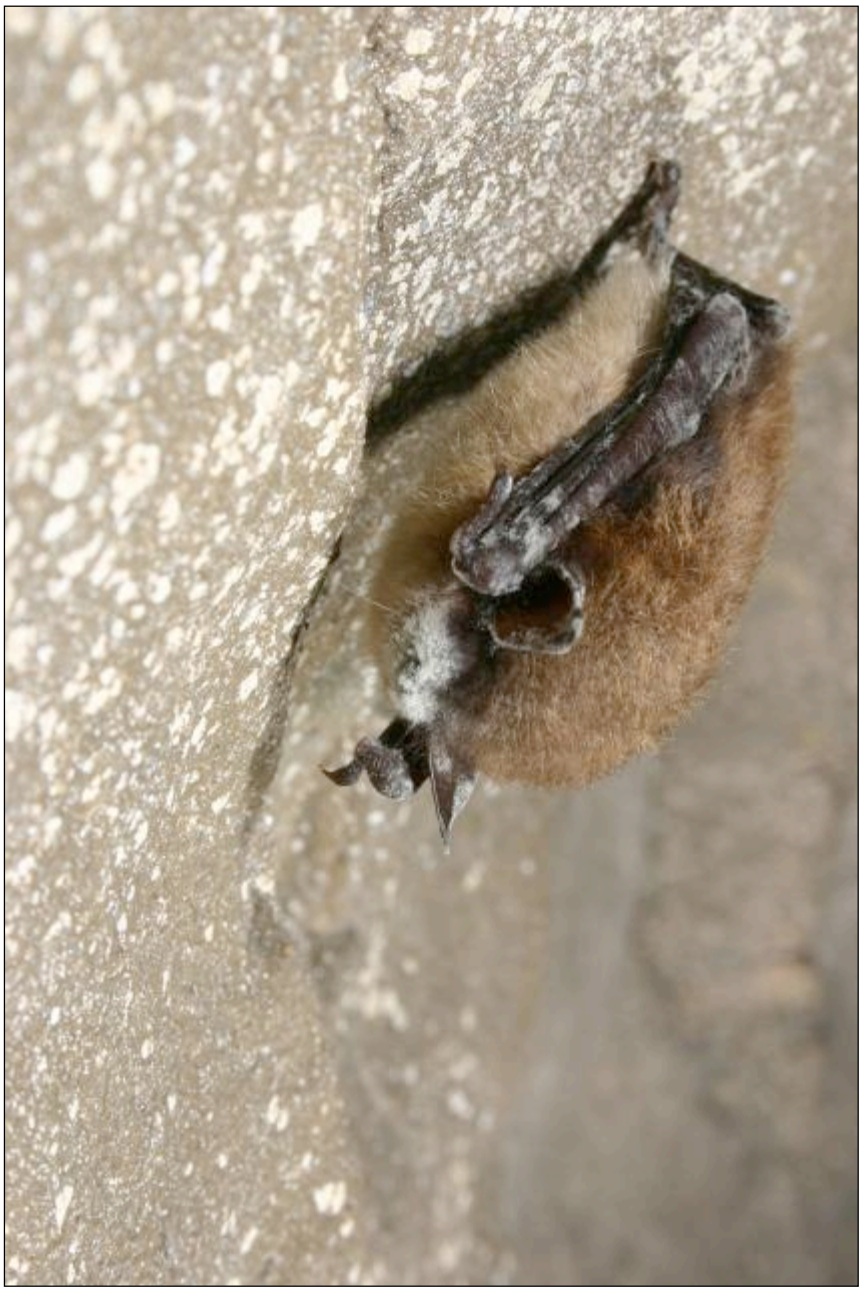
BATS, WHITE-NOSE SYNDROME, AND FEDERAL CAVE AND MINE CLOSURES



A report by the Center for Biological Diversity

January 26, 2011

Cover photo: *Little brown bat (*Myotis lucifugus*) in a New York cave, displaying characteristic fuzz of white-nose syndrome on nose and wings.*
Credit: Al Hicks, New York Dept. of Environmental Conservation

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Bats, White-nose Syndrome, and Federal Cave and Mine Closures

Delay is the deadliest form of denial.
~~C. Northcote Parkinson, British historian, 1909-1993

Executive Summary

In the span of just four winters, a deadly new disease called white-nose syndrome (WNS) that devastates bat populations has spread rapidly across the country from east to west. The bat illness was first documented in a cave in upstate New York in 2006, and as of spring 2010, the white-nose pathogen had been reported as far west as western Oklahoma (see Figure 1). In affected bat colonies, mortality rates have reached as high as 100 percent, virtually emptying caves once harboring tens of thousands of bats and leaving cave floors littered with the innumerable small bones of the dead. At least six bat species are known to be susceptible, and the fungus associated with the disease has been found on another three species. Two federally listed endangered bat species are among those affected thus far. Scientists and conservationists are gravely concerned that if current trends continue, one or more bat species could become extinct in the next couple of decades or sooner.

