

III Compatibility Issues

Overview

The ongoing ability of Fort Knox to perform its current and future missions have a primary dependence upon the consensus of the surrounding community to adapt to the external effects of these missions. This consensus can be acquired and maintained only through a continual effort. This effort must involve communication not only between Fort Knox and the region but also between the individual component governments, institutions, businesses, and other entities that comprise this region. The first step was to define what specific issues create problems either on or off post. This section will lay out additional examples, not previously referenced, that have either been documented as having occurred in the past, may be ongoing, or may arise in the future because of change in Fort Knox's missions or change in the surrounding communities.

Physical Encroachment

In discussing the number of residential structures in the buffer zones previously; the focus was on U.S. Census data. The rate of growth was indicated by building permit data from both the U.S. Census and local agencies responsible for permitting. To obtain another perspective, data was acquired from local E-911's. Table 16 shows the actual number of residential addresses within each buffer zone. The one-mile buffer total of over 8,000 excluding Bullitt County amplifies the role that physical encroachment may play on maintaining missions at Fort Knox.

Table 16 Residential Structures Per E911

RESIDENTIAL STRUCTURES PER E911		
	1 MILE BUFFER	2-5 MILE BUFFER
Bullitt County	nda	
Lebanon Junction		
Shepherdsville		
Hardin County	777	5,624
Elizabethtown		4,580
Radcliff*	5,439	4,669
Vine Grove		2,880
West Point	522	
Meade County	778	4,372
Brandenburg		
Muldraugh	616	
Nelson County		204
TOTAL	8,132	22,329

Source: Respective County E911 Agencies

Hardin County - 22 Sept. 2020, Meade - 13 Oct. 2020,

Nelson - 22 Sept. 2020.

In looking at the data further in Table, Hardin County has 103 residences within 100 ft of the post boundary, 95 of those in the City of Radcliff. Meade County has 46 residences within this perimeter, 35 of those in the City of Muldraugh. Going out to 500 ft these numbers increase to 518 for Hardin and 492 for Meade, the vast majority in Muldraugh. At 1,000 ft, it yields 1,122 and 771 respectively, again with the majority being within Muldraugh. An issue of concern would be the increase in these numbers. In reviewing the permit data presented earlier, it can be found that 48 of the residential permits issued in Hardin County since 2009 were within 1,000 ft of the reservation boundary, 33 of these in Radcliff. Looking at Radcliff further, 19 were

within 500 ft with 5 being within 100 ft. In Meade County, 27 permits were issued within 1,000 ft, 11 of those under 500 ft. Of those only 4 were within Muldraugh. In Bullitt County no permits were issued

Table 17 Residential Structures Within Distance of Boundary

RESIDENTIAL STRUCTURES WITHIN DISTANCE OF BOUNDARY						
Existing from E911	100 ft		500 ft		1,000 ft	
	Existing	Permitted	Existing	Permitted	Existing	Permitted
Bullitt County	nda	0	nda	2	nda	9
Lebanon Junction						0
Shepherdsville						
Hardin County	8	2	127	5	217	15
Elizabethtown						
Radcliff*	95	5	338	19	805	33
Vine Grove						
West Point	0	nda	0	nda	102	nda
Meade County	11	0	77	9	141	23
Brandenburg						
Muldraugh	35	0	415	2	630	4
Nelson County						
TOTAL	149	7	957	37	1,895	84

Source: Existing, Respective County E911 Agencies, Hardin County - 22 Sept. 2020, Meade - 13 Oct. 2020, Nelson - 22 Sept. 2020.

Permitted - *Radcliff- Official data only available for 2017 - 2019. Years 2009-2011, 2016 from newspaper accounts. Unable to locate in which buffer.

nda = no data available.

NOTE: these are inclusive, thus the 100 ft are also in the 500 & 1000 zones.

within 100 ft. Of the 2 within 500 ft, one was the replacement of an existing mobile home with a newer one. Only 7 more were permitted out to 1,000 ft.

Vertical Obstructions

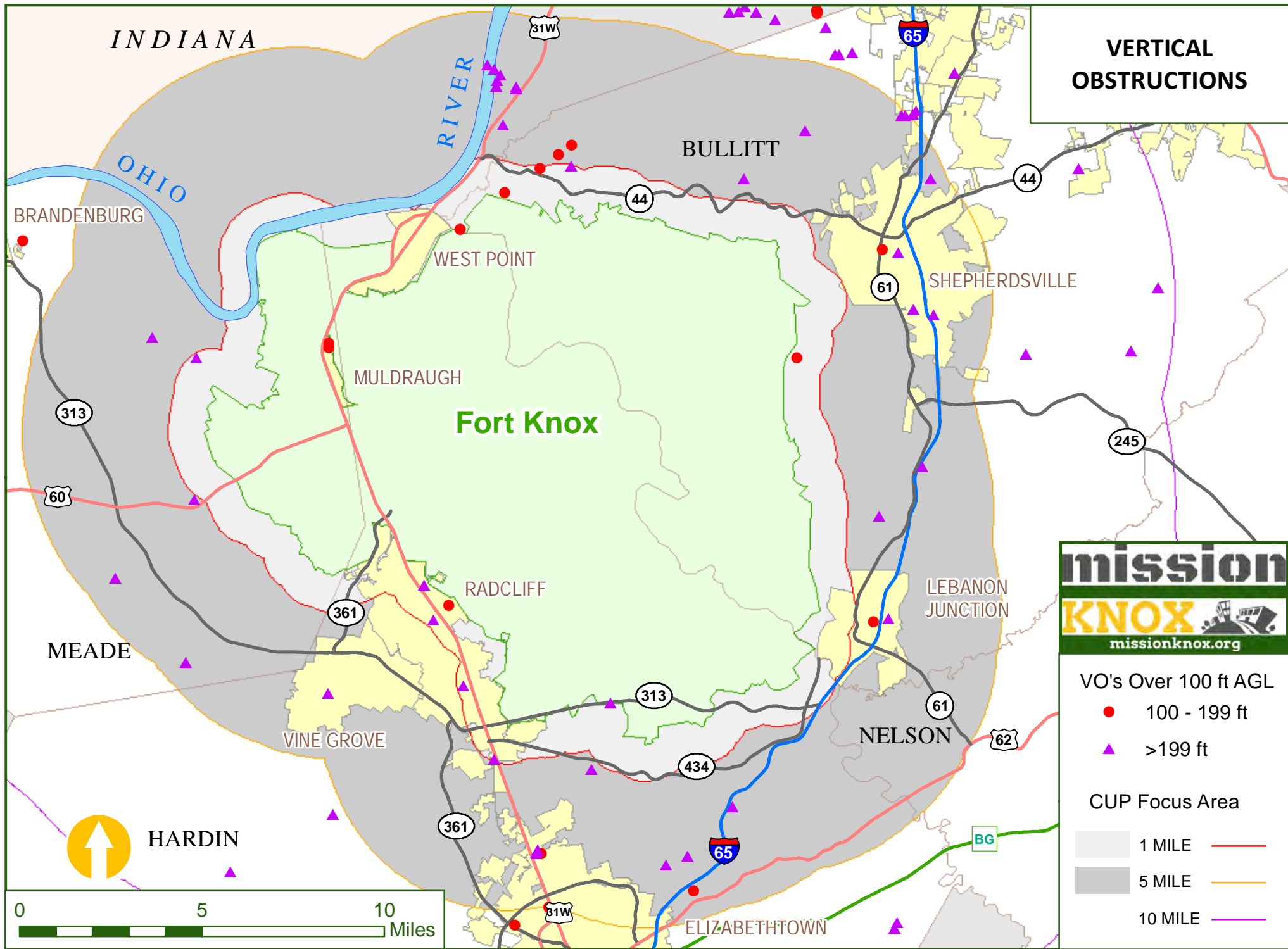
Physical encroachment can also be vertical. Vertical Obstructions (VO) to aerial platforms are a hazard to operations in and around Fort Knox. Map 30 shows many VO's that may impede missions. There are seven towers of 200 ft or greater within the one-mile buffer and an additional 31 in the five-mile zone.⁹² See Table 18. As will be addressed in the frequency spectrum section, cellular communications towers can also create other issues such as interference. In the study area they are currently all under 200 ft. Five over 100 ft, two in the five-mile and three more in the ten-mile buffer. More are being created due to the rapid expansion of cellular phone service. Data available shows 52 in the study area as of 2019 versus 19 in 2002.⁹³ This excludes cell towers located on post. See Map 31.

Table 18 Vertical Obstructions Over 100 ft.

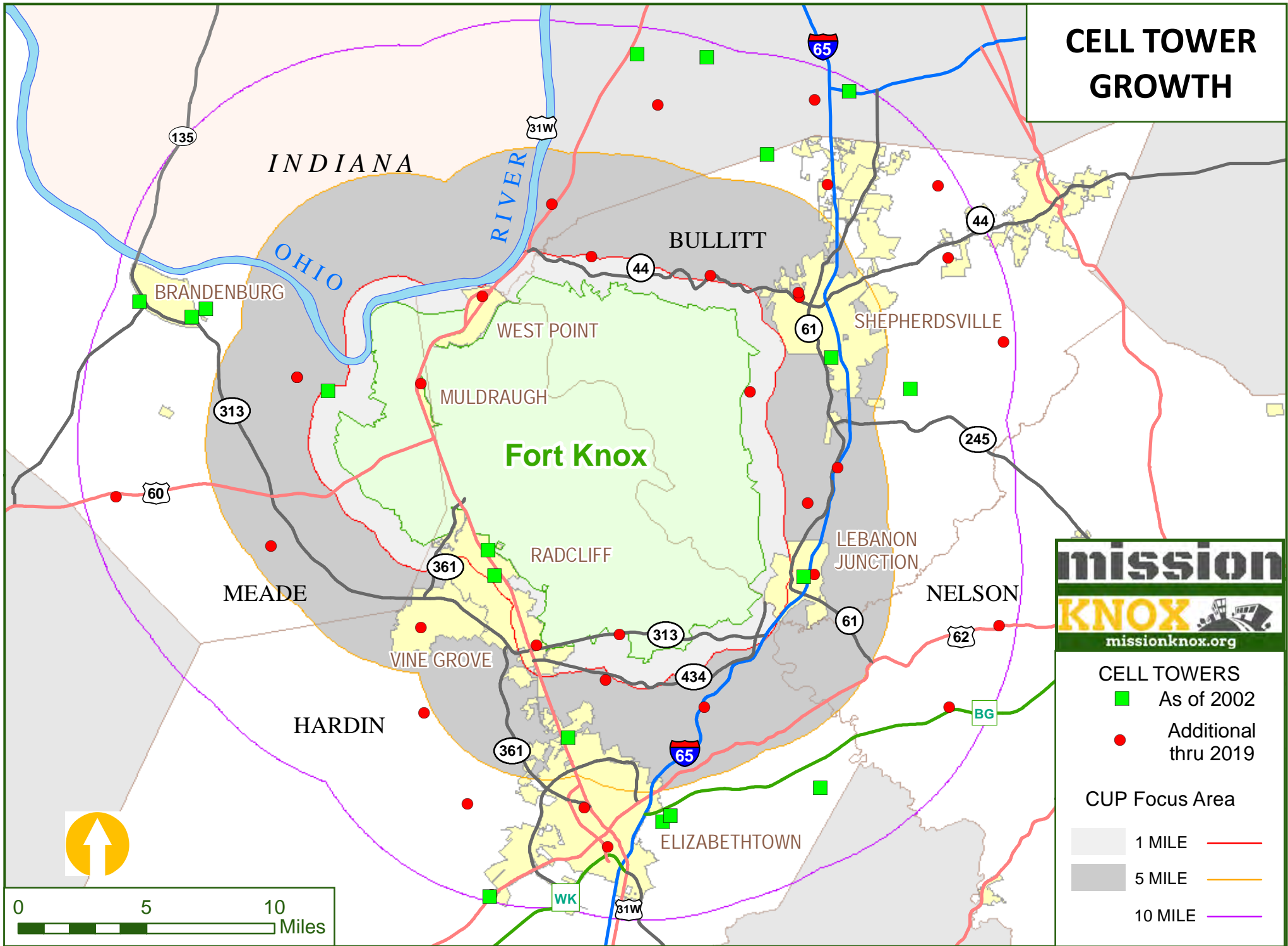
VERTICAL OBSTRUCTIONS			
Height	1 Mile	5 Mile	10 Mile
Over 100 ft	7	6	29
Over 200 ft	7	31	48

Drones

(SECTION NOT COMPLETE)



MAP 30 - VERTICAL OBSTRUCTIONS



MAP 31 - CELL TOWER GROWTH

Noise

Noise from the installation is commonly considered to be an issue. The result of munitions use in training and overflights in and around the post boundaries; both have anecdotal and documented histories of conflicts between the military and the surrounding communities. The results of which have resulted in Fort Knox having had curfews at times; other installations have had ranges closed or limits placed on the size of explosions.

“...blast noise cost the Army millions of dollars a year. As more people move closer to military installations (a current trend), encroachment issues such as noise have the potential to cause further repercussions.”⁹⁴

Noise sources can be considered to arise from three sources: Small Arms Weapons, Large Caliber Weapons and Explosives, and Aviation Activity. These noises emanate from the over 100 ranges located throughout the post. The CUP study reviewed data and insights from two noise studies that have been conducted at Fort Knox since 2009 in Section II.

Documented noise complaints were reviewed to understand both their type and location. The primary source for this data was an inventory of complaints and responses collected by the Garrison's Public Affairs Office. The dataset, covering the years from 2007 – 2019, can be broken into two types of noise related issues. Noise in general considered to be loud sounds coming from the installation or from aircraft associated with the military and vibrations resulting from these same activities that may have resulted in longer term affects.

For the purposes here the data is portrayed in Map 32.

Further details regarding this data may be found in Appendix B - Noise and Encroachment Complaints.

DAGIR

As discussed in the Fort Knox future mission's profile in Section II, the DAGIR will be a high use facility. The noise levels and frequency customary over the past few years are expected increase dramatically. When the construction stated on the DAGIR ranges information was released regarding the new facilities. The information emphasized the increase noise levels that would occur.

““... there will be a shift in noise levels as they make the transition to the DAGIR range. Wilcox Range is already experiencing heightened levels because of the diversion from Yano. Once Yano construction is complete in 2023, residents in nearby Bullitt County can expect increased noise levels as the DAGIR range goes live.””⁹⁵

It should be noted that a finding of “...no significant impact...” was decided in the Environmental Assessment (EA) conducted prior to beginning construction of the DAGIR via the conversion of the existing Yano range area.⁹⁶

It will be strongly suggested in Section V, Implementation Strategy that use be made of tools and studies available to mitigate this most personal conflict between some of the surrounding community and Fort Knox. This is yet another factor that should be addressed in the short term through communication methods in the Implementation Strategy. The long-term methods suggested such as building codes and realty disclosures may also help alleviate some of the future complaints that will be forthcoming.

NOISE & ENCROACHMENT COMPLAINTS 2007 - 2019

Source
Complaints, Fort Knox Public Affairs Office
- Jan. 2020.
Risk Zones, 2018 ICUZ Study via Fort
Knox Directorate of Public Works.



