review process before development. A wildfire mitigation plan—which analyzes the site location, building construction and design, fuels management/landscaping, access, and water availability—is required for at-risk areas and may result in approval conditions. Like California, the city of Boulder implemented a ban on wood shake roofs and has a strong fuels management program. Pitkin County enforces wildfire defensible space and construction standards through its 1041 Hazard Review process.

Florida. Extreme drought conditions in Florida have exacerbated the state's fire hazard problem. The initial response from many local governments has been to raise public awareness about wildfires. Local governments also have committed to improving firefighting capabilities, but changes to building and land-use codes have been slow. Some local governments have taken action, attending FIREWISE workshops conducted by the Florida Division of Forestry.

Indian River County is taking a sweeping approach with a comprehensive countywide wildfire mitigation plan. The plan assesses the wildfire hazard through the land development regulatory process. In a collaborative approach, fire experts, government officials, homeowners, and community stakeholder groups will meet to assess and establish levels of risk, determine residents' wildfire awareness, document fire suppression capabilities and deficiencies, study coordination issues, and evaluate how land-use codes deal with wildfire mitigation. The goal for the county and participating municipalities is to

identify a list of mitigation actions. A technical advisory subcommittee will consider a variety of land-use planning techniques, such as overlay and floating districts, buffering provisions (defensible space concept), landscaping treatment (fire-retardant vegetation), and development accessibility.

Wildfire concerns also have prompted Collier and Alachua counties to consider reviewing their comprehensive plans and land-use codes. Florida requires that all local land-use codes be consistent with comprehensive plans. The counties will consider transfer of development rights, clustering residential development in rural areas, wildfire overlay zones, fire-tolerant vegetation, and the requirement of a fire management plan. The city of Palm Coast is in the process of enacting an ordinance that requires vacant lot owners to cut underbrush. Other communities may amend their building codes to prohibit the use of vinyl products for soffits and siding, and require the use of fire-retardant roofing materials.

These cases represent just a handful of American jurisdictions confronting the growing wildfire threat and its potentially disastrous consequences. Planners can learn from the Los Alamos disaster and consider which regulatory tools are most effective for mitigating fires in their area, seeking out better land-use practices to prevent residential fire disasters during W-UI fires. Taking advantage of the tools given to us early enough in the planning process will be an ounce of prevention before development and fires occur.

NEWS BRIEFS

Illinois Landmark Bites the Dust

The demolition of a 19th-century home in Winnetka, Illinois, has brought the posh North Shore suburb of Chicago a spate of largely unwanted media attention regarding the issue of historic preservation. George Garrick, an Internet venture capitalist, acquired the 11-bedroom, pre-Civil War lakefront home and its 3.5-acre lot for \$12 million. He then applied for a demolition permit, which caught the attention of community preservationists and the Landmark Preservation Council of Illinois. Because the home was not a designated landmark and the city had no ordinance establishing authority to designate it as one, the house and preservation advocates were at Garrick's mercy. Despite efforts by the city, its advisory landmark commission, and community members, Garrick had the house demolished. Interestingly, Garrick has not yet applied for a building permit to replace the structure.

According to David Bahlmer, executive director of the Landmark Preservation Council of Illinois, Winnetka's lack of authority to prevent the teardown of historic buildings is not unusual. Some communities in the region are experiencing teardown rates as high as 40 percent of their historic housing stock. However, other communities are proactively addressing the problem of preserving historic buildings and community character in the face of escalating land values and consumers' preference for larger homes.

Bahlmer identified nearby Lake Forest, Illinois, as a model for an effective preservation strategy. Its ordinance, which combines both regulations and incentives, has not faced any legal or residential opposition since its adoption in 1998. Lake Forest planner Cathy Cerniak cites several reasons for the effectiveness of the ordinance. In surveys conducted every few years, almost 80 percent of residents rank historic preservation among the top three

REFERENCES

- Cohen, Jack D. 2000a. "Preventing Disaster: Home Ignitability in the Wildland-Urban Interface." *Journal of Forestry* 98 (3): 15-21.
- Cohen, Jack D. 2000b. "A Brief Summary of My Los Alamos Fire Destruction Examination." *Wildfire* 9 (4): 16-18.
- *Planning for Post-Disaster Recovery and Reconstruction* PAS Report #483/484, APA/FEMA, December 1998.
- www.firelab.org

priorities. The ordinance is administered by a volunteer preservation commission composed of community members with backgrounds in architecture, design, and landscape architecture. The commission collectively approaches and addresses the community “as friends and neighbors.” Finally, the planning commission meets with local Realtors on a quarterly basis to discuss the preservation ordinance and an associated tool—the real estate rider, which is voluntarily attached to real estate contracts. This approach to education and cooperation has raised the level of awareness within the community, and has essentially discouraged potential buyers and existing residents from applying for demolition permits.

Subscribers of the Planning Advisory Service may contact us for a copy of the Lake Forest Historic Preservation Ordinance and Real Estate Rider.