Biologists believe WNS is transferred primarily bat to bat, and from bat to cave or mine, where hibernating bats congregate. However, there is strong evidence that the WNS pathogen — a newly described fungus — was transported to North America via human transmission. The fungus has been identified in Europe, but does not appear to sicken bats there. It is thus believed that the fungus, *Geomyces destructans*, was introduced to North America from Europe by an unwitting caver. Fungal material appears to be easily transferred between caves via clothing, boots and other gear, suggesting that human transport may play a significant role in long-distance transmission of the disease.

Given this risk, it is critically important that human access to caves be restricted, particularly in areas where the disease is not currently known, including large areas of the western United States. Decontamination measures, while helpful, are quite painstaking and even if carried out well are not a complete guarantee that fungal material will be removed from contaminated clothing and gear. As the white-nose fungus has been consistently found in soils of WNS-infected caves, "wild" or off-trail caving (as opposed to guided tours on developed paths) tends to pose the greatest risk of fungal transport, as boots and other gear can become quite muddy.

To address the critical need for cave closures, the Center for Biological Diversity filed an Administrative Procedure Act petition in January 2010 calling for the administrative closure of all bat caves and abandoned mines on federal lands in the lower 48 states. One year later, we have surveyed all the major federal public land agencies (U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service and Bureau of Land Management) to determine the extent of WNS-related cave and mine closures across the country and found that although caves have been closed across much of the eastern United States, many areas in the West remain open.

In the eastern United States, caves and mines on national forest lands have been closed by emergency order since 2009 (Figure 2). Likewise, a number of eastern national parks have completely or partially closed their caves. Caves within the jurisdiction of the Tennessee Valley Authority are completely closed as of late 2009, and caves and mines within all national wildlife refuges nationwide have been closed since fall 2010.

In the western United States, cave closures have been far more limited. The Rocky Mountain Region of the Forest Service closed all caves and abandoned mines in 2010 in response to the western Oklahoma discovery. Several national parks have either partially or completely closed caves within their borders in response to WNS. In New Mexico, the Bureau of Land Management has recently implemented a partial closure, restricting access to approximately two dozen caves. Most western national parks with cave resources are in the process of tightening access to caves, subjecting all caves that had been previously unregulated to permitting systems. Most national park staff said few, if any, permits would be issued in the near future until more is learned about WNS.

The limited extent of closures in the West to date leaves bat caves and mines on the vast majority of federal public lands open and vulnerable to the inadvertent transmission of WNS by people. These federal jurisdictions include the remaining regions of the U.S. Forest Service in the lower 48 (Southwestern, Northern, Intermountain, Pacific Northwest and Pacific Southwest); and virtually all Bureau of Land Management lands (Figure 2). The National Park Service has kept its popular show caves open in both the East and West, and appears to have few plans to alter this approach.

Many western federal land managers are delaying action at the very time when action could be most meaningful and effective — in other words, *before* the bat disease reaches the West. Rather than delay closures of bat caves and mines until WNS is closer to, or actually documented in, western states, federal land managers must move quickly to declare closures of all bat caves and abandoned mines, allowing access only for essential scientific research and safety purposes.

Introduction

Throughout much of North America, bats are the primary consumers of night-flying insects. While scientists are only beginning to understand the importance of bats through quantitative measure, it is clear that bats provide enormous ecological benefits by eating moths, beetles and other insects whose populations would otherwise go largely unchecked. The little brown bat, a species commonly found across much of the continent and severely affected by WNS, can eat at least half its weight in insects every summer night.[1] In an agricultural region of Texas, a study found that the value of bats' pest-eating services to local farmers totaled an estimated $741,000 per year, for a crop worth $4.6 million to 6.4 million.[2] Studies of bats in the tropics have shown that bats there consume as many or more plant-eating insects as birds do, providing tremendous protective benefits to both forests and farm crops.[3]

Thus the current rapid loss of bats in North America to a newly emergent disease, known as white-nose syndrome, is deeply troubling for its potential costs and impacts to humans, as well as the threat posed to wildlife diversity and ecosystem health. Not only are entire bat species at risk, but other cave-dwelling organisms, many of them rare and little studied, may also be in jeopardy. Bats bring nourishment, through their guano and bodies, into sites where full-time cave denizens, such as springtails, millipedes, spiders and many other creatures directly or indirectly depend on the influx of organic matter bats provide.[4] Ultimately, the bat die-off precipitated by WNS could lead

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1 Kunz 1980. "Daily energy budget of free-living bats." Pp. 369-392, Proc. 5th Int. Bat Research Conf. Texas Tech. Lubbock.