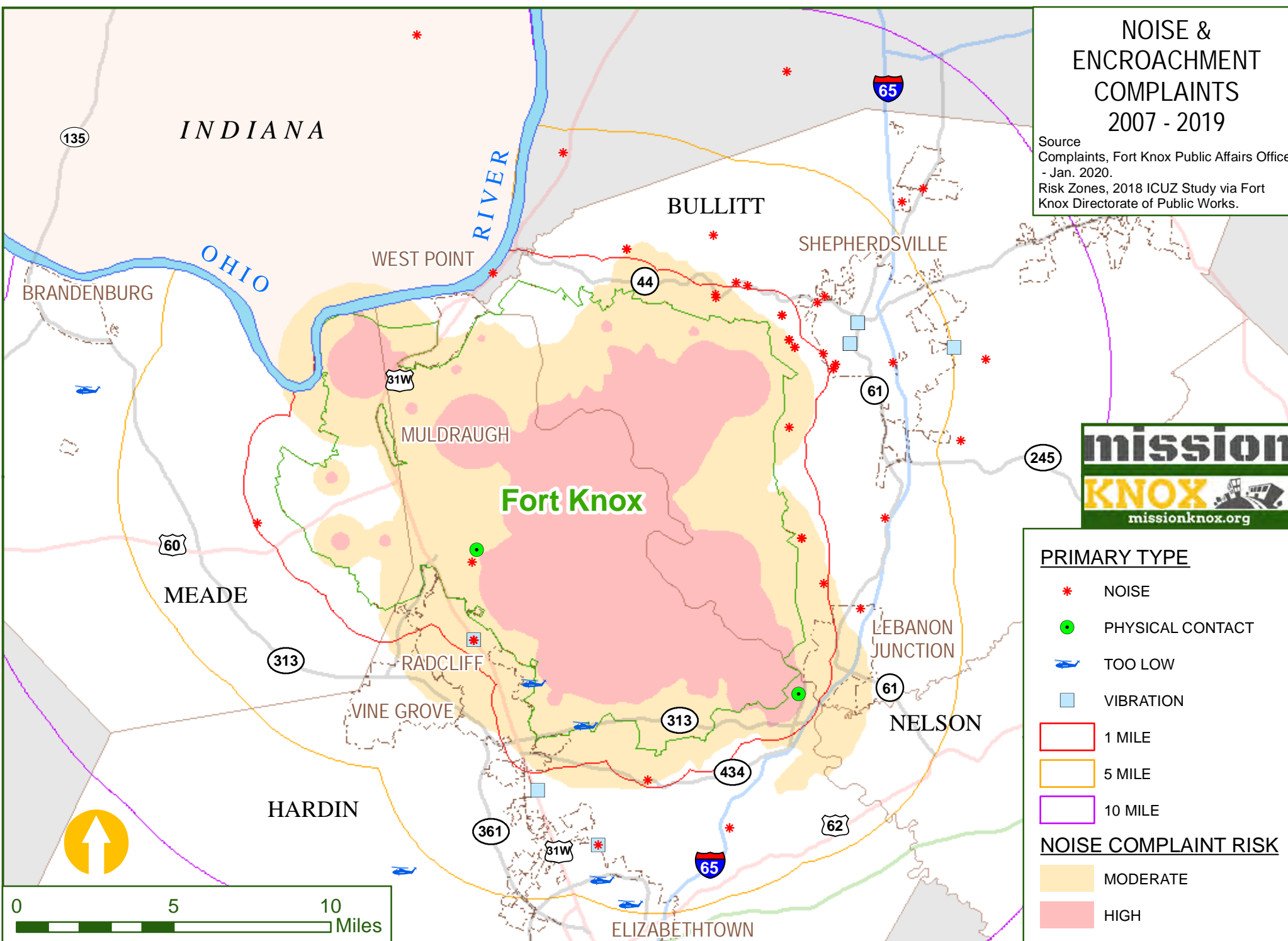
PRIMARY TYPE

- * NOISE
- PHYSICAL CONTACT
- ✈ TOO LOW
- VIBRATION

- 1 MILE
- 5 MILE
- 10 MILE

NOISE COMPLAINT RISK

- MODERATE
- HIGH



MAP 32 - NOISE & ENCROACHMENT COMPLAINTS

Spectrum Frequency

Spectrum frequency issues for this study are broken into two categories. Communications, which include items such as voice, data, navigation, detection, or other systems and visible light, which is a predominate concern during the hours of darkness.

As a communication tool, the electro-magnetic spectrum frequency suffers from the fact that it is a constrained and limited resource. It is basically the same situation we see in any other resource such as land, transportation, or housing as an example. There is only so much available and while sometimes it is possible to create more, such as housing or roads, it isn't always thus. Like land, there is no more frequency ranges available, so they are allocated based on regulation. In addition, the increase can have other issues, more housing can lead to other conflicts with noise as an example. As with the other resources the demand is both from the military and community side of the boundary.

Visible light presents the opposite issue. The excess of ambient light during the night creates issues with mission conduct and with various tools used. Creation of unnatural night-time environments can lead to degradation of training.

Communications

Primary uses in the military involve the obvious communication aspects via radio and satellite links. The other parts of the spectrum are also used such as radar, infra-red, and microwave.

The civilians in the community rely on cellular, radio, tv, and other types of communications. The advent of numerous wireless devices

such as door openers, cameras, lighting, and many other home convenience items place additional demands on the available bandwidth. The proliferation of cell phones has increased the demand for towers. In addition to the use of the spectrum itself conflicts arise from the physical infrastructure required. Cellular, microwave, and other communications towers create flight hazards. These towers can also impact radar and other conflicting transmitters or receivers.

In looking at the study area specifically, the siting of towers in and around the urban areas to keep up with demand creates additional VO's. Along the major highways such as I-65, 31W, and KY 313 the need for these towers to handle communication traffic has increased. The physiography of the Knobs creates natural high points to try and locate these towers due to their proximity.

Light

Light pollution can serve as a deterrent to mission conduct by creating areas unsuitable to conduct nighttime operations in a proper combat scenario. This can have a direct impact on the level of effectiveness of training.⁹⁷

An additional consideration of light pollution is the concern of its affects upon protected species. The bats of the region can be susceptible to issues involving their travel corridors. While night lighting might attract greater densities of food source it is believed that it can disrupt their commuting patterns. The Gray Bats forage along streams and lakes while the Indiana Bats avoid open fields for woodlands.⁹⁸⁹⁹¹⁰⁰

To understand what impacts light pollution may have on the missions of Fort Knox a understanding of the level of pollution present is

required. One source of night light data is the Suomi National Polar Partnership satellite flown by NASA and NOAA. It provides a polar orbiting satellite which collects nighttime data worldwide daily. The primary imagery from the satellite is the Visible Infrared Imaging Radiometer Suite (VIIRS). VIIRS data is available from the National Oceanic and Atmospheric Administration (NOAA).¹⁰¹ Map 33 shows the study area with this data overlain. The various cities and the cantonment area are visible in this view from March 2019. It provides a reference of looking at the illuminated terrain from above. We can enhance the data and use a false color image to provide additional details in Map 34. In looking at the change back in time from Map 34 to Map 35 which shows the same area in March 2013, one noticeable feature is the fading of the core range area of the installation as it has become brighter in 2019.

An issue with VIIRS imagery is the available resolution. Ranging between 0.6 to 2.7 km it does have some restricted value in a small study area. One method to obtain higher resolution is to create a simulation of nighttime lighting using other data. Two other methods were applied during this study to provide this visual simulation of the potential light pollution in our study area. The first was through the use of E911 point structure addresses. See Map (XX) Revealing a more detailed portrayal of the contrast between areas, it brings out the development along roads and highlights the urban cores and enhances the less densely populated rural areas. Data availability presents a problem with this method due to the inability to illustrate Bullitt County or Fort Knox. To circumvent this, the same technique was applied with Microsoft's "US Building Footprints" dataset. See Map (YY). This data, which is available nation-wide, provides the more complete view desired. Instead of the points from the E911 data we see the outlines

of individual buildings. It depicts the more dramatic dark areas of the installation and the more precise areas of residential development seen previously in the study area review of housing. This simulation reveals specific areas on interest that could provide opportunities for study and the use of tools to minimize their impacts.

Natural growth of industrial, commercial, in addition to residential will only increase the issued related to light pollution over time.

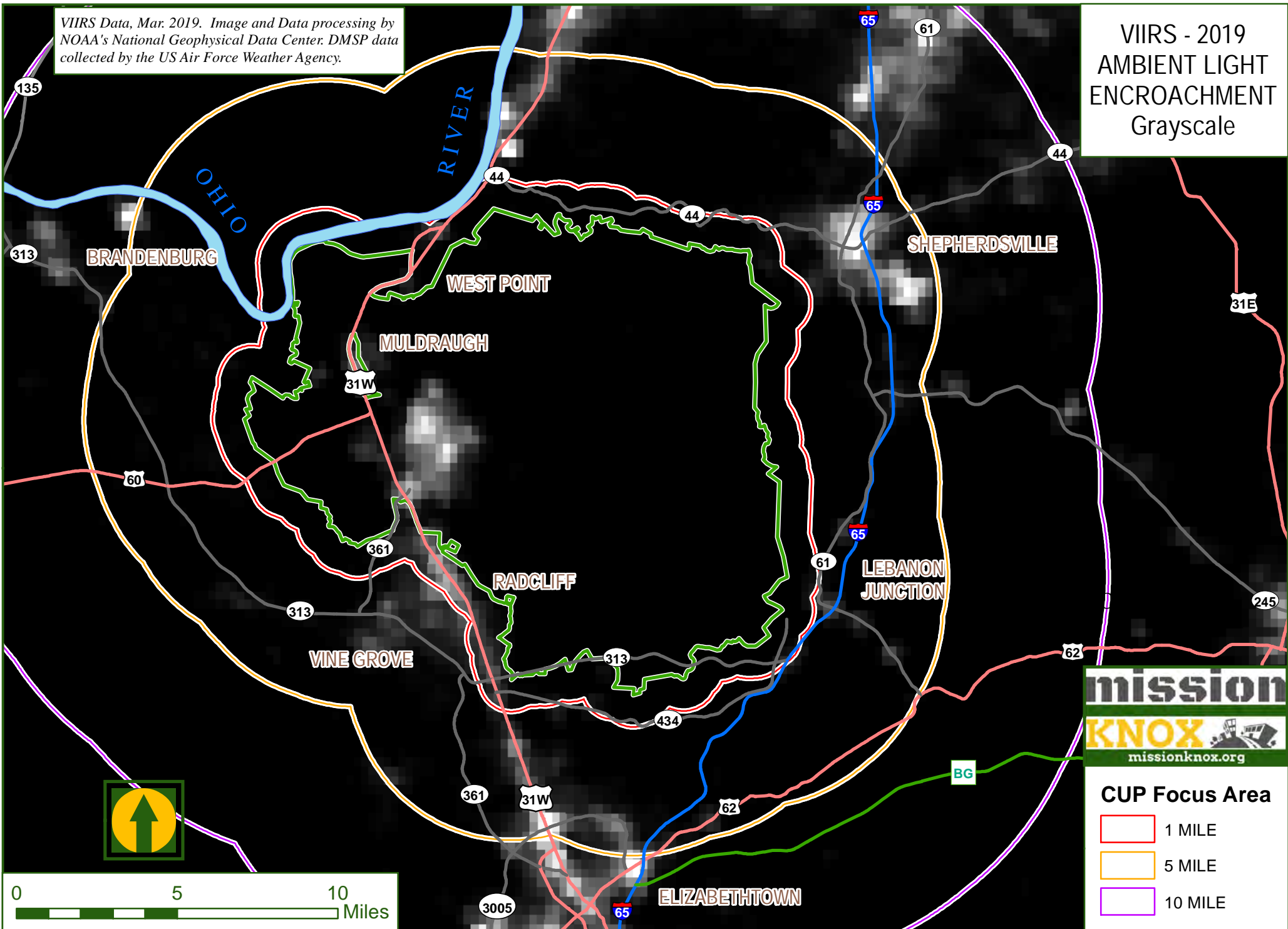
Consideration should be given to mitigation policies some of which are presented in next section and included in the Implementation Strategy.



Figure 36 Night Sling Load Training. Source: U.S. Army, Fort Knox Garrison Command.

VIIRS Data, Mar. 2019. Image and Data processing by NOAA's National Geophysical Data Center. DMSP data collected by the US Air Force Weather Agency.

VIIRS - 2019 AMBIENT LIGHT ENCROACHMENT Grayscale



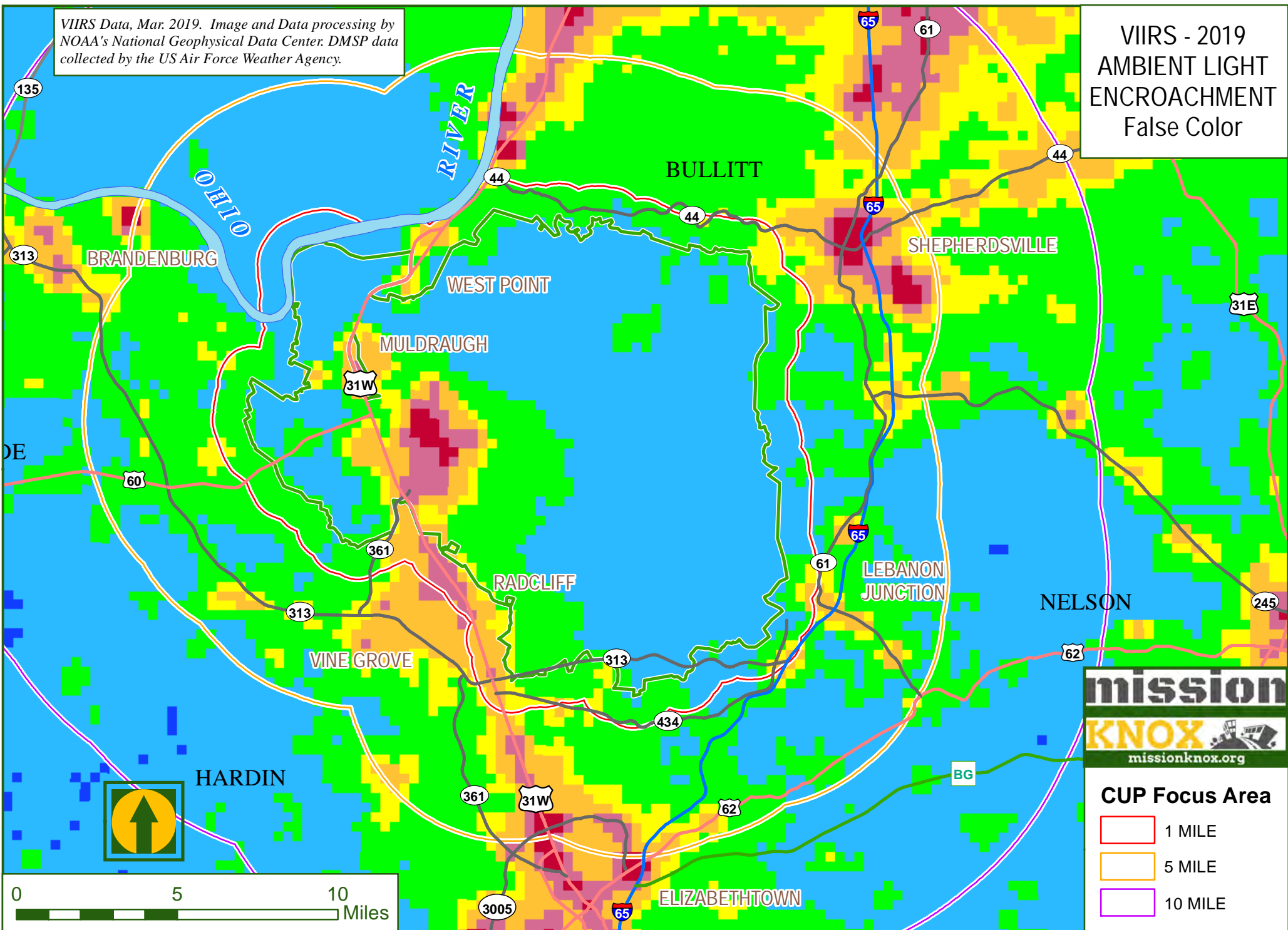
CUP Focus Area

- 1 MILE
- 5 MILE
- 10 MILE

MAP 33 - VIIRS - 2019, AMBIENT LIGHT ENCROACHMENT

VIIRS Data, Mar. 2019. Image and Data processing by NOAA's National Geophysical Data Center. DMSP data collected by the US Air Force Weather Agency.