Nate Hutcheson

Barns Face Height Restrictions in Deschutes County, Oregon

By Peter Sleeth

When Oregon’s legendary Governor Tom McCall decried “sagebrush subdivisions” in 1973 and launched a fight to make Oregon a pioneer in land-use planning, he was talking about the unregulated subdivisions in Oregon’s high desert country that includes Deschutes County.

In subsequent years, Deschutes County got ahead of the planning curve. It is today the only county in Oregon to regulate outdoor lighting to preserve the star-studded night skies, while also being the only county to regulate viewsheds from roads and rivers. Much is there to protect—from the high desert of central Oregon, stunning views are available of mountain peaks named the Three Sisters, Broken Top, and Mount Washington.

Now Deschutes County is trying for another first—this one may be a first in the nation: County planners in April proposed an ordinance to limit the height of agricultural buildings in the county. The reason? They are blocking the views of pricey homes built on some of those very “sagebrush subdivisions” McCall decried nearly 30 years ago.

The proposed zoning regulation would limit the height of agricultural buildings to no more than 30 feet—the same restriction that is now in place on homes in the county. Although sent to the Deschutes County Board of Commissioners for approval, it drew so much concern on April 12 that it was bounced back to planners for more public input.

Calling the proposed ordinance unconstitutional, hobby farmer and developer Pat Gisler said he would fight it; Gisler’s own 46-foot high horse arena helped prompt the fight after it blocked mountain views of his neighbors outside Bend, Oregon.

Almost everywhere in the United States, farm use supercedes non-farm use in matters of zoning. In the Midwest, state legislation often explicitly exempts agriculture from zoning regulations. The result is that most places cannot even consider the kind of restrictions Deschutes County is proposing.

But the county’s unusual combination of stunning views of the Cascade Mountains, scenery, and relatively small agricultural activity has helped generate the demand for the zoning restrictions. Horse breeding is the leading agricultural activity in the county—it replaced breeding llamas.

George Read, director of the Deschutes County Community Development Department points out that the desert soils, with only 12 inches of rain annually, makes for poor farm country.

Deschutes County was 29th out of 36 Oregon counties in farm income in 1999.

Meanwhile, the 1990s brought rapid growth – increasing Deschutes County’s population by 54 percent from 74,958 people in 1990 to 115,367 in 2000. To make an even tighter squeeze, 80 percent of Deschutes County’s 3,055 square miles of desert and forest is owned by the government.

The results is no surprise—farms and the city are growing closer. Under Oregon’s strict land-use planning laws, a new farm in Deschutes County today would likely require 160 acres in order to build a house. Although smaller lots can be built upon, it can be difficult to obtain the approvals on land zoned for farming or forest uses.

Thus, lots subdivided years ago are typically the target of the ordinance. Planning commissioner Frank Deggendorfer, himself a part-time hay farmer, says the idea is to stop the building of massive horse arenas and barns on small parcels of 40 acres and less that block neighbors’ views. Typically, these structures are put up by hobby farmers. “The growth here has been phenomenal in the last eight years,” Deggendorfer says. “We are becoming, certainly, more urban.”

Sleeth is a reporter for The Oregonian in Portland, Oregon.

ZONING Reports

Floodplain Protection Zoning Overlay: Draft Report

Prepared by ACP–Visioning and Planning for City of Rocky Mount, North Carolina, Department of Planning and Development. Order from City of Rocky Mount, Department of Planning and Development, One Government Plaza, Second Floor, P.O. Box 1180, Rocky Mount, NC 27802. November 20, 2000. 60 pp. \$10.

In an effort to strengthen its floodplain development regulations in the wake of hurricanes Dennis and Floyd, which caused damage worth \$400 million, the city of Rocky Mount engaged ACP–Visioning and Planning to prepare this study. Its recommendations are clear and progressive, extending many standards to the 500-year floodplain and reconciling many regulations with current needs and zoning. The study is well organized and easy to follow while raising serious issues and suggesting equally serious solutions.

Zoning News is a monthly newsletter published by the American Planning Association. Subscriptions are available for \$55 (U.S.) and \$78 (foreign). W. Paul Farmer, Executive Director; William R. Klein, Director of Research.

Zoning News is produced at APA. Jim Schwab and Michael Davidson, Editors; Shannon Armstrong, Barry Bain, Jerome Cleland, Fay Dolnick, Nate Hutcheson, Sanjay Jeer, Megan Lewis, Angela Mesaros, Marya Morris, Reporters; Sherrie Matthews, Assistant Editor; Lisa Barton, Design and Production.

Copyright ©2001 by American Planning Association, 122 S. Michigan Ave., Suite 1600, Chicago, IL 60603. The American Planning Association also has offices at 1776 Massachusetts Ave., N.W., Washington, DC 20036; www.planning.org

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the American Planning Association.

Printed on recycled paper, including 50-70% recycled fiber and 10% postconsumer waste.