2 Cleveland et al. 2006. "Economic value of the pest-control service provided by Brazilian free-tailed bats in south-central Texas." Front. Ecol. Environ. 4(5):238-243.

3 Kalka et al. 2008. "Bats limit arthropods and herbivory in a tropical forest," Science 320: 71. Williams-Guillén et al. 2008. "Bats limit insects in a Neotropical agroforestry system," Science 320:70.

4 E.g., http://www.eurekalert.org/features/kids/2010-12/uoia-biu120210.php

to the unraveling of numerous bat-dependent relationships in both the natural world and in human systems such as agriculture and forestry, the costs of which may well be an irreversible process of species extinction and economic loss.

This report is a summary of actions taken to stem the spread of WNS across North America. Specifically, the Center for Biological Diversity has examined the status of cave and mine closures on federal lands across the lower 48 states. Such closure is the prime precautionary management action against WNS recommended by the U.S. Fish and Wildlife Service and numerous biologists who have studied the bat disease. Bat-to-bat transmission of WNS is surely occurring, but scientists strongly believe that human transmission of the white-nose pathogen is also possible, and likely was the means by which the disease was introduced to this continent.[5]

In January 2010, the Center for Biological Diversity filed an Administrative Procedure Act petition calling for the administrative closure of all bat caves and abandoned mines on federal lands in the lower 48 states, as an emergency measure against the spread of WNS. Our request was made in the hopes that sweeping cave and mine closures would forestall the spread of the bat disease into new areas of the country and give scientists more time to study both the bat malady and possible treatments. One year later, we surveyed all the major federal public land agencies (U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service and Bureau of Land Management) to determine the present status of WNS-related cave and mine closures across the country.

Our aim is to reemphasize the pressing need for immediate cave and abandoned mine closures across all federal lands in both the eastern and western United States. While most eastern federal lands are now administratively closed to cave and mine access, large areas of the West remain open, making western bat populations highly vulnerable to the possible spread of WNS by people. While there is yet time to take meaningful action against this risk, federal land managers must do so, or leave bats and ecosystems unnecessarily exposed to an overwhelming threat of devastation and loss.

Methods

In December 2010 and January 2011, Center staff interviewed more than three dozen federal employees, obtaining information about cave and mine closures, or lack thereof, in all regions of the lower 48 states. We also learned about other WNS-related management actions, including decontamination requirements for cave visitors and WNS response planning. While we took note of advancing efforts to prepare for WNS on still-unaffected lands and report on some of these here, our focus remains fixed on precautionary cave and mine closure as the key action by which the advance of WNS across the country may be controlled. In the absence of effective, feasible treatments for sick bats, prevention is the best tool available — now and probably in the future — against WNS.

We present our findings in the form of a map (see Figure 2) showing areas of complete, substantial, partial and no WNS-related federal cave and mine closures. We also show our results in tabular form (see Table 1), on an agency-by-agency basis. Each federal land unit was placed in one of four categories pertaining to cave and mine closure: Complete, Substantial, Partial or None. "Complete" closures mean 100-percent restriction on all nonessential cave and mine access. Complete closures do allow authorized scientific research and emergency entry. "Substantial" closures are those in which the majority of caves, as well as mines, if present, are administratively off-limits to nonessential access. "Partial" closure indicates that a handful or small proportion of cave or mine sites within a particular jurisdiction have been selectively closed. Partial is generally

[5] Castle and Cryan 2010. "White-nose syndrome in bats: a primer for resource managers," Park Science 27: 20-25.

synonymous with what some agencies, such as Bureau of Land Management, have called "targeted" closures. If there were no WNS-associated closures in a specific federal land unit, we indicated it with the designation "None."

In accord with the way in which the different federal land agencies administer their own holdings, we adopted their regional subdivisions. Thus the U.S. Forest Service was treated at the level of Regions; the Bureau of Land Management at the level of statewide offices; and the National Park Service on a park-by-park basis. More detail on closures and other WNS-associated actions is presented in narrative fashion below.