VIIRS - 2019
AMBIENT LIGHT
ENCROACHMENT
False Color



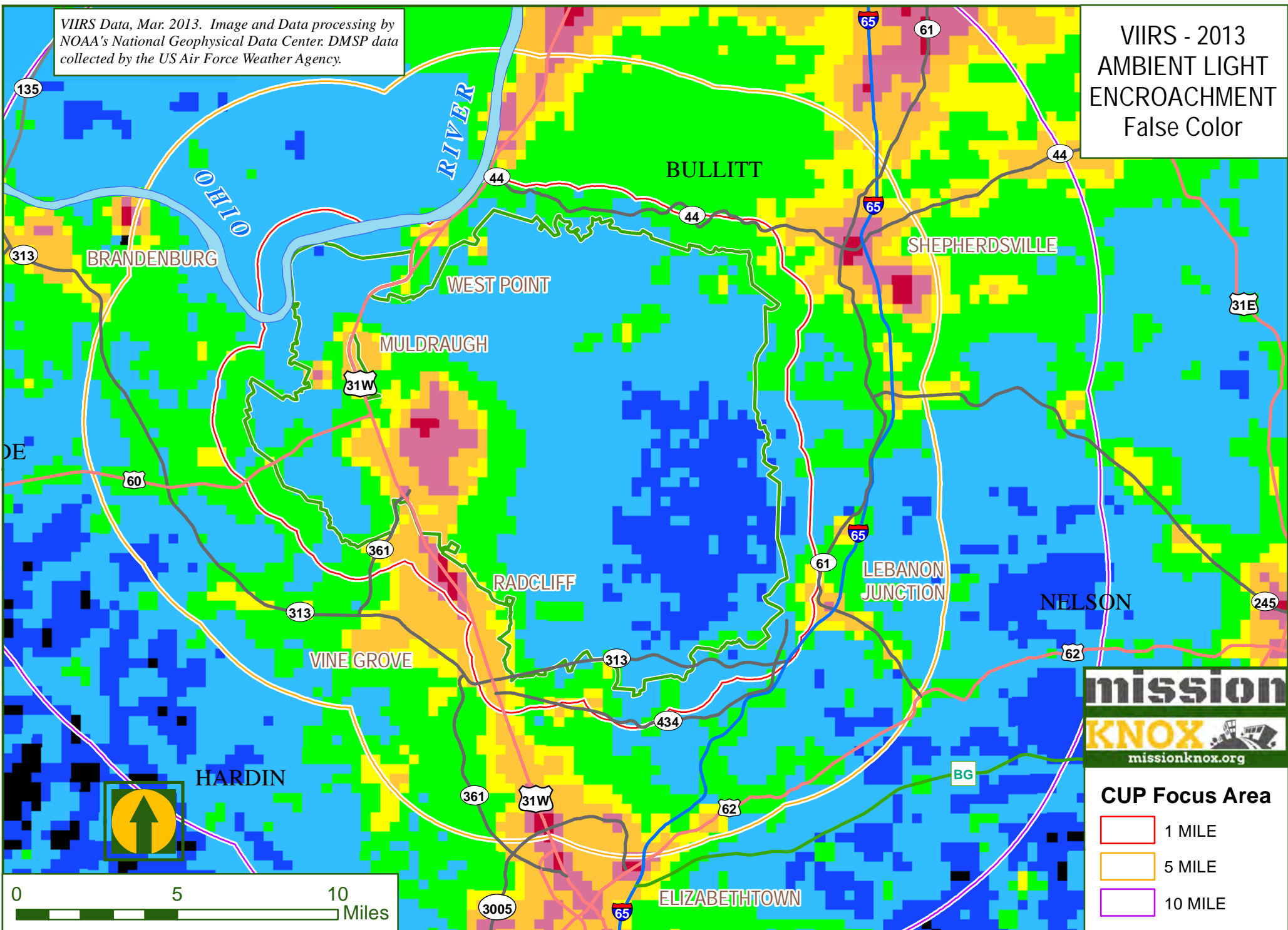
mission
KNOX
missionknox.org

CUP Focus Area

- 1 MILE
- 5 MILE
- 10 MILE

VIIRS Data, Mar. 2013. Image and Data processing by NOAA's National Geophysical Data Center. DMSP data collected by the US Air Force Weather Agency.

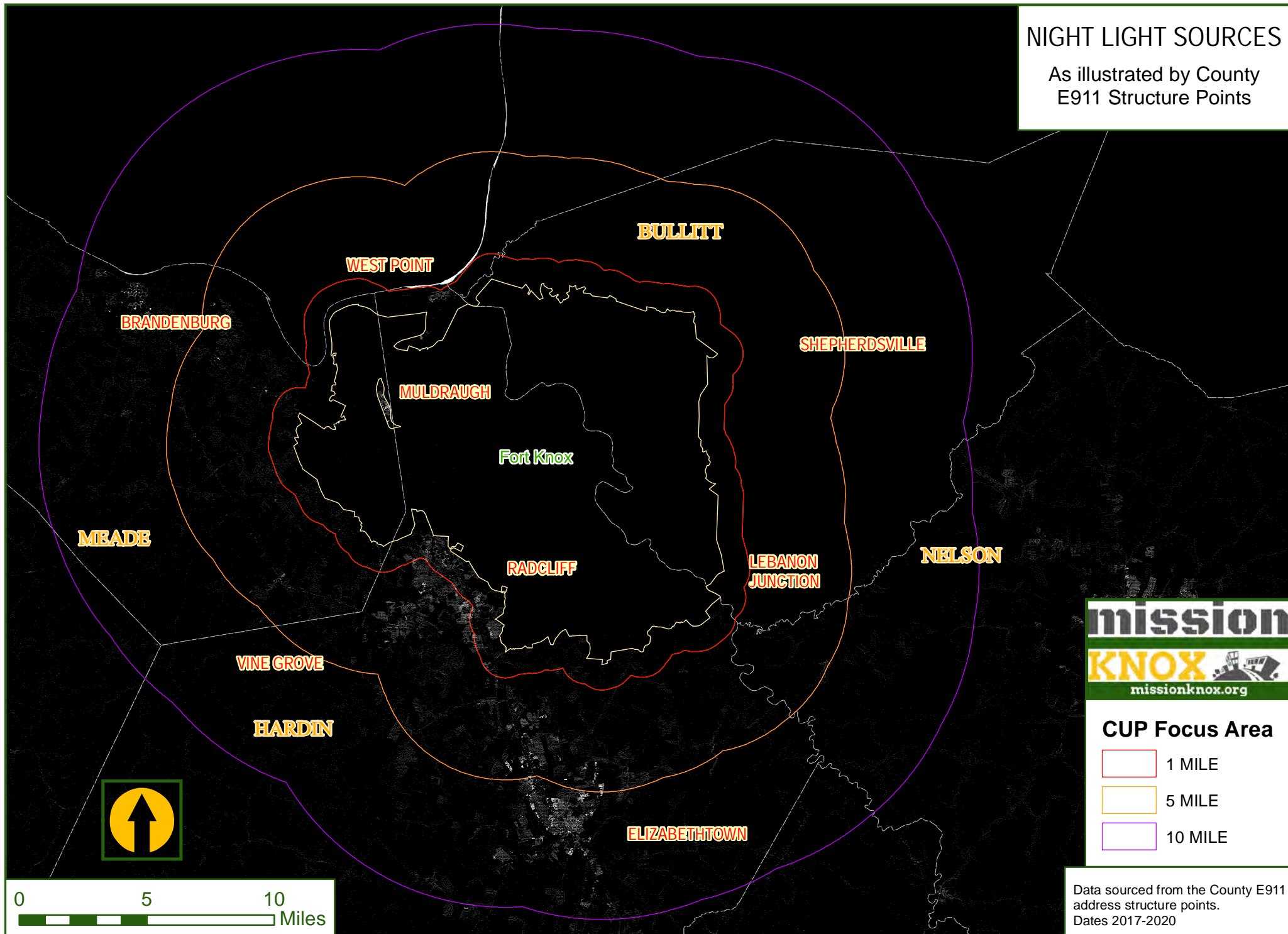
VIIRS - 2013
AMBIENT LIGHT
ENCROACHMENT
False Color



MAP 35 - VIIRS - 2013, AMBIENT LIGHT ENCROACHMENT

NIGHT LIGHT SOURCES

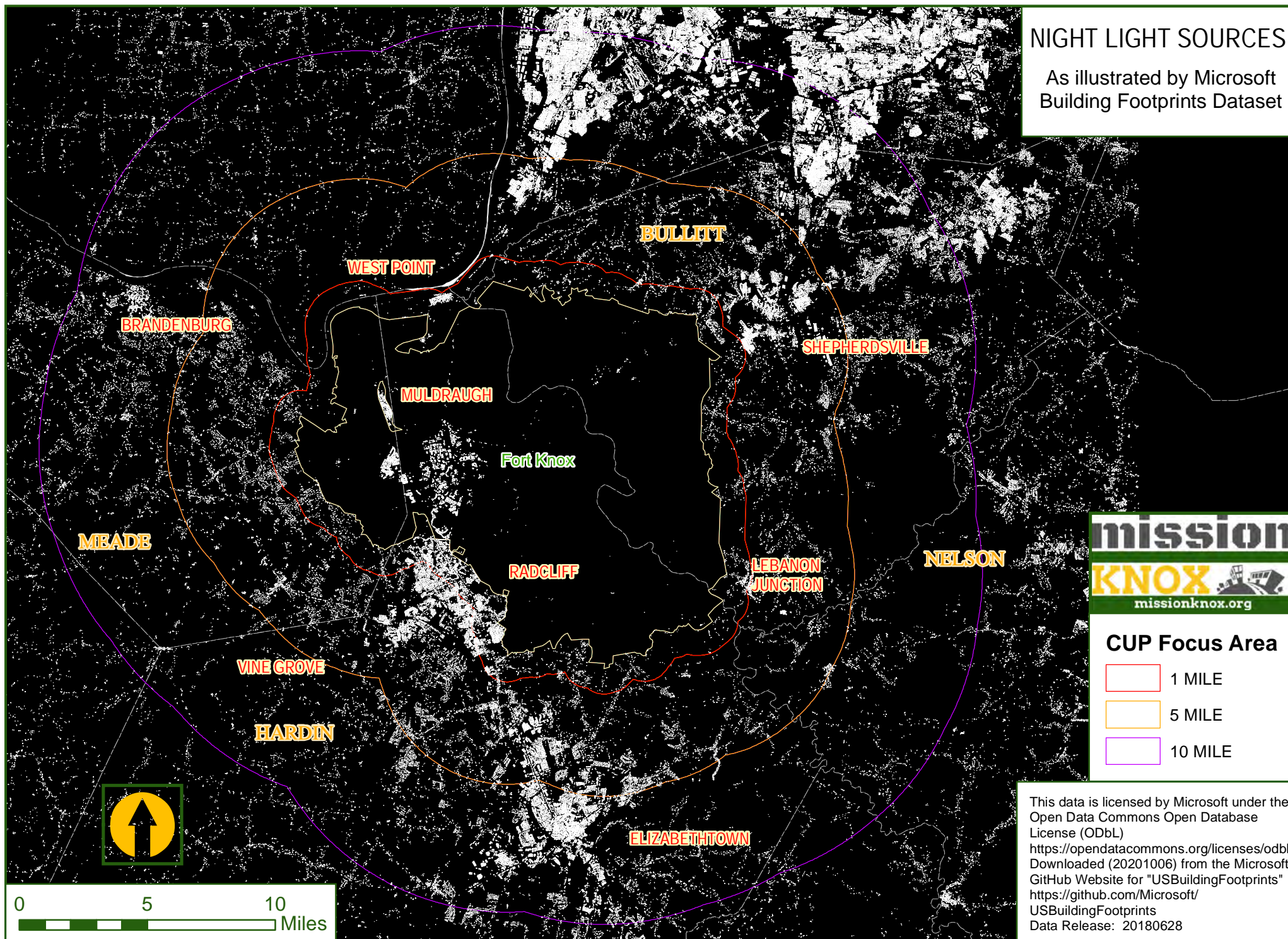
As illustrated by County
E911 Structure Points



Data sourced from the County E911
address structure points.
Dates 2017-2020

NIGHT LIGHT SOURCES

As illustrated by Microsoft
Building Footprints Dataset



Laser Encroachment

Incidents of individuals targeting aircraft with lasers were first reported in the 1990's with the advent of wide-spread low-cost devices becoming readily available. The FBI started keeping records of such events in the mid 90's and the FAA began tracking in 2010.¹⁰² Since 2005 with a report of 311 incidents, it rose to over 2,800 in 2010 nation-wide. It continued to a peak of 7,383 incidents in 2016, fell off under 6,000 but rose again to 6,852 in 2020.¹⁰³ Figure 37 shows the number of incidents in Kentucky over the past 10 years.

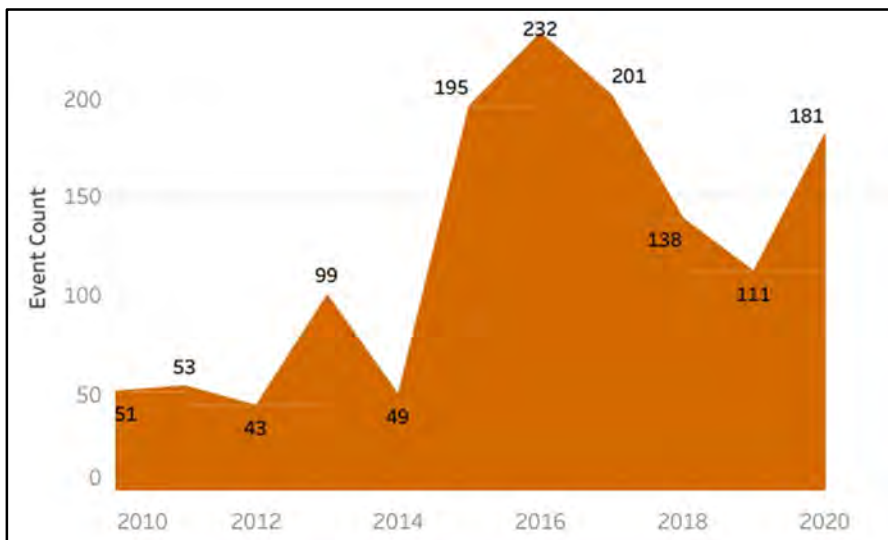


Figure 37 Laser Events in Kentucky.¹⁰⁴

Fort Knox had reported incidents in 2021. In two cases lasers were pointed at civilian aircraft using Special Use Airspace around ranges on the installation. Both incidents were from an area north of KY 313 near KY 251. Military Police were dispatched but no culprits were apprehended.¹⁰⁵ Federally, individuals can be prosecuted both criminally and civilly with penalties up to \$250,000 and five years in

prison.¹⁰⁶ The frequent aircraft overflights, use of night vision equipment, and rise in cases make this an area for concern. Education and enforcement are the current options for confronting this issue.



Figure 38 Green Laser in Cockpit. Source: *api.army.mil*

Environmental

Environmental issues can be broad in concept; thus, they are defined as follows for this study. Protection of species and habit, Natural disasters and their mitigation Land loss to over-development. In due course, all of this tie back to the preservation of land in an undeveloped or minimal state of development.

Endangered Species and Habitat

Land use of both Fort Knox and the surrounding communities influence several species in the local environment. The military and the local communities both have a vested interest in protecting the wildlife in the area. The military has legal obligations to protect any endangered species that are present within the installation's borders. According to the Center for Public Environmental Oversight, "Some of the biodiverse creatures and flora are protected by the Endangered Species Act, the Migratory Bird Treaty Act, the Marine Mammal Protection Act, and other laws".¹⁰⁷ The military may also find itself being graced with positive public relations when enacting policies that aim to protect wildlife and lead them to be viewed as an example in ecosystem-preservation. Meanwhile, the surrounding communities often care about ecosystem preservation, it may stem from pride in their local environment. The wildlife in the area is often a symbol of the region and preserving it is like preserving a local identity.