Results

Our survey of federal land managers found that although caves and mines have been closed across the eastern United States where WNS has already taken hold, caves and mines across millions of acres of federal lands in the West, where closures could potentially prevent the spread of the disease to new areas, remain open. As of mid-January 2011, the vast majority of federal caves and abandoned mines in states east of the Mississippi River are administratively closed to nonessential human access. In the West, by contrast, only the Rocky Mountain Region of the Forest Service, taking in the states of Nebraska, Kansas, Colorado, and parts of South Dakota and Wyoming, has closed caves and abandoned mines. The only other cave closures in the West include all national wildlife refuge lands, limited closures in some national parks, a partial closure of caves on Bureau of Land Management lands in New Mexico and a couple of caves on Bureau lands in Wyoming. This leaves caves and abandoned mines open and exposed on the majority of federal lands in the West, including all remaining Bureau of Land Management lands and the balance of Forest Service lands in the West. The following discussion provides detail on closures to date.

Existing Federal Cave and Mine Closures for WNS

Most federal closures of caves and mines are still limited to the eastern United States, where WNS is already found in numerous sites, from New Hampshire to Tennessee. In the past year, a few areas of the West — largely the "eastern" zone of the West, closest to current WNS-affected sites — have also been closed to cave and mine entry.

In spring 2009, the U.S. Forest Service issued sweeping emergency-closure orders for all caves and abandoned mines in the Eastern and Southern regions (the very few exceptions for popular "show caves" are discussed in the next section). After the WNS-associated fungus was found on a bat in western Oklahoma, the Forest Service released an emergency closure order for caves and abandoned mines in the Rocky Mountain Region (Colorado, Kansas, Nebraska, and parts of South Dakota and Wyoming). After Wyoming's governor requested that all Forest Service lands in the state be made off-limits to cave recreation, the agency issued a cave and mine access ban for the remaining national forests in the western portion of Wyoming.

The U.S. Fish and Wildlife Service declared a complete ban on recreational caving and abandoned mine access in any national wildlife refuge in September 2010. This move had few actual impacts on the ground, as most refuge caves and mines were already closed to recreational access, but it was nonetheless symbolically important. The Fish and Wildlife Service is the lead agency on national WNS response and coordination, and therefore its comprehensive closure pronouncement created an example for other agencies to follow.

The Tennessee Valley Authority, a federal agency that controls cave-rich lands within its multistate service area in the Southeast, officially closed all its caves as a protective measure against WNS in November 2009.

Complete, 100-percent cave closures are in place in three national parks: Delaware Water Gap National Recreation Area, Great Smoky Mountains National Park and El Malpais National Monument. Unfortunately, the first two parks already have WNS in resident bats. Caves in another park, Ozark National Scenic Riverways, are almost entirely closed since the WNS fungus was found on five endangered gray bats there last year.[6] One show cave at Ozark remains open for twice-daily tours during the summer months.

Several other parks, not yet afflicted with WNS but with extensive cave resources, are now under a substantial ban on cave entry. These are Buffalo National River, Cumberland Gap National Historical Park and Great Basin National Park. The three interconnected show caves at the nearly bat-less Timpanogos Cave National Monument remain open, but the other caves in the park are closed to public access, earning a "substantial" closure designation from us.

The Bureau of Land Management has closed a small number of caves in the West as a precautionary measure against the spread of WNS. A recent interagency plan for WNS in the state of New Mexico (which is currently outside the zone of infection) included an initial list of about two dozen "significant" caves on Bureau land that are now closed.[7] A few bat caves in Wyoming have also been closed over the past year in response to the WNS threat.

Looking ahead, cave closures are reportedly in the works for some national parks in the West, including Craters of the Moon National Monument and Lava Beds National Monument. Forest Service sources state that they are working on broad-based emergency-closure orders for the Northern and Intermountain regions. Under the New Mexico interagency WNS plan, some caves on national forests in New Mexico may soon be administratively closed. According to Forest Service staff in the Southwest, the regional forester is not interested in pursuing a region-wide closure order and is instead leaving decision-making about cave and mine closures to individual forests. Forest Service staff gave no specific date when any of these closures would go into effect.

Several national parks, including El Malpais, Lava Beds and Craters of the Moon national monuments, have recently updated their plans under the 1988 Cave Protection Act. As part of these plans, El Malpais issued a complete closure of all caves, Lava Beds instituted year-round closure of more than a dozen caves, and Craters of the Moon will require permits for access to any backcountry cave. Personnel at the national monument said that, at least initially, they anticipate issuing no cave permits except for research.

Federal Lands Without WNS Cave and Mine Closures

The majority of caves and abandoned mines on western federal lands are still open for public entry, leaving bats in the West dangerously unprotected from possible human transmission of the bat disease (Figure 2). The federal agency with probably the greatest number of vulnerable bat sites is the Bureau of Land Management. Unfortunately, no state office of the Bureau has instituted complete cave and mine closures, nor do any appear to have imminent plans to do so. For the most part, not even partial closures have been executed in response to the threat of WNS. Although it is the policy of the Bureau of Land Management and other federal land agencies to strongly discourage unauthorized access into abandoned mines due primarily to human safety concerns,[8] there is no specific regulation prohibiting public access into abandoned mines.

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[6] The first incident of the white-nose fungus found on gray bats.

[7] http://www.blm.gov/pgdata/etc/medialib/blm/nm/programs/wildlife/white-nose_syndrome.Par.78519.File.dat/Final_NM_Interagency_wns_ResponsePlan_05Nov2010_wAppendices.pdf

[8] http://www.blm.gov/wo/st/en/prog/more/Abandoned_Mine_Lands/Safety_Education/stay_out-stay_alive.html

The Forest Service's Southwestern, Intermountain, Northern, Pacific Southwest and Pacific Northwest regions, unlike the other three, more easterly Forest Service regions, have not declared emergency closures for WNS. No caves or other bat sites have been specifically closed for WNS in these western regions to date.

A small number of show caves remain open for tours on Forest Service land in the three, otherwise completely closed Forest Service regions. These sites are so few relative to the number of caves and mines now closed in these regions, and the risk of WNS transmittal relatively low in these caves, that we decided a "complete" closure designation was the most accurate and fair representation of closure status in these jurisdictions.

Show caves remain open at most national parks, including at Carlsbad Caverns National Park, Mammoth Cave National Park, Jewel Cave National Monument, and Wind Cave National Park. Most of these parks do not appear to be planning complete closure, even if WNS moves closer.

Discussion

The extent of federal cave and mine closures has grown since the Center for Biological Diversity filed its federal petition a year ago, but not enough. New closures in the Rocky Mountain Region of the Forest Service, on additional western Park Service units, and at few sites administered by the Bureau of Land Management are important steps in the right direction, but far too many western caves and mines are still open to public entry at this crucial time, before WNS has moved into the West.

The general pattern of cave and mine closure response remains too slow and reactionary, with land managers waiting to act until evidence of the bat disease appears in a new, closer location. This is demonstrated not only by the fact that the majority of western federal caves and mines are still open, but also by the dearth of definite timelines for substantive action, whether closures, decontamination requirements or WNS response planning. Despite the fact that the main threat of human transmission of WNS is transport of the disease into entirely new regions of the country, distant from current sites, land managers still act as if distance is protective, which is not the case.

Only last year, the white-nose fungus apparently jumped 900 miles westward from the westernmost site known in 2009. Hibernating bat species, which are the type of bat infected by WNS thus far, do not move anywhere approaching this kind of distance. While no one will probably ever know for sure how this and other leaps of WNS occurred, in the face of such an overwhelming threat to our native wildlife, we assert that the precautionary principle must rule. If WNS can jump 900 miles in 2010, it could possibly jump that far, or farther, in 2011. The WNS fungus could easily show up in West Coast states.

Targeted, or Partial, Closures Are Inadequate

Targeted closures, as have been recommended by the national office of the Bureau of Land Management in formal guidance[9] to its field offices, are not sufficiently protective for vulnerable bats. This is primarily because by definition, targeted or partial closures leave many bat sites still open and exposed to potential WNS transmission by people. Further, bats occupy many more sites in the West than the relatively few, large, significant locations presently documented and under consideration for the partial-closure approach. The majority of caves and abandoned mines in the

[9] Instruction Memorandum No. 2010-181, 8/19/10, U.S. Dept. of Int. Bureau of Land Management, from Asst. Director, Renewable Resources and Planning, Subject: White-nose Syndrome.

western United States individually host only small numbers of bats, but because bats intermingle with each other when not in hibernacula — and also may shift from site to site from year to year, or within the period of a single year — even smaller bat sites are crucial to protect.

In addition to being more protective for bats, complete closures of caves and mines will discourage movement of cave and mine recreation from "closed" regions to still "open" ones. The public message is straightforward, and federal land managers appropriately convey the urgency of preventing the human spread of WNS into *any* caves or mines, whether they host large or small bat colonies.

Show Caves: High Risk or Low Risk?