The Fort Knox and the study area have a large wildlife profile. Within the Fort Knox area there are 13 species that are considered either endangered, threatened, or of special concern by the state of Kentucky. Three of these are considered endangered; the Indiana Bat, and the mouse-eared (Myotis) bats - Northern Long Eared, and Gray. Two

additional are listed as threatened, the Bald Eagle and the Kirtland's Snake. The remaining species are of special concern, meaning the species should be monitored, examples include the Evening Bat and the Henslow's Sparrow.¹⁰⁸

Table 19 Fort Knox - Species

THREATENED, ENDANGERED, AND SPECIAL CONCERN SPECIES				
Scientific Name	Common Name	Class	US Status	KY Status
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Aves	No Status	Threatened
<i>Junco hyemalis</i>	Dark-eyed Junco	Aves	No Status	Special Concern
<i>Nycticeius humeralis</i>	Evening Bat	Mammalia	No Status	Special Concern
<i>Orconectes inermis inermis</i>	Ghost Crayfish	Malacostraca	No Status	Special Concern
<i>Myotis grisescens</i>	Gray Myotis	Mammalia	Endangered	Threatened
<i>Hyla versicolor</i>	Gray Treefrog	Amphibia	No Status	Special Concern
<i>Centronyx henslowii</i>	Henslow's Sparrow	Aves	No Status	Special Concern
<i>Myotis sodalis</i>	Indiana Bat	Mammalia	Endangered	Endangered
<i>Clonophis kirtlandii</i>	Kirtland's Snake	Reptilia	No Status	Threatened
<i>Ictinia mississippiensis</i>	Mississippi Kite	Aves	No Status	Special Concern
<i>Myotis septentrionalis</i>	Northern Myotis	Mammalia	Threatened	Endangered
<i>Cistothorus platensis</i>	Sedge Wren	Aves	No Status	Special Concern
<i>Accipiter striatus</i>	Sharp-shinned Hawk	Aves	No Status	Special Concern

Source: KY Dept. of Fish & Wildlife Resources, Query of USGS Quadrangle "Fort Knox"



Figure 39 Gray Bat (*Myotis grisescens*). Photo: John MacGregor, KY Dept. F&WR.

The presence of endangered and protected species affects Fort Knox's missions. There are several national and state laws that dictate how the installation can operate when it comes to protecting the species. For example, any actions on the installation that may affect the animal's habitat must be coordinated with environmental personnel. A large amount of responsibility for this problem can be placed on development of the outside communities. As the land around the installation becomes more developed, the natural habitats of these species are destroyed and often move into the installation where there are large tracts of undeveloped land. The development of the rural landscape creates a situation where Fort Knox will be confronted with additional species seeking refuge resulting in more limitations on activity.



Figure 40 Indiana Bat (*Myotis sodalis*). Photo: John MacGregor, KY Dept. F&WR.

Fort Knox and the surrounding area's goals can work to protect local wildlife and mitigate operational slowdowns on the base. In 2005 a large maternity colony of Indian Bats was discovered in the northeastern area of the installation. In response Fort Knox created the Indiana Bat Management Area (IBMA). This area of over 1,400 acres has served to protect the species and through efforts to increase summer roosting sites the bats have flourished.¹⁰⁹ This location is in Bullitt County and there are other areas of concern in the one-mile buffer. See Map 36. It should also be

noted that all of Meade County is considered by United States Fish & Wildlife Service (USFWS) to be "Critical Habitat" for the Indiana Bat.¹¹⁰ Fort Knox continues to work with the USFWS and the Kentucky Department of Fish and Wildlife Resources (KDFWR) in operating around the protected species. Fort Knox monitors the protected species' status, any current habitats on post. Fort Knox and the surrounding communities should work together to identify natural resources and habitats and resolve to limit the encroachment in those areas.

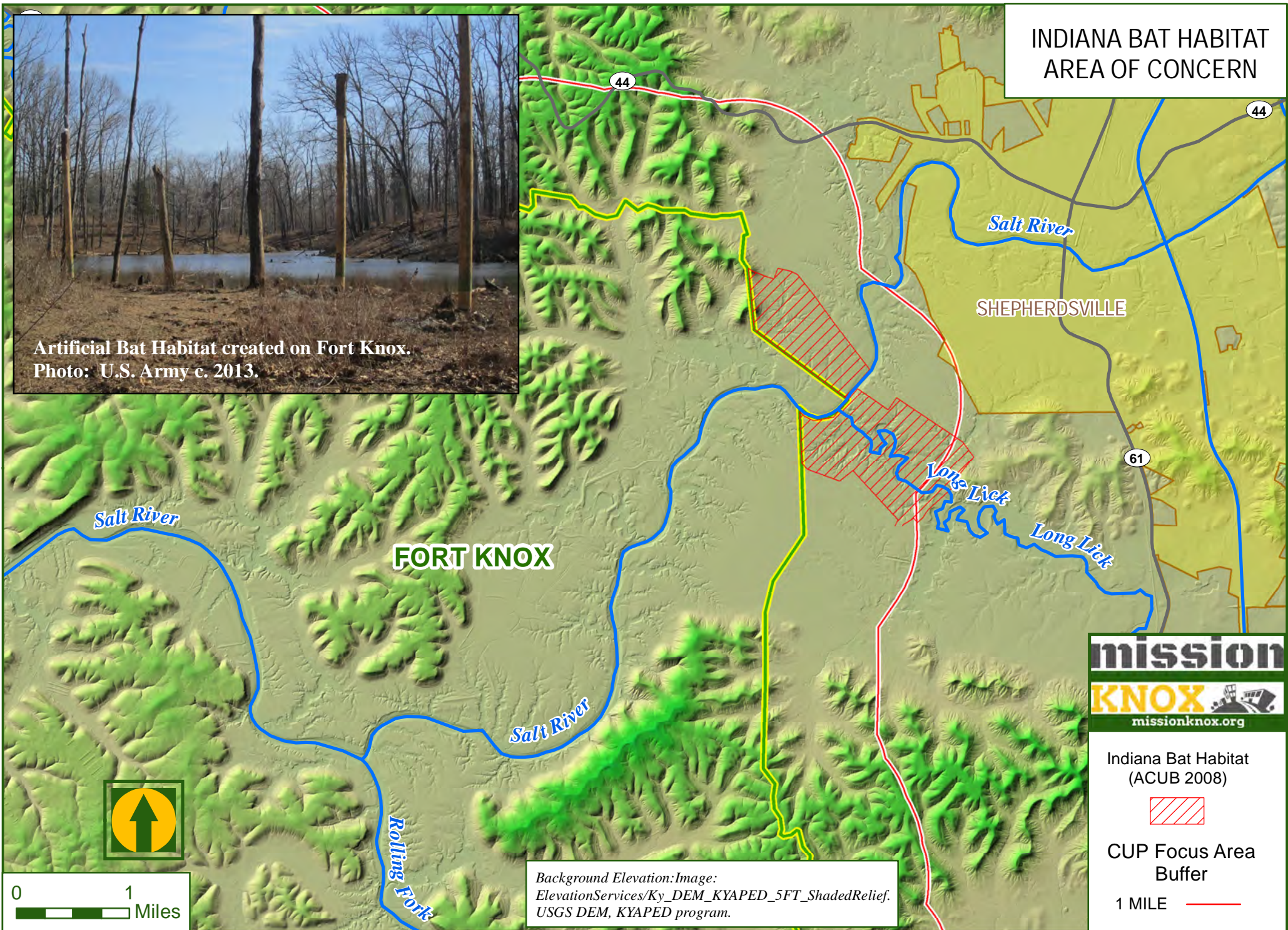


Figure 41 Artificial Bat Habitat created on Fort Knox. Photo: U.S. Army, c. 2013.

Invasive Species

Invasive species are plants or animals that come into an area quickly and heavily alter the native ecology. They are usually unwanted and tend to have a degrading effect on the existing environment. A famous example of invasive species is Kudzu, a leafy vine whose growth has been known to overtake large swaths of land. While invasive species are not a major issue for the operations at Fort Knox, the possibility of invasive species in the installation could pose a

threat to operations. Development outside of the installation always has the potential to alter the ecosystem and create an unwanted or harmful scenario.



MAP 36 - INDIANA BAT HABITAT AREA OF CONCERN

Officials in Kentucky are currently monitoring and dealing with many invasive species that have a wide range of effects on the natural Kentucky ecosystem and human development. They include plants that outcompete other native plants for nutrients and space, such as Garlic Mustard, Purple Loosestrife, and Eurasian Water-Milfoil. Animal species that outcompete other animals for food and take over habitats, such as zebra mussels, are also of concern.¹¹¹ Of potential concern in the study area are Asian Carp, and wild pigs. They are now resident in the state and are spreading.¹¹²

While Fort Knox does not report any serious threat from invasive species on operations, continuous development in the outside community can push the habitats of many species closer to the installation. An example is the presence of coyotes, thus the Fort Knox website detailed in an announcement *“Dealing With Wildlife Native To Kentucky”* on how to manage an increased presence of coyotes on post for personnel operating in the area.¹¹³ The increase in wildlife in the installation could bring in species that have the potential to harm the natural habitat and thus the mission. To deter the threats of invasive species, Fort Knox and surrounding communities should continue to identify natural resources/habitats and limit the encroachment in those areas.

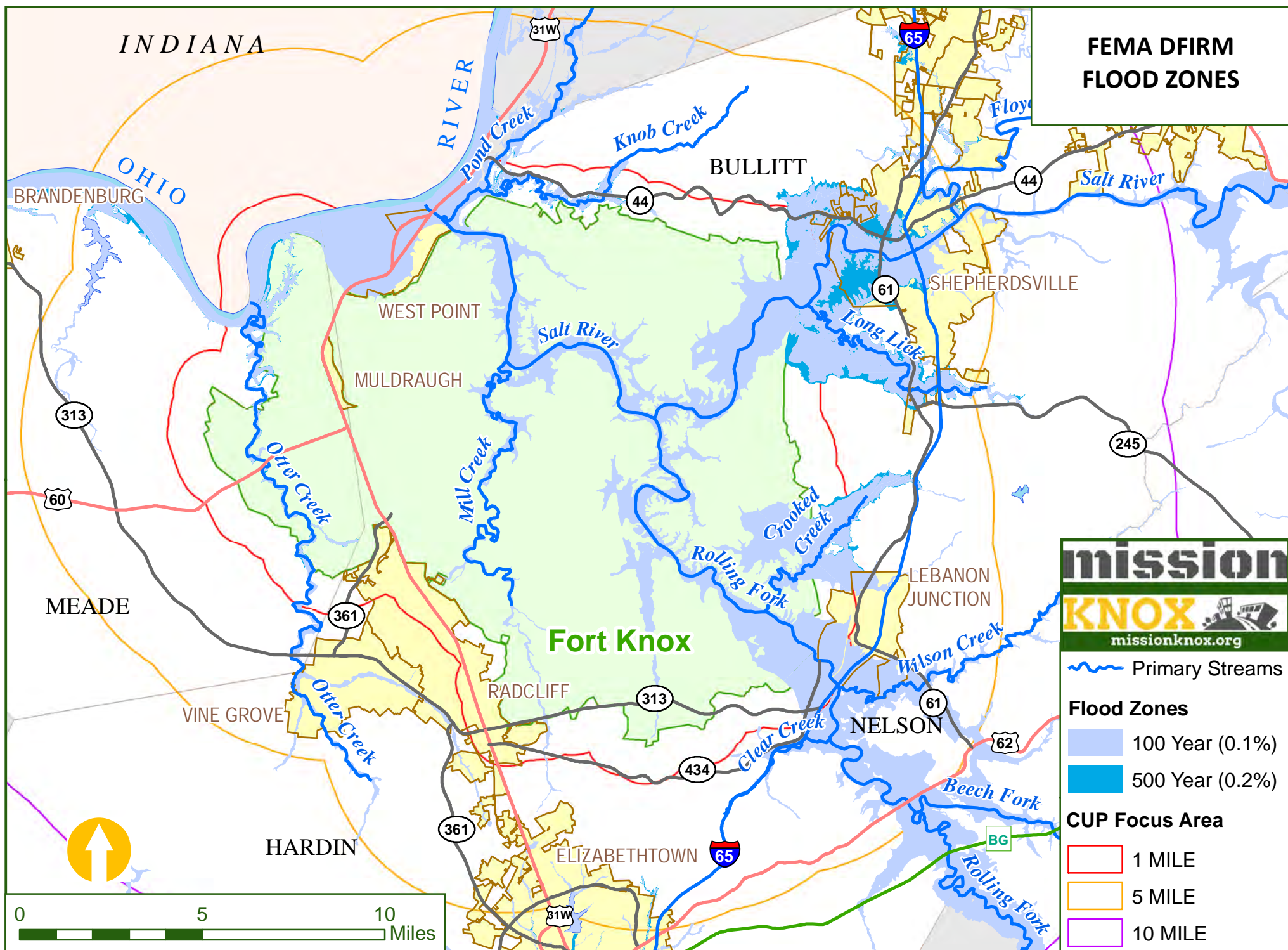
Natural Disasters

Natural disasters as they relate to the study are ones that are the result of or the change of landforms. These include flooding, karst, land subsidence, and landslides as predominant issues in the study area.

Flooding

Flooding is one of the most common disasters in the state and certainly in the Fort Knox Area. In the last 50 years the state of Kentucky has experienced over 50 Presidential flood declarations. Specifically in the Fort Knox area there are many rivers with a history of flooding, including the Ohio, Salt, and Rolling Fork Rivers, along with creeks that are susceptible to flooding that include Mill Creek and Cedar Creek.¹¹⁴ With the ever-growing threat of climate change, there is the increased threat of flooding in the state. According to the Environmental Protection Agency (EPA), since 1958 the southeast region of the United States has experienced a 27% increase in precipitation during heavy rainstorms and annual precipitation in Kentucky has increased 5% since the first half of the 20th century; both trends are expected to continue.¹¹⁵ The chance of flooding in the future is elevated for Fort Knox and the study area. See Map 37.

The risk of flooding in the area threatens both the installation and the development of surrounding communities while simultaneously hindering encroachment onto the base. The risk of flooding associated with the multiple rivers and creeks in the installation can pose challenges to military operations; trainings could be affected, and infrastructure has the potential to be damaged. Meanwhile, urban development near the installation poses additional threats through urban flooding. Resulting from the increase in impervious surface that reduces the natural ability of the area to absorb rainfall thus magnifying hazards downstream.¹¹⁶ The development of roads or parking lots in surrounding communities have the potential to affect the installation in this manner.



MAP 37 - FEMA DFRIM FLOOD ZONES

Flood risk zones do work to limit encroachment onto the installation by the surrounding communities. The rivers and streams running through and around the installation and the respective flood plains can serve to limit development on portions of land that are in proximity. Building on or near any floodplain takes considerable planning and often involves heavy regulations. These types of restrictions can help limit encroachment onto the installation and is a benefit to mission protection.

Going forward, Fort Knox should work with its nearby communities on the flooding concerns. This includes continuing to monitor any development near floodplains and working with communities to protect against flooding. This could include reducing pavement and other construction that limits natural water absorption, maintaining proper stormwater management, and development of codes to these ends.

Wildfire

Fire is of concern due to large tracts of grass and forest lands that make up and surround the installation. 2010 was a year of reckoning with the accumulation of down timber from the 2009 ice storm and drought. Fort Knox had over 12,000 acres subject to wildfire. Working with the surrounding communities through existing mutual aid agreements, Fort Knox and several area fire departments responded to fight these fires.¹¹⁷ Kentucky Air Guard Blackhawks using sling load water buckets assisted.¹¹⁸ During October wildfires also occurred off post in Bullitt County near the boundary along KY 44 and Hardin County over 1,000 acres burned in agriculture lands near I-65 in the southern part of the county.¹¹⁹ Cooperative agreements proved effective in dealing with this situation.



Figure 42 *Firefighters respond to wildfires at Fort Knox, Oct. 2010.. Photo: U.S. Army.*

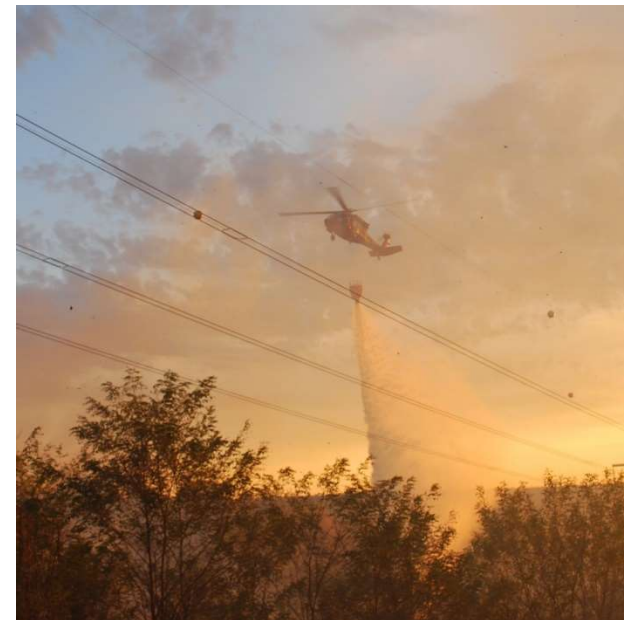


Figure 43 *KYANG Blackhawk assist with wildfires at Fort Knox, Oct. 2010. Photo: U.S. Army.*

Karst

A large portion of the study area landscape is a karst topography. Karst topography is described as having “...rocky ground, caves, sinkholes, underground rivers, and the absence of surface streams and lakes it results from the excavating effects of underground water on massive soluble limestone.”¹²⁰ The primary hazardous conditions associated with karst is sinkholes. Sinkholes are depressions in the ground that are caused by caves which become large enough that the tops extend to the surface and eventually collapse in. Sinkholes have the potential to cause both human and economic loss. This can occur through cover-collapse; where the ground above the sinkhole collapses into itself completely. When there is anything above the collapse it will be affected; infrastructure, agricultural products, and human life are all at threat. Additionally, sinkholes can have flooding, where the amount of precipitation exceeds than what can flow through the conduit and subsequently floods the surface. Again, effecting nearby infrastructure, agricultural products, and human life.¹²¹

The state of Kentucky is historically, one of the most karst prone regions in the world. The springs and wells inherent to karst landscape, provide water to many Kentucky cities. Approximately 55% of Kentucky is underlain by rocks that could develop karst, given enough time, and about 38% of the state has some karst development. The state is known to have well-developed karst features in another 25%.¹²² This karst topography forms the Mammoth Cave System in Kentucky. The world’s longest cave system at over 400 miles in length.¹²³ The Fort Knox region is not excluded from the large presence of karst landscapes, specifically in the western half of the installation and the communities there. See Map 38. The threat of sinkholes associated with this karst is ever present.



Figure 44 Sinkhole Flooding, Photo credit: Kentucky Geological Survey.

Sinkholes are a threat that will inevitably hinder some of the operations and trainings that will take place within the installation, having to work around some sinkholes that have been, or will, completely collapse or by having to avoid sinkhole flooding. However, the presence of karst landscape on the western portion of the base can be a clear influence in limiting encroachment. The presence of karst topography in the region directly surrounding the installation needs to maintain careful development and should hinder the amount of development that will reach the borders of Fort Knox. Fort Knox should work with neighboring communities to identify and educate regarding karst and sinkhole areas. With a primary focus to help avoid poor, dangerous investments and further inhibit encroachment.

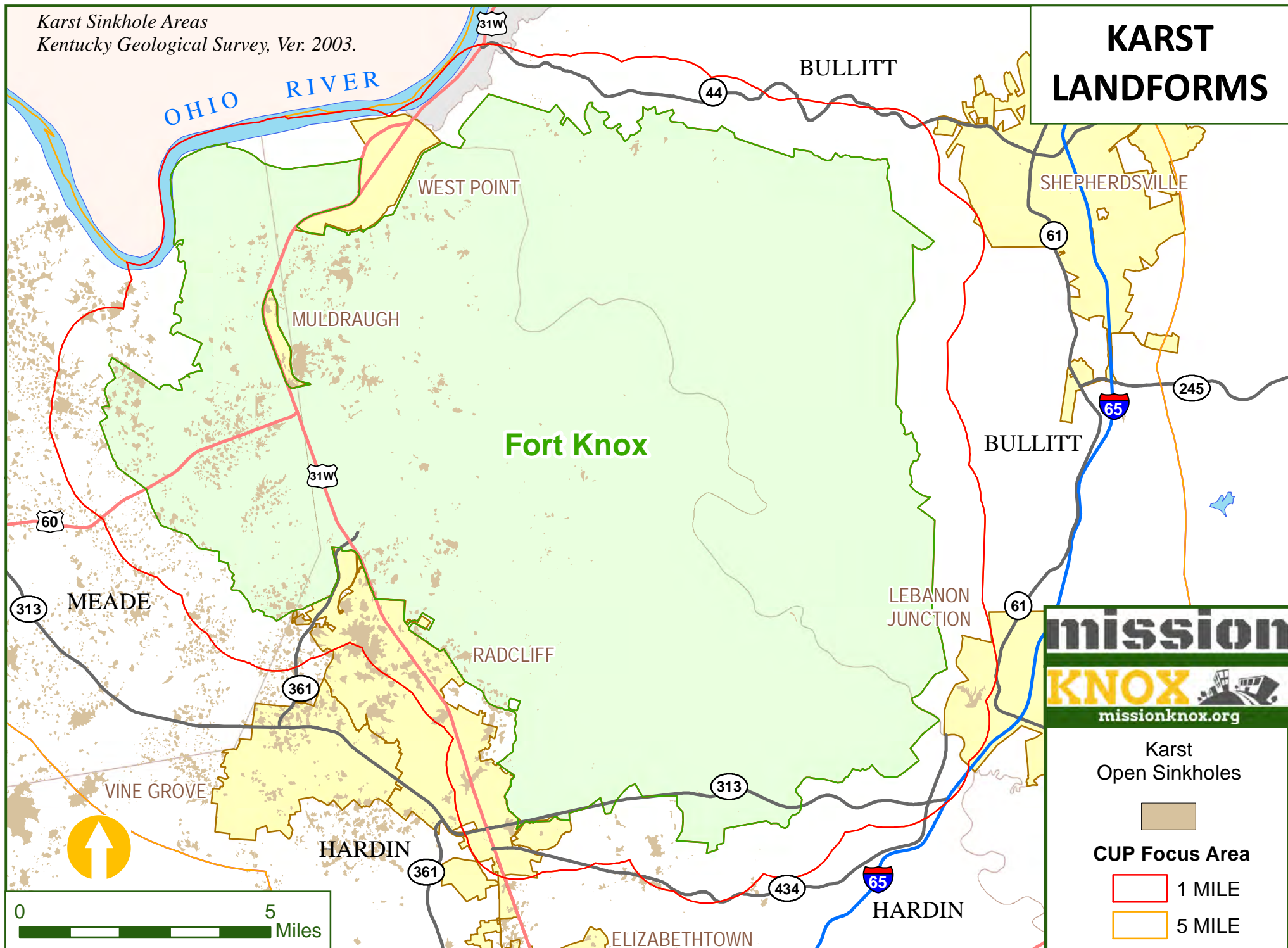
As an example, Meade County’s Subdivision Regulations contain the following regarding easements which limits construction near sink holes.

Drainage Easements - Drainage Easements over all watercourses, drainage ways, channels, streams or sinkholes are hereby granted. Said easements are 20 feet in width, centered on each primary drain, being 10 feet[sic] on each side of said flow line or a 20-foot radius around the center of a sinkhole. The storm water easement is a non-buildable area. This does not prohibit pond or retention basin construction in the area. No building or structure may be constructed within or protrude into this non-buildable area.¹²⁴

This provides some protection but with the expansive nature of karst, larger areas of restriction could be more valuable.

Karst Sinkhole Areas
Kentucky Geological Survey, Ver. 2003.

KARST LANDFORMS



MAP 38 - KARST LANDFORMS

Landslides

Landslides are flows of rock, earth, or debris due to gravity and the combination of soil, moisture, and slope angle. Landslides can either be a slow, gradual processes or an abrupt, sudden occurrence. They can be caused by hazardous weather conditions, such as rainfall, earthquakes, or erosion. They can be caused human activity, including vibrations from traffic and machinery, blasting, deforestation, and agriculture. Munitions use for training can potentially contribute to this on a localized level and could be reviewed further. The consequences of landslides are damage to infrastructure and loss of life. Landslides are estimated to cost the United States \$1 to \$2 billion annually and cause more than 25 fatalities. In Kentucky they exceed \$4 million annually.¹²⁵ Most landslides that occur in the state are in the mountain regions of the eastern half of the state. However, the study area has experienced several landslides in its history. A landslide inventory placed Hardin and Nelson Counties in the top 50 by the number of landslides recorded in Kentucky.¹²⁶

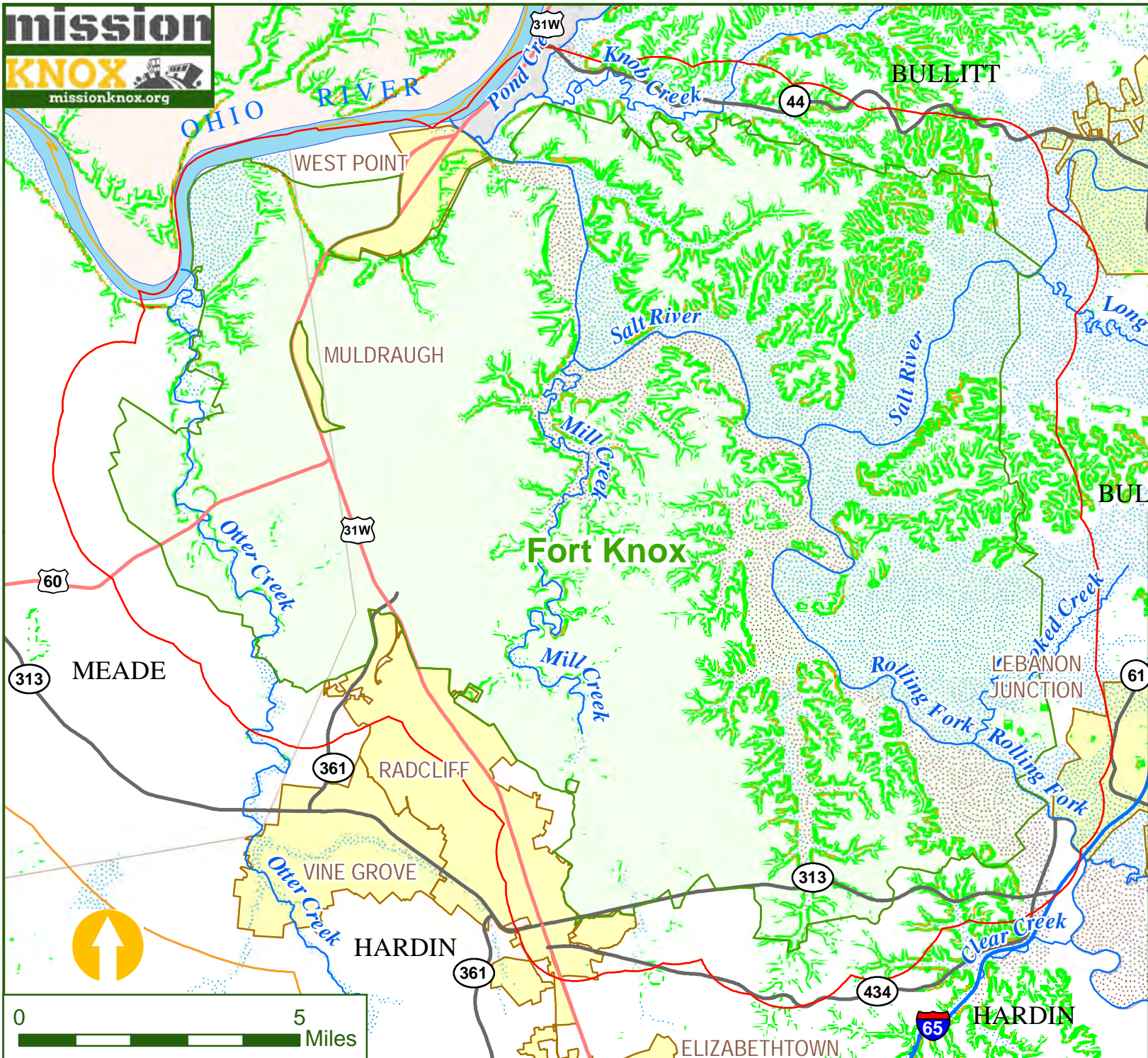
Landslides are a hazard for the installation and the surrounding communities. The threat of landslides caused by natural weather conditions are a concern and can be detrimental to operations and development. However, landslides can also be caused by human factors. As development gets closer, especially in the Knobs area, this threat grows. At the same time continuous military operations could set off a landslide in the outside community in areas that are at risk. See Map. Fort Knox and the surrounding communities need to work together to avoid these hazards and any economic loss due to landslides in area. Developing an inventory of high-risk landslide areas could be of value.

Landslides occur in areas of steep slopes, particularly in areas of unstable soils. Map 39 shows locations in the study area with slopes in excess of 5%. This is noticeable in the zone along the Muldraugh Escarpment on the west side of the Salt River and Rolling Fork. It also carries into the Knobs area. Rock falls, a type of landslide, tend to occur in areas of limestone cliffs. Road cuts tend to exacerbate this issue. Along the Bluegrass Parkway in Hardin County coming down from the Muldraugh Escarpment is very illustrative of this phenomena locally.



Figure 45 *Rock slide along the Bluegrass Parkway. Source: Kentucky Geological Survey.*

LANDSLIDES AREAS OF RISK



Slopes

- 5 - 10%
- 11 - 15%
- 16 - 23%

General Geology

- Alluvium
- Clay, silt, sand, and gravel
- Artificial fill

CUP Focus Area

- 1 MILE
- 5 MILE

*Slopes calculated from USGS, 30m DEM.
General Geology, Kentucky Geological Survey, 2005.*