Most show caves on eastern federal lands remain open, and it appears the intention of the National Park Service, along with the Forest Service, which operates a handful of show caves, to allow continued public visitation to these popular attractions, whether in the East or West. On the face of it, especially with the high volume of visitation most of these attractions receive, the agencies' failure to close show caves is troubling. National parks, in particular, may be significant contributors to local and regional economies, and we are concerned that in some cases politics more than biology is directing show-cave decisions.

Rather than shutter these popular sites, most national parks with show caves have instituted screening and decontamination procedures for cave tour participants, or are in the process of establishing such practices for next summer. These actions, combined with the facts that most national park show caves harbor few bats, and most show cave visitors are not hard-core cavers, probably reduces the risk of WNS transmission to a significant extent. However, we do believe that the sheer volume of visitors presents its own risk factor, and visitors cannot be entirely relied upon during the screening process to offer accurate information about whether their shoes have been worn in any other cave, etc.

Thus, we urge the National Park Service to enact closures of show caves in parks where bats are abundant (e.g. Mammoth Cave National Park) or federally listed bat species are present (e.g., gray bats in Ozark National Scenic Riverways). We would also like to see some studies conducted on the efficacy of the screening and decontamination procedures used at national parks, so that the degree of WNS protection afforded by them is better quantified, and can be more objectively considered in show-cave management and closure policy.

A few national park caves that are still open for visitation cause us particular concern. Carlsbad Caverns, which has close to 800,000 Brazilian free-tailed bats and 16 other bat species, but no hibernacula, has nine backcountry caves for which access has traditionally been granted by permit. All but one is still open since the appearance of WNS in North America. While the caves at Carlsbad, located in southern New Mexico, are too warm for bats to hibernate in during winter, it is unknown whether hibernating species that roost in the park may still be susceptible to the WNS fungus if it is introduced there.

Jewel Cave National Monument in South Dakota, which has some important bat resources, has no plans to close the cave to tours, even if WNS shows up in the state. While the entrance for most visitors is located far from the natural cave entrance, which is the only place bats occur, we found it troubling nonetheless that the most conservative, precautionary measures are not contemplated at this time.

Many federal agencies, including the Park Service, appear to be operating on a wait-and-see basis, postponing significant restrictions on access until WNS crosses the Continental Divide or otherwise moves closer to them. As discussed elsewhere in this report, waiting for WNS to move closer

before enacting stricter cave closure measures is not an appropriate strategy for this deadly wildlife disease.

Essential Access

Even with complete closures of caves and mines, some limited access will be necessary at times, for important research purposes, or to conduct safety operations such as search and rescue operations. In our Administrative Procedure Act petition, we clearly spelled out that scientific study, especially as it concerned WNS, should continue. Nonetheless, we think federal land managers should strive to limit even these entries, and weigh the cost and benefits of WNS transmission versus the potential gain from having new information at this time.