MAP 39 - LANDSLIDES AREAS OF RISK

Land Development

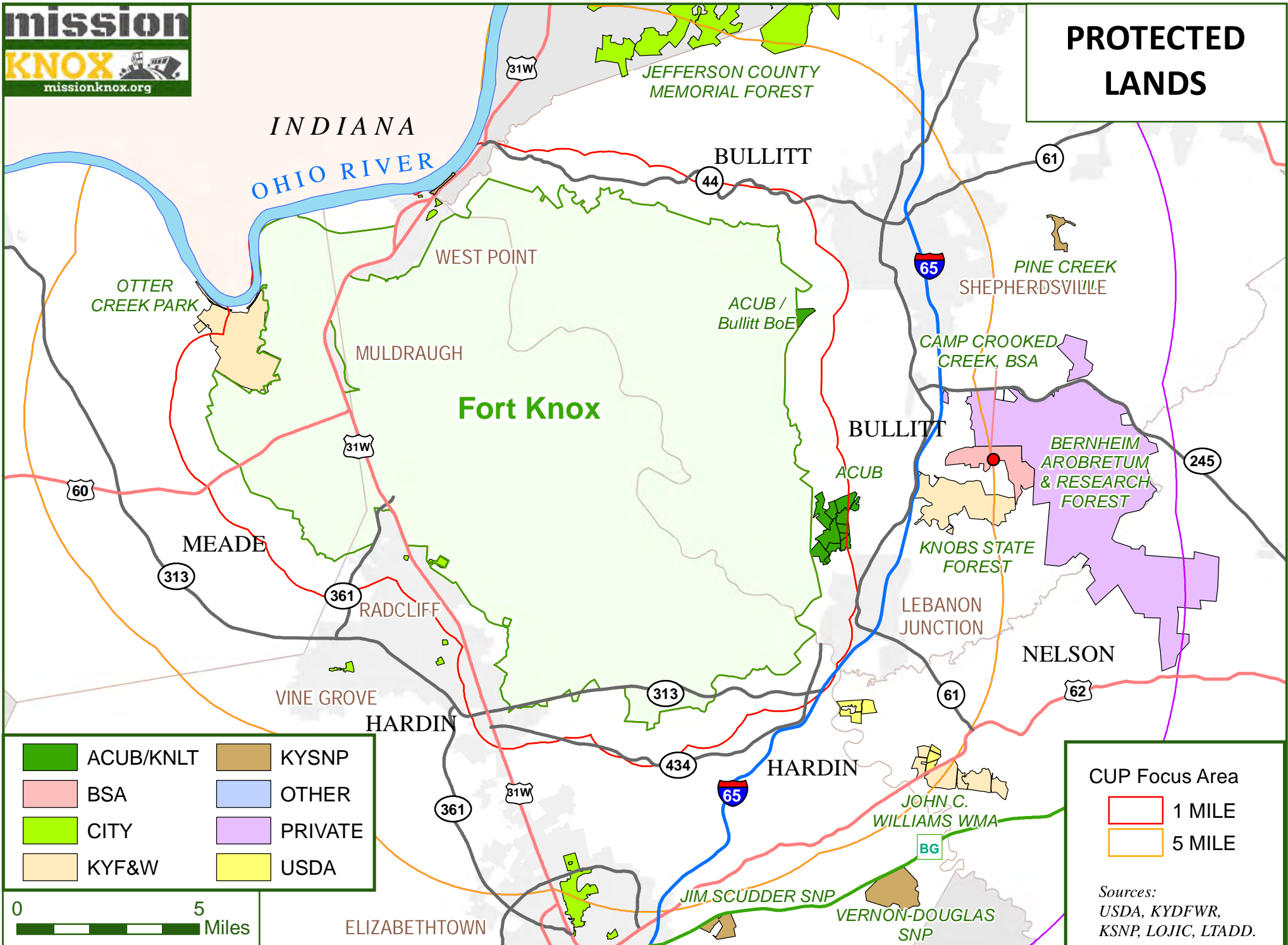
A basic concept for all compatible use is the type of development “outside the fence” is directly related to the issue that arise that lessen mission capability. From the aspect of environmental concerns, the conversion of forest, wetlands, or agricultural land into residential, commercial, other denser types of use increase the chance of conflict between the post and the surrounding communities. The need for land use policies remains key to creating a scenario where the land can continue to be use but in ways that enhance its compatibility or at the least do not increase tensions. The continued pressures for growth in the region require careful planning by all parties. As is presented in Section IV – Compatibility Mitigation Tools, there have been several successful programs implemented in the region. These include the use of the Army Compatible Use Buffer (ACUB) program, specialized zoning in the KY 313 Buffer Corridor implemented by Hardin County Planning and Development. The Purchase of Agricultural Conservation Easements (PACE) program which assist in maintain land in agricultural use. There remain many other opportunities available for these types of programs. These are discussed further in Section IV and in Section V - Implementation Strategy.

Fort Knox has neighbors that have numerous land holdings that serve to preserve habitat and thus protect its mission footprint. These conservation lands are dedicated areas whose operations intend to protect and care for natural lands for the public good and the sustainment of the ecosystem. These neighbors include conservatories administered by several different organizations working to preserve natural places. One entity’s operations near Fort Knox, the Bernheim Arboretum and Research Forest which comprises 16,137 acres. It worked with a coterie to include Fort Knox, that created the Bernheim-

Fort Knox Wildlands Corridor. The Kentucky Natural Lands Trust (KNLT) who manages the Crooked Creek Preserve of 155 acres and other conservation easements of an additional 308 acres and The Knobs State Forest & Wildlife Management Area with 2,035 acres, managed by KDFWR and the Kentucky Division of Forestry, are also partners in this effort.¹²⁷ See Map 40.

This preservation is in many ways a good thing for the Fort Knox installation. It serves to limit development on land directly adjacent and provides relief from wildlife movement due to urban development. Fort Knox can be hindered by these conservatory lands by having to concern itself with operations that may have a negative effect on these lands, such as noise and air pollution.

PROTECTED LANDS



MAP 40 - PROTECTED LANDS

Loss of Agricultural Lands

Across the state and in the Fort Knox region, farming still plays a vital role in the economy. Hitting a peak of \$6.5 billion in cash receipts for the state in 2014.¹²⁸ A significant portion of the land in the five-mile buffer zone around the Fort Knox installation is suitable for agricultural. Predominately present on the eastern and southern edges of the installation. See Map 41. This agricultural land is characterized as being sparsely populated and having little urban development associated with it. Farmland does not often contribute to activities that can affect installation operations. This agricultural land's placement is a benefit to installation operations by limiting urban encroachment, if it remains agricultural, urban development is deterred, serving as a buffer between the installation and urban encroachment.

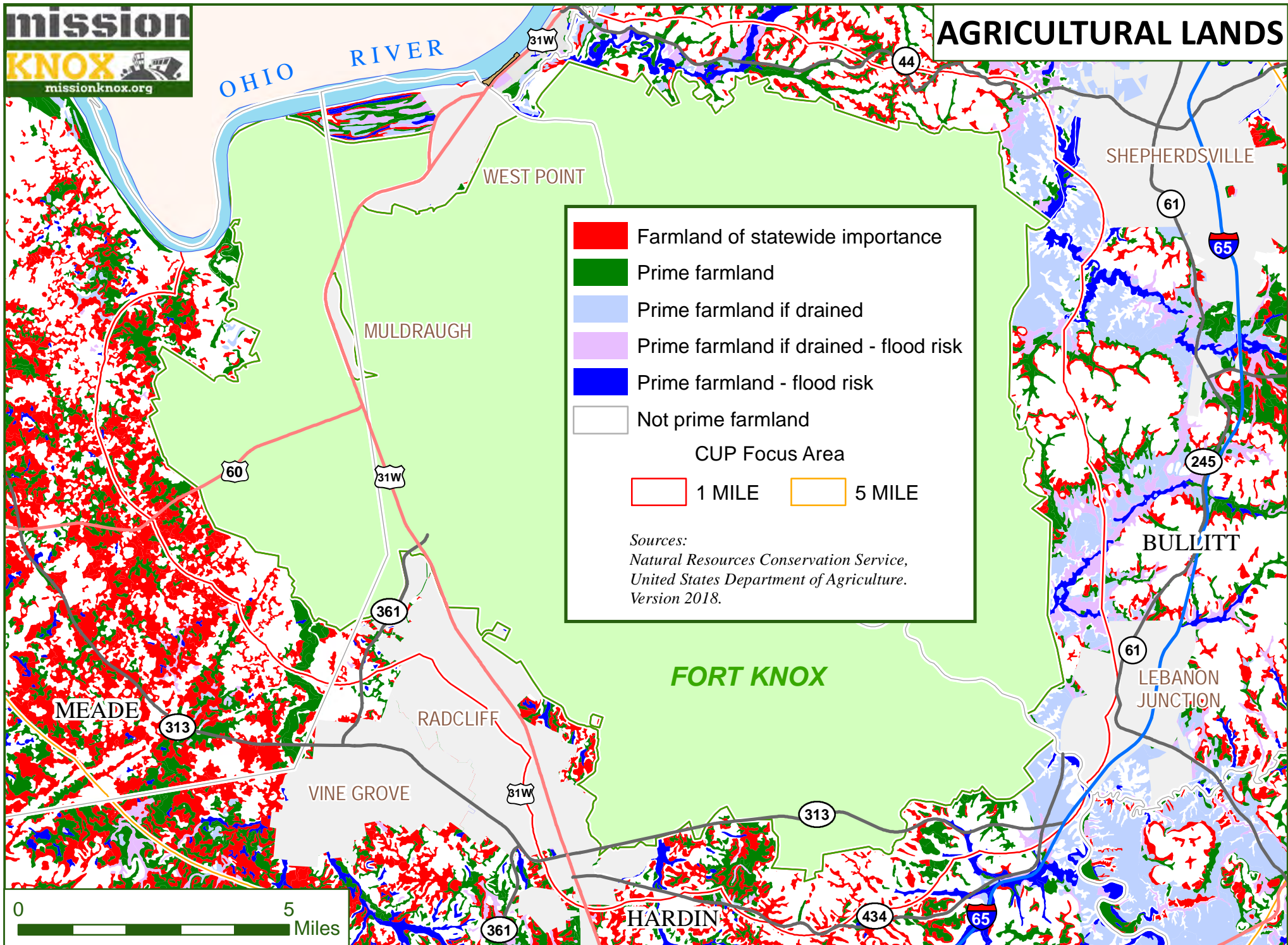
This does not mean that the placement of agricultural land offers no downsides. Farm operations generally do not pose some threat to Fort Knox operations, however the use of herbicide and pesticide affecting air and water quality in the installation can be of concern. Largely though, agricultural operations near the installation do better than harm for military operations.

Although noise is a factor that can contribute to degradation of some types of farming, Fort Knox typically does not negatively affect farming. The larger issue is the subdividing and residential development of lands formally used for agriculture. As was previously laid out, the parcel count in the buffer zones has increased over the past several years. This is due to the creation of new residential subdivisions which are an issue with respect to compatible use. In an attempt to prevent this there are several programs that work at maintaining agricultural lands while still ensuring the owners are able to extract their investment.

Programs such as Purchase of Agricultural Conservation Easement (PACE) and Army Compatible Use Buffer (ACUB) will be addressed in Section IV, Compatibility Mitigation Tools.



Figure 46 Tobacco in field. Source: LTADD file photo, 2013.



MAP 41 - AGRICULTURAL LANDS

Air and Water Quality

Air quality and water quality are terms describing the standard expectations of the air and water used by humans to protect human health and public welfare. It relates to the level of pollutants in the air and the water the community uses daily. When the air or water is overrun with pollutants, it can be considered low quality. There are many reasons why both Fort Knox and the surrounding communities would strive for high standards of air and water quality. It can affect human health in a number of ways, including asthma, emphysema, chronic bronchitis, or damaged airways all from poor air quality and gastro-intestinal illness, eye infections, and increased cancer risks from poor water quality. The potential to affect things other than human health includes threatening recreational and fishing waters, or affecting crop production.¹²⁹ Thus, air and water quality standards are important for a community, both for physical health and the health of the environment. In the study area, the combination of the military operations and the growth of the outside community can complicate the ability to maintain air and water quality.

The installation and the communities have a level of legal responsibility to strive for high standards of air and water quality. There are two main pieces of legislation that establish this; the Clean Air Act and the Clean Water Act. The Clean Air Act is another federal law, passed in 1970, that regulates air emissions from stationary and mobile sources. It monitors the number of pollutants dispersed in the air and also sets air quality standards for the country.¹³⁰ The Clean Water Act was a federal law passed in 1972 that sets the standard for regulating how pollutants are discharged into waters in the United States. The law provided guidance for pollution control standards for wastewater and pollutant discharge and also set recommendations for water quality

criteria.¹³¹ These standards, administered by the Environmental Protection Agency (EPA), are aimed at protecting air and water quality that will affect community development and operations.

Meanwhile, the post has the responsibility to follow the regulations of the Clean Air Act and Clean Water Act. According to the U.S. Army's Environmental Protection and Enhancement plan, army installations will: *"...comply with all legally applicable and appropriate Federal, state, and local air quality control regulations."*¹³² and *"...comply with legally applicable and appropriate Federal, state, and local regulations regarding water resources management."*¹³³ The creates the legal standard, along with the duty to public health, and preservation of the ecosystem apply to the communities and the installation.

There are several activities the outside community and the installation do that will affect the air and water quality of the other. They include, but are not limited to, transportation activities, landfills, herbicide/pesticide application, ammunition exercises, wastewater treatment, animal waste being left, yard clippings disbursement, open detonations, open burnings, littering, ozone depleting chemicals use, and external combustion. Some of these activities are done by both groups, some are done solely by the external community, and some are done solely by the installation.

The focus for Fort Knox and the surrounding community is to limit the harm done by poor air and water quality by closely follow standards and guidance issued by the EPA and the Kentucky Energy and Environment Cabinet (EEC). These agencies establish the levels of pollutants allowed to be dispersed and enforce regulations that are enacted to protect air and water quality.

Urban Heat Issues

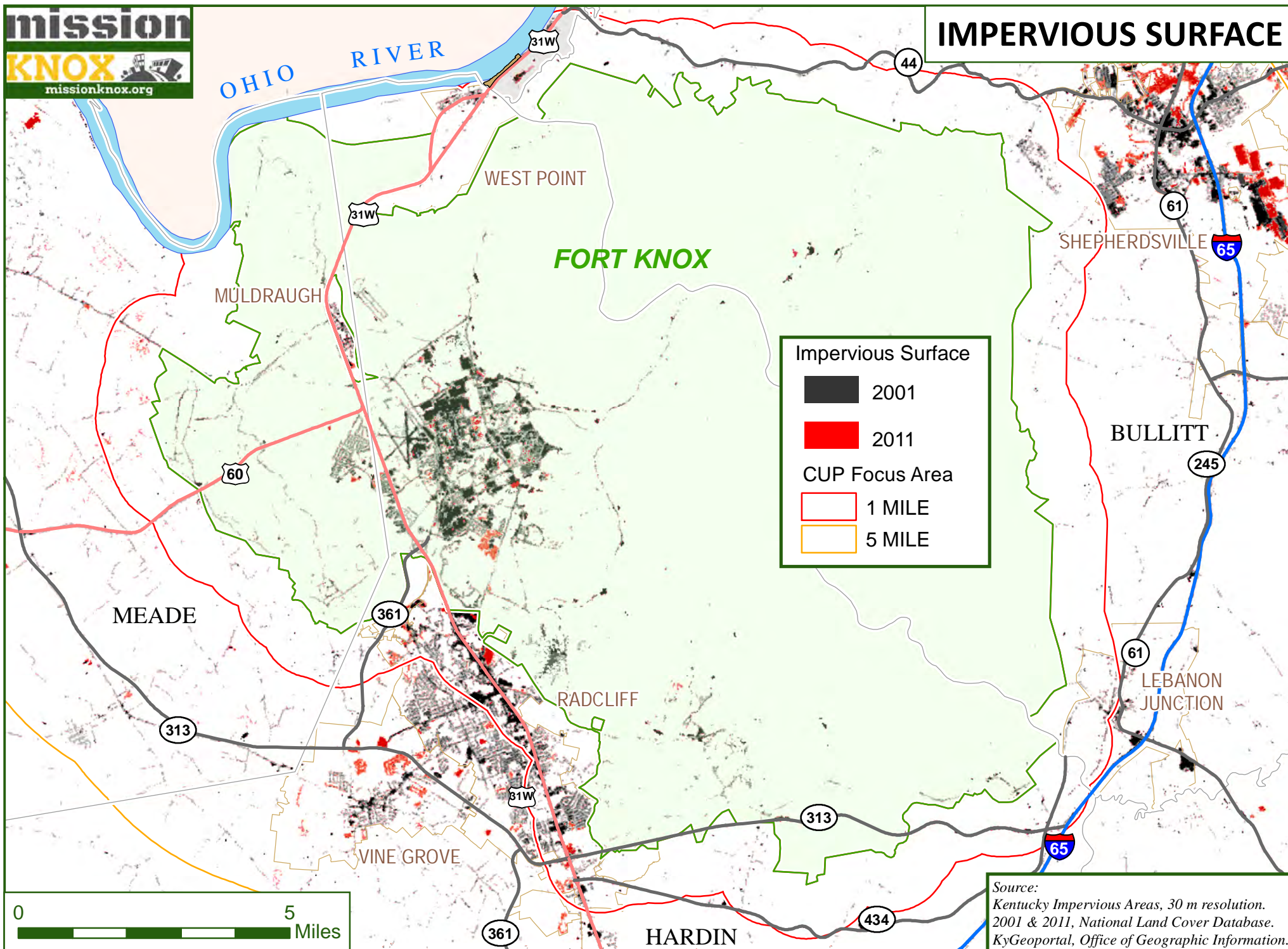
Urban heat, commonly referred to as heat islands, is urban areas with temperature significantly higher than rural areas nearby. This increased heat is due to buildings, roads, and other urban infrastructure that absorb and re-emit the radiation from the sun more than natural features such as trees and grass.¹³⁴

With additional urban growth comes the destruction of features that reduce heat in an area. In nearby Louisville, parts of the city are so affected by urban heat that temperatures often reach 10 degrees warmer than other parts of the city.¹³⁵

There are numerous results that occur on the urban area and on the neighboring places. These include increased energy consumption and cost, elevated air pollutant levels from energy creation, detriments to human health and comfort, and decreased water quality by increased temperature of stormwater runoff.¹³⁶

The threats of urban heat looms over the Fort Knox installation as the outside community continues to develop to expand. As communities transition from rural to urban, the potential for urban heat grows in concurrence. If these communities replace trees and grassy areas with pavement and buildings, they face the possibility of increased temperatures like Louisville and other large urban areas. The effects of this may not be limited to the communities surrounding Fort Knox, the installation itself may see some consequences of the growth. This includes overflow of the heat in the surrounding urban areas to the detriment of the individuals on the installation, pollutants that find their way from the heat island sources, and the effect of increased energy cost.