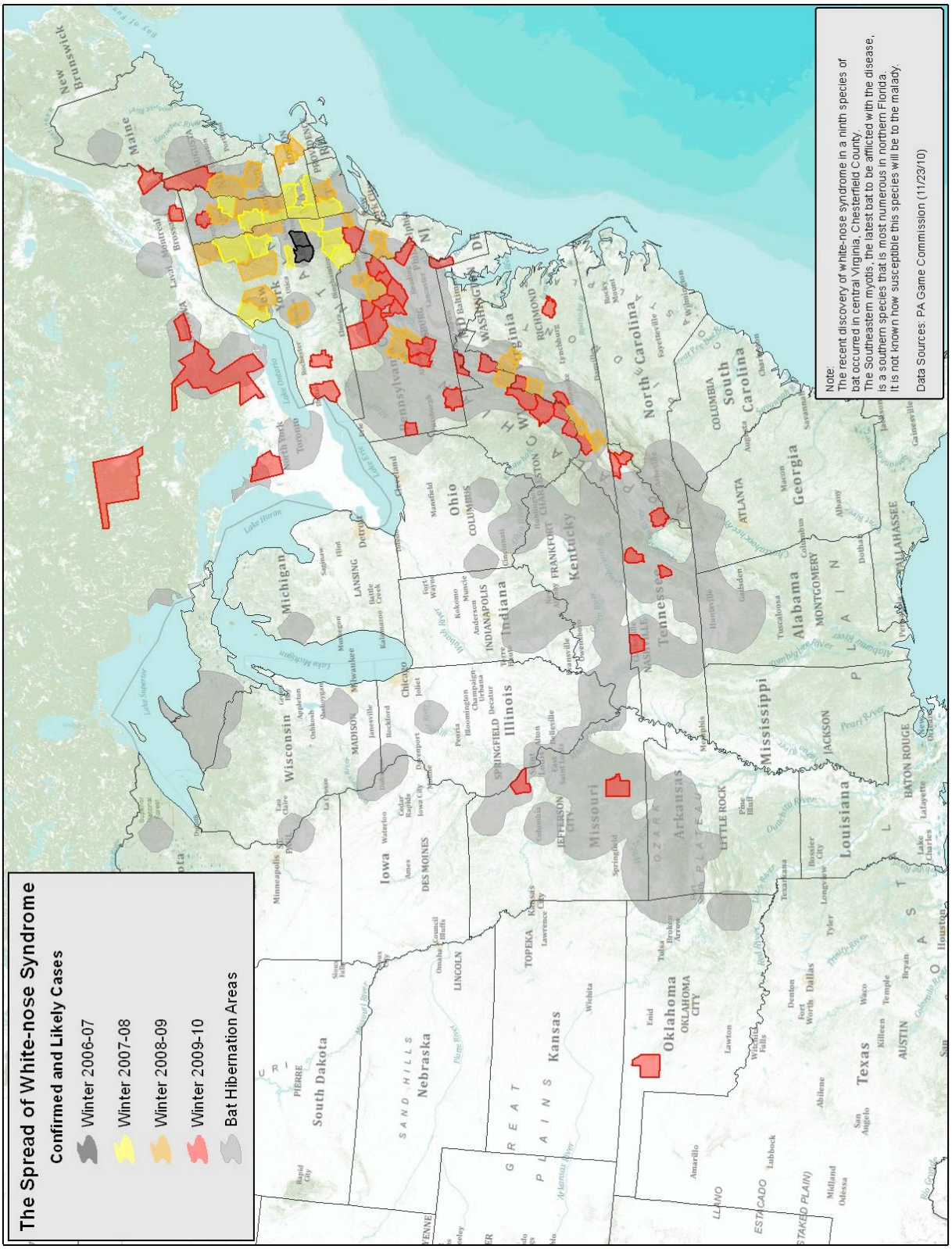
Conclusion

Complete bans on non-essential access into federal caves and abandoned mines need to be implemented immediately. Western public lands still remain largely open and vulnerable to the possibility of human transmission of the bat disease fungus. Closures should not wait on site inventories, which could drag out over years, and they should not be held hostage to caver resistance or other political pressures.

It is clear that complete cave closures for WNS are feasible because the U.S. Forest Service has already implemented them in three of its nine regions, and because the National Park Service, in particular, has long regulated cave access. We do not agree with some federal land managers who assert that the unlikelihood of total compliance is a reason to shrink from comprehensive access restrictions. WNS is a wildlife crisis of unprecedented proportions in North America, and the necessity of protecting our common wildlife heritage is a message we think will resonate with many users of public lands, even caving devotees.

There is no known way to treat white-nose syndrome. The best hope for bats is to slow the movement of the illness into new parts of the country. While we cannot stop bats from spreading the illness themselves, we can limit human access to bat caves and abandoned mines, and thereby reduce the risk of transmission by people. Right now, this is the best hope that bats have, and we need to make sure we give them full advantage of it before it is too late.

Figure 1. Map of the spread of white-nose syndrome, 2006-2010.