Map 42 illustrates the issue via growth of impervious surfaces. Images from the National Land Cover Database compare the amount of impervious surface change between the years 2001 and 2011. This growth is easily visible even with the 30 m resolution of the product.



MAP 42 - IMPERVIOUS SURFACE

Infrastructure

The availability of a highly developed infrastructure is key to attracting and maintaining a vibrant and growing community. Fort Knox in turn requires the same. Transportation networks, good and plentiful water and energy, and a nice place for families to live and enjoy themselves. As with many other factors this leads to potential conflicts. The balance of these features need to be maintained with a focus to location. New or improved roads create development, development creates housing, water, sewer, and energy demands.

Water/Sewer

Kentucky is blessed with numerous sources of fresh water, with more miles of running water than any state except Alaska.¹³⁷ The limestone topography creates numerous aquifers that can also serve as water sources. Approximately 95% of Kentuckians have access to public drinking water.¹³⁸ In the 1990's Kentucky passed several laws to assist in the development of systems to provide drinking water to all its citizens. The four-county study area is covered by 16 separate water utilities. Some of these cross-county boundaries. Within the five-mile buffer zone, eleven of these systems provide service to some portion. Fort Knox's system is currently managed by Hardin County Water District #1. See Table 20.

Table 20 Water Utilities

STUDY AREA WATER UTILITIES						
	Households Served				Buffer	
	Bullitt	Hardin	Meade	Nelson	1 Mile	5 Mile
Lebanon Junction	922			10	X	X
Louisville Water Company	18,375			1	X	X
Hardin County Water District #1		11,139	227		X	X
Fort Knox	3	1,715	1,230			
Hardin County Water District #2		27,277			X	X
Vine Grove Water Dept.		1,852				X
West Point Water Dept.		473			X	
Doe Valley Utilities Inc.			796			X
Meade County Water District		14	3,211		X	X
Muldraugh Water			537		X	
Bardstown Municipal Water Dept.		157		10,519		X

Source: Kentucky Infrastructure Authority, WRIS Portal

Sewer is primarily provided in the incorporated cities of the study area. With a few package plants serving individual facilities such as schools or mobile home parks in the unincorporated parts of the counties. Standalone septic systems provide disposal for the remainder of the residents or commercial enterprises. See Table 21.

Residential and commercial development require access to water and waste treatment. Expansion of systems is usually costly and is done only on planned areas and typically not undertaken on spec by the systems themselves. Hookups along existing lines, however, are common as it increases customer base for basically no cost. The minimum lot size for septic can provide some resistance to denser development. Long stretches of water lines to serve a few customers can be expensive and costs are not typically recouped, but they do occur via low interest loan and grant programs thus can create further development in rural areas that otherwise might not happen. The situation of taxpayer dollars subsidizing improvements that increase

privately owned land value which is then sub-divided is of concern and an issue to be considered.

Table 21 Sewer Utilities

STUDY AREA SEWER UTILITIES					
	Households Served			Buffer	
	Bullitt**	Hardin	Meade	1 Mile	5 Mile
City of Lebanon Junction	705			X	X
City of Shepherdsville	5,470			X	X
City of Elizabethtown		13152		X	X
Fort Knox*					
Hardin County Water District #1 (Radcliff)		10,061		X	X
City of Vine Grove		2,088	2		X
City of West Point		445		X	
Doe Valley Association Inc.			813		X
City of Muldraugh			532	X	

Source: Kentucky Infrastructure Authority, WRIS Portal

*No data available. Can be presumed to approximate water system to slightly fewer.

Fort Knox Wastewater Treatment Plant processes waste for the City of Muldraugh's collection system.

** There are two additional package plants that serve small mobile home parks in the 5 mile buffer area.

Transportation

In the Regional and Community Profiles, Section I, several roadway improvements were highlighted that were important for the viability of Fort Knox. They can, however, also create encroachment issues as land is opened up for development due to improved access. It is very important for local communities to consider the types and densities of development that may be allowed in certain areas along these major routes in the vicinity of Fort Knox.

Examples of these efforts include the KY 313 Corridor along the southern boundary of Fort Knox. By limiting the size of residential parcels, it helped to restrict residential development. This strategy has been effective as the current average parcel size in the corridor is 10.823 acres.¹³⁹ This is a great example of cooperation between local

government entities and Fort Knox to help protect the training capacity on Fort Knox while protecting local property owners from noise and other impacts that result from military training.

An additional example is in Bullitt County, where a portion of KY 245 has recently seen some local government influence. In April of 2021, Bullitt County Planning and Zoning implemented a tourism district on this segment of KY 245 which was established “...to provide areas in which the principal use of land is devoted to commercial establishments and resort and recreational areas which cater specifically to the needs of tourist-oriented trade.”¹⁴⁰ This section of roadway has an AADT volume between 10,000-15,000 vehicles.¹⁴¹ It provides direct access from the City of Bardstown to I-65 and is along the route of the Kentucky Bourbon Trail. Permitted uses within this newly designated district were established to ensure that development fit harmoniously and are compatible, with inappropriate intrusion minimized. Included are new agricultural-tourism zoning classifications. This will likely reduce residential development within this portion of the study area. Additionally, the current KYTC *Six-Year Plan* has included construction funds to widen a two-mile portion of KY 245. This widening is scheduled to being in 2022 and extends westerly from the I-65 interchange, Exit 112. Research on reducing access points along this corridor to reduce congestion are also be considered.

Many areas of concern were addressed in Section I that involve growth around new and existing roadways. These include potential for residential development along KY 361 and KY 313, near the post. US 60 and KY 1882 in Meade County. The new Exit 114 in Bullitt County while intended to promote industrial growth such as warehousing related to logistics has potential to encourage additional residential development in the one-mile buffer. Any dense residential developments in these

areas can also defeat the original intent of some of these roadways. To bypass existing congestion and promote overall better access.

It will be crucial for other local governments to consider similar types of policies to help protect the integrity of Fort Knox as well as landowners within the one-mile boundary of the reservation.

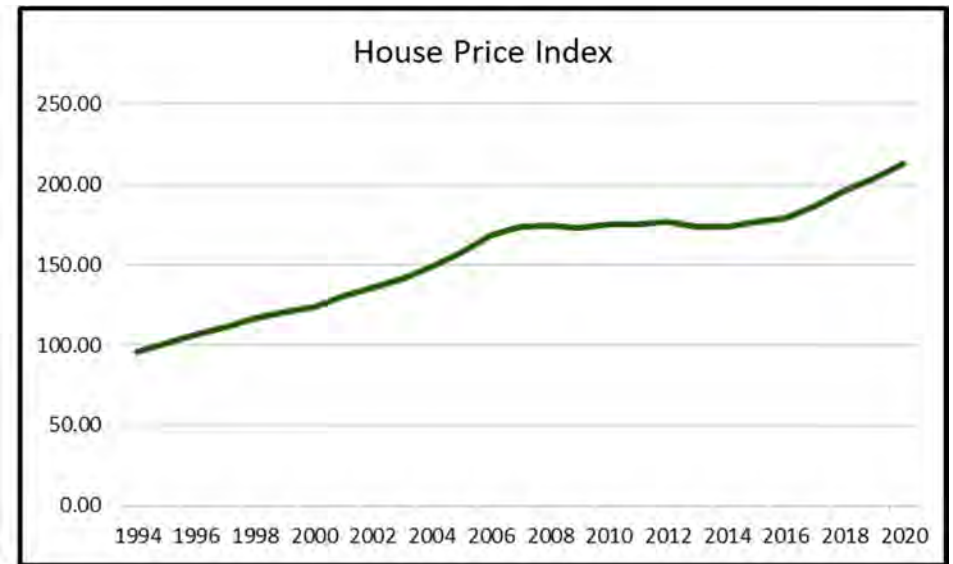
Housing

The availability of affordable housing is an ongoing concern anywhere. The Fort Knox region has its own set of unique issues. Housing for permanent residents and a large transient population create a set of problems as the requirements for each may conflict with the other. Home prices have continued to rise. More recently spurred on by a combination of demand, raw materials, uncertainties of the COVID-19 pandemic, and record low interest rates. Chart 16 shows the price index for the Elizabethtown-Fort Knox MSA over the past 16 years. A steady rise has made housing cost grow in excess of normal inflation.

Housing on the installation is privately owned and managed. There have been several new housing units built. There are currently over 2,300 homes on post.¹⁴² This does not include the barracks areas for single soldiers. Currently approximately \$80 million is being used build another 60 new units and numerous renovations to existing homes.¹⁴³

Section I illustrated the eb and flow of the new housing in the study area. While the need exists for housing, that must be tempered by the type and location where it is constructed.

Chart 16 House Price Index



U.S. Federal Housing Finance Agency. 1995 Q1 = 100.

While the need exists for housing exists, there are several compatibility issues associated with the need when housing outside of the installation comes into place. When private developers bring in housing closer to the installation, personnel who work at Fort Knox can utilize these houses. At the same time, the public who does not work on the installation may be eligible for this housing. There will be completion for these houses that the military personnel may not be able to compete for. Meanwhile as the public inches closer in these homes the military operations may be compromised by having to move certain operations and monitor nearby public activity. Fort Knox should continue to support development of housing on the installation for soldiers and continue to work with their neighboring communities to monitor any housing development near its borders.

Electric Grid / Energy

Background

Alternative energy, or renewable energy, are energy sources that are naturally replenishing and virtually inexhaustible, but are limited in the amount of energy that is available per unit of time. The common alternative energy sources are biomass (including wood, municipal waste, and ethanol), hydropower, geothermal, wind, and solar. In 2020, 12% of energy consumed in the United States was sourced by renewable methods. In 2000, this figure was only 6.2%, and while the number was at 6.5% in 1975, it included virtually zero solar, wind, geothermal, and biomass sources other than wood.¹⁴⁴

The state of Kentucky's use of renewable sources trails that of the rest of the country. In 2019, only around 6.2% of Kentucky's energy consumption was fueled by renewable sources, and less than 0.3% of that was renewable sources other than biofuel and hydropower.¹⁴⁵ While the state does not have a large presence of renewable resources, it is ripe for increased renewable output; this is based on the state's natural landscape, the ongoing need for energy security, and the ongoing push to reduce greenhouse gas emissions.

Two of the most promising renewable energy sources in the region, however, also pose a threat to the harmony of Fort Knox and the surrounding communities, solar and wind power. With any new development near the Fort Knox installation and the advancement of renewable energy as a technology and a preferred energy source, solar panels and wind turbines could become more common near the installation.

Issues

With any new development near the Fort Knox installation and the advancement of renewable energy as a technology and a preferred energy source, solar panels and wind turbines could become more common near the installation. Large scale infrastructure energy operations have the potential to negatively affect the operations of Fort Knox, including airspace issues, spectrum constraints, and safety concerns. The chief concern with solar energy on military operations is the threat of glare caused by solar panels that inhibits aircrafts operations. When positioned at the right place and at the right time, there is the possibility that a solar panel can reflect light that will adversely affects a manned aircraft. These can also conflict with any "dark skies" initiatives. Wind energy near the installation has two main issues. One is that the vertical height of wind turbines may create airspace issues; the number of and height of the wind turbines in an area can be a constraint on available airspace, leading to hazardous flying conditions. Additionally, spectrum capabilities such as radar can be hindered with the wind turbines. Weather or airfield radars require an unobstructed line of sight and wind turbines constructed in this line of sight may affect this. On-board or other weapons guidance systems may also be affected. The supporting electric transmission lines may provide additional issue as aerial obstructions. While beneficial toward conservation, street lighting and other utility energy saving programs are not necessarily aligned with dark skies policy and do not address glint and glare from residential solar arrays.

Implementation

Fort Knox has been a leader in energy conservation and has shown success at being energy independent as necessary. In October 2018

they were able to successfully test going “off the grid”. They disconnected themselves completely from all external sources of energy becoming completely energy independent while continuing to perform all their normal activities.¹⁴⁶ This didn’t occur without prior planning and efforts. Fort Knox has worked to improve energy efficiencies in equipment, construction materials, and methods for several years. They had tried and tested many types of internal energy production. This included incinerators to burn waste, wind turbine experiments, and solar panels scattered around the post on buildings and in a separate field. The solar panels which at one point could produce over 3.5 megawatts of power are part of the overall solution. Geothermal became the backbone to this effort. In 2015 it was heating and cooling over 6 million square feet of floor space across the installation. Natural Gas also became a major part of the post’s efforts to become a net zero energy user.¹⁴⁷ All these efforts have combined to Fort Knox being recognized nationally with numerous awards and accolades resulting from their focus on energy. A small recent sample include:

2020 - Energy and Water Resilience Program Effectiveness, Secretary of the Army.¹⁴⁸

2020 – Project Award, Federal Energy Management Awards, U.S. Department of Energy.¹⁴⁹

2019 - Energy and Water Resilience and Individual Exceptional Performance, Secretary of the Army.¹⁵⁰

2019 - Better Buildings Interior Lighting Campaign, U.S. Department of Energy.¹⁵¹

Numbers from 2015 illustrate the levels of success. 570 miles of geothermal piping tied to 6,000 geothermal wells on post, a 10-acre

solar array, in excess of \$18 million in annual savings, and a 57% savings in energy consumption.¹⁵²

Figure 47 Solar Panel Array at Fort Knox. Photo Credit: U.S. Army.



Creating the necessary infrastructure.

There have also been successful energy stories off post. The Hardin County Landfill has had success with energy through a gas plant built onsite. Map 43. In 2005 East Kentucky Power Cooperative (EKPC) started construction on the plant which produces electricity from the methane created by the decaying trash. Working in cooperation with Nolin RECC, EKPC’s plant consisted of three generators producing about 2.4 megawatts of power.¹⁵³ In 2012 the County netted approximately \$140,000 of the \$176,000 generated from the carbon credits program over a three-quarter period.¹⁵⁴



Figure 48 Pearl Hollow Landfill Entrance. Photo Credit: Hardin County Fiscal Court.

Issue in surrounding region involving LG&E pipeline expansion subject to lawsuits, solar field projects also have been sued, issues with the necessary zoning changes.

Future Considerations

Recent interest in expansion of gas service in areas of Bullitt County and solar fields in Hardin County have raised compatibility concerns in this area.

In Bullitt County the extension of a Louisville Gas and Electric (LG&E) natural gas pipeline between US 31E and I-65 near the new exit 114 interchange has been proposed and challenged in the courts. Map 43. The proposed 12-mile pipeline, expected to cost \$74 million, would provide additional capacity to serve both industrial and residential customers in the area. It would cross several private properties

including lands owned by Bernheim Arboretum and Research Forest. This is being done via condemnation lawsuits that remain ongoing.¹⁵⁵ Growth in the area could occur as a result of this project, determination of the type of growth thus compatibility is an area to keep in focus.