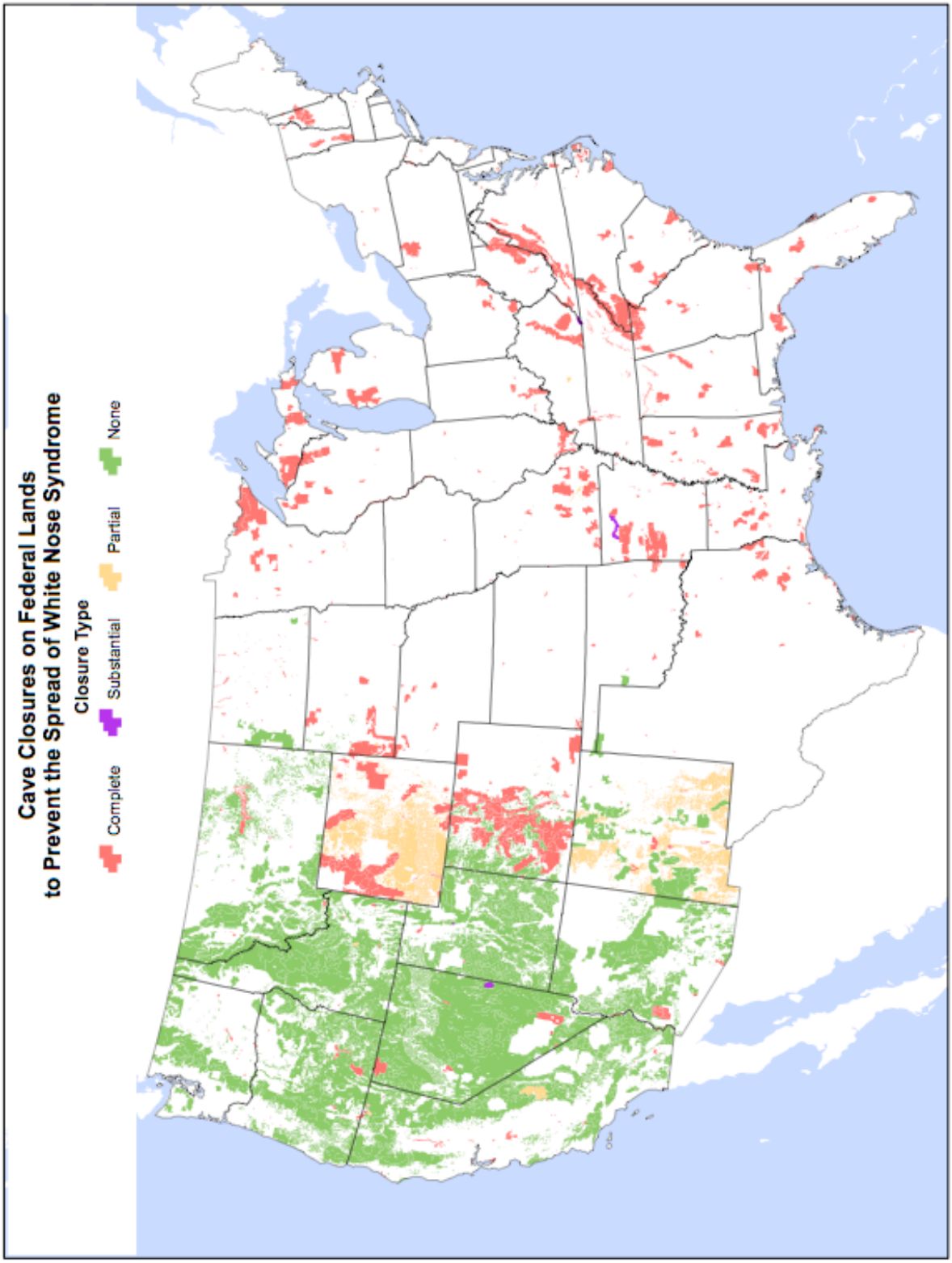


Figure 2. Map of cave and mine closures on federal lands to prevent the spread of white-nose syndrome.

Table 1: Federal Land Cave and Mine Closures for White-Nose Syndrome

Land Management Unit	Agency*	Closure Type†
Buffalo National River	NPS	Substantial
Carlsbad Caverns National Park	NPS	Partial
Craters of the Moon National Monument	NPS	Partial
Cumberland Gap National Historical Park	NPS	Substantial
Delaware Water Gap National Recreation Area	NPS	Complete
El Malpais National Monument	NPS	Complete
Great Basin National Park	NPS	Substantial
Great Smoky Mountains National Park	NPS	Complete
Jewel Cave National Monument	NPS	Partial
Lava Beds National Monument	NPS	Partial
Mammoth Cave National Park	NPS	Partial
New River Gorge National River	NPS	Complete
Oregon Caves National Monument	NPS	Partial
Ozark National Scenic Riverways	NPS	Partial
Sequoia & Kings Canyon National Park	NPS	Partial
Timpanogos Cave National Monument	NPS	Substantial
Wind Cave National Park	NPS	Partial
Eastern Region	USFS	Complete
Southern Region	USFS	Complete
Rocky Mountain Region	USFS	Complete
Southwestern Region	USFS	None
Northern Region	USFS	None
Pacific Southwest Region	USFS	None
Pacific Northwest Region	USFS	None
Intermountain Region	USFS	None
Arizona	BLM	None
California	BLM	None
Colorado	BLM	None
Idaho	BLM	None
Montana/Dakotas	BLM	None
New Mexico	BLM	Partial
Nevada	BLM	None
Oregon	BLM	None
Utah	BLM	None
Washington	BLM	None
Wyoming	BLM	Partial
Other States	BLM	None
All	TVA	Complete
All National Wildlife Refuges	FWS	Complete

*NPS—National Park Service; USFS—U.S. Forest Service; BLM—Bureau of Land Management; TVA—Tennessee Valley Authority; FWS—U.S. Fish and Wildlife Service.

†See text for definitions of closure type categories.