In Hardin County, LG&E has proposed what would be the largest solar project in Kentucky. A 100-megawatt plant near Cecilia was originally planned to come online before 2024.¹⁵⁶ This project is located just outside the ten-mile buffer of the study area. See Map 44. It has become an issue locally with some local neighbor opposition. The requirements for rezoning and conditional use permitting process became a judicial issue.¹⁵⁷ There are currently 12 active solar projects in the region, two in Bullitt and ten in Hardin County.¹⁵⁸ Solar field projects have become contentious statewide, mainly due to concerns of losing agricultural lands. In February 2021 a bill was filled in the state legislature that could ban large-scale solar projects.¹⁵⁹ It would allow local governments to prohibit construction of solar arrays on farmland and further regulate some other farmland preservation programs to restrict solar arrays. Senate Bill 266 was introduced in committee but proceeded no further during the session.¹⁶⁰

The ongoing demand for energy will continue to play a role in the region. The need for continued and enhanced communication would be beneficial to all. To completely restrict the development of solar and wind energy capabilities in the Fort Knox area would be too great a constraint on external development. Businesses and residents may want the benefits associated with these sources thus limitations imposed by the base may cause tensions. Eliminating the possibility of renewable energy development could hinder economic and community growth for the area.

NOTE: Spatial Accuracy of this data is not valid for large scale mapping. Most is based on dated sources and at scales of 1:24,000 or smaller.

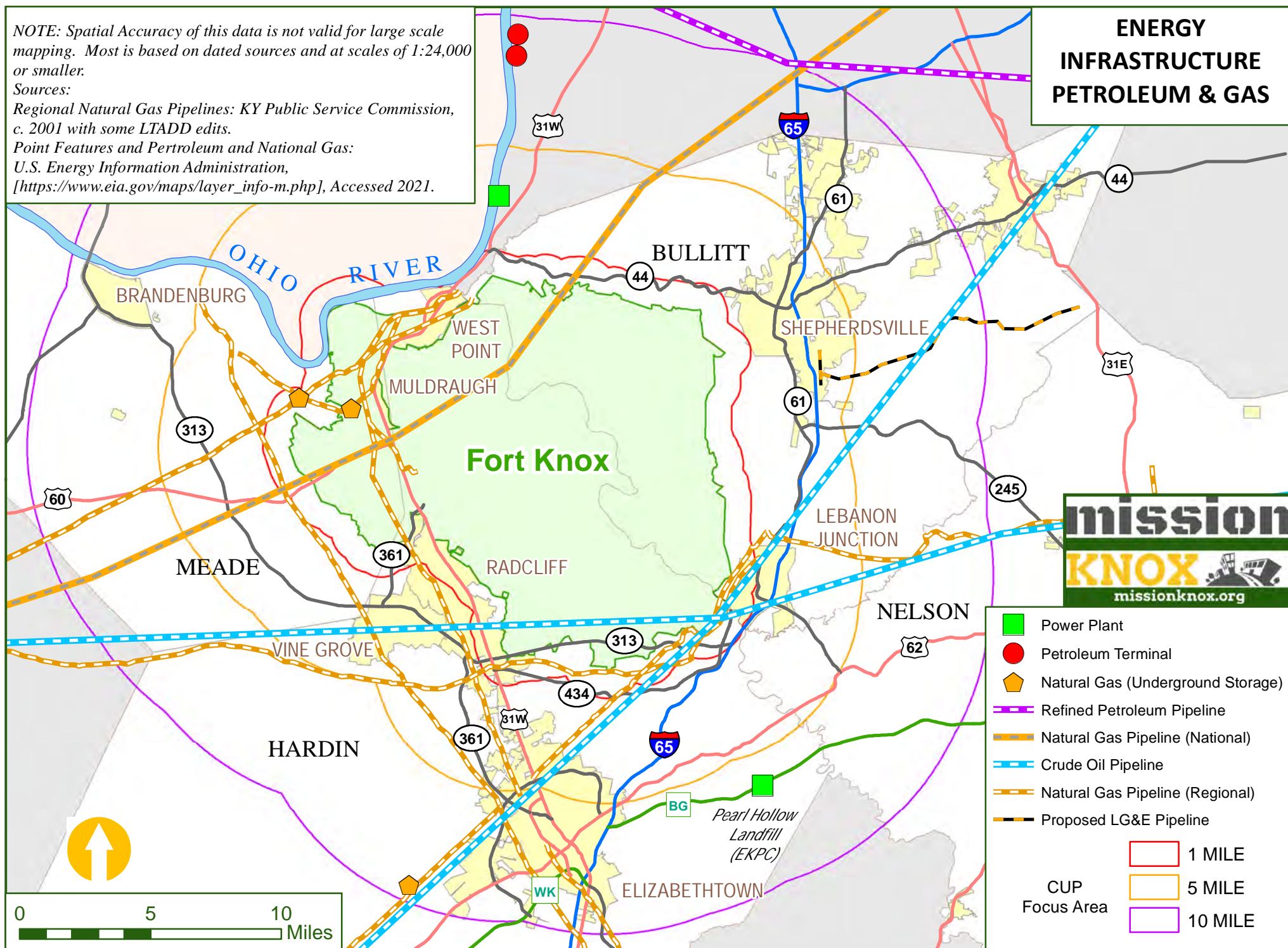
Sources:

Regional Natural Gas Pipelines: KY Public Service Commission, c. 2001 with some LTADD edits.

Point Features and Petroleum and National Gas:

U.S. Energy Information Administration, [https://www.eia.gov/maps/layer_info-m.php], Accessed 2021.

ENERGY INFRASTRUCTURE PETROLEUM & GAS



MAP 43 - ENERGY INFRASTRUCTURE - PETROLEUM & GAS

NOTE: Spatial Accuracy of this data is not valid for large scale mapping. Most is based on dated sources and at scales of 1:24,000 or smaller.

Sources:

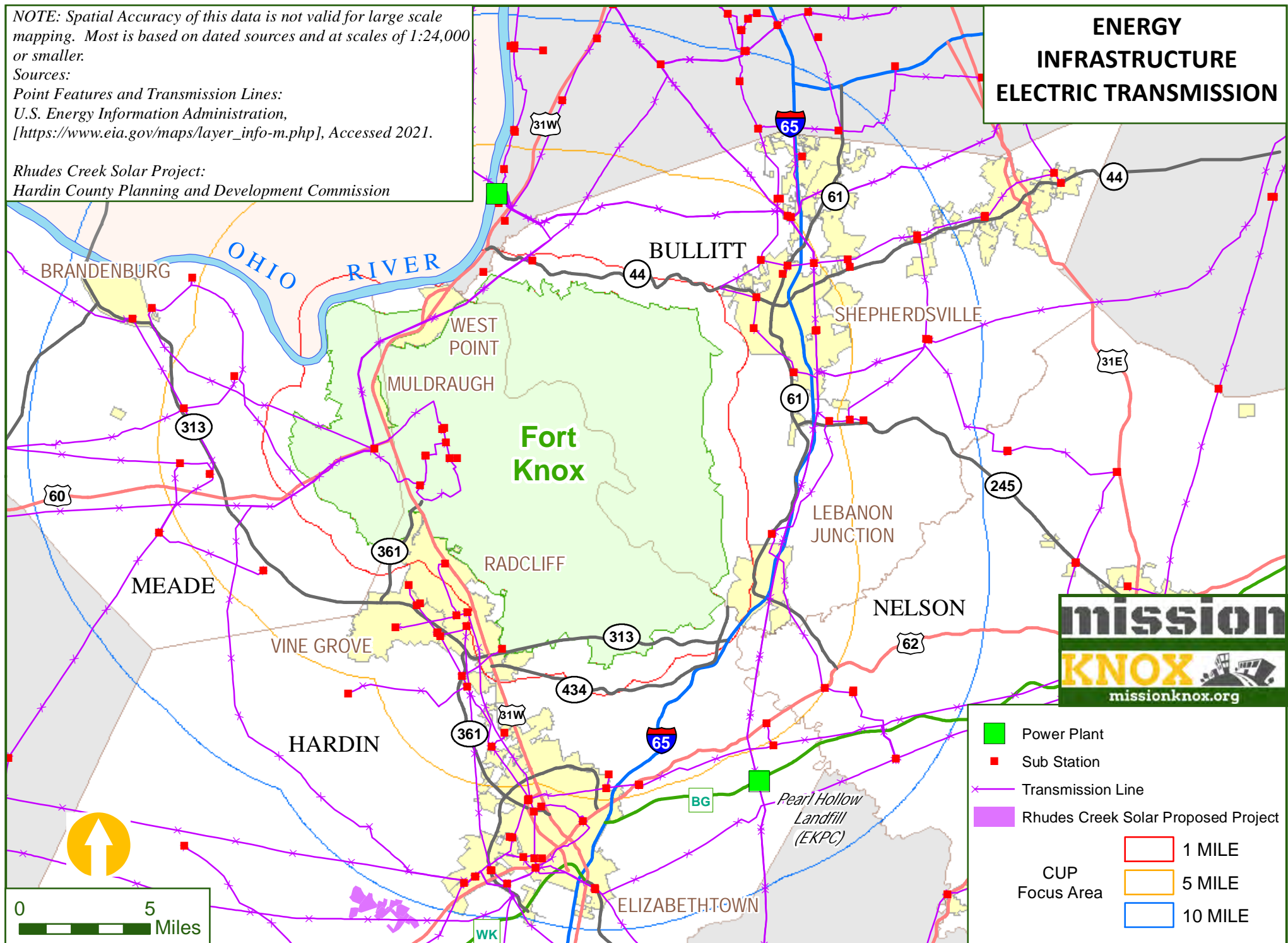
Point Features and Transmission Lines:

U.S. Energy Information Administration,
[https://www.eia.gov/maps/layer_info-m.php], Accessed 2021.

Rhodes Creek Solar Project:

Hardin County Planning and Development Commission

ENERGY INFRASTRUCTURE ELECTRIC TRANSMISSION



MAP 44 - ENERGY INFRASTRUCTURE - ELECTRIC TRANSMISSION

Workforce / Labor Pool

Highlighted in Section II, Fort Knox has an enormous economic impact to the region. The availability of the workforce with the appropriate skill set is crucial to the continuation of current and future missions. The study area has a long history of growth and with current change dynamics on how work is completed places stress on the continued availability of this workforce.

The Elizabethtown-Ft. Knox MSA was recognized as No. 5 in the nation for Small Cities annual growth in business services jobs in NewGeography's 2016 report.¹⁶¹ Placing 7th on the *All Cities* list in the same study. The region continues to adapt to the fluctuation in personnel, both military and civilian, at Fort Knox. The post continues to bring in small to medium-sized military units that help alleviate reductions from the past due to downsizing events such as BRAC. The most recent notable addition was in 2020 with the activation of V Corps. This brought 635 soldiers and their dependents to Fort Knox. Additional surges include the Army Cadet training for future officers which takes place on post during the summer months. This same timeframe also finds a major portion of ROTC training occurring on the installation. These incremental military increases also have brought additional civilian personnel as well boosting other sectors such as retail trade, accommodations and food services, and real estate. One result of this activity is the increased number of military spouses coming to the area. While providing an increased labor force with varied experience for business and industry to recruit from, the connection of this individual with the jobs has proven challenging. The region has been proactive in dealing with the various shortages and

demands that are thus placed on the workforce. Three programs in particular highlight ongoing efforts for both Fort Knox and the region.

Sector Training Focus

Currently there are 250+ open positions and job seekers in the Fort Knox local market do not possess the necessary coding skills and certifications. Thus, there are cases where defense contractors are forced to fly people in during the work week. This hurts the region's growth potential and more importantly the stability of the installation.



Figure 49 Greater Knox Coding Academy Lab, Photo Credit: The News-Enterprise

The Greater Knox Coding Academy was initiated as a pilot program operated by Elizabethtown Community and Technical College (ECTC) in January 2020 through a Statewide Reserve Grant administered by the Lincoln Trail Workforce Development Board (LTWDB). The Coding

Academy was designed to support the civilian workforce shortages in the IT field at Ft. Knox. The Coding Academy allowed students to enter the job market within months through short term certifications in Java, Security+, and CompTIA A+. Per discussions with Fort Knox contractors, many of these coding positions have starting annual salaries over \$65,000. In addition to the coding instruction, all students received assistance with career readiness, resume writing, job interviewing, networking, dress for success, social media, and emotional intelligence. The subsequent positive outcomes have resulted in the program continuing to be offered and has been placed on the State Eligible Training Provider List (ETPL). Of note are several companies who have supported the program with sponsorships to assist with program operations and student fees.

The Academy's creation was a collaborative effort. Partners in this initiative included ECTC, U. S. Army, KRDA, LTWDB, Local school systems in Hardin, Meade and Nelson Counties and the Kentucky Career Center - Lincoln Trail (KCC-LT).

The Coding Academy continues to focus on filling a critical shortage of IT workforce with coding skills with the Army and its contractors. Skills for positions such as network administration, systems engineers, cyber security and developers will be offered. Training on Dot Net, Microsoft, Unix, Cloud, Salesforce are examples of additional programs that are now offered. It is anticipated that this academy will continue to expand and become a talent pipeline for not only Fort Knox, but other area businesses and become a strong economic development tool for attracting businesses to the region. Covid-19 restrictions provided a few bumps along the way during the first class, but the second class began on February 16, 2021.

Military Spouse Employment Initiatives

KRDA has worked to develop a new process to assist military spouses relocating or currently stationed at Fort Knox. KRDA, in cooperation with KCC-LT, LTWDB, and Fort Knox, has created an innovative, detailed model for employment assistance.¹⁶²

*"Statistics say that upwards of 70 percent of job opportunities don't come from a job board but rather from professional relationships that military spouses, being new to the community, typically don't have," said KRDA CEO Brig. Gen. Retired Jim Iacocca. "We are tapping into our caring, supportive community to help our military spouses connect with organizations and people who may open the door to a new employment opportunity. As expected, the community response was immediate and overwhelming and we couldn't be more grateful."*¹⁶³



Figure 50 Spouse Career Fair, Photo Credit: Lance Cpl. Jackeline M. Perez Rivera/Marine Corps

The KCC-LT manages the three-step process featured on the new Greater Fort Knox website: greaterfortknox.com. Beginning with a short questionnaire, the information gathered helps match participants with an experienced KCC-LT professional who assists with the job search and any required training at no cost to the spouse.¹⁶⁴

“Whether it’s training, career workshops, or help finding employment, our career center team provides a one-stop shop for any employment or training needs,” per LTWDB’s Sherry Johnson. The LTWDB is the regional oversight board for the KCC-LT.¹⁶⁵

Subsequently in the process, military spouses will be matched with a community connector to help them grow their professional network. This can often open the door to new, professional opportunities. KRDA facilitated the recruitment of the volunteer community connectors who are providing this supplementary support.¹⁶⁶

Teleworking

Teleworking is a growing employment opportunity and is especially an attractive option for military spouses. The LTWDB staff is working closely with Army Community Service (ACS) and Eastern Kentucky Concentrated Employment Program (EKCEP) staff about the possibility of expanding Teleworks USA to Fort Knox.

A background from their website:

Teleworks USA is an innovative program that is bringing cutting-edge telework (work-from-home) employment opportunities to jobseekers, especially those in rural areas and small towns, allowing them to participate in the global economy without relocating.

Started as Kentucky Teleworks in 2011 by the Eastern Kentucky Concentrated Employment Program, Inc. (EKCEP) as a part of the American Recovery and Reinvestment Act (ARRA), Teleworks USA has created a virtual pipeline of employment to many communities, actively recruiting national and global companies to bring legitimate work-from-home jobs to people through a computer and Internet-driven virtual workplace.

Teleworks USA is a social-enterprise initiative of the Eastern Kentucky Concentrated Employment Program (EKCEP), Inc. (www.ekcep.org) and is a cutting-edge program that has been connecting the people of Eastern Kentucky to digital economy employment with global and national remote companies since 2015.

These efforts have resulted in more than 3,400 Eastern Kentuckians going to work for global and national remote employers and over \$76M in new wages being brought into the region.¹⁶⁷

These programs are illustrative of the continued need to develop resources and have Fort Knox and the regional communities work together